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REMEDIAL ACTION PLAN
11-19 FRENCHMANS ROAD RANDWICK NSW 2031
PREPARED FOR FRENCHMANS LODGE PROPERTIES PTY LTD
CES DOCUMENT REFERENCE: CES190901-FRE-AD

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Revision Number	Revision Date	Description
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EXECUTIVE SUMMARY

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Frenchmans Lodge Properties Pty Ltd (the Client) care of Centurion Group Pty Ltd to undertake specific intrusive investigations and prepare a Remedial Action Plan (RAP) for 11-19 Frenchmans Road, Randwick NSW 2031 (herein referred to as the site). The site is formally defined as Lot 3 and 4 in DP 13779 and Lot 10 DP 845575 and covers an area of approximately 0.27 hectares. It is currently zoned as Medium Density Residential. The site has a history of mixed residential and use as a hospital.

The site is proposed to be developed by the demolition of existing site structures and the construction of a new residential aged care facility with two levels of basement comprising workshop/storage rooms in the lowest level and carparking, staff amenities, resident facilities and facility services (laundry and waste rooms) in the upper basement level.

A Preliminary Site Investigation (PSI) (CES 2019a) with preliminary soil testing (three locations) and a Geotechnical Investigation (GI) (CES 2019b) were conducted at the Site in November 2019. The PSI found further investigation was necessary to target identified data gaps which included:

- *"The hydraulic elevator shaft sump, hydraulic pump, oil storage tank and stormwater system downgradient of the elevator sump pump discharge point;*
- *The chemical storage area;*
- *The grease trap; and*
- *To provide site coverage of fill material in a further 4 locations.'*

The further investigation was undertaken on 03 May 2021, targeting the gaps identified in the PSI report.

The key sources of contaminants identified at the site were filling of unknown origin, small scale plant, operational equipment and chemical storage. The contaminants of concern (identified in the revised conceptual model) include heavy metals, TPH, BTEX, PAHs, and OCPs. The main contaminants were identified in shallow fill from boreholes BH4, BH6, BH8, and BH9 to BH11. The laboratory detected contaminant concentrations in excess of the Site's adopted HIL/HSLs (B and C) and/or EIL/ESLs (Public Open Space (coarse soils) in the soil samples collected from these locations. Statistical analysis of contaminant concentrations confirmed remediation and/or management of contaminants on Site is necessary.

The objective of remediation is to provide sufficient engineering and management controls to make the site suitable (with respect to soil contamination) for the proposed development, to ensure protection of human health and the environment during and post remediation works, and to manage soils in a cost-effective manner. In absence of a site-specific assessment, remediation criteria include the HIL B/HSL D, HIL C/HSL D, and EIL/ESL (public open space (coarse soils)).

With reference to State Environmental Planning Policy No 55—Remediation of Land, the Client, via its appointed certified contaminated land consultant, should notify the Council 30 days prior to commencement of the remediation works that the works are considered to be Category 2 remediation works.

Based on the remedial options assessment, the applicable and preferred remedial option for the COPCs is: Excavation, transport and disposal of impacted soils at the site to a suitably licensed facility due mainly to the excess cut/fill volumes of the proposed development and to avoid the site requiring an EMP following completion of the remediation works. It is noted that all remediation works at the site must be undertaken in accordance with a Construction Environment Management Plan to mitigate risks to workers and the public during earthworks at the site.

The procedure for excavation and offsite disposal is as follows:

- The remediation areas are set out onsite;
- The area is excavated to the identified depth, with soils either excavated directly to trucks for offsite disposal at a suitably licenced waste facility capable of accepting the waste, or stockpiled onsite for offsite disposal at a later date;
- Waste classification of the material for offsite disposal is required prior to offsite disposal. Preliminary Waste classification is presented in Table 6;
- Following excavation of the impacted soils, validation of the excavation should be carried out in accordance with Section 14.

Remediation works should be carried out in accordance with Sections 12 to 14. Upon completion of the identified remediation works, the site will be suitable for the proposed residential aged care development. Contingency measures for remediation, site management, and unexpected finds are detailed within this RAP.

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11-19 FRENCHMANS ROAD RANDWICK NSW 2031
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LIST OF ABBREVIATIONS

ACM	Asbestos Containing Material
AHD	Australian Height Datum
ASS	Acid Sulfate Soil
BTEX	Benzene, Toluene, Ethylbenzene and Total Xylenes
CES	Consulting Earth Scientists Pty Ltd
CLM	Contaminated Land Management
COPC	Contaminants of Potential Concern
DECCW	Department of Environment and Climate Change and Water
DLWC	Department of Land and Water Conservation
EMP	Environmental Management Plan
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
km	Kilometre
LGA	Local Government Area
LPI	Land and Property Information Division
LEP	Local Environmental Plan
m	Metre
mbgl	metres Below Ground Level
NEPM	National Environment Protection Measure
NSW	New South Wales
OCP	Organochlorine Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PSI	Preliminary Site Investigation
PSP	Project Safety Plan
RAP	Redial Action Plan
TRH	Total Recoverable Hydrocarbons
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

REMEDIAL ACTION PLAN

11-19 FRENCHMANS ROAD RANDWICK NSW 2031

PREPARED FOR FRENCHMANS LODGE PROPERTIES PTY LTD

CES DOCUMENT REFERENCE: CES190901-FRE-AB

1 INTRODUCTION

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Frenchmans Lodge Properties Pty Ltd (the Client) care of Centurion Group Pty Ltd to undertake specific intrusive investigations and prepare a Remedial Action Plan (RAP) for 11-19 Frenchmans Road, Randwick NSW 2031 (herein referred to as the site). A site location plan is presented as Figure 1.

The site is proposed to be developed by the demolition of existing site structures and the construction of a new residential aged care facility with two levels of basement comprising workshop/storage rooms in the lowest level and carparking, staff amenities, resident facilities and facility services (laundry and waste rooms) in the upper basement level. The lower basement level is limited to approximately one third of the building footprint, in the south east. Above grade levels comprise residential and dining facilities and communal areas.

Plans of the proposed development, *Proposed Residential Care Facility 11-19 Frenchmans Road Randwick NSW* (Boffa Robertson Group, dated 30 September 2020) are presented as Appendix A.

A landscape plan *Summitcare Randwick Landscape Development Application Issue* C (Arcadia, dated August 2020) indicates that areas outside of the basement excavation footprint are to be landscaped, in addition to some areas overlying the basement excavation. A landscape plan is included in Appendix A.

A Preliminary Site Investigation (PSI) was previously prepared by CES:

- CES (2019) *Preliminary Site Investigation, 11-19 Frenchmans Road, Randwick NSW 2031*, (CES document reference: CES190901-FRE-AB, dated 25 November 2019).

The PSI (CES 2019) recommended that there was insufficient information to determine that the site is suitable for the proposed development, or if remediation/management of contamination is required. Further investigation to resolve the assessment was recommended, as presented below:

"*Targeted investigation of the following:*

- *The hydraulic elevator shaft sump, hydraulic pump, oil storage tank and stormwater system downgradient of the elevator sump pump discharge point;*
- *The chemical storage area;*
- *The grease trap; and*

- *To provide site coverage of fill material in a further 4 locations."*

Further investigations were undertaken on 03 May 2021, with the results presented in Section 9. The investigations identified contaminant concentrations in excess of the adopted Tier 1 screening criteria for both human health and ecological risk assessment. To address the identified risks, this RAP was prepared.

This RAP has been prepared in general accordance with the requirements specified for a Remedial Action Plan with reference to the following guidelines:

- NSW Environment Protection Authority (EPA) 2020, *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA);
- NSW EPA 2014, *Waste Classification Guidelines, Part 1: Classifying Waste*;
- NSW EPA 2017, *Contaminated Land Management, Guidelines for the NSW Auditor Scheme (3rd Edition)*;
- NSW EPA 1995, *Contaminated Sites: Sampling Design Guidelines*;
- NSW EPA 2004. *Chemical Control Order in Relation to Scheduled Chemical Wastes*; and
- National Environment Protection Council (NEPC) 1999, *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*, as amended 2013 (ASC NEPM (NEPC 2013));

2 OBJECTIVES AND SCOPE OF WORK

2.1 OBJECTIVES

The principal objectives of the works are as follows:

- Undertake the recommended investigations presented in the PSI (CES 2019);
- Characterise the contamination status of the site and determine the site's suitability for the proposed development;
- Determine preliminary waste classification;
- Determine the extent of remediation required to make the site suitable for the proposed development;
- Set remediation goals which will assist in making the site suitable for the proposed residential use and will pose no unacceptable risk to human health or to the environment;
- Document all procedures and plans to be implemented to reduce risks to acceptable levels for the proposed high density aged care residential land use; and
- Establish the environmental safeguards required to complete the remediation in an environmentally acceptable manner.

2.2 SCOPE OF WORK

To achieve the objectives the following scope of work was adopted:

- Review the PSI report (CES 2019) and other relevant updated information including updated plans of the proposed development;
- Intrusive investigation of eight locations in a targeting investigation as recommended in the PSI report;
- Assessment of the site environmental data against generic Tier 1 Screening Criteria for human health and ecological risk assessment;
- Preparation of detailed Conceptual Site Model (CSM) characterising the contamination sources, pathways and (current and future) receptors;
- Determination of the extent of remediation required to make the site suitable in the context of the proposed development design;
- Evaluation of remediation options and rationale for the recommended remedial option including contingency plan, if the selected remedial strategy fails;
- Establishment of remediation goals, acceptance criteria and remediation endpoints;
- Determination of a Validation Plan for the remedial works;
- Preparation of outline Construction Site Management Plan requirements for stormwater, soil management, noise control, dust control, odour control and WHS plan for the operational phase of remediation;

- Determination of Contingency Plans to respond to site incidents that may affect site workers or surrounding site environments or communities;
- Identification of regulatory compliance requirements such as licences or approvals;
- Identification of a remediation timeline and schedule and hours of remedial work operations;
- Identification of appropriate personnel to contact during remediation;
- Identification of reporting requirements; and
- Identification of long-term site management plan requirements (if required).

This RAP and the information summarised within has been prepared on the basis of information provided in existing reports which should be read in conjunction with this RAP.

2.3 REVISION OF THIS RAP

This RAP is applicable for the duration of the construction works at the site. It may be necessary to revise and re-issue the RAP in order to reflect changes in project objectives; parties responsible for implementation of the RAP and development; unexpected finds; or changes to planning or statutory requirements.

If revision of the RAP is necessary, the following procedure should be followed:

- Review of the RAP by an experienced environmental consultant with reference to the changes requiring the revision. This review should also be done in consultation with the appointed Site Auditor, where necessary, the Local Council, particularly if the updated report varies or is inconsistent with any condition of consent imposed by Council which could require a 'Modification of Consent' application under the Environmental Planning and Assessment Act 1979 to be submitted to modify the consent;
- Update the RAP, including the document register revision number information, to address the requirements of the changed conditions;
- The updated RAP should be provided to the Site Auditor for review and endorsement prior to re-issue; and
- Re-issue the RAP and provide notice to the key stakeholders that previous versions have been superseded.

A copy of any revised RAP should be provided to the Key Stakeholders listed in the distribution register.

3 SITE INFORMATION AND SETTING

The site information presented below is based on a review of government and publicly available information sources.

3.1 SITE IDENTIFICATION

The site is located at 11-19 Frenchmans Road, Randwick NSW 2031, within the Randwick City Council Local Government Area (LGA) and comprises three lots, identified as Lot 3 and 4 in DP 13779 and Lot 10 DP 845575. The site covers an area of approximately 2,715 m^2 (0.27 hectares) and is irregular in shape, roughly forming a T-shape. The geographical extent of the site is presented in Table 1 and presented in Figure 2:

Table 1: Geographical extent of the site (GDA 1994 MGA 56)

Corner/point of site	Eastings	Northings
Southeast corner of site	337826	6246594
Northeast corner of site	337821	6246617
Southwest corner of site	337755	6246570
Northwest corner of site	337750	6246599

3.2 SITE ZONING

The site is zoned as R3 – Medium Density Residential in the Randwick Local Environmental Plan 2012.

3.3 SITE DESCRIPTION

The site is irregular in shape, roughly forming a T-shape, is located near the crest of a slope and gently slopes to the northeast (<3% slope). The site is occupied and is currently used an aged care facility and residential dwellings. The site surface, outside of building footprints, was observed to generally covered with hard standing, with the exception of small, landscaped areas in peripheral areas of the site.

3.4 PROPOSED DEVELOPMENT

The site is proposed to be developed by the demolition of existing site structures and the construction of a new residential aged care facility with two levels of basement comprising workshop/storage rooms in the lowest level and carparking, staff amenities, resident facilities, and facility services (laundry and waste rooms) in the upper basement level. The lower basement level is limited to approximately one third of the building footprint, in the south east. Above grade levels comprise residential and dining facilities and communal areas. Plans of the proposed development, *Proposed Residential Care Facility 11-19 Frenchmans Road Randwick NSW* prepared by Boffa Robertson Group dated 30 September 2020 are presented as Appendix A.

Setbacks from the site boundary of the proposed basements range from 0.67 m in the north west of the development to 7.64 m in the south of the development – that is to say the proposed basements extend over the vast majority of the site.

A landscape plan *Summitcare Randwick Landscape Development Application Issue* C prepared by Arcadia dated August 2020 indicates that areas outside of the basement excavation footprint are to be landscaped, in addition to areas overlying basement excavation. A landscape plan is included in Appendix A. Based on the landscaped design details, it is likely that the landscaped areas are intended to be used for recreation.

A copy of the *Bulk Earthworks Cut/Fill Plan* prepared by Henry & Hamas dated December 2019 Referenced 19826_DA_BE01 is provided in Appendix B, with excavations to between 69.45 to 72.25 m AHD required over the building footprint, which provides a predicted cut from existing levels of between 2 to 4 m in areas of single basement and up to 9 m in the area of the building with two levels of basement.

Outside of basement excavations, more minor cuts of between 0.25 to 0.75 are required, with fill of up to 1 m required in two localised areas of the north east of the site.

3.5 SURROUNDING LAND USE

The site is situated in an area of mixed residential land use, with residential land use adjacent to the site in all directions.

The site immediate surrounding land use is presented in Table 2.

Table 2: Surrounding Land Use

Orientation	Description
North	Low and high density residential.
West	Low and high density residential.
South	Low and high density residential.
East	Low and high density residential. A service station is located approximately 100 m to the east of the site.

3.6 SENSITIVE RECEPTORS

Sensitive receptors are presented in Table 3.

Table 3: Sensitive Receptors Onsite and Nearby

Sensitive Receptor	Receptor Type	Orientation and Distance from Site
Current/Future Site Occupiers Residential	Human Health – High Density Residential	0 m
Future Site Workers (Construction) Occupational Health	Human Health	0 m
Current/Future Nearby Site Occupiers (offsite) Residential,	Human Health – Low/High Density Residential,	0 m
Coogee Bay/Glebe Gully Recreational, Ecological	Human Health – Recreational;	1.8 km south east (Coogee Bay) 350 m south east (Glebe Gully)

	Ecological – Marine water Ecosystem (Coogee Bay) Freshwater ecosystem (Glebe Gully)	

3.7 TOPOGRAPHY

The topography of the site is generally flat, with gentle slopes to the north east (<3% slope). The site is situated near the crest of a slope between 75 to 77 m AHD.

3.8 GEOLOGY

A review of the Sydney 1:100 000 Sheet 9130, 1st edition. Geological Survey of New South Wales, Sydney geological map indicates that the site is positioned on a boundary of geological units and is underlain by Triassic medium to coarse grained quartz sandstone, very minor shale and laminate lenses of the Hawkesbury Sandstone Group and Quaternary medium to fine-grained marine sand with podsols.

3.9 SOILS

A review of the Sydney 1:100 000 Sheet 9130 soil landscape map indicates that the site is underlain by Newport aeolian landscapes.

3.10 HYDROGEOLOGY

A review of the Hydrogeology Map of Australia, Commonwealth of Australia (Geoscience Australia) indicates that the site is likely to be underlain by porous, extensive highly productive aquifers.

No information on groundwater flow direction is currently available, however based on local topography shallow groundwater is likely to flow to the north east. There is uncertainty with respect to this assessment.

3.11 SENSITIVE LOCAL ENVIRONMENTS

Underground Petroleum Storage System (UPSS) environmentally sensitive zones represent areas that are likely to be vulnerable to contamination from leaking UPSS, due to geological or groundwater properties. A review of the Department of Environment, Climate Change and Water (NSW) UPSS Regulation – Sensitive Zones Map (2010) (Randwick City Council) shows that the site is located within an UPSS environmentally sensitive zone.

UPSS environmentally sensitive zones have been identified by the NSW EPA through a risk-based approach to protecting sensitive environmental receptors. They represent a conservative assessment of areas that are likely to be vulnerable to contamination from leaking UPSS (due to geology or groundwater properties), or in close proximity to vulnerable environmental receptors

(such as national parks and anything that is likely to be adversely affected by contaminated groundwater, e.g. groundwater bores, rivers, lakes, etc.).

As there are no records of any UPSS at the Site, this is not considered further.

3.12 ACID SULFATE SOILS

With reference to the Botany Bay Acid Sulphate Soils Risk Map, Edition 2, 1:25,000 (Department of Land and Water Conservation, 1997), the site is situated in an area of no known occurrence of acid sulfate soils: "*Acid sulfate soils are not known or expected to occur in these environments"* With respect to the Randwick City Council LEP 2012 the site is not situated on land classified as Class 1 - 5 and as such Acid Sulfate Soils are not considered further.

3.13 METEOROLOGY

The site is located approximately 6.4 km north east of the former Commonwealth Bureau of Meteorology Sydney Airport weather station (Station ID 066037). The following climatic information was obtained from this data source, based on data recorded from 1939 to 2019:

- Mean monthly rainfall was variable throughout the year, with rainfall being highest during June (125.3 mm) and lowest during September (60.0 mm);
- Highest mean temperatures (recorded at 3 pm) occur during the months of December to March (mean maximum 21.1 to 24.8 degrees Celsius); and
- Cooler temperatures (recorded at 9 am) occur during the months of June to August (mean temperature 10.8 to 12.5 degrees Celsius).

4 PRELIMINARY SITE INVESTIGATION (CES190901-FRE-AD)

Detailed site walkover observations, site history information, and results of limited soil sampling is presented in *Preliminary Site Investigation, 11-19 Frenchmans Road, Randwick NSW 2031*, dated 25 November 2019 (CES document reference: CES190901-FRE-AB) and summarised below:

4.1 SITE HISTORY

A summary of the site history assessment is presented below:

- The historical title review indicates that the site has a history of mixed residential (Lots 3 and 4 in DP13779) and use as a hospital, from as early as 1936 (Part Lot 10 DP845575). A review of the previous title holders of the site identified no high-risk land uses such as heavy commercial/industrial or uses likely to require bulk storage of chemicals (except for prior hospital use and the current age care) or hydrocarbon fuels;
- Review of historical aerial photographs there is a potential for the site to have been impacted by previous developments, most likely due to the potential of historic filling and demolition of structures with the potential to contain hazardous building materials, and hospital activities (including incinerator, ash disposal, and medical wastes). It is unlikely that the site was subject to significant industrial processes based on the aerial photographs;
- Topographical map review does not indicate that the site has a risk of historical use for potentially contaminating activities such as heavy commercial/industrial uses;
- The site is not listed on the NSW EPA Contaminated Sites Register. No sites within a 500 m buffer of the site are listed on the NSW EPA Contaminated Sites Register;
- The site is not listed on the NSW EPA PFAS Investigation Programme. No sites within a 1 km buffer of the site are listed on the NSW EPA PFAS Investigation Programme, Department of Defence PFAS Investigation & Management Program or Airservices Australia National PFAS Management Program;
- The site is not subject to an Environment Protection Licence (EPL) issued under the Protection of the Environment Operations Act 1997; and
- Review of historic business directories indicate that the Site has been used as a hospital from 1950.

4.2 SITE WALKOVER

A summary of the site walkover assessment is presented below:

- A grease trap was observed at the east of the larger central building. Approximately 1 m wide by 3 m long, depth unknown;
- A cleaning and paint storage room was identified near the western boundary of the site;
- A hydraulic oil storage tank and pump associated with the lift in the main facility building;
- No bulk fuel storage was observed onsite during the site walkover;

- No groundwater wells were observed onsite during the site walkover; and
- No suspected Asbestos Containing Materials (ACM) were observed on-site during the site walkover however it was reported that there are ACM in the central structure of the site. An Asbestos Register was not provided.

4.3 INTRUSIVE INVESTIGATION

A summary of the intrusive investigation is presented below:

- Fill material comprising fine grained brown to dark brown sand with trace fine angular gravel and roots was encountered to a maximum depth of 1.5 m;
- Groundwater was not observed during drilling. Boreholes were extended to 8 m depth;
- No soils encountered during fieldwork exhibited visual or olfactory indicators of contamination such as odours or staining;
- No soils encountered during fieldwork exhibited indicators of ash or medical wastes;
- No asbestos or suspected asbestos containing materials (ACM) was observed in site soils field screening; and
- In soil samples collected and analysed, contaminants of potential concern identified in the Preliminary Conceptual Site Model did not exceed the conservative Tier 1 human health or ecological risk screening criteria.

5 PRELIMINARY CONCEPTUAL MODEL

Based on the results of the PSI (CES 2019), a preliminary conceptual site model is presented below.

5.1 POTENTIAL SOURCES OF CONTAMINATION

From a review of the available information relating to the site and surrounding area, there is a potential for the site to have been impacted by the previous activities at the site:

- The site has been subject to filling for the purposes of previous developments;
- Three samples of fill material were collected and analysed as part of the investigation. Contaminant concentrations were not detected in excess of the conservative Tier 1 screening criteria. Due to the preliminary nature of the investigation and the likely heterogeneous nature of fill materials, the potential for contaminant concentrations in excess of the Tier 1 screening criteria at the site remains;
- Previous structures (above and below ground) at the site which have been demolished may have contained hazardous building materials, with the potential to impact near surface soils;
- No potential ACM were observed during fieldwork and asbestos, lead, and PCB concentrations were not detected above the Tier 1 screening criteria. Due to the preliminary nature of the investigation and the likely heterogeneous distribution of hazardous building materials (if present) both above and below ground (such as asbestos pipework) the potential for hazardous building materials at the site remains;
- The site has a history of use as a hospital, which could include the use of small scale plant (incinerator and resultant ash disposal), asbestos pipework (such as fire water pipework) and operational equipment and chemical storage which have the potential to impact soil and groundwater from incidental leaks and spills;
- During the site walkover assessment, a chemical storage area, hydraulic elevator and grease trap were observed. Investigation of this potential sources of impact has not been undertaken.
- Based on anecdotal information, there is potential for hydrocarbon impact arising from stormwater pipes downgradient of the hydraulic elevator sump pump.
- Two service stations have been located within 100 m of the site, one 24 m to the west and one 100 m to the east. The direction for groundwater flow is unknown, however based on a review for the local topography, it is likely to flow to the east, which may result in contaminants from the nearby former service station impacting the site;
- Based on observations made during drilling, groundwater at the site is a depths of greater than 8 mbgl. Applying the petroleum vapour intrusion assessment site screening using vertical screening distances (ITRC 2014), groundwater at the site is greater than the maximum vertical screening distance (distance from the petroleum vapour source and the bottom of the building foundation) of 5.49 m (18 ft) for industrial petroleum sites, therefore

petroleum vapour intrusion risk from an offsite source is considered to be low, and is therefore not considered further.

5.2 CONTAMINANTS OF POTENTIAL CONCERN (COPC)

Contaminants of Potential Concern (CoPC) associated with the site are:

Fill Materials of unknown origin:

The COPCs for fill materials that may be encountered onsite are presented below based on a broad range of potential contaminants.

- Petroleum Hydrocarbons (analysed as TRH);
- Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Organochlorine Pesticides (OCP);
- Polychlorinated Biphenyls (PCBs);
- Arsenic, cadmium, copper, lead, mercury, and zinc (common metal and metalloids); and
- Asbestos.

Developments containing hazardous building materials (including demolition):

The COPCs for developments containing hazardous building materials are presented below;

- Lead; and
- Asbestos.

Small scale plant and operational equipment and chemical storage.

- TRH;
- BTEX;
- Lead; and
- Fats oils and grease.

5.3 POTENTIAL PATHWAYS

The pathways through which contaminants may reach receptors are in part determined by the nature and behaviour of the contaminant. Considering the potential contamination sources and the likely subsurface conditions to be encountered on the site, the following potential pathways have been identified, taking into account the development plan:

- Direct dermal contact;
- Incidental ingestion;

- Inhalation of particulate matter (dust);
- Inhalation of vapours from impacted soil;
- Dissolution or suspension (leaching) from soils to groundwater; and
- Ecological exposure to impacted soil and groundwater.

Pathways not considered:

- Ingestion of impacted biota (terrestrial or aquatic); and
- Inhalation of vapours from groundwater.

5.4 RECEPTORS

Based on the proposed high-density residential aged care development, the potential receptors for the contaminants of concern are:

- Site workers (acute/short term risks);
- Current/Future site users;
- Offsite residential users;
- Groundwater; and
- Aquatic ecological receptors (i.e. Glebe Gully and Coogee Bay, approximately 350 m and 1.8 km east of the site, respectively).

5.5 CONCEPTUAL MODEL – POLLUTANT LINKAGES

The identified contaminant sources, pathways and receptors have been assessed to establish plausible pollutant linkages:

- Dermal contact with impacted soils in landscaped areas by current/future site users;
- Dermal contact with impacted soils during construction by site workers;
- Incidental ingestion of impacted soils in landscaped areas by current/future site users;
- Incidental ingestion of impacted soils during construction by site workers;
- Incidental ingestion of impacted surface water during construction by site workers;
- Inhalation of particulate matter (asbestos or contaminated soil/dust) by current/future site users;
- Inhalation of particulate matter (asbestos or contaminated soil/dust) during construction by site workers;
- Inhalation of volatile contaminants from soil by current/future site users (indoor and outdoor);
- Inhalation of volatile contaminants from soil by site workers during construction (indoor and outdoor);

- Contamination of groundwater through the downward migration of leachable contaminants;
- Potential contamination of surface water could occur through downward and lateral migration of leachable/soluble contaminants;
- Terrestrial biota uptake of contaminants from soils or groundwater; and
- Aquatic biota uptake of contaminants from surface water.

As a number of potential pollutant linkages are present, further assessment was carried out as recommended by the PSI (CES 2019).

6 FIELDWORK PROGRAMME

The following sampling programme was designed based on the previous assessment and investigation.

6.1 DATA QUALITY OBJECTIVES

The DQO process is a seven-step iterative planning approach that is used to define the type, quantity and quality of data needed to inform decisions relating to the objectives of the investigation.

6.1.1 Step 1 – State the Problem

This step comprises a summary of the environmental impact that will require new environmental data and identifies the resources required to resolve the issue.

The problem is:

- Due to the limited investigation conducted to date and based on the findings of the PSI further investigation is required to assess the extent and nature of any contamination of the soil.
- Data gaps have been identified in the understanding of the site's suitability based on the PSI assessment, as presented in the recommended further investigation in the PSI (CES 2019).

The objective is:

- Further the understanding of the contamination (if any) at the site and the assessment of site suitability; and
- Determine if the site is suitable for the proposed new aged care development.

The consultant project team will comprise Mark Challoner (CEnvP – Site Contamination Specialist) and Tristan Goodbody (Associate Environmental Engineer) for technical review and Andrew Carras (Environmental Scientist) for fieldwork and technical reporting.

The Sub-contract analytical laboratories are Envirolab (Primary) and ALS (Secondary).

The appropriate regulator is Randwick City Council.

The preliminary conceptual site model is presented in Section 5.

6.1.2 Step 2 – Identify the Decision Statement

This step comprises the identification of decisions that need to be made about the impact and the new environmental data required to make them.

- Are there concentrations of contaminants of concern which exceed the adopted screening criteria selected based on the receptor and exposure type presented in the CSM?
- How do the detected concentrations of contaminants of concern compare to the criteria for classification of waste?

It is expected that by resolving these questions, it will be possible to resolve the objectives of the project.

6.1.3 Step 3 – Identify Inputs to the Decision

This step involves the identification of the information required to support any decision and whether any new environmental data will be required.

- Relevant existing soil data from previous investigations;
- New soil laboratory analytical data collected, field observations and measurements made during field work;
- Field and laboratory QAQC data quality assessment;
- Published Tier 1 Screening criteria for the contaminants of concern as published in *ASC NEPM Schedule B1* (NEPC 2013) adopted screening criteria and rational are presented in Section .

6.1.4 Step 4 – Define the Study Boundaries

This step involves the spatial and temporal aspects of the environmental media that the data must represent to support the decision (s).

- Lateral – as defined by the site perimeter shown on Figure 2;
- Vertical – as defined by the site surface to the maximum depth of the deepest soil bore advanced at the site during investigation, 8 m; and
- Temporarily – This project involves the collection of spot sampling events at the proposed locations. As a result, the concentrations detected by the laboratory in the samples recovered will be representative of discrete moments in time and as such, will be subject to climatic and anthropogenic activities at that point or related to human activities that have occurred up to that point at the particular sampling location and therefore may not be representative of long term concentrations. If average concentrations are required to enable an understanding of longer term (chronic) risks, then additional sampling may be required.

6.1.5 Step 5 – Develop the Decision Rule

This step comprises defining the parameter of interest, specifying the action level and integrating Step 1 to 4 into a single statement that gives a logical basis for choosing between alternative actions.

- The acceptable limits for the QA/QC samples collected during the investigation are presented in Table 4;

  A decision on the acceptance of the analytical data will be made on the basis of the Data Quality Indicators (DQI) in the context of the PARCC parameters as follows.

  - Precision: A quantitative measure of the variability (or reproducibility) of data;
  - Accuracy: A quantitative measure of the closeness of reported data to the "true" value;
  - Representativeness: The confidence (expressed qualitatively) that data is representative of each media present on Site;
  - Completeness: A measure of the amount of useable data from a data collection activity; and
  - Comparability: The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event.
- The parameters of interest are the concentrations in the sampled media of the contaminants of concern;
- Assessment criteria are Published Tier 1 screening criteria for the contaminants of concern (ASC NEPM Schedule B1 (NEPC 2013)).
- Criteria for General Solid Waste (GSW) and Restricted Solid Waste (RSW) presented in the *Waste Classification Guidelines: Part 1 Classifying Waste* (NSW EPA 2014).

The following decision rules are presented:

1. Are contaminant concentrations detected in excess of the adopted Tier 1 screening criteria?
2. Do contaminant concentrations pose an unacceptable risk to the receptors identified in the CSM?
3. Is there sufficient data to revise the CSM and resolve the data gaps in the site characterisation?
4. Is remediation or management of contamination required to make the site suitable for the proposed development?
5. How do the detected concentrations of contaminants of concern compare to the criteria for classification of waste?

6.1.6 Step 6 – Specify Limits on Decision Errors

This step involves specifying the decision-maker's acceptable limits on decision errors.

Specific limits for this project are in accordance with the appropriate guidance made or endorsed by the NSW EPA, appropriate indicators of data quality, and standard procedures for field sampling and handling.

6.1.7 Step 7 – Optimise the Fieldwork Program Design

The optimised program for the fieldwork is presented in the subsequent Section 6.2.

6.2 INTRUSIVE INVESTIGATION

Fieldwork was completed on 3 May 2021.

6.2.1 Sample Density

Eight locations were assessed on 03 May 2021; which, when combined with the three sample locations assessed previously as part of the PSI (CES 2019), exceeds the minimum sample density prescribed by Table A of the *Sampling Design Guidelines* (NSW EPA 1995) for a detailed site investigation for a site 0.27 ha in size (8 locations).

6.2.2 Sample Pattern

Sample locations were selected on a targeted basis (four locations BH8 to BH11)) and in accessible areas of the site distributed to provide of site coverage (four locations BH4 to BH7).

Sample locations are presented on Figure 2.

6.2.3 Sample Depth

The sampling at the eight locations was conducted by drilling boreholes using a hand auger to a maximum depth based on method refusal. Where required, concrete coring techniques were used to penetrate concrete slabs at surface.

Samples were collected from near surface sample points and through the soil profile at regular intervals (where possible).

6.2.4 Field Screening

Field screening of samples were carried out by a combination of olfactory and visual contamination indications such as odours, staining or the presence of building rubble, and using a calibrated Photoionisation Detector (PID). A calibration certificate for the PID is provided in Appendix E.

Field screening in accordance with ASC NEPM (NEPC 2013), Schedule B (2) Section 11.3.2 of 10 L soil samples for asbestos was not carried out due to the limited volume of soils collected from boreholes completed.

6.2.5 Sample Collection

Care was taken to ensure that representative samples were obtained, and that the integrity was maintained, particularly when dealing with potentially volatile or semi-volatile compounds. Samples were collected directly from hand augers using new nitrile gloves for each sample and placing the soil directly into laboratory supplied containers.

Samples for QAQC assessment (Blind and Split samples) were not homogenised in order to preserve potentially volatile or semi-volatile compounds, instead duplicate and triplicate samples were collected from similar depths from similar targeted material.

6.2.6 Decontamination Procedures

Dedicated sampling equipment (new nitrile gloves) and laboratory prepared sample containers were used. The hand auger was decontaminated using a combination of Decon 90 and potable water.

6.2.7 Sample Containers

Soil sample containers comprised glass jars with Teflon lined lids and zip locked bags supplied by the primary laboratory. The jars were completely filled leaving no headspace, labelled with the job number, date, unique sampling point identification and initials of the project environmental scientist/engineer.

6.2.8 Method of Sample Storage and Handling

The samples were immediately placed in an esky/cool box in which ice has been added, to keep the samples cool. The samples in the cool box were then transported to the laboratory.

6.2.9 Sample Analysis Schedule

Based on the preliminary CSM, samples were analysed for Total Recoverable Hydrocarbons (TRH), Benzene Toluene Ethylbenzene and Xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAH) Polychlorinated Biphenyls (PCB), Organochlorine and Organophosphate Pesticides (OCP/OPP), 8 common metals and metalloids and asbestos (500mL NEPM).

6.2.10 Sample Logging

The boreholes were logged in accordance with AS1726-2017 and soil samples were collected during fieldwork by a qualified experienced geo-environmental engineer. The log records the following data:

- Sample number and depth;
- Soil classification, colour, consistency or density, odour and moisture content;
- Depth of excavation;
- Method of excavation; and
- The depth of first encountered free water.

6.2.11 QA/QC Documentation

While on site, the supervising engineer filled out a copy of a ‘sample register’, which documents:

- Time of sample collection;
- Weather; and

- Sample location and depth.

All samples were classified in the field based on soil/fill characteristics and obvious signs of contamination such as discolouration or odour were noted on the field logs.

All samples, including QC samples, were transported to the primary and check laboratories under Chain-of Custody (COC) procedures and maintained in an ice-filled cooler. The following details were recorded on the COC form:

- Site identification;
- The sampler;
- Nature of the sample;
- Collection time and date;
- Analyses to be performed; and
- Sample preservation method.

7 SITE ASSESSMENT CRITERIA

The selection of the most appropriate investigation levels for use with a site specific environmental setting and land use scenario should consider factors including the protection of human health and ecosystems.

Investigation and screening levels are provided in *Guideline on Investigation Levels for Soil and Groundwater* (Schedule B1, ASC NEPM (NEPC 2013)) for commonly encountered contaminants which are applicable to generic land use scenarios and include consideration of, where possible, the soil type and the depth of contamination.

Investigation levels and screening levels are the concentrations of a contaminant above which further appropriate investigation and evaluation will be required. Investigation and screening levels provide the basis of Tier 1 risk assessment.

7.1 SOIL

7.1.1 Human Health Assessment

To address potential health impacts at the site, CES compared the analytical testing results against a set of health based soil investigation criteria appropriate for the proposed land-use. That is, the Health Investigation Level (HIL) has been set at a level that provides confidence that contaminant concentrations below the HIL will not adversely affect human health.

As described in Section 3.4, the future site land-use proposed is high density residential aged care living development with limited areas of landscaping; therefore, HIL B (residential land minimal opportunities for soil access) criteria have been adopted as a conservative approach for the assessment of human health for the main portion of the site and HIL C (public open space) has been adopted for the minor landscaped areas of the site.

For multistorey buildings where non-residential uses (e.g. car parking or commercial use) exist in a basement or at ground level, then land use category HSL D (commercial/industrial) should be applied for the assessment of vapour intrusion. Based on the proposed development at the site, there is a proposed car park and other non-residential uses in the two basement levels. Therefore, the HSL D will apply to the majority of the site for the assessment of vapour intrusion, with HSL C applied to the minor landscaped areas of the site.

7.1.2 Asbestos

Health screening levels for asbestos in soils, which are based on scenario-specific likely exposure levels, are outlined in Table 7 of Schedule B1, ASC NEPM (NEPC 2013). Based on the proposed

aged care living development with gardens and access to soil, the Residential B exposure setting has been selected for the majority of the site and Residential C for landscaped areas.

The adopted Site Assessment Criteria based on the land use presented in the proposed development are presented on Figure 6.

7.1.3 Ecological Assessment

To address the potential ecological impacts at the site, CES compared the analytical testing results against a set of ecological investigation and screening levels (EILs) appropriate for the proposed land use of urban residential and public open space (aged care development).

The ASC NEPM (NEPC 2013) EIL criteria adopted were adjusted using the CSIRO for *NEPM Ecological Investigation Level Calculation Spreadshee*t (CSIRO, 2010) based on site specific soil physiochemical properties determined from analysis results from sample BH6/0.15 m of pH (5.1 pH), cation exchange capacity (CEC) (6.9 cmolc/kg), organic content (3.9%) and clay content (11%). Additionally, the ASC NEPM (NEPC 2013) ESL (coarse soil texture) was adopted for the ecological assessment.

7.2 WASTE CLASSIFICATION

For off-site disposal of soils, the assessment should be undertaken in accordance with the NSW EPA (2014) *Waste Classification Guidelines: Part 1 Classifying Waste.*

8 QUALITY ASSURANCE / QUALITY CONTROL

Quality Assurance and Quality Control (QAQC) assessment is presented below, including field procedures, field QAQC sampling, and laboratory QAQC procedures.

The QA/QC Data Acceptance criteria are presented in Table 4.

Table 4: QA/QC Data Acceptance Criteria

QA/QC Sample Type	Method of Assessment	Acceptable Range
Field QA/QC		
Blind and Split Replicates	The assessment of split replicate is undertaken by calculating the Relative Percent Difference (RPD) of the replicate concentration compared with the original sample concentration. The RPD is defined as: $RPD = 100 \times \frac{\lvert X_1 - X_2 \rvert}{Average}$ Where: X_1 and X_2 are the concentration of the original and replicate samples.	*The acceptable range depends upon the levels detected:* ▪ *0 – 100% RPD (When the average concentration is < 5 times the PQL)* ▪ *0 – 75% RPD (When the average concentration is 5 to 10 times the PQL)* ▪ *0 – 50% RPD (When the average concentration is > 10 times the PQL)*
Blanks (Rinsate, Trip and Field Blanks)	*Each blank is analysed as per the original samples.*	*Analytical Result < PQL*
Laboratory QA/QC		
Laboratory Duplicates	Assessment as per Split Replicates.	*The acceptable range depends upon the levels detected:* ▪ *0 – 100% RPD (When the average concentration is < 4 times the PQL)* ▪ *0 – 50% RPD (When the average concentration is 4 to 10 times the PQL)* ▪ *0 – 30% RPD (When the average concentration is > 10 times the PQL)*
Surrogates Matrix Spikes Laboratory Control Samples	Assessment is undertaken by determining the % Recovery of the known spike or addition to the sample. $\%\ Recovery = 100 \times \frac{C - A}{B}$ Where: A = Concentration of analyte determined in the original sample; B = Added Concentration; C = Calculated Concentration.	Surrogates: 70% – 130% Matrix Spikes: 70% - 130% (Organics) 80% - 120% (Inorganics) LCS: 70% - 130% (Organics) 90% - 110% (Inorganics)
Method Blanks	Each blank is analysed as per the original samples.	*Analytical Result < PQL*
Note: *PQL = Laboratory Practical Quantitation Limit or the minimum detection limit for a particular analyte.*		

8.1 GENERAL FIELD QAQC PROCEDURES

Quality assurance procedures adopted for the assessment included:

1. Conducting fieldwork and sampling in accordance with established CES Standard Operation Procedures;
2. Ensuring field screening instruments are calibrated;
3. Placing samples immediately on ice following sampling;
4. Ensuring correct sampling containers and preservatives are employed for contaminants being analysed; and
5. Ensuring analysis was performed within recommended holding times.

All samples were labelled with a unique identifier consisting of the sample location. Soil samples were placed into laboratory prepared and supplied sample containers. After collection, samples were placed directly into an ice-filled esky and transported to a NATA accredited laboratory for the analytes selected, under chain of custody (COC) protocols.

8.2 FIELD QA / QC RESULTS

Field QA/QC for this project consisted of a blind replicate, split replicate, a trip spike, and a trip blank. The results of the QAQC assessment including the Relative Percentage Difference (RPD) calculations are presented in Tables 15 and 16.

Blind (duplicate) and split (triplicate) samples provide a check on the analytical proficiency of the laboratories and consist of duplicate or triplicate samples collected from the same location and media. These samples are preserved, stored, transported, prepared, and analysed in an identical manner in the primary laboratory (blind) or the secondary laboratory (split).

8.2.1 Blind Replicate Samples

One blind replicate (duplicate) sample was collected to meet the requirements of the ASC NEPM (NEPC 2013) of a minimum of 5% of samples. The sample was preserved, stored, transported, prepared and analysed in an identical manner. The results of analyses on the primary and blind replicate sample pair were assessed by calculating the Relative Percentage Difference (RPDs) between the results.

Blind replicate RPD results conformed to the Data Acceptance Criteria (DAC) presented in Table 4.

8.2.2 Split Samples

One split replicate (triplicate) sample was collected to meet the requirements of the ASC NEPM (NEPC 2013) of minimum of 5% of samples. The sample was preserved, stored, transported, prepared and analysed in an identical manner. The results of analyses on the primary and blind replicate sample pair were assessed by calculating the Relative Percentage Difference (RPDs) between the results.

Split replicate RPD results conformed to the Data Acceptance Criteria (DAC) presented in Table 4.

8.2.3 Trip Blanks

Trip blanks consisted of pre-washed bottles containing laboratory prepared distilled or de-ionised water or uncontaminated soil. The role of trip blanks is to detect potential contamination during sample transport. These samples reside in transport vessels during sampling activities and are not opened in the field.

One Trip Blank was collected and analysed. Trip Blank results were not detected in excess of the laboratory PQL, and therefore conformed to the DAC.

8.2.4 Trip Spikes

Trip spikes consisted of pre-washed bottles containing laboratory prepared water or soil spiked with a distinct concentration of volatile contaminant. The role of trip spikes is to ensure correct handling, in particular the use of ice boxes, is utilised when during collection and transport.

One Trip Spike was collected and analysed. Trip Spike recoveries were detected within the range presented as acceptable in the DAC.

8.3 LABORATORY QA/QC ASSESSMENT

The reliability of test results from the analytical laboratories was monitored according to the QA/QC procedures used by the NATA accredited laboratory. The QA/QC programme employed by Envirolab (the primary laboratory) and ALS (the secondary laboratory) specifies holding times, extraction dates, method descriptions, Chain of Custody (COC) requirements, analysis, PQLs and acceptance criteria for the results. Laboratory QA/QC requirements to be undertaken by Envirolab are based on ASC NEPM (NEPC 2013) requirements.

Laboratory QA/QC assessment results are presented in the Laboratory Certificates of Analysis and documentation presented in Appendix C. Review of QAQC comments in the laboratory Certificates of Analysis did not identify issues which would indicate that are likely to have had a material effect on the assessment of laboratory analytical data.

8.4 QAQC ASSESSMENT SUMMARY

The field procedures applied, and laboratory QA/QC programme demonstrates that the data provided by the laboratory is representative of the properties of the samples provided by CES. The samples were collected in accordance with established CES standard operating procedures. The QA/QC assessment did not detect any issues with the quality of the data collected therefore CES has a high degree of confidence in the quality of the data provided, and the data within this report is representative and suitable for the assessment.

9 RESULTS

9.1 ENCOUNTERED SUBSURFACE CONDITIONS

Detailed descriptions and depths of materials encountered are presented on the borehole logs included in Appendix D.

A subsurface model has been prepared and is presented in Table 5.

The depths of the various strata are based on the depths encountered at the borehole locations and may be different at other parts of the site.

It should be noted that the depths provided in this table relate to the ground level at the time of the current investigation in May 2021.

Table 5: Inferred Subsurface Model

Geotechnical Unit	Approximate Depth to Top of Unit (m)	Approximate Thickness (m)	Typical Description
Concrete	0.0	0.1	• CONCRETE
FILL	0.0 - 0.12	0.40 to 1.4	• Silty SAND: fine to medium grained, well sorted, dark brown, trace sub-rounded gravels, some minor clay (some locations), with rootlets (some locations), brown/grey/dark brown/dark grey, foreign materials include terracotta, glass, and bitumen (some locations) • SAND, fine grained, brown/dark brown. Trace angular gravel, roots. Moist
SAND	0.35 to 1.5	0.25	• Clayey SAND: fine to coarse grained, light grey/dark grey/light brown/white, trace fine angular gravel
SANDSTONE	0.20 to 1.75	>7.25 (Base not penetrated)	• SANDSTONE: fine grained, dark to pale grey, brown and red, extremely weathered to fresh, extremely low to high strength. Horizontal laminations of shale (1-5 mm thick at 10-50 mm spacings)

Groundwater was not encountered during drilling.

9.2 FIELD SCREENING

No soils encountered during fieldwork exhibited visual or olfactory indicators of contamination such as odours or staining.

PID screening of soils did not detect VOC in soil headspace in excess of 7.1ppm indicating volatile contamination is unlikely. PID results are presented on borehole logs presented as Appendix D.

No asbestos or suspected asbestos containing materials (ACM) were observed in site soils.

9.3 LABORATORY ANALYSIS

Soil analytical results are presented in Table 14, including a comparison to the adopted screening criteria.

Asbestos field screening results and laboratory analytical results are presented on Table 15, including a comparison to the adopted screening criteria.

A comparison of soil analytical results to the waste classification guidelines are presented in Table 19.

Tables 14, 15 and 19 include analytical results from the PSI report (CES 2019a) to allow for a complete assessment of the site's environmental data.

Laboratory Certificates of Analysis, Sample Receipt Notification, and Chain of Custody documentation is presented as Appendix C.

9.3.1 Human Health Screening Assessment

The following exceedances of the adopted human health screening assessment were detected, as presented in Table 14:

- Carcinogenic Polycyclic Aromatic Hydrocarbons expressed as Benzo(a)pyrene Toxic Equivalence Quotient (TEQ) exceeded the human health screening criterion in samples BH8/0.15 (6.6mg/kg), BH10/0.15 (6.5mg/kg), and BH11/0.15 (8.4mg/kg);
- Aldrin and Dieldrin exceeded the human health screening criteria in sample BH9/0.15 (440 and 13 mg/kg, respectively); and
- Lead exceeded the human health screening criterion in samples BH4/0.15 (1,300 mg/kg), BH8/0.15 (2,200 mg/kg), and BH11/0.15 (2,100 mg/kg).

9.3.2 Ecological Assessment

The following exceedances of the adopted EIL/ESL criteria were detected, as presented in Table 14:

- Benzo(a)pyrene exceeded the ESL criterion in samples BH4/0.15 (1.2 mg/kg), BH6/0.15 (2.1 mg/kg), BH8/0.15 (4.6 mg/kg), BH10 /0.15 (4.6 mg/kg), and BH11/5.9 (5.9 mg/kg);
- TRH >C16-C34 exceeded the ESL criterion in samples BH6/0.15 (410 mg/kg), BH8/0.15 (370 mg/kg), BH9/0.15 (1900 mg/kg), and BH10/0.15 (700 mg/kg);

- Copper exceeded the EIL criterion in sample BH11/0.15 (140 mg/kg);
- Lead exceeded the EIL criterion in samples BH4/0.15 (1,300 mg/kg), BH8/0.15 (2,200 mg/kg), and BH11/0.15 (2,100 mg/kg); and
- Zinc exceeded the EIL criterion in samples BH8/0.15 (430 mg/kg) and BH11/0.15 (670 mg/kg).

Soil physiochemical properties used in the EIL/ESL calculation re provided in Table 18.

9.3.3 Waste Classification

A summary of waste classification results as presented in Tables 6 and 19, is presented below:

- Concentrations of benzo(a)pyrene (maximum 5.9 mg/kg) reported were below the SCC1 and TCLP1 criteria for general solid waste;
- Scheduled chemical concentrations exceeded the SCC2 criteria for restricted solid waste and therefore should be classified as scheduled chemical waste (as hazardous waste);
- Concentrations of lead (maximum 2200 mg/kg) were below the SCC2 and TCLP2 criteria for restricted solid waste;
- No ACM or asbestos fines were detected or observed within any of the fill materials.

10 DISCUSSION OF ADDITIONAL INTRUSIVE INVESTIGATION

10.1 HUMAN HEALTH RISK ASSESSMENT

Exceedance of the human health screening criteria for Carcinogenic Polycyclic Aromatic Hydrocarbons expressed as benzo(a)pyrene TEQ, adlrin and dieldrin, and lead have been identified in fill soils, which indicates that the fill soils at the site may pose an unacceptable risk to human health.

Statistical analysis of contaminant concentrations (including 95% upper confidence limit, mean, and standard deviation) using the PRO UCL software package is presented in Table 14.

Human Health exceedances are presented on Figure 3.

Based on the above, remediation or management is required to make the site suitable for the proposed development.

10.2 ECOLOGICAL RISK ASSESSMENT

Exceedances of the EIL/ESL criteria for benzo(a)pyrene, lead, zinc, and TRH have been identified in fill soils, which indicates that the fill soils at the site may pose an unacceptable risk to ecological receptors.

Statistical analysis of contaminate concentrations (including 95% upper confidence limit, mean, and standard deviation) using the PRO UCL software package is presented in Table 14. Statistical analysis is provided in Appendix F.

Ecological exceedances are presented on Figure 3.

Based on the above, remediation or management is required to make the site suitable for the proposed development.

10.3 PRELIMINARY WASTE CLASSIFICATION

Preliminary waste classification is presented in Table 6.

Table 6: Preliminary Waste Classification

Unit	Extents	Thickness of Unit (m)	Description	Number of Samples Analysed	Waste Classification	Expected Volume m^3
1 FILL	BH9	0.07	FILL: Silty gravelly SAND: fine to medium grained, well sorted, sub-rounded gravels, brown/grey/dark grey	1	Hazardous Waste - Scheduled Chemical Waste	20
2 FILL	BH4, BH8, and BH11	0.35 to unknown	FILL: Silty SAND: medium grained, well sorted, dark brown, with gravel and rootlets FILL: Silty SAND: fine to medium grained, well sorted with clay and minor gravels, grey/brown FILL: Silty gravelly SAND: fine to medium grained, well sorted, sub-rounded gravels, dark brown/dark grey, foreign materials include glass and bitumen	3	Restricted Solid Waste	110
3 FILL	BH1 to BH3, BH5 to BH7, and BH10	0.07 to 1.40	FILL: silty SAND, medium grained, well sorted dark brown, with gravels and rootlets.	7	General Solid Waste	990

Unit	Extents	Thickness of Unit (m)	Description	Number of Samples Analysed	Waste Classification	Expected Volume m^3
4 Natural Soil and Natural Sandstone	Across site	0.05 to unknown	Clayey SAND: medium to coarse grained, well sorted, light brown. Sandstone: fine grained, dark grey/brown, trace fine, shale laminations	0	Unknown	9370

Note 1: Based on borehole logs and subsurface model presented in Table 5

Note 2: Natural Material was calculated subtracting total indicative fill volume removed from the estimated Bulk Earthworks Quantity of cut presented in Appendix B.

Note 3: Indicative volumes are based on observations made during fieldwork and assumed remediation extents based on half the distance between impacted and unimpacted investigation locations, and as such are subject to validation assessment and actual thicknesses encountered during remediation works.

10.4 RECOMMENDATIONS

Based on a Tier 1 screening human health and ecological risk assessment, the Site in its current condition is not suitable for the proposed development, and remediation or management of contamination present on Site is required.

As the proposed development includes excavation of the entire soil profile over the majority of the site to allow for the construction of basements, excavation and offsite disposal is likely to be the most suitable remediation method to manage the human health and ecological risks identified in the investigations and make the site suitable for the proposed development.

The extent of remediation required is presented on Figure 4 and a waste classification plan is presented on Figure 5. The extent of the excavations is presented on Figure 4 and is subject to confirmation by validation sampling and has been determined based on half the distance between exceeding samples and non-exceeding samples.

It is noted that remediation extents could be further delineated through further sampling during remediation; however, this could result delays to allow for sample analysis and assessment.

A Remedial Action Plan is presented in the subsequent Sections.

11 REMEDIAL ACTION PLAN

The NSW Environmental Planning and Assessment Regulation (2000), under the Environmental Planning and Assessment Act (EP&A) 1979 (NSW Government, 1979), provides the legislative framework within which notifications and approvals must be made for redevelopment of the site. The remediation works (involving potential exposure to contaminated materials and handling potential contaminated waste materials) to be undertaken must comply with the applicable environmental legislative requirements. Table 7 provides a summary of the applicable legislation and regulations for the proposed remediation works.

Table 7: Applicable Legislation / Regulation

Legislation / Regulation	Applicability
Contaminated Land Management Act 1997	Establishes the process for investigating and remediating land.
Protection of the Environment Operations Act 1997 (POEO Act)	Framework to minimise harm to the environment (in particular pollution of air and water and noise emissions) and not cause an offence under the Act. Discharge to stormwater may require a licence under the Act if required.
Protection of the Environment Operations (Waste) Regulation 2005	Transporters of waste (including Restricted Solid Waste and Hazardous Waste) are required to be licensed under the Act. Some waste disposal / processing facilities are required to be licensed under the Act. Requirements in relation to transportation, collection, storage or disposal of waste.
State Environment Planning Policy No 55 – Remediation of Land	SEPP 55 specifies consent requirements for remediation, specifies certain considerations that are relevant for rezoning land, and requiring that remediation is conducted to meet certain standards and notification requirements.
Work Health and Safety Act 2011	All works to be conducted in accordance with WHS Act.
Work Health and Safety Regulation 2011	All works to be conducted in accordance with WHS Regulations.
SafeWork NSW	Notifications required for asbestos removal, hazardous chemicals, lead, and demolition.

11.1 SEPP 55 REMEDIATION CATEGORY

Based on review of the Randwick Local Environmental Plan 2012, the site does not fall within the definition of Category 1 remediation. Development consent is required for Category 1 remediation works which may occur when there is a potential for significant environmental impacts from the work. In accordance with SEPP 55, Category 1 remediation work is a remediation work that is:

a) Designated development; or

b) Carried out or to be carried out on land declared to be critical habitat, or

c) Likely to have a significant effect on a critical habitat or a threatened species, population or ecological community, or

d) Development for which another State environmental planning policy or a regional plan requires development consent, or

e) Carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument:

i. Coastal protection,

ii. Conservation or heritage conservation,

iii. Habitat area, habitat protection area, habitat or wildlife corridor,

iv. Environment protection,

v. Escarpment, escarpment protection or escarpment preservation,

vi. Floodway,

vii. Littoral forest,

viii. Nature reserve,

ix. Scenic area or scenic protection

x. Wetland, or

f) Carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Western Lands Commissioner).

As such, since the remediation works, the development and the site location do not meet the definition of Category 1, CES considers that the remediation activities at the site are consistent with Category 2 remediation. Category 2 remediation does not require consent but will require 30-day notification to Council outlining the investigations and proposed remediation work plan.

11.2 NOTIFICATIONS AND PERMIT REQUIREMENTS

All works related to the site remediation must be undertaken with the appropriate notifications and permits in place. A summary of the key notifications and permits which will be required prior to initiating works are listed below:

- Notice to Council 30 days prior to commencement of the work, in accordance with Clause 16 of SEPP 55 with respect to Category 2 remediation works;
- As the works are likely to require demolition of existing site structures Development Consent to for the demolition work is likely to be required.
- Any other relevant approvals should be submitted and approved before any works are carried out.

12 REMEDIATION OPTIONS AND STRATEGY

12.1 REMEDIATION GOAL

The site is proposed to be redeveloped with the construction of a new residential aged care facility with two level basement and gardens. A copy of the development plans is presented in Appendix A. The development generally includes the excavation of the entire site from boundary to boundary to allow the construction of the proposed basement. A copy of the bulk earthworks plan is provided in Appendix B. The goal of remedial works is to provide sufficient engineering and management controls to make the site suitable (with respect to soil contamination) for the proposed development, to ensure protection of human health and the environment during and post remediation works, and to manage soils in a cost-effective manner.

12.2 REMEDIATION END POINT

The remediation end point is impacted soils are removed from site and soil contaminant concentrations in validation samples do not exceed the adopted remediation acceptance criteria

12.3 REMEDIATION CRITERIA

As a conservative approach, in the absence ofany site specific risk assessment and modelling (as defined in *Contaminated Land Guidelines Consultants Reporting on Contaminated Land* (NSW EPA 2020)), the Tier 1 screening criteria presented in Section 7 have been adopted as remediation criteria to ensure the soil contamination is remediated to a level that does not present an unacceptable human health or ecological exposure risk based on the proposed land use setting.

Use of the conservative Tier 1 screening criteria was considered appropriate as remediation criteria due to the proposed development, where extensive excavation and offsite disposal was required by the design.

Site land use settings and site remediation criteria are presented in Figure 6 and Table 20, respectively.

12.4 EXTENT OF REMEDIATION REQUIRED

Exceedances of the Site Screening Criteria are presented on Figure 3 and the corresponding extent of remediation is presented on Figure 4.

In the remediation extents presented on Figure 4 the vertical extent of remediation is assumed to extend to the base of the fill , and is subject to validation sampling.

12.5 REMEDIATION OPTIONS ASSESSMENT AND RATIONALE FOR SELECTION

In accordance with the *Key Principles for the Remediation & Management of Contaminated Sites (Distilled from ANZECC / NHMRC (1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites) (NEPC 2013)* the preferred hierarchy of options for site clean-up and management are:

1. On-site treatment so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level; or
2. Off-site treatment so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site.

If it is not possible for either of the two above options to be implemented, then other options for consideration should include:

a) removal of contaminated soil to an approved site or facility, followed by (where necessary) replacement with clean fill;

b) isolation of the contamination on-site in an appropriately designed and managed containment facility;

c) a less sensitive land use to minimise the need for remedial works which may include partial remediation; or

d) leaving contaminated material in-situ providing there is no immediate danger to the environment or community and the site has appropriate management controls in place.

The guidance also considers that:

- Contaminated site management strategies should reflect the need to protect all segments of the environment, both biological and physical (air, land and water, including groundwater). During the assessment and remediation of sites, there should be appropriate controls in place to control emissions to air, land and water.
- The fundamental goal of remediation should be to render a site acceptable and safe for long-term continuation of its existing use or proposed use where a change of land use is part of the remediation strategy and maximise to the extent practicable its potential future uses.
- Clean-up should not proceed if the process is likely to create a greater adverse effect than leaving the site undisturbed. This decision would need to be revised in the light of new technologies or clean-up strategies becoming available.
- A multi-disciplinary approach is essential to the effective clean-up of contaminated sites.

Consideration must be given to public and occupational health and safety in the development of any strategy to assess, remediate and manage a contaminated site.

A brief description of remedial methods is provided below.

12.5.1 Treatment Technologies

Treatment technologies are used to permanently and significantly reduce the toxicity, mobility or volume of contaminated wastes. Treatment technologies may be targeted towards in situ or ex situ remediation and may include biological, thermal, separation, and physical/chemical treatment and containment. Treatment technologies require various levels of assessment and approval prior to implementation.

12.5.2 Removal to Landfill

Removal to landfill involves physically moving impacted soil to an off-site location for storage, treatment or disposal. Waste must be assessed and managed in accordance with NSW EPA (2014) Waste Classification Guidelines. In some instances, waste soils must be treated and re-assessed prior to disposal. Waste soils must be disposed at licensed landfill premises that have the appropriate licence and is capable of accepting the waste.

12.5.3 Physical Barrier Systems (Capping)

Physical barrier systems (or capping) limit access to the impacted material, mitigate surface water infiltration through the underlying material and control or reduce migration of the substances into the surrounding environment. This option can include creating horizontal or vertical barriers around and on top of the impacted material in place or relocating the impacted material to a constructed encapsulation area. In addition, the barrier may also be used to control the emission of odours and gases/vapours, reduce erosion and improve aesthetics.

12.5.4 Institutional Controls

Institutional controls include measures such as land use restriction through zoning, site management (e.g. Environmental Management Plans) and access restrictions, restrictions on intrusive works and relocation of receptors. Although exposure can be reduced by these means, the impacted media are not directly remediated. Institutional controls can restrict design elements of a re-development.

12.6 REMEDIAL OPTIONS ASSESSMENT

A remedial options assessment for the site contamination is outlined in Table 8.

Table 8: Remedial Options Assessment

Remedial Method	Applicability	Method	Advantage	Disadvantage	Further Consider?
Polycyclic Aromatic Hydrocarbons (PAH) and Total Recoverable Hydrocarbons (TRH)					
On-site treatment of PAH and TRH impacted soils and re-use on-site	• Yes	• On-site in-situ or ex-situ biological, chemical, or thermal treatment (Enhanced soil washing with surfactants, bio-stimulation/bio-augmentation, landfarming, bio-pile, chemox, thermal desorption)	• Reduced disposal volume and cost. • Soils can be re-used on-site. • If successful, no Environment Management Plan on property title required.	• Requires bench scale, pilot trial studies to determine effectiveness and potential impact on site and site surroundings. • Requires impact and geo-chemical assessment. • Requires long-contact time with impacted soil. • May not be suitable if other contaminants are found in the soil. • Nature of remediation method may require Regulatory approval. • Excess cut volume required for the proposed development required offsite disposal of soils	• No
Off-site treatment of PAH and TRH impacted soils and return to the site	• Yes	• Off-site biological, chemical, or thermal treatment (Enhanced soil washing with surfactants, bio-stimulation/bio-augmentation,	• Reduction of waste to landfill. Reduced disposal volume and cost.	• Requires bench scale, pilot trial studies to determine effectiveness and potential impact on site and site surroundings.	• No

Remedial Method	Applicability	Method	Advantage	Disadvantage	Further Consider?
		landfarming, bio-pile, chemox, thermal desorption.		• Requires impact and geo-chemical assessment. • Requires long-contact time with impacted soil. • May not be suitable if other contaminants are found in the soil. • Nature of remediation method will require Regulatory approval. • Double handling of soils. • Requires strict monitoring and tracking of soils and remedial method off-site. • Requires verification testing of returned soils and subject to ENM Order requirements. • May hold up construction if soils are not returned to site in a timely manner. • Excess cut volume required for the proposed development required offsite disposal of soils	
Excavation, transport, and disposal of PAH and TRH impacted	• Yes	• Excavate and transport soils off-site (Waste	• Fast and effective.	• Increased disposal volume and cost.	• Yes

Remedial Method	Applicability	Method	Advantage	Disadvantage	Further Consider?
soils at licensed facility		Classification is subject to further sampling and analysis).	• Removes impacted material and subsequently any ongoing liability or need for any long-term management. • If successful, no Environment Management Plan on property title required. • Excess cut volume required for the proposed development required offsite disposal of soils	• Imported VENM/ENM may be required subject to geotechnical assessment. • Additional site testing to determine extent and validation upon removal. • Requires excavation in accordance with CEMP.	
On-site Containment of PAH and TRH impacted soils	• Yes	• Determine extent and concentration of PAH, retain soils onsite, over excavate basement and place impacted soils at based of excavation, survey location with coordinates and elevation. Contain PAH under hard-stand, and marker tape.	• No excavations for off-site disposal required. • Reduced disposal volume and cost. • Soils can be left in-place on-site. • Reduction of waste to landfill.	• Potential reduction in land value. • Required vapour intrusion assessment (TRH). • Handling of impacted soils during excavation works (over most of the site). • Subject to further leachability testing for on-site re-use. • Requires long-term management - Environmental Management Plan (EMP) on property title required. • PAH soils to managed and handled via Construction Environment Management Plan (CEMP). CEMP would require site induction	• No

Remedial Method	Applicability	Method	Advantage	Disadvantage	Further Consider?
				requirement's, control measures, and monitoring measures, and quality control measures to ensure that environmental controls are being implemented and are effective. • EMP/CEMP must be administered until PAH removal is confirmed. • May limit design elements of development. • Excess cut volume required for the proposed development required offsite disposal of soils	
On-site relocation of PAH and TRH impacted soils to an area of less sensitive land use	• Yes	• Determine extent and concentration of PAH, relocate PAH impacted soils to areas of less sensitive land use.	• No off-site disposal required. • Reduced disposal volume and cost. • Soils can be beneficially re-used on-site. • Reduction of waste to landfill. • No EMP required.	• Concentrations detected exceed criteria for areas onsite of less sensitive use. • Subject to further leachability testing for on-site re-use. • PAH soils to managed and handled via Construction Environment Management Plan (CEMP). CEMP would require site induction requirement's, control	• No

Remedial Method	Applicability	Method	Advantage	Disadvantage	Further Consider?
				measures, and monitoring measures, and quality control measures to ensure that environmental controls are being implemented and are effective. • EMP/CEMP must be administered until PAH removal is confirmed. • May limit design elements of development. • Excess cut volume required for the proposed development required offsite disposal of soils	
OCPs (Aldrin and Dieldrin) and metals (copper, lead, and zinc)					
On-site containment of OCP chemicals and/or metals	• Yes metals (copper, lead, and zinc) • No aldrin and dieldrin	• Determine extent of contamination, retain soils onsite, over excavate basement and place impacted soils at based of excavation, survey location with coordinates and elevation. Contain contaminated soils beneath under hard-stand, and marker tape.	• No excavations for off-site disposal required. • Reduced disposal volume and cost. • Soils can be left in-place on-site if no human health risk. • Reduction of waste to landfill.	• Potential reduction in land value. • Requires long-term management - Environmental Management Plan (EMP) on property title. • Handling of impacted soils during excavation works (over most of the site). • Contaminated soils to be managed and handled via Environmental Management	• No

Remedial Method	Applicability	Method	Advantage	Disadvantage	Further Consider?
				Plan. EMP requires site induction requirement's, control measures, monitoring measures, and quality control measures to ensure that environmental controls are being implemented and are effective. • EMP must be administered until contaminated soil removal is confirmed. • May limit design elements of development.	
Excavation, transport, and disposal of contaminated soils impacted soils at licensed facility	• Yes	• Excavate and transport soils off-site.	• Fast and effective. • Removes impacted material and subsequently any ongoing liability or need for any long-term management. • If successful, no Environment Management Plan on property title required. Excess cut volume required for the proposed development required offsite disposal of soils	• Increased disposal volume and cost. • Imported VENM/ENM may be required subject to geotechnical assessment. • Additional site testing to determine extent and validation upon removal. • Requires excavation in accordance with CEMP.	• Yes

Based on the remedial options assessment, the applicable and preferred remedial option for the COPCs is likely to be a excavation, transportation and disposal to a licensed facility due mainly to the excess cut/fill volumes of the proposed development and to avoid the site requiring an EMP following completion of the remediation works.

Excavation, relocation and onsite encapsulation of impacted materials is also discussed as a remedial contingency plan.

It is noted that all remediation works at the site must be undertaken in accordance with a Construction Environment Management Plan (refer to Section 13.7) to mitigate risks to workers and the public during earthworks at the site.

13 REMEDIATION METHOD

13.1 OFFSITE DISPOSAL

Excavation and offsite disposal at a suitably licenced waste disposal facility consists of physically removing the contaminated medium and therefore the contamination from the site. This method is considered likely to be the most suitable remediation approach as this approach has low technological risk and provides a fast, effective remediation methodology. This remediation method is considered suitable for TRH, PAH, aldrin and dieldrin, copper, lead, and zinc impacts.

The procedure for excavation and offsite disposal is as follows:

- The targeted areas for offsite disposal are set out onsite as presented in Figure 4;
- The area is excavated to the target depth (natural materials), with soils either excavated directly to trucks for offsite disposal at a suitably licenced waste facility capable of accepting the waste, or stockpiled onsite for offsite disposal at a later date;
- Waste classification of the material for offsite disposal is required prior to offsite disposal. Preliminary Waste classification is presented in Table 6;
- Following excavation of the fill materials, validation of the underlying natural materials should be undertaken. Excavation should be carried out in accordance with Section 14.

It is noted that continued excavation of natural material to proposed development target depth may be undertaken.

13.1.1 Excavation volumes and contamination extent

Indicative volumes of contaminated material are provided in Table 9. Volumes have been calculated using Figure 4, encountered subsurface conditions, and basement excavation depths. It is noted that there is uncertainty associated with volume estimated.

Table 9: Excavation Volumes and Contamination Extent

	Section A	Section B	Section C	Section D	Section E
Contamination Extent/Area (m^2)	310	120	180	145	120
Average Thickness (m)[1]	0.2	0.7	0.4	0.35	0.15
Indicative Volume (m^3)[3]	65	85	75	55	20
Waste Classification	Restricted Solid Waste	General Solid Waste	Hazardous Waste Scheduled Chemical Waste	Restricted Solid Waste	General Solid Waste

Note 1: Based on borehole logs and subsurface model presented in Table 5

Note 2: Natural Material was calculated subtracting total indicative fill volume removed from the estimated Bulk Earthworks Quantity of cut presented in Appendix B.

Note 3: Indicative volumes are based on observations made during fieldwork and assumed remediation extents based on half the distance between impacted and unimpacted investigation locations, and as such are subject to validation assessment and actual thicknesses encountered during remediation works.

Note 4: Sections are presented on Figure 4.

13.2 REMEDIATION SEQUENCING

The sequencing and timing of remediation at the site will be under control of the Site Manager who will have control of all aspects of the construction (i.e. timing, stakeholder engagement, permits, technical, plant and site management, waste management, environmental controls and subcontractor management).

It is noted that at this time the site staging plan has not been finalised. Following finalisation of the construction staging plan, the RAP should be reviewed and updated if required to suit the proposed staging plan. An indicative sequence of site construction and remediation is provided below:

1. Notifications given, and permit requirements obtained;
2. Installation of environmental, safety, traffic management, construction utilities, site boundary, and waste management controls;
3. Mobilisation of site amenities;
4. Redundant utility location, isolation, and capping;
5. Manual demolition and removal of interior materials, any recyclables, and any hazardous materials removal and clearance;
6. Excavation and removal of surface concrete slab;

7. Excavation, stockpiling (as required), and off-site disposal of fill materials (as required);
8. Classification of stockpiled soils and validation sampling of excavated remediation areas (as excavations continue); and
9. Excavation, and off-site disposal of natural soils.

13.3 PRELIMINARIES

Prior to undertaking any works, the nominated remediation contractor should prepare health, safety and environment plans (HESPs) to ensure that potential hazards related to the work are identified and control measures are implemented. Safe work method statements should be prepared for tasks required to be undertaken by both the environmental consultant and the remediation contractor to complete their respective scopes of work.

The remediation contractor is to confirm that all necessary environmental management, notifications, permits and safety controls are in place.

Service plans will be requested from the Dial Before You Dig service and from the Council as necessary to identify the location of underground services at the site. The remediation contractor should determine and seek approval for excavations and construction works in and over the sewer easement which may be subject to Council or Sydney Water requirements for working near pipes and assets. Sydney Water require approval under their Sydney Water Technical Guidelines: Building over and adjacent to pipe assets (Sydney Water, October 2015).

13.4 SITE PREPARATION

Table 10 below summarises the measures that should be implemented prior to remediation works at the site.

Table 10: Site Preparation

Item	Description
Site Access	Access to the site remediation area will be controlled by the remediation contractor performing the works and the site will be off limits to all non-essential personnel. The public will not have access to this area of the site.
Site Signage	Signage will be installed on the site, with direction to key areas (including to decontamination units, wash down areas, exits, etc.) and traffic restrictions. Signage at the main access points will include after-hours contact details.
Fencing or Hoarding	The site is to be secured with perimeter security fencing which must be maintained around the site and internal excavation areas if physical barriers are not already in place. Shade cloth should be installed on fences and hoardings. Additional fencing should be erected where required to secure work areas and

Item	Description
	exclusion zones. Regular maintenance and repair of all retained fences and hoardings within and surrounding the site will be undertaken during the period of the remediation work.
Traffic Management	It is the remediation contractor's responsibility to liaise with others on the property outside the designated site works boundary, and adjacent to the site, to ensure works are completed in accordance with directions from the Site Manager. The remediation contractor may need to excavate, and transport impacted soils off-site. Driving through the impacted areas is to be avoided and dust suppression is to be undertaken where trafficking is unavoidable. Transport of materials to and from site will need to consider traffic management options which take into account the size of the site and any access restrictions to the site. The site access and exit roads are to be monitored for spillage and tracking from the site and are to be kept clean with street sweeper following waste removal off-site.
Decontamination Facilities	The remediation contractor shall isolate or eliminate the risk of cross-contamination or off-site transport of hazardous or contaminated materials via the vehicle tyres by manual removal and wheel washing facility. A wheel washing facility will be required for vehicles leaving the remediation area of the site, either for waste disposal or other activities, based on site conditions, to minimise dust and soil emitting off-site. A decontamination facility for workers (hand and eye washing facilities etc.) should be installed for use during the works. These facilities should be clearly signposted and indicated to site workers during site inductions.
Supply of Utilities	The installation and commissioning of all temporary site services (e.g. electricity, water, sewerage and telecommunications) required for the duration of the works should be installed to the requirements of the appropriate regulatory authorities and should be installed outside areas of proposed excavations. All approvals in respect to the installation, operation and eventual removal of temporary services shall be obtained.
Site Contractor's Facilities	All site accommodation and facilities required for the remediation works will be established in conformance with relevant regulations and authority's requirements. Existing site infrastructure may be utilised for this purpose (if present). Licensed persons in accordance with statutory requirements will carry out all connections. The following facilities may need to be established adjacent to or in close proximity to the site for the site works: • site offices; • amenities; • work sheds (including decontamination facilities) and changing areas for the use of the remediation contractor, subcontractors and consultants; • temporary site sheds; • bins for rubbish generated by personnel.
Waste Management	Unless materials are removed from site upon excavation, designated waste management areas are to be set up on or near to the site to manage impacted excavated soil for disposal or impacted soils stored on the site are to be managed in accordance with approved environmental controls.

13.5 CONTROLLED EXCAVATION

Any impacted fill material requiring off-site disposal is to be excavated in a controlled manner under the supervision of the remediation contractor with experience in contaminated site projects.

Contaminated material is to be excavated and placed directly into waste trucks, skip bins and / or stockpiled on sealed areas or plastic sheeting in a manner and location to reduce stormwater runoff and erosion for waste classification prior to off-site disposal. Erosion control methods may include covering of the stockpiles with plastic tarp, silt fencing, hay bales, or similar to control sediments from leaving the stockpile area. Stockpile odours must be controlled through stockpile covering, application of vapour suppressant foam, or immediate removal from the site in covered truck load.

Impacted soil is to be excavated using an appropriately equipped excavator. Site personnel will wear appropriate personal protective equipment in the designated work area. The excavation depth will be sufficient to remove all impacted material.

Once the target depth has been reached and confirmed by the environmental consultant, visual inspection is to be undertaken and soil validation samples are to be collected for laboratory analysis. Results are to be compared with site assessment criteria/validation criteria as presented in Section 7 to assess the suitability of the site for high density aged care residential use following the completion of the remediation works.

13.6 SOIL STOCKPILE MANAGEMENT

If soil stockpiling is required onsite, stockpile management procedures, soil erosion and sedimentation controls, and procedures to manage contamination must be applied to all stockpiled material.

The location of the stockpiles should be selected to fit with the expected stages of the project. In addition to the general requirements and assumptions for excavations noted above, these additional requirements apply to stockpiled soils:

- The remediation contractor is responsible for the selection, location and preparation of surfaces for the placement of stockpiles. Stockpiles will only be placed at approved locations.
- Stockpiles will be strategically located to mitigate environmental impacts while facilitating material handling requirements.
- The remediation contractor is responsible for tracking the movement of materials between excavations and stockpiles.

- Stockpiles must be managed by the remediation contractor to mitigate the effects of dust, odour, vapours, and liquid run-off.
- During excavation, soils must be characterised by visual and olfactory means, and placed in segregated stockpiles based on field screening methods described below.
- The remediation contractor must excavate soils to minimise cross-contamination of soil types, contamination, and liquids.
- Contaminated materials will only be stockpiled in locations that do not pose any risk of environmental impairment of the stockpile area or surrounding areas (i.e. sealed surfaces such as sealed concrete, asphalt, high density polyethylene or a combination of these).
- Stockpiles will only be constructed in areas of the site that have been located and prepared in accordance with the requirements of this RAP.
- All such preparatory works will be undertaken prior to the placement of material in the stockpile.
- Access routes will be established around the material stockpiles to enable access from adjoining traffic routes.

The following sections outline the recommended materials segregation process, stockpile sampling methodology, laboratory analytical frequency, analyte list, and stockpile classification and assessment criteria.

13.6.1 Stockpile Segregation Process

Excavated materials shall be separated into segregated stockpiles of similar or homogeneous material types (e.g. Fill, natural soil, sand, clay), similar contamination, similar origin (e.g. a specific area of the site), and other similar characteristics (e.g. high water content, discolouration).

Observation of staining, discolouration, residual liquids, water, and odour shall be documented by the site environmental consultant during soil excavations. The stockpile documentation should include a description of the stockpiled location and prepared ground surface, material description, soil description, colour, description of discolouration or staining, odour description and intensity as non-existent, weak, distinct, strong, or very strong, estimated volume, and water or liquid description.

13.6.2 Stockpile Waste Classification

Classification of stockpiled to be removed from the site will be undertaken in accordance with the *Waste Classification Guidelines Part 1 Classifying Waste* (NSW EPA 2014). Contaminants analysed will include:

- Heavy Metals;

- PAH;
- Moderately harmful pesticides list in Table 1 of *Waste Classification Guidelines Part 1 Classifying Waste* (NSW EPA 2014);
- TRH;
- BTEX;
- Scheduled chemicals list in Table 1 of *Waste Classification Guidelines Part 1 Classifying Waste* (NSW EPA 2014); and
- Asbestos

A preliminary waste classification has been carried out and is presented in Section 10.3 and further sampling may be required.

13.6.3 Stockpile Assessment and Sampling Methodology

Stockpile assessment and sampling methodology should be in general conformance with the referenced regulatory and guidance documents within this RAP and as directed by the environmental consultant. In addition, reference is made to the following document for general guidance on stockpile sampling methodology:

- AS1141.3.1-2012, Methods for sampling and testing aggregates, Method 3.1: Sampling – Aggregates;
- Cement Concrete & Aggregates Australia, Guideline to Sampling for the Extractive Industry, August 2006; and
- ASTM D6009-12, Standard Guide for Sampling Waste Piles.

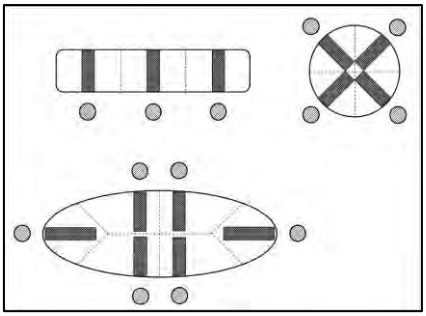
The method of stockpile field screening assessment and sampling shall consider the size of the stockpile, the expected degree of homogeneity, the known history, the expected contaminant distribution, contaminant volatility and physical characteristics, the space availability needed to interrogate the contents of a stockpile, the qualifications of the sampling environmental consultant and equipment operator, the quality of sampling equipment, and the environmental controls in-place.

13.6.4 General guidance for field screening stockpiles of volume up to 200m^3

- Sketch and measure the stockpile dimensions, location, and immediate vicinity impediments and record this information on the Field Inspection Form.
- Collect minimum 10 field screening samples from the stockpile for visual, olfactory and/or PID measurement (where volatile contaminants are present). The screening samples should be discrete and collected evenly throughout the stockpile via a systematic grid.
- The 10 samples should be collected in both bag for PID measurement and clean glass jar(s) for laboratory analyses and be of suitable volume for analyses.

- Screening samples should be collected by opening the stockpile using mechanical means (i.e. backhoe) or penetrating the stockpile using hand auger or push tube. Examples of stockpile partitioning are shown in Figure 14-1 below as reproduced from AS11413.1-2012.
- Sampling should penetrate the entire depth of the stockpile.
- Samples should be handled with appropriate personal protective equipment.
- The samples should be collected using decontaminated equipment.
- Samples should be taken a minimum 200 mm from the soil exposed surface.

Figure 7 Example Stockpile Partitioning (Source: Reproduced from AS11413.1-2012).



13.6.5 General guidance for field screening stockpiles of volume greater than 200m^3:

For stockpiles greater than 200 m^3, the minimum number of field screening PID samples should include 10 samples for the first 200 m^3 and then 1 sample per 25 m^3. Example: a stockpile of 350 m^3 should include a minimum of 16 field screening samples.

13.6.6 Laboratory Analytical Frequency

The minimum number of soil samples required for analytical testing will be based on the NSW EPA Sampling Design Guidelines, Schedule B2, Table 4, ASC NEPM (NEPC 2013), and the Victorian EPA Publication IWRG 702.

The number of samples for analytical purposes is primarily based on the soil volume (e.g. either less or greater than 200 m^3) and the method of assessment as either:

Method 1: Highest individual measured concentration; or,

Method 2: Comparison of the calculated 95% Upper Confidence Limit of the Average Concentration against the adopted criteria.

Stockpiles Less than 200m^3

For stockpiles less than 200 m^3, the minimum number of samples for analyses utilising assessment Method 1 is reproduced from Table 4 Schedule B2, ASC NEPM (NEPC 2013) and IWRG702 in Table 11 below:

Table 11: Minimum number of samples for stockpile 200 m^3 or less (minimum of 3 then 1:25m^3)

Soil Volume, m^3	Minimum Number of Samples for Analyses
<75	3
75 - <100	4
100 - <125	5
125 - <150	6
150 - <175	7
175 - <200	8
>200	1:25

Where assessment Method 2 is required for stockpiles less than 200 m^3, a recommended minimum number of ten samples should be analysed.

Stockpiles Greater than 200m^3

For stockpiles greater than 200 m^3, the minimum number of samples for analyses utilising assessment Method 1 or Method 2 is reproduced from IWRG702 in Table 12 below:

Table 12: **Minimum number of samples for stockpile soil volumes greater than 200 m^3**

Soil Volume, m^3	Minimum Number of Samples at 1:25 m^3	Minimum number of samples to calculate 95%UCL of the Average Concentration
300	12	10
400	16	10
500	20	10
600	24	10
700	28	10
800	32	10
900	36	10
1000	40	10
1500	60	10
2000	80	10
2500	100	10
3000	120	12 (1:250)
4000	160	16 (1:250)
4500	180	18 (1:250)
5000	200	20 (1:250)
>5000	1:25 m^3	1:250 m^3

*: Taken from Table 3 of EPA Publication IWRG 702

13.7 INSITU WASTE CLASSIFICATION

In the event insitu sampling is required, insitu assessment and sampling methodology should be in general conformance with the referenced regulatory and guidance documents within this RAP and as directed by an experienced environmental consultant.

The minimum number of soil samples required for insitu analytical testing will be dependent on the estimated volume of material to be classified. The sampling density will follow the criteria presented in provided in Tables 11 and 12 above.

Contaminants of concern for insitu waste classification should be consistent with those presented in Section 13.6.2 for stockpile waste classification.

13.8 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN REQUIREMENTS

The Remediation contractor shall develop a Construction Environmental Management Plan (CEMP) that describes the measures to reduce adverse impact of the construction activities on the environment and sensitive receptors (e.g. residential properties to the south). The CEMP is to include, as a minimum:

- placement of site accommodation, toilets, storage compounds and personal decontamination units;
- vehicle access and areas where access is to be restricted;
- enclosure or delineation of the site for safety;
- protection of existing vegetation;
- methods of odour, dust, and vapour control;
- dust and asbestos trigger levels for action;
- noise mitigation and monitoring methods;
- site drainage management measures;
- control of discharges from and within the site;
- methods of control of erosion on the site;
- methods of controlling surface run off from the site;
- methods of controlling discharges to watercourses or drains so that they comply with EPA and Sydney Water requirements;
- location and procedures (including spill contingencies) for refuelling and chemical storage on site; and
- material stockpile areas and sediment control.

13.9 WASTE MATERIALS TRACKING

Materials excavated or removed from the site should be tracked in order to provide detailed and accurate information about the location and quantity of all materials both on- and off-site from the time of their excavation until their disposal. The disposal locations will be determined by the remediation contractor. Over and above waste dockets supplied by the receiving landfill, the following information is to be documented by the remediation contractor:

- Origin of material on the site;
- material type and description;
- approximate volume (m3);
- time and date of excavation and transport;
- truck licence and registration number.

This information, along with the landfill docket number, is to be provided to the environmental consultant so as to be included in the validation report.

It should be noted that Section 4.3.7 of Guideline for the NSW Site Auditor Scheme 3rd Edition (NSW EPA 2017) states that:

"…site auditors must have regard to the provisions of the NSW Government's framework for managing wastes. In New South Wales, it is an offence to transport waste to a place that cannot lawfully receive it, or use a site to receive waste that cannot lawfully be used as a waste facility. To ensure that waste generators (or their representatives) do not trigger such offences:

- *In relation to disposal, they must ensure their waste is carefully classified in accordance with the Waste Classification Guidelines – Part 1: Classifying Waste (EPA 2014) as in force from time to time (the 'Waste Guidelines', available from Waste classification guidelines: www.epa.nsw.gov.au/your-environment/waste/classifying-waste/waste-classificationguidelines), and the waste is taken to a facility that is lawfully able to receive that waste; and*
- *In relation to re-use for land application purposes, they must ensure their waste meets the requirements of the resource recovery order and resource recovery exemption framework.*"

13.10 ONSITE MATERIALS TRACKING

Materials excavated and transported from one area of the site to another should be tracked in order to provide detailed and accurate information about the location and quantity of all materials. The following information should be recorded for material.

- Origin of material on the site;
- material type and description;
- approximate volume (m^3);
- time and date of excavation and transport; and
- Location of the material reuse onsite.

13.11 SOIL OFF-SITE DISPOSAL

Following receipt of waste classification results, the total volumes of stockpiled material for offsite disposal will be transported by a licenced transporter to an appropriately licensed facility for disposal. Prior to the disposal of waste materials from the site, the remediation contractor will seek written approval from the receiving facility to accept the waste.

13.12 ONGOING MONITORING/ MANAGEMENT

The preferred remediation approach is designed to treat contaminated material, remove contaminated materials from the site and dispose at a licenced facility or contain contaminated materials to prevent exposure of future site users to the contaminants, such that there remains no

risk to human health. If this approach is validated as successful, the requirement for on-going monitoring or management to ensure continued protection of human health and the environment will not be required.

If the preferred remediation approach is unsuccessful and the contingency approach of onsite encapsulation is required (refer to Section 13.15), then ongoing management in the form of an EMP is required.

13.13 SITE REINSTATEMENT

Imported materials may be required to reinstate some of the excavated areas, excavations will be backfilled with imported virgin excavated natural material (VENM) or Excavated Natural Material (ENM) as defined in the NSW EPA general resource recovery order "The Excavated Natural Material Order 2014". All material must be certified as suitable for the intended use.

VENM/ENM sourced from a quarry or other supplier, should either be accompanied by a certified letter stating that the material is VENM/ENM or ideally come with chemical certification by means of confirmatory validation data from the source site. It may also be prudent for the environmental consultant supervising the works to visit the source site to assess the potential for contamination.

Observations will be made by the consultant during importation/use to confirm that the material is consistent with the documentation. Geotechnical considerations with respect to backfilling (drainage of the material, compaction, density) should be taken into account by the remediation contractor (with the possibility of engaging a suitably qualified geotechnical consultant to provide advice on backfilling specifications).

During the importation of validated fill material for site reinstatement, if needed, receipts and dockets will be provided by the supplier of the material for every truck or load of material that is trucked into site. These dockets will also need to be kept on file as part of the remediation documentation.

Landscaping soil and garden mixes are an exception to the requirement of VENM due to their processed nature. This material would need to be approved on a case by case basis prior to being used on site and provision of any compliance certificates, product information sheets and the preparation by a reputable landscape supplier. Laboratory testing will be required at the discretion of the Site Auditor and environmental consultant on site.

13.14 REMEDIAL CONTINGENCIES

The proposed remedial option should be effective in dealing with the identified impacts, however contingency strategies may be required in the event of certain scenarios.
Anticipated potential remedial contingencies are detailed in Table 13.

Table 13: Remedial Contingencies

Potential issues	Proposed Corrective Actions	Responsible Person	Communication and Additional Sampling/Monitoring
Excavation becomes unmanageable due to mud	Improve drainage collection system; add geotextile/gravel in problem areas; strip off mud/slurry materials. Drains, gutters, roads and access ways shall be maintained free of sediment. Site personnel or dedicated site manager to remain vigilant of breaches of sediment controls.	Remediation contractor	Advise site manager of potential breaches. Breaches are to be recorded in the daily site log and provided to the Client and the appointed environmental consultant or site environmental officer. No additional monitoring/sampling required unless stormwater drains are inundated with evidence of contaminated materials from site.
Excessive stormwater runoff in drains or excavation areas	Minimise active contaminated work area; improve stormwater diversion. Check control measures are adequate to prevent surface water runoff entering and leaving excavation and stockpile areas. Temporary bunding or diversion drain, impermeable sheeting placed under stockpiles, silt fences/hay bales surrounding stockpiles and protect existing drains with silt/sediment mats or bunds. Regularly inspect drains to ensure that they are protected from runoff.	Remediation contractor to contact Environmental consultant to test any accumulated water.	Breaches are to be recorded in the daily site log and provided to the Client and the appointed environmental consultant. No additional monitoring/sampling required unless stormwater drains are inundated with evidence of contaminated materials from site. Water accumulated in excavations to be sampled by environmental consultant for applicable contaminants of concern. Management/disposal options to be formulated based on analytical results.
Excessive dust	Use water sprays or water fogging equipment; stop dust-generating activity until better dust control can be achieved or apply interim capping systems on stockpiles or exposed material. Stop work in high wind conditions.	Remediation contractor	Breaches are to be recorded in the daily site log. Monitoring/sampling required where removal of asbestos is occurring in accordance with licenced asbestos removalist's asbestos control plan.
Heavy rain, wind, or inclement weather	Temporarily stop work. Ensure site security is stable. Ensure sediment and surface water controls are operating correctly. If possible, divert surface water away from active work areas or excavations. Cover stockpiles with tarp and weights.	Remediation contractor	None.
Equipment failures	Maintain spare equipment or parts; keep rental options available or shut down affected operations until repairs are made. Clean up	Remediation contractor	Sample any impacted stockpiled materials (TRH, BTEX compounds and PAHs) and determine appropriate disposal/treatment option

Potential issues	Proposed Corrective Actions	Responsible Person	Communication and Additional Sampling/Monitoring
	the spill with absorbent material. Stockpile the impacted material in a secure location.		based on an assessment of analytical results.
Unexpected contamination findings (such as areas of fly tipping or potentially contaminated fill)	Stop work immediately and consult with a specialist as to appropriate management options. Further details are included in Unexpected Finds Management Plan Appendix A.	Remediation contractor	Sampling and laboratory testing of potentially contaminated material to determine appropriate management options based on an assessment of analytical results. Analyses may include heavy metals, TRH, BTEX compounds, PAHs, and asbestos (as required).
Neighbour or community complaints	Stop works and implement control measures to address complaint (if possible).	Remediation contractor	Coordinate a community consultation process prior to and during the works. Notify relevant Project Managers following complaint. Report complaint as per Client management procedures.
Selected remedial options are not effective	It is anticipated that the proposed RAP will be effective in dealing with the on-site impact, however, alternative remedial methods will be identified and applied, in consultation with the Client and other stakeholders, as appropriate.	Remediation contractor	Unidentified impacts at the site will need additional sampling to assess appropriate remedial action.

13.15 CONTINGENCY REMEDIATION METHOD - ONSITE ENCAPSULATION

In the event that ground conditions or concentrations of contaminants mean that offsite disposal is not economically or practically feasible, an alternative option for remediation is on-site encapsulation, as described below.

Onsite encapsulation comprises retention of impacted soils onsite in an area where access to the soils is limited by physical barriers and administrative controls. Due to the specifics of the proposed development, the most suitable location of encapsulation of impacted soils is considered to be below the basement slab and would be achieved by over-digging the basement excavation and placing the relevant material in a containment cell underneath the basement slab. This remediation method is considered likely to suitable for TRH, PAH, copper, lead, and zinc impacts. This method is not considered suitable for the aldrin and dieldrin impacted soils.

The procedure for onsite encapsulation is as follows:

- Undertake leachability assessment of the impacted soils (this assessment can also be undertaken ex situ while materials are stockpiled onsite);

- The targeted areas for offsite disposal are set out onsite as presented in Figure 4;
- The area is excavated to the target depth, with soils stockpiled onsite;
- Following excavation of the impacted soils, validation of the excavation should be carried out in accordance with Section 14.
- Basement excavations are completed with the excavation extended to a sufficient depth to allow for the placement of the impacted soils below the designed base of slab;
- Impacted soils are placed at the base of the excavation, subject to suitable geotechnical controls such as compaction and level 1 supervision;
- A marker layer is placed over the contaminated material; and
- A suitable Environmental Management Plan is prepared to document the administrative controls required to minimise the risk of exposure to the impacted soils.

14 VALIDATION PLAN

Validation sampling is to be undertaken following removal of impacted or contaminated soils during the site bulk excavation to ensure that the horizontal and vertical extent of impacts are removed. Sampling is to be conducted in accordance with relevant NSW EPA guidance to confirm whether the identified contamination has been adequately removed from the excavated areas and whether any further remediation is required.

As groundwater remediation is not required, groundwater validation is not required.

Based on the soil results to date for the site, the contaminants of potential concern (COPC) are identified as:

- Fill soils:
  - Human Health: benzo(a)pyrene TEQ, OCP (aldrin and dieldrin), and lead.
  - Ecological Health: TRH >C16-C34, benzo(a)pyrene, copper, lead, and zinc.

Based on the COPC identified in the previous PSI (CES 2019a) and this investigation, natural soil/bedrock samples (noting all remediation areas are to be excavated to the fill/natural soil interface) will be collected from the base of excavations and analysed for:

- TRH;
- PAHs;
- OCP; and/or
- Common metals and metalloids.

Excavation sidewall samples will be assessed for the COPC applicable to the remediation area if they are present after excavation

14.1 VALIDATION SAMPLING

Validation sampling should be carried out in the areas targeted for remediation as outlined below.

14.1.1 Excavated Areas

A systematic and judgemental sampling regime will be adopted for validation of areas where impacted soils (as defined in Figure 4) have been removed by excavation.

Following excavation of impacted areas, the walls and base of each excavation area will be field screened and documented for the following characteristics:

- visual and olfactory evidence of impact;
- spatial relationship to known impacts; and,

- geologic or hydrogeological evidence of preferential pathways.

Systematic grid-based samples retrieved in-situ will be collected from the walls and base of excavations and analysed at a frequency of one sample per 25 m^2 and increased depending on field observations. Judgemental samples will also be collected where distinct soil differences occur.

If validation samples detect contaminants in excess of the site assessment criteria, additional material will be excavated and treated, until the area can be successfully validated.

14.1.2 Fill Stockpile Areas

If the material from excavated areas is stockpiled onsite and placed on areas that are not sealed or prepared with a suitable geofabric liner (HDPE or similar) validation of the footprint of the stockpiled material will be required. Validation should be undertaken in a similar manner to excavated areas. Analysis of these stockpile footprints would be at a frequency of 1 sample per 25 m^2. Judgemental samples will also be collected where distinct soil differences occur. Samples will be analysed for the contaminants of concern relevant to the stockpiled materials.

14.1.3 Waste Classification

For remediation areas requiring off-site disposal of soils the following chemical contaminants should be analysed in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste*, (NSW EPA 2014):

- Heavy Metals;
- PAH;
- Moderately harmful pesticides list in table 1 of waste classification guidelines;
- TRH;
- BTEX; and
- Scheduled chemicals list in table 1 of waste classification guidelines.

14.1.4 Imported VENM

Importation of VENM is not considered likely to be required at the site.

If required VENM, sourced from a quarry or other supplier, should either be accompanied by a certified letter stating that the material is VENM, and ideally be accompanied by analytical data from the source site.

An environmental consultant should undertake an inspection of the source of the material, and if necessary complete sampling of the material, to assess potential for contamination. Observations will be made by the consultant during importation/use to confirm that the material is consistent with the documentation.

Geotechnical considerations with respect to backfilling (drainage of the material, compaction, density) should be taken into account by the remediation contractor (with the possibility of engaging a suitably qualified geotechnical consultant to provide advice on backfilling specifications).

During the importation of validated fill material for site reinstatement, receipts and dockets are to be provided by the supplier of the material for every truck or load of material that is trucked into the site. These dockets will also be required to be kept on file as part of the site reinstatement documentation.

14.1.5 Imported ENM

Where ENM is to be imported to the site for use as backfill, the material should be sampled and assessed in accordance with the NSW EPA Resource Recovery Order, ENM Order 2014 prior to being imported to the site.

14.1.6 Imported Material Validation

Any VENM or ENM imported to site for use must be accompanied by suitable documentation to demonstrate that the material meets with the classification of VENM or the ENM General Resource Recovery exemption issued by the NSW EPA. Fill that is not accompanied by adequate certification shall be rejected from Site.

Prior to and following placement, the imported material will be inspected for any visual signs of contamination, foreign material or variations in material type to that expected from the source site. The inspection will include:

- Inspection for obvious sign of contamination or unacceptable characteristics including odours, discolouration, waste materials (slag, ash, building wastes, containers, rubbish) and potential asbestos containing materials (including fibro, cement pipes and compressed cement sheeting); and
- Confirmation that the material is what is expected from the source site (e.g. ripped sandstone, shale, clay soil etc).

Any material exhibiting signs of contamination or that is not the expected material will be rejected. To confirm the suitability of the material for use on-site from a contamination perspective, ongoing validation testing of the material imported to the site will be undertaken.

The validation testing will involve as a minimum:

- Collection of a minimum of three samples per VENM source site under 15,000m3 or one sample per 5,000m3 for source sites where greater than 15,000m3 will be sourced of VENM imported to the site; and

- Laboratory analysis of the material at a NATA registered laboratory for a suite of common contaminants including heavy metals;TPH; BTEX, PAH, OCP, and asbestos.

The results will be compared to the SAC applicable to the area of the site.

Where an imported material does not meet the SAC, the material should be considered unsuitable and rejected from site.

14.1.7 Method of Sample Collection

Care will be taken to ensure that representative samples are obtained and that the integrity is maintained, particularly when dealing with potentially volatile or semi-volatile compounds. Specific sampling procedures for each method of collection are provided below in following sections.

14.1.8 Sample Collection

Samples will be collected using either a decontaminated stainless steel trowel or by using new nitrile gloves for each sample and placing the soil directly into laboratory supplied containers.

14.1.9 Decontamination Procedures

The following decontamination procedures will be adopted for sampling equipment.

14.1.10Sampling Equipment

Sampling equipment, such as trowels, will be washed between sampling events using Decon 90 (or similar laboratory grade detergent) initially followed by adequate rinsing with clean potable and de-ionised water. To check the adequacy of the decontamination protocol, rinsate samples will be collected for analysis.

14.1.11Sample Containers

Soil sample containers will comprise glass or plastic containers, as required, supplied by either the primary or secondary laboratory. The containers will be completely filled leaving no headspace, labelled with the job number, date, unique sampling point identification and initials of the project environmental scientist/engineer.

14.1.12Method of Sample Storage and Handling

The samples will immediately be placed in an esky / cool box in which ice has been added, to keep the samples below a temperature of approximately 4^{o}C. At the end of each day, the samples in the cool box will be transported to laboratory (within holding times).

14.1.13Sample Logging

A log of excavation works and soil/groundwater samples collected will be completed during fieldwork by a qualified environmental engineer/scientist. The log records the following data:

- Sample number and depth;
- Soil classification, colour, consistency or density, odour and moisture content;
- Depth of excavation;
- Excavator bucket refusal;
- Method of excavation; and
- The depth of first encountered free water.

14.1.14QA / QC Documentation

While on site, the supervising engineer/scientist will be required to fill out a copy of a 'sample register', which documents:

- Time of sample collection;
- Weather;
- Unique sample identification number; and
- Sample location and depth.

All samples will be classified in the field based on soil/fill/groundwater characteristics and obvious signs of contamination such as discolouration or odour will be noted on a log.

All samples, including QC samples, will be transported to the primary and check laboratories under Chain-of Custody (COC) procedures and maintained in an ice-filled cooler. The following details will be recorded on the COC form:

- Site identification;
- The sampler;
- Nature of the sample;
- Collection time and date;
- Analyses to be performed;
- Sample preservation method;
- Departure time from site; and
- Dispatch courier(s).

14.2 FIELD SCREENING

Although not anticipated, where volatile contaminants are encountered, field screening will be undertaken to screen potentially contaminated material being removed from the excavations for the presence of volatile compounds. Field screening will be conducted using a Photo-Ionisation

Detector (PID) or similar instrument capable of measuring Volatile Organic Compounds (VOCs) in air.

The instrument will be operated using the controlled headspace method in accordance with a documented procedure by appropriately trained persons. Full documentation will be provided relating to the calibration of the instrument, the samples analysed, gas screening results and site observations. These results will be compiled and presented in the validation report.

The presence of elevated levels of VOCs in imported material will result in that batch of material being rejected.

14.3 QUALITY ASSURANCE AND QUALITY CONTROL PROGRAM (QA/QC)

The proposed field and laboratory QA/QC programme for this project is consistent with ASC NEPM (NEPC 2013)requirements. The programme consists of the following:

- Laboratory blind replicates at 1 in 20 (5 %) samples or one per batch; and
- Split samples (intra-lab duplicates) at 1 in 20 (5 %) samples or one per batch.

14.3.1 Field QA/QC Programme

Field QA/QC consists of the application of documented quality work procedures and the collection of field QC samples listed above.

14.3.1.1 Environmental Samples

The environmental samples collected for the validation programme are representative samples of soil/groundwater collected for analysis. Environmental samples are the original samples taken from a particular location and other samples are blind replicates or split samples of the original.

14.3.1.2 Blind Replicate Samples

Blind replicate samples are provided by the collection of two similar samples from the same location or successively from the same monitoring bore. These samples are preserved, stored, transported, prepared and analysed in an identical manner to environmental samples.

14.3.1.3 Split Samples

Split samples provide a check on the analytical proficiency of the laboratories. Split samples are collected from the same location or successively from the same monitoring bore. Split samples must be taken from the same location as the blind replicate, thus becoming a triplicate sample. However, split samples are not taken as often as blind replicates. Spilt samples (triplicates) are preserved, stored, transported, prepared and analysed in an identical manner to environmental samples, but are sent for testing to a different laboratory.

14.3.1.4 Trip Spike

Laboratory-prepared VOC spikes consisting of distilled, de-ionised water or sand spiked with known concentrations of BTEX should be included in QA/QC programmes where light fraction TPH, BTEX and other VOCs concentrations are being measured. Laboratory-prepared VOC spikes should be included at a rate of one per sample batch submitted for VOC analysis. These samples are to be submitted for BTEX analysis with resulting concentrations compared with the concentrations of the known additions. Generally, samples are spiked with concentrations of 10, 10, 10 and 30 ppm of benzene, toluene, ethylbenzene and total xylenes, respectively. The purpose of these samples is to monitor VOC losses during transit.

14.3.1.5 Trip Blank

Trip blanks consisting of pre-washed bottles containing distilled or de-ionised water and appropriate preservatives or laboratory-prepared sand blank containing acid-washed quartz sand will be supplied by the analytical laboratory. The role of trip blanks is to detect potential contamination during sample transport. These samples reside in transport vessels during sampling activities and are not opened in the field. Typically, one trip blank is submitted with each batch of samples for VOC analysis. Trip blanks are analysed at the laboratory as regular samples or only for volatile organic compounds, as deemed appropriate.

14.4 VALIDATION REPORTING

Following the remediation and validation works, a validation report will be prepared in accordance with the NSW EPA (2020) *Guidelines for Consultants Reporting on Contaminated Sites*. The validation report will detail the extent and nature of the remedial works undertaken, characterisation and disposal of contaminated soils, the validation of imported clean fill and topsoil (if any) and will consider the overall status of the site.
The report will include the following sections:

- executive summary;
- scope of works and objectives;
- site identification;
- site history;
- site conditions and surrounding environment;
- geology and hydrogeology;
- previous investigation results;
- summary of the RAP;
- validation criteria;
- nature and extent of the remediation undertaken;
- sampling and analysis plan and sampling methodology;

- field and laboratory QA/QC;
- results of the validation sampling and sampling of imported fill materials;
- information supplied by the remediation contractor (such as waste disposal documentation);
- discussion of the land use suitability at the completion of remedial works; and,
- conclusions.

It should be noted that to enable the validation report to be produced, the remediation contractor will be required to supply the following to the environmental consultant:

- the quantities and types of waste disposed;
- details of the receiving facility/facilities accepting waste from the site;
- disposal dockets for the waste disposed;
- details of any imported materials (including VENM certification, laboratory results, origin and supplier, exemption details, quantities and areas of placement), survey data (including surveys of excavations and following backfilling works).

15 WORK HEALTH AND SAFETY

All works conducted at the site as part of the remediation or site excavation process will comply with the Work Health and Safety Act 2011 and associated Regulations.

The remediation contractor will prepare a work health and safety (WHS) plan that outlines the risks and control measures of site remedial works. The plan should cover site specific requirements associated with the asbestos and PAH's contamination known to be present within fill and natural soils at the site.

The environmental consultant will prepare a WHS Plan for the sampling works it will undertake.

Typically, the WHS plan should address the following issues:

- regulatory requirements;
- responsibilities hazard identification and control;
- air monitoring (including action levels) during excavation and construction (if necessary);
- noise;
- odours;
- chemical hazard control;
- handling procedures;
- personal protective equipment (PPE);
- work zones;
- decontamination procedures;
- emergency response plans;
- contingency plans; and
- incident reporting.

The plan should include emergency contact numbers such as police, fire brigade, hospital and contact details for all relevant personnel. Response to any incidents occurring on site should be in accordance with the plan. The plan should include an Induction and Tool Box Discussion Register.

All those working or visiting the site should be inducted into the plan.

16 SITE MANAGEMENT PLAN

16.1 HOURS OF OPERATION

Remediation work hours will only be permitted during the following times, subject to Council approval:

- Monday to Friday: 7:00 am to 6:00 pm
- Saturday: 8:00 am to 1:00 pm.
- Sundays or Public holidays: No work permitted.

Emergency work is permitted outside of these hours.

16.2 SITE SIGNAGE AND CONTACTS

Signage will be installed on the site, with direction to key areas (including to decontamination units, wash down areas, exits, etc.) and traffic restrictions. Signage at the main access points will include after-hours contact details of the remediation contractor and site manager.

16.3 SITE ACCESS

Transport of materials to and from site will need to consider traffic management options which take into account the size of the site and any access restrictions to the site. The site access and exit roads are to be monitored for spillage and tracking from the site and are to be kept clean with street sweeper following waste removal off-site.

During the remediation works, perimeter fencing will be erected to restrict public access to the work area. Only authorised personnel will be permitted to enter the remediation works area.

Vehicle access will be managed at the entry access point to the site to reduce the tracking of potential contaminated soils around and off-site. This shall be achieved by sweeping the entry on an as-needed basis. Any collected material shall be treated as contaminated material and will be disposed of as required.

16.4 SEDIMENT AND RUNOFF MANAGEMENT

A soil and water management plan must be implemented for the control of sediments and runoff leaving or entering the site. All control measures must be installed in accordance with Managing Urban Stormwater: Soil and Construction Volume 1, 4th Edition, NSW Government, March 2004. In the event excavated materials may be required to be stockpiled on site, the material will be required to be stockpiled in a designated location and covered to prevent dust emissions or wash-out during potential rainfall events. Methodology for stockpiling of materials on-site is provided in this RAP.

Drainage and sediment erosion control is required to mitigate the potential for:

- Migration of clean and impacted soil off-site and across the site itself; and

- Migration of clean and impacted surface water and groundwater off-site and across the site itself.

Migration of clean or impacted soil off-site can increase the sediment load in receiving waters and storm water drains, while impacted soils may also release contaminants into these environments. Migration of impacted surface and/or groundwater off-site may result in the release of contaminants into sensitive receiving waters or public utilities (sewer or storm water). Migration of impacted soil, surface water or groundwater across the site may also lead to re-contamination of remediated portions of the site.

Uncontrolled migration of clean surface water across the site may cause erosion and result in transport of soil and sediment off-site. Drainage and erosion controls to be implemented may include the following:

- Hay-bale and geofabric fences to control soil erosion;
- The use of silt/sediment mesh to control surface water run-on or run-off. Where possible, clean run-off should be diverted around the site to minimise the volume of water requiring management; and
- Temporary bunding.

These sediment control features may be placed around:

- The individual site boundaries (up, across and down gradient);
- Soil stockpiles (if created);
- Excavation areas; and
- Stormwater drains.

Appropriate regulatory and utility permits will be required to allow disposal of run-off to either the stormwater or the sewer. Review of the permitting regulations will need to be done with the local authority and/or water authority managing the sewer (storm and sewerage) network.

16.5 AIR QUALITY

16.5.1 Dust Control

The greatest potential for dust generation may occur during soil treatment or excavation, stockpiling and reinstatement works. Control procedures for the site should be implemented on an as needed basis and could include the following:

- Use of hand held water sprays or hoses to dampen exposed soil and fill surfaces. However, it is important to recognise that there is an environmental risk associated with the generation of excessive and / or contaminated run-off and this should be managed accordingly;
- Stockpiling material in small stockpiles;

- Covering stockpiles; and
- Staging works to take advantage of the prevailing winds to minimise the impact of dusts.

16.5.2 Odour

Odour is not anticipated be an issue at the site during the excavation and remediation works however if required odour issues can be mitigated by covering of soils, and mist sprays/odour suppressants at site boundaries.

The following measures are generally used to mitigate odour, if generated:

- Minimise working area within odorous soils;
- All stockpiles will be covered to prevent odour dispersion and potential off gassing;
- Excavation works should take advantage of the prevailing winds to minimise the dispersal of nuisance odours to any neighbouring properties; and
- Use of odour suppressant such as Biosolve or suitable alternative may be applied to stockpiled excavated material to reduce odour.

16.5.3 Potential Vapour Exposure in Subsurface Areas

Occupational health and safety requirements must be met to prevent exposure from impacted soil and / or groundwater during excavation and soil management works. It is not anticipated that soils impacted by volatile contaminants will be encountered, however if encountered the risks to site workers should be managed as outlined below.

Prior to excavation works, or access to utility pits, control measures to protect against exposure to vapour inhalation should be implemented. These measures might include but are not limited to:

- Using a photo-ionisation detector (PID) in the operator breathing zone;
- Setting PID action levels;
- Using respirators or implementing ventilation measures if action levels are exceeded; and
- Stopping work and accessing methods of eliminating vapour exposure.
- Assessment of confined spaces on-site and in nearby off-site utility pits or other sub-surface structures is to be done only by appropriately trained and accredited confined space personnel.

Occupational health and safety requirements under NSW legislation or industry codes of practice must be met for entry into confined spaces such as trenches during future building works.

16.5.4 Noise

The remediation works shall comply with the NSW EPA Draft Construction Noise Guideline (2020).

16.6 ASBESTOS MANAGEMENT

Investigations did not detect ACM or asbestos fibres in samples collected from fill materials in extensive sampling and analysis undertaken at the site.

If asbestos is found in site soils during the further investigations or during the site works the following should be considered in order to manage the risks associated with asbestos

The works associated with the remediation and management of asbestos and asbestos contaminated soils should carried out in accordance with the relevant legislation including:

Legislation/Regulation	**Key Project Requirements**
Protection of the Environmental Operations Act 1997 (POEO Act) and Regulations	Undertake all activities so as to minimise harm to the environment with regards to asbestos
Protection of the Environment Operations (Waste) Regulation	Requirements in relation to transportation, collection, storage or disposal of asbestos waste.
Environmental Planning and Assessment Act 1979	Compliance with development consent conditions issued by the Consent Authority to manage effects on the environment.
National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)	Compliance with the new ASC NEPM (NEPC 2013) guidelines and the referenced documentation – in particular Western Australia Department of Health – Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites (GARMACS) in Western Australia, May 2009.

And, as appropriate:

- Work Health and Safety Act 2011.
- Work Health and Safety Regulation 2011.
- Safework NSW – How to Safely Remove Asbestos, Code of Practice (2019).
- Safework NSW – How to Manage and Control Asbestos in the Workplace, Code of Practice (2019).
- Safework NSW – How to Manage Work Health and Safety Risks, Code of Practice (2019).
- Australian Standard AS 1319-1994, Safety Signs for the Occupational Environment; and
- Australian Standard AS 31000:-2009, Risk Management.

Specific legislative requirements also referred to in this RAP are:

- The Work Health and Safety Act requires all persons who conduct a business or undertaking (PCBU) to ensure that, as reasonably practicable, workers and other persons are not put at risk from work carried out as part of the business or undertaking.
- The PCBU must undertake a risk assessment of asbestos containing materials and eliminate the exposure of persons at the workplace from airborne asbestos. The exposure standard for asbestos must not be exceeded. Air monitoring must be carried out during the removal of friable asbestos.
- All forms of asbestos are a prohibited carcinogenic substance. The use of asbestos containing materials is prohibited apart from the purpose of sampling and analysis, maintenance, removal, disposal, encapsulation or enclosure.
- A Class B licence is required for removal of the bonded ACM, where the quantities exceed $10m^2$.
- A Class A licence is require for removal of friable asbestos and quantities over 10 m^2.
- The PCBU must provide health monitoring to a worker if they are involved in asbestos removal work and is at risk of exposure to asbestos when carrying out the work.
- Excavated soil found to contain asbestos during the bulk earthworks will be removed from site by an appropriately licensed asbestos removal contractor and disposed of in accordance with current NSW EPA guidelines and relevant industry codes of practice.
- Asbestos waste is a trackable waste in accordance with NSW EPA guidelines and must be tracked in accordance with NSW EPA requirements.

17 SUMMARY AND RECOMMENDATIONS

This RAP has been prepared to manage contamination at the Site and to make the Site suitable for the proposed residential aged care facility.

Successful implementation of the RAP should render this site suitable for the proposed development.

Based on the remedial options assessment, the applicable and preferred remedial option for the COPCs is: Excavation, transport, and disposal of impacted soils at the site to a suitably licensed facility.

Remediation works should be carried out in accordance with Sections 11 to 16.

Contingency measures for remediation, site management, and unexpected finds are detailed within this RAP.

It is noted that all excavations at the site must be undertaken in accordance with a suitable Construction Environment Management Plan to mitigate risks to workers and the public during earthworks at the site.

18 LIMITATIONS OF THIS REPORT

This report has been prepared for use by the client who commissioned the works in accordance with the project brief and based on information provided by the client. The advice contained in this report relates only to the current project and all results, conclusions and recommendations should be reviewed by a competent person with experience in geotechnical and environmental investigations before being used for any other purpose. CES accepts no liability for use or interpretation by any person or body other than the client. This report must not be reproduced except in full and must not be amended in any way without prior approval by the client and CES.

This report does not provide a complete assessment of the environmental status of the site and is limited to the scope defined therein. It is noted that areas of the site could not be investigated due to the presence of structures including the residential property and presence of ponds. Should information become available regarding conditions at the site including previously unknown sources of contamination, CES reserves the right to review the report in the context of the additional information.

19 REFERENCES

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Figures

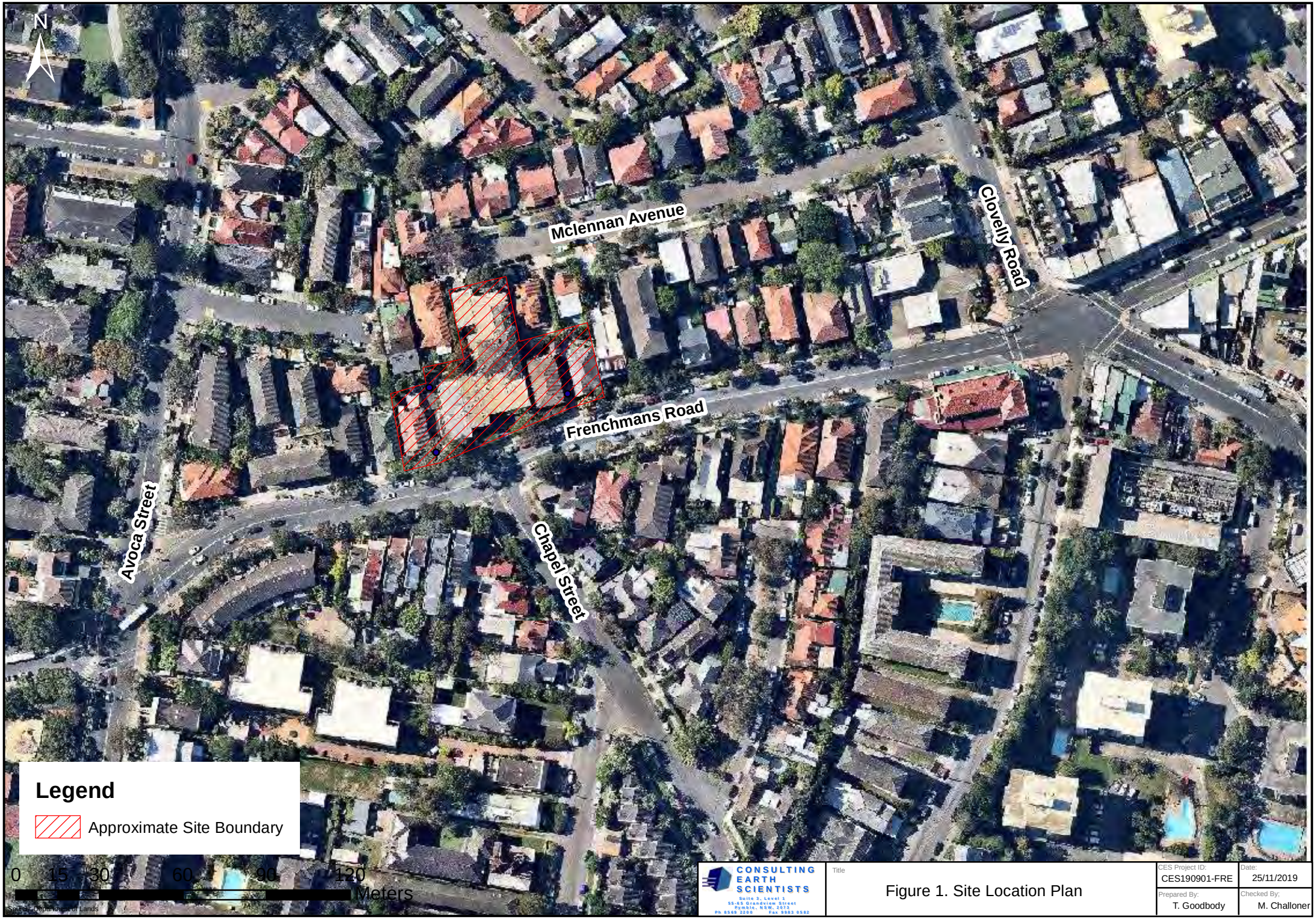

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Figure 1. Site Location Plan

CES Project ID:	Date:
CES190901-FRE	25/11/2019
Prepared By: T. Goodbody	Checked By: M. Challoner

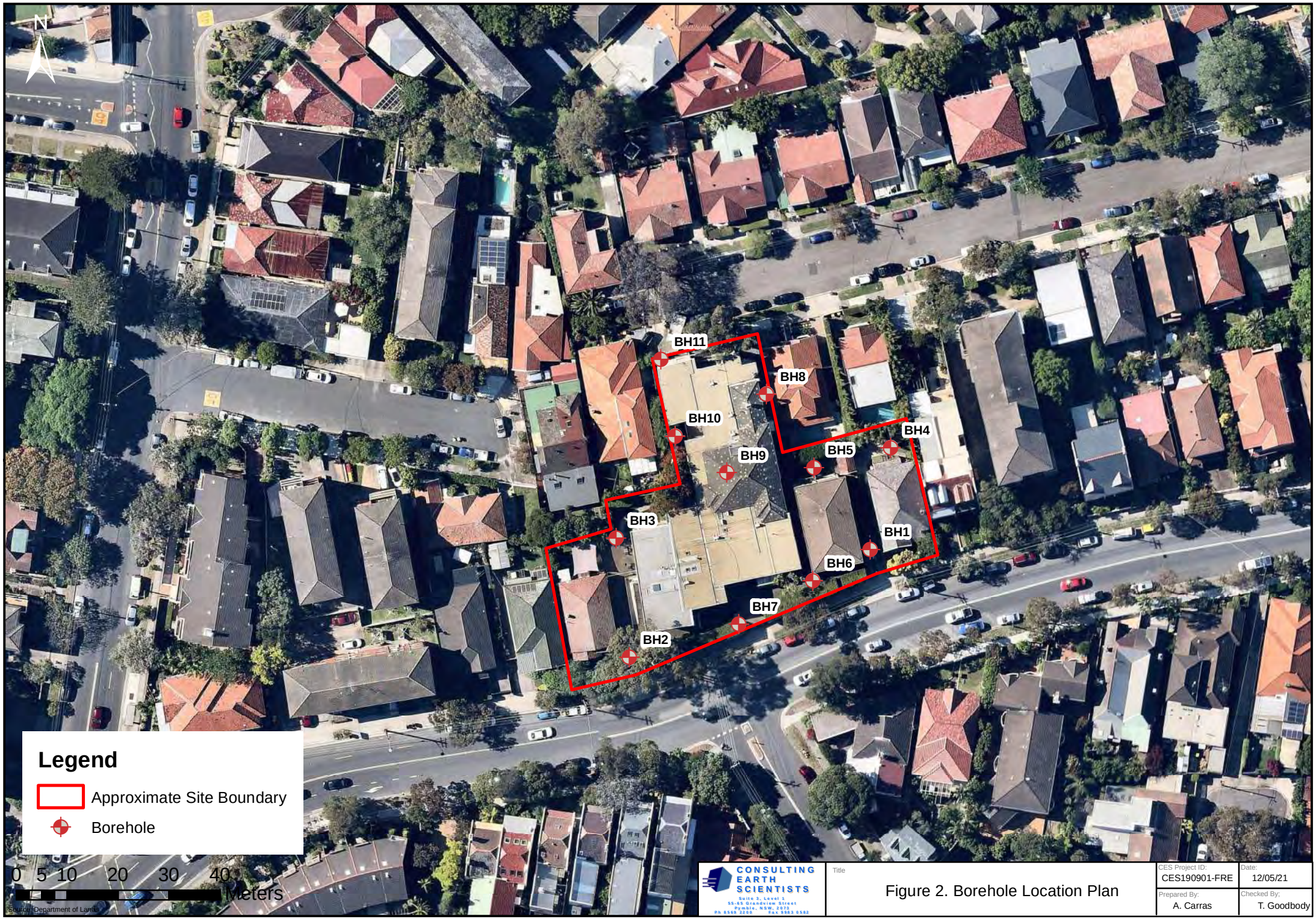

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Figure 2. Borehole Location Plan

CES Project ID:	Date:
CES190901-FRE	12/05/21
Prepared By: A. Carras	Checked By: T. Goodbody

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Figure 3. Assessment Criteria Exceedance Plan

CES Project ID:	Date:
CES190901-FRE	12/05/21
Prepared By:	Checked By:
A. Carras	T. Goodbody

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Figure 4. Remedial Extent Plan

CES Project ID:	Date:
CES190901-FRE	31/05/2021
Prepared By: A. Carras	Checked By: T. Goodbody

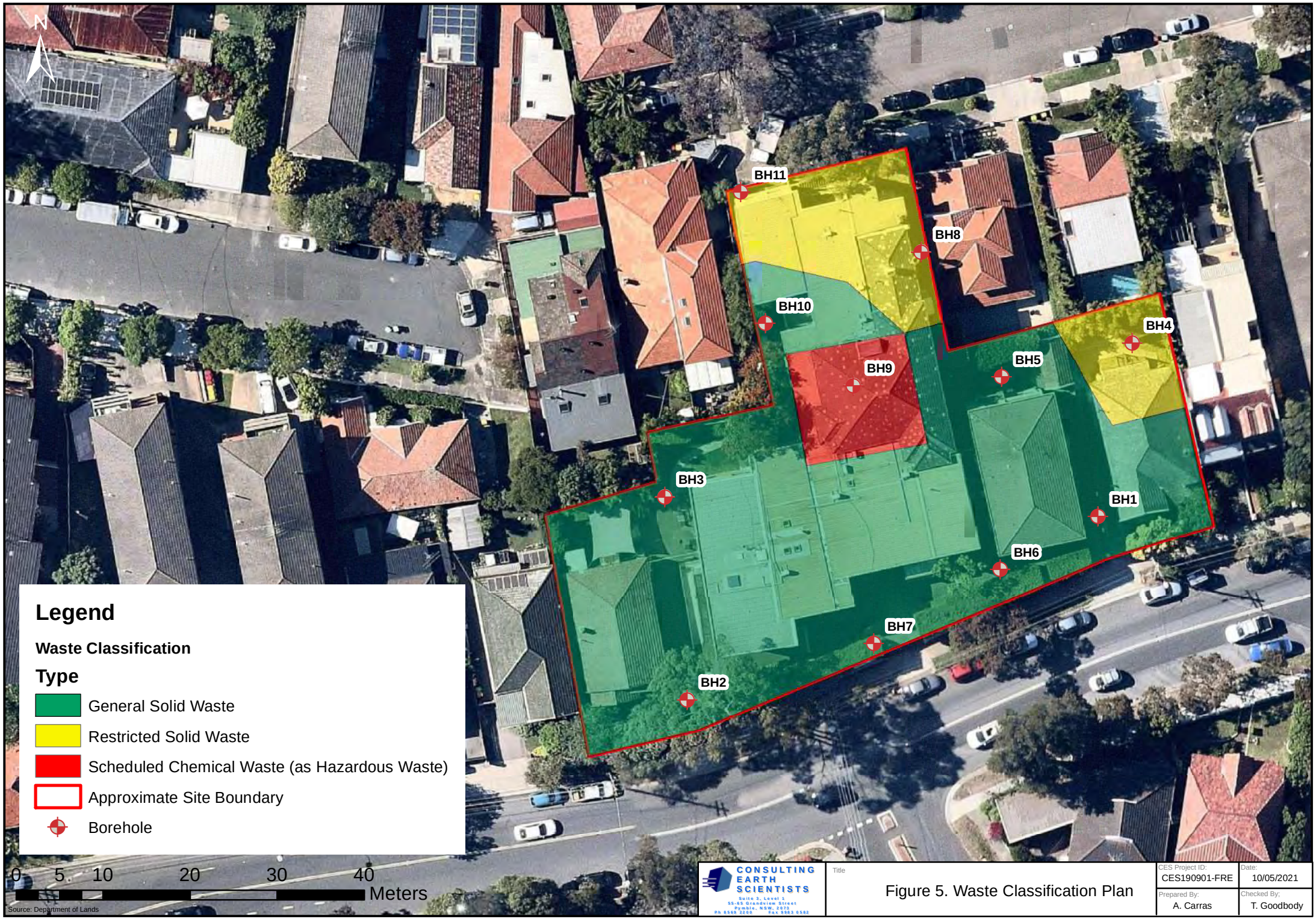

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Figure 5. Waste Classification Plan

CES Project ID:	Date:
CES190901-FRE	10/05/2021
Prepared By:	Checked By:
A. Carras	T. Goodbody

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Title

Figure 6. Site Assessment Criteria Plan

CES Project ID:	Date:
CES190901-FRE	31/05/2021
Prepared By: A. Carras	Checked By: T. Goodbody

Tables

Table 14: Summary of Analysis results and Comparison to Tier 1 Screening Criteria

		Lab Report	HIL B/HSL D	HIL C/HSL C	EIL/ESL Urban	230559	230559	230559	268144	268144	268144	268144	268144	268144	268144	268144	95% Upper	Mean	Standard
		Job #	High Density	Recreational	residential and	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Confidence		Deviation
		Sample	Residential (0-<1m	Areas	Public Open	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	BH10	BH11	Limit conducted		
		Depth	Sand) including		Space (coarse	0.5	0.5	1.5	0.15	0.15	0.15	0.05	0.15	0.15	0.15	0.15	on HIL/HSL		
		Date Sampl	basement parking		soils)	07/11/2019	06/11/2019	06/11/2019	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	exceedances		
	Units	PQL																	
TRH C6 - C9	mg/kg	25	-	-	-	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	N/A	N/A	N/A
TRH C6 - C10	mg/kg	25	-	-	-	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	N/A	N/A	N/A
vTPH C6 - C10 lessBTEX (F1)	mg/kg	25	260	45	180*	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	N/A	N/A	N/A
Benzene	mg/kg	0.2	3	0.5	50	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	N/A	N/A	N/A
Toluene	mg/kg	0.5	NL	220	85	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	N/A	N/A	N/A
Ethylbenzene	mg/kg	1	NL	55	70	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	N/A
m+p-xylene	mg/kg	2	-	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	N/A	N/A	N/A
o-Xylene	mg/kg	1	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	N/A
naphthalene	mg/kg	1	NL	3	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	N/A
Total +ve Xylenes	mg/kg	3	230	40	105	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	N/A	N/A	N/A
TRH C10 - C14	mg/kg	50	-	-	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	N/A	N/A	N/A
TRH C15 - C28	mg/kg	100	-	-	-	<100	<100	<100	<100	<100	**280**	**140**	**270**	**980**	**430**	<100	N/A	N/A	N/A
TRH C29 - C36	mg/kg	100	-	-	-	<100	<100	<100	<100	<100	**200**	**180**	**130**	**1100**	**360**	**120**	N/A	N/A	N/A
TRH >C10-C16	mg/kg	50	-	-	-	<50	<50	<50	<50	<50	**53**	<50	<50	<50	<50	<50	N/A	N/A	N/A
TRH >C10 - C16less Naphthalene (F2)	mg/kg	50	NL	110	120*	<50	<50	<50	<50	<50	**53**	<50	<50	<50	<50	<50	N/A	N/A	N/A
TRH >C16-C34	mg/kg	100	-	-	300	<100	<100	<100	<100	<100	**410**	**270**	**370**	**1900**	**700**	**120**	**801.8**	**365.5**	**551**
TRH >C34-C40	mg/kg	100	-	-	2800	<100	<100	<100	<100	<100	**150**	**130**	<100	**370**	**230**	<100	N/A	N/A	N/A
Total +ve TRH (>C10-C40)	mg/kg	50	-	-	-	<50	<50	<50	<50	<50	**610**	**400**	**370**	**2300**	**930**	**120**	N/A	N/A	N/A
Naphthalene	mg/kg	0.1	-	-	170	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	**0.3**	**0.4**	N/A	N/A	N/A
Acenaphthylene	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	**0.4**	**0.1**	**0.9**	<0.1	**1.5**	<0.1	N/A	N/A	N/A
Acenaphthene	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Fluorene	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	**0.5**	**0.4**	N/A	N/A	N/A
Phenanthrene	mg/kg	0.1	-	-	-	**0.2**	<0.1	<0.1	**0.8**	**0.1**	**0.7**	**0.4**	**2.7**	**0.1**	**5.2**	**4.9**	N/A	N/A	N/A
Anthracene	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	**0.3**	<0.1	**0.2**	**0.1**	**1.4**	<0.1	**1.9**	**1.8**	N/A	N/A	N/A
Fluoranthene	mg/kg	0.1	-	-	-	**0.3**	**0.2**	<0.1	**2**	**0.5**	**2.3**	**0.8**	**9.4**	**0.2**	**11**	**12**	N/A	N/A	N/A
Pyrene	mg/kg	0.1	-	-	-	**0.2**	**0.2**	<0.1	**2**	**0.6**	**2.6**	**1**	**11**	**0.3**	**11**	**13**	N/A	N/A	N/A
Benzo(a)anthracene	mg/kg	0.1	-	-	-	**0.1**	**0.1**	<0.1	**2**	**0.5**	**1.8**	**0.6**	**4.3**	**0.2**	**4**	**5.8**	N/A	N/A	N/A
Chrysene	mg/kg	0.1	-	-	-	<0.1	**0.1**	<0.1	**1.3**	**0.5**	**1.3**	**0.4**	**5.8**	<0.1	**5.8**	**6.3**	N/A	N/A	N/A
Benzo(b,j+k)fluoranthene	mg/kg	0.2	-	-	-	<0.2	**0.3**	<0.2	**2**	**0.8**	**3.2**	**1**	**7.2**	<0.2	**7.4**	**8.9**	N/A	N/A	N/A
Benzo(a)pyrene	mg/kg	0.05	-	-	0.7	**0.1**	**0.2**	<0.05	**1.2**	**0.4**	**2.1**	**0.58**	**4.6**	**0.1**	**4.6**	**5.9**	**4.463**	**1.8**	**2.188**
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	-	-	-	<0.1	**0.1**	<0.1	**0.5**	**0.2**	**1**	**0.3**	**2.3**	<0.1	**2.1**	**2.9**	N/A	N/A	N/A
Dibenzo(a,h)anthracene	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	**0.1**	<0.1	**0.2**	<0.1	**0.5**	<0.1	**0.5**	**0.6**	N/A	N/A	N/A
Benzo(g,h,i)perylene	mg/kg	0.1	-	-	-	<0.1	**0.1**	<0.1	**0.8**	**0.3**	**1.2**	**0.3**	**2.3**	<0.1	**2.3**	**3.5**	N/A	N/A	N/A
Total +vePAH's	mg/kg	0.05	400	300	-	**0.91**	**1.4**	<0.05	**13**	**3.8**	**17**	**5.5**	**53**	**0.96**	**58**	**66**	N/A	N/A	N/A
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5	4	3	-	<0.5	<0.5	<0.5	**1.8**	**0.5**	**2.9**	**0.8**	**6.6**	<0.5	**6.5**	**8.4**	**5.8**	**2.591**	**3.087**
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5	4	3	-	<0.5	<0.5	<0.5	**1.8**	**0.6**	**2.9**	**0.8**	**6.6**	<0.5	**6.5**	**8.4**	**5.8**	**2.6**	**3.081**
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	4	3	-	<0.5	<0.5	<0.5	**1.8**	**0.6**	**2.9**	**0.9**	**6.6**	<0.5	**6.5**	**8.4**	**5.8**	**2.609**	**3.075**
alpha-BHC	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
HCB	mg/kg	0.1	15	10	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
beta-BHC	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
gamma-BHC	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Heptachlor	mg/kg	0.1	10	10	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
delta-BHC	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Aldrin	mg/kg	0.1	6	10	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**440**	**1**	<0.1	**438**	**40.13**	**132.6**
Heptachlor Epoxide	mg/kg	0.1	10	10	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
gamma-Chlordane	mg/kg	0.1	90	70	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
alpha-chlordane	mg/kg	0.1	90	70	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Endosulfan I	mg/kg	0.1	400	340	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
pp-DDE	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Dieldrin	mg/kg	0.1	6	10	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**13**	<0.1	<0.1	**12.94**	**1.227**	**3.905**
Endrin	mg/kg	0.1	20	20	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Endosulfan II	mg/kg	0.1	400	340	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
pp-DDD	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Endrin Aldehyde	mg/kg	0.1	20	20	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
pp-DDT	mg/kg	0.1	-	-	180	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Endosulfan Sulphate	mg/kg	0.1	400	340	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Methoxychlor	mg/kg	0.1	500	400	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Total +ve DDT+DDD+DDE	mg/kg	0.1	600	400	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Dichlorvos	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Dimethoate	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Diazinon	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Chlorpyriphos-methyl	mg/kg	0.1	340	250	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Ronnel	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Fenitrothion	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Malathion	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Chlorpyriphos	mg/kg	0.1	340	250	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Parathion	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Bromophos-ethyl	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Ethion	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Azinphos-methyl (Guthion)	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Aroclor 1016	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Aroclor 1221	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Aroclor 1232	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Aroclor 1242	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Aroclor 1248	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Aroclor 1254	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Aroclor 1260	mg/kg	0.1	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Total +ve PCBs (1016-1260)	mg/kg	0.1	1	1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A
Arsenic	mg/kg	4	500	300	100	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	**12**	N/A	N/A	N/A
Cadmium	mg/kg	0.4	150	90	-	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	**0.8**	N/A	N/A	N/A
Chromium	mg/kg	1	500	300	420	**5**	**7**	**6**	**9**	**11**	**11**	**9**	**12**	**6**	**8**	**19**	N/A	N/A	N/A
Copper	mg/kg	1	30000	17000	110	**2**	**15**	**8**	**61**	**31**	**34**	**29**	**54**	**48**	**52**	**140**	**76.57**	**43.09**	**37.51**
Lead	mg/kg	1	1200	600	1100	**11**	**290**	**18**	**1300**	**250**	**360**	**110**	**2200**	**180**	**330**	**2100**	**1529**	**650**	**820**
Mercury	mg/kg	0.1	120	80	-	<0.1	<0.1	<0.1	**0.2**	**1**	**0.2**	**0.1**	**0.7**	**0.2**	**0.2**	**0.7**	N/A	N/A	N/A
Nickel	mg/kg	1	1200	1200	75	<1	**2**	**1**	**3**	**4**	**7**	**5**	**6**	**2**	**3**	**11**	N/A	N/A	N/A
Zinc	mg/kg	1	60000	30000	250	**44**	**40**	**56**	**210**	**120**	**110**	**100**	**430**	**61**	**150**	**670**	**318.3**	**181**	**196.7**

Table 15: Asbestos Laboratory Analytical Results

		Lab Report	HSL D High Commercial Industrial	HIL C/HSL C Recreational Areas	230559	230559	230559	268144	268144	268144	268144	268144	268144	268144	268144
		Project Number			Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	Frenchmans Roa	1 Frenchmans Road	1 Frenchmans Road	1 Frenchmans Road
		Sample			BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	BH10	BH11
		Depth			0.5	0.5	1.5	0.15	0.15	0.15	0.05	0.15	0.15	0.15	0.15
		Date Sampled			07/11/2019	06/11/2019	06/11/2019	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
	Units	PQL													
Sample mass tested	g		-	-	440.2	247.25	283.95	461.05	473.08	367.67	387.19	299.69	Approx. 45g	533.74	476.82
Sample Description	-		-	-	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & debris	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil	-		-	-	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	Insufficient sample for NEPM 500mL analysis.	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected
Trace Analysis	-		-	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos#1	g/kg	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	N/A	-	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	--	-	-	–	–	–	–	–	–	–	–	-	–	–
FA and AF Estimation*	g	--	-	-	–	–	–	–	–	–	–	–	-	–	–
ACM >7mm Estimation*	%(w/w)	0.01	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001
Mass / Dimension of Sample	-		-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sample Description	-		-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Asbestos ID in materials	-		-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trace Analysis	-		-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 16: Soil QAQC Assessment Results

			268144	268144	ES2116624001				
			CES190901 Frenchmans Road Randwick	CES190901 Frenchmans Road Randwick	CES190901 Frenchmans Road Randwick	**Average**	**Blind RPD**	**Average**	**Split RPD**
		Sample	BH5	QS1	QS1A				
		Depth	0.15				%		%
		Date Sampled	03/05/2021						
	Units	PQL							
TRH C6 - C9	mg/kg	25	<25	<25	<10	N/A	N/A	N/A	N/A
TRH C6 - C10	mg/kg	25	<25	<25	<10	N/A	N/A	N/A	N/A
vTPH C6 - C10 lessBTEX (F1)	mg/kg	25	<25	<25	<10	N/A	N/A	N/A	N/A
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	N/A	N/A	N/A	N/A
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	N/A	N/A	N/A	N/A
Ethylbenzene	mg/kg	1	<1	<1	<0.5	N/A	N/A	N/A	N/A
m+p-xylene	mg/kg	2	<2	<2	<0.5	N/A	N/A	N/A	N/A
o-Xylene	mg/kg	1	<1	<1	<0.5	N/A	N/A	N/A	N/A
naphthalene	mg/kg	1	<1	<1	<1	N/A	N/A	N/A	N/A
Total +ve Xylenes	mg/kg	3	<3	<3	<0.5	N/A	N/A	N/A	N/A
TRH C10 - C14	mg/kg	50	<50	<50	<50	N/A	N/A	N/A	N/A
TRH C15 - C28	mg/kg	100	<100	<100	<100	N/A	N/A	N/A	N/A
TRH C29 - C36	mg/kg	100	<100	100	<100	75.000	66.7%	N/A	N/A
TRH >C10-C16	mg/kg	50	<50	<50	<50	N/A	N/A	N/A	N/A
TRH >C10 - C16less Naphthalene (F2)	mg/kg	50	<50	<50	<50	N/A	N/A	N/A	N/A
TRH >C16-C34	mg/kg	100	<100	110	<100	80.000	75.0%	N/A	N/A
TRH >C34-C40	mg/kg	100	<100	<100	<100	N/A	N/A	N/A	N/A
Total +ve TRH (>C10-C40)	mg/kg	50	<50	110	<50	80.000	75.0%	N/A	N/A
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.5	N/A	N/A	N/A	N/A
Acenaphthylene	mg/kg	0.1	<0.1	0.1	<0.5	0.100	50.0%	N/A	N/A
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.5	N/A	N/A	N/A	N/A
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.5	N/A	N/A	N/A	N/A
Phenanthrene	mg/kg	0.1	0.1	0.2	0.5	0.150	66.7%	0.175	228.6%
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.5	N/A	N/A	N/A	N/A
Fluoranthene	mg/kg	0.1	0.5	0.6	0.6	0.550	18.2%	0.500	20.0%
Pyrene	mg/kg	0.1	0.6	0.8	0.7	0.700	28.6%	0.600	16.7%
Benzo(a)anthracene	mg/kg	0.1	0.5	0.6	<0.5	0.550	18.2%	0.375	66.7%
Chrysene	mg/kg	0.1	0.5	0.5	<0.5	0.500	0.0%	0.375	66.7%
Benzo(b,j+k)fluoranthene	mg/kg	0.2	0.8	1.0	0.6	0.900	22.2%	0.800	25.0%
Benzo(a)pyrene	mg/kg	0.05	0.4	0.7	<0.5	0.525	47.6%	0.325	46.2%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	0.2	0.4	<0.5	0.300	66.7%	0.225	22.2%
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	<0.1	<0.5	N/A	N/A	N/A	N/A
Benzo(g,h,i)perylene	mg/kg	0.1	0.3	0.4	<0.5	0.350	28.6%	0.275	18.2%
alpha-BHC	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
HCB	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
beta-BHC	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
gamma-BHC	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Heptachlor	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
delta-BHC	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Aldrin	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Heptachlor Epoxide	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
gamma-Chlordane	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
alpha-chlordane	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Endosulfan I	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
pp-DDE	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Dieldrin	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Endrin	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Endosulfan II	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
pp-DDD	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
pp-DDT	mg/kg	0.1	<0.1	<0.1	<0.2	N/A	N/A	N/A	N/A
Endosulfan Sulphate	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Methoxychlor	mg/kg	0.1	<0.1	<0.1	<0.2	N/A	N/A	N/A	N/A
Total +ve DDT+DDD+DDE	mg/kg	0.1	<0.1	<0.1	<0.2	N/A	N/A	N/A	N/A
Dichlorvos	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Dimethoate	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Diazinon	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Chlorpyriphos-methyl	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Ronnel	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Fenitrothion	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Malathion	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Chlorpyriphos	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Parathion	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Bromophos-ethyl	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Ethion	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Azinphos-methyl (Guthion)	mg/kg	0.1	<0.1	<0.1	<0.05	N/A	N/A	N/A	N/A
Aroclor 1016	mg/kg	0.1	<0.1	<0.1	-	N/A	N/A	N/A	N/A
Aroclor 1221	mg/kg	0.1	<0.1	<0.1	-	N/A	N/A	N/A	N/A
Aroclor 1232	mg/kg	0.1	<0.1	<0.1	-	N/A	N/A	N/A	N/A
Aroclor 1242	mg/kg	0.1	<0.1	<0.1	-	N/A	N/A	N/A	N/A
Aroclor 1248	mg/kg	0.1	<0.1	<0.1	-	N/A	N/A	N/A	N/A
Aroclor 1254	mg/kg	0.1	<0.1	<0.1	-	N/A	N/A	N/A	N/A
Aroclor 1260	mg/kg	0.1	<0.1	<0.1	-	N/A	N/A	N/A	N/A
Total +ve PCBs (1016-1260)	mg/kg	0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A	N/A
Arsenic	mg/kg	4	<4	<4	<5	N/A	N/A	N/A	N/A
Cadmium	mg/kg	0.4	<0.4	<0.4	<1	N/A	N/A	N/A	N/A
Chromium	mg/kg	1	11	10	8	11	9.5%	11	27.3%
Copper	mg/kg	1	31	32	31	32	3.2%	31	0.0%
Lead	mg/kg	1	250	270	293	260	7.7%	250	17.2%
Mercury	mg/kg	0.1	1.0	1.1	1.0	1.050	9.5%	1.000	0.0%
Nickel	mg/kg	1	4	4	3	4	0.0%	4	25.0%
Zinc	mg/kg	1	120	130	121	125	8.0%	120	0.8%
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	N/A	N/A	N/A	N/A
Asbestos ID in soil <0.1g/kg*	-	N/A	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	N/A	N/A	N/A	N/A
ACM >7mm Estimation*	g	--	–	–	-	N/A	N/A	N/A	N/A
FA and AF Estimation*	g	--	–	–	-	N/A	N/A	N/A	N/A
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	-	N/A	N/A	N/A	N/A
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	-	N/A	N/A	N/A	N/A

Table 17: Soil QA/QC Results (Blanks and Trip Spikes)

		Sample Type	Trip Spike	Trip Blank
		Sample	TS	TB
		Laboratory Report	268144	268144
		Date Sampled	03/05/2021	03/05/2021
	Units	PQL		
TRH C6 - C9	mg/kg	25	-	<25
TRH C6 - C10	mg/kg	25	-	<25
vTPH C6 - C10 lessBTEX (F1)	mg/kg	25	-	<25
Benzene	mg/kg	0.2	77%	<0.2
Toluene	mg/kg	0.5	78%	<0.5
Ethylbenzene	mg/kg	1	78%	<1
m+p-xylene	mg/kg	2	77%	<2
o-Xylene	mg/kg	1	76%	<1
naphthalene	mg/kg	1	-	<1
Total +ve Xylenes	mg/kg	3	-	<3

Table 18: EIL Soil Physiochemical Properties

Sample			BH6
Depth			0.15
Date Sampled	Units	PQL	3/05/2021
Iron	mg/kg	10	9400
pH 1:5 soil:CaCl2	pH Units	0.1	5.1
Total Organic Carbon(Walkley Black)	mg/kg	1000	39000
Exchangeable Ca	meq/100g	0.1	5.4
Exchangeable K	meq/100g	0.1	0.1
Exchangeable Mg	meq/100g	0.1	1.4
Exchangeable Na	meq/100g	0.1	<0.1
Cation Exchange Capacity	meq/100g	1	6.9
Clay in soils <2µm	% (w/w)	1	11

Table 19: Waste Classification Results

	NSW EPA CT1 Criteria for General Solid Waste	NSW EPA CT2 Criteria for Restircted Solid Waste	NSW EPA TCLP1 Criteria for General Solid Waste	NSW EPA SCC1 Criteria for General Solid Waste	NSW EPA TCLP2 Criteria for Restircted Solid Waste	NSW EPA SCC2 Criteria for Restricted Solid Waste														95% Upper Confidence Limit conducted on exceedances
Lab Report									230559	230559	230559	268144	268144	268144	268144	268144	268144	268144	268144	
Project Number									ES190901-FS	ES190901-FS	ES190901-FS	Fenchmans	Fenchmans	Fenchmans	Fenchmans	Fenchmans	Fenchmans	Fenchmans	Fenchmans	
Sample									BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	BH10	BH11	
Depth									0.5	0.5	1.5	0.15	0.15	0.15	0.05	0.15	0.15	0.15	0.15	
Date Sampled									07/11/2019	06/11/2019	06/11/2019	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021	
							Units	PQL												
TRH C6 - C9	650	2600	N/A	650	N/A	2600	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	N/A
TRH C6 - C10	-	-	-	-	-	-	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	N/A
vTPH C6 - C10 lessBTEX (F1)	-	-	-	-	-	-	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	N/A
Benzene	10	40	0.5	18	2	72	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	N/A
Toluene	288	1152	14.4	518	57.6	2073	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	N/A
Ethylbenzene	600	2400	30	1,080	120	4,320	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A
m+p-xylene	-	-	-	-	-	-	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	N/A
o-Xylene	-	-	-	-	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A
naphthalene	-	-	-	-	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A
Total +ve Xylenes	1000	4000	50	1,800	200	7,200	mg/kg	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	N/A
TRH C10 - C14	-	-	-	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	N/A
TRH C15 - C28	-	-	-	-	-	-	mg/kg	100	<100	<100	<100	<100	<100	**280**	**140**	**270**	**980**	**430**	<100	N/A
TRH C29 - C36	-	-	-	-	-	-	mg/kg	100	<100	<100	<100	<100	<100	**200**	**180**	**130**	**1100**	**360**	**120**	N/A
Total +ve TPH (C10-C36)	10000	40000	N/A	10,000	N/A	40,000	mg/kg	50	<50	<50	<50	<100	<100	**505**	**345**	**425**	**2105**	**815**	**195**	N/A
TRH >C10-C16	-	-	-	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	**53**	<50	<50	<50	<50	<50	N/A
TRH >C10 - C16less Naphthalene (F2)	-	-	-	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	**53**	<50	<50	<50	<50	<50	N/A
TRH >C16-C34	-	-	-	-	-	-	mg/kg	100	<100	<100	<100	<100	<100	**410**	**270**	**370**	**1900**	**700**	**120**	N/A
TRH >C34-C40	-	-	-	-	-	-	mg/kg	100	<100	<100	<100	<100	<100	**150**	**130**	<100	**370**	**230**	<100	N/A
Total +ve TRH (>C10-C40)	-	-	-	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	**610**	**400**	**370**	**2300**	**930**	**120**	N/A
Naphthalene	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	**0.3**	**0.4**	N/A
Acenaphthylene	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.4**	**0.1**	**0.9**	<0.1	**1.5**	<0.1	N/A
Acenaphthene	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Fluorene	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	**0.5**	**0.4**	N/A
Phenanthrene	-	-	-	-	-	-	mg/kg	0.1	**0.2**	<0.1	<0.1	**0.8**	**0.1**	**0.7**	**0.4**	**2.7**	**0.1**	**5.2**	**4.9**	N/A
Anthracene	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	**0.3**	<0.1	**0.2**	**0.1**	**1.4**	<0.1	**1.9**	**1.8**	N/A
Fluoranthene	-	-	-	-	-	-	mg/kg	0.1	**0.3**	**0.2**	<0.1	**2**	**0.5**	**2.3**	**0.8**	**9.4**	**0.2**	**11**	**12**	N/A
Pyrene	-	-	-	-	-	-	mg/kg	0.1	**0.2**	**0.2**	<0.1	**2**	**0.6**	**2.6**	**1**	**11**	**0.3**	**11**	**13**	N/A
Benzo(a)anthracene	-	-	-	-	-	-	mg/kg	0.1	**0.1**	**0.1**	<0.1	**2**	**0.5**	**1.8**	**0.6**	**4.3**	**0.2**	**4**	**5.8**	N/A
Chrysene	-	-	-	-	-	-	mg/kg	0.1	<0.1	**0.1**	<0.1	**1.3**	**0.5**	**1.3**	**0.4**	**5.8**	<0.1	**5.8**	**6.3**	N/A
Benzo(b,j+k)fluoranthene	-	-	-	-	-	-	mg/kg	0.2	<0.2	**0.3**	<0.2	**2**	**0.8**	**3.2**	**1**	**7.2**	<0.2	**7.4**	**8.9**	N/A
Benzo(a)pyrene	0.8	3.2	-	10	-	23	mg/kg	0.05	**0.1**	**0.2**	<0.05	**1.2**	**0.4**	**2.1**	**0.58**	**4.6**	**0.1**	**4.6**	**5.9**	**4.5**
Benzo(a)pyrene TCLP	-	-	0.04	-	0.16	-	mg/L	0.001	-	-	-	-	-	-	-	<0.001	-	<0.001	<0.001	N/A
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	mg/kg	0.1	<0.1	**0.1**	<0.1	**0.5**	**0.2**	**1**	**0.3**	**2.3**	<0.1	**2.1**	**2.9**	N/A
Dibenzo(a,h)anthracene	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	**0.2**	<0.1	**0.5**	<0.1	**0.5**	**0.6**	N/A
Benzo(g,h,i)perylene	-	-	-	-	-	-	mg/kg	0.1	<0.1	**0.1**	<0.1	**0.8**	**0.3**	**1.2**	**0.3**	**2.3**	<0.1	**2.3**	**3.5**	N/A
Total +vePAH's	200	800	N/A	200	N/A	800	mg/kg	0.05	**0.91**	**1.4**	<0.05	**13**	**3.8**	**17**	**5.5**	**53**	**0.96**	**58**	**66**	N/A
Benzo(a)pyrene TEQ calc (zero)	-	-	-	-	-	-	mg/kg	0.5	<0.5	<0.5	<0.5	**1.8**	**0.5**	**2.9**	**0.8**	**6.6**	<0.5	**6.5**	**8.4**	N/A
Benzo(a)pyrene TEQ calc(half)	-	-	-	-	-	-	mg/kg	0.5	<0.5	<0.5	<0.5	**1.8**	**0.6**	**2.9**	**0.8**	**6.6**	<0.5	**6.5**	**8.4**	N/A
Benzo(a)pyrene TEQ calc(PQL)	-	-	-	-	-	-	mg/kg	0.5	<0.5	<0.5	<0.5	**1.8**	**0.6**	**2.9**	**0.9**	**6.6**	<0.5	**6.5**	**8.4**	N/A
alpha-BHC	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
HCB	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
beta-BHC	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
gamma-BHC	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Heptachlor	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
delta-BHC	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Aldrin	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**440**	**1**	<0.1	N/A
Heptachlor Epoxide	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
gamma-Chlordane	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
alpha-chlordane	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Endosulfan I	60	240	3	108	12	432	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
pp-DDE	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Dieldrin	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**13**	<0.1	<0.1	N/A
Endrin	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Endosulfan II	60	240	3	108	12	432	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
pp-DDD	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Endrin Aldehyde	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
pp-DDT	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Endosulfan Sulphate	60	240	3	108	12	432	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Methoxychlor	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Total +ve DDT+DDD+DDE	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Endosulfan	60	240	3	108	12	432	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Scheduled Chemicals	<50	<50	N/A	<50	N/A	<50	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**453**	**1**	<0.1	**451**
Dichlorvos	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Dimethoate	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Diazinon	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Chlorpyriphos-methyl	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Ronnel	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Fenitrothion	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Malathion	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Chlorpyriphos	4	16	0.2	7.5	0.8	30	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Parathion	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Bromophos-ethyl	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Ethion	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Azinphos-methyl (Guthion)	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Aroclor 1016	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Aroclor 1221	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Aroclor 1232	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Aroclor 1242	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Aroclor 1248	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Aroclor 1254	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Aroclor 1260	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Total +ve PCBs (1016-1260)	<50	<50	N/A	<50	N/A	<50	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A
Arsenic	100	400	5.0	500	20	2000	mg/kg	4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	**12**	N/A
Cadmium	20	80	1	100	4	400	mg/kg	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	**0.8**	N/A
Chromium	100	400	5	1900	20	7600	mg/kg	1	**5**	**7**	**6**	**9**	**11**	**11**	**9**	**12**	**6**	**8**	**19**	N/A
Copper	-	-	-	-	-	-	mg/kg	1	**2**	**15**	**8**	**61**	**31**	**34**	**29**	**54**	**48**	**52**	**140**	N/A
Lead	100	400	-	1500	-	6000	mg/kg	1	**11**	**290**	**18**	**1300**	**250**	**360**	**110**	**2200**	**180**	**330**	**2100**	**1529**
TCLP Lead	-	-	5	-	20	-	mg/L	0.1	-	-	-	**6.9**	-	**0.1**	-	**4.1**	-	-	**7.7**	N/A
Mercury	4	16	0.2	50	0.8	200	mg/kg	0.1	<0.1	<0.1	<0.1	**0.2**	**1**	**0.2**	**0.1**	**0.7**	**0.2**	**0.2**	**0.7**	N/A
Nickel	40	160	2	1050	8	4200	mg/kg	1	<1	**2**	**1**	**3**	**4**	**7**	**5**	**6**	**2**	**3**	**11**	N/A
Zinc	-	-	-	-	-	-	mg/kg	1	**44**	**40**	**56**	**210**	**120**	**110**	**100**	**430**	**61**	**150**	**670**	N/A

Table 20: Site Remediation Criteria

			HIL B/HSL D High Density Residential (0-<1m Sand) including basement parking	HIL C/HSL C Recreational Areas	EIL/ESL Urban residential and Public Open Space (coarse soils)
	Units	PQL			
TRH C6 - C9	mg/kg	25	-	-	-
TRH C6 - C10	mg/kg	25	-	-	-
vTPH C6 - C10 lessBTEX (F1)	mg/kg	25	260	45	180*
Benzene	mg/kg	0.2	3	0.5	50
Toluene	mg/kg	0.5	NL	220	85
Ethylbenzene	mg/kg	1	NL	55	70
m+p-xylene	mg/kg	2	-	-	-
o-Xylene	mg/kg	1	-	-	-
naphthalene	mg/kg	1	NL	3	-
Total +ve Xylenes	mg/kg	3	230	40	105
TRH C10 - C14	mg/kg	50	-	-	-
TRH C15 - C28	mg/kg	100	-	-	-
TRH C29 - C36	mg/kg	100	-	-	-
TRH >C10-C16	mg/kg	50	-	-	-
TRH >C10 - C16less Naphthalene (F2)	mg/kg	50	NL	110	120*
TRH >C16-C34	mg/kg	100	-	-	300
TRH >C34-C40	mg/kg	100	-	-	2800
Total +ve TRH (>C10-C40)	mg/kg	50	-	-	-
Naphthalene	mg/kg	0.1	-	-	170
Acenaphthylene	mg/kg	0.1	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-
Fluorene	mg/kg	0.1	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-
Anthracene	mg/kg	0.1	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-
Pyrene	mg/kg	0.1	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-
Chrysene	mg/kg	0.1	-	-	-
Benzo(b,j+k)fluoranthene	mg/kg	0.2	-	-	-
Benzo(a)pyrene	mg/kg	0.05	-	-	0.7
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	-	-	-
Dibenzo(a,h)anthracene	mg/kg	0.1	-	-	-
Benzo(g,h,i)perylene	mg/kg	0.1	-	-	-
Total +vePAH's	mg/kg	0.05	400	300	-
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5	4	3	-
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5	4	3	-
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	4	3	-

Table 20: Site Remediation Criteria

			HIL B/HSL D High Density Residential (0-<1m Sand) including basement parking	HIL C/HSL C Recreational Areas	EIL/ESL Urban residential and Public Open Space (coarse soils)
	Units	PQL			
alpha-BHC	mg/kg	0.1	-	-	-
HCB	mg/kg	0.1	15	10	-
beta-BHC	mg/kg	0.1	-	-	-
gamma-BHC	mg/kg	0.1	-	-	-
Heptachlor	mg/kg	0.1	10	10	-
delta-BHC	mg/kg	0.1	-	-	-
Aldrin	mg/kg	0.1	6	10	-
Heptachlor Epoxide	mg/kg	0.1	10	10	-
gamma-Chlordane	mg/kg	0.1	90	70	-
alpha-chlordane	mg/kg	0.1	90	70	-
Endosulfan I	mg/kg	0.1	400	340	-
pp-DDE	mg/kg	0.1	-	-	-
Dieldrin	mg/kg	0.1	6	10	-
Endrin	mg/kg	0.1	20	20	-
Endosulfan II	mg/kg	0.1	400	340	-
pp-DDD	mg/kg	0.1	-	-	-
Endrin Aldehyde	mg/kg	0.1	20	20	-
pp-DDT	mg/kg	0.1	-	-	180
Endosulfan Sulphate	mg/kg	0.1	400	340	-
Methoxychlor	mg/kg	0.1	500	400	-
Total +ve DDT+DDD+DDE	mg/kg	0.1	600	400	-
Dichlorvos	mg/kg	0.1	-	-	-
Dimethoate	mg/kg	0.1	-	-	-
Diazinon	mg/kg	0.1	-	-	-
Chlorpyriphos-methyl	mg/kg	0.1	340	250	-
Ronnel	mg/kg	0.1	-	-	-
Fenitrothion	mg/kg	0.1	-	-	-
Malathion	mg/kg	0.1	-	-	-
Chlorpyriphos	mg/kg	0.1	340	250	-
Parathion	mg/kg	0.1	-	-	-
Bromophos-ethyl	mg/kg	0.1	-	-	-
Ethion	mg/kg	0.1	-	-	-
Azinphos-methyl (Guthion)	mg/kg	0.1	-	-	-
Aroclor 1016	mg/kg	0.1	-	-	-
Aroclor 1221	mg/kg	0.1	-	-	-
Aroclor 1232	mg/kg	0.1	-	-	-
Aroclor 1242	mg/kg	0.1	-	-	-
Aroclor 1248	mg/kg	0.1	-	-	-
Aroclor 1254	mg/kg	0.1	-	-	-
Aroclor 1260	mg/kg	0.1	-	-	-
Total +ve PCBs (1016-1260)	mg/kg	0.1	1	1	-
Arsenic	mg/kg	4	500	300	100
Cadmium	mg/kg	0.4	150	90	-
Chromium	mg/kg	1	500	300	420
Copper	mg/kg	1	30000	17000	110
Lead	mg/kg	1	1200	600	1100
Mercury	mg/kg	0.1	120	80	-
Nickel	mg/kg	1	1200	1200	75
Zinc	mg/kg	1	60000	30000	250
ACM >7mm Estimation*	%(w/w)	<0.01	0.05	0.02	-
FA and AF Estimation*#2	%(w/w)	<0.001	0.001	0.001	-

Appendix A
Development Plans

P R O P O S E D

RESIDENTIAL CARE FACILITY

11-19 Frenchmans Road, Randwick, NSW

Drawing List

DWG. No.	Drawing Title	Scale	Size
DA00	- Cover Page	NTS	A1
DA01	- Site Plan	1:200	A1
DA02	- Site Analysis	1:200	A1
DA02a	- Site Anayis - Locality Plan	NTS	A1
DA03	- Lower Basement Floor Plan	1:200	A1
DA04	- Basement Floor Plan	1:200	A1
DA05	- Ground Floor Plan	1:200	A1
DA06	- First Floor Plan	1:200	A1
DA07	- Second Floor Plan	1:200	A1
DA08	- Third Floor Plan	1:200	A1
DA09	- Roof Plan	1:200	A1
DA10	- Sections (A,B & C)	1:200	A1
DA11	- Sections (D, E, F & G)	1:200	A1
DA12	- Section H & Elevations (South & West Boundary)	1:200	A1
DA13	- Elevations (North, East, South & West)	1:200	A1
DA14	- Street Elevations Proposed	1:200	A1
DA15	- Street Elevation @ Frenchmans Road - Photomontage	NTS	A1
DA16	- Street Elevation @ McLennan Avenue - Photomontage	NTS	A1
DA17	- Shadow Diagrams Existing & Proposed (21 June 8am. & 12 pm.)	1:500	A1
DA17a	- Shadow Diagrams Existing & Proposed (21 June 9am. & 3 pm.)	1:500	A1
DA18	- Shadow diagrams Existing & Proposed (21 June 4 pm.)	1:500	A1
DA18a	- 3D Image Showing Built form penetrating 12m Height	NTS	A1
DA19	- Solar Access Diagrams	NTS	A1
DA20	- Gross Floor Area Diagram - Ground Floor Plan	1:200	A1
DA21	- Gross Floor Area Diagram - First Floor Plan	1:200	A1
DA22	- Gross Floor Area Diagram - Second Floor Plan	1:200	A1
DA23	- Gross Floor Area Diagram - Third Floor Plan	1:200	A1
DA24	- Demolition Plan	1:200	A1

SUMMITCARE
WARMTH WORTH WELLBEING

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PRELIMINARY DA ISSUE
30.09. 2020

2017 DA00

DEVELOPMENT STATISTIC

SITE AREA		2,709.7 m²
	BCA FLOOR AREA	SEPP 2004 GROSS FLOOR AREA (VERTICAL VILLAGE)
LOWER BASEMENT.FL.	521.6 m²	-
BASEMENT.FL.	1,557.2 m²	-
GROUND FL.	1,340.2 m²	905.8 m²
FIRST FL.	1,393.4 m²	1,278.9 m²
SECOND FL.	1,338.6 m²	1,231.0 m²
THIRD FL.	391.0 m²	369.6 m²
TOTAL	6,541.9 m²	3,785.2 m²
FSR		1.397 : 1
CARPARKING / AMBULANCE		19+1= 20 spaces
LANDSCAPE AREA		1,130.3 m²
LANDSCAPE AREA PER BED		13.14 m²

RESIDENT ACCOMMODATION			
	1 BED	2 BED	TOTAL
GROUND FL.	17	0	17
FIRST FL.	24	4 x 2	32
SECOND FL.	22	4 x 2	30
THIRD FL.	7	0	7
TOTAL NUMBER OF THIRD FL. ILUs			= 2
TOTAL NUMBER OF BEDS			= **86**
TOTAL NUMBER OF ROOMS			78 + 2 = **80**

LEGEND

	PROPOSED RCF
	BOUNDARY
	SOFT LANDSCAPE
	HARD LANDSCAPE
	FENCE TYPE 1
	FENCE TYPE 2
+ ex RL.76.80	EXISTING LEVEL RL.
+ RL.76.80	NEW FINISHED LEVEL RL.
+ TOW RL.	PROPOSED TOP OF WALL LEVEL
	LOWER GROUND FLOOR
	BASEMENT FLOOR
	FIRST FLOOR
	SECOND FLOOR
	THIRD FLOOR
	PROPOSED ROADS AND DRIVEWAYS
	EXISTING TREES TO REMAIN
	EXISTING TREES TO BE REMOVED
F1	1800H POWDER COATED STEEL BLADE SECURITY FENCE ON MASONRY WALL RENDERED AND PAINTED WITH 400 X400 X1950H MASONRY COLUMN POST RENDERED AND PAINTED FINISH + EXISTING FENCE
F2	1800H COLORBOND STEEL FENCING & RETAINING WALL + EXISTING FENCE
F3	1800H COLORBOND STEEL FENCING + EXISTING FENCE

NOTE:
- ALL EXISTING FENCING EXCEPT FOR FRENCHMANS ROAD AND Mc LENNAM AVENUE BOUNDARIES TO REMAIN. NEW FENCING TO BE BUILT INSIDE THE BOUNDARY ADJACENT

No.	Amendment	Date
5	Preliminary DA issue	30.09.2020
4	Development Application Issue	07.09.2020
3	Development Application Issue for review	14.08.2020
2	Development Application Issue for review	11.08.2020
1	Development application issue	19.12.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
SITE PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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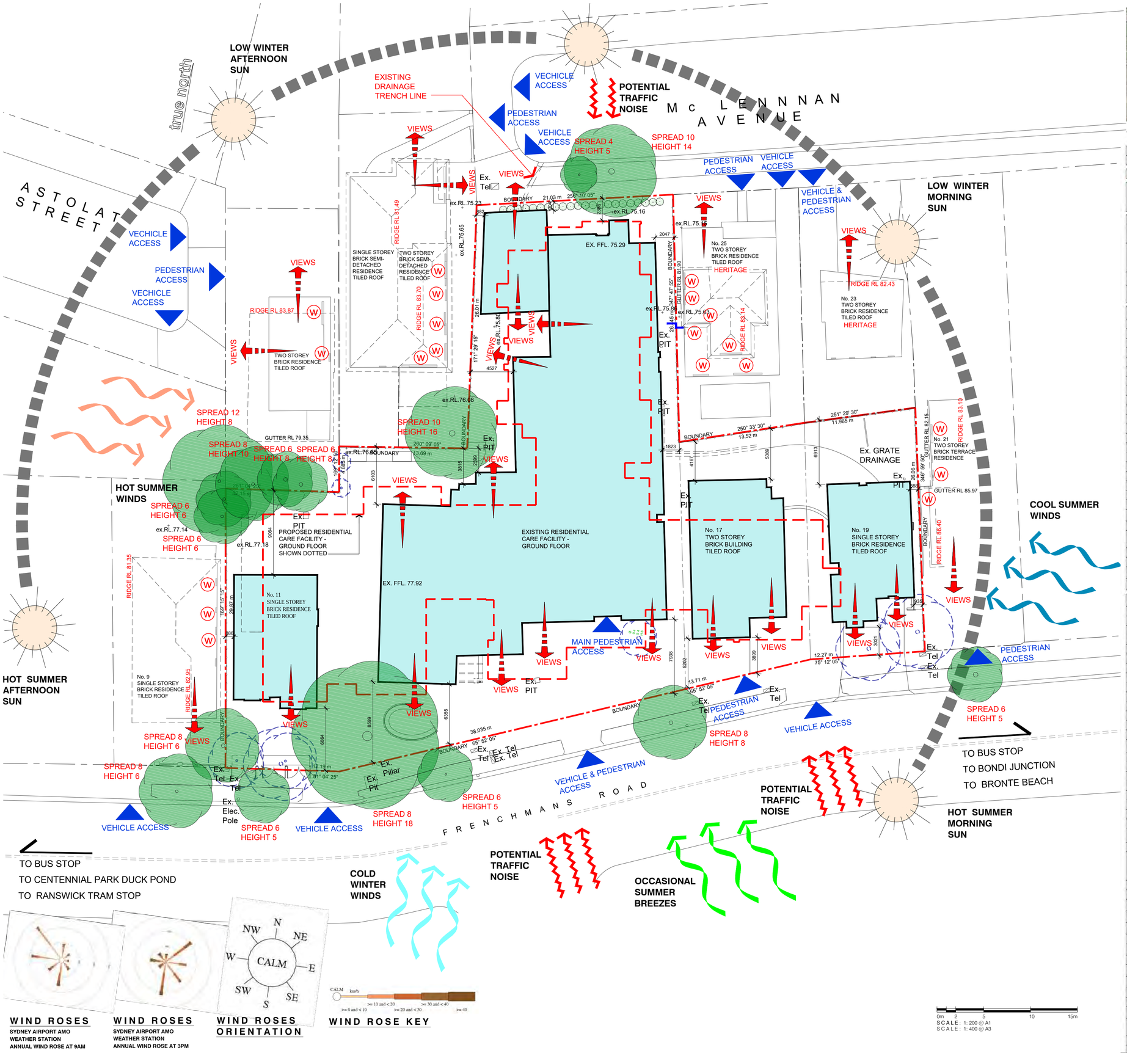
Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	1912 /	DA01
Drawn	SS		
Amendment	5		

SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3
0m 2 5 10 15m



WIND ROSES
SYDNEY AIRPORT AMO WEATHER STATION ANNUAL WIND ROSE AT 9AM

WIND ROSES
SYDNEY AIRPORT AMO WEATHER STATION ANNUAL WIND ROSE AT 3PM

WIND ROSES ORIENTATION

WIND ROSE KEY

LOCALITY PLAN
NOT TO SCALE

SEPP PART 3 - DESIGN REQUIREMENTS	REFER TO
Division 1 General	
30. Site analysis	
1. A consent authority must not consent to a development application made pursuant to this Chapter unless the consent authority is satisfied that the applicant has taken into account a site analysis prepared by the applicant in accordance with this clause.	This drawing
2. A site analysis must:	
A. Contain information about the site and its surrounds as described in subclauses (3) and (4), and	Please refer below
B. Be accompanied by a written statement (supported by plans including drawings of sections and elevations and, in the case of proposed development on land adjoining land zoned primarily for urban purposes, an aerial photograph of the site):	Design Statement
i. Explaining how the design of the proposed development has regard to the site analysis, and	Design Statement
ii. Explaining how the design of the proposed development has regard to the design principles set out in Division 2.	Design Statement
3. The following information about a site is to be identified in a site analysis:	
A. Site dimensions:	
• Length	Survey Plans
• Width	Survey Plans
B. Topography:	
• spot levels and/or contour	Survey Plans
• north point	All Plans
• natural drainage	Civil Drawings
• any contaminated soils or filled areas	Site Investigation Report
C. Services:	
• easements	N/A
• connections for drainage and utility services	Civil Drawings
D. Existing vegetation:	
• location	Survey Plans
• height	Survey Plans
• spread of established trees	Survey Plans
• species	Arborist Report
E. Micro climates:	
• orientation	This drawing
• prevailing winds	This drawing
F. Location of:	
• buildings and other structures	This drawing and DA01 – Site Plan
• heritage features and items including archaeology	This drawing
• fences	This drawing, DA01 – Site Plan & DA05 – Ground Floor Plan
• property boundaries	All plans
• pedestrian and vehicle access	This drawing
G. Views to and from the site	DA15 / DA16 – Street elevation & Perspectives
H. Overshadowing by neighbouring structures	DA17/DA18 – Shadow Diagrams
4. The following information about the surrounds of a site is to be identified in a site analysis:	
A. Neighbouring buildings:	
• location	Survey Plans
• height	Survey Plans
• use	Survey Plans
• balconies on adjacent properties	Survey Plans
• pedestrian and vehicle access to adjacent properties	Survey Plans
B. Privacy:	
• adjoining private open spaces	Survey Plans
• living room windows overlooking site	Survey Plans
• location of any facing doors and/or windows	Survey Plans
C. Walls built to the site's boundary:	
• location	DA01 – Site Plan
• height	DA01 – Site Plan
• materials	DA01 – Site Plan
D. Difference in levels between the site and adjacent properties at their boundaries	Survey Plans
E. Views and solar access enjoyed by neighbouring properties	This drawing
F. Major trees on adjacent properties	Survey Plans
G. Street frontage features:	
• poles	Survey Plans
• trees	Survey Plans
• kerb crossovers	Survey Plans
• bus stops	Survey Plans
• other services	Survey Plans
H. The built form and character of adjacent development (including buildings opposite on both sides of the street(s) fronted):	
• architectural character	All plans
• front fencing	This drawing, DA01 – Site Plan, DA05 – Ground Floor Plan & DA14 – Street Elevations Proposed
• garden styles	Landscape
I. Heritage features of surrounding locality and landscape	Heritage Report
J. Direction and distance to local facilities:	DA02a – Site Analysis Locality Plan
• local shops	DA02a – Site Analysis Locality Plan
• schools	DA02a – Site Analysis Locality Plan
• public transport	Traffic Report
• recreation and community facilities	DA02a – Site Analysis Locality Plan
K. Public open space:	
• location	DA02a – Site Analysis Locality Plan
• use	DA02a – Site Analysis Locality Plan
L. Adjoining bushland or environmentally sensitive land	N/A
M. Sources of nuisance:	N/A
• flight paths	DA02a – Site Analysis Locality Plan
• noisy roads or significant noise sources	This drawing, DA02a – Site Analysis Locality Plan
• polluting operations	N/A

LEGEND

	OUTLINE OF EXISTING SUMMITCARE BUILDING G/F
	OUTLINE OF PROPOSED SUMMITCARE BUILDING G/F
	BOUNDARY
	VIEWS
	PEDESTRIAN OR VEHICLE ACCESS
	EXISTING TREES TO REMAIN
	EXISTING TREES TO BE DEMOLISHED
	PROPOSE 1800H FENCE AND LANDSCAPE SCREENING FOR PRIVACY SCREENING REFER TO LANDSCAPE DOCUMENTS FOR DETAIL
	OCCASIONAL SUMMER BREEZES
	COOL SUMMER WINDS
	HOT SUMMER WINDS
	COLD WINTER WINDS
	TRAFFIC NOISE
W	WINDOW OF NEIGHBOURING BUILDINGS

NOTES:

1. REFER TO SURVEY DWGS FOR NEIGHBOURING PROPERTIES' WINDOWS AND DOORS' SILL AND HEAD HEIGHTS.
2. PLANT SPECIES REFER TO ABORIST REPORT
3. REFER TO DA01 - SITE PLAN FOR FENCING TYPES, RETAINING WALLS LOCATION, HEIGHT AND DETAILS

No.	Amendment	Date
5	Preliminary DA Issue	30.09.2020
4	Development Application Issue	07.09.2020
3	Development Application Issue for review	14.08.2020
2	Development Application Issue for review	11.08.2020
1	Development application issue	19.12.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
SITE ANALYSIS

SUMMITCARE
WARMTH WORTH WELLBEING

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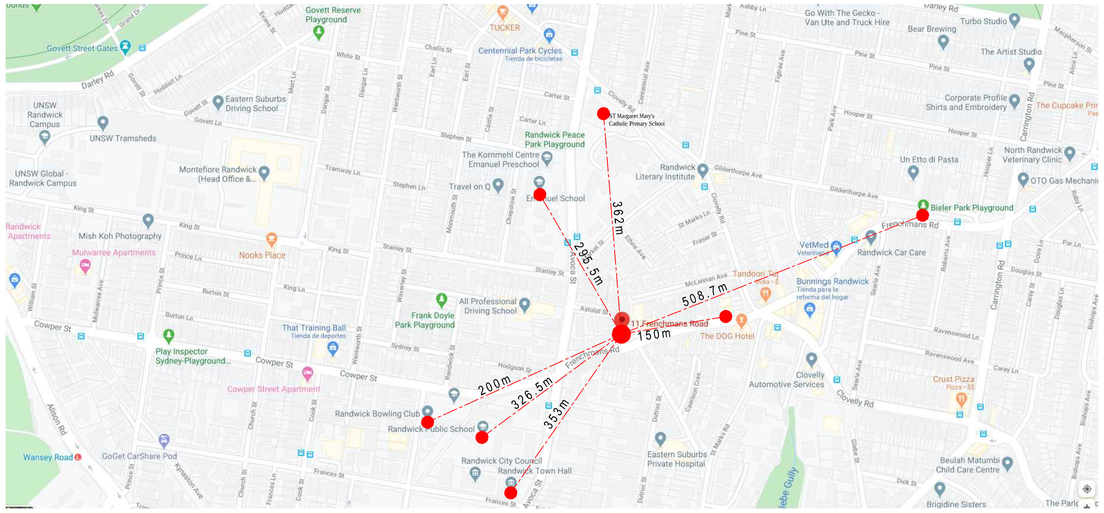
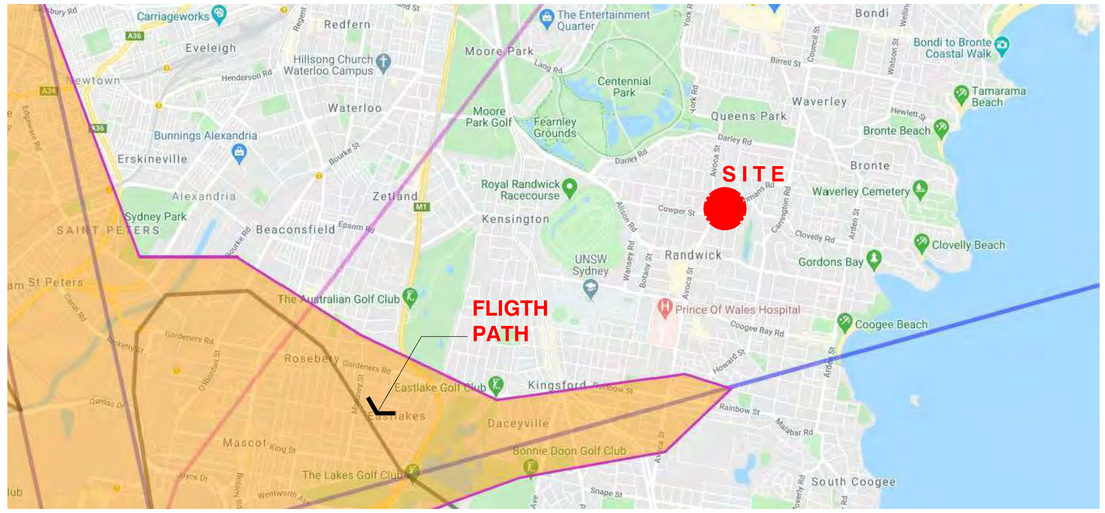
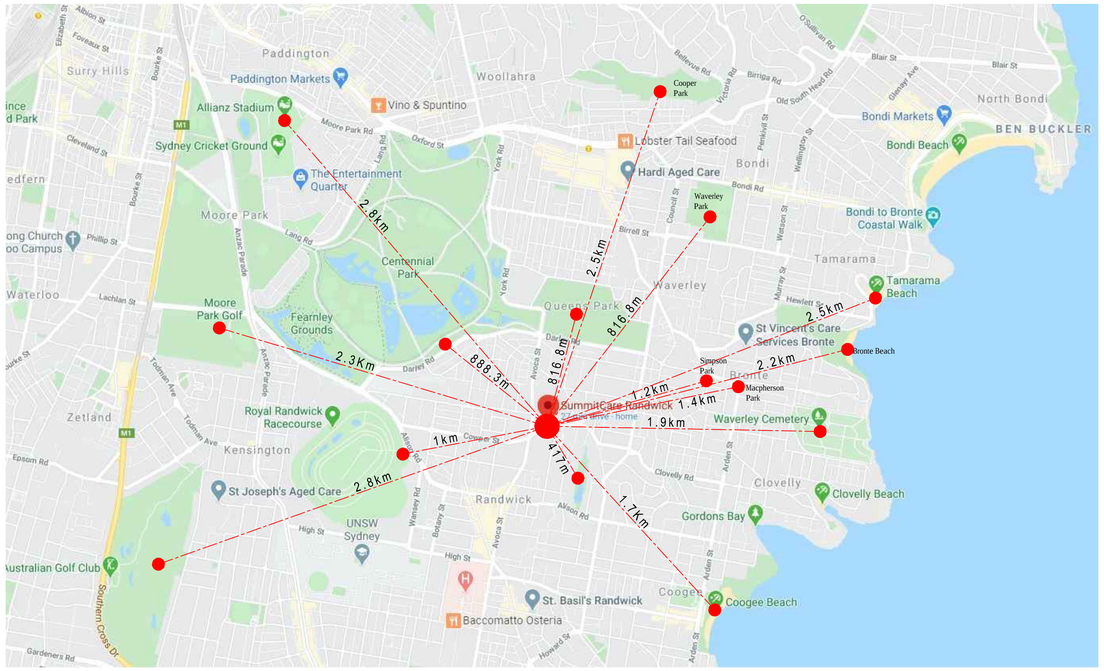
Date	JULY 2019	Job No. :	Drawing
Scale	AS SHOWN	1912 /	DA02
Drawn	SS		
Amendment	5		



DIRECTIONS & DISTANCES TO LOCAL FACILITY PLAN



FLIGTH PATH PLAN



PUBLIC OPEN SPACE PLAN

LOCATION PLAN

No.	Amendment	Date
3	Preliminary DA Issue	30.09.2020
2	Development Application Issue	07.09.2020
1	Development Application Issue for review	14.08.2020

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
SITE ANALYSIS - LOCALITY PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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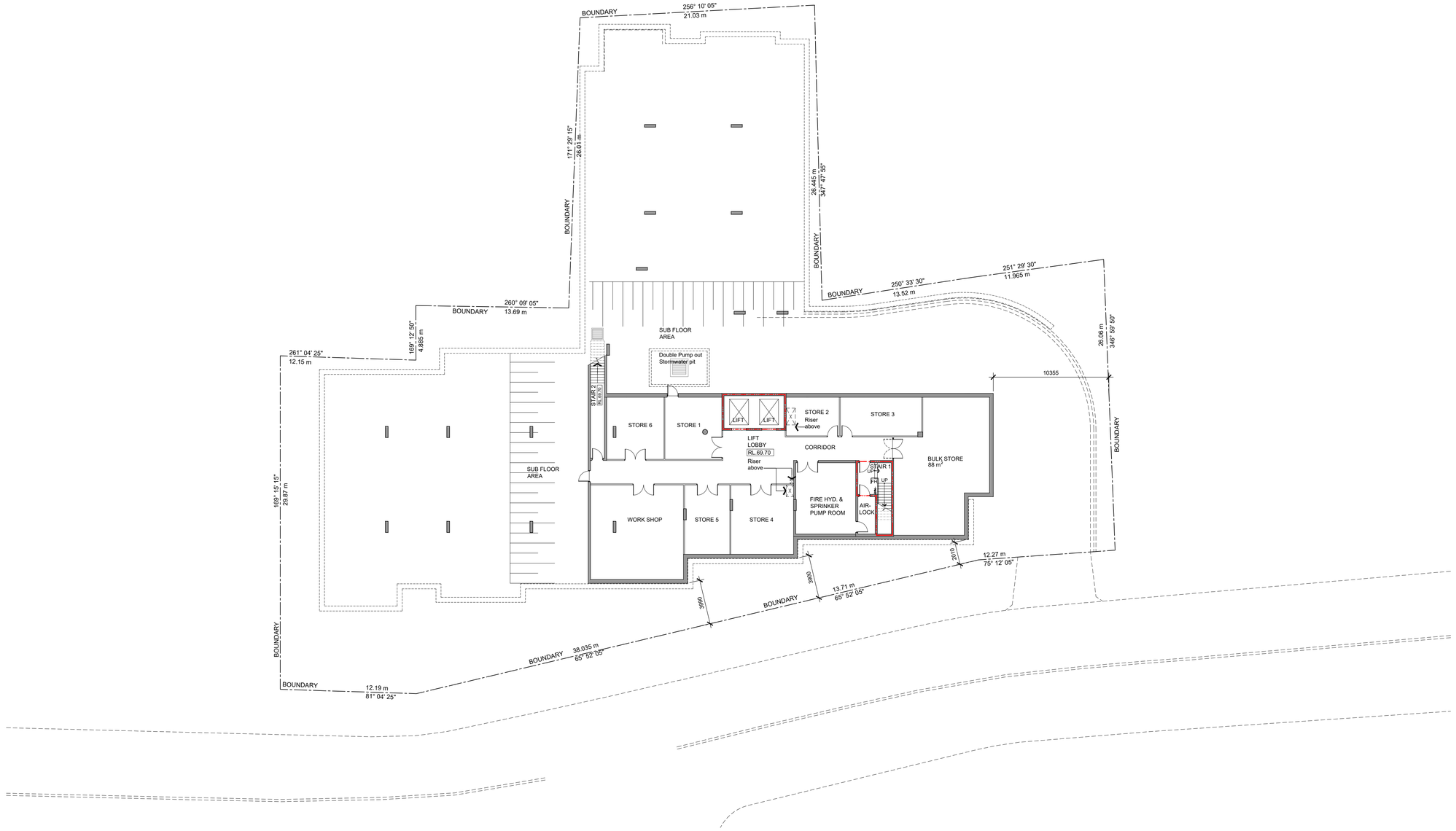
Date	JULY 2019	Job No. : Drawing	
Scale	AS SHOWN	1912 / DA02a	
Drawn	SS		
Amendment	3		



0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

LEGEND

	BOUNDARY
	MASONRY WALL
	STUD WALL
	OUTLINE OF WALL ABOVE / BELOW
	ROOF OUTLINE
	NEW FENCE
+ ex.RL.00.00	EXISTING LEVELS
RL.00.00	PROPOSED LEVELS
	PROPOSED DOOR
	PROPOSED WINDOW
	MOBILE BATH
	CEILING FAN
	ELEVATION TAG
	SECTION / ELEVATION TAG

ACOUSTIC REQUIREMENTS

	Rw 36 10.38mm laminated OR Rw 36 6/12/8 glass
	Rw 31 10mm monolithic OR Rw 34 6/12/6 glass
	Rw 27 6mm monolithic OR Rw 34 6/12/6 glass

NCC 2019 - SECTION J REQUIREMENTS

Envelope Construction	Total System R-Value (m²K/W)
J1.3 Roof and ceiling construction	≥ 3.70
J1.4 Roof lights	N/A
J1.5a Total System external wall construction (all facades)	≥ 2.39
J1.5b Total System internal wall construction (between conditioned & unconditioned areas)	≥ 1.00
J1.6a Floor construction (above an unconditioned zone)	≥ 2.00
J1.6b Floor construction (concrete slab on ground)	No insulation required

Glazing - Frame Construction (Uniform solution)	Orientation	Total System SHGC	Total System SHGC
J1.5c Total Window Frame construction	All facades	≤ 4.00	≤ 0.29

No.	Amendment	Date
11	Preliminary DA Issue	30.09.2020
10	Development Application Issue	07.09.2020
9	Development Application Issue for review	14.08.2020
8	Development Application Issue for review	11.08.2020
7	Preliminary Issue discussion	27.07.2020
6	Preliminary Issue for coordination	08.07.2020
5	Preliminary Issue for review & comment	06.07.2020
4	Development Application Issue	19.12.19
3	Preliminary Issue	03.12.19
2	Preliminary Issue	06.11.19
1	Preliminary Issue	18.09.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
LOWER BASEMENT FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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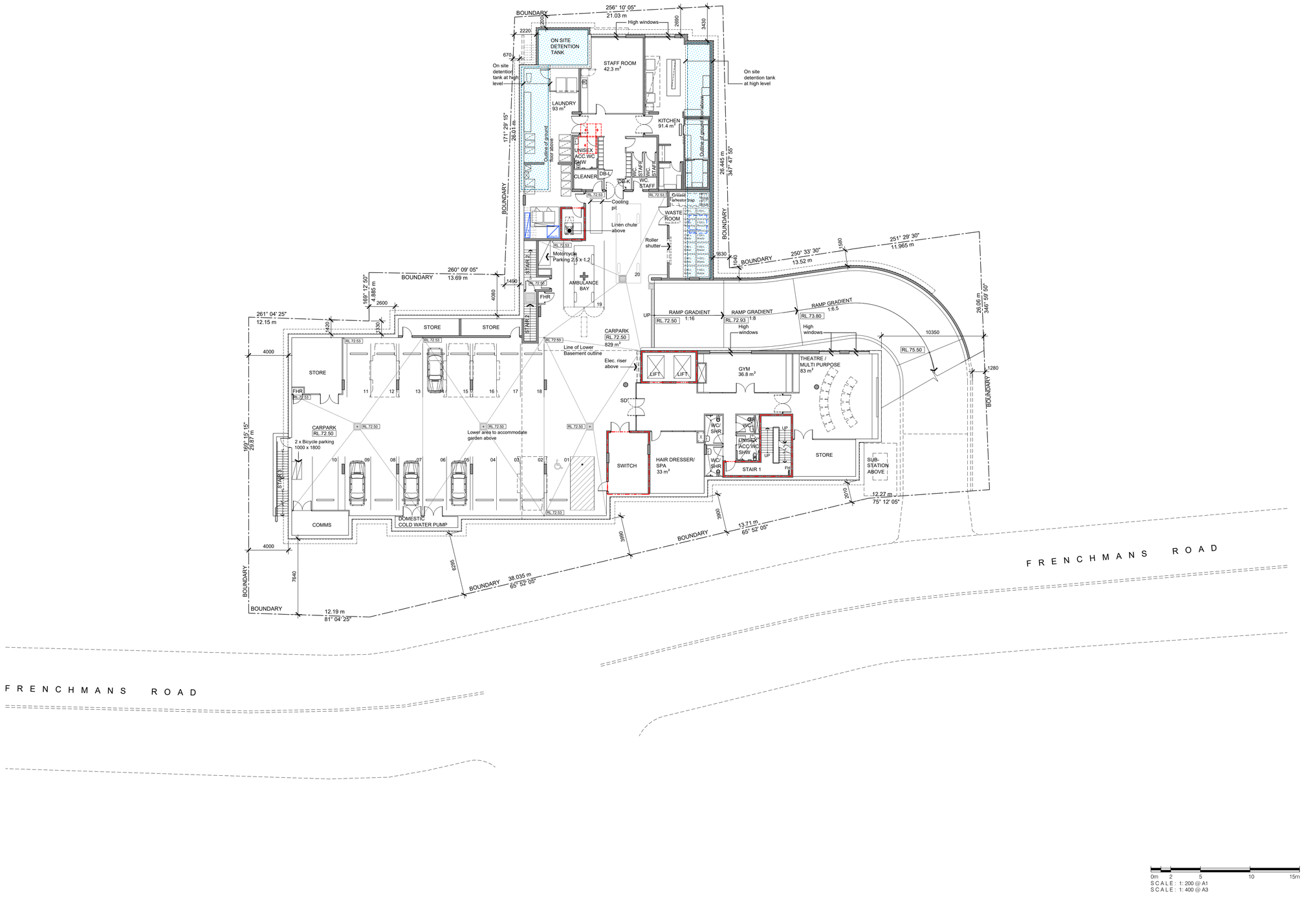
Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	1912 /	DA03
Drawn	SS / WW		
Amendment	11		



0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

LEGEND

	BOUNDARY
	MASONRY WALL
	STUD WALL
	OUTLINE OF WALL ABOVE / BELOW
	ROOF OUTLINE
	NEW FENCE
+ ex.RL.00.00	EXISTING LEVELS
RL.00.00	PROPOSED LEVELS
	PROPOSED DOOR
	PROPOSED WINDOW
	MOBILE BATH
	CEILING FAN
	ELEVATION TAG
	SECTION / ELEVATION TAG

ACOUSTIC REQUIREMENTS

	Rw 36 10.38mm laminated OR Rw 36 6/12/8 glass
	Rw 31 10mm monolithic OR Rw 34 6/12/6 glass
	Rw 27 6mm monolithic OR Rw 34 6/12/6 glass

NCC 2019 - SECTION J REQUIREMENTS

Envelope Construction	Total System R-Value (m²K/W)
J1.3 Roof and ceiling construction	≥ 3.70
J1.4 Roof lights	N/A
J1.5a Total System external wall construction (all facades)	≥ 2.39
J1.5b Total System internal wall construction (between conditioned & unconditioned areas)	≥ 1.00
J1.6a Floor construction (above an unconditioned zone)	≥ 2.00
J1.6b Floor construction (concrete slab on ground)	No insulation required

Glazing - Frame Construction (Uniform solution)	Orientation	Total System SHGC	Total System SHGC
J1.5c Total Window Frame construction	All facades	≤ 4.00	≤ 0.29

No.	Amendment	Date
13	Preliminary DA Issue	30.09.2020
12	Development Application Issue	07.09.2020
11	Development Application Issue for review	14.08.2020
10	Development Application Issue for review	13.08.2020
9	Development Application Issue for review	11.08.2020
8	Preliminary Issue discussion	27.07.2020
7	Preliminary Issue for coordination	08.07.2020
6	Preliminary Issue for review & comment	06.07.2020
5	building outline modifed following changes on the upper level	27.04.20
4	Development Application Issue	19.12.19
3	Preliminary Issue	03.12.19
2	Preliminary Issue	06.11.19
1	Preliminary Issue	18.09.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
BASEMENT FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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Email : brgroup@brgr.net

Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	2017 /	DA04
Drawn	SS / WW		
Amendment	13		

LEGEND

	BOUNDARY
	MASONRY WALL
	STUD WALL
	OUTLINE OF WALL ABOVE / BELOW
	ROOF OUTLINE
	NEW FENCE
+ ex.RL.00.00	EXISTING LEVELS
RL 00.00	PROPOSED LEVELS
	PROPOSED DOOR
	PROPOSED WINDOW
	MOBILE BATH
	CEILING FAN
	ELEVATION TAG
	SECTION / ELEVATION TAG

ACOUSTIC REQUIREMENTS

	Rw 36 10.38mm laminated OR Rw 36 6/12/8 glass
	Rw 31 10mm monolithic OR Rw 34 6/12/6 glass
	Rw 27 6mm monolithic OR Rw 34 6/12/6 glass

NCC 2019 - SECTION J REQUIREMENTS

Envelope Construction	Total System R-Value (m²K/W)
J1.3 Roof and ceiling construction	≥ 3.70
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J1.5b Total System internal wall construction (between conditioned & unconditioned areas)	≥ 1.00
J1.6a Floor construction (above an unconditioned zone)	≥ 2.00
J1.6b Floor construction (concrete slab on ground)	No insulation required

Glazing - Frame Construction (Uniform solution)	Orientation	Total System SHGC	Total System SHGC
J1.5c Total Window Frame construction	All facades	≤ 4.00	≤ 0.29

No.	Amendment	Date
14	Preliminary DA Issue	30.09.2020
13	Development Application Issue	07.09.2020
12	Development Application Issue for review	14.08.2020
11	Development Application Issue for review	11.08.2020
10	Preliminary Issue discussion	27.07.2020
9	Preliminary Issue for coordination	08.07.2020
8	Preliminary Issue for review & comment	06.07.2020
7	Changes required to avoid removing tree	27.04.20
6	Development Application Issue	19.12.19
5	Preliminary Issue	03.12.19
4	Preliminary Issue	06.11.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
GROUND FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	2017 / DA05	
Drawn	SS		
Amendment	14		

LEGEND

	BOUNDARY
	MASONRY WALL
	STUD WALL
	OUTLINE OF WALL ABOVE / BELOW
	ROOF OUTLINE
	NEW FENCE
+ ex.RL.00.00	EXISTING LEVELS
RL.00.00	PROPOSED LEVELS
	PROPOSED DOOR
	PROPOSED WINDOW
	MOBILE BATH
	CEILING FAN
	ELEVATION TAG
	SECTION / ELEVATION TAG

ACOUSTIC REQUIREMENTS

	Rw 36 10.38mm laminated OR Rw 36 6/12/8 glass
	Rw 31 10mm monolithic OR Rw 34 6/12/6 glass
	Rw 27 6mm monolithic OR Rw 34 6/12/6 glass

NCC 2019 - SECTION J REQUIREMENTS

Envelope Construction	Total System R-Value (m²K/W)
J1.3 Roof and ceiling construction	≥ 3.70
J1.4 Roof lights	N/A
J1.5a Total System external wall construction (all facades)	≥ 2.39
J1.5b Total System internal wall construction (between conditioned & unconditioned areas)	≥ 1.00
J1.6a Floor construction (above an unconditioned zone)	≥ 2.00
J1.6b Floor construction (concrete slab on ground)	No insulation required

Glazing - Frame Construction (Uniform solution)	Orientation	Total System SHGC	Total System SHGC
J1.5c Total Window Frame construction	All facades	≤ 4.00	≤ 0.29

No.	Amendment	Date
14	Preliminary DA Issue	30.09.2020
13	Development Application Issue	07.09.2020
12	Development Application Issue for review	14.08.2020
11	Development Application Issue for review	11.08.2020
10	Preliminary Issue discussion	27.07.2020
9	Preliminary Issue for coordination	08.07.2020
8	Preliminary Issue for review & comment	06.07.2020
7	Changes required to avoid removing tree	27.04.20
6	Development Application Issue	19.12.19
5	Preliminary Issue	03.12.19
4	Preliminary Issue	06.11.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
FIRST FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

boffa robertson group
architecture, health and aged care planning, project management
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AUSTRALIA
Tel. (02) 9406 7000
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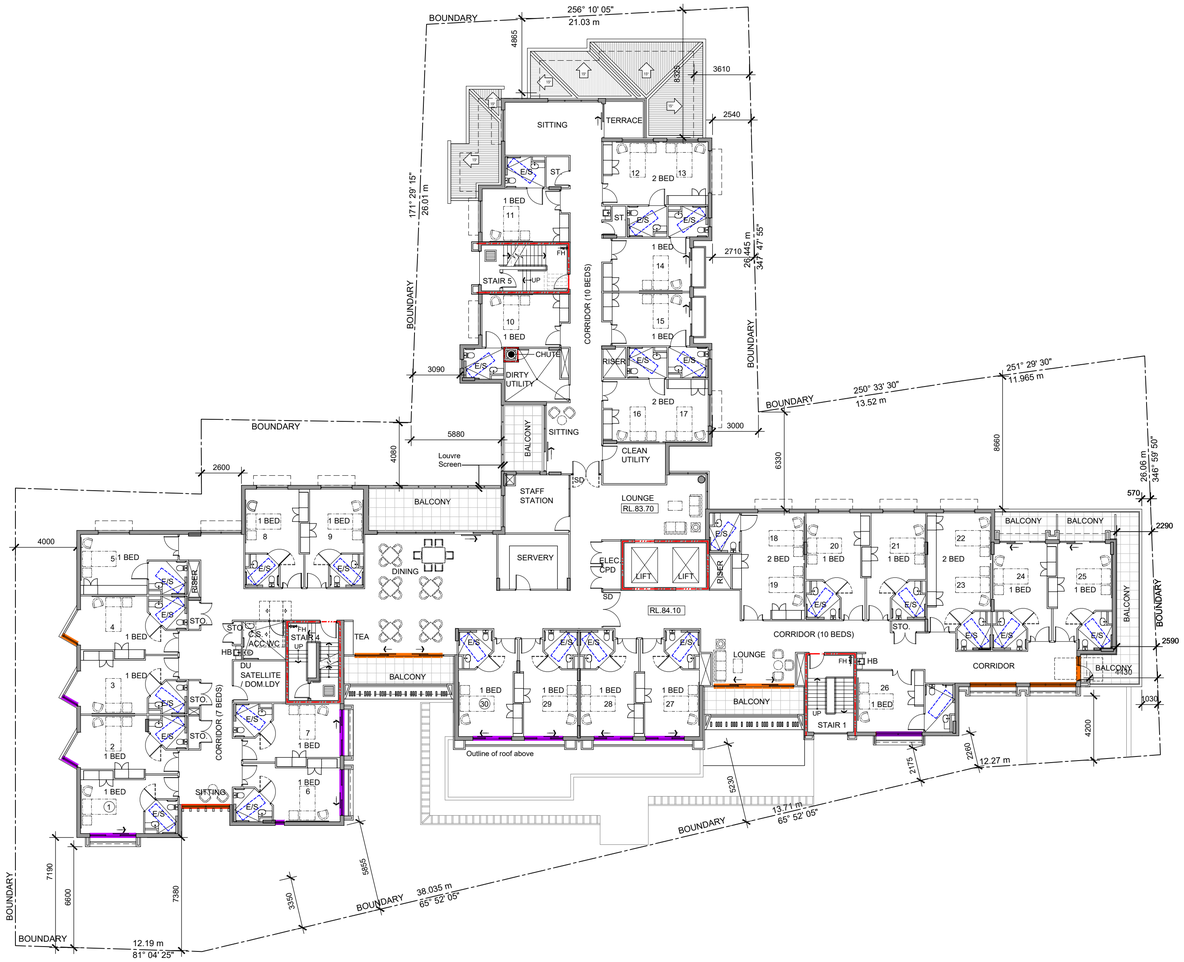
Email : brgroup@brgr.net

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	2017 / DA06	
Drawn	SS		
Amendment	14		



LEGEND

	BOUNDARY
	MASONRY WALL
	STUD WALL
	OUTLINE OF WALL ABOVE / BELOW
	ROOF OUTLINE
	NEW FENCE
+ ex.RL.00.00	EXISTING LEVELS
RL.00.00	PROPOSED LEVELS
	PROPOSED DOOR
	PROPOSED WINDOW
	MOBILE BATH
	CEILING FAN
	ELEVATION TAG
	SECTION / ELEVATION TAG

ACOUSTIC REQUIREMENTS

	Rw 36 10.38mm laminated OR Rw 36 6/12/8 glass
	Rw 31 10mm monolithic OR Rw 34 6/12/6 glass
	Rw 27 6mm monolithic OR Rw 34 6/12/6 glass

NCC 2019 - SECTION J REQUIREMENTS

Envelope Construction	Total System R-Value (m^2K/W)
J1.3 Roof and ceiling construction	≥ 3.70
J1.4 Roof lights	N/A
J1.5a Total System external wall construction (all facades)	≥ 2.39
J1.5b Total System internal wall construction (between conditioned & unconditioned areas)	≥ 1.00
J1.6a Floor construction (above an unconditioned zone)	≥ 2.00
J1.6b Floor construction (concrete slab on ground)	No insulation required

Glazing - Frame Construction (Uniform solution)	Orientation	Total System SHGC	Total System SHGC
J1.5c Total Window Frame construction	All facades	≤ 4.00	≤ 0.29

No.	Amendment	Date
14	Preliminary DA Issue	30.09.2020
13	Development Application Issue	07.09.2020
12	Development Application Issue for review	14.08.2020
11	Development Application Issue for review	11.08.2020
10	Preliminary Issue discussion	27.07.2020
9	Preliminary Issue for coordination	08.07.2020
8	Preliminary Issue for review & comment	06.07.2020
7	Changes required to avoid removing tree, Northern wing pulled back from boundary, Dwelling units to eastern wing converted to 8 bedrooms (10 beds)	27.04.20
6	Development Application Issue	19.12.19
5	Preliminary Issue	03.12.19
4	Preliminary Issue	06.11.19
3	Preliminary Issue	18.09.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
SECOND FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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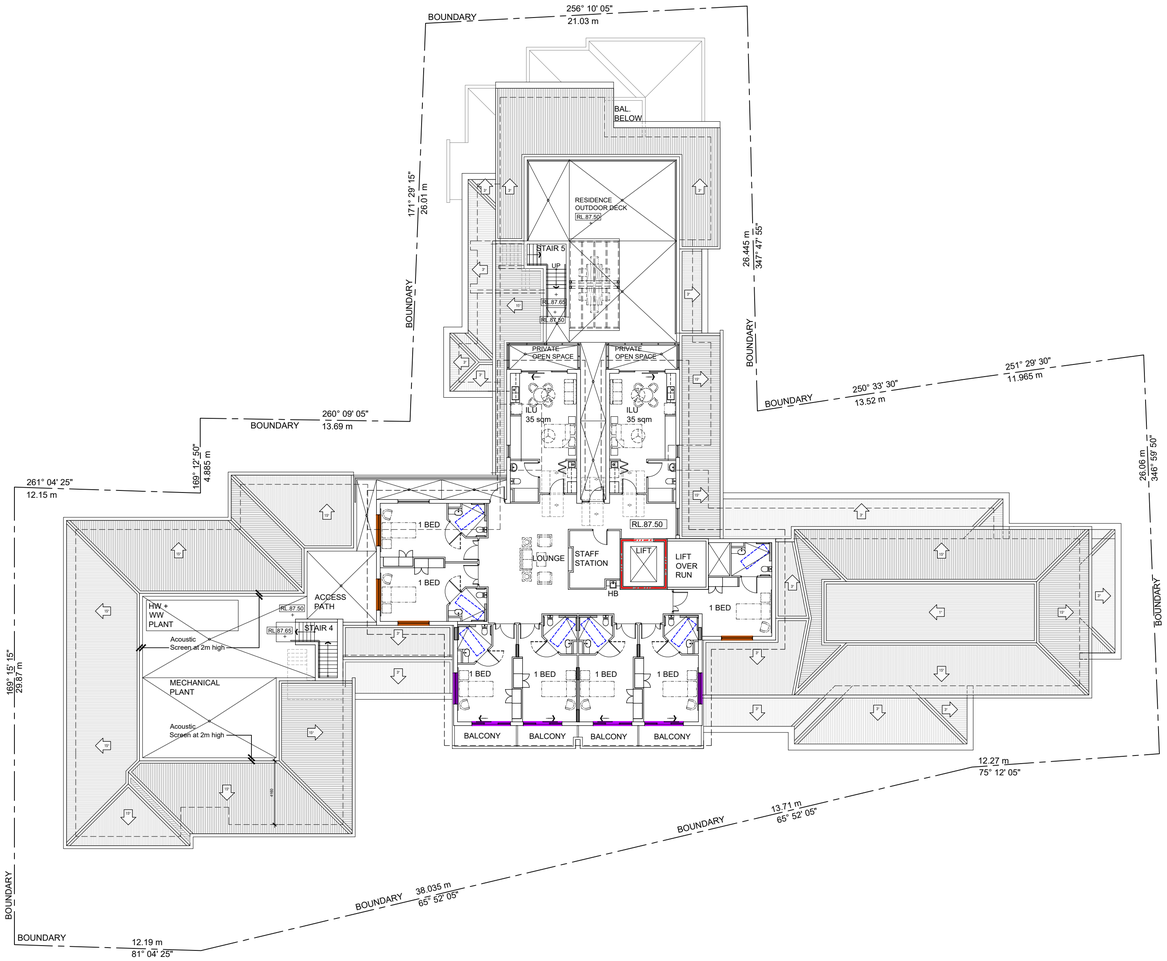
Tel. (02) 9406 7000
Fax. (02) 9406 7099
Email : brgroup@brgr.net

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

Date	JAN 2019
Scale	1:200@A1
Drawn	SS
Amendment	14

Job No. : Drawing
2017 / DA07



BASIX and Thermal Comfort Inclusions

Floors	Concrete between levels, no insulation required
Walls	External walls: Brick Veneer with R2.0 insulation (insulation only value) External colour: Medium (0.475<SA<0.7) Inter-tenancy walls: Minimum 75mm Hebel Power Panel to walls adjacent to neighbours and hallways, no insulation required. Internal walls (within units): Plasterboard on studs
Windows	Aluminium framed double glazing: U-value: 3.40 (equal to or lower than) SHGC: 0.33 (±10%) Given values are AFRC total window system values (glass and frame) Note: Openability modelled as per BASIX Thermal Protocol – 4.14.2 and NatHERS Technical Note 1.2 – 10.11 with regards to restricted openings
Ceilings	Plasterboard ceiling with R3.0 insulation (insulation only value) to where roof is above. Plasterboard ceiling, no insulation where neighbouring units are above. Note: Loss of ceiling insulation due to penetrations from down lights have been accounted for in accordance with BCA Technical Note 2 and Sealed LED down lights at a maximum of one every 2.5m2
Roof	Metal roof with foil backed blanket (Ru1.3 and Rd1.3) External colour: Dark (SA > 0.7)
Floor coverings	Tiles to throughout
Hot water system	Central gas-fired boiler with R1.0 (~38mm) insulation to ring main and supply risers
Fixtures	Showerheads: 4.0 star low flow (>4.5L but <=6.0L/min) Toilets: 4.0 star Kitchen taps: 5.0 star Bathroom vanity taps: 5.0 star
Cooling systems	Ceiling fans + single phase air conditioning to living areas and bedrooms: Min. 3 star
Heating systems	Ceiling fans + single phase air conditioning to living areas and bedrooms: Min. 3 star
Appliances	Dish washer: 3.0 star water & 4.0 star energy rating Clothes washer: 3.0 star water & 4.0 star energy rating Clothes dryer: 6.0 star energy rating Refrigerator: 3.5 star energy rating
Ventilation in units	Kitchen - Individual fan, externally ducted to façade, manual on/off switch Bathrooms - Individual fan, externally ducted to façade, manual on/off switch Laundry - Individual fan, externally ducted to façade, manual on/off switch
Other	Electric cooktop & electric oven Well-ventilated fridge space Air conditioning day-night zoned between bedrooms and living areas

LEGEND

	BOUNDARY
	MASONRY WALL
	STUD WALL
	OUTLINE OF WALL ABOVE / BELOW
	ROOF OUTLINE
	NEW FENCE
+ ex.RL 00.00	EXISTING LEVELS
RL 00.00	PROPOSED LEVELS
	PROPOSED DOOR
	PROPOSED WINDOW
	MOBILE BATH
	CEILING FAN
	ELEVATION TAG
	SECTION / ELEVATION TAG

ACOUSTIC REQUIREMENTS

	Rw 36 10.38mm laminated OR Rw 36 6/12/8 glass
	Rw 31 10mm monolithic OR Rw 34 6/12/6 glass
	Rw 27 6mm monolithic OR Rw 34 6/12/6 glass

NCC 2019 - SECTION J REQUIREMENTS

Envelope Construction	**Total System R-Value (m²K/W)**
J1.3 Roof and ceiling construction	≥ 3.70
J1.4 Roof lights	N/A
J1.5a Total System external wall construction (all facades)	≥ 2.39
J1.5b Total System internal wall construction (between conditioned & unconditioned areas)	≥ 1.00
J1.6a Floor construction (above an unconditioned zone)	≥ 2.00
J1.6b Floor construction (concrete slab on ground)	No insulation required

Glazing - Frame Construction (Uniform solution)	**Orientation**	**Total System SHGC**	**Total System SHGC**
J1.5c Total Window Frame construction	All facades	≤ 4.00	≤ 0.29

No.	Amendment	Date
14	Preliminary DA Issue	30.09.2020
13	Development Application Issue	07.09.2020
12	Development Application Issue for review	14.08.2020
11	Development Application Issue for review	11.08.2020
10	Preliminary Issue discussion	27.07.2020
9	Preliminary Issue for coordination	08.07.2020
8	Preliminary Issue for review & comment	06.07.2020
7	Meeting with PM	22.06.2020
6	2 x Dwelling Suite added and Plant ares modified.	21.05.2020
5	2 x Dwelling Suite added and Plant ares modified.	27.04.20
4	Development Application Issue	19.12.19
3	Preliminary Issue	03.12.19
2	Preliminary Issue	06.11.19
1	Preliminary Issue	27.08.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
THIRD FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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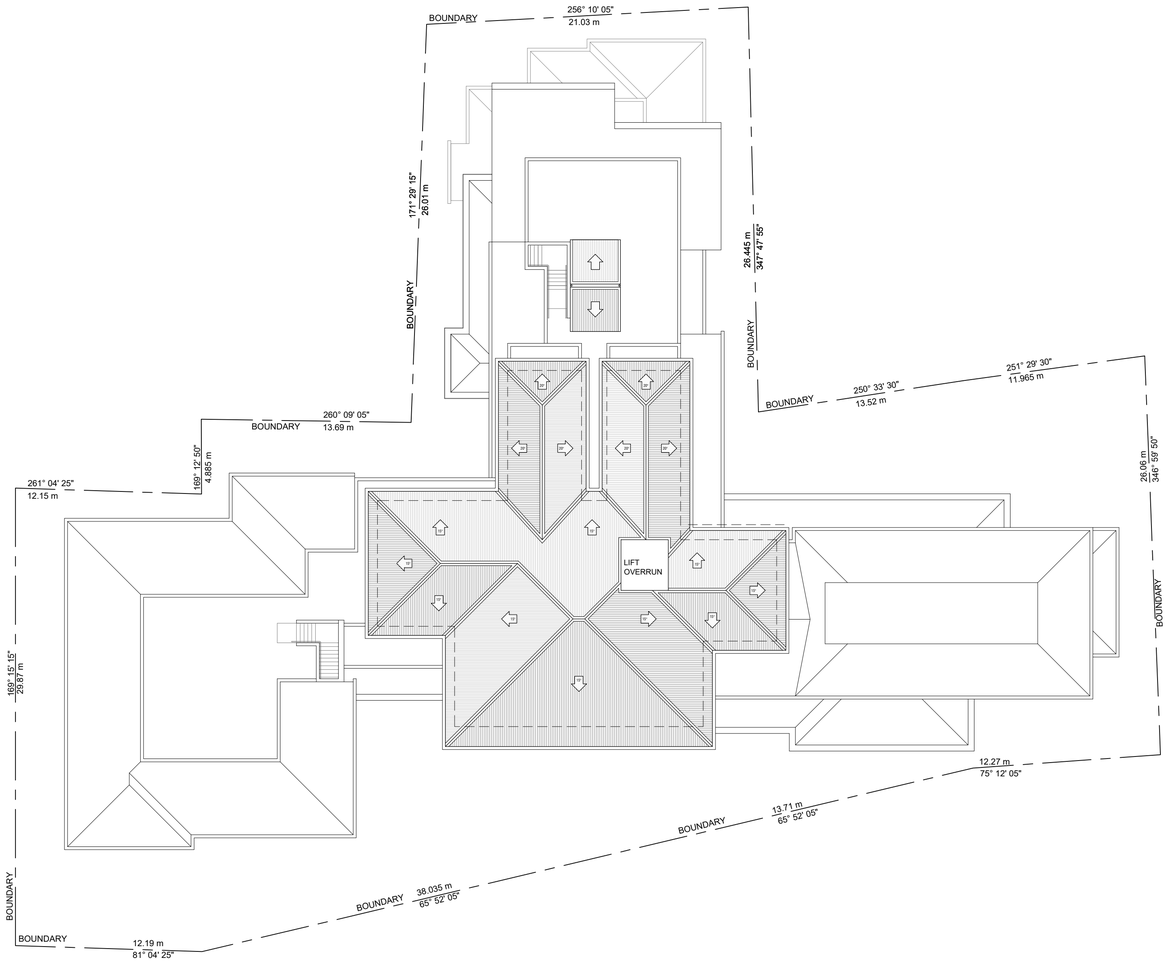
Tel. (02) 9406 7000
Fax. (02) 9406 7099
Email : brgroup@brgr.net

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	2017 / DA08	
Drawn	SS / WW		
Amendment	14		



LEGEND

	BOUNDARY
	MASONRY WALL
	STUD WALL
	OUTLINE OF WALL ABOVE / BELOW
	ROOF OUTLINE
	NEW FENCE
+ ex.RL.00.00	EXISTING LEVELS
RL.00.00	PROPOSED LEVELS
	PROPOSED DOOR
	PROPOSED WINDOW
	MOBILE BATH
	CEILING FAN
	ELEVATION TAG
	SECTION / ELEVATION TAG

ACOUSTIC REQUIREMENTS

	Rw 36 10.38mm laminated OR Rw 36 6/12/8 glass
	Rw 31 10mm monolithic OR Rw 34 6/12/6 glass
	Rw 27 6mm monolithic OR Rw 34 6/12/6 glass

NCC 2019 - SECTION J REQUIREMENTS

Envelope Construction	Total System R-Value (m^2K/W)
J1.3 Roof and ceiling construction	≥ 3.70
J1.4 Roof lights	N/A
J1.5a Total System external wall construction (all facades)	≥ 2.39
J1.5b Total System internal wall construction (between conditioned & unconditioned areas)	≥ 1.00
J1.6a Floor construction (above an unconditioned zone)	≥ 2.00
J1.6b Floor construction (concrete slab on ground)	No insulation required

Glazing - Frame Constuction (Uniform solution)	Orientation	Total System SHGC	Total System SHGC
J1.5c Total Window Frame construction	All facades	≤ 4.00	≤ 0.29

No.	Amendment	Date
14	Preliminary DA Issue	30.09.2020
13	Development Application Issue	07.09.2020
12	Development Application Issue for review	14.08.2020
11	Development Application Issue for review	11.08.2020
10	Preliminary Issue discussion	27.07.2020
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8	Preliminary Issue for review & comment	06.07.2020
7	Meeting with PM	22.06.2020
6	2 x Dwelling Suite added and Plant ares modified.	21.05.2020
5	2 x Dwelling Suite added and Plant ares modified.	27.04.20
4	Development Application Issue	19.12.19
3	Preliminary Issue	03.12.19
2	Preliminary Issue	06.11.19
1	Preliminary Issue	27.08.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
ROOF PLAN

0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

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architecture, health and aged care planning, project management
Suite 7, Level 1 Epica, 9 Railway Street
Chatswood NSW 2067
AUSTRALIA
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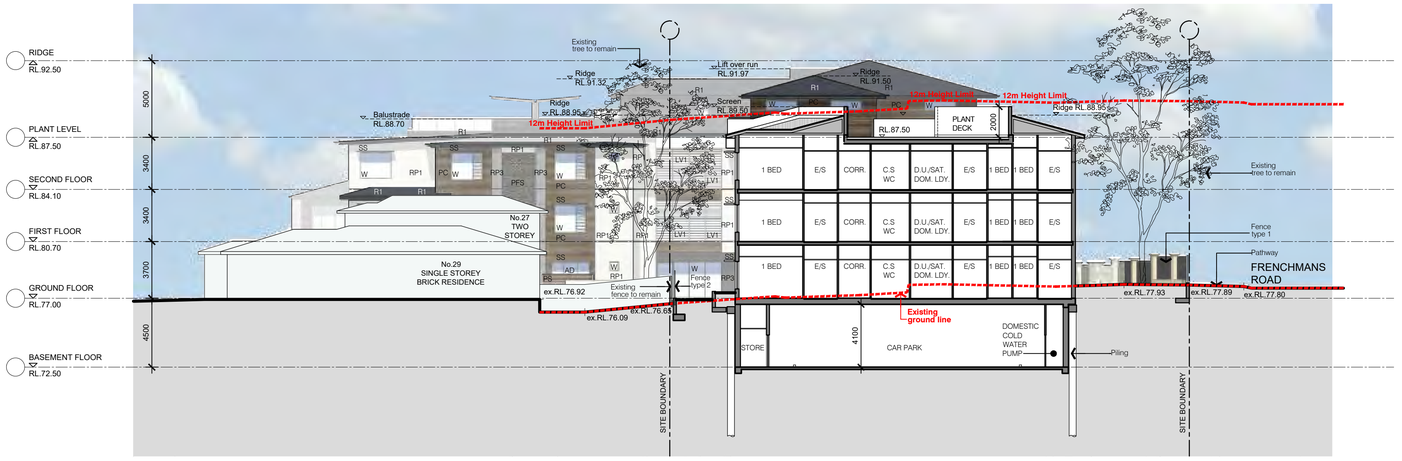
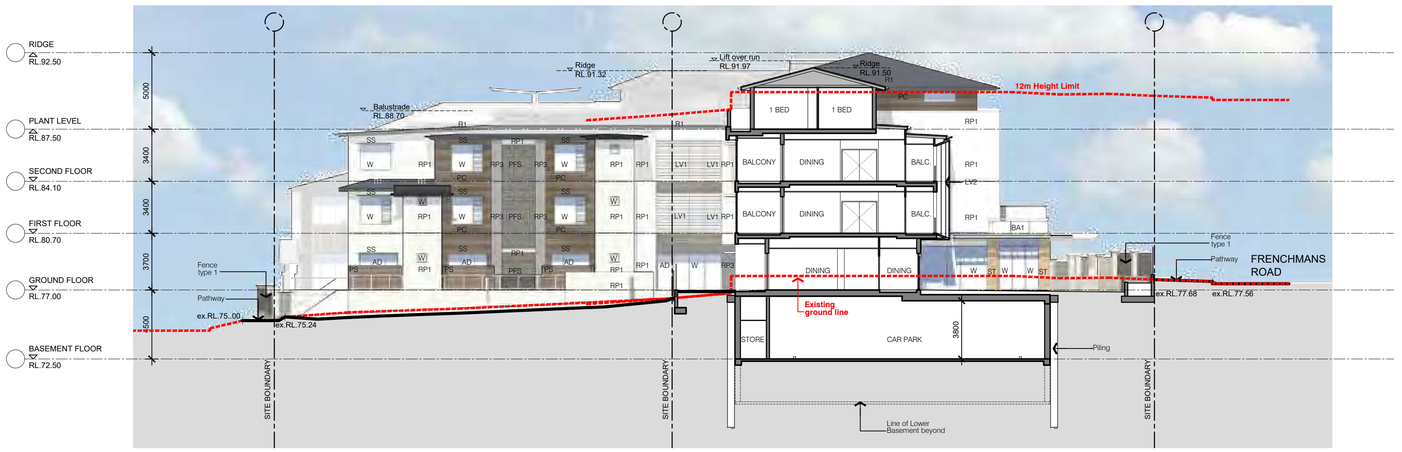
Email : brgroup@brgr.net

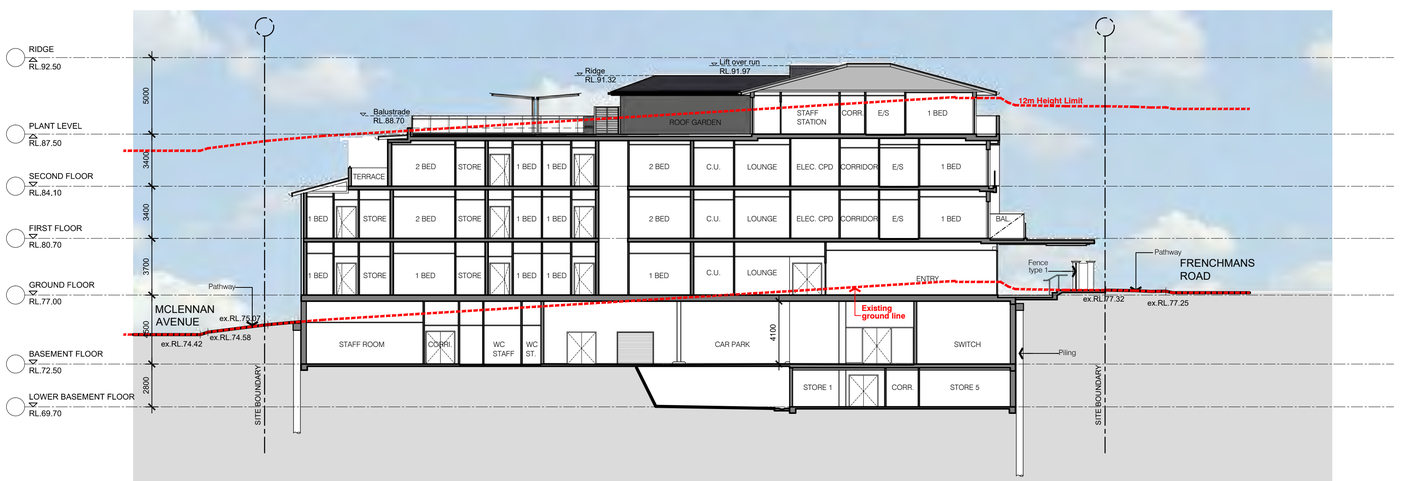
Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	2017 /	DA09
Drawn	SS / WW		
Amendment	14		



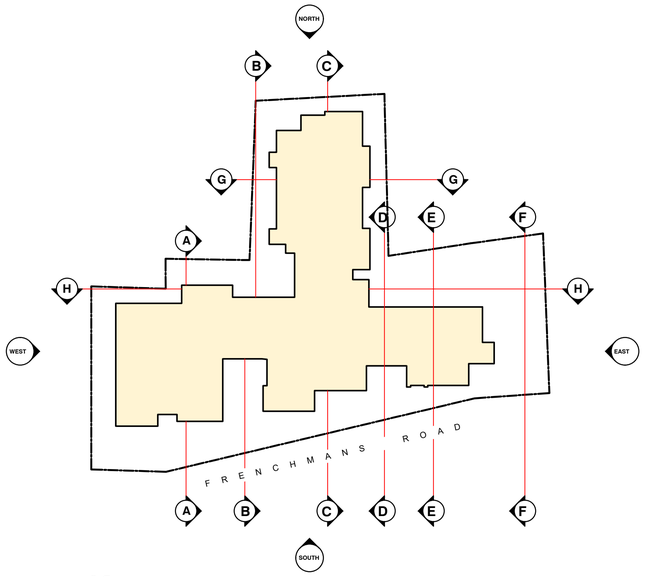
01 Section A
Scale 1:200



02 Section B
Scale 1:200



03 Section C
Scale 1:200



KEY PLAN

LEGEND

AD	ALUMINIUM FRAMED DOORS
BA1	BALUSTRADE - TYPE 1 (GLASS)
BA2	BALUSTRADE - TYPE 2 (DECORATIVE GRILLE)
EGL	EXISTING GROUND LINE
FGL	FINISHED GROUND LINE
LV1	LOUVRE - POWDER COATED
LV2	LOUVRE DECORATIVE
PC	PREFINISHED CLADDING (TIMBER LOOK)
PFS	PERFORATED SCREEN - POWDER COATED
PS	1800H PRIVACY SCREEN
R1	ROOF, GUTTER, DP - TYPE 1 (CORRUGATED COLORBOND, COLOR IRONSTONE)
RP1	RENDERED PAINTED WALL - COLOUR WHITE
RP2	RENDERED PAINTED WALL - COLOUR BROWN
RP3	RENDERED PAINTED WALL - COLOUR GREY
RS	ROLLER SHUTTER - SILVER
RW	RETAINING WALL - STONE CLADDING
SS	SUN SHADING
ST	STONE CLADING
W	ALUMINIUM FRAMED WINDOWS

FENCE TYPES

F1	1800H POWDER COATED STEEL BLADE SECURITY FENCE ON MASONRY WALL RENDERED AND PAINTED WITH 400 X400 X1950H MASONRY COLUMN POST RENDERED AND PAINTED FINISH
F2	1800H COLORBOND STEEL FENCING ON MASONRY WALL RENDERED AND PAINTED + EXISTING FENCE

No.	Amendment	Date
7	Preliminary DA Issue	30.09.2020
6	Development Application Issue	07.09.2020
5	Development Application Issue for review	14.08.2020
4	Development Application Issue for review	11.08.2020
3	Development Application Issue	19.12.19
2	Preliminary Issue	19.11.19
1	Preliminary Issue	27.08.19

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
SECTIONS (A, B & C)

SUMMITCARE
WARMTH WORTH WELLBEING

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architecture, health and aged care planning, project management
Suite 7, Level 1 Epica, 9 Railway Street
Chatswood NSW 2067
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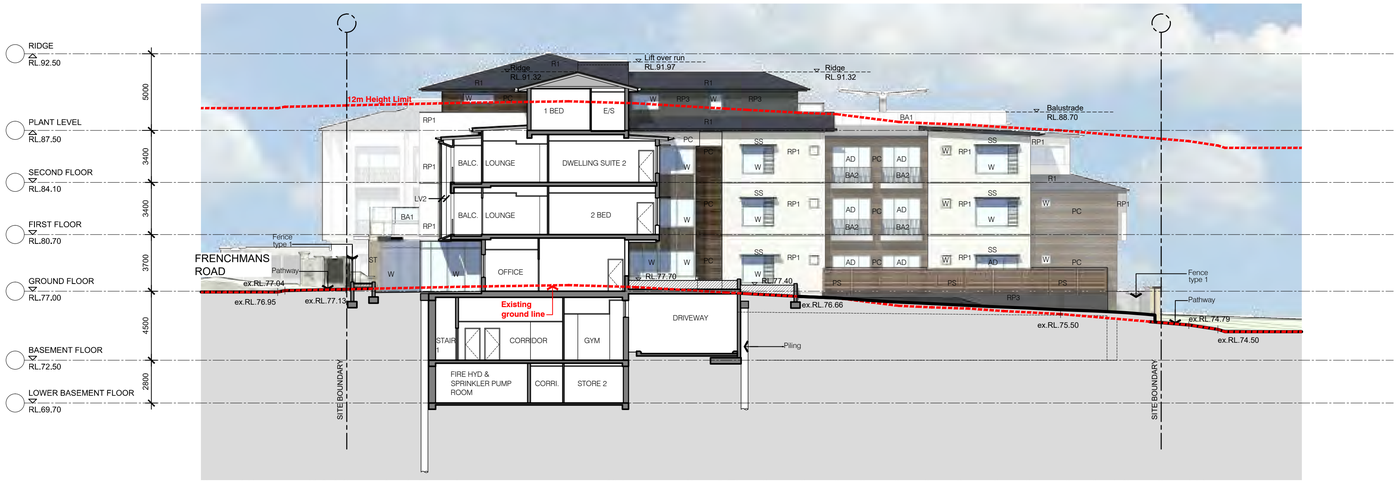
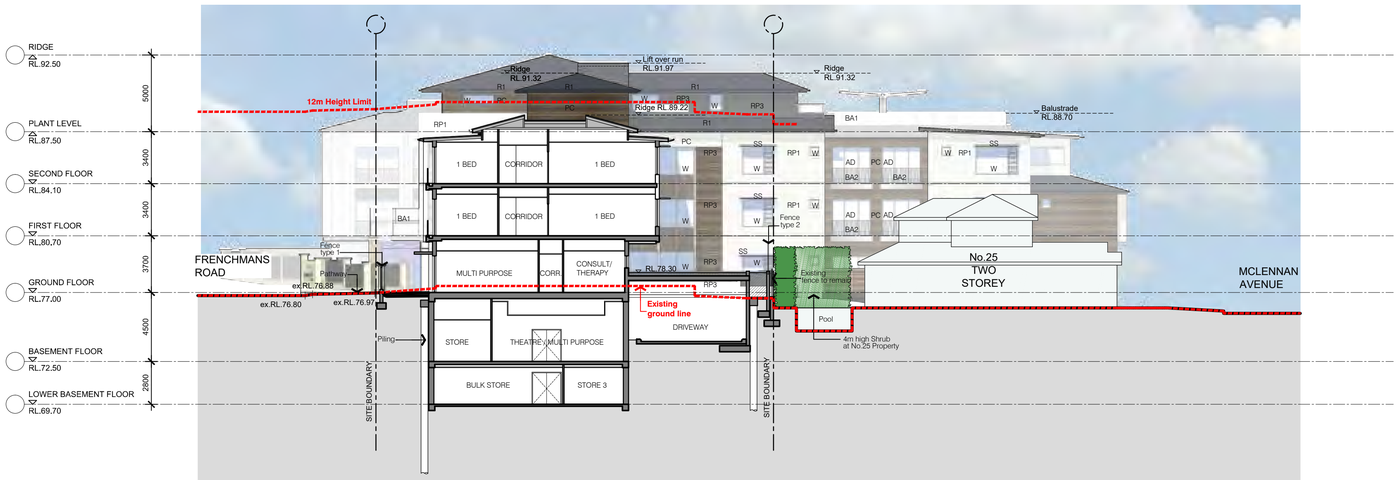
Tel. (02) 9406 7000
Fax. (02) 9406 7099
Email : brgroup@brgr.net

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

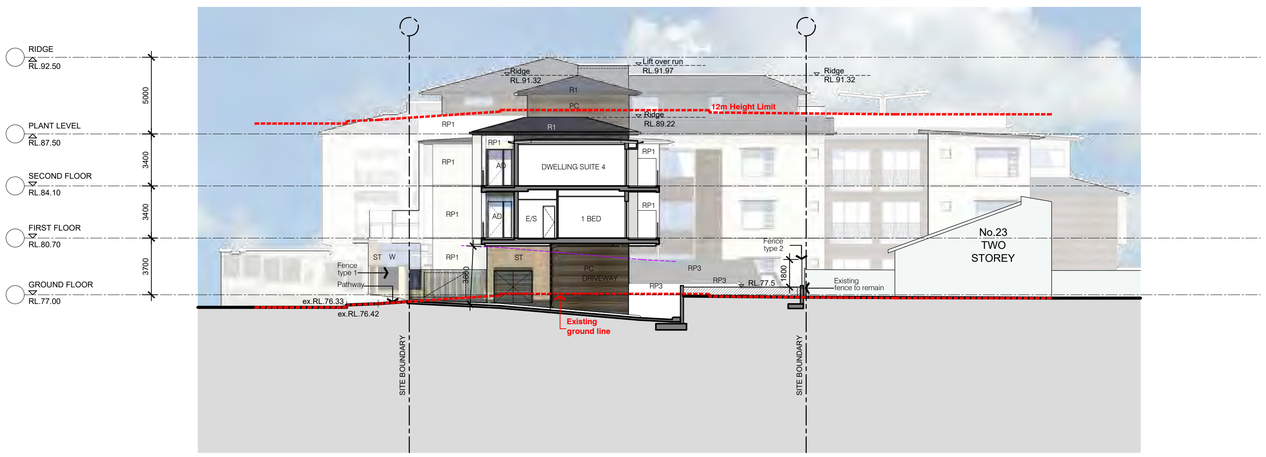
Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	1912 / DA10	
Drawn	WW		
Amendment	7		



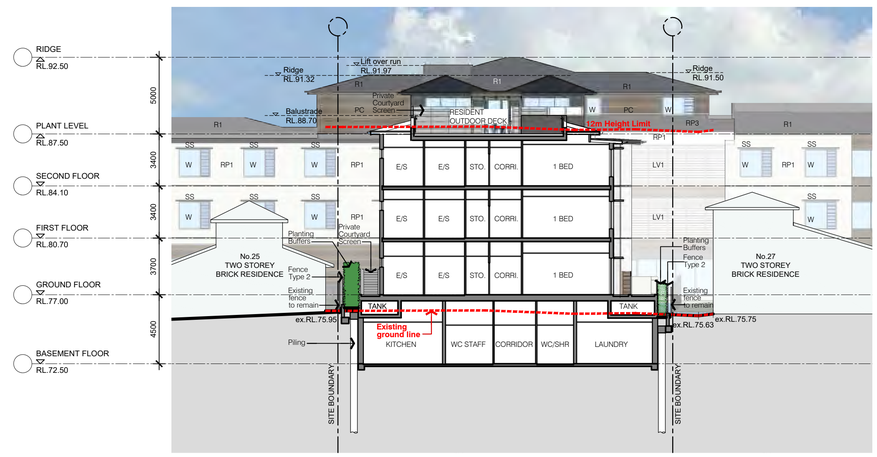
04 Section D
Scale 1:200



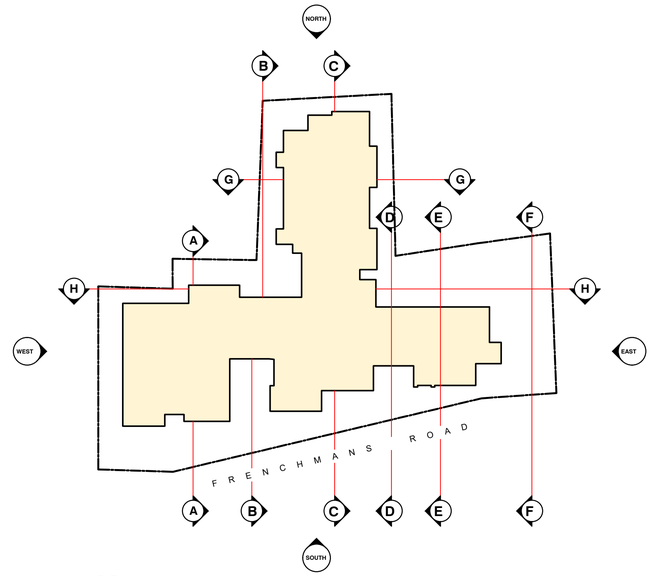
05 Section E
Scale 1:200



06 Section F
Scale 1:200



07 Section G
Scale 1:200



KEY PLAN

LEGEND

AD	ALUMINIUM FRAMED DOORS
BA1	BALUSTRADE - TYPE 1 (GLASS)
BA2	BALUSTRADE - TYPE 2 (DECORATIVE GRILLE)
EGL	EXISTING GROUND LINE
FGL	FINISHED GROUND LINE
LV1	LOUVRE - POWDER COATED
LV2	LOUVRE DECORATIVE
PC	PREFINISHED CLADDING (TIMBER LOOK)
PFS	PERFORATED SCREEN - POWDER COATED
PS	1800H PRIVACY SCREEN
R1	ROOF, GUTTER, DP - TYPE 1 (CORRUGATED COLORBOND, COLOR IRONSTONE)
RP1	RENDERED PAINTED WALL - COLOUR WHITE
RP2	RENDERED PAINTED WALL - COLOUR BROWN
RP3	RENDERED PAINTED WALL - COLOUR GREY
RS	ROLLER SHUTTER - SILVER
RW	RETAINING WALL - STONE CLADDING
SS	SUN SHADING
ST	STONE CLADDING
W	ALUMINIUM FRAMED WINDOWS

FENCE TYPES

F1	1800H POWDER COATED STEEL BLADE SECURITY FENCE ON MASONRY WALL RENDERED AND PAINTED WITH 400 X400 X1950H MASONRY COLUMN POST RENDERED AND PAINTED FINISH
F2	1800H COLORBOND STEEL FENCING ON MASONRY WALL RENDERED AND PAINTED + EXISTING FENCE

No.	Amendment	Date
7	Preliminary DA Issue	30.09.2020
6	Development Application Issue	07.09.2020
5	Development Application Issue for review	14.08.2020
4	Development Application Issue for review	11.08.2020
3	Development Application Issue	19.12.19
2	Preliminary Issue	19.11.19
1	Preliminary Issue	27.08.19

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
SECTIONS (D, E, F & G)

SUMMITCARE
WARMTH WORTH WELLBEING

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Chatswood NSW 2067
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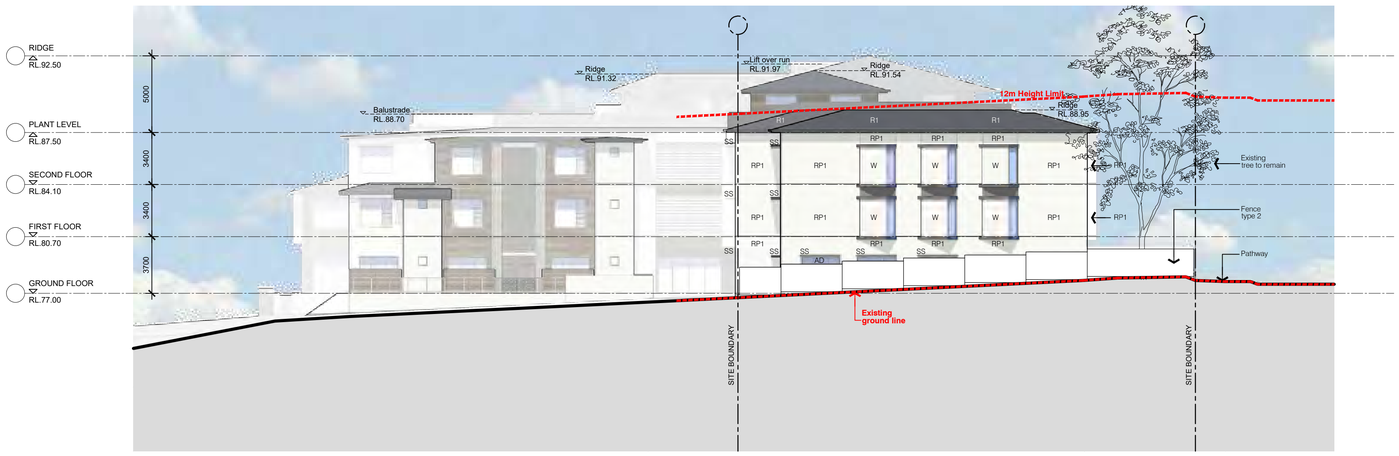
Email : brgroup@brgr.net

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

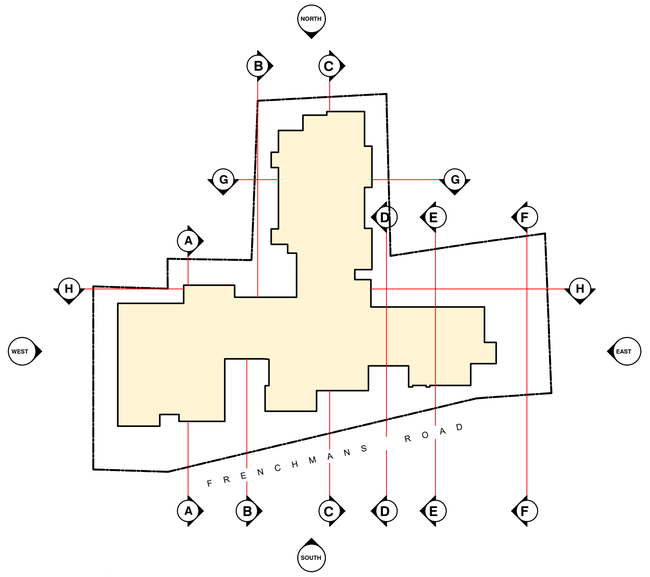
Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN		
Drawn	WW	1912 / DA11	
Amendment	7		

08 Section H
Scale 1:200

09 South Boundary Elevation
Scale 1:200



10 West Boundary Elevation
Scale 1:200



KEY PLAN

LEGEND

AD	ALUMINIUM FRAMED DOORS
BA1	BALUSTRADE - TYPE 1 (GLASS)
BA2	BALUSTRADE - TYPE 2 (DECORATIVE GRILLE)
EGL	EXISTING GROUND LINE
FGL	FINISHED GROUND LINE
LV1	LOUVRE - POWDER COATED
LV2	LOUVRE DECORATIVE
PC	PREFINISHED CLADDING (TIMBER LOOK)
PFS	PERFORATED SCREEN - POWDER COATED
PS	1800H PRIVACY SCREEN
R1	ROOF, GUTTER, DP - TYPE 1 (CORRUGATED COLORBOND, COLOR IRONSTONE)
RP1	RENDERED PAINTED WALL - COLOUR WHITE
RP2	RENDERED PAINTED WALL - COLOUR BROWN
RP3	RENDERED PAINTED WALL - COLOUR GREY
RS	ROLLER SHUTTER - SILVER
RW	RETAINING WALL - STONE CLADDING
SS	SUN SHADING
ST	STONE CLADING
W	ALUMINIUM FRAMED WINDOWS

FENCE TYPES

F1	1800H POWDER COATED STEEL BLADE SECURITY FENCE ON MASONRY WALL RENDERED AND PAINTED WITH 400 X400 X1950H MASONRY COLUMN POST RENDERED AND PAINTED FINISH
F2	1800H COLORBOND STEEL FENCING ON MASONRY WALL RENDERED AND PAINTED + EXISTING FENCE

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

No.	Amendment	Date
6	Preliminary DA Issue	30.09.2020
5	Development Application Issue	07.09.2020
4	Development Application Issue for review	14.08.2020
3	Development Application Issue for review	11.08.2020
2	Development Application Issue	19.12.19
1	Preliminary Issue	19.11.19

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
SECTION H & ELEVATIONS
(South & West Boundary)

SUMMITCARE
WARMTH WORTH WELLBEING

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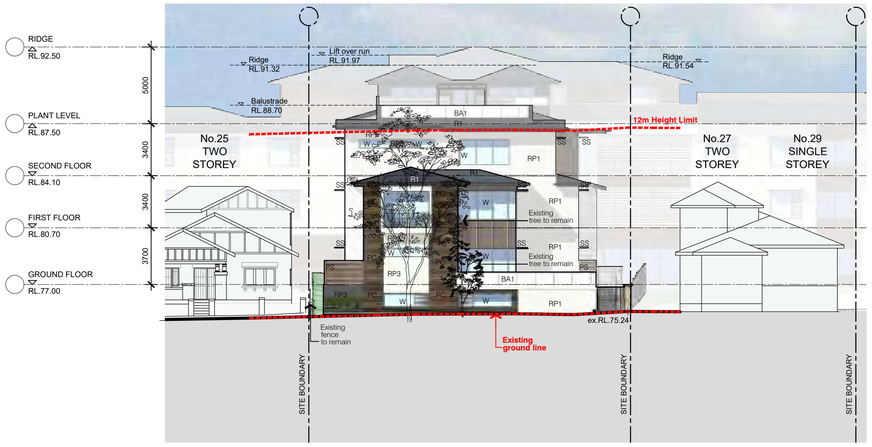
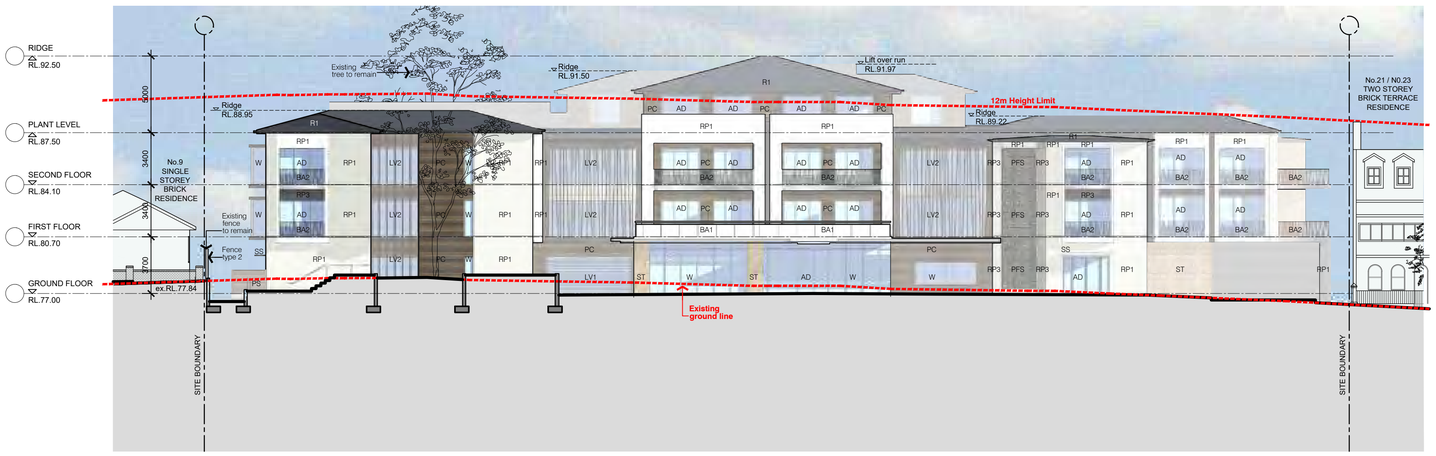
Date	NOV 2019	Job No. : Drawing	
Scale	AS SHOWN	1912 / DA12	
Drawn	WW		
Amendment	6		



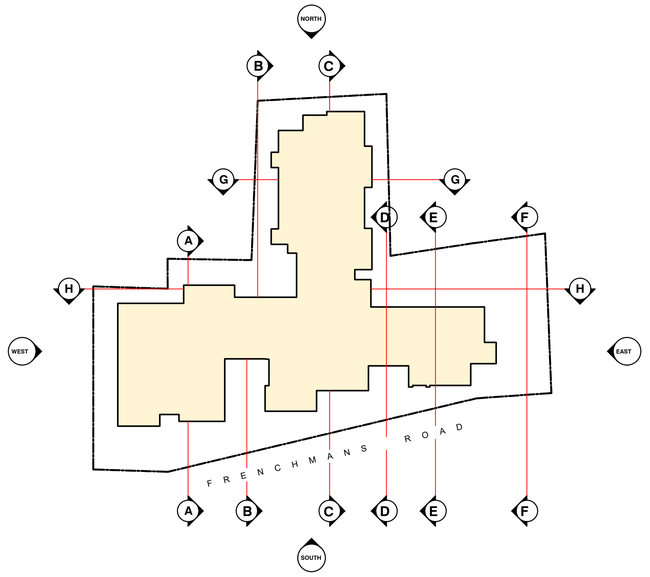
11 NORTH ELEVATION
Scale 1:200

12 EAST ELEVATION
Scale 1:200



13 SOUTH ELEVATION
Scale 1:200

14 WESTELEVATION
Scale 1:200



KEY PLAN

LEGEND

AD	ALUMINIUM FRAMED DOORS
BA1	BALUSTRADE - TYPE 1 (GLASS)
BA2	BALUSTRADE - TYPE 2 (DECORATIVE GRILLE)
EGL	EXISTING GROUND LINE
FGL	FINISHED GROUND LINE
LV1	LOUVRE - POWDER COATED
LV2	LOUVRE DECORATIVE
PC	PREFINISHED CLADDING (TIMBER LOOK)
PFS	PERFORATED SCREEN - POWDER COATED
PS	1800H PRIVACY SCREEN
R1	ROOF, GUTTER, DP - TYPE 1 (CORRUGATED COLORBOND, COLOR IRONSTONE)
RP1	RENDERED PAINTED WALL - COLOUR WHITE
RP2	RENDERED PAINTED WALL - COLOUR BROWN
RP3	RENDERED PAINTED WALL - COLOUR GREY
RS	ROLLER SHUTTER - SILVER
RW	RETAINING WALL - STONE CLADDING
SS	SUN SHADING
ST	STONE CLADDING
W	ALUMINIUM FRAMED WINDOWS

FENCE TYPES

F1	1800H POWDER COATED STEEL BLADE SECURITY FENCE ON MASONRY WALL RENDERED AND PAINTED WITH 400 X400 X1950H MASONRY COLUMN POST RENDERED AND PAINTED FINISH
F2	1800H COLORBOND STEEL FENCING ON MASONRY WALL RENDERED AND PAINTED + EXISTING FENCE

No.	Amendment	Date
8	Preliminary DA Issue	30.09.2020
7	Development Application Issue	07.09.2020
6	Development Application Issue for review	14.08.2020
5	Development Application Issue for review	10.08.2020
4	Development Application Issue	19.12.19
3	Preliminary Issue	19.11.19
2	Preliminary Issue	18.09.19
1	Preliminary Issue	27.08.19

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
ELEVATIONS (North, East, South & West)

SUMMITCARE
WARMTH WORTH WELLBEING

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Fax. (02) 9406 7099
Email : brgroup@brgr.net

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	1912 / DA13	
Drawn	WW		
Amendment	8		

01 SOUTH STREET ELEVATION
Scale 1:500

0m 5 10 25m 50m
SCALE: 1: 500 @ A1
SCALE: 1: 1000 @ A3

02 SOUTH STREET ELEVATION - PART 1
Scale 1:200

0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

03 SOUTH STREET ELEVATION - PART 2
Scale 1:200

0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

04 NORTH STREET ELEVATION
Scale 1:200

0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

No.	Amendment	Date
5	Preliminary DA Issue	30.09.2020
4	Development Application Issue	07.09.2020
3	Development Application Issue for review	14.08.2020
2	Development Application Issue for review	12.08.2020
1	Development Application Issue	19.12.19

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
STREET ELEVATIONS PROPOSED

SUMMITCARE
WARMTH WORTH WELLBEING

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Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	1912 / DA14	
Drawn	AL		
Amendment	5		

01 Frenchmans Road Street Elevation
Proposed

02 Frenchmans Road Street Elevation
Existing

03 Opposite side of Frenchmans Road Street Elevation
Existing

No.	Amendment	Date
4	Preliminary DA Issue	30.09.2020
3	Development Application Issue	07.09.2020
2	Development Application Issue for review	14.08.2020
A	Preliminary Issue	00.06.19

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
STREET ELEVATION @
FRENCHMANS ROAD-PHOTOMONTAGE

SUMMITCARE

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Date	JULY 2019	Job No. : Drawing	
Scale	NTS @ A1	2017 /	DA15
Drawn	VI		
Amendment	4		

01 McLennan Avenue Street Elevation
Proposed

02 McLennan Avenue Street Elevation
Existing

03 View from Chapel Street
Proposed

04 View from Chapel Street
Existing

No.	Amendment	Date
4	Preliminary DA Issue	30.09.2020
3	Development Application Issue	07.09.2020
2	Development Application Issue for review	14.08.2020
A	Preliminary Issue	00.06.19

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
STREET ELEVATION @
MCLENNAN AVENUE -PHOTOMONTAGE

SUMMITCARE

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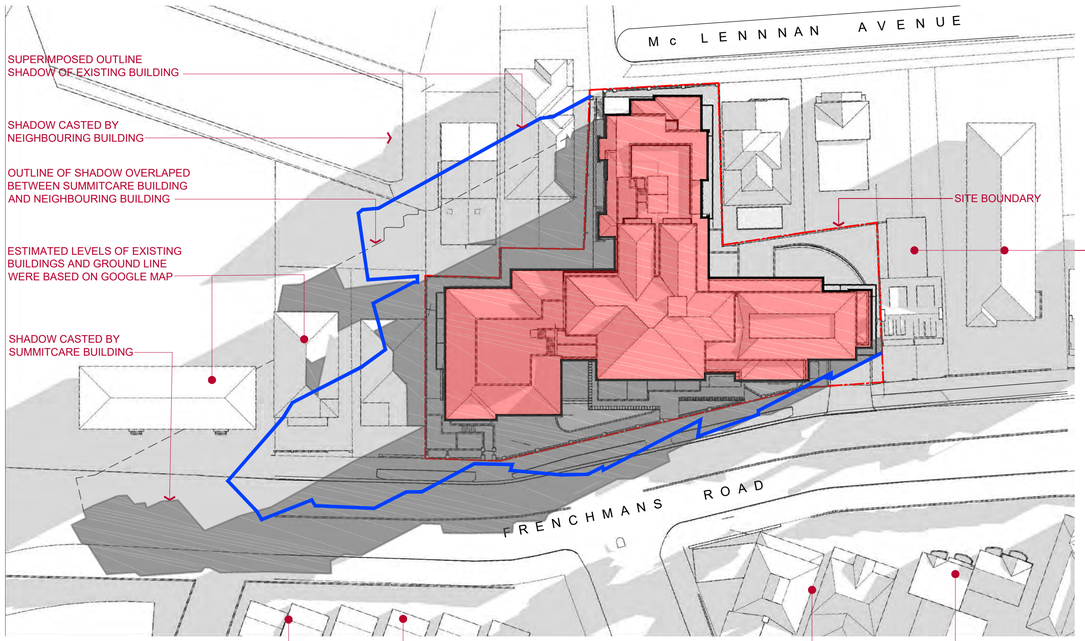
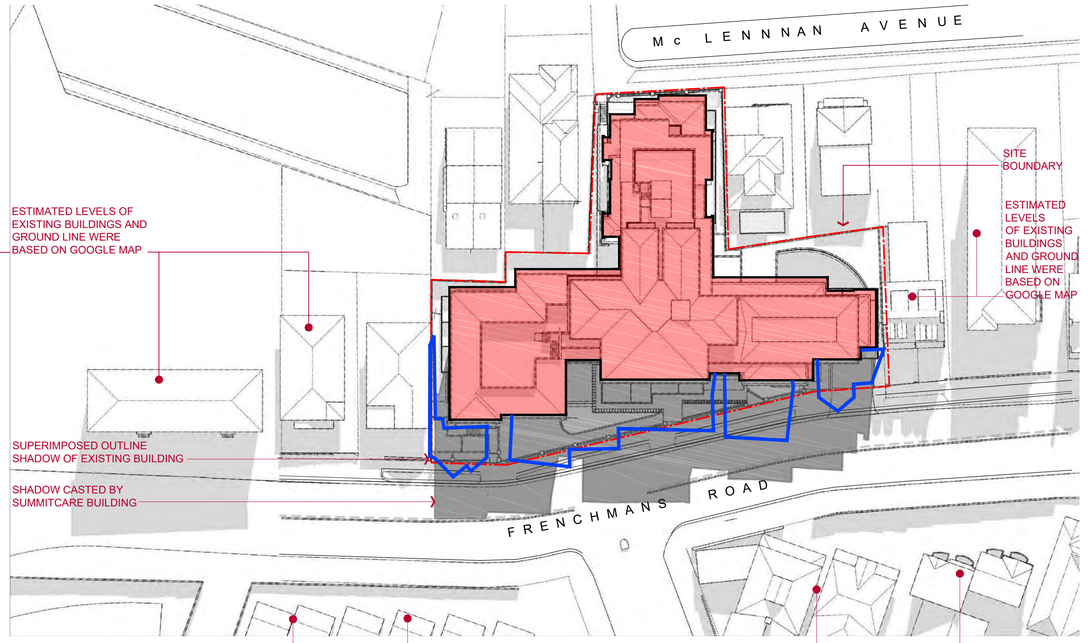
Date	JULY 2019	Job No. : Drawing
Scale	NTS @ A1	2017 / DA16
Drawn	VI	
Amendment	4	



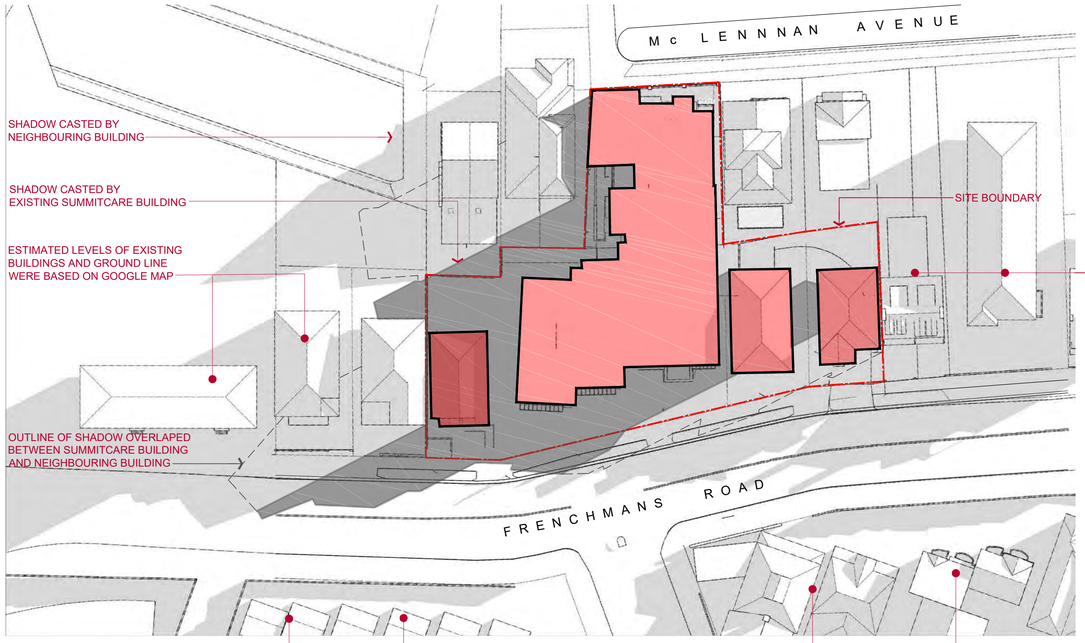
21 JUNE 8AM
PROPOSED



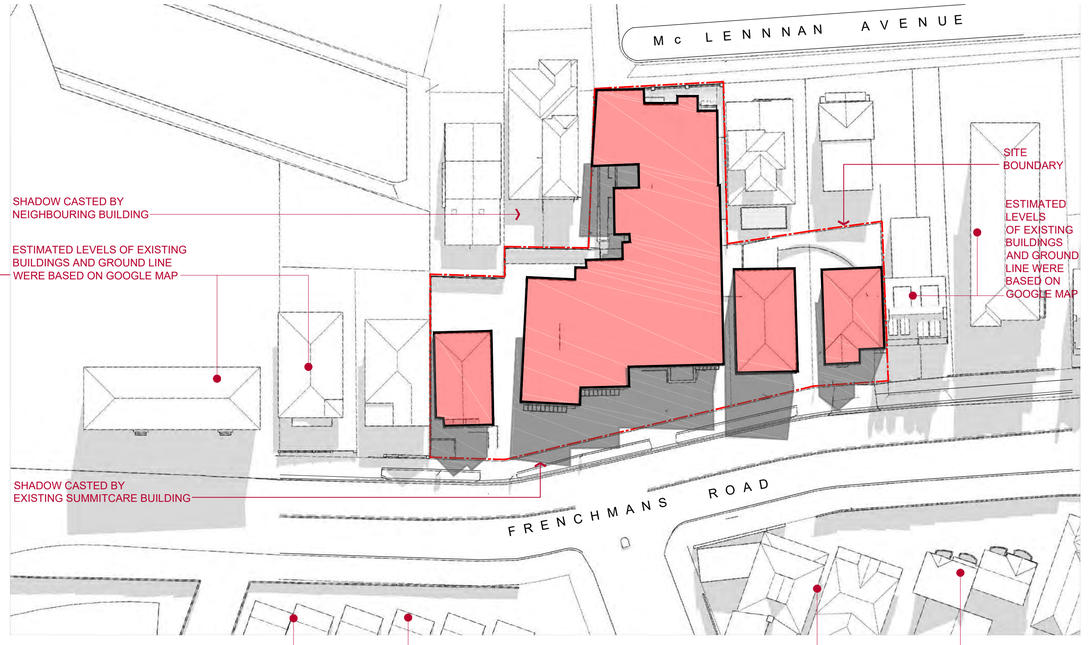
21 JUNE 12PM
PROPOSED

LEGEND

	BUILDING ROOF OUTLINE
	SHADOW CASTED BY SUMMITCARE BUILDING
	SHADOW CASTED BY NEIGHBOURING BUILDING
	OUTLINE OF SHADOW OVERLAPEDED BETWEEN SUMMITCARE BUILDING AND NEIGHBOURING BUILDING
	SUPERIMPOSED OUTLINE SHADOW OF EXISTING BUILDING
	SITE BOUNDARY



21 JUNE 8AM
EXISTING



21 JUNE 12PM
EXISTING

0m 5 10 25m 50m
SCALE: 1: 500 @ A1
SCALE: 1: 1000 @ A3

No.	Amendment	Date
4	Preliminary DA Issue	30.09.2020
3	Development Application Issue	07.09.2020
2	Development Application Issue for review	14.08.2020
1	Development Application Issue	19.12.19

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
SHADOW DIAGRAMS
Existing & Proposed- 21June 8am & 12pm

SUMMITCARE

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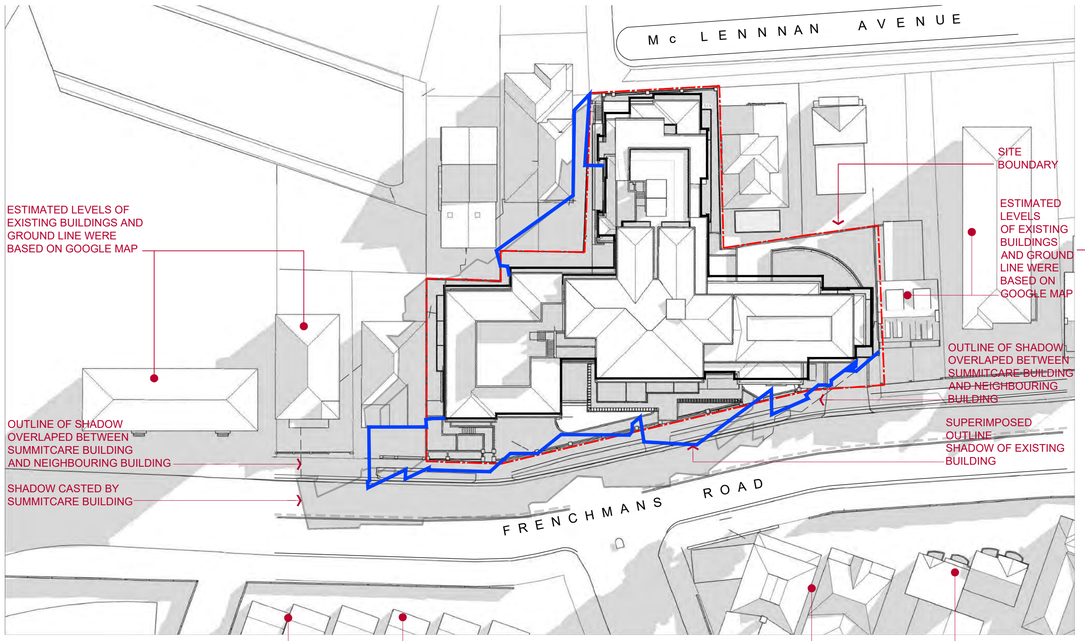
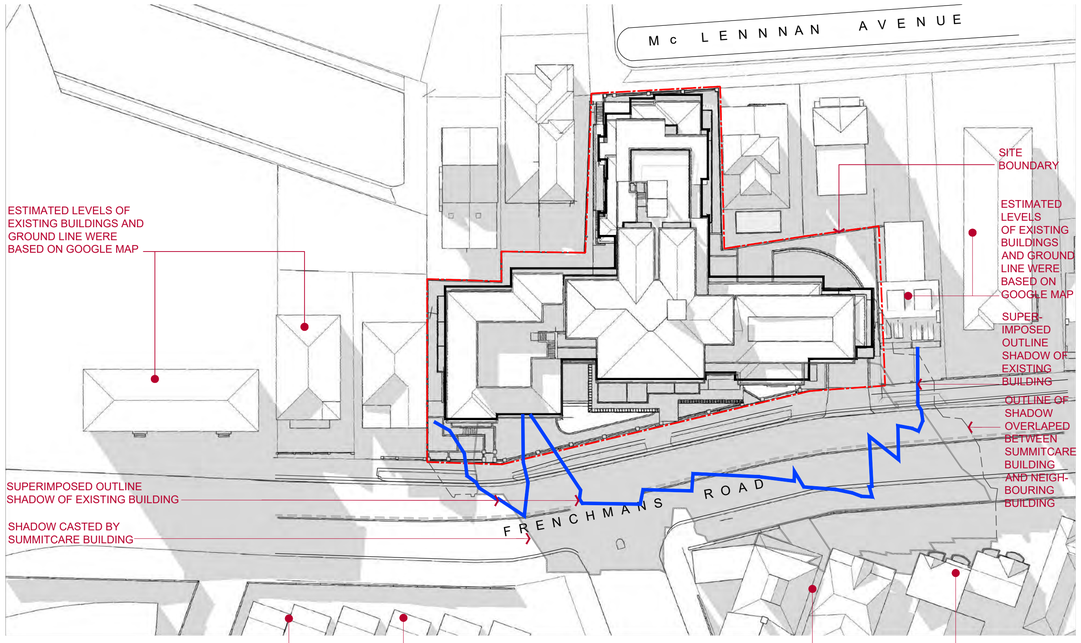
Email : brgroup@brgr.net

Date	JAN 2019	Job No. : Drawing
Scale	1: 500	1912 / DA17
Drawn	VI	
Amendment	4	



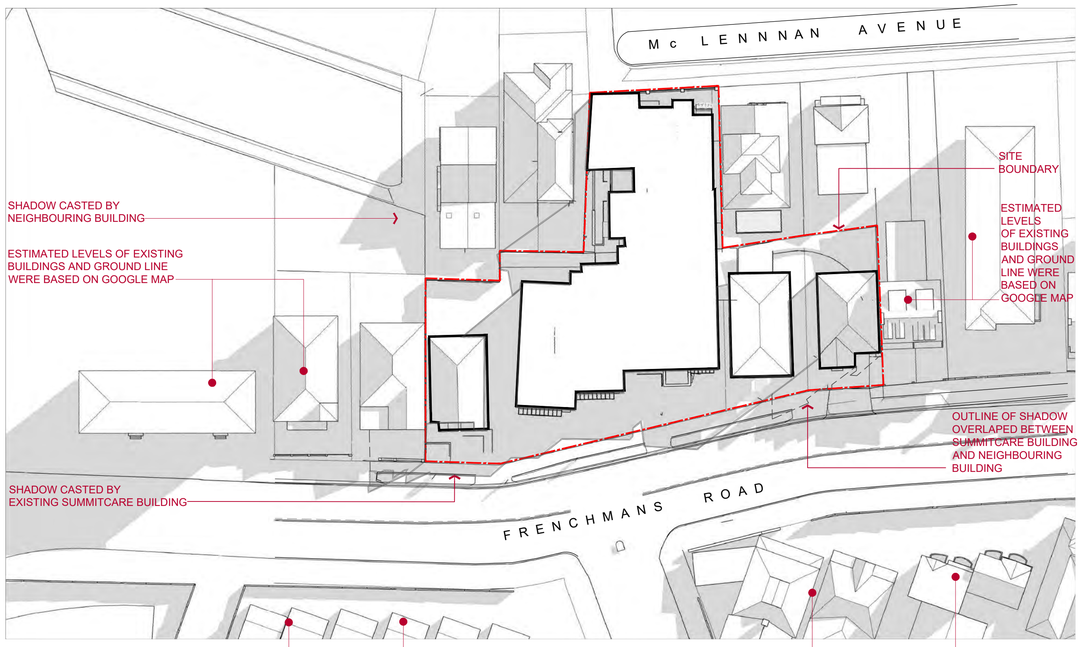
21 JUNE 9AM
PROPOSED



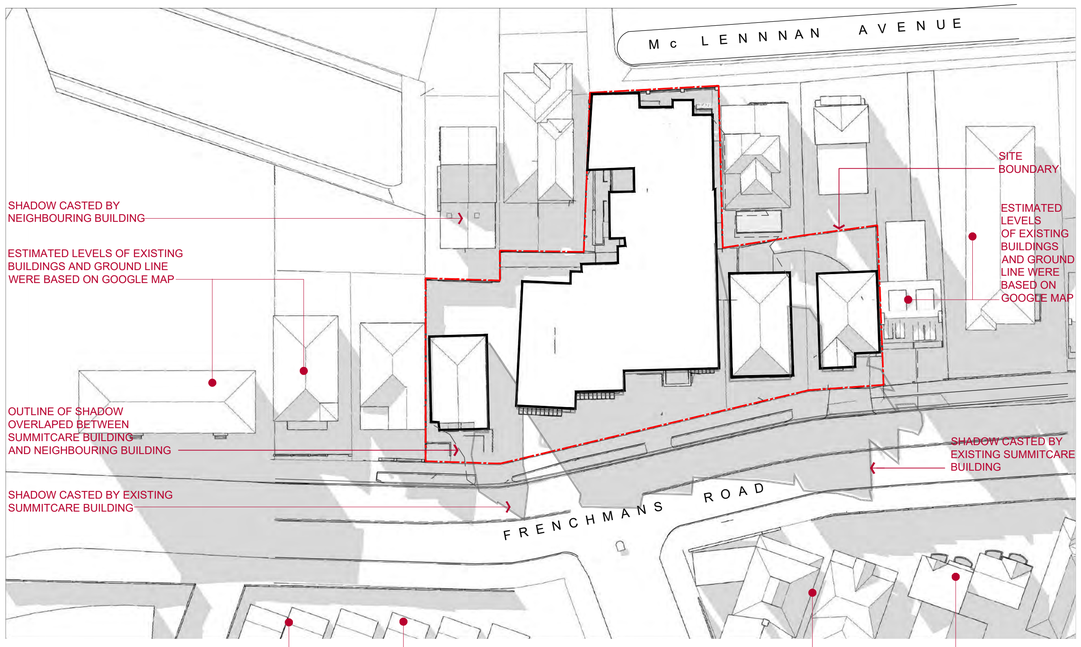
21 JUNE 3PM
PROPOSED

LEGEND

	BUILDING ROOF OUTLINE
	SHADOW CASTED BY SUMMITCARE BUILDING
	SHADOW CASTED BY NEIGHBOURING BUILDING
	OUTLINE OF SHADOW OVERLAPEDED BETWEEN SUMMITCARE BUILDING AND NEIGHBOURING BUILDING
	SUPERIMPOSED OUTLINE SHADOW OF EXISTING BUILDING
	SITE BOUNDARY



21 JUNE 9AM
EXISTING



21 JUNE 3PM
EXISTING

0m 5 10 25m 50m
SCALE: 1: 500 @ A1
SCALE: 1: 1000 @ A3

No.	Amendment	Date
1	Preliminary DA Issue	30.10.20

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
SHADOW DIAGRAMS
Existing & Proposed- 21June 9am & 3pm

SUMMITCARE

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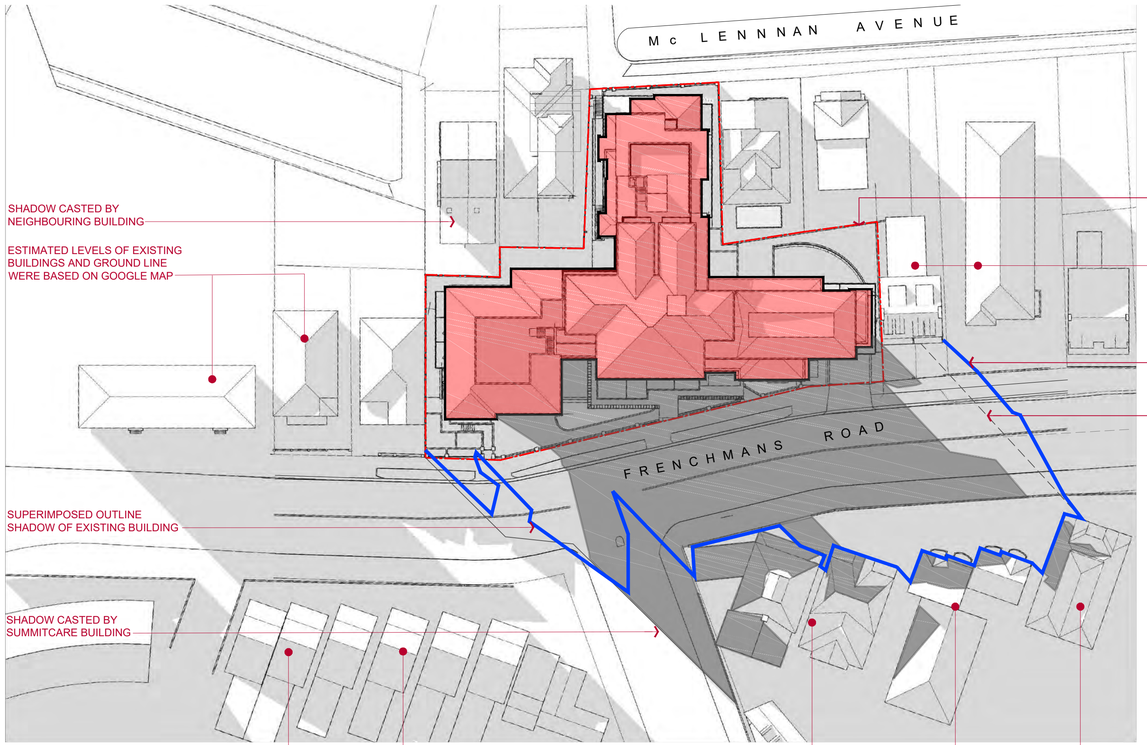
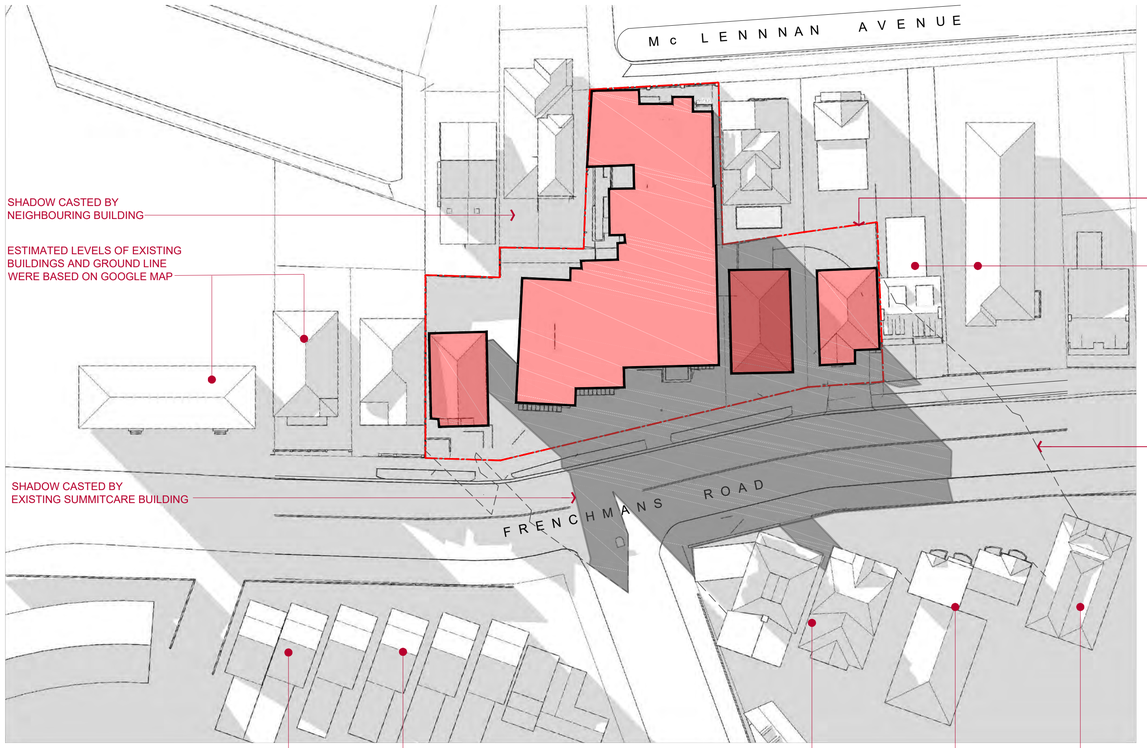
Email : brgroup@brgr.net

Date	JAN 2019	Job No. : Drawing	
Scale	1: 500	1912 / DA17a	
Drawn	VI		
Amendment	1		



21 JUNE 4PM

PROPOSED



21 JUNE 4PM

EXISTING

LEGEND

	BUILDING ROOF OUTLINE
	SHADOW CASTED BY SUMMITCARE BUILDING
	SHADOW CASTED BY NEIGHBOURING BUILDING
	OUTLINE OF SHADOW OVERLAPEDED BETWEEN SUMMITCARE BUILDING AND NEIGHBOURING BUILDING
	SUPERIMPOSED OUTLINE SHADOW OF EXISTING BUILDING
	SITE BOUNDARY

0m 5 10 25m 50m

SCALE: 1: 500 @ A1

SCALE: 1: 1000 @ A3

No.	Amendment	Date
4	Preliminary DA Issue	30.09.2020
3	Development Application Issue	07.09.2020
2	Development Application Issue for review	14.08.2020
1	Development Application Issue	19.12.19

Project

FRENCHMANS LODGE

11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing

SHADOW DIAGRAMS

Existing & Proposed- 21June 4pm

SUMMITCARE

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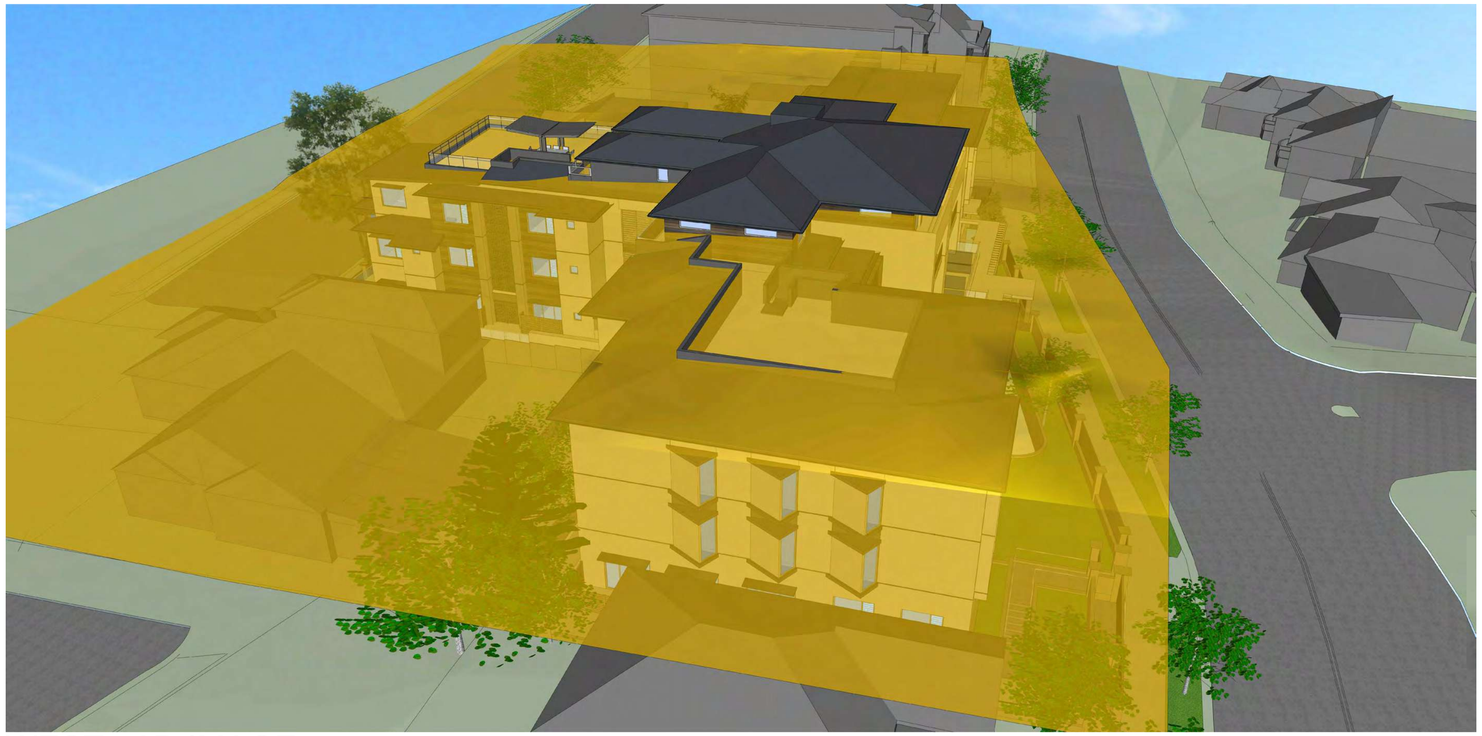
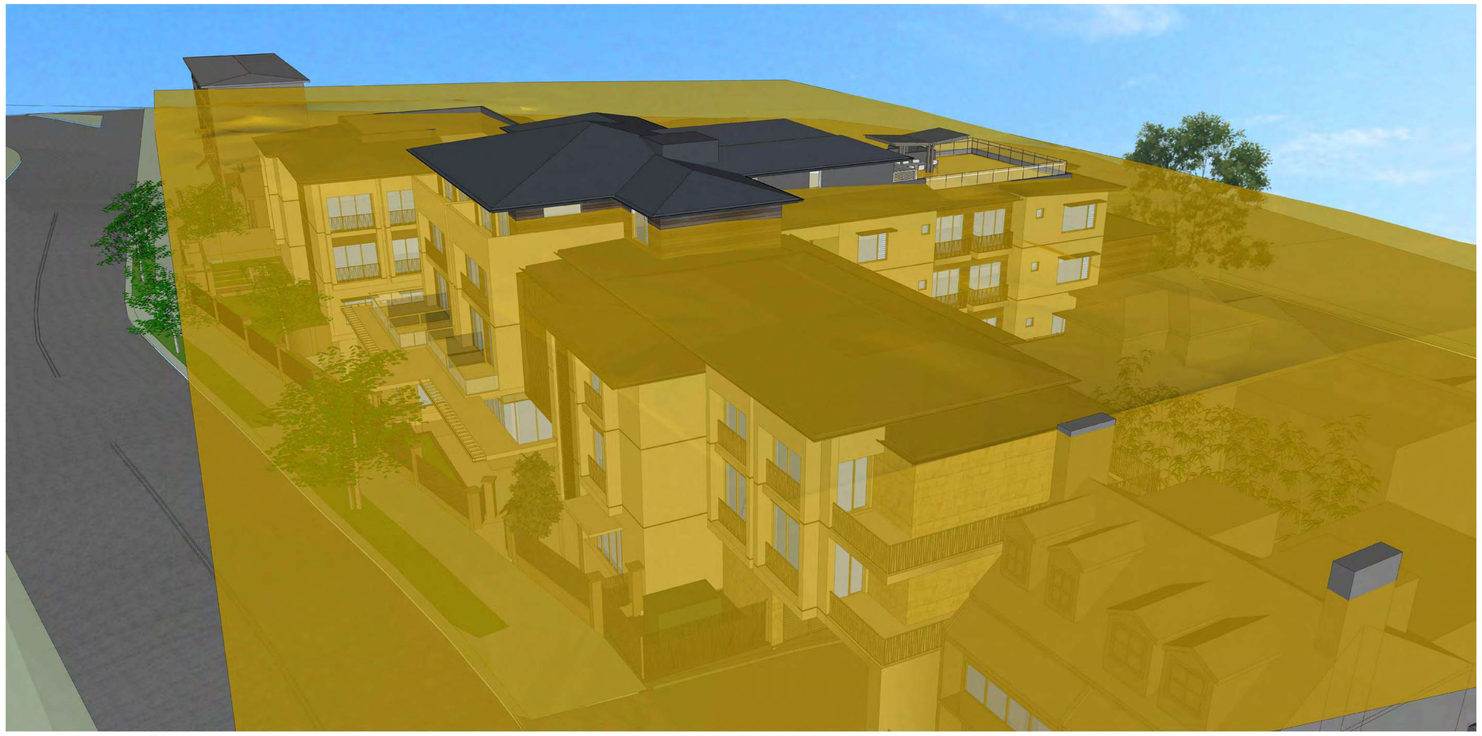
Email : brgroup@brgr.net

Date	JAN 2019	Job No. : Drawing	
Scale	1:500	1912 / DA18	
Drawn	VI		
Amendment	4		



WEST - 3D IMAGE



EAST - 3D IMAGE

The above graphics are showing the 3D model of the proposed development with the 12m height control represented by a yellow coloured plane. These images demonstrate the extent of built form that penetrates the height control

No.	Amendment	Date
1	Preliminary DA Issue	30.09.2020

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
3D IMAGE Showing
built form penetrating 12m height

SUMMITCARE

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Tel. (02) 9406 7000
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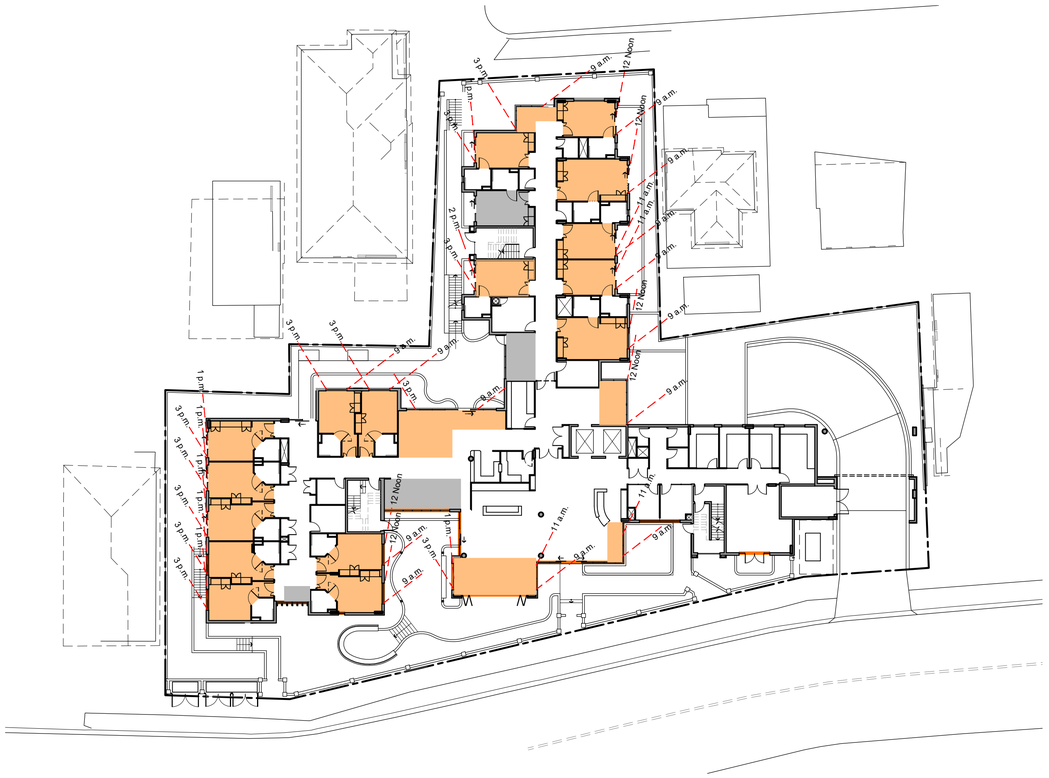
Email : brgroup@brgr.net

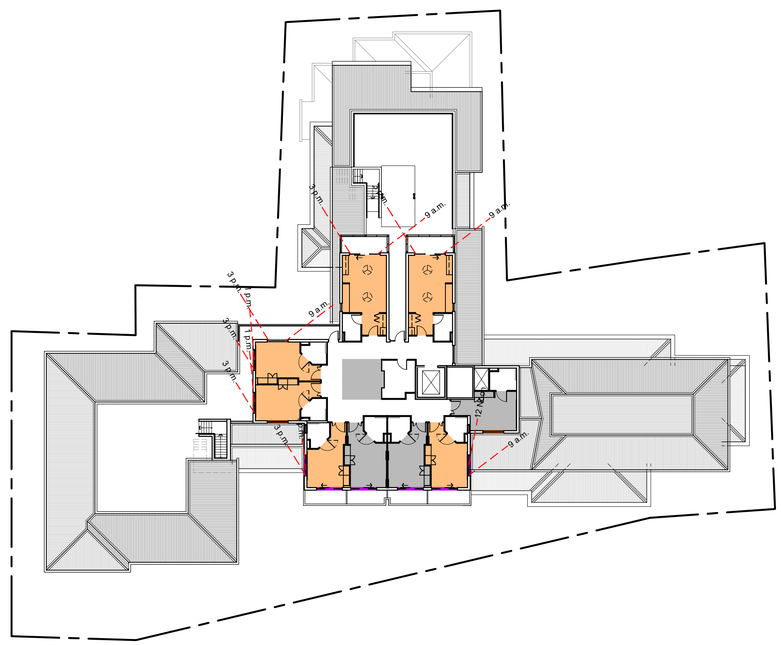
Date	JAN 2019	Job No. : Drawing	
Scale	1:500	1912 / DA18a	
Drawn	SS		
Amendment	1		



GROUND FLOOR PLAN

FIRST FLOOR PLAN

SECOND FLOOR PLAN



THIRD FLOOR PLAN

LEGEND

	Rooms with SOLAR ACCESS between 9am to 3pm
	NO SOLAR ACCESS

0m 2 5 10 20m
SCALE: 1:300

No.	Amendment	Date
3	Preliminary DA Issue	30.09.2020
2	Development Application Issue	07.09.2020
1	Preliminary Issue	14.08.2020

Project
FRENCHMANS LODGE
11-15, 17 & 19 Frenchmans Road, RANDWICK

Drawing
SOLAR ACCESS DIAGRAMS

SUMMITCARE

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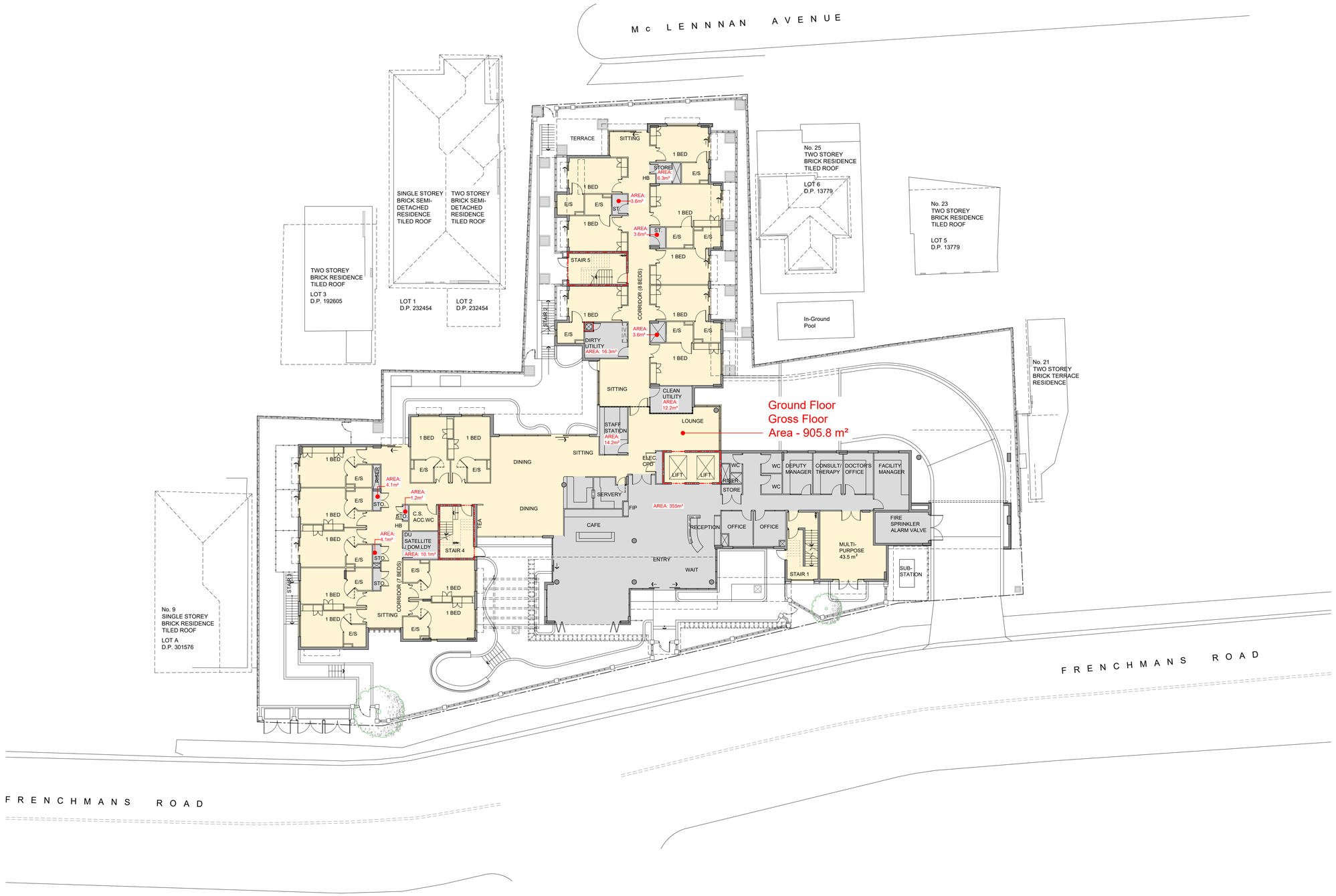
Date	AUG 2020	Job No. : Drawing	
Scale	1:300 @ A1	1912/	DA19
Drawn	AL		
Amendment	3		

GROSS FLOOR AREA

	SEPP 2004 GROSS FLOOR AREA (VERTICAL VILLAGE)
LOWER BASEMENT.FL.	-
BASEMENT.FL.	-
GROUND FL.	905.8 m²
FIRST FL.	1,278.9 m²
SECOND FL.	1,231.0 m²
THIRD FL.	369.6 m²
TOTAL	3,785.2 m²



0m 2 5 10 15m
SCALE: 1: 200 @ A1
SCALE: 1: 400 @ A3

No.	Amendment	Date
4	Preliminary DA Issue	30.09.2020
3	Development Application Issue	07.09.2020
2	Development Application Issue for review	14.08.2020
1	Development Application Issue for review	11.08.2020

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
GROSS FLOOR AREA DIAGRAM - GROUND FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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Email : brgroup@brgr.net

Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	2017 / DA20	
Drawn	SS		
Amendment	4		

GROSS FLOOR AREA

	SEPP 2004 GROSS FLOOR AREA (VERTICAL VILLAGE)
LOWER BASEMENT.FL.	-
BASEMENT.FL.	-
GROUND FL.	905.8 m²
FIRST FL.	1,278.9 m²
SECOND FL.	1,231.0 m²
THIRD FL.	369.6 m²
TOTAL	3,785.2 m²

0m 2 5 10 15m
SCALE: 1:200 @ A1
SCALE: 1:400 @ A3

No.	Amendment	Date
4	Preliminary DA Issue	30.09.2020
3	Development Application Issue	07.09.2020
2	Development Application Issue for review	14.08.2020
1	Development Application Issue for review	11.08.2020

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
GROSS FLOOR AREA DIAGRAM - FIRST FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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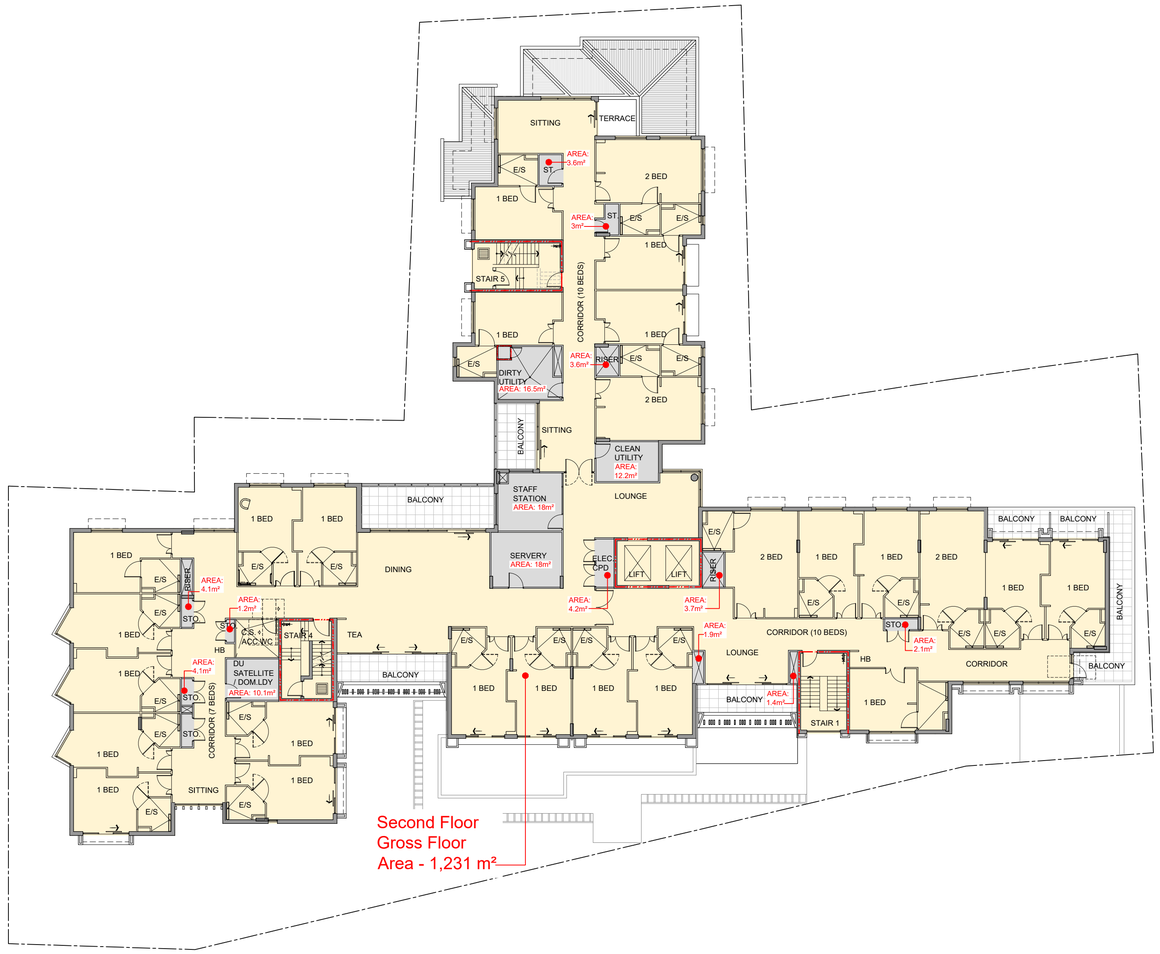
Email : brgroup@brgr.net

Date	JAN 2019	Job No. : Drawing
Scale	AS SHOWN	2017 / DA21
Drawn	SS	
Amendment	4	

GROSS FLOOR AREA

	SEPP 2004 GROSS FLOOR AREA (VERTICAL VILLAGE)
LOWER BASEMENT.FL.	-
BASEMENT.FL.	-
GROUND FL.	905.8 m²
FIRST FL.	1,278.9 m²
SECOND FL.	1,231.0 m²
THIRD FL.	369.6 m²
TOTAL	3,785.2 m²



EXCLUDED AREA GFA : 107.6m²

No.	Amendment	Date
4	Preliminary DA Issue	30.09.2020
3	Development Application Issue	07.09.2020
2	Development Application Issue for review	14.08.2020
1	Development Application Issue for review	11.08.2020

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
GROSS FLOOR AREA DIAGRAM - SECOND FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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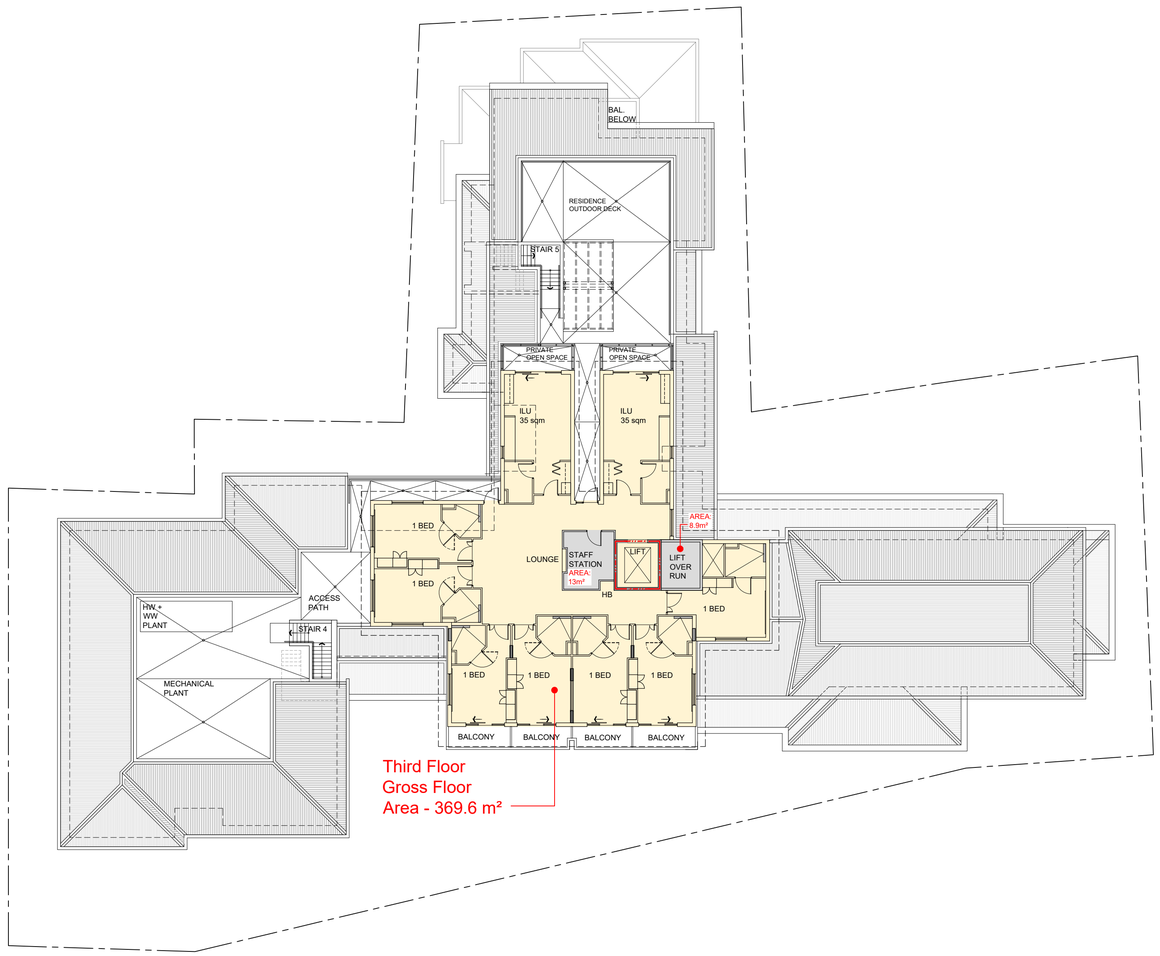
AUSTRALIA
Tel. (02) 9406 7000
Fax. (02) 9406 7099
Email : brgroup@brgr.net

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	2017 / DA22	
Drawn	SS		
Amendment	4		

GROSS FLOOR AREA

	SEPP 2004 GROSS FLOOR AREA (VERTICAL VILLAGE)
LOWER BASEMENT.FL.	-
BASEMENT.FL.	-
GROUND FL.	905.8 m²
FIRST FL.	1,278.9 m²
SECOND FL.	1,231.0 m²
THIRD FL.	369.6 m²
TOTAL	3,785.2 m²



EXCLUDED AREA GFA : 21.3 m²

No.	Amendment	Date
4	Preliminary DA Issue	30.09.2020
3	Development Application Issue	07.09.2020
2	Development Application Issue for review	14.08.2020
1	Development Application Issue for review	11.08.2020

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
GROSS FLOOR AREA DIAGRAM - THIRD FLOOR PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

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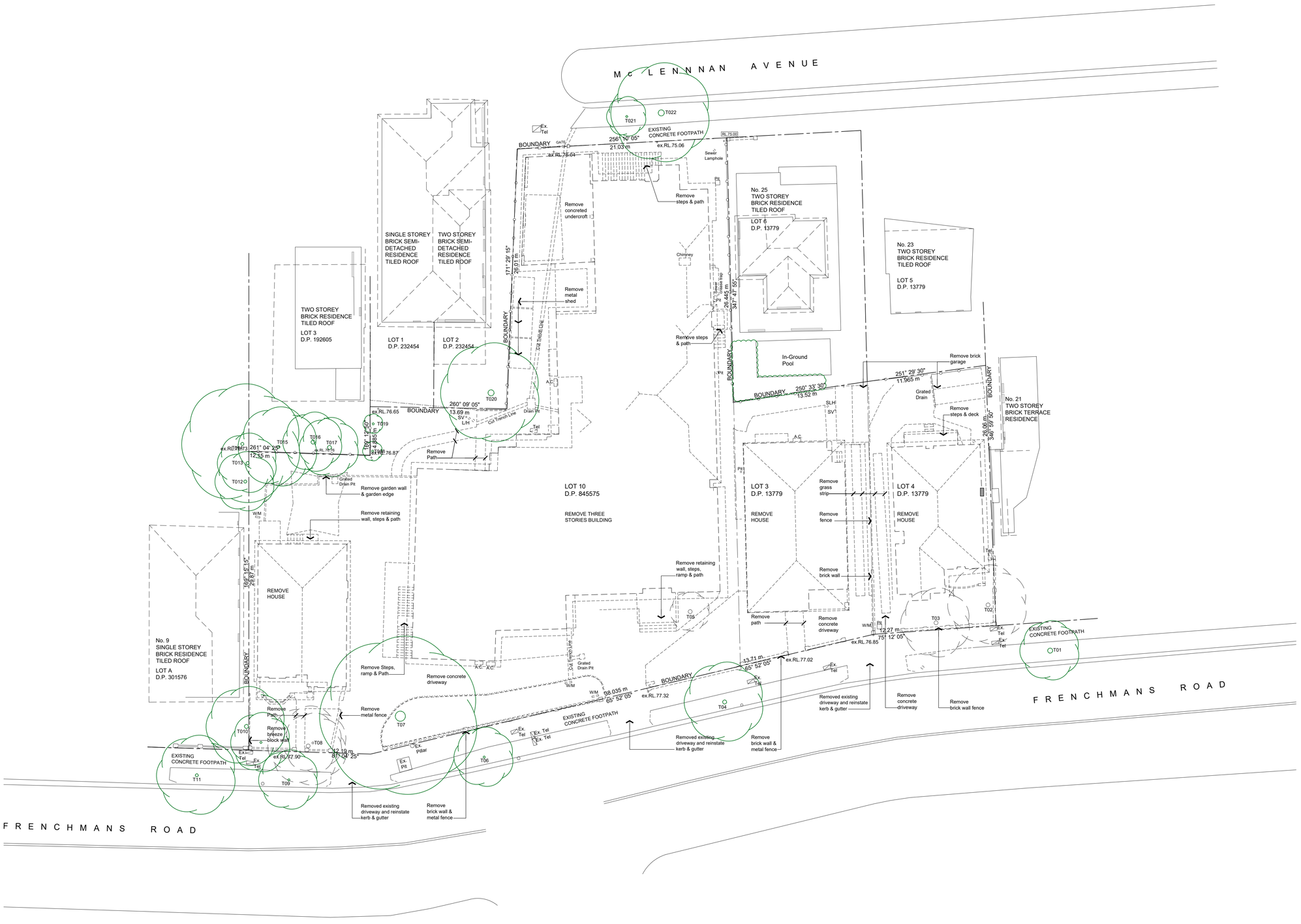
Email : brgroup@brgr.net

0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	2017 / DA23	
Drawn	SS		
Amendment	4		

LEGEND

—— – ——	BOUNDARY
- - - - - -	EXISTING WALLS, DOORS, WINDOWS, FENCE, RETAINING WALL, SANITARY's, DRIVEWAY, PATH, PIT, SERVICES TO BE REMOVED
—·—·—	EXISTING FENCE TO BE RETAINED
	EXISTING TREES TO REMAIN
	TREES TO BE REMOVED
+ ex.RL.0.0	EXISTING LEVELS
RL.00.00	PROPOSED LEVELS



0m 2 5 10 15m
SCALE : 1: 200 @ A1
SCALE : 1: 400 @ A3

No.	Amendment	Date
5	Preliminary DA Issue	30.09.2020
4	Development Application Issue	07.09.2020
3	Development Application Issue for review	14.08.2020
2	Development Application Issue for review	11.08.2020
1	Development application issue	19.12.19

Project
SUMMIT CARE
11-19 Frenchmans Road, Randwick

Drawing
DEMOLITION PLAN

SUMMITCARE
WARMTH WORTH WELLBEING

boffa robertson group
architecture, health and aged care planning, project management
Suite 7, Level 1 Epica, 9 Railway Street
Chatswood NSW 2067
AUSTRALIA
Tel. (02) 9406 7000
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Date	JAN 2019	Job No. : Drawing	
Scale	AS SHOWN	1912 / DA24	
Drawn	SS		
Amendment	5		

Appendix B
Bulk Earthworks Plan

BULK EARTHWORKS PLAN

SCALE 1:200

0 4 8 12 16 20m

4 3 2 1

SCALE 1:200

BULK EARTHWORKS GENERAL NOTES

REFER TO GEOTECHNICAL INVESTIGATION REPORT FOR INFORMATION RELATING TO EXISTING GROUND CONDITIONS, SITE TREATMENT AND SUPERVISION.

THE LOCATIONS OF UNDERGROUND SERVICES SHOWN ON THESE DRAWINGS HAVE BEEN PLOTTED FROM SURVEY AND AUTHORITY INFORMATION. THE SERVICE INFORMATION HAS BEEN PREPARED ONLY TO SHOW THE APPROXIMATE POSITIONS OF ANY KNOWN SERVICES AND MAY NOT BE AS CONSTRUCTED OR ACCURATE.

HENRY AND HYMAS PTY LTD CANNOT GUARANTEE THAT THE SERVICES INFORMATION SHOWN ON THESE DRAWINGS, ACCURATELY INDICATES THE PRESENCE OR ABSENCE OF SERVICES OR THEIR LOCATION AND WILL ACCEPT NO LIABILITY FOR INACCURACIES IN THE SERVICES INFORMATION SHOWN ARISING FROM ANY CAUSE WHATSOEVER.
CONTRACTORS ARE TO CONTACT THE RELEVANT SERVICE AUTHORITY PRIOR TO COMMENCEMENT OF EXCAVATION.
FOR COMMENCEMENT OF WORKS ON SITE, SEARCH RESULTS ARE TO BE KEPT ON SITE AT ALL TIMES.

ALL SERVICES ARE TO BE LOCATED AND CUT OFF PRIOR TO THE COMMENCEMENT OF EXCAVATION AND FILLING OPERATIONS.

ALL TOP SOIL, ORGANIC MATTER AND FILL MATERIAL SHALL BE REMOVED FROM ALL AREAS UNDER BUILDING AND CARPARK LOCATIONS TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER. AREAS TO BE FULLY STRIPPED OF EXISTING FILL AND DARK BROWN BLACK UPPER ORGANIC ALLUVIUM.

UPON COMPLETION OF STRIPPING AND PRIOR TO PLACEMENT OF FILL THE ENTIRE SITE SHALL BE PROOF ROLLED WITH A MINIMUM OF 6 PASSES OF A VIBRATOR PADFOOT ROLLER OF NOT LESS THEN 9 TONNE MINIMUM DEAD WEIGHT OR AS SPECIFIED IN THE GEOTECHNICAL REPORT. ANY SOFT OR HEAVING AREAS SHALL BE REMOVED TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER TO A MINIMUM DEPTH OF 500mm AND THEN BACKFILLED WITH APPROVED MATERIAL IN 200mm THICK LOOSE LAYERS COMPACTED TO 98% OF STANDARD MAX. DRY DENSITY AND TO WITHIN +/- 2% OF STANDARD OPTIMUM MOISTURE CONTENT. APPROVED BACKFILL MATERIAL MAY BE CRUSHED ROCK OR SANDY LOAM WITH A PLASTICITY INDEX LESS THAN 15%.

IMPORTED FILLING:
THE CONTRACTOR WILL IMPORT SUITABLE FILL FROM AN EXTERNAL SOURCE. EXCAVATION MATERIALS MEETING THE REQUIRED SPECIFICATION MAY BE USED AS FILL. THIS MAY INCLUDE RECYCLED MATERIALS IF THEY ARE SUITABLY BLENDED/CONDITIONED TO MEET MATERIALS SPECIFICATIONS.

COMPACTION REQUIREMENTS

1. PREPARATION FOR PAVEMENT:
   CLEAR SITE, STRIP TOP-SOIL, CUT AND FILL AND PREPARATIONS OF SUB-GRADE SHALL BE AS DESCRIBED IN " SUBGRADE PREPARATION".
2. SUB-GRADE SHALL BE COMPACTED TO 98% STANDARD DRY DENSITY RATIO AT OPTIMUM MOISTURE CONTENT ± 2% IN ACCORDANCE WITH AS 1289 5.1.1., TOP 300MM TO 100% SDD.
3. LOWER BASE COURSE SHALL BE CONSTRUCTED FROM CRUSHED SANDSTONE COMPACTED TO 100% STANDARD DRY DENSITY RATIO AT OPTIMUM MOISTURE CONTENT ± 2% IN ACCORDANCE WITH AS 1289 5.1.1. OF THICKNESS NOTED ON DRAWINGS.
4. BASE COURSE SHALL BE CONSTRUCTED FROM FINE CRUSHED ROCK COMPACTED TO 100% STANDARD DRY DENSITY RATIO AT OPTIMUM MOISTURE CONTENT ± 2% IN ACCORDANCE WITH AS 1289 5.1.1 OF THICKNESS NOTED ON DRAWINGS.
5. WEARING SURFACE SHALL BE ASPHALTIC CONCRETE TO STANDARD SPECIFICATION, MINIMUM THICKNESS = 30mm U.N.O.
6. TESTING OF THE SUBGRADE AND PAVEMENT LAYERS SHALL BE CARRIED OUT BY APPROVED N.A.T.A. REGISTERED LABORATORY.

DEPTH OF CUT & FILL RANGE				
LOWER VALUE		UPPER VALUE		COLOUR
-10.0	to	-8.0	m	
-8.0	to	-6.0	m	
-6.0	to	-4.0	m	
-4.0	to	-3.0	m	
-3.0	to	-2.0	m	
-2.0	to	-1.5	m	
-1.5	to	-1.0	m	
-1.0	to	-0.75	m	
-0.75	to	-0.50	m	
-0.50	to	-0.25	m	
-0.25	to	0.0	m	
0.0	to	0.25	m	
0.25	to	0.50	m	
0.50	to	0.75	m	
0.75	to	1.0	m	
1.0	to	1.5	m	
1.5	to	2.0	m	
2.0	to	3.0	m	
3.0	to	4.0	m	
4.0	to	6.0	m	
6.0	to	8.0	m	
8.0	to	10.0	m	

BULK EARTHWORKS QUANTITIES

TOTAL AREA (2,670 m²)		
CUT	10,489	m³
FILL	55	m³
EXCESS OF CUT OVER FILL	10,434	m³
EXCAVATION FOR RETAINING WALLS NOT INCLUDED IN CALCULATION		
EXCAVATION FOR SERVICE TRENCHES NOT INCLUDED IN CALCULATION		
THE VOLUME SHOWN ABOVE HAS BEEN CALCULATED AFTER STRIPPING THE TOP SOIL OFF THE EXISTING SURFACE. TOP SOIL STRIPPING DEPTH 100mm. EXISTING TOPSOIL DEPTH TBC ON SITE.		

PAVEMENT THICKNESS "INCLUDING BEDDING THICKNESS"

DRIVEWAY	250	mm
BUILDING SLAB	250	mm
FOOTPATH AREAS	150	mm
LANDSCAPING AREAS	100	mm

FOR DA ONLY

SURVEY INFORMATION
SURVEYED BY
CONSULTING SURVEYORS
DENNY LINKER & CO.
DATUM: A.H.D.

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
02	ISSUED FOR DA	BH	BH	16.07.2020
01	PRELIMINARY ISSUE	BH	BH	11.12.2019

Client: FRENCHMANS LODGE PROPERTIES PTY LTD
Architect: BOFFA ROBERTSON GROUP

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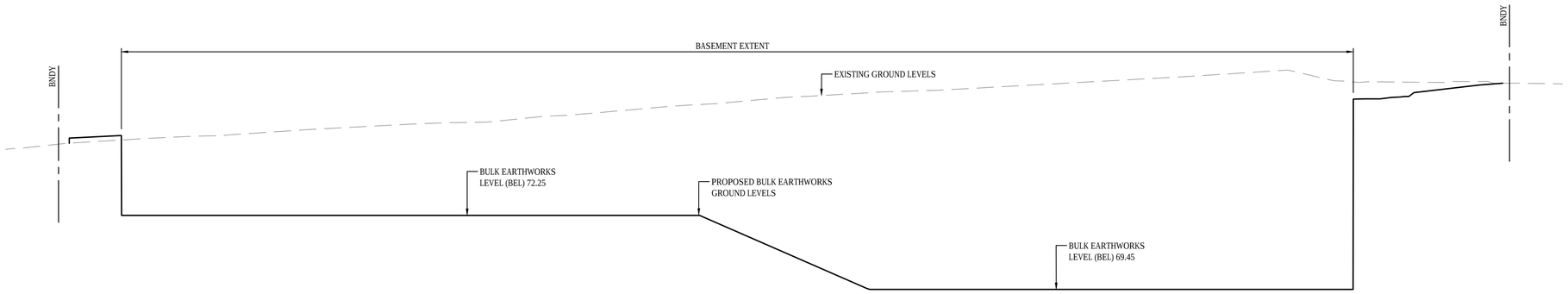
henry&hymas

Project: SUMMIT CARE
11-19 FRENCHMANS ROAD, RANDWICK NSW

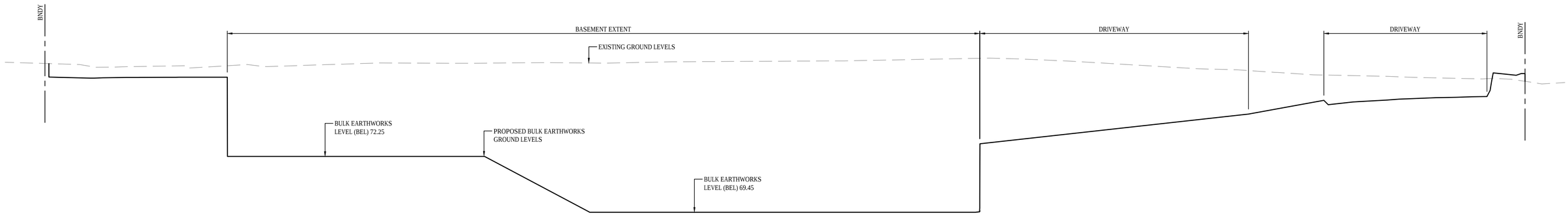
Title: BULK EARTHWORKS
CUT/FILL PLAN

Drawn	Designed	Date
B.Hurlstone	L.Villa	DEC 2019
Checked	Approved	Scale @A1
T.Rozehnal	A.Francis	1:200

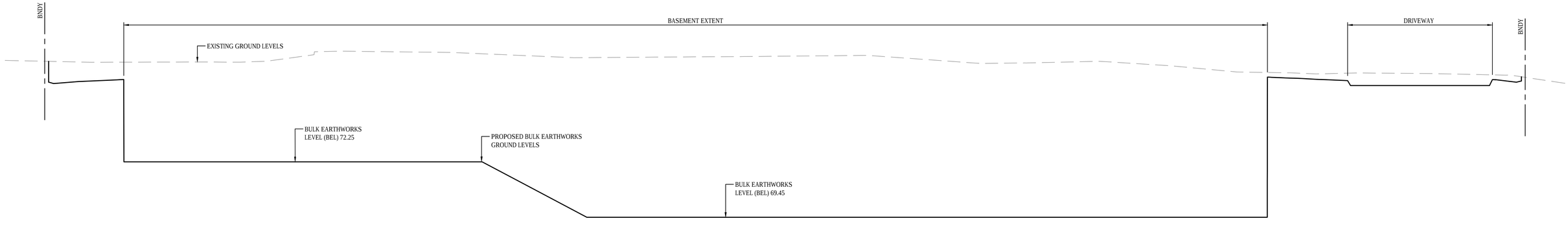
Drawing number: 19826_DA_BE01
Revision: 02



SECTION 3
SCALE: 1:100 BE01



SECTION 2
SCALE: 1:100 BE01



SECTION 1
SCALE: 1:100 BE01

0 2 4 6 8 10m
2 1
SCALE 1:100

FOR DA ONLY

SURVEY INFORMATION
SURVEYED BY
CONSULTING SURVEYORS
DENNY LINKER & CO.
DATUM: A.H.D.

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
02	ISSUED FOR DA	BH	BH	16.07.2020
01	PRELIMINARY ISSUE	BH	BH	11.12.2019

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Project
SUMMIT CARE
11-19 FRENCHMANS ROAD, RANDWICK NSW

Title
BULK EARTHWORKS
SECTIONS

Drawn	Designed	Date
B.Hurlstone	B.Hurlstone	DEC 2019
Checked	Approved	Scale @A1
T.Rozehnal	A.Francis	1:100 @ A1

Drawing number
19826_DA_BE02
Revision
02

Appendix C
Laboratory Reports

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ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 268144

Client Details

Client	Consulting Earth Scientists Pty Ltd
Attention	Tristan Goodbody
Address	Suite 3, Level 1, 55 Grandview Street, Pymble, NSW, 2073

Sample Details

Your Reference	**CES190901 Frenchmans Road Randwick**
Number of Samples	12 Soil
Date samples received	03/05/2021
Date completed instructions received	03/05/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	04/05/2021
Date of Issue	04/05/2021

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Nyovan Moonean, Panika Wongchanda
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Dragana Tomas, Senior Chemist
Ken Nguyen, Senior Customer Service
Lucy Zhu, Asbestos Supervisor
Manju Dewendrage, Chemist
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021	04/05/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	75	72	86	92	73

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		268144-6	268144-7	268144-8	268144-9	268144-10
Your Reference	UNITS	BH9	BH10	BH11	TS	TB
Depth		0.15	0.15	0.15	-	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021	04/05/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	[NA]	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	[NA]	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	[NA]	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	77%	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	78%	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	78%	<1
m+p-xylene	mg/kg	<2	<2	<2	77%	<2
o-Xylene	mg/kg	<1	<1	<1	76%	<1
naphthalene	mg/kg	<1	<1	<1	[NA]	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	[NA]	<3
Surrogate aaa-Trifluorotoluene	%	73	76	82	108	75

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		268144-11
Your Reference	UNITS	QS1
Depth		-
Date Sampled		03/05/2021
Type of sample		Soil
Date extracted	-	03/05/2021
Date analysed	-	04/05/2021
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	77

svTRH (C10-C40) in Soil						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021	04/05/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	280	140	270
TRH C_{29} - C_{36}	mg/kg	<100	<100	200	180	130
TRH >C_{10} -C_{16}	mg/kg	<50	<50	53	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	53	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	410	270	370
TRH >C_{34} -C_{40}	mg/kg	<100	<100	150	130	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	610	400	370
Surrogate o-Terphenyl	%	102	96	106	104	100

svTRH (C10-C40) in Soil					
Our Reference		268144-6	268144-7	268144-8	268144-11
Your Reference	UNITS	BH9	BH10	BH11	QS1
Depth		0.15	0.15	0.15	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	980	430	<100	<100
TRH C_{29} - C_{36}	mg/kg	1,100	360	120	100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	1,900	700	120	110
TRH >C_{34} -C_{40}	mg/kg	370	230	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	2,300	930	120	110
Surrogate o-Terphenyl	%	110	116	94	94

PAHs in Soil						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	03/05/2021	03/05/2021	04/05/2021	04/05/2021	04/05/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Acenaphthylene	mg/kg	<0.1	<0.1	0.4	0.1	0.9
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Phenanthrene	mg/kg	0.8	0.1	0.7	0.4	2.7
Anthracene	mg/kg	0.3	<0.1	0.2	0.1	1.4
Fluoranthene	mg/kg	2.0	0.5	2.3	0.8	9.4
Pyrene	mg/kg	2.0	0.6	2.6	1	11
Benzo(a)anthracene	mg/kg	2.0	0.5	1.8	0.6	4.3
Chrysene	mg/kg	1.3	0.5	1.3	0.4	5.8
Benzo(b,j+k)fluoranthene	mg/kg	2	0.8	3.2	1	7.2
Benzo(a)pyrene	mg/kg	1.2	0.4	2.1	0.58	4.6
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	0.2	1.0	0.3	2.3
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	0.2	<0.1	0.5
Benzo(g,h,i)perylene	mg/kg	0.8	0.3	1.2	0.3	2.3
Total +ve PAH's	mg/kg	13	3.8	17	5.5	53
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.8	0.5	2.9	0.8	6.6
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.8	0.6	2.9	0.8	6.6
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.8	0.6	2.9	0.9	6.6
Surrogate p-Terphenyl-d14	%	102	105	122	118	120

PAHs in Soil					
Our Reference		268144-6	268144-7	268144-8	268144-11
Your Reference	UNITS	BH9	BH10	BH11	QS1
Depth		0.15	0.15	0.15	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	03/05/2021	04/05/2021
Naphthalene	mg/kg	<0.1	0.3	0.4	<0.1
Acenaphthylene	mg/kg	<0.1	1.5	<0.1	0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.5	0.4	<0.1
Phenanthrene	mg/kg	0.1	5.2	4.9	0.2
Anthracene	mg/kg	<0.1	1.9	1.8	<0.1
Fluoranthene	mg/kg	0.2	11	12	0.6
Pyrene	mg/kg	0.3	11	13	0.8
Benzo(a)anthracene	mg/kg	0.2	4.0	5.8	0.6
Chrysene	mg/kg	<0.1	5.8	6.3	0.5
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	7.4	8.9	1
Benzo(a)pyrene	mg/kg	0.1	4.6	5.9	0.65
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	2.1	2.9	0.4
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.5	0.6	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	2.3	3.5	0.4
Total +ve PAH's	mg/kg	0.96	58	66	5.3
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	6.5	8.4	0.9
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	6.5	8.4	0.9
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	6.5	8.4	1
Surrogate p-Terphenyl-d14	%	122	116	109	118

Organochlorine Pesticides in soil						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	03/05/2021	03/05/2021	04/05/2021	04/05/2021	04/05/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	84	83	87	91	91

Organochlorine Pesticides in soil					
Our Reference		268144-6	268144-7	268144-8	268144-11
Your Reference	UNITS	BH9	BH10	BH11	QS1
Depth		0.15	0.15	0.15	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	03/05/2021	04/05/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	440	1.0	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	13	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	95	90	88	90

Organophosphorus Pesticides in Soil						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	03/05/2021	03/05/2021	04/05/2021	04/05/2021	04/05/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	84	83	87	91	91

Organophosphorus Pesticides in Soil					
Our Reference		268144-6	268144-7	268144-8	268144-11
Your Reference	UNITS	BH9	BH10	BH11	QS1
Depth		0.15	0.15	0.15	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	03/05/2021	04/05/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	95	90	88	90

PCBs in Soil						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	03/05/2021	03/05/2021	04/05/2021	04/05/2021	04/05/2021
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	84	83	87	91	91

PCBs in Soil					
Our Reference		268144-6	268144-7	268144-8	268144-11
Your Reference	UNITS	BH9	BH10	BH11	QS1
Depth		0.15	0.15	0.15	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	03/05/2021	04/05/2021
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	95	90	88	90

Acid Extractable metals in soil						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021	04/05/2021
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021	04/05/2021
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	9	11	11	9	12
Copper	mg/kg	61	31	34	29	54
Lead	mg/kg	1,300	250	360	110	2,200
Mercury	mg/kg	0.2	1.0	0.2	0.1	0.7
Nickel	mg/kg	3	4	7	5	6
Zinc	mg/kg	210	120	110	100	430

Acid Extractable metals in soil					
Our Reference		268144-6	268144-7	268144-8	268144-11
Your Reference	UNITS	BH9	BH10	BH11	QS1
Depth		0.15	0.15	0.15	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021
Arsenic	mg/kg	<4	<4	12	<4
Cadmium	mg/kg	<0.4	<0.4	0.8	<0.4
Chromium	mg/kg	6	8	19	10
Copper	mg/kg	48	52	140	32
Lead	mg/kg	180	330	2,100	270
Mercury	mg/kg	0.2	0.2	0.7	1.1
Nickel	mg/kg	2	3	11	4
Zinc	mg/kg	61	150	670	130

Moisture						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021	04/05/2021
Moisture	%	16	12	9.9	10	17

Moisture					
Our Reference		268144-6	268144-7	268144-8	268144-11
Your Reference	UNITS	BH9	BH10	BH11	QS1
Depth		0.15	0.15	0.15	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021
Moisture	%	16	12	17	13

Asbestos ID - soils NEPM - ASB-001						
Our Reference		268144-1	268144-2	268144-3	268144-4	268144-5
Your Reference	UNITS	BH4	BH5	BH6	BH7	BH8
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	04/05/2021	04/05/2021	04/05/2021	04/05/2021	04/05/2021
Sample mass tested	g	461.05	473.08	367.67	387.19	299.69
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & debris	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001				
Our Reference		268144-7	268144-8	268144-11
Your Reference	UNITS	BH10	BH11	QS1
Depth		0.15	0.15	-
Date Sampled		03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil
Date analysed	-	04/05/2021	04/05/2021	04/05/2021
Sample mass tested	g	533.74	476.82	385.11
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–
FA and AF Estimation*	g	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001

Asbestos ID - soils		
Our Reference		268144-6
Your Reference	UNITS	BH9
Depth		0.15
Date Sampled		03/05/2021
Type of sample		Soil
Date analysed	-	04/05/2021
Sample mass tested	g	Approx. 45g
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.

Method ID	Methodology Summary
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-13	268144-2
Date extracted	-			03/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Date analysed	-			04/05/2021	1	04/05/2021	04/05/2021		04/05/2021	04/05/2021
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	120	109
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	120	109
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	120	108
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	121	110
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	118	111
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	120	109
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	114	104
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	77	1	75	72	4	85	80

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-13	268144-2
Date extracted	-			03/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Date analysed	-			04/05/2021	1	04/05/2021	04/05/2021		04/05/2021	04/05/2021
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	113	103
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	86	86
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	108	79
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	113	103
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	110	10	86	86
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	108	79
Surrogate o-Terphenyl	%		Org-020	99	1	102	97	5	119	96

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	268144-2
Date extracted	-			03/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Date analysed	-			04/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	110	83
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	74	70
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	79	70
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	0.8	0.7	13	113	83
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	0.3	0.3	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	2.0	2.2	10	100	75
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	2.0	2.3	14	104	74
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	2.0	2.2	10	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	1.3	1.6	21	86	#
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	2	2.4	18	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	1.2	1.3	8	103	#
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.5	0.7	33	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	0.8	1	22	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	122	1	102	107	5	126	110

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	268144-2
Date extracted	-			03/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Date analysed	-			04/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	77
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	85	72
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	105	79
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	117	81
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	112	86
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	85
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	121	95
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	109	88
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	105	88
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	107	80
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	101	1	84	84	0	87	81

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	268144-2
Date extracted	-			03/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Date analysed	-			04/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	76
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	81
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	117
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	108
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	83
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	78	96
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	85	95
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	101	1	84	84	0	87	81

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	268144-2
Date extracted	-			03/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Date analysed	-			04/05/2021	1	03/05/2021	03/05/2021		03/05/2021	03/05/2021
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	120	80
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	101	1	84	84	0	87	81

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-13	268144-2
Date prepared	-			04/05/2021	1	04/05/2021	04/05/2021		04/05/2021	04/05/2021
Date analysed	-			04/05/2021	1	04/05/2021	04/05/2021		04/05/2021	04/05/2021
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	103	103
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	102	96
Chromium	mg/kg	1	Metals-020	<1	1	9	8	12	108	106
Copper	mg/kg	1	Metals-020	<1	1	61	48	24	103	106
Lead	mg/kg	1	Metals-020	<1	1	1300	1300	0	102	97
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.2	0.2	0	111	#
Nickel	mg/kg	1	Metals-020	<1	1	3	2	40	103	100
Zinc	mg/kg	1	Metals-020	<1	1	210	200	5	104	97

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Sample 268144-6 was sub-sampled from a jar provided by the client.

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Note: All samples analysed as received. However, samples 268144-1-3,5,11 are below the minimum 500mL sample volume as per National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013.

PAHs in Soil - # Percent recovery for the matrix spike is not possible to report as the high concentration of analytes in sample 268144-2 have caused interference.

8 metals in soil - # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

CHAIN OF CUSTODY - Client

Fines Characterisation

ENVIROLAB GROUP - National phone number 1300 42 43 44

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Client: Consulting Earth Scientists	**Client Project Name / Number / Site etc (ie report title):** CES190901 Frenchmans Road Randwick
Contact Person: Andrew Carars	
Project Mgr: Andrew Carras	**PO No.:**
Sampler: Andrew Carras	**Envirolab Quote No. :**
Address: Level 1 Suite 3, 55-65 Grandview Street, Pymble NSW	**Date results required:** 1-day **Or choose:** standard / same day / 1 day / 2 day / 3 day *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: **Mob:** 0497 018 918	**Report format:** esdat / equis /
Email: andrew.carras@consultingearth.com.au; tristan.goodbody@consultingearth.com.au	**Lab Comments:**

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 6A - 500mL NEPM asb	VTRH/BTEX														Provide as much information about the sample as you can
1	BH1 0.15	—	3/5/21	Soil	X															
2	BH5 0.15				X															
3	BH6 0.15				X															
4	BH7 0.05				X															NO SOIL NEPM 6A please take from jar.
5	BH8 0.15				X															
6	BH9 0.15				X															
7	BH10 0.15				X															
8	BH11 0.15				X															
9	TS					X														
10	TB					X														
11	QS1				X															
—	QS1A				X															Send QS1A to ALS please.
12	BH4 0.5 CH																			

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 208144

Date Received: 03/05/21
Time Received: 15:35
Received By: CF
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (Company): Consulting Earth Scientists	**Received by (Company):** ECS SYD	***Lab use only:***	& advise of QA combo
Print Name: ANDREW CARRAS	**Print Name:** Christine	**Samples Received:** Cool or Ambient (circle one)	
Date & Time: 3/5/21	**Date & Time:** 1535 03/05/21	**Temperature Received at:** 2 (if applicable)	
Signature:	**Signature:**	**Transported by:** Hand delivered / courier	

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customerservice@envirolab.com.au
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CERTIFICATE OF ANALYSIS 268144-A

Client Details

Client	Consulting Earth Scientists Pty Ltd
Attention	Andrew Carras
Address	Suite 3, Level 1, 55 Grandview Street, Pymble, NSW, 2073

Sample Details

Your Reference	**CES190901 Frenchmans Road Randwick**
Number of Samples	12 Soil
Date samples received	03/05/2021
Date completed instructions received	05/05/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	06/05/2021
Date of Issue	07/05/2021

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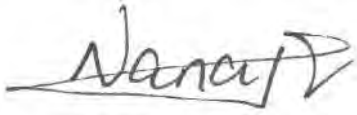
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Hannah Nguyen, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

CEC		
Our Reference		268144-A-3
Your Reference	UNITS	BH6
Depth		0.15
Date Sampled		03/05/2021
Type of sample		Soil
Date prepared	-	05/05/2021
Date analysed	-	06/05/2021
Exchangeable Ca	meq/100g	5.4
Exchangeable K	meq/100g	0.1
Exchangeable Mg	meq/100g	1.4
Exchangeable Na	meq/100g	<0.1
Cation Exchange Capacity	meq/100g	6.9

Misc Inorg - Soil		
Our Reference		268144-A-3
Your Reference	UNITS	BH6
Depth		0.15
Date Sampled		03/05/2021
Type of sample		Soil
Date prepared	-	06/05/2021
Date analysed	-	06/05/2021
Total Organic Carbon (Walkley Black)	mg/kg	39,000
pH 1:5 soil:$CaCl_2$	pH Units	5.1

Clay 50-120g		
Our Reference		268144-A-3
Your Reference	UNITS	BH6
Depth		0.15
Date Sampled		03/05/2021
Type of sample		Soil
Date prepared	-	05/05/2021
Date analysed	-	06/05/2021
Clay in soils <2µm	% (w/w)	11

Acid Extractable metals in soil		
Our Reference		268144-A-3
Your Reference	UNITS	BH6
Depth		0.15
Date Sampled		03/05/2021
Type of sample		Soil
Date prepared	-	05/05/2021
Date analysed	-	06/05/2021
Iron	mg/kg	9,400

TCLP Preparation - Acid						
Our Reference		268144-A-1	268144-A-3	268144-A-5	268144-A-7	268144-A-8
Your Reference	UNITS	BH4	BH6	BH8	BH10	BH11
Depth		0.15	0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
pH of soil for fluid# determ.	pH units	7.0	7.0	7.8	8.3	7.9
pH of soil TCLP (after HCl)	pH units	1.7	1.7	1.7	1.7	1.7
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	4.9	4.9	4.9	4.9	4.9

PAHs in TCLP (USEPA 1311)				
Our Reference	UNITS	268144-A-5	268144-A-7	268144-A-8
Your Reference		BH8	BH10	BH11
Depth		0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil
Date extracted	-	06/05/2021	06/05/2021	06/05/2021
Date analysed	-	06/05/2021	06/05/2021	06/05/2021
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	129	117	125

Metals in TCLP USEPA1311					
Our Reference		268144-A-1	268144-A-3	268144-A-5	268144-A-8
Your Reference	UNITS	BH4	BH6	BH8	BH11
Depth		0.15	0.15	0.15	0.15
Date Sampled		03/05/2021	03/05/2021	03/05/2021	03/05/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	06/05/2021	06/05/2021	06/05/2021	06/05/2021
Date analysed	-	06/05/2021	06/05/2021	06/05/2021	06/05/2021
Lead in TCLP	mg/L	6.9	0.1	4.1	7.7

Method ID	Methodology Summary
AS1289.3.6.3	Determination Particle Size Analysis using AS1289.3.6.3 and AS1289.3.6.1 and in house method INORG-107. Clay fraction at <2µm reported.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004. Please note that the mass used may be scaled down from the default based on sample mass available.
Inorg-036	Total Organic Carbon or Matter - A titrimetric method that measures the oxidisable organic content of soils.
Metals-020	Determination of various metals by ICP-AES.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Org-022/025	Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date prepared	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	[NT]
Date analysed	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	[NT]
Date analysed	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	[NT]
Total Organic Carbon (Walkley Black)	mg/kg	1000	Inorg-036	<1000	[NT]	[NT]	[NT]	[NT]	97	[NT]
pH 1:5 soil:$CaCl_2$	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date prepared	-			05/05/2021	[NT]	[NT]	[NT]	[NT]	05/05/2021	[NT]
Date analysed	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	[NT]
Iron	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	98	[NT]

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	[NT]
Date analysed	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	[NT]
Naphthalene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	81	[NT]
Acenaphthylene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	68	[NT]
Fluorene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	73	[NT]
Phenanthrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	88	[NT]
Anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	78	[NT]
Pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	84	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	86	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-022/025	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	73	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	127	[NT]	[NT]	[NT]	[NT]	119	[NT]

QUALITY CONTROL: Metals in TCLP USEPA1311					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	268144-A-5
Date extracted	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	06/05/2021
Date analysed	-			06/05/2021	[NT]	[NT]	[NT]	[NT]	06/05/2021	06/05/2021
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	[NT]	[NT]	96	91

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Ming To

From: Aileen Hie
Sent: Wednesday, 5 May 2021 10:37 AM
To: Ming To
Subject: FW: Results for Registration 268144 CES190901 Frenchmans Road Randwick

Ref: 268144A.
TAT: 1 day
Due: 06/05/2021
MT

From: Andrew Carras <andrew.carras@consultingearth.com.au>
Sent: Wednesday, 5 May 2021 10:25 AM
To: Ken Nguyen <KNguyen@envirolab.com.au>; SydneyMailbox <Sydney@envirolab.com.au>
Cc: Tristan Goodbody <tristan.goodbody@consultingearth.com.au>
Subject: RE: Results for Registration 268144 CES190901 Frenchmans Road Randwick

Hi,

As mentioned in the email below - Could I please get sample BH6/0.15 (3) analysed for soil EIL parameters on a 1-day TAT?

Could I also get the following samples analysed for TCLP B(a)P and Lead on a one-day TAT:

	BH4/0.15 (1)	BH6/0.15 (3)	BH8/0.15 (5)	BH10/0.15 (7)	BH11/0.15 (8)
B(a)P	-	-	Yes	Yes	Yes
Lead	Yes	Yes	Yes	-	Yes

Kind Regards,

Andrew Carras
Environmental Geologist

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EARTH
SCIENTISTS

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55, Grandview Street
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Tel: +61 2 8569 2200 Fax: +61 2 9983 0582 M: +61 497 018 918
E-Mail: andrew.carras@consultingearth.com.au

ABN 67 151 524 757

Ming To

From: Ken Nguyen
Sent: Tuesday, 4 May 2021 8:05 PM
To: Ming To
Cc: Simon Song; Aileen Hie
Subject: FW: Results for Registration 268144 CES190901 Frenchmans Road Randwick

Follow Up Flag: Follow up
Flag Status: Flagged

Ref: 268144-A
TAT: 1 day
Due: 06/05/2021
MT

From: Andrew Carras <andrew.carras@consultingearth.com.au>
Sent: Tuesday, 4 May 2021 8:03 PM
To: Ken Nguyen <KNguyen@envirolab.com.au>
Cc: Tristan Goodbody <tristan.goodbody@consultingearth.com.au>
Subject: RE: Results for Registration 268144 CES190901 Frenchmans Road Randwick

Hi,

Could I please get sample BH6/0.15 (3) analysed for soil EIL parameters on a 1-day TAT?

Kind Regards,

Andrew Carras
Environmental Geologist

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EARTH
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E-Mail: andrew.carras@consultingearth.com.au

ABN 67 151 524 757

From: Ken Nguyen <KNguyen@envirolab.com.au>
Sent: Tuesday, 4 May 2021 7:23 PM
To: Andrew Carras <andrew.carras@consultingearth.com.au>; Tristan Goodbody

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2116624**	Page	: 1 of 8
Client	: **CONSULTING EARTH SCIENTISTS**	Laboratory	: Environmental Division Sydney
Contact	: ANDREW CARRAS	Contact	: Customer Services ES
Address	: Suite 3, Level 1 55-65 Grandview Street PYMBLE NSW, AUSTRALIA 2073	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: CES190901 Frenchmans Road Randwick	Date Samples Received	: 04-May-2021 17:10
Order number	: ----	Date Analysis Commenced	: 06-May-2021
C-O-C number	: ----	Issue Date	: 11-May-2021 17:25
Sampler	: ----		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG005: Poor precision was obtained for Iron on sample ES2116556-1 and ES2116624-1 Results have been confirmed by re-extraction and reanalysis.
- EG035: Positive Hg result ES2116624 #1 has been confirmed by reanalysis.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	QS1A	----	----	----	----
			Sampling date / time	03-May-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2116624-001	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**15.6**	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	----	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	----	----	----	----
Asbestos Type	1332-21-4	-	--	**-**	----	----	----	----
Synthetic Mineral Fibre	----	0.1	g/kg	**No**	----	----	----	----
Organic Fibre	----	0.1	g/kg	**No**	----	----	----	----
Sample weight (dry)	----	0.01	g	**497**	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	**A. SMYLIE**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**8**	----	----	----	----
Copper	7440-50-8	5	mg/kg	**31**	----	----	----	----
Lead	7439-92-1	5	mg/kg	**293**	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**3**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**121**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	**1.0**	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	QS1A	----	----	----	----
			Sampling date / time	03-May-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2116624-001	--------	--------	--------	--------
				Result	----	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	----	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	----	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	----	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	QS1A	----	----	----	----
				Sampling date / time	03-May-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2116624-001	--------	--------	--------	--------
					Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		**0.5**	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		**0.6**	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		**0.7**	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		**0.6**	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		**2.4**	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		**0.6**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg		<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	QS1A	----	----	----	----
				Sampling date / time	03-May-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2116624-001	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**86.4**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**100.0**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**128**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**81.4**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**84.8**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**69.2**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**98.0**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**110**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**94.5**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**104**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		**98.6**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		**105**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Sample ID - Sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	QS1A - 03-May-2021 00:00	Mid brown soil.

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA200: AS 4964 - 2004 Identification of Asbestos in Soils

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2116624**	Page	: 1 of 10
Client	: **CONSULTING EARTH SCIENTISTS**	Laboratory	: Environmental Division Sydney
Contact	: ANDREW CARRAS	Contact	: Customer Services ES
Address	: Suite 3, Level 1 55-65 Grandview Street PYMBLE NSW, AUSTRALIA 2073	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: CES190901 Frenchmans Road Randwick	Date Samples Received	: 04-May-2021
Order number	: ----	Date Analysis Commenced	: 06-May-2021
C-O-C number	: ----	Issue Date	: 11-May-2021
Sampler	: ----		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3669104)									
ES2116624-001	QS1A	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	8	11	35.1	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	3	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	31	27	15.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	293	258	12.7	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	121	103	16.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3669106)									
ES2115906-003	Anonymous	EA055: Moisture Content	----	0.1	%	52.0	53.4	2.7	0% - 20%
ES2117049-001	Anonymous	EA055: Moisture Content	----	0.1	%	13.8	13.9	0.0	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3669103)									
ES2116556-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3662106)									
ES2116744-002	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3662105)									
ES2116744-002	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3662105) - continued									
ES2116744-002	Anonymous	EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3662105)									
ES2116744-002	Anonymous	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3662104)									
ES2116744-002	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3662104) - continued									
ES2116744-002	Anonymous	EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3662103)									
ES2116744-002	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	130	130	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3664140)									
ES2116643-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2116381-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3662103)									
ES2116744-002	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	150	150	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	160	170	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3664140)									
ES2116643-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2116381-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 3664140)									
ES2116643-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2116381-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 3664140) - continued									
ES2116381-001	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3669104)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	93.8	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	100	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	93.6	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	102	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	93.4	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	92.6	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	91.1	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3669103)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.073 mg/kg	112	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3662106)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	106	62.0	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 3662105)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	92.5	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	89.5	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	92.3	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	80.8	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	86.3	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	76.4	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	75.2	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.2	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	78.5	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	86.4	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	84.8	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	85.5	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	90.4	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.4	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	95.8	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.3	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	83.4	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	75.6	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	75.8	54.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3662105)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3662105) - continued								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	106	59.0	119
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	91.3	62.0	128
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	87.1	54.0	126
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	95.2	67.0	119
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	87.9	70.0	120
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	78.2	72.0	120
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	78.8	68.0	120
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	86.8	68.0	122
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	81.3	69.0	117
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	80.9	76.0	118
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	80.1	64.0	122
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	80.7	70.0	116
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	102	69.0	121
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	78.6	66.0	118
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	86.4	68.0	124
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	81.8	62.0	112
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	79.9	68.0	120
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	81.4	65.0	127
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	78.7	41.0	123
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3662104)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	110	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	109	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	106	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	107	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	111	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	114	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	111	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	111	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	92.3	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	96.3	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	82.5	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	106	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	94.8	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	86.5	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	85.8	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	83.0	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3662103)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	101	75.0	129

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3662103) - continued								
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	99.5	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	102	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3664140)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	104	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3662103)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	100	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	99.4	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	118	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3664140)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	106	68.4	128
EP080: BTEXN (QCLot: 3664140)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	103	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	105	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	106	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	108	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	111	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	99.8	63.0	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3669104)							
ES2116624-001	QS1A	EG005T: Arsenic	7440-38-2	50 mg/kg	96.7	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	97.5	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	99.4	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	97.8	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	97.8	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	97.5	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	96.5	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3669103)							
ES2116556-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	94.0	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3662106)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3662106) - continued							
ES2116744-002	Anonymous	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	111	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 3662105)							
ES2116744-002	Anonymous	EP068: gamma-BHC	58-89-9	0.5 mg/kg	108	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	90.1	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	107	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	114	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	102	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	85.5	70.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3662105)							
ES2116744-002	Anonymous	EP068: Diazinon	333-41-5	0.5 mg/kg	102	70.0	130
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	100	70.0	130
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	91.0	70.0	130
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	78.3	70.0	130
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	75.9	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3662104)							
ES2116744-002	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	94.1	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	103	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3662103)							
ES2116744-002	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	106	73.0	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	119	53.0	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	115	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3664140)							
ES2116381-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	87.4	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3662103)							
ES2116744-002	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	113	73.0	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	116	53.0	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	76.5	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3664140)							
ES2116381-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	83.6	70.0	130
EP080: BTEXN (QCLot: 3664140)							
ES2116381-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	86.8	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	93.2	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	100	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	97.0	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	100	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080: BTEXN (QCLot: 3664140) - continued							
ES2116381-001	Anonymous	EP080: Naphthalene	91-20-3	2.5 mg/kg	90.2	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2116624**	Page	: 1 of 6
Client	: **CONSULTING EARTH SCIENTISTS**	Laboratory	: Environmental Division Sydney
Contact	: ANDREW CARRAS	Telephone	: +61-2-8784 8555
Project	: CES190901 Frenchmans Road Randwick	Date Samples Received	: 04-May-2021
Site	: ----	Issue Date	: 11-May-2021
Sampler	: ----	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
QS1A	**03-May-2021**	**----**	----	----	**10-May-2021**	17-May-2021	✓
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag (EA200)							
QS1A	**03-May-2021**	**----**	----	----	**07-May-2021**	30-Oct-2021	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
QS1A	**03-May-2021**	**10-May-2021**	30-Oct-2021	✓	**10-May-2021**	30-Oct-2021	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
QS1A	**03-May-2021**	**10-May-2021**	31-May-2021	✓	**11-May-2021**	31-May-2021	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066)							
QS1A	**03-May-2021**	**06-May-2021**	17-May-2021	✓	**07-May-2021**	15-Jun-2021	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068)							
QS1A	**03-May-2021**	**06-May-2021**	17-May-2021	✓	**07-May-2021**	15-Jun-2021	✓
EP068B: Organophosphorus Pesticides (OP)							
Soil Glass Jar - Unpreserved (EP068)							
QS1A	**03-May-2021**	**06-May-2021**	17-May-2021	✓	**07-May-2021**	15-Jun-2021	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
QS1A	**03-May-2021**	**06-May-2021**	17-May-2021	✓	**07-May-2021**	15-Jun-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071)							
QS1A	**03-May-2021**	**06-May-2021**	17-May-2021	✓	**07-May-2021**	15-Jun-2021	✓
Soil Glass Jar - Unpreserved (EP080)							
QS1A	**03-May-2021**	**07-May-2021**	17-May-2021	✓	**07-May-2021**	17-May-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071)							
QS1A	**03-May-2021**	**06-May-2021**	17-May-2021	✓	**07-May-2021**	15-Jun-2021	✓
Soil Glass Jar - Unpreserved (EP080)							
QS1A	**03-May-2021**	**07-May-2021**	17-May-2021	✓	**07-May-2021**	17-May-2021	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
QS1A	**03-May-2021**	**07-May-2021**	17-May-2021	✓	**07-May-2021**	17-May-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.

Preparation Methods	Method	Matrix	Method Descriptions
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

ENVIROLAB GROUP - National phone number 1300 42 43 44

Fines Characterisation

Subcon / Forward Lab / Split WO

Lab / Analysis: Labmaster → Ashton

Organised By / Date:

Relinquished By / Date:

Courier / Courier:

WO No:

Attached PO / Internal Sheet:

Relinquished by Christine ECS SYD 1120 04/05/21

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Ph 0406 350 706 / adelaide@envirolab.com.au

Client: Consulting Earth Scientists
Contact Person: Andrew Carars
Project Mgr: Andrew Carras
Sampler: Andrew Carras
Address: Level 1 Suite 3, 55-65 Grandview Street, Pymble NSW
Phone: **Mob:** 0497 018 918
Email: andrew.carras@consultingearth.com.au; tristan.goodbody@consultingearth.com.au

Client Project Name / Number / Site etc (ie report title): CES190901 Frenchmans Road Randwick
PO No.:
Envirolab Quote No.:
Date results required: 1-day
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

Environmental Division Sydney
Work Order Reference
ES2116624

Telephone : +61-2-8784 8555

Sample Information

Envirolab Sample ID	Client Sample ID or Information	Depth	Date sampled	Type of sample	Combo 6A - 500mL NEPM asb	vTRH/BTEX		Comments
1	BH4/0.15	—	3/5/21	Soil	X			
2	BH5/0.15				X			
3	BH6/0.15				X			
4	BH7/0.05				X			
5	BH8/0.15				X			
6	BH9/0.15				X			
7	BH10/0.15				X			
8	BH11/0.15				X			
9	TS					X		
10	TB					X		
11	QS1				X			Send QS1A to ALS please.
—	QS1A				X			
12	RH 4/05 CH							

Provide as much information about the sample as you can

ENVIROLAB GROUP Envirolab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200
Job No: 211611 / 44
Date Received: 03/05/21
Time Received: 15:35
Received By: CH
Temp: Cool / Ambient
Cooling: Ice / Icepack
Security: Intact / Broken / None

No 500mL Nepm 6A, please take from jar.

Relinquished by (Company): Consulting Earth Scientists
Print Name: ANDREW CARRAS
Date & Time: 3/5/21
Signature:

Received by (Company): ECS SYD
Print Name: Christine
Date & Time: 03/05/21 15:35
Signature:

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 2 (If applicable)
Transported by: Hand delivered / courier

* advise of 6A combo

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Page No:

Appendix D
Borehole Logs

Project ID:	CES190901-FRE
Client:	Frenchmans Lodge Properties Pty Ltd
Project:	Environmental and Geotechnical Site Investigation
Location:	11-19 Frenchmans Road, Randwick, NSW

CONSULTING EARTH SCIENTISTS
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LOG ID: BH01

Sheet: 1 of 1

X-Coord:	337813.1	**Date Commenced:**	07/11/2019	**Logged by:**	BR
Y-Coord:	6246595.5	**Date Completed:**	07/11/2019	**Checked by:**	MK
Surface Elevation (R.L) :		**Hole Diameter (mm):**	110 mm		

Drilling Information				LITHOLOGY					Samples	Tests		
Depth (mBGL)	R.L. (m)	Method (Support)	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics colour, moisture, secondary and minor component	Consistency / Density	Moisture	Sample ID	SPT	Pocket Penetrometer (kPa) 100 200 300 400	Notes and additional observations
0	0					Topsoil: SAND, fine, dark brown/yellow. Trace grass, leaves and roots, moist.						
						FILL: SAND, fine, dark brown/yellow. Trace Sandstone fragments. Trace grass and roots, moist.			BH01 - 0.5 m - Fill	SPT at 0.5 m {6, >30} refusal		
					SP	SAND: fine, dark brown/yellow. Trace Sandstone fragments. Trace grass and roots, moist.	VD					
						Begin core drilling at 0.8 m bgl. Refer to BH01 corelog for details						
1	-1											

Project ID: CES190901-FRE
Client: Frenchmans Lodge Propertites Pty Ltd
Project: Environmental and Geotechnical Site Investigation
Location: 11-19 Frenchmans Road, Randwick, NSW

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Corehole ID: BH01

Sheet: 1 of 1

X-Coord: 337813.1
Y-Coord: 6246595.5
Surface Elevation (R.L.): Surf Elevation AHD

Date Commenced: 07/11/2019
Date Completed: 07/11/2019
Hole Diameter (mm): 75 MM

Logged by: BR
Checked by: MK

Drilling Information					LITHOLOGY						Natural Defects		
Depth (mBGL)	R.L. (m)	Method (Support)	% Coreloss	Water	Symbol	Rock Description ROCK TYPE: grain characteristics, colour structure, minor components	Weathering	Estimated Strength MPa (0.03 EL, 0.1 VL, 0.3 L, 1 M, 3 H, 10 VH, EH)	Is (50) MPa	RQD %	Spacing (mm) (20, 60, 200, 600, 2000)	Description
1	-1	NMLC Core	0%			Refer to BH01 borelog for details.						
						Sandstone: fine grained, light brown, very low strength, extremely weathered.	XW					0.88~0.9 m, CZ, 0, R, Cu, EW
												0.96 m, P, 0, R, Cu, EW
						Sandstone: fine grained, pale grey, low strength, moderately weathered, horizontal laminations of fine grained Shale, 10~20 mm spacing, 2~3 mm thick.	MW			20%		1.17~1.21 m, CZ, 0, R, Cu, EW
												1.32 m, P, 5, R, Cu, MW
2	-2											1.72~ 2 m, CZ, 0, R, Cu, MW
												2.08~2.34 m, CZ, 0, R, Cu, MW
						Sandstone: fine grained, pale grey, low strength, moderately weathered.	MW			62%		2.5 m, P, 5, R, Cu, MW
3	-3											3.19~3.21 m, CZ, 0, R, Cu, MW
												3.61~3.63 m, CZ, 0, R, Cu, MW
												3.68~3.71 m, CZ, 0, R, Cu, MW
4	-4					SAND: fine, pale grey, moist, dense						
						Sandstone: fine grained, pale grey, low strength, moderately weathered.						3.84 m, P, 10, R, Cu, MW
						Sandstone: fine to medium grained, dark pink, low strength, moderately weathered.	MW			0%		4.6~4.61 m, CZ, 0, R, Cu, MW
												4.73~5 m, CZ, 0, R, MW
5	-5					End of hole at 5 m. Target depth.						
6												

Project ID:	CES190901-FRE
Client:	Frenchmans Lodge Properties Pty Ltd
Project:	Environmental and Geotechnical Site Investigation
Location:	11-19 Frenchmans Road, Randwick, NSW

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LOG ID: BH02

Sheet: 1 of 1

X-Coord:	337767.4	**Date Commenced:**	06/11/2019	**Logged by:**	BR
Y-Coord:	6246577.6	**Date Completed:**	06/11/2019	**Checked by:**	MK
Surface Elevation (R.L) :		**Hole Diameter (mm):**	110 mm		

Drilling Information				LITHOLOGY					Samples	Tests		
Depth (mBGL)	R.L. (m)	Method (Support)	Water	Symbol	USCS Symbol	**Description** SOIL TYPE: plasticity or particle characteristics colour, moisture, secondary and minor component	Consistency / Density	Moisture	Sample ID	SPT	Pocket Penetrometer (kPa) 100 200 300 400	Notes and additional observations
0	0					Concrete: Pavement						
						FILL: SAND, fine, brown/dark brown. Trace angular gravel. Trace roots, moist			BH02 - 0.5 m - Fill	SPT at 0.5 m {4, >30} refusal		
					SP	SAND: fine, brown/dark brown. Trace angular gravel. Trace roots, moist	VD					
						Begin core drillng at 0.75 m bgl. Refer to BH02 corelog for details						
1	-1											

Project ID:	CES190901-FRE
Client:	Frenchmans Lodge Propertites Pty Ltd
Project:	Environmental and Geotechnical Site Investigation
Location:	11-19 Frenchmans Road, Randwick, NSW

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Corehole ID: BH02

Sheet: 1 of 1

X-Coord:	337767.4	**Date Commenced:**	07/11/2019	**Logged by:**	BR
Y-Coord:	6246577.6	**Date Completed:**	07/11/2019	**Checked by:**	MK
Surface Elevation (R.L):		**Hole Diameter (mm):**	75 MM		

Drilling Information					LITHOLOGY					Natural Defects		
Depth (mBGL)	R.L. (m)	Method (Support)	% Coreloss	Water	Symbol	Rock Description ROCK TYPE: grain characteristics, colour structure, minor components	Weathering	Estimated Strength MPa (0.03 EL, 0.1 VL, 0.3 L, 1 M, 3 H, 10 VH, EH)	Is (50) MPa	RQD %	Spacing (mm) (20, 60, 200, 600, 2000)	Description
1	-1	NMLC Core	0%			Refer to BH02 borelog for details.	MW			94%		1.31~1.34 m, CZ, 0, R, Cu, MW 1.48~1.51 m, CZ, 0, R, Cu, MW
2	-2					Sandstone: fine grained, light brown to light grey, medium strength, moderately weathered, horizontal laminations of fine grained Shale, 20~30 mm spacing, 4-5 mm thick.						1.7~1.74 m, CZ, 0, R, Cu, MW
3	-3					Sandstone: fine grained, light grey, medium strength, slightly weathered, horizontal laminations of fine grained Shale, 5~10 mm spacing, 1~2 mm thick.	SW			100%		2.69 m, P, 5, R, Cu, SW
4	-4											4.1 m, P, 5, Cu, R, SW 4.32 m, P, 5, R, Cu, SW
5	-5											4.65 m, P, 5, R, Cu, SW
6	-6					laminations increasing to 10~50 mm spacing, 2~3 mm thick.				78%		5.9 m, P, 5, R, Cu, SW 6.28~6.29 m, CZ, 0, R, Cu, SW 6.35~6.37 m, CZ, 0, R, Cu, SW 6.75~6.83 m, CZ, 0, R, Cu, SW, infill with fine dense Sand.
7	-7					Sandstone: fine to medium grained, brown/ light pink, low strength, highly weathered.	HW					6.89~6.91 m, CZ, 0, R, Cu, MW 7.16 m, P, 5, R, Cu, HW
8	-8					Sandstone: fine grained, light pink, high strength, slightly weathered.	SW					7.29~7.3 m, CZ, 0, R, Cu, HW 7.44~7.46 m, CZ, 0, R, Cu, HW
9						End of hole at 8 m. Target depth.						7.72~7.83 m, CZ, 0, R, Cu, SW

Project ID:	CES190901-FRE
Client:	Frenchmans Lodge Properties Pty Ltd
Project:	Environmental and Geotechnical Site Investigation
Location:	11-19 Frenchmans Road, Randwick, NSW

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LOG ID: BH03

Sheet: 1 of 1

X-Coord:	337764	**Date Commenced:**	06/11/2019	**Logged by:**	BR
Y-Coord:	6246599	**Date Completed:**	06/11/2019	**Checked by:**	MK
Surface Elevation (R.L) :		**Hole Diameter (mm):**	110 mm		

Drilling Information				LITHOLOGY					Samples	Tests		
Depth (mBGL)	R.L. (m)	Method (Support)	Water	Symbol	USCS Symbol	Description SOIL TYPE: plasticity or particle characteristics colour, moisture, secondary and minor component	Consistency / Density	Moisture	Sample ID	SPT	Pocket Penetrometer (kPa) 100 200 300 400	Notes and additional observations
0	0					Topsoil: SAND, fine, dark brown/yellow. Trace gravel. Trace grass, leaves and roots, moist.						
						FILL: SAND, fine, dark grey/brown. Trace silt and roots, moist.				SPT at 0.5 to 0.95 m {2,2,2} N=4		
									BH03 - 1.5 m - Fill			
1	-1				SP	SAND: fine, light grey/dark grey, trace fine angular gravel, moist, very dense.	VD		BH03 -1.75 m - SAND	SPT at 1.5 to 1.75 m {10, >30} refusal		
						Begin core drilling at 1.75 m bgl. Refer to BH03 corelog for details						
2	-2											

Drill Company:	Hagstrom Drilling Pty Ltd	**Operator Name:**	Steve Bennett
Machine Type:	DB08		

Refer to Standard Sheets for details of abbreviations

Project ID:	CES190901-FRE
Client:	Frenchmans Lodge Propertites Pty Ltd
Project:	Environmental and Geotechnical Site Investigation
Location:	11-19 Frenchmans Road, Randwick, NSW

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Corehole ID: BH03

Sheet: 1 of 1

X-Coord:	337764	**Date Commenced:**	06/11/2019	**Logged by:**	BR
Y-Coord:	6246599	**Date Completed:**	06/11/2019	**Checked by:**	MK
Surface Elevation (R.L):		**Hole Diameter (mm):**	75 MM		

Drilling Information | **LITHOLOGY** | **Natural Defects**

Depth (mBGL)	R.L. (m)	Method (Support)	% Coreloss	Water	Symbol	Rock Description (ROCK TYPE: grain characteristics, colour structure, minor components)	Weathering	Estimated Strength MPa (0.03 EL, 0.1 VL, 0.3 L, 1 M, 3 H, 10 VH, EH)	Is (50) MPa	RQD %	Spacing (mm) (20, 60, 200, 600, 2000)	Description
2	-2	NMLC Core	0%			Refer to BH03 borelog for details.	EW					
						Sandstone: fine grained, dark grey/ brown, extremely low strength, extremely weathered, trace fine, brown Sand.	MW					2.34 m, P, 5, R, Cu, MW
						Sandstone: fine grained, light grey, medium strength, moderately weathered, horizontal laminations of fine grained Shale, 20~30 mm spacing, 1~2 mm thick.	SW					2.6 m, P, 5, R, Cu, SW
3	-3					Sandstone: fine grained, pale grey, high strength, slightly weathered, horizontal laminations of fine grained Shale, 10~20 mm spacing, 1~2 mm thick. Trace fine, brown Sand.						3.08~3.1 m, CZ, 0, R, Cu, SW
4	-4									88%		
5	-5											5.38~5.39 m, CZ, 0, R, Cu, SW
						Sandstone: fine grained, light brown/ light grey, high strength, fresh. Trace fine, light grey Sand.	FR					5.53~5.54 m, P, 5, Cu, R, FR
6	-6											5.59~5.64 m, CZ, 5, R, Cu, FR
												6.16~6.17 m, CZ, 0, R, Cu, FR
7	-7									94%		6.63~6.65 m, SZ, 0, R, Cu, FR
												7.49~7.51 m, SZ, 0, R, Cu, FR
8	-8											7.7~7.71 m, SZ, 0, R, Cu, FR
						End of hole at 8 m. Target depth.						
9												

Drill Company:	Hagstrom Drilling Pty Ltd	**Operator Name:**	Steve Bennett
Machine Type:	DB08		

Refer to Standard Sheets for details of abbreviations

Project ID:	CES190901-FRE	**Easting:**	337817.77
Project:	Environmental Site Investigation	**Northing:**	6246616.96
Client:	Frenchmans Lodge Properties Pty Ltd	**Elevation:**	N/A
Location:	11-19 Frenchmans Road, Randwick	**Environmental Log:**	**BH04**

CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble NSW 2073
PH: (02) 8569 2200 FAX: (02) 9983 0582

DRILLING INFO.			LITHOLOGY		SAMPLING INFORMATION			WELL DETAIL
Depth	Method	Water	Symbol	Description	Sample ID	Type	FID/PID (ppm) 0 2.5 5.0 7.5	
0.0	Hand auger			FILL: Silty SAND, medium grained, dark brown, trace rootlets and sand, moist.	BH04-0.15m			
				SAND: medium to coarse grained, light brown, moist.				
0.5				**Hand auger refusal on inferred Sandstone. No groundwater observed during drilling.**				

Drill Company:	Consulting Earth Scientists	**Date Commenced:**	03/05/2021
Drill Model:	Hand Auger	**Date Completed:**	03/05/2021
Hole Diameter (mm):	110mm	**Logged/checked by:**	AC / TG

Project ID:	CES190901-FRE	**Easting:**	337802.76
Project:	Environmental Site Investigation	**Northing:**	6246613.07
Client:	Frenchmans Lodge Properties Pty Ltd	**Elevation:**	N/A
Location:	11-19 Frenchmans Road, Randwick	**Environmental Log:**	**BH05**

CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble NSW 2073
PH: (02) 8569 2200 FAX: (02) 9983 0582

DRILLING INFO.			LITHOLOGY		SAMPLING INFORMATION			WELL DETAIL
Depth	Method	Water	Symbol	Description	Sample ID	Type	FID/PID (ppm) 0 2.5 5.0 7.5	
0.0	Hand auger			FILL: Silty SAND, medium grained, dark brown, trace rootlets and subrounded sand, moist.	BH05-0.15m			
				Clayey SAND: medium to coarse grained, light brown, medium plasticity clay, moist.				
0.5				**Hand auger refusal on inferred Sandstone. No groundwater observed during drilling.**				

Drill Company:	Consulting Earth Scientists	**Date Commenced:**	03/05/2021
Drill Model:	Hand Auger	**Date Completed:**	03/05/2021
Hole Diameter (mm):	110mm	**Logged/checked by:**	AC / TG

Project ID:	CES190901-FRE	**Easting:**	337802.59
Project:	Environmental Site Investigation	**Northing:**	6246590.93
Client:	Frenchmans Lodge Properties Pty Ltd	**Elevation:**	N/A
Location:	11-19 Frenchmans Road, Randwick	**Environmental Log:**	**BH06**

CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble NSW 2073
PH: (02) 8569 2200 FAX: (02) 9983 0582

DRILLING INFO.			LITHOLOGY		SAMPLING INFORMATION			WELL DETAIL
Depth	Method	Water	Symbol	Description	Sample ID	Type	FID/PID (ppm) 0 2.5 5.0 7.5	
0.0	Hand auger			FILL: Silty SAND, fine to medium grained, dark brown, trace rootlets, moist.				
					BH06-0.15m			
				Hand auger refusal on inferred Sandstone. No groundwater observed during drilling.				

Drill Company:	Consulting Earth Scientists	**Date Commenced:**	03/05/2021
Drill Model:	Hand Auger	**Date Completed:**	03/05/2021
Hole Diameter (mm):	110mm	**Logged/checked by:**	AC / TG

Project ID:	CES190901-FRE	**Easting:**	337788.06
Project:	Environmental Site Investigation	**Northing:**	6246582.42
Client:	Frenchmans Lodge Properties Pty Ltd	**Elevation:**	N/A
Location:	11-19 Frenchmans Road, Randwick	**Environmental Log:**	**BH07**

CONSULTING EARTH SCIENTISTS
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55 Grandview Street, Pymble NSW 2073
PH: (02) 8569 2200 FAX: (02) 9983 0582

DRILLING INFO.			LITHOLOGY		SAMPLING INFORMATION			WELL DETAIL
Depth	Method	Water	Symbol	Description	Sample ID	Type	FID/PID (ppm) 0 2.5 5.0 7.5	
0.0	Hand auger			FILL: Silty SAND, fine to medium grained, dark brown, trace rootlets, moist.	BH07-0.05m			
				Hand auger refusal on inferred Sandstone. No groundwater observed during drilling.				

Drill Company:	Consulting Earth Scientists	**Date Commenced:**	03/05/2021
Drill Model:	Hand Auger	**Date Completed:**	03/05/2021
Hole Diameter (mm):	110mm	**Logged/checked by:**	AC / TG

Project ID: CES190901-FRE **Easting:** 337793.52

Project: Environmental Site Investigation **Northing:** 6246627.45

Client: Frenchmans Lodge Properties Pty Ltd **Elevation:** N/A

Location: 11-19 Frenchmans Road, Randwick **Environmental Log:** **BH08**

CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble NSW 2073
PH: (02) 8569 2200 FAX: (02) 9983 0582

DRILLING INFO.			LITHOLOGY		SAMPLING INFORMATION			WELL DETAIL
Depth	Method	Water	Symbol	Description	Sample ID	Type	FID/PID (ppm) 0 2.5 5.0 7.5	
0.0	Hand auger			FILL: Silty SAND, fine to medium grained, grey/ brown, trace clay, subrounded gravels and rootlets, moist.	BH08-0.15m			
				Hand auger refusal on inferred Sandstone. No groundwater observed during drilling.				

Drill Company: Consulting Earth Scientists **Date Commenced:** 03/05/2021

Drill Model: Hand Auger **Date Completed:** 03/05/2021

Hole Diameter (mm): 110mm **Logged/checked by:** AC / TG

Project ID: CES190901-FRE **Easting:** 337785.70

Project: Environmental Site Investigation **Northing:** 6246612.07

Client: Frenchmans Lodge Properties Pty Ltd **Elevation:** N/A

Location: 11-19 Frenchmans Road, Randwick **Environmental Log:** **BH09**

CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble NSW 2073
PH: (02) 8569 2200 FAX: (02) 9983 0582

DRILLING INFO.			LITHOLOGY		SAMPLING INFORMATION			WELL DETAIL
Depth	Method	Water	Symbol	Description	Sample ID	Type	FID/PID (ppm) 0 2.5 5.0 7.5	
0.0	Hand auger			Concrete				
				FILL: Silty SAND, fine to medium grained, grey/ brown, with subrounded gravels, moist.	BH09-0.15m			
				Hand auger refusal on inferred Sandstone. No groundwater observed during drilling.				

Drill Company: Consulting Earth Scientists **Date Commenced:** 03/05/2021

Drill Model: Hand Auger **Date Completed:** 03/05/2021

Hole Diameter (mm): 110mm **Logged/checked by:** AC / TG

Project ID: CES190901-FRE **Easting:** 327775.6

Project: Environmental Site Investigation **Northing:** 6246619.25

Client: Frenchmans Lodge Properties Pty Ltd **Elevation:** N/A

Location: 11-19 Frenchmans Road, Randwick **Environmental Log:** **BH10**

CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble NSW 2073
PH: (02) 8569 2200 FAX: (02) 9983 0582

DRILLING INFO.			LITHOLOGY		SAMPLING INFORMATION			WELL DETAIL
Depth	Method	Water	Symbol	Description	Sample ID	Type	FID/PID (ppm) 0 2.5 5.0 7.5	
0.0	Hand auger			Concrete				
				FILL: Silty SAND, fine to medium grained, grey/ brown, with subrounded gravels, moist.				
				SAND: meidum to corase grained, light brown, moist.	BH10-0.15m			
				Hand auger refusal on inferred Sandstone. No groundwater observed during drilling.				

Drill Company: Consulting Earth Scientists **Date Commenced:** 03/05/2021

Drill Model: Hand Auger **Date Completed:** 03/05/2021

Hole Diameter (mm): 110mm **Logged/checked by:** AC / TG

Project ID:	CES190901-FRE	**Easting:**	337772.79
Project:	Environmental Site Investigation	**Northing:**	6246634.30
Client:	Frenchmans Lodge Properties Pty Ltd	**Elevation:**	N/A
Location:	11-19 Frenchmans Road, Randwick	**Environmental Log:**	**BH11**

CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble NSW 2073
PH: (02) 8569 2200 FAX: (02) 9983 0582

DRILLING INFO.			LITHOLOGY		SAMPLING INFORMATION			WELL DETAIL
Depth	Method	Water	Symbol	Description	Sample ID	Type	FID/PID (ppm) 0 2.5 5.0 7.5	
0.0	Hand auger			Concrete				
				FILL: Silty SAND, fine to medium grained, grey/ brown, trace subrounded gravel, glass fragments and rootlets, moist.	BH11-0.15m			

Drill Company:	Consulting Earth Scientists	**Date Commenced:**	03/05/2021
Drill Model:	Hand Auger	**Date Completed:**	03/05/2021
Hole Diameter (mm):	110mm	**Logged/checked by:**	AC / TG

Appendix E
Calibration Certificate

PID Calibration Certificate

Instrument **PhoCheck Tiger**
Serial No. **T-105517**

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6ev			
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm	N/A	N/A
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		93ppm Isobutylene	NATA	SY361		92.9ppm

Calibrated by: **Kylie Rawlings**

Calibration date: **29/04/2021**

Next calibration due: **26/10/2021**

Appendix F
PRO UCL Statistical Analysis

	General UCL Statistics for Full Data Sets	
User Selected Options		
From File	R:\2019\CES190901-FRE Frenchmans Rd, Randwick GI\08b_Report_Preparation\08f_RAP and DGI\UCL raw d	
Full Precision	OFF	
Confidence Coefficient	95%	
Number of Bootstrap Operations	2000	

Lead

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	11	Minimum of Log Data	2.398
Maximum	2200	Maximum of Log Data	7.696
Mean	649.9	Mean of log Data	5.507
Median	290	SD of log Data	1.722
SD	820		
Std. Error of Mean	247.2		
Coefficient of Variation	1.262		
Skewness	1.354		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.731	Shapiro Wilk Test Statistic	0.919
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1098	95% H-UCL	12769
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2879
95% Adjusted-CLT UCL (Chen-1995)	1164	97.5% Chebyshev (MVUE) UCL	3761
95% Modified-t UCL (Johnson-1978)	1115	99% Chebyshev (MVUE) UCL	5494
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.52	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	1249		
MLE of Mean	649.9		
MLE of Standard Deviation	901		
nu star	11.45		
Approximate Chi Square Value (.05)	4.865	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	1057
Adjusted Chi Square Value	4.187	95% Jackknife UCL	1098
		95% Standard Bootstrap UCL	1036
Anderson-Darling Test Statistic	0.415	95% Bootstrap-t UCL	1466
Anderson-Darling 5% Critical Value	0.771	95% Hall's Bootstrap UCL	1053
Kolmogorov-Smirnov Test Statistic	0.223	95% Percentile Bootstrap UCL	1047
Kolmogorov-Smirnov 5% Critical Value	0.267	95% BCA Bootstrap UCL	1125
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1728
		97.5% Chebyshev(Mean, Sd) UCL	2194
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3110
95% Approximate Gamma UCL	1529		
95% Adjusted Gamma UCL	1777		
Potential UCL to Use		Use 95% Approximate Gamma UCL	1529

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Dieldrin

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	2

Raw Statistics		Log-transformed Statistics	
Minimum	0.05	Minimum of Log Data	-2.996
Maximum	13	Maximum of Log Data	2.565
Mean	1.227	Mean of log Data	-2.49
Median	0.05	SD of log Data	1.677
SD	3.905		
Std. Error of Mean	1.177		
Coefficient of Variation	3.182		
Skewness	3.317		

Warning: There are only 2 Distinct Values in this data
There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values to compute bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.345	Shapiro Wilk Test Statistic	0.345
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	3.361	95% H-UCL	3.525
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.896
95% Adjusted-CLT UCL (Chen-1995)	4.422	97.5% Chebyshev (MVUE) UCL	1.169
95% Modified-t UCL (Johnson-1978)	3.557	99% Chebyshev (MVUE) UCL	1.705
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.251	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	4.892		
MLE of Mean	1.227		
MLE of Standard Deviation	2.45		
nu star	5.519		
Approximate Chi Square Value (.05)	1.399	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	3.164
Adjusted Chi Square Value	1.092	95% Jackknife UCL	N/A
		95% Standard Bootstrap UCL	N/A
Anderson-Darling Test Statistic	3.842	95% Bootstrap-t UCL	N/A
Anderson-Darling 5% Critical Value	0.835	95% Hall's Bootstrap UCL	N/A
Kolmogorov-Smirnov Test Statistic	0.573	95% Percentile Bootstrap UCL	N/A
Kolmogorov-Smirnov 5% Critical Value	0.278	95% BCA Bootstrap UCL	N/A

113	Data not Gamma Distributed at 5% Significance Level										95% Chebyshev(Mean, Sd) UCL	6.359
114											97.5% Chebyshev(Mean, Sd) UCL	8.579
115	Assuming Gamma Distribution										99% Chebyshev(Mean, Sd) UCL	12.94
116					95% Approximate Gamma UCL	4.841						
117					95% Adjusted Gamma UCL	6.205						
118												
119	Potential UCL to Use										Use 99% Chebyshev (Mean, Sd) UCL	12.94
120												
121	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
122	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
123	and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.											
124												
125												
126	Aldrin											
127												
128	General Statistics											
129					Number of Valid Observations	11					Number of Distinct Observations	3
130												
131	Raw Statistics										Log-transformed Statistics	
132					Minimum	0.05					Minimum of Log Data	-2.996
133					Maximum	440					Maximum of Log Data	6.087
134					Mean	40.13					Mean of log Data	-1.898
135					Median	0.05					SD of log Data	2.797
136					SD	132.6						
137					Std. Error of Mean	39.99						
138					Coefficient of Variation	3.305						
139					Skewness	3.317						
140												
141												
142	Warning: There are only 3 Distinct Values in this data											
143	There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.											
144	Those methods will return a 'N/A' value on your output display!											
145												
146	It is necessary to have 4 or more Distinct Values to compute bootstrap methods.											
147	However, results obtained using 4 to 9 distinct values may not be reliable.											
148	It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.											
149												
150	Relevant UCL Statistics											
151	Normal Distribution Test										Lognormal Distribution Test	
152					Shapiro Wilk Test Statistic	0.346					Shapiro Wilk Test Statistic	0.473
153					Shapiro Wilk Critical Value	0.85					Shapiro Wilk Critical Value	0.85
154	Data not Normal at 5% Significance Level										Data not Lognormal at 5% Significance Level	
155												
156	Assuming Normal Distribution										Assuming Lognormal Distribution	
157					95% Student's-t UCL	112.6					95% H-UCL	3676
158	95% UCLs (Adjusted for Skewness)										95% Chebyshev (MVUE) UCL	12.34
159					95% Adjusted-CLT UCL (Chen-1995)	148.6					97.5% Chebyshev (MVUE) UCL	16.5
160					95% Modified-t UCL (Johnson-1978)	119.3					99% Chebyshev (MVUE) UCL	24.68
161												
162	Gamma Distribution Test										Data Distribution	
163					k star (bias corrected)	0.162					Data do not follow a Discernable Distribution (0.05)	
164					Theta Star	248.2						
165					MLE of Mean	40.13						
166					MLE of Standard Deviation	99.8						
167					nu star	3.557						
168					Approximate Chi Square Value (.05)	0.555					Nonparametric Statistics	

Adjusted Level of Significance	0.0278	95% CLT UCL 105.9
Adjusted Chi Square Value	0.399	95% Jackknife UCL 112.6
		95% Standard Bootstrap UCL N/A
Anderson-Darling Test Statistic	3.327	95% Bootstrap-t UCL N/A
Anderson-Darling 5% Critical Value	0.881	95% Hall's Bootstrap UCL N/A
Kolmogorov-Smirnov Test Statistic	0.498	95% Percentile Bootstrap UCL N/A
Kolmogorov-Smirnov 5% Critical Value	0.285	95% BCA Bootstrap UCL N/A
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 214.4
		97.5% Chebyshev(Mean, Sd) UCL 289.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 438
95% Approximate Gamma UCL	257.2	
95% Adjusted Gamma UCL	358.1	
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL 438

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

BaP TEQ half

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.25	Minimum of Log Data	-1.386
Maximum	8.4	Maximum of Log Data	2.128
Mean	2.6	Mean of log Data	0.115
Median	0.8	SD of log Data	1.447
SD	3.081		
Std. Error of Mean	0.929		
Coefficient of Variation	1.185		
Skewness	1.054		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.769	Shapiro Wilk Test Statistic	0.85
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.284	95% H-UCL	19.16
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.295
95% Adjusted-CLT UCL (Chen-1995)	4.443	97.5% Chebyshev (MVUE) UCL	10.71
95% Modified-t UCL (Johnson-1978)	4.333	99% Chebyshev (MVUE) UCL	15.44
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.582	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	4.47		
MLE of Mean	2.6		
MLE of Standard Deviation	3.409		
nu star	12.8		
Approximate Chi Square Value (.05)	5.755	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	4.128

	Adjusted Chi Square Value	5.006
	Anderson-Darling Test Statistic	0.741
	Anderson-Darling 5% Critical Value	0.765
	Kolmogorov-Smirnov Test Statistic	0.207
	Kolmogorov-Smirnov 5% Critical Value	0.265
	Data appear Gamma Distributed at 5% Significance Level	
	Assuming Gamma Distribution	
	95% Approximate Gamma UCL	5.78
	95% Adjusted Gamma UCL	6.645
	Potential UCL to Use	

	95% Jackknife UCL	4.284				
	95% Standard Bootstrap UCL	4.035				
	95% Bootstrap-t UCL	4.948				
	95% Hall's Bootstrap UCL	3.877				
	95% Percentile Bootstrap UCL	4.095				
	95% BCA Bootstrap UCL	4.427				
	95% Chebyshev(Mean, Sd) UCL	6.649				
	97.5% Chebyshev(Mean, Sd) UCL	8.401				
	99% Chebyshev(Mean, Sd) UCL	11.84				
	Use 95% Approximate Gamma UCL	5.78				

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Bap TEQ

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.25	Minimum of Log Data	-1.386
Maximum	8.4	Maximum of Log Data	2.128
Mean	2.591	Mean of log Data	0.098
Median	0.8	SD of log Data	1.456
SD	3.087		
Std. Error of Mean	0.931		
Coefficient of Variation	1.192		
Skewness	1.053		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.767	Shapiro Wilk Test Statistic	0.844
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.278	95% H-UCL	19.47
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.277
95% Adjusted-CLT UCL (Chen-1995)	4.438	97.5% Chebyshev (MVUE) UCL	10.69
95% Modified-t UCL (Johnson-1978)	4.327	99% Chebyshev (MVUE) UCL	15.42
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.575	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	4.509		
MLE of Mean	2.591		
MLE of Standard Deviation	3.418		
nu star	12.64		
Approximate Chi Square Value (.05)	5.652	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	4.122
Adjusted Chi Square Value	4.911	95% Jackknife UCL	4.278

281											95% Standard Bootstrap UCL	4.059
282					Anderson-Darling Test Statistic	0.771					95% Bootstrap-t UCL	4.81
283					Anderson-Darling 5% Critical Value	0.766					95% Hall's Bootstrap UCL	3.86
284					Kolmogorov-Smirnov Test Statistic	0.203					95% Percentile Bootstrap UCL	4.141
285					Kolmogorov-Smirnov 5% Critical Value	0.266					95% BCA Bootstrap UCL	4.327
286					**Data follow Appr. Gamma Distribution at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL	6.649
287											97.5% Chebyshev(Mean, Sd) UCL	8.404
288					**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL	11.85
289					95% Approximate Gamma UCL	5.795						
290					95% Adjusted Gamma UCL	6.669						
291												
292					**Potential UCL to Use**						Use 95% Approximate Gamma UCL	5.795
293												
294	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
295	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
296	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
297												
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299	**baP TEQ pql**											
300												
301	**General Statistics**											
302					Number of Valid Observations	11					Number of Distinct Observations	8
303												
304					**Raw Statistics**						**Log-transformed Statistics**	
305					Minimum	0.25					Minimum of Log Data	-1.386
306					Maximum	8.4					Maximum of Log Data	2.128
307					Mean	2.609					Mean of log Data	0.125
308					Median	0.9					SD of log Data	1.444
309					SD	3.075						
310					Std. Error of Mean	0.927						
311					Coefficient of Variation	1.179						
312					Skewness	1.053						
313												
314												
315	**Relevant UCL Statistics**											
316					**Normal Distribution Test**						**Lognormal Distribution Test**	
317					Shapiro Wilk Test Statistic	0.772					Shapiro Wilk Test Statistic	0.852
318					Shapiro Wilk Critical Value	0.85					Shapiro Wilk Critical Value	0.85
319					**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**	
320												
321					**Assuming Normal Distribution**						**Assuming Lognormal Distribution**	
322					95% Student's-t UCL	4.29					95% H-UCL	19.2
323					**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL	8.353
324					95% Adjusted-CLT UCL (Chen-1995)	4.449					97.5% Chebyshev (MVUE) UCL	10.78
325					95% Modified-t UCL (Johnson-1978)	4.339					99% Chebyshev (MVUE) UCL	15.55
326												
327					**Gamma Distribution Test**						**Data Distribution**	
328					k star (bias corrected)	0.586					**Data appear Gamma Distributed at 5% Significance Level**	
329					Theta Star	4.456						
330					MLE of Mean	2.609						
331					MLE of Standard Deviation	3.41						
332					nu star	12.88						
333					Approximate Chi Square Value (.05)	5.814					**Nonparametric Statistics**	
334					Adjusted Level of Significance	0.0278					95% CLT UCL	4.134
335					Adjusted Chi Square Value	5.06					95% Jackknife UCL	4.29
336											95% Standard Bootstrap UCL	4.078

337				Anderson-Darling Test Statistic	0.716					95% Bootstrap-t UCL	4.849
338				Anderson-Darling 5% Critical Value	0.765					95% Hall's Bootstrap UCL	3.893
339				Kolmogorov-Smirnov Test Statistic	0.209					95% Percentile Bootstrap UCL	4.2
340				Kolmogorov-Smirnov 5% Critical Value	0.265					95% BCA Bootstrap UCL	4.291
341				**Data appear Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL	6.65
342										97.5% Chebyshev(Mean, Sd) UCL	8.399
343				**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL	11.83
344				95% Approximate Gamma UCL	5.781						
345				95% Adjusted Gamma UCL	6.642						
346											
347				**Potential UCL to Use**						Use 95% Approximate Gamma UCL	5.781
348											
349	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**										
350	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**										
351	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**										
352											
353											
354	**TRH >C16-C34**										
355											
356				**General Statistics**							
357				Number of Valid Observations	11					Number of Distinct Observations	7
358											
359				**Raw Statistics**						**Log-transformed Statistics**	
360				Minimum	50					Minimum of Log Data	3.912
361				Maximum	1900					Maximum of Log Data	7.55
362				Mean	365.5					Mean of log Data	5.089
363				Median	120					SD of log Data	1.304
364				SD	551						
365				Std. Error of Mean	166.1						
366				Coefficient of Variation	1.508						
367				Skewness	2.542						
368											
369											
370				**Relevant UCL Statistics**							
371				**Normal Distribution Test**						**Lognormal Distribution Test**	
372				Shapiro Wilk Test Statistic	0.64					Shapiro Wilk Test Statistic	0.845
373				Shapiro Wilk Critical Value	0.85					Shapiro Wilk Critical Value	0.85
374				**Data not Normal at 5% Significance Level**						**Data not Lognormal at 5% Significance Level**	
375											
376				**Assuming Normal Distribution**						**Assuming Lognormal Distribution**	
377				95% Student's-t UCL	666.5					95% H-UCL	1684
378				**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL	955.8
379				95% Adjusted-CLT UCL (Chen-1995)	774.7					97.5% Chebyshev (MVUE) UCL	1224
380				95% Modified-t UCL (Johnson-1978)	687.8					99% Chebyshev (MVUE) UCL	1750
381											
382				**Gamma Distribution Test**						**Data Distribution**	
383				k star (bias corrected)	0.598					**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
384				Theta Star	611.5						
385				MLE of Mean	365.5						
386				MLE of Standard Deviation	472.7						
387				nu star	13.15						
388				Approximate Chi Square Value (.05)	5.993					**Nonparametric Statistics**	
389				Adjusted Level of Significance	0.0278					95% CLT UCL	638.7
390				Adjusted Chi Square Value	5.226					95% Jackknife UCL	666.5
391										95% Standard Bootstrap UCL	624.4
392				Anderson-Darling Test Statistic	0.828					95% Bootstrap-t UCL	1163

Anderson-Darling 5% Critical Value	0.763	95% Hall's Bootstrap UCL 1709
Kolmogorov-Smirnov Test Statistic	0.262	95% Percentile Bootstrap UCL 652.7
Kolmogorov-Smirnov 5% Critical Value	0.265	95% BCA Bootstrap UCL 810.9
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1090
		97.5% Chebyshev(Mean, Sd) UCL 1403
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2018
95% Approximate Gamma UCL	801.8	
95% Adjusted Gamma UCL	919.5	
Potential UCL to Use		Use 95% Approximate Gamma UCL 801.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

B(a)P

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.025	Minimum of Log Data	-3.689
Maximum	5.9	Maximum of Log Data	1.775
Mean	1.8	Mean of log Data	-0.51
Median	0.58	SD of log Data	1.829
SD	2.188		
Std. Error of Mean	0.66		
Coefficient of Variation	1.215		
Skewness	1.032		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.784	Shapiro Wilk Test Statistic	0.939
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2.996	95% H-UCL	50.39
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.422
95% Adjusted-CLT UCL (Chen-1995)	3.105	97.5% Chebyshev (MVUE) UCL	11.04
95% Modified-t UCL (Johnson-1978)	3.03	99% Chebyshev (MVUE) UCL	16.2
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.473	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	3.805		
MLE of Mean	1.8		
MLE of Standard Deviation	2.617		
nu star	10.41		
Approximate Chi Square Value (.05)	4.199	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	2.886
Adjusted Chi Square Value	3.579	95% Jackknife UCL	2.996
		95% Standard Bootstrap UCL	2.83
Anderson-Darling Test Statistic	0.374	95% Bootstrap-t UCL	3.357
Anderson-Darling 5% Critical Value	0.776	95% Hall's Bootstrap UCL	2.729

449				Kolmogorov-Smirnov Test Statistic	0.167				95% Percentile Bootstrap UCL	2.92		
450				Kolmogorov-Smirnov 5% Critical Value	0.268				95% BCA Bootstrap UCL	3.127		
451				**Data appear Gamma Distributed at 5% Significance Level**					95% Chebyshev(Mean, Sd) UCL	4.676		
452									97.5% Chebyshev(Mean, Sd) UCL	5.921		
453				**Assuming Gamma Distribution**					99% Chebyshev(Mean, Sd) UCL	8.365		
454				95% Approximate Gamma UCL	4.463							
455				95% Adjusted Gamma UCL	5.236							
456												
457				**Potential UCL to Use**					Use 95% Approximate Gamma UCL	4.463		
458												
459	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
460	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
461	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
462												
463												
464	**Aldrin**											
465												
466	**General Statistics**											
467				Number of Valid Observations	11				Number of Distinct Observations	3		
468												
469				**Raw Statistics**					**Log-transformed Statistics**			
470				Minimum	0.05				Minimum of Log Data	-2.996		
471				Maximum	440				Maximum of Log Data	6.087		
472				Mean	40.13				Mean of log Data	-1.898		
473				Median	0.05				SD of log Data	2.797		
474				SD	132.6							
475				Std. Error of Mean	39.99							
476				Coefficient of Variation	3.305							
477				Skewness	3.317							
478												
479												
480	**Warning: There are only 3 Distinct Values in this data**											
481	**There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.**											
482	**Those methods will return a 'N/A' value on your output display!**											
483												
484	**It is necessary to have 4 or more Distinct Values to compute bootstrap methods.**											
485	**However, results obtained using 4 to 9 distinct values may not be reliable.**											
486	**It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.**											
487												
488	**Relevant UCL Statistics**											
489				**Normal Distribution Test**					**Lognormal Distribution Test**			
490				Shapiro Wilk Test Statistic	0.346				Shapiro Wilk Test Statistic	0.473		
491				Shapiro Wilk Critical Value	0.85				Shapiro Wilk Critical Value	0.85		
492				**Data not Normal at 5% Significance Level**					**Data not Lognormal at 5% Significance Level**			
493												
494				**Assuming Normal Distribution**					**Assuming Lognormal Distribution**			
495				95% Student's-t UCL	112.6				95% H-UCL	3676		
496				**95% UCLs (Adjusted for Skewness)**					95% Chebyshev (MVUE) UCL	12.34		
497				95% Adjusted-CLT UCL (Chen-1995)	148.6				97.5% Chebyshev (MVUE) UCL	16.5		
498				95% Modified-t UCL (Johnson-1978)	119.3				99% Chebyshev (MVUE) UCL	24.68		
499												
500				**Gamma Distribution Test**					**Data Distribution**			
501				k star (bias corrected)	0.162				**Data do not follow a Discernable Distribution (0.05)**			
502				Theta Star	248.2							
503				MLE of Mean	40.13							
504				MLE of Standard Deviation	99.8							

505					nu star	3.557						
506					Approximate Chi Square Value (.05)	0.555		**Nonparametric Statistics**				
507					Adjusted Level of Significance	0.0278					95% CLT UCL	105.9
508					Adjusted Chi Square Value	0.399					95% Jackknife UCL	112.6
509											95% Standard Bootstrap UCL	N/A
510					Anderson-Darling Test Statistic	3.327					95% Bootstrap-t UCL	N/A
511					Anderson-Darling 5% Critical Value	0.881					95% Hall's Bootstrap UCL	N/A
512					Kolmogorov-Smirnov Test Statistic	0.498					95% Percentile Bootstrap UCL	N/A
513					Kolmogorov-Smirnov 5% Critical Value	0.285					95% BCA Bootstrap UCL	N/A
514					**Data not Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL	214.4
515											97.5% Chebyshev(Mean, Sd) UCL	289.8
516					**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL	438
517					95% Approximate Gamma UCL	257.2						
518					95% Adjusted Gamma UCL	358.1						
519												
520					**Potential UCL to Use**						Use 99% Chebyshev (Mean, Sd) UCL	438
521												
522	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
523	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
524	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
525												
526												
527	**Dieldrin**											
528												
529	**General Statistics**											
530					Number of Valid Observations	11					Number of Distinct Observations	2
531												
532					**Raw Statistics**			**Log-transformed Statistics**				
533					Minimum	0.05					Minimum of Log Data	-2.996
534					Maximum	13					Maximum of Log Data	2.565
535					Mean	1.227					Mean of log Data	-2.49
536					Median	0.05					SD of log Data	1.677
537					SD	3.905						
538					Std. Error of Mean	1.177						
539					Coefficient of Variation	3.182						
540					Skewness	3.317						
541												
542												
543	**Warning: There are only 2 Distinct Values in this data**											
544	**There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.**											
545	**Those methods will return a 'N/A' value on your output display!**											
546												
547	**It is necessary to have 4 or more Distinct Values to compute bootstrap methods.**											
548	**However, results obtained using 4 to 9 distinct values may not be reliable.**											
549	**It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.**											
550												
551	**Relevant UCL Statistics**											
552					**Normal Distribution Test**			**Lognormal Distribution Test**				
553					Shapiro Wilk Test Statistic	0.345					Shapiro Wilk Test Statistic	0.345
554					Shapiro Wilk Critical Value	0.85					Shapiro Wilk Critical Value	0.85
555					**Data not Normal at 5% Significance Level**			**Data not Lognormal at 5% Significance Level**				
556												
557					**Assuming Normal Distribution**			**Assuming Lognormal Distribution**				
558					95% Student's-t UCL	3.361					95% H-UCL	3.525
559					**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL	0.896
560					95% Adjusted-CLT UCL (Chen-1995)	4.422					97.5% Chebyshev (MVUE) UCL	1.169

561				95% Modified-t UCL (Johnson-1978)	3.557					99% Chebyshev (MVUE) UCL	1.705	
562												
563				**Gamma Distribution Test**						**Data Distribution**		
564				k star (bias corrected)	0.251					**Data do not follow a Discernable Distribution (0.05)**		
565				Theta Star	4.892							
566				MLE of Mean	1.227							
567				MLE of Standard Deviation	2.45							
568				nu star	5.519							
569				Approximate Chi Square Value (.05)	1.399					**Nonparametric Statistics**		
570				Adjusted Level of Significance	0.0278					95% CLT UCL	3.164	
571				Adjusted Chi Square Value	1.092					95% Jackknife UCL	N/A	
572										95% Standard Bootstrap UCL	N/A	
573				Anderson-Darling Test Statistic	3.842					95% Bootstrap-t UCL	N/A	
574				Anderson-Darling 5% Critical Value	0.835					95% Hall's Bootstrap UCL	N/A	
575				Kolmogorov-Smirnov Test Statistic	0.573					95% Percentile Bootstrap UCL	N/A	
576				Kolmogorov-Smirnov 5% Critical Value	0.278					95% BCA Bootstrap UCL	N/A	
577				**Data not Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL	6.359	
578										97.5% Chebyshev(Mean, Sd) UCL	8.579	
579				**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL	12.94	
580				95% Approximate Gamma UCL	4.841							
581				95% Adjusted Gamma UCL	6.205							
582												
583				**Potential UCL to Use**						Use 99% Chebyshev (Mean, Sd) UCL	12.94	
584												
585				**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**								
586				**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**								
587				**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**								
588												
589												
590	**Copper**											
591												
592				**General Statistics**								
593				Number of Valid Observations	11					Number of Distinct Observations	11	
594												
595				**Raw Statistics**						**Log-transformed Statistics**		
596				Minimum	2					Minimum of Log Data	0.693	
597				Maximum	140					Maximum of Log Data	4.942	
598				Mean	43.09					Mean of log Data	3.334	
599				Median	34					SD of log Data	1.152	
600				SD	37.51							
601				Std. Error of Mean	11.31							
602				Coefficient of Variation	0.871							
603				Skewness	1.801							
604												
605				**Relevant UCL Statistics**								
606				**Normal Distribution Test**						**Lognormal Distribution Test**		
607				Shapiro Wilk Test Statistic	0.831					Shapiro Wilk Test Statistic	0.9	
608				Shapiro Wilk Critical Value	0.85					Shapiro Wilk Critical Value	0.85	
609				**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**		
610												
611				**Assuming Normal Distribution**						**Assuming Lognormal Distribution**		
612				95% Student's-t UCL	63.59					95% H-UCL	181.1	
613				**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL	130.6	
614				95% Adjusted-CLT UCL (Chen-1995)	68.26					97.5% Chebyshev (MVUE) UCL	165.5	
615				95% Modified-t UCL (Johnson-1978)	64.61					99% Chebyshev (MVUE) UCL	234.2	
616												

617	**Gamma Distribution Test**						**Data Distribution**					
618	k star (bias corrected)	1.01					**Data appear Gamma Distributed at 5% Significance Level**					
619	Theta Star	42.65										
620	MLE of Mean	43.09										
621	MLE of Standard Deviation	42.87										
622	nu star	22.23										
623	Approximate Chi Square Value (.05)	12.51					**Nonparametric Statistics**					
624	Adjusted Level of Significance	0.0278					95% CLT UCL	61.69				
625	Adjusted Chi Square Value	11.33					95% Jackknife UCL	63.59				
626							95% Standard Bootstrap UCL	61.26				
627	Anderson-Darling Test Statistic	0.31					95% Bootstrap-t UCL	74.57				
628	Anderson-Darling 5% Critical Value	0.746					95% Hall's Bootstrap UCL	152.8				
629	Kolmogorov-Smirnov Test Statistic	0.179					95% Percentile Bootstrap UCL	62.36				
630	Kolmogorov-Smirnov 5% Critical Value	0.261					95% BCA Bootstrap UCL	66.64				
631	**Data appear Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL	92.39				
632							97.5% Chebyshev(Mean, Sd) UCL	113.7				
633	**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL	155.6				
634	95% Approximate Gamma UCL	76.57										
635	95% Adjusted Gamma UCL	84.49										
636												
637	**Potential UCL to Use**						Use 95% Approximate Gamma UCL	76.57				
638												
639	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
640	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
641	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
642												
643												
644	**Lead**											
645												
646	**General Statistics**											
647	Number of Valid Observations	11					Number of Distinct Observations	11				
648												
649	**Raw Statistics**						**Log-transformed Statistics**					
650	Minimum	11					Minimum of Log Data	2.398				
651	Maximum	2200					Maximum of Log Data	7.696				
652	Mean	649.9					Mean of log Data	5.507				
653	Median	290					SD of log Data	1.722				
654	SD	820										
655	Std. Error of Mean	247.2										
656	Coefficient of Variation	1.262										
657	Skewness	1.354										
658												
659	**Relevant UCL Statistics**											
660	**Normal Distribution Test**						**Lognormal Distribution Test**					
661	Shapiro Wilk Test Statistic	0.731					Shapiro Wilk Test Statistic	0.919				
662	Shapiro Wilk Critical Value	0.85					Shapiro Wilk Critical Value	0.85				
663	**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
664												
665	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
666	95% Student's-t UCL	1098					95% H-UCL	12769				
667	**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL	2879				
668	95% Adjusted-CLT UCL (Chen-1995)	1164					97.5% Chebyshev (MVUE) UCL	3761				
669	95% Modified-t UCL (Johnson-1978)	1115					99% Chebyshev (MVUE) UCL	5494				
670												
671	**Gamma Distribution Test**						**Data Distribution**					
672	k star (bias corrected)	0.52					**Data appear Gamma Distributed at 5% Significance Level**					

673					Theta Star	1249						
674					MLE of Mean	649.9						
675					MLE of Standard Deviation	901						
676					nu star	11.45						
677					Approximate Chi Square Value (.05)	4.865		**Nonparametric Statistics**				
678					Adjusted Level of Significance	0.0278					95% CLT UCL	1057
679					Adjusted Chi Square Value	4.187					95% Jackknife UCL	1098
680											95% Standard Bootstrap UCL	1042
681					Anderson-Darling Test Statistic	0.415					95% Bootstrap-t UCL	1423
682					Anderson-Darling 5% Critical Value	0.771					95% Hall's Bootstrap UCL	1054
683					Kolmogorov-Smirnov Test Statistic	0.223					95% Percentile Bootstrap UCL	1059
684					Kolmogorov-Smirnov 5% Critical Value	0.267					95% BCA Bootstrap UCL	1167
685					**Data appear Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL	1728
686											97.5% Chebyshev(Mean, Sd) UCL	2194
687					**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL	3110
688					95% Approximate Gamma UCL	1529						
689					95% Adjusted Gamma UCL	1777						
690												
691					**Potential UCL to Use**						Use 95% Approximate Gamma UCL	1529
692												
693	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
694	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
695	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
696												
697												
698	**Zinc**											
699												
700	**General Statistics**											
701	Number of Valid Observations					11	Number of Distinct Observations					11
702												
703	**Raw Statistics**						**Log-transformed Statistics**					
704	Minimum					40	Minimum of Log Data					3.689
705	Maximum					670	Maximum of Log Data					6.507
706	Mean					181	Mean of log Data					4.785
707	Median					110	SD of log Data					0.908
708	SD					196.7						
709	Std. Error of Mean					59.31						
710	Coefficient of Variation					1.087						
711	Skewness					1.962						
712												
713	**Relevant UCL Statistics**											
714	**Normal Distribution Test**						**Lognormal Distribution Test**					
715	Shapiro Wilk Test Statistic					0.725	Shapiro Wilk Test Statistic					0.934
716	Shapiro Wilk Critical Value					0.85	Shapiro Wilk Critical Value					0.85
717	**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
718												
719	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
720	95% Student's-t UCL					288.5	95% H-UCL					406.5
721	**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL					388.5
722	95% Adjusted-CLT UCL (Chen-1995)					316	97.5% Chebyshev (MVUE) UCL					482.1
723	95% Modified-t UCL (Johnson-1978)					294.3	99% Chebyshev (MVUE) UCL					666
724												
725	**Gamma Distribution Test**						**Data Distribution**					
726	k star (bias corrected)					1.043	**Data appear Gamma Distributed at 5% Significance Level**					
727	Theta Star					173.6						
728	MLE of Mean					181						

729					MLE of Standard Deviation	177.2						
730					nu star	22.94						
731					Approximate Chi Square Value (.05)	13.05				**Nonparametric Statistics**		
732					Adjusted Level of Significance	0.0278					95% CLT UCL	278.6
733					Adjusted Chi Square Value	11.85					95% Jackknife UCL	288.5
734											95% Standard Bootstrap UCL	274.8
735					Anderson-Darling Test Statistic	0.574					95% Bootstrap-t UCL	502.5
736					Anderson-Darling 5% Critical Value	0.745					95% Hall's Bootstrap UCL	784.7
737					Kolmogorov-Smirnov Test Statistic	0.196					95% Percentile Bootstrap UCL	280
738					Kolmogorov-Smirnov 5% Critical Value	0.261					95% BCA Bootstrap UCL	320.5
739					**Data appear Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL	439.5
740											97.5% Chebyshev(Mean, Sd) UCL	551.4
741					**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL	771.1
742					95% Approximate Gamma UCL	318.3						
743					95% Adjusted Gamma UCL	350.5						
744												
745					**Potential UCL to Use**						Use 95% Approximate Gamma UCL	318.3
746												
747	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
748	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
749	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
750												