REPORT TO

HEALTH INFRASTRUCTURE

ON

STAGE 1 AND PRELIMINARY STAGE 2 ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED NEW INTEGRATED SERVICES BUILDING

AT

LIVERPOOL HOSPITAL, MAIN CAMPUS, ELIZABETH STREET, LIVERPOOL, NSW

Date: 13 February 2020
Ref: E32837BDrpt

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Executive Summary

Johnstaff Projects Pty Ltd on behalf of Health Infrastructure NSW ('the client') commissioned JK Environments (JKE) to undertake a Stage 1 and Preliminary Stage 2 Environmental Site Assessment (ESA) for the proposed new Integrated Services Building at Liverpool Health + Academic Precinct (Liverpool Hospital), Main Campus, Elizabeth Street, Liverpool, NSW ('the site'). The main campus is also referred to as the western campus. The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

This report has been prepared for the proposed new Integrated Services Building development and supports the lodgement of the associated Sate Significant Development Application (SSDA).

The primary aims of the assessment were to: identify potential contamination sources and contaminants of concern; assess the soil and groundwater contamination conditions; provide a preliminary waste classification for off-site disposal of in-situ soil; assess the potential for acid sulfate soils; assess the potential for dryland salinity; and comment on site suitability for the proposed development.

The following potential contamination sources/areas of environmental concern have been identified at the site: Fill material (imported from an unknown source/s); Historical agricultural use at the (grazing, markets gardens and a piggery); Hazardous building materials (demolition activities) and former on-site and off-site fuel storage, mechanical workshops, dry cleaning and printing in the area.

The potential on-site human receptors that were identified included site users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users and recreational water users. Ecological receptors include terrestrial organisms and plants within unpaved areas (including the proposed landscaped areas), and freshwater ecology in the Georges River.

To assess the risk the scope of works included collection soil samples from 15 sampling locations (MW1 to MW15) drilled in accessible areas of the site. Three groundwater monitoring wells (MW1 to MW3) were installed by JK Geotechnics and sampled by JKE. JKE have previous investigated the north east section of the site, this included soil sampling from seven boreholes (JKE129, JKE131 and JKE133 to JKE137) and one groundwater monitoring well in borehole JKE135 (MWJKE135). The previous relevant previous assessment data and results are presented within this report. Groundwater monitoring well MWJKE135 was resampled.

Fill material was encountered at the surface or beneath the pavement in all boreholes. Selected soil samples were analysed for contaminants of potential concern, potential acid sulfate soils and potential saline soil conditions. Groundwater samples were analysed for contaminants of potential concern and salinity parameters. The results were compared against the selected site assessment criteria.

Surface Asbestos Containing Material (ACM) and friable asbestos were previously identified in the surface fill soils at sampling location JKE136 and JKE137 in the north east section of the site during the previous JKE assessment in August 2019. Interim asbestos related controls were implemented by the South Western Sydney Liverpool Health District (SWSLHD) including asbestos air fibre monitoring, temporary capping of the exposed soil with builder's plastic and the placement of 100mm of clean sand and barricading of the exposed surface soils within the area surrounding sampling location JKE136. JKE also prepared an Interim Asbestos Management Plan (IAMP) for the SWSLHD implantation. Based on the information provided by the SWSLHD, JKE were of the opinion that immediate asbestos risk to receptors was low provided that the temporary cap was maintained and the JKE IAMP was implemented.

Further surface ACM were identified during the recent field works. ACM was not encountered within boreholes MW1 to MW15. Friable asbestos was not detected within the fill samples analysed by the laboratory.

The carcinogenic Polyclclic Aromatic Hydrocarbons (PAHs) result for the fill soil sample DUPMP103 (MW3 (0-0.2m)) was above human health site assessment criteria.

Potential Acid Sulfate Soils were not identified. Saline soil and groundwater conditions were identified.

A number of data gaps were identified, as outlined in Section 10.5. The data gaps mostly relate to further soil sampling following the demolition of the existing to meet the NSW EPA Contaminated Sites Sampling Design Guidelines 1995, further assessment of the friable and carcinogenic PAHs soil impacted areas.

Based on the findings of the assessment, JKE are of the opinion that the site can be made suitable for the proposed new Integrated Services Building development provided that the following is implemented:

- The data gaps identified in Section 10.5 are addressed. This can be done following the demolition of the buildings and prior to commencement of remediation works. The requirements for the data gap investigations works are to be outlined in the Remediation Action Plan (RAP);
- A RAP and Asbestos Management Plan (AMP) are prepared;
- A Validation Report is prepared on completion of the remediation works;
- A long-term Environmental Management Plan (EMP) is prepared at the completion of remediation and validations works, in the event that the capping and containment approached to remediation is adopted; and
- A Salinity Management Plan (SMP) is prepared and implemented during development works.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of this report.

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Abbreviations

Asbestos Fines/Fibrous Asbestos	**AF/FA**
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Added Contaminant Limits	**ACL**
Asbestos Containing Material	**ACM**
Australian Drinking Water Guidelines	**ADWG**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Above-Ground Storage Tank	**AST**
Below Ground Level	**BGL**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Cation Exchange Capacity	**CEC**
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Data Quality Objective	**DQO**
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Ecological Investigation Level	**EIL**
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Ecological Screening Level	**ESL**
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Environmental Site Assessment	**ESA**
Ecological Screening Level	**ESL**
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Hardness Modified Trigger Values	**HMTV**
Health Screening Level	**HSL**
Health Screening Level-Site Specific Assessment	**HSL-SSA**
International Organisation of Standardisation	**ISO**
JK Environments	**JKE**
Lab Control Spike	**LCS**
Light Non-Aqueous Phase Liquid	**LNAPL**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
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Source, Pathway, Receptor	**SPR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Standard Sampling Procedure	**SSP**
Standing Water Level	**SWL**
Trip Blank	**TB**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**

1 INTRODUCTION

Johnstaff Projects Pty Ltd on behalf of Health Infrastructure NSW ('the client') commissioned JK Environments (JKE) to undertake a Stage 1 and Preliminary Stage 2 Environmental Site Assessment (ESA) for the proposed new Integrated Services Building at Liverpool Health + Academic Precinct (Liverpool Hospital), Main Campus, Elizabeth Street, Liverpool, NSW ('the site'). The main campus is also referred to as the western campus. The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

This report has been prepared for the proposed new Integrated Services Building development and supports the lodgement of the associated Sate Significant Development Application (SSDA).

A geotechnical investigation was undertaken in conjunction with this assessment by JK Geotechnics (JKG). The results of the investigation are presented in a separate report (Ref: 32837Arpt, dated February 2020)[1]. This report should be read in conjunction with the JKG report.

JKE have previously completed a number of Stage 1 (desktop) assessments and intrusive investigations within the Liverpool Health + Academic Precinct (LHAP) main/western campus. A summary of the relevant information has been included in Section 2 and discussed within this report as applicable.

Environmental Investigation Services (EIS) has recently been re-branded to JK Environments and will continue to function as the environmental division of JK Group alongside JK Geotechnics and JK Drilling.

1.1 Proposed Development Details

JKE understand that the proposed development will include demolition of the existing Cancer Building, Pathology Building, Alex Grimson building and the Thomas and Rachael Moore Education Centre. We understand that the existing oncology bunkers in the central/west and the existing P1 car park basement in the south section of the site are to be retained.

A new three to six storey Integrated Services Building is proposed to occupy the majority of the site. The Integrated Services Building will be occupied for hospital associated hospital use, with retail use also proposed in some areas on the ground floor. New hard stand pavements and landscaping are proposed in areas of the site not occupied by the proposed new building.

The proposed new building will be underlain by a partial basement level located in central section of the site. The proposed basement level will be constructed at RL7.9m, and will require excavation to approximately 1.5m Below Ground Level (mBGL) to 4.0mBGL. The ground floor level will be constructed at RL12.2m, and will require cut and fill earthworks around the basement level to a maximum depth/height of approximately 1.5m.

[1] Referred to as JKG report

1.2 Aims and Objectives

The primary aims of the assessment were to identify any past or present potentially contaminating activities at the site, identify the potential for site contamination, and make a preliminary assessment of the soil and groundwater contamination conditions. The assessment objectives were to:

- Provide an appraisal of the past site use(s) based on a review of historical records;
- Assess the current site conditions and use(s) via a site walkover inspection;
- Identify potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Assess the soil and groundwater contamination, dryland salinity and Acid Sulfate Soil (ASS) conditions via implementation of a preliminary sampling and analysis program (SAQP);
- Prepare a conceptual site model (CSM) to identify source, pathway and receptor (SPR) linkages;
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Provide a preliminary waste classification for off-site disposal of soil;
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint); and
- Assess whether further intrusive investigation and/or remediation is required.

1.3 Scope of Work

The assessment was undertaken generally in accordance with a JKE proposal (Ref: EP50653BD) of 6 November 2019 and written acceptance from the client of 27 November 2019. The scope of work included the following:

- Review of previous investigation reports prepared by JKG and EIS/JKE for Liverpool Hospitals western campus, applicable to the proposed new Integrated Services Building development;
- Review of major services identified by the 'Dial Before You Dig'(DBYD) plans;
- Preparation of Safe Work Method Statement (SWMS) and Disruption Notice (DN);
- Walkover inspection of accessible areas of the site. Observations of conditions and likely land use at surrounding properties will be made;
- Preparation of a CSM;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC);
- Data Quality Assessment; and
- Preparation of a report including a Tier 1 risk assessment.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[2], other guidelines made under or with regards to the Contaminated Land Management Act (1997)[3], State Environmental Planning Policy No.55 – Remediation of Land (1998)[4], Site Investigations for Urban Salinity (2002)[5] and National Acid Sulfate Soil Guidance (2018)

[2] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

[3] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

[4] *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW) (referred to as SEPP55)

[5] Department of Land and Water Conservation (DLWC), (2002). *Site Investigations for Urban Salinity,* (referred to as DLWC 2002)

documents and the Acid Sulfate Soil Management Advisory Committee (ASSMAC) Acid Sulfate Soil Manual (1998)[6]. A list of reference documents/guidelines is included in the appendices.

[6] Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). *Acid Sulfate Soils Manual* (ASS Manual 1998)

2 SITE INFORMATION

2.1 Background

JKE have recently prepared a number of reports for the future development of Liverpool Hospital. A summary of the most relevant report to the proposed Integrated Services Building development area is provide in the sections below.

2.1.1 Summary of Liverpool Hospitals Site History

JKE has recently prepared a Stage 1 ESA in September 2019[7] for the proposed civil infrastructure works (within the hospitals western campus). The proposed civil infrastructure development area is located in the north, east and south of the western campus and approximately 20m to the east of the north east section of the proposed new Integrated Services Building development area. The JKE Stage 1 ESA included review of general site historical information (including a Lotsearch report) and key previous investigations undertaken by JKE for the western campus. A high-level summary of Liverpool Hospital western campus site history known to JKE is presented below:

- Parts of the hospital were occupied for vegetable farming and other farming activities in the 1890s. A block of 120 acres of land to the east of railway line was purchased for a new hospital farm and piggery in 1917 (source: *The history of Liverpool Hospital from early settlement to 1993. C.Raszewski, V.Walker, Y. Scarbrow and C. MacArthur*);
- Historical aerial photographs reviewed for JKE Stage 1 ESA indicated that the Hospital had been progressively developed between 1930 and 2005, with a number of buildings demolished and constructed during this time frame. A review of historical aerial photographs for the new Integrated Services Building development area is presented in Section 4.1;
- WorkCover NSW (now SafeWork NSW) records for the hospital were obtained by JKE in 2008 and in 2019 for the JKE Stage 1 ESA. The records indicated that a number of former hazardous goods were stored at the hospital including petroleum and diesel Underground Storage Tanks (USTs) and Above Ground Storage Tanks (ASTs). Further information relating to hazardous good storage at the hospital and relevant to the site is presented in Section 4.2; and
- Previous investigations undertaken by JKE in the central and south-east section of the western campus (immediately to the east of the central portion of the new Integrated Services Building development area) identified Asbestos Containing Materials (ACM), elevated concentrations of lead, Polyaromatic hydrocarbons (PAHs), including benzo(a)pyrene in the fill soil. Remediation and validations work included excavation and off-site disposal of impacted soil during the clinical services development undertaken between 2007 and 2008. The remediation works also included the removal of a former abandoned diesel Underground Storage Tank (UST). The former UST was located approximately 150m to the south east and downgradient of the new Integrated Services Building development area.

Further review of site historical information relevant to the proposed new Integrated Services Building development area is presented in Section 4.

[7] Report to Johnstaff Projects Pty Ltd, on Stage 1 Environmental Site Assessment, for Proposed Liverpool Hospital – Civil and Infrastructure Works, at Elizabeth Street, Liverpool, NSW (JKE ref: E32465BDrpt2, dated 20 September 2019) (referred to as JKE Stage 1 ESA)

2.1.2 Stage 2 Environmental Site Assessment

JKE have recently prepared a Stage 2 ESA report in September 2019[8] for the proposed civil infrastructure works. The intrusive soils and groundwater assessment was primarily undertaken for the proposed civil and infrastructure works development. However, the assessment also included an assessment of a portion of the hospital outside of the proposed civil infrastructure works development area to assist Liverpool Hospital in potential future planning pathways.

The additional investigation area falls within the north east section of the proposed new Integrated Services Building development area, with seven sampling location (JKE129, JKE131, JK133 to JKE137) drilled and one groundwater monitoring well installed. These JKE Stage 2 ESA sampling locations within the proposed new Integrated Services Building development area are shown on Figure 2. The data and other information obtained from the relevant sampling locations has been included and discussed as applicable within this Preliminary Stage 2 ESA. A summary of the results of JKE Stage 2 ESA (prepared for the proposed civil infrastructure works development area is provided below).

The primary aims of the JKE Stage 2 ESA were to: identify potential contamination sources and CoPC; assess the soil and groundwater contamination conditions; provide a preliminary waste classification for off-site disposal of in-situ soil; assess the potential for ASS conditions; assess the potential for dryland salinity; and comment on site suitability for the proposed civil infrastructure works development.

The following potential contamination sources/AEC were identified at the site: Fill material (imported from an unknown source/s); Historical agricultural use at the (grazing, markets gardens and a piggery); Hazardous building materials (demolition activities) and former on-site and off-site fuel storage, mechanical workshops, dry cleaning and printing in the area.

The potential on-site human receptors that were identified included site users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users and recreational water users. Ecological receptors include terrestrial organisms and plants within unpaved areas (including the proposed landscaped areas), and freshwater ecology in the Georges River.

The scope of works included collection of soil samples from forty sampling locations (JKE101 to JKE140) drilled in accessible areas. Four groundwater monitoring wells (MWJKE102, MWJKE108, MWJKE122 and MWJKE135) were installed. JKEMW108 remained dry throughout the assessment. Fill material was encountered at the surface or beneath the pavement in all boreholes. Selected soil samples were analysed for CoPC, potential ASS and potential saline conditions. Groundwater samples were analysed for CoPC and salinity parameters. The results were compared against the SAC. Asbestos bulk quantification was during fill soil sampling.

Some of the Total Recoverable Hydrocarbons (TRH) results for fill soils samples obtain from the south section of the site on and adjacent to Elizabeth Street and in the east section of the western campus were above the

[8] Report to Johnstaff Projects Pty Ltd, on Stage 2 Environmental Site Assessment, for Proposed Liverpool Hospital – Civil and Infrastructure Works, at Elizabeth Street, Liverpool, NSW (JKE ref: E32465BDrpt4, dated 10 October 2019) (referred to as JKE Stage 2 ESA)

adopted human health and ecological SAC. The copper and zinc results of all groundwater samples obtained were above adopted the ecological criteria. Following a detailed review of the CSM, laboratory results and proposed civil infrastructure development details, JKE were of the opinion that risk to the human and ecological receptors was low.

ASS was encountered in the extremely weathered bedrock sample JKE116 (15.4-15.6m). However, based on the proposed civil infrastructure development earthworks details, an Acid Sulfate Soil Management Plan (ASSMP) was not considered necessary.

Saline soils were identified and a Salinity Management Plan (SMP) was considered necessary for the proposed civil infrastructure development.

JKE were of the opinion that the site is suitable from a contamination view point for the proposed civil infrastructure works development and remediation was not required, provided that the head construction contractor prepare a formal unexpected finds procedure (UFP).

Outside of the proposed civil infrastructure works development area and within the north east section of the proposed new Integrated Services Building development, the JKE Stage 2 ESA identified the following asbestos elevations above the SAC. These sampling locations and contamination data are shown in the attached Figure 3:

- Asbestos fibres were identified in the fibre cement fragment AMF1; and
- The calculated Asbestos Fines/ Friable Asbestos (AF/FA) fill soil concentrations of 0.0373% w/w (JKE136 (0-0.2m)) and 0.0085% w/w (JKE137 (0.04-0.2m)) were above the SAC of 0.001% w/w.

Asphaltic concrete (AC) pavement was located at the surface at sampling location JKE137. However, exposed surface soils were evident at sampling location JKE136. To further assess the risk of asbestos dust exposure to receptors, Interim asbestos controls recommended by JKE were implemented by the South Western Sydney Local Health District (SWSLHD), including asbestos air fibre monitoring and temporary capping/barricading of the exposed surface soils within the area surrounding sampling location JKE136. Based on the information provided by the SWSLHD (attached in Appendix I), JKE were of the opinion that immediate risk to receptor was low provided that an interim Asbestos Management Plan (IAMP) was prepared and implemented to manage the risks.

JKE have subsequently prepared an IAMP in December 2019[9] for the entire Liverpool Hospital grounds for the SWSLHD. The IAMP included the recommendation for an 'emu pick' of potential surface ACM across the entire hospital grounds, a visual asbestos surface clearance inspection/certificate and at the SWSLHD request a semi-permanent capping procedure for the area surrounding JKE136. JKE have not received confirmation if the above has been undertaken.

Further asbestos delineation intrusive investigations and more permanent management controls (e.g. permanent capping of the impacted areas or off-site disposal of impacted soils) were recommended by JKE.

[9] Report to South Western Sydney Local Health District, on Interim Asbestos Management Plan (IAMP), Interim Due Diligence and Management, at Liverpool Hospital, Elizabeth Street, Liverpool, NSW (JKE ref: E32865PLrpt IAMP, dated 13 December 2019) (referred to as JKE IAMP)

The above will need to be considered/addressed as part proposed new Integrated Services Building development as the asbestos impacted area are located within the site area.

2.1.3 Hazardous Building Materials

Johnstaff Projects Pty Ltd have provided JKE with a Hazardous Materials Survey Report and Register prepared for the Hospital[10]. The EMS HAZMAT report appeared to be targeted to the older buildings at the hospital and included an assessment of the existing Alex Grimson building located in the central section of the new Integrated Services Building development area, which is to be demolished as part of the development.

Asbestos containing materials (ACM) in friable and non-friable forms were identified or assumed within Alex Grimson Building in building materials including: Asbestos vinyl floor sheeting, fibre cement sheeting external, mastic sealant, internal heater coils with the plantroom ductwork, bituminous membrane around the large water tank within the plant room, fire door, electrical equipment and other building materials.

The EMS HAZMAT also indicated that any pre-1970's underlying paint, particularly to external surfaces of older buildings was likely to contain Lead and metal capacitors within the older style fluorescent light fittings were found within the Alex Grimson building and are presumed to contain Polychlorinated Bi-phenyl's (PCB's).

JKE have recently been engaged Johnstaff Projects Pty Ltd on behalf of Health Infrastructure NSW to undertaken a HAZMAT assessment of the basement P1 carpark (including the boiler room and engineering offices) which are to be demolished or refurbished as part of the new Integrated Services Building development.

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner:	Health Infrastructure NSW
Site Address:	Part of 50 Goulburn Street, Liverpool, NSW (Liverpool Hospital). Address also known as Elizabeth Street, Liverpool, NSW.
Lot & Deposited Plan:	Part of Lot 501 DP 1165217
Current Land Use:	Hospital
Proposed Land Use:	Hospital
Local Government Authority:	Liverpool City Council
Current Zoning:	SP2 Infrastructure (Health Services Facility and Education) – Liverpool LEP 2008 (Liverpool Hospital)
Site Area (m^2):	Approximately 23,000m^2

[10] Report to South Western Sydney LHD, on Hazardous Materials Survey Report and Register, for Liverpool Hospital, Liverpool, NSW (EMS Report No: EMS19 6723, dated 9 May 2019) (referred to as EMS HAZAMT report)

RL (AHD in m) (approx.):	11-14
Geographical Location (decimal degrees) (approx.):	Latitude: -33.919454 Longitude: 150.928948
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2

2.3 Site Location and Regional Setting

The site is located in a predominantly residential and commercial area of Liverpool and within the west section of Liverpool hospitals western campus. The site is bounded by Campbell Street to the north, Goulburn Street to the west, Elizabeth to the south and Liverpool Hospital western campus to the west. The south east section of the site is located approximately 220m to the north-west of Georges River.

2.4 Topography

The regional topography is characterised by gentle slopes which generally fall to the east and south east at approximately 2-4°. The site is located on the side of a hill and has a gentle slope towards the south at approximately 1-2°. Parts of the site appear to have been levelled to account for the slope and accommodate the existing development.

2.5 Site Inspection

A walkover inspection of the site was undertaken by JKE on 26 November 2019. The inspection was limited to accessible areas of the site and immediate surrounds. Selected site photographs obtained during the inspection are attached in the appendices.

A summary of the inspection findings are outlined in the following subsections:

2.5.1 Current Site Use and/or Indicators of Former Site Use

At the time of the inspection, the majority of site was occupied by a number of multistorey hospital buildings identified as Education building, Alex Grimson building, Pathology Building and the Cancer Therapy building. A multistorey car park (identified as P2) partially occupied the north east section of the site and a basement car park (identified as P1) partially occupied the south east section of the site.

JKE note that the site has been occupied by the hospital since the late 1800's.

2.5.2 Buildings, Structures and Roads

The hospital buildings appeared to have been constructed of brick, concrete metals and fibre cement sheeting. A concrete surfaced loading dock was located in the central section of the site, with vehicle access to the loading dock gained via Goulburn Street. Asphaltic concrete surface roads were located in the north east and south section of the site providing access to the P2 and P1 car parks respectively.

2.5.3 Boundary Conditions, Soil Stability and Erosion

The north west boundary of the site was fenced by brick and metal, the remainder of the site boundaries were generally unfenced, however sections of the site boundary were defined by the existing buildings. Areas of exposed gravelly silty sand fill soils were evident in the landscapes along Elizabeth, Goulburn, Forbes and Campbell Streets and within the site boundary, particularly in the north and south west sections of the site.

A partially exposed fill batter was observed in the north section within a landscaped area located between the Cancer Therapy/ Pathology buildings and the Alex Grimson building. The fill batter appeared approximately 3m in height and fell to the south at approximately 2-10°. Brick retaining walls were present at some locations along the fill batter. The exposed fill material that was observed at the surface of the batter contained inclusions of igneous, sandstone and ironstone gravels and minor inclusions of brick, concrete and glass.

There appeared to be no evidence of significant erosion.

2.5.4 Visible or Olfactory Indicators of Contamination

Potential ACM (fibre cement fragments) observed on the surface approximately in the landscaped areas surrounding the Alex Grimson building in the north/central section of the site. The potential ACM were sampled and labelled as FCF1 to FCF4 and are shown of Figure 2.

2.5.5 Presence of Drums/Chemicals, Waste and Fill Material

A dangerous goods storage area was observed at a second smaller located dock located at the east end of the Pathology building as shown in Figure 2. Access to the dangerous goods storage was restricted at the time of the inspection, however signage indicated that stored chemicals included ethyl alcohol (100L), methyl alcohol (100L) and xylene (1,000L).

2.5.6 Drainage and Services

Stormwater drainage services were identified within the curb/gutter alignments along Campbell, Goulburn and Elizabeth Streets and within the internal roadways within the hospital grounds in the east, central and north sections of the site. Surface water is expected to flow in sympathy with the site and regional topography before entering the stormwater system which most likely flows to the Georges River located approximately 220m to the south west of the site.

2.5.7 Sensitive Environments

Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site. However, Georges River is located approximately 220m to the south-east of the site and could be considered as a potential receptor for contaminated groundwater and/or surface water.

2.5.8 Landscaped Areas and Visible Signs of Plant Stress

Landscaped areas were located along Elizabeth, Goulburn, Forbes and Campbell Street and within internal areas of the site not currently occupied by buildings. Landscaped areas included large trees, shrubs and exotic grass cover. The vegetation generally appeared relatively healthy with no sign of stress; however, the grass cover was scarce in some areas.

2.6 Surrounding Land Use

During the site inspection, JKE observed the following land uses in the immediate surrounds:

- North – Campbell Street, Liverpool Hospitals Health Service and Ingham institute. Liverpool Girls/Boys High School was located to the north east of the site;
- South – Elizabeth Street, Bigge Park and TAFE NSW;
- East – Liverpool Hospital western campus and the Main Southern Railway, bisecting Liverpool Hospitals western and eastern campuses; and
- West – Goulburn Street, residential apartments and commercial land use approximately 150m to the west and south-west of the site.

2.7 Underground Services

The 'Dial Before You Dig' (DBYD) plans were reviewed for the assessment in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration.

The DBYD plans indicated that a number of underground services including telecommunication, electrical, gas, water, sewer and stormwater extends along Elizabeth, Goulburn, Forbes and Campbell Streets. These underground services appear to service the hospital and extent beneath the site in areas.

The service trench backfill could have been imported from unknown sources and there is potential for the service trenches to act as preferential pathway for contamination migration from up gradient sources (i.e. through relatively permeable backfill).

2.8 Section 10.7 Planning Certificate

The s10.7 (2 and 5) planning certificate for the site (Lot 501 DP1165217) were reviewed for the assessment. Copies of the certificates are attached in the appendices. A summary of the relevant information is outlined below:

- The site is not deemed to be: significantly contaminated; subject to a management order; subject of an approved voluntary management proposal; or subject to an on-going management order under the provisions of the CLM Act 1997;
- The site is not subject to a Site Audit Statement (SAS);
- The site is not identified on the Loose-fill asbestos insulation register (maintained by the NSW Department of Fair Trading);
- The site is located within an Acid Sulfate Soil (ASS) risk area;
- The site is located within a potentially saline soils area;

- The site is subject to flood related controls;
- The site is located within the Biggie Park Conservation Area;
- The site is identified as containing environmentally significant land under Liverpool LEP 2008; and
- Part of the site is identified as being within a heritage conservation area.

3 GEOLOGY AND HYDROGEOLOGY

A Lotsearch report was obtained for the entire Liverpool Hospital western campus area for the JKE Stage 1 ESA. The Lotsearch report is attached in the appendices. A summary of the relevant geology and hydrogeology information for the site is presented below.

3.1 Regional Geology

Regional geological information presented in the Lotsearch report indicated that the site is underlain by Bringelly Shale of the Wianamatta Group, which typically consists of shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff.

3.2 Acid Sulfate Soil (ASS) Risk and Planning

The site is not located in an acid sulfate soil (ASS) risk area according to the risk maps prepared by the Department of Land and Water Conservation.

ASS information presented in the Lotsearch report indicated that the site is located within a Class 5 area. Works in Class 5 areas that could pose an environmental risk in terms of ASS include works within 500m of adjacent Class 1,2,3,4 land which are likely to lower the water table below 1m AHD on the adjacent Class 1,2,3,4 land.

3.3 Salinity Hazard Map

The site is located within the area of Western Sydney included in the Salinity Potential Map (2002). Based upon interpretation from the geological formations and soil groups presented on the map, the site is located in a region of moderate to high salinity potential.

The moderate classification is attributed to scattered areas of scalding and indicator vegetation, in areas where concentrations have not been mapped. Saline areas may occur in this zone, which have not been identified or may occur if factors change adversely.

3.4 Hydrogeology

Hydrogeological information presented in the Lotsearch report indicated that the regional aquifer on-site and in the area immediately surrounding the site includes porous, extensive aquifers of low to moderate productivity. There were a total of 32 registered bores within the report buffer of 2,000m. In summary:

- The nearest registered bore (ref: GW113069) was located approximately 136m from the site. This was utilised for monitoring purposes;
- The majority of the bores were registered for monitoring purposes;
- There were no nearby bores (i.e. within 1,618m) registered for domestic or irrigation uses; and
- The drillers log information from the closest registered bores typically identified clay soil or loamy sand to depths of approximately 18mBGL, underlain by sandstone bedrock. Standing water levels (SWLs) in the bores ranged from 1.10mBGL to 2.4mBGL, however the SWLs were generally only provided for bores registered at distances of greater than 1,500m from the site.

The information reviewed for this assessment indicated that the subsurface conditions at the site are likely to consist of residual and alluvial soils overlying relatively deep bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. The groundwater may also be saline. JKE note that there is a reticulated water supply in the area and the use groundwater as a drinking water resource is highly unlikely. Use of groundwater is not proposed as part of the development.

3.5 Receiving Water Bodies

Georges River which is located approximately 220m to the south-east of the site and is the closest water body to the site. The Georges River is downgradient from site and is considered to be a potential receptor of excess surface water flows and groundwater.

4 ADDITIONAL SITE HISTORY INFORMATION

4.1 Review of Historical Aerial Photographs

Historical aerial photographs were included in the Lotsearch report. JKE has reviewed the photographs and summarised relevant information in the following table:

Table 4-1: Summary of Historical Aerial Photographs

Year	Details
1943	The north west section of the site appeared to be occupied by a large 'C' shaped building. Three smaller rectangular shaped buildings were located in the south sections of the site. Two of the sheds appeared to have been occupied for residential purposes. The remainder of the site appeared to have been occupied for agricultural and grazing purposes. There appeared to be a number of small agricultural sheds adjacent to the buildings in the centre of the site. The surrounds appeared similar to the site and were most likely used for residential and agricultural/market garden purposes. What appeared to be the former Liverpool Hospital (now TAFE NSW) was located approximately 20m to the south of the site and beyond Elizabeth Street
1955	The site appeared similar to the 1943 aerial photograph. However, what appeared to be earth works were apparent in the central section of the site. What appeared to be construction associated materials were arranged in a number of areas at the site. What appeared to be a small rectangular shaped market garden was located approximately 10m to the east of the building location in the north west section of the site. The immediate site surrounds appeared similar to the 1943 aerial photograph. However, what appeared to be buildings and open space associated with a school (Liverpool Boys and Girls High School) were apparent to the north east of the site.
1961	The site appeared similar to the 1955 aerial photograph. However, a number of new rectangular shaped buildings appeared to be located in the west and central section of the site. The east and north east section of the site still appeared to have been occupied for agricultural purposes. The immediate site surrounds appeared similar to the 1955 aerial photograph. However, the south west section of the western campus appeared to have been developed with buildings demolished and new buildings constructed. The residential landuse in the surrounding area appeared to have increased.
1965	The site appeared similar to the 1961 aerial photograph. However, one of the rectangular shaped buildings constructed in the central section of the site prior to 1961 appeared to have been demolished. The immediate surrounds appeared similar to the 1961 aerial photograph.
1970	The site appeared similar to the 1965 aerial photograph. However, the market garden to the east of the building located in the north west section of the site appeared to have been demolished and this area covered with hardstand. The site appeared to have no longer occupied for agricultural use.

Year	Details
	The immediate surrounds appeared similar to the 1965 aerial photograph. However, the surrounding area appeared to have no longer occupied for agricultural use.
1982	The site appeared similar to the 1970 aerial photograph. However, all but one of the rectangular shaped buildings constructed in the west and central section of the site between 1955 and 1961 appeared to have been demolished. A large multistorey rectangular shaped building was located in the central section of the site (the existing Alex Grimson Building). The north east section of the site appeared to be occupied by a hard stand on grade car park. The immediate surrounds appeared similar to the 1970 aerial photograph. However, a new multistorey building appeared to be located immediately to the east of the site (the existing Don Everett building).
1991	The site appeared similar to the 1982 aerial photograph. However, the area adjacent to the buildings in the south section of the site appeared to have been covered within by a hard stand and occupied for car parking. The immediate surrounds appeared similar to the 1982 aerial photograph.
2004	The site appeared to have undergone major redevelopment. With the exception of the multistorey rectangular shaped building located in the central section of the site (the existing Alex Grimson Building), all other buildings and surfaces appeared to have been demolished. A number of new multistorey interconnecting hospital buildings had been constructed. A multistorey car park was located in the north east section of the site. Landscaping appeared to have been established in areas surrounding the buildings. The immediate surrounds appeared similar to the 1991 aerial photograph. However, earthworks were apparent immediately to the east of the site.
2009	The site appeared similar to the 2004 aerial photograph. The immediate surrounds appeared similar to the 2004 aerial photograph. However, a new multistorey building appeared to have been constructed immediately to the east of the site (the existing Mental Health Unit). Additionally, significant earthworks (associated with the construction of the New Clinical Services Building) were evident approximately 100m to the east of the south section of the site.

An additional review of aerial photographs (Nearmap and Google Earth) identified what appeared to be a service station (canopy and bowsers were evident in various aerial photographs) approximately 280m to the south-west of the site and on the corner of Elizabeth and George Streets. In addition to this, the property to the east of the service station appeared to have been occupied as a car yard. These sites appeared vacant in 2018. There is a potential for existing/former petroleum Underground Storage Tanks (USTs) at these sites and it likely that they may have also included mechanical workshops.

4.2 SafeWork NSW Records

WorkCover NSW (now SafeWork NSW) records for the hospital were obtained by JKE in 2008 and in 2019 for the JKE Stage 1 ESA. The records indicated that a number of former hazardous goods were stored at the hospital including petroleum and diesel Underground Storage Tanks (USTs) and Above Ground Storage Tanks (ASTs). A summary of the relevant information is provided below:

- A 16,000L diesel UST appears to have been located adjacent to the clinical services former loading dock. The current status of the UST is unclear, however it is possible that the tank may have been removed as part of previous development works associated with the Clinical Services Building and the underlying basement. The former/current location of the UST is approximately 100m to the east of the south section of the site and is considered to be likely down gradient of the site. The approximate former location of the UST is shown on Figure 2 and is identified as UST No 3;
- Two bunded (10,000L and 15,000L) above ground diesel tanks (AST's) are located within the basement of the new clinical services building. The diesel tanks appear to be the fuel source for backup generator power. The diesel tanks were not witnessed by JKE during the site inspection. The ASTs are located approximately 110m to the south east of the south section of the site and are considered to be likely down gradient of the site. The approximate location of the AST's are shown on Figure 2 and are identified as AST No 5; and
- Stored hazardous chemicals including Ethyl Alcohol Solution (2,000L), Acetone (100L) and Xylene (1,00L) are located immediately to the east of the existing pathology building (see Figure 2). This was confirmed during the site inspection. Accidental spillage of these hazardous material could have resulted in contamination impacts to soil and groundwater.

4.3 NSW EPA Records

The Lotsearch report included information from the NSW EPA databases for the following:

- Records maintained in relation to contaminated land under Section 58 of the CLM Act 1997;
- Records of sites notified in accordance with the Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997 (2015)[11]; and
- Licensed activities under the Protection of the Environment Operations Act (1997)[12].

The search included the site area and surrounding areas in the report buffer of 1,000m. The search indicated the following:

- There were no records for the site or any properties in the report buffer under Section 58 of the CLM Act 1997;
- The site has not been notified with regards to the Duty to Report Contamination under Section 60 of the CLM Act 1997. There were three notified properties in the report buffer, however the notified sites were located either beyond the Georges River (down and cross gradient) or up and beyond the crest of the hill. The notified sites are not considered to pose a risk of contamination to the site;
- Records indicate that South Western Sydney Area Health Service holds a current POEO licence (1034388) under the POEO Act 1997. The licence relates to the storage of Hazardous, Industrial or

[11] NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997.* (referred to as Duty to Report Contamination)

[12] Protection of the Environment Operations Act 1997 (NSW). (referred to as POEO Act 1997)

Group A Waste Generation (>100-500 T). The location of the storage operation within the Hospital Campus cannot be confirmed from the supplied information. JKE are of the opinion that the POEO licence relates to hospital associated medical wastes and is not considered to be an onsite contamination risk to the proposed redevelopment area. The storage medical waste is likely to be occur under controlled conditions and disposed of off-site as required; and

- Current and historical POEO licenses were identified for several properties within the report buffer, however these activities are considered unlikely to pose a contamination risk to the site and were mostly associated with industrial land use a undertaken a considerable distance and downgradient of the site.

The Lotsearch report review of other NSW EPA databases indicated that the site is located within an Underground Petroleum Storage System (UPSS) sensitive zone.

4.4 Historical Business Directory and Additional Lotsearch Information

Historical business records for the site and surrounding areas in the report buffer were included in the Lotsearch report. The records indicated the following:

- There were a number of motor mechanics business registered within the report buffer between 1965 and 1988. These businesses were located between approximately 303m and 455m to the south-west, and west of the site;
- A service station was identified within the report buffer between 1967 and 1993. The service station was identified as a road match for Elizabeth Street. The exact location of the service station cannot be confirmed. However, JKE are of the opinion that the service station may be that identified (up/cross gradient from the site) via the review of additional aerial imagery, see Section 4.1;
- There was a printers/letterpress business registered within the report buffer in the 1960s. The business was located approximately 100m to the west and up-gradient of the site; and
- There was a dry cleaning business registered within the report buffer between 1975 and 1988. The business was located approximately 411m to the west and up-gradient of the site.

Based on the regional topography, geology and anticipated groundwater flow (towards Georges River) any former (or current) motor mechanic business, dry cleaners and printers located to the west of the site are considered to be up-gradient and would represent a potential source of contamination which has the potential to migrate onto the site.

In addition to the above, JKE have reviewed additional information contained within the Lotsearch report and note the following:

- Georges River is located approximately 220m to the south-east of the site and is identified under the NSW EPA Per-and poly-fluroalkyl substance (PFAS) investigation program. The PFAS source site is identified as Holsworthy Barracks (including Liverpool Fire Station) located approximately 6km to the south-east of the site. The risk of PFAS impacts on the site is considered very low as the site is up gradient of Georges River and a considerable distance from the PFAS source site;
- The site is not identified as a James Hardie asbestos manufacturing and waste disposal site;
- There were a number of local or state heritage items in the immediate surrounds; and

- There were no significant ecological constraints at the site, however significant ecological constraints were identified in the immediate surrounds.

4.5 Integrity of Site History Information

The majority of the site history information was obtained from government organisations as outlined in the relevant sections of this report. The veracity of the information from these sources is considered to be relatively high. A certain degree of information loss can be expected given the lack of specific land use details over time. JKE have relied upon the Lotsearch report and have not independently verified any information contained within. However, it is noted that the Lotsearch report is generated based on databases maintained by various government agencies and is expected to be reliable.

5 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) and the review of site history information. Reference should also be made to the figures attached in the appendices.

A review of the CSM in relation to source, pathway and receptor (SPR) linkages has been undertaken as part of the Tier 1 risk assessment process, as outlined in Section 10.

5.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 5-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material – The site appears to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and could be contaminated. During the site inspection exposed fill material at the surface of the site were observed to contained inclusions of igneous, sandstone and ironstone gravels and minor inclusions of brick, concrete and glass. Friable asbestos was previously encountered within the fill material at the JKE Stage 2 ESA sampling locations JKE136 and JKE 137.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Historical agricultural use – The site appears to have been used for grazing and market garden purposes and a piggery. This could have resulted in contamination across the site via use of machinery, application of pesticides and building/demolition of various structures. Irrigation pipes made from asbestos cement may also be associated with this AEC.	Heavy metals, TRH, PAHs, OCPs, PCBs and asbestos JKE note that pesticides only became commercially available in the 1940s. Prior to this time pesticides were predominantly heavy metal compounds.
Hazardous Building Material – The EMS HAZMAT report indicated that hazardous building materials including friable and non-friable asbestos are located within the Alex Grimson Building. Additional lead containing paints and PCB containing light capacitors maybe located within the buildings. Potential ACM in the form of fibre cement fragments (sample ref: FCF1 to FCF4) were identified on surface in the north/central section of the site in the adjacent areas around the Alex Grimson Building. The approximate location of the sampled potential ACM are shown in Figure 2.	Asbestos, lead and PCBs

Source / AEC	CoPC
Hazardous building material may be present at the surface or within the fill material as a result of former building and demolition activities at Liverpool Hospital.	
Onsite and Off-site – Fuel storage and mechanical workshops: SafeWork NSW records and the site inspection indicated that stored hazardous chemicals including Ethyl Alcohol Solution, Acetone and Xylene were identified in the northern section of the site (located immediately east of the existing pathology building) and within the site area. SafeWork NSW records indicated that a number of USTs and ASTs were formerly located within the western campus of Liverpool Hospital and off-site. The closest UST and AST locations to the site are shown on Figure 2 and are located approximately 80m to the east of the site. UST 3 was likely removed during the basement excavation of the hospitals clinical services building. The potential UST 3 and existing ASTs 5 locations are down gradient from the site and not considered to be a potential source of off-site migration to the site. A former service station and mechanical workshops have been identified to the south-west, within 175m of the site and up-gradient of the site. Spillage or discharge of stored chemicals from up-gradient sites could have occurred and have the potential to migrate onto the site via groundwater or underground service pipework/tranches which run through the site.	Heavy metals (lead), TRH and BTEX
Offsite - Dry Cleaners and Printers: Former dry cleaning and printing/letterpress businesses were identified between approximately 100m and 411m to the west and up gradient of the site. Spillage or discharge of stored chemicals from up-gradient sites could have occurred and has the potential to migrate onto the site via groundwater or underground services pipework/trenches which run through the site.	TRHs and VOCs, including tetrachloroethene (also known as perchloroethylene - PCE) and the breakdown products trichloroethene (TCE), cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC).

5.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 5-2: CSM

Potential mechanism for contamination	The potential mechanisms for contamination are most likely to include 'top-down' impacts and spills. There is a potential for sub-surface releases to have occurred if deep fill (or other buried industrial infrastructure) is present on or off-site. Impacts to the site could occur via the migration of contaminated groundwater or underground service via pipework/trenching.
Affected media	Soil and groundwater have been identified as potentially affected media. The potential for groundwater impacts is considered to be relatively low, however this requires further assessment. Surface FCF has been identified to contain asbestos.
Receptor identification	Human receptors include site users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users and recreational water users within George River. Ecological receptors include terrestrial organisms and plants within unpaved areas (including the proposed landscaped areas), and freshwater ecology in Georges River.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene, BTEX and VOCs). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary contact and ingestion. Exposure during future site use could occur via direct contact with soil in unpaved areas such as gardens, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings and basements. Exposure to groundwater may to occur in the Georges River through direct migration, as the groundwater has the potential to enter the river via the stormwater system (which is expected to discharge into the river) in a drained basement scenario.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into service trenches, the proposed basement and/or building (either from soil contamination or volatilisation of contaminants from groundwater); • Contact (dermal, ingestion or inhalation) with exposed soils in landscaped areas and/or unpaved areas or during construction and earthworks; and • Migration of groundwater off-site and into nearby water bodies, including aquatic ecosystems and those being used for recreation.
Presence of preferential pathways for contaminant movement	Underground services (e.g. telecommunications, electrical gas, water sewer and stormwater) and the associated trench/trench backfill is considered to be a potential preferential pathway for contaminant migrations. This could occur via groundwater/seepage if present, or via soil/vapour migration through the underground pipework and/ or trench backfill.

6 SAMPLING, ANALYSIS AND QUALITY PLAN

6.1 Data Quality Objectives (DQO)

Data Quality Objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in Section 1.2. The DQOs were prepared with reference to the process outlined in Schedule B2 of NEPM (2013) and the Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[13]. The seven-step DQO approach for this project is outlined in the following sub-sections.

The DQO process is validated in part by the Data Quality Assurance/Quality Control (QA/QC) Evaluation. The Data (QA/QC) Evaluation is summarised in Section 8.1 and the detailed evaluation is provided in the appendices.

6.1.1 Step 1 - State the Problem

The CSM identified potential sources of contamination/AEC at the site that may pose a risk to human health and the environment. Investigation data is required to assess the contamination status of the site, assess the risks posed by the contaminants in the context of the proposed development/intended land use, and assess whether remediation is required. This information will be considered by the consent authority in exercising its planning functions in relation to the development proposal.

An assessment is also required to evaluate the impacts of dryland salinity and ASS on the proposed development.

A waste classification is required prior to off-site disposal of material excavated for the proposed development.

The information gathered by JKE will be considered by the consent authority in exercising its planning functions in relation to the development proposal.

The DQOs were developed by the author of this report and checked by the reviewer. Both the author and reviewer were joint decision-makers in relation to Step 2 of the DQO process.

6.1.2 Step 2 - Identify the Decisions of the Study

The objectives of the assessment are outlined in Section 1.2. The decisions to be made reflect these objectives and are as follows:

- Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?
- Are any results above the SAC?
- Do potential risks associated with contamination exist, and if so, what are they?
- Is remediation required?
- Is an Acid Sulfate Soil Management Plan (ASSMP) required?
- Is a Salinity Management Plan (SMP) required?

[13] NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

- Is the site characterisation sufficient to provide adequate confidence in the above decisions?
- Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

6.1.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing relevant environmental data from previous reports (see Section 2);
- Site information, including site observations and site history documentation;
- Sampling of potentially affected media, including soil and groundwater and fibre cement fragments;
- Observations of sub-surface variables such as soil type, photo-ionisation detector (PID) concentrations, odours and staining, and groundwater physiochemical parameters;
- Laboratory analysis of soils, fibre cement and groundwater for the CoPC identified in the CSM; and
- Field and laboratory QA/QC data.

6.1.4 Step 4 - Define the Study Boundary

The sampling was confined to the site boundaries as shown in Figure 2 and was limited vertically to the dept of each borehole (spatial boundary). The sampling was completed on 26 November 2019, 26 November 2019, 28 November 2019 for sampling locations MW1 to MW15 and 8 August 2019, 9 August 2019, 30 August 2019 for sampling locations JKE129, JKE131 and JKE133 to JKE137 (temporal boundary).

The assessment of potential risk to adjacent land users has been made based on data collected within the site boundary.

Sampling was not undertaken within the existing building footprint or in high traffic flow areas of the site due to access constraints.

6.1.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

6.1.5.1 Tier 1 Screening Criteria

The laboratory data will be assessed against relevant Tier 1 screening criteria (referred to as SAC), as outlined in Section 7. Exceedances of the SAC do not necessarily indicate a requirement for remediation or a risk to human health and/or the environment. Exceedances are considered in the context of the CSM and valid SPR-linkages.

For this assessment, the individual results have been assessed as either above or below the SAC. Statistical evaluation of the dataset via calculation of mean values and/or 95% upper confidence limit (UCL) values has not been undertaken due to the spatial distribution of the data and the number of samples submitted for analysis.

6.1.5.2 Field and Laboratory QA/QC

Field QA/QC included analysis of inter-laboratory duplicates, intra-laboratory duplicates, trip spike, trip blank and rinsate samples. Further details regarding the sampling and analysis undertaken, and the acceptable limits adopted, is provided in the Data Quality (QA/QC) Evaluation in the appendices.

JKE note that the DQO's and Data Quality (QA/QC) associated with previously sampling locations JKE129, JKE131 and JKE133 to JKE137 located in the north-east section of the site was assessed as part of the previous JKE Stage 2 ESA.

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the attached laboratory reports. These criteria were developed and implemented in accordance with the laboratory's National Association of Testing Authorities, Australia (NATA) accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence are reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, JKE typically adopt the most conservative concentration reported (or in some cases, consider the data from the affected sample as an estimate).

6.1.5.3 Appropriateness of Practical Quantitation Limits (PQLs)

The PQLs of the analytical methods are considered in relation to the SAC to confirm that the PQLs are less than the SAC. In cases where the PQLs are greater than the SAC, a discussion of this is provided.

6.1.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. For this assessment, the null hypothesis has been adopted which is that, there is considered to be a complete SPR linkage for the CoPC identified in the CSM unless this linkage can be proven not to (or unlikely to) exist. The null hypothesis has been adopted for this assessment.

6.1.7 Step 7 - Optimise the Design for Obtaining Data

The most resource-effective design will be used in an optimum manner to achieve the assessment objectives. Adjustment of the assessment design can occur following consultation or feedback from project stakeholders. For this investigation, the design was optimised via consideration of the various lines of evidence used to select the sample locations, the media being sampled, and also by the way in which the data were collected.

The sampling plan and methodology are outlined in the following sub-sections.

6.2 Soil Sampling Plan and Methodology

The soil sampling plan and methodology adopted for this assessment is outlined in the table below:

Table 6-1: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	Samples were obtained from 15 locations for the Preliminary Stage 2 ESA. Samples were previously obtained from seven sampling locations for the JKE Stage 2 ESA within the north east section of the site. The total number of sampling locations (22) is shown on the attached Figure 2. This total number of locations did not meet the minimum sampling density for hotspot identification, as outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995)[14] based on a site area of approximately 28,3000m^2. The sampling density did not meet the investigation regime for suspected asbestos as outlined in Table 1 of the Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009)[15] (endorsed in NEPM 2013). Samples for preliminary ASS assessment were obtained from seven sampling locations (MW1, MW2, MW3, MW5, MW8, MW10, MW11 and MW14). Samples for the JKE Stage 2 ESA were obtained from one sampling location (JKE 135) within the north east section of the site. The total number of sampling locations was not designed to meet the requirements outlined in the National Acid Sulfate Soil Guidance: National acid sulfate soils sampling and identification methods manual (2018), based on the site area and type of disturbance. Samples for salinity assessment were obtained from eight sampling locations (MW1, MW2, MW3, MW5, MW8, MW10, MW11, MW14 and JKE135). This sampling density was not designed to meet the initial investigation requirements of two to four locations per hectare recommended in the DLWC 2002.
Sampling Plan	The sampling locations were placed on a judgemental sampling plan and were broadly positioned for site coverage, taking into consideration areas that were not easily accessible due the hospital buildings and public highly accessible areas. This sampling plan was considered suitable to make a preliminary assessment of potential risks associated with the AEC and CoPC identified in the CSM, and assess whether further investigation is warranted.
Set-out and Sampling Equipment	Sampling locations were set out using a hand held GPS unit (with an accuracy of ±2m). In-situ sampling locations were checked for underground services by an external contractor prior to sampling. Samples were collected using either a hand auger or drill rig equipped with spiral flight augers (150mm diameter) from a Standard Penetration Test (SPT) split-spoon sampler, and/or directly from the auger.

[14] NSW EPA, (1995), Contaminated Sites Sampling Design Guidelines. (referred to as EPA Sampling Design Guidelines 1995)

[15] Western Australian (WA) Department of Health (DoH), (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia. (referred to as WA DoH 2009)

Aspect	Input
Sample Collection and Field QA/QC	Soil samples were obtained between 26 and 28 November 2019 in accordance with the standard sampling procedure (SSP) attached in the appendices. Soil samples were collected from the fill and natural profiles based on field observations. The sample depths are shown on the logs attached in the appendices. Samples were placed in glass jars with plastic caps and Teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis. Asbestos related controls were implemented for the field work undertaken on 28 November 2019 in the areas adjacent to the former sampling locations JKE136 and JKE137, due to the previous detection of friable asbestos in the fill soils at these locations. Asbestos control included the set up of dedicated asbestos works area (by the sub-contracted SafeWork NSW licensed asbestos removalist) and asbestos air fibre monitoring. The asbestos air fibre monitoring results were all less than 0.01fibres/mL. The asbestos air fibre monitoring results are attached in the appendices.
Field Screening	A portable Photoionisation Detector (PID) fitted with a 10.6mV lamp was used to screen the samples for the presence of volatile organic compounds (VOCs). PID screening for VOCs was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. PID calibration records are maintained on file by JKE. The field screening for asbestos quantification included the following: • A representative bulk sample was collected from fill at no more than 1m intervals, or from each distinct fill profile. The quantity of material for each sample varied based on whatever return could be achieved using the auger. The bulk sample intervals are shown on the attached borehole logs; • Each sample was weighed using an electronic scale; • Each bulk sample was passed through a sieve with a 7.1mm aperture and inspected for the presence of fibre cement; • The condition of fibre cement or any other suspected asbestos materials was noted on the field records; and • If observed, any fragments of fibre cement in the bulk sample were collected, placed in a zip-lock bag and assigned a unique identifier. Calculations for asbestos content were undertaken based on the requirements outlined in Schedule B1 of NEPM (2013), as summarised in Section 7.1. ASS field tests including pH_F and pH_{FOX} were undertaken on a selection of samples at the laboratory.
Decontamination and Sample Preservation	Sampling personnel used disposable nitrile gloves during sampling activities. Re-usable sampling equipment was decontaminated as outlined in the SSP. Soil samples were preserved by immediate storage in an insulated sample container with ice. On completion of the fieldwork, the samples were stored temporarily in fridges in the JKE warehouse before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

6.3 Groundwater Sampling Plan and Methodology

The groundwater sampling plan and methodology is outlined in the table below:

Table 6-2: Groundwater Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Groundwater monitoring wells were installed in MW1 (MW1), MW2 (MW2) and MW3 (MW3). A groundwater monitoring well was previously installed in JKE135 (MW135) for the JKE Stage 2 ESA. The wells were positioned to gain a snap-shot of the groundwater conditions. Considering the topography and the location of the nearest down-gradient water body, MW1 was considered to be in the up-gradient area of the site and would be expected to provide an indication of groundwater flowing onto (beneath) the site from the west and the north. MW3, MW2 and MW135 were considered to be in the intermediate to down-gradient area of the site and would be expected to provide an indication of groundwater flowing across (beneath) the site and beyond the down-gradient site boundary towards Georges River. Groundwater monitoring well MW135 was also installed at a presumed downgradient location of the identified hazardous good storage area, associated with the loading dock located at the east section of the pathology building.
Monitoring Well Installation Procedure	The monitoring well construction details are documented on the appropriate borehole logs attached in the appendices. The monitoring wells were installed to depths of approximately 6.34mBGL to 12.1mBGL. The wells were generally constructed as follows: • 50mm diameter Class 18 PVC (machine slotted screen) was installed in the lower section of the well to intersect groundwater; • 50mm diameter Class 18 PVC casing was installed in the upper section of the well (screw fixed); • A 2mm sand filter pack was used around the screen section for groundwater infiltration; • A hydrated bentonite seal/plug was used on top of the sand pack to seal the well; and • A gatic cover was installed at the surface with a concrete plug to limit the inflow of surface water.
Monitoring Well Development	The monitoring wells were developed between 26 and 28 November 2019 (MW1, MW2 and MW3). Monitoring well MW135 was developed on 8 August 2019 for the JKE Stage 2 ESA. All monitoring wells were developed using a submersible electrical pump in accordance with the SSP. Due to the hydrogeological conditions, groundwater inflow into the wells was relatively low, therefore the wells were pumped until they were effectively dry. The field monitoring records and calibration data are attached in the appendices.
Groundwater Sampling	The monitoring wells were allowed to recharge for approximately five to seven days (for monitoring wells MW1 to MW3) and approximately three months for monitoring well MW135. Groundwater samples were obtained on 11 December 2019. JKE note that monitoring well MW135 was sampled on 16 August 2019 for the JKE Stage 2 ESA. Prior to sampling, the monitoring wells were checked for the presence of Light Non-Aqueous Phase Liquids (LNAPL) using an inter-phase probe electronic dip meter. The monitoring well head space was checked for VOCs using a calibrated PID unit. The samples were obtained using a peristaltic pump or a disposable plastic bailer. During sampling, the following parameters were monitored using calibrated field instruments (see SSP): • Standing water level (SWL) using an electronic dip meter; and • pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) using a YSI Multi-probe water quality meter.

Aspect	Input
	Steady state conditions were considered to have been achieved when the difference in the pH measurements was less than 0.2 units and the difference in conductivity was less than 10%. Groundwater samples were obtained directly from the single use PVC tubing or from the bailer contents and placed in the sample containers. Duplicate samples were obtained by alternate filling of sample containers. This technique was adopted to minimise disturbance of the samples and loss of volatile contaminants associated with mixing of liquids in secondary containers, etc. Groundwater removed from the wells during development and sampling was transported to JKE in jerry cans and stored in holding drums prior to collection by a licensed waste water contractor for off-site disposal. The field monitoring record and calibration data are attached in the appendices.
Decontaminant and Sample Preservation	The decontamination procedure adopted during sampling is outlined in the SSP attached in the appendices. During development, the pump was flushed between monitoring wells with potable water (single-use tubing was used for each well). The pump tubing was discarded after each sampling event and replaced therefore no decontamination procedure was considered necessary. The samples were preserved with reference to the analytical requirements and placed in an insulated container with ice in accordance with the SSP. On completion of the fieldwork, the samples were temporarily stored in a fridge at the JKE office, before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.

6.4 Analytical Schedule

The analytical schedule (for primary samples) is outlined in the following table:

Table 6-3: Analytical Schedule (Primary Samples) including the previous JKE Stage 2 ESA within the site

Analyte/CoPC	Fill Samples	Natural Soil Samples	Fibre Cement Material Samples	Groundwater Samples
Heavy Metals	36	6	-	4
Chromium VI	1	-	-	-
TRH/BTEX	36	6	-	4
PAHs	36	6	-	4
OCPs/OPPs	35	2	-	-
PCBs	35	2	-	-
Asbestos	35	-	4	-
ASS Field Test	6	24	-	-
ASS Characteristics (Chromium Suite – Acid Base Accounting)	-	8	-	-

Analyte/CoPC	Fill Samples	Natural Soil Samples	Fibre Cement Material Samples	Groundwater Samples
ASS (sPOCAS)	-	2	-	-
CEC	-	13	-	-
pH	-	17	-	4
Electro Conductivity (EC)	-	17	-	4
Resistivity	-	17	-	-
Texture (used to determine EC extract – Ece)	-	17	-	-
Sulphate and Chloride	-	17	-	4
TCLP Metals and/or PAHs	7	-	-	-

6.4.1 Laboratory Analysis

Samples were analysed by an appropriate, NATA Accredited laboratory using the analytical methods detailed in Schedule B(3) of NEPM 2013. Reference should be made to the laboratory reports attached in the appendices for further details. The laboratory reports for the JKE Stage 2 ESA are also attached in the appendices.

Table 6-4: Laboratory Details - Sampling Locations MW1 to MW15

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicates, trip blanks, trip spikes and field rinsate samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	232077, 232077 - A, 232050, 232050 – A, 233029 and 232131
Inter-laboratory duplicates	Envirolab Services Pty Ltd VIC, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	19227, 19227 – A and 19445

Table 6-5: Laboratory Details - Sampling Locations JKE129, JKE131, JKE133 to JKE137 (JKE Stage 2 ESA)

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicates, trip blanks, trip spikes and field rinsate samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	223302, 223661, 223661-A, 224207, 223298, 223787, 223303, 223772, 223772-A and 225210
Inter-laboratory duplicates	Envirolab Services Pty Ltd VIC, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	17672, 17738, 17738-A and 17823

7 SITE ASSESSMENT CRITERIA (SAC)

The SAC were derived from the NEPM 2013 and other guidelines as discussed in the following sub-sections. The guideline values for individual contaminants are presented in the attached report tables and further explanation of the various criteria adopted is provided in the appendices.

7.1 Soil

Soil data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013) as outlined below.

7.1.1 Human Health

- Health Investigation Levels (HILs) for a ‘residential with accessible soils’ exposure scenario (HIL-A) has been adopted as a screening tool. This is most conservative assessment criteria;
- Health Screening Levels (HSLs) for a ‘low-high density residential’ exposure scenario (HSL-A & HSL-B). HSLs were calculated based on conservative assumptions including a ‘sand’ type and a depth interval of 0m to 1m;
- Where exceedances of the HSLs were reported for hydrocarbons (TRH/BTEX and naphthalene), the soil health screening levels for direct contact presented in the CRC Care Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document (2011)[16] were considered; and
- Asbestos was assessed against the ‘residential with accessible soils’ exposure scenario (HSL-A). A summary of the asbestos criteria is provided in the table below:

Table 7-1: Details for Asbestos SAC

Guideline	Applicability
Asbestos in Soil	The HSL-A criteria were adopted for the assessment of asbestos in soil. The SAC adopted for asbestos were derived from the NEPM 2013 and are based on WA DoH (2009) guidance. The SAC included the following: • <0.01% w/w bonded asbestos containing material (ACM) in soil; and • <0.001% w/w asbestos fines/fibrous asbestos (AF/FA) in soil. The NEPM (2013) and WA DoH (2009) also specify that the surface should be free of visible asbestos. Concentrations for bonded ACM concentrations in soil are based on the following equation which is presented in Schedule B1 of NEPM (2013): $\textbf{\% w/w asbestos in soil} = \dfrac{\textbf{\% asbestos content x bonded ACM (kg)}}{\text{Soil volume (L) x soil density (kg/L)}}$ However, we are of the opinion that the actual soil volume in a 10L bucket varies considerably due to the presence of voids, particularly when assessing cohesive soils. Therefore, each bucket sample was weighed using electronic scales and the above equation was adjusted as follows (we note that the units have also converted to grams):

[16] Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC Care), (2011). Technical Report No. 10 - *Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document*

Guideline	Applicability
	% w/w asbestos in soil = $\frac{\textbf{\% asbestos content x bonded ACM (g)}}{\text{Soil weight (g)}}$

7.1.2 Environment (Ecological – terrestrial ecosystems)

- Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for an 'urban residential and public open space' (URPOS) exposure scenario. These have only been applied to the top 2m of soil as outlined in NEPM (2013). The criterion for benzo(a)pyrene has been increased from the value presented in NEPM (2013) based on the Canadian Soil Quality Guidelines[17];
- ESLs were adopted based on the soil type; and
- EILs for selected metals were calculated based on the most conservative added contaminant limit (ACL) values presented in Schedule B(1) of NEPM (2013) and published ambient background concentration (ABC) values presented in the document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)[18] . This method is considered to be adequate for the Tier 1 screening.

7.1.3 Management Limits for Petroleum Hydrocarbons

Management limits for petroleum hydrocarbons (as presented in Schedule B1 of NEPM 2013) were considered (if required) following evaluation of human health and ecological risks, and risks to groundwater.

7.1.4 Waste Classification

Data for the waste classification assessment were assessed in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (2014)[19] as outlined in the following table:

Table 7-2: Waste Categories

Category	Description
General Solid Waste (non-putrescible)	• If Specific Contaminant Concentration (SCC) ≤ Contaminant Threshold (CT1) then Toxicity Characteristics Leaching Procedure (TCLP) not needed to classify the soil as general solid waste; and • If TCLP ≤ TCLP1 and SCC ≤ SCC1 then treat as general solid waste.
Restricted Solid Waste (non-putrescible)	• If SCC ≤ CT2 then TCLP not needed to classify the soil as restricted solid waste; and • If TCLP ≤ TCLP2 and SCC ≤ SCC2 then treat as restricted solid waste.
Hazardous Waste	• If SCC > CT2 then TCLP not needed to classify the soil as hazardous waste; and • If TCLP > TCLP2 and/or SCC > SCC2 then treat as hazardous waste.
Virgin Excavated Natural Material (VENM)	Natural material (such as clay, gravel, sand, soil or rock fines) that meet the following:

[17] Canadian Council of Ministers of the Environment, (1999). *Canadian soil quality guidelines for the protection of environmental and human health: Benzo(a)Pyrene (1997)* (referred to as the Canadian Soil Quality Guidelines)
[18] Olszowy, H., Torr, P., and Imray, P., (1995), *Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4*. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission
[19] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

Category	Description
	• That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

7.1.5 Acid Sulfate Soil

The action criteria presented in the *National Acid Sulfate Soil Guidance: National acid sulfate soils sampling and identification methods manual* (2018) are summarised in the following table:

Table 7-3: ASS Action Criteria Based on Soil Texture and Volume of Material Being Disturbed

Type of material		Net Acidity			
Texture range (NCST 2009)	**Approximate clay content (%)**	**1–1000 t materials disturbed**		**> 1000 t materials disturbed**	
		% S-equiv. (oven-dried basis)	**mol H^+/t (oven-dried basis)**	**% S-equiv. (oven-dried basis)**	**mol H^+/t (oven-dried basis)**
Fine **light medium to heavy clays**	>40	≥0.10	≥62	≥0.03	≥18
Medium **clayey sand to light clays**	5–40	≥0.06	≥36	≥0.03	≥18
Coarse and Peats **sands to loamy sands**	<5	≥0.03	≥18	≥0.03	≥18

The action criteria for coarse textured soils and >1,000t of proposed soil disturbance were adopted for this assessment.

JKE note that the Acid Sulfate Soil Manual (1998)[20] action criteria for 'coarse textured soils' were adopted previously adopted for the JKE Stage 2 ESA for sampling location JKE135.

Table 7-4: ASS Action Criteria

Category	Description	Criteria
Coarse Textured Soils	Sands to loamy sands	• pH - less than 5; • Total Actual Acidity (TAA)/Total Sulfide Acidity (TSA)/ Total Potential Acidity (TPA) (pH5.5) – greater than 18mol H^+/tonne; and • S_{pos} – greater than 0.03% sulfur oxidisable.
Medium Textured Soils	Sandy loams to light clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 36mol H^+/tonne; and • S_{pos} – greater than 0.06% sulfur oxidisable.

[20] Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). *Acid Sulfate Soils Manual* (referred to as ASS Manual 1998)

Category	Description	Criteria
Fine Textured Soils	Medium to heavy clays and silty clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 62mol H^+/tonne; and • S_{pos} – greater than 0.1% sulfur oxidisable.

It is noted that where disturbance of greater than 1,000 tonnes of ASS is proposed, the action criteria for 'coarse textured soils' apply to all soil types.

Background information on ASS and the assessment process is provided in the appendices.

7.2 Groundwater

Groundwater data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013), following an assessment of environmental values in accordance with the Guidelines for the Assessment and Management of Groundwater Contamination (2007)[21]. Environmental values for this assessment include aquatic ecosystems, human uses, and human-health risks in non-use scenarios.

7.2.1 Human Health

- The NEPM (2013) HSLs were not applicable for this project as the proposed basement (as shown in Table K) will either intersect groundwater or groundwater will be located at <2m below the basement floor level . On this basis, JKE have undertaken a site specific assessment (SSA) for the Tier 1 screening of human health risks posed by volatile contaminants in groundwater. The assessment included selection of alternative Tier 1 criteria that were considered suitably protective of human health. These criteria are based on drinking water guidelines and have been referred to as HSL-SSA. The criteria were based on the following (as shown in the attached report tables):
    - Australian Drinking Water Guidelines 2011 (updated 2018)[22] for BTEX compounds and selected VOCs;
    - World Health Organisation (WHO) document titled Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality (2008)[23] for petroleum hydrocarbons;
    - USEPA Region 9 screening levels for naphthalene (threshold value for tap water); and
    - The use of the laboratory PQLs for other contaminants where there were no Australian guidelines.
- The Australian Drinking Water Guidelines 2011 (updated 2018)[24] were multiplied by a factor of 10 to assess potential risks associated with incidental/recreational-type exposure to groundwater (e.g. within down-gradient water bodies, with bore water used for irrigation, or with seepage water in the basement). These have been deemed as 'recreational' SAC.

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[21] NSW Department of Environment and Conservation, (2007). *Guidelines for the Assessment and Management of Groundwater Contamination*

[22] National Health and Medical Research Council (NHMRC), (2018). *National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011* (referred to as ADWG 2011)

[23] World Health Organisation (WHO), (2008). *Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality* (referred to as WHO 2008)

[24] National Health and Medical Research Council (NHMRC), (2018). *National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011* (referred to as ADWG 2011)

7.2.2 Environment (Ecological - aquatic ecosystems)

Groundwater Investigation Levels (GILs) for 95% protection of freshwater species were adopted based on the Default Guideline Values in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018)[25]. The 99% trigger values were adopted where required to account for bioaccumulation. Low and moderate reliability trigger values were also adopted for some contaminants where high-reliability trigger values don't exist.

7.3 Dryland Salinity

7.3.1 Soil pH Salinity and Plant Growth

The electrical conductivity (EC) of a 1:5 soil:water extract is commonly used as an indicator of soil salinity conditions as the reading is directly related to the electrolyte (salt) concentration of the extract. In order to compare the laboratory data with published salinity classes, the results are converted to equivalent saturated paste (ECe) using texture adjustment values presented in DLWC 2002.

The following table provides a summary of plant response with reference to salinity:

Table 7-5: Plant Response to Soil Salinity

ECe (dS/m)	Salinity Class	Plant Response[1]
<2	Non-saline	Salinity effects mostly negligible
2-4	Slightly saline	Yields of very sensitive crops may be affected
4-8	Moderately saline	Yield of many crops affected
8-16	Very saline	Only tolerant crops yield satisfactorily
>16	Highly saline	Only a few very tolerant crops yield satisfactorily

Note:

1 - Plant Response to Salinity Class has been adopted from DLWC 2002

7.3.2 Soil pH and Plant Growth

Soil pH is a measure of the acidity or alkalinity of the soils and values have been assessed as an indicator of soil fertility with respect to plant growth. The optimal pH for plant growth is between 5.5 and 7. Beyond this range, effective revegetation of exposed soil following disturbance is increasingly difficult and the potential for erosion is considered to increase.

Highly alkaline soils are commonly associated with saline and sodic soil conditions and can limit the ability of plants to take up water and nutrients. Highly acidic soils exhibit aluminium toxicity toward plants and can limit the ability of plants to take up other essential nutrients including molybdenum.

[25] Australian and New Zealand Governments (ANZG), (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (referred to as ANZG 2018)

Interpretation of soil pH with respect to plant growth is undertaken using the ratings published in Bruce and Rayment (1982[26]) presented below:

Table 7-6: Plant Response to Soil pH

pH	Rating
<4.5	Extremely acidic
4.5-5.0	Very strongly acidic
5.1-5.5	Strongly acidic
5.6 – 7.3	Optimal plant growth
7.4-7.8	Mildly alkaline
7.9-8.4	Moderately alkaline
8.5-9.0	Strongly alkaline
>9.1	Very strongly alkaline

7.3.3 Cation Exchange Capacity (CEC) in Soil

The ability of soils to attract, retain and exchange cations (positively charged ions) is estimated by the calculated CEC value. CEC represents the major controlling factor in stability of clay soil structure, nutrient availability for plant growth, soil pH and the reaction of the soil to chemical applications (fertilisers, conditioners etc.).

High CEC soils have a greater capacity to retain nutrients, however, deficient soils require greater applications of nutrients to correct imbalances. Low CEC soils have a reduced capacity to retain nutrients and may result in leaching of nutrients from the soil in the event of excess nutrient applications.

Metson (1961[27]) developed a set of ratings for effective CEC and the most abundant cations. These are summarised below (values are in meq/100g):

[26] Bruce, R.C. and Rayment, G.E., (1982). *Analytical Methods and Interpretations used by the Agricultural Chemistry Branch for Soil and Land Use Surveys,* (referred to as Bruce and Rayment 1982)
[27] Metson, A.J, (1961). *Methods of Chemical Analysis for Soil Survey Samples* (referred to as Metson 1961)

Table 7-7: CEC Rating

Rating	eCEC	Exch Na	Exch K	Exch Ca	Exch Mg
Very low	<6	0-0.1	0-0.2	0-2	0-0.3
Low	6-12	0.1-0.3	0.2-0.3	2-5	0.3-1
Moderate	12-25	0.3-0.7	0.3-0.7	5-10	1-3
High	25-40	0.7-2	0.7-2	10-20	3-8
Very high	>40	>2	>2	>20	>8

Note:
CEC – Cation Exchange Capacity, Na – Sodium, K – Potassium, Ca – Calcium, Mg – Magnesium

7.3.4 Exchangeable Sodium Percentage or Sodicity (ESP%)

Exchangeable sodium is an important soil stability and salinity parameter. Excessive exchangeable sodium leads to unstable soils, increased runoff, potential salinity, dispersivity and water logging problems.

Normally the sodium content is expressed as a percentage of the CEC as other cations counteract the negative effects of sodium (known as ESP% and termed sodicity). The effect of the exchangeable sodium (exchangeable sodium percentage, ESP) varies with other soil factors such as the type of clay, the relative quantity of magnesium and the quantity of organic matter. However, Charman & Murphy (2000[28]) indicate that a soil is generally considered sodic if the ESP exceeds 6% and extremely sodic if the ESP exceeds 15%.

7.3.5 Groundwater Salinity

EC values in groundwater are dependent on numerous factors and can vary with changes in temperature and pH conditions. Suttar (1990[29]) has classed water into different types based on EC values as outlined in the table below.

Table 7-8: EC Ranges in Water

Water Type	EC (µS/cm)
Deionised Water	0.5 – 3
Pure Rainwater	<15
Freshwater Rivers	0 – 800
Marginal River Water	800 – 1,600
Brackish Water	1600 – 4,800
Saline Water	>4,800

[28] Charman, P.E.V and Murphy, B.W (eds), (2000).*Soils: Their Management and Properties,* (referred to as Charman and Murphy 2000)
[29] Suttar, S., (1990). *Ribbons of Blue Handbook, Scitech*, Victoria (referred to as Suttar 1990)

Water Type	EC (µS/cm)
Seawater	51,500
Industrial Waters	100 – 10,000

7.4 Recommendations for Durability with Reference to AS2159-2009

In designing for durability, reference should be made to the requirements listed in the AS2159-2009. The exposure classification for concrete and steel piles and foundations is outlined in the following tables.

Table 7-9: Exposure Classification for Concrete Piles

Exposure Conditions				Exposure Classification	
Sulphate (expressed as SO_4)		**pH**	**Chlorides in Groundwater (ppm)**	**Soil Conditions A[1]**	**Soil Conditions B[2]**
In Soil (ppm)	**In Groundwater (ppm)**				
<5,000	<1,000	>5.5	<6,000	Mild	Non-aggressive
5,000-10,000	1,000-3,000	4.5-5.5	6,000-12,000	Moderate	Mild
10,000-20,000	3,000-10,000	4-4.5	12,000-30,000	Severe	Moderate
>20,000	>10,000	<4	>30,000	Very severe	Severe

Notes:

1 - High permeability soils (eg sands and gravels) which are in groundwater

2 – Low permeability soils (eg silts and clays) or all soils above groundwater

Table 7-10: Exposure Classification for Steel Piles

Exposure Conditions				Exposure Classifications	
pH	**Chlorides**		**Resistivity (ohm.cm)**	**Soil Conditions A[1]**	**Soil Conditions B[2]**
	In Soil (ppm)	**In Groundwater (ppm)**			
>5	<5,000	<1,000	>5,000	Non-aggressive	Non-aggressive
4-5	5,000-20,000	1,000-10,000	2,000-5,000	Mild	Non-aggressive
3-4	20,000-50,000	10,000-20,000	1,000-2,000	Moderate	Mild
<3	>50,000	>20,000	<1,000	Severe	Moderate

Notes:

1 - High permeability soils (eg sands and gravels) which are in groundwater

2 – Low permeability soils (eg silts and clays) or all soils above groundwater

8 RESULTS

The results for assessment are presented below, including the results for former JKE sampling locations JKE129, JKE131, JK133 to JKE137 drilled within the north east section of the site for the previous JKE Stage 2 ESA.

8.1 Summary of Data (QA/QC) Evaluation

The data evaluation is presented in the appendices. In summary, JKE are of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

8.2 Subsurface Conditions

A summary of the subsurface conditions encountered during the investigation is presented in the following table. Reference should be made to the borehole logs attached in the appendices for further details.

Table 8-1: Summary of Subsurface Conditions

Profile	Description
Pavement	Asphaltic Concrete (AC) was encountered at the surface in MW1, MW2, JKE129, JKE131, JKE133, JKE135, JKE137 extended to depths of approximately 0.05mBGL to 0.09mBGL.
Fill	Fill was encountered at the surface or beneath the pavement in all boreholes and extended to depths of approximately 1.1m to 2.1mBGL. MW4 to MW15, JKE129, JKE131 and JKE133 were terminated in the fill at a maximum depth of approximately 0.2mBGL to 0.9mBGL. The fill typically comprised silty clay, silty sand, gravelly silty sand, silty sandy clay and silty clayey sand with inclusions of igneous, sandstone, ironstone, siltstone and river gravels, ash, slag, root fibres and building rubble (bricks, concrete and tile fragments). Neither staining nor odours were encountered in the fill material during the fieldwork. Fibre cement fragments (FCF) were not encountered within the fill material during the fieldwork.
Natural Soil	Natural residual silty clay, sandy clay, silty sand and sand were encountered beneath the fill in all boreholes were the fill was able to be penetrated.
Bedrock	Siltstone bedrock (Bringelly Shale) was encountered in MW1, MW2 and MW3 beneath the natural soil and extended to the termination of the boreholes.
Groundwater	Groundwater seepage was encountered in borehole JKE135 during drilling at approximately 7.9mBGL and approximately 8.6m BGL at the completion of drilling on 8 August 2019. Groundwater seepage was not encountered in the remaining boreholes during drilling. All remaining boreholes remained dry on completion of drilling and a short time after. Groundwater was encountered in all of the monitoring wells during monitoring. Further information is provided in Section 8.3.

8.3 Field Screening

A summary of the field screening results are presented in the following table:

Table 8-2: Summary of Field Screening

Aspect	Details
PID Screening of Soil Samples and of Monitoring Well Headspace for VOCs	PID soil sample headspace readings are presented in attached report tables and the COC documents attached in the appendices. The results ranged from 0ppm to 18.1ppm equivalent isobutylene. These results indicate low levels PID detectable VOCs. Select samples with elevated PID readings were analysed for TRH and BTEX. The PID in the monitoring well MW3 headspace was 18.2ppm. The groundwater samples obtained from monitoring well TE4 was analysed for TRH and VOCs (including BTEX).
Bulk Screening for Asbestos	The bulk field screening results are summarised in the attached report tables. All other results were below the SAC.
Field Observations	Stained or odorous soils and potential ACM were not encountered during the subsurface field work. Five potential ACM (fibre cement fragments) were observed on the surface of the site as shown in Figure 2. The potential ACM were forwarded to the laboratory for asbestos analysis.
Groundwater Depth & Flow	Standing Water Levels (SWLs) measured in the monitoring wells installed at the site ranged from 4.0mBGL (MW3) to 8.06mBGL (MW135). Groundwater RLs calculated on these measurements ranged from RL2.81m to RL7.9m. The groundwater RLs indicate that excavation for the proposed basement may intercept groundwater. A contour plot was not prepared for this assessment. However, a contour plot was prepared for the groundwater levels using Surfer v11.0.642 (Surface Mapping Program) for the previous JKE Stage 2 ESA, which incorporated the previous groundwater levels recorded at MW135. The groundwater RLs calculated on these measurements ranged from RL 1.70m to RL 2.99m and indicted that groundwater was likely to flow from the west to the north-east.
Groundwater Field Parameters	Field measurements recorded during sampling were as follows: - pH ranged from 6.59 to 7.12; - EC ranged from 9,309µS/cm to 15,092µS/cm; - Eh ranged from -56.4mV to 62.6mV; and - DO ranged from 0.5ppm to 3.6ppm.
LNAPL petroleum hydrocarbons	Phase separated product (i.e. LNAPL) were not detected using the interphase probe during groundwater sampling.

8.4 Soil Laboratory Results

The soil laboratory results are compared to the relevant SAC in the attached report tables. A summary of the results assessed against the SAC is presented below:

8.4.1 Human Health and Environmental (Ecological) Assessment

Table 8-3: Summary of Soil Laboratory Results – Human Health and Environmental (Ecological)

Analyte	Results Compared to SAC
Heavy Metals	The total chromium results for the fill soils samples of 380mg/kg (MW4 (0.2-0.4m)), 170mg/kg (DUPMP106/ MW4 (0.2-0.4m)), 270mg/kg (DUPMP106: lab replicate/ MW4 (0.2-0.4m)), and 230mg/kg (DUPMP106: lab triplicate/ MW4 (0.2-0.4m)) were above the human health SAC of 100mg/kg. Speciated hexavalent chromium analysis (Cr^{6+}) was undertake on the following samples, MW4 (0.2-0.4m), DUPMP106/ MW4 (0.2-0.4m)) and DUPMP106: lab replicate// MW4 (0.2-0.4m)). The results were below the PQL of 10mg/kg and less than human health SAC. All other heavy metals results were below the human health SAC. The following heavy metal results were above the ecological SAC: • The total chromium results for the fill soil samples of 380mg/kg (MW4 (0.2-0.4m)), (DUPMP106: lab replicate/ MW4 (0.2-0.4m)) and 230mg/kg (DUPMP106: lab triplicate/ MW4 (0.2-0.4m)) were above the ecological SAC of 203mg/kg. Speciated chromium analysis (Cr^{6+}) was undertake on the following samples, MW4 (0.2-0.4m) and DUPMP106: lab replicate/ MW4 (0.2-0.4m)). The results were below the PQL of 10mg/kg and less than ecological SAC; and • The nickel result of 52mg/kg for the fill sample MW5 (0.3-0.4m) was above the ecological SAC of 35mg/kg. All other heavy metals results were below the ecological SAC.
TRH	All TRH results were below the human health SAC. The TRH (F3) results for the fill soils samples of 340mg/kg (MW2 (0.05-0.3m)), 370mg/kg (MW2 (0.05-0.3m): lab replicate), 420mg/kg (MW15 (0-0.2m)) and 550mg/kg (DUPMP103/MW3 (0-0.2m) were above the ecological SAC of 300mg/kg. All of the remaining TRH results were below the ecological SAC.
BTEX	All BTEX results were below the SAC.
PAHs	The Carcinogenic PAHs result of 15mg/kg for the fill sample DUPMP103 (MW3 (0-0.2m)) was above the human health SAC of 3mg/kg. This concentration is greater than 250% of the SAC. All other PAH results were below the SAC.
OCPs and OPPs	All OCP and OPP results were below the SAC.
PCBs	All PCB results were below the SAC.
Asbestos	The calculated AF/FA concentration of 0.0373% w/w (JKE136 (0-0.2m)) and 0.0085% w/w (JKE137 (0.04-0.2m)) were above the SAC of 0.001% w/w. All remaining asbestos soil results were below the SAC. Laboratory analysis confirmed that the FCF samples (FCF1, FCF2, FCF3 and AMF1) obtained from the surface of the site contained asbestos fibres.

Analyte	Results Compared to SAC
	ACM (e.g. fibre cement fragments) were not encountered in the subsurface soils during the bulk screening field works.

8.4.2 Human Health Assessment (Direct Contact and Management Limits)

For completeness, the TRH, BTEX and naphthalene results were compared to the Management Limits (*Residential, Parkland and Public Open Space*) and the Direct Contact criteria (*Residential with Accessible Soil* - also suitably protective of intrusive maintenance workers) for petroleum hydrocarbons (NEPM 2013). The results were below the relevant criteria.

8.4.3 Waste Classification Assessment

The laboratory results were assessed against the criteria presented in Part 1 of the Waste Classification Guidelines, as summarised previously in this report. The results are presented in the report tables attached in the appendices. A summary of the results is presented in the following table:

Table 8-4: Summary of Soil Laboratory Results Compared to CT and SCC Criteria

Analyte	No. of Samples Analysed	No. of Results > CT Criteria	No. of Results > SCC Criteria	Comments
Heavy Metals	51	8	0	Lead concentrations exceeded the CT1 criterion in the fill samples MW1 (0.7-0.9m). The lead concentration was 130mg/kg. Chromium concentrations exceeded the CT1 criterion in the fill sample MW4 (0.2-0.4m) and associated Duplicate sample DUPMP106. The maximum chromium concentration was 380mg/kg. Nickel concentrations exceeded the CT1 criterion in fill samples MW5 (0.3-0.4m), JKE129 (0.09-0.25m), JKE131 (0.07-0.2m), JKE133 (0.08-0.2m) and JKE133 (0.2-0.3m). The maximum nickel concentration was 80mg/kg.
TRH	51	0	0	-
BTEX	51	0	0	-
Total PAHs	51	0	0	-
Benzo(a)pyrene	51	1	0	Benzo(a)pyrene concentrations of 10mg/kg exceeded the CT1 criterion in the fill soil sample DUPMP103 (MW3 (0-0.2m)).
OCPs & OPPs	44	0	0	-
PCBs	44	0	0	-

Analyte	No. of Samples Analysed	No. of Results > CT Criteria	No. of Results > SCC Criteria	Comments
Asbestos	35	-	-	Asbestos was detected in the fill samples JKE136 (0-0.2m) and JKE137 (0.04-0.2m). ACM surface fragments also detected asbestos (AMF1, FCF2, FCF2 and FCF3).

Table 8-5: Summary of Soil Laboratory Results Compared to TCLP Criteria

Analyte	No. of Samples Analysed	No. of Results > TCLP Criteria	Comments
Chromium	1	0	-
Lead	1	0	-
Nickel	5	0	-
Benzo(a)pyrene	1	0	-

8.4.4 Acid Sulfate Soil Assessment

The soil laboratory results were assessed against the action criteria adopted for the assessment. The results are presented in the attached report tables and are summarised below.

Table 8-6: Summary of Results

Analyte	Comments
pH_F and pH_{Fox}	None of the pH_F results were below pH 4 and therefore none of the samples were indicative of actual ASS. The pH_{FOX} results ranged from pH 3.5 to pH 7.7. Selected samples were targeted for further analysis (Scr) where a pH drop was encountered of 1 unit or more, along with a selection of other samples for depth and spatial coverage across the site.
pH_{kcl} and pH_{ox} **(sampling location JKE135 only)**	The pH_{KCl} results for sample JKE135 (1.75-1.95m) exceeded (i.e. were below) the action criterion of pH 5. Following oxidation, the pH_{ox} results for the sample JKE135 (1.7-1.95m) exceeded (i.e. were below) the action criterion of pH 5. The pH of the sample dropped by 0.5 units following oxidation.
Net Acidity	Net acidity results for the silty clay soil samples MW2 (2.8-3.0m) and MW2 (3.0-3.5m) exceeded the action criteria.
Acid Trail **(sampling location JKE135 only)**	The TAA, TPA and TSA results for the samples analysed from borehole JKE135 were below the action criteria of 18mol H^+/tonne.
SCr	All SCr were below the PQL.
Sulfur Trail	The S_{pos}% results for the samples analysed from JKE135 ranged for 0.008% to 0.02% and were below the action criterion of 0.03%.

Analyte	Comments
(sampling location JKE135 only)	
Liming Rate	The liming rate required for neutralisation ranged from below the PQL to 3.4 kg$CaCO_3$/tonne.

8.5 Groundwater Laboratory Results

The groundwater laboratory results are compared to the relevant SAC in the attached report tables. JKE note that the laboratory analysis of the groundwater samples obtained from monitoring well MW3 was unable to be undertaken by the laboratory for some CoPC, due to the high silt content of the samples. A summary of the results assessed against the SAC is presented in the following table:

Table 8-7: Summary of Groundwater Laboratory Results – Human Health and Environmental (Ecological)

Analyte	Results Compared to SAC
Heavy Metals	The following heavy metals results were above the ecological SAC: • The copper results for the groundwater samples of 3µg/L (MW3), 2µg/L (DUPW2/MW135) and 30µg/L (MW135, sampled for the JKE Stage 2 ESA) were above the ecological SAC of 1.4µg/L; and • The zinc results for the groundwater samples of 9µg/L (MW2) and 17µg/L (MW3), 11µg/L (DUPW1/MW1) and 48µg/L (MW135, sampled for the JKE Stage 2 ESA) were above the ecological SAC of 8µg/L; and All of the remaining heavy metals results were below the human health and ecological SAC.
TRH	All TRH results were below the SAC.
BTEX	All BTEX results were below the SAC.
Other VOCs	All VOC results were below the SAC.
PAHs	The benzo(a)pyrene result in the groundwater sample MW3 was 0.4µg/L. The result was greater than the recreational water use SAC of 0.1µg/L. The phenanthrene result in the groundwater sample MW3 was 3.4µg/L. The result was greater than the ecological SAC of 0.6µg/L. The benzo(a)pyrene result in the groundwater sample MW3 was 0.4µg/L. The result was greater than the ecological SAC of 0.1µg/L. All other PAH results were below the human health, recreational water use and ecological SAC.
Other Parameters	The results for pH, EC and hardness are summarised below: • pH ranged from 7.0 to 7.5 and within the acceptable ecological pH range of 6.5-8.5; and • EC ranged from 7,600µS/cm to 23,000µS/cm.

8.6 Salinity Results

8.6.1 Results Summary

A summary of the results is presented below.

Table 8-8: Summary of Laboratory Results

Analyte	Results
EC & ECe	The EC soil results ranged from 42µS/m to 780µS/m. The ECe soil results ranged from less than the laboratory detected limit (PQL) to 6.7dS/m.
Resistivity	Resistivity soil values were calculated based on the raw EC values. The resistivity values for the soil samples ranged from 1,282ohm.cm to 23,810ohm.cm.
pH	The soil results of the analysis ranged from 5.0 to 9.6.
CEC	The soil results of the analysis ranged from 1.2meq/100g to 27meq/100g. ESP values calculated from the CEC results ranged from 0.4% to 34.5%.
Sulphate	The soil results ranged from 10mg/kg to 370mg/kg.
Chloride	The soil results ranged from less than the PQL to 970mg/kg.
Groundwater	The groundwater results ranged from: • pH of 7.0 to 7.5; • EC of 7,600µS/cm to 23,000 µS/cm; • Chloride of 3,100mg/L to 8,500mg/L; and • Sulphate of 380mg/L to 970mg/L.

8.6.2 Results Interpretation

The soil laboratory results are compared to the relevant SAC in the attached report tables. Interpretation of the results against the SAC is provided in the following table.

Table 8-9: Interpretation of Laboratory Results

Parameter	Notes
Soil Salinity and Plant Growth	The ECe results ranged from non-saline to moderately saline. The majority of the results were classed as non to moderately saline.
Soil pH and Plant Growth	The soil pH results ranged from acidic to strongly alkaline. The majority of the soils were generally within the optimum range for plant growth.
CEC in Soil	The CEC values ranged from very low to moderate range which is typical of the soil formation encountered at the site and are generally indicative of the low levels of organic matter within the soils.
ESP%	The ESP% values of the samples ranged from 0.4% to 34.5%. Five samples were classed as highly sodic.

Parameter	Notes
Groundwater Salinity	The laboratory results indicate that the groundwater is saline.
Soil Conditions for Exposure Classification (AS2159-2009)	The boreholes drilled for the investigation have indicated that the subsurface conditions at the site generally comprise of moderately permeable residual soils (i.e. silty clays). Alluvial soils were identified in borehole MW2 (i.e. silty sand). Some of the soil samples were obtained from below the groundwater table. Based on this, the exposure classification outlined under 'Soil Conditions A' has been adopted for the assessment.
Exposure Classification for Concrete Piles/Foundations (AS2159-2009)	The soil pH and sulphate results indicate that the soils are mild to moderately aggressive towards buried concrete. The groundwater pH, sulphate and chloride results indicate that the groundwater is mild to moderately aggressive towards buried concrete.
Exposure Classification for Steel Piles/Foundations (AS2159-2009)	The soil resistivity, pH and chloride results indicate that the soils are non-aggressive to mildly-aggressive towards buried steel. The groundwater pH and chloride results indicate that the groundwater is mildly-aggressive towards buried steel.

9 PRELIMINARY WASTE CLASSIFICATION ASSESSMENT

9.1 Waste Classification of Fill

Based on the results of the assessment, and at the time of reporting, the fill material in the vicinity of sampling locations JKE136 and JKE137 is classified as **General Solid Waste (non-putrescible) containing Special Waste (asbestos)**. Further waste classification is required to assess the extent of asbestos in the areas surrounding sampling locations JKE136 and JKE137. Fill should be disposed of to a facility that is appropriately licensed by the NSW EPA to receive this waste stream.

Based on the results of the assessment, and at the time of reporting, the remainder of the fill material at the site is likely to be classified as **General Solid Waste (non-putrescible)**. However, further waste classification is required once the surface ACM has been removed and the buildings haven been demolished to provide further site coverage.

Fill should be disposed of to a facility that is appropriately licensed by the NSW EPA to receive this waste stream. The facility should be contacted to obtain the required approvals prior to commencement of excavation.

At this stage, the approximate volume of soil required for off-site disposal cannot be confirmed.

9.2 Preliminary Classification of Natural Soil

Based on the scope of work undertaken for this assessment, and at the time of reporting, JKE are of the opinion that the shallow natural at the site meets is likely to meet the definition of **VENM** for off-site disposal or re-use purposes. However, the VENM classification must be confirmed (via, additional sampling and laboratory analysis) following the removal of the overlying fill material.

In accordance with Part 1 of the Waste Classification Guidelines, VENM is pre-classified as general solid waste and can also be disposed of accordingly to a facility that is licensed to accept it. Alternatively, material classified and confirmed as VENM may be considered suitable for re-use on-site (from a contamination viewpoint), or alternatively, may be suitable for beneficial reuse at another site as fill material.

Material classed as VENM must not be mixed with any fill material (including building rubble) as this will invalidate the VENM classification. Where doubt exists about the difference between fill and VENM material a suitably qualified environmental consultant should be contacted to inspect the material and provide further advice.

10 DISCUSSION

10.1 Tier 1 Risk Assessment and Review of CSM

For a contaminant to represent a risk to a receptor, the following three conditions must be present:

1. Source – The presence of a contaminant;
2. Pathway – A mechanism or action by which a receptor can become exposed to the contaminant; and
3. Receptor – The human or ecological entity which may be adversely impacted following exposure to contamination.

If one of the above components is missing, the potential for adverse risks is relatively low.

10.1.1 Surface ACM and Risk to Human Health

Surface ACM were identified in the north and east sections of the site. The ACM sampling locations are shown in Figure 3. The ACM were unable to be broken by hand and therefore considered non-friable by our field staff.

The source of the ACM is likely to be associated with the demolition of former buildings or agricultural sheds in these areas of the site. JKE are of the opinion that the ACM at the site is likely a localised surface issue. However, there remains a potential for further surface ACM to be located within the proposed development area.

Although the ACM were considered non-friable, weathering, vehicle/pedestrian traffic and general mismanagement could have a potential to generate asbestos fibres. Generated asbestos fibres could pose a human health (inhalation) risk to potential site receptors including the public, hospital staff and construction workers. The risk could be managed by the engagement of an asbestos removal contractor to undertake a surface "emu pick" of potential ACM with a visual asbestos clearance undertaken following the removal works. JKE were/are of the opinion that the above should be undertaken over the entire Liverpool Hospital grounds and therefore this recommendation was provided in the previously prepared JKE IAMP.

10.1.2 Soil Contamination

10.1.2.1 AF/FA in Fill and Risk to Human Health

The calculated AF/FA concentration of 0.0373% w/w (JKE136 (0-0.2m)) and 0.0085% w/w (JKE137 (0.04-0.2m)) were above the SAC of 0.001% w/w. These sampling locations are in the north-east section of the site. The sampling locations and contamination data are shown in Figure 3. AF/FA or ACM were not observed during soil sampling and bulk screening field works. AF/FA materials are considered friable.

The source of the AF/FA is likely to be associated with the demolition of former buildings, agricultural sheds in these areas of the site or importation of fill material. Although only small amounts of demolition rubble were encountered in the corresponding fill profiles. There is a potential that the AF/FA could be associated with dust residue from demolition of former buildings in the area or degraded surface ACM.

AF/FA identified in fill soils have the potential to generate air borne asbestos fibres during high winds or other disturbance, including foot traffic and excavation. Potential inhalation of asbestos fibres represents a risk to site receptors including the public, hospital staff, maintenance and construction workers during excavation works.

The friable asbestos in the surficial fill was identified during the JKE Stage 2 ESA. At the time, JKE recommended that interim asbestos management controls be implemented in the area around sampling location JKE136. Asphaltic concrete was located at and surrounding JKE137 and therefore the area was already considered to be isolated. As discussed in Section 2.1.2, interim asbestos related controls were implemented by the SWSLHD including asbestos air fibre monitoring, temporary capping of the exposed soil with builders plastic and the placement of 100mm of clean sand and barricading of the exposed surface soils within the area surrounding sampling location JKE136. Based on the information provided by the SWSLHD (attached in Appendix I), JKE were of the opinion that immediate risk to receptors was low provided that the temporary cap was maintained and the JKE IAMP was implemented.

Permanent asbestos management controls (e.g. permanent capping of off-site disposal of asbestos impacted soils to a licensed landfill) will be required for this area of the site during the proposed new Integrated Service Building development. A Remediation Action Plan (RAP) and Asbestos Management Plan (AMP) will be required for the proposed new Integrated Service Building development to address the asbestos risks to construction workers and on-going use of the site as a hospital.

Based on the results of this assessment, the AF/FA impacts appear to be relatively localised to the sample locations JKE136 and JKE137. However, access to this area was limited and further delineation investigations are required prior to remediation and excavation.

10.1.2.2 Carcinogenic PAHs in Fill and Risk to Human Health

The carcinogenic PAHs result of 15mg/kg for the fill sample DUPMP103 (MW3 (0-0.2m)) was above HIL-A SAC of 3mg/kg and greater than 250% of the SAC. This result is also above the above HIL-C SAC of 3mg/kg for ‘public open space, secondary schools and footpaths’ land use scenarios. The sampling location and carcinogenic PAHs contamination data is shown in Figure 3.

The PAHs are likely to be associated with imported fill material. The corresponding fill profile at sampling location MW3 contained traces of ash, which is a known potential source of PAHs.

The carcinogenic PAHs impacted fill material encountered at sampling location MW3 will likely need to be excavated for the proposed landscaping works in this area. Further delineation investigations are required prior to remediation and excavation to assess the extent of the carcinogenic PAHs impacted fill soil.

A Remediation Action Plan (RAP) will be required for the proposed new Integrated Service Building development to address the carcinogenic PAHs risk to construction workers and on-going use of the site as a hospital.

10.1.2.3 Nickel and TRH (F3) and Risk to Ecological Health

The nickel result of 52mg/kg for the fill sample MW5 (0.3-0.4m) was above the HIL SAC of 35mg/kg. The TRH (F3) results for the fill soils samples of 340mg/kg (MW2 (0.05-0.3m)), 370mg/kg (MW2 (0.05-0.3m): lab replicate), 420mg/kg (MW15 (0-0.2m)) and 550mg/kg (DUPMP103/MW3 (0-0.2m) were above the ecological ESL of 300mg/kg. The sampling locations and ecological contamination data is shown in Figure 4.

The source of the nickel and TRH is likely associated with the importation of fill. Additionally, naturally occurring plant matter can contain mid to heavy fraction TRHs.

JKE are of the opinion that nickel and TRH results above the ecological SAC represent a very low risk to the ecological receptors and remediation is not considered necessary for the following reasons:

- The TRHs are likely to be associated with the existing vegetation rather than a petroleum source;
- The vegetation at the site did not appear to be showing any obvious signs of stress (e.g. die back) and largely appeared healthy and well established. However, it is noted that some of the grass cover was limited, this was generally attributed to the canopy of well-established tree cover and pedestrian foot traffic;
- Sensitive ecological receptors were not identified;
- The proposed new Integrated Services Building development includes covering the majority of the site with hardstand. This will prevent access to the underling fill soils; and
- Elevated concentrations of nickel or TRH were not encountered in the groundwater samples analysed which suggests that the risk of migration of nickel and TRH from the fill soils is unlikely.

10.1.2.4 Chromium in Soil

Elevated concentrations of total chromium were encountered in the fill sample MW4 (0.2-0.4) and its associated duplicates. The maximum total chromium concentration was 380mg/kg. The results indicated that the total chromium concentration was greater than the SAC of 100mg/kg and above 250% of the SAC. However, the SAC is for hexavalent chromium (Chromium VI) and not for total chromium. Additional analysis was undertaken on the sample for hexavalent chromium. The results were below the SAC.

The source of this chromium is most like associated with the fill material as no point source contamination was encountered at this location.

The most conservative criteria of 'residential with accessible soils' exposure scenario (HIL-A) SAC were adopted for the assessment. JKE note that all total chromium and hexavalent chromium results were below the NEPM 2013 'residential with minimal soil access' exposure scenario (HIL-B) criteria.

10.1.3 Groundwater

10.1.3.1 Monitoring Well MW3 and Risk to Human and Ecological Health

The benzo(a)pyrene result in the groundwater sample MW3 was above the recreational water use SAC. The benzo(a)pyrene and phenanthrene results in the groundwater sample MW3 were also above the ecological SAC. The groundwater sampling location MW3 and contamination data is shown in Figure 4.

Although elevated concentrations of carcinogenic PAHs were encountered in the fill soil sample DUPMP103 (primary sample MW3 0-0.2m), leachate analysis (TCLP) demonstrated that the PAHs were not leaching at significant concentrations. Additionally, the underling natural soils did not encounter PAHs at concentrations above the laboratory detection limit.

JKE note that the groundwater sample obtained from groundwater monitoring well MW3 was extremely silty. There is a potential that the silt portion within the sample contained some PAHs which were detected during the laboratory analysis of the groundwater sample.

Due to the silt content of the sample MW3, the laboratory was unable to complete the requested analysis for TRH (NEPM, F1 and F2), BTEX and VOCs. Detectable concentrations of mid to heavy fraction TRHs were reported by the laboratory for the groundwater sample M3. This could also be attributed to the high silt content of the sample.

At this stage, JKE are of the opinion that the detection of PAHs and mid to heavy fraction TRHs in the groundwater sample MW3 is likely to represent a low risk to human and ecological receptors. However, this should be confirmed by the redevelopment and sampling groundwater monitoring well MW3. The additional groundwater samples should be analysed for PAHs, TRH, BTEX and VOCs.

10.1.3.2 Copper, Zinc and Risk to Ecological Health

The copper results for the groundwater samples of MW3 and DUPW2 (MW135) and the zinc results for the groundwater samples of MW2, MW3) and DUPW1 (MW1) were above the ecological SAC. The sampling locations and ecological contamination data is shown in Figure 4.

Elevated concentrations of copper and zinc were not encountered is the soil samples analysed for the assessment. Elevations of heavy metals (particularly copper and zinc) are very common in urban groundwater as a result surface run-off and leaking water infrastructure.

The concentrations of copper and zinc at MW135 appear to have decreased since sampling for the JKE Stage 2 ESA undertaken in August 2019.

JKE are of the opinion that the copper and zinc groundwater elevations are associated with a regional issue. The copper and zinc concentrations do not pose a risk to human health. These concentrations may need to be considered in the event of any dewatering during basement excavation works.

10.2 Acid Sulfate Soils

Some of the results were outside of the ASS Action Criteria. However, these results are considered to be indicative of mildly acidic soils associated with organic/humic material rather than PASS as significant concentrations of oxidisable sulfur (indicated by the low S_{pos}% results) and chromium reducible sulfur (SCr) were not encountered in the samples analysed.

Considering the information reviewed for this assessment (risk maps, subsurface conditions and laboratory results etc.), PASS or ASS conditions and are not likely to be disturbed during the new Integrated Services Building development.

10.3 Salinity

Slightly to moderately saline soils and saline groundwater were identified by the preliminary salinity assessment. The design team must take into account the saline and aggressive conditions identified at the site.

Considering the information reviewed for this assessment (risk maps, subsurface conditions and laboratory results etc.). Saline soils are likely to be disturbed during the proposed new Integrated Services Building development. Therefore, a SMP is considered necessary for the proposed development.

10.4 Decision Statements

The decision statements are addressed below:

> *Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?*

Yes. The AEC are summarised in the CSM in Section 5.

> *Are any results above the SAC?*

Yes. The results of the assessment are summarised in Section 8.

> *Do potential risks associated with contamination exist, and if so, what are they?*

Yes. Surface ACM has been identified. Friable asbestos (AF/FA) has been identified within the fill soils at sampling locations JKE136 and JKE137. Carcinogenic PAHs has been identified in the fill soils at sampling location MW3. Further discussion is presented in Section 10.

> *Is remediation required?*

Yes. A RAP is required for the proposed new Integrated Services Building.

> *Is an Acid Sulfate Soil Management Plan (ASSMP) Required?*

No. See section 10.2.

> *Is a Salinity Management Plan (SMP) Required?*

Yes. See Section 10.3.

Is the site characterisation sufficient to provide adequate confidence in the above decisions?

Yes. However, the data gaps identified in Section 10.5 should be addressed, prior to implementation of the RAP.

Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

The proposed new Integrated Services Building site can be made suitable for the proposed development subject to the preparation and implementation of a RAP.

10.5 Data Gaps

An assessment of data gaps is provided in the following table:

Table 10-1: Data Gap Assessment

Data Gap	Assessment
Soil sampling density below minimum guideline density	Sampling was limited to approximately 58% of the minimum sampling density recommended in the EPA Sampling Design Guidelines 1995. A further 16 sampling location are required to meet the EPA Sampling Design Guidelines 1995 recommended minimum sampling density. The assessment identified fill containing ash, slag, demolition waste, friable asbestos (AF/FA) within the fill soils at sampling locations JKE136 and JKE137 and Carcinogenic PAHs in the fill soils at sampling location MW3. Due to site access constraints associated with the existing hospital buildings associated hospital use, the additional soil assessment will need to be undertaken following the demolition of the existing buildings. The additional 16 sampling locations should be placed in a systematic grid sampling pattern. Additional sampling undertaken to target the fill material beneath the buildings and beneath the hazardous good storage area at the east end of the existing pathology building. This data gap should be further assessed to inform the remedial tasks to be identified in the RAP.
Extent of fill soil AF/FA (friable asbestos) at and adjacent to sampling location JKE136 and JKE137	The vertical and horizontal extent of friable asbestos (AF/FA) within the fill soils at sampling locations JKE136 and JKE137 requires further assessment. This data gap should be further assessed to inform the remedial tasks to be identified in the RAP.
Extent of fill soil Carcinogenic PAHs at Sampling location MW3	The vertical and horizontal extent of Carcinogenic PAHs in the fill soils at sampling location MW3 requires further assessment. This data gap should be further assessed to inform the remedial tasks to be identified in the RAP.
Potential for groundwater contamination in the	Based on the site history and the results reported, the potential for significant groundwater contamination to pose a risk to the receptors is considered to be low.

Data Gap	Assessment
south section of the site (MW3)	However, concentrations of PAHs were encountered in the groundwater samples MW3 above the SAC and mid to heavy fractions TRHs were encountered. As discussed in Section 10.1.3, the groundwater sample obtained from groundwater monitoring well MW3 was extremely silty. JKE recommend that MW3 should be redeveloped and sampled. The additional groundwater samples should be analysed for PAHs, TRH, BTEX and VOCs. This data gap should be further assessed to inform the remedial tasks to be identified in the RAP. Further groundwater investigations may be required following an assessment of the additional groundwater results from MW3.

11 CONCLUSIONS AND RECOMMENDATIONS

The assessment included a review of historical information and sampling from 22 boreholes and four groundwater monitoring wells. The site has historically been used for agricultural purposes in the early 1900's after which the site has been used as a hospital.

JKE consider that the report objectives outlined in Section 1.2 have been addressed. Based on the findings of the assessment, JKE are of the opinion that the site can be made suitable for the proposed new Integrated Services Building development described in Section 1.1 provided that the following is implemented:

- The data gaps identified in Section 10.5 are addressed. This can be done following the demolition of the buildings and prior to commencement of remediation works. The requirements for the data gap investigations works are to be outlined in the RAP;
- A RAP and AMP are prepared;
- A Validation Report is prepared on completion of the remediation works;
- A long-term EMP is prepared at the completion of remediation and validations works, in the event that the capping and containment approached to remediation is adopted; and
- A SMP is prepared and implemented during development works.

11.1 Regulatory Requirements

The regulatory requirements applicable for the development are outlined below:

Table 11-1: Regulatory Requirements

Regulator	Requirements
NSW EPA – Duty to Report	Based on the results, the interim asbestos related controls implemented and the asbestos air fibre monitoring. JKE consider that there is no requirement to notify the NSW EPA under the NSW EPA Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997 (2015)[30]. However, recommendations provided above should be implemented.
SafeWork	Sites with asbestos become a 'workplace' when work is carried out there and require a register and asbestos management plan. Appropriate SafeWork NSW notification will be required for asbestos removal works or handling. Contractors are also required to be appropriately licensed for the asbestos works undertaken (i.e. bonded or friable asbestos works).
Waste Management	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.
Disposal of Groundwater during Dewatering	In the event dewatering is required during excavation works, Council, NSW Water and other relevant approvals (from authorities like NSW EPA, Sydney Water etc.) should be obtained prior to the commencement of dewatering.

[30] NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997* (referred to as Duty to Report Contamination)

12 LIMITATIONS

The report limitations are outlined below:

- JKE accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKE proposal; and terms of contract between JKE and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKE has not undertaken any verification process, except where specifically stated in the report;
- JKE has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKE accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKE have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. JKE should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information About This Report

These notes have been prepared by JKE to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors

This report has been prepared in response to specific project requirements as stated in the JKE proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKE will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by JKE to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions

Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data

Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations

Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals
Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Assessment Report
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely
Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

Appendix A: Report Figures

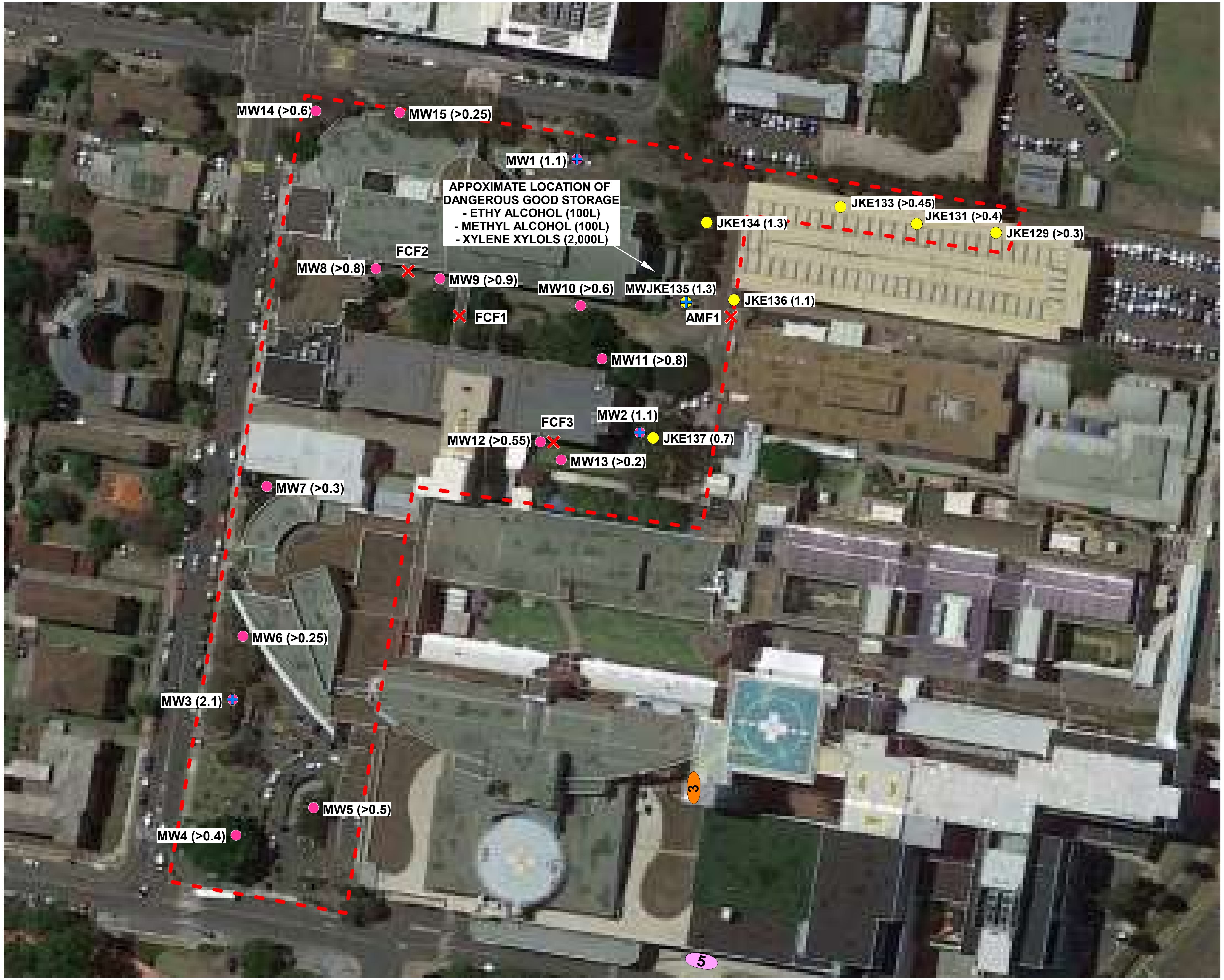
PLOT DATE: 30/01/2020 3:47:59 PM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\32000'S\32837A LIVERPOOL HOSPITAL\CAD\32837A.DWG

0 20 40 60 80 100
SCALE 1:2000 @A4 m

This plan should be read in conjunction with the Environmental report.

Title:	SITE LOCATION PLAN
Location:	MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW
Job No: E32837BD	Figure: 1

JKEnvironments



LEGEND:

(red dashed line)	APPROXIMATE SITE BOUNDARY
MW (0.1)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
MW (0.1)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
JKE (0.1)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
MWJKE (0.1)	RPT4 OCTOBER 2019 BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
FCF1	SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER
AMF1	SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER (JKE Rpt ref: E32465BDrpt4, dated October 2019)
3	APPOXIMATE LOCATION OF UNDERGROUND STORAGE TANK, STATUS UNKNOWN
5	APPOXIMATE LOCATION OF EXISTING ABOVEGROUND STORAGE TANKS, WITHIN A BASEMENT

0 65

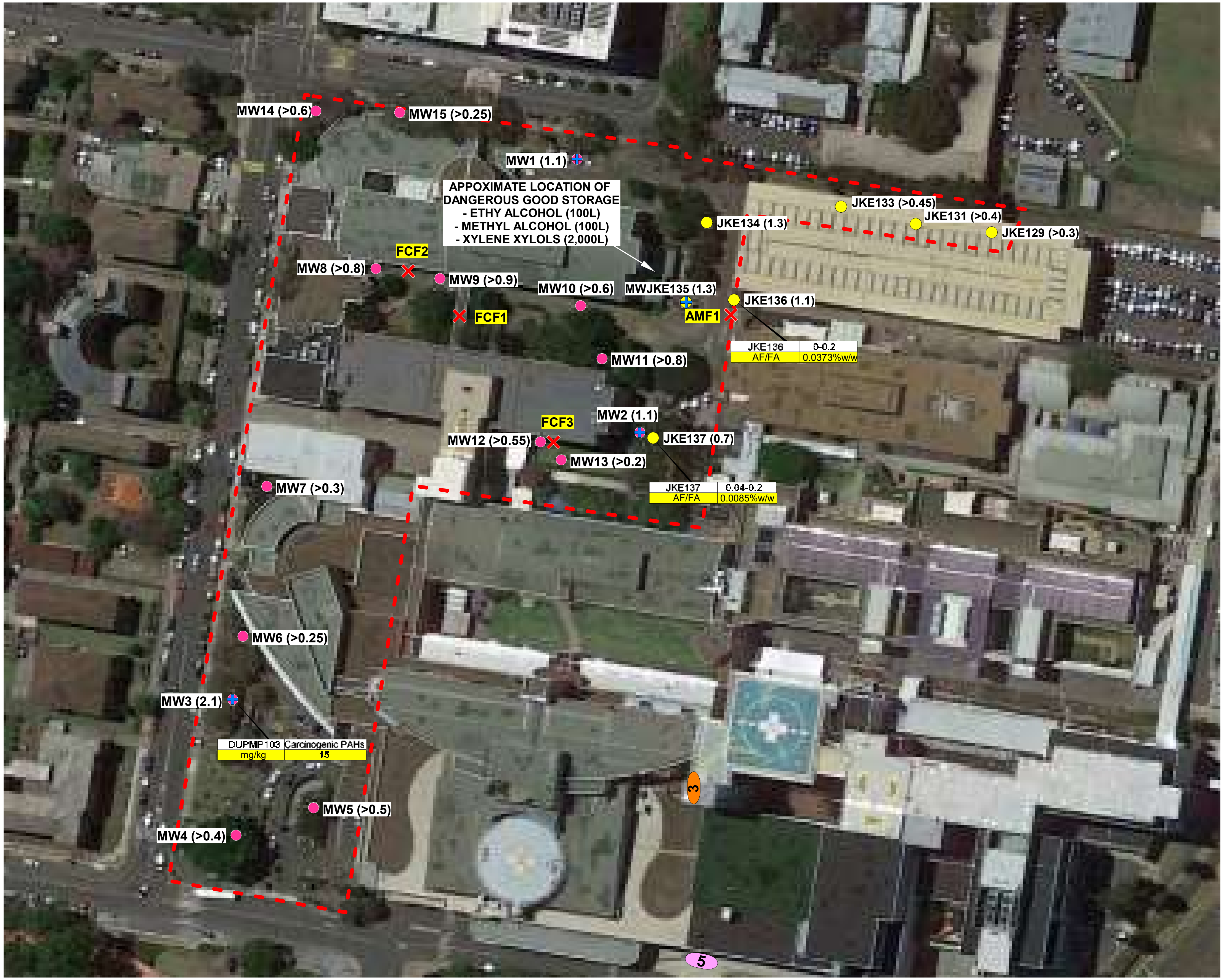
Scale Metres

Notes: Reference should be made to the report text for a full understanding of this plan.

Image Sources: Google Earth and Fitzpatrick and Partners (Project No: 21807, Drawing No: A-EW-0220, dated 9/12/2019)

Title:	**SAMPLE LOCATION PLAN**
Location:	MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW
Project No:	E32837BDrpt
Figure No:	2

JK ENVIRONMENTS



LEGEND:

(red dashed line)	APPROXIMATE SITE BOUNDARY
MW (0.1)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
MW (0.1)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
JKE (0.1)	RPT4 OCTOBER 2019 BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
MWJKE (0.1)	RPT4 OCTOBER 2019 BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
FCF1	SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER
AMF1	SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER (JKE Rpt ref: E32465BDrpt4, dated October 2019)
3	APPOXIMATE LOCATION OF UNDERGROUND STORAGE TANK, STATUS UNKNOWN
5	APPOXIMATE LOCATION OF EXISTING ABOVEGROUND STORAGE TANKS, WITHIN A BASEMENT
(yellow box)	SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK (%W/W or mg/kg)

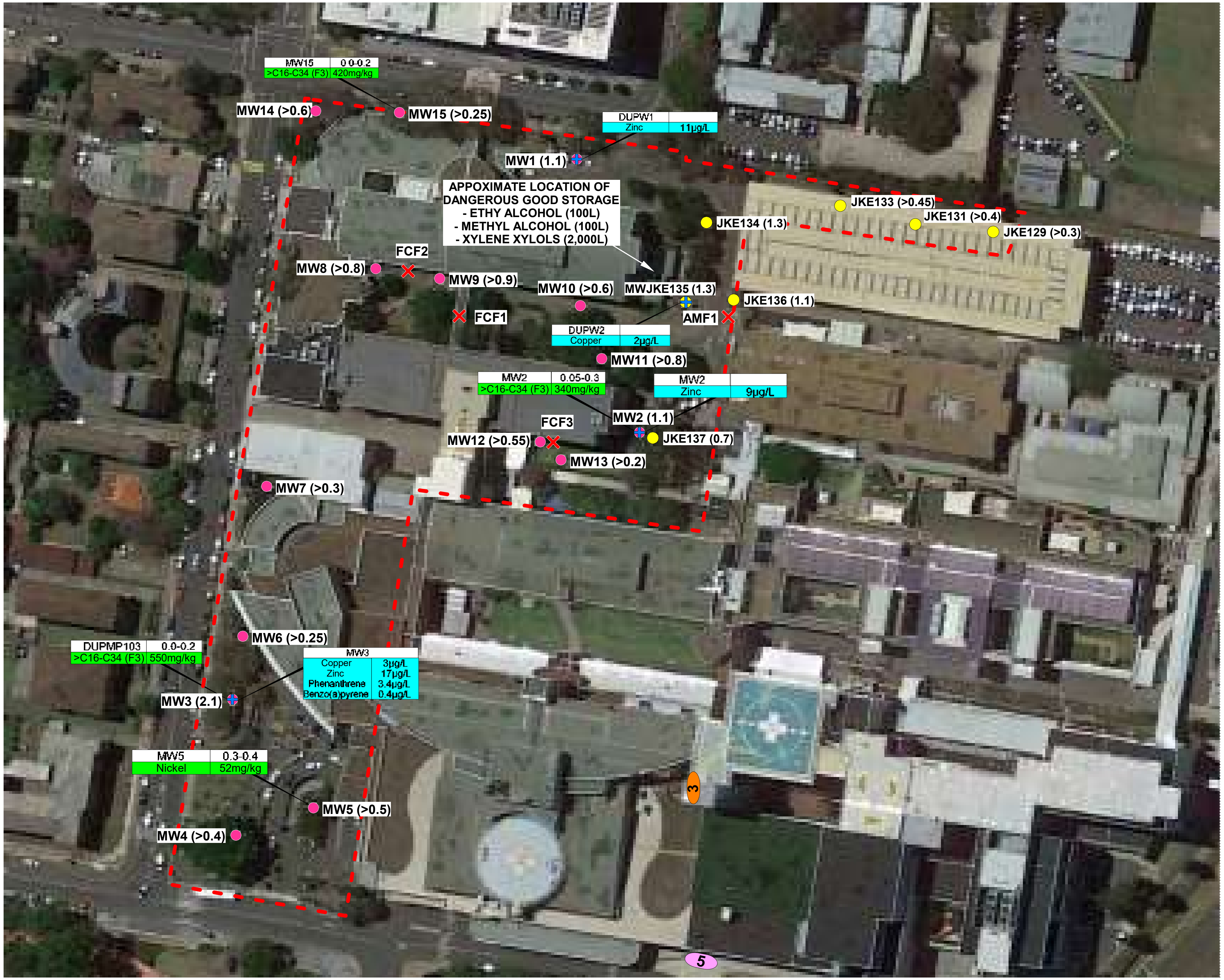
Scale 0 — 65 Metres

Notes: Reference should be made to the report text for a full understanding of this plan.

Image Sources: Google Earth and Fitzpatrick and Partners (Project No: 21807, Drawing No: A-EW-0220, dated 9/12/2019)

Title:	CONTAMINATION DATA PLAN - HUMAN HEALTH
Location:	MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW
Project No:	E32837BDrpt
Figure No:	3

JK ENVIRONMENTS



LEGEND:

	APPROXIMATE SITE BOUNDARY
MW (0.1)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
MW (0.1)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
JKE (0.1)	RPT4 OCTOBER 2019 BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
MWJKE (0.1)	RPT4 OCTOBER 2019 BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
FCF1	SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER
AMF1	SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER (JKE Rpt ref: E32465BDrpt4, dated October 2019)
3	APPOXIMATE LOCATION OF UNDERGROUND STORAGE TANK, STATUS UNKNOWN
5	APPOXIMATE LOCATION OF EXISTING ABOVEGROUND STORAGE TANKS, WITHIN A BASEMENT
	SOIL CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK (mg/kg)
	GROUNDWATER CONTAMINATION ABOVE SAC (µg/L)

Scale 0 – 65 Metres

Notes: Reference should be made to the report text for a full understanding of this plan.

Image Sources: Google Earth and Fitzpatrick and Partners (Project No: 21807, Drawing No: A-EW-0220, dated 9/12/2019)

Title: CONTAMINATION DATA PLAN - ECOLOGICAL

Location: MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW

Project No: E32837BDrpt

Figure No: 4

JK ENVIRONMENTS

Appendix B: Laboratory Results Summary Tables

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC:	Ambient Background Concentration
ACM:	Asbestos Containing Material
ADWG:	AustralianDrinking Water Guidelines
AF:	Asbestos Fines
ANZG	Australian and New Zealand Guidelines
B(a)P:	Benzo(a)pyrene
CEC:	Cation Exchange Capacity
CRC:	Cooperative Research Centre
CT:	Contaminant Threshold
EILs:	Ecological Investigation Levels
ESLs:	Ecological Screening Levels
FA:	Fibrous Asbestos
GIL:	Groundwater Investigation Levels
HILs:	Health Investigation Levels
HSLs:	Health Screening Levels
HSL-SSA:	Health Screening Level-SiteSpecific Assessment
NA:	Not Analysed
NC:	Not Calculated
NEPM:	National Environmental Protection Measure
NHMRC:	National Health and Medical Research Council
NL:	Not Limiting
NSL:	No Set Limit
OCP:	Organochlorine Pesticides
OPP:	Organophosphorus Pesticides
PAHs:	Polycyclic Aromatic Hydrocarbons
ppm:	Parts per million
PCBs:	Polychlorinated Biphenyls
PCE:	Perchloroethylene (Tetrachloroethylene or Teterachloroethene)
pH_{KCL} :	pH of filtered 1:20, 1M KCL extract, shaken overnight
pH_{ox} :	pH of filtered 1:20 1M KCl after peroxide digestion
PQL:	Practical Quantitation Limit
RS:	Rinsate Sample
RSL:	Regional Screening Levels
SAC:	Site Assessment Criteria
SCC:	Specific Contaminant Concentration
S_{Cr}:	Chromium reducible sulfur
S_{POS}:	Peroxide oxidisable Sulfur
SSA:	Site Specific Assessment
SSHSLs:	Site Specific Health Screening Levels
TAA:	Total Actual Acidity in 1M KCL extract titrated to pH6.5
TB:	Trip Blank
TCA:	1,1,1 Trichloroethane (methyl chloroform)
TCE:	Trichloroethylene (Trichloroethene)
TCLP:	Toxicity Characteristics Leaching Procedure
TPA:	Total Potential Acidity, 1M KCL peroxide digest
TS:	Trip Spike
TRH:	Total Recoverable Hydrocarbons
TSA:	Total Sulfide Acidity (TPA-TAA)
UCL:	Upper Level Confidence Limit on Mean Value
USEPA	United States Environmental Protection Ager
VOCC:	Volatile Organic Chlorinated Compounds
WHO:	World Health Organisation

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also refered to as the B(a)P Toxic Equivalence Quotient (TEQ).
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with high traffic have been quoted).

Waste Classification and TCLP Table:

- Data assessed using the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014).
- The assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion.
- Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde.

TABLE A
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.
HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	160	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
MW1	0.05-0.2	Fill: Gravelly silty sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
MW1	0.2-0.4	Fill: Silty sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
MW1	0.5-0.7	Fill: Silty clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
MW1	0.7-0.9	Fill: Silty sandy clay	7	<0.4	17	22	130	0.1	21	140	2.8	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW1	1.5-1.7	Silty clay	13	<0.4	23	16	15	<0.1	5	18	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW2	0.05-0.3	Fill: Silty clay	5	<0.4	19	29	20	<0.1	17	34	0.9	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW2 (replicate)	0.05-0.3	Fill: Silty clay	6	<0.4	15	27	21	<0.1	13	35	0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
MW2	1.5-1.7	Silty clay	<4	<0.4	8	4	7	<0.1	1	2	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW3	0-0.2	Fill: Silty clay	6	<0.4	15	20	29	<0.1	19	39	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW3	1-1.5	Fill: Silty clay	5	<0.4	15	26	39	<0.1	23	44	1.6	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW3	2.1-2.4	Silty clay	6	<0.4	8	8	9	<0.1	2	5	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW3	3.3-3.45	Silty clay	<4	<0.4	4	2	<1	<0.1	<1	1	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW4	0-0.2	Fill: Silty clayey sand	<4	<0.4	12	12	11	<0.1	6	40	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW4	0.2-0.4	Fill: Silty clay	<4	<0.4	380	57	23	<0.1	15	63	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW4	0.2-0.4	Fill: Silty clay	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW5	0-0.2	Fill: Silty sand	<4	<0.4	9	7	7	<0.1	5	20	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW5	0.3-0.4	Fill: Silty sandy clay	<4	<0.4	13	39	21	<0.1	52	48	0.08	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW6	0-0.1	Fill: Silty clayey sand	<4	<0.4	8	6	7	<0.1	4	17	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW6	0.1-0.2	Fill: Silty clay	<4	<0.4	10	11	14	<0.1	11	35	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW7	0-0.1	Fill: Silty sandy clay	7	<0.4	9	14	15	<0.1	3	63	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW8	0-0.2	Fill: Silty sand	<4	<0.4	13	23	21	<0.1	10	66	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW8	0.2-0.4	Fill: Silty clay	6	<0.4	14	12	18	<0.1	7	17	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW8 (replicate)	0.2-0.4	Fill: Silty clay	5	<0.4	11	11	11	<0.1	5	12	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
MW8 (triplicate)	0.2-0.4	Fill: Silty clay	9	<0.4	17	17	15	<0.1	7	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW9	0-0.15	Fill: Silty sandy clay	<4	<0.4	5	10	25	<0.1	3	54	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW9	0.2-0.4	Fill: Silty clay	9	<0.4	10	22	19	<0.1	11	49	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW10	0-0.3	Fill: Silty clayey sand	<4	<0.4	14	18	12	<0.1	14	58	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW11	0-0.2	Fill: Silty clayey sand	<4	<0.4	5	9	5	<0.1	7	17	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW11	0.2-0.6	Fill: Silty clay	9	<0.4	20	13	33	<0.1	11	44	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW12	0-0.1	Fill: Sandy clay	5	<0.4	12	13	30	<0.1	5	74	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW12 (replicate)	0-0.1	Fill: Sandy clay	5	<0.4	13	13	27	<0.1	6	69	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
MW12	0.15-0.3	Fill: Silty clay	5	<0.4	10	23	39	<0.1	10	56	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW13	0-0.1	Fill: Silty sandy clay	8	<0.4	13	16	53	0.1	5	37	1.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW14	0-0.2	Fill: Silty sand	<4	<0.4	22	27	16	<0.1	9	50	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW14	0.45-0.6	Fill: Silty clay	<4	<0.4	15	25	24	<0.1	19	43	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
MW15	0-0.2	Fill: Silty sand	<4	<0.4	15	29	18	<0.1	8	70	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
DUPMP101	-	Fill: Gravelly silty sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP102	-	Fill: Silty sand	5	<0.4	18	27	17	<0.1	8	49	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
DUPMP103	-	Fill: Silty clay	5	<0.4	13	24	17	0.1	19	31	92	15	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	NA
DUPMP103 (replicate)	-	Fill: Silty clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	NA	NA
DUPMP106	-	Fill: Silty clay	NA	NA	170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106	-	Fill: Silty clay	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (replicate)	-	Fill: Silty clay	NA	NA	270	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (replicate)	-	Fill: Silty clay	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (triplicate)	-	Fill: Silty clay	NA	NA	230	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP107	-	Fill: Silty sandy clay	<4	<0.4	5	12	24	<0.1	3	60	0.3	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP109	-	Fill: Silty clay	6	<0.4	11	13	14	0.1	4	15	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FCF1	Surface	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF2	Surface	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF3	Surface	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
Total Number of Samples			36	36	42	36	36	36	36	36	35	35	28	28	28	28	28	28	28	29	28	29
Maximum Value			13	<PQL	380	57	130	0.1	52	140	92	15	<PQL	<PQL	<PQL	<PQL	0.1	<PQL	<PQL	<PQL	<PQL	NC

* Hexavalent Chromium Cr^{6+} laboratry results

Concentration above the SAC **VALUE**

TABLE B
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
MW1	0.7-0.9	Fill: Silty sandy clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0.1
MW1	1.5-1.7	Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	18.1
MW2	0.05-0.3	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW2 (replicate)	0.05-0.3	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW2	1.5-1.7	Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW3	0-0.2	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW3	1-1.5	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW3	2.1-2.4	Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW3	3.3-3.45	Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	3.1
MW4	0-0.2	Fill: Silty clayey sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW4	0.2-0.4	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW5	0-0.2	Fill: Silty sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW5	0.3-0.4	Fill: Silty sandy clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW6	0-0.1	Fill: Silty clayey sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW6	0.1-0.2	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW7	0-0.1	Fill: Silty sandy clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW8	0-0.2	Fill: Silty sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW8	0.2-0.4	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0.1
MW8 (replicate)	0.2-0.4	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0.1
MW9	0-0.15	Fill: Silty sandy clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW9	0.2-0.4	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW10	0-0.3	Fill: Silty clayey sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW11	0-0.2	Fill: Silty clayey sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW11	0.2-0.6	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW12	0-0.1	Fill: Sandy clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW12 (replicate)	0-0.1	Fill: Sandy clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW12	0.15-0.3	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW13	0-0.1	Fill: Silty sandy clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW14	0-0.2	Fill: Silty sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW14	0.45-0.6	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
MW15	0-0.2	Fill: Silty sand	0m to <1m	Sand	<25	65	<0.2	<0.5	<1	<3	<1	0
DUPMP102	-	Fill: Silty sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	-
DUPMP103	-	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
DUPMP107	-	Fill: Silty sandy clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	-
DUPMP109	-	Fill: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
Total Number of Samples					35	35	35	35	35	35	35	31
Maximum Value					<PQL	65	<PQL	<PQL	<PQL	<PQL	<PQL	18.1

Concentration above the SAC **VALUE**

The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

SITE ASSESSMENT CRITERIA

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
MW1	0.7-0.9	Fill: Silty sandy clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW1	1.5-1.7	Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW2	0.05-0.3	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW2 (replicate)	0.05-0.3	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW2	1.5-1.7	Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW3	0-0.2	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW3	1-1.5	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW3	2.1-2.4	Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW3	3.3-3.45	Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW4	0-0.2	Fill: Silty clayey sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW4	0.2-0.4	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW5	0-0.2	Fill: Silty sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW5	0.3-0.4	Fill: Silty sandy clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW6	0-0.1	Fill: Silty clayey sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW6	0.1-0.2	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW7	0-0.1	Fill: Silty sandy clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW8	0-0.2	Fill: Silty sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW8	0.2-0.4	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW8 (replicate)	0.2-0.4	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW9	0-0.15	Fill: Silty sandy clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW9	0.2-0.4	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW10	0-0.3	Fill: Silty clayey sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW11	0-0.2	Fill: Silty clayey sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW11	0.2-0.6	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW12	0-0.1	Fill: Sandy clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW12 (replicate)	0-0.1	Fill: Sandy clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW12	0.15-0.3	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW13	0-0.1	Fill: Silty sandy clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW14	0-0.2	Fill: Silty sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW14	0.45-0.6	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
MW15	0-0.2	Fill: Silty sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
DUPMP102	-	Fill: Silty sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
DUPMP103	-	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
DUPMP107	-	Fill: Silty sandy clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
DUPMP109	-	Fill: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3

TABLE C
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																			
							AGED HEAVY METALS-EILs						EILs		ESLs								
				pH	CEC (cmol$_c$/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2) plus napthalene	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	1	0.1	25	50	100	100	0.2	0.5	1	1	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
MW1	0.7-0.9	Fill: Silty sandy clay	Coarse	NA	NA	NA	7	17	22	130	21	140	<1	NA	<25	<50	160	160	<0.2	<0.5	<1	<3	0.2
MW1	1.5-1.7	Silty clay	Coarse	NA	NA	NA	13	23	16	15	5	18	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW2	0.05-0.3	Fill: Silty clay	Coarse	NA	NA	NA	5	19	29	20	17	34	<1	<0.1	<25	<50	340	400	<0.2	<0.5	<1	<3	0.1
MW2 (replicate)	0.05-0.3	Fill: Silty clay	Coarse	NA	NA	NA	6	15	27	21	13	35	<1	<0.1	<25	<50	370	410	<0.2	<0.5	<1	<3	0.08
MW2	1.5-1.7	Silty clay	Coarse	NA	NA	NA	<4	8	4	7	1	2	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW3	0-0.2	Fill: Silty clay	Coarse	NA	NA	NA	6	15	20	29	19	39	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.06
MW3	1-1.5	Fill: Silty clay	Coarse	NA	NA	NA	5	15	26	39	23	44	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.2
MW3	2.1-2.4	Silty clay	Coarse	NA	NA	NA	6	8	8	9	2	5	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW3	3.3-3.45	Silty clay	Coarse	NA	NA	NA	<4	4	2	<1	<1	1	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW4	0-0.2	Fill: Silty clayey sand	Coarse	NA	NA	NA	<4	12	12	11	6	40	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW4	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	<4	380	57	23	15	63	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW4	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW5	0-0.2	Fill: Silty sand	Coarse	NA	NA	NA	<4	9	7	7	5	20	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW5	0.3-0.4	Fill: Silty sandy clay	Coarse	NA	NA	NA	<4	13	39	21	52	48	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.08
MW6	0-0.1	Fill: Silty clayey sand	Coarse	NA	NA	NA	<4	8	6	7	4	17	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW6	0.1-0.2	Fill: Silty clay	Coarse	NA	NA	NA	<4	10	11	14	11	35	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW7	0-0.1	Fill: Silty sandy clay	Coarse	NA	NA	NA	7	9	14	15	3	63	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW8	0-0.2	Fill: Silty sand	Coarse	NA	NA	NA	<4	13	23	21	10	66	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW8	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	6	14	12	18	7	17	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW8 (replicate)	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	5	11	11	11	5	12	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW8 (triplicate)	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	9	17	17	15	7	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW9	0-0.15	Fill: Silty sandy clay	Coarse	NA	NA	NA	<4	5	10	25	3	54	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.1
MW9	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	9	10	22	19	11	49	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW10	0-0.3	Fill: Silty clayey sand	Coarse	NA	NA	NA	<4	14	18	12	14	58	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW11	0-0.2	Fill: Silty clayey sand	Coarse	NA	NA	NA	<4	5	9	5	7	17	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW11	0.2-0.6	Fill: Silty clay	Coarse	NA	NA	NA	9	20	13	33	11	44	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.08
MW12	0-0.1	Fill: Sandy clay	Coarse	NA	NA	NA	5	12	13	30	5	74	<1	<0.1	<25	<50	270	230	<0.2	<0.5	<1	<3	<0.05
MW12 (replicate)	0-0.1	Fill: Sandy clay	Coarse	NA	NA	NA	5	13	13	27	6	69	<1	<0.1	<25	<50	130	110	<0.2	<0.5	<1	<3	<0.05
MW12	0.15-0.3	Fill: Silty clay	Coarse	NA	NA	NA	5	10	23	39	10	56	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW13	0-0.1	Fill: Silty sandy clay	Coarse	NA	NA	NA	8	13	16	53	5	37	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.2
MW14	0-0.2	Fill: Silty sand	Coarse	NA	NA	NA	<4	22	27	16	9	50	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW14	0.45-0.6	Fill: Silty clay	Coarse	NA	NA	NA	<4	15	25	24	19	43	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
MW15	0-0.2	Fill: Silty sand	Coarse	NA	NA	NA	<4	15	29	18	8	70	<1	<0.1	<25	65	420	190	<0.2	<0.5	<1	<3	<0.05
DUPMP101	-	Fill: Gravelly silty sand	Coarse	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP102	-	Fill: Silty sand	Coarse	NA	NA	NA	5	18	27	17	8	49	<1	<0.1	<25	<50	240	140	<0.2	<0.5	<1	<3	<0.05
DUPMP103	-	Fill: Silty clay	Coarse	NA	NA	NA	5	13	24	17	19	31	<1	<0.1	<25	<50	550	110	<0.2	<0.5	<1	<1	10
DUPMP106	-	Fill: Silty clay	Coarse	NA	NA	NA	NA	170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106	-	Fill: Silty clay	Coarse	NA	NA	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (replicate)	-	Fill: Silty clay	Coarse	NA	NA	NA	NA	270	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (replicate)	-	Fill: Silty clay	Coarse	NA	NA	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (triplicate)	-	Fill: Silty clay	Coarse	NA	NA	NA	NA	230	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP107	-	Fill: Silty sandy clay	Coarse	NA	NA	NA	<4	5	12	24	3	60	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.06
DUPMP109	-	Fill: Silty clay	Coarse	NA	NA	NA	6	11	13	14	4	15	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
Total Number of Samples							36	42	36	36	36	36	35	28	35	35	35	35	35	35	35	35	35
Maximum Value							13	380	57	130	52	140	<PQL	<PQL	<PQL	65	550	410	<PQL	<PQL	<PQL	<PQL	10

* Hexavalent Chromium Cr^{6+} laboratry results
Concentration above the SAC — **Value**

The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

				pH	CEC (cmol$_c$/kg)	Clay Content (% clay)	AGED HEAVY METALS-EILs						EILs		ESLs								
							Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2) plus	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	1	0.1	25	50	100	100	0.2	0.5	1	1	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
MW1	0.7-0.9	Fill: Silty sandy clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	300	2800	50	85	70	105	20
MW1	1.5-1.7	Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	300	2800	50	85	70	105	20
MW2	0.05-0.3	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW2 (replicate)	0.05-0.3	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW2	1.5-1.7	Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	300	2800	50	85	70	105	20
MW3	0-0.2	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW3	1-1.5	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW3	2.1-2.4	Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	300	2800	50	85	70	105	20
MW3	3.3-3.45	Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	300	2800	50	85	70	105	20
MW4	0-0.2	Fill: Silty clayey sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW4	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW4	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	--	203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW5	0-0.2	Fill: Silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW5	0.3-0.4	Fill: Silty sandy clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW6	0-0.1	Fill: Silty clayey sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW6	0.1-0.2	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW7	0-0.1	Fill: Silty sandy clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW8	0-0.2	Fill: Silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW8	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW8 (replicate)	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW8 (triplicate)	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	--	--	--	--	--	--	--	--	--	--
MW9	0-0.15	Fill: Silty sandy clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW9	0.2-0.4	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW10	0-0.3	Fill: Silty clayey sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW11	0-0.2	Fill: Silty clayey sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW11	0.2-0.6	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW12	0-0.1	Fill: Sandy clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW12 (replicate)	0-0.1	Fill: Sandy clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW12	0.15-0.3	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW13	0-0.1	Fill: Silty sandy clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW14	0-0.2	Fill: Silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW14	0.45-0.6	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
MW15	0-0.2	Fill: Silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
DUPMP101	-	Fill: Gravelly silty sand	Coarse	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DUPMP102	-	Fill: Silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
DUPMP103	-	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
DUPMP106	-	Fill: Silty clay	Coarse	NA	NA	NA	--	203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DUPMP106	-	Fill: Silty clay	Coarse	NA	NA	NA	--	203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DUPMP106 (replicate)	-	Fill: Silty clay	Coarse	NA	NA	NA	--	203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DUPMP106 (replicate)	-	Fill: Silty clay	Coarse	NA	NA	NA	--	203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DUPMP106 (triplicate)	-	Fill: Silty clay	Coarse	NA	NA	NA	--	203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DUPMP107	-	Fill: Silty sandy clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	300	2800	50	85	70	105	20
DUPMP109	-	Fill: Silty clay	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	300	2800	50	85	70	105	20

TABLE D

SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES

All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful	Total Scheduled		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	50	0.2	0.5	1	1	100
General Solid Waste CT1			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	<50	<50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	<50	<50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	<50	<50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	<50	<50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
MW1	0.05-0.2	Fill: Gravelly silty sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
MW1	0.2-0.4	Fill: Silty sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
MW1	0.5-0.7	Fill: Silty clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
MW1	0.7-0.9	Fill: Silty sandy clay	7	<0.4	17	22	**130**	0.1	21	140	2.8	0.2	NA	NA	NA	NA	NA	<25	<50	<100	130	130	<0.2	<0.5	<1	<3	NA
MW1	1.5-1.7	Silty clay	13	<0.4	23	16	15	<0.1	5	18	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
MW2	0.05-0.3	Fill: Silty clay	5	<0.4	19	29	20	<0.1	17	34	0.9	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	140	320	460	<0.2	<0.5	<1	<3	Not Detected
MW2 (replicate)	0.05-0.3	Fill: Silty clay	6	<0.4	15	27	21	<0.1	13	35	0.5	0.08	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	160	310	470	<0.2	<0.5	<1	<3	NA
MW2	1.5-1.7	Silty clay	<4	<0.4	8	4	7	<0.1	1	2	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
MW3	0-0.2	Fill: Silty clay	6	<0.4	15	20	29	<0.1	19	39	0.3	0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW3	1-1.5	Fill: Silty clay	5	<0.4	15	26	39	<0.1	23	44	1.6	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW3	2.1-2.4	Silty clay	6	<0.4	8	8	9	<0.1	2	5	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
MW3	3.3-3.45	Silty clay	<4	<0.4	4	2	<1	<0.1	<1	1	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
MW3	4-4.3	Silty clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW4	0-0.2	Fill: Silty clayey sand	<4	<0.4	12	12	11	<0.1	6	40	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	140	140	<0.2	<0.5	<1	<3	Not Detected
MW4	0.2-0.4	Fill: Silty clay	<4	<0.4	**380**	57	23	<0.1	15	63	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW4	0.2-0.4	Fill: Silty clay	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW5	0-0.2	Fill: Silty sand	<4	<0.4	9	7	7	<0.1	5	20	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW5	0.3-0.4	Fill: Silty sandy clay	<4	<0.4	13	39	21	<0.1	**52**	48	0.08	0.08	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW6	0-0.1	Fill: Silty clayey sand	<4	<0.4	8	6	7	<0.1	4	17	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW6	0.1-0.2	Fill: Silty clay	<4	<0.4	10	11	14	<0.1	11	35	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW7	0-0.1	Fill: Silty sandy clay	7	<0.4	9	14	15	<0.1	3	63	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW8	0-0.2	Fill: Silty sand	<4	<0.4	13	23	21	<0.1	10	66	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW8	0.2-0.4	Fill: Silty clay	6	<0.4	14	12	18	<0.1	7	17	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW8 (replicate)	0.2-0.4	Fill: Silty clay	5	<0.4	11	11	11	<0.1	5	12	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
MW8 (triplicate)	0.2-0.4	Fill: Silty clay	9	<0.4	17	17	15	<0.1	7	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW9	0-0.15	Fill: Silty sandy clay	<4	<0.4	5	10	25	<0.1	3	54	0.3	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW9	0.2-0.4	Fill: Silty clay	9	<0.4	10	22	19	<0.1	11	49	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW10	0-0.3	Fill: Silty clayey sand	<4	<0.4	14	18	12	<0.1	14	58	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW11	0-0.2	Fill: Silty clayey sand	<4	<0.4	5	9	5	<0.1	7	17	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW11	0.2-0.6	Fill: Silty clay	9	<0.4	20	13	33	<0.1	11	44	0.3	0.08	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW12	0-0.1	Fill: Sandy clay	5	<0.4	12	13	30	<0.1	5	74	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	120	220	340	<0.2	<0.5	<1	<3	Not Detected
MW12 (replicate)	0-0.1	Fill: Sandy clay	5	<0.4	13	13	27	<0.1	6	69	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	100	100	<0.2	<0.5	<1	<3	NA
MW12	0.15-0.3	Fill: Silty clay	5	<0.4	10	23	39	<0.1	10	56	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW12	0.5-0.55	Fill: Sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW13	0-0.1	Fill: Silty sandy clay	8	<0.4	13	16	53	0.1	5	37	1.5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW14	0-0.2	Fill: Silty sand	<4	<0.4	22	27	16	<0.1	9	50	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW14	0.45-0.6	Fill: Silty clay	<4	<0.4	15	25	24	<0.1	19	43	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
MW15	0-0.2	Fill: Silty sand	<4	<0.4	15	29	18	<0.1	8	70	0.3	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	260	250	510	<0.2	<0.5	<1	<3	Not Detected
DUPMP101	-	Fill: Gravelly silty sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP102	-	Fill: Silty sand	5	<0.4	18	27	17	<0.1	8	49	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	130	150	280	<0.2	<0.5	<1	<3	NA
DUPMP103	-	Fill: Silty clay	5	<0.4	13	24	17	0.1	19	31	92	**10**	<0.1	<0.1	<0.1	0.3	<0.1	<25	<50	380	260	640	<0.2	<0.5	<1	<1	NA
DUPMP103 (replicate)	-	Fill: Silty clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	<0.1	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP104	-	Fill: Silty sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP105	-	Fill: Silty clayey sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106	-	Fill: Silty clay	NA	NA	**170**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106	-	Fill: Silty clay	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (replicate)	-	Fill: Silty clay	NA	NA	**270**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (replicate)	-	Fill: Silty clay	NA	NA	<10*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP106 (triplicate)	-	Fill: Silty clay	NA	NA	**230**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP107	-	Fill: Silty sandy clay	<4	<0.4	5	12	24	<0.1	3	60	0.3	0.06	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
DUPMP108	-	Fill: Silty clay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DUPMP109	-	Fill: Silty clay	6	<0.4	11	13	14	0.1	4	15	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
FCF1	Surface	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF2	Surface	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
FCF3	Surface	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
Total Number of samples			36	36	42	36	36	36	36	36	35	35	28	29	29	29	28	35	35	35	35	35	35	35	35	35	29
Maximum Value			13	<PQL	380	57	130	0.1	52	140	92	10	<PQL	<PQL	<PQL	0.3	<PQL	<PQL	<PQL	380	320	640	<PQL	<PQL	<PQL	<PQL	NC

*** Hexavalent Chromium Cr6+ laboratry results**

Concentration above the CT1	VALUE
Concentration above SCC1	VALUE
Concentration above the SCC2	VALUE

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TABLE E
SOIL LABORATORY TCLP RESULTS
All data in mg/L unless stated otherwise

			Chromium	Lead	Nickel	B(a)P
PQL - Envirolab Services			0.01	0.03	0.02	0.001
TCLP1 - General Solid Waste			5	5	2	0.04
TCLP2 - Restricted Solid Waste			20	20	8	0.16
TCLP3 - Hazardous Waste			>20	>20	>8	>0.16
Sample Reference	**Sample Depth**	**Sample Description**				
MW1	0.7-0.9	Fill: Silty clay	NA	0.97	NA	NA
MW4	0.2-0.4	Fill: Silty clay	<0.01	NA	NA	NA
MW5	0.3-0.4	Fill: Silty sandy clay	NA	NA	0.04	NA
DUPMP103	-	Fill: Silty clay	NA	NA	NA	<0.001
Total Number of samples			1	1	1	1
Maximum Value			<PQL	0.97	0.04	<PQL

General Solid Waste	**VALUE**
Restricted Solid Waste	**VALUE**
Hazardous Waste	**VALUE**

TABLE F
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
All data in mg/kg unless stated otherwise

			C_6-C_{10} (F1) plus BTEX	>C_{10}-C_{16} (F2) plus napthalene	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			**RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE**			
Sample Reference	**Sample Depth**	**Soil Texture**				
MW1	0.7-0.9	Coarse	<25	<50	160	160
MW1	1.5-1.7	Coarse	<25	<50	<100	<100
MW2	0.05-0.3	Coarse	<25	<50	340	400
MW2 (replicate)	0.05-0.3	Coarse	<25	<50	370	410
MW2	1.5-1.7	Coarse	<25	<50	<100	<100
MW3	0-0.2	Coarse	<25	<50	<100	<100
MW3	1-1.5	Coarse	<25	<50	<100	<100
MW3	2.1-2.4	Coarse	<25	<50	<100	<100
MW3	3.3-3.45	Coarse	<25	<50	<100	<100
MW4	0-0.2	Coarse	<25	<50	<100	<100
MW4	0.2-0.4	Coarse	<25	<50	<100	<100
MW5	0-0.2	Coarse	<25	<50	<100	<100
MW5	0.3-0.4	Coarse	<25	<50	<100	<100
MW6	0-0.1	Coarse	<25	<50	<100	<100
MW6	0.1-0.2	Coarse	<25	<50	<100	<100
MW7	0-0.1	Coarse	<25	<50	<100	<100
MW8	0-0.2	Coarse	<25	<50	<100	<100
MW8	0.2-0.4	Coarse	<25	<50	<100	<100
MW8 (replicate)	0.2-0.4	Coarse	<25	<50	<100	<100
MW9	0-0.15	Coarse	<25	<50	<100	<100
MW9	0.2-0.4	Coarse	<25	<50	<100	<100
MW10	0-0.3	Coarse	<25	<50	<100	<100
MW11	0-0.2	Coarse	<25	<50	<100	<100
MW11	0.2-0.6	Coarse	<25	<50	<100	<100
MW12	0-0.1	Coarse	<25	<50	270	230
MW12 (replicate)	0-0.1	Coarse	<25	<50	130	110
MW12	0.15-0.3	Coarse	<25	<50	<100	<100
MW13	0-0.1	Coarse	<25	<50	<100	<100
MW14	0-0.2	Coarse	<25	<50	<100	<100
MW14	0.45-0.6	Coarse	<25	<50	<100	<100
MW15	0-0.2	Coarse	<25	65	420	190
DUPMP102	-	Coarse	<25	<50	240	140
DUPMP103	-	Coarse	<25	<50	550	110
DUPMP107	-	Coarse	<25	<50	<100	<100
DUPMP109	-	Coarse	<25	<50	<100	<100
Total Number of Samples			35	35	35	35
Maximum Value			<PQL	65	550	410

Concentration above the SAC **VALUE**

MANAGEMENT LIMIT ASSESSMENT CRITERIA

			C_6-C_{10} (F1) plus BTEX	>C_{10}-C_{16} (F2) plus napthalene	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			**RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE**			
Sample Reference	**Sample Depth**	**Soil Texture**				
MW1	0.7-0.9	Coarse	700	1000	2500	10000
MW1	1.5-1.7	Coarse	700	1000	2500	10000
MW2	0.05-0.3	Coarse	700	1000	2500	10000
MW2 (replicate)	0.05-0.3	Coarse	700	1000	2500	10000
MW2	1.5-1.7	Coarse	700	1000	2500	10000
MW3	0-0.2	Coarse	700	1000	2500	10000
MW3	1-1.5	Coarse	700	1000	2500	10000
MW3	2.1-2.4	Coarse	700	1000	2500	10000
MW3	3.3-3.45	Coarse	700	1000	2500	10000
MW4	0-0.2	Coarse	700	1000	2500	10000
MW4	0.2-0.4	Coarse	700	1000	2500	10000
MW5	0-0.2	Coarse	700	1000	2500	10000
MW5	0.3-0.4	Coarse	700	1000	2500	10000
MW6	0-0.1	Coarse	700	1000	2500	10000
MW6	0.1-0.2	Coarse	700	1000	2500	10000
MW7	0-0.1	Coarse	700	1000	2500	10000
MW8	0-0.2	Coarse	700	1000	2500	10000
MW8	0.2-0.4	Coarse	700	1000	2500	10000
MW8 (replicate)	0.2-0.4	Coarse	700	1000	2500	10000
MW9	0-0.15	Coarse	700	1000	2500	10000
MW9	0.2-0.4	Coarse	700	1000	2500	10000
MW10	0-0.3	Coarse	700	1000	2500	10000
MW11	0-0.2	Coarse	700	1000	2500	10000
MW11	0.2-0.6	Coarse	700	1000	2500	10000
MW12	0-0.1	Coarse	700	1000	2500	10000
MW12 (replicate)	0-0.1	Coarse	700	1000	2500	10000
MW12	0.15-0.3	Coarse	700	1000	2500	10000
MW13	0-0.1	Coarse	700	1000	2500	10000
MW14	0-0.2	Coarse	700	1000	2500	10000
MW14	0.45-0.6	Coarse	700	1000	2500	10000
MW15	0-0.2	Coarse	700	1000	2500	10000
DUPMP102	-	Coarse	700	1000	2500	10000
DUPMP103	-	Coarse	700	1000	2500	10000
DUPMP107	-	Coarse	700	1000	2500	10000
DUPMP109	-	Coarse	700	1000	2500	10000

TABLE G
SOIL LABORATORY RESULTS COMPARED T0 DIRECT CONTACT CRITERIA
All data in mg/kg unless stated otherwise

Analyte		C_6-C_{10}	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}-C_{40}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services		25	50	100	100	0.2	0.5	1	1	1	
CRC 2011 -Direct contact Criteria		82,000	62,000	85,000	120,000	1,100	120,000	85,000	130,000	29,000	
Site Use		**Intrusive Maintenance Worker - DIRECT SOIL CONTACT**									
Sample Reference	**Sample Depth**										
MW1	0.7-0.9	<25	<50	160	160	<0.2	<0.5	<1	<3	<1	0.1
MW1	1.5-1.7	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	18.1
MW2	0.05-0.3	<25	<50	340	400	<0.2	<0.5	<1	<3	<1	0
MW2 (replicate)	0.05-0.3	<25	<50	370	410	<0.2	<0.5	<1	<3	<1	0
MW2	1.5-1.7	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW3	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW3	1-1.5	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW3	2.1-2.4	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW3	3.3-3.45	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	3.1
MW4	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW4	0.2-0.4	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW5	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW5	0.3-0.4	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW6	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW6	0.1-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW7	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW8	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW8	0.2-0.4	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0.1
MW8 (replicate)	0.2-0.4	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0.1
MW9	0-0.15	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW9	0.2-0.4	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW10	0-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW11	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW11	0.2-0.6	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW12	0-0.1	<25	<50	270	230	<0.2	<0.5	<1	<3	<1	0
MW12 (replicate)	0-0.1	<25	<50	130	110	<0.2	<0.5	<1	<3	<1	0
MW12	0.15-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW13	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW14	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW14	0.45-0.6	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
MW15	0-0.2	<25	65	420	190	<0.2	<0.5	<1	<3	<1	0
DUPMP102	-	<25	<50	240	140	<0.2	<0.5	<1	<3	<1	-
DUPMP103	-	<25	<50	550	110	<0.2	<0.5	<1	<1	<1	-
DUPMP107	-	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	-
DUPMP109	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-
Total Number of Samples		35	35	35	35	35	35	35	35	35	31
Maximum Value		<PQL	65	550	410	<PQL	<PQL	<PQL	<PQL	<PQL	18.1

Concentration above the SAC **VALUE**

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TABLE H
ASBESTOS QUANTIFICATION - FIELD OBSERVATIONS AND LABORATORY RESULTS
HSL-A: Residential with garden/accessible soils; children's day care centers; preschools; and primary schools

FIELD DATA															LABORATORY DATA											
Date Sampled	Sample reference	Sample Depth	Visible ACM in top 100mm	Approx. Volume of Soil (L)	Soil Mass (g)	Mass ACM (g)	Mass Asbestos in ACM (g)	[Asbestos from ACM in soil] (%w/w)	Mass ACM <7mm (g)	Mass Asbestos in ACM <7mm (g)	[Asbestos from ACM <7mm in soil] (%w/w)	Mass FA (g)	Mass Asbestos in FA (g)	[Asbestos from FA in soil] (%w/w)	Lab Report Number	Sample refeference	Sample Depth	Sample Mass (g)	Asbestos ID in soil (AS4964) >0.1g/kg	Trace Analysis	Total Asbestos (g/kg)	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation (g)	FA and AF Estimation (g)	ACM >7mm Estimation %(w/w)	FA and AF Estimation %(w/w)
SAC			**No**					**0.01**			**0.001**			**0.001**											**0.01**	**0.001**
26/11/2019	MW1	0.05-0.2	No	NA	--	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW1	0.05-0.2	726.31	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
26/11/2019	MW1	0.2-0.5	NA	10	3,900	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW1	0.2-0.4	718.01	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
26/11/2019	MW1	0.5-0.7	NA	10	2,900	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW1	0.5-0.7	727.26	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
26/11/2019	MW1	0.7-1.1	NA	10	7,600	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28/11/2019	MW2	0.05-1.1	No	10	10,800	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW2	0.05-0.3	490.39	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW3	0-1.0	No	10	7,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW3	0-0.2	789.9	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW3	1.0-2.1	NA	10	6,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW3	1-1.5	449.01	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW4	0-0.2	No	10	10,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW4	0-0.2	444.37	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW4	0.2-0.4	NA	10	12,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW4	0.2-0.4	956.26	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW5	0-0.3	No	10	10,900	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW5	0-0.2	577.97	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW5	0.3-0.5	NA	10	17,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW5	0.3-0.4	1009.4	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW6	0-0.1	No	10	10,900	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW6	0-0.1	581.03	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW6	0.1-0.25	NA	10	10,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW6	0.1-0.2	790.1	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW7	0-0.3	No	10	14,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW7	0-0.1	479.9	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW8	0-0.2	No	10	10,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW8	0-0.2	693.16	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
27/11/2019	MW8	0.2-0.8	NA	10	8,900	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW8	0.2-0.4	593.46	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/11/2019	MW9	0-0.15	No	10	12,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW9	0-0.15	763.37	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/11/2019	MW9	0.15-0.9	No	10	4,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW9	0.2-0.4	641.82	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/11/2019	MW10	0-0.6	No	10	5,800	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW10	0-0.3	874.2	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/11/2019	MW11	0-0.2	No	10	7,800	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW11	0-0.2	869.42	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/11/2019	MW11	0.2-0.8	NA	10	5,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW11	0.2-0.6	694.34	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/11/2019	MW12	0-0.1	NA	10	4,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW12	0-0.1	552.03	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/11/2019	MW12	0.1-0.5	NA	10	2,600	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW12	0.15-0.3	582.42	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected: Synthetic mineral fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/11/2019	MW13	0-0.2	NA	10	4,500	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW13	0-0.1	740.11	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
26/11/2019	MW14	0-0.45	No	10	11,600	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW14	0-0.2	615.94	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
26/11/2019	MW14	0.45-0.6	NA	10	4,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW14	0.45-0.6	839.2	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
26/11/2019	MW15	0-0.25	No	10	9,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	23077	MW15	0-0.2	541.86	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001

Concentration above the SAC **VALUE**

TABLE I
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZG 2018 Fresh Waters	SAMPLES MW1	MW1 (replicate)	MW2	MW2 (replicate)	MW3	MW135	DUPW1	DUPW2
Inorganic Compounds and Parameters										
pH		6.5 - 8.5	7	NA	7.1	NA	7.5	7.3	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	**15000**	NA	**23000**	NA	**7600**	**13000**	NA	NA
Metals and Metalloids										
Arsenic (As III)	1	24	<1	NA	**3**	NA	**7**	<1	<1	<1
Cadmium	0.1	0.2	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Chromium (SAC for Cr III adopted)	1	3.3	<1	NA	<1	NA	<1	<1	<1	<1
Copper	1	1.4	<1	NA	<1	NA	**3**	<1	<1	**2**
Lead	1	3.4	<1	NA	<1	NA	<1	<1	<1	<1
Total Mercury (inorganic)	0.05	0.06	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05	<0.05
Nickel	1	11	**2**	NA	**2**	NA	**4**	<1	**2**	**1**
Zinc	1	8	**8**	NA	**9**	NA	**17**	**5**	**11**	**3**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)										
Benzene	1	950	<1	NA	<1	<1	NA	<1	<1	<1
Toluene	1	180	<1	NA	<1	<1	NA	<1	<1	<1
Ethylbenzene	1	80	<1	NA	<1	<1	NA	<1	<1	<1
m+p-xylene	2	75	<2	NA	<2	<2	NA	<2	<2	<2
o-xylene	1	350	<1	NA	<1	<1	NA	<1	<1	<1
Total xylenes	2	NSL	<2	NA	<2	<2	NA	<2	<2	<2
Volatile Organic Compounds (VOCs), including chlorinated VOCs										
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
Chloromethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
Vinyl Chloride	10	100	<10	NA	<10	<10	NA	<10	<10	<10
Bromomethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
Chloroethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
1,1-Dichloroethene	1	700	<1	NA	<1	<1	NA	<1	<1	<1
Trans-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,1-dichloroethane	1	90	<1	NA	<1	<1	NA	<1	<1	<1
Cis-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Bromochloromethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Chloroform	1	370	<1	NA	<1	<1	NA	<1	<1	<1
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dichloroethane	1	1900	<1	NA	<1	<1	NA	<1	<1	<1
1,1,1-trichloroethane	1	270	<1	NA	<1	<1	NA	<1	<1	<1
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Cyclohexane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Carbon tetrachloride	1	240	<1	NA	<1	<1	NA	<1	<1	<1
Benzene	1	950	<1	NA	<1	<1	NA	<1	<1	<1
Dibromomethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dichloropropane	1	900	<1	NA	<1	<1	NA	<1	<1	<1
Trichloroethene	1	330	<1	NA	<1	<1	NA	<1	<1	<1
Bromodichloromethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
trans-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
cis-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,1,2-trichloroethane	1	6500	<1	NA	<1	<1	NA	<1	<1	<1
Toluene	1	180	<1	NA	<1	<1	NA	<1	<1	<1
1,3-dichloropropane	1	1100	<1	NA	<1	<1	NA	<1	<1	<1
Dibromochloromethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Tetrachloroethene	1	70	<1	NA	<1	<1	NA	<1	<1	<1
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Chlorobenzene	1	55	<1	NA	<1	<1	NA	<1	<1	<1
Ethylbenzene	1	80	<1	NA	<1	<1	NA	<1	<1	<1
Bromoform	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
m+p-xylene	2	75	<2	NA	<2	<2	NA	<2	<2	<2
Styrene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,1,2,2-tetrachloroethane	1	400	<1	NA	<1	<1	NA	<1	<1	<1
o-xylene	1	350	<1	NA	<1	<1	NA	<1	<1	<1
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Isopropylbenzene	1	30	<1	NA	<1	<1	NA	<1	<1	<1
Bromobenzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
n-propyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
2-chlorotoluene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
4-chlorotoluene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,3-dichlorobenzene	1	260	<1	NA	<1	<1	NA	<1	<1	<1
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,4-dichlorobenzene	1	60	<1	NA	<1	<1	NA	<1	<1	<1
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dichlorobenzene	1	160	<1	NA	<1	<1	NA	<1	<1	<1
n-butyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2,4-trichlorobenzene	1	85	<1	NA	<1	<1	NA	<1	<1	<1
Hexachlorobutadiene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2,3-trichlorobenzene	1	3	<1	NA	<1	<1	NA	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	0.2	16	<0.2	NA	**0.3**	NA	**3.5**	<0.2	<0.2	<0.1
Acenaphthylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	NA	<0.1	NA	**1.5**	<0.1	<0.1	<0.1
Phenanthrene	0.1	0.6	<0.1	NA	<0.1	NA	**3.4**	<0.1	<0.1	<0.1
Anthracene	0.1	0.01	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Fluoranthene	0.1	1	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	**1.1**	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	NA	<0.1	NA	**1**	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	NA	<0.2	NA	<0.6	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	NA	<0.1	NA	**0.4**	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1

Concentration above the SAC	Value
Positive result	**Value**
GIL >PQL	Red

JKEnvironments

TABLE J
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILs
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	Recreational (10 x NHMRC ADWG)	SAMPLES							
			MW1	MW1 (replicate)	MW2	MW2 (replicate)	MW3	MW135	DUPW1	DUPW2
Inorganic Compounds and Parameters										
pH		6.5 - 8.5	7	NA	7.1	NA	7.5	7.3	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	15000	NA	23000	NA	7600	13000	NA	NA
Metals and Metalloids										
Arsenic (As III)	1	100	<1	NA	3	NA	7	<1	<1	<1
Cadmium	0.1	20	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Chromium (total)	1	500	<1	NA	<1	NA	<1	<1	<1	<1
Copper	1	20000	<1	NA	<1	NA	3	<1	<1	2
Lead	1	100	<1	NA	<1	NA	<1	<1	<1	<1
Total Mercury (inorganic)	0.05	10	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05	<0.05
Nickel	1	200	2	NA	2	NA	4	<1	2	1
Zinc	1	30000	8	NA	9	NA	17	5	11	3
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)										
Benzene	1	10	<1	NA	<1	<1	NA	<1	<1	<1
Toluene	1	8000	<1	NA	<1	<1	NA	<1	<1	<1
Ethylbenzene	1	3000	<1	NA	<1	<1	NA	<1	<1	<1
m+p-xylene	2	NSL	<2	NA	<2	<2	NA	<2	<2	<2
o-xylene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Total xylenes	2	6000	<2	NA	<2	<2	NA	<2	<2	<2
Volatile Organic Compounds (VOCs), including chlorinated VOCs										
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
Chloromethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
Vinyl Chloride	10	3	<10	NA	<10	<10	NA	<10	<10	<10
Bromomethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
Chloroethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	NA	<10	<10	<10
1,1-Dichloroethene	1	300	<1	NA	<1	<1	NA	<1	<1	<1
Trans-1,2-dichloroethene	1	600	<1	NA	<1	<1	NA	<1	<1	<1
1,1-dichloroethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Cis-1,2-dichloroethene	1	600	<1	NA	<1	<1	NA	<1	<1	<1
Bromochloromethane	1	2500	<1	NA	<1	<1	NA	<1	<1	<1
Chloroform	1		<1	NA	<1	<1	NA	<1	<1	<1
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dichloroethane	1	30	<1	NA	<1	<1	NA	<1	<1	<1
1,1,1-trichloroethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Cyclohexane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Carbon tetrachloride	1	30	<1	NA	<1	<1	NA	<1	<1	<1
Benzene	1	10	<1	NA	<1	<1	NA	<1	<1	<1
Dibromomethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dichloropropane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Trichloroethene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Bromodichloromethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
trans-1,3-dichloropropene	1	1000	<1	NA	<1	<1	NA	<1	<1	<1
cis-1,3-dichloropropene	1	1000	<1	NA	<1	<1	NA	<1	<1	<1
1,1,2-trichloroethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Toluene	1	8000	<1	NA	<1	<1	NA	<1	<1	<1
1,3-dichloropropane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Dibromochloromethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Tetrachloroethene	1	500	<1	NA	<1	<1	NA	<1	<1	<1
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Chlorobenzene	1	3000	<1	NA	<1	<1	NA	<1	<1	<1
Ethylbenzene	1	3000	<1	NA	<1	<1	NA	<1	<1	<1
Bromoform	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
m+p-xylene	2	NSL	<2	NA	<2	<2	NA	<2	<2	<2
Styrene	1	300	<1	NA	<1	<1	NA	<1	<1	<1
1,1,2,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
o-xylene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Isopropylbenzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Bromobenzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
n-propyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
2-chlorotoluene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
4-chlorotoluene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,3-dichlorobenzene	1	200	<1	NA	<1	<1	NA	<1	<1	<1
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,4-dichlorobenzene	1	400	<1	NA	<1	<1	NA	<1	<1	<1
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dichlorobenzene	1	15000	<1	NA	<1	<1	NA	<1	<1	<1
n-butyl benzene	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	NA	<1	<1	<1
1,2,4-trichlorobenzene	1	300	<1	NA	<1	<1	NA	<1	<1	<1
1,2,3-trichlorobenzene	1		<1	NA	<1	<1	NA	<1	<1	<1
Hexachlorobutadiene	1	7	<1	NA	<1	<1	NA	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	0.2	NSL	<0.2	NA	**0.3**	NA	**3.5**	<0.2	<0.2	<0.1
Acenaphthylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	NA	<0.1	NA	**1.5**	<0.1	<0.1	<0.1
Phenanthrene	0.1	NSL	<0.1	NA	<0.1	NA	**3.4**	<0.1	<0.1	<0.1
Anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Fluoranthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	**1.1**	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	NA	<0.1	NA	**1**	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	NA	<0.2	NA	<0.6	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	NA	<0.1	NA	**0.4**	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.3	<0.1	<0.1	<0.1

Concentration above the SAC	**Value**
Positive result	**Value**
GIL >PQL	Red

JKEnvironments

TABLE K
GROUNDWATER LABORATORY RESULTS COMPARED TO HSLs
All data in µg/L unless stated otherwise

				C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services				10	50	1	1	1	2	1	
NEPM 2013 - Land Use Category				**HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**								
MW1	5.25	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	6
MW2	7.5	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	12.2
MW2 (replicate)	7.5	0m to <2m	Sand	<10	NA	<1	<1	<1	<2	<1	12.2
MW135	8.06	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	0
DUPW1	-	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	NA
DUPW2	-	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	NA
Total Number of Samples				6	5	6	6	6	6	6	4
Maximum Value				<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	12.2

Concentration above the SAC **Value**
Positive result **Value**
The guideline corresponding to the elevated value is highlighted in grey in the Groundwater Assessment Criteria Table below

HSL GROUNDWATER ASSESSMENT CRITERIA

Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
MW1	5.25	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
MW2	7.5	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
MW2 (replicate)	7.5	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
MW135	8.06	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
DUPW1	-	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
DUPW2	-	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA

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TABLE L
GROUNDWATER LABORATORY RESULTS COMPARED TO SITE SPECIFIC HSLs - RISK ASSESSMENT
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NHMRC ADWG 2011 (v3.5 2018)	WHO 2008	USEPA RSL Tapwater 2017	SAMPLES					
					MW1	MW2	MW2 (replicate)	MW135	DUPW1	DUPW2
Total Recoverable Hydrocarbons (TRH)										
C_6-C_9 Aliphatics (assessed using F1)	10	-	15000	-	<10	<10	<10	<10	<10	<10
>C_9-C_{14} Aliphatics (assessed using F2)	50	-	100	-	<50	<50	NA	<50	<50	<50
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)										
Benzene	1	1	-	-	<1	<1	<1	<1	<1	<1
Toluene	1	800	-	-	<1	<1	<1	<1	<1	<1
Ethylbenzene	1	300	-	-	<1	<1	<1	<1	<1	<1
Total xylenes	2	600	-	-	<2	<2	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	1	-	-	6.1	<1	<1	<1	<1	<1	<1
Volatile Organic Compounds (VOCs), including chlorinated VOCs										
Dichlorodifluoromethane	10	-	-	-	<10	<10	<10	<10	<10	<10
Chloromethane	10	-	-	-	<10	<10	<10	<10	<10	<10
Vinyl Chloride	10	0.3	-	-	<10	<10	<10	<10	<10	<10
Bromomethane	10	-	-	-	<10	<10	<10	<10	<10	<10
Chloroethane	10	-	-	-	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	10	-	-	-	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	1	30	-	-	<1	<1	<1	<1	<1	<1
Trans-1,2-dichloroethene	1	60	-	-	<1	<1	<1	<1	<1	<1
1,1-dichloroethane	1	-	-	-	<1	<1	<1	<1	<1	<1
Cis-1,2-dichloroethene	1	60	-	-	<1	<1	<1	<1	<1	<1
Bromochloromethane	1	250	-	-	<1	<1	<1	<1	<1	<1
Chloroform	1		-	-	<1	<1	<1	<1	<1	<1
2,2-dichloropropane	1	-	-	-	<1	<1	<1	<1	<1	<1
1,2-dichloroethane	1	3	-	-	<1	<1	<1	<1	<1	<1
1,1,1-trichloroethane	1	-	-	-	<1	<1	<1	<1	<1	<1
1,1-dichloropropene	1	-	-	-	<1	<1	<1	<1	<1	<1
Cyclohexane	1	-	-	-	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	1	3	-	-	<1	<1	<1	<1	<1	<1
Benzene	1	1	-	-	<1	<1	<1	<1	<1	<1
Dibromomethane	1	-	-	-	<1	<1	<1	<1	<1	<1
1,2-dichloropropane	1	-	-	-	<1	<1	<1	<1	<1	<1
Trichloroethene	1	-	-	-	<1	<1	<1	<1	<1	<1
Bromodichloromethane	1	-	-	-	<1	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	1	100	-	-	<1	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	1	100	-	-	<1	<1	<1	<1	<1	<1
1,1,2-trichloroethane	1	-	-	-	<1	<1	<1	<1	<1	<1
Toluene	1	800	-	-	<1	<1	<1	<1	<1	<1
1,3-dichloropropane	1	-	-	-	<1	<1	<1	<1	<1	<1
Dibromochloromethane	1	-	-	-	<1	<1	<1	<1	<1	<1
1,2-dibromoethane	1	-	-	-	<1	<1	<1	<1	<1	<1
Tetrachloroethene	1	50	-	-	<1	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	1	-	-	-	<1	<1	<1	<1	<1	<1
Chlorobenzene	1	300	-	-	<1	<1	<1	<1	<1	<1
Ethylbenzene	1	300	-	-	<1	<1	<1	<1	<1	<1
Bromoform	1	-	-	-	<1	<1	<1	<1	<1	<1
m+p-xylene	2	-	-	-	<2	<2	<2	<2	<2	<2
Styrene	1	30	-	-	<1	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	1	-	-	-	<1	<1	<1	<1	<1	<1
o-xylene	1	-	-	-	<1	<1	<1	<1	<1	<1
1,2,3-trichloropropane	1	-	-	-	<1	<1	<1	<1	<1	<1
Isopropylbenzene	1	-	-	-	<1	<1	<1	<1	<1	<1
Bromobenzene	1	-	-	-	<1	<1	<1	<1	<1	<1
n-propyl benzene	1	-	-	-	<1	<1	<1	<1	<1	<1
2-chlorotoluene	1	-	-	-	<1	<1	<1	<1	<1	<1
4-chlorotoluene	1	-	-	-	<1	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	1	-	-	-	<1	<1	<1	<1	<1	<1
Tert-butyl benzene	1	-	-	-	<1	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	1	-	-	-	<1	<1	<1	<1	<1	<1
1,3-dichlorobenzene	1	20	-	-	<1	<1	<1	<1	<1	<1
Sec-butyl benzene	1	-	-	-	<1	<1	<1	<1	<1	<1
1,4-dichlorobenzene	1	40	-	-	<1	<1	<1	<1	<1	<1
4-isopropyl toluene	1	-	-	-	<1	<1	<1	<1	<1	<1
1,2-dichlorobenzene	1	1500	-	-	<1	<1	<1	<1	<1	<1
n-butyl benzene	1	-	-	-	<1	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	1	-	-	-	<1	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	1	30	-	-	<1	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	1		-	-	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	7	-	-	<1	<1	<1	<1	<1	<1

Concentration above the SAC	Value
Positive result	**Value**
GIL >PQL	Red

TABLE M
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW14 (0-0.2)	Arsenic	4	<4	5	3.5	86
Dup Ref = DUPMP102	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	22	18	20.0	88
Envirolab Report: 232077	Copper	1	27	27	27.0	0
	Lead	1	16	17	16.5	6
	Mercury	0.1	<0.1	<0.1	NC	NC
	Nickel	1	9	8	8.5	12
	Zinc	1	50	49	49.5	2
	Naphthalene	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	<0.05	<0.05	NC	NC
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	Total OCPs	0.1	<0.1	<0.1	NC	NC
	Total OPPs	0.1	<0.1	<0.1	NC	NC
	Total PCBs	0.1	<0.1	<0.1	NC	NC
	TRH C_6-C_{10} (F1)	25	<25	<25	NC	NC
	TRH >C_{10}-C_{16} (F2)	50	<50	<50	NC	NC
	TRH >C_{16}-C_{34} (F3)	100	<100	240	145.0	131
	TRH >C_{34}-C_{40} (F4)	100	<100	140	95.0	95
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

RPD Results Above the Acceptance Criteria — VALUE

TABLE N
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW9 (0-0.15)	Arsenic	4	<4	<4	NC	NC
Dup Ref = DUPMP107	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	5	5	5.0	0
Envirolab Report: 232077	Copper	1	10	12	11.0	18
	Lead	1	25	24	24.5	4
	Mercury	0.1	<0.1	<0.1	NC	NC
	Nickel	1	3	3	3.0	0
	Zinc	1	54	60	57.0	11
	Naphthalene	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	0.1	0.1	0.1	0
	Pyrene	0.1	0.1	0.1	0.1	0
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	0.1	0.06	0.1	50
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	<100	<100	NC	NC
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

RPD Results Above the Acceptance Criteria — VALUE

TABLE O
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW4 (0.2-0.4)	Chromium	1	380	170	275.0	76
Dup Ref = DUPMP106	Cr^{6+}	10	<10	<10	NC	NC
Envirolab Report: 232077 (Total Cr)						
Envirolab Report: 232077 - A (Cr^{6+})						

RPD Results Above the Acceptance Criteria | VALUE

TABLE P

SOIL INTER-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS

All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	Envirolab VIC PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW3 (0-0.2)	Arsenic	4	4	6	5	5.5	18
Dup Ref = DUPMP103	Cadmium	0.4	0.4	<0.4	<0.4	NC	NC
	Chromium	1	1	15	13	14.0	14
Envirolab Report: 232077	Copper	1	1	20	24	22.0	18
Envirolab VIC Report: 19227	Lead	1	1	29	17	23.0	52
	Mercury	0.1	0.1	<0.1	0.1	0.1	67
	Nickel	1	1	19	19	19.0	0
	Zinc	1	1	39	31	35.0	23
	Naphthalene	0.1	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	0.1	<0.1	1	0.5	181
	Acenaphthene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	0.1	<0.1	0.3	0.2	143
	Phenanthrene	0.1	0.1	<0.1	5.6	2.8	196
	Anthracene	0.1	0.1	<0.1	2	1.0	190
	Fluoranthene	0.1	0.1	0.1	14	7.1	197
	Pyrene	0.1	0.1	0.1	15	7.6	197
	Benzo(a)anthracene	0.1	0.1	<0.1	11	5.5	198
	Chrysene	0.1	0.1	<0.1	8.6	4.3	198
	Benzo(b,j+k)fluoranthene	0.2	0.2	<0.2	15	7.6	197
	Benzo(a)pyrene	0.05	0.05	0.06	10	5.0	198
	Indeno(123-cd)pyrene	0.1	0.1	<0.1	3.6	1.8	195
	Dibenzo(ah)anthracene	0.1	0.1	<0.1	1.1	0.6	183
	Benzo(ghi)perylene	0.1	0.1	<0.1	3.8	1.9	195
	Heptachlor Epoxide	0.1	0.1	<0.1	0.2	0.1	120
	gamma-Chlordane	0.1	0.1	<0.1	0.1	0.1	67
	Total (other) OCPs	0.1	0.1	<0.1	<0.1	NC	NC
	Total OPPs	0.1	0.1	<0.1	<0.1	NC	NC
	Total PCBs	0.1	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	25	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	100	<100	550	300.0	167
	TRH >C34-C40 (F4)	100	100	<100	110	80.0	75
	Benzene	0.2	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	1	<1	<1	NC	NC
	m+p-xylene	2	2	<2	<2	NC	NC
	o-xylene	1	1	<1	<1	NC	NC

RPD Results Above the Acceptance Criteria | VALUE

TABLE Q
SOIL INTER-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	Envirolab VIC PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW2 (0.05-0.3)	Arsenic	4	4	5	6	5.5	18
Dup Ref = DUPMP109 (0-0.3)	Cadmium	0.4	0.4	<0.4	<0.4	NC	NC
	Chromium	1	1	19	11	15.0	53
Envirolab Report: 232077	Copper	1	1	29	13	21.0	76
Envirolab VIC Report: 19227	Lead	1	1	20	14	17.0	35
	Mercury	0.1	0.1	<0.1	0.1	0.1	67
	Nickel	1	1	17	4	10.5	124
	Zinc	1	1	34	15	24.5	78
	Naphthalene	0.1	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	0.1	0.1	<0.1	0.1	67
	Anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	0.1	0.2	<0.1	0.1	120
	Pyrene	0.1	0.1	0.2	<0.1	0.1	120
	Benzo(a)anthracene	0.1	0.1	0.1	<0.1	0.1	67
	Chrysene	0.1	0.1	0.1	<0.1	0.1	67
	Benzo(b,j+k)fluoranthene	0.2	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	0.05	0.1	<0.05	0.1	120
	Indeno(123-cd)pyrene	0.1	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	0.1	0.1	<0.1	0.1	67
	TRH C6-C10 (F1)	25	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	100	340	<100	195.0	149
	TRH >C34-C40 (F4)	100	100	400	<100	225.0	156
	Benzene	0.2	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	1	<1	<1	NC	NC
	m+p-xylene	2	2	<2	<2	NC	NC
	o-xylene	1	1	<1	<1	NC	NC

RPD Results Above the Acceptance Criteria VALUE

TABLE R
GROUNDWATER INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in µg/L unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW1	Arsenic	1	<1	<1	NC	NC
Dup Ref = DUPW1	Cadmium	0.1	<0.1	<0.1	NC	NC
	Chromium	1	<1	<1	NC	NC
Envirolab Report: 233029	Copper	1	<1	<1	NC	NC
	Lead	1	<1	<1	NC	NC
	Mercury	0.05	<0.05	<0.05	NC	NC
	Nickel	1	2	2	2	0
	Zinc	1	8	11	10	32
	Naphthalene	0.2	<0.2	<0.2	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.1	<0.1	<0.1	NC	NC
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	10	<10	<10	NC	NC
	TRH >C10-C16 (F2)	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	<100	<100	NC	NC
	Benzene	1	<1	<1	NC	NC
	Toluene	1	<1	<1	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

RPD Results Above the Acceptance Criteria VALUE

TABLE S
GROUNDWATER INTER-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in µg/L unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	Envirolab VIC PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW135	Arsenic	1	1	<1	<1	NC	NC
Dup Ref = DUPW2	Cadmium	0.1	0.1	<0.1	<0.1	NC	NC
	Chromium	1	1	<1	<1	NC	NC
Envirolab Report: 233029	Copper	1	1	<1	2	1.25	120.0
Envirolab Vic Report: 19227	Lead	1	1	<1	<1	NC	NC
	Mercury	0.05	0.05	<0.05	<0.05	NC	NC
	Nickel	1	1	<1	1	0.75	66.7
	Zinc	1	1	5	3	4	50.0
	Naphthalene	0.2	0.2	<0.2	<0.1	NC	NC
	Acenaphthylene	0.1	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	NC	NC
	Indeno(123-cd)pyrene	0.1	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	10	10	<10	<10	NC	NC
	TRH >C10-C16 (F2)	50	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	100	<100	<100	NC	NC
	Benzene	1	1	<1	<1	NC	NC
	Toluene	1	1	<1	<1	NC	NC
	Ethylbenzene	1	1	<1	<1	NC	NC
	m+p-xylene	2	2	<2	<2	NC	NC
	o-xylene	1	1	<1	<1	NC	NC

RPD Results Above the Acceptance Criteria **VALUE**

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TABLE T
SUMMARY OF FIELD QA/QC RESULTS

ANALYSIS	Envirolab PQL		TB-S1[S]	TB-W1[W]	TS-W1[W]	FRMW1[W]	TS-S1[S]
			26.11.19	3.12.19	3.12.19	26.11.19	26.11.19
	mg/kg	µg/L	mg/kg	µg/L	µg/L	µg/L	% Recovery
Benzene	0.2	<1	<0.2	<1	123%	<1	94%
Toluene	0.5	<1	<0.5	<1	107%	<1	88%
Ethylbenzene	1	<1	<1	<1	98%	<1	91%
m+p-xylene	2	<2	<2	<2	95%	<2	100%
o-xylene	1	<1	<1	<1	98%	<1	99%

Explanation:
[W] Sample type (water)
[S] Sample type (sand)
BTEX concentrations in trip spikes are presented as % recovery

Values above PQLs/Acceptance criteria **VALUE**

TABLE U
SUMMARY OF LABORATORY RESULTS - ACID SULFATE SOIL ANALYSIS

		Analysis	pH_F	pH_{FOX}	pH_{FOX}	pH Change	a-Net Acidity without ANCE	s-Net Acidity without ANCE	SCr	Liming Rate - without ANCE
							moles H+/t	%w/w S	%w/w	kg $CaCO_3$/tonne
National Acid Sulfate Soils Guidance (2018)		Coarse Textured Soil	pH <4 (indicates actual ASS)			by calculation	18molH+/ tonne	0.03% w/w	0.03% w/w	-
Sample Reference	**Sample Depth (m)**	**Sample Description**								
MW1	1.1-1.3	Fill: Silty sandy clay	5.8	4.0	Low reaction	1.8	NA	NA	NA	NA
MW1	2.4-2.7	Silty clay	5.5	4.1	Low reaction	1.4	NA	NA	NA	NA
MW1	3-3.3	Silty clay	5.2	4.1	Low reaction	1.1	NA	NA	NA	NA
MW1	4-4.2	Siltstone	5.4	4.0	Low reaction	1.4	NA	NA	NA	NA
MW2	1.1-1.2	Fill: Silty clay	7.4	6.2	Medium reaction	1.2	NA	NA	NA	NA
MW2	1.8-2	Silty clay	4.6	3.6	Low reaction	1	NA	NA	NA	NA
MW2	2.8-3	Silty clay	4.7	3.5	Low reaction	1.2	45	0.07	<0.005	3.4
MW2	3-3.35	Silty clay	4.6	3.5	Low reaction	1.1	30.00	0.05	<0.005	2.2
MW2	3.8-4	Sand	5.2	4.0	Low reaction	1.2	<5	0.01	<0.005	<0.75
MW2	4.85-5	Silty sand	7.1	5.8	Low reaction	1.3	NA	NA	NA	NA
MW2	5.4-5.7	Silty sand	7.6	6.2	Medium reaction	1.4	<5	<0.005	<0.005	<0.75
MW2 (Replicate)	5.4-5.7	Silty sand	7.6	6.2	Medium reaction	1.4	<5	<0.005	<0.005	<0.75
MW2	6.2-6.45	Silty clay	8.3	6.1	Low reaction	2.2	<5	<0.005	<0.005	<0.75
MW2	7-7.5	Silty clay	8.4	7.1	Low reaction	1.3	NA	NA	NA	NA
MW2	7.65-7.85	Silty clay	8.3	6.4	Low reaction	1.9	NA	NA	NA	NA
MW2	8.6-8.9	Silty clay	8.3	6.8	Low reaction	1.5	NA	NA	NA	NA
MW2	9.2-9.4	Silty clay	7.9	6.3	Low reaction	1.6	NA	NA	NA	NA
MW2	9.9-10.2	Silty clay	8.0	5.4	Low reaction	2.6	<5	<0.005	<0.005	<0.75
MW2	10.6-10.8	Silty clay	7.6	4.0	Low reaction	3.6	<5	<0.005	<0.005	<0.75
MW2	11.7-11.9	Silty clay	7.8	4.9	Low reaction	2.9	<5	<0.005	<0.005	<0.75
MW3	2.1-2.4	Silty clay	5.7	4.2	Medium reaction	1.5	NA	NA	NA	NA
MW3	4-4.3	Silty clay	7.5	5.9	Low reaction	1.6	NA	NA	NA	NA
MW3	5.3-5.7	Silty clay	7.6	6.1	Low reaction	1.5	NA	NA	NA	NA
MW3	6-6.45	Silty clay	8.2	6.1	Low reaction	2.1	NA	NA	NA	NA
MW3	6.8-7.2	Siltstone	8.0	6.4	Low reaction	1.6	NA	NA	NA	NA
MW5	0.3-0.5	Fill: Silty sandy clay	8.2	7.7	Extreme reaction	0.4	NA	NA	NA	NA
MW7	0-0.1	Fill: Silty sandy clay	7.4	5.0	Medium reaction	2.4	NA	NA	NA	NA
MW8	0.2-0.4	Fill: Silty clay	7.4	5.2	Medium reaction	2.2	NA	NA	NA	NA
MW10	0-0.3	Fill: Silty clayey sand	8.2	6.6	Extreme reaction	1.6	NA	NA	NA	NA
MW11	0.2-0.6	Fill: Silty clay	7.0	3.8	Medium reaction	3.2	NA	NA	NA	NA
MW14	0.45-0.6	Fill: Silty clay	6.5	3.7	Medium reaction	2.8	NA	NA	NA	NA
Total Number of Samples			31	31	-	1	9	9	8	9
Minimum Value			4.6	3.5	-	0.4	30	0.01	<PQL	2.2
Maximum Value			8.4	7.7	-	0.4	45	0.07	<PQL	3.4

Values Exceeding Action Criteria **VALUE**

TABLE V
SUMMARY OF SOIL LABORATORY RESULTS - EC and ECe

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	ECe (dS/m)	Salinity Class[1]
Sample Depth Range - 0 to 3.0m					
MW1	1.1-1.3	Silty clay	150	<2	**Non-saline**
MW2	1.1-1.2	Silty clay	570	4	**Moderately Saline**
MW3	2.1-2.4	Silty clay	240	<2	**Non-saline**
MW5	0.3-0.5	Fill: Silty sandy clay	110	<2	**Non-saline**
MW7	0-0.1	Fill: Silty sandy clay	86	<2	**Non-saline**
MW8	0.2-0.4	Fill: Silty clay	42	<2	**Non-saline**
MW10	0-0.3	Fill: Silty clayey sand	96	<2	**Non-saline**
MW11	0.2-0.6	Fill: Silty clay	57	<2	**Non-saline**
MW14	0.45-0.6	Fill: Silty clay	83	<2	**Non-saline**
					Non-saline
Sample Depth Range - 3.0m to 12.0m					
MW1	4-4.2	Siltstone	200	<2	**Non-saline**
MW2	3-3.35	Silty clay	540	3.8	**Slightly Saline**
MW2	3.8-4.0	Sand	240	3.4	**Slightly Saline**
MW2	7-7.5	Silty clay	170	<2	**Non-saline**
MW2	11.7-11.9	Silty clay	740	6.3	**Moderately Saline**
MW3	6.8-7.2	Siltstone	300	2.7	**Slightly Saline**
					Non-saline
Total Number of Samples			15	5	-
Minimum Value			42	2.7	-
Maximum Value			740	6.3	-

Explanation

1 - Salinity Class has been adopted from '*Site Investigations for Urban Salinity*' DLWC 2002.

ECe Values (dS/m)	Salinity Class
<2	**Non-Saline**
2 to 4	**Slightly Saline**
4 to 8	**Moderately Saline**
8 to 16	**Very Saline**
>16	**Highly Saline**

Abbreviations

EC - Electrical Conductivity
ECe - Extract Electrical Conductivity

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TABLE W
SUMMARY OF RESISTIVITY CALCULATION ON SOIL EC RESULTS

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	Resistivity[1] (ohm.cm)	Classification[2] Condition A
Sample Depth Range - 0 to 3.0m					
MW1	1.1-1.3	Silty clay	150	6,667	Non-Aggressive
MW2	1.1-1.2	Silty clay	570	1,754	**Moderately Aggressive**
MW3	2.1-2.4	Silty clay	240	4,167	**Mildly Aggressive**
MW5	0.3-0.5	Fill: Silty sandy clay	110	9,091	Non-Aggressive
MW7	0-0.1	Fill: Silty sandy clay	86	11,628	Non-Aggressive
MW8	0.2-0.4	Fill: Silty clay	42	23,810	Non-Aggressive
MW10	0-0.3	Fill: Silty clayey sand	96	10,417	Non-Aggressive
MW11	0.2-0.6	Fill: Silty clay	57	17,544	Non-Aggressive
MW14	0.45-0.6	Fill: Silty clay	83	12,048	Non-Aggressive
Sample Depth Range - 3.0m to 12.0m					
MW1	4-4.2	Siltstone	200	5,000	**Mildly Aggressive**
MW2	3-3.35	Silty clay	540	1,852	**Moderately Aggressive**
MW2	3.8-4.0	Sand	240	4,167	**Mildly Aggressive**
MW2	7-7.5	Silty clay	170	5,882	Non-Aggressive
MW2	11.7-11.9	Silty clay	740	1,351	**Moderately Aggressive**
MW3	6.8-7.2	Siltstone	300	3,333	**Mildly Aggressive**
Total Number of Samples			15	15	-
Minimum Value			42	1,351	-
Maximum Value			740	23,810	-

Explanation

1 - Resistivity values have been calculated on the laboratory EC values presented in Table B

2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C])
Classification is based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

Resistivity Values (ohm.cm)	Classification for Steel Piles
>5,000	**Non-Aggressive**
2,000 - 5,000	**Mildly Aggressive**
1,000 - 2,000	**Moderately Aggressive**
<1,000	**Severely Aggressive**

Abbreviations

EC - Electrical Conductivity

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TABLE X
SUMMARY OF SOIL LABORATORY RESULTS - pH

Borehole Number	Sample Depth (m)	Sample Description	pH	Classification for Concrete Piles[1] Soil Condition A[2]	Classification for Steel Piles[1] Soil Condition A[2]
Sample Depth Range - 0 to 3.0m					
MW1	1.1-1.3	Silty clay	6.1	Mildly Aggressive	Non-Aggressive
MW2	1.1-1.2	Silty clay	8	Mildly Aggressive	Non-Aggressive
MW2	1.1-1.2	Silty clay	8	Mildly Aggressive	Non-Aggressive
MW3	2.1-2.4	Silty clay	5.7	Mildly Aggressive	Non-Aggressive
MW5	0.3-0.5	Fill: Silty sandy clay	8.8	Mildly Aggressive	Non-Aggressive
MW7	0-0.1	Fill: Silty sandy clay	7.5	Mildly Aggressive	Non-Aggressive
MW8	0.2-0.4	Fill: Silty clay	7.9	Mildly Aggressive	Non-Aggressive
MW10	0-0.3	Fill: Silty clayey sand	9.6	Mildly Aggressive	Non-Aggressive
MW11	0.2-0.6	Fill: Silty clay	7.3	Mildly Aggressive	Non-Aggressive
MW14	0.45-0.6	Fill: Silty clay	7	Mildly Aggressive	Non-Aggressive
Sample Depth Range - 3.0m to 12.0m					
MW1	4-4.2	Siltstone	6	Mildly Aggressive	Non-Aggressive
MW2	3-3.35	Silty clay	5	Moderately Aggressive	Mildly Aggressive
MW2	3.8-4.0	Sand	5.5	Moderately Aggressive	Non-Aggressive
MW2	7-7.5	Silty clay	8.9	Mildly Aggressive	Non-Aggressive
MW2	11.7-11.9	Silty clay	8.5	Mildly Aggressive	Non-Aggressive
MW3	6.8-7.2	Siltstone	8.5	Mildly Aggressive	Non-Aggressive
Total Number of Samples			16	-	-
Minimum Value			5	-	-
Maximum Value			9.6	-	-

Explanation
1 - pH Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [C] & 6.5.2 [C])
2 - Classification is based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

pH Value	Classification for Concrete Piles
>5.5	Mildly Aggressive
4.5 - 5.5	Moderately Aggressive
4 - 4.5	Severely Aggressive
<4	Very Severely Aggressive

pH Value	Classification for Steel Piles
>5	Non-Aggressive
4.0 - 5.0	Mildly Aggressive
3.0 - 4.0	Moderately Aggressive
<3	Severely Aggressive

TABLE Y
SUMMARY OF SOIL LABORATORY RESULTS - SULPHATE & CHLORIDES

Borehole Number	Sample Depth (m)	Sample Description	Sulphate (mg/kg)	Chloride (mg/kg)	Classification for Concrete Piles[1] SO4 - Soil Condition A[2]	Classification for Steel Piles[1] Cl - Soil Condition A[2]
Sample Depth Range - 0 to 3.0m						
MW1	1.1-1.3	Silty clay	120	95	Mildly Aggressive	Non-Aggressive
MW2	1.1-1.2	Silty clay	340	550	Mildly Aggressive	Non-Aggressive
MW2	1.1-1.2	Silty clay	370	620	Mildly Aggressive	Non-Aggressive
MW3	2.1-2.4	Silty clay	230	260	Mildly Aggressive	Non-Aggressive
MW5	0.3-0.5	Fill: Silty sandy clay	23	20	Mildly Aggressive	Non-Aggressive
MW7	0-0.1	Fill: Silty sandy clay	10	34	Mildly Aggressive	Non-Aggressive
MW8	0.2-0.4	Fill: Silty clay	10	<10	Mildly Aggressive	Non-Aggressive
MW10	0-0.3	Fill: Silty clayey sand	54	<10	Mildly Aggressive	Non-Aggressive
MW11	0.2-0.6	Fill: Silty clay	10	10	Mildly Aggressive	Non-Aggressive
MW14	0.45-0.6	Fill: Silty clay	49	20	Mildly Aggressive	Non-Aggressive
Sample Depth Range - 3.0m to 12.0m						
MW1	4-4.2	Siltstone	150	140	Mildly Aggressive	Non-Aggressive
MW2	3-3.35	Silty clay	130	770	Mildly Aggressive	Non-Aggressive
MW2	3.8-4.0	Sand	61	300	Mildly Aggressive	Non-Aggressive
MW2	7-7.5	Silty clay	62	110	Mildly Aggressive	Non-Aggressive
MW2	11.7-11.9	Silty clay	160	940	Mildly Aggressive	Non-Aggressive
MW3	6.8-7.2	Siltstone	150	660	Mildly Aggressive	Non-Aggressive
Total Number of Samples			16	14	-	-
Minimum Value			10	10	-	-
Maximum Value			370	940	-	-

Explanation
1 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [C] & 6.5.2 [C])
2 - Classification is based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

Sulphate (SO4) Values	Classification for Concrete Piles	Chloride (Cl) Values	Classification for Steel Piles
<5,000	Mildly Aggressive	<5,000	Non-Aggressive
5,000 - 10,000	Moderately Aggressive	5,000 - 20,000	Mildly Aggressive
10,000 - 20,000	Severely Aggressive	20,000 - 50,000	Moderately Aggressive
>20,000	Very Severely Aggressive	>50,000	Severely Aggressive

TABLE Z
SUMMARY OF SOIL LABORATORY RESULTS - CEC & ESP

Borehole Number	Sample Depth (m)	Sample Description	Total CEC	Ca	K	Mg	Na	ESP[1]
			(meq/100g)					%
MW1	4-4.2	Siltstone	5.6	0.4	0.2	3.2	1.7	30.4
MW2	1.1-1.2	Silty clay	4.1	1.2	<0.1	2	0.8	19.5
MW2	3.8-4.0	Sand	1.2	<0.1	<0.1	0.79	0.4	33.3
MW3	2.1-2.4	Silty clay	4.3	0.5	<0.1	2.5	1.3	30.2
MW3	6.8-7.2	Siltstone	5.8	0.5	0.1	3.2	2	34.5
MW5	0.3-0.5	Fill: Silty sandy clay	18	15	0.2	2.9	0.11	0.6
MW7	0-0.1	Fill: Silty sandy clay	13	7.4	0.8	4.6	<0.1	0.8
MW8	0.2-0.4	Fill: Silty clay	14	12	0.3	2.1	<0.1	0.7
MW10	0-0.3	Fill: Silty clayey sand	27	26	0.3	1.5	<0.1	0.4
MW11	0.2-0.6	Fill: Silty clay	8.6	5.7	0.3	2.5	<0.1	1.2
MW14	0.45-0.6	Fill: Silty clay	12	8.7	0.3	2.6	0.31	2.6
Total Number of Samples			11	10	8	11	7	11
Minimum Value			1.20	0.40	0.10	0.79	0.11	0.40
Maximum Value			27.00	26.00	0.80	4.60	2.00	34.48

Explanation

1 - Sodicity rating has been adopted from the publication *'Site Investigations for Urban Salinity' DLWC* 2002.

ESP Value	Sodicity Rating
< 5%	Non-Sodic
5% to 15%	Sodic
> 15%	Highly Sodic

Abbreviation

CEC: Cation Exchange Capacity
ESP: Exchangeable Sodium Percentage (Each Na/CEC)
Mg: Exchangeable Magnesium
Na: Exchangeable Sodium
K: Exchangeable Potassium
Ca: Exchangeable Calcium

JKEnvironments

TABLE AA
SUMMARY OF GROUNDWATER LABORATORY RESULTS

Sample Reference	Field Measurements[1]						Laboratory Results				Classification for Concrete Piles[2] Soil Condition A[3]	Classification for Steel Piles[2] Soil Condition A[3]
	SWL (m)	pH	EC (µS/cm)	Temp (°C)	Eh (mV)	DO (mg/L)	pH	EC (µS/cm)	SO4 (mg/L)	Cl (mg/L)		
MW1	5.25	6.59	12288	22.2	6.26	0.6	7	15000	420	5200	Mildly Aggressive	Mildly Aggressive
MW2	7.5	6.93	12977	24.3	-36.6	0.5	7.1	23000	970	8500	Moderately Aggressive	Mildly Aggressive
MW3	4	7.12	9309	20.5	-56.4	3.6	7.5	7600	380	3100	Mildly Aggressive	Mildly Aggressive
MW135	8.06	6.83	15092	22.5	46.3	0.6	7.3	13000	590	4500	Mildly Aggressive	Mildly Aggressive
Total Number of Samples	4	4	4	4	4	4	4	4	4	4	-	-
Minimum Value	4	6.59	9309	20.5	-56.4	0.5	7	7600	380	3100	-	-
Maximum Value	8.06	7.12	15092	24.3	46.3	3.6	7.5	23000	970	8500	-	-

Explanation
1 - Field Measurements were obtained on 11 December 2019

Exposure Classification for Concrete Piles
2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [A] & [C])
3 - Classification is based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

pH	Sulphate (mg/L)	Chloride (mg/L)	Classification
> 5.5	<1,000	<6,000	Mildly Aggressive
4.5 - 5.5	1,000 - 3,000	6,000 - 12,000	Moderately Aggressive
4.0 - 4.5	3,000 - 10,000	12,000 - 30,000	Severely Aggressive
< 4	>10,000	>30,000	Very Severely Aggressive

Exposure Classification for Steel Piles
2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.5.2 [A] & [C])
3 - Classification is also based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

pH	Chloride (mg/L)	Classification
> 5	<1,000	Non-Aggressive
4.0 - 5.0	1,000 - 10,000	Mildly Aggressive
3.0 - 4.0	10,000 - 20,000	Moderately Aggressive
<3	>20,000	Severely Aggressive

Abbreviation

SWL - Standing Water Level	SO4 - Sulphate
EC - Electrical Conductivity	Cl - Chloride
Eh - Redox Potential	DO - Dissolved Oxygen

Laboratory Results Summary Tables

JKE Stage 2 ESA 2019

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TABLE A-1
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.
HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)		
			Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos	TOTAL PCBs	ASBESTOS FIBRES
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	160	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
JKE129	0.09-0.25	F: Gravelly sand	<4	<0.4	**8**	**66**	**2**	<0.1	**80**	**34**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
JKE129	0.25-0.3	F: Silty clay	<4	<0.4	**16**	**27**	**4**	<0.1	**39**	**19**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
JKE131	0.07-0.2	F: Gravelly sand	<4	<0.4	**5**	**73**	**1**	<0.1	**53**	**27**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
JKE131	0.2-0.3	F: Silty clay	<4	<0.4	**9**	**28**	**2**	<0.1	**35**	**16**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
JKE131 (replicate)	0.2-0.3	F: Silty clay	<4	<0.4	**10**	**26**	**2**	<0.1	**40**	**18**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
JKE133	0.08-0.2	F: Gravelly sand	<4	<0.4	**6**	**63**	**2**	<0.1	**63**	**29**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
JKE133	0.2-0.3	F: Silty clay	<4	<0.4	**9**	**30**	**2**	<0.1	**50**	**21**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
JKE134	0-0.2	F: Silty sand	<4	<0.4	**7**	**11**	**8**	<0.1	**13**	**21**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
JKE134	0.5-0.95	F: Sility clayey sand	<4	<0.4	**6**	<1	**4**	<0.1	<1	**1**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
JKE134	1.5-1.7	Silty clay	<4	<0.4	**5**	**4**	**4**	<0.1	<1	**2**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
JKE136	0-0.2	F: Silty clay	<4	<0.4	**9**	**16**	**26**	**0.1**	**9**	**63**	**0.1**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Detected
JKE136	0.4-0.8	F: Silty clay	**4**	<0.4	**11**	**6**	**16**	<0.1	**3**	**10**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
JKE136	1.5-1.7	Silty clay	<4	<0.4	**7**	**5**	**7**	<0.1	**1**	**4**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
JKE137	0.04-0.2	F: Silty clay	**5**	<0.4	**14**	**21**	**51**	**0.2**	**7**	**57**	**4**	**0.8**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Detected
JKE137	0.5-0.7	F: Silty clay	<4	<0.4	**8**	**4**	**8**	<0.1	**2**	**3**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Total Number of Samples			33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	27
Maximum Value			5	<PQL	16	73	51	0.2	80	63	4	0.8	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Detected

Concentration above the SAC — **VALUE**
Concentration above the PQL — **Bold**

TABLE B-1
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
JKE129	0.09-0.25	F: Gravelly sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE129	0.25-0.3	F: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE131	0.07-0.2	F: Gravelly sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE131	0.2-0.3	F: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE131 (replicate)	0.2-0.3	F: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE133	0.08-0.2	F: Gravelly sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE133	0.2-0.3	F: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE134	0-0.2	F: Silty sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE134	0.5-0.95	F: Sility clayey sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE134	1.5-1.7	Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE136	0-0.2	F: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE136	0.4-0.8	F: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE136	1.5-1.7	Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE137	0.04-0.2	F: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
JKE137	0.5-0.7	F: Silty clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0
Total Number of Samples					15	15	15	15	15	15	15	15
Maximum Value					<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL

Concentration above the SAC **VALUE**

The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

SITE ASSESSMENT CRITERIA

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1
NEPM 2013 HSL Land Use Category					HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
JKE129	0.09-0.25	F: Gravelly sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE129	0.25-0.3	F: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE131	0.07-0.2	F: Gravelly sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE131	0.2-0.3	F: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE131 (replicate)	0.2-0.3	F: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE133	0.08-0.2	F: Gravelly sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE133	0.2-0.3	F: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE134	0-0.2	F: Silty sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE134	0.5-0.95	F: Sility clayey sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE134	1.5-1.7	Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE136	0-0.2	F: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE136	0.4-0.8	F: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE136	1.5-1.7	Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE137	0.04-0.2	F: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
JKE137	0.5-0.7	F: Silty clay	0m to <1m	Sand	45	110	0.5	160	55	40	3

TABLE C-1
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																			
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	AGED HEAVY METALS-EILs						EILs		ESLs								
							Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	1	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
JKE129	0.09-0.25	F: Gravelly sand	Coarse	8.43	43	7	<4	8	66	2	80	34	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE129	0.25-0.3	F: Silty clay	Coarse	8.43	43	7	<4	16	27	4	39	19	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE131	0.07-0.2	F: Gravelly sand	Coarse	8.43	43	7	<4	5	73	1	53	27	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE131	0.2-0.3	F: Silty clay	Coarse	8.43	43	7	<4	9	28	2	35	16	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE131 (replicate)	0.2-0.3	F: Silty clay	Coarse	8.43	43	7	<4	10	26	2	40	18	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE133	0.08-0.2	F: Gravelly sand	Coarse	8.43	43	7	<4	6	63	2	63	29	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE133	0.2-0.3	F: Silty clay	Coarse	8.43	43	7	<4	9	30	2	50	21	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE134	0-0.2	F: Silty sand	Coarse	7.5	8	8	<4	7	11	8	13	21	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE134	0.5-0.95	F: Sility clayey sand	Coarse	8.43	43	7	<4	6	<1	4	<1	1	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE134	1.5-1.7	Silty clay	Coarse	8.43	43	7	<4	5	4	4	<1	2	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE136	0-0.2	F: Silty clay	Coarse	8.43	43	7	<4	9	16	26	9	63	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.1
JKE136	0.4-0.8	F: Silty clay	Coarse	8.43	43	7	4	11	6	16	3	10	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE136	1.5-1.7	Silty clay	Coarse	8.43	43	7	<4	7	5	7	1	4	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
JKE137	0.04-0.2	F: Silty clay	Coarse	8.43	43	7	5	14	21	51	7	57	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	0.52
JKE137	0.5-0.7	F: Silty clay	Coarse	8.43	43	7	<4	8	4	8	2	3	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
Total Number of Samples							15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Maximum Value							5	16	73	51	80	63	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.52

Concentration above the SAC — **VALUE**

The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	AGED HEAVY METALS-EILs						EILs		ESLs								
							Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	1	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
JKE129	0.09-0.25	F: Gravelly sand	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE129	0.25-0.3	F: Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE131	0.07-0.2	F: Gravelly sand	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE131	0.2-0.3	F: Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE131 (replicate)	0.2-0.3	F: Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE133	0.08-0.2	F: Gravelly sand	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE133	0.2-0.3	F: Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE134	0-0.2	F: Silty sand	Coarse	7.5	8	8	100	413	218	1263	175	522	170	180	180	120	300	2800	50	85	70	105	20
JKE134	0.5-0.95	F: Sility clayey sand	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE134	1.5-1.7	Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE136	0-0.2	F: Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE136	0.4-0.8	F: Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE136	1.5-1.7	Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE137	0.04-0.2	F: Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20
JKE137	0.5-0.7	F: Silty clay	Coarse	8.43	43	7	100	413	258	1263	565	1422	170	180	180	120	300	2800	50	85	70	105	20

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TABLE D-1
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful	Total Scheduled		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	50	0.2	0.5	1	1	100
General Solid Waste CT1			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	50	50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	50	50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	50	50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	50	50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
JKE129	0.09-0.25	F: Gravelly sand	<4	<0.4	**8**	**66**	**2**	<0.1	**80**	**34**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
JKE129	0.25-0.3	F: Silty clay	<4	<0.4	**16**	**27**	**4**	<0.1	**39**	**19**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
JKE131	0.07-0.2	F: Gravelly sand	<4	<0.4	**5**	**73**	**1**	<0.1	**53**	**27**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
JKE131	0.2-0.3	F: Silty clay	<4	<0.4	**9**	**28**	**2**	<0.1	**35**	**16**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
JKE131 (replicate)	0.2-0.3	F: Silty clay	<4	<0.4	**10**	**26**	**2**	<0.1	**40**	**18**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
JKE133	0.08-0.2	F: Gravelly sand	<4	<0.4	**6**	**63**	**2**	<0.1	**63**	**29**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
JKE133	0.2-0.3	F: Silty clay	<4	<0.4	**9**	**30**	**2**	<0.1	**50**	**21**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
JKE134	0-0.2	F: Silty sand	<4	<0.4	**7**	**11**	**8**	<0.1	**13**	**21**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
JKE134	0.5-0.95	F: Sility clayey sand	<4	<0.4	**6**	<1	**4**	<0.1	<1	**1**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
JKE134	1.5-1.7	Silty clay	<4	<0.4	**5**	**4**	**4**	<0.1	<1	**2**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
JKE136	0-0.2	F: Silty clay	<4	<0.4	**9**	**16**	**26**	**0.1**	**9**	**63**	**0.1**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Detected
JKE136	0.4-0.8	F: Silty clay	**4**	<0.4	**11**	**6**	**16**	<0.1	**3**	**10**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
JKE136	1.5-1.7	Silty clay	<4	<0.4	**7**	**5**	**7**	<0.1	**1**	**4**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
JKE137	0.04-0.2	F: Silty clay	**5**	<0.4	**14**	**21**	**51**	**0.2**	**7**	**57**	**4**	**0.52**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Detected
JKE137	0.5-0.7	F: Silty clay	<4	<0.4	**8**	**4**	**8**	<0.1	**2**	**3**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
Total Number of samples			33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	27
Maximum Value			5	<PQL	16	73	51	0.2	80	63	4	0.52	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Detected

TABLE E-1
SOIL LABORATORY TCLP RESULTS
All data in mg/L unless stated otherwise

			Nickel
PQL - Envirolab Services			0.02
TCLP1 - General Solid Waste			2
TCLP2 - Restricted Solid Waste			8
TCLP3 - Hazardous Waste			>8
Sample Reference	**Sample Depth**	**Sample Description**	
JKE129	0.09-0.25	F: Gravelly sand	0.1
JKE131	0.07-0.2	F: Gravelly sand	0.1
JKE133	0.08-0.2	F: Gravelly sand	0.09
JKE133	0.2-0.3	F: Silty clay	0.08
Total Number of samples			4
Maximum Value			0.1

General Solid Waste	**VALUE**
Restricted Solid Waste	**VALUE**
Hazardous Waste	**VALUE**

TABLE F-1
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
All data in mg/kg unless stated otherwise

			C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			**RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE**			
Sample Reference	**Sample Depth**	**Soil Texture**				
JKE129	0.09-0.25	Coarse	<25	<50	<100	<100
JKE129	0.25-0.3	Coarse	<25	<50	<100	<100
JKE131	0.07-0.2	Coarse	<25	<50	<100	<100
JKE131	0.2-0.3	Coarse	<25	<50	<100	<100
JKE131 (replicate)	0.2-0.3	Coarse	<25	<50	<100	<100
JKE133	0.08-0.2	Coarse	<25	<50	<100	<100
JKE133	0.2-0.3	Coarse	<25	<50	<100	<100
JKE134	0-0.2	Coarse	<25	<50	<100	<100
JKE134	0.5-0.95	Coarse	<25	<50	<100	<100
JKE134	1.5-1.7	Coarse	<25	<50	<100	<100
JKE136	0-0.2	Coarse	<25	<50	<100	<100
JKE136	0.4-0.8	Coarse	<25	<50	<100	<100
JKE136	1.5-1.7	Coarse	<25	<50	<100	<100
JKE137	0.04-0.2	Coarse	<25	<50	<100	<100
JKE137	0.5-0.7	Coarse	<25	<50	<100	<100
Total Number of Samples			118	118	118	118
Maximum Value			<PQL	290	2300	1100

Concentration above the SAC	**VALUE**

MANAGEMENT LIMIT ASSESSMENT CRITERIA						
			C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			**RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE**			
Sample Reference	**Sample Depth**	**Soil Texture**				
JKE129	0.09-0.25	Coarse	700	1000	2500	10000
JKE129	0.25-0.3	Coarse	700	1000	2500	10000
JKE131	0.07-0.2	Coarse	700	1000	2500	10000
JKE131	0.2-0.3	Coarse	700	1000	2500	10000
JKE131 (replicate)	0.2-0.3	Coarse	700	1000	2500	10000
JKE133	0.08-0.2	Coarse	700	1000	2500	10000
JKE133	0.2-0.3	Coarse	700	1000	2500	10000
JKE134	0-0.2	Coarse	700	1000	2500	10000
JKE134	0.5-0.95	Coarse	700	1000	2500	10000
JKE134	1.5-1.7	Coarse	700	1000	2500	10000
JKE136	0-0.2	Coarse	700	1000	2500	10000
JKE136	0.4-0.8	Coarse	700	1000	2500	10000
JKE136	1.5-1.7	Coarse	700	1000	2500	10000
JKE137	0.04-0.2	Coarse	700	1000	2500	10000
JKE137	0.5-0.7	Coarse	700	1000	2500	10000

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TABLE G-1
SOIL LABORATORY RESULTS COMPARED T0 DIRECT CONTACT CRITERIA
All data in mg/kg unless stated otherwise

Analyte		C_6-C_{10}	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}-C_{40}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services		25	50	100	100	0.2	0.5	1	1	1	
CRC 2011 -Direct contact Criteria		4,400	3,300	4,500	6,300	100	14,000	4,500	12,000	1,400	
Site Use		**RESIDENTIAL WITH ACCESSIBLE SOIL- DIRECT SOIL CONTACT**									
Sample Reference	**Sample Depth**										
JKE129	0.09-0.25	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE129	0.25-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE131	0.07-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE131	0.2-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE131 (replicate)	0.2-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE133	0.08-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE133	0.2-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE134	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE134	0.5-0.95	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE134	1.5-1.7	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE136	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE136	0.4-0.8	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE136	1.5-1.7	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE137	0.04-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
JKE137	0.5-0.7	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0
Total Number of Samples		118	118	118	118	118	118	118	118	118	115
Maximum Value		<PQL	290	2300	1100	<PQL	<PQL	<PQL	<PQL	<PQL	120

Concentration above the SAC **VALUE**

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TABLE H-1
ASBESTOS QUANTIFICATION - FIELD OBSERVATIONS AND LABORATORY RESULTS
HSL-A: Residential with garden/accessible soils; children's day care centers; preschools; and primary schools

FIELD DATA														LABORATORY DATA													
Date Sampled	Sample reference	Sample Depth	Visible ACM in top 100mm	Approx. Volume of Soil (L)	Soil Mass (g)	Mass ACM (g)	Mass Asbestos in ACM (g)	[Asbestos from ACM in soil] (%w/w)	Mass ACM <7mm (g)	Mass Asbestos in ACM <7mm (g)	[Asbestos from ACM <7mm in soil] (%w/w)	Mass FA (g)	Mass Asbestos in FA (g)	[Asbestos from FA in soil] (%w/w)	Lab Report Number	Sample refeference	Sample Depth	Sample Mass (g)	Asbestos ID in soil (AS4964) >0.1g/kg	Trace Analysis	Total Asbestos (g/kg)	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation (g)	FA and AF Estimation (g)	ACM >7mm Estimation %(w/w)	FA and AF Estimation %(w/w)
SAC			**No**					**0.01**			**0.001**			**0.001**											**0.01**	**0.001**
9.8.19	JKE129	0.09-0.2	NO	10	4,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE129	0.09-0.25	920.55	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
9.8.19	JKE131	0.07-0.2	NO	10	3,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE131	0.07-0.2	891.89	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
9.8.19	JKE131	0.2-0.4	NA	10	3,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE131	0.2-0.3	699.37	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
9.8.19	JKE133	0.08-0.2	NO	10	3,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE133	0.08-0.2	1088.38	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
9.8.19	JKE133	0.2-0.45	NA	10	3,900	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8.8.19	JKE134	0-0.5	NO	10	12,500	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE134	0-0.2	788.35	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
8.8.19	JKE134	0.5-1.3	NA	10	8,900	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE134	0.5-0.95	942.46	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
8.8.19	JKE136	0-0.4	NO	10	11,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE136	0-0.2	599.06	Chrysotile asbestos detected: Organic fibres detected	No asbestos detected	0.3727	No visible asbestos detected	–	0.2233	<0.01	**0.0373**
8.8.19	JKE136	0.4-1.1	NA	10	10,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE136	0.4-0.8	437.68	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
8.8.19	JKE137	0.04-0.5	NO	10	5,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	223661	JKE137	0.04-0.2	739.61	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	Chrysotile	–	0.0632	<0.01	**0.0085**
8.8.19	JKE137	0.5-0.7	NA	10	2,500	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Concentration above the SAC **VALUE**

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TABLE I-1
SUMMARY OF FIBRE CEMENT ANALYSIS FOR ASBESTOS

		Asbestos
Sample Reference	**Sample Description**	
AMF1	Fibre cement material	**Asbestos detected**
Total Number of Samples		1

Asbestos detected in fibre cement

TABLE J-1
GROUNDWATER LABORATORY RESULTS COMPARED TO HSLs
All data in µg/L unless stated otherwise

				C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services				10	50	1	1	1	3	1	
NEPM 2013 - Land Use Category				**HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**								
MWJKE135	7.85	2m to <4m	Sand	<10	<50	<1	<1	<1	<3	<1	1.8
Total Number of Samples				1	1	1	1	1	1	1	1
Maximum Value				<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	1.8

Concentration above the SAC	VALUE
Site specific assesment (SSA) required	VALUE

The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

HSL GROUNDWATER ASSESSMENT CRITERIA

				C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services				10	50	1	1	1	3	1
NEPM 2013 - Land Use Category				**HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL**						
Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**							
MWJKE135	7.85	2m to <4m	Sand	1000	1000	800	NL	NL	NL	NL

TABLE K-1

ROUNDWATER LABORATORY RESULTS COMPARED TO SITE SPECIFIC HSLs - RISK ASSESSMEN

All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NHMRC ADWG 2018	MWJKE135
Volatile Organic Compounds (VOCs), including chlorinated VOCs			
Vinyl Chloride	**10**	0.3	<10
1,1-Dichloroethene	1	30	<1
Chloroform	1	250	<1
Bromodichloromethane	1		<1
1,2-dichloroethane	1	3	<1
Chlorobenzene	1	300	<1
1,3-dichlorobenzene	1	300	<1
1,4-dichlorobenzene	1	40	<1
1,2-dichlorobenzene	1	1500	<1

Concentration above the HSL -SSA	VALUE
PQL exceeds GIL	**BOLD/RED**

TABLE L-1
SUMMARY OF GROUNDAWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZG 2018 Fresh Waters	MWJKE135
Inorganic Compounds and Parameters			
pH	0.1	6.5 - 8.5	8
Electrical Conductivity (µS/cm)	1	NSL	14,000
Metals and Metalloids			
Arsenic (As III)	1	24	<1
Cadmium	0.1	0.2	<0.1
Chromium (VI)	1	1	<1
Copper	1	1.4	**30**
Lead	1	3.4	<1
Total Mercury (inorganic)	0.05	0.06	<0.05
Nickel	1	11	3
Zinc	1	8	**48**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)			
Benzene	1	950	<1
Toluene	1	180	<1
Ethylbenzene	1	80	<1
m+p-xylene	2	75	<2
o-xylene	1	350	<1
Total xylenes	1	NSL	<1
Volatile Organic Compounds (VOCs), including chlorinated VOCs			
Dichlorodifluoromethane	10	NSL	<10
Chloromethane	10	NSL	<10
Vinyl Chloride	10	100	<10
Bromomethane	10	NSL	<10
Chloroethane	10	NSL	<10
Trichlorofluoromethane	10	NSL	<10
1,1-Dichloroethene	1	700	<1
Trans-1,2-dichloroethene	1	NSL	<1
1,1-dichloroethane	1	90	<1
Cis-1,2-dichloroethene	1	NSL	<1
Bromochloromethane	1	NSL	<1
Chloroform	1	370	<1
2,2-dichloropropane	1	NSL	<1
1,2-dichloroethane	1	1900	<1
1,1,1-trichloroethane	1	270	<1
1,1-dichloropropene	1	NSL	<1
Cyclohexane	1	NSL	<1
Carbon tetrachloride	1	240	<1
Benzene	1	see BTEX	<1
Dibromomethane	1	NSL	<1
1,2-dichloropropane	1	900	<1
Trichloroethene	1	NSL	<1
Bromodichloromethane	1	NSL	<1
trans-1,3-dichloropropene	1	NSL	<1
cis-1,3-dichloropropene	1	NSL	<1
1,1,2-trichloroethane	1	6500	<1
Toluene	1	see BTEX	<1
1,3-dichloropropane	1	1100	<1
Dibromochloromethane	1	NSL	<1
1,2-dibromoethane	1	NSL	<1
Tetrachloroethene	1	70	<1
1,1,1,2-tetrachloroethane	1	NSL	<1
Chlorobenzene	1	55	<1
Ethylbenzene	1	see BTEX	<1
Bromoform	1	NSL	<1
m+p-xylene	2	see BTEX	<2
Styrene	1	NSL	<1
1,1,2,2-tetrachloroethane	1	400	<1
o-xylene	1	see BTEX	<1
1,2,3-trichloropropane	1	NSL	<1
Isopropylbenzene	1	30	<1
Bromobenzene	1	NSL	<1
n-propyl benzene	1	NSL	<1
2-chlorotoluene	1	NSL	<1
4-chlorotoluene	1	NSL	<1
1,3,5-trimethyl benzene	1	NSL	<1
Tert-butyl benzene	1	NSL	<1
1,2,4-trimethyl benzene	1	NSL	<1
1,3-dichlorobenzene	1	260	<1
Sec-butyl benzene	1	NSL	<1
1,4-dichlorobenzene	1	60	<1
4-isopropyl toluene	1	NSL	<1
1,2-dichlorobenzene	1	160	<1
n-butyl benzene	1	NSL	<1
1,2-dibromo-3-chloropropane	1	NSL	<1
1,2,4-trichlorobenzene	1	85	<1
Hexachlorobutadiene	1	NSL	<1
1,2,3-trichlorobenzene	1	3	<1
Polycyclic Aromatic Hydrocarbons (PAHs)			
Naphthalene	0.2	16	<0.2
Acenaphthylene	0.1	NSL	<0.1
Acenaphthene	0.1	NSL	<0.1
Fluorene	0.1	NSL	<0.1
Phenanthrene	0.1	0.6	<0.1
Anthracene	0.1	0.01	<0.1
Fluoranthene	0.1	1	<0.1
Pyrene	0.1	NSL	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1
Chrysene	0.1	NSL	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1

Concentration above the GIL	**VALUE**
PQL exceeds GIL	**BOLD/RED**

JKEnvironments

TABLE M-1

SUMMARY OF LABORATORY RESULTS - ACID SULFATE SOIL ANALYSIS (sPOCAS)

		Analysis	pH_{KCL}	TAA	pH_{ox}	TPA	TSA	S_{POS}	SCr	Liming Rate
				pH 6.5		pH 6.5	pH 6.5	%w/w	%w/w	kg $CaCO_3$/tonne
Acid Sulfate Soil Manual (1998) - Action Criteria		Coarse Textured Soil	pH 5.0	18molH+/ tonne	pH 5.0	18molH+/ tonne	18molH+/ tonne	0.03% w/w	0.03% w/w	
Sample Reference	**Sample Depth (m)**	**Sample Description**								
JKE135	1.7-1.95	Silty clay	4.8	<5	4.3	5	<5	0.02	NA	1.2
JKE135	9.1-9.45	Silty sandy clay	7.1	<5	7.4	<5	<5	0.008	NA	<0.75
Total Number of Samples			2	2	2	2	2	2	1	2
Minimum Value			4.8	<PQL	4.3	5	5	0.008	0.17	1.2
Maximum Value			7.1	<PQL	7.4	5	<PQL	0.02	0.17	1.2

Values Exceeding Action Criteria **VALUE**

JKEnvironments

TABLE N-1
SUMMARY OF SOIL LABORATORY RESULTS - EC and ECe

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	ECe (dS/m)	Salinity Class[1]
JKE135	3.0-3.45	Silty clay	210	<2	**Non-saline**
JKE135	9.1-9.45	Silty sandy clay	780	6.7	**Moderately Saline**
Total Number of Samples			2	14	-
Minimum Value			210	<2	-
Maximum Value			780	6.7	-

Explanation

1 - Salinity Class has been adopted from '*Site Investigations for Urban Salinity*' DLWC 2002.

(dS/m)	Salinity Class
<2	Non-Saline
2 to 4	Slightly Saline
4 to 8	Moderately Saline
8 to 16	Very Saline
>16	Highly Saline

Abbreviations

EC - Electrical Conductivity

ECe - Extract Electrical Conductivity

JKEnvironments

TABLE O-1
SUMMARY OF RESISTIVITY CALCULATION ON SOIL EC RESULTS

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	Resistivity[1] (ohm.cm)	Classification[2] Condition A
JKE135	3.0-3.45	Silty clay	210	4,762	Mildly Aggressive
JKE135	9.1-9.45	Silty sandy clay	780	1,282	Moderately Aggressive
Total Number of Samples			2	2	-
Minimum Value			210	1,282	-
Maximum Value			780	4,762	-

Explanation

1 - Resistivity values have been calculated on the laboratory EC values presented in Table S

2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C])
Classification is based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

Resistivity Values (ohm.cm)	Classification for Steel Piles
>5,000	Non-Aggressive
2,000 - 5,000	Mildly Aggressive
1,000 - 2,000	Moderately Aggressive
<1,000	Severely Aggressive

Abbreviations

EC - Electrical Conductivity

TABLE P-1
SUMMARY OF SOIL LABORATORY RESULTS - pH

Borehole Number	Sample Depth (m)	Sample Description	pH	Classification for Concrete Piles[1] Soil Condition A[2]	Classification for Steel Piles[1] Soil Condition A[2]
JKE135	3.0-3.45	Silty clay	5.5	**Moderately Aggressive**	**Non-Aggressive**
JKE135	9.1-9.45	Silty sandy clay	8.6	**Mildly Aggressive**	**Non-Aggressive**
Total Number of Samples			2	-	-
Minimum Value			5.5	-	-
Maximum Value			8.6	-	-

Explanation

1 - pH Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [C] & 6.5.2 [C])

2 - Classification is based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

pH Value	Classification for Concrete Piles
>5.5	**Mildly Aggressive**
4.5 - 5.5	**Moderately Aggressive**
4 - 4.5	**Severely Aggressive**
<4	**Very Severely Aggressive**

pH Value	Classification for Steel Piles
>5	**Non-Aggressive**
4.0 - 5.0	**Mildly Aggressive**
3.0 - 4.0	**Moderately Aggressive**
<3	**Severely Aggressive**

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TABLE Q-1
SUMMARY OF SOIL LABORATORY RESULTS - SULPHATE & CHLORIDES

Borehole Number	Sample Depth (m)	Sample Description	Sulphate (mg/kg)	Chloride (mg/kg)	Classification for Concrete Piles[1] SO4 - Soil Condition A[2]	Classification for Steel Piles[1] Cl - Soil Condition A[2]
JKE135	3.0-3.45	Silty clay	110	200	Mildly Aggressive	Non-Aggressive
JKE135	9.1-9.45	Silty sandy clay	140	970	Mildly Aggressive	Non-Aggressive
Total Number of Samples			2	2	-	-
Minimum Value			110	200	-	-
Maximum Value			140	970	-	-

Explanation
1 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [C] & 6.5.2 [C])
2 - Classification is based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

Sulphate (SO4) Values	Classification for Concrete Piles	Chloride (Cl) Values	Classification for Steel Piles
<5,000	Mildly Aggressive	<5,000	Non-Aggressive
5,000 - 10,000	Moderately Aggressive	5,000 - 20,000	Mildly Aggressive
10,000 - 20,000	Severely Aggressive	20,000 - 50,000	Moderately Aggressive
>20,000	Very Severely Aggressive	>50,000	Severely Aggressive

JKEnvironments

TABLE R-1
SUMMARY OF SOIL LABORATORY RESULTS - CEC & ESP

Borehole Number	Sample Depth (m)	Sample Description	Total CEC	Ca	K	Mg	Na	ESP[1]
			(meq/100g)					%
JKE135	3.0-3.45	Silty clay	2.7	<0.1	<0.1	1.6	1.1	**40.7**
Total Number of Samples			1	0	0	1	1	1
Minimum Value			2.70	0.00	0.00	1.60	1.10	40.74
Maximum Value			2.70	0.00	0.00	1.60	1.10	40.74

Explanation

1 - Sodicity rating has been adopted from the publication *'Site Investigations for Urban Salinity' DLWC* 2002.

ESP Value	Sodicity Rating
< 5%	**Non-Sodic**
5% to 15%	**Sodic**
> 15%	**Highly Sodic**

Abbreviation

CEC: Cation Exchange Capacity
ESP: Exchangeable Sodium Percentage (Each Na/CEC)
Mg: Exchangeable Magnesium
Na: Exchangeable Sodium
K: Exchangeable Potassium
Ca: Exchangeable Calcium

JKEnvironments

TABLE S-1
SUMMARY OF GROUNDWATER LABORATORY RESULTS

Sample Reference	Field Measurements[1]						Laboratory Results				Classification for Concrete Piles[2] Soil Condition A[3]	Classification for Steel Piles[2] Soil Condition A[3]
	SWL (m)	pH	EC (µS/cm)	Temp (°C)	Eh (mV)	DO (mg/L)	pH	EC (µS/cm)	SO4 (mg/L)	Cl (mg/L)		
MWJKE135	7.85	6.94	10702	21	115.1	4.7	8	14000	490	3400	Mildly Aggressive	Mildly Aggressive
Total Number of Samples	1	1	1	1	1	1	1	1	1	1	-	-
Minimum Value	7.85	6.94	10702	21	115.1	4.7	8	14000	490	3400	-	-
Maximum Value	7.85	6.94	10702	21	115.1	4.7	8	14000	490	3400	-	-

Explanation

1 - Field Measurements were obtained on 16 August 2019

Exposure Classification for Concrete Piles

2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [A] & [C])

3 - Classification is based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

pH	Sulphate (mg/L)	Chloride (mg/L)	Classification
> 5.5	<1,000	<6,000	Mildly Aggressive
4.5 - 5.5	1,000 - 3,000	6,000 - 12,000	Moderately Aggressive
4.0 - 4.5	3,000 - 10,000	12,000 - 30,000	Severely Aggressive
< 4	>10,000	>30,000	Very Severely Aggressive

Exposure Classification for Steel Piles

2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.5.2 [A] & [C])

3 - Classification is also based on Soil condition 'A' - high permeability soils (e.g. sands & gravel) that are in groundwater.

pH	Chloride (mg/L)	Classification
> 5	<1,000	Non-Aggressive
4.0 - 5.0	1,000 - 10,000	Mildly Aggressive
3.0 - 4.0	10,000 - 20,000	Moderately Aggressive
<3	>20,000	Severely Aggressive

Abbreviation

SWL - Standing Water Level	SO4 - Sulphate
EC - Electrical Conductivity	Cl - Chloride
Eh - Redox Potential	DO - Dissolved Oxygen

Appendix C: Site Information and Site History

Proposed Development Plans

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MAIN WORKS SSDA

Liverpool Health & Academic Precinct
Elizabeth Street, Liverpool NSW

Revision: **05 (DRAFT FOR REVIEW)**
24 JANUARY 2020

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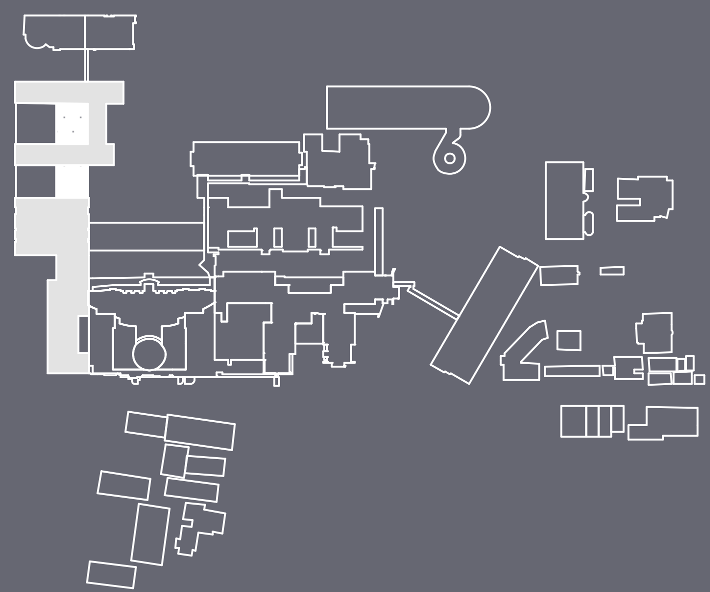

MAIN WORKS - SSDA - DRAWING LIST

	COVER
A-SSDA-MW-01	DRAWING LIST
A-SSDA-MW-02	LOCATION PLAN
A-SSDA-MW-03	EXISTING SITE PLAN
A-SSDA-MW-04	BUILDING DEMOLITION PLAN
A-SSDA-MW-05	BASEMENT DEMOLITION PLAN
A-SSDA-MW-06	SITE PLAN
A-SSDA-MW-07	BASEMENT
A-SSDA-MW-08	GROUND PLAN
A-SSDA-MW-09	LEVEL 1
A-SSDA-MW-10	LEVEL 2
A-SSDA-MW-11	LEVEL 3
A-SSDA-MW-12	LEVEL 4
A-SSDA-MW-13	LEVEL 5
A-SSDA-MW-14	LEVEL 6 - PLANT
A-SSDA-MW-15	ROOF
A-SSDA-MW-16	SECTION THROUGH NORTH IPU TOWER
A-SSDA-MW-17	SECTION THROUGH EXISTING BUNKER
A-SSDA-MW-18	SECTION THROUGH SOUTH IPU TOWER
A-SSDA-MW-19	SECTION THROUGH MAIN ENTRY
A-SSDA-MW-20	SECTION THROUGH ELIZABETH STREET
A-SSDA-MW-21	SECTION THROUGH CAMPBELL STREET
A-SSDA-MW-22	NORTH ELEVATION
A-SSDA-MW-23	EAST ELEVATION 01
A-SSDA-MW-24	EAST ELEVATION 02
A-SSDA-MW-25	WEST ELEVATION 01
A-SSDA-MW-26	WEST ELEVATION 02
A-SSDA-MW-27	SOUTH ELEVATION - EXISTING BUILDINGS
A-SSDA-MW-28	SOUTH ELEVATION
A-SSDA-MW-29	SOUTH ELEVATION - NEW AMBULANCE STATION
A-SSDA-MW-30	FACADE DETAIL SECTION IPU TOWER
A-SSDA-MW-31	FACADE DETAIL SECTION PODIUM
A-SSDA-MW-32	FACADE DETAIL SECTION BRICK
A-SSDA-MW-33	SCHEDULE OF FINSIHES: SOUTH WEST VIEW
A-SSDA-MW-34	SCHEDULE OF FINSIHES: EAST VIEW
A-SSDA-MW-35	3D VIEW: CORNER OF GOULBURN AND ELIZABETH ST
A-SSDA-MW-36	3D VIEW: CORNER OF GOULBURN AND CAMPBELL ST
A-SSDA-MW-37	3D VIEW: FORBES STREET COURTYARD
A-SSDA-MW-38	3D VIEW: INTERNAL HOSPITAL STREET
A-SSDA-MW-39	SHADOW DIAGRAMS
A-SSDA-MW-40	VISUAL IMPACT ASSESSMENT
A-SSDA-MW-41	VISUAL IMPACT ASSESSMENT
A-SSDA-MW-42	VISUAL IMPACT ASSESSMENT
A-SSDA-MW-43	VISUAL IMPACT ASSESSMENT

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE

25mm ON ORIGINAL

DRAWING
DRAWING LIST

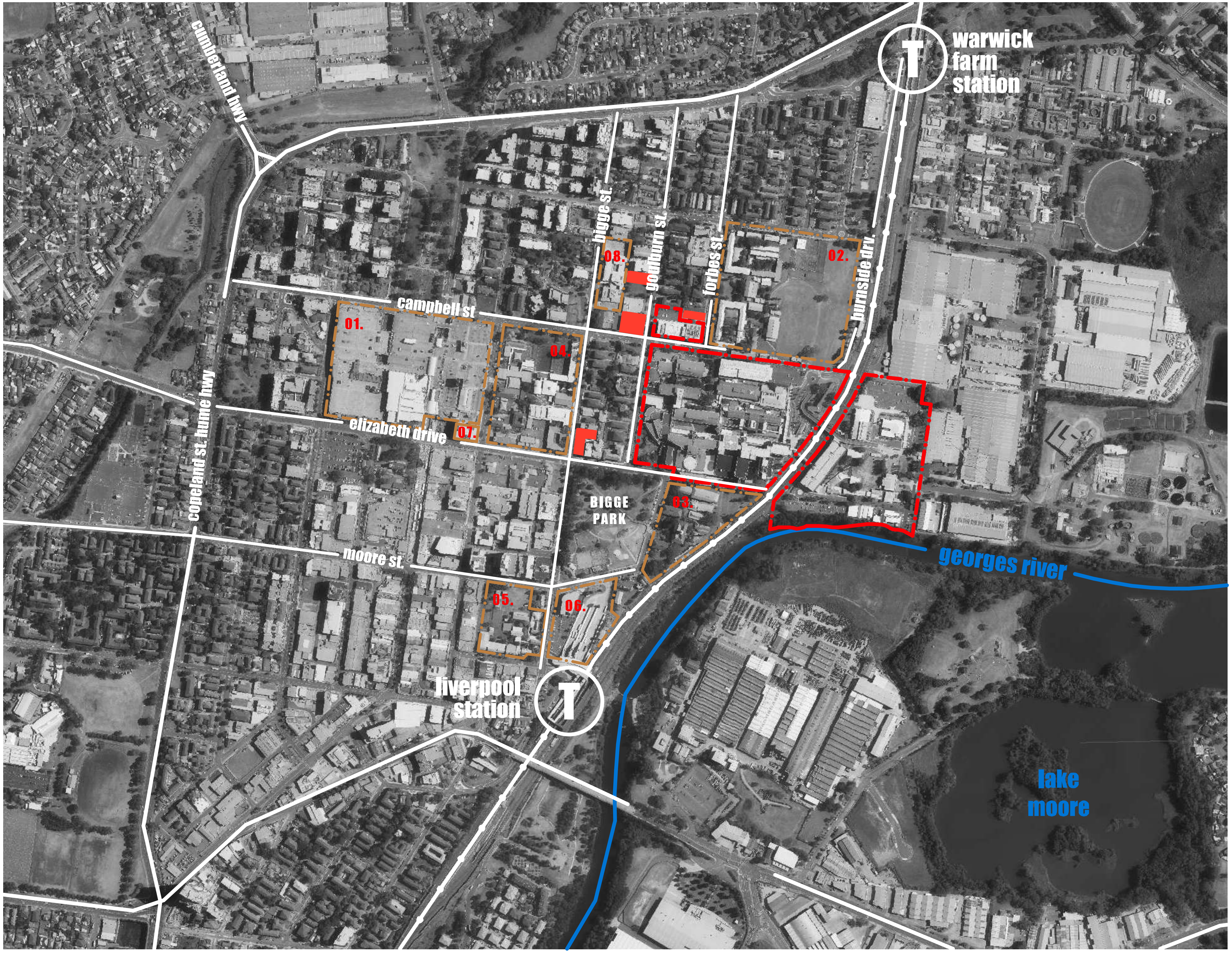
PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-01
ISSUE 05

STATUS
DRAFT FOR REVIEW

KEY SITES

01. westfield liverpool
02. liverpool public high schools
03. tafe liverpool
04. all saints catholic collage
05. liverpool public school
06. liverpool bus depot
07. university of western sydney
08. sydney southwest private hospital



liverpool hospital

health administration corporation owned sites

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03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH

SCALE

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DRAWING
LOCATION PLAN

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-02

ISSUE
05

STATUS
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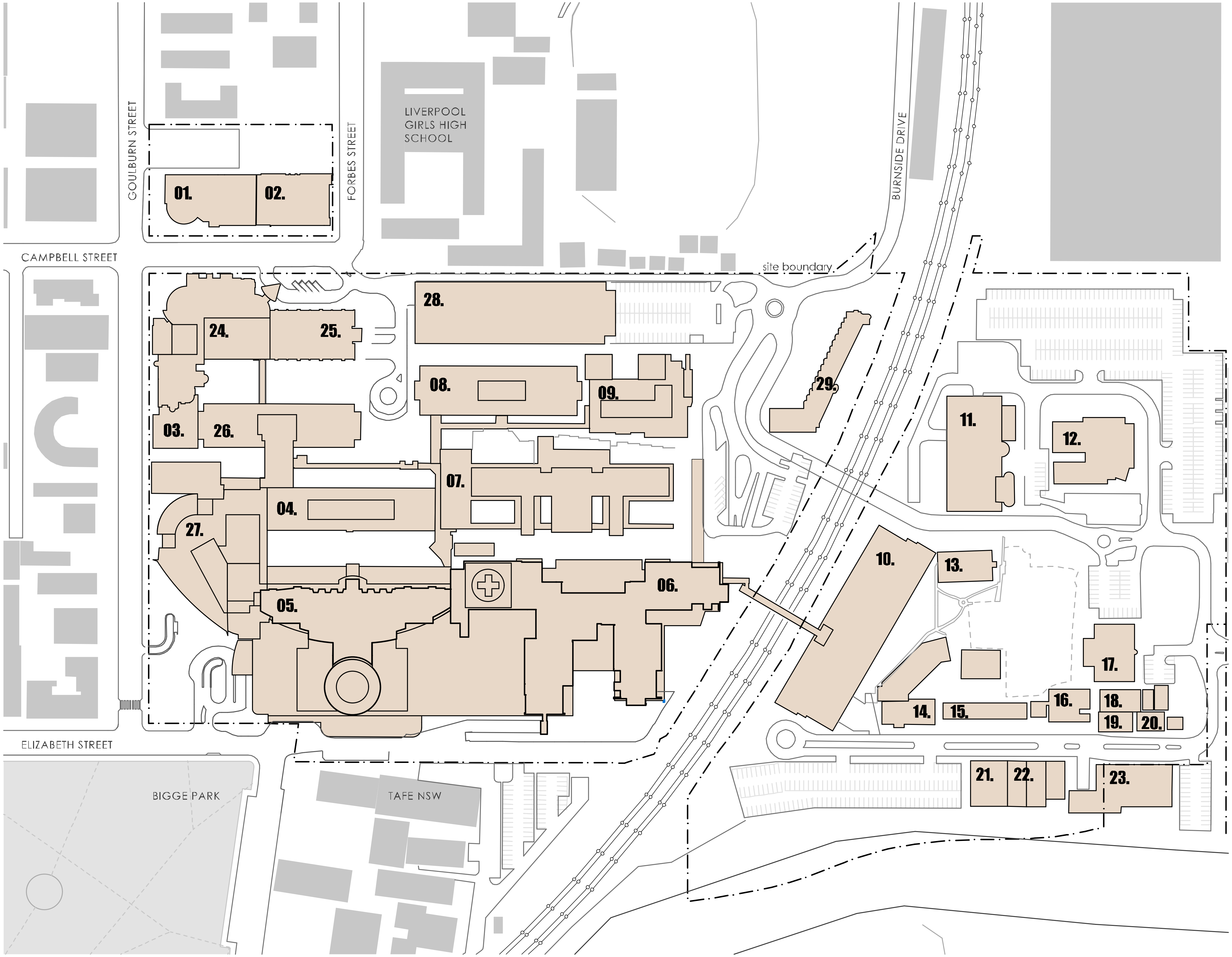

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit
10. P4 multi-storey car park
11. central energy building
12. ngara health education
13. bungala building
14. child care centre
15. staff education trainning
16. physical recources
17. admin building
18. multicultural health services
19. biu admin
20. biu nursing area
21. interpret building
22. store shed
23. isd swsahs
24. cancer building
25. pathology building
26. alex grimson
27. thomas & rachael moore edu. centre
28. P2 car park
29. ron dunbier

liverpool campus

existing buildings

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04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH

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1:2000 @A3

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EXISTING SITE PLAN

PRINT DATE
23/01/2020

PROJECT NO.
21807

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A-SSDA-MW-03

ISSUE
05

STATUS
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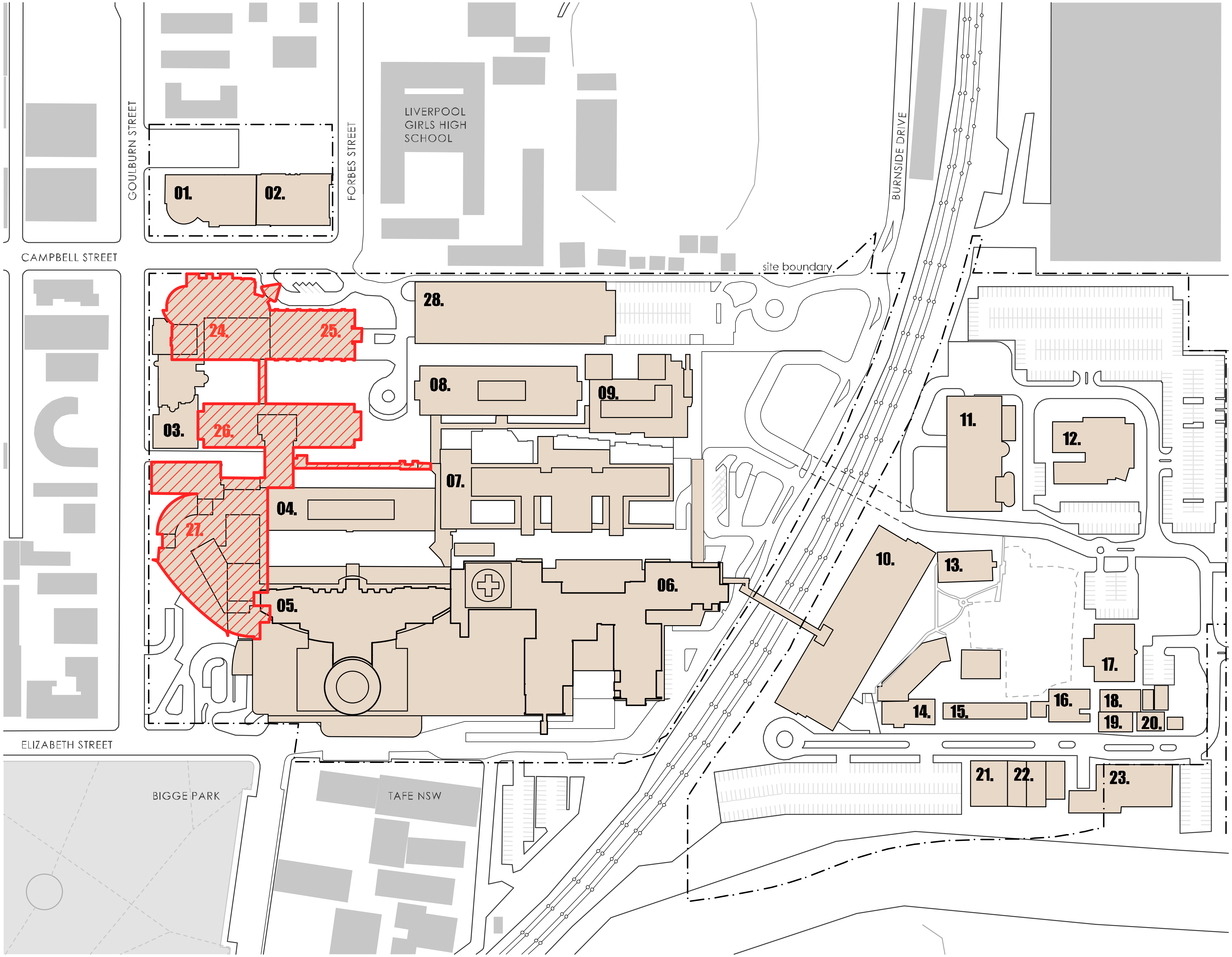
LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit
10. P4 multi-storey car park
11. central energy building
12. ngara health education
13. bungala building
14. child care centre
15. staff education trainning
16. physical recources
17. admin building
18. multicultural health services
19. biu admin
20. biu nursing area
21. interpret building
22. store shed
23. isd swsahs
24. cancer building
25. pathology building
26. alex grimson
27. thomas & rachael moore education centre
28. P2 car park



buildings to be demoslished
liverpool campus
existing buildings

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04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
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14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH
SCALE
1:2000 @A3
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DRAWING
BUILDING DEMOLITION PLAN

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-04

ISSUE
05

STATUS
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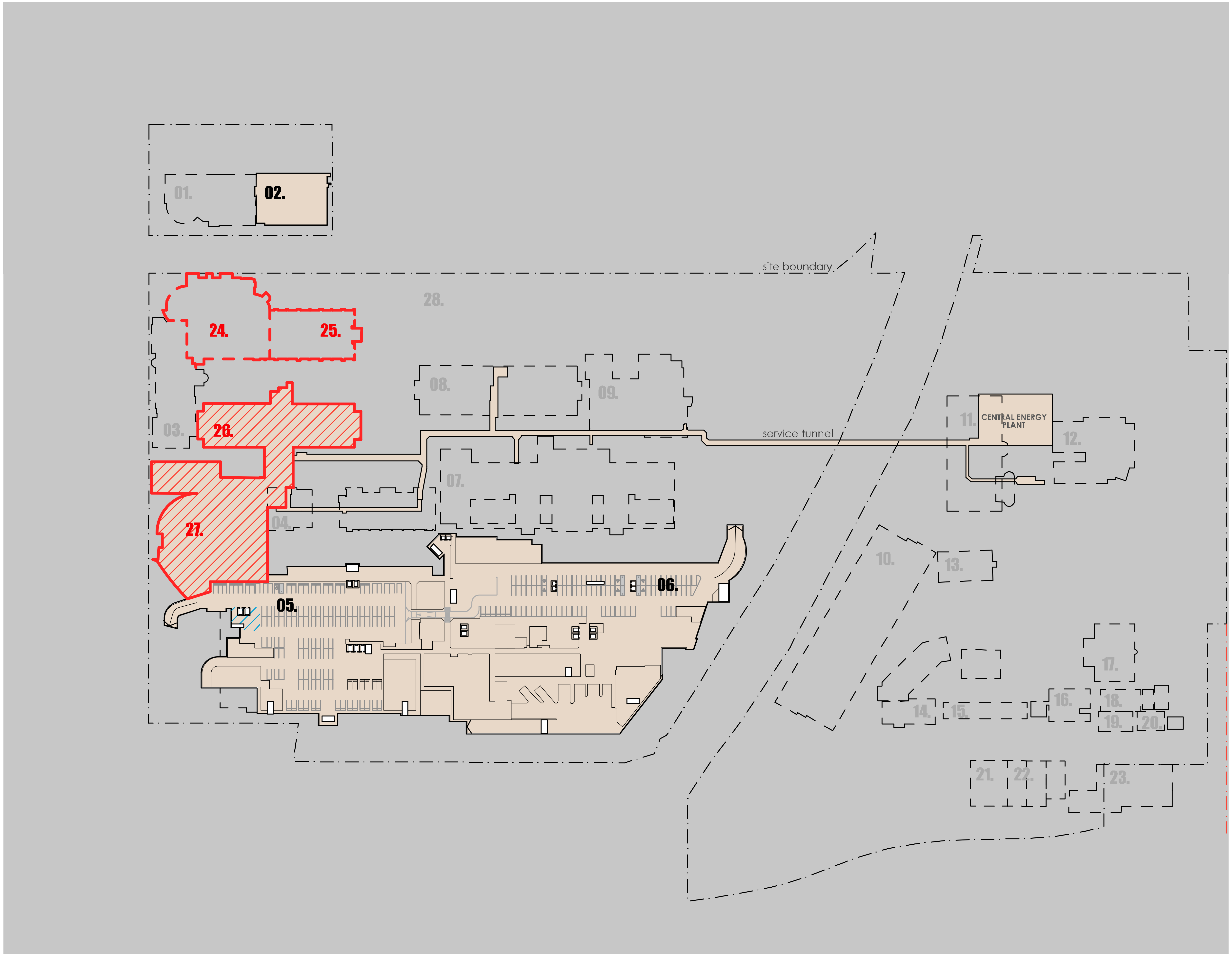
LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit
10. P4 multi-storey car park
11. central energy building
12. ngara health education
13. bungala building
14. child care centre
15. staff education trainning
16. physical recources
17. admin building
18. multicultural health services
19. biu admin
20. biu nursing area
21. interpret building
22. store shed
23. isd swsahs
24. cancer building
25. pathology building
26. alex grimson
27. thomas & rachael moore education centre
28. P2 car park



buildings above shown dotted
buildings above to be demolished
basement to be demoslished
liverpool campus
existing buildings

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REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH

SCALE 1:2000 @A3

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BASEMENT DEMOLITION PLAN

PRINT DATE
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PROJECT NO. 21807

DRAWING NO. A-SSDA-MW-05

ISSUE 05

STATUS
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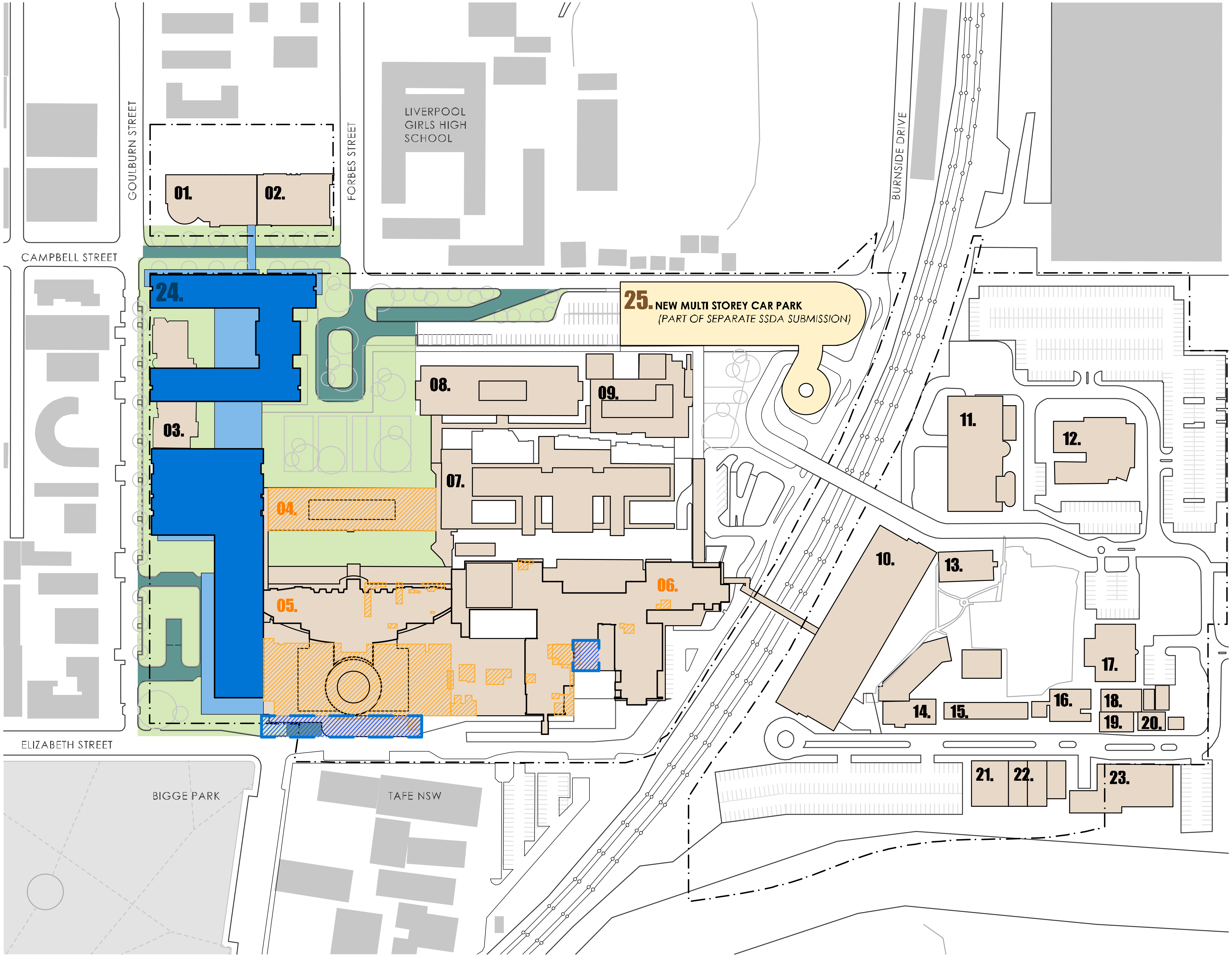
LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit
10. P4 multi-storey car park
11. central energy building
12. ngara health education
13. bungala building
14. child care centre
15. staff education trainning
16. physical recources
17. admin building
18. multicultural health services
19. biu admin
20. biu nursing area
21. interpret building
22. store shed
23. isd swsahs
24. new integrated services building (ISB)
25. new multi storey car park
(part of separate SSDA)

** BUILDINGS 04, 05 & 06 TO BE REFURBISHED INTERNALLY*



road works
landscape works
new integrated services building (ISB)
external facade/works to existing clinical services buildings
refurbished area of existing building, internal works only
liverpool campus
existing buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH
SCALE 1:2000 @A3
25mm ON ORIGINAL

DRAWING
SITE PLAN

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-06

ISSUE
05

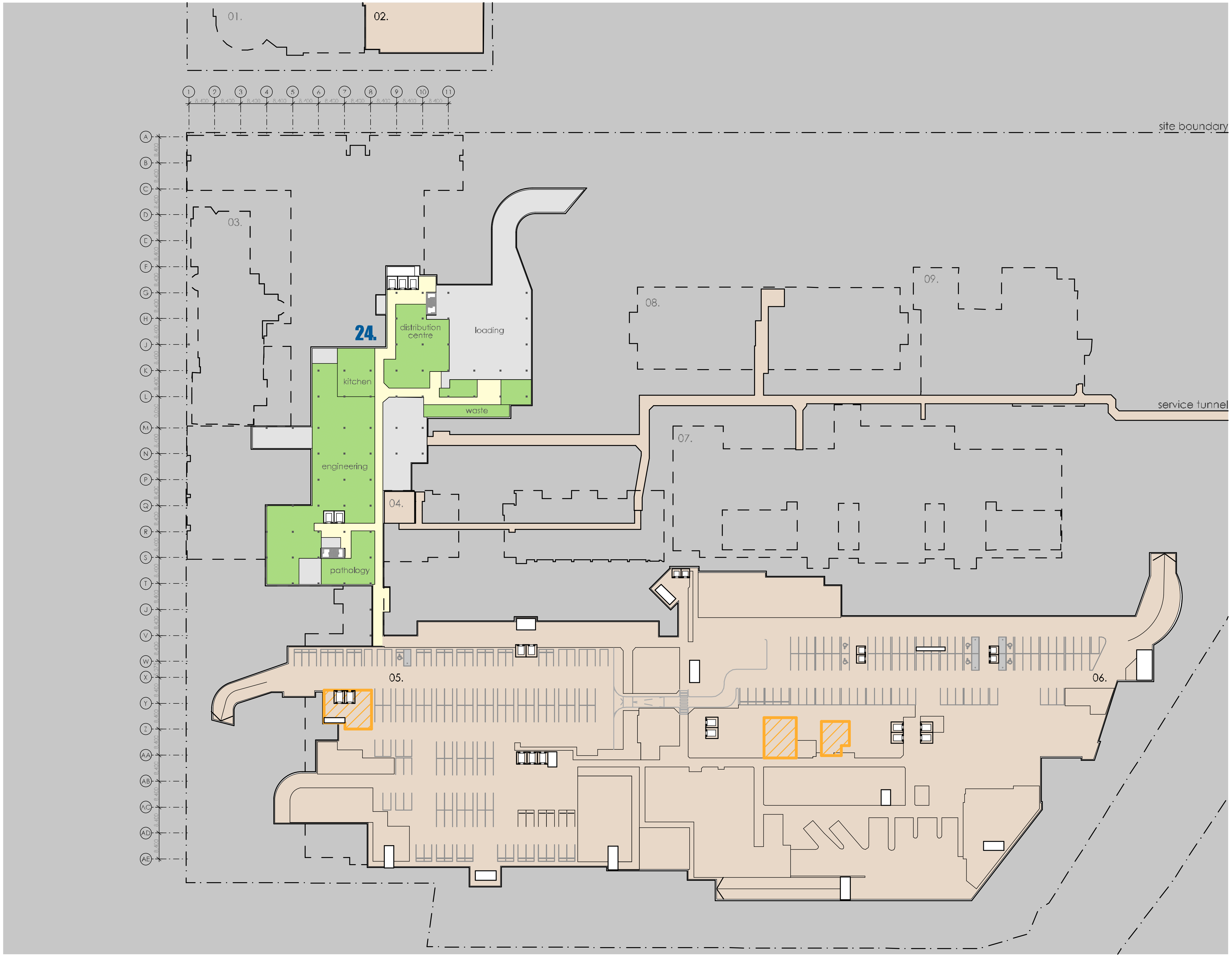
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

BASEMENT **RL+ 7.900**



refurbished area of existing building. internal works only

new external facade/works expansion of existing building

buildings above shown dotted

liverpool campus

existing clinical buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:1200 @A3
25mm ON ORIGINAL

DRAWING
BASEMENT

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-07
ISSUE 05

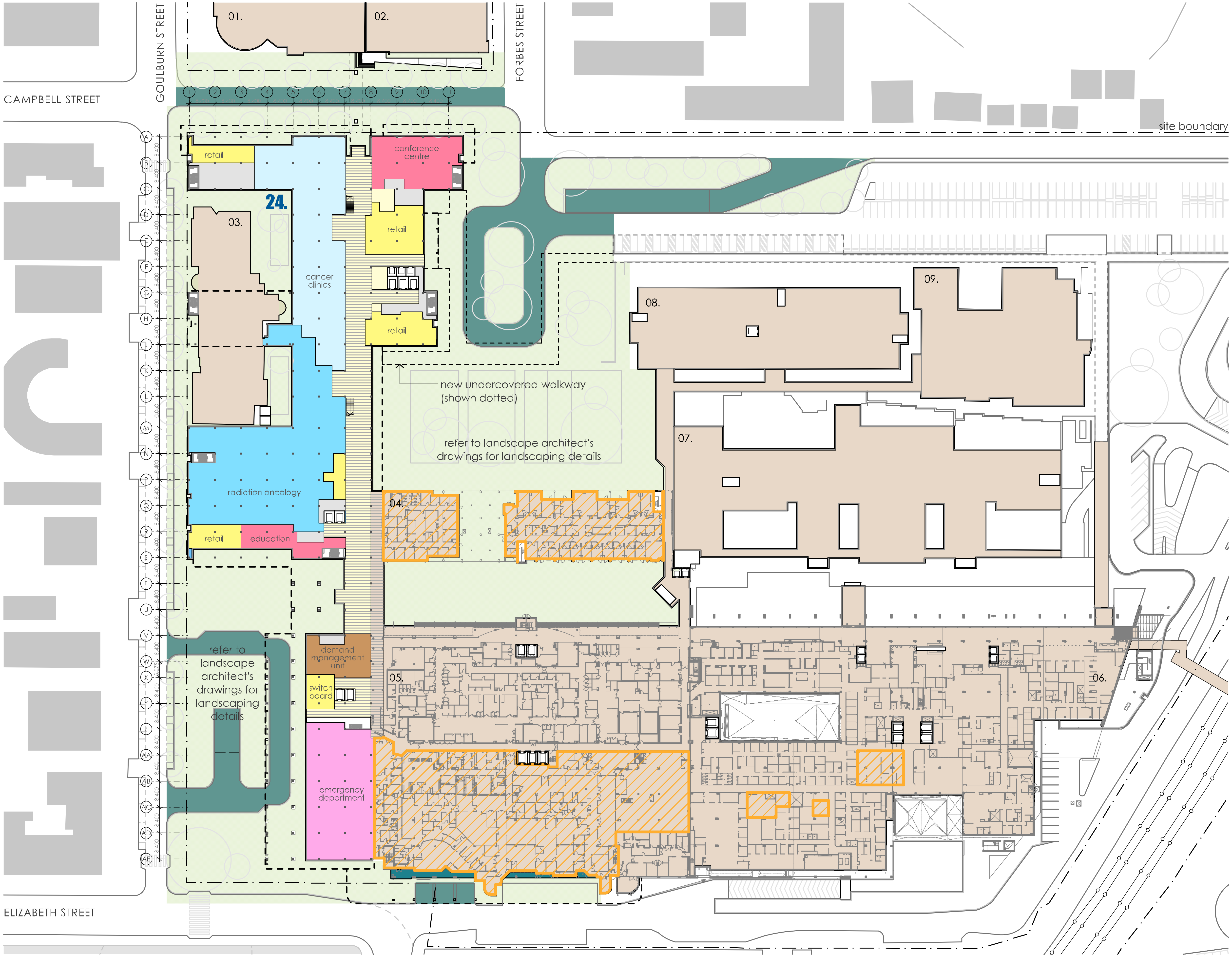
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

GROUND FLOOR **RL+ 12.200**



road works
landscape works
refurbished area of existing building. internal works only
new external facade/works expansion of existing building
liverpool campus
existing clinical buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
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04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:1200 @A3
25mm ON ORIGINAL

DRAWING
GROUND PLAN

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-08

ISSUE
05

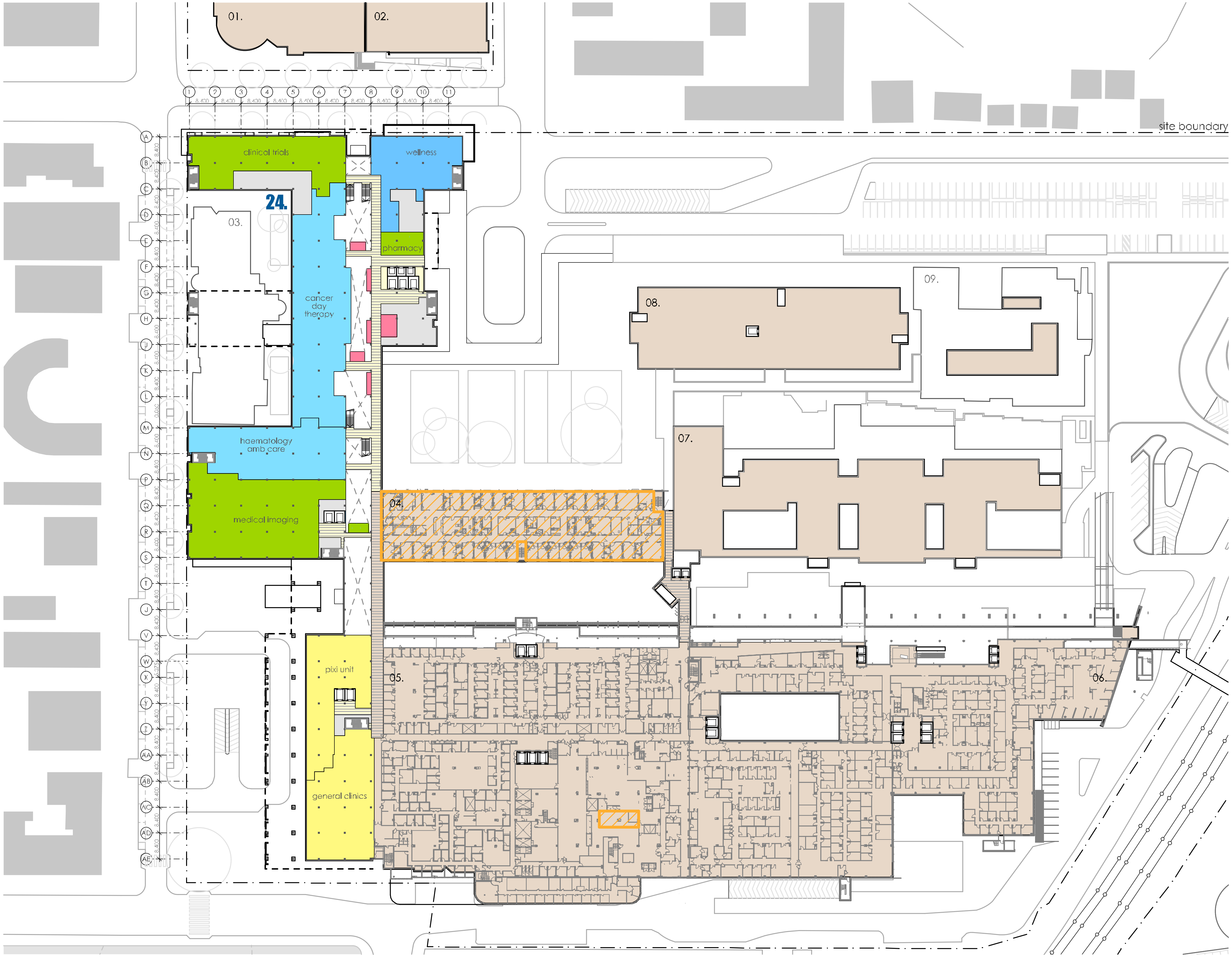
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

LEVEL 1 **RL+ 16.400**



refurbished area of existing building. internal works only
new external facade/works expansion of existing building
liverpool campus
existing clinical buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH
SCALE 1:1200 @A3
25mm ON ORIGINAL

DRAWING
LEVEL 1

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-09

ISSUE
05

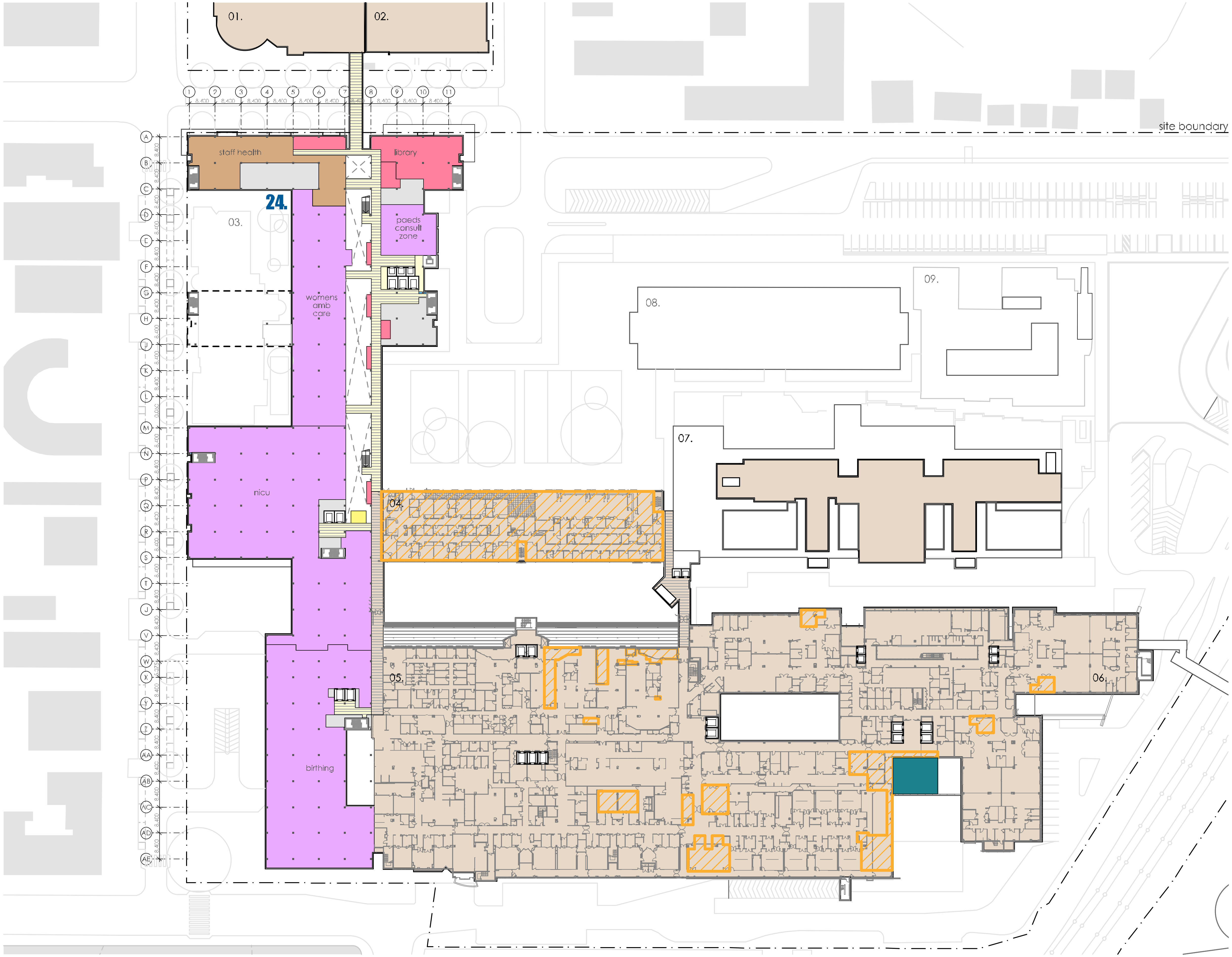
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

LEVEL 2 **RL+ 20.600**



refurbished area of existing building. internal works only

new external facade/works expansion of existing building

liverpool campus

existing clinical buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH

SCALE 1:1200 @A3

25mm ON ORIGINAL

DRAWING
LEVEL 2

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-10

ISSUE
05

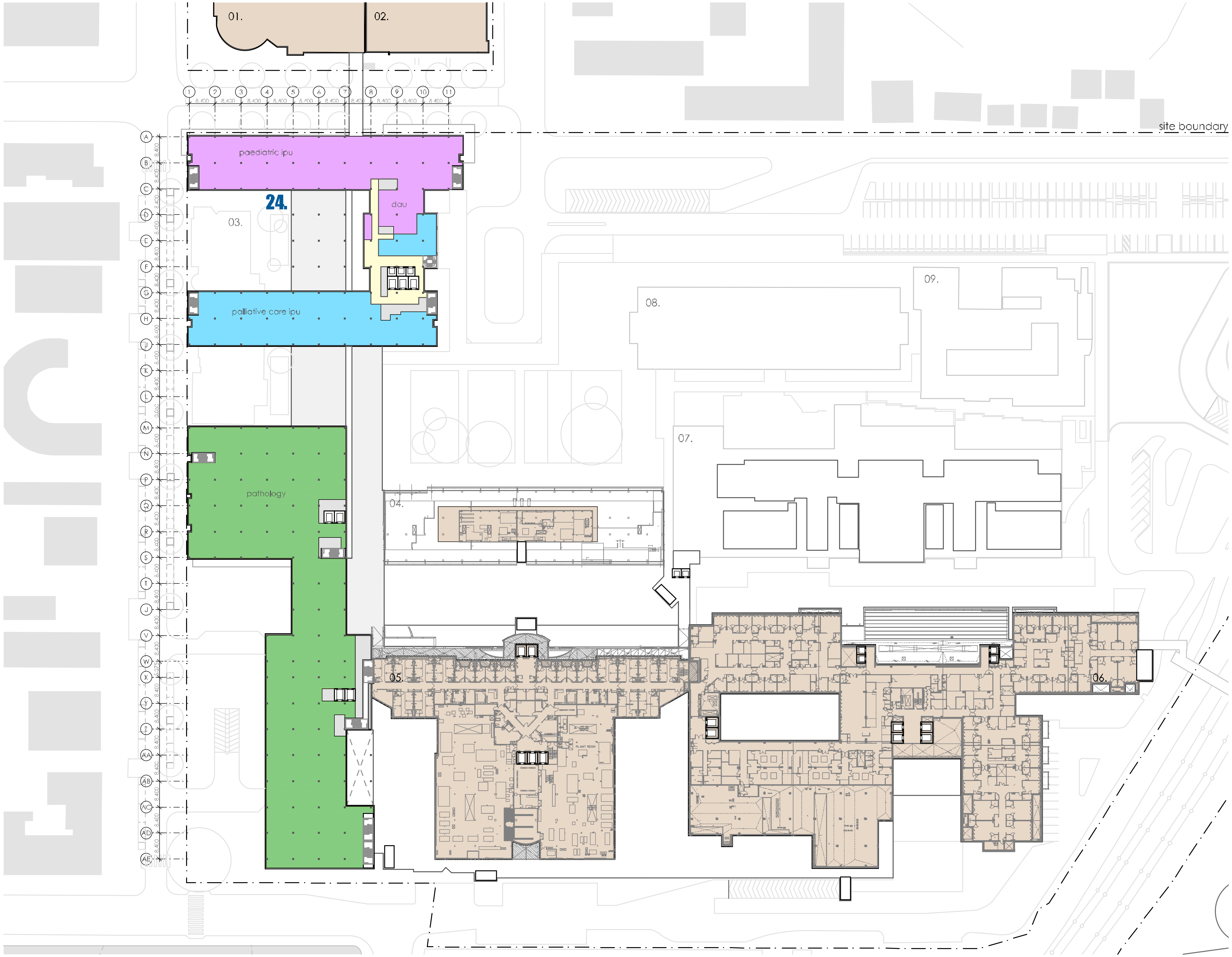
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

LEVEL 3 **RL+ 25.100**



refurbished area of existing building. internal works only

new external facade/works expansion of existing building

liverpool campus

existing clinical buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH

SCALE
1:1200 @A3

25mm ON ORIGINAL

DRAWING
LEVEL 3

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-11

ISSUE
05

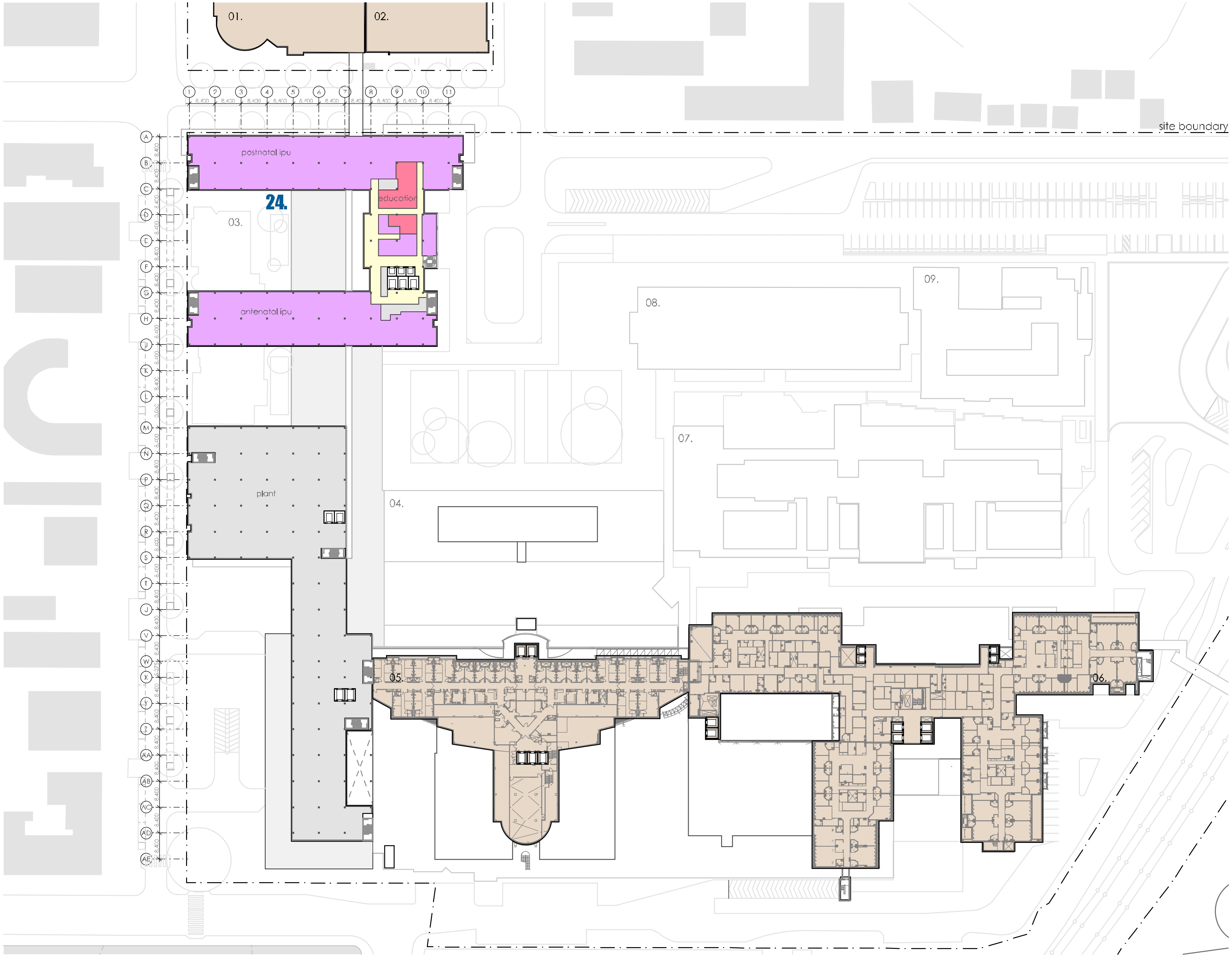
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

LEVEL 4 **RL+ 29.600**



refurbished area of existing building. internal works only

new external facade/works expansion of existing building

liverpool campus

existing clinical buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HE & ACADEMIC PRECINCT
ELIZABETH STREE RPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:1200 @A3
25mm ON ORIGINAL

DRAWING
LEVEL 4

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-12

ISSUE
05

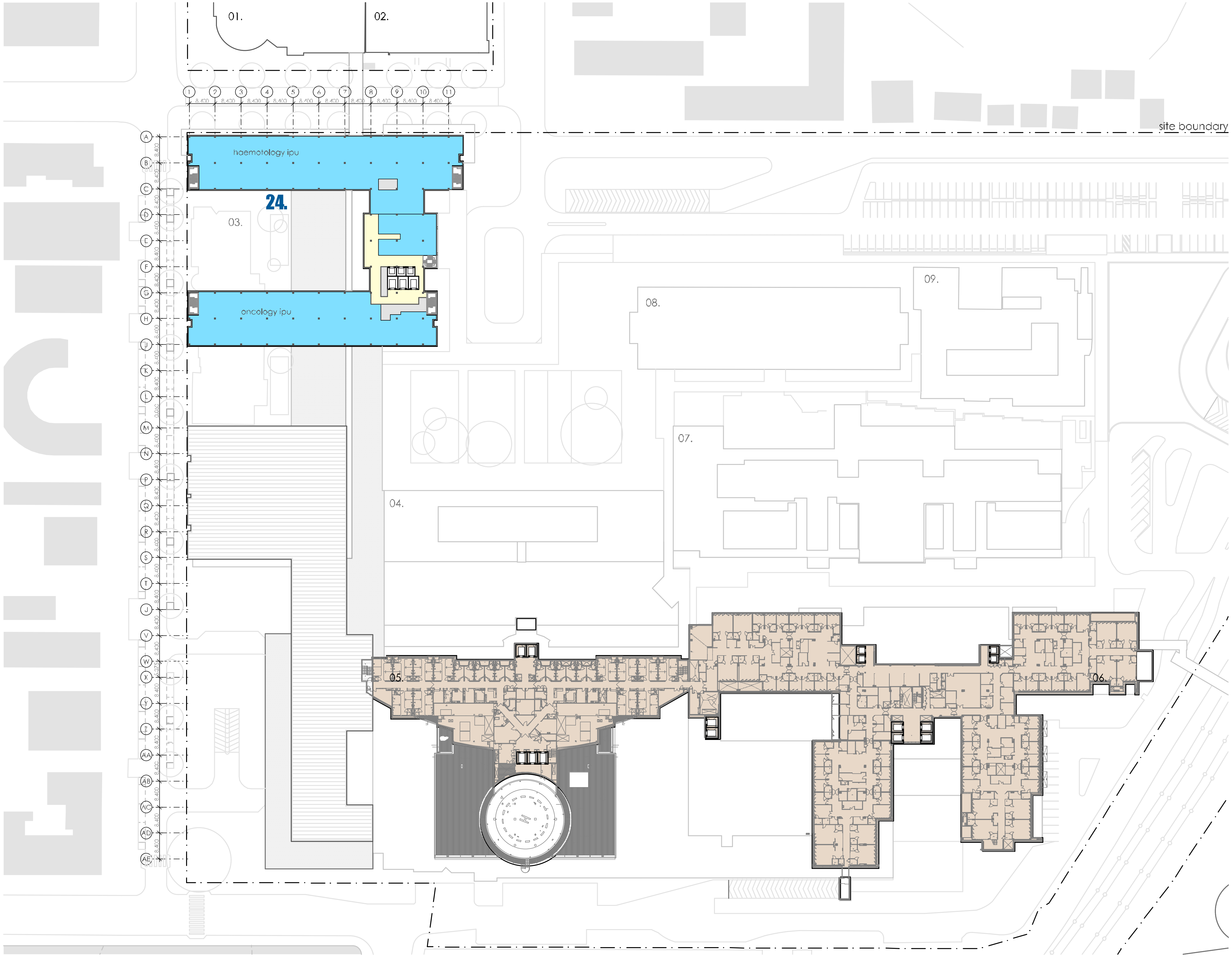
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

LEVEL 5 **RL+ 34.100**



refurbished area of existing building. internal works only

new external facade/works expansion of existing building

liverpool campus

existing clinical buildings

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DRAWINGS SHOW DESIGN INTENT ONLY. SHOP DRAWINGS ARE TO BE PROVIDED FOR APPROVAL PRIOR TO CONSTRUCTION OR MANUFACTURE.
INCONSISTENCIES ARE TO BE REPORTED TO fitzpatrick + partners.

AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH

SCALE
1:1200 @A3

25mm ON ORIGINAL

DRAWING
LEVEL 5

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-13

ISSUE
05

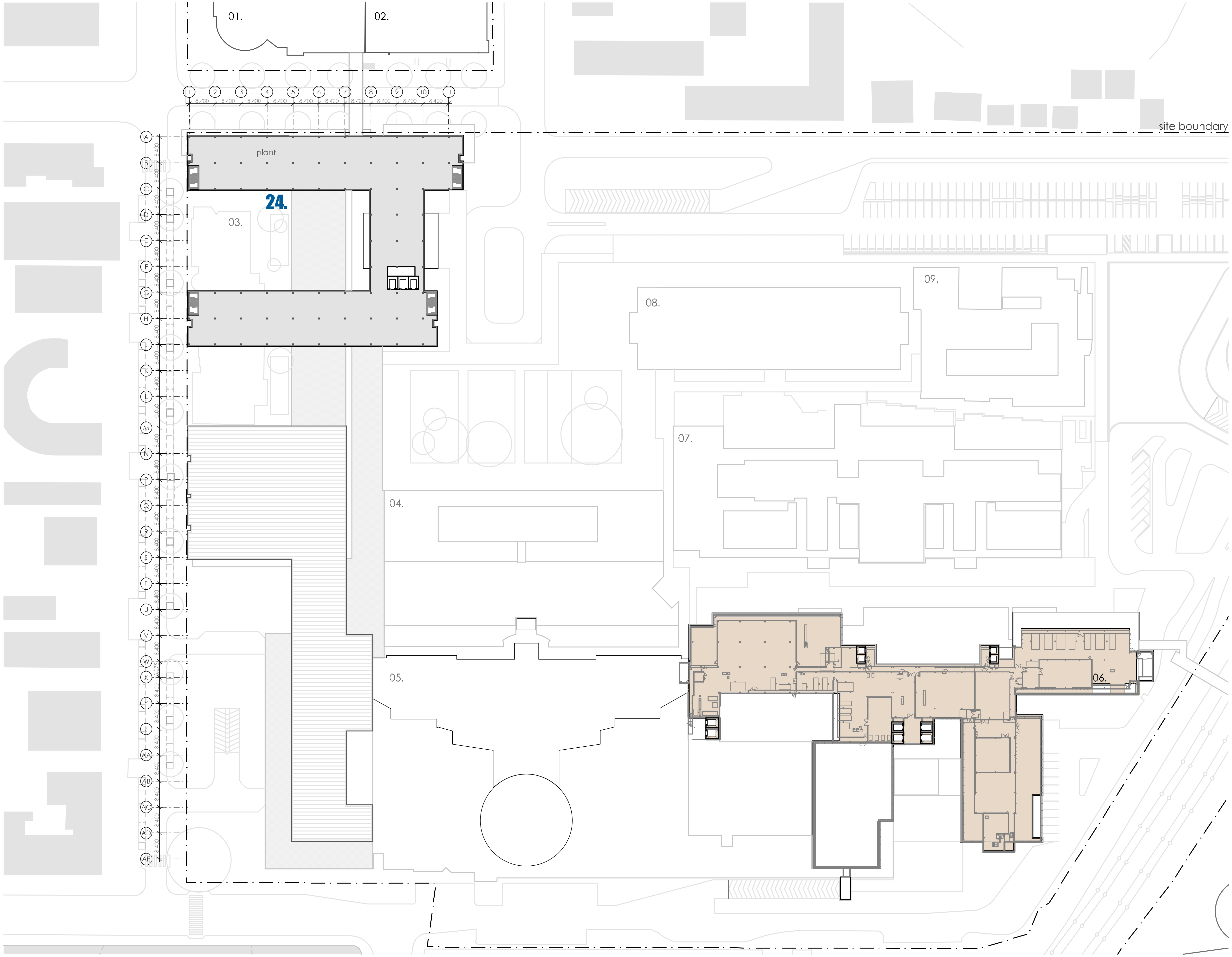
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

LEVEL 6 **RL+ 38.600**



refurbished area of existing building. internal works only

new external facade/works expansion of existing building

liverpool campus

existing clinical buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:1200 @A3
25mm ON ORIGINAL

DRAWING
LEVEL 6 - PLANT

PRINT DATE
23/01/2020

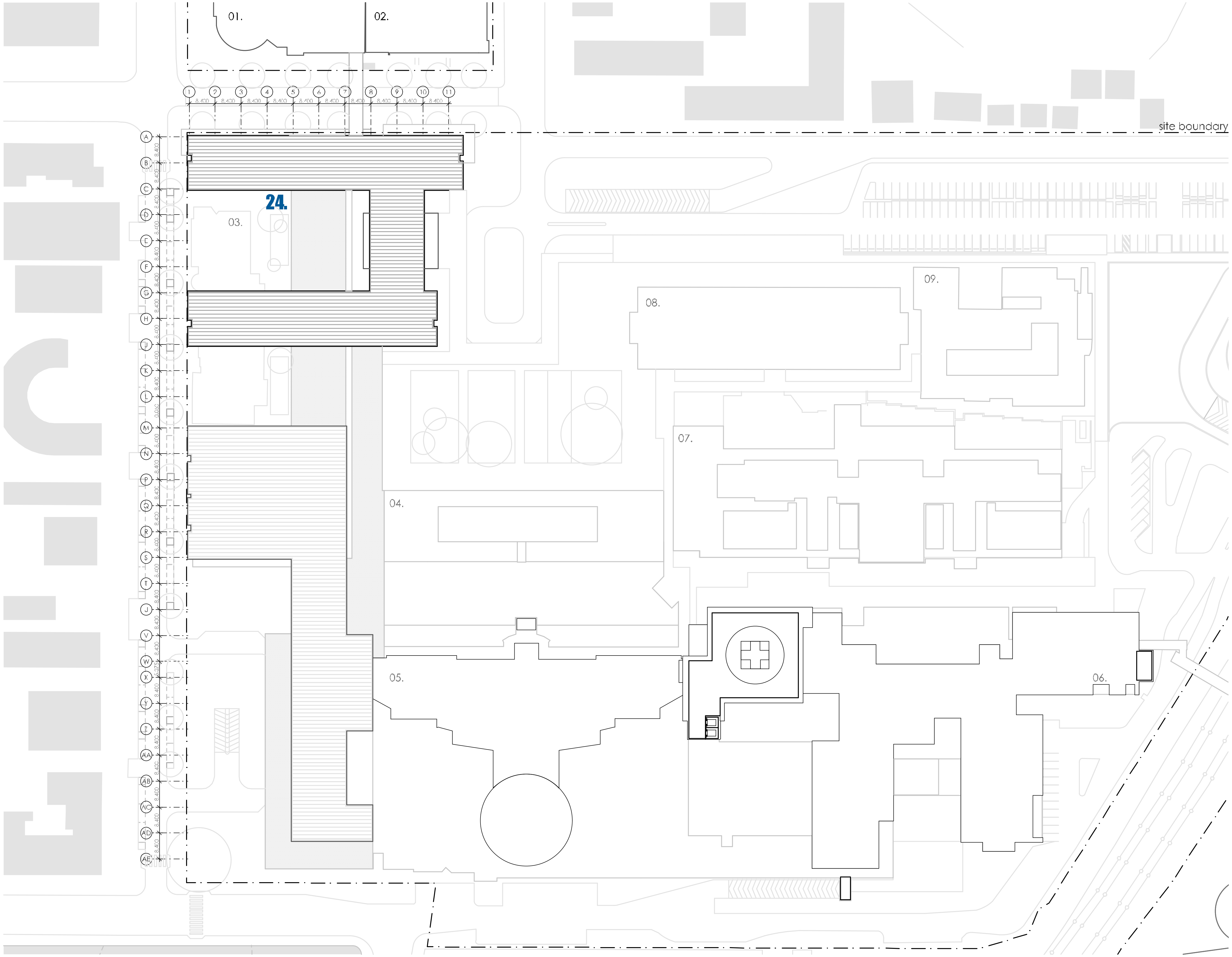
PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-14
ISSUE 05

STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)



refurbished area of existing building. internal works only

new external facade/works expansion of existing building

liverpool campus

existing clinical buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:1200 @A3
25mm ON ORIGINAL

DRAWING
ROOF

PRINT DATE
23/01/2020

PROJECT NO.
21807

DRAWING NO.
A-SSDA-MW-15

ISSUE
05

STATUS
DRAFT FOR REVIEW