NSW HEALTH

Liverpool Hospital Redevelopment - Stage 2

Infrastructure and Ancillary Hospital Works

Project Application and
Environmental Assessment

Appendix G

Multi Storey Car Park

- Technical specification
- Environmental Site Assessment
- Survey report
- Car park ventilation statement
- External Finishes Schedule
- Architectural drawings

Prepared by: LFA (Pacific) Pty Ltd
and
Capital Insight Pty Ltd

In conjunction with:

For: Department of Planning
On behalf of : NSW Health

Appendix G

Technical Specification

October 2008 Prepared by: Leighton Irwin Pty Ltd

LIVERPOOL HOSPITAL
MULTI STOREY CARPARK

PROJECT REQUIREMENTS

TECHNICAL SPECIFICATION

Leighton Irwin Pty Ltd

September 2007

CONTENTS

GENERAL REQUIREMENTS

1.1 SCOPE

The project comprises the detailed design and construction of a new multi storey car park at Liverpool Hospital, and includes connections to new vehicle and pedestrian bridges and new minor access roads off former Elizabeth street, and the provision in the structure for a possible future lift to the car park.

The scope of the project generally comprises:

- Programming of the works to achieve completion by the agreed date.
- Detailed design of the works, including preparation of documentation demonstrating compliance with specified design requirements
- Demolition works as required to clear the site.
- Clearing of site to be developed
- Diversion of existing site services as necessary to carry out the works.
- Temporary fencing, lighting, hoarding and security of the site during construction.
- Construction of new multi deck carpark, with connections to new road and pedestrian bridges.
- New fencing and other siteworks
- New services to the site as required by the new works
- Obtaining all authority approvals as required, however noting that NSW Heath is to lodge the Project Plan Application.

1.2 DEVELOPMENT APPROVAL

The Minister for Planning has approved (under Section 750(1) of the Environmental Planning and Assessment Act 1979) the concept plan for the new Hospital development, including the carparking facilities.

Refer to the requirements generally set out in Determination of Major Project No 06 116 , and in particular to Sections 5.6 and 5.7 relating to the Multi-Deck Car Park, and Section 6 relating to Community Information, Consultation and Involvement.

The Project Company is responsible for complying with the requirements of the Determination, as they apply to the Multi-storey Carpark and the requirements of the project plan approval when determined.

1.3 AUTHORITY APPROVALS

Except for project plan approval, obtain all necessary approvals from all relevant authorities and utilities in sufficient time to not delay the works.

Provide copies of all approvals to the Principal.

1.4 INDEPENDENT CERTIFICATION

Provide certification that the design and construction complies with the BCA and all relevant Codes.

Certification to be provided by a suitably qualified independent certifier, with all associated costs being born by the Project Company.

1.5 PRINCIPAL'S REVIEWS

At the times below, submit documentation for the Principal or his representative to review for compliance with briefed requirements.

Milestones for review include:

a. On completion of detailed design.

b. On completion of Construction documentation.

Interim reviews may be held as thought necessary by the Principal or his representative or the Project Company to enable the development of the design and construction documents to proceed with confidence.

The Principal shall also review finishes and colours of materials.

1.6 AESTHETIC STANDARDS

The external form, materials, finishes and colours shown on the Car Park Concept Plan drawings have been developed to compliment the proposed finishes to the new Hospital development.

The external form, materials, finishes and colours shown on the car park concept plan will form the basis of the Project Plan Application (PPA) submission.

The Principal has no desire to change the design, but will consider alternatives if benefits can be demonstrated, or where changes need to be incorporated to provide for compliance with the BCA.

1.7 ACCEPTANCE STANDARDS

In the *Design Requirements* section of this Volume the general, minimum and particular requirements for materials and workmanship are specified, together with the relevant Australian Standards against which the proposal shall be accepted or rejected. Variations to these requirements, of generally similar or equivalent standard and which meet the relevant Australian Standards, will be considered.

1.8 GENERAL CONSTRUCTION

The car park shall be constructed to generally in accordance with the Car Park Concept Plan Design Drawings and this Specification in form, materials, and finishes.

Documentation of the works shall be submitted and reviewed by the Principal before construction commences.

The new vehicle bridge will not be available for construction traffic. Construction access will be via the Scrivener Street entry.

The Project Company is to comply with requirements of the Long Service Payments Corporation before construction can commence on the site.

All materials storage will only be permitted on the work site.

There will be no parking provision for building workers on the hospital campus.

1.9 SITE SURVEY

The Principal will provide a survey of the site.

Review the sufficiency of the information shown on the Survey, and carry out any additional surveying necessary to fully define the existing conditions.

1.10 GEOTECHNICAL SURVEY

A preliminary geotechnical survey and report has been prepared by Jeffery and Katauskas Pty Ltd, and is included for information only.

It does not form part of the contract documents.

The Project Company shall make his own additional investigations and assessment of the in-ground materials likely to be encountered, and shall allow accordingly.

No claim for variation shall be considered irrespective of the strata actually encountered on site.

1.11 MEETINGS AND CONSULTATION

During the progress of the works, regular meetings shall be held to monitor expenditure, design and construction progress and difficulties, at which the Project Company, the Principal and the Principal's Project Director shall attend.

It is anticipated that such meetings will be held fortnightly at first, becoming monthly, and will be chaired by the Project Director, who will issue minutes.

Note the need for consultation and coordination with other works that will be under construction at the same time as the car park.

Note also that forward notification of any disruptions to access for hospital staff and vehicles is required.

1.12 DELIVERABLES

As the contract proceeds, the following deliverables shall be submitted

The deliverables shall be reviewed by the Principal or his representative within 10 business days before work on succeeding phases shall commence

Project Agreement

- Detailed program for detailed design, design development, documentation, and construction, in MS Project format showing detailed sequence of works in each stage of the works and the critical path.

Design Documentation

- All drawings as scheduled for the Project Agreement, with all design features finalised and clearly showing agreed setout and levels of building.
- Final colour and finishes schedules
- Structural certification
- All certifications required by authorities
- Certification by Independent Certifier that the design complies with the BCA.
- All samples as required by this specification.

Construction Documentation

- Architectural working drawings
- Civil works working drawings
- Structural working drawings
- Mechanical Services drawings
- Hydraulic Services working drawings
- Electrical Services working drawings
- Site works plans and details,
- Landscaping plans and schedules

Prior to Construction

- Construction Environment Management Plans including description of work methodology for maintaining maximum access to the pedestrian bridge during the works.

Other Submissions

- Lighting, power, communications and security layouts
- Colour schedules, internal and external

On Completion

- Certification by the Independent Certifier that the built works comply with the BCA.
- Services certification of compliance with relevant Australian Standards
- Services manuals
- As built drawings
- Certification of the design and construction by the Project Company and their Consultants that the works have been constructed in accordance with this specification and project plan approval requirements.

1.13 QUALITY ASSURANCE

Neither the Principal nor his representatives will be carrying out detailed site supervision during construction and does not act as an independent certifier, assessor or valuer, but will make inspections from time to time to verify that construction is proceeding in conformity with the approved documents. Note that any inspections do not imply approval or acceptance.

The Project Company shall implement a quality system for both design and construction to provide assurance to the Principal that the briefed requirements have been met and shall state with his Tender how it is proposed to demonstrate this.

The Project Company, the consulting Architects and Engineers, and the Independent Certifier shall provide verification and certification as required in regard to compliance of the construction with the Principal’s requirements, all relevant codes, standards, project plan approval and Council requirements

1.14 SETTING OUT

The levels and features shown on the drawings are believed to be accurate, but the Project Company shall, before commencing work, verify these and resolve any anomalies.

Accurately set out the works using a registered practicing surveyor and provide a check survey once the works have progressed to ground floor level.

1.15 SUPERVISION

Provide full time supervision on site for the duration of the works and dedicated to this project alone, to supervise and co-ordinate the work of all trades.

1.16 PROGRAMME

Update and reissue the program on a monthly basis indicating progress against the target program.

1.17 AS-BUILT DRAWINGS

On completion of construction, provide one electronic copy and two hard copies of as-built drawings of the following services and the building:

- Stormwater drainage
- Hydraulic services
- Fire services

- Security, Fire detection / monitoring
- Electrical installation
- Mechanical installation
- Building plans and site setout.

The Project Company shall verify with the Principal the format required for the electronic version prior to the preparation of the drawings.

1.18 TEMPORARY SERVICES

Extent

The Project Company will provide and maintain all temporary services systems, isolated and separately metered from existing services provided by the Principal or from services to be installed as part of the Work. The Project Company shall make temporary water, electricity, telephone and sewer facilities available to carry out the works, provide sanitary and other facilities for workmen as required by authorities, pay all fees and charges and remove the temporary services on practical completion.

Temporary Power and Lighting

A point of connection will be provided for electrical power reticulation by the Project Company for construction and lighting purposes as required to perform the work under the Contract. The Project Company will provide a temporary meter adjacent to the point of connection to enable monitoring of the electrical power consumption for the duration of the project.

Lighting for public access ways on the perimeter of the building site will be provided by the Project Company, the extent of which will be determined in conjunction with the Principal or his representative. All other lighting requirements necessary for the Project Company to carry out the Work under the Contract will be provided by the Project Company.

Temporary Water

The Principal will provide water for the building site. The Project Company will connect a temporary metered water supply to an approved point of connection on the existing water main and provide water points and wash-out drums as required to perform the works under the Contract. The Project Company will be responsible for the proper management of the facilities.

1.19 SAMPLES

Provide the Principal with samples of materials or fixtures as requested.

1.20 LICENSED PERSONNEL

Only licensed persons shall carry out electrical, plumbing, drainage and other trade works required by regulation to be carried out by licensed personnel.

1.21 MATERIALS AND WORKMANSHIP

The minimum acceptable standards of materials and workmanship shall be those described in the appropriate Australian Standards and Codes or in accordance with current good trade practice where there is no relevant standard.

1.22 OBVIOUS WORK

When an item of material or workmanship is to be obviously inferred or is usual and proper in the class of work generalised in this specification and is necessary for the full and proper completion of the works, the same shall be provided at no extra cost notwithstanding its omission from the Principal's Brief.

1.23 MAKING GOOD DAMAGE

Any damage that has occurred to or defects that may have appeared in the work during its progress shall be made good however it may have been caused.

This shall include the complete replacement of fittings, equipment or items that cannot be effectively repaired or made good to the satisfaction of the Principal.

1.24 ALIGNMENT AND SEQUENCE OF WORKS

It is a fundamental requirement that the car park design aligns with the new vehicle and pedestrian bridges and in particular the compatibility of the car park levels with the road and pedestrian bridge levels for connection.

It is understood that the Project Company has examined the Car Park Concept Plan in this regard however the works are to be provided in the following stages.

Stage 1:

The design shall firstly be sufficiently completed so as to confirm the levels established in the Car Park Concept Plan for the connections to the road and pedestrian bridges, and the level of each deck to be served by the pedestrian bridge lift tower being provided by others.

Stage 2:

Completion of the design, documentation, construction, and commissioning of the new multi deck car park.

1.25 TEMPORARY SIGNS

Provide all temporary signs as necessary to direct the emergency vehicles, the staff and public during all stages of the work, particularly in relation to the use of former Elizabeth Street, the new vehicular bridge, and access to the new pedestrian bridge and its lift.

1.26 DILAPIDATION SURVEY

The Project Company shall carry out a dilapidation survey prior to the commencement of works.

Prepare a dilapidation survey of the Child Care Centre and its external areas, the Hugh Jardine building, the works site boundary, existing pavements, kerb and gutters, pits, and services to paving areas adjacent to the works within the Hospital site. Provide three copies to the Principal.

Dilapidation surveys shall contain coloured photos and commentary of all existing defective conditions to adjacent buildings and paved areas.

All defects which are not photographed at the commencement of the works which are evident at completion will be assumed to be as a result of the works, and be rectified by the Project Company at his cost.

1.27 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLANS

Prepare a Construction Environmental Management Plan (CEMP) in accordance with ISO 14000 , and as set out in the Project Agreement, and as required by the project plan approval requirements, and including compliance with NSW Occupational Health and Safety Regulation.

Prepare management reports updating the CEMP and monitoring results on a monthly basis. Document attendance to incidents in these reports and the corrective action taken to prevent similar incidents.

1.28 ON COMPLETION

Clean and remove all dust, dirt, marks, paint etc. from all surfaces, light fittings, accessories, appliances, etc.

DESIGN REQUIREMENTS

1 GENERAL

Scope

The scope of the design and documentation requirements is as shown on the drawings and as has been confirmed by the Project Company by site inspection, and generally comprises the following:

- Site clearance works.
- Demolition works, including all buildings, swimming pool, tennis court, fences, walls, paving, miscellaneous external furniture, and site services and existing pavements outside the site as necessary for the making of connections to existing road/s.
- Construction of new multi storey carpark, including all associated earthworks.
- Railcorp requirements for buildings alongside the railway corridor including deflection wall along western side of multi storey carpark.
- Allowance within structure for future lift shaft.
- Alterations to Elizabeth Street for new controlled southern entry/exit to new multi storey carpark.
- New bridge link from multi storey carpark to Early Works Vehicular Bridge over railway line (to be constructed by others) for new northern entry/exit to carpark.
- Temporary pedestrian pathway on southern and western side of Multistorey Carpark site to new pedestrian bridge and its central lift and stair core (constructed by others for the Principal under Early Works).
- Cladding to external elements of the pedestrian bridge lift shafts and stairs previously constructed under Early Works.

Reference Documents

Refer to GENERAL REQUIREMENTS for full listing of drawings, reports and information provided by the Principal to form the basis of the design.

Refer to the various trade sections for additional requirements in relation to the works and Quality.

2 DESIGN INFORMATION SUBMISSION

Design Phase Submissions

Provide all necessary documentation to describe the design of the building, the materials used, the finishes, and all services.

The submission shall include, but is not limited to the following:

General Information:

- List of all Consultants, with responsibilities indicated, including Independent Certifier.

Drawings:

- Dimensioned 1:200 Site Plan of the new multistorey carpark, new roads, alterations to Elizabeth Street to the extent of the works, with adjacent buildings indicated, and all existing and new boundaries shown.

- Dimensioned 1:100 plans of all levels, showing location of structural elements, parking bays and aisle arrangements, aisle widths, all parking bays (with sizes nominated), proposed traffic flow, stairs, balustrades, retaining and screen walls, and showing all lift shafts, stairs, and adjacent vehicular and pedestrian bridges constructed as Early Works (to extent sufficient to show connections with new multistorey carpark).
- 1:100 elevations of new multistorey carpark, including elevations of the existing Early Works bridges where appropriate (but not obscuring elevations of carpark).
- Dimensioned 1:100 north/south and east/west sections through new multi storey carpark, with levels clearing indicated.
- Dimensioned 1:20 sections through each type of external wall elevation, showing balustrading, screens, etc.
- 1:100 plans of all levels showing location of new and adjacent existing lighting, power, and fire services.

Design Report:

- Report on BCA compliance of the Project Company's design, including description of how, egress, and fire services are provided for.
- Description of structural system and footing design.
- Description of retaining wall types used, and of deflection wall.
- Description of all materials, stating location, use, and finish.
- Description of all services, and nominating all associated fittings and product types.
- Description of any departures to the Principal's Request for Proposal Design or this specification, in terms of planning, appearance, materials, finishes, and services.

Data Submissions (not part of tender)

- List of all subcontractors involved in building works
- List of all products and suppliers.
- Site survey of completed works.
- Schedule of materials and finishes
- Internal & external colour schedule

Refer also to Trade Sections.

Shop Drawings (not part of tender)

Refer to Trade Sections

Certification/Warranties (not part of tender)

Design Certification: By suitably qualified Independent Certifier.

Construction Certificate: By suitably qualified Independent Certifier.

Refer also to Trade Sections.

3 DESIGN PARAMETERS

3.1 GENERAL

Design Layout

The design layout of the carpark and associated areas is to be based generally on the Request for Proposal Car Park Concept Plan

Building Setout

The building shall be located clear of the 10 metre Railway Impact Zone, and maintain the minimum clearance to the Child care centre nominated on Car Park Concept Plan

Building ends shall be minimum 1 metre clear of any adjacent structure. The location and levels of the vehicular bridge connection, and the new pedestrian bridge and associated lift and stair tower are fixed.

Car Park Levels

The levels on of the pedestrian and vehicular bridges over the railway line are determined by the minimum clearances required by Rail Corp. The proposed levels to the car park at the relevant connection points shall comply with the levels nominated in the documents.

Car Parking Numbers

The parking space numbers shown on the plans and nominated in the Request for Proposal documents are the minimum number of parking spaces to be provided.

All space numbers nominated are for full size car spaces. Any small car spaces provided shall be additional to the nominated numbers.

Provide the number of disabled access parking spaces as required by the BCA for a Hospital staff carpark.

3.2 PARKING DESIGN STANDARDS

The parking shall generally be designed to AS 2890.1 Class 3 parking facility as the minimum standard, except where specifically nominated as follows:

Minimum Acceptable Dimensions

Two way parking aisle width:	6000 mm
One way parking aisle width:	3800 mm
One way circulation roadway width:	3500 mm
Two way circulation roadway width:	5800 mm
Minimum headroom clearance:	2200 mm
Minimum head room to right of way:	3500 mm

General Requirements

All kerb corners to be radiused to prevent damage to tyres

Kerbs to be minimum 150 mm high unless specifically nominated otherwise.

3.3 BUILDING DESIGN REQUIREMENTS

General Design Requirement

The building design shall generally be in accordance with the Request for Proposal Drawings, with the appearance and finishes to comply with the indicated elevations.

BCA Compliance

The building shall be in full compliance with the requirements of the Building Code of Australia, which take precedence over the Tender Drawing.

The Project Company shall review the Principal's Car Park Concept Plan Request for Proposal Design and make provision for any requirement not complying with the BCA within his revised planning. All matters relating to fire separation, egress, and fire services must be specifically addressed.

Amended Project Plan Application

Where any replanning to the Principals Project Plan Application design, which is to be based on the Request for Proposal Design, is proposed by the Project Company, and approved by the Principal, the Project Company will be required to submit any necessary revision to the approved Project Plan Application documentation, and bear all resultant costs of both the application and the works, and make provision within his program for any resultant time delays.

Specific Design Requirements

The concrete parking decks are to be sealed, and are to be of a non-slip finish.

Access to stairs to be protected by the provision of bollards. Bollards to match existing used elsewhere in the Hospital in material, height, fixing, and finishes.

Ballustrades shall comply with the BCA and meet all safety barrier requirements, and generally match the appearance of the existing balustrading.

All exposed services must be securely supported and protected from damage by vehicles or vandalism.

Screening on the eastern façade to prevent viewing over the child care centre and to minimise view of vehicles from the child care centre.

Inclusion of SKM ventilation report recommendations as proposed by the Project Company and to be agreed during direct treaty phase.

3.4 FUTURE LIFT

Provision of lift shaft for possible future lift to be incorporated in the structure. Lift size to be advised in direct treaty phase.

3.5 EXTERNAL WORKS

General Requirements

The Project Company shall carry out detailed design and construction of the following, based on the concept site plan and the stormwater drainage plan strategy plan and shall be responsible for:

- Paving on site, including design of all levels
- Entries from and alterations to Elizabeth Street for new entry to multistorey carpark, including new kerbs, gutters, footpath, vehicle crossings and drain pipes from the grated drains at new gates to the kerbs.
- Roof drainage from multi storey carpark, and storage and connection for WC, car park building cleaning, and site landscaping and irrigation system as required to comply with ESD considerations.
- Stormwater pit and pipe inverts, sizes, connections, and junction pit details
- Providing all on-site vehicle and pedestrian paving, kerbs, gutters, retaining walls, stormwater drainage, oil and sediment interception pits at discharges to sewer and stormwater outlets, external lighting, fencing, gates and landscaping as generally shown on the drawings.
- Making good to existing paving to Elizabeth Street within work area.
- Making good external paving outside of the work area where damaged by the works.

Pavement Design

The parking and loading/unloading areas shall suit operational and council requirements, plus RTA guidelines and all applicable standards. The design shall take account of the geotechnical report recommendations.

The main driveways generally shall be asphaltic concrete pavement designed for a minimum 2×10^{6} Equivalent Standard Axles in accordance with RTA design procedures.

Levels

The pavements shall fall away from the stair entries sufficient to prevent entry of water to the buildings, and away from pedestrian walkways.

The general pavement design shall be graded to storm water pits so as to prevent run off from the site onto adjacent areas and roadways, and to prevent water ponding on the pavement.

Kerb and Gutters

Provide concrete kerbs all around paved areas, and kerb and gutters where required to channel the overland flow to concrete dish drains, stormwater pits and stormwater piping.

Pits and Grates

Provide all necessary pits and grated drains as required throughout the site, including landscape areas.

Pits and gratings/covers shall be appropriate to the vehicle or pedestrian loadings.

Refer to *Drainage* for details of any the oil and sediment interceptor pits, and the storm water detention pits.

Retaining Walls

Provide retaining walls between levels as necessary. The type of retaining walls shall be included with the tender.

Inspections and Certification

Provide civil engineering inspections of the external works by the design engineers, and provide their certification of compliance with the design of all civil engineering work.

Landscaping

The external areas within the work area shall be graded evenly to provide falls to stormwater pits. All areas not paved are to be turfed and landscaped with an approved landscape design suitable for the location.

Guard Rails

Provide guard rails where necessary .

3.6 WORKS TO ELIZABETH STREET

Provide new access aisle through the existing traffic island in middle of Elizabeth Street opposite the new southern entry to the car park.

Provide new kerbs and make good road pavement generally as specified for pavement design.

3.7 TEMPORARY WORKS

Temporary Pathway

Provide temporary concrete pathway and hoarding as required by authority along full length of western boundary to Rail Reserve, connecting from Elizabeth street kerb at southern end to pedestrian accessway through ramped road at northern end, with connection to new stair and lift area at pedestrian overbridge at centre of site.

The path shall be of concrete construction, of 1200 mm minimum width.

Remove path at end of works and make good area as nominated for landscaping.

SITE PREPARATION

1 GENERALLY

Scope

The scope of Site Preparation is as required to clear the site for the new works, and generally comprises the following:

- Remove all rubbish from all areas
- Remove all redundant fencing.
- Remove all miscellaneous external furniture
- Remove all redundant concrete kerbs, gutters, islands, footpaths, crossings, and slabs.
- Remove all redundant paving.
- Remove redundant services and pits.
- Relocation of existing services which serve areas outside the work area.
- Remove redundant external and court lighting.
- Remove trees where required by the design.
- Install fencing to secure the site boundary.

Related Sections

Refer to DEMOLITION and GROUND WORKS for requirements in relation to preparation for new works.

2 QUALITY

Tender Submissions

No requirement

Data Submissions

Work method statement on maintenance of safe public access to pedestrian bridge lift and stair

Samples

No Requirement

Inspections

Provide civil engineering inspections of the site clearance by the design engineers, and provide the Principal with copies of their certification of compliance with the design of all civil engineering work.

3 CONSTRUCTION

3.1 GENERAL REQUIREMENT

Carry out all necessary site clearance and preparation works as necessary to carry out the works.

DEMOLITION

1 GENERALLY

Scope
The scope of Demolition is as required to clear the site for the new works, and generally comprises the following:

- Demolition of all buildings and masonry walls within the work area.
- Demolition of swimming pool and associated structures.
- Demolition of barbecue and shade structures

Related Sections
Refer to SITE PREPARATION for requirements in relation to preparation for new works.

Refer to HYDRAULIC SERVICES for requirements for diversion of services.

2 QUALITY

Tender Submissions
No requirement

Data Submissions
Work method statement on maintenance of public access to existing lift and stairs

Samples
No Requirement

Inspections
No Requirement

3 CONSTRUCTION

3.1 GENERAL REQUIREMENT

Carry out all necessary demolition works as necessary to carry out the works.

Standard
Carry out all works in compliance with AS 2601 TBC and WorkCover requirements.

Sequence of works
Refer to PRELIMINARIES for requirements in relation to maintaining public access to existing lift and stairway to overhead pedestrian walkway.

CIVIL WORKS

1 GENERAL

Scope
The scope of Civil Engineering includes the design and construction of;

- Ground works
- Carpark & road pavements
- Kerbs and gutters
- Footpaths
- Concrete elements associated with road works
- Accommodation of landscaping elements
- Making good of existing surfaces where new underground services installed.

Related *Sections*
Refer to Structural Section

2 QUALITY

2.1 SUBMISSIONS

Tender Submission
Schedule of areas and construction material types

Data Submissions
Engineering design criteria

Shop Drawings

- Set-out Plan
- Ground works plan
- Road & drainage plan
- Typical road cross sections
- Long sections
- Kerb return details
- Kerb and gutter details

Certification/Warranties
Full engineering certification including signoff of compaction testing.

2.2 SAMPLES

No requirement

2.3 INSPECTIONS

Tests

- Compaction of Earthworks
- Concrete strength

Witness Points
To Civil Engineer’s requirements.

3 REQUIREMENTS

3.1 DESIGN

Due consideration shall be given in the design to durability, serviceability, strength and quality of the structures to produce a finished product that is fit for its intended purpose.

All works are to comply with the structural requirements of the Building Code of Australia.

Throughout this Section the word “design” shall be taken to include the words “construct” and “construction”.

3.2 CERTIFICATES

Supply certificates obtained from the Civil Engineers stating that the engineering works designed by them, including items supplied by manufacturers on their behalf e.g., comply with all the requirements of the Contract and that the works have been constructed as shown on the “work-as-executed” drawings.

Obtaining of such a compliance certificate shall not relieve the Project Company of any obligations or liabilities under the Contract.

Engineers must be accredited members of the Institution of Engineers, Australia.

3.3 DOCUMENTATION

Prepare all documents required for the proper construction of works.

3.4 SITE INVESTIGATION

A geotechnical site investigation has been carried out by Jeffery & Katauskas Pty Ltd and the report is scheduled in the Request for Proposal Document.

The site investigation information given in the report is information on the nature of the ground at each tested part. It is not a complete description of conditions existing below the surface.

The Project Company shall make his own interpretations of the data presented in the Geotechnical Site Investigation Report, and his own assessment of any interpretations, deductions, conclusions or recommendations contained in that Report.

The Project Company shall determine fully and to his complete satisfaction all the subsurface conditions and all the design parameters that are to be used in the design of the works. This shall be based on specialist professional advice. Failure to comply with this shall not be a basis for any cost variation. Any further geotechnical work is to be undertaken by a qualified Geotechnical Engineer, and at the Contractor’s own cost.

The additional work and site inspection for any additional testing, the Project Company may wish to undertake shall be arranged through the Project Manager

3.5 STABILITY

Keep all existing, temporary and *new* structures in a stable condition. Any excavation works must not generate excessive vibrations onto existing structures. Size machinery to minimise disturbance.

Keep adjacent structures, including paths and accesses, stable during and after the completion of works in the Contract, so that their operations are not affected by the new works, by means of sheet piling, piering, underpinning, bank stabilisation or other suitable methods.

3.6 SURVEY MARKS

The Project Company shall provide necessary survey checks to satisfy himself the survey marks or details provided in the Request for Proposal have not been disturbed and that their levels, if shown on the drawings, agree with the levels of one or more existing features on the site.

3.7 TERMITE BARRIER

The use of chemicals in soils to provide a termite barrier is not permitted. Provide suitable termite barriers to satisfy Code requirements.

3.8 FOOTINGS

Design all footings based on (the Project Companys) interpretations of the data presented in the Geotechnical Site Investigation Report and any supplementary site investigation that may have been carried out.

Pay particular attention to:

High water table in the design of footings, slabs. Consider the effect of hydrostatic pressures on all elements, if applicable.

- The removal of all topsoil from under buildings, walkways and pavements.
- The effects of trees, both existing and to be planted under this Contract and any future planting. State in the drawings that the design allows for the effects of trees in close proximity.
- Aggressive soils - may need special cements or protection of footings.
- Found all footings on a similar bearing stratum unless effects of differential settlement are catered for in the design.
- Do not found building works into organic soils.
- Potential vibration from the railway corridor

Where appropriate refer to of AS2870 *Residential slabs and footings -Construction,* for the design of footings and slabs.

Footings and slabs, etc. in the vicinity of sewers, pipelines etc. shall comply with the requirements of the relevant Authority.

3.9 PAVEMENTS

Show all joint locations and details on the drawings for pavements and ramps etc. Pay particular attention to joint layout and details to prevent differential movement between panels at the joints (other than movement perpendicular to the joint) and to prevent shrinkage cracks. Design pavements taking into consideration recommendations contained within the Geotechnical Report.

Hot dip galvanise dowels in joints to both internal and external concrete slabs.

3.10 PROTECTION OF TANKING OR WATERPROOFING MATERIALS

Protect any tanking or waterproofing materials during and after backfilling or covering operations.

3.11 DUST AND NOISE CONTROL

At all times and especially during any demolition works, apply dust and noise control measures to minimise disturbance to the functioning of neighbouring buildings and areas. Refer also to subsection DEMOLITION of this section.

3.12 AUTHORITIES CONDITIONS

The Project Company shall satisfy all the conditions of all relevant authorities such as RailCorp, the local Council, Sydney Water Corporation, Roads and Traffic Authority and the Environmental Protection Authority.

4 GROUNDWORKS

4.1 BULK EARTHWORKS

Design bulk earthworks to minimise impact on the environment and provide control measures during construction to this effect.

The Project Company shall establish his bulk earthwork levels based on his own design within the specified criteria and carry out the necessary works. Any discrepancy between the levels given on the Tender Drawings and the actual ground levels shall not form a basis for any cost variation.

4.2 COMPACTION OF EARTHWORKS

Show requirements for compaction of earthworks on the drawings.

Obtain test certificates from a NATA registered Laboratory for compaction of earthworks and provide these to Principal if requested.

4.3 TESTING

Have an independent approved NATA registered testing authority perform all the compaction testing of earthworks and provide test certificates to the Principal if requested.

Obtain certification that aggregates are suitable for use in roadwork and concrete.

Do not proceed with work subject to testing until tests are satisfactorily completed.

4.4 EROSION AND SEDIMENTATION CONTROL

Stage the works such that the agents of erosion are minimised at any one time, plan, carry out and maintain the work to avoid erosion, contamination, and sedimentation of the site, surrounding areas and drainage systems.

Liaise and comply with the requirements of the Department of Conservation and Land Management (Soil Conservation Service) and the local Council.

4.5 MAXIMUM SLOPE

Limit the slope of embankments to a maximum of *I* in 4 unless specified otherwise elsewhere in the Design Documents, nor exceed the grade recommended in the Geotechnical Report.

4.6 EXCAVATION IN PUBLIC AREAS

Before excavating any public area including roads, footpaths, reserves, and the like, obtain the approval of the relevant authorities and comply with their requirements for alternative traffic arrangements, excavation methods, backfilling, and reinstatement**.**

Restore areas outside the limits of the Works, which have been disturbed by the Works, to their original condition on completion of the excavation. Reinstate surfaces to their original level without subsidence and without cracking at junctions with existing surfaces.

Restore pavements to match existing. Regrass grassed areas if specified in the Design Documents.

4.7 BAD GROUND

Should unexpected and/or unsuitable material be encountered in the excavation, or soft, wet and unstable areas develop during excavation, consult a Geotechnical Engineer to determine appropriate remedial works. Submit to the Principal details of any alterations to the submitted construction documents resulting from such advice, before undertaking any additional work.

4.8 SITE CLEARING

Obtain information relating to buried services, and identify location and depth of these services. Where services are identified, allow to divert / concrete encase in accordance with the requirements of the relevant statutory authority.

Clear only the site areas to be occupied by works such as buildings, paving, excavations, regrading and the like, or specified as areas to be landscaped or cleared.

Remove everything on or above the site surface, including rubbish, scrap, vegetable matter and organic debris, scrub, timber, stumps, boulders, rubble, and the like.

Grub out stumps and roots over 75 mm diameter to a minimum depth of 500 mm below subgrade level under buildings or paving, or 300 mm below finished surface in unpaved areas.

4.9 SPOIL - GROUNDWORKS

Allow to complete testing of soils to be removed from site so that environmental hazards are identified.

Remove surplus excavated material or site clearance material from the site unless otherwise specified in the Design Documents.

4.10 SITE RESTORATION

Upon completion of the Works, restore the natural ground surfaces of the site (i.e. the surfaces which the Contract does not require to be altered) to the condition existing at the commencement of the work under the Contract.

4.11 FILLING

Provide filling free from perishable matter, imported on to the site from an approved source unless the specified filling type can be provided from spoil recovered from the excavations.

Filling Types:

General filling: Graded material, maximum particle size 75 *mm.*

Hardcore: inorganic hard material capable of being compacted to an even stable surface.

Granular material: Maximum particle size 75mm; percentage passing 0.075mm sieve -25 maximum; plasticity index not greater than 15~/o and not less than *2%.*

4.12 PLACING FILLING

Suitably prepare the ground surface to receive filling. Place and compact filling in layers not exceeding 300mm to the required dimensions, levels, grades, and cross section.

Under bearing surfaces such as footings, slabs and paving, compact the filling, and where necessary the subgrade, to comply with Roads and Traffic Authority Standards or to the recommendations of the Geotechnical Report, whichever is more critical.

Supply satisfactory evidence in the form of test reports from a NATA registered laboratory to demonstrate that the required compaction has been achieved.

4.13 SERVICE TRENCHES

Backfill and adequately compact service trenches under footings, slabs and pavements to prevent loss of support to and settlement of structure above.

5 PAVEMENTS

5.1 GENERAL

Pavements include roads, parking areas, bus, paths and hard-standing areas.

Refer to subsection GROUNDWORKS for requirements on bulk earthworks and compaction of earthworks.

5.2 GROUND MOVEMENT

Design the pavements to allow for movements in the foundations caused by moisture variations. Design rigid pavements so there is no differential movement between panel at joints, other than movements perpendicular to the joint.

5.3 DESIGN PARAMETERS

Design all pavements for a 25 year life. Design all pavements to be used by trucks for a minimum 1 x 10^4 ~ repetitions of a standard axle load. For other vehicular traffic areas design for 1 .0x10^5 repetitions of a standard axle load. The standard axle load is as defined in AUSTROADS Pavement Design. Where applicable comply also with the requirements of the local authority (for example, bus bays forming part of a main road).

5.4 LANDSCAPING

Allow for landscaping requirements in the design

5.5 PAVEMENT CONSTRUCTION

Pavement may be either flexible or rigid in construction. For flexible construction finish with a surface coat of asphaltic concrete. For rigid method of construction finish with a reinforced concrete surface.

Concrete pavements for vehicles shall be a minimum 150mm thick and reinforced with not less than F92 mesh at top. Other concrete pavements shall be a minimum 100mm thick and reinforced with not less than F72 mesh at top. Provide a thicker pavement and heavier mesh as the design requires.

When merging with existing works, provide a neat transition. Ensure that no differential movements occur at the joint, other than movements perpendicular to the joint

5.6 MATERIALS REQUIREMENT

Use road base material complying with Roads and Traffic Authority

Standards. Do not use breccia or dolerite in road base or concrete mix and

limit fly ash content to 20% of cementitious content of mix by weight.

Use concrete complying with the requirements of subsection CONCRETE of this Section. Use concrete of strength appropriate to the environment. For roads and parking areas use concrete of minimum 32 MPa characteristic compressive strength or higher as the environment requires.

5.7 FINISHES

For vehicular trafficked pavements provide a non-skid finish and for pedestrian trafficked pavements a non-slip finish.

5.8 GRADES

Limit finished vertical grades so as not to exceed 1 in 10 and provide vertical curves where change of grade exceeds 3%. Provide crossfalls as the design requires.

5.9 SUBSOIL DRAINAGE

Provide subsoil drainage or spoon drains at periphery of excavation to allow for seepage from the ground. Where old excavations are backfilled additional drainage may be required to prevent a sub-soil water trap forming.

Provide sub-soil drainage to cut side of road or ramp pavements and to the back face of retaining walls. For road and paving formation provide subsoil drain at all low points to remove water trapped in the base/sub-base course.

5.10 EDGING CONSTRUCTION

Construct continuous edging of concrete to free perimeters of roads and parking areas to ensure stability of roadworks construction. Timber edging is acceptable for footpaths only. Provide concrete kerbs and gutters and footpaths as *necessary.*

5.11 CLEARANCE

Provide a minimum 1000 mm clearance between road edging and buildings, retaining walls and other obstructions.

STRUCTURAL DESIGN

1 GENERALLY

1.1 SCOPE

The scope of the structural design generally comprises the design and documentation of the following building elements:

- Floors, vertical load bearing elements (wall and columns etc.), stairs, foundations traffic barriers and balustrades.
- Concrete deflection wall, to be designed and constructed in accordance with Rail Corp requirements.

The consultant will also provide structural advice on any other building matters relating to the structural integrity of the building.

2 QUALITY

2.1 INSPECTIONS

Tests
Material testing shall be undertaken and records kept in accordance with the applicable Australian Standards.

Witness Points
Inspections shall be carried out by the consultant sufficient to permit the completed works to be certified as being in accordance with the documented design.

3 DESIGN

Generally
The structural design shall be carried out in accordance with the requirements of the Building Code of Australia and the principles of structural mechanics. Specific code references below are the current versions of the nominated Australian Standard.

Loads
Dead and Live loads including vehicle impact shall be in accordance with AS1170.1

Wind loads shall be determined from AS1170.2

Earthquake loads shall be determined from AS1170.2

Load combinations shall be in accordance with AS1170.1

Structural Design
The structural design of new elements of the building shall be carried out in accordance with the appropriate material design standard as nominated below:

Structural Steel	AS4100 AS4600 as appropriate
Composite Structures	AS2327.1
Reinforced & Prestressed Concrete	AS3600
Masonry Structures	AS3700
Timber	AS1720.1
Piled Foundations	AS2159

Foundations
The foundations are to be designed in accordance with recommendations in the geotechnical reports of Jeffery and Katauskas Pty Ltd (Ref: MZ20303Z and M21170Z) dated 13 July 2006 and 9 August 2007.

The Existing Structure
Where interfaces occur between the new and existing structure, or where the existing structure is used to support new elements, the existing structure shall be assessed accordingly.

Shop Drawings
Where the chosen construction form requires the preparation of workshop drawings, these shall be reviewed by the consultant, who will verify compliance with the design documents.

Certification
The consultant shall certify that the completed structural design of the new works complies with the Building Code of Australia and relevant Australian Standards.

If the existing building is used to support elements of the new works, the consultant shall certify that the structural adequacy of the existing building is not compromised by the additional loads.

Provide adequate drainage to prevent ponding of water elevated structures. Size drainage requirements to cope with 1:20 year design storm.

Structural Elements to be designed to satisfy the appropriate “Limit State” conditions to comply with satisfactory structural performance.

The natural frequency of slabs / beams must satisfy the Code requirements to avoid pedestrian discomfort. Structural elements must be sized to limit deflection and sway, and also to be stable under braking forces of vehicles. Perimeter barriers must be designed to withstand vehicle impact and prevent vehicles from falling from structure.

4 CONSTRUCTION

4.1 GENERALLY

The construction shall be carried out in accordance with the requirements of the building code of Australia and relevant Australian Standards.

Certification
The consultant shall certify that the works have been carried out in accordance with design documentation.

As-built documentation
A copy of “as-built” drawings is to be provided by the consultant for the proprietor’s records.

A copy of all reviewed shop drawings pertaining to the structure is to be provided by the consultant for the proprietor’s records.

4.2 DEFLECTION WALL

Refer to Rail Corp construction guidelines for requirements for the design and construction of the deflection wall at Ground Level on the railway side of the carpark. The wall shall be designed and constructed in accordance with these requirements.

Where access provided through wall during construction phase, section to be infilled on provision of alternative means of access. Infill to maintain the integrity of the deflection wall.

5 CONCRETE

5.1 STANDARDS

Design all concrete work to the requirements of AS 3600 Concrete Structures Code and other relevant codes.

5.2 DOCUMENTS

Prepare drawings for all works, showing layout plans, sections and working

details. Show clearly on the drawings all slab and wall thicknesses, reinforcement, concrete quality and cover, etc.

5.3 DEFLECTIONS

Design reinforced concrete slabs to avoid excessive deflections that will adversely affect the serviceability of the structure, the applied finishes or any secondary construction. Comply with serviceability limits of AS3600(UNO)

5.4 DURABILITY

Design external structural concrete elements for a minimum exposure classification of B1. The design shall also comply with a minimum 50 year lifetime durability complying with Section *4 Design for Durability* of AS 3600 *Concrete Structures Code,* whichever is more severe.

5.5 MATERIALS REQUIREMENT

Use materials complying with Australian Standards. Do not use breccia or dolerite in concrete mixes and limit fly ash content to 20% by weight of cementitious content.

5.6 TESTING

Submit names of the testing authority and personnel engaged in sampling, preparing and handling test specimens to the Principal if requested. The testing authority shall be NATA registered.

Submit results of tests on request to the Principal.-

5.7 DRYING SHRINKAGE

The drying shrinkage limits for the concrete in any part of the works shall, where required, be as specified for that part and shall be measured by submitting samples to dying shrinkage tests as specified. The measure of drying shrinkage shall be the percentage change in dimension of the sample after a period of 8 weeks, in accordance With ASIC12.12 *Method for the determination of drying shrinkage of concrete.*

Unless otherwise specified the maximum permissible drying shrinkage shall be as follows:

F’ c (MPa)	Shrinkage (microstrain)
10,15,20	600
25,32	650
40, 45, 50	700

5.8 LOST FORMWORK

Permanent or lost formwork, if required, shall be incombustible, shall not contain calcium chloride and shall not impair the structural performance of the concrete.

5.9 FORMWORK AND FORMED SURFACES

Comply with AS3610 Formwork for concrete for formwork and formed surfaces.

The minimum standard of finishes to formed concrete surfaces, based on AS3610, shall be as follows:

CONCRETE ELEMENT OR SURFACE	*FORMWORK CLASS*
Exposed concrete off form finished on external façade	1C
Normal architectural work and surfaces not otherwise specified	2C
Surfaces to be rendered or hidden by other finishes	3
Surfaces permanently concealed (e.g. footings)	4

Refer also to Architectural Schedule of Finishes, which shall take precedence in case of conflict with the above requirements.

5.10 UNFORMED SURFACES

Tolerance clauses shall be shown on the drawings or specified, and when tested by a straight edge placed anywhere on the surface in any direction, concrete surfaces shall comply with the following.

CLASS A Maximum deviation from a 3m straight edge	3mm
CLASS B Maximum deviation from a 3m straight edge	6mm
CLASS C Maximum deviation from a 600mm straight edge	6mm

Appropriate finishing methods for unformed surfaces shall be documented.

5.11 DIMENSIONAL TOLERANCES

Comply with A53600 Clause 19,5 for dimensional tolerances, the following requirements are more stringent.

Construct formwork etc. so that the finished concrete is within stated in the following table as applicable as applicable:

FORMWORK CLASS TO AS 36100	DEVIATION FROM CORRECT POSITION	MAXIMUM MISALIGNMENT Between Pours	Across Joints
1 or 1C	10 mm	**1mm** -	**0mm**
2 or 2C	15 mm	2mm -	2mm

5.12 CURING

Concrete shall be cured by an appropriate method for at least 7 days in accordance with AS3600 Clause 19.1.5 and in particular with Clause 4.5.

Curing compounds shall be to the requirements of AS3799 *Liquid membrane-forming using compounds for concrete.*

Submit certified test results if requested for:

- Curing efficiency
- Discolouration of concrete surfaces
- Adverse effect on adhesion of applied finishes.

Do not use ineffective or inappropriate curing compounds. Do not use wax-based or chlorinated rubber-based curing compounds on surfaces forming substrates to toppings such as concrete toppings and cement-based render. Apply as a continuous coating without visible breaks or pinholes, at the rate recommended by the manufacturer.

5.13 REJECTION OF CONCRETE

Concrete shall be liable to rejection in accordance with Clause 19.1.10 of AS3600. The requirements of AS3600 shall apply along with any additional requirements of AS1379 *The specification and manufacture of concrete.*

Project assessment of strength grade shall apply in accordance with AS1379.

Additional to the above, hardened concrete represented by any one sample with a test strength less than 0.9 times the required characteristic strength shall be liable to rejection.

Rejected concrete shall be removed from the site.

6 STRUCTURAL STEELWORK

6.1 PERFORMANCE BASED

All materials, construction, fabrication and erection is to be in accordance with the requirements of AS4100 – Steel Structures Code.

6.2 MATERIALS & COMPONENTS

Standards

Cold formed sections: to AS/NZS 4600

Steel Grade Table

Type of steel	**Grade**
Universal beams and columns, parallel flange channels, large angles to AS/NZS 3679.1	300
Flat, small angles, taper flange beams and columns to AS/NZS 3679.1	250
Welded sections to AS/NZS 3679.2	300
Hot rolled plates, floor plates and slabs to AS/NZS 3678	250
Hollow sections to AS 1163:	
-Circular sections less than 265mm outside diameter	250
- Sections other than the above	350
Cold formed purlins and girts to AS 1397	G450 Z275
Steel rails to AS 1085.1	(one grade only)

6.3 EXECUTION

Fabrication

Structural members to be supplied in single lengths.

Provide fabrication workshop drawings for all structural steelwork. Other than work shown on workshop drawings as ”site work”, do not fabricate or weld structural steel on site.

To minimise long term member deflections it will be permissible to introduce camber into structural beams.

Allow to carry out testing of welded connections (either X-ray or “dye-testing”)

Testings to be carried out by approved and independent testing authority.

Provide certificates that structural steel elements comply with the requirements of Clause6.2

Bolting

Connection bolts: For connection bolts not shown on the drawings, provide ht-dipped galvanised high strength bolts, nuts and washers to AS/NZS 1252 and snug tight bolting category 8.8/S

Foundation bolts: Provide each foundation bolt with 2 nuts and 2 oversize washers and provide sufficient thread to permit the levelling nut to be set below the base plate.

Hexagonal commercial bolts: To AS/NZS 1111

Hexagonal nuts: Class 5

Extra large flat washers: to AS 1237 Appendix A

Lock nuts: provide lock nuts for bolts in movinmg parts or parts subject to vibration and for vertical bolts in tension.

Welding

All welding to be in accordance with AS/NZS 1554.1. Use category GP welds except in all butt welds and highly loaded fillet welds (above 75% of weld capacity), where category SP welds are to be used.

Erection

Temporary connections: Do not attach cleats except as shown on shop drawings.

Hand flame cutting: Do not hand flame cut bolt holes.

Movements: Provide for thermal movements during erection

Anchor bolts: For each group of anchor bolts provide a template with setting out lines clearly marked for positioning the bolts when casting in.

Grouting at supports: Do not grout if temperature of base plate or footing surface exceeds 38^{o} C

6.4 FINISHES

Finishes Generally

Allow to prepare and coat structural steelwork to achieve a minimum design life or 50 years. Steelwork to be prepared in accordance with AS1627. Remove all loose mill scale, rust, oil or grease globules of weld metal / slag and foreign matter.

Protective Coatings Generally

Shop work: Apply the primer coat or protective system to the structural steel before delivery to the site.

Transport & handling: Protect paintwork from damage during transport and handling. Do not handle or transport steel members until paintwork is dry.

Site work: After erection, repair damage to the shop coating and apply coating omitted at site connections.

Priming:

Time delay: Prime the steel surface as soon as b\possible after surface preparation and before the surface deteriorates. If the surface is contaminated or rust bloomed, repeat surface preparation before priming.

Fast drying primers: Do not provide fast drying primers where surface preparation is less than class 1.5.

Concrete encasing: Where members are part concrete encased extend the priming 25mm into the surface to be encased.

Galvanising

If steel work is to be hot dipped galvanised, ensure minimum coating mass is 550 g/m^2 with average of 600g/m^2.

Protection

Protect steel work from impact damage during construction and make good any defects.

MASONRY

1 GENERALLY

Scope

The scope of Masonry is as shown on the drawings or as to be designed :

Standard

Materials, construction and detailing to AS 3700

2 QUALITY

Tender Submissions

No requirement

Data Submissions

No requirement

Samples

Split block and face block.

Inspections

Provide architectural inspections of the cavity construction, and provide the Principal with copies of their notification of inspection when carried out and as part of the certification of compliance with the Principal's design and specification for the works.

Provide reports by the Project Company's consultants of inspections of the cavities during construction, and provide the Principal with copies of their notification of inspection when carried out, and as part of the certification of compliance with the Principal's design and specification for the works.

3 MATERIALS AND COMPONENTS

Masonry Units

Concrete blocks shall be approved face quality blocks, to match existing.

Split Blocks shall be approved to match existing.

Modular half blocks and closers shall be supplied to maintain bond.

Blocks shall be uniform in size, with sharp unbroken arrises and free from cracks and other defects.

Steel Components

Galvanizing:

Galvanize steel components (including fasteners) to AS 1214 or AS 1650 as appropriate, where

- exposed to weather;
- embedded in masonry;

Corrosion resistance rating:

- Steel products (including reinforcement) not less than: R2

Lintels:

Mild steel flat or angle lintels galvanized to AS 1650, class Z600

Mortar Materials

Sand: Fine aggregate with a low clay content and free from efflorescing salts, selected for colour and grading.

Additives: Do not use additives unless approved.

Cement type to AS 3972: GP, to match existing.

Hydrated Lime: AS 1672

Cavity Flashings

Material: To AS 2904.

Required material: Bitumen coated 0.45 mm thick aluminium core ‘super alcor’.

Cavity ties

All ties shall be of the following types, manufactured by Masonry Ties Pty Ltd or approved equal.

Cavity ties in external walls and other ties within the outer leaf of external walls shall be formed from 3.0 mm thick steel hot dip galvanised following fabrication to a minimum Z600 coating class to achieve an R3 corrosion resistance rating as defined in AS 3700.

All other ties shall be fabricated from sheet steel zinc coated to a minimum Z 275 coating class to achieve an R2 corrosion resistance rating as defined in AS 3700.

Ties shall be the maximum length possible for each situation except that where lengths are specified this shall be the maximum length required which shall be reduced only if necessary to fit the situation.

4 CONSTRUCTION

4.1 GENERAL REQUIREMENT

Walls to stairs shall be cavity block walls, and generally match the walls to the existing fire isolated stairs in construction and finish.

Provide all necessary damp proof courses, cavity flashings, brick ties, weep holes and control joints.

Clean masonry progressively as the work proceeds. Clean facework to remove mortar smears, stains and discolouration.

Set out masonry with joints of uniform width and the minimum cutting of masonry units.

No chasing shall be done in walls which are proposed to remain unrendered.

Where a wall is to remain unrendered, surface mount services to a configuration approved by the Principal.

Do not close the cavity at the jambs of external openings.

Cavity Flashings

Location: Provide flashings and weatherings in the following locations where applicable:

- Floors: Full width of outer leaf immediately above slab or shelf angle, continuous across cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf two courses above. Where the slab supports the outer skin and is not rebated bed the flashing in a suitable sealant.
- Under sills: 30 mm into the outer leaf bed joint one course below the sill, extending up across the cavity and under the sill.
- Over lintels to openings: Full width of outer leaf immediately above the lintel, continuous across cavity, 30 mm into the inner leaf two courses above; Extend at least 15 mm beyond the lintels.

- At abutments with structural frames or supports: Vertical flashing in the cavity from 150 mm wide material, wedged and grouted into a groove in the frame opposite the cavity.
- At stiles where cavities are closed: Full height flashing extending 75 mm beyond the closure into the cavity, interleaved with the sill and head flashing at each end. Fix to frame stiles.

Installation: All joints lapped and bedded in bitumen.

METALWORK

1 GENERALLY

Scope

The scope of Metalwork is as shown on the drawings and nominated in the EXTERNAL FINISHES SCHEDULE, and generally comprises the following:

- Metal screens
- Balustrading
- Bollards
- Safety railings
- Speed humps
- Aluminium windows and doors to fire stairs and lift lobby

Cross References

Refer to the following sections for related work:

- STRUCTURAL STEEL, for finishes to steelwork.
- DOORS, for metal door frames.
- CLADDING & ROOFING, for proprietary metal cladding and roof sheeting
- EXTERNAL FINISHES SCHEDULE, for required finishes to metal elements.

2 QUALITY

Tender Submissions

Location of all barriers, metal screens, balustrades, railings, bollards to be shown on drawings.

Data Submissions

Workshop drawings approved by the Project Company's consultants of balustrades, bollards, safety railings and barriers.

Workshop drawings of alumimium windows and doors, identifying proposed aluminium sections and layout.

Workshop drawings of metal screens and for review by the Principal, including support system and set out of all panels.

Samples

No samples required

Inspections

Provide reports by the Project Company's consultants of inspections during installation and on completion, and provide the Principal with copies of their notification of inspection when carried out, and as part of the certification of compliance with the Principal's design and specification for the works.

RailCorp guidelines on potential effect of electrolysis on metal integrity and finishes to be investigated and advice forwarded to the Principal,

3 MATERIALS AND COMPONENTS

Steel

Tube: To AS 1163.

Bar sections: To AS 3679.1.

Sheet: To AS 1595.

Steel for Powder Coating and Electroplating

Electric resistance welded tube: To AS 1450 "bright".

Cold rolled bar: To AS 1443 "bright".

Cold rolled sheet: To AS 1595/CA2S-E.

Coated Steel

Galvanized tube: To AS 1163.

Zinc, zinc/iron or aluminium/zinc-coated sheet: To AS 1397.

Prepainted sheet: To AS 2728.

Coating class for sheet: Not less than the recommendations of AS 1397 Appendix B.

Aluminium and Aluminium Alloys

Bars: To AS 1865.

Extrusions: To AS 1866.

Drawn tube: To AS 1867.

Plate and sheets: To AS 1734.

Fasteners

Bolts and screws: To AS 1111.

Hexagon nuts: To AS 1112.

Metal washers: To AS 1237.

Machine screws: To AS 1427.

Pressed nuts: To AS 1474.

Self-drilling screws: To AS 3566.

Tapping and metallic drive screws: To AS B194.

Electroplating: To AS 1897.

Galvanizing: To AS 1214.

4 CONSTRUCTION

4.1 GENERAL REQUIREMENT

Generally

Provide balustrades, railings, bollards, steel stairs etc. incidental to satisfactorily completing the works.

Metals

Use metals so that they transmit the loads imposed and ensure the rigidity of the assembly without causing deflection or distortion of finished surfaces.

Incompatible metals: Separate using concealed layers of suitable materials in appropriate thicknesses.

Fasteners

Use fasteners so that they transmit the loads and without causing galvanic corrosion.

To aluminium and aluminium alloys: Use aluminium alloy or non-magnetic stainless steel fixing devices only.

4.2 FABRICATION

Fabricate and pre-assemble items in the workshop wherever practicable.

Edges and surfaces: Keep clean, neat and free from burrs and indentations. Remove sharp edges without excessive radiusing.

Joints: Fit accurately to a fine hairline.

Tube bends: Form bends in tube without visibly deforming the cross section.

Colour finished work: Match colours of sheets, extrusions and heads of fasteners.

Thermal movement: Accommodate thermal movement in joints and fastenings.

Welding

Steel welding: To AS 1554.1.

Aluminium welding: To AS 1665.

Site welds: Do not weld on site without approval. Wherever possible locate site welds in positions for down hand welding.

Stainless steel: Comply with the recommendations of AWRA Technical Note 16.

4.3 FINISHES

Finishing

Finish visible joints made by welding, brazing or soldering methods appropriate to the class of work (including grinding or buffing) before further treatment such as painting, galvanizing or electroplating. Ensure self-finished metals are without surface colour variations after jointing.

Preparation for coating

Before applying coatings to metalwork, complete cutting, drilling and other fabrication, and prepare the surface by a suitable method to AS 1627.

Preparation for thermoset powder coating

Unprotected steel: Remove rust to AS 1627.4 Class 2½, clean by immersing in trichloroethylene or an alkaline solution, and apply a coat of iron phosphate.

Galvanized steel: Clean by immersing in a suitable alkaline or acidic solution, apply a zinc phosphate chemical conversion coating, rinse and degrease.

Aluminium: Pretreatment as recommended in AS 3715 Appendix B, including the application of a conversion coating.

Galvanizing

To AS 1650.

Minimum coating class: Z200.

Electroplating

Zinc: AS 1789.

Nickel and chromium: To AS 1192.

Service condition number: Not less than 2.

Anodizing

To AS 1231, not less than class AA10.

Thermoset powder coating

To AS 3715.

4.4 SPECIFIC REQUIREMENTS

Metal Screens

Provide metal screens where indicated on the drawings.

Screens shall comprise galvanised MS angle frames with aluminium meshed panels as detailed.

Leg of angle frame to be turned out.

Metal screens to be supported on galvanised steel “T” sections fixed to concrete façade. Panels to be bolted to support framing, with 25mm spacers.

Refer to the EXTERNAL FINISHES SCHEDULE for details of the type and finish to the mesh panels.

Framing to be fully welded. All fixings to be galvanised.

Stair balustrades and Handrails

Provide galvanised steel balustrades to new stairs, all to comply with the BCA. Refer to EXTERNAL FINISHES SCHEDULE.

Concrete balustrade handrails

Provide rectangular galvanised mild steel handrails to top of concrete balustrades, as detailed on drawings, with MS flat posts and intermediate rail. Member sizes and fixings to be detailed by Project Company’s engineering consultant.

Crash rail

Provide rectangular galvanised mild steel crash rails at perimeter of all slabs not indicated to have concrete balustrades. Crash rail to be generally as detailed on drawings. Member sizes and fixings to be detailed by Project Company’s engineering consultant.

Crash rail to comply with AS2890.

Bollards

Provide painted steel bollards to protect access to fire stairs, and where ever services or corners of stairs etc can be damaged.

Speed humps

Provide proprietary steel speed humps where shown on the drawings. Fixings to comply with manufacturers recommendations.

Guard Rails

Provide continuous galvanised steel Armco type guard rails to the following areas:

- New vehicular ramps

Window assemblies to lift lobbies and fire stairs

Provide aluminium windows and doors to the new lift lobbies and fire stairs, where indicated on drawings. All installations to be fully weatherproof, and be provided with trim angles onto all adjacent surfaces.

Refer to EXTERNAL FINISHES SCHEDULE, for finish to framing

Glazed doors only required to Level 6 landing.

The existing sections may be re-used where undamaged finish can be provided.

Door hardware to match existing.

Standards:

The design and installation of the windows shall be in accordance with AS 2047 and AS 2048. All sections are to be of commercial standard.

Glazing shall be in accordance with AS 1288 and AS 2208.

DOORS & HARDWARE

1 GENERALLY

Scope

The scope of Doors and Hardware is as shown on the drawings, and generally comprises

- Doors to stairs at each level, complete with hardware. Doors to be flush timber doors with steel door frames.
- Door hardware including hinges, escape hinge sets, door furniture, door plates, keying, bolts, stops, etc.
- Doors to be of fire resistant construction where required by the BCA.

Cross references

Refer to the following sections:

- METALWORK, for aluminium framed doors to the lift lobby.
- EXTERNAL FINISHES SCHEDULE, for finishes to doors.

2 QUALITY

2.1 SUBMISSIONS

Tender Submission

No requirement

Data Submissions

Proprietary doors and door frames: Submit the manufacturer's written approval of the installing firm.

Fire resistant doorsets: Submit certification from an independent testing authority showing compliance with the required fire rating.

Shop Drawings

No requirement

Certification/Warranties

Fire Doors: Fire door installation to be certified as complying with AS 1905.1

2.2 SAMPLES

No requirement.

2.3 INSPECTIONS

Tests

No requirement.

Witness Points

No requirement.

3 MATERIALS AND COMPONENTS

3.1 DOORS

Timber Doors

Flush doors: To AS 2688

Fire Resistant Doorsets
Materials: To AS 1905.1

Door Frames
Steel door frames: To As 1905.1

Coated steel sheet: To AS 1397

To be assembled from minimum 1.5 mm thick coated steel sections.

Flashings and Weatherings
Materials: To AS 2904. Use flashings and weatherings that are corrosion resistant, compatible with the other materials in the installation, and coated with a non-staining compound where necessary.

Jointing Materials
Use jointing and pointing materials, including sealants, mastics, primers, gaskets and compressible fillers of types compatible when used together, and non staining to finished surfaces. Do not use bituminous materials on absorbent surfaces.

Hardware
Materials: All hardware to match hardware installed in stairs to existing carpark, in type and finish.

4 CONSTRUCTION

4.1 GENERALLY

Joints
Make accurately fitted tight joints so that neither fasteners nor fixing devices such as pins, screws, adhesives and pressure indentations are visible on exposed surfaces.

Operation
Ensure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and that they are lubricated where appropriate.

Installation
Install doors so that the frames

- are plumb, level, straight and true within acceptable building tolerances;
- are adequately fixed or anchored to the building structure; and
- will not carry any building loads, including loads caused by structural deflection or shortening.

4.2 DOORS

Timber Doors
Installation: To AS1909

Timber doors shall be external grade solid core flush panel doors, minimum thickness of 35 mm.

Timber doors shall be edge stripped to full perimeter.

Timber doors shall have painted finish.

Fire Resistant Doorsets
Installation: To AS 1905.1

Fire door sets shall be external grade, with paint finish.

Fire resistance: As required by BCA.

Steel Door Frames
Installation: To As 1905.1

4.3 HARDWARE

General

All hardware to match hardware installed in existing stair (at lift lobby), in type and finish.

Fixing

Use fixings of material compatible with the item being fixed, matching where exposed, and of sufficient strength, size and quality to perform their function. Provide a corrosion resistant finish to concealed fixings.

Support: Provide appropriate back support (for example lock stiles, blocking, wall noggings and backing plates) for hardware fixings. Provide reinforcing plate to all frames scheduled.

Security: Locate exposed fixings to lock furniture on the inside faces of external doors and on the inside faces of internal doors to lockable rooms.

All locks are to be provided with cylinders masterkeyed to the Hospitals masterkey system. Provide 4 sets of tagged keys for each lock.

Completion

On completion leave the hardware properly adjusted with working parts in working order.

CLADDING & ROOFING

1 GENERALLY

Scope

The scope of Roofing is as shown on the drawings, and generally comprises the following:

- Profiled metal cladding to lift and stair shafts.
- Profiled metal sheet cladding to stair shafts
- Metal deck roofing over car park top decks.
- Metal deck roof to covered way. All associated roof plumbing, including gutters, downpipes, spreaders, and the rainwater collection pipes to car park.
- Roof plumbing to concrete roof areas.

Cross references

Refer to the following sections:

- STRUCTURAL STEEL, for support framing to roof sheeting and wall cladding.
- METALWORK, for metal screens
- EXTERNAL FINISHES SCHEDULE, for finishes to roof sheeting and wall cladding.

2 QUALITY

Tender Submissions

No requirement

Data Submissions

Trade literature and maintenance information for the membrane roofing system and metal roofing.

Workshop drawings of cladding panels for review by the Hospital, including support system and set out of all panels.

Workshop drawings approved by the Project Company’s consultants of roof drainage system, including the rainwater collection tanks. Drawings to include details of tank construction and support system.

Samples

No Requirement

Inspections

Provide reports by the Project Company’s consultants of the rainwater drainage and collection systems, of inspections during installation and on completion, and provide the Principal with copies of their notification of inspection when carried out, and as part of the certification of compliance with the Principal’s design and specification for the works.

Provide reports by the membrane manufacturer of inspections during installation and on completion, and provide as part of the certification of compliance with the Principal’s design and specification for the works.

Certification/Warranties

Provide 10 year warranty for material and installation of the waterproof membrane roofing from the manufacturer.

3 MATERIALS AND COMPONENTS

3.1 METAL CLADDING

Type: Provide a proprietary system of preformed sheet and purpose-made accessories.

Prepainted and organic film/metal laminate products: To AS 2728.

Product Manufacturer	BlueScope
Product Profile	Spandek
Material:	Zincalume
Finish:	Colorbond Metalic
Colour:	Refer EXTERIOR COLOUR SCHEDULE
Thickness (base metal)	0.48 mm
Grade	Colorbond Metalic
Fixing:	To manufacturers instruction
Design & Installation	To AS 1562.1
Accessories:	Provide material with the same finish as roofing

sheets.

3.2 ROOF SHEETING

Product Manufacturer	BlueScope
Product Profile	Custom Orb 16mm profile corrugated wall cladding
Material:	Zincalume
Finish:	Colorbond Metalic
Colour:	Refer EXTERIOR COLOUR SCHEDULE
Thickness (base metal)	0.48 mm
Grade	Colorbond Metalic
Fixing:	To manufacturers instruction
Design & Installation	To AS 1562.1
Vertical direction	As shown
Accessories:	Provide material with the same finish as roofing

sheets.

3.3 MEMBRANE ROOFING

Membranes

Bituminous multilayer sheet systems: To AS CA55.

Single layer sheet and seamless systems: Use proprietary systems.

3.4 ROOF PLUMBING

Metal rainwater goods: To AS 2179 and AS 2180, including installation.

Flashing material: To AS 2904.

Required flashing material: to match existing.

4 CONSTRUCTION

4.1 METAL CLADDING

Total installation to be in complete accordance with the manufacturers written recommendations.

4.2 METAL ROOF SHEETING

Total installation to be in complete accordance with the manufacturers written recommendations.

4.3 SUBSTRATES FOR MEMBRANES

Apply the membrane to dry, smooth, firm continuous decking surfaces, clean and free of loose or foreign matter, graded to fall to drains without ponding.

Minimum fall: 1:60.

Fillets: Provide solid 45^{o} angle fillets or coves at junction between deck and vertical surfaces.

4.4 MEMBRANE SYSTEM

Proprietary system
To match existing to stairs and lift lobby.

Insulation
To match existing.

Surface protection/finish:
To match existing

Other requirements
Plinths, Kerbs & Upstands: Membrane shall turn up the sides of plinths, kerbs and upstands for a height no less than 150 mm. The top of the membrane shall be fixed using a pressure strip. Provide a bond breaking corner fillet at internal corners. Seal All “free edges” of membrane with sealant at pressure strips. For upstand concrete beams, provide a proprietary reglet at the same height as the pressure strip used at hobs and plinths.

Venting
Provide proprietary venting system to allow moisture to be vented from under membrane.

Outlets
Membrane shall be clamped to proprietary roof outlets supplied by others. Seal membrane to flashing at sump type outlets.

Provide the flashings, cappings, gutters, rainwater heads, outlets and downpipes, necessary to complete the roof system.

4.5 ROOF PLUMBING

Jointing sheet metal rainwater goods
Butt joints: Make over a backing strip of the same material.

Soldered joints: Do not solder aluminium or aluminium/zinc coated steel.

Sealing: Seal fasteners and mechanically fastened joints. Fill the holes of blind rivets with silicone sealant.

Downpipes
Prefabricate ‘zincaleum’ steel downpipes to the required section to suit the requirements, and shape as detailed on the drawings.

Connect feet to rainwater collection tanks or rainwater drains.

Downpipe support:
Provide stand off brackets to match existing.

Rainwater collection tanks
Provide large diameter rainwater collection tanks as shown on the drawings. Tanks to be of prefabricated fibre glass construction capable of withstanding imposed hydrostatic pressure.

Tanks to be provided with sealed inlet and outlet to required size. Provide piped overflow system connected to each tank a maximum of 900mm below top of tank.

Provide a sealed removable access panel within 400mm of base of tank.

Drain to tank to be connected to site irrigation system. Drain form overflow pipes to be connected to site stormwater drainage system

PAINTING

1 GENERALLY

Scope
The scope of Painting is as shown on the drawings and nominated in EXTERNAL FINISHES SCHEDULE, and generally comprises the following:

- External paint finish to new stairs.
- External paint finish to existing stair and lift shafts.
- Painting to doors and frames to stairs.
- Level indication markers to columns
- Parking space and road marking
- Painting to non pre-finished bollards

2 QUALITY

Tender Submissions
No requirement

Data Submissions
Schedule of paint types and manufacturers.

Colour schedule

Samples
No Requirement

Inspections
Provide reports by the Project Company's consultants of inspections on completion, and provide the Principal with copies of their notification of inspection when carried out, and as part of the certification of compliance with the Principal's design and specification for the works.

3 CONSTRUCTION

3.1 GENERAL REQUIREMENT

Paint only those surfaces where the equivalent surface in the existing carpark is painted.

Standards
Carry out painting in accordance with AS 2311 and AS 2312.

Preparation
Carry out all preparation to surfaces to be painted in accordance with the manufacturers written recommendations.

Painting System
Timber and metalwork shall be painted with a solvent borne painting system.

Road Marking
Mark out parking spaces, and internal circulation to aisle and roads with standard symbols and directional traffic arrows on pavements with road marking paint.

Lift and stair shafts
High build external grade paint as nominated in EXTERNAL FINISHES SCHEDULE.
Prepare all surfaces in accordance with the manufacturers written requirements.

SIGNS

1 GENERALLY

Scope

The scope of Signs is as shown on the drawings, and generally comprises the following:

- All statutory signs to stairs and services
- Soffit mounted directional signs for vehicular movement in carparking areas.
- External post mounted signs.

Cross References

Refer to the following sections:

- PAINTING, for traffic flow signs on the floor surface.

2 QUALITY

Tender Submissions

No requirement

Data Submissions

No requirement

Samples

No Requirement

Inspections

Provide reports by the Project Company's consultants of inspections on completion, and provide the Principal with copies of their notification of inspection when carried out, and as part of the certification of compliance with the Principal's design and specification for the works.

3 CONSTRUCTION

3.1 GENERAL REQUIREMENT

Statutory Signs

Provide statutory signs required by the BCA on fire doors, fire hose reel cupboards etc. in the form of full width strips of Traffolyte with appropriate engraving.

External Signs

Provide external signs to AS 1742.1 to control traffic and parking as necessary to suit the design.

Allow for the installation of four external signs 1500 mm long by 1200 mm high, built up from zincalume and with a powder coated finish mounted on steel posts, with nominal 300 painted characters.

Provide 4 weeks notice of the requirement for the wording to the signs.

Traffic flow signs

Provide soffit mounted signs indicating direction to parking and to exit at each major change of direction within the multi storey carpark.

Signs to match existing.

HYDRAULIC SERVICES

1 GENERAL

1.1 DESCRIPTION OF WORK

Extent of work:
The scope of the Hydraulic services works includes the design and installation of the following services;

- Stormwater Drainage
- Rainwater collection system
- Cold water service
- Irrigation system
- Fire Fighting

Provide and extend the hydraulic services to the new car park within the site area and beyond as necessary.

Design and construct all work in accordance with the relevant Australian Standards and to the satisfaction of all relevant authorities.

Attention is drawn to AS 3500, AS 2419, AS 2441, AS 2444, AS *1841.* AS1596,

ASS6O1. Obtain copies of the relevant Australian Standards, Building

Code of Australia, New South Wales Code of Practice — Plumbing and Draining,

Health Department — Circulars and Guidelines, other pertinent information and retain

on-site for the duration of the works.

The design of hydraulic services is the responsibility of the Project Company

Separate design drawings are required for each hydraulic service provided on the

developed site.

Cross References
Refer to the following sections:

- CLADDING & ROOFING, for roof drainage system design requirements..

2 QUALITY

Tender Submissions
No requirement

Data Submissions
Workshop drawings approved by the Project Company's consultants of stormwater drainage system, including the rainwater collection tanks, and the site irrigation system.

Provide reports by the Project Company's consultants of the stormwater, rainwater drainage and collection and irrigation systems, covering the inspections during installation and on completion, and provide the Principal with copies of their notification of inspection when carried out, and as part of the certification of compliance with the Principal's design and specification for the works.

Samples
No Requirement

Inspections
Provide reports by the Project Company's consultants of inspections on completion, and provide the Principal with copies of their notification of inspection when carried out, and as part of the certification of compliance with the Principal's design and specification for the works.

3 CONSTRUCTION

3.1 PIPEWORK GENERALLY

Buildings:
Size and design the main reticulation systems to cater for the buildings that are shown on the drawings.

Redundant Services:
Disconnect and cap off redundant hydraulic services.

Pipe Protection:
Provide wrapping to in-ground pipelines in accordance with the manufacturer's recommendations for aggressive soil conditions.

Provide pipe lagging to pipelines located in areas of extreme weather conditions.

Pipe Identification:
Apply pipe identification markers to all accessible pipework including those pipes located in plumbing riser ducts and plant rooms. Markers to clearly indicate pipe contents or function and indicate the flow direction.

Provide pipeline identification tape to in-ground pipework. Ensure the tape is installed above the pipeline, in the trench and along the centre line.

Exposed Pipework:
Generally conceal water service pipework, however if unavoidable construct the exposed pipework in copper pipe material.

Location:
Do not locate pipes under buildings except where required to serve fixtures or appliances in the buildings. Every effort should be made to divert the pipes around buildings.

Align drainage runs and services to avoid installation through tree root systems.

3.2 EXISTING INFRASTRUCTURE & SERVICES

Locate all existing infrastructure and services in the vicinity of the site prior to commencement of work and connect into the existing infrastructure.

Ensure existing services have adequate capacity to service both new and existing loads. If existing services are inadequate then provide facilities with acceptable criteria.

Connect into the existing services where necessary. Ensure that the levels and locations of these connections are adequate.

3.3 SOIL AND WATER MANAGEMENT

Prepare a soil and water management plan in accordance with the principles laid out in “Soil and Water Management for Urban Development” issued by the NSW Department of Housing.

Have the management plan prepared by a person accepted by the international Erosion Control Association as having the necessary skills to prepare such a plan.

Submit the management plan prior to any work being undertaken at the site. Strictly adhered to this requirement.

Appoint a specific person who has the responsibility and authority to ensure that all erosion control devices and strategies are maintained in effective condition during the currency of the contract.

Carry out construction in strict accordance with the management plan or with variations to that plan, which are authorized in writing by the person who prepared the original plan.

4 STORMWATER DRAINAGE

4.1 DESCRIPTION

General

Provide a gravity service to discharge stormwater from the site into an approved disposal system.

Roof drainage

The car park roof water disposal system is to incorporate a rainwater collection tank system, with overflow piping connected to the site stormwater system. Refer to CLADDING & ROOFING for details of the tank system.

Surface Water

Provide a stormwater drainage system to adequately protect all buildings and the environment from damage by stormwater and prevent ponding on paved surfaces.

4.2 PIPEWORK

General

Provide stormwater drainage of UPVC, FRC, VC or RC materials, Other materials may be used as long as they comply with the Australian Standard and Local Council requirements.

Jointing of the materials to be as follows:

• UPVC	pipesolvent ring or rubber ring
• FRC pipe	rubber ring
• VC pipe	rubber ring
• RC pipe	rubber ring

Provide 225mm diameter minimum size pipelines for draining grated pits or inlet head walls.

Lay the pipes straight between pits, except for those pipes carrying roof water, which may have bends and junctions.

Avoid locating pipes under buildings. Where this is unavoidable, minimize the extent of pipe runs under buildings.

Electrical Pit Drainage

Provide graded drainage pipelines from the electrical pits and connect the pipelines into the pits of the on-site stormwater system. Terminate the pipelines with flap valves in the stormwater pits.

4.3 PITS

General

Provide pits at junctions of pipes 225mm diameter and greater, and at changes of direction except for pipelines carrying roof water. Do not locate pits near doorways or in areas where their location becomes a safety issue.

Pits located in hard paved areas are to be aligned with the adjacent walls and/or paved features. Ensure the covers and surrounds blend in with the surrounding paved features. Pits in other areas are to have their covers set 25mm below the finish surface.

Provide pits with solid covers unless grated covers are required to collect surface water.

Use cast iron pit covers with concrete in-fill and cast iron frames (except for grated pits)

Grated pits to have cast iron gratings with the appropriate frame. Secure the grates in position to prevent unauthorised removal.

4.4 SURFACE DRAINAGE

General

Provide a reticulated primary stormwater and subsoil drainage system to collect and dispose of stormwater running onto and off the developed site.

Locate pits and arrange falls to paving and surface areas, such that water does not flow through or into covered areas, covered walkways or flow down steps in the storm event for which the drainage system is designed.

Stormwater inlets are located outside planting beds and aligned with an adjacent edge such as a paving planting bed edge.

Position the outlets to prevent water ponding outside the building or in other areas.

Design the system that in the event of blockage or other failure of the stormwater system, water will not enter the buildings but will escape over adjoining paved or ground surfaces in the manner of the major/minor system recommended by “Australian Rainfall and Runoff”.

The recurrence interval used for the design of the minor drainage system to be appropriate far the degree of risk to buildings or structures likely to be affected, but in any case the interval is not less than twenty years. The recurrence interval for the major system is 100 years.

Show on the drawings all design assumptions used in designing the system.

Dish Drains

Provide dish drains in areas of the site where required.

Channel Drains

Provide precast channel drain with fixed cast iron grates to areas of the site where required. Secure the grates in position to prevent unauthorised removal.

Grass Swales

Provide grass swales strategically to convey stormwater away from new site works. Avoid locating swales under new of future building sites and across areas such as free play and covered areas, where they could cause interference or injury to the user of that area.

Area Drainage

Provide surface and sub-soil drainage to the free play area and other areas where ground water is to be removed. Grade and drain these works away from the site into pits of the stormwater system or other suitable discharge area.

4.5 ROOF DRAINAGE

Roof Water

Provide gutter receivers, downpipes. rainwater spreaders and rainwater outlets to collect all roof water and discharge into the stormwater drainage system.

Roof Drainage

Base the roof drainage calculations on the Experimental Building Station Notes on the Science of Building No’s 151,152 and 153 and AS 3600.

Provide heavy gauge metal downpipes at all exposed locations. Ensure that the downpipes are vandal resistant.

Connect downpipes to rainwater collection tanks, as shown on drawings. Refer to CLADDING & ROOFING. Connect overflow pipes to inground drainage systems providing watertight connections.

4.6 IRRIGATION SYSTEM

An irrigation system shall be provided to cover all landscaped areas.

The Project Company's consultant shall design a site irrigation system, which shall incorporate the rainwater collection tanks. The rainwater collection tank system shall have override connection to alternative mains pressure system. Where connection to rainwater collection tanks not viable (ie western boundary landscaped areas), system to be connected to mains pressure system.

Provide automatic time controls to all systems, with override facility. Controls to be contained within lockable control cupboard in a secure, weather protected location.

5 FIRE FIGHTING

5.1 DESCRIPTION OF SERVICES

Provide a separate and independent fire hydrant system in accordance with AS2419 and the local authority requirements. The hydrant system is a dedicated pipeline that is not metered nor used for any other purposes.

Provide a fire hose reel service from the existing metered domestic services and boosted if required.

5.2 HYDRANT SYSTEM

The minimum size of the pipeline is 100mm diameter. Extend the fire hydrant system from the existing infrastructure. Provide pressurization pump set and/or tank if the residual pressure is below the required standard.

Ensure all buildings and facilities for the whole site are covered by the hydrant placements.

Provide the fire hydrant service using pipeline material accepted by the local authorities.

5.3 HYDRANT LANDING VALVES

Provide standard bronze Double Headed Landing valves 65mm nominal diameter with brass “Stortz” quick couplings unless required otherwise by the Fire Brigade.

Locate the on-site hydrants 10 metres from any building and spaced at no more than 60 metres apart. Landing valve height to be between 750mm minimum to 1200mm maximum above ground level.

5.4 HOSE REELS

Provide copper type B tube and fittings for the fire hose reel service.

Provide hose reels 36m long x 20mm fixed arm type hose reels complete with fixed plate noting operation instructions. The hose reel must also have a device to secure the hose nozzle to the valve assembly when the valve is shut.

House the hose reel in a recessed cabinet.

5.5 TESTING AND MAINTENANCE

Implement a testing and maintenance program for the hydrants and hose reels in accordance with AS1851 and BCA requirements.

5.6 FIRE EXTINGUISHERS

Provide portable fire extinguishers to applicable locations within the buildings after consultation with the Fire Brigade and in accordance with AS 2444.

ELECTRICAL SERVICES

1 ELECTRICAL SERVICES

Scope

The scope of the Electrical services works includes the design and installation of the following services;

- Provision of power to the car park site, with
- Main electrical switchboard and power and lighting provision throughout car park
- Emergency and Exit lighting
- Security services

The Project Company shall ascertain where power to the building can be supplied from, and include for all necessary works, including any necessary amplification of power to the site.

The power to the lift and stairs will be provided by the hospital from a temporary source, and the power supply for the lift and stair shall be relocated onto the carpark switchboard on completion of the carpark. This arrangement will be clarified during the detailed design phase by others for the pedestrian bridge.

The new switchboard shall be fitted with a suitable rated 3 phase Quicklag circuit breaker for the lift supply TBC, suitably rated 3 phase Quicklag circuit breakers for submains to new light and power distribution boards located on each level, and two triple pole Quicklag spaces.

Provide suitably rated 3 phase 2 hour fire rated submains from then new lift circuit breaker to the new lift control panel, leaving 3 metre tails for termination by others.

Provide suitably rated 3 phase PVC/PVC submains to terminate at the new light and power distribution boards.

The new light and power distribution boards shall be fitted with 3 phase main switch Quicklag final sub-circuit breakers, bypass switches for all PE cell external lighting controls, a lockable hinged front door and 12 single pole spaces.

Provide all light fittings, emergency lights and EXIT signs, as referred to in this design specification.

Provide all power outlets as referred to in this design specification.

2 QUALITY

2.1 SUBMISSIONS

Tender Submission

- Schedule of lighting fittings
- Manufacturer of light switches and GPO’s
- Manufacturer of switchboards

Shop Drawings

Main Carpark switchboard

General light and power layout drawings

As Installed Drawings

Certification/Warranties

Emergency lighting

General electrical installation

Provide reports by the Project Company's consultants of the electrical systems, of inspections during installation and on completion, and provide the Principal with copies of their notification of inspection when carried out, and as part of the certification of compliance with the Principal's design and specification for the works.

Samples

Light Fittings

Tests

Refer to later clause

3 GENERALLY

Carry out the whole of the electrical installation in accordance with the requirements of all authorities and/or utilities having jurisdiction.

Standards

Carry out the electrical installation in accordance with the following standards :

AS/NZS 3000	General Electrical Installation
AS 3439	Electrical Switchboards
AS/NZS 3008	Electrical Installations – Selection of Cables
AS 1680	Interior Lighting
AS/NZS 2293	Emergency Lighting
TS 009	Austel Telephone Installations

Energy Australia Service Rules

Building Code of Australia

Insurance Council of Australia

All other relevant standards.

Electrical Contractor

All electrical cabling works shall be carried out by specialist sub-contractors experienced in this type of design and construct work, who shall be nominated in the *Tender Submission Documents.*

General Electrical Installation Wiring

All wiring shall comprise 0.6/1KV grade stranded copper conductors of approved manufacture and colour coding. Minimum conductor size shall be 2.5 mm sq. Earthing conductors shall comprise insulated 2.5 mm sq. copper wire. The wiring shall be carried out on the "loop-in" principle, the jointing of conductors and the use of connectors will not be permitted except where required by the SAA. Wiring Rules to allow for connections to light fittings being made with approved heat resisting cables. Wires in which kinks or abrasions have occurred will be rejected and must be replaced.

For all wires and cables used, the insulation of each phase, neutral and switch wire shall be distinctly and uniformly coloured (eg. red, white, blue for actives, black for neutral, grey for switch wires and green for insulated earths.)

Lighting final sub-circuits shall be PVC insulated cable where run in PVC conduits or PVC insulated and sheathed cable elsewhere.

Conduits

Conduits where required are to be of minimum 20 mm dia. grey PVC and shall be concealed wherever possible. Where run externally they shall be of weatherproof type (non-fading).

All spare conduits shall be fitted with suitable draw wires.

Fittings and Accessories

Supply all normal and emergency lights, exit signs, external lights, GPO's, light switches, cabling, wiring accessories and all other items required for the installation.

General Lighting

Provide general lighting in accordance with AS 1680 to all areas..

Lighting shall be generally provided by 2 x 36 watt surface mounted, weatherproof IP67, fluorescent luminaires fitted with colour 33 4300 deg. K (white) fluorescent tubes, polycarbonate diffuser0.9 lagging power factor, low loss ballasts (watts loss 5.5), and either blocking inductors or lead/lag arrangement acceptable to Energy Australia. Minimum lighting level 40 lux.

External wall mounted lighting shall be provided by suitable weather and insect proof metal halide luminaires, minimum lighting level 30 lux.

All surface mounted lights shall be securely fixed into position in an approved manner by a minimum of two points of attachment.

Earth Connections

All lighting and power outlets shall be provided with an earth connection. Earth conductors must be adequately protected against mechanical damage.

Emergency Lighting

Provide single point White Lite, non maintained, monitored, nickel cadmium type, fluorescent emergency lights (either separate units or incorporated into fittings) and 2 x 10 watt, sustained, dual rate, nickel cadmium type White ILte, monitored, EXIT signs installed in accordance with the requirements of AS/NZS 2293. All fittings used must have AS/NZS 2293 classification.

Provide suitable monitoring cables wired back to the new satellite testing point at the new sub-distribution board location.

Lamps

Lamps and tubes shall be supplied and installed for all light fittings, shall be of Australian manufacture, suitable for 250 volt AC operation. All lamps and tubes shall have a guaranteed life of not less than 3500 hours or 12 months. All lamps and tubes having a lesser life shall be removed and replaced at no cost.

Connections To Equipment

All equipment shall be provided with a local isolating switch. Supply, mount and wire the local isolating switches and carry out additional wiring to, or on, the equipment as necessary.

Permanent Connections

Provide power and make permanent connections to built in plant and equipment. Neutral and earth conductors must be run to the isolating switch for every permanent connection.

Switches

Light switches shall be white HPM "Excel" type (or similar) single pole, toggle flush type, rated 10 amp minimum and shall in any case be rated to carry the connected load. Switches shall be mounted approximately 1200 mm above the floor on the lock side of the door unless otherwise specified. They are not to be placed across the junction of different wall finishes.

Where switches fall adjacent to each other, they shall be ganged under a common flush plate. Flush plates shall be coloured white to match the GPO plates.

General Purpose Outlets

Provide general purpose outlets (GPO's) where required for routine purposes, of the single or twin type, mounted in or in a suitable wall box at a height of 1000 mm above floor level unless otherwise required. They shall be white HPM "Excel" type (or similar) of the moulded plastic coverplate type. Unless otherwise required they shall be flush combination type 10 amp switch and 10 amp 3 pin receptacle, coloured white to match the light switches.

Labelling

Every switch and switchboard control shall be labelled with engraved traffolyte labels so as to provide ready identification of all circuits.

The designation of the circuits installed into the switchboard shall be marked on the circuit directory.

Testing

Insulation and continuity tests are to be carried out during the progress of the work. On completion the electrical installation shall be tested under normal working conditions and as directed by the Principal. Notification of Electrical work and certificate of Compliance shall be prepared and submitted to Energy Australia.

All defects disclosed during the tests shall be remedied immediately and if required by the Principal, fresh tests shall be carried out. Each item of equipment shall be silent in operation, all vibration being reduced to a minimum. Any item that is considered to be noisy by the Principal shall be removed from the site and replaced with a silent type.

Security services

To Be Advised

Roof option additional items:

MRF	Metal deck roofing	Lysaght Spandek Colour "Colorbond Metallic Steel Citi".	Bluescope steel or similar	Roofing	
RG	Guttering and fascia	Colorbond steel profiled quad gutter as design drgs. Colour "Colorbond Metallic Steel Citi".	Bluescope steel or similar	Eaves of metal deck roof.	
STS3	Steel roof structure	Galvanised MS to Engineers design. Nil finish.			

Landscape Concept

The development of a landscape zone between the multi-deck car park and the childcare centre is an important screening device in seeking to ameliorate the scale and bulk of the car park on the centre. The proposed planting strip would aim to provide both high and low level visual screening to the full length of this perimeter. The strategy has been adopted to provide screening of the upper levels of the car park while also breaking down the bulk car park envelope on the ground plane. The planting strategy will also make allowance for passive surveillance through this zone and into the car park.

It is envisaged that the four rainwater collection tanks on the east façade will harvest roof water for garden irrigation.

All plant material proposed would be drought tolerant and not require a high level of maintenance to maintain a satisfactory appearance.

Appendix G

Environmental Site Assessment

October 2008

Prepared by:

EIS (A Division of Jeffrey
Katauskas Pty Ltd

EIS

ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

CAPITAL INSIGHT PTY LTD

ON

ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED MULTI STOREY CAR PARK DEVELOPMENT

AT

LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL

JUNE 2007

REF: E21171FK-RPT

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TABLE OF CONTENTS

1 INTRODUCTION

Capital Insight commissioned Environmental Investigation Services (EIS), a division of Jeffery & Katauskas Pty Ltd (J&K), to undertake an environmental site screening to assess the likelihood of contamination of the subsurface soils and groundwater for a proposed multi-storey car park development at Liverpool Hospital. The entire hospital site is identified as Lot 1 and 2 in DP 596770 and at the time of the assessment the area under investigation was occupied by a staff recreation building, swimming pool and tennis court. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2.

The screening was undertaken generally in accordance with an EIS proposal of 5 December 2006 and Capital Insight written acceptance of 23 April 2007.

EIS understand that the proposed development includes a multistorey car park constructed on grade.

This report describes the investigation procedures and presents the results of the environmental site assessment, together with comments, discussion and recommendations.

A geotechnical investigation was performed concurrently with the environmental site screening by J&K and the results are presented in a separate report (Ref. JobNoRPT, dated ##, 2004).

1.1 Previous Reports

EIS completed a preliminary screening of the site in conjunction with a geotechnical investigation performed by J&K in 2006. The results of the investigation are presented in;

> *"Report To NSW Department Of Commerce On Preliminary Environmental Site Assessment For Proposed Liverpool Hospital Re-Development Project At Liverpool Hospital, Elizabeth Street, Liverpool. July 2006 Ref:E20303F-Rpt"*

The results of the investigation have been incorporated into this report.

2 ASSESSMENT OBJECTIVES

2.1 Investigation Objectives

The primary objective of the investigation was to assess the soil and groundwater conditions at the site in relation to the suitability of the site for the proposed land use in accordance with the *Guidelines for Consultants Reporting on Contaminated Sites NSW DECC (formerly the EPA) 1997* and the *State Environmental Planning Policy No.55 – Remediation of Land* (SEPP55).

A secondary investigation objective was to undertake a preliminary waste classification assessment for off-site disposal of excavated soil and rock associated with the proposed development works.

2.2 Data Quality Objectives

The data quality objectives for the assessment are outlined in the following table:

<table>
<tr><td>State the problem</td><td>Contaminated soil may exist at the site. The principal contaminants of concern at the site are considered to be petroleum hydrocarbons, asbestos, heavy metals, polycyclic aromatic hydrocarbons, organochlorine pesticides and polychlorinated biphenyls. Due to the presence of a number of underground storage tanks to the north of the proposed car park there is also the potential for groundwater contamination associated with petroleum hydrocarbons, volatile organic compounds and heavy metals.</td></tr>
<tr><td>Identify the decision</td><td>The principal objectives of the study are to assess whether the concentrations of contaminants in the soil and groundwater exceed the site assessment criteria (guideline concentrations).</td></tr>
<tr><td>Identify inputs into the decision</td><td>The following data will be reviewed to resolve the decision statement:
• Physical site data that includes topography and other relevant information.
Analytical schedule for soils
<table>
<tr><th>Class</th><th>Analytes</th></tr>
<tr><td>Metals and metalloids</td><td>Arsenic
Cadmium
Chromium
Copper
Mercury
Nickel
Lead
Zinc</td></tr>
<tr><td>Organics</td><td>Total Petroleum Hydrocarbons
BTEX (benzene, toluene, ethyl benzene, xylenes)
Polycyclic Aromatic Hydrocarbons
Pesticides: Organochlorine
Polychlorinated Biphenyls</td></tr>
<tr><td>Asbestos</td><td>Asbestos identification</td></tr>
</table>
Analytical schedule for groundwater
<table>
<tr><th>Class</th><th>Analytes</th></tr>
<tr><td>Metals and metalloids</td><td>Arsenic
Cadmium
Chromium
Copper
Mercury
Nickel
Lead
Zinc</td></tr>
<tr><td>Organics</td><td>Total Petroleum Hydrocarbons
BTEX (benzene, toluene, ethyl benzene, xylenes)</td></tr>
</table>
</td></tr>
</table>

	Field QA/QC samples will include inter and intra laboratory duplicates at ratios of 5% and 10% respectively; rinsate sample and trip spike.
Study Boundaries	The study will be confined to the boundaries of the proposed new multi-storey car park shown in Figure 4.
Develop a Decision Rule	The results of the sample analysis will be compared with the concentrations specified in the site assessment criteria (see below).
Specify Limits on Decision Errors	A 20% probability of an error in deciding that the site is unacceptable, when in actual fact it is, has been adopted for this site. Similarly, a 5% probability of an error deciding that the site is acceptable when it is not has been adopted.
Optimise the Design for Obtaining data	If necessary an additional round of sampling may be undertaken. The overall data set will be optimised by review of the data as the project proceeds. If necessary adjustments will be made to the sampling and/or analytical program.

2.2.1 Data Quality Indicators

The purpose of Data Quality Indicators is to develop criteria to assess the reliability of the laboratory data. The following Data Quality Indicators established for this project are summarised below:

- Collection and analysis of 5% of the field samples as inter-laboratory duplicates.
- Collection and analysis of 10% of the field samples as intra-laboratory duplicates.
- Relative percentage differences (RPDs) will be calculated for inter-laboratory and intra-laboratory duplicates. The RPD is calculated as the absolute value of the difference between the initial and repeat result divided by the average value, expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:
  - For results greater than 10 times the Practical Quantitation Limit (PQL) RPDs less than 50% are considered acceptable.
  - For results that are between 5 and 10 times PQL RPDs less than 75% are considered acceptable.
  - For results that are less than 5 times the PQL RPDs less than 100% are considered acceptable.
- Review of laboratory QA/QC data (including surrogate recovery, repeat analysis, duplicates, matrix spikes and method blanks).

The success of the Data Quality Indicators will be based on an assessment of the data set as a whole and not on individual acceptance or exceedance within the data set.

2.3 Quality Assurance (QA)

Quality Assurance involves all of the actions, procedures and checks to ensure that the data is representative, the integrity of the samples and the result are representative. The QA procedures for this project will involve:

- collection of soil and water samples in appropriately pre-treated jars/bottles with Teflon lined lids;
- collection of 5% of the field samples as inter-laboratory duplicate analysis;
- collection of 10% of the duplicate samples for intra-laboratory analysis;
- collection of equipment rinsate samples;
- analysis of a trip spike for groundwater analysis;
- chain-of-custody identifying; each sample, the sampler, nature of the sample, collection date, analyses to be performed and quality assurance/quality control (QA/QC) procedures required; departure date from the site; and receipt by the laboratory;
- comparison of the analysis required to the holding time;
- analytical methods in accordance with Schedule B(3), NEPC (1999) Guideline on Laboratory Analyses of Potentially Contaminated Soils;
- laboratory NATA accreditation for analytical methods used;

2.4 Quality Control (QC)

Quality control monitors and measures the effectiveness of the QA procedures and will include:

- review of sample percentage recoveries;
- review of laboratory QA/QC procedures (ie. surrogates, laboratory duplicates, matrix spikes, etc);
- review of sample relative percent differences (required to be less than 50% for soil samples with results greater than 10 times the laboratory limits of reporting);
- review trip blank, trip spike and rinsate blank analyses; and
- review of laboratory method blank analysis.

3 SITE INFORMATION

3.1 Site Description

The site identification details are summarised below:

Site Owner:	NSW Department of Commerce
Site Address:	Liverpool Hospital, Elizabeth Street, Liverpool
Lot & Deposited Plan:	Part of Lot 1 and 2 in DP 596770
Local Government Authority:	Liverpool City Council
Site Area of Proposed car park:	Approximately 8000m^2
AHD:	Approximately 10m
Geographical Location (MGA):	N:6244502 E:308790 (approximately)
Site Locality Plan:	Refer to Figure 1
Site Layout Plan	Refer to Figure 2

Liverpool Hospital is located to the north–east of the junction of Elizabeth Street and Goulburn Street. The site is located within a gently undulating regional topographic setting that generally falls to the south-east at approximately 1-2°. The site has a similar topography to the region except for the elevated railway line, which bisects the hospital site in an approximately north-south orientation.

At the time of the investigation the site was occupied by the existing hospital and mental health section to the west of the railway line and by various commercial use activities to the east of the railway line, including a child care centre, tennis court, heliport and energy building.

The hospital site was bounded by high schools and an industrial area to the north. A TAFE (with open grassed areas) and the Georges River bounded the site to the south. Medium to high density residential areas were located to the west of the site and north of the west section of the site.

The investigation was confined to an area of the hospital currently occupied by the staff recreation building, swimming pool and tennis court. The approximate area was bounded by a railway line to the west and an internal hospital access road to the south.

A large concrete pad (approximately 6m by 3m) with metal plates was located in the south section of the site, an identical pad is located approximately 30m to the west on the opposite side of the railway track. These access an 1800mm diameter (6 meter below ground level) high pressure Sydney Water sewer pipe located 6m below the surface that connnects most of Liverpool to the sewerage farm in Warwick Farm (to the east). The pads are located where the pipe splits in two (on hospital side) to run under the railway line, and then combine back together on the Warwick Farm side.

A 55,000 litre diesel underground storage tank associated with the hospital Central Energy building was located to the north-east of the site. A child care centre was located to the east of the site an on-grade car park was located to the south of the site on the opposite side of the hospital access road.

Areas around the staff recreation area, the swimming pool and the tennis court were grassed. Shrubs and trees were located in the south west corner of the site. There were no obvious indications of plant stress.

3.2 Regional Geology and Hydrogeology

The 1:100,000 geological map of Penrith (Map 9030, 1:100,000 Department of Mineral Resources –1991) indicates the site to be located in the vicinity of the contact between areas underlain by Quaternary fluvial deposits of clayey quartzose sand and clay, and areas 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.

The stratigraphy of the site is expected to consist of residual clayey soils overlying relatively shallow bedrock in the west section and alluvial sandy soil overlying deep bedrock in the east section.

The acid sulfate soil risk maps indicate areas of high risk, low risk and no known occurrence of acid sulfate soils. The acid sulfate soil risk map for Liverpool (Acid Sulfate Soil Risk Map- 9030S2 edition 2, December 1997, 1:25000, Department of Land and Soil Conservation) indicates that the site is located within an area of no known occurrence of acid sulfate soil. The closest area at risk of acid sulfate soil is the bottom sediment of the Georges River approximately 200m to the south.

3.3 Potential Contamination Sources

3.3.1 General Contamination Processes

Contamination of surface and subsurface soils generally arises from previous land use that can include petroleum hydrocarbon and warehouse storage, manufacturing processes and pesticide and fertiliser usage. Imported fill soils may contain contaminants derived from unknown sources. Migration of contaminants can occur in permeable subsurface soil or fill materials and via man-made and natural drainage systems. The extent of contamination migration is dependent on the hydro-geological environment and the chemical and physical characteristics of the contaminants. Contamination migration in clayey soils can be expected to be limited, whilst sandy soils are conducive to greater spatial migration.

Backfill to service trenches can form contamination migration pathways via poorly compacted or permeable backfill. Backfill may also be contaminated.

The general history of contamination of sites in the Sydney region indicates that analysis for heavy metals including lead, copper and zinc should be incorporated in the schedule of laboratory testing. In addition screening tests should be performed on selected samples for polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCs), polychlorinated biphenyls (PCBs), petroleum hydrocarbons (TPH), asbestos monocyclic aromatic hydrocarbons (BTEX) and asbestos. Contaminants including cyanide, phenolic compounds, barium, beryllium, cobalt, manganese, vanadium and boron are generally associated with specific site industrial uses and so have not been considered in this investigation.

3.3.2 Potential Site Specific Contamination

The principal potential contamination sources at this site are considered to be:

- Imported fill material used to raise site levels;
- Asbestos building materials left behind after demolition of older buildings;
- Asbestos building materials associated with current buildings; and
- Petroleum hydrocarbons and volatile organic compounds associated with existing and former underground storage tanks.

3.4 Potential Receptors

The main potential contamination receptors are considered to include:

- Georges River located approximately 200m to the south of the site.
- Site visitors, workers and adjacent property owners, who may come into contact with contaminated soil and/or be exposed to contaminated dust arising from construction activity.
- Future site occupants.

3.5 Contaminant Laydown and Transport Mechanisms

At this site, mobile contaminants would be expected to move down to the groundwater table and migrate laterally down-slope from the source. The movement of contaminants would be expected to be associated with groundwater flow.

Soil borne contaminants may potentially be distributed as dust across the site if disturbed. Volatile soil contaminants could potentially be released in the vapour phase if disturbed.

3.6 Results of Previous Investigation

EIS completed a preliminary screening of the site in conjunction with a geotechnical investigation performed by J&K in 2006. The results of the investigation are presented in;

"Report To NSW Department Of Commerce On Preliminary Environmental Site Assessment For Proposed Liverpool Hospital Re-Development Project At Liverpool Hospital, Elizabeth Street, Liverpool. July 2006 Ref:E20303F-Rpt"

The preliminary assessment involved sampling from eight boreholes across the entire site. One borehole BH1004 was located within the area of the proposed multi-storey car park. Sample BH1004(0-0.2m) was analysed for heavy metals, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (TPH), monocyclic aromatic hydrocarbons (BTEX), asbestos, organochlorine (OC) pesticides and polychlorinated biphenyls (PCBs). The analytical results for the sample were all less than the site assessment criteria. No asbestos was detected in the sample.

4 ASSESSMENT CRITERIA DEVELOPMENT

4.1 Regulatory Background

In 1997 the NSW Government introduced the *Contaminated Land Management Act, 1997* (CLM Act). This act, associated regulations, State Environmental Planning Policy (SEPP) No.55 – Remediation of Land (1998) and associated NSW DECC (EPA) guidelines, were designed to provide uniform state-wide control of the management, investigation and remediation of contaminated land.

Prior to granting consent for any proposed rezoning or development, SEPP55 requires the consent authority to:

- consider whether the land is contaminated;
- consider whether the site is suitable, or if contaminated, can be made suitable by remediation, for the proposed land use;
- be satisfied that remediation works will be undertaken prior to use of the site for the proposed use.

Should the assessment indicate that the site poses a risk to human health or the environment, remediation of the site is required prior to commencement of the proposed development works. SEPP55 requires that the relevant local council be notified of all remediation works, whether or not development consent is required. Where development consent is not required, 30 days written notice of the proposed works must be provided to council. Details of validation of remediation work must also be submitted to Council within one month of completion of remediation works.

The consent authority may request that a site audit be undertaken during, or following the completion of the site assessment process. Under the terms of the CLM Act the NSW DECC (EPA) Site Auditor Scheme was developed to provide a system of independent review for assessment reports. An accredited Contaminated Site Auditor is engaged to review reports prepared by suitably qualified consultants to ensure that the investigation has been undertaken in accordance with the guidelines and confirm that the sites are suitable for their intended use.

Section 59(2) of the CLM Act states that specific notation relating to contaminated land issues must be included on S.149 planning certificates prepared by Council where the land to which the certificate relates is:

- within an investigation or remediation area.
- subject to an investigation or remediation order by the DECC (EPA).
- the subject of a voluntary investigation or remediation proposal.
- the subject of a site audit statement.

Submission of contaminated site investigation and validation reports to council as part of rezoning or development application submissions may also result in notation of actual or potential site contamination on future S.149 certificates prepared for the site.

Section 60 of the CLM Act sets out a positive duty on an owner, or person whose activities cause contamination, to notify the DECC if they are aware that the contamination presents a significant risk of harm.

Off-site disposal of fill, contaminated material and excess soil/rock excavated as part of the proposed development works is regulated by the provisions of the Protection of the Environment Operations Act (POEO Act 1997) and associated regulations and guidelines including the *NSW DECC (EPA) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes* (1999). All materials should be classified in accordance with these guidelines prior to disposal.

Section 143 of the *Protection of the Environment Operations 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.

4.2 Soil Contaminant Threshold Concentrations

The soil investigation levels adopted for this investigation are derived from the NSW DECC (EPA) document *Guidelines for the NSW Site Auditor Scheme (1998)* and the National Environmental Protection Council document *National Environmental Protection (Assessment of Site Contamination) Measure 1999*. The contaminant thresholds listed below are levels at which further investigation and evaluation is required to assess whether the site is considered suitable for the proposed urban land use.

To accommodate the range of human and ecological exposure settings, a number of generic settings are used on which the Health based Investigation Levels (HILs) can be based. Four categories of HILs are adopted for urban site assessments. Contaminant levels for a standard residential site with gardens and accessible soil (Column A in Table A-1) are based on protection of a young child resident at the site. The remaining categories (Columns D to F) present alternative exposure settings where there is reduced access to soil or reduced exposure time. These categories include residential land use with limited soil access, recreational and public open space and commercial/industrial use. Where the proposed land use will include more than one land use category (eg. mixed residential/commercial development) the exposure setting of the most "sensitive" land use is adopted for the site.

Threshold concentrations for petroleum hydrocarbon contaminants including total petroleum hydrocarbons (TPH) and monocyclic aromatic hydrocarbon (BTEX) compounds have previously been established in the *NSW DECC (EPA) Contaminated Sites: Guidelines for Assessing Service Station Sites* (1994) publication and this document is referenced in the 1998 Site Auditor Guidelines. Heavy fraction petroleum hydrocarbon aliphatic/aromatic component threshold concentrations have also been introduced in the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (NEPC Guidelines).

The urban interim Ecological Investigation Levels (EILs) are generic values based on phytotoxicity data for plant response to specific contaminants in a sandy loam matrix and are included in the contaminated site assessment where the proposed land use includes gardens and accessible soils.

The *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (NEPC Guidelines) do not provide numeric guidelines for the assessment of asbestos in soil. NSW DECC (EPA) advice has indicated that based on health concerns there should be no asbestos in soil at the surface, however the NSW DECC (EPA) have not published numerical guidelines for the assessment of asbestos in subsurface soils.

The WorkCover publication *Your Guide to Working with Asbestos: Safety Guidelines and Requirements for Work Involving Asbestos* (NSW WorkCover 2003) indicates that inappropriately buried asbestos materials are considered to be friable asbestos material. "Any asbestos cement product, which has been subjected to weathering, severely damaged by hail, damaged by heat/fire or other mechanical action, or illegal water blasting is (also defined as) a friable asbestos product". Under the *NSW Occupational Health and Safety (OHS) Regulations 2001* and WorkCover requirements all necessary disturbance works associated with asbestos containing materials must be conducted by a licensed AS-1 Asbestos Removal Contractor.

4.2.1 Site Assessment Criteria for Soil Contaminants

The "parks and recreational open space" exposure setting has been adopted for this assessment as EIS consider that this is the most appropriate exposure scenario for a hospital. The appropriate soil criteria are listed in the following table:

Site Soil Assessment Criteria (mg/kg)			
Contaminant	**HIL Column F Exposure Setting**	**Guidelines for Assessing Service Station Sites (1994)**	**Ecological Investigation Levels**
Inorganics			
Arsenic (total)	200		20
Cadmium	40		3
Chromium (III)	24%		400
Copper	2000		100
Lead	600		600
Mercury (inorganic)	30		1
Nickel	600		60
Zinc	14000		200
Organic Contaminants			
TPH (C_6-C_9)		65	
TPH (C_{10}-C_{36})		1000	
Benzene		1	
Toluene		1.4	
Ethylbenzene		3.1	
Total Xylenes		14	
Total PAHs	40		
Benzo(a)pyrene	2		
Aldrin + Dieldrin	20		
Chlordane	100		
DDT+ DDD + DDE	400		
Heptachlor	20		
PCBs (Total)	20		

For the purpose of off-site disposal, the classification of soil into 'inert', 'solid', 'industrial' and 'hazardous' waste categories is defined by chemical contaminant criteria outlined in the *NSW DECC (EPA) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes - 1999.* These chemical contaminant criteria are summarised in Table A-2.

4.3 Evaluation of Soil Analysis Data and Contaminant Threshold Concentrations

Assessment of the soil analytical data using the soil contaminant threshold concentrations has been undertaken in accordance with the methodology outlined in the *National Environmental Protection (Assessment of Site Contamination) Measure (1999) Schedule 7(a) Soil Investigation Levels* and the statistical analysis methods outlined in the *NSW EPA Contaminated Sites Sampling Design Guidelines (1995).*

The following criteria have been adopted for assessment of the analytical data:

- For a site to be considered suitable for the proposed land use the 95% Upper Confidence Limit (UCL) value of the arithmetic mean concentration of each contaminant should be less than the applicable contaminant threshold concentration.
- The relevance of localised elevated values must also be considered and should not be obscured by consideration only of the arithmetic mean of the results. The results must also meet the following criteria:
    - the standard deviation of the results must be less than 50% of the soil assessment criteria; and
    - no single value exceeds 250% of the relevant soil assessment criteria.

Where contamination results exceed the site criteria developed above a method of remediating the site is to physically and selectively remove the contamination hotspots from the site. This process should be continued until statistical analysis of the data meets the above criteria. Validation of the remediated site is generally required to demonstrate that the site is suitable for the proposed land use.

4.4 Groundwater Contaminant Trigger Values

Groundwater resources in NSW are managed and regulated by environmental and planning legislation, including the Protection of the Environment Operations (POEO) Act 1997, the Environmental Planning and Assessment Act (1979) and the Water Management Act (2000).

The 1999 NEPC Guidelines refer to trigger values presented in the ANZECC Australian Water Quality Guidelines (1992) and the NHMRC Australian Drinking Water Guidelines (2004). These guideline values define water quality parameters at the point of use including aquatic ecosystems (fresh and marine waters), drinking water, industrial and agricultural/irrigation uses.

In 2000, ANZECC released the Australian and New Zealand Guidelines for Fresh and Marine Water Quality which supersede the previous guideline documents. The ANZECC 2000 guidelines include a complete framework for the development of appropriate guidelines for aquifer assessment.

The appropriate settings for current and potential uses of groundwater should be identified in establishing applicable groundwater trigger values:

- raw drinking water source;
- agricultural use – stock watering;
- agricultural and domestic use – irrigation;
- protection of aquatic ecosystems – freshwater; and

- protection of aquatic ecosystems – marine.

For specific contaminants where a trigger value has not been provided in the ANZECC (2000), trigger values for this assessment have been drawn from *Environmental Quality Standards in the Netherlands (1999)* Dutch Intervention Values.

4.4.1 Site Assessment Criteria for Groundwater Contaminants

The presence of elevated contaminant concentrations in groundwater triggers further investigation of aquifer conditions to assess the source(s) of contamination and the lateral and vertical extent of the contamination. The 95% trigger values for fresh water have been adopted for this investigation. These concentrations are presented in the following table:

Site Groundwater Assessment Criteria (mg/L)	
Contaminant	**95% Trigger Value for fresh water**
Inorganics	Fresh
Arsenic	0.024
Cadmium	0.0002
Chromium	0.001
Copper	0.0014
Lead	0.0034
Mercury	0.0006
Nickel	0.011
Zinc	0.008
Organics	
TPH C_{10}-C_{36}	0.6$
Benzene	0.95
Toluene	0.18
Ethyl benzene	0.08
o-Xylene	0.35
m+p Xylene	0.03
Total Xylenes	-

$ Dutch Intervention Value for mineral oil, Environmental Quality Standards in the Netherlands (1999).

5 ASSESSMENT PLAN AND METHODOLOGY

The *NSW DECC (EPA) Sampling Design Guidelines (1995)* for contaminated site investigations state a minimum of 19 evenly spaced sampling points should be undertaken for a site of this size (approximately 80000m^2). Ten sampling locations have been undertaken for this investigation. This density is approximately 55% of the minimum sampling density. The density of sampling is considered appropriate for a multi-storey car park.

The boreholes were drilled on a systematic grid with a spacing of up to 20m to 40m between sampling points. A systematic sampling plan was considered most appropriate for this investigation as:

- no specific potential contaminant sources were identified by the available site history.
- the distribution of contamination is expected to be associated with imported potentially contaminated fill material and is therefore likely to be random.

Sampling was not undertaken beneath the buildings, swimming pool or tennis court and the existing buildings at the site as access was not possible during the field investigation.

The sampling rationale is summarised in the following Table:

Locations	Rationale	Analytes
P1 to P9 inclusive and B4	Assess the soil across the investigation area. Monitoring wells were installed in P4, P6 and P8	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCs), polychlorinated biphenyls (PCBs), petroleum hydrocarbons (TPH), monocyclic aromatic hydrocarbons (BTEX) and asbestos.

6 INVESTIGATION PROCEDURE

6.1 Subsurface Investigation and Soil Sampling Methods

Subsurface investigations were undertaken using a track mounted hydraulically operated drill rig equipped with spiral flight augers. Soil samples were obtained from a Standard Penetration Test (SPT) sampler or directly from the auger when conditions did not allow use of the SPT sampler.

The SPT sampler was washed with phosphate free detergent and rinsed following each sampling event. The spiral flight augers were decontaminated using a scrubbing brush and potable water and Decon 90 solution (phosphate free detergent) followed by rinsing with potable water. Sampling personnel used disposable Nylex gloves during sampling activities.

Soil samples were obtained at various depths, based on observations made during the field investigation. All samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. During the investigation, samples were preserved by immediate storage in an insulated sample container with ice. Each sample was labelled with a unique job number, the sampling location, sampling depth and date. All samples were recorded on the borehole logs presented in Appendix A and on the chain of custody (COC) record presented in Appendix B.

On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody procedures. Detailed EIS field sampling protocols are included in Appendix D.

6.1.1 Photoionisation Detector (PID) Screening

A portable PID was used in this investigation to assist with selection of samples for laboratory hydrocarbon (TPH/BTEX) analysis. The PID is sensitive to volatile organic compounds. The sensitivity of the PID is dependent on the organic compound and varies for different mixtures of hydrocarbons. Some compounds give relatively high readings and some can be undetectable even though present in identical concentrations. The portable PID is best used semi-quantitatively to compare samples contaminated by the same hydrocarbon source.

The PID is calibrated before use by measurement of an isobutylene standard gas. All the PID measurements are quoted as parts per million (ppm) isobutylene equivalents.

Photoionisation detector (PID) screening of detectable volatile organic compounds (VOC) was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled glass jar samples following equilibration of the headspace gases. The PID headspace data is included on the COC documents.

6.2 Groundwater Monitoring Well Installation and Water Sampling Methods

6.2.1 Drilling and Well (Temporary Standpipe) Installation

Three monitoring wells were installed at borehole locations (P4, P6 and P8) as shown on Figure 2. The monitoring wells were installed as follows:

- Boreholes were drilled at all locations to a depth of approximately 9m.
- 50mm diameter Class 18 PVC was installed in the boreholes and consisted of machine slotted PVC screen from 9m to 6m and unslotted PVC casing from the surface to 6m.
- A 2mm graded sand filter pack was installed around the PVC to a height of 3m above the slotted PVC section.
- A bentonite seal was installed above the filter pack.
- Borehole cuttings were installed above the bentonite seal to approximately 0.5m below the ground surface.
- A concrete/cement grout was then used to seal the monitoring well with a gatic cover installed flush with the surrounding surface.

The monitoring well construction details are documented on appropriate borehole logs presented in Appendix A.

6.2.2 Monitoring Well Development, Purging and Sampling

Groundwater wells were developed using a dedicated disposable polyethylene bailer. During development the pH, temperature, conductivity and redox potential were monitored (where possible) using calibrated field instruments to assess the development of steady state conditions. No groundwater was present in well P8. Wells P4 and P6 were purged dry, recharge was very slow.

Due to the very slow recharge rate the wells were sampled directly after a period 18 days. Groundwater samples were obtained from each monitoring event using a new disposable polyethylene bailer. All samples were preserved in accordance with water sampling requirements detailed in the NEPC Guidelines (1999) and placed in an insulated container with ice. On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody procedures.

6.3 Laboratory Analysis

6.3.1 Soil Samples

Analysis of soil samples was undertaken by NATA registered laboratories using analytical methods detailed in the Schedule B(3) NEPC (1999) Guideline on Laboratory Analysis of Potentially Contaminated Soils. Laboratory analysis was undertaken by Envirolab Services Pty Ltd (NATA Accreditation No. 2901) with additional Quality Control Analysis undertaken by SGS Environmental Services Pty Ltd (NATA Accreditation No. 2562).

For this investigation selected soil samples were analysed for contaminants using the following laboratory techniques:

- Heavy metals – Nitric acid digestion. Analysis by ICP.
- Low level mercury – cold vapour AAS.
- OC pesticides and PCBs – Extracted with acetone/hexane. Analysis by GC/ECD.
- PAHs – Soil extracted with dichloromethane/acetone. Analysis by GC/MS.
- TPH (volatile) – Soil extracted with methanol. Analysis by P&T GC/PID.
- TPH – Soil extracted with dichloromethane/acetone. Analysis by GC/FID.
- BTEX – Soil extracted with methanol. Analysis by P&T PID. Confirmed with column flame ionisation detection.
- Asbestos – Polarizing light microscopy.

Toxicity characteristic leaching procedure (TCLP) leachates were prepared by rotating soil samples in a mild acid solution for 18 hours (NSW EPA WD-3 Method). Leachates were analysed using the analytical procedures outlined above.

6.3.2 Groundwater samples

Analysis of water samples for this assessment was undertaken by NATA registered laboratories using analytical techniques endorsed by the NSW EPA (Schedule B(3) of

NEPC 1999 does not apply to water samples). Laboratory analysis was undertaken by Envirolab Services Pty Ltd (NATA Accreditation No. 2901).

For this investigation selected groundwater samples were analysed for contaminants using the following laboratory techniques:

- Heavy metals – Direct injection. Analysis by ICP-AES.
- Low level mercury – Direct injection. Analysis by flow injection AAS.
- TPH (volatile) – P&T. Analysis by GC/FID.
- TPH – Solvent (dichloromethane) extraction. Analysis GC/FID.
- BTEX – Direct P&T. Analysis by GC/PID. Confirmed with column flame ionisation detection.

7 RESULTS OF INVESTIGATION

7.1 Subsurface Conditions

Site details and borehole locations are shown on Figure 2. For details of the subsurface soil profile reference should be made to the borehole logs in Appendix A. A summary of the subsurface conditions encountered by the boreholes is presented below:

Fill

All boreholes encountered fill that ranged in depth from 0.3m in P6 and P7 to greater than 1.5m in P1. The fill material was typically silty clay. Traces of coal were encountered in all of the boreholes except P3, P4, and P5. The fill was not fully penetrated in P1 (refusal at 1.5m) and P2 (refusal at 0.5m)

Natural Soils

The fill was underlain by medium to high plasticity silty clay that ranged in depth from 3.6m in P4 to 7.8m in P7. The silty clay was underlain silty clayey sand/silty sand.

Bedrock

Bedrock was not encountered in any of the boreholes.

Groundwater

All boreholes were dry on completion. Standing water levels of 8.49m and 8.6m (below ground level) were recorded in P6 and P4 respectively after 18 days.

7.2 Laboratory Results - Soil

The laboratory analysis results for soil samples are summarised in Table B to Table F inclusive and analysis reports are presented in Appendix B The site soil assessment criteria for this investigation are specified in the "Site Assessment Criteria for Soil Contaminants" section earlier in this report. The results of the analyses are summarised below.

Heavy Metals

Fifteen individual fill and one natural soil samples were analysed for heavy metals. All of the results were less than the human health risk assessment criteria.

With the exception of one sample the results of the analyses were below the Ecological Investigation Levels (EIL). Sample P3 contained a cadmium concentration of 8.7mg/kg, the EIL for cadmium is 3mg/kg.

Petroleum Hydrocarbons (TPH) and Monocyclic Aromatic Hydrocarbons (BTEX)

PID soil sample headspace readings were all zero ppm equivalent isobutylene. These results indicate a lack of PID detectable volatile organic contaminants. Fifteen individual fill and one natural soil samples were analysed for petroleum hydrocarbons and BTEX compounds. The results of the analyses were below less than the practical quantitation limit of the analytical technique and below the site assessment criteria.

Polycyclic Aromatic Hydrocarbons (PAHs)

Fifteen individual fill and one natural soil samples were analysed for a range of PAHs including Benzo(a)pyrene. The results of the analyses were below less than the practical quantitation limit of the analytical technique and below the site assessment criteria.

Organochlorine (OC) Pesticides and Polychlorinated Biphenyls (PCBs)

Fifteen individual fill and one natural soil samples were analysed for a range of OC pesticides and PCBs. The results of the analyses were below laboratory practical quantitation limit and less than the site assessment criteria.

Asbestos

Fifteen individual fill and one natural soil samples were analysed. No asbestos fibres were found at the reporting limit of 0.1g/kg in any of the samples analysed.

Toxicity Characteristics Leaching Procedure (TCLP)

TCLP extractions were undertaken on five selected samples that returned the highest heavy metal and Benzo(a)pyrene results. The results of the analyses were all less than the TCLP1 criteria listed in Table A-2.

7.3 Laboratory Results - Groundwater

The laboratory analysis results for groundwater samples are summarised in Table I and the analysis reports are presented in Appendix B. The site groundwater assessment criteria are presented in an Section. The results of the analysis are summarised below:

Heavy Metals

Two groundwater samples were analysed for heavy metals. The results of the analyses were below the site assessment criteria.

Petroleum Hydrocarbons (TPH) and Monocyclic Aromatic Hydrocarbons (BTEX)

Two groundwater samples were analysed for petroleum hydrocarbons and BTEX compounds. The results of the analyses were below practical quantitation limit of the analytical technique and the site assessment criteria.

7.4 Assessment of Analytical QA/QC

The objective of the assessment of the laboratory QA/QC is to ensure that the sample data is reliable. All laboratory reports for project E21171FK have been checked and issued as final by the following NATA Registered Laboratories unless stated otherwise:

- Laboratory — SGS Laboratories Pty Ltd
  NATA Accreditation No. 2562
  Report numbers: 52354
- Laboratory — Envirolab Services Pty Ltd
  NATA Accreditation No. 2901
  Report numbers: 10936, 10936a 11398
- Laboratory — Pickford and Rhyder Consulting
  NATA Accreditation No. 2515
  Report numbers: 50315

Chain of custody documentation and/or sample receipt advice notices were signed and dated by Envirolab Services, and SGS, laboratories stating that all samples were received cool, in good order and in suitable containers. EIS and laboratory QA/QC procedures for the site screening are summarised in the following table:

Contaminant	QA/QC Procedure Soil							
	Total no. of Samples	Intra-lab Duplicate	Inter-lab Duplicate	Repeat Analysis	Matrix Spike	Lab Blank	Surrogate Spike	Field Blank
Heavy metals	16	2	2	2	1	2	-	1
TPH	16	2	2	2	1	2	16	1
BTEX	16	2	2	2	1	2	16	1
PAH	16	2	2	2	1	2	16	-
PCB	16	2	2	2	1	2	16	-
OC pest	16	2	2	2	1	2	16	-
TCLP PAH	5	-	-	-	1	1	5	-
TCLP Metals	5	-	-	-	1	1		-

Contaminant	**QA/QC Procedure Groundwater**							
	Total no. of Samples	**Intra-lab Duplicate**	**Trip spike**	**Repeat Analysis**	**Matrix Spike**	**Lab Blank**	**Surrogate Spike**	**Field Blank**
Heavy metals	2	1	-	-	1	1	-	-
TPH	2	1	-	-	1	1	2	1
BTEX	2	1	1	-	1	1	2	1
pH	1	-	-	-	-	-	-	-
Elec conductivity	1	-	-	1	1	1	-	-
TDS	1	-	-	1	1	1	-	-

Field QA/QC samples are specified below:

Inter-laboratory soil duplicates	-	DUP5 was a duplicate of P4 (0-0.3m) DUP4 is a duplicate of P9 (0-0.2m)
Intra-laboratory soil duplicates	-	DUP1 was duplicate of P6 (0-0.2m) DUP2 was duplicate of P5 (0-0.2m)
Intra-laboratory water duplicate	-	DUP1 was a duplicate of P6 (report 11398)
Field blanks	-	FB1 was a soil field blank that consisted of commercially available sand. FB was a soil field blank that consisted of demineralised water.
Trip spike	-	Trip spike (Envirolab report 11398) was a trip spike prepared by the laboratory.
Rinsate	-	R1 was a rinsate sampler of the SPT sampler used for soil sampling.

The RPD results for the field QA/QC duplicate samples are summarised in Table G.

7.4.1 Data Quality Indicators

COMPLETENESS		
Field Considerations	**Laboratory considerations**	**Comments**
All critical locations sampled. All samples collected. Standard operation procedures (SOPs) appropriate and complied with (EIS Sampling protocols). Experienced samplers. Documentation (borehole logs and chain of custody correct).	All critical samples analysed. All analytes analysed. Appropriate laboratory methods and PQLs. Sample documentation complete Sample holding times complied with, except TCLP analysis for PAHs.	All of the data (100%) was used in the assessment. Samples obtained for critical samples and chemicals of concern. A regular grid across the site was not sampled due to inaccessible areas beneath buildings, tennis court and swimming pool. TCLP analysis for PAHs was outside of the 14 day holding time. This was not considered to have had a significant impact on the data set as: • The contaminant of concern was benzo[a]pyrene. This PAH has a high molecular weight and low vapour pressure and is relatively stable. • The sample has been stored in a refrigerator at the lab.

COMPARABILITY		
Field Considerations	**Laboratory considerations**	**Comments**
Same SOPs were used on each occasion. Samplers Experienced. Climatic conditions for each sampling event (fine and sunny). Similar samples were collected on each occasion (size of sample and container).	Similar analytical methods used. Envirolab was used as the primary laboratory. SGS were used as the check laboratory. There were minor variations in some of the PQLs between the laboratories. These are not considered to have had an adverse impact on the data set as a whole. Units used by the laboratory were the same.	Same approach to sampling on all occasions. No significant influence on sampling from climatic or sampling conditions. Similar samples (ie soil and water) were handled and treated in an identical manner.

REPRESENTATIVENESS		
Field considerations	**Laboratory Considerations**	**Comments**
Fill soils, natural soils and groundwater sampled.	All critical samples analysed.	Samples were collected to reflect the characteristics of fill soils, natural soils and groundwater. Sample collection, handling, storage and preservation considered appropriate. No laboratory artefacts were detected. Traces of heavy metals were detected in the field blanks. These are routinely encountered in the matrix (commercially available sand) used for the field blank and were measured at concentrations consistent with previous results.

PRECISION		
Field considerations	**Laboratory Considerations**	**Comments**
SOP appropriate and complied with.	Intra and Inter laboratory field duplicates analysed. Laboratory duplicates analysed.	RPDs calculated and were acceptable for inter and intra laboratory duplicates. The inter laboratory groundwater RPDs for nickel and zinc were above the acceptance criteria. The higher values were used for assessment purposes. RPDs for laboratory duplicates were acceptable.

ACCURACY		
Field considerations	**Laboratory Considerations**	**Comments**
SOP appropriate and complied with.	Analysis of • field blanks • method blanks • matrix spikes • trip spike • surrogate spikes • Laboratory control samples.	Results were all within acceptable limits.

The QA/QC data reported by SGS and Envirolab Services laboratories for the documented soil and water samples were assessed to be of sufficient quality to be considered acceptable for the environmental assessment of EIS project E21171FK. The QA/QC data including the RPD results are considered to meet the Data Quality Objectives developed for this project.

8 COMMENTS AND RECOMMENDATIONS

The environmental site assessment undertaken for the proposed multi storey car park development at Liverpool Hospital, was designed to assess the suitability of the site for the proposed land use. The proposed development consists of a multi storey car park constructed on grade.

The site assessment included performance of a site inspection and soil/fill sampling was undertaken on the basis of relatively uniform exploration spacing across accessible area of the site. No sampling was undertaken beneath any of the buildings, the swimming pool or the tennis court.

The results of the laboratory tests on selected soils samples covered a range of contaminants commonly encountered in the Sydney region. All results were less than the appropriate Health Investigation Levels. No asbestos was detected in any of the samples.

The cadmium result for sample P3 (0.0m to 0.2m) was above the Ecological Investigation Levels (EILs) specified in the *National Environmental Protection (Assessment of Site Contamination)* Measure 1999 *(NEPC Guidelines).* These EILs are principally concerned with phytotoxicity (i.e. adverse effects on plant growth in established and proposed areas of landscaping) and are described in the *NEPC Guidelines* as *"somewhat arbitrary"*, as the effect of these compounds on plant growth will depend on the soil and plant type. This elevation is not considered significant as:

- There were no obvious signs of plant stress or vegetation die back on the site;
- The cadmium elevation did not extend to the deeper soil profile (the cadmium concentration in the sample P3 (0.7-0.95m) was less than the practical quantitation limit); and
- The multi-storey car park will extend across the area.

Additional TCLP analysis of the fill soils has indicated that for the purposes of off-site disposal, the fill soils are classified as 'inert' waste according to the criteria outlined in *NSW DECC (EPA) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes - 1999*. Any excess excavated soils should be disposed of to a suitable NSW DECC (EPA) licensed "inert" waste landfill. Should significant quantities of fill material require disposal, additional analysis including TCLP testing is recommended to confirm this classification. Tests should typically be undertaken on the basis of one sample per 500m^3 of fill to be disposed.

Groundwater was encountered in monitoring wells P4 and P6 at depths of approximately 8.5m. Monitoring well P8 was dry at the time of sampling. P4 and P6 were located down gradient of the underground storage tanks associated with the Central Energy Building. No elevated concentrations of TPH/BTEX or heavy metals were detected in either of the samples.

The investigation undertaken by EIS included the analysis of 16 soil samples for the presence of asbestos fibres using NATA accredited microscopic screening techniques. Asbestos, either apparent to the naked eye or apparent using microscopic techniques were not detected within the samples. The scope of work undertaken was designed to assess widespread surficial contamination and has not included an exhaustive assessment of the site for the presence of small scale asbestos contamination. EIS adopts no responsibility for small scale or buried asbestos features at the site which may be encountered during future earth or construction works at the site.

A Hazardous Building Materials Survey of the building and on-site structures should be undertaken prior to demolition. All hazardous building materials should be removed in accordance with consultants recommendations prior to demolition.

The boreholes drilled for the investigation have enabled an assessment to be made of the existence of significant, large quantities of contaminated soils. The conclusions based on this investigation are that, while major contamination of the site is not apparent, problems may be encountered with smaller scale features between boreholes. EIS adopts no responsibility whatsoever for any problems such as underground storage tanks, buried items or contaminated material that may be encountered between sampling locations at the site. The proposed construction activities at the site should be planned on this basis, and any unexpected problem areas that are encountered between boreholes should be immediately inspected by experienced environmental personnel. This should ensure that such problems are dealt with in an appropriate manner, with minimal disruption to the project timetable and budget.

During demolition works, the site should be inspected by experienced environmental personnel to assess any unexpected conditions or subsurface facilities that may be discovered between investigation locations. This should facilitate appropriate adjustment of the works programme and schedule in relation to the changed site conditions.

Based on the scope of work undertaken, the site is considered to be suitable for the proposed development.

9 LIMITATIONS

The conclusions developed in this report are based on site conditions which existed at the time of the site assessment. They are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, and visual observations of the site and vicinity, together with the interpretation of available historical information and documents reviewed as described in this 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.

Previous industrial 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.

During construction at the site, soil, fill and any unsuspected materials that are encountered should be monitored by qualified environmental and geotechnical engineers to confirm assumptions made on the basis of the limited investigation data, and possible changes in site level and other conditions since the investigation. Soil materials considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa.

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. Copyright in this report is the property of EIS. EIS has used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report.

Should you require any further information regarding the above, please do not hesitate to contact us.

Yours faithfully
For and on behalf of
ENVIRONMENTAL INVESTIGATION SERVICES

AJ Kingswell
Associate

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ABBREVIATIONS

AAS	Atomic Absorption Spectrometry
ADWG	Australian Drinking Water Guidelines
AGST	Above Ground Storage Tank
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment Conservation Council
ASS	Acid Sulfate Soil
B(a)P	Benzo(a)pyrene
BH	Borehole
BTEX	Benzene, Toluene, Ethyl benzene, Xylene
COC	Chain of Custody documentation
CLM	Contaminated Land Management
DECC	Department of Environment and Climate Change (formerly DEC and EPA)
DNR	NSW Department of Natural Resources (now split between DWE and DECC)
DWE	NSW Department of Water and Energy
DP	Deposited Plan
DQO	Data Quality Objective
EC	Electrical Conductivity
EIL	Ecological Investigation Level
EPA NSW	Environment Protection Authority, New South Wales (now part of DECC)
GC-ECD	Gas Chromatograph-Electron Capture Detector
GC-FID	Gas Chromatograph-Flame Ionisation Detector
GC-MS	Gas Chromatograph-Mass Spectrometer
HIL	Health Based Investigation Level
HM	Heavy Metals
ICP-AES	Inductively Couple Plasma – Atomic Emission Spectra
NATA	National Association of Testing Authorities, Australia
NEPC.	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
OCPs	Organochlorine Pesticides
OHS (OH&S)	Occupational Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photo-ionisation Detector
PPIL	Provisional Phyto-toxicity Investigation Levels
PQL	Practical Quantitation Limit
P&T	Purge & Trap
RAP	Remedial Action Plan
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SEPP	State Environmental Planning Policy
sPOCAS	Suspension Peroxide Oxidation Combined Acidity and Sulfate
SPT	Standard Penetration Test
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TP	Test Pit
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WP	Work Plan

REFERENCE DOCUMENTS

- ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (and updates).
- ASSMAC (1998) (Acid Sulfate Soils Management Advisory Committee) Acid Sulfate Soil Manual.
- Australian Government, National Occupational Health and Safety Commission (2005) Code of Practice for the Safe Removal of Asbestos.
- Australian Government, National Occupational Health and Safety Commission (2005) Code of Practice for the Management and Control of Asbestos in Workplaces.
- Australian Petroleum Institute Code of Practice (CP22) Removal and Disposal of Underground Storage Tanks.
- Australian Standard (2004) Storage and Handling of Flammable and Combustible Liquids. AS1940-2004.
- DUAP/NSW EPA (1998) (now NSW Department of Planning / NSW Department of Environment and Climate Change (DECC) incorporating the EPA) Managing Land Contamination: Planning Guidelines SEPP 55 - Remediation of Land.
- Dutch Ministry of Housing, Spatial Planning and the Environment (1994) Environmental Quality Standards in the Netherlands.
- NEPM. (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPC. Guidelines).
- NSW EPA (1994) (now NSW DEC) Contaminated Sites: Guidelines for Assessing Service Station Sites.
- NSW EPA (1995) (now NSW DECC) Contaminated Sites: Sampling Design Guidelines.
- NSW EPA (1996) (now NSW DECC) Guidelines for Solid Waste Landfills.
- NSW EPA (1997) (now NSW DECC) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.
- NSW EPA (1998) (now DECC) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme.
- NSW EPA (1999) (now NSW DECC) Contaminated Sites: Guideline son Significant Risk of Harm and the Duty to Report.
- NSW EPA (1999) (now NSW DECC) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes.
- NSW Legislation (1948) Rivers and Foreshores Improvement Act.
- NSW Legislation (1975) Dangerous Goods Act.
- NSW Legislation (1994) Environmental Planning and Assessment Act (EP&AA) and associated Regulations.
- NSW Legislation (1997) Contaminated Land Management Act.
- NSW Legislation (1997) Protection of the Environment Operations Act No156 which includes Schedule 2 of the Clean Waters Regulations 1972 made under the Clean Waters Act (1970).
- NSW Legislation (2000) Occupational Health and Safety Act.
- NSW Regulation (2001) Occupation Health and Safety Regulation.
- NSW Regulation (1999) Abandoning Underground Storage Tanks for Flammable and Combustible Liquids (Ref: DG310 October 1999).
- NSW WorkCover (2003) Your Guide to Working With Asbestos: Safety Guidelines and Requirements for Work Involving Asbestos.
- NSW WorkCover Code of Practice (2005) Storage and Handling of Dangerous Goods.
- US EPA (2004) Region 9 Preliminary Remediation Goals.

TABLE A-1
ENVIRONMENTAL AND HEALTH-BASED SOIL INVESTIGATION LEVELS (mg/kg)

Substances	Health Investigation Levels (HILs)[1]				Interim Urban Ecological Investigation Levels (EILs)[1]	NSW EPA Guidelines for Assessing Service Station Sites[2]	Back-ground Ranges[1]
	A	D	E	F			
	'Standard' residential with garden/ accessible soil (home-grown produce contributing less than 10% of vegetable and fruit intake; no poultry); includes children's day-care centres, kindergartens, preschools and primary schools	Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise apartments and flats	Parks, recreational open space and playing fields; includes secondary schools	Commercial/Industrial; includes premises such as shops and offices as well as factories and industrial sites			
METALS/METALLOIDS							
Arsenic (total)	100	400	200	500	20		1-50
Barium					300		100-3000
Beryllium	20	80	40	100			
Cadmium	20	80	40	100	3		1
Chromium(III)	12%	48%	24%	60%	400		
Chromium(VI)	100	400	200	500	1		
Chromium (total)							5-1000
Cobalt	100	400	200	500			1-40
Copper	1000	4000	2000	5000	100		2-100
Lead	300	1200	600	1500	600		2-200
Manganese	1500	6000	3000	7500	500		850
Methyl mercury	10	40	20	50			
Mercury (inorganic)	15	60	30	75	1		0.03
Nickel	600	2400	600	3000	60		5-500
Vanadium					50		20-500
Zinc	7000	28000	14000	35000	200		10-300
ORGANICS							
Aldrin + Dieldrin	10	40	20	50			
Chlordane	50	200	100	250			
DDT + DDD + DDE	200	800	400	1000			
Heptachlor	10	40	20	50			
Polycyclic aromatic hydrocarbons (PAHs)	20	80	40	100			
Benzo(a)pyrene	1	4	2	5			
Phenol	8500	34000	17000	42500			
PCBs (total)	10	40	20	50			
Petroleum Hydrocarbon Components (constituents):							
>C16 - C35 Aromatics	90	360	180	450			
>C16 - C35 Aliphatics	5600	22400	11200	28000			
>C35 Aliphatics	56000	224000	112000	280000			
C6-C9						65	
C10-C40						1000	
Benzene						1	
Toluene						1.4	
Ethyl Benzene						3.1	
Total Xylenes						14	
OTHER							
Boron	3000	12000	6000	15000			
Cyanides (complexed)	500	2000	1000	2500			
Cyanides (free)	250	1000	500	1250			
Phosphorus					2000		
Sulfur					600		
Sulfate					2000		

Reference should be made to the following guidelines for further details (as referenced in the above table):

1 National Environment Protection (Assessment of Site Contamination) Measure - 1999, National Environment Protection Council. Human exposure settings based on land use have been established for HILs and details are outlined in Taylor and Langley 1998.

2 NSW DECC (formerly EPA) Guidelines for Assessing Service station Sites - 1994.

Ref: NEPM Guidelines – June 2007

TABLE A - 2
CHEMICAL CONTAMINANT CRITERIA FOR WASTE CLASSIFICATION
ENVIRONMENTAL GUIDELINES: ASSESSMENT, CLASSIFICATION AND MANAGEMENT OF LIQUID AND NON-LIQUID WASTES - NSW EPA* 1999

INERT WASTE	SOLID WASTE	INDUSTRIAL WASTE	HAZARDOUS WASTE
IF SCC ≤ CT1, TCLP NOT NEEDED	IF SCC ≤ CT2, TCLP NOT NEEDED	IF SCC ≤ CT3, TCLP NOT NEEDED	IF TCLP > TCLP3 STORE OR TREAT AS APPROPRIATE
IF TCLP ≤ TCLP1 AND SCC ≤ SCC1 TREAT AS INERT WASTE	IF TCLP1 < TCLP ≤ TCLP2 AND SCC ≤ SCC2 TREAT AS SOLID WASTE	IF TCLP2 < TCLP ≤ TCLP3 AND SCC ≤ SCC3 OR IF TCLP ≤ TCLP3 AND SCC2 < SCC ≤ SCC3 TREAT AS INDUSTRIAL WASTE	
IF TCLP ≤ TCLP1 AND SCC > SCC1, IMMOBILISE (EPA APPROVED METHOD) OR RECLASSIFY WASTE	IF TCLP1 < TCLP ≤ TCLP2 AND SCC > SCC2, IMMOBILISE (EPA APPROVED METHOD) OR RECLASSIFY WASTE	IF TCLP2 < TCLP ≤ TCLP3 AND SCC > SCC3, IMMOBILISE (EPA APPROVED METHOD) OR RECLASSIFY WASTE	IF TCLP ≤ TCLP3 AND SCC > SCC3 AND IMMOBILISATION NOT EPA APPROVED, STORE OF TREAT WASTE AS APPROPRIATE

	INERT WASTE			SOLID WASTE			INDUSTRIAL WASTE		
CONTAMINANT	CT1 (mg/kg)	TCLP1 (mg/L)	SCC1 (mg/kg)	CT2 (mg/kg)	TCLP2 (mg/L)	SCC2 (mg/kg)	CT3 (mg/kg)	TCLP3 (mg/L)	SCC3 (mg/kg)
Arsenic	10	0.5	500	100	5[3]	500	400	20	2,000
Beryllium	2	0.1	100	20	1.0[10]	100	80	4	400
Cadmium	2	0.1	100	20	1.0[3]	100	80	4	400
Chromium (total)[5]	10	0.5	1,900	100	5[3]	1,900	400	20	7,600
Cyanide (total)[6]	32[2]	1.6	5,900	320	16	5,900	1280	64	23,600
Cyanide (Amenable)[6,8]	7[7]	0.35	300	70	3.5	300	280	14	1,200
Fluoride	300	15	10,000	3,000	150[4]	10,000	12,000	600	40,000
Lead	10	0.5	1,500	100	5[3]	1,500	400	20	6,000
Mercury	0.4	0.02	50	4	0.2[3]	50	16	0.8	200
Molybdenum	10	0.5	1,000	100	5[4]	1,000	400	20	4,000
Nickel	4	0.2	1,050	40	2[4]	1,050	160	8	4,200
Selenium	2	0.1	50	20	1[3]	50	80	4	200
Silver	10	0.5	180	100	5.0[3]	180	400	20	720
Benzene	1.0	0.05	18	10	0.5[3]	18	40	2	72
Toluene	28.8	1.44	518	288	14.4[3]	518	1,152	57.6	2,073
Ethylbenzene	60	3	1,080	600	30[6]	1,080	2,400	120	4,320
Total xylenes	100	5	1,800	1,000	50[14]	1,800	4,000	200	7,200
Total petroleum hydrocarbons (C6-C9)[11,13]	-	-	650	-	-	650	-	-	2,600
Total petroleum hydrocarbons (C10-C36)[11,13] (C10-C14, C15-C28, C29-C36)	-	-	5,000	-	-	10,000	-	-	40,000
Benzo(a)pyrene[4]	0.08	0.004	1	0.8	0.04[5]	10	3.2	0.16	23
Polycyclic aromatic hydrocarbons (Total)[4,11,12]	-	-	200	-	-	200	-	-	800
Polychlorinated biphenyls[8]	-	-	2	-	-	<50	-	-	<50
Phenol (nonhalogenated)	28.8	1.44	518	288	14.4[13]	518	1,152	57.6	2,073
Scheduled chemicals[7,8]	-	-	1	-	-	<50	-	-	<50

* NSW EPA is now a unit with the NSW Department of Environment and Climate Change

Ref: WasteClass.doc
June 2007

TABLE A - 3
SUMMARY ORGANIC AND INORGANIC GROUNDWATER CONTAMINANT GUIDELINE LEVELS[6]

ANALYTE		Drinking Water[1]	ANZECC 2000 95% Values[2]		NSW EPA Service Stations[3]		
			Fresh Water	Marine Water	Health Based	Fresh Water	Marine Water
Arsenic (As) (As III)		0.007	0.024	0.0023	-	-	-
Cadmium (Cd)		0.002	0.0002	0.0055	-	-	-
Chromium (Cr) (Hexavalent)		0.05	0.001	0.0044	-	-	-
Copper (Cu)		2.0	0.0014	0.0013	-	-	-
Iron (Fe) (Filtrable)		0.3	1.0	-	-	-	-
Lead (Pb)		0.01	0.0034	0.0044	0.01	0.001-0.005	0.005
Mercury (Hg) - inorganic		0.001	0.0006	0.08	-	-	-
Nickel (Ni)		0.02	0.011	0.07	-	-	-
Zinc (Zn)		3	0.008	0.015	-	-	-
BTEX	Benzene	0.001	0.95	0.7	0.01	0.3	0.3
	Toluene	0.8	0.18	0.18	0.8	0.3	-
	Ethyl Benzene	0.3	0.08	0.005	0.3	0.14	-
	o-Xylene	-	0.35	0.35	-	-	-
	m+*p*-Xylene	-	0.03	0.03	-	-	-
	Total Xylenes	0.6	-	-	0.6	0.38	0.38
Polycyclic Aromatic Hydrocarbons	Naphthalene	-	0.016	0.07	-	-	-
	Anthracene	-	0.0004	0.0004	-	-	-
	Phenanthrene	-	0.002	0.002	-	-	-
	Fluoranthrene	-	0.0014	0.0014	-	-	-
	Benzo(a)pyrene	0.00001	0.0002	0.0002	0.00001	-	-
	Total PAHs	-	-	-	-	0.003	0.003
Total Phenol			0.32	0.52	0.002	0.05	0.05
PCB – Aroclor 1242		-	0.0006	-	-	-	-
PCB – Aroclor 1254		-	0.00003	-	-	-	-
Organochlorine Pesticides	Aldrin	0.00001	0.000001	0.000003	-	-	-
	Dieldrin	0.00001	0.00001	0.00001	-	-	-
	Chlordane	0.00001	0.00008	-	-	-	-
	DDT	0.00006	0.00001	-	-	-	-
	Endosulfan	0.00005	0.0002	0.00001	-	-	-
	Endrin	-	0.00002	0.0000008	-	-	-
	Heptachlor	0.00005	0.00009	0.0000004	-	-	-
	Lindane	0.00005	0.00002	0.000007	-	-	-
	Methoxychlor	0.0002	0.000005	0.000004	-	-	-
	Total	-	-	-	-	-	-
pH		6.5-8.5	6.5-8.5[4]	7-8.5[5]	-	-	-
Sulphate (SO_4)		500	-	-	-	-	-
Fluoride (F)		1.5	-	-	-	-	-
Chloride (Cl)		250	-	-	-	-	-
Nitrate (as N)			0.7	0.7	-	-	-

Notes:

-	No set guideline concentration
1	NHMRC / ARMCANZ Australian Drinking Water Guidelines (1996)
2	ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters, 2000 – Trigger values for protection of 95% of species
3	NSW EPA (now DECC) Guidelines for Assessing Service Station Sites 1994
4	ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters, 2000 – Level for NSW Lowland Rivers
5	ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters, 2000 – Level for South-east Australian estuaries
6	All concentrations expressed in milligrams per litre (mg/L)

TABLE B
SUMMARY OF LABORATORY TEST DATA
HEAVY METALS - SOILS
All data in mg/kg unless stated otherwise

ANALYTE	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
PQL - Envirolab Services	4.0	1.0	1.0	1.0	1.0	0.1	1.0	1.0
Guideline concentration-HIL *	500	100	60%	5000	1500	75	3000	35000
Guideline concentration -EIL *	20	3	400	100	600	1	60	200
SAMPLE (Depth in metres)								
B4 (0.0-0.3)	LPQL	LPQL	18	3.8	21	LPQL	5.6	15
P1 (0.0-0.2)	LPQL	LPQL	14	12	28	LPQL	7.3	32
P1 (0.7-0.95)	LPQL	LPQL	13	8.9	43	0.11	5.6	20
P1 (1.3-1.5)	LPQL	LPQL	8.7	23	70	LPQL	6.8	200
P2 (0.0-0.2)	4.6	LPQL	15	49	32	0.15	11	56
P3 (0.0-0.2)	13	***8.7***	22	23	34	LPQL	14	33
P3 (0.7-0.95)	LPQL	LPQL	13	15	25	LPQL	5.6	24
P3 (1.7-1.95) ++	5.6	LPQL	23	6.6	31	LPQL	3	7.2
P4 (0.0-0.3)	LPQL	LPQL	14	6.8	67	LPQL	8.5	51
P4 (0.7-0.95)	LPQL	LPQL	23	6.3	29	LPQL	8.3	24
P5 (0.0-0.2)	LPQL	LPQL	12	3.9	20	LPQL	4.7	9.8
P6 (0.0-0.2)	4.7	LPQL	19	6.8	29	LPQL	7	17
P7 (0.0-0.2)	6.7	LPQL	23	15	40	LPQL	9.7	42
P8 (0.0-0.2)	LPQL	LPQL	11	10	29	0.12	5.7	24
P9 (0.0-0.2)	6.6	LPQL	16	13	42	0.15	6.4	43
P9 (0.7-0.95)	LPQL	LPQL	14	14	25	0.12	5.4	23
Total no. of samples	16	16	16	16	16	16	16	16
Maximum Value	13	8.7	23	49	70	0.15	14	200
Mean Value	4	9	16	14	36	0	7	41
Standard Deviation	3.1	-	4.4	11.4	15.0	0.0	2.5	46.0
Coefficient of Variation	0.8	-	0.3	0.8	0.4	0.5	0.3	1.1
Upper Level 95% Confidence Limit on Mean Value	5	1	18	19	42	0	9	62

EXPLANATION:
*: National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC Guidelines)
HIL - Column F, Commercial/Industrial
EIL - Interim Urban Ecological Investigation Levels (EILs)

** Natural soil sample, excluded from statistical analysis

Concentration above HIL	**100**
Concentration above EIL	***100***

PQL: Practical Quantitation Limit
LPQL: Less than PQL
NA: Not Analysed

NOTE: Statistical analysis only shown where appropriate.

TABLE C
SUMMARY OF LABORATORY TEST DATA
ORGANICS - SOILS
All data in mg/kg unless stated otherwise

ORGANICS	Total PAHs	B(a)P	Aldrin and Dieldrin	Chlordane	DDT & DDD & DDE	Heptachlor	PCBs
PQL - Envirolab	-	0.05	0.1	0.1	0.1	0.1	0.1
Guideline concentration *	100	5	50	250	1000	50	50
SAMPLE (Depth in metres)							
B4 (0.0-0.3)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P1 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P1 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P1 (1.3-1.5)	7.3	0.5	LPQL	LPQL	LPQL	LPQL	LPQL
P2 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P3 (0.0-0.2)	0.25	0.05	LPQL	LPQL	LPQL	LPQL	LPQL
P3 (0.7-0.95)	0.89	0.09	LPQL	LPQL	LPQL	LPQL	LPQL
P3 (1.7-1.95) ++	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P4 (0.0-0.3)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P4 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P5 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P6 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P7 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P8 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P9 (0.0-0.2)	4.4	0.4	LPQL	LPQL	LPQL	LPQL	LPQL
P9 (0.7-0.95)	1.48	0.08	LPQL	LPQL	LPQL	LPQL	LPQL
Total no. of samples	16	16	16	16	16	16	16
Maximum Value	7.3	0.5	0	0	0	0	0
Mean Value	2.86	0.22	-	-	-	-	-
Standard Deviation	2.94	0.21	-	-	-	-	-
Coefficient of Variation	1.03	0.94	-	-	-	-	-
Upper Level 95% Confidence Limit on Mean Value	6	0.4	-	-	-	-	-

EXPLANATION:

*: National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC Guidelines)
Column F, Commercial/Industrial

** Natural soil sample, excluded from statistical analysis

Concentration above guideline level ☐

ABBREVIATIONS:

PCBs: Polychlorinated Biphenyls
PAH: Polycyclic aromatic hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL

TABLE D
SUMMARY OF LABORATORY TEST DATA
PETROLEUM HYDROCARBONS - SOIL

All data in mg/kg unless stated otherwise

	PETROLEUM HYDROCARBONS								
	Total Petroleum Hydrocarbons				Benzene	Toluene	Ethyl Benzene	Total Xylenes	PID Reading
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}					
PQL - Envirolab	25	100	100	100	1.0	1.0	1.0	3.0	
Guideline concentration *	65	1000			1	1.4	3.1	14	
SAMPLE (Depth in metres)									
B4 (0.0-0.3)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P1 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P1 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P1 (1.3-1.5)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P2 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P3 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P3 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P3 (1.7-1.95) ++	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P4 (0.0-0.3)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P4 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P5 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P6 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P7 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P8 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P9 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P9 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
Total no. of samples	16	16	16	16	16	16	16	16	
Maximum Value	0	0	0	0	0	0	0	0	

EXPLANATION:
* EPA Guidelines for Assessing Service Station Sites - 1994

** Natural soil sample, excluded from statistical analysis

Concentration above Guideline Level ▭
PQL: Practical Quantitation Limit
LPQL: - Less than Practical QuantitationLimit
NOTE: Statistical analysis only shown where appropriate

TABLE E
SUMMARY OF LABORATORY TEST DATA
ASBESTOS IN SOIL

ANALYTE	Asbestos Identification
Reporting limit	0.1g/kg
SAMPLE (Depth in metres)	
B4 (0.0-0.3)	No asbestos detected
P1 (0.0-0.2)	No asbestos detected
P1 (0.7-0.95)	No asbestos detected
P1 (1.3-1.5)	No asbestos detected
P2 (0.0-0.2)	No asbestos detected
P3 (0.0-0.2)	No asbestos detected
P3 (0.7-0.95)	No asbestos detected
P3 (1.7-1.95) ++	No asbestos detected
P4 (0.0-0.3)	No asbestos detected
P4 (0.7-0.95)	No asbestos detected
P5 (0.0-0.2)	No asbestos detected
P6 (0.0-0.2)	No asbestos detected
P7 (0.0-0.2)	No asbestos detected
P8 (0.0-0.2)	No asbestos detected
P9 (0.0-0.2)	No asbestos detected
P9 (0.7-0.95)	No asbestos detected

PQL - Practical Quantitation Limit
++ natural soil sample

TABLE F
SUMMARY OF LABORATORY TEST DATA
TOXICITY CHARACTERISTICS LEACHING PROCEDURE (TCLP)

All data in mg/L unless stated otherwise

ANALYTE	Cd	Cr	Pb	Ni	B(a)P
PQL - Envirolab	0.01	0.01	0.03	0.04	0.001
Guideline concentration * TCLP1 Inert	0.1	0.5	0.5	0.2	0.004
Guideline concentration *TCLP2 Solid	1	5	5	2	0.04
Guideline concentration * TCLP3 Industrial	4	20	20	8	0.16
SAMPLE					
P1 0-0.2m	na	<0.01	<0.03	0.02	<0.001
P1 1.3-1.5m	na	na	0.09	0.02	<0.001
P3 0-0.2m	<0.01	<0.01	<0.03	<0.02	<0.001
P3 0.7-0.95m	na	<0.01	<0.03	0.02	<0.001
P9 0-0.2m	na	<0.01	<0.03	<0.02	<0.001
Total no. of samples	5	5	5	5	5
Maximum Value	0	0	0.09	0.02	0

EXPLANATION:

* Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid wastes (NSW EPA 1999)

Further reference should be made to Table A-2 for waste classification criteria

Value above guideline level ▨

NOTE: Statistical analysis only shown where appropriate

TABLE G
QA/QC - RELATIVE PERCENTAGE DIFFERENCES

SAMPLE	ANALYSIS	INITIAL (mg/kg)	REPEAT (mg/kg)	MEAN (mg/kg)	RPD %
Intra-laboratory Soil P6 (0.0-0.2) = DUP1	Arsenic	4.7	4.5	4.6	4
	Cadmium	LPQL	LPQL	nc	nc
	Chromium	19	18	18.5	5
	Copper	6.8	4.8	5.8	34
	Lead	29	26	27.5	11
	Mercury	LPQL	LPQL	nc	nc
	Nickel	7	6.3	6.65	11
	Zinc	17	14	15.5	19
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc
Intra-laboratory Soil P5 (0.0-0.2) = DUP2	Arsenic	LPQL	LPQL	nc	nc
	Cadmium	LPQL	LPQL	nc	nc
	Chromium	12	7.6	9.8	45
	Copper	3.9	3.8	3.85	3
	Lead	20	20	20	0
	Mercury	LPQL	LPQL	nc	nc
	Nickel	4.7	3.5	4.1	29
	Zinc	9.8	8.3	9.05	17
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc
Inter -laboratory soil P4 (0-0.3m) Dup5	Arsenic	LPQL	3	nc	nc
	Cadmium	LPQL	0.2	nc	nc
	Chromium	14	11	12.5	24
	Copper	6.8	4.7	5.75	37
	Lead	67	37	52	58
	Mercury	LPQL	<0.05	nc	nc
	Nickel	8.5	4.1	6.3	70
	Zinc	51	25	38	68
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc
Inter -laboratory soil P9 (0-0.2m) Dup4	Arsenic	6.6	5	5.8	28
	Cadmium	LPQL	0.2	nc	nc
	Chromium	16	11	13.5	37
	Copper	13	12	12.5	8
	Lead	42	42	42	0
	Mercury	0.15	0.15	0.15	0
	Nickel	6.4	4.2	5.3	42
	Zinc	43	44	43.5	2
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc
Intra-laboratory Water Dup1 =P6	Arsenic	0.003	0.003	0.003	0
	Cadmium	LPQL	LPQL	nc	nc
	Chromium	LPQL	LPQL	nc	nc
	Copper	LPQL	LPQL	nc	nc
	Lead	LPQL	LPQL	nc	nc
	Mercury	LPQL	LPQL	nc	nc
	Nickel	0.008	0.009	0.0085	12
	Zinc	0.03	0.039	0.0345	26
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc

Explanation

RPD : Relative Percentage Difference
nc : Not calculated

TABLE H
QA/QC - FIELD BLANKS, SPIKES AND RINSATES

SAMPLE	ANALYSIS	RESULT
		mg/Kg
Field blank Rpt 10936 FB1	Arsenic	<4.0
	Cadmium	<1.0
	Chromium	4.7
	Copper	1.1
	Lead	2.9
	Mercury	<0.1
	Nickel	<1.0
	Zinc	<1.0
	C_6-C_9 TPH	LPQL
	C_{10}-C_{14} TPH	LPQL
	C_{15}-C_{28} TPH	LPQL
	C_{29}-C_{36} TPH	LPQL
	Benzene	LPQL
	Toluene	LPQL
	Ethylbenzene	LPQL
	Total Xylenes	LPQL
Rinsate Rpt 10936 R1		mg/L
	Benzene	LPQL
	Toluene	LPQL
	Ethylbenzene	LPQL
	Total Xylenes	LPQL
Field blank Rpt 11398 FB		mg/L
	C_6-C_9 TPH	LPQL
	C_{10}-C_{14} TPH	LPQL
	C_{15}-C_{28} TPH	LPQL
	C_{29}-C_{36} TPH	LPQL
	Benzene	LPQL
	Toluene	LPQL
	Ethylbenzene	LPQL
	Total Xylenes	LPQL
Trip spike		%age
	Benzene	78
	Toluene	83
	Ethylbenzene	76
	m+p xylenes	74
	o-xylene	76

Explanation

RPD : Relative Percentage Difference
nc : Not calculated

TABLE I
GROUNDWATER MONITORING ANALYSIS
All results in mg/L unless stated otherwise.

Contaminant	PQL Envirolab	Guideline Concentration		SAMPLES	
		ANZECC 2000	Drinking Water	P4	P6
pH	-		6.5-8.5	-	6.6
TDS				-	8400
Conductivity (µS/cm)	1.0			-	14,000
Arsenic (As III)	0.001	0.024	0.007	0.003	0.003
Cadmium	0.0001	0.0002	0.002	LPQL	LPQL
Chromium	0.001	0.001	0.05	LPQL	LPQL
Copper	0.001	0.0014	2.0	LPQL	LPQL
Lead	0.001	0.0034	0.3	LPQL	LPQL
Mercury	0.0001	0.0006	0.001	LPQL	LPQL
Nickel	0.001	0.011	0.02	0.008	0.008
Zinc	0.001	0.008	3.0	0.021	0.03
Hydrocarbons C6-C9	0.01	nsl	nsl	LPQL	LPQL
Hydrocarbons C10-C14	0.05	0.6**		LPQL	LPQL
Hydrocarbons C15-C28	0.1				
Hydrocarbons C29-C36	0.1				
Benzene	0.001	0.95	0.001	LPQL	LPQL
Toluene	0.001	0.18	0.8	LPQL	LPQL
Ethyl Benzene	0.001	0.08	0.3	LPQL	LPQL
Total xylenes	0.003	0.35	0.6	LPQL	LPQL
o-xylene	0.001	0.03	NSL	LPQL	LPQL
m+p-xylene	0.002		NSL	LPQL	LPQL

EXPLANATION:
NA : Not Analysed
NSL : No set limit

* Trigger value for protection of 95% of freshwater species.
Australian and New Zealand Guidelines for Fresh and Marine Water Quality,
Australian and New Zealand Environment and Conservation Council 2000.
** Dutch Intervention Value for mineral oil, Environmental Quality Standards in the Netherlands (1999).

Concentration above guideline level ☐
nsl - No set limit

TABLE J-1
SUMMARY OF SOIL SAMPLE LABORATORY ANALYSIS SCHEDULE

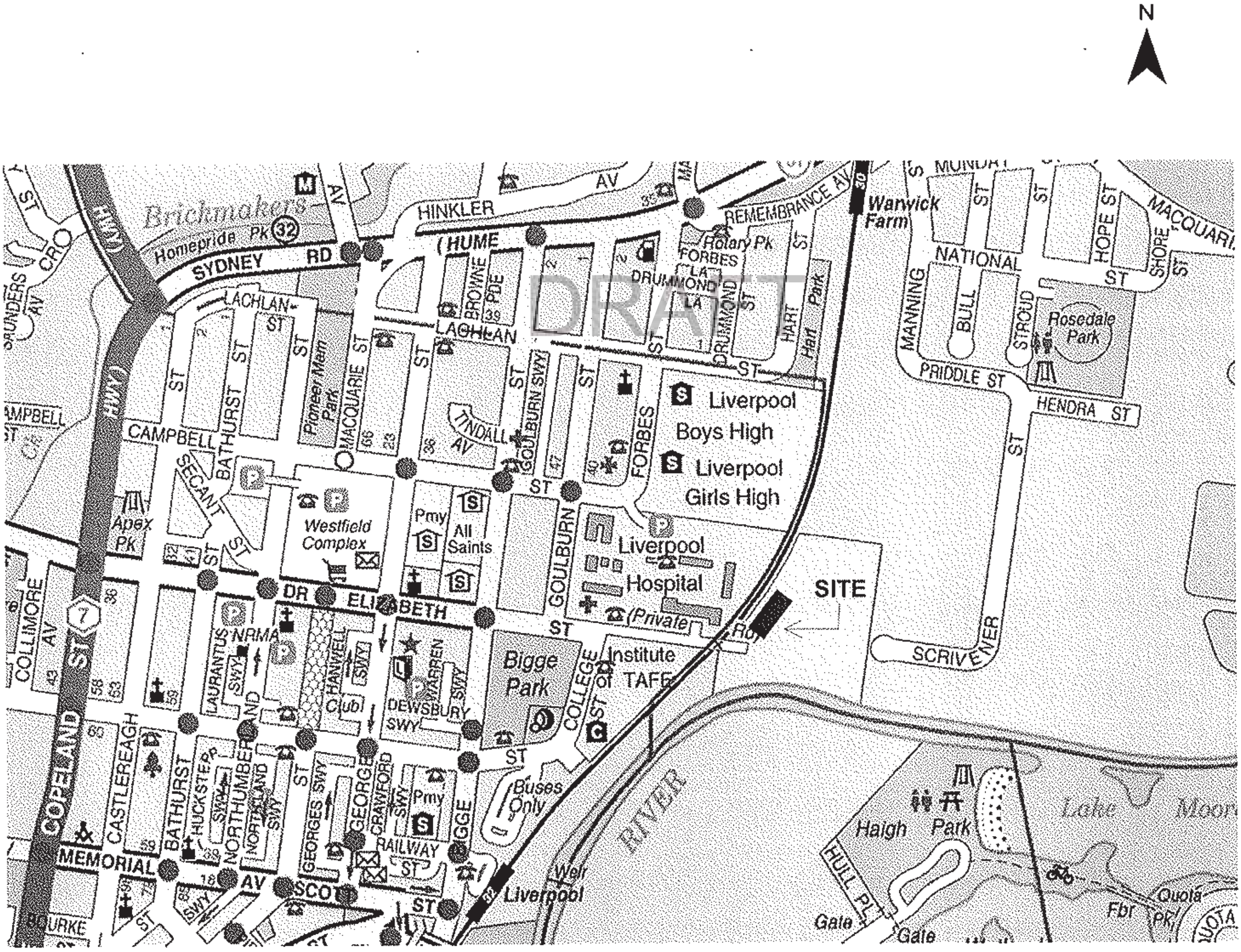
Borehole	Date Drilled	Depth (metres)	Matrix	Analyses Undertaken								Laboratory Batch Reference
				Metals	TPH/BTEX	PAH	OC/PCB	VOC	Asbestos	POCAS	TCLP	
P1	30/04/07	0-0.2	Fill	1	1	1	1		1		1	Envirolab 10936 P&R 50315
		0.7-0.95	Fill	1	1	1	1		1			
		1.3-1.5	Fill	1	1	1	1		1		1	Envirolab 10936-A
P2	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P3	30/04/07	0-0.2	Fill	1	1	1	1		1		1	Envirolab 10936 P&R 50315
		0.7-0.95	Fill	1	1	1	1		1		1	
		1.7-1.95	Natural	1	1	1	1		1			Envirolab 10936-A
P4	30/04/07	0-0.3	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
		0.7-0.95	Fill	1	1	1	1		1			
P5	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P6	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P7	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P8	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P9	30/04/07	0-0.2	Fill	1	1	1	1		1		1	Envirolab 10936 P&R 50315
		0.7-0.95		1	1	1	1		1			
												Envirolab 10936-A
B4	30/04/07	0-0.3	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
Totals				16	16	16	16	0	16	0	5	

TABLE J-2
SUMMARY OF WATER SAMPLE LABORATORY ANALYSIS SCHEDULE

Borehole	Date Sampled	Matrix	Analyses Undertaken					Laboratory Batch
			Metals	TPH	BTEX	pH/EC	TDS	
P4	17/05/07	water	1		1			11398
P6	17/05/07	water	1	1	1	1	1	11398
Totals			2	1	2	1	1	

TABLE K
SUMMARY OF FIELD QA/QC ANALYSES

Sample ID	Date	Sample Type	Matrix	Analyses Undertaken				Laboratory Batch
				Metals	TPH	BTEX	PAH	
FB1	30/04/07	Field Blank	Sand	1	1	1		Env 10936
FB	17/05/07	Field Blank	Sand		1	1		Env 11398
DUP1 & P6 (0.0-0.2)	30/04/07	Intra lab dup	fill	1	1	1		Env 10936
DUP2 & P5 (0.0-0.2)	30/04/07	Intra lab dup	fill	1	1	1		Env 10936
DUP1 & P6	17/05/07	Intra lab dup	Water	1		1		Env 11398
R1	30/04/07	Rinsate	water					Env 10936
DUP4 P9 (0-0.2m)	30/04/07	Inter lab dup	Fill	1	1	1		SGS 52354
DUP5 P4 (0-0.3m)	30/04/07	Inter lab dup	Fill	1	1	1		SGS 52354
Trip Spike	17/05/07	Trip spike	water			1		Env 11398
Totals				6	6	8	0	

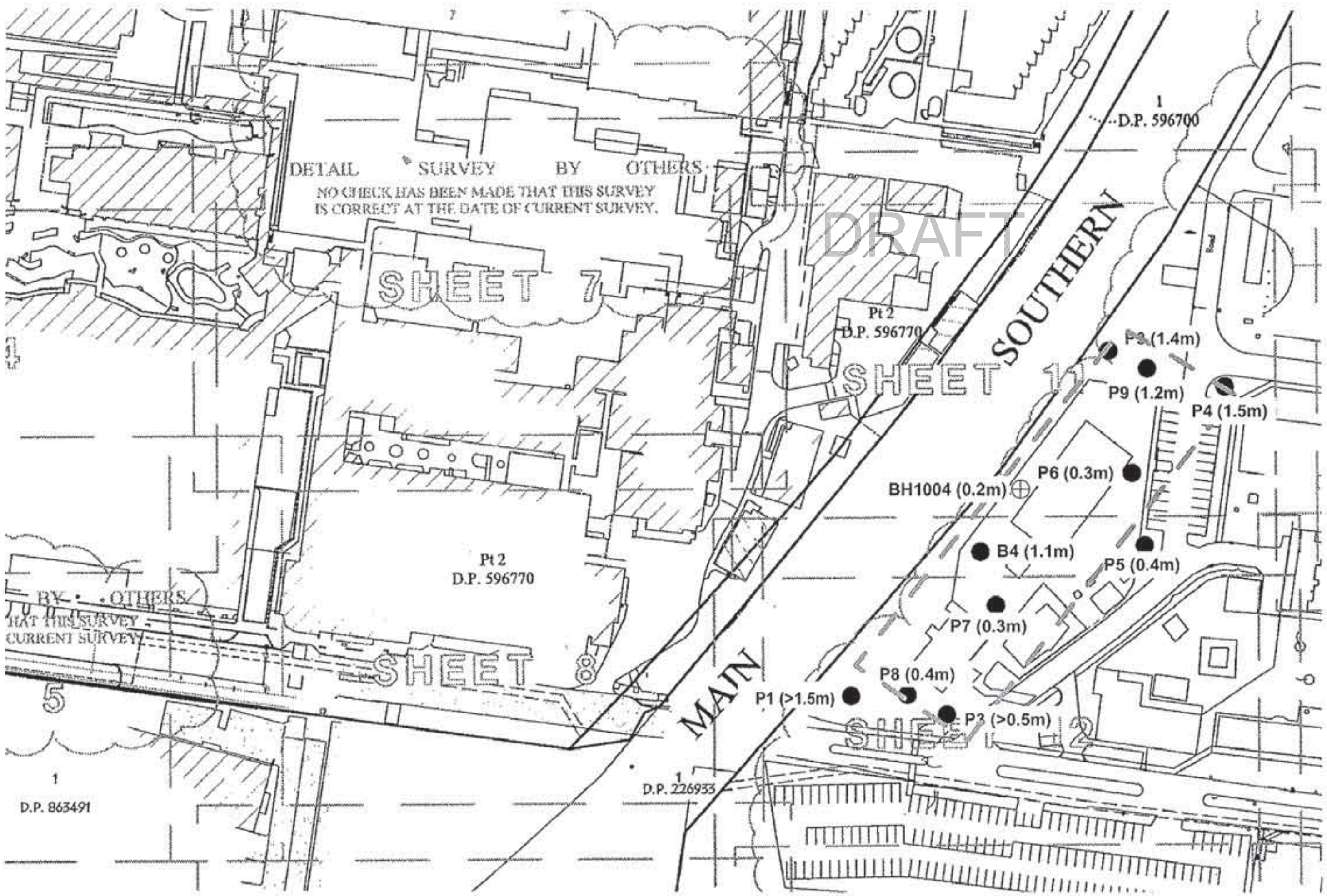


SITE LOCATION PLAN
Proposed Multi-Storey Car Park
Liverpool Hospital, Elizabeth Street, Liverpool

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

EIS
ENVIRONMENTAL INVESTIGATION SERVICES

Job No: E21171FK
Figure: 2



N

LEGEND

⊕	Borehole location (2006 investigation)
●	Borehole location (2007 investigation)
P6 (0.3m)	Borehole number and depth of fill
⌜ ⌟	Approximate footprint of proposed multi-storey car park.

Scale (m)
0 20 40 60 80 100

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

BOREHOLE LOCATION PLAN
Proposed Multi-Storey Car Park
Liverpool Hospital, Elizabeth Street, Liverpool

EIS
ENVIRONMENTAL
INVESTIGATION
SERVICES

Job No: E21171FK
Figure: 2

APPENDIX A

ENVIRONMENTAL INVESTIGATION SERVICES
CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
B4
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0	▨		FILL: Silty clay, medium to high plasticity, brown, with a trace of fine to medium grained sand, root fibres, coal, igneous and ironstone gravel.	MC<PL			GRASS COVER
	■				N = 11 5,5,6		▨		FILL: Silty clay, medium to high plasticity, brown mottled grey, with a trace of coal.				
					N = 19 5,9,10	1	▨	CL-CH	SILTY CLAY: medium to high plasticity, red mottled grey, with ironstone gravel.	-	St	-	
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P1
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER
JK300
Logged/Checked by: V.B./
R.L. Surface: N/A
Datum:

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0	▨		FILL: Silty clay, low to medium plasticity, brown, with fine to medium grained sand, with a trace of igneous gravel.	MC<PL			GRASS COVER
	■				N = 7 2,3,4		▨		FILL: Silty clay, medium to high plasticity, brown, with a trace of fine to medium grained sand and coal.	MC<PL			
	■					1	▨		FILL: Silty sand, fine to medium grained, grey brown, with a trace of coal.	W			
									END OF BOREHOLE AT 1.5m				AUGER REFUSAL
						2							
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P2
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Date: 30-4-07

Method: SPIRAL AUGER
JK300

R.L. Surface: N/A

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION	■		■			0	▨		FILL: Silty clay, low to medium plasticity, brown, with fine to medium grained sand, and a trace of igneous and sandstone gravel, root fibres and coal.	MC<PL			GRASS COVER
									END OF BOREHOLE AT 0.5m				
						1							
						2							
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P3
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Method: SPIRAL AUGER
JK300

R.L. Surface: N/A

Date: 30-4-07

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0	▨		FILL: Silty clay, medium to high plasticity, brown, with fine to medium grained sand, igneous and sandstone gravel and root fibres.	MC<PL			GRASS COVER
	■				N = 13 3,7,6	1	▨		as above, but no root fibres.				
	■				N = 15 5,7,8		▧	CL-CH	SILTY CLAY: medium to high plasticity, red mottled grey.	MC<PL	(VSt)		
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES
CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P4
1/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER
JK300
Logged/Checked by: V.B./
R.L. Surface: N/A
Datum:

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0			FILL: Silty clay, medium to high plasticity, brown, with fine to medium grained sand, a trace of root fibres and coal.	MC<PL			GRASS COVER
	■				N = 5 1,2,3	1			as above, but with a trace of igneous gravel.				
	■				N = 17 5,8,9	2 3		CL-CH	SILTY CLAY: medium to high plasticity, red mottled grey brown.	MC<PL	(VSt)	-	
						4 5		SC	SILTY CLAYEY SAND: fine to medium grained, brown.	M	(F)		
						6 7		SM	SILTY SAND: fine to medium grained, brown.				

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P4
2/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Date: 30-4-07

Method: SPIRAL AUGER JK300

R.L. Surface: N/A

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SM	SILTY SAND: fine to medium grained, brown.	M			
						8							
▼ AFTER 18 DAYS													
						9			END OF BOREHOLE AT 9.0m				MONITORING WELL INSTALLED TO 9m, CLASS 18 SLOTTED PVC FROM 9m TO 3m, CASING FROM 3m TO SURFACE, 2mm SAND FILTER PACK FROM 9m TO 3m, BENTONITE SEAL FROM 3m TO 2.6m BACKFILLED WITH SAND (AND/ OR CUTTINGS) TO SURFACE AND COMPLETED WITH A STEEL GATIC COVER AND LOCKABLE CAP
						10							
						11							
						12							
						13							
						14							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P5
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Date: 30-4-07

Method: SPIRAL AUGER
JK300

R.L. Surface: N/A

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0	▩		FILL: Silty clay, low to medium plasticity, brown, with a trace of slag, coal and root fibres.	MC≈PL			GRASS COVER
	■				N = 5 1,2,3		▨	CL	SILTY CLAY: low to medium plasticity, brown, with root fibres.	MC≈PL	(F)	-	
	■				N = 13 3,5,8	1	▨		as above, but red mottled grey, with ironstone gravel.				
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES
CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P6
1/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0			FILL: Silty clay, medium plasticity, brown, with a trace of root fibres and coal.	MC>PL			GRASS COVER
								CL-CH	SILTY CLAY: medium to high plasticity, brown mottled grey.	MC<PL	(F)	-	
	■				N = 6 2,3,3								
						1							
									as above, but red mottled grey.		(VSt)		
	■				N = 17 5,6,11								
						2							
						3							
									SILTY CLAY: medium to high plasticity, brown, with a trace of fine to medium grained sand.				
						4							
								SC	SILTY CLAYEY SAND: fine to medium grained, brown.	M	-		
						5							
									as above, but light brown.				
						6							
								SM	SILTY SAND: fine to medium grained, light brown.				
						7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P6
2/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Date: 30-4-07

Method: SPIRAL AUGER
JK300

R.L. Surface: N/A

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
								SM	SILTY SAND: fine to medium grained, light brown.	M			
						8			as above, but dark brown.	M-W			
▼ AFTER 18 DAYS													
						9			END OF BOREHOLE AT 9.0m				MONITORING WELL INSTALLED TO 9m, CLASS 18 SLOTTED PVC FROM 9m TO 3m, CASING FROM 3m TO SURFACE, 2mm SAND FILTER PACK FROM 9m TO 3m, BENTONITE SEAL FROM 3m TO 2.8m, BACKFILLED WITH SAND (AND/ OR CUTTINGS) TO SURFACE AND COMPLETED WITH A STEEL GATIC COVER AND LOCKABLE CAP
						10							
						11							
						12							
						13							
						14							

ENVIRONMENTAL INVESTIGATION SERVICES
CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P7
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0			FILL: Silty clay, medium to high plasticity, brown, with a trace of fine to medium grained sand, root fibres and coal.	MC>PL			GRASS COVER
								CL-CH	SILTY CLAY: medium to high plasticity, brown mottled grey, with a trace of root fibres.	MC≈PL	(St)	-	
	■				N = 8 2,3,5	1							
									as above, but with root fibres absent, red mottled grey.				
	■				N = 15 3,6,9								
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							

Appendix G

Environmental Site Assessment

October 2008

Prepared by:

EIS (A Division of Jeffrey
Katauskas Pty Ltd

ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

CAPITAL INSIGHT PTY LTD

ON

ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED MULTI STOREY CAR PARK DEVELOPMENT

AT

LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL

JUNE 2007

REF: E21171FK-RPT

Principal: E H Fletcher BSc (Eng) ME
115 WICKS ROAD, MACQUARIE PARK NSW 2113 • TEL: 02 9888 5000 • FAX: 02 9888 5004
POSTAL ADDRESS: PO BOX 976, NORTH RYDE BC NSW 1670
EIS IS A DIVISION OF JEFFERY & KATAUSKAS PTY LTD • ABN 17 003 550 801
Principals: B F Walker BE DIC MSc P Stubbs BSc MIEAust D Treweek Dip Tech

TABLE OF CONTENTS

1 INTRODUCTION

Capital Insight commissioned Environmental Investigation Services (EIS), a division of Jeffery & Katauskas Pty Ltd (J&K), to undertake an environmental site screening to assess the likelihood of contamination of the subsurface soils and groundwater for a proposed multi-storey car park development at Liverpool Hospital. The entire hospital site is identified as Lot 1 and 2 in DP 596770 and at the time of the assessment the area under investigation was occupied by a staff recreation building, swimming pool and tennis court. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2.

The screening was undertaken generally in accordance with an EIS proposal of 5 December 2006 and Capital Insight written acceptance of 23 April 2007.

EIS understand that the proposed development includes a multistorey car park constructed on grade.

This report describes the investigation procedures and presents the results of the environmental site assessment, together with comments, discussion and recommendations.

A geotechnical investigation was performed concurrently with the environmental site screening by J&K and the results are presented in a separate report (Ref. JobNoRPT, dated ##, 2004).

1.1 Previous Reports

EIS completed a preliminary screening of the site in conjunction with a geotechnical investigation performed by J&K in 2006. The results of the investigation are presented in;

> *"Report To NSW Department Of Commerce On Preliminary Environmental Site Assessment For Proposed Liverpool Hospital Re-Development Project At Liverpool Hospital, Elizabeth Street, Liverpool. July 2006 Ref:E20303F-Rpt"*

The results of the investigation have been incorporated into this report.

2 ASSESSMENT OBJECTIVES

2.1 Investigation Objectives

The primary objective of the investigation was to assess the soil and groundwater conditions at the site in relation to the suitability of the site for the proposed land use in accordance with the *Guidelines for Consultants Reporting on Contaminated Sites NSW DECC (formerly the EPA) 1997* and the *State Environmental Planning Policy No.55 – Remediation of Land* (SEPP55).

A secondary investigation objective was to undertake a preliminary waste classification assessment for off-site disposal of excavated soil and rock associated with the proposed development works.

2.2 Data Quality Objectives

The data quality objectives for the assessment are outlined in the following table:

<table>
<tr><td>State the problem</td><td>Contaminated soil may exist at the site. The principal contaminants of concern at the site are considered to be petroleum hydrocarbons, asbestos, heavy metals, polycyclic aromatic hydrocarbons, organochlorine pesticides and polychlorinated biphenyls. Due to the presence of a number of underground storage tanks to the north of the proposed car park there is also the potential for groundwater contamination associated with petroleum hydrocarbons, volatile organic compounds and heavy metals.</td></tr>
<tr><td>Identify the decision</td><td>The principal objectives of the study are to assess whether the concentrations of contaminants in the soil and groundwater exceed the site assessment criteria (guideline concentrations).</td></tr>
<tr><td>Identify inputs into the decision</td><td>The following data will be reviewed to resolve the decision statement:
Physical site data that includes topography and other relevant information.
Analytical schedule for soils
<table>
<tr><th>Class</th><th>Analytes</th></tr>
<tr><td>Metals and metalloids</td><td>Arsenic
Cadmium
Chromium
Copper
Mercury
Nickel
Lead
Zinc</td></tr>
<tr><td>Organics</td><td>Total Petroleum Hydrocarbons
BTEX (benzene, toluene, ethyl benzene, xylenes)
Polycyclic Aromatic Hydrocarbons
Pesticides: Organochlorine
Polychlorinated Biphenyls</td></tr>
<tr><td>Asbestos</td><td>Asbestos identification</td></tr>
</table>
Analytical schedule for groundwater
<table>
<tr><th>Class</th><th>Analytes</th></tr>
<tr><td>Metals and metalloids</td><td>Arsenic
Cadmium
Chromium
Copper
Mercury
Nickel
Lead
Zinc</td></tr>
<tr><td>Organics</td><td>Total Petroleum Hydrocarbons
BTEX (benzene, toluene, ethyl benzene, xylenes)</td></tr>
</table>
</td></tr>
</table>

	Field QA/QC samples will include inter and intra laboratory duplicates at ratios of 5% and 10% respectively; rinsate sample and trip spike.
Study Boundaries	The study will be confined to the boundaries of the proposed new multi-storey car park shown in Figure 4.
Develop a Decision Rule	The results of the sample analysis will be compared with the concentrations specified in the site assessment criteria (see below).
Specify Limits on Decision Errors	A 20% probability of an error in deciding that the site is unacceptable, when in actual fact it is, has been adopted for this site. Similarly, a 5% probability of an error deciding that the site is acceptable when it is not has been adopted.
Optimise the Design for Obtaining data	If necessary an additional round of sampling may be undertaken. The overall data set will be optimised by review of the data as the project proceeds. If necessary adjustments will be made to the sampling and/or analytical program.

2.2.1 Data Quality Indicators

The purpose of Data Quality Indicators is to develop criteria to assess the reliability of the laboratory data. The following Data Quality Indicators established for this project are summarised below:

- Collection and analysis of 5% of the field samples as inter-laboratory duplicates.
- Collection and analysis of 10% of the field samples as intra-laboratory duplicates.
- Relative percentage differences (RPDs) will be calculated for inter-laboratory and intra-laboratory duplicates. The RPD is calculated as the absolute value of the difference between the initial and repeat result divided by the average value, expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:
    - For results greater than 10 times the Practical Quantitation Limit (PQL) RPDs less than 50% are considered acceptable.
    - For results that are between 5 and 10 times PQL RPDs less than 75% are considered acceptable.
    - For results that are less than 5 times the PQL RPDs less than 100% are considered acceptable.
- Review of laboratory QA/QC data (including surrogate recovery, repeat analysis, duplicates, matrix spikes and method blanks).

The success of the Data Quality Indicators will be based on an assessment of the data set as a whole and not on individual acceptance or exceedance within the data set.

2.3 Quality Assurance (QA)

Quality Assurance involves all of the actions, procedures and checks to ensure that the data is representative, the integrity of the samples and the result are representative. The QA procedures for this project will involve:

- collection of soil and water samples in appropriately pre-treated jars/bottles with Teflon lined lids;
- collection of 5% of the field samples as inter-laboratory duplicate analysis;
- collection of 10% of the duplicate samples for intra-laboratory analysis;
- collection of equipment rinsate samples;
- analysis of a trip spike for groundwater analysis;
- chain-of-custody identifying; each sample, the sampler, nature of the sample, collection date, analyses to be performed and quality assurance/quality control (QA/QC) procedures required; departure date from the site; and receipt by the laboratory;
- comparison of the analysis required to the holding time;
- analytical methods in accordance with Schedule B(3), NEPC (1999) Guideline on Laboratory Analyses of Potentially Contaminated Soils;
- laboratory NATA accreditation for analytical methods used;

2.4 Quality Control (QC)

Quality control monitors and measures the effectiveness of the QA procedures and will include:

- review of sample percentage recoveries;
- review of laboratory QA/QC procedures (ie. surrogates, laboratory duplicates, matrix spikes, etc);
- review of sample relative percent differences (required to be less than 50% for soil samples with results greater than 10 times the laboratory limits of reporting);
- review trip blank, trip spike and rinsate blank analyses; and
- review of laboratory method blank analysis.

3 SITE INFORMATION

3.1 Site Description

The site identification details are summarised below:

Site Owner:	NSW Department of Commerce
Site Address:	Liverpool Hospital, Elizabeth Street, Liverpool
Lot & Deposited Plan:	Part of Lot 1 and 2 in DP 596770
Local Government Authority:	Liverpool City Council
Site Area of Proposed car park:	Approximately 8000m^2
AHD:	Approximately 10m
Geographical Location (MGA):	N:6244502 E:308790 (approximately)
Site Locality Plan:	Refer to Figure 1
Site Layout Plan	Refer to Figure 2

Liverpool Hospital is located to the north–east of the junction of Elizabeth Street and Goulburn Street. The site is located within a gently undulating regional topographic setting that generally falls to the south-east at approximately 1-2°. The site has a similar topography to the region except for the elevated railway line, which bisects the hospital site in an approximately north-south orientation.

At the time of the investigation the site was occupied by the existing hospital and mental health section to the west of the railway line and by various commercial use activities to the east of the railway line, including a child care centre, tennis court, heliport and energy building.

The hospital site was bounded by high schools and an industrial area to the north. A TAFE (with open grassed areas) and the Georges River bounded the site to the south. Medium to high density residential areas were located to the west of the site and north of the west section of the site.

The investigation was confined to an area of the hospital currently occupied by the staff recreation building, swimming pool and tennis court. The approximate area was bounded by a railway line to the west and an internal hospital access road to the south.

A large concrete pad (approximately 6m by 3m) with metal plates was located in the south section of the site, an identical pad is located approximately 30m to the west on the opposite side of the railway track. These access an 1800mm diameter (6 meter below ground level) high pressure Sydney Water sewer pipe located 6m below the surface that connnects most of Liverpool to the sewerage farm in Warwick Farm (to the east). The pads are located where the pipe splits in two (on hospital side) to run under the railway line, and then combine back together on the Warwick Farm side.

A 55,000 litre diesel underground storage tank associated with the hospital Central Energy building was located to the north-east of the site. A child care centre was located to the east of the site an on-grade car park was located to the south of the site on the opposite side of the hospital access road.

Areas around the staff recreation area, the swimming pool and the tennis court were grassed. Shrubs and trees were located in the south west corner of the site. There were no obvious indications of plant stress.

3.2 Regional Geology and Hydrogeology

The 1:100,000 geological map of Penrith (Map 9030, 1:100,000 Department of Mineral Resources –1991) indicates the site to be located in the vicinity of the contact between areas underlain by Quaternary fluvial deposits of clayey quartzose sand and clay, and areas 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.

The stratigraphy of the site is expected to consist of residual clayey soils overlying relatively shallow bedrock in the west section and alluvial sandy soil overlying deep bedrock in the east section.

The acid sulfate soil risk maps indicate areas of high risk, low risk and no known occurrence of acid sulfate soils. The acid sulfate soil risk map for Liverpool (Acid Sulfate Soil Risk Map- 9030S2 edition 2, December 1997, 1:25000, Department of Land and Soil Conservation) indicates that the site is located within an area of no known occurrence of acid sulfate soil. The closest area at risk of acid sulfate soil is the bottom sediment of the Georges River approximately 200m to the south.

3.3 Potential Contamination Sources

3.3.1 General Contamination Processes

Contamination of surface and subsurface soils generally arises from previous land use that can include petroleum hydrocarbon and warehouse storage, manufacturing processes and pesticide and fertiliser usage. Imported fill soils may contain contaminants derived from unknown sources. Migration of contaminants can occur in permeable subsurface soil or fill materials and via man-made and natural drainage systems. The extent of contamination migration is dependent on the hydro-geological environment and the chemical and physical characteristics of the contaminants. Contamination migration in clayey soils can be expected to be limited, whilst sandy soils are conducive to greater spatial migration.

Backfill to service trenches can form contamination migration pathways via poorly compacted or permeable backfill. Backfill may also be contaminated.

The general history of contamination of sites in the Sydney region indicates that analysis for heavy metals including lead, copper and zinc should be incorporated in the schedule of laboratory testing. In addition screening tests should be performed on selected samples for polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCs), polychlorinated biphenyls (PCBs), petroleum hydrocarbons (TPH), asbestos monocyclic aromatic hydrocarbons (BTEX) and asbestos. Contaminants including cyanide, phenolic compounds, barium, beryllium, cobalt, manganese, vanadium and boron are generally associated with specific site industrial uses and so have not been considered in this investigation.

3.3.2 Potential Site Specific Contamination

The principal potential contamination sources at this site are considered to be:

- Imported fill material used to raise site levels;
- Asbestos building materials left behind after demolition of older buildings;
- Asbestos building materials associated with current buildings; and
- Petroleum hydrocarbons and volatile organic compounds associated with existing and former underground storage tanks.

3.4 Potential Receptors

The main potential contamination receptors are considered to include:

- Georges River located approximately 200m to the south of the site.
- Site visitors, workers and adjacent property owners, who may come into contact with contaminated soil and/or be exposed to contaminated dust arising from construction activity.
- Future site occupants.

3.5 Contaminant Laydown and Transport Mechanisms

At this site, mobile contaminants would be expected to move down to the groundwater table and migrate laterally down-slope from the source. The movement of contaminants would be expected to be associated with groundwater flow.

Soil borne contaminants may potentially be distributed as dust across the site if disturbed. Volatile soil contaminants could potentially be released in the vapour phase if disturbed.

3.6 Results of Previous Investigation

EIS completed a preliminary screening of the site in conjunction with a geotechnical investigation performed by J&K in 2006. The results of the investigation are presented in;

"Report To NSW Department Of Commerce On Preliminary Environmental Site Assessment For Proposed Liverpool Hospital Re-Development Project At Liverpool Hospital, Elizabeth Street, Liverpool. July 2006 Ref:E20303F-Rpt"

The preliminary assessment involved sampling from eight boreholes across the entire site. One borehole BH1004 was located within the area of the proposed multi-storey car park. Sample BH1004(0-0.2m) was analysed for heavy metals, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (TPH), monocyclic aromatic hydrocarbons (BTEX), asbestos, organochlorine (OC) pesticides and polychlorinated biphenyls (PCBs). The analytical results for the sample were all less than the site assessment criteria. No asbestos was detected in the sample.

4 ASSESSMENT CRITERIA DEVELOPMENT

4.1 Regulatory Background

In 1997 the NSW Government introduced the *Contaminated Land Management Act, 1997* (CLM Act). This act, associated regulations, State Environmental Planning Policy (SEPP) No.55 – Remediation of Land (1998) and associated NSW DECC (EPA) guidelines, were designed to provide uniform state-wide control of the management, investigation and remediation of contaminated land.

Prior to granting consent for any proposed rezoning or development, SEPP55 requires the consent authority to:

- consider whether the land is contaminated;
- consider whether the site is suitable, or if contaminated, can be made suitable by remediation, for the proposed land use;
- be satisfied that remediation works will be undertaken prior to use of the site for the proposed use.

Should the assessment indicate that the site poses a risk to human health or the environment, remediation of the site is required prior to commencement of the proposed development works. SEPP55 requires that the relevant local council be notified of all remediation works, whether or not development consent is required. Where development consent is not required, 30 days written notice of the proposed works must be provided to council. Details of validation of remediation work must also be submitted to Council within one month of completion of remediation works.

The consent authority may request that a site audit be undertaken during, or following the completion of the site assessment process. Under the terms of the CLM Act the NSW DECC (EPA) Site Auditor Scheme was developed to provide a system of independent review for assessment reports. An accredited Contaminated Site Auditor is engaged to review reports prepared by suitably qualified consultants to ensure that the investigation has been undertaken in accordance with the guidelines and confirm that the sites are suitable for their intended use.

Section 59(2) of the CLM Act states that specific notation relating to contaminated land issues must be included on S.149 planning certificates prepared by Council where the land to which the certificate relates is:

- within an investigation or remediation area.
- subject to an investigation or remediation order by the DECC (EPA).
- the subject of a voluntary investigation or remediation proposal.
- the subject of a site audit statement.

Submission of contaminated site investigation and validation reports to council as part of rezoning or development application submissions may also result in notation of actual or potential site contamination on future S.149 certificates prepared for the site.

Section 60 of the CLM Act sets out a positive duty on an owner, or person whose activities cause contamination, to notify the DECC if they are aware that the contamination presents a significant risk of harm.

Off-site disposal of fill, contaminated material and excess soil/rock excavated as part of the proposed development works is regulated by the provisions of the Protection of the Environment Operations Act (POEO Act 1997) and associated regulations and guidelines including the *NSW DECC (EPA) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes* (1999). All materials should be classified in accordance with these guidelines prior to disposal.

Section 143 of the *Protection of the Environment Operations 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.

4.2 Soil Contaminant Threshold Concentrations

The soil investigation levels adopted for this investigation are derived from the NSW DECC (EPA) document *Guidelines for the NSW Site Auditor Scheme (1998)* and the National Environmental Protection Council document *National Environmental Protection (Assessment of Site Contamination) Measure 1999*. The contaminant thresholds listed below are levels at which further investigation and evaluation is required to assess whether the site is considered suitable for the proposed urban land use.

To accommodate the range of human and ecological exposure settings, a number of generic settings are used on which the Health based Investigation Levels (HILs) can be based. Four categories of HILs are adopted for urban site assessments. Contaminant levels for a standard residential site with gardens and accessible soil (Column A in Table A-1) are based on protection of a young child resident at the site. The remaining categories (Columns D to F) present alternative exposure settings where there is reduced access to soil or reduced exposure time. These categories include residential land use with limited soil access, recreational and public open space and commercial/industrial use. Where the proposed land use will include more than one land use category (eg. mixed residential/commercial development) the exposure setting of the most "sensitive" land use is adopted for the site.

Threshold concentrations for petroleum hydrocarbon contaminants including total petroleum hydrocarbons (TPH) and monocyclic aromatic hydrocarbon (BTEX) compounds have previously been established in the *NSW DECC (EPA) Contaminated Sites: Guidelines for Assessing Service Station Sites* (1994) publication and this document is referenced in the 1998 Site Auditor Guidelines. Heavy fraction petroleum hydrocarbon aliphatic/aromatic component threshold concentrations have also been introduced in the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (NEPC Guidelines).

The urban interim Ecological Investigation Levels (EILs) are generic values based on phytotoxicity data for plant response to specific contaminants in a sandy loam matrix and are included in the contaminated site assessment where the proposed land use includes gardens and accessible soils.

The *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (NEPC Guidelines) do not provide numeric guidelines for the assessment of asbestos in soil. NSW DECC (EPA) advice has indicated that based on health concerns there should be no asbestos in soil at the surface, however the NSW DECC (EPA) have not published numerical guidelines for the assessment of asbestos in subsurface soils.

The WorkCover publication *Your Guide to Working with Asbestos: Safety Guidelines and Requirements for Work Involving Asbestos* (NSW WorkCover 2003) indicates that inappropriately buried asbestos materials are considered to be friable asbestos material. "Any asbestos cement product, which has been subjected to weathering, severely damaged by hail, damaged by heat/fire or other mechanical action, or illegal water blasting is (also defined as) a friable asbestos product". Under the *NSW Occupational Health and Safety (OHS) Regulations 2001* and WorkCover requirements all necessary disturbance works associated with asbestos containing materials must be conducted by a licensed AS-1 Asbestos Removal Contractor.

4.2.1 Site Assessment Criteria for Soil Contaminants

The "parks and recreational open space" exposure setting has been adopted for this assessment as EIS consider that this is the most appropriate exposure scenario for a hospital. The appropriate soil criteria are listed in the following table:

Site Soil Assessment Criteria (mg/kg)			
Contaminant	**HIL Column F Exposure Setting**	**Guidelines for Assessing Service Station Sites (1994)**	**Ecological Investigation Levels**
Inorganics			
Arsenic (total)	200		20
Cadmium	40		3
Chromium (III)	24%		400
Copper	2000		100
Lead	600		600
Mercury (inorganic)	30		1
Nickel	600		60
Zinc	14000		200
Organic Contaminants			
TPH (C_6-C_9)		65	
TPH (C_{10}-C_{36})		1000	
Benzene		1	
Toluene		1.4	
Ethylbenzene		3.1	
Total Xylenes		14	
Total PAHs	40		
Benzo(a)pyrene	2		
Aldrin + Dieldrin	20		
Chlordane	100		
DDT + DDD + DDE	400		
Heptachlor	20		
PCBs (Total)	20		

For the purpose of off-site disposal, the classification of soil into 'inert', 'solid', 'industrial' and 'hazardous' waste categories is defined by chemical contaminant criteria outlined in the *NSW DECC (EPA) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes - 1999*. These chemical contaminant criteria are summarised in Table A-2.

4.3 Evaluation of Soil Analysis Data and Contaminant Threshold Concentrations

Assessment of the soil analytical data using the soil contaminant threshold concentrations has been undertaken in accordance with the methodology outlined in the *National Environmental Protection (Assessment of Site Contamination) Measure (1999) Schedule 7(a) Soil Investigation Levels* and the statistical analysis methods outlined in the *NSW EPA Contaminated Sites Sampling Design Guidelines (1995)*.

The following criteria have been adopted for assessment of the analytical data:

- For a site to be considered suitable for the proposed land use the 95% Upper Confidence Limit (UCL) value of the arithmetic mean concentration of each contaminant should be less than the applicable contaminant threshold concentration.
- The relevance of localised elevated values must also be considered and should not be obscured by consideration only of the arithmetic mean of the results. The results must also meet the following criteria:
  - the standard deviation of the results must be less than 50% of the soil assessment criteria; and
  - no single value exceeds 250% of the relevant soil assessment criteria.

Where contamination results exceed the site criteria developed above a method of remediating the site is to physically and selectively remove the contamination hotspots from the site. This process should be continued until statistical analysis of the data meets the above criteria. Validation of the remediated site is generally required to demonstrate that the site is suitable for the proposed land use.

4.4 Groundwater Contaminant Trigger Values

Groundwater resources in NSW are managed and regulated by environmental and planning legislation, including the Protection of the Environment Operations (POEO) Act 1997, the Environmental Planning and Assessment Act (1979) and the Water Management Act (2000).

The 1999 NEPC Guidelines refer to trigger values presented in the ANZECC Australian Water Quality Guidelines (1992) and the NHMRC Australian Drinking Water Guidelines (2004). These guideline values define water quality parameters at the point of use including aquatic ecosystems (fresh and marine waters), drinking water, industrial and agricultural/irrigation uses.

In 2000, ANZECC released the Australian and New Zealand Guidelines for Fresh and Marine Water Quality which supersede the previous guideline documents. The ANZECC 2000 guidelines include a complete framework for the development of appropriate guidelines for aquifer assessment.

The appropriate settings for current and potential uses of groundwater should be identified in establishing applicable groundwater trigger values:

- raw drinking water source;
- agricultural use – stock watering;
- agricultural and domestic use – irrigation;
- protection of aquatic ecosystems – freshwater; and

- protection of aquatic ecosystems – marine.

For specific contaminants where a trigger value has not been provided in the ANZECC (2000), trigger values for this assessment have been drawn from *Environmental Quality Standards in the Netherlands (1999)* Dutch Intervention Values.

4.4.1 Site Assessment Criteria for Groundwater Contaminants

The presence of elevated contaminant concentrations in groundwater triggers further investigation of aquifer conditions to assess the source(s) of contamination and the lateral and vertical extent of the contamination. The 95% trigger values for fresh water have been adopted for this investigation. These concentrations are presented in the following table:

Site Groundwater Assessment Criteria (mg/L)	
Contaminant	**95% Trigger Value for fresh water**
Inorganics	Fresh
Arsenic	0.024
Cadmium	0.0002
Chromium	0.001
Copper	0.0014
Lead	0.0034
Mercury	0.0006
Nickel	0.011
Zinc	0.008
Organics	
TPH C_{10}-C_{36}	0.6$
Benzene	0.95
Toluene	0.18
Ethyl benzene	0.08
o-Xylene	0.35
m+p Xylene	0.03
Total Xylenes	-

$ Dutch Intervention Value for mineral oil, Environmental Quality Standards in the Netherlands (1999).

5 ASSESSMENT PLAN AND METHODOLOGY

The *NSW DECC (EPA) Sampling Design Guidelines (1995)* for contaminated site investigations state a minimum of 19 evenly spaced sampling points should be undertaken for a site of this size (approximately 80000m^2). Ten sampling locations have been undertaken for this investigation. This density is approximately 55% of the minimum sampling density. The density of sampling is considered appropriate for a multi-storey car park.

The boreholes were drilled on a systematic grid with a spacing of up to 20m to 40m between sampling points. A systematic sampling plan was considered most appropriate for this investigation as:

- no specific potential contaminant sources were identified by the available site history.
- the distribution of contamination is expected to be associated with imported potentially contaminated fill material and is therefore likely to be random.

Sampling was not undertaken beneath the buildings, swimming pool or tennis court and the existing buildings at the site as access was not possible during the field investigation.

The sampling rationale is summarised in the following Table:

Locations	Rationale	Analytes
P1 to P9 inclusive and B4	Assess the soil across the investigation area. Monitoring wells were installed in P4, P6 and P8	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCs), polychlorinated biphenyls (PCBs), petroleum hydrocarbons (TPH), monocyclic aromatic hydrocarbons (BTEX) and asbestos.

6 INVESTIGATION PROCEDURE

6.1 Subsurface Investigation and Soil Sampling Methods

Subsurface investigations were undertaken using a track mounted hydraulically operated drill rig equipped with spiral flight augers. Soil samples were obtained from a Standard Penetration Test (SPT) sampler or directly from the auger when conditions did not allow use of the SPT sampler.

The SPT sampler was washed with phosphate free detergent and rinsed following each sampling event. The spiral flight augers were decontaminated using a scrubbing brush and potable water and Decon 90 solution (phosphate free detergent) followed by rinsing with potable water. Sampling personnel used disposable Nylex gloves during sampling activities.

Soil samples were obtained at various depths, based on observations made during the field investigation. All samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. During the investigation, samples were preserved by immediate storage in an insulated sample container with ice. Each sample was labelled with a unique job number, the sampling location, sampling depth and date. All samples were recorded on the borehole logs presented in Appendix A and on the chain of custody (COC) record presented in Appendix B.

On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody procedures. Detailed EIS field sampling protocols are included in Appendix D.

6.1.1 Photoionisation Detector (PID) Screening

A portable PID was used in this investigation to assist with selection of samples for laboratory hydrocarbon (TPH/BTEX) analysis. The PID is sensitive to volatile organic compounds. The sensitivity of the PID is dependent on the organic compound and varies for different mixtures of hydrocarbons. Some compounds give relatively high readings and some can be undetectable even though present in identical concentrations. The portable PID is best used semi-quantitatively to compare samples contaminated by the same hydrocarbon source.

The PID is calibrated before use by measurement of an isobutylene standard gas. All the PID measurements are quoted as parts per million (ppm) isobutylene equivalents.

Photoionisation detector (PID) screening of detectable volatile organic compounds (VOC) was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled glass jar samples following equilibration of the headspace gases. The PID headspace data is included on the COC documents.

6.2 Groundwater Monitoring Well Installation and Water Sampling Methods

6.2.1 Drilling and Well (Temporary Standpipe) Installation

Three monitoring wells were installed at borehole locations (P4, P6 and P8) as shown on Figure 2. The monitoring wells were installed as follows:

- Boreholes were drilled at all locations to a depth of approximately 9m.
- 50mm diameter Class 18 PVC was installed in the boreholes and consisted of machine slotted PVC screen from 9m to 6m and unslotted PVC casing from the surface to 6m.
- A 2mm graded sand filter pack was installed around the PVC to a height of 3m above the slotted PVC section.
- A bentonite seal was installed above the filter pack.
- Borehole cuttings were installed above the bentonite seal to approximately 0.5m below the ground surface.
- A concrete/cement grout was then used to seal the monitoring well with a gatic cover installed flush with the surrounding surface.

The monitoring well construction details are documented on appropriate borehole logs presented in Appendix A.

6.2.2 Monitoring Well Development, Purging and Sampling

Groundwater wells were developed using a dedicated disposable polyethylene bailer. During development the pH, temperature, conductivity and redox potential were monitored (where possible) using calibrated field instruments to assess the development of steady state conditions. No groundwater was present in well P8. Wells P4 and P6 were purged dry, recharge was very slow.

Due to the very slow recharge rate the wells were sampled directly after a period 18 days. Groundwater samples were obtained from each monitoring event using a new disposable polyethylene bailer. All samples were preserved in accordance with water sampling requirements detailed in the NEPC Guidelines (1999) and placed in an insulated container with ice. On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody procedures.

6.3 Laboratory Analysis

6.3.1 Soil Samples

Analysis of soil samples was undertaken by NATA registered laboratories using analytical methods detailed in the Schedule B(3) NEPC (1999) Guideline on Laboratory Analysis of Potentially Contaminated Soils. Laboratory analysis was undertaken by Envirolab Services Pty Ltd (NATA Accreditation No. 2901) with additional Quality Control Analysis undertaken by SGS Environmental Services Pty Ltd (NATA Accreditation No. 2562).

For this investigation selected soil samples were analysed for contaminants using the following laboratory techniques:

- Heavy metals – Nitric acid digestion. Analysis by ICP.
- Low level mercury – cold vapour AAS.
- OC pesticides and PCBs – Extracted with acetone/hexane. Analysis by GC/ECD.
- PAHs – Soil extracted with dichloromethane/acetone. Analysis by GC/MS.
- TPH (volatile) – Soil extracted with methanol. Analysis by P&T GC/PID.
- TPH – Soil extracted with dichloromethane/acetone. Analysis by GC/FID.
- BTEX – Soil extracted with methanol. Analysis by P&T PID. Confirmed with column flame ionisation detection.
- Asbestos – Polarizing light microscopy.

Toxicity characteristic leaching procedure (TCLP) leachates were prepared by rotating soil samples in a mild acid solution for 18 hours (NSW EPA WD-3 Method). Leachates were analysed using the analytical procedures outlined above.

6.3.2 Groundwater samples

Analysis of water samples for this assessment was undertaken by NATA registered laboratories using analytical techniques endorsed by the NSW EPA (Schedule B(3) of

NEPC 1999 does not apply to water samples). Laboratory analysis was undertaken by Envirolab Services Pty Ltd (NATA Accreditation No. 2901).

For this investigation selected groundwater samples were analysed for contaminants using the following laboratory techniques:

- Heavy metals – Direct injection. Analysis by ICP-AES.
- Low level mercury – Direct injection. Analysis by flow injection AAS.
- TPH (volatile) – P&T. Analysis by GC/FID.
- TPH – Solvent (dichloromethane) extraction. Analysis GC/FID.
- BTEX – Direct P&T. Analysis by GC/PID. Confirmed with column flame ionisation detection.

7 RESULTS OF INVESTIGATION

7.1 Subsurface Conditions

Site details and borehole locations are shown on Figure 2. For details of the subsurface soil profile reference should be made to the borehole logs in Appendix A. A summary of the subsurface conditions encountered by the boreholes is presented below:

Fill

All boreholes encountered fill that ranged in depth from 0.3m in P6 and P7 to greater than 1.5m in P1. The fill material was typically silty clay. Traces of coal were encountered in all of the boreholes except P3, P4, and P5. The fill was not fully penetrated in P1 (refusal at 1.5m) and P2 (refusal at 0.5m)

Natural Soils

The fill was underlain by medium to high plasticity silty clay that ranged in depth from 3.6m in P4 to 7.8m in P7. The silty clay was underlain silty clayey sand/silty sand.

Bedrock

Bedrock was not encountered in any of the boreholes.

Groundwater

All boreholes were dry on completion. Standing water levels of 8.49m and 8.6m (below ground level) were recorded in P6 and P4 respectively after 18 days.

7.2 Laboratory Results - Soil

The laboratory analysis results for soil samples are summarised in Table B to Table F inclusive and analysis reports are presented in Appendix B The site soil assessment criteria for this investigation are specified in the "Site Assessment Criteria for Soil Contaminants" section earlier in this report. The results of the analyses are summarised below.

Heavy Metals

Fifteen individual fill and one natural soil samples were analysed for heavy metals. All of the results were less than the human health risk assessment criteria.

With the exception of one sample the results of the analyses were below the Ecological Investigation Levels (EIL). Sample P3 contained a cadmium concentration of 8.7mg/kg, the EIL for cadmium is 3mg/kg.

Petroleum Hydrocarbons (TPH) and Monocyclic Aromatic Hydrocarbons (BTEX)

PID soil sample headspace readings were all zero ppm equivalent isobutylene. These results indicate a lack of PID detectable volatile organic contaminants. Fifteen individual fill and one natural soil samples were analysed for petroleum hydrocarbons and BTEX compounds. The results of the analyses were below less than the practical quantitation limit of the analytical technique and below the site assessment criteria.

Polycyclic Aromatic Hydrocarbons (PAHs)

Fifteen individual fill and one natural soil samples were analysed for a range of PAHs including Benzo(a)pyrene. The results of the analyses were below less than the practical quantitation limit of the analytical technique and below the site assessment criteria.

Organochlorine (OC) Pesticides and Polychlorinated Biphenyls (PCBs)

Fifteen individual fill and one natural soil samples were analysed for a range of OC pesticides and PCBs. The results of the analyses were below laboratory practical quantitation limit and less than the site assessment criteria.

Asbestos

Fifteen individual fill and one natural soil samples were analysed. No asbestos fibres were found at the reporting limit of 0.1g/kg in any of the samples analysed.

Toxicity Characteristics Leaching Procedure (TCLP)

TCLP extractions were undertaken on five selected samples that returned the highest heavy metal and Benzo(a)pyrene results. The results of the analyses were all less than the TCLP1 criteria listed in Table A-2.

7.3 Laboratory Results - Groundwater

The laboratory analysis results for groundwater samples are summarised in Table I and the analysis reports are presented in Appendix B. The site groundwater assessment criteria are presented in an Section. The results of the analysis are summarised below:

Heavy Metals

Two groundwater samples were analysed for heavy metals. The results of the analyses were below the site assessment criteria.

Petroleum Hydrocarbons (TPH) and Monocyclic Aromatic Hydrocarbons (BTEX)

Two groundwater samples were analysed for petroleum hydrocarbons and BTEX compounds. The results of the analyses were below practical quantitation limit of the analytical technique and the site assessment criteria.

7.4 Assessment of Analytical QA/QC

The objective of the assessment of the laboratory QA/QC is to ensure that the sample data is reliable. All laboratory reports for project E21171FK have been checked and issued as final by the following NATA Registered Laboratories unless stated otherwise:

• Laboratory	SGS Laboratories Pty Ltd NATA Accreditation No. 2562 Report numbers: 52354
• Laboratory	Envirolab Services Pty Ltd NATA Accreditation No. 2901 Report numbers: 10936, 10936a 11398
• Laboratory	Pickford and Rhyder Consulting NATA Accreditation No. 2515 Report numbers: 50315

Chain of custody documentation and/or sample receipt advice notices were signed and dated by Envirolab Services, and SGS, laboratories stating that all samples were received cool, in good order and in suitable containers. EIS and laboratory QA/QC procedures for the site screening are summarised in the following table:

Contaminant	**QA/QC Procedure Soil**							
	Total no. of Samples	**Intra-lab Duplicate**	**Inter-lab Duplicate**	**Repeat Analysis**	**Matrix Spike**	**Lab Blank**	**Surrogate Spike**	**Field Blank**
Heavy metals	16	2	2	2	1	2	-	1
TPH	16	2	2	2	1	2	16	1
BTEX	16	2	2	2	1	2	16	1
PAH	16	2	2	2	1	2	16	-
PCB	16	2	2	2	1	2	16	-
OC pest	16	2	2	2	1	2	16	-
TCLP PAH	5	-	-	-	1	1	5	-
TCLP Metals	5	-	-	-	1	1		-

Contaminant	QA/QC Procedure Groundwater							
	Total no. of Samples	**Intra-lab Duplicate**	**Trip spike**	**Repeat Analysis**	**Matrix Spike**	**Lab Blank**	**Surrogate Spike**	**Field Blank**
Heavy metals	2	1	-	-	1	1	-	-
TPH	2	1	-	-	1	1	2	1
BTEX	2	1	1	-	1	1	2	1
pH	1	-	-	-	-	-	-	-
Elec conductivity	1	-	-	1	1	1	-	-
TDS	1	-	-	1	1	1	-	-

Field QA/QC samples are specified below:

Inter-laboratory soil duplicates	-	DUP5 was a duplicate of P4 (0-0.3m) DUP4 is a duplicate of P9 (0-0.2m)
Intra-laboratory soil duplicates	-	DUP1 was duplicate of P6 (0-0.2m) DUP2 was duplicate of P5 (0-0.2m)
Intra-laboratory water duplicate	-	DUP1 was a duplicate of P6 (report 11398)
Field blanks	-	FB1 was a soil field blank that consisted of commercially available sand. FB was a soil field blank that consisted of demineralised water.
Trip spike	-	Trip spike (Envirolab report 11398) was a trip spike prepared by the laboratory.
Rinsate	-	R1 was a rinsate sampler of the SPT sampler used for soil sampling.

The RPD results for the field QA/QC duplicate samples are summarised in Table G.

7.4.1 Data Quality Indicators

COMPLETENESS **Field Considerations**	**Laboratory considerations**	**Comments**
All critical locations sampled. All samples collected. Standard operation procedures (SOPs) appropriate and complied with (EIS Sampling protocols). Experienced samplers. Documentation (borehole logs and chain of custody correct).	All critical samples analysed. All analytes analysed. Appropriate laboratory methods and PQLs. Sample documentation complete Sample holding times complied with, except TCLP analysis for PAHs.	All of the data (100%) was used in the assessment. Samples obtained for critical samples and chemicals of concern. A regular grid across the site was not sampled due to inaccessible areas beneath buildings, tennis court and swimming pool. TCLP analysis for PAHs was outside of the 14 day holding time. This was not considered to have had a significant impact on the data set as: • The contaminant of concern was benzo[a]pyrene. This PAH has a high molecular weight and low vapour pressure and is relatively stable. • The sample has been stored in a refrigerator at the lab.

COMPARABILITY **Field Considerations**	**Laboratory considerations**	**Comments**
Same SOPs were used on each occasion. Samplers Experienced. Climatic conditions for each sampling event (fine and sunny). Similar samples were collected on each occasion (size of sample and container).	Similar analytical methods used. Envirolab was used as the primary laboratory. SGS were used as the check laboratory. There were minor variations in some of the PQLs between the laboratories. These are not considered to have had an adverse impact on the data set as a whole. Units used by the laboratory were the same.	Same approach to sampling on all occasions. No significant influence on sampling from climatic or sampling conditions. Similar samples (ie soil and water) were handled and treated in an identical manner.

REPRESENTATIVENESS		
Field considerations	**Laboratory Considerations**	**Comments**
Fill soils, natural soils and groundwater sampled.	All critical samples analysed.	Samples were collected to reflect the characteristics of fill soils, natural soils and groundwater. Sample collection, handling, storage and preservation considered appropriate. No laboratory artefacts were detected. Traces of heavy metals were detected in the field blanks. These are routinely encountered in the matrix (commercially available sand) used for the field blank and were measured at concentrations consistent with previous results.

PRECISION		
Field considerations	**Laboratory Considerations**	**Comments**
SOP appropriate and complied with.	Intra and Inter laboratory field duplicates analysed. Laboratory duplicates analysed.	RPDs calculated and were acceptable for inter and intra laboratory duplicates. The inter laboratory groundwater RPDs for nickel and zinc were above the acceptance criteria. The higher values were used for assessment purposes. RPDs for laboratory duplicates were acceptable.

ACCURACY		
Field considerations	**Laboratory Considerations**	**Comments**
SOP appropriate and complied with.	Analysis of • field blanks • method blanks • matrix spikes • trip spike • surrogate spikes • Laboratory control samples.	Results were all within acceptable limits.

The QA/QC data reported by SGS and Envirolab Services laboratories for the documented soil and water samples were assessed to be of sufficient quality to be considered acceptable for the environmental assessment of EIS project E21171FK. The QA/QC data including the RPD results are considered to meet the Data Quality Objectives developed for this project.

8 COMMENTS AND RECOMMENDATIONS

The environmental site assessment undertaken for the proposed multi storey car park development at Liverpool Hospital, was designed to assess the suitability of the site for the proposed land use. The proposed development consists of a multi storey car park constructed on grade.

The site assessment included performance of a site inspection and soil/fill sampling was undertaken on the basis of relatively uniform exploration spacing across accessible area of the site. No sampling was undertaken beneath any of the buildings, the swimming pool or the tennis court.

The results of the laboratory tests on selected soils samples covered a range of contaminants commonly encountered in the Sydney region. All results were less than the appropriate Health Investigation Levels. No asbestos was detected in any of the samples.

The cadmium result for sample P3 (0.0m to 0.2m) was above the Ecological Investigation Levels (EILs) specified in the *National Environmental Protection* (*Assessment of Site Contamination*) Measure 1999 *(NEPC Guidelines).* These EILs are principally concerned with phytotoxicity (i.e. adverse effects on plant growth in established and proposed areas of landscaping) and are described in the *NEPC Guidelines* as *"somewhat arbitrary"*, as the effect of these compounds on plant growth will depend on the soil and plant type. This elevation is not considered significant as:

- There were no obvious signs of plant stress or vegetation die back on the site;
- The cadmium elevation did not extend to the deeper soil profile (the cadmium concentration in the sample P3 (0.7-0.95m) was less than the practical quantitation limit); and
- The multi-storey car park will extend across the area.

Additional TCLP analysis of the fill soils has indicated that for the purposes of off-site disposal, the fill soils are classified as 'inert' waste according to the criteria outlined in *NSW DECC (EPA) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes - 1999*. Any excess excavated soils should be disposed of to a suitable NSW DECC (EPA) licensed "inert" waste landfill. Should significant quantities of fill material require disposal, additional analysis including TCLP testing is recommended to confirm this classification. Tests should typically be undertaken on the basis of one sample per 500m^3 of fill to be disposed.

Groundwater was encountered in monitoring wells P4 and P6 at depths of approximately 8.5m. Monitoring well P8 was dry at the time of sampling. P4 and P6 were located down gradient of the underground storage tanks associated with the Central Energy Building. No elevated concentrations of TPH/BTEX or heavy metals were detected in either of the samples.

The investigation undertaken by EIS included the analysis of 16 soil samples for the presence of asbestos fibres using NATA accredited microscopic screening techniques. Asbestos, either apparent to the naked eye or apparent using microscopic techniques were not detected within the samples. The scope of work undertaken was designed to assess widespread surficial contamination and has not included an exhaustive assessment of the site for the presence of small scale asbestos contamination. EIS adopts no responsibility for small scale or buried asbestos features at the site which may be encountered during future earth or construction works at the site.

A Hazardous Building Materials Survey of the building and on-site structures should be undertaken prior to demolition. All hazardous building materials should be removed in accordance with consultants recommendations prior to demolition.

The boreholes drilled for the investigation have enabled an assessment to be made of the existence of significant, large quantities of contaminated soils. The conclusions based on this investigation are that, while major contamination of the site is not apparent, problems may be encountered with smaller scale features between boreholes. EIS adopts no responsibility whatsoever for any problems such as underground storage tanks, buried items or contaminated material that may be encountered between sampling locations at the site. The proposed construction activities at the site should be planned on this basis, and any unexpected problem areas that are encountered between boreholes should be immediately inspected by experienced environmental personnel. This should ensure that such problems are dealt with in an appropriate manner, with minimal disruption to the project timetable and budget.

During demolition works, the site should be inspected by experienced environmental personnel to assess any unexpected conditions or subsurface facilities that may be discovered between investigation locations. This should facilitate appropriate adjustment of the works programme and schedule in relation to the changed site conditions.

Based on the scope of work undertaken, the site is considered to be suitable for the proposed development.

9 LIMITATIONS

The conclusions developed in this report are based on site conditions which existed at the time of the site assessment. They are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, and visual observations of the site and vicinity, together with the interpretation of available historical information and documents reviewed as described in this 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.

Previous industrial 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.

During construction at the site, soil, fill and any unsuspected materials that are encountered should be monitored by qualified environmental and geotechnical engineers to confirm assumptions made on the basis of the limited investigation data, and possible changes in site level and other conditions since the investigation. Soil materials considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa.

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. Copyright in this report is the property of EIS. EIS has used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report.

Should you require any further information regarding the above, please do not hesitate to contact us.

Yours faithfully
For and on behalf of
ENVIRONMENTAL INVESTIGATION SERVICES

AJ Kingswell
Associate

E H Fletcher
Principal Engineer

ABBREVIATIONS

AAS	Atomic Absorption Spectrometry
ADWG	Australian Drinking Water Guidelines
AGST	Above Ground Storage Tank
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment Conservation Council
ASS	Acid Sulfate Soil
B(a)P	Benzo(a)pyrene
BH	Borehole
BTEX	Benzene, Toluene, Ethyl benzene, Xylene
COC	Chain of Custody documentation
CLM	Contaminated Land Management
DECC	Department of Environment and Climate Change (formerly DEC and EPA)
DNR	NSW Department of Natural Resources (now split between DWE and DECC)
DWE	NSW Department of Water and Energy
DP	Deposited Plan
DQO	Data Quality Objective
EC	Electrical Conductivity
EIL	Ecological Investigation Level
EPA NSW	Environment Protection Authority, New South Wales (now part of DECC)
GC-ECD	Gas Chromatograph-Electron Capture Detector
GC-FID	Gas Chromatograph-Flame Ionisation Detector
GC-MS	Gas Chromatograph-Mass Spectrometer
HIL	Health Based Investigation Level
HM	Heavy Metals
ICP-AES	Inductively Couple Plasma – Atomic Emission Spectra
NATA	National Association of Testing Authorities, Australia
NEPC.	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
OCPs	Organochlorine Pesticides
OHS (OH&S)	Occupational Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photo-ionisation Detector
PPIL	Provisional Phyto-toxicity Investigation Levels
PQL	Practical Quantitation Limit
P&T	Purge & Trap
RAP	Remedial Action Plan
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SEPP	State Environmental Planning Policy
sPOCAS	Suspension Peroxide Oxidation Combined Acidity and Sulfate
SPT	Standard Penetration Test
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TP	Test Pit
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WP	Work Plan

REFERENCE DOCUMENTS

- ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (and updates).
- ASSMAC (1998) (Acid Sulfate Soils Management Advisory Committee) Acid Sulfate Soil Manual.
- Australian Government, National Occupational Health and Safety Commission (2005) Code of Practice for the Safe Removal of Asbestos.
- Australian Government, National Occupational Health and Safety Commission (2005) Code of Practice for the Management and Control of Asbestos in Workplaces.
- Australian Petroleum Institute Code of Practice (CP22) Removal and Disposal of Underground Storage Tanks.
- Australian Standard (2004) Storage and Handling of Flammable and Combustible Liquids. AS1940-2004.
- DUAP/NSW EPA (1998) (now NSW Department of Planning / NSW Department of Environment and Climate Change (DECC) incorporating the EPA) Managing Land Contamination: Planning Guidelines SEPP 55 - Remediation of Land.
- Dutch Ministry of Housing, Spatial Planning and the Environment (1994) Environmental Quality Standards in the Netherlands.
- NEPM. (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPC. Guidelines).
- NSW EPA (1994) (now NSW DEC) Contaminated Sites: Guidelines for Assessing Service Station Sites.
- NSW EPA (1995) (now NSW DECC) Contaminated Sites: Sampling Design Guidelines.
- NSW EPA (1996) (now NSW DECC) Guidelines for Solid Waste Landfills.
- NSW EPA (1997) (now NSW DECC) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.
- NSW EPA (1998) (now DECC) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme.
- NSW EPA (1999) (now NSW DECC) Contaminated Sites: Guideline son Significant Risk of Harm and the Duty to Report.
- NSW EPA (1999) (now NSW DECC) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes.
- NSW Legislation (1948) Rivers and Foreshores Improvement Act.
- NSW Legislation (1975) Dangerous Goods Act.
- NSW Legislation (1994) Environmental Planning and Assessment Act (EP&AA) and associated Regulations.
- NSW Legislation (1997) Contaminated Land Management Act.
- NSW Legislation (1997) Protection of the Environment Operations Act No156 which includes Schedule 2 of the Clean Waters Regulations 1972 made under the Clean Waters Act (1970).
- NSW Legislation (2000) Occupational Health and Safety Act.
- NSW Regulation (2001) Occupation Health and Safety Regulation.
- NSW Regulation (1999) Abandoning Underground Storage Tanks for Flammable and Combustible Liquids (Ref: DG310 October 1999).
- NSW WorkCover (2003) Your Guide to Working With Asbestos: Safety Guidelines and Requirements for Work Involving Asbestos.
- NSW WorkCover Code of Practice (2005) Storage and Handling of Dangerous Goods.
- US EPA (2004) Region 9 Preliminary Remediation Goals.

TABLE A-1
ENVIRONMENTAL AND HEALTH-BASED SOIL INVESTIGATION LEVELS (mg/kg)

Substances	Health Investigation Levels (HILs)[1]				Interim Urban Ecological Investigation Levels (EILs)[1]	NSW EPA Guidelines for Assessing Service Station Sites[2]	Back-ground Ranges[1]
	A	D	E	F			
	'Standard' residential with garden/ accessible soil (home-grown produce contributing less than 10% of vegetable and fruit intake; no poultry); includes children's day-care centres, kindergartens, preschools and primary schools	Residential with minimal opportunities for soil access: includes dwellings with fully and permanently paved yard space such as high-rise apartments and flats	Parks, recreational open space and playing fields: includes secondary schools	Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites			
METALS/METALLOIDS							
Arsenic (total)	100	400	200	500	20		1-50
Barium					300		100-3000
Beryllium	20	80	40	100			
Cadmium	20	80	40	100	3		1
Chromium(III)	12%	48%	24%	60%	400		
Chromium(VI)	100	400	200	500	1		
Chromium (total)							5-1000
Cobalt	100	400	200	500			1-40
Copper	1000	4000	2000	5000	100		2-100
Lead	300	1200	600	1500	600		2-200
Manganese	1500	6000	3000	7500	500		850
Methyl mercury	10	40	20	50			
Mercury (inorganic)	15	60	30	75	1		0.03
Nickel	600	2400	600	3000	60		5-500
Vanadium					50		20-500
Zinc	7000	28000	14000	35000	200		10-300
ORGANICS							
Aldrin + Dieldrin	10	40	20	50			
Chlordane	50	200	100	250			
DDT + DDD + DDE	200	800	400	1000			
Heptachlor	10	40	20	50			
Polycyclic aromatic hydrocarbons (PAHs)	20	80	40	100			
Benzo(a)pyrene	1	4	2	5			
Phenol	8500	34000	17000	42500			
PCBs (total)	10	40	20	50			
Petroleum Hydrocarbon Components (constituents):							
>C16 - C35 Aromatics	90	360	180	450			
>C16 - C35 Aliphatics	5600	22400	11200	28000			
>C35 Aliphatics	56000	224000	112000	280000			
C6-C9						65	
C10-C40						1000	
Benzene						1	
Toluene						1.4	
Ethyl Benzene						3.1	
Total Xylenes						14	
OTHER							
Boron	3000	12000	6000	15000			
Cyanides (complexed)	500	2000	1000	2500			
Cyanides (free)	250	1000	500	1250			
Phosphorus					2000		
Sulfur					600		
Sulfate					2000		

Reference should be made to the following guidelines for further details (as referenced in the above table):

1 National Environment Protection (Assessment of Site Contamination) Measure - 1999, National Environment Protection Council. Human exposure settings based on land use have been established for HILs and details are outlined in Taylor and Langley 1998.

2 NSW DECC (formerly EPA) Guidelines for Assessing Service station Sites - 1994.

Ref: NEPM Guidelines – June 2007

TABLE A - 2

CHEMICAL CONTAMINANT CRITERIA FOR WASTE CLASSIFICATION

ENVIRONMENTAL GUIDELINES: ASSESSMENT, CLASSIFICATION AND MANAGEMENT OF LIQUID AND NON-LIQUID WASTES - NSW EPA* 1999

INERT WASTE	SOLID WASTE	INDUSTRIAL WASTE	HAZARDOUS WASTE
IF SCC ≤ CT1, TCLP NOT NEEDED	IF SCC ≤ CT2, TCLP NOT NEEDED	IF SCC ≤ CT3, TCLP NOT NEEDED	IF TCLP > TCLP3 STORE OR TREAT AS APPROPRIATE
IF TCLP ≤ TCLP1 AND SCC ≤ SCC1 TREAT AS INERT WASTE	IF TCLP1 < TCLP ≤ TCLP2 AND SCC ≤ SCC2 TREAT AS SOLID WASTE	IF TCLP2 < TCLP ≤ TCLP3 AND SCC ≤ SCC3 OR IF TCLP ≤ TCLP3 AND SCC2 < SCC ≤ SCC3 TREAT AS INDUSTRIAL WASTE	
IF TCLP ≤ TCLP1 AND SCC > SCC1, IMMOBILISE (EPA APPROVED METHOD) OR RECLASSIFY WASTE	IF TCLP1 < TCLP ≤ TCLP2 AND SCC > SCC2, IMMOBILISE (EPA APPROVED METHOD) OR RECLASSIFY WASTE	IF TCLP2 < TCLP ≤ TCLP3 AND SCC > SCC3, IMMOBILISE (EPA APPROVED METHOD) OR RECLASSIFY WASTE	IF TCLP ≤ TCLP3 AND SCC > SCC3 AND IMMOBILISATION NOT EPA APPROVED, STORE OF TREAT WASTE AS APPROPRIATE

	INERT WASTE			SOLID WASTE			INDUSTRIAL WASTE		
CONTAMINANT	CT1 (mg/kg)	TCLP1 (mg/L)	SCC1 (mg/kg)	CT2 (mg/kg)	TCLP2 (mg/L)	SCC2 (mg/kg)	CT3 (mg/kg)	TCLP3 (mg/L)	SCC3 (mg/kg)
Arsenic	10	0.5	500	100	5[3]	500	400	20	2,000
Beryllium	2	0.1	100	20	1.0[10]	100	80	4	400
Cadmium	2	0.1	100	20	1.0[3]	100	80	4	400
Chromium (total)[5]	10	0.5	1,900	100	5[3]	1,900	400	20	7,600
Cyanide (total)[6]	32[2]	1.6	5,900	320	16	5,900	1280	64	23,600
Cyanide (Amenable)[6,8]	7[7]	0.35	300	70	3.5	300	280	14	1,200
Fluoride	300	15	10,000	3,000	150[4]	10,000	12,000	600	40,000
Lead	10	0.5	1,500	100	5[3]	1,500	400	20	6,000
Mercury	0.4	0.02	50	4	0.2[3]	50	16	0.8	200
Molybdenum	10	0.5	1,000	100	5[4]	1,000	400	20	4,000
Nickel	4	0.2	1,050	40	2[4]	1,050	160	8	4,200
Selenium	2	0.1	50	20	1[3]	50	80	4	200
Silver	10	0.5	180	100	5.0[3]	180	400	20	720
Benzene	1.0	0.05	18	10	0.5[3]	18	40	2	72
Toluene	28.8	1.44	518	288	14.4[3]	518	1,152	57.6	2,073
Ethylbenzene	60	3	1,080	600	30[6]	1,080	2,400	120	4,320
Total xylenes	100	5	1,800	1,000	50[14]	1,800	4,000	200	7,200
Total petroleum hydrocarbons (C6-C9)[11,13]	-	-	650	-	-	650	-	-	2,600
Total petroleum hydrocarbons (C10-C36)[11,13] (C10-C14, C15-C28, C29-C36)	-	-	5,000	-	-	10,000	-	-	40,000
Benzo(a)pyrene[4]	0.08	0.004	1	0.8	0.04[5]	10	3.2	0.16	23
Polycyclic aromatic hydrocarbons (Total)[4,11,12]	-	-	200	-	-	200	-	-	800
Polychlorinated biphenyls[8]	-	-	2	-	-	<50	-	-	<50
Phenol (nonhalogenated)	28.8	1.44	518	288	14.4[13]	518	1,152	57.6	2,073
Scheduled chemicals[7,8]	-	-	1	-	-	<50	-	-	<50

* NSW EPA is now a unit with the NSW Department of Environment and Climate Change

Ref: WasteClass.doc
June 2007

TABLE A - 3
SUMMARY ORGANIC AND INORGANIC GROUNDWATER CONTAMINANT GUIDELINE LEVELS[6]

ANALYTE		Drinking Water[1]	ANZECC 2000 95% Values[2]		NSW EPA Service Stations[3]		
			Fresh Water	Marine Water	Health Based	Fresh Water	Marine Water
Arsenic (As) (As III)		0.007	0.024	0.0023	-	-	-
Cadmium (Cd)		0.002	0.0002	0.0055	-	-	-
Chromium (Cr) (Hexavalent)		0.05	0.001	0.0044	-	-	-
Copper (Cu)		2.0	0.0014	0.0013	-	-	-
Iron (Fe) (Filtrable)		0.3	1.0	-	-	-	-
Lead (Pb)		0.01	0.0034	0.0044	0.01	0.001-0.005	0.005
Mercury (Hg) - inorganic		0.001	0.0006	0.08	-	-	-
Nickel (Ni)		0.02	0.011	0.07	-	-	-
Zinc (Zn)		3	0.008	0.015	-	-	-
BTEX	Benzene	0.001	0.95	0.7	0.01	0.3	0.3
	Toluene	0.8	0.18	0.18	0.8	0.3	-
	Ethyl Benzene	0.3	0.08	0.005	0.3	0.14	-
	o-Xylene	-	0.35	0.35	-	-	-
	m+*p*-Xylene	-	0.03	0.03	-	-	-
	Total Xylenes	0.6	-	-	0.6	0.38	0.38
Polycyclic Aromatic Hydrocarbons	Naphthalene	-	0.016	0.07	-	-	-
	Anthracene	-	0.0004	0.0004	-	-	-
	Phenanthrene	-	0.002	0.002	-	-	-
	Fluoranthrene	-	0.0014	0.0014	-	-	-
	Benzo(a)pyrene	0.00001	0.0002	0.0002	0.00001	-	-
	Total PAHs	-	-	-	-	0.003	0.003
Total Phenol			0.32	0.52	0.002	0.05	0.05
PCB – Aroclor 1242		-	0.0006	-	-	-	-
PCB – Aroclor 1254		-	0.00003	-	-	-	-
Organochlorine Pesticides	Aldrin	0.00001	0.000001	0.000003	-	-	-
	Dieldrin	0.00001	0.00001	0.00001	-	-	-
	Chlordane	0.00001	0.00008	-	-	-	-
	DDT	0.00006	0.00001	-	-	-	-
	Endosulfan	0.00005	0.0002	0.00001	-	-	-
	Endrin	-	0.00002	0.0000008	-	-	-
	Heptachlor	0.00005	0.00009	0.0000004	-	-	-
	Lindane	0.00005	0.00002	0.000007	-	-	-
	Methoxychlor	0.0002	0.000005	0.000004	-	-	-
	Total	-	-	-	-	-	-
pH		6.5-8.5	6.5-8.5[4]	7-8.5[5]	-	-	-
Sulphate (SO_4)		500	-	-	-	-	-
Fluoride (F)		1.5	-	-	-	-	-
Chloride (Cl)		250	-	-	-	-	-
Nitrate (as N)			0.7	0.7	-	-	-

Notes:

-	No set guideline concentration
1	NHMRC / ARMCANZ Australian Drinking Water Guidelines (1996)
2	ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters, 2000 – Trigger values for protection of 95% of species
3	NSW EPA (now DECC) Guidelines for Assessing Service Station Sites 1994
4	ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters, 2000 – Level for NSW Lowland Rivers
5	ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters, 2000 – Level for South-east Australian estuaries
6	All concentrations expressed in milligrams per litre (mg/L)

TABLE B
SUMMARY OF LABORATORY TEST DATA
HEAVY METALS - SOILS

All data in mg/kg unless stated otherwise

ANALYTE	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
PQL - Envirolab Services	4.0	1.0	1.0	1.0	1.0	0.1	1.0	1.0
Guideline concentration-HIL *	500	100	60%	5000	1500	75	3000	35000
Guideline concentration -EIL *	20	3	400	100	600	1	60	200
SAMPLE (Depth in metres)								
B4 (0.0-0.3)	LPQL	LPQL	18	3.8	21	LPQL	5.6	15
P1 (0.0-0.2)	LPQL	LPQL	14	12	28	LPQL	7.3	32
P1 (0.7-0.95)	LPQL	LPQL	13	8.9	43	0.11	5.6	20
P1 (1.3-1.5)	LPQL	LPQL	8.7	23	70	LPQL	6.8	200
P2 (0.0-0.2)	4.6	LPQL	15	49	32	0.15	11	56
P3 (0.0-0.2)	13	***8.7***	22	23	34	LPQL	14	33
P3 (0.7-0.95)	LPQL	LPQL	13	15	25	LPQL	5.6	24
P3 (1.7-1.95) ++	5.6	LPQL	23	6.6	31	LPQL	3	7.2
P4 (0.0-0.3)	LPQL	LPQL	14	6.8	67	LPQL	8.5	51
P4 (0.7-0.95)	LPQL	LPQL	23	6.3	29	LPQL	8.3	24
P5 (0.0-0.2)	LPQL	LPQL	12	3.9	20	LPQL	4.7	9.8
P6 (0.0-0.2)	4.7	LPQL	19	6.8	29	LPQL	7	17
P7 (0.0-0.2)	6.7	LPQL	23	15	40	LPQL	9.7	42
P8 (0.0-0.2)	LPQL	LPQL	11	10	29	0.12	5.7	24
P9 (0.0-0.2)	6.6	LPQL	16	13	42	0.15	6.4	43
P9 (0.7-0.95)	LPQL	LPQL	14	14	25	0.12	5.4	23
Total no. of samples	16	16	16	16	16	16	16	16
Maximum Value	13	8.7	23	49	70	0.15	14	200
Mean Value	4	9	16	14	36	0	7	41
Standard Deviation	3.1	-	4.4	11.4	15.0	0.0	2.5	46.0
Coefficient of Variation	0.8	-	0.3	0.8	0.4	0.5	0.3	1.1
Upper Level 95% Confidence Limit on Mean Value	5	1	18	19	42	0	9	62

EXPLANATION:

*: National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC Guidelines)
HIL - Column F, Commercial/Industrial
EIL - Interim Urban Ecological Investigation Levels (EILs)

** Natural soil sample, excluded from statistical analysis

Concentration above HIL	**100**
Concentration above EIL	***100***

PQL: Practical Quantitation Limit
LPQL: Less than PQL
NA: Not Analysed

NOTE: Statistical analysis only shown where appropriate.

TABLE C
SUMMARY OF LABORATORY TEST DATA
ORGANICS - SOILS
All data in mg/kg unless stated otherwise

ORGANICS	Total PAHs	B(a)P	Aldrin and Dieldrin	Chlordane	DDT & DDD & DDE	Heptachlor	PCBs
PQL - Envirolab	-	0.05	0.1	0.1	0.1	0.1	0.1
Guideline concentration *	100	5	50	250	1000	50	50
SAMPLE (Depth in metres)							
B4 (0.0-0.3)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P1 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P1 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P1 (1.3-1.5)	7.3	0.5	LPQL	LPQL	LPQL	LPQL	LPQL
P2 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P3 (0.0-0.2)	0.25	0.05	LPQL	LPQL	LPQL	LPQL	LPQL
P3 (0.7-0.95)	0.89	0.09	LPQL	LPQL	LPQL	LPQL	LPQL
P3 (1.7-1.95) ++	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P4 (0.0-0.3)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P4 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P5 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P6 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P7 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P8 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
P9 (0.0-0.2)	4.4	0.4	LPQL	LPQL	LPQL	LPQL	LPQL
P9 (0.7-0.95)	1.48	0.08	LPQL	LPQL	LPQL	LPQL	LPQL
Total no. of samples	16	16	16	16	16	16	16
Maximum Value	7.3	0.5	0	0	0	0	0
Mean Value	2.86	0.22	-	-	-	-	-
Standard Deviation	2.94	0.21	-	-	-	-	-
Coefficient of Variation	1.03	0.94	-	-	-	-	-
Upper Level 95% Confidence Limit on Mean Value	6	0.4	-	-	-	-	-

EXPLANATION:

*: National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC Guidelines)
Column F, Commercial/Industrial

** Natural soil sample, excluded from statistical analysis

Concentration above guideline level ☐

ABBREVIATIONS:

PCBs: Polychlorinated Biphenyls
PAH: Polycyclic aromatic hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL

TABLE D
SUMMARY OF LABORATORY TEST DATA
PETROLEUM HYDROCARBONS - SOIL
All data in mg/kg unless stated otherwise

	PETROLEUM HYDROCARBONS								
	Total Petroleum Hydrocarbons				Benzene	Toluene	Ethyl Benzene	Total Xylenes	PID Reading
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}					
PQL - Envirolab	25	100	100	100	1.0	1.0	1.0	3.0	
Guideline concentration *	65	1000			1	1.4	3.1	14	
SAMPLE (Depth in metres)									
B4 (0.0-0.3)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P1 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P1 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P1 (1.3-1.5)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P2 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P3 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P3 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P3 (1.7-1.95) ++	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P4 (0.0-0.3)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P4 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P5 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P6 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P7 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P8 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P9 (0.0-0.2)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
P9 (0.7-0.95)	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
Total no. of samples	16	16	16	16	16	16	16	16	
Maximum Value	0	0	0	0	0	0	0	0	

EXPLANATION:
* EPA Guidelines for Assessing Service Station Sites - 1994

** Natural soil sample, excluded from statistical analysis

Concentration above Guideline Level ☐
PQL: Practical Quantitation Limit
LPQL: - Less than Practical QuantitationLimit
NOTE: Statistical analysis only shown where appropriate

TABLE E
SUMMARY OF LABORATORY TEST DATA
ASBESTOS IN SOIL

ANALYTE	Asbestos Identification
Reporting limit	0.1g/kg
SAMPLE (Depth in metres)	
B4 (0.0-0.3)	No asbestos detected
P1 (0.0-0.2)	No asbestos detected
P1 (0.7-0.95)	No asbestos detected
P1 (1.3-1.5)	No asbestos detected
P2 (0.0-0.2)	No asbestos detected
P3 (0.0-0.2)	No asbestos detected
P3 (0.7-0.95)	No asbestos detected
P3 (1.7-1.95) ++	No asbestos detected
P4 (0.0-0.3)	No asbestos detected
P4 (0.7-0.95)	No asbestos detected
P5 (0.0-0.2)	No asbestos detected
P6 (0.0-0.2)	No asbestos detected
P7 (0.0-0.2)	No asbestos detected
P8 (0.0-0.2)	No asbestos detected
P9 (0.0-0.2)	No asbestos detected
P9 (0.7-0.95)	No asbestos detected

PQL - Practical Quantitation Limit
++ natural soil sample

TABLE F
SUMMARY OF LABORATORY TEST DATA
TOXICITY CHARACTERISTICS LEACHING PROCEDURE (TCLP)

All data in mg/L unless stated otherwise

ANALYTE	Cd	Cr	Pb	Ni	B(a)P
PQL - Envirolab	0.01	0.01	0.03	0.04	0.001
Guideline concentration * TCLP1 Inert	0.1	0.5	0.5	0.2	0.004
Guideline concentration *TCLP2 Solid	1	5	5	2	0.04
Guideline concentration * TCLP3 Industrial	4	20	20	8	0.16
SAMPLE					
P1 0-0.2m	na	<0.01	<0.03	0.02	<0.001
P1 1.3-1.5m	na	na	0.09	0.02	<0.001
P3 0-0.2m	<0.01	<0.01	<0.03	<0.02	<0.001
P3 0.7-0.95m	na	<0.01	<0.03	0.02	<0.001
P9 0-0.2m	na	<0.01	<0.03	<0.02	<0.001
Total no. of samples	5	5	5	5	5
Maximum Value	0	0	0.09	0.02	0

EXPLANATION:

* Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid wastes (NSW EPA 1999)

Further reference should be made to Table A-2 for waste classification criteria

Value above guideline level ▨

NOTE: Statistical analysis only shown where appropriate

TABLE G
QA/QC - RELATIVE PERCENTAGE DIFFERENCES

SAMPLE	ANALYSIS	INITIAL (mg/kg)	REPEAT (mg/kg)	MEAN (mg/kg)	RPD %
Intra-laboratory Soil P6 (0.0-0.2) = DUP1	Arsenic	4.7	4.5	4.6	4
	Cadmium	LPQL	LPQL	nc	nc
	Chromium	19	18	18.5	5
	Copper	6.8	4.8	5.8	34
	Lead	29	26	27.5	11
	Mercury	LPQL	LPQL	nc	nc
	Nickel	7	6.3	6.65	11
	Zinc	17	14	15.5	19
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc
Intra-laboratory Soil P5 (0.0-0.2) = DUP2	Arsenic	LPQL	LPQL	nc	nc
	Cadmium	LPQL	LPQL	nc	nc
	Chromium	12	7.6	9.8	45
	Copper	3.9	3.8	3.85	3
	Lead	20	20	20	0
	Mercury	LPQL	LPQL	nc	nc
	Nickel	4.7	3.5	4.1	29
	Zinc	9.8	8.3	9.05	17
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc
Inter -laboratory soil P4 (0-0.3m) Dup5	Arsenic	LPQL	3	nc	nc
	Cadmium	LPQL	0.2	nc	nc
	Chromium	14	11	12.5	24
	Copper	6.8	4.7	5.75	37
	Lead	67	37	52	58
	Mercury	LPQL	<0.05	nc	nc
	Nickel	8.5	4.1	6.3	70
	Zinc	51	25	38	68
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc
Inter -laboratory soil P9 (0-0.2m) Dup4	Arsenic	6.6	5	5.8	28
	Cadmium	LPQL	0.2	nc	nc
	Chromium	16	11	13.5	37
	Copper	13	12	12.5	8
	Lead	42	42	42	0
	Mercury	0.15	0.15	0.15	0
	Nickel	6.4	4.2	5.3	42
	Zinc	43	44	43.5	2
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc
Intra-laboratory Water Dup1 =P6	Arsenic	0.003	0.003	0.003	0
	Cadmium	LPQL	LPQL	nc	nc
	Chromium	LPQL	LPQL	nc	nc
	Copper	LPQL	LPQL	nc	nc
	Lead	LPQL	LPQL	nc	nc
	Mercury	LPQL	LPQL	nc	nc
	Nickel	0.008	0.009	0.0085	12
	Zinc	0.03	0.039	0.0345	26
	C_6-C_9 TPH	LPQL	LPQL	nc	nc
	C_{10}-C_{14} TPH	LPQL	LPQL	nc	nc
	C_{15}-C_{28} TPH	LPQL	LPQL	nc	nc
	C_{29}-C_{36} TPH	LPQL	LPQL	nc	nc
	Benzene	LPQL	LPQL	nc	nc
	Toluene	LPQL	LPQL	nc	nc
	Ethylbenzene	LPQL	LPQL	nc	nc
	Total Xylenes	LPQL	LPQL	nc	nc

Explanation

RPD : Relative Percentage Difference
nc : Not calculated

TABLE H
QA/QC - FIELD BLANKS, SPIKES AND RINSATES

SAMPLE	ANALYSIS	RESULT
		mg/Kg
Field blank Rpt 10936 FB1	Arsenic	<4.0
	Cadmium	<1.0
	Chromium	4.7
	Copper	1.1
	Lead	2.9
	Mercury	<0.1
	Nickel	<1.0
	Zinc	<1.0
	C_6-C_9 TPH	LPQL
	C_{10}-C_{14} TPH	LPQL
	C_{15}-C_{28} TPH	LPQL
	C_{29}-C_{36} TPH	LPQL
	Benzene	LPQL
	Toluene	LPQL
	Ethylbenzene	LPQL
	Total Xylenes	LPQL
Rinsate Rpt 10936 R1		mg/L
	Benzene	LPQL
	Toluene	LPQL
	Ethylbenzene	LPQL
	Total Xylenes	LPQL
Field blank Rpt 11398 FB		mg/L
	C_6-C_9 TPH	LPQL
	C_{10}-C_{14} TPH	LPQL
	C_{15}-C_{28} TPH	LPQL
	C_{29}-C_{36} TPH	LPQL
	Benzene	LPQL
	Toluene	LPQL
	Ethylbenzene	LPQL
	Total Xylenes	LPQL
Trip spike		%age
	Benzene	78
	Toluene	83
	Ethylbenzene	76
	m+p xylenes	74
	o-xylene	76

Explanation

RPD : Relative Percentage Difference
nc : Not calculated

TABLE I
GROUNDWATER MONITORING ANALYSIS
All results in mg/L unless stated otherwise.

Contaminant	PQL Envirolab	Guideline Concentration		SAMPLES	
		ANZECC 2000	Drinking Water	P4	P6
pH	-		6.5-8.5	-	6.6
TDS				-	8400
Conductivity (µS/cm)	1.0			-	14,000
Arsenic (As III)	0.001	0.024	0.007	0.003	0.003
Cadmium	0.0001	0.0002	0.002	LPQL	LPQL
Chromium	0.001	0.001	0.05	LPQL	LPQL
Copper	0.001	0.0014	2.0	LPQL	LPQL
Lead	0.001	0.0034	0.3	LPQL	LPQL
Mercury	0.0001	0.0006	0.001	LPQL	LPQL
Nickel	0.001	0.011	0.02	0.008	0.008
Zinc	0.001	0.008	3.0	0.021	0.03
Hydrocarbons C6-C9	0.01	nsl	nsl	LPQL	LPQL
Hydrocarbons C10-C14	0.05	0.6**		LPQL	LPQL
Hydrocarbons C15-C28	0.1				
Hydrocarbons C29-C36	0.1				
Benzene	0.001	0.95	0.001	LPQL	LPQL
Toluene	0.001	0.18	0.8	LPQL	LPQL
Ethyl Benzene	0.001	0.08	0.3	LPQL	LPQL
Total xylenes	0.003	0.35	0.6	LPQL	LPQL
o-xylene	0.001	0.03	NSL	LPQL	LPQL
m+p-xylene	0.002		NSL	LPQL	LPQL

EXPLANATION:
NA : Not Analysed
NSL : No set limit

* Trigger value for protection of 95% of freshwater species.
Australian and New Zealand Guidelines for Fresh and Marine Water Quality,
Australian and New Zealand Environment and Conservation Council 2000.
** Dutch Intervention Value for mineral oil, Environmental Quality Standards in the Netherlands (1999).

Concentration above guideline level ☐
nsl - No set limit

TABLE J-1
SUMMARY OF SOIL SAMPLE LABORATORY ANALYSIS SCHEDULE

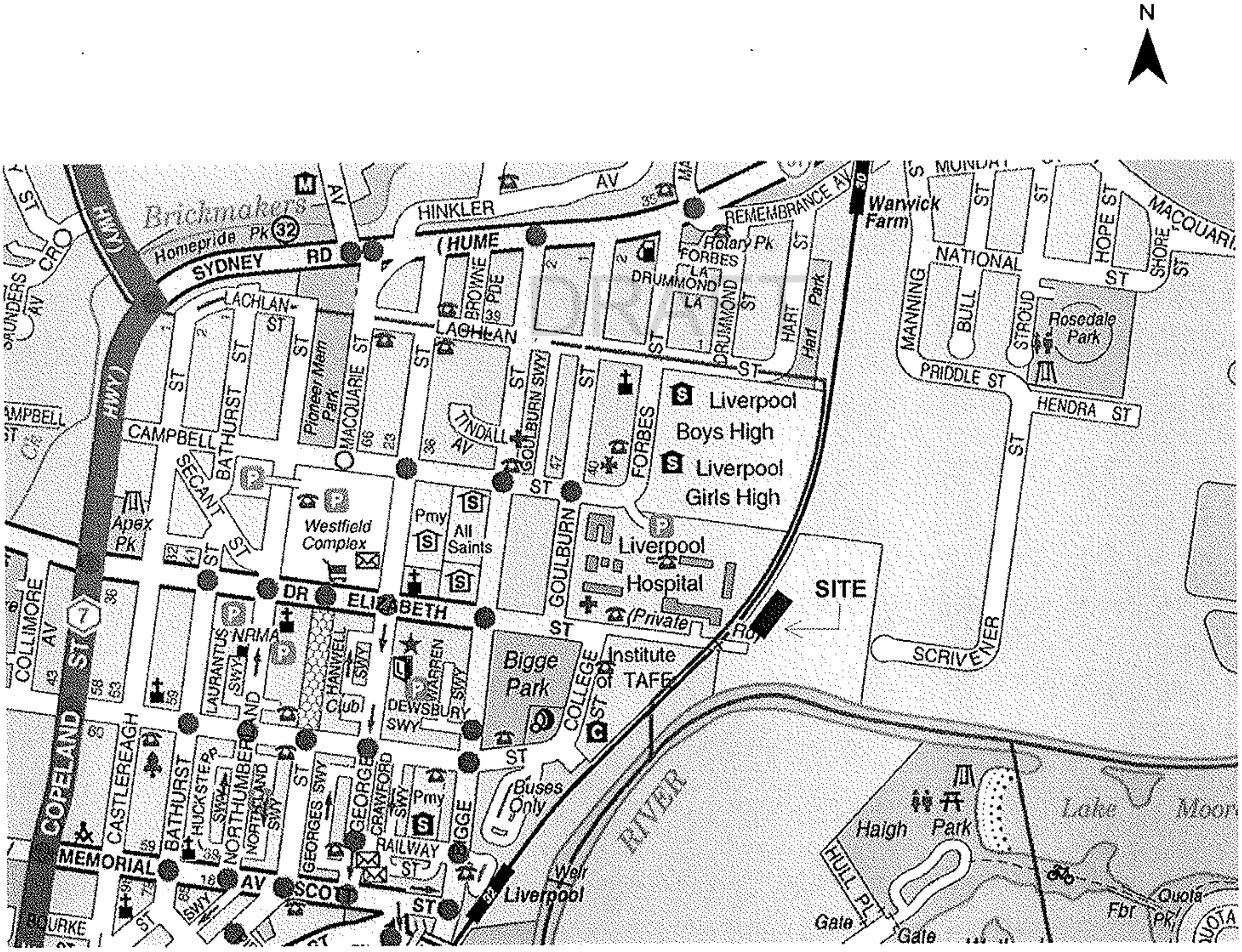
Borehole	Date Drilled	Depth (metres)	Matrix	Analyses Undertaken								Laboratory Batch Reference
				Metals	TPH/BTEX	PAH	OC/PCB	VOC	Asbestos	POCAS	TCLP	
P1	30/04/07	0-0.2	Fill	1	1	1	1		1		1	Envirolab 10936 P&R 50315
		0.7-0.95	Fill	1	1	1	1		1			
		1.3-1.5	Fill	1	1	1	1		1		1	Envirolab 10936-A
P2	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P3	30/04/07	0-0.2	Fill	1	1	1	1		1		1	Envirolab 10936 P&R 50315
		0.7-0.95	Fill	1	1	1	1		1		1	
		1.7-1.95	Natural	1	1	1	1		1			Envirolab 10936-A
P4	30/04/07	0-0.3	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
		0.7-0.95	Fill	1	1	1	1		1			
P5	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P6	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P7	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P8	30/04/07	0-0.2	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
P9	30/04/07	0-0.2	Fill	1	1	1	1		1		1	Envirolab 10936 P&R 50315
		0.7-0.95		1	1	1	1		1			
												Envirolab 10936-A
B4	30/04/07	0-0.3	Fill	1	1	1	1		1			Envirolab 10936 P&R 50315
Totals				16	16	16	16	0	16	0	5	

TABLE J-2
SUMMARY OF WATER SAMPLE LABORATORY ANALYSIS SCHEDULE

Borehole	Date Sampled	Matrix	Analyses Undertaken					Laboratory Batch
			Metals	TPH	BTEX	pH/EC	TDS	
P4	17/05/07	water	1		1			11398
P6	17/05/07	water	1	1	1	1	1	11398
Totals			2	1	2	1	1	

TABLE K
SUMMARY OF FIELD QA/QC ANALYSES

Sample ID	Date	Sample Type	Matrix	Analyses Undertaken				Laboratory Batch
				Metals	TPH	BTEX	PAH	
FB1	30/04/07	Field Blank	Sand	1	1	1		Env 10936
FB	17/05/07	Field Blank	Sand		1	1		Env 11398
DUP1 & P6 (0.0-0.2)	30/04/07	Intra lab dup	fill	1	1	1		Env 10936
DUP2 & P5 (0.0-0.2)	30/04/07	Intra lab dup	fill	1	1	1		Env 10936
DUP1 & P6	17/05/07	Intra lab dup	Water	1		1		Env 11398
R1	30/04/07	Rinsate	water					Env 10936
DUP4 P9 (0-0.2m)	30/04/07	Inter lab dup	Fill	1	1	1		SGS 52354
DUP5 P4 (0-0.3m)	30/04/07	Inter lab dup	Fill	1	1	1		SGS 52354
Trip Spike	17/05/07	Trip spike	water			1		Env 11398
Totals				6	6	8	0	



SITE LOCATION PLAN

Proposed Multi-Storey Car Park

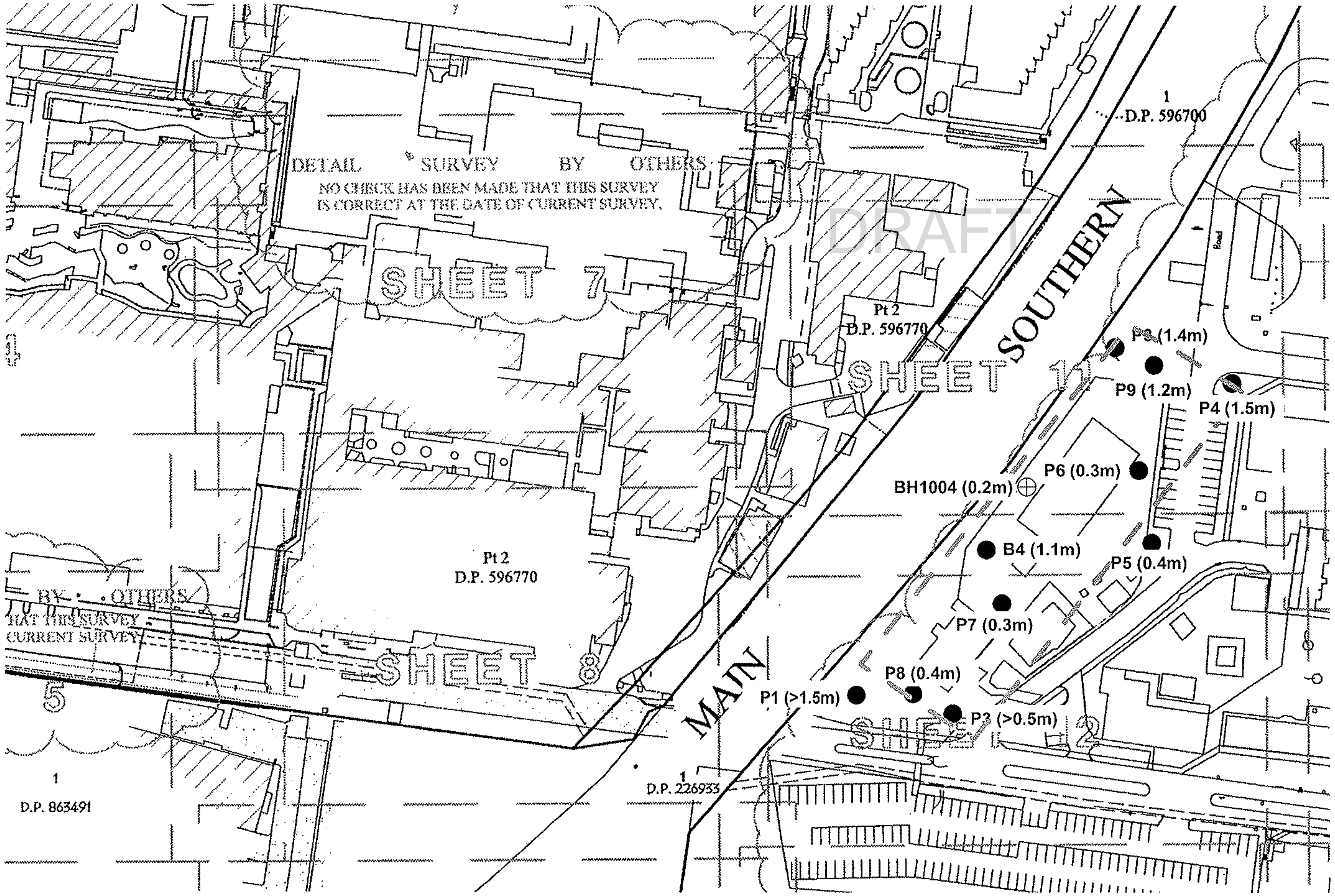
Liverpool Hospital, Elizabeth Street, Liverpool

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

EIS

ENVIRONMENTAL INVESTIGATION SERVICES

Job No:	E21171FK
Figure:	2



N

LEGEND

⊕	Borehole location (2006 investigation)
●	Borehole location (2007 investigation)
P6 (0.3m)	Borehole number and depth of fill
▨	Approximate footprint of proposed multi-storey car park.

Scale (m)

0 20 40 60 80 100

Note: *Reference should be made to the text of the report for a full description of this plan.*

BOREHOLE LOCATION PLAN
Proposed Multi-Storey Car Park
Liverpool Hospital, Elizabeth Street, Liverpool

ENVIRONMENTAL INVESTIGATION SERVICES

Job No: E21171FK
Figure: 2

APPENDIX A

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
B4
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0	▩		FILL: Silty clay, medium to high plasticity, brown, with a trace of fine to medium grained sand, root fibres, coal, igneous and ironstone gravel.	MC<PL			GRASS COVER
	■				N = 11 5,5,6		▩		FILL: Silty clay, medium to high plasticity, brown mottled grey, with a trace of coal.				
					N = 19 5,9,10	1	▨	CL-CH	SILTY CLAY: medium to high plasticity, red mottled grey, with ironstone gravel.	-	St	-	
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES
CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P1
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION	■		■			0	▨		FILL: Silty clay, low to medium plasticity, brown, with fine to medium grained sand, with a trace of igneous gravel.	MC<PL			GRASS COVER
	■				N = 7 2,3,4		▨		FILL: Silty clay, medium to high plasticity, brown, with a trace of fine to medium grained sand and coal.	MC<PL			
	■					1	▨		FILL: Silty sand, fine to medium grained, grey brown, with a trace of coal.	W			
						2 3 4 5 6 7			END OF BOREHOLE AT 1.5m				AUGER REFUSAL

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P2
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION	■		■			0	▨		FILL: Silty clay, low to medium plasticity, brown, with fine to medium grained sand, and a trace of igneous and sandstone gravel, root fibres and coal.	MC<PL			GRASS COVER
									END OF BOREHOLE AT 0.5m				
						1							
						2							
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P3
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Date: 30-4-07

Method: SPIRAL AUGER
JK300

R.L. Surface: N/A

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION	■		■			0	▨		FILL: Silty clay, medium to high plasticity, brown, with fine to medium grained sand, igneous and sandstone gravel and root fibres.	MC<PL			GRASS COVER
	■				N = 13 3,7,6	1	▨		as above, but no root fibres.				
	■				N = 15 5,7,8		▧	CL-CH	SILTY CLAY: medium to high plasticity, red mottled grey.	MC<PL	(VSt)	-	
						2 3 4 5 6 7			END OF BOREHOLE AT 1.95m				

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P4
1/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Date: 30-4-07

Method: SPIRAL AUGER
JK300

R.L. Surface: N/A

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty clay, medium to high plasticity, brown, with fine to medium grained sand, a trace of root fibres and coal.	MC<PL			GRASS COVER
					N = 5 1,2,3				as above, but with a trace of igneous gravel.				
						1							
					N = 17 5,8,9			CL-CH	SILTY CLAY: medium to high plasticity, red mottled grey brown.	MC<PL	(VSt)	-	
						2							
						3							
								SC	SILTY CLAYEY SAND: fine to medium grained, brown.	M	(F)		
						4							
						5							
								SM	SILTY SAND: fine to medium grained, brown.				
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES
CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No. **P4**
2/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
								SM	SILTY SAND: fine to medium grained, brown.	M			
						8							
▼ AFTER 18 DAYS													
						9			END OF BOREHOLE AT 9.0m				MONITORING WELL INSTALLED TO 9m, CLASS 18 SLOTTED PVC FROM 9m TO 3m, CASING FROM 3m TO SURFACE, 2mm SAND FILTER PACK FROM 9m TO 3m, BENTONITE SEAL FROM 3m TO 2.6m BACKFILLED WITH SAND (AND/ OR CUTTINGS) TO SURFACE AND COMPLETED WITH A STEEL GATIC COVER AND LOCKABLE CAP
						10							
						11							
						12							
						13							
						14							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P5
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0	▩		FILL: Silty clay, low to medium plasticity, brown, with a trace of slag, coal and root fibres.	MC≈PL			GRASS COVER
	■				N = 5 1,2,3		▨	CL	SILTY CLAY: low to medium plasticity, brown, with root fibres.	MC≈PL	(F)	-	
	■				N = 13 3,5,8	1	▨		as above, but red mottled grey, with ironstone gravel.				
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P6
1/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
Logged/Checked by: V.B./
R.L. Surface: N/A
Datum:

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0			FILL: Silty clay, medium plasticity, brown, with a trace of root fibres and coal.	MC>PL			GRASS COVER
								CL-CH	SILTY CLAY: medium to high plasticity, brown mottled grey.	MC<PL	(F)	-	
	■				N = 6 2,3,3								
						1							
									as above, but red mottled grey.		(VSt)		
	■				N = 17 5,6,11								
						2							
						3							
									SILTY CLAY: medium to high plasticity, brown, with a trace of fine to medium grained sand.				
						4							
								SC	SILTY CLAYEY SAND: fine to medium grained, brown.	M	-		
						5							
									as above, but light brown.				
						6							
								SM	SILTY SAND: fine to medium grained, light brown.				
						7							

ENVIRONMENTAL INVESTIGATION SERVICES
CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P6
2/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
								SM	SILTY SAND: fine to medium grained, light brown.	M			
▼ AFTER 18 DAYS						8			as above, but dark brown.	M-W			
						9			END OF BOREHOLE AT 9.0m				MONITORING WELL INSTALLED TO 9m, CLASS 18 SLOTTED PVC FROM 9m TO 3m, CASING FROM 3m TO SURFACE, 2mm SAND FILTER PACK FROM 9m TO 3m, BENTONITE SEAL FROM 3m TO 2.8m, BACKFILLED WITH SAND (AND/ OR CUTTINGS) TO SURFACE AND COMPLETED WITH A STEEL GATIC COVER AND LOCKABLE CAP
						10							
						11							
						12							
						13							
						14							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P7
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER
JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0			FILL: Silty clay, medium to high plasticity, brown, with a trace of fine to medium grained sand, root fibres and coal.	MC>PL			GRASS COVER
								CL-CH	SILTY CLAY: medium to high plasticity, brown mottled grey, with a trace of root fibres.	MC≈PL	(St)	-	
	■				N = 8 2,3,5								
						1							
									as above, but with root fibres absent, red mottled grey.				
	■				N = 15 3,6,9								
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P8
1/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD
Project: PROPOSED MULTI-STOREY CAR PARK
Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK
Date: 30-4-07
Method: SPIRAL AUGER
JK300
R.L. Surface: N/A
Datum:
Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION & AFTER 18 DAYS	■		■			0	⊠		FILL: Silty clay, medium to high plasticity, brown, with fine to medium grained sand, and a trace of coal, root fibres and igneous gravel.	MC<PL			GRASS COVER
	■				N = 7 2,3,4		▨	CL-CH	SILTY CLAY: medium to high plasticity, brown mottled red, with a trace of root fibres.	MC<PL	(F- St)	-	
	■				N = 7 2,3,4	1 2 3 4 5	▨		as above, but red mottled grey, root fibres absent.				
						6 7	▨		as above, but brown mottled grey.				

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

ENVIRONMENTAL LOG

Borehole No.
P8
2/2

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Date: 30-4-07

Method: SPIRAL AUGER
JK300

R.L. Surface: N/A

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
								CL-CH	SILTY CLAY: medium to high plasticity, brown mottled grey.				
						8		CL-CH	SILTY SANDY CLAY: medium to high plasticity, brown, fine to medium grained sand.	MC<PL	(VSt)		
								SC	SILTY CLAYEY SAND: fine to medium grained, red mottled brown.	M-W			
						9			END OF BOREHOLE AT 9.0m				MONITORING WELL INSTALLED TO 9m, CLASS 18 SLOTTED PVC FROM 9m TO 3m, CASING FROM 3m TO SURFACE, 2mm SAND FILTER PACK FROM 9m TO 3m, BENTONITE SEAL FROM 3m TO 2.6m, BACKFILLED WITH SAND (AND/ OR CUTTINGS) TO SURFACE AND COMPLETED WITH A STEEL GATIC COVER AND LOCKABLE CAP
						10							
						11							
						12							
						13							
						14							

ENVIRONMENTAL INVESTIGATION SERVICES

CONSULTING ENVIRONMENTAL ENGINEERS

EIS

ENVIRONMENTAL LOG

Borehole No.
P9
1/1

Environmental logs are not to be used for geotechnical purposes

Client: CAPITAL INSIGHT PTY LTD

Project: PROPOSED MULTI-STOREY CAR PARK

Location: LIVERPOOL HOSPITAL, LIVERPOOL, NSW

Job No. E21171FK

Date: 30-4-07

Method: SPIRAL AUGER JK300

R.L. Surface: N/A

Datum:

Logged/Checked by: V.B./

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■			0	▨		FILL: Silty clay, medium to high plasticity, brown, with a trace of fine grained sand, root fibres and coal.	MC<PL			GRASS COVER
	■				N = 10 5,6,4		▨		FILL: Silty clay, medium to high plasticity, brown, with a trace of igneous and ironstone gravel.				
						1	▨						
	■				N = 18 6,8,10		▧	CL-CH	SILTY CLAY: medium to high plasticity, brown mottled grey.	MC<PL	(St)	-	
						2			END OF BOREHOLE AT 1.95m				
						3							
						4							
						5							
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
1004
1/4

Client: NSW DEPARTMENT OF COMMERCE
Project: PROPOSED LIVERPOOL HOSPITAL REDEVELOPMENT PROJECT
Location: LIVERPOOL HOSPITAL, NSW

Job No. M20303ZA
Date: 1-6-06
Method: SPIRAL AUGER & WASHBORING
EDSON 3000
R.L. Surface:
Datum:
Logged/Checked by: M.T./AJH

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty sand, fine to medium grained, dark brown, with igneous gravel and root fibres.	M			GRASS COVER
								SP	SAND: fine to coarse grained, light brown, with a trace of ironstone gravel.	D	(L)	-	ALLUVIAL
					N = 38 13,17,21	1		CH	SILTY CLAY: high plasticity, red brown and light grey, with a trace of fine to medium grained sand and ironstone gravel.	MC<PL	H	>600 >600 >600	
					N = 37 11,16,21	2		CH	SANDY CLAY: high plasticity, red brown and light grey, with a trace of ironstone gravel.			>600 >600 >600	
					N = 36 11,15,21	3		SC	CLAYEY SAND: fine to medium grained, red brown and light grey, with ironstone gravel.	M	D		
						4		SP	SAND: fine to medium grained, light grey and orange brown, with occasional silty clay seams.				
					N > 29 18,25, 4/10mm END	5			as above, but orange brown, red and light grey.				
								SC	CLAYEY SAND: fine to medium grained, red brown and light grey.				
					N > 17 12,17/ 150mm END	6		SC/CL	CLAYEY SAND/SANDY CLAY: fine to medium grained, high plasticity, light grey.	M/ MC<PL	D/ H		
						7		SP	SAND: fine to medium grained, light grey and brown.	M	D		

APPENDIX B

AK 16 MAY 2007

PICKFORD & RHYDER CONSULTING PTY LTD
ABN 17 105 546 076
Occupational Hygiene Measurements and Solutions.

PO Box 1422 Lane Cove 1595
Rear - 244 Burns Bay Road
Lane Cove NSW Australia
Phone: (02) 9418 9151
Fax: (02) 9418 9150

15 May 2007

Mr Adrian Kingswell
Environmental Investigation Services
115 Wicks Road
MACQUARIE PARK NSW 2113

Fax: 9888-5004

CERTIFICATE OF ANALYSIS – ASBESTOS IDENTIFICATION

YOUR REFERENCE/JOB No.: E21171FK
TYPE OF SAMPLES: Bulk samples - as received from EIS
SITE LOCATION: Liverpool - Multi Storey Carpark
DATE SAMPLED: 30 April 2007 **DATE RECEIVED:** 4 May 2007
OUR REFERENCE: 50315/30-ID

TEST METHOD: Soil samples examined by Stereomicroscopy and Polarized Light Microscopy (with Dispersion Staining) in accordance with AS 4964-2004: - 'Method for the qualitative identification of asbestos in bulk samples' as outlined in Laboratory Method ID/1. The Reporting Limit for the results in this Certificate is numerically equal to the lowest detection limit of 0.1 g/kg. Trace asbestos analysis has been conducted on each sample, which is generally designed to detect 'respirable' asbestos fibres (i.e. less than 3 micrometres in width) distributed throughout the sample.

All sampling and site work have been undertaken by the client - the analytical procedures and results reported on this Certificate have been conducted by Pickford & Rhyder Consulting.

Sample No	*Lab No*	*Sample Location*
BH4 0.0-0.3	50315	soil sample as received
P1 0.0-0.2	50316	soil sample as received
P1 0.7-0.95	50317	soil sample as received
P1 1.3-1.5	50318	soil sample as received
P2 0.0-0.2	50319	soil sample as received
P3 0.0-0.2	50320	soil sample as received
P3 0.7-0.95	50321	soil sample as received
P3 1.7-1.95	50322	soil sample as received
P4 0.0-0.3	50323	soil sample as received
P4 0.7-0.95	50324	soil sample as received
P5 0.0-0.2	50325	soil sample as received
P6 0.0-0.2	50326	soil sample as received
P7 0.0-0.2	50327	soil sample as received
P8 0.0-0.2	50328	soil sample as received
P9 0.0-0.2	50329	soil sample as received
P9 0.7-0.95	50330	soil sample as received

Analysis and Comments:-

Sample No		
BH4 0-0.3	no asbestos detected	The sample was a brown soil with stones, of approximate weight 46 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P1 0.0-0.2	no asbestos detected	The sample was a brown soil with stones, of approximate weight 38 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.

P1 0.7-0.95	no asbestos detected	The sample was a brown soil with stones, of approximate weight 25 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P1 1.3-1.5	no asbestos detected	The sample was a grey, sandy soil, of approximate weight 18 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P2 0.0-0.2	no asbestos detected	The sample was a brown soil with stones and plant matter, of approximate weight 48 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P3 0.0-0.2	no asbestos detected	The sample was a brown soil with stones, of approximate weight 38 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P3 0.7-0.95	no asbestos detected	The sample was a brown soil with stones, of approximate weight 20 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P3 1.7-1.95	no asbestos detected	The sample was a grey soil with stones, of approximate weight 13 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P 4 0.0-0.3	no asbestos detected	The sample was a brown soil with stones, of approximate weight 60 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P 4 0.7-0.95	no asbestos detected	The sample was a brown soil, of approximate weight 12 g. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P5 0.0-0.2	no asbestos detected	The sample was a brown soil with plant matter, of approximate weight 42 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P 6 0.0-0.2	no asbestos detected	The sample was a brown soil, of approximate weight 25 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P7 0.0-0.2	no asbestos detected	The sample was a brown soil with plant matter, of approximate weight 53 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P8 0.0-0.2	no asbestos detected	The sample was a grey/brown soil with stones, of approximate weight 53 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.

P9 0.0-0.2	no asbestos detected	The sample was a brown soil with stones, of approximate weight 45 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.
P9 0.7-0.95	no asbestos detected	The sample was a brown soil, of approximate weight 22 g, in which organic fibres were detected. No asbestos fibres were found at the Reporting Limit of 0.1 g/kg.

Analysed and reported by:

Gary Conaty,
Approved Identifier and Signatory.

NATA
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Accreditation number 2515

SGS

11 May 2007

TEST REPORT

Jeffery and Katauskas Pty Ltd
115 Wicks Road
Macquarie Park
North Ryde BC
NSW 1670

Your Reference: E21171FK, Liverpool
Report Number: 52354

Attention: Adrian Kingswell

Dear Adrian
The following samples were received from you on the date indicated.

Samples: Qty.	2 Soil Samples
Date of Receipt of Samples:	03/05/07
Date of Receipt of Instructions:	03/05/07
Date Preliminary Report Emailed:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report. Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

Yours faithfully
SGS ENVIRONMENTAL SERVICES

	Edward ibrahim
Ly Kim Ha	**Edward Ibrahim**
Senior Organic Chemist	**Laboratory Services Manager**

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Page 1 of 8

SGS Australia Pty Ltd
ABN 44 000 964 278
Environmental Services Unit 10, 33 Maddox Street, Alexandria Australia
t (02) 8594 0400 f (02) 8594 0499
www.au.sgs.com
Member of the SGS Group

BTEX in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ------------- ------------	52354-1 DUP 4 Fill-Silty Clay 30/04/2007	52354-2 DUP 5 Fill-Silty Clay 30/04/2007
Benzene	mg/kg	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<0.5	<0.5
Total Xylenes	mg/kg	<1.5	<1.5
BTEX Surrogate (%)	%	83	88

TRH in soil with..C6-C9 by P/T Our Reference: Your Reference Sample Type Date Sampled	UNITS ------------- ------------	52354-1 DUP 4 Fill-Silty Clay 30/04/2007	52354-2 DUP 5 Fill-Silty Clay 30/04/2007
TRH C_6 - C_9 P&T	mg/kg	<20	<20
TRH C_{10} - C_{14}	mg/kg	<20	<20
TRH C_{15} - C_{28}	mg/kg	<50	<50
TRH C_{29} - C_{36}	mg/kg	<50	<50

Acid Extractable Metals in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ------------- ------------	52354-1 DUP 4 Fill-Silty Clay 30/04/2007	52354-2 DUP 5 Fill-Silty Clay 30/04/2007
Arsenic	mg/kg	5	3
Cadmium	mg/kg	0.2	0.2
Chromium	mg/kg	11	11
Copper	mg/kg	12	4.7
Lead	mg/kg	42	37
Mercury	mg/kg	0.15	<0.05
Nickel	mg/kg	4.2	4.1
Zinc	mg/kg	44	25

Moisture Our Reference: Your Reference Sample Type Date Sampled	UNITS ------------- ------------	52354-1 DUP 4 Fill-Silty Clay 30/04/2007	52354-2 DUP 5 Fill-Silty Clay 30/04/2007
Moisture	%	13	16

Method ID	Methodology Summary
SEO-017	BTEX/TRH C6-C9 - Determination by Purge and Trap Gas Chromatography with Flame Ionisation Detection (FID) and Photo Ionisation Detection (PID). The surrogate spike used is aaa-trifluorotoluene.
SEO-018	BTEX - Determination by purge and trap/ Gas Chromatography with MS Detection.
SEO-020	TRH - Determination of Total Recoverable Hydrocarbons by gas chromatography following extraction with DCM/Acetone for solids and DCM for liquids.
SEM-010	Metals - Determination of various metals by ICP-AES following aqua regia digest.
SEM-005	Mercury - Determination of Mercury by Cold Vapour Generation Atomic Absorption Spectroscopy.
AN002	Preparation of soils, sediments and sludges undergo analysis by either air drying, compositing, subsampling and 1:5 soil water extraction where required. Moisture content is determined by drying the sample at 105 ± 5°C.

QUALITY CONTROL BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Benzene	mg/kg	0.5	SEO-017	<0.5	[NT]	[NT]	LCS	80 || [N/T]
Toluene	mg/kg	0.5	SEO-017	<0.5	[NT]	[NT]	LCS	83 || [N/T]
Ethylbenzene	mg/kg	0.5	SEO-017	<0.5	[NT]	[NT]	LCS	83 || [N/T]
Total Xylenes	mg/kg	1.5	SEO-017	<1.5	[NT]	[NT]	LCS	88 || [N/T]
BTEX Surrogate (%)	%	0	SEO-018	85	[NT]	[NT]	LCS	89 || [N/T]
QUALITY CONTROL TRH in soil with..C6-C9 by P/T	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
TRH C_6 - C_9 P&T	mg/kg	20	SEO-017	<20	[NT]	[NT]	LCS	106 || [N/T]
TRH C_{10} - C_{14}	mg/kg	20	SEO-020	<20	[NT]	[NT]	LCS	92 || [N/T]
TRH C_{15} - C_{28}	mg/kg	50	SEO-020	<50	[NT]	[NT]	LCS	95 || [N/T]
TRH C_{29} - C_{36}	mg/kg	50	SEO-020	<50	[NT]	[NT]	LCS	95 || [N/T]
QUALITY CONTROL Acid Extractable Metals in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Arsenic	mg/kg	3	SEM-010	<3	52354-1	5 || 5 || RPD: 0	52354-2	77 || [N/T]
Cadmium	mg/kg	0.1	SEM-010	<0.1	52354-1	0.2 || 0.2 || RPD: 0	52354-2	84 || [N/T]
Chromium	mg/kg	0.3	SEM-010	<0.3	52354-1	11 || 11 || RPD: 0	52354-2	81 || [N/T]
Copper	mg/kg	0.5	SEM-010	<0.5	52354-1	12 || 11 || RPD: 9	52354-2	85 || [N/T]
Lead	mg/kg	1	SEM-010	<1	52354-1	42 || 39 || RPD: 7	52354-2	79 || [N/T]
Mercury	mg/kg	0.05	SEM-005	<0.05	52354-1	0.15 || 0.15 || RPD: 0	52354-2	102 || [N/T]
Nickel	mg/kg	0.5	SEM-010	<0.5	52354-1	4.2 || 4.4 || RPD: 5	52354-2	81 || [N/T]
Zinc	mg/kg	0.3	SEM-010	<0.3	52354-1	44 || 44 || RPD: 0	52354-2	89 || [N/T]
QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank				
Moisture	%	1	AN002	<1				

Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[HBG] : Results not Reported due to High Background Interference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Result Comments

Date Organics extraction commenced: 05/05/07
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Dioxins/Furans* and PAH in XAD and PUF).
This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

Quality Control Protocol

Reagent Blank: Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.
Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 10 samples.
Matrix Spike Duplicates: Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.
Surrogate Spike: Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.
Control Standards: Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.
Additional QC Samples: A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

TO:
SGS Environmental Services
Unit 16/ 33 Maddox Street
ALEXANDRIA
Phone: (02) 8594 0400
Fax: (02) 8594 0499

Attention: Matt/Jamie

Date Results Required: STANDARD

SAMPLE AND CHAIN OF CUSTODY FORM

EIS Job Number: E21171FK

Sheet 1/1

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

Phone: (02) 9888 5000
Fax: (02) 9888 5004

Contact: Adrian Kingswell

Project: Multi-storey Car Park
Location: Liverpool
Sampler: Vittal Boggaram

Sample Preservation:
In esky on ice

								Tests Required									
Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Depth (m)	Sample Container	PID (ppm/ Odour)	Sample Description	Heavy Metals	TPH/BTEX								Comments/Detection Limits Required
30/4/07	1		DUP4	–	Glass jar Teflon seal ~~+ Asb Bag~~	0	Fill:- silty clay	X	X								
↓	2		DUP5	–	Glass jar Teflon seal ~~+ Asb Bag~~	0	↓	X	X								
					Glass jar Teflon seal + Asb Bag												
					Glass jar Teflon seal + Asb Bag												
					Glass jar Teflon seal + Asb Bag												
					Glass jar Teflon seal + Asb Bag												

SGS
Received 7/5/7
By
Time 2:30 am/[✓ pm]
Samples intact [✓ yes]/no
Ice/Cooler Pack [✓ yes]/no
Comments: 52354

Relinquished By: Vittal B.S	Date: 3/05/2007 Time: 12:30	Received By: 8/5/07 @ 2:30pm	Remarks:
Relinquished By:	Date: Time:	Received By:	

TO:
SGS Environmental Services
Unit 16/ 33 Maddox Street
ALEXANDRIA
Phone: (02) 8594 0400
Fax: (02) 8594 0499

Attention: Matt/Jamie

Date Results Required: STANDARD

SAMPLE AND CHAIN OF CUSTODY FORM

EIS Job Number: E21171FK

Sheet 1 / 1

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

Phone: (02) 9888 5000
Fax: (02) 9888 5004

Contact: Adrian Kingswell

Project: Multi-storey Car Park
Location: Liverpool
Sampler: Vittal Boggaram

Sample Preservation:
In esky on ice

Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Depth (m)	Sample Container	PID (ppm/ Odour)	Sample Description	Tests Required: Heavy Metals	Tests Required: TPH/BTEX									Comments/Detection Limits Required
30/4/07	1		DUP4	–	Glass jar Teflon seal ~~+ Asb Bag~~	0	Fill:- Silty Clay	X	X									
↓	2		DUP5	–	Glass jar Teflon seal ~~+ Asb Bag~~	0	↓	X	X									
					Glass jar Teflon seal + Asb Bag													
					Glass jar Teflon seal + Asb Bag													
					Glass jar Teflon seal + Asb Bag													
					Glass jar Teflon seal + Asb Bag													

SGS
Received 3/5/7
By
Time 2:30 am/[✓ pm]
Samples intact [✓ yes]/no
Ice/Cooler Pack [✓ yes]/no
Comments: 52354

Relinquished By: Vittal · B·S	Date: 3/05/2007 Time: 12:30 ·	Received By: 3/5/07 @ 2:30pm	Remarks:
Relinquished By:	Date: Time:	Received By:	

Envirolab Services Pty Ltd
ABN 37 112 535 645
54 Frenchs Rd Willoughby NSW 2068
ph 02 9958 5801 fax 02 9958 5803
email: tnotaras@envirolabservices.com.au

CERTIFICATE OF ANALYSIS 11398

Client:
Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Vittal Boggaram

Sample log in details:

Your Reference:	**E21171FK, Liverpool**
No. of samples:	5 Waters
Date samples received:	28/05/07
Date completed instructions received:	28/05/07

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	4/06/07
Date of Preliminary Report:	Not Issued
Issue Date:	4/06/07

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

Results Approved By:

Jacinta Hurst
Operations Manager

vTPH & BTEX in Water						
Our Reference:	UNITS	11398-1	11398-2	11398-3	11398-4	11398-5
Your Reference	-------------	P4	P6	Dup1	FB	Trip Spike
Date Sampled	------------	25/05/07	25/05/07	25/05/07	25/05/07	25/05/07
Type of sample		Water	Water	Water	Water	Water
Date extracted	--	3/06/2007	3/06/2007	3/06/2007	3/06/2007	3/06/2007
Date analysed	--	3/06/2007	3/06/2007	3/06/2007	3/06/2007	3/06/2007
TPH C_6 - C_9	µg/L	[NA]	<10	[NA]	<10	[NA]
Benzene	µg/L	<1.0	<1.0	<1.0	<1.0	78%
Toluene	µg/L	<1.0	<1.0	<1.0	<1.0	83%
Ethylbenzene	µg/L	<1.0	<1.0	<1.0	<1.0	76%
m+p-xylene	µg/L	<2.0	<2.0	<2.0	<2.0	74%
o-xylene	µg/L	<1.0	<1.0	<1.0	<1.0	76%
Surrogate Dibromofluoromethane	%	104	105	95	138	127
Surrogate toluene-d8	%	87	87	89	84	108
Surrogate 1-bromo-4-fluorotoluene	%	78	91	85	99	99

sTPH in Water (C10-C36) Our Reference:	UNITS	11398-2	11398-4
Your Reference	-------------	P6	FB
Date Sampled	------------	25/05/07	25/05/07
Type of sample		Water	Water
Date extracted	--	30/05/2007	30/05/2007
Date analysed	--	30/05/2007	30/05/2007
TPH C_{10} - C_{14}	µg/L	<50	<50
TPH C_{15} - C_{28}	µg/L	<100	<100
TPH C_{29} - C_{36}	µg/L	<100	<100
Surrogate o-Terphenyl	%	94	92

8 HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	11398-1 P4 25/05/07 Water	11398-2 P6 25/05/07 Water	11398-3 Dup1 25/05/07 Water
Arsenic-Dissolved	µg/L	3.0	3.0	3.0
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1
Mercury-Dissolved	µg/L	<0.5	<0.5	<0.5
Nickel-Dissolved	µg/L	8.0	8.0	9.0
Zinc-Dissolved	µg/L	21	30	39

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	11398-2 P6 25/05/07 Water
pH	pH Units	6.6
Electrical Conductivity	µS/cm	14,000
Total Dissolved Solids (grav)	mg/L	8,400

Method ID	Methodology Summary
GC.16	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
GC.13	Water samples are analysed directly by purge and trap GC-MS.
GC.3	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
Metals.22 ICP-MS	Determination of various metals by ICP-MS.
Metals.21 CV-AAS	Determination of Mercury by Cold Vapour AAS.
LAB.1	pH - Measured using pH meter and electrode in accordance with APHA 20th ED, 4500-H+.
LAB.2	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA2510 20th ED and Rayment & Higginson.
LAB.18	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 20th ED, 2540-C.

QUALITY CONTROL vTPH & BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	--			[NT]	[NT]	[NT]	[NR]	[NR]
Date analysed	--			[NT]	[NT]	[NT]	[NR]	[NR]
TPH C_6 - C_9	µg/L	10	GC.16	<10	[NT]	[NT]	LCS	114%
Benzene	µg/L	1	GC.13	<1.0	[NT]	[NT]	LCS	97%
Toluene	µg/L	1	GC.13	<1.0	[NT]	[NT]	LCS	115%
Ethylbenzene	µg/L	1	GC.13	<1.0	[NT]	[NT]	LCS	120%
m+p-xylene	µg/L	2	GC.13	<2.0	[NT]	[NT]	LCS	119%
o-xylene	µg/L	1	GC.13	<1.0	[NT]	[NT]	LCS	117%
Surrogate Dibromofluoromethane	%		GC.13	[NT]	[NT]	[NT]	LCS	82%
Surrogate toluene-d8	%		GC.13	[NT]	[NT]	[NT]	LCS	100%
Surrogate 1-bromo-4-fluorotoluene	%		GC.13	[NT]	[NT]	[NT]	LCS	91%

QUALITY CONTROL TPH in Water (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	--			[NT]	[NT]	[NT]	[NR]	[NR]
Date analysed	--			[NT]	[NT]	[NT]	[NR]	[NR]
TPH C_{10} - C_{14}	µg/L	50	GC.3	<50	[NT]	[NT]	LCS	99%
TPH C_{15} - C_{28}	µg/L	100	GC.3	<100	[NT]	[NT]	LCS	93%
TPH C_{29} - C_{36}	µg/L	100	GC.3	<100	[NT]	[NT]	LCS	120%
Surrogate o-Terphenyl	%		GC.3	[NT]	[NT]	[NT]	LCS	100%

QUALITY CONTROL 8 HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Arsenic-Dissolved	µg/L	1	Metals.22 ICP-MS	<1	[NT]	[NT]	LCS	96%
Cadmium-Dissolved	µg/L	0.1	Metals.22 ICP-MS	<0.1	[NT]	[NT]	LCS	95%
Chromium-Dissolved	µg/L	1	Metals.22 ICP-MS	<1	[NT]	[NT]	LCS	98%
Copper-Dissolved	µg/L	1	Metals.22 ICP-MS	<1	[NT]	[NT]	LCS	100%
Lead-Dissolved	µg/L	1	Metals.22 ICP-MS	<1	[NT]	[NT]	LCS	95%
Mercury-Dissolved	µg/L	0.5	Metals.21 CV-AAS	<0.5	[NT]	[NT]	LCS	98%
Nickel-Dissolved	µg/L	1	Metals.22 ICP-MS	<1	[NT]	[NT]	LCS	96%
Zinc-Dissolved	µg/L	1	Metals.22 ICP-MS	<1	[NT]	[NT]	LCS	96%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Electrical Conductivity	µS/cm	1	LAB.2	<1.0	11398-2	14000 || [N/T]	LCS	98%
Total Dissolved Solids (grav)	mg/L	5	LAB.18	<5	11398-2	8400 || 8500 || RPD: 1	LCS	101%

Report Comments:

Asbestos analysed by: Not applicable for this job

INS: Insufficient sample for this test
RPD: Relative Percent Difference
NR: Not requested
NT: Not tested
NA: Test not required
<: Less than
PQL: Practical Quanitation Limit
LCS: Laboratory Control Sample
>: Greater than

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria:

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable. Surrogates: Generally 60-140% is acceptable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
54 Frenchs Rd Willoughby NSW 2068
ph 02 9958 5801 fax 02 9958 5803
email: tnotaras@envirolabservices.com.au

CERTIFICATE OF ANALYSIS 10936-A

Client:
Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Vittal Boggaram

Sample log in details:

Your Reference:	**E21171FK, Liverpool**
No. of samples:	Additional Testing on 5 Soils
Date samples received:	03/05/07
Date completed instructions received:	25/05/07

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	1/06/07
Date of Preliminary Report:	Not Issued
Issue Date:	31/05/07

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Tests not covered by NATA are denoted with *.

Results Approved By:

Jacinta Hurst
Operations Manager

Metals in TCLP						
Our Reference:	UNITS	10936-A-4	10936-A-6	10936-A-8	10936-A-9	10936-A-26
Your Reference	-------------	P1	P1	P3	P3	P9
Depth	------------	0.0/0.2	1.3/1.5	0.0/0.2	0.7/0.95	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
pH of soil for fluid# determ.	pH units	6.60	9.20	7.90	7.50	7.10
pH of soil for fluid # determ. (acid)	pH units	1.70	1.70	1.70	1.70	1.70
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	5.00	5.20	5.00	4.90	4.90
Cadmium in TCLP	mg/L	[NA]	[NA]	<0.01	[NA]	[NA]
Chromium in TCLP	mg/L	<0.01	[NA]	<0.01	<0.01	<0.01
Lead in TCLP	mg/L	<0.03	0.09	<0.03	<0.03	<0.03
Nickel in TCLP	mg/L	0.02	0.02	<0.02	0.02	<0.02

PAHs in TCLP (USEPA 1311) Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	10936-A-4 P1 0.0/0.2 30/04/07 Soil	10936-A-6 P1 1.3/1.5 30/04/07 Soil	10936-A-8 P3 0.0/0.2 30/04/07 Soil	10936-A-9 P3 0.7/0.95 30/04/07 Soil	10936-A-26 P9 0.0/0.2 30/04/07 Soil
Date extracted	--	30/05/2007	30/05/2007	30/05/2007	30/05/2007	30/05/2007
Date analysed	--	30/05/2007	30/05/2007	30/05/2007	30/05/2007	30/05/2007
Naphthalene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthylene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluorene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Anthracene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoranthene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Pyrene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(a)anthracene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chrysene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(b,k)fluoranthene	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Surrogate p-Terphenyl-d_{14}	%	93	103	100	94	90

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Metals.20 ICP-AES	Determination of various metals by ICP-AES.
GC.12	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.

QUALITY CONTROL Metals in TCLP	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Cadmium in TCLP	mg/L	0.01	Metals.20 ICP-AES	<0.01	[NT]	[NT]	LCS	103%
Chromium in TCLP	mg/L	0.01	Metals.20 ICP-AES	<0.01	[NT]	[NT]	LCS	105%
Lead in TCLP	mg/L	0.03	Metals.20 ICP-AES	<0.03	[NT]	[NT]	LCS	101%
Nickel in TCLP	mg/L	0.02	Metals.20 ICP-AES	<0.02	[NT]	[NT]	LCS	102%

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	--			[NT]	[NT]	[NT]	[NR]	[NR]
Date analysed	--			[NT]	[NT]	[NT]	[NR]	[NR]
Naphthalene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	LCS	91%
Acenaphthylene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	LCS	94%
Phenanthrene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	LCS	88%
Anthracene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	LCS	100%
Pyrene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	LCS	99%
Benzo(a)anthracene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	LCS	95%
Benzo(b,k)fluoranthene	mg/L	0.002	GC.12	<0.002	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	LCS	81%
Indeno(1,2,3-c,d)pyrene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/L	0.001	GC.12	<0.001	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		GC.12	[NT]	[NT]	[NT]	LCS	89%

Report Comments:

Asbestos analysed by: Not applicable for this job

INS: Insufficient sample for this test	NT: Not tested	PQL: Practical Quanitation Limit
RPD: Relative Percent Difference	NA: Test not required	LCS: Laboratory Control Sample
NR: Not requested	<: Less than	>: Greater than

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria:

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable. Surrogates: Generally 60-140% is acceptable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
54 Frenchs Rd Willoughby NSW 2068
ph 02 9958 5801 fax 02 9958 5803
email: tnotaras@envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC NSW 1670

ph: 02 9888 5000
Fax: 02 9888 5001

Attention: Vittal Boggaram

Sample log in details:

Your reference:	**E21171FK, Liverpool**
Envirolab Reference:	**11398**
Date received:	28/05/07
Date results expected to be reported:	**4/06/07**

Samples received in appropriate condition for analysis:	YES
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice
Completed documentation received:	YES

Comments:

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9958 5801 fax: 02 9958 5803
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

TO:
Envirolab Services Pty Ltd
54 Frenchs Road Willoughby 2068

Phone: (02) 9958 5801
Fax: (02) 9958 5803

Attention: Aileen

Date Results Required: STANDARD

SAMPLE AND CHAIN OF CUSTODY FORM

EIS Job Number: E21171FK

Sheet 1/1

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

Phone: (02) 9888 5000
Fax: (02) 9888 5004

Contact: Vittal Boggaram

Project: Proposed Multi-storey Carpark
Location: Liverpool
Sampler: Vittal Boggaram

Sample Preservation:
In esky on ice

Tests Required

	Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Sample Container	PID (ppm/ Odour)	Sample Description	Heavy metals	TPH/BTEX	pH / EC / TDS	BTEX						Comments/Detection Limits Required
1	25/05/07			P4	2* BTEX Vials HDPE Plastic Bottle	–	WATER	☒			☒						
2	↓			P6	1 L Amber Bottle 2* BTEX Vials HDPE Plastic Bottle	–	↓	☒	☒	☒							
3	↓			Dup 1	1* BTEX Vial HDPE Plastic Bottle	–	↓	☒			☒						
4	↓			FB	2* BTEX Vials	–	↓		☒								
5	↓			TRIP SPIKE	1* BTEX Vial	–	↓				☒						

Envirolab Envirolab Services
54 Frenchs Rd
Willoughby NSW 2068
Ph 9958 5801
Job No: 11398
Date received: 28/5/07
Received by: AU
Time: 12pm
Temp: [✓ Cool]/Ambient
Security: intact/Broken/[✓ None]

Relinquished By: Vittal.B.S

Date: 28/05/07
Time: 1230

Received By: AU.

Relinquished By:

Date:
Time:

Received By:

Remarks:

All analysis PQLs to ANZECC (2000) Detection Limits Please

TO:
Pickford & Rhyder Consulting Pty Ltd
244 Burns Bay Road, Lane Cove, NSW - 2066

Phone: (02) 9418 9151
Fax: (02) 9418 9150

Attention: Gary / Lisa

Date Results Required: STANDARD

SAMPLE AND CHAIN OF CUSTODY FORM

EIS Job Number: E21171FK

Sheet 1/3

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

Phone: (02) 9888 5000
Fax: (02) 9888 5004

Contact: Adrian Kingswell

Sample Preservation:
In esky on ice

Project: Multi-storey Car Park
Location: Liverpool
Sampler: Vittal Boggaram

Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Depth (m)	Sample Container	PID (ppm/ Odour)	Sample Description	Tests Required									Comments/Detection Limits Required
								Asbestos									
30/4/07			BH4	0·0 0·3	Plastic Bag	-	Fill:- Clay	☒									
↓			P1	0·0 0·2	Plastic Bag	-	↓	☒									
↓			↓	0·7 0·95	Plastic Bag	-	↓	☒									
↓			↓	1·3 1·5	Plastic Bag	-	Fill:- Sand	☒									
↓			P2	0·0 0·2	Plastic Bag	-	Fill:- Clay	☒									
↓			P3	0·0 0·2	Plastic Bag	-	Fill:- Clay	☒									

Relinquished By: Vittal·B S
Date: 3/05/07
Time: 12:30
Received By: Lisa Ma 4/5/07

Relinquished By:
Date:
Time:
Received By:

Remarks:

TO:
Pickford & Rhyder Consulting Pty Ltd
244 Burns Bay Road, Lane Cove, NSW - 2066

Phone: (02) 9418 9151
Fax: (02) 9418 9150

Attention: Gary / Lisa

Date Results Required: STANDARD

SAMPLE AND CHAIN OF CUSTODY FORM

EIS Job Number: E21171FK

Sheet 2/3

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

Phone: (02) 9888 5000
Fax: (02) 9888 5004

Contact: Adrian Kingswell

Project: Multi-storey Car Park
Location: Liverpool
Sampler: Vittal Boggaram

Tests Required

Sample Preservation
In esky on ice

Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Depth (m)	Sample Container	PID (ppm/ Odour)	Sample Description	Asbestos									Comments/Detection Limits Required
30/4/07			P3	0·7 0·95	Plastic Bag	-	Fill:- Clay	X									
↓			↓	1·7 1·95	Plastic Bag	-	Silty clay	X									
			P4	0·0 0·3	Plastic Bag	-	Fill:- Clay	X									
			↓	0·7 0·95	Plastic Bag	-	↓	X									
			P5	0·0 0·2	Plastic Bag	-	Fill:- Clay	X									
↓			P6	0·0 0·2	Plastic Bag	-	↓	X									

Relinquished By: Vittal·B·S
Date: 3/05/07
Time: 12:30.
Received By:
4/5/07

Relinquished By:
Date:
Time:
Received By:

Remarks:

TO:
Pickford & Rhyder Consulting Pty Ltd
244 Burns Bay Road, Lane Cove, NSW - 2066

Phone: (02) 9418 9151
Fax: (02) 9418 9150

Attention: Gary / Lisa

Date Results Required: STANDARD

SAMPLE AND CHAIN OF CUSTODY FORM

EIS Job Number: E21171FK

Sheet 3/3

FROM:
Environmental Investigation Services

Rear 115 Wicks Road
Macquarie Park NSW 2113

Phone: (02) 9888 5000
Fax: (02) 9888 5004

Contact: Adrian Kingswell

Project: Multi-storey Car Park
Location: Liverpool
Sampler: Vittal Boggaram

Sample Preservation:
In esky on ice

Date Sampled	Time Sampled	Location	Sample/ Borehole Number	Depth (m)	Sample Container	PID (ppm/ Odour)	Sample Description	Asbestos									Comments/Detection Limits Required
30/4/07			P7	0.0/0.2	Plastic Bag	-	Fill: Clay	X									
↓			P8	0.0/0.2	Plastic Bag	-	↓	X									
↓			P9	0.0/0.2	Plastic Bag	-	↓	X									
↓			↓	0.7/0.95	Plastic Bag	-	↓	X									
					Plastic Bag	-											
					Plastic Bag	-											

Tests Required

Relinquished By: Vittal B.S	Date: 3/05/07 Time: 12:30	Received By: 4/5/07	Remarks:
Relinquished By:	Date: Time:	Received By:	

Envirolab

Envirolab Services Pty Ltd
ABN 37 112 535 645
54 Frenchs Rd Willoughby NSW 2068
ph 02 9958 5801 fax 02 9958 5803
email: tnotaras@envirolabservices.com.au

CERTIFICATE OF ANALYSIS 10936

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Adrian Kingswell

Sample log in details:

Your Reference:	**E21171FK, Liverpool**
No. of samples:	32 Soils, 1 Water
Date samples received:	03/05/07
Date completed instructions received:	03/05/07

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	10/05/07
Date of Preliminary Report:	Not Issued
Issue Date:	7/05/07

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

Results Approved By:

Jacinta Hurst
Operations Manager

vTPH & BTEX in Soil						
Our Reference:	UNITS	10936-1	10936-4	10936-5	10936-6	10936-7
Your Reference	------------	B4	P1	P1	P1	P2
Depth	------------	0.0/0.3	0.0/0.2	0.7/0.95	1.3/1.5	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
vTPH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
m + p-Xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	81	81	84	85	84

vTPH & BTEX in Soil						
Our Reference:	UNITS	10936-8	10936-9	10936-10	10936-11	10936-12
Your Reference	-------------	P3	P3	P3	P4	P4
Depth	-----------	0.0/0.2	0.7/0.95	1.7/1.95	0.0/0.3	0.7/0.95
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
vTPH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
m + p-Xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	89	84	88	85	86

vTPH & BTEX in Soil						
Our Reference:	UNITS	10936-14	10936-17	10936-20	10936-23	10936-26
Your Reference	-------------	P5	P6	P7	P8	P9
Depth	------------	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
vTPH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
m + p-Xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	86	88	90	86	92

vTPH & BTEX in Soil **Our Reference:** **Your Reference** **Depth** **Date Sampled** **Type of sample**	**UNITS** ------------ ------------	**10936-27** **P9** **0.7/0.95** **30/04/07** **Soil**	**10936-29** **Dup1** **-** **30/04/07** **Soil**	**10936-30** **Dup2** **-** **30/04/07** **Soil**	**10936-32** **FB1** **-** **30/04/07** **Soil**
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007
vTPH C_6 - C_9	mg/kg	<25	<25	<25	<25
Benzene	mg/kg	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0
m + p-Xylene	mg/kg	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	88	82	90	95

sTPH in Soil (C10-C36)						
Our Reference:	UNITS	10936-1	10936-4	10936-5	10936-6	10936-7
Your Reference	-------------	B4	P1	P1	P1	P2
Depth	------------	0.0/0.3	0.0/0.2	0.7/0.95	1.3/1.5	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
TPH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TPH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TPH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	103	106	104	107	109

sTPH in Soil (C10-C36)						
Our Reference:	UNITS	10936-8	10936-9	10936-10	10936-11	10936-12
Your Reference	-------------	P3	P3	P3	P4	P4
Depth	------------	0.0/0.2	0.7/0.95	1.7/1.95	0.0/0.3	0.7/0.95
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
TPH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TPH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TPH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	109	106	102	109	106

sTPH in Soil (C10-C36)						
Our Reference:	UNITS	10936-14	10936-17	10936-20	10936-23	10936-26
Your Reference	-------------	P5	P6	P7	P8	P9
Depth	------------	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
TPH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TPH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TPH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	106	105	106	105	111

sTPH in Soil (C10-C36) **Our Reference:** **Your Reference** **Depth** **Date Sampled** **Type of sample**	**UNITS** ------------ ------------	**10936-27** **P9** **0.7/0.95** **30/04/07** **Soil**	**10936-29** **Dup1** **-** **30/04/07** **Soil**	**10936-30** **Dup2** **-** **30/04/07** **Soil**	**10936-32** **FB1** **-** **30/04/07** **Soil**
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007
TPH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50
TPH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100
TPH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100
Surrogate o-Terphenyl	%	109	99	100	101

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	10936-1 B4 0.0/0.3 30/04/07 Soil	10936-4 P1 0.0/0.2 30/04/07 Soil	10936-5 P1 0.7/0.95 30/04/07 Soil	10936-6 P1 1.3/1.5 30/04/07 Soil	10936-7 P2 0.0/0.2 30/04/07 Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	1.0	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	1.6	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	1.4	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	0.6	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.6	<0.1
Benzo(b,k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.8	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	0.5	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	0.3	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.3	<0.1
Surrogate p-Terphenyl-d_{14}	%	92	105	100	103	100

PAHs in Soil **Our Reference:** **Your Reference** **Depth** **Date Sampled** **Type of sample**	**UNITS** ------------- ------------	**10936-8** **P3** **0.0/0.2** **30/04/07** **Soil**	**10936-9** **P3** **0.7/0.95** **30/04/07** **Soil**	**10936-10** **P3** **1.7/1.95** **30/04/07** **Soil**	**10936-11** **P4** **0.0/0.3** **30/04/07** **Soil**	**10936-12** **P4** **0.7/0.95** **30/04/07** **Soil**
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	0.3	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.1	0.2	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(b,k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.05	0.09	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	108	103	108	103	98

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	10936-14 P5 0.0/0.2 30/04/07 Soil	10936-17 P6 0.0/0.2 30/04/07 Soil	10936-20 P7 0.0/0.2 30/04/07 Soil	10936-23 P8 0.0/0.2 30/04/07 Soil	10936-26 P9 0.0/0.2 30/04/07 Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.3
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.8
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.8
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.6
Benzo(b,k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	0.7
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	0.4
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Surrogate p-Terphenyl-d_{14}	%	100	105	109	100	113

PAHs in Soil **Our Reference:** **Your Reference** **Depth** **Date Sampled** **Type of sample**	**UNITS** ------------- -------------	**10936-27** **P9** **0.7/0.95** **30/04/07** **Soil**
Date extracted	--	4/05/2007
Date analysed	--	5/05/2007
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.4
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.4
Pyrene	mg/kg	0.3
Benzo(a)anthracene	mg/kg	0.1
Chrysene	mg/kg	0.2
Benzo(b,k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	0.08
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Surrogate *p*-Terphenyl-d_{14}	%	101

Organochlorine Pesticides in soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------ ------------	10936-1 B4 0.0/0.3 30/04/07 Soil	10936-4 P1 0.0/0.2 30/04/07 Soil	10936-5 P1 0.7/0.95 30/04/07 Soil	10936-6 P1 1.3/1.5 30/04/07 Soil	10936-7 P2 0.0/0.2 30/04/07 Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	117	119	114	115	117

Organochlorine Pesticides in soil **Our Reference:** **Your Reference** **Depth** **Date Sampled** **Type of sample**	**UNITS** ------------- ------------	**10936-8** **P3** **0.0/0.2** **30/04/07** **Soil**	**10936-9** **P3** **0.7/0.95** **30/04/07** **Soil**	**10936-10** **P3** **1.7/1.95** **30/04/07** **Soil**	**10936-11** **P4** **0.0/0.3** **30/04/07** **Soil**	**10936-12** **P4** **0.7/0.95** **30/04/07** **Soil**
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	118	107	115	117	119

Organochlorine Pesticides in soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------ ------------	10936-14 P5 0.0/0.2 30/04/07 Soil	10936-17 P6 0.0/0.2 30/04/07 Soil	10936-20 P7 0.0/0.2 30/04/07 Soil	10936-23 P8 0.0/0.2 30/04/07 Soil	10936-26 P9 0.0/0.2 30/04/07 Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	113	113	119	113	110

Organochlorine Pesticides in soil **Our Reference:** **Your Reference** **Depth** **Date Sampled** **Type of sample**	UNITS ------------- ------------	**10936-27** **P9** **0.7/0.95** **30/04/07** **Soil**
Date extracted	--	4/05/2007
Date analysed	--	5/05/2007
HCB	mg/kg	<0.1
alpha-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Surrogate TCLMX	%	116

PCBs in Soil						
Our Reference:	UNITS	10936-1	10936-4	10936-5	10936-6	10936-7
Your Reference	-------------	B4	P1	P1	P1	P2
Depth	------------	0.0/0.3	0.0/0.2	0.7/0.95	1.3/1.5	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	117	119	114	115	117

PCBs in Soil						
Our Reference:	UNITS	10936-8	10936-9	10936-10	10936-11	10936-12
Your Reference	------------	P3	P3	P3	P4	P4
Depth	-----------	0.0/0.2	0.7/0.95	1.7/1.95	0.0/0.3	0.7/0.95
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	118	107	115	117	119

PCBs in Soil						
Our Reference:	UNITS	10936-14	10936-17	10936-20	10936-23	10936-26
Your Reference	-------------	P5	P6	P7	P8	P9
Depth	-----------	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	4/05/2007	4/05/2007	4/05/2007	4/05/2007	4/05/2007
Date analysed	--	5/05/2007	5/05/2007	5/05/2007	5/05/2007	5/05/2007
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	113	113	119	113	110

PCBs in Soil **Our Reference:** **Your Reference** **Depth** **Date Sampled** **Type of sample**	**UNITS** ------------- ------------	**10936-27** **P9** **0.7/0.95** **30/04/07** **Soil**
Date extracted	--	4/05/2007
Date analysed	--	5/05/2007
Arochlor 1016	mg/kg	<0.1
Arochlor 1232	mg/kg	<0.1
Arochlor 1242	mg/kg	<0.1
Arochlor 1248	mg/kg	<0.1
Arochlor 1254	mg/kg	<0.1
Arochlor 1260	mg/kg	<0.1
Surrogate TCLMX	%	116

Acid Extractable metals in soil						
Our Reference:	UNITS	10936-1	10936-4	10936-5	10936-6	10936-7
Your Reference	-------------	B4	P1	P1	P1	P2
Depth	------------	0.0/0.3	0.0/0.2	0.7/0.95	1.3/1.5	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Arsenic	mg/kg	<4.0	<4.0	<4.0	<4.0	4.6
Cadmium	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	mg/kg	18	14	13	8.7	15
Copper	mg/kg	3.8	12	8.9	23	49
Lead	mg/kg	21	28	43	70	32
Mercury	mg/kg	<0.10	<0.10	0.11	<0.10	0.15
Nickel	mg/kg	5.6	7.3	5.6	6.8	11
Zinc	mg/kg	15	32	20	200	56

Acid Extractable metals in soil						
Our Reference:	UNITS	10936-8	10936-9	10936-10	10936-11	10936-12
Your Reference	-------------	P3	P3	P3	P4	P4
Depth	------------	0.0/0.2	0.7/0.95	1.7/1.95	0.0/0.3	0.7/0.95
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Arsenic	mg/kg	13	<4.0	5.6	<4.0	<4.0
Cadmium	mg/kg	8.7	<1.0	<1.0	<1.0	<1.0
Chromium	mg/kg	22	13	23	14	23
Copper	mg/kg	23	15	6.6	6.8	6.3
Lead	mg/kg	34	25	31	67	29
Mercury	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
Nickel	mg/kg	14	5.6	3.0	8.5	8.3
Zinc	mg/kg	33	24	7.2	51	24

Acid Extractable metals in soil						
Our Reference:	UNITS	10936-14	10936-17	10936-20	10936-23	10936-26
Your Reference	-------------	P5	P6	P7	P8	P9
Depth	------------	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Arsenic	mg/kg	<4.0	4.7	6.7	<4.0	6.6
Cadmium	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	mg/kg	12	19	23	11	16
Copper	mg/kg	3.9	6.8	15	10	13
Lead	mg/kg	20	29	40	29	42
Mercury	mg/kg	<0.10	<0.10	<0.10	0.12	0.15
Nickel	mg/kg	4.7	7.0	9.7	5.7	6.4
Zinc	mg/kg	9.8	17	42	24	43

Acid Extractable metals in soil **Our Reference:** **Your Reference** **Depth** **Date Sampled** **Type of sample**	**UNITS** ------------ ------------	**10936-27** **P9** **0.7/0.95** **30/04/07** **Soil**	**10936-29** **Dup1** **-** **30/04/07** **Soil**	**10936-30** **Dup2** **-** **30/04/07** **Soil**	**10936-32** **FB1** **-** **30/04/07** **Soil**
Arsenic	mg/kg	<4.0	4.5	<4.0	<4.0
Cadmium	mg/kg	<1.0	<1.0	<1.0	<1.0
Chromium	mg/kg	14	18	7.6	4.7
Copper	mg/kg	14	4.8	3.8	1.1
Lead	mg/kg	25	26	20	2.9
Mercury	mg/kg	0.12	<0.10	<0.10	<0.10
Nickel	mg/kg	5.4	6.3	3.5	<1.0
Zinc	mg/kg	23	14	8.3	<1.0

Moisture						
Our Reference:	UNITS	10936-1	10936-4	10936-5	10936-6	10936-7
Your Reference	-------------	B4	P1	P1	P1	P2
Depth	------------	0.0/0.3	0.0/0.2	0.7/0.95	1.3/1.5	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Moisture	%	13	16	17	17	14

Moisture						
Our Reference:	UNITS	10936-8	10936-9	10936-10	10936-11	10936-12
Your Reference	-------------	P3	P3	P3	P4	P4
Depth	------------	0.0/0.2	0.7/0.95	1.7/1.95	0.0/0.3	0.7/0.95
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Moisture	%	12	11	16	15	21

Moisture						
Our Reference:	UNITS	10936-14	10936-17	10936-20	10936-23	10936-26
Your Reference	-------------	P5	P6	P7	P8	P9
Depth	------------	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2	0.0/0.2
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil	Soil
Moisture	%	14	18	20	10	13

Moisture					
Our Reference:	UNITS	10936-27	10936-29	10936-30	10936-32
Your Reference	-------------	P9	Dup1	Dup2	FB1
Depth	------------	0.7/0.95	-	-	-
Date Sampled		30/04/07	30/04/07	30/04/07	30/04/07
Type of sample		Soil	Soil	Soil	Soil
Moisture	%	13	19	15	0.30

BTEX in Water Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	10936-33 R1 - 30/04/07 Water
Date extracted	--	4/05/2007
Date analysed	--	5/05/2007
Benzene	µg/L	<1.0
Toluene	µg/L	<1.0
Ethylbenzene	µg/L	<1.0
m+p-xylene	µg/L	<2.0
o-xylene	µg/L	<1.0
Surrogate Dibromofluoromethane	%	104
Surrogate toluene-d8	%	100
Surrogate 1-bromo-4-fluorotoluene	%	102

Method ID	Methodology Summary
GC.16	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
GC.14	Soil samples extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
GC.3	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
GC.12	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
GC-5	Soil samples are extracted with hexane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC-6	Soil samples are extracted with hexane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals.20 ICP-AES	Determination of various metals by ICP-AES.
Metals.21 CV-AAS	Determination of Mercury by Cold Vapour AAS.
LAB.8	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.
GC.13	Water samples are analysed directly by purge and trap GC-MS.

QUALITY CONTROL vTPH & BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	--			[NT]	10936-1	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--			[NT]	10936-1	5/05/2007 || 5/05/2007	[NR]	[NR]
vTPH C_6 - C_9	mg/kg	25	GC.16	<25	10936-1	<25 || <25	LCS	83%
Benzene	mg/kg	1	GC.14	<1.0	10936-1	<1.0 || <1.0	LCS	74%
Toluene	mg/kg	1	GC.14	<1.0	10936-1	<1.0 || <1.0	LCS	86%
Ethylbenzene	mg/kg	1	GC.14	<1.0	10936-1	<1.0 || <1.0	LCS	83%
m + p-Xylene	mg/kg	2	GC.14	<2.0	10936-1	<2.0 || <2.0	LCS	84%
o-Xylene	mg/kg	1	GC.14	<1.0	10936-1	<1.0 || <1.0	LCS	86%
Surrogate aaa-Trifluorotoluene	%		GC.14	[NT]	10936-1	81 || 87 || RPD: 7	LCS	88%

QUALITY CONTROL sTPH in Soil (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	--			[NT]	10936-1	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--			[NT]	10936-1	5/05/2007 || 5/05/2007	[NR]	[NR]
TPH C_{10} - C_{14}	mg/kg	50	GC.3	<50	10936-1	<50 || <50	LCS	109%
TPH C_{15} - C_{28}	mg/kg	100	GC.3	<100	10936-1	<100 || <100	LCS	86%
TPH C_{29} - C_{36}	mg/kg	100	GC.3	<100	10936-1	<100 || <100	LCS	90%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	--			[NT]	10936-1	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--			[NT]	10936-1	5/05/2007 || 5/05/2007	[NR]	[NR]
Naphthalene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	LCS	95%
Acenaphthylene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	LCS	101%
Phenanthrene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	LCS	99%
Anthracene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	LCS	116%
Pyrene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	LCS	115%
Benzo(a)anthracene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	LCS	113%
Benzo(b,k)fluoranthene	mg/kg	0.2	GC.12	<0.2	10936-1	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	GC.12	<0.05	10936-1	<0.05 || <0.05	LCS	95%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	GC.12	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		GC.12	[NT]	10936-1	92 || 93 || RPD: 1	LCS	103%

QUALITY CONTROL **Organochlorine Pesticides in soil**	**UNITS**	**PQL**	**METHOD**	**Blank**	**Duplicate Sm#**	**Duplicate results** **Base II Duplicate II %RPD**	**Spike Sm#**	**Spike % Recovery**
Date extracted	--			[NT]	10936-1	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--			[NT]	10936-1	5/05/2007 || 5/05/2007	[NR]	[NR]
HCB	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	131%
gamma-BHC	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	106%
Heptachlor	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	121%
delta-BHC	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	126%
Heptachlor Epoxide	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	119%
gamma-Chlordane	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	106%
Dieldrin	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	117%
Endrin	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	116%
pp-DDD	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	111%
Endosulfan II	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	LCS	113%
Methoxychlor	mg/kg	0.1	GC-5	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		GC-5	[NT]	10936-1	117 || 119 || RPD: 2	LCS	113%

QUALITY CONTROL **PCBs in Soil**	**UNITS**	**PQL**	**METHOD**	**Blank**	**Duplicate Sm#**	**Duplicate results** **Base II Duplicate II %RPD**	**Spike Sm#**	**Spike % Recovery**
Date extracted	--			[NT]	10936-1	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--			[NT]	10936-1	5/05/2007 || 5/05/2007	[NR]	[NR]
Arochlor 1016	mg/kg	0.1	GC-6	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	GC-6	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	GC-6	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	GC-6	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	GC-6	<0.1	10936-1	<0.1 || <0.1	LCS	110%
Arochlor 1260	mg/kg	0.1	GC-6	<0.1	10936-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		GC-6	[NT]	10936-1	117 || 119 || RPD: 2	LCS	125%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Arsenic	mg/kg	4	Metals.20 ICP-AES	<4.0	10936-1	<4.0 || <4.0	LCS	101%
Cadmium	mg/kg	1	Metals.20 ICP-AES	<1.0	10936-1	<1.0 || <1.0	LCS	99%
Chromium	mg/kg	1	Metals.20 ICP-AES	<1.0	10936-1	18 || 18 || RPD: 0	LCS	104%
Copper	mg/kg	1	Metals.20 ICP-AES	<1.0	10936-1	3.8 || 4.0 || RPD: 5	LCS	103%
Lead	mg/kg	1	Metals.20 ICP-AES	<1.0	10936-1	21 || 18 || RPD: 15	LCS	101%
Mercury	mg/kg	0.1	Metals.21 CV-AAS	<0.10	10936-1	<0.10 || <0.10	LCS	92%
Nickel	mg/kg	1	Metals.20 ICP-AES	<1.0	10936-1	5.6 || 5.7 || RPD: 2	LCS	103%
Zinc	mg/kg	1	Metals.20 ICP-AES	<1.0	10936-1	15 || 16 || RPD: 6	LCS	102%

QUALITY CONTROL Moisture	**UNITS**	**PQL**	**METHOD**	**Blank**	**Duplicate Sm#**	**Duplicate results Base || Duplicate || %RPD**
Moisture	%	0.1	LAB.8	<0.10	10936-1	13 || 13 || RPD: 0

QUALITY CONTROL BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	--			[NT]	[NT]	[NT]	[NR]	[NR]
Date analysed	--			[NT]	[NT]	[NT]	[NR]	[NR]
Benzene	µg/L	1	GC.13	<1.0	[NT]	[NT]	LCS	110%
Toluene	µg/L	1	GC.13	<1.0	[NT]	[NT]	LCS	103%
Ethylbenzene	µg/L	1	GC.13	<1.0	[NT]	[NT]	LCS	101%
m+p-xylene	µg/L	2	GC.13	<2.0	[NT]	[NT]	LCS	98%
o-xylene	µg/L	1	GC.13	<1.0	[NT]	[NT]	LCS	99%
Surrogate Dibromofluoromethane	%		GC.13	[NT]	[NT]	[NT]	LCS	116%
Surrogate toluene-d8	%		GC.13	[NT]	[NT]	[NT]	LCS	100%
Surrogate 1-bromo-4-fluorotoluene	%		GC.13	[NT]	[NT]	[NT]	LCS	104%

QUALITY CONTROL vTPH & BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	--	10936-14	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--	10936-14	5/05/2007 || 5/05/2007	[NR]	[NR]
vTPH C_6 - C_9	mg/kg	10936-14	<25 || <25	10936-4	92%
Benzene	mg/kg	10936-14	<1.0 || <1.0	10936-4	87%
Toluene	mg/kg	10936-14	<1.0 || <1.0	10936-4	92%
Ethylbenzene	mg/kg	10936-14	<1.0 || <1.0	10936-4	92%
m + p-Xylene	mg/kg	10936-14	<2.0 || <2.0	10936-4	93%
o-Xylene	mg/kg	10936-14	<1.0 || <1.0	10936-4	95%
Surrogate aaa-Trifluorotoluene	%	10936-14	86 || 92 || RPD: 7	10936-4	89%

QUALITY CONTROL sTPH in Soil (C10-C36)	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	--	10936-14	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--	10936-14	5/05/2007 || 5/05/2007	[NR]	[NR]
TPH C_{10} - C_{14}	mg/kg	10936-14	<50 || <50	10936-4	109%
TPH C_{15} - C_{28}	mg/kg	10936-14	<100 || <100	10936-4	90%
TPH C_{29} - C_{36}	mg/kg	10936-14	<100 || <100	10936-4	96%

QUALITY CONTROL PAHs in Soil	**UNITS**	**Dup. Sm#**	**Duplicate Base + Duplicate + %RPD**	**Spike Sm#**	**Spike % Recovery**
Date extracted	--	10936-14	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--	10936-14	5/05/2007 || 5/05/2007	[NR]	[NR]
Naphthalene	mg/kg	10936-14	<0.1 || <0.1	10936-4	96%
Acenaphthylene	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	10936-14	<0.1 || <0.1	10936-4	100%
Phenanthrene	mg/kg	10936-14	<0.1 || <0.1	10936-4	95%
Anthracene	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	10936-14	<0.1 || <0.1	10936-4	114%
Pyrene	mg/kg	10936-14	<0.1 || <0.1	10936-4	113%
Benzo(a)anthracene	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	10936-14	<0.1 || <0.1	10936-4	109%
Benzo(b,k)fluoranthene	mg/kg	10936-14	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	10936-14	<0.05 || <0.05	10936-4	101%
Indeno(1,2,3-c,d)pyrene	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	10936-14	100 || 98 || RPD: 2	10936-4	102%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	--	10936-14	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--	10936-14	5/05/2007 || 5/05/2007	[NR]	[NR]
HCB	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	10936-14	<0.1 || <0.1	10936-4	139%
gamma-BHC	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	10936-14	<0.1 || <0.1	10936-4	107%
Heptachlor	mg/kg	10936-14	<0.1 || <0.1	10936-4	127%
delta-BHC	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	10936-14	<0.1 || <0.1	10936-4	131%
Heptachlor Epoxide	mg/kg	10936-14	<0.1 || <0.1	10936-4	122%
gamma-Chlordane	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	10936-14	<0.1 || <0.1	10936-4	106%
Dieldrin	mg/kg	10936-14	<0.1 || <0.1	10936-4	118%
Endrin	mg/kg	10936-14	<0.1 || <0.1	10936-4	114%
pp-DDD	mg/kg	10936-14	<0.1 || <0.1	10936-4	109%
Endosulfan II	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]

QUALITY CONTROL Organochlorine Pesticides in soil	**UNITS**	**Dup. Sm#**	**Duplicate Base + Duplicate + %RPD**	**Spike Sm#**	**Spike % Recovery**
pp-DDT	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	10936-14	<0.1 || <0.1	10936-4	109%
Methoxychlor	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	10936-14	113 || 116 || RPD: 3	10936-4	118%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	--	10936-14	4/05/2007 || 4/05/2007	[NR]	[NR]
Date analysed	--	10936-14	5/05/2007 || 5/05/2007	[NR]	[NR]
Arochlor 1016	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	10936-14	<0.1 || <0.1	10936-4	110%
Arochlor 1260	mg/kg	10936-14	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	10936-14	113 || 116 || RPD: 3	10936-4	126%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Arsenic	mg/kg	10936-14	<4.0 || <4.0	10936-4	109%
Cadmium	mg/kg	10936-14	<1.0 || <1.0	10936-4	103%
Chromium	mg/kg	10936-14	12 || 7.6 || RPD: 45	10936-4	111%
Copper	mg/kg	10936-14	3.9 || 5.5 || RPD: 34	10936-4	118%
Lead	mg/kg	10936-14	20 || 22 || RPD: 10	10936-4	102%
Mercury	mg/kg	10936-14	<0.10 || <0.10	10936-4	95%
Nickel	mg/kg	10936-14	4.7 || 4.1 || RPD: 14	10936-4	108%
Zinc	mg/kg	10936-14	9.8 || 12 || RPD: 20	10936-4	102%
QUALITY CONTROL Moisture	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD		
Moisture	%	10936-14	14 || 14 || RPD: 0		

Report Comments:

Asbestos analysed by: Not applicable for this job

INS: Insufficient sample for this test
RPD: Relative Percent Difference
NR: Not requested
NT: Not tested
NA: Test not required
<: Less than
PQL: Practical Quanitation Limit
LCS: Laboratory Control Sample
>: Greater than

Quality Control Definitions

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

Laboratory Acceptance Criteria:

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable. Surrogates: Generally 60-140% is acceptable.

APPENDIX C

EIS

Groundwater Monitoring Report

Client:	**Capital Insight Pty Ltd**	**Job No.:**	E20974F
Project:	Proposed Multi-Storey Car Park	**Well No.:**	P4
Location:	Liverpool Hospital, Liverpool, NSW	**Depth (m):**	9m.

WELL FINISH

X	**Gatic Cover**	☐	**Standpipe**	☐	**PVC Pipe**

WELL DEVELOPMENT

	Stage 1	Stage 2		Stage 1	Stage 2
Method:	Bailer		**SWL – Before: (m)**	8.58m	
Date:			**Time – Before:**	–	
Undertaken By:	~~VB~~ TH		**SWL – After: (m)**	–	
Vol. Water Removed:	0		**Time – After:**	–	

Comments:

WELL PURGE DETAILS

Method:	Bailer		**SWL – Before:**	8.60m. (TOG)
Date:	17/5/07		**Time – Before:**	11:14 am.
Undertaken By:	VB		**SWL – After:**	8.90m.
PID Reading: (ppm)	–		**Time – After:**	11:21am.
Total Vol Removed:	500ml			

PURGING MEASUREMENTS

Volume Removed (L)	Temp (°C)	pH	EC (mS/cm)	DO (mg/L)	Eh (mV)
500ml	25.0	6.81	9.95	2.00	-31.5
DRY.	–	–	–	–	–

Comments:

WELL SAMPLING DETAILS

Method:	Bailer		DO (mg/L)	3.87
Date:	25/5/07		**SWL – Before:**	8.58m (TOG)
Undertaken By:	VB		**Time- Before**	12:24 pm.
pH	6.30		**Water Temperature (°C)**	23.4
Eh (mV)	23.5		**EC: (mS/cm)**	10.94

Containers Used/Comments TOG is approximately 80mm above TOC. (0.08m).
2XBTEX + 1 HNO3 – No more sample.

Tested By:	VB	Remarks:
Date Tested:	25/5/07	- All measurements are corrected to ground level
Checked By:		- All stated Volumes are in Litres
Date:		- SWL is an abbreviation for standing water level

EIS

Groundwater Monitoring Report

Client:	**Capital Insight Pty Ltd**	**Job No.:**	E20974F
Project:	Proposed Multi-Storey Car Park	**Well No.:**	P6
Location:	Liverpool Hospital, Liverpool, NSW	**Depth (m):**	9m.

WELL FINISH

X	**Gatic Cover**		**Standpipe**		**PVC Pipe**

WELL DEVELOPMENT

	Stage 1	Stage 2		Stage 1	Stage 2
Method:	Bailer		**SWL – Before: (m)**	8.49m	–
Date:			**Time – Before:**	–	–
Undertaken By:	VB TH		**SWL – After: (m)**	–	–
Vol. Water Removed:	–		**Time – After:**	–	–

Comments:

WELL PURGE DETAILS

Method:	Bailer		**SWL – Before:**	8.49m.
Date:	17/5/07		**Time – Before:**	11:39am.
Undertaken By:	VB		**SWL – After:**	8.92m.
PID Reading: (ppm)	–		**Time – After:**	11:45am.
Total Vol Removed:	1.75ltr			

PURGING MEASUREMENTS

Volume Removed (L)	Temp (°C)	pH	EC (mS/cm)	DO	Eh (mV)
1.75ltr	21.9	6.79	13.41	5.10	72.6
DRY.	–	–	–	–	–

Comments:

WELL SAMPLING DETAILS

Method:	Bailer.		Do (mg/L)	5.69
Date:	25/5/07		**SWL – Before:**	8.49m.
Undertaken By:	VB.		**Time- Before**	13:07
pH	7.28		**Water Temperature (°C)**	20.0
Eh (mV)	163.6		**EC: (mS/cm)**	12.84.

Containers Used/Comments TOG is 0.08m above TOC.

Tested By:	VB	Remarks:
Date Tested:	25/5/07.	- All measurements are corrected to ground level
Checked By:		- All stated Volumes are in Litres
Date:		- SWL is an abbreviation for standing water level

Groundwater Monitoring Report

Client:	**Capital Insight Pty Ltd**	**Job No.:**	E20974F
Project:	Proposed Multi-Storey Car Park	**Well No.:**	P8
Location:	Liverpool Hospital, Liverpool, NSW	**Depth (m):**	9m.

WELL FINISH

X	**Gatic Cover**		**Standpipe**		**PVC Pipe**

WELL DEVELOPMENT

	Stage 1	Stage 2		Stage 1	Stage 2
Method:	Bailer		**SWL – Before: (m)**	DRY	–
Date:			**Time – Before:**	–	–
Undertaken By:	~~VB~~ TH		**SWL – After: (m)**	–	–
Vol. Water Removed:	–		**Time – After:**	–	–

Comments:

WELL PURGE DETAILS

Method:	Bailer		**SWL – Before:**	– DRY
Date:	17/5/07		**Time – Before:**	11:30 am.
Undertaken By:	VB		**SWL – After:**	–
PID Reading: (ppm)	–		**Time – After:**	–
Total Vol Removed:	0			

PURGING MEASUREMENTS

Volume Removed (L)	Temp (°C)	pH	EC (mS/cm)	DO	Eh (mV)
DRY to 9.0M	–	–	–	–	–

Comments:

WELL SAMPLING DETAILS

Method:	Bailer.		DO (mg/L)	
Date:	25/5/07		**SWL – Before:**	DRY
Undertaken By:	VB		**Time- Before**	12:55 PM
pH	–		**Water Temperature (°C)**	–
Eh (mV)	–		**EC: (mS/cm)**	–

Containers Used/Comments Not Sampled. TOG is 0.11m above TOC.

Tested By:	VB	Remarks:
Date Tested:	25/5/07	- All measurements are corrected to ground level
Checked By:		- All stated Volumes are in Litres
Date:		- SWL is an abbreviation for standing water level

APPENDIX D

SOIL AND GROUNDWATER SAMPLING PROTOCOLS

These protocols specify the basic procedures to be used when sampling soils or groundwater for environmental site assessments undertaken by Environmental Investigation Services. The purpose of these protocols is to provide standard methods for: sampling, decontamination procedures for sampling equipment, sample preservation, sample storage and sample handling. Deviations from these procedures must be recorded.

SOIL SAMPLING

(i) prepare a test pit/borehole log.

(ii) Layout sampling equipment on clean plastic sheeting to prevent direct contact with ground surface. The work area should be at a distance from the drill/rig excavator such that the drill rig/excavator can operate in a safe manner.

(iii) Ensure all sampling equipment has been decontaminated prior to use.

(iv) Remove any surface debris from the immediate area of the sampling location.

(v) Collect samples and place in a glass jar with a Teflon sea. This should be undertaken as quickly as possibly to prevent the loss of volatiles. If possible, fill the glass jars completely.

(vi) Label the jar with the EIS job number, sample location (eg. TP1), sampling interval and date. If more than one sample container is used, this should also be indicated (eg. 2 = Sample jar 1 of 2 jars).

(vii) Photoionisation detector (PID) screening of volatile organic compounds (VOCs) should be undertaken on samples using the soil sample headspace method. Headspace measurements are taken following equilibration of the headspace gasses in partly filled glass jars. PID headspace data is recorded on the borehole/test pit log and the chain of custody forms.

(viii) Record the lithology of the sample and sample depth on the borehole/test pit log in accordance with AS1726-1993.

(ix) Store the sample in a sample container cooled with ice or chill packs. On completion of the sampling the sample container should be delivered to the lab immediately or stored in the refrigerator prior to delivery to the lab.

(x) Check for the presence of groundwater after completion of each borehole using an electronic dip metre or water whistle. Boreholes should be left open until the end of fieldwork. All groundwater levels in the boreholes should be rechecked on the completion of the fieldwork.

(xi) Backfill the boreholes/test pits with the excavation cuttings or clean sand prior to leaving the site.

DECONTAMINATION PROCEDURES FOR SOIL SAMPLING EQUIPMENT

(i) All of the equipment associated with the soil sampling procedure should be decontaminated between every sampling location.

(ii) The following equipment and materials are required for the decontamination procedure:

- Phosphate free detergent (Extran 100)
- Tap water
- Two buckets
- Stiff brushes
- Plastic sheets

(iii) Ensure the decontamination materials are clean prior to proceeding with the decontamination.

(iv) Fill both buckets with clean tap water and add phosphate free detergent to one bucket.

(v) In the bucket containing the detergent scrub the sampling equipment until all the material attached to the equipment has been removed.

(vi) Rinse sampling equipment in the bucket containing tap water.

(vii) Place cleaned equipment on clean plastic sheets.

If all materials are not removed by this procedure, high-pressure water cleaning is recommended. If any equipment is not completely decontaminated by both these processes that equipment should not be used until it has been thoroughly cleaned.

GROUNDWATER SAMPLING

Groundwater samples are more sensitive to contamination than soil samples and therefore adhesion to this protocol is particularly important to obtain reliable, reproducible results. The recommendations details in AS2306.1 are considered to form a minimum standard.

The basis of this protocol is to maintain the security of the borehole and obtain accurate and representative groundwater samples. The following procedure should be used for collection of groundwater samples from previously installed piezometers.

(i) After piezometer installation, at least four bore volumes should be pumped from the piezometers to remove any water introduced during the drilling process. Piezometers should then be left to recharge for at least five days before purging and sampling. Prior to purging or sampling the condition of each well should observed and any anomalies recorded on the field data sheets. The following information should be noted: the condition of the well, noting any signs of damage, tampering or complete destruction; the condition and operation of the well lock; the condition of the protective casing and the cement footing (raised or cracked); and, the presence of water between protective casing and well.

(ii) Take the groundwater level from the collar of the piezometer using an electronic dipmeter. The collar level should be taken during the site visit using a dumpy level and staff.

(iii) Purging and sampling of piezometers should generally be done on the same site visit. Layout and organize all equipment associated with groundwater sampling in a location where they will not interfere with the sampling procedure and will not pose a risk of contaminating samples. Equipment generally required includes:

- New disposable polyethylene bailer and sufficient cord OR submersible pump.
- Micropore filtration system (for heavy metals samples).
- Filter paper (glass fibre and 0.45(m).
- Buckets with volume increments.
- Sample containers – at least 1 x Teflon bottle with 1ml nitric acid, 1 x 75mL glass vial and 2 x 1L amber glass bottles for each piezometer.
- pH/Cond/Eh/T meters.
- Glass jars for purged samples.
- Esky and ice.
- Latex gloves.
- Distilled water (for cleaning).
- Electronic dipmeter.
- Groundwater sampling forms and notebook.
- Aluminium foil and labels.

(iv) Clean the Micropore filtration system thoroughly with distilled water prior to use and between each sample. Filter paper should be changed between samples. 0.45um filter paper should be placed below the glass fibre filter paper in the filtration system.

(v) Ensure all non-disposable sampling equipment is decontaminated or that new disposable equipment is available prior to any work commencing at a new location. The procedure for decontamination of groundwater equipment is outlined at the end of this section.

(vi) Disposable gloves should be used whenever samples are taken to protect the sampler and to assist in avoidance of contamination.

(vii) Purge at least four bore volumes from the well. Take pH, conductivity, redox potential, and temperature measurements of the purged groundwater at regular intervals during purging. (Say, every 5-10 litres if abundant groundwater and every 1 litre if only limited groundwater is encountered). Groundwater condition measurements should be taken from a sample in a clean glass jar which has been taken directly from the sampling equipment (either pump or bailer). Electrodes should be placed in the sample after the electrodes have been rinsed with distilled water. Purged volumes and groundwater measurements should be recorded on the field sampling sheet. An assessment of the turbidity of the sample should also be made based on three categories: silty, opaque and clear.

(viii) Prepare all sample bottles. Label bottles with EIS job number, borehole number and date of collection.

(ix) Fill amber sample bottles and BTEX vial directly from pump or bailer. Ensure sampling equipment does not touch sample containers. Sample bottles and vials must be filled to the brim, so that a reverse meniscus is formed, seal with aluminium foil and then cap. Check that no air has entered the sample invert and check for bubbles.

(x) Fill vacuum filtration system and turn on filter pump.

(xi) Undertake pH/Cond/Eh/T of a sample taken in a clean glass jar used only for groundwater condition measurements. Turn the meters on and insert the electrodes into the sample. Record the measurements when the instruments have stabilized, then discard the sample. Clean the electrodes with distilled water between measurements.

(xii) When the sample filtering is complete (note: at least 50mL of filtered sample is required for heavy metal analysis), decant the filtered sample into a Teflon bottle containing nitric acid. Check label of sample bottle to ensure container has been treated with nitric acid and not sulfuric acid. Clean the filtration system with distilled water and replace the filters ready for the next sample.

(xiii) Photoionisation detector (PID) screening of volatile organic compounds (VOC) should be undertaken on groundwater samples using the sample headspace method during fieldwork. VOC data is obtained from partly filled glass jar samples following equilibration of the headspace gases. The PID headspace data should be included on the chain of custody forms and borehole logs.

(xiv) Store the sample in a sample container cooled with ice or chill packs. On completion of the sampling the sample container should be delivered to the lab immediately or stored in the refrigerator prior to delivery to the lab.

(xv) Record the sample on the appropriate log in accordance with AS1726-1993. At the end of each water sampling complete a chain of custody form.

DECONTAMINATION PROCEDURE FOR GROUNDWATER SAMPLING EQUIPMENT

(i) All of the equipment associated with the groundwater sampling procedure should be decontaminated between every sampling location.

(ii) The following equipment and materials are required for the decontamination procedure:

- Phosphate free detergent (Extran 100).
- Tap water.
- Distilled water.
- Two buckets.
- Plastic sheets.

(iii) Fill one bucket with clean tap water and phosphate free detergent, and one bucket with distilled water.

(iv) Flush tap water and detergent through pump. Wash sampling equipment and pump head using brushes in the bucket containing detergent until all materials attached to the equipment are removed.

(v) Flush pump with distilled water.

(vi) Change water and detergent solution after each sampling location.

(vii) Rinse sampling equipment in the bucket containing distilled water.

(viii) Place cleaned equipment on clean plastic sheets.

If all materials are not removed by this procedure that equipment should not be used until it has been thoroughly cleaned.

QA/QC DEFINITIONS

The QA/QC terms used in this report are defined below. The definitions are in accordance with current US EPA SW-846 (1994) methods and those described in Environmental Sampling and Analysis, A Practical Guide, (H. Keith 1991).

Practical Quantitation Limit (PQL), Limit of Reporting (LOR) and Estimated Quantitation Limit (EQL)

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection limit (MDL) for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations.
"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit", Keith (1991).

Accuracy

The proximity of an averaged result to the true value, where all random errors have been statistically removed. Accuracy is measured by percent recovery. Acceptable limits for accuracy generally lie between 70% to 130% recoveries. Certain laboratory methods may allow for values that lie outside these limits.

Precision

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD). Acceptable targets for precision in this report will be less than 50% RPD for concentrations greater than ten times the PQL, less than 75% RPD for concentrations between five and ten times the PQL and less than 100% RPD for concentrations that are less than five times the PQL.

Blanks

The purpose of laboratory and field blanks is to check for artifacts and interferences that may arise during sampling and analysis.

Matrix Spikes

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula;

$$\frac{(\text{spiked sample result} - \text{sample result})}{\text{concentration of spike added}} \times 100$$

Acceptable recovery limits are 70% to 130%.

Surrogate Spikes

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

Duplicates

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula:

$$\frac{|\,D1 - D2\,|}{|\,(D1 + D2)/2\,|} \times 100$$

where D1 is the sample concentration and D2 is the duplicate sample concentration.

JOB NO: E20974F
LOCATION: LIVERPOOL HOSPITAL, LIVERPOOL

EIS

CALIBRATION CERTIFICATE

~~PID~~

~~Make: MiniRAE~~	~~Model: 2000~~	~~Unit:~~	~~Date of last factory calibration:~~
~~Date of calibration:~~		~~Name of Calibrator:~~	
~~Calibration gas: Iso-butylene~~		~~Calibration Gas Concentration: 100.0 ppm~~	
~~Measured reading: ppm~~		~~Error in measured reading: ± ppm~~	

DISSOLVED OXYGEN

Make: Orion	Model: Four star
Date of calibration: 25/5/07	Name of Calibrator: Vittal Boggaram.
Theoretical value: 101% to 103%	
Measured value: 102·3%.	

pH METER

Make: Orion	Model: Four star	
Date of calibration: 25/5/07	Name of Calibrator: Vittal Boggaram.	
Buffer 1: Theoretical pH = 7.01± 0.01	Expiry date: JUL 07	Lot No: EG1064
Buffer 2: Theoretical pH = 4.01± 0.01	Expiry date: AUG 07	Lot No: EH1579
Measured reading of Buffer 1: 7·01		
Measured reading of Buffer 2: 4·01		
Slope: 100·4		

CONDUCTIVITY METER

Make: Orion	Model: 130a	
Date: 25/5/07	Name of Calibrator: Vittal Boggaram	Temperature: 23°C
Calibration solution: 1413 µs/cm @ 20°c	Expiry date: SEP 07	Lot No: EI 1991
Theoretical conductivity at temperature (see solution container):		1359 µS/cm
Measured conductivity:		1292 µS/cm

REDOX METER

Make: Orion	Model: 250A
Date of calibration: 25/5/07	Name of Calibrator: Vittal Boggaram.
Theoretical redox value: 240mV	Lot NO: 01480
Measured redox reading: 232·7mV	Exp: SEP 2011

JOB NO: E20974F
LOCATION: LIVERPOOL HOSPITAL, LIVERPOOL

EIS

CALIBRATION CERTIFICATE

PID

Make: MiniRAE	Model: 2000	Unit:	Date of last factory calibration:
Date of calibration:		Name of Calibrator:	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: ppm		Error in measured reading: ± ppm	

DISSOLVED OXYGEN

Make: Orion	Model: Four star
Date of calibration: 17/5/07	Name of Calibrator: Vittal Boggaram
Theoretical value: 101% to 103%	
Measured value: 102·3%.	

pH METER

Make: Orion	Model: Four star	
Date of calibration: 17/5/07	Name of Calibrator: Vittal Boggaram.	
Buffer 1: Theoretical pH = 7.01± 0.01	Expiry date: July 07	Lot No: EG1064
Buffer 2: Theoretical pH = 4.01± 0.01	Expiry date: AUG 07	Lot No: EH1579
Measured reading of Buffer 1: 7·00		
Measured reading of Buffer 2: 4·01		
Slope: 100·4		

CONDUCTIVITY METER

Make: Orion		Model: 130a	
Date: 17/5/07	Name of Calibrator: Vittal Boggaram		Temperature: 24.5°C
Calibration solution: 1413µS/cm@20°c		Expiry date: SEP 07	Lot No: EI1991
Theoretical conductivity at temperature (see solution container):			1386µS/cm
Measured conductivity:			1344µS/cm

REDOX METER

Make: Orion	Model: 250A	
Date of calibration: 17/5/07	Name of Calibrator: Vittal Boggaram	
Theoretical redox value:	240mV	LOT NO: 01480
Measured redox reading:	205.5mV	EXP :- SEP 2011

PID 1

ENVIROEQUIP

Your Environmental Equipment Supplier

SERVICE OR REPAIR: MINIRAE 2000 PID

COMPANY	Environmental Investigation Services		
CONTACT	Adrian Kingswell		
SERIAL NO.	110-006735	**LAMP TYPE**	10.6 eV
QUOTE NO.	FOL 1554	**RECEIVED**	15 Mar 07

REQUEST/PROBLEM DESCRIPTION
Service and Calibration.

This equipment has been calibrated to the manufacturer's specifications, using the standards shown below:

ISOBUTYLENE STANDARD (PPM)	TRACEABILITY LOT NO.	CALIBRATION READING (PPM)
0.0	FRESH AIR	0.0 PPM
94.4	83872/1	94.7 PPM

Upgraded to latest firmware version: V2.00
Cleaned sensor assembly, sensor housing and metal filter
Cleaned and checked lamp and lamp housing
Disassembled & cleaned pump
Battery deep discharge and charge completed

COMMENTS/ADDITIONAL REPAIRS/SERVICES PERFORMED
Always use a water trap filter. NEXT SERVICE/CALIBRATION DUE SEP 07

SERVICED BY	O. KIUMARSI	**COMPLETED**	15 MAR 07
SIGNATURE			

JOB NO: E21171FK
LOCATION: LIVERPOOL HOSPITAL, LIVERPOOL

EIS

CALIBRATION CERTIFICATE

PID

Make: MiniRAE	Model: 2000	Unit: 1 (110-006735)	Date of last factory calibration: 15 MAR 07
Date of calibration: 30/04/2007		Name of Calibrator: Vittal Boggaram	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: 98.6 ppm		Error in measured reading: ± -1.4 ppm	

DISSOLVED OXYGEN

Make: Orion	Model: Four star
Date of calibration:	Name of Calibrator:
Theoretical value: 101% to 103%	
Measured value:	

pH METER

Make: Orion	Model: Four star	
Date of calibration:	Name of Calibrator:	
Buffer 1: Theoretical pH = 7.01± 0.01	Expiry date:	Lot No:
Buffer 2: Theoretical pH = 4.01± 0.01	Expiry date:	Lot No:
Measured reading of Buffer 1:		
Measured reading of Buffer 2:		
Slope:		

CONDUCTIVITY METER

Make: Orion		Model: 130a	
Date:	Name of Calibrator:		Temperature: °C
Calibration solution:		Expiry date:	Lot No:
Theoretical conductivity at temperature (see solution container): µS/cm			
Measured conductivity: µS/cm			

REDOX METER

Make: Orion	Model: 250A
Date of calibration:	Name of Calibrator:
Theoretical redox value: 240mV	
Measured redox reading: mV	

Appendix G

Survey Report

October 2008

Prepared by:

Parking Consultants
International

CONFIDENTIAL

Survey Report
Liverpool Hospital Car Park

Prepared for Capital Insight
Attention: John Parsons, Development Manager

16th April 2007

Atkinson Capital Insight
RECEIVED
17 APR 2007
PD
PM
Other al
File:

TABLE OF CONTENTS

Appendices

1 Brief

Liverpool Hospital, with 600 beds, is one of Sydney's largest tertiary and teaching hospitals.

Planning is well advanced for a major expansion of the hospital, referred to as Liverpool Hospital Stage 2 Redevelopment. The increase in facilities and provision of services will result in a requirement for considerable additional parking on the hospital site. A traffic transport and parking study has been completed by others, which concluded that total on-site parking needs for the hospital will increase from the present level of approximately 1,510 spaces to 2,390 spaces.

Parking on the Liverpool Hospital campus is presently managed by International Parking Group (IPG). The management contract, signed in December 1993, gives IPG exclusive rights to operate the car parking at the hospital for a twenty year period, which leaves a little over 8 years of the term currently remaining.

Parking Consultants International assisted Capital Insight in preparing financial feasibilities (report dated 5th December 2006) under a number of different scenarios.

This report addresses the execution of the surveys recommended in our December 2006 report and takes into consideration the written brief received from the client on 6th March 2007.

2 Analysis of Metro Parking Statistics

As part of our study we obtained from Metro Parking occupancy data and casual parking statistics. We have summarised this information for comparison with our surveys.

2.1 Occupancy Data

The occupancy of the outpatient and visitor parking (referred to in this report as casual parking for brevity) was provided by Metro Parking for a typical day in February 2007 and this is summarised as follows.

Peak individual occupancies at time of total peak occupancy (2 pm)

	Campbell St.	Clinical Services Building	Eastern Campus	TOTAL	Capacity	% Occupancy
Casuals	169	95	0	264	273	97%
Staff	378	41	621	1040	1090	95%
	547	**136**	**621**	**1304**	**1363**	96%

CONFIDENTIAL

2.2 Analysis of Casual Parking

Metro Parking provided statistics on casual parking, analysed by length of stay for a typical month (February 2007) and this is summarised as follows.

Statistics for February 2007 - Metro "casual trading reports" - Multi level and Clinical Service Building car parks

			Weekdays	Weekend days
Stay (hrs)	Cars	%	Cars	Cars
0.5 FREE	1707	9%		
0.5	2114	11%		
1	3929	20%		
1.5	3517	18%		
2	2278	12%		
2.5	1367	7%		
3	4529	23%		
Total paid	**17734**	**100%**	14931	2803
Total	**19441**			
Average cars per day			747	350

Overall the average length of stay was 1.79 hours (1 hour 45 mins).

On weekdays the average length of stay was 1.82 hours (1 hr 49 mins) and on weekend days 1.65 hours (I hour 39 minutes)

3 Report on Surveys

We undertook a number of surveys as agreed. In addition, we elected to undertake license plate surveys on the 2 casual parking areas, even though these surveys were not part of our proposed scope of work.

After examining the available data and visiting the site, it was decided that the license plate surveys would provide us some very useful data relating to length of stay, and at the same time would provide us with occupancy information.

The method used for the license plate surveys was to note license plate details at the entry and exit over a 15 hour period, together with the times of arrival and departure. This information was then analysed on the computer to obtain length of stay information.

Interview surveys were conducted (as detailed in 3.3 below) in order to obtain essential information from casual parkers.

Finally, the information received by the Hospital management in its staff surveys was analysed and summarised.

3.1 Occupancy Surveys

Our occupancy surveys of casual parking spaces indicated the following: -

Peak individual occupancies at time of total casual peak occupancy (10 am)

	Campbell St.	**Clinical Services Building**		**TOTAL**	**Capacity**	**% Occupancy**
Casuals	123	121		244	273	89%

The overall casual space occupancy per the PCI surveys was 244 spaces (89%) compared with 264 spaces (97%) per the Metro statistics.

In the interests of conservatism we have adopted the higher figure, noting that the variance is only 8% of the capacity.

3.2 License Plate Surveys

A survey of license plate numbers was conducted on Friday, 23 March 2007 from 6.00am to 9.00pm at the casual section of the Multi-Level car park and the Clinical Services Building car park.

The entry and exit points at the multistorey car park are in close proximity to each other so that both could be observed simultaneously to record the details. The entry and exit points for the CSB car park are separated and therefore each location was surveyed independently.

Appendix A provides extracts from the license plate matching sheets, to demonstrate the methodology used.

The results of these surveys were as follows.

Average length of stay	1 hr 45 mins.
Number of cars in	720
Maximum occupancy	244
Turnover per space	2.95

The surveys in both car parks, particularly the multi-storey car park were complicated by the presence of a number of longer stay parkers. On examining the Metro records, it became clear that some staff are using the casual car park. We therefore excluded from our analysis all cars exceeding 6 hours. This resulted in the same average stay as that reported by Metro.

3.3 Interview Surveys

Interview surveys were conducted at the two main entries to the hospital. A survey form was prepared (see Appendix B) with questions relating to:-

a) Mode of travel to the hospital
b) If by car whether parking was found at the hospital car parks; if no parking found where did they park
c) Would they have parked at the hospital if additional spaces were available
d) Average length of stay
e) Number of persons per vehicle
f) Postcode of the Suburb of origin

A total of 233 visitors and outpatients were interviewed and analysed. The interview form and data are provided in **Appendix B.**

Summary of interviews based on the response from visitors are given below:

Purpose of Visit		
Outpatient / Day Clinic *	28%	67
Visitor to an inpatient	71%	163
Contractor	1%	3
TOTAL	**100%**	**233**
Regular / Frequent Visitor (if yes)	**11%**	**25**
Mode of transport		
Car	73%	169
Train	9%	20
Bus	3%	8
Taxi	8%	21
Walk / Cycle	2%	4
Other	5%	11
TOTAL	**100%**	**233**
Number of people who travelled in one car		
Driver alone	21%	36
2 people	51%	85
3 people	21%	36
More than 3 people	7%	12
TOTAL	**100%**	**169**
Average people per car (incl.driver)		**2.14**

* Note: Outpatients included a number of respondents who clearly belonged in that category but replied otherwise (for example people accompanying outpatients who responded on their behalf).

The majority of visitors (169 or 73%) came to the hospital by car. These respondents nominated where they parked as follows:-

Location of parking		
In the hospital car parks	36%	61
Elsewhere	64%	108
TOTAL	100%	**169**
Would have parked at the hospital if additional space were available?		
Yes	18%	20
No	52%	56
Not responded	30%	32
TOTAL	**100%**	**108**
Chargeable Duration of parking (hrs)		
0.5	15%	
1	22%	
2	**31%**	
3	21%	
4+	11%	
Total	100%	

The length of stay percentages are very similar to those derived from the Metro data.

We also subanalysed data separately for outpatients and visitors and obtained the following data:-

	Outpatients	**Visitors**
Percentage by car	49%	82%
People per car	Not applicable as passengers not counted	2.16

3.4 Staff Surveys

We were provided by Capital Insight with 352 usable hard copy staff survey responses to questions put by the hospital regarding their modes of transport, location of parking, and their home location.

The data was collated and reported in Appendix C. A summary of the findings is as follows:-

The average length of stay in the multi-storey car park was 9 hours 45 minutes.

Total responses classified based on their mode of transport was:-

Drivers	298	85%
Passenger	11	3%
Bus	4	1%
Train	25	7%
Walk	11	3%
Dropped off	3	1%
Total	**352**	**100%**

Of the 298 staff who came by car, the following were responses as to where they parked: -

Parking Area	**No.**	**%**
Staff parked in Multistorey	65	22%
Staff parked in Eastern campus	56	19%
Staff parked in Health service parking	1	0%
Staff parked in Disabled park	1	0%
Staff parked near Helipad	17	6%
Sub Total - Parked in Hospital Grounds	**140**	**47**
Staff parked in the street	130	44%
Staff parked near Warwick Farm station	4	1%
Staff parked in Railway car park	20	7%
Staff parked in Westfield	4	1%
Total	**298**	**100%**

Staff indicated that they commenced their journey to work from the following suburbs:_

Staff Travelled from	**No.**	**%**
Bonnyrigg	10	3%
Bossley Park	8	2%
Camden	6	2%
Campelltown	35	10%
Casuala	10	3%
Fairfield	11	3%
Glenfield	5	1%
Hinchinbrook	12	3%
Ingleburn	7	2%
Liverpool	14	4%
Macquarie Fields	9	3%
Mittagong	7	2%
Narellan Vale	9	3%
Panania	6	2%

Staff Travelled from	No.	%
Prestons	8	2%
Wattlegrove	5	1%
West Hoxton	6	2%
Wollongong	5	1%
Other various locations	162	46%
Location not specified	17	5%
Total	**352**	**100%**

4 Conclusions

The conclusions from our surveys and from the Metro statistics are summarised in the following table.

Liverpool Hospital Summary of Data Obtained from PCI Surveys & from Metro statistics

	Present Total Demand								On Site Occupancy					On Site Supply	
	No. People	% by car	people per car	% cars/ people	Avg.cars /day	Turnover	TOTAL No.spaces demand	% car spaces to demand factors	Parking on-site	Cars	Spaces	Avg. length of stay (hrs)	% car spaces to demand factors	Spaces	% Occupancy
Daytime staff	2576	85%	n/a	n/a	2189	1	2189		48%	1040	1040	9.75		1090	95%
Evening Staff (5%)	152														
Weekend staff (10%)	303														
Staff (FTE)	**3030**							72% of total FTE					72% of total FTE		
Outpatients	2808	49%	n/a	n/a	1376	2.95	466	17% of occupied beds	40%	550	186		17% of occupie d beds		
Beds occupied per day	**433**														
Visitors #	**1517**	82%	2.14	38%	581	2.95	197	45% of occupied bes	39%	229	78		45% of occupie d bes		
(to inpatients)															
CASUAL					**1957**		**663**			**779**	**264**	**1.75**		**273**	97%
TOTALS					**4146**		**2853**			**1819**	**1304**				
Notes -	# Based on file data of 3.5 visitors per occupied bed per day														
n/a = not applicable															

The table on the previous page summarises all the key information with regard to : -

- Present total demand (yellow background)
- On-site occupancy (blue background)
- On-site supply (brown background)

Commenting on the columns from left to right : -

PRESENT TOTAL DEMAND

- Number of people : data received from Capital Insight as part of briefing for original report (converted to daily figures for outpatients, visitors and beds occupied)
- % by car: figures from staff and interview surveys
- People per car: from interview surveys (note irrelevant for outpatients and negligible for staff)
- % cars to people (visitors) : calculated by dividing (percentage by car) by (no. people per car)
- Average cars per day: calculated by multiplying no. people X percentage by car
- Turnover: derived from license plate surveys
- Total spaces demand: calculated by dividing total cars by turnover
- % Car spaces to demand factors: % car space demand to factors stated

ON SITE OCCUPANCY

- Parking on site (percentage): calculated peak occupancy as percentage of total demand Note: that these percentages vary only marginally from the percentages derived from the interview and staff surveys.
- Cars: calculated from above percentage
- Spaces : per license plate / occupancy survey. Note: (i) visitors and outpatients figures based on total casuals and calculated pro rata to total demand figures (ii) Turnover per space per total demand
- Average length of stay: from staff surveys and from casual statistics and interviews
- % Car spaces to demand factors: % car space demand to factors stated

ON SITE SUPPLY

- Spaces : Per data from Capital Insight
- Occupancy (percentage) : Per surveys and data.

In summary this data represents the input for evaluating both the current parking income and future feasibility studies.

Parking Consultants International

Cristina Lynn

Peter Burrows

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APPENDIX A

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Appendix A

LIVERPOOL HOSPITAL - LICENSE PLATE SURVEY							
			LENGTH OF STAY				
Time IN	Time OUT	License Plate	< 6 Hours	6-8 hours	8-10 hours	10-12 hours	> 12 hours
7:40:00		4FRODO					
	18:05:00	4FRODO				10:25:00	
8:45:00		A0057T					
	16:25:00	A0057T		7:40:00			
9:15:00		A0094Q					
	12:55:00	A0094Q	3:40:00				
18:35:00		A120HR					
	19:25:00	A120HR	0:50:00				
18:35:00		AA46RS					
	20:10:00	AA46RS	1:35:00				
18:35:00		AAG35Z					
	19:15:00	AAG35Z	0:40:00				
10:20:00		AB54HN					
	11:40:00	AB54HN	1:20:00				
18:40:00		ABM62L					
	20:35:00	ABM62L	1:55:00				
9:45:00		ABM84T					
	20:20:00	ABM84T				10:35:00	
13:50:00		AC20AF					
	13:55:00	AC20AF	0:05:00				
8:20:00		AC22NK					
	14:45:00	AC22NK		6:25:00			
10:00:00		AC33VD					
	11:45:00	AC33VD	1:45:00				
14:40:00		AC69NZ					
	15:20:00	AC69NZ	0:40:00				
15:00:00		AC90VK					
	16:15:00	AC90VK	1:15:00				
18:50:00		AD12PG					
	19:40:00	AD12PG	0:50:00				
10:25:00		AD1426					
	12:35:00	AD1426	2:10:00				
19:20:00		AD18KY					
	19:50:00	AD18KY	0:30:00				
14:25:00		AD72HI					
	16:00:00	AD72HI	1:35:00				
9:45:00		ADB89H					
	10:55:00	ADB89H	1:10:00				
9:35:00		ADH95P					
	12:10:00	ADH95P	2:35:00				
13:00:00		ADJ63V					
	15:30:00	ADJ63V	2:30:00				
9:15:00		AET055					
	11:00:00	AET055	1:45:00				
7:35:00		AEZ21PS					
	11:30:00	AEZ21PS	3:55:00				
12:10:00		AF17MF					
	15:00:00	AF17MF	2:50:00				
17:55:00		AF265					
	20:00:00	AF265	2:05:00				
13:55:00		AF28AJ					
	20:15:00	AF28AJ		6:20:00			
18:35:00		AFF54J					
	20:15:00	AFF54J	1:40:00				
16:45:00		AFO97V					
	19:10:00	AFO97V	2:25:00				
10:15:00		AG102G					
	19:05:00	AG10ZG			8:50:00		
9:55:00		AG21LZ					
	11:50:00	AG21LZ	1:55:00				

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11:55:00		AG26YQ					
	13:00:00	AG26YQ	1:05:00				
18:20:00		AG86MG					
	20:25:00	AG86MG	2:05:00				
10:20:00		AGL98E					
	19:15:00	AGL98E			8:55:00		
11:55:00		AGX78P					
	19:30:00	AGX78P		7:35:00			
15:30:00		AH31NG					
	15:35:00	AH31NG	0:05:00				
18:10:00		AH31NG					
	19:20:00	AH31NG	1:10:00				
9:20:00		AH63QD					
	11:30:00	AH63QD	2:10:00				
10:10:00		AHN04G					
	11:25:00	AHN04G	1:15:00				
19:10:00		AHN57Z					
	19:55:00	AHN57Z	0:45:00				
8:10:00		AI18YL					
	13:00:00	AI18YL	4:50:00				
15:30:00		AI97CS					
	16:25:00	AI97CS	0:55:00				
10:10:00		AIA89K					
	14:45:00	AIA89K	4:35:00				
9:45:00		AJ33GE					
	10:20:00	AJ33GE	0:35:00				
10:30:00		AJ35CR					
	10:35:00	AJ35CR	0:05:00				
17:05:00		AJ59YH					
	17:25:00	AJ59YH	0:20:00				
9:45:00		AJ93BD					
	11:35:00	AJ93BD	1:50:00				
17:40:00		AJD122					
	18:45:00	AJD122	1:05:00				
11:00:00		AJH80P					
	18:05:00	AJH80P		7:05:00			
9:30:00		AJM263					
	18:55:00	AJM263			9:25:00		
10:00:00		AJV52J					
	10:20:00	AJV52J	0:20:00				
16:55:00		AJW94T					
	17:35:00	AJW94T	0:40:00				
16:20:00		AJZ22H					
	17:15:00	AJZ22H	0:55:00				
7:40:00		AK38FJ					
	15:00:00	AK38FJ		7:20:00			
18:15:00		AK45UW					
	19:15:00	AK45UW	1:00:00				
15:25:00		AKD97C					
	16:20:00	AKD97C	0:55:00				
12:15:00		AKO64U					
	14:40:00	AKO64U	2:25:00				
17:00:00		AL02WE					
	17:45:00	AL02WE	0:45:00				
14:50:00		AL44WF					
	15:50:00	AL44WF	1:00:00				
18:45:00		AL592R					
	19:40:00	AL592R	0:55:00				
9:40:00		AL84KH					
	11:25:00	AL84KH	1:45:00				
12:10:00		AM00HB					
	14:45:00	AM00HB	2:35:00				
18:50:00		AM54ZT					
	20:20:00	AM54ZT	1:30:00				
17:55:00		AM90JV					

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	19:10:00	AM90JV	1:15:00				
12:20:00		AMA66S					
	15:35:00	AMA66S	3:15:00				
18:50:00		AMF65P					
	19:30:00	AMF65P	0:40:00				
18:30:00		AMW45P					
	20:45:00	AMW45P	2:15:00				
12:05:00		AN12RF					
	12:40:00	AN12RF	0:35:00				
12:10:00		AN31UK					
	17:05:00	AN31UK	4:55:00				
9:35:00		AN52WA					
	11:45:00	AN52WA	2:10:00				
14:00:00		AN62JC					
	16:15:00	AN62JC	2:15:00				
18:20:00		ANH77K					
	20:00:00	ANH77K	1:40:00				
9:10:00		AO66NA					
	10:15:00	AO66NA	1:05:00				
14:15:00		AOH54C					
	16:25:00	AOH54C	2:10:00				
12:30:00		AOH72A					
	16:55:00	AOH72A	4:25:00				
9:55:00		AOY67G					
	12:05:00	AOY67G	2:10:00				
9:40:00		AOY68G					
	10:45:00	AOY68G	1:05:00				
8:00:00		AOY92S					
	14:55:00	AOY92S	6:55:00				
11:50:00		AP1269					
	12:10:00	AP1269	0:20:00				
17:30:00		APF19D					
	17:40:00	APF19D	0:10:00				
16:05:00		APR05F					
	17:05:00	APR05F	1:00:00				
18:20:00		APR0SF					
	19:15:00	APR0SF	0:55:00				
16:50:00		AQB13H					
	18:35:00	AQB13H	1:45:00				
15:55:00		AQB62A					
	16:20:00	AQB62A	0:25:00				
17:20:00		AQM03Q					
	19:55:00	AQM03Q	2:35:00				
9:20:00		AQY36Y					
	10:55:00	AQY36Y	1:35:00				
18:50:00		AS0714					
	20:10:00	AS0714	1:20:00				
14:40:00		ASG103					
	15:50:00	ASG103	1:10:00				
9:15:00		ASJ412					
	11:40:00	ASJ412	2:25:00				
18:45:00		ASK68G					
	19:20:00	ASK68G	0:35:00				
12:40:00		ASQ71B					
	14:40:00	ASQ71B	2:00:00				
8:25:00		ASR54M					
	10:05:00	ASR54M	1:40:00				
9:20:00		ASX21A					
	11:20:00	ASX21A	2:00:00				
15:10:00		ASY78X					
	15:45:00	ASY78X	0:35:00				
8:30:00		ATD07R					
	12:40:00	ATD07R	4:10:00				
9:35:00		ATN36Y					
	11:30:00	ATN36Y	1:55:00				

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12:25:00		ATO07T					
	14:50:00	ATO07T	2:25:00				
17:15:00		AUA70A					
	19:15:00	AUA70A	2:00:00				
10:30:00		AUG76Z					
	17:20:00	AUG76Z		6:50:00			
10:00:00		AUM77Q					
	10:30:00	AUM77Q	0:30:00				
18:20:00		AW162D					
	19:25:00	AW162D	1:05:00				
12:35:00		AWQ98J					
	17:55:00	AWQ98J	5:20:00				
12:15:00		AWV42D					
	14:45:00	AWV42D	2:30:00				
19:15:00		AYZ81L					
	20:35:00	AYZ81L	1:20:00				
10:10:00		AZF78G					
	12:05:00	AZF78G	1:55:00				
16:10:00		AZL53Q					
	17:50:00	AZL53Q	1:40:00				
10:00:00		AZV35E					
	11:50:00	AZV35E	1:50:00				
15:30:00		AZV59F					
	16:00:00	AZV59F	0:30:00				
7:35:00		BAA01A					
	18:35:00	BAA01A				11:00:00	
9:55:00		BAE70V					
	11:50:00	BAE70V	1:55:00				
15:50:00		BAF26U					
	16:10:00	BAF26U	0:20:00				
12:40:00		BAJ55G					
	17:50:00	BAJ55G	5:10:00				
7:35:00		BAK082					
	18:05:00	BAK082				10:30:00	
12:20:00		BBE29V					
	17:15:00	BBE29V	4:55:00				
10:20:00		BBE87K					
	15:55:00	BBE87K	5:35:00				
16:55:00		BM471					
	18:10:00	BM471	1:15:00				
10:25:00		BND081			9:30:00		
	19:55:00	BND081					
10:25:00		BP358					
	11:10:00	BP358	0:45:00				
11:25:00		BS0358					
	16:45:00	BS0358	5:20:00				
12:50:00		BS1173					
	13:00:00	BS1173	0:10:00				
12:05:00		BYO80Y					
	15:50:00	BYO80Y	3:45:00				
11:15:00		CYF065					
	12:35:00	CYF065	1:20:00				
9:45:00		DB140					
	10:25:00	DB140	0:40:00				
12:15:00		DCB019					
	15:35:00	DCB019	3:20:00				
15:55:00		DL482					
	18:50:00	DL482	2:55:00				
11:35:00		DRM005					
	14:35:00	DRM005	3:00:00				
15:25:00		FJ495					
	16:15:00	FJ495	0:50:00				
8:25:00		GH496					
	11:00:00	GH496	2:35:00				
20:20:00		IONICA					

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	20:40:00	IONICA	0:20:00				
9:50:00		JMJ001					
	10:55:00	JMJ001	1:05:00				
10:25:00		KAW55E					
	12:55:00	KAW55E	2:30:00				
17:25:00		KAW55E					
	18:35:00	KAW55E	1:10:00				
10:20:00		KB0681					
	15:15:00	KB0681	4:55:00				
17:40:00		KR008					
	18:05:00	KR008	0:25:00				
10:15:00		KWC000					
	11:00:00	KWC000	0:45:00				
15:30:00		LAO88V					
	16:05:00	LAO88V	0:35:00				
15:30:00		MBG388					
	16:05:00	MBG388	0:35:00				
11:45:00		MC4772					
	14:10:00	MC4772	2:25:00				
7:20:00		MIN09H					
	12:50:00	MIN09H	5:30:00				
12:15:00		MMIYMN					
	12:40:00	MMIYMN	0:25:00				
9:15:00		MS3269					
	11:10:00	MS3269	1:55:00				
9:50:00		MVC170					
	10:50:00	MVC170	1:00:00				
7:55:00		NAL003					
	17:20:00	NAL003			9:25:00		
17:05:00		NX142Y					
	18:15:00	NX142Y	1:10:00				
8:50:00		NXF17B					
	16:40:00	NXF17B		7:50:00			
14:20:00		NXN94H					
	17:40:00	NXN94H	3:20:00				
9:45:00		OHS161					
	10:05:00	OHS161	0:20:00				
17:15:00		OPM626					
	17:35:00	OPM626	0:20:00				
15:10:00		PC072					
	16:15:00	PC072	1:05:00				
8:45:00		PC2277					
	18:05:00	PC2277			9:20:00		
9:30:00		PC299					
	15:35:00	PC299		6:05:00			
17:50:00		PL356					
	19:55:00	PL356	2:05:00				
12:20:00		PSG72S					
	15:05:00	PSG72S	2:45:00				
16:55:00		PUR288					
	18:25:00	PUR288	1:30:00				
17:40:00		PYR164					
	20:15:00	PYR164	2:35:00				
11:10:00		PYT056					
	15:35:00	PYT056	4:25:00				
9:15:00		QNZ371					
	10:45:00	QNZ371	1:30:00				
9:45:00		RFS101					
	11:30:00	RFS101	1:45:00				
16:05:00		RH8018					
	17:35:00	RH8018	1:30:00				
15:15:00		RHO369					
	16:20:00	RHO369	1:05:00				
18:05:00		RIE243					
	20:15:00	RIE243	2:10:00				

CONFIDENTIAL

15:15:00		RM6408					
	16:35:00	RM6408	1:20:00				
9:45:00		ROU561					
	11:00:00	ROU561	1:15:00				
14:50:00		RP191					
	16:10:00	RP191	1:20:00				
9:10:00		RUD823					
	10:20:00	RUD823	1:10:00				
12:20:00		RYN533					
	14:35:00	RYN533	2:15:00				
10:05:00		RYU646					
	12:40:00	RYU646	2:35:00				
18:40:00		S20916					
	20:45:00	S20916	2:05:00				
7:55:00		SBK436					
	18:05:00	SBK436				10:10:00	
9:55:00		SDU059					
	11:45:00	SDU059	1:50:00				
17:40:00		SIN662					
	19:30:00	SIN662	1:50:00				
9:35:00		SPP785					
	10:15:00	SPP785	0:40:00				
13:50:00		SRG10N					
	18:20:00	SRG10N	4:30:00				
17:20:00		SRK123					
	18:10:00	SRK123	0:50:00				
10:20:00		TA350					
	11:25:00	TA350	1:05:00				
18:20:00		TF5153					
	19:40:00	TFS153	1:20:00				
12:20:00		TGT265					
	12:50:00	TGT265	0:30:00				
15:35:00		TH518					
	16:20:00	TH518	0:45:00				
12:35:00		TMO13					
	12:55:00	TMO13	0:20:00				
9:40:00		TMY262					
	10:45:00	TMY262	1:05:00				
19:20:00		TQL473					
	20:45:00	TQL473	1:25:00				
15:20:00		TVC560					
	17:40:00	TVC560	2:20:00				
18:25:00		TWG281					
	19:25:00	TWG281	1:00:00				
15:50:00		TWG514					
	17:35:00	TWG514	1:45:00				
17:20:00		TWY412					
	18:35:00	TWY412	1:15:00				
10:20:00		USN700					
	11:10:00	USN700	0:50:00				
16:00:00		UTF579					
	17:10:00	UTF579	1:10:00				
9:40:00		UTV160					
	11:10:00	UTV160	1:30:00				
10:30:00		UWK661					
	12:10:00	UWK661	1:40:00				
12:40:00		VEX677					
	15:00:00	VEX677	2:20:00				
10:30:00		VKZ657					
	10:35:00	VKZ657	0:05:00				
19:10:00		VLK213					
	19:35:00	VLK213	0:25:00				
12:25:00		VMG678					
	13:40:00	VMG678	1:15:00				
18:05:00		VOG076					

CONFIDENTIAL

	19:30:00	VOG076	1:25:00				
12:35:00		VOJ707					
	15:10:00	VOJ707	2:35:00				
9:15:00		VPB667					
	11:30:00	VPB667	2:15:00				
11:30:00		VQK567					
	12:55:00	VQK567	1:25:00				
17:10:00		VRR795					
	19:05:00	VRR795	1:55:00				
15:45:00		VST537					
	16:25:00	VST537	0:40:00				
15:30:00		VTG064					
	17:15:00	VTG064	1:45:00				
10:05:00		VTZ00M					
	11:00:00	VTZ00M	0:55:00				
9:30:00		VWK661					
	10:35:00	VWK661	1:05:00				
9:15:00		VXC566					
	10:05:00	VXC566	0:50:00				
17:15:00		WDV087					
	18:10:00	WDV087	0:55:00				
13:50:00		WFJ402					
	14:50:00	WFJ402	1:00:00				
9:45:00		WNA530					
	15:20:00	WNA530	5:35:00				
8:15:00		WNZ998					
	15:45:00	WNZ998		7:30:00			
17:10:00		WSH120					
	19:40:00	WSH120	2:30:00				
8:50:00		WTU648					
	10:50:00	WTU648	2:00:00				
10:20:00		XAG744					
	10:55:00	XAG744	0:35:00				
8:10:00		XBY781					
	10:05:00	XBY781	1:55:00				
18:50:00		XEV826					
	20:25:00	XEV826	1:35:00				
14:50:00		XHX051					
	15:50:00	XHX051	1:00:00				
10:25:00		XJP480					
	12:15:00	XJP480	1:50:00				
7:50:00		XOK308					
	19:25:00	XOK308				11:35:00	
13:05:00		XPH330					
	14:55:00	XPH330	1:50:00				
10:25:00		XPL548					
	10:35:00	XPL548	0:10:00				
10:25:00		XSD736					
	15:00:00	XSD736	4:35:00				
12:40:00		XTW561					
	14:25:00	XTW561	1:45:00				
9:50:00		XWD062					
	12:30:00	XWD062	2:40:00				
13:45:00		XYE823					
	14:40:00	XYE823	0:55:00				
8:20:00		YEN525					
	11:25:00	YEN525	3:05:00				
16:45:00		YEN803					
	17:45:00	YEN803	1:00:00				
9:35:00		YFS997					
	10:20:00	YFS997	0:45:00				
12:05:00		YGU396					
	17:20:00	YGU396	5:15:00				
8:25:00		YHR097					
	9:20:00	YHR097	0:55:00				

CONFIDENTIAL

17:15:00		YHV902					
	18:35:00	YHV902	1:20:00				
14:55:00		YID582					
	18:15:00	YID582	3:20:00				
8:45:00		YKN558					
	12:35:00	YKN558	3:50:00				
9:35:00		YLR624					
	9:40:00	YLR624	0:05:00				
18:05:00		YND317					
	19:50:00	YND317	1:45:00				
9:20:00		YOK951					
	10:25:00	YOK951	1:05:00				
16:15:00		YOQ779					
	18:05:00	YOQ779	1:50:00				
9:15:00		YPC754					
	10:55:00	YPC754	1:40:00				
9:40:00		YQC887					
	19:00:00	YQC887			9:20:00		
9:50:00		YQS851					
	11:10:00	YQS851	1:20:00				
12:40:00		YQX252					
	17:15:00	YQX252	4:35:00				
9:50:00		YRP800					
	10:45:00	YRP800	0:55:00				
17:00:00		YTC590					
	18:15:00	YTC590	1:15:00				
10:05:00		YUN585					
	11:20:00	YUN585	1:15:00				
14:30:00		YXZ966					
	17:25:00	YXZ966	2:55:00				
10:15:00		ZCW323					
	10:50:00	ZCW323	0:35:00				
17:20:00		ZKN483					
	18:50:00	ZKN483	1:30:00				
14:50:00		ZLC071					
	16:10:00	ZLC071	1:20:00				
6:00:00		ADX98K					
	21:00:00	ADX98K					15:00:00
15:20:00		AF97SV					
	21:00:00	AF97SV	5:40:00				
19:25:00		AFN87Q					
	21:00:00	AFN87Q	1:35:00				
6:00:00		AH57ER					
	7:30:00	AH57ER	1:30:00				
18:05:00		AI27XO					
	21:00:00	AI27XO	2:55:00				
18:50:00		AJA93K					
	21:00:00	AJA93K	2:10:00				
7:15:00		AJD122					
	7:35:00	AJD122	0:20:00				
16:50:00		AL58PB					
	21:00:00	AL58PB	4:10:00				
19:25:00		AO99TD					
	21:00:00	AO99TD	1:35:00				
6:00:00		AOU32B					
	7:40:00	AOU32B	1:40:00				
6:00:00		API12C					
	21:00:00	API12C					15:00:00
18:25:00		AQQ61H					
	21:00:00	AQQ61H	2:35:00				
6:00:00		AWB82M					
	12:50:00	AWB82M		6:50:00			
6:00:00		BCM000					
	17:50:00	BCM000				11:50:00	
18:50:00		BMW532					

CONFIDENTIAL

	21:00:00	BMW532	2:10:00				
20:00:00		DR8348					
	21:00:00	DR8348	1:00:00				
6:00:00		KIM672					
	7:10:00	KIM672	1:10:00				
15:45:00		LD2505					
	21:00:00	LD2505	5:15:00				
6:00:00		LH9883					
	7:40:00	LH9883	1:40:00				
17:50:00		QYH584					
	21:00:00	QYH584	3:10:00				
6:00:00		RVX969					
	8:05:00	RVX969	2:05:00				
18:25:00		SEJ002					
	21:00:00	SEJ002	2:35:00				
11:25:00		VJK111					
	21:00:00	VJK111			9:35:00		
13:50:00		WLB458					
	21:00:00	WLB458		7:10:00			
18:10:00		XBR991					
	21:00:00	XBR991	2:50:00				
18:45:00		YEN803					
	21:00:00	YEN803	2:15:00				
18:30:00		YNW831					
	21:00:00	YNW831	2:30:00				
9:30:00		ZBD476					
	15:45:00	ZBD476		6:15:00			
14:00:00		A2469					
	15:25:00	A2469	1:25:00				
8:20:00		AA60EV					
	16:40:00	AA60EV			8:20:00		
10:00:00		AA79FS					
	12:10:00	AA79FS	2:10:00				
8:40:00		AB730					
	10:50:00	AB730	2:10:00				
19:00:00		ABH10D					
	19:15:00	ABH10D	0:15:00				
9:10:00		ABJ200					
	12:20:00	ABJ200	3:10:00				
8:20:00		ABL78B					
	9:35:00	ABL78B	1:15:00				
10:00:00		AC25GP					
	11:05:00	AC25GP	1:05:00				
10:30:00		AC30YN					
	11:15:00	AC30YN	0:45:00				
9:20:00		AC61FA					
	10:40:00	AC61FA	1:20:00				
11:15:00		AC90QE					
	11:55:00	AC90QE	0:40:00				
7:45:00		AC91MC					
	17:15:00	AC91MC			9:30:00		
9:00:00		ACA53U					
	15:55:00	ACA53U		6:55:00			
16:05:00		ACA53U					
	17:20:00	ACA53V	1:15:00				
9:25:00		AD32PB					
	10:05:00	AD32PB	0:40:00				
11:55:00		AE09UD					
	14:00:00	AE09UD	2:05:00				
11:30:00		AE26GE					
	14:55:00	AE26GE	3:25:00				
11:45:00		AE35HV					
	15:45:00	AE35HV	4:00:00				
18:25:00		AE52ZK					
	21:00:00	AE52ZK	2:35:00				

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11:05:00		AF21HR					
	12:00:00	AF21HR	0:55:00				
11:55:00		AF42PK					
	15:20:00	AF42PK	3:25:00				
18:55:00		AFBOIL					
	21:00:00	AFBOIL	2:05:00				
10:20:00		AG00QK					
	11:30:00	AG00QK	1:10:00				
11:45:00		AG15ZX					
	17:20:00	AG15ZX	5:35:00				
9:15:00		AGR265					
	10:25:00	AGR265	1:10:00				
9:40:00		AH21ER					
	10:15:00	AH21ER	0:35:00				
10:05:00		AH79VZ					
	11:10:00	AH79VZ	1:05:00				
15:40:00		AH98QR					
	16:30:00	AH98QR	0:50:00				
18:45:00		AH99YS					
	19:10:00	AH99YS	0:25:00				
10:40:00		AI59P1					
	11:25:00	AI59PI	0:45:00				
8:40:00		AI75BF					
	10:15:00	AI75BF	1:35:00				
10:40:00		AIZ90Z					
	12:00:00	AIZ90Z	1:20:00				
8:55:00		AJ40XF					
	12:00:00	AJ40XF	3:05:00				
9:25:00		AK89YQ					
	16:45:00	AK89YQ		7:20:00			
15:20:00		AKC26X					
	15:50:00	AKC26X	0:30:00				
8:35:00		ALK49H					
	9:55:00	ALK49H	1:20:00				
8:55:00		AM88PG					
	10:00:00	AM88PG	1:05:00				
10:35:00		AN30TN					
	14:45:00	AN30TN	4:10:00				
8:20:00		ANL50D					
	9:15:00	ANL50D	0:55:00				
9:40:00		ANN74B					
	10:50:00	ANN74B	1:10:00				
8:45:00		AO04NR					
	9:15:00	AO04NR	0:30:00				
12:00:00		AOW23Z					
	14:30:00	AOW23Z	2:30:00				
9:05:00		APY07L					
	10:45:00	APY07L	1:40:00				
8:55:00		AQH11T					
	16:45:00	AQH11T		7:50:00			
8:00:00		ART64H					
	19:45:00	ART64H				11:45:00	
8:10:00		ASA94T					
	10:40:00	ASA94T	2:30:00				
9:00:00		ASL39W					
	9:50:00	ASL39W	0:50:00				
14:30:00		ASZ13K					
	15:05:00	ASZ13K	0:35:00				
10:15:00		ATC32W					
	17:50:00	ATC32W		7:35:00			
9:55:00		ATG43H					
	14:00:00	ATG43H	4:05:00				
8:40:00		ATW53W					
	11:10:00	ATW53W	2:30:00				

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APPENDIX B

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NSW HEALTH

parking consultants international
adding value to your properties through excellence in parking design, planning and

APPENDIX B

Liverpool Hospital – March 2007

LEAVING - INTERCEPT INTERVIEW FORM

	Time & Date	__________ am __________ pm ______ / ______ 2007

My name is ....of Parking Consultants International. We would be most grateful if you could spare two minutes to answer a few quick questions.

Q1	What was the purpose of your visit to Liverpool Hospital today? *EXPLAIN* * *<u>Outpatient / Day Clinic includes</u> obtaining treatment or advice, seeing clinician (pre or post op) but <u>not being admitted or staying overnight.</u>*	Outpatient / Day Clinic *................☐ Accompanying Outpatient ....☐ Inpatient ....☐ Visitor to an inpatient ....☐ Hospital Doctor ....☐ Consulting suite Doctor ....☐ Staff ....☐ Visiting Medical Officer *(VMO)*.........☐ Contractor ....☐ Other – please specify ______________________________ **ALSO** Regular / Frequent Visitor (if yes) ....☐
Q2	How did you travel to the hospital today?	Car ....☐ Train ....☐ Bus ....☐ Taxi ....☐ Walk / Cycle ....☐ Other – please specify ______________________________
Q3	If you came by car how many people were in the vehicle (including driver)?	Driver alone ....☐ 2 people ....☐ 3 people ....☐ More than 3 people ....☐
Q4	If you came by car where did you park?	In the hospital car park .... ☐ Elsewhere – please specify ______________________________
Q5	Would have parked at the hospital if additional spaces were available	Yes ....☐ No ....☐
Q6	How long did you spend or expect to spend in the car park or parked elsewhere today?	Less than 30 minutes ....☐ Between 30 min & 1 hour ....☐ Between 1 and 2 hours ....☐ Between 2 and 3 hours...................☐ More than 3 hours ....☐
Q7	What is your residential postcode?	______________________________

Thank you for your time.

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APPENDIX C

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Appendix C

Liverpool Hospital - Staff Survey

	Where do you normally travel from	Normal Arrival Time	Normal departure time	Car as driver	Car as driver with passenger	Car as passenger	set down/pick up	Parking location Street	Parking Multi Storey	Parking Eastern Campus	Parking near Warwick Farm station	Parking Railway Car Park	Helipad	health serv car park	Westfields	Taxi	walk	BUS	Route Number (BUS)	Train Liverpool Station	Train Warwick Farm Station	Bicycle	Motor Cycle	Other (specify)
1	Casula	13:00	22:00	1				1																
		6:30	15:30	1				1																
2	St. Marys	7:50	16:30	1						1														
3	Sandy Point	6:15	18:00	1				1																
4	Bonnyrigg	3:45	20:00	1				1																
5	Sans Souci	8:00	16:30	1				1																
6	Paddington	7:30	20:00	1								1												
7	Canley Vale	7:00	16:30	1					1															
8	Narellan Vale	8:00	16:30	1							1													
9	Penrith	7:30	18:30	1																				
10	Campbelltown	8:00	18:00	1						1														
11	Casula	7:50	16:30	1							1													
12	Fairfield West	6:30	15:00	1					1															
13	Bonnyrigg	8:30	17:50	1						1														
		14:30	23:40	1						1														
		6:30	15:40	1						1														
14	Prestons	6:50	7:50	1						1														
		13:20	22:00	1						1														
15	Panania	6:30	7:30	1					1															
		13:00	22:30	1					1															
		21:00	8:00	1					1															
16	Campbelltown	21:30	7:30																	1				
17	Fairfield West	6:30	15:30	1				1																
		8:30	17:30	1				1																
		14:30	23:30	1				1																
18	Mount Annan	6:30	15:30	1				1																
		8:30	17:30	1				1																
		14:30	23:30	1				1																
19	Narellan Vale	6:30	15:30	1				1																
		8:30	17:30	1				1																
		14:30	23:30	1				1																
20	Narellan Vale	6:30	15:30	1					1															
		14:30	23:30	1					1															
21	Bonnyrigg	14:30	23:30	1				1																
		7:00	15:30	1				1																
		9:00	17:30	1				1																
22	Catherinfield	15:00	23:30	1					1															
		9:00	17:30	1					1															
23	Warwick Farm	6:30	15:30	1						1														
24	Glenfield	6:15	15:30	1				1																
25	Ingleburn	6:30	15:30	1					1															
		8:30	17:30	1					1															
		14:30	23:30	1					1															
26	Campbelltown	15:00	23:30	1					1															
		18:00	23:30	1					1															
27	Campbelltown	7:00	15:30	1						1														
28	Grays Point	8:30	17:30	1					1															
31	Guildford	7:00	15:30	1				1																
32	Camden	8:30	17:00																	1				
33	Campbelltown	8:00	17:30	1						1														
34	Penrith	7:30	16:30	1																				
35	Narellan Vale	8:00	16:30	1				1																
36	Liverpool	16:00	20:00	1				1																
37	Cartwright	5:40	14:30															1	TWAY80					
38	Ingleburn	4:30	9:00	1				1																
39	Warwick Farm	4:45	9:00														1							
40	Silverdale	7:30	17:30	1						1														
41	Roseville	8:00	18:00	1						1														
42	Marsfield	7:30	16:00	1				1																
43	Campbelltown	7:30	5:00	1						1														
44	Lilyfield	8:30	17:30	1				1																
45	Strathfield	9:00	17:30	1				1												1				
46	Kensington	7:45	16:30	1				1																
47	Leichhardt	8:30	18:30	1				1																
48	West Hoxton	8:15	15:30	1						1														
49	Liverpool	8:10	19:55	1				1																
50	Camden	8:30	17:00	1						1														
51	Narellan Vale	8:00	17:00	1						1														
52	Manly	8:00	17:00	1						1														
53	Panania	8:00	16:30	1				1																
54	Northmead	8:15	17:00	1						1														
55	Rosemeadow	8:00	18:50																	1				
56	Liverpool	8:30	17:00														1							
57	Penrith	8:00	16:30	1						1														
58	Blue Mountain	8:00	18:00																				1	
59	Smithfield	8:30	17:00	1						1														
		9:00	17:30	1						1														
60	Campbelltown	8:30	18:30	1					1															
61	Bossley Park	6:50	17:00	1					1															
		8:00	18:00	1					1															
		8:30	18:30	1					1															
62	Revesby	7:00	15:30	1						1														
		10:00	18:30	1						1														
63	Woollongong	10:00	18:30	1				1																
		9:00	17:30	1				1																
		8:00	16:30	1				1																
64	St Ives	7:55	17:30	1				1																
65	The Oaks	6:50	16:00	1					1															
66	St Helens Park	6:30	16:30	1				1																
67	Cronulla	7:00	15:30	1				1																
		13:30	22:00	1				1																
68	Green Valley	7:00	15:30	1				1																
		13:30	22:00	1				1																
69	Glenfield	7:30	16:00														1							
70	Camperdown	7:00	15:30																	1				
		13:30	22:00																	1				
71	West Ryde	9:30	18:00	1											1									
72	Campbelltown	9:00	17:30	1				1																
		10:30	19:00	1									1											
		12:00	20:30	1											1									
		13:00	21:30	1				1																
73	West Hoxton	10:00	21:30	1					1															
		21:15	7:15	1					1															
74	Voyager Point	8:00	17:00	1					1															
75	Glenfield	8:30	17:00	1				1																
76	Kingsgrove	8:30	17:00	1				1																
77	Parramatta	8:00	16:30	1				1																
78	Camden	8:00	16:30	1				1																
		15:30	0:00	1				1																
		13:30	22:00	1				1																
79	Cecil Hills	7:50	14:00	1									1											
80	Minto	7:45	16:15	1				1												1				
		8:15	17:00	1				1																

CONFIDENTIAL

	Where do you normally travel from	Normal Arrival Time	Normal departure time	Car as driver	Car as driver with passenger	Car as passenger	set down/pick up	Parking location Street	Parking Multi Storey	Parking Eastern Campus	Parking near Warwick Farm station	Parking Railway Car Park	Helipad	health serv car park	Westfields	Taxi	walk	BUS	Route Number (BUS)	Train Liverpool Station	Train Warwick Farm Station	Bicycle	Motor Cycle	Other (specify)
82	Menai	7:15	16:15	1								1												
83	Bossley Park	6:40	15:40	1				1																
		13:15	22:00	1				1																
84	Hoxton Park	6:45	15:30	1									1											
		13:00	22:00			1	1																	
85	Seven Hills	13:30	22:00																	1				
86	Hinchinbrook	13:30	22:00	1									1											
		7:00	15:30	1									1											
87	Campbelltown	13:00	22:00	1				1																
88	Prestons	6:30	13:30	1				1																
		13:00	22:00	1				1																
89	Liverpool	6:45	15:30	1				1																
		13:00	22:00	1									1											
90	Paddington	7:30	18:30	1						1														
91	Newtown	8:00	17:20	1				1																
92	Leuneah	5:20	14:30																	1				
93	Campbelltown	7:15	17:00																	1				
94	Strathfield	8:00	18:00	1									1											
		14:00	0:00	1									1											
95	Parramatta	8:15	5:00	1																1				
96	Ashfield	7:30	17:00	1					1															
		8:00	18:00	1					1															
97	Harrington Par	8:00	17:00	1				1																
98	Seven Hills	7:50	16:12																	1				
99	Eaglevale	6:50	16:00	1					1															
100	Mittagong	7:15	16:30	1				1												1				
		7:50	16:45	1				1																
101	Wattle Grove	6:00	15:30	1					1															
		7:00	17:00	1					1															
102	Macquarie Fiel	6:50	3:40	1				1																
103	Mount Annan	6:35	15:45	1				1																
104	Alexandria	6:45	15:30	1					1															
		7:00	17:00	1					1															
105	Heckenberg	8:30	17:00	1				1																
106	Hinchinbrook	6:30	15:30	1				1																
107	Surry Hills	8:00	18:00	1						1														
108	Rockdale	8:30	17:00																	1				
109	Fairfield	7:00	15:30	1								1												
		7:10	16:30	1								1												
110	Campbelltown	21:30	7:30	1				1																
111	Campbelltown	7:00	15:30	1				1																
		14:30	23:00	1				1																
112	Campbelltown	7:10	15:45	1				1																
		13:40	22:00	1				1																
		21:30	7:30	1				1																
113	Fairfield	6:40	15:30	1				1																
		13:00	22:00	1					1															
114	West Hoxton	7:00	15:30	1				1							1						1			
		13:30	22:00	1				1																
115	West Hoxton	6:45	15:15	1											1									
116	Eschol Park	6:40	16:00	1						1														
117	Hill Top	8:30	17:30	1									1											
118	Edensor Park	6:30	15:30	1									1											
		13:00	22:30	1									1											
		21:00	7:30	1									1											
119	Punchbowl	8:00	17:30	1						1														
		8:30	6:00	1						1														
120	Hill Top	8:00	17:00	1						1														
121	Silverdale	8:10	17:00	1						1														
122	Revesby	8:00	18:00	1										1										
123	Campbelltown	6:45	15:30	1				1																
124	Chipping Norto	7:45	16:45	1						1														
125	Menai	21:00	8:00	1					1															
		13:00	22:30	1					1															
126	Campbelltown	7:00	15:30	1					1															
		13:00	22:00	1					1															
		21:30	7:30	1					1															
127	Green Valley	5:00	14:30															1						
128	Bonnyrigg	5:15	14:30	1				1																
129	Hinchinbrook	5:50	14:25															1						
130	Merrylands	5:00	6:00	1				1																
131	Bossley Park	6:40	15:40	1				1																
		13:10	22:00	1				1																
132	Sadlier	5:15	14:30			1																		
133	Hinchinbrook	5:45	14:30	1					1															
134		5:30	14:30	1						1														
135	Abbotsbury	9:00	14:00	1				1																
136	Liverpool	6:30	10:00														1							
		15:00	18:30														1							
137	Hinchinbrook	6:30	10:00			1	1																	
		15:00	18:30			1	1																	
138	Liverpool	6:30	10:00														1							
		15:00	18:00														1							
139	Mittagong	6:00	15:00	1								1												
		6:30	15:30	1								1												
		8:00	16:30	1								1												
		9:00	17:30	1								1												
		10:00	18:30	1								1												
140	Green Valley	8:00	13:30	1					1															
141	Cecil Hills	8:25	17:10	1						1														
142	Burwood	8:30	17:30	1				1																
143	Macquarie Lin	7:15	16:45	1				1																
144	Prestons	16:00	0:30	1				1																
145	Chester Hill	8:15	16:30																	1				
146	Bossley Park	9:00	14:00	1						1														
147	Marrickville	8:00	17:30	1						1														
148	Parramatta	9:00	17:30	1				1																
149	Campbelltown	6:40	15:30	1				1																
150	Canley Height	6:30	15:40	1								1												
		8:30	17:40	1								1												
		14:30	23:40	1								1												
151	Winston Hills	6:30	15:30	1					1															
152	Werombi	8:30	14:00	1				1																
153	Liverpool	7:00	17:00														1							
154	Campbelltown	21:00	8:00	1				1																
155	Picnic Point	6:45	16:00	1								1												
156	Baulkham Hill	13:00	22:30	1									1											
		6:50	16:00	1									1											
		21:00	8:30	1									1											
157	?	21:15	7:30	1				1																
158	?	6:50	15:30	1					1															
159	Cobbitty	7:45	17:00	1						1														
160	Wattle Grove	6:40	15:40	1					1															
		13:15	22:10	1					1															
		21:15	7:45	1					1															
161	Liverpool	17:30	2:30														1							
162	?	5:30	14:30			1																		
163	Casula	7:30	11:30			1																		

CONFIDENTIAL

	Where do you normally travel from	Normal Arrival Time	Normal departure time	Car as driver	Car as driver with passenger	Car as passenger	set down/pick up	Parking location Street	Parking Multi Storey	Parking Eastern Campus	Parking near Warwick Farm station	Parking Railway Car Park	Helipad	health serv car park	Westfields	Taxi	walk	BUS	Route Number (BUS)	Train Liverpool Station	Train Warwick Farm Station	Bicycle	Motor Cycle	Other (specify)
164	Hoxton Park	5:00	14:30			1																		
165	Heckenberg	3:30	12:30	1																				1
166	Liverpool	5:30	14:30														1							
167	Fairfield	5:30	14:30	1						1														
168	Liverpool	5:45	14:30			1																		
169	Casula	5:30	14:30	1					1															
170	Casula	5:30	14:30			1																		
171	Casula	6:30	15:00	1				1																
172	Smithfield	5:45	14:30	1						1														
173	Hinchinbrook	6:55	15:30	1				1																
174	Bankstown	6:50	15:30	1								1												
175	Picton	7:45	17:00	1					1															
176	Mt Pritchard	5:45	14:30	1						1														
177	Macquarie Fiel	8:30	16:30	1				1																
178	Macquarie Fiel	7:00	13:30	1								1												
179	Macquarie Fiel	13:20	22:00	1							1													
180	?	13:15	22:10	1								1												
181	Heckenberg	6:30	15:30	1				1																
182	Wetherill Park	7:15	16:00	1						1														
183	Macquarie Fiel	7:30	16:30	1						1														
184	Macquarie Fiel	9:00	17:30	1				1																
185	Abbotsbury	7:30	16:30	1				1																
186	Holsworthy	9:10	14:20	1				1																
187	Rossmore	6:30	15:30	1						1														
188	Rossmore	6:30	15:30	1						1														
189	Rossmore	6:30	15:30	1						1														
190	Hoxton Park	8:15	17:00	1					1															
191	Camperdown	8:30	17:30	1				1																
192	Chester Hill	7:45	17:30	1					1															
193	Woollongong	8:15	17:00	1				1																
194	Liverpool	8:30	15:15	1					1															
195	Como	9:00	16:10																	1				
196	Fairfield	7:50	17:00	1				1																
197	Dulwich Hill	8:00	16:30	1				1																
198	Chester Hill	8:30	17:00	1				1																
199	Camden	8:00	16:30	1				1																
200	Macquarie Fiel	7:30	16:30	1						1														
201	Cronulla	8:20	17:30	1				1																
202	Cremorne	9:00	17:00	1					1															
203	Tahmoor	8:10	17:00	1					1															
204	Ingleburn	6:00	15:30	1				1																
205	?	6:00	15:30	1						1														
206	Glenfield	6:50	15:30																	1				
207	Fairfield	6:30	15:30	1				1																
208	Surry Hills	7:00	15:30	1					1															
209	Macquarie Fiel	13:30	18:00	1					1															
210	Glenfield	6:40	16:00																	1				
211	Padstow	7:30	13:00	1				1																
		15:30	22:00	1				1																
212	?	9:30	18:00	1								1												
213	Panania	7:30	13:30	1					1															
		15:30	22:00	1					1															
219	Illawong	7:30	16:30	1				1																
220	Hurstville	7:30	16:30	1				1																
221	St Ives	8:15	17:30	1				1																
222	Greenfield Par	8:30	17:00	1				1																
223	?	9:00	13:30																	1				
224	Campbelltown	21:00	7:45	1					1															
225	Woollongong	8:15	17:15	1				1																
226	Campbelltown	8:00	17:00	1								1												
227	Ingleburn	7:40	7:05																	1				
228	Sandy Point	8:00	16:45	1				1																
229	Ingleburn	7:40	17:00			1																		
230	Ashcroft	8:00	16:30	1							1													
231	Neutral Bay	9:00	6:00	1				1																
232	Campbelltown	8:00	15:15																	1				
233	St Andrews	8:00	16:30	1						1														
234	Casula	8:20	16:10	1						1														
235	Roseville	8:00	16:30	1									1											
236	Campbelltown	8:30	17:00	1						1														
237	Chipping Norto	8:00	17:00	1					1															
238	Prestons	6:35	15:30	1				1																
239	Erskine Park	7:30	16:00	1				1																
240	Hinchinbrook	21:20	7:30	1				1																
241	?	14:30	22:00	1					1															
242	Merrylands	6:45	16:15																	1				
243	Campbelltown	13:30	22:15																	1				
244	Bexley	7:00	15:30	1								1												
245	Casula	7:00	15:30														1							
246	Cabramatta	6:45	15:30			1																		
247	West Ryde	7:45	18:00	1					1															
248	Penrith	6:50	15:45	1								1												
249	Bonnyrigg	6:30	15:30	1						1														
250	Edensor Park	6:30	15:30	1						1														
251	Hinchinbrook	5:30	14:30	1						1														
252	Campbelltown	5:30	14:30	1						1														
253	?	5:30	14:30	1						1														
254	Bonnyrigg	5:45	14:30	1						1														
255	?	5:30	14:30	1				1																
256	?	8:00	17:30	1						1														
257	?	7:50	17:00	1					1															
258	Mt Pritchard	5:45	10:00	1				1																
259	Casula	3:50	12:30	1				1																
260	Wetherill Park	8:15	17:15	1				1																
261	Horningsea Pa	8:00	16:30	1				1																
262	Prestons	21:00	20:40	1					1															
263	Narellan Vale	9:30	8:30	1					1															
264	?	8:00	16:30	1					1															
		15:30	0:00	1					1															
265	Chipping Norto	7:50	7:25	1				1																
266	Lurnea	8:15	17:00	1				1																
267	Mt Pritchard	6:50	14:00	1					1															
268	Prestons	8:00	16:30															1	867					
269	Kingsford	8:00	17:00	1				1																
270	Campelltown	7:00	15:30	1				1																
271	Edgecliff	8:00	16:30	1				1																
272	?	7:00	15:30	1				1												1				
273	Burwood	7:30	17:30																					
274	Silverdale	15:45	23:00	1									1											
275	?	6:00	14:30	1					1															
276	Coogee	8:00	18:00	1				1																
277	Hinchinbrook	13:30	22:00	1				1																

CONFIDENTIAL

①

SYDNEY SOUTH WEST
AREA HEALTH SERVICE
NSW HEALTH

LIVERPOOL HOSPITAL STAGE 2 RE- DEVELOPMENT PLANNING

STAFF TRAVEL QUESTIONNAIRE

Your assistance in completing this questionnaire is greatly appreciated.
Please return via email to debbie.flood@cs.nsw.gov.au or via internal mail to:

Deborah Flood
Redevelopment Project Office
Building 12 RPAH Campus
Missenden Road
CAMPERDOWN 2050

---

* Where do you normally travel from: CASULA ①

* What time do you normally

ARRIVE	DEPART
1300	2200
0630	1530 .

* What is your normal principal travel mode:

- [✓ Car]
  - [✓ Driver]
  - Passenger
  - Park where on the street . very hard to get parking have to come 30-45 minutes early to find parking.
  - Set down/pick up
- Train
  - Liverpool Station

Warwick Farm Station
Travel to/from Station……………………………………
(eg. Walk or bus)

- Bus

  Route No.

- Walk

  To/from…the parked car on the street.

- Bicycle
- Motor Bike
- Taxi
- Combination……………………………………

  (eg. Arrive car/depart train)

THANK YOU

Appendix G

Car Park Ventilation Statement

Sinclair Knight Merz
100 Christie Street
PO Box 164
St Leonards NSW
Australia 1590

Tel: +61 2 9928 2100
Fax: +61 2 9928 2500
Web: www.skmconsulting.com

Frank Tong
Capital Insight
C/0 Sydney South West Area Health Service
Locked Bag 7017
LIVERPOOL   BC 1871

24 October 2008 *081024 SKM Car Park Ventiilation Summary.doc*

Dear Frank

Liverpool Hospital Stage 2: Concurrent Works Car park ventilation

SKM have reviewed the ventilation impact of the new multi-storey car park on the proposed childcare centre. A detailed analysis and recommendations are provided in the Liverpool Hospital Car Park Concept Design: Car park ventilation report (August 2007) which has since been superseded by the current car park design. The particular recommendations of the report in relation to the child care centre will be adopted into the car park design. Notably these include that:

- The new car park will be naturally ventilated and will comply with AS 1668.2: The Use of Mechanical Ventilation and Air Conditioning in Buildings, Section 4 Ventilation of Enclosures Used by Vehicles with Internal Combustion Engines in locations where natural ventilation is not possible.
- Compliance with AS1668.2 requires that the internal environment of a car park is safe for occupants and that if the internal air quality is acceptable to health, it is concluded that the air quality of any discharges either through mechanical or natural ventilation are equal to or better than that in the car park.
- Further, that the distance from the car park to the child care centre exceeds the AS1668.2 criteria for distance between naturally ventilated facades and other structures and any air quality issues could be managed within guidelines.

In summary, there are no adverse effects in relation to the proposed car park design on the child care centre or any adjacent structures.

Yours faithfully

David O'Neill
Principal
Phone: 9032 1036
Fax: 9928 2205
E-mail: DONeill@skm.com.au

Appendix G

External Finishes Schedule

October 2008 Prepared by: Rice Daubney

RICE DAUBNEY

LIVERPOOL HOSPITAL
CONCURRENT WORKS
NEW MULTI DECK CAR PARK

Project No. 07509

EXTERNAL FINISHES SCHEDULE

DATE: 9th August 2007
ISSUE: A

CODE	**TYPE**	**SPECIFICATION**	**SUPPLIER**	**APPLICATION**	**REMARKS**
RC	Reinforced concrete up stands & columns	To Structural Engineers design.			
RC1	Reinforced concrete lift core walls	To Structural Engineers design with paint finish. Dulux Colour Specifier “Gasgoyne Grey PG1H6”.	Dulux Render Effects or similar	External Walls	
RC2	Reinforced concrete stair walls	To Structural Engineers design with paint finish. Dulux Colour Specifier “Sunlounge P10H9”	Dulux Render Effects or similar	External Walls	
MWC1	Metal wall cladding – corrugated profile	Lysaght Custom Orb, set out with vertical ridges. Colour “Colorbond Metallic Steel Citi”	Bluescope steel or similar	Wall cladding to core & firestairs as shown on design drawings.	Cladding set in panels framed with Galvanised MS angles.
WIN	Window and door frame	Natural Anodised Aluminium frames with clear glazing.		Glazed openings to lift and stair core as shown on design drgs.	
DR	Doors	Single leaf solid core doors. Paint finish “Dulux Colour Specifier Sunlounge P10H9”	Paint: Dulux Weathershield or similar	Exit doors to fire stairs.	
DR1	Doors	Full glazed Anodised Aluminum doors and frame.		Doors to lift lobby on Level 6.	

CODE	**TYPE**	**SPECIFICATION**	**SUPPLIER**	**APPLICATION**	**REMARKS**
CB	Barriers	Galvanised MS rectangular hollow sections as design drgs. Nil finish.		Barriers fixed on concrete upstand.	
HR	Handrails	Galvanised MS rectangular hollow sections. Nil finish.			Typical handrail except handrail within firestair.
STS1	Structural Steel mesh screen	Anodised Aluminium grated mesh panels as detail design drgs. Profile: HA255.	Hi-Light Industries	Screens where shown on drgs fixed to structural Steel support	Aluminum panels framed with Galvanised MS angles.
STS2	Structural Steel mesh screen	Anodised Aluminium grated mesh panels as detail design drgs. Profile TBA – Denser than HA255 for Childcare privacy.	Hi-Light Industries	Screens where shown on drgs fixed to structural Steel support – Level 1 facing childcare only.	Aluminum panels framed with Galvanised MS angles.
DP	Downpipes	Colorbond Steel circular downpipes. Colour “Colorbond Metallic Steel Citi”.	Bluescope steel or similar	Rainwater goods	
WT	Watertanks	Pre-fabricated fibre glass with paint finish. Paint finish “Dulux Colour Specifier Sunlounge P10H9”	Paint: Dulux Weathershield or similar	Rainwater collection tanks.	

Roof option additional items:

MRF	Metal deck roofing	Lysaght Spandek Colour "Colorbond Metallic Steel Citi".	Bluescope steel or similar	Roofing	
RG	Guttering and fascia	Colorbond steel profiled quad gutter as design drgs. Colour "Colorbond Metallic Steel Citi".	Bluescope steel or similar	Eaves of metal deck roof.	
STS3	Steel roof structure	Galvanised MS to Engineers design. Nil finish.			

Landscape Concept

The development of a landscape zone between the multi-deck car park and the childcare centre is an important screening device in seeking to ameliorate the scale and bulk of the car park on the centre. The proposed planting strip would aim to provide both high and low level visual screening to the full length of this perimeter. The strategy has been adopted to provide screening of the upper levels of the car park while also breaking down the bulk car park envelope on the ground plane. The planting strategy will also make allowance for passive surveillance through this zone and into the car park.

It is envisaged that the four rainwater collection tanks on the east façade will harvest roof water for garden irrigation.

All plant material proposed would be drought tolerant and not require a high level of maintenance to maintain a satisfactory appearance.

Appendix G

Architectural Drawings

October 2008

Prepared by: Rice Daubney

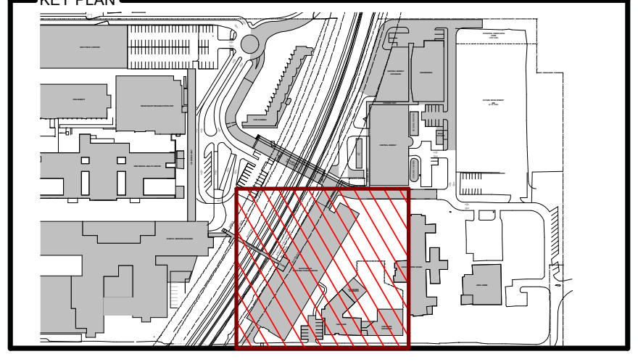
PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
1	PRELIMINARY SCHEME DESIGN	10.05.07	CY
2	PRELIMINARY SCHEME DESIGN	28.05.07	CY
3	PRELIMINARY SCHEME DESIGN	30.05.07	CY
4	PRELIMINARY SCHEME DESIGN	21.06.07	CY
5	PRELIMINARY SCHEME DESIGN	28.06.07	RG
6	PRELIMINARY SCHEME DESIGN	05.07.07	RG
7	SCHEME DESIGN (SELECTED ELEMENTS)	13.07.07	RG
8	SCHEME DESIGN (SELECTED ELEMENTS)	09.08.07	RG

REVISION	DESCRIPTION	DATE	VERIFIED

REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



CONSULTANTS

STRUCTURAL & CIVIL
TTW and Connell Wagner

MECHANICAL & ELECTRICAL
SKM

LANDSCAPE ARCHITECT
SITE IMAGE

ESD CONSULTANT
NORMAN DISNEY & YOUNG

DESIGN AND CONSTRUCTION

ARCHITECT

RICE DAUBNEY
110 WALKER STREET
NORTH SYDNEY 2060

T (02) 9956 2666
F (02) 9959 3015
E rd@ricedaubney.com.au
A.C.N. 001 350 769

PROJECT

LIVERPOOL HOSPITAL
REDEVELOPMENT
STAGE 2 PHASE 1

SYDNEY

DRAWING TITLE

CONCURRENT WORKS
CARPARK & CHILDCARE
LOWER GROUND
SD ISSUE

DRAWING SCALE	DRAWN	VERIFIED	DATE
AS SHOWN	LB	CY	09.08.07

PROJECT No	DRAWING No	ISSUE
07509	MD-AR1100	8

01 PLAN
GROUND / LEVEL 1

1:200

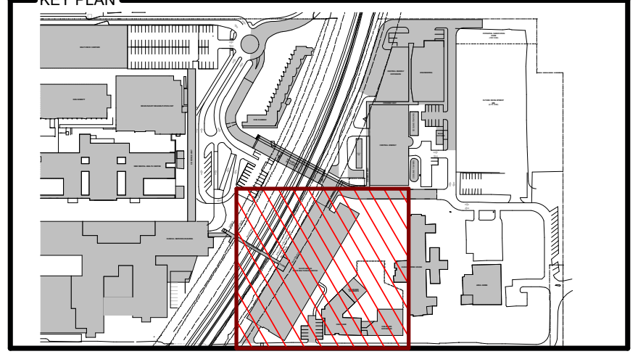
PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
1	PRELIMINARY SCHEME DESIGN	10.05.07	CY
2	PRELIMINARY SCHEME DESIGN	28.05.07	CY
3	PRELIMINARY SCHEME DESIGN	30.05.07	CY
4	PRELIMINARY SCHEME DESIGN	21.06.07	CY
5	PRELIMINARY SCHEME DESIGN	28.06.07	RG
6	PRELIMINARY SCHEME DESIGN	05.07.07	RG
7	SCHEME DESIGN (SELECTED ELEMENTS)	13.07.07	RG
8	SCHEME DESIGN (SELECTED ELEMENTS)	09.08.07	RG

REVISION	DESCRIPTION	DATE	VERIFIED

REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



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PROJECT
LIVERPOOL HOSPITAL
REDEVELOPMENT
STAGE 2 PHASE 1

SYDNEY

DRAWING TITLE
CONCURRENT WORKS
MULTI-DECK CARPARK
GROUND, LEVEL 1
SD ISSUE

DRAWING SCALE	DRAWN	VERIFIED	DATE
AS SHOWN	LB	CY	09.08.07

PROJECT No	DRAWING No	ISSUE
07509	MD-AR1200	8

01 PLAN
LEVEL 2 / LEVEL 3

1:200

PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
1	PRELIMINARY SCHEME DESIGN	10.05.07	CY
2	PRELIMINARY SCHEME DESIGN	28.05.07	CY
3	PRELIMINARY SCHEME DESIGN	30.05.07	CY
4	PRELIMINARY SCHEME DESIGN	21.06.07	CY
5	PRELIMINARY SCHEME DESIGN	28.06.07	RG
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8	SCHEME DESIGN (SELECTED ELEMENTS)	09.08.07	RG

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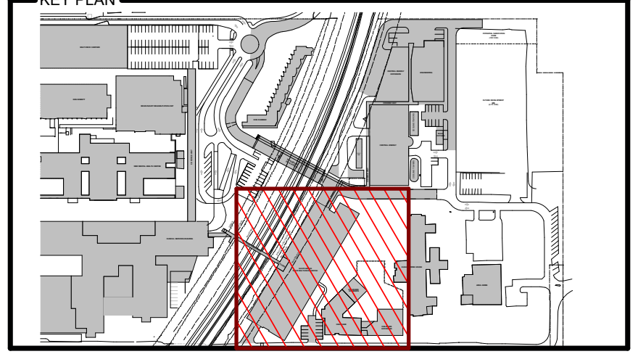
REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



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PROJECT
LIVERPOOL HOSPITAL
REDEVELOPMENT
STAGE 2 PHASE 1

SYDNEY

DRAWING TITLE
CONCURRENT WORKS
MULTI-DECK CARPARK
LEVEL 2/3, 4/5, 8/9
SD ISSUE

DRAWING SCALE	DRAWN	VERIFIED	DATE
AS SHOWN	LB	CY	09.08.07

PROJECT No	DRAWING No	ISSUE
07509	MD-AR1300	8

01 PLAN
LEVEL 6 / LEVEL 7 (1)

1:200

PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
1	PRELIMINARY SCHEME DESIGN	10.05.07	CY
2	PRELIMINARY SCHEME DESIGN	28.05.07	CY
3	PRELIMINARY SCHEME DESIGN	30.05.07	CY
4	PRELIMINARY SCHEME DESIGN	21.06.07	CY
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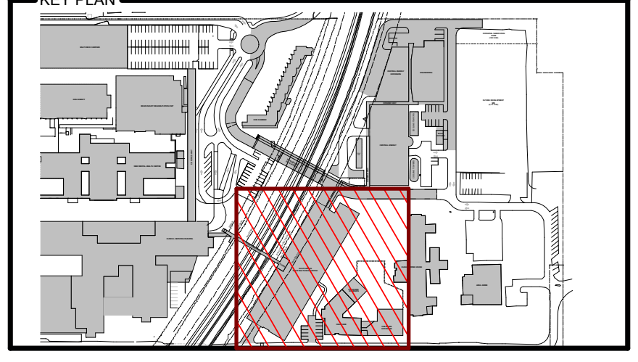
REVISION	DESCRIPTION	DATE	VERIFIED

REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



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PROJECT
LIVERPOOL HOSPITAL
REDEVELOPMENT
STAGE 2 PHASE 1

SYDNEY

DRAWING TITLE
CONCURRENT WORKS
MULTI-DECK CARPARK
LEVEL 6/7
SD ISSUE

DRAWING SCALE	DRAWN	VERIFIED	DATE
AS SHOWN	LB	CY	09.08.07

PROJECT No	DRAWING No	ISSUE
07509	MD-AR1301	8

LEGEND

- BOUNDARY
- TO BE DEMOLISHED
- FENCE
- ▨ EXISTING BUILDING RETAINED
- ▩ EXISTING + NO CHANGE
- ▨ EXISTING + REFURBISHMENT
- ☐ NEW CONSTRUCTION
- EXISTING TREE REMOVED
- EXISTING TREE RETAINED
- PROPOSED VEGETATION

01 PLAN
LEVEL 10 / ROOF

1:200

PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
1	PRELIMINARY SCHEME DESIGN	10.05.07	CY
2	PRELIMINARY SCHEME DESIGN	28.05.07	CY
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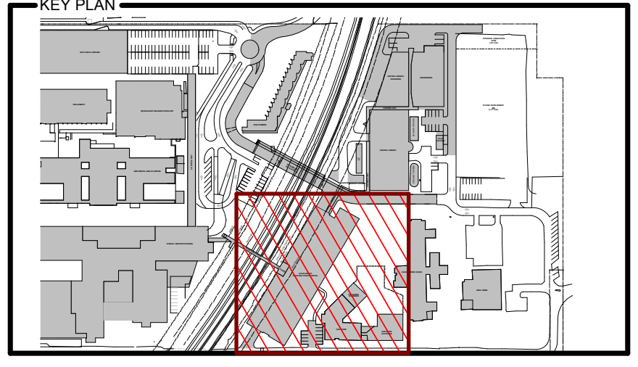
8	SCHEME DESIGN (SELECTED ELEMENTS)	09.08.07	RG

REVISION	DESCRIPTION	DATE	VERIFIED

REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



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PROJECT
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REDEVELOPMENT
STAGE 2 PHASE 1

SYDNEY

DRAWING TITLE
CONCURRENT WORKS
MULTI-DECK CARPARK
LVL10, ROOF
SD ISSUE

DRAWING SCALE	DRAWN	VERIFIED	DATE
AS SHOWN	LB	CY	09.08.07

PROJECT No	DRAWING No	ISSUE
07509	MD-AR1400	8

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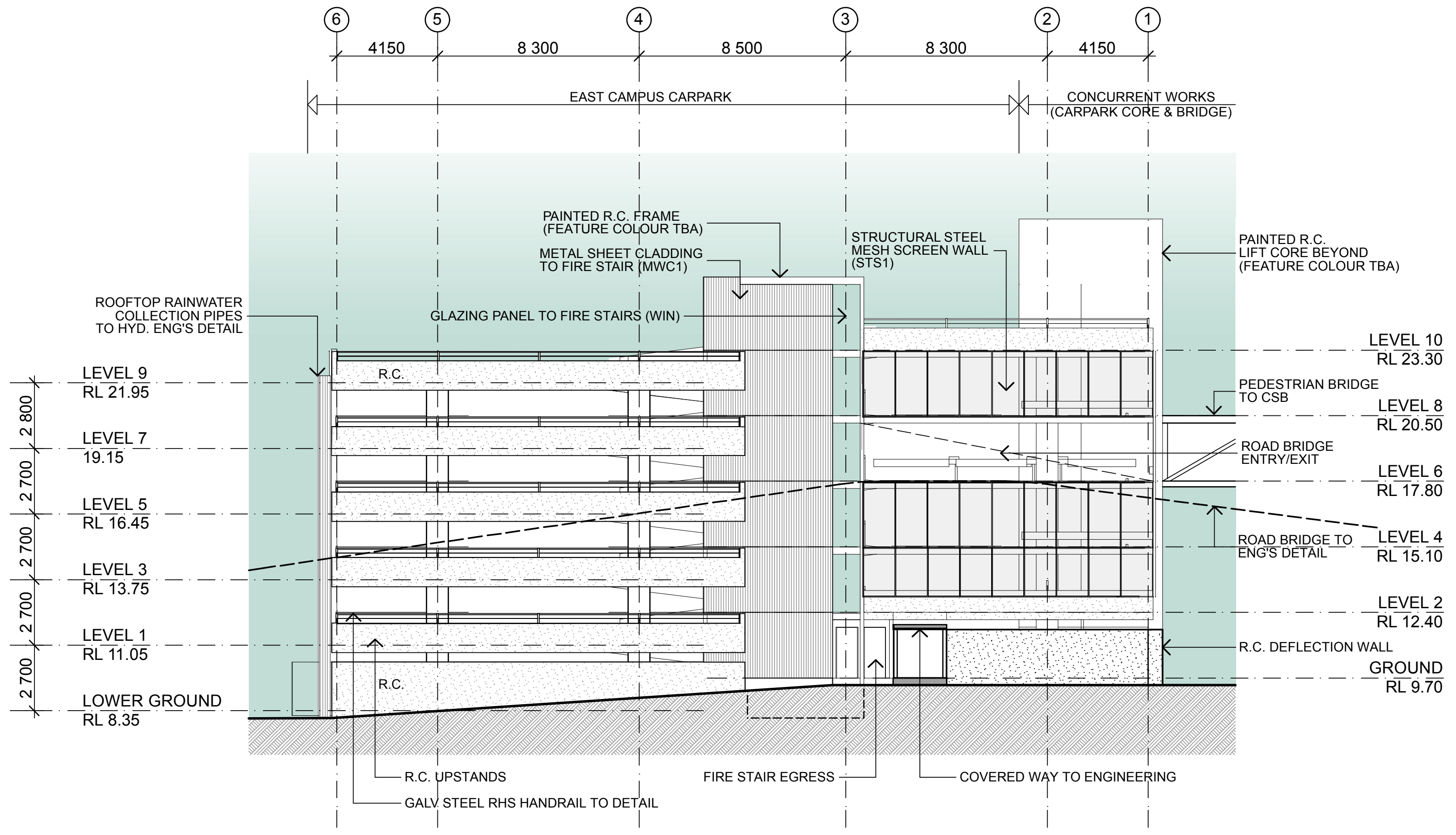
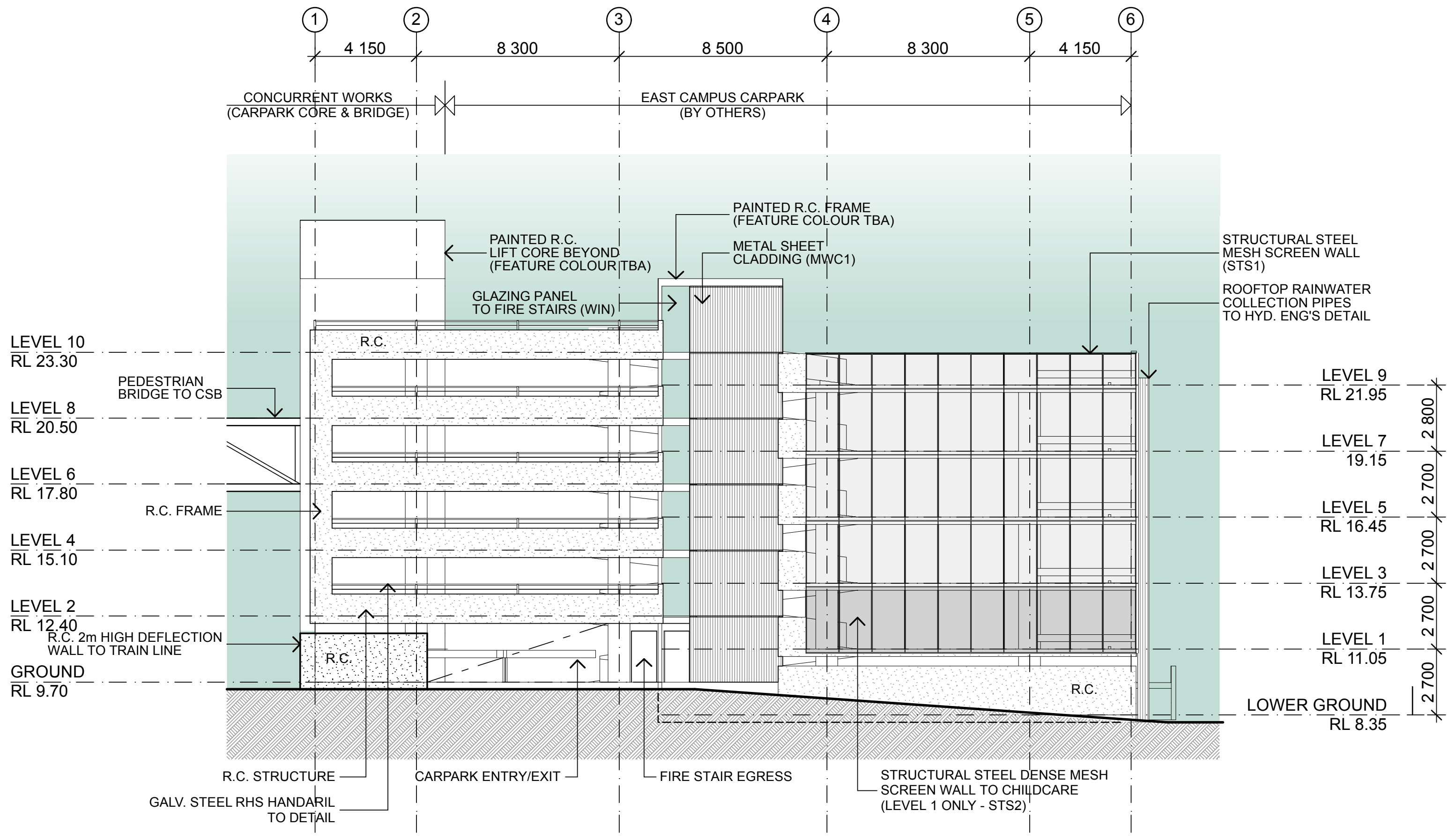
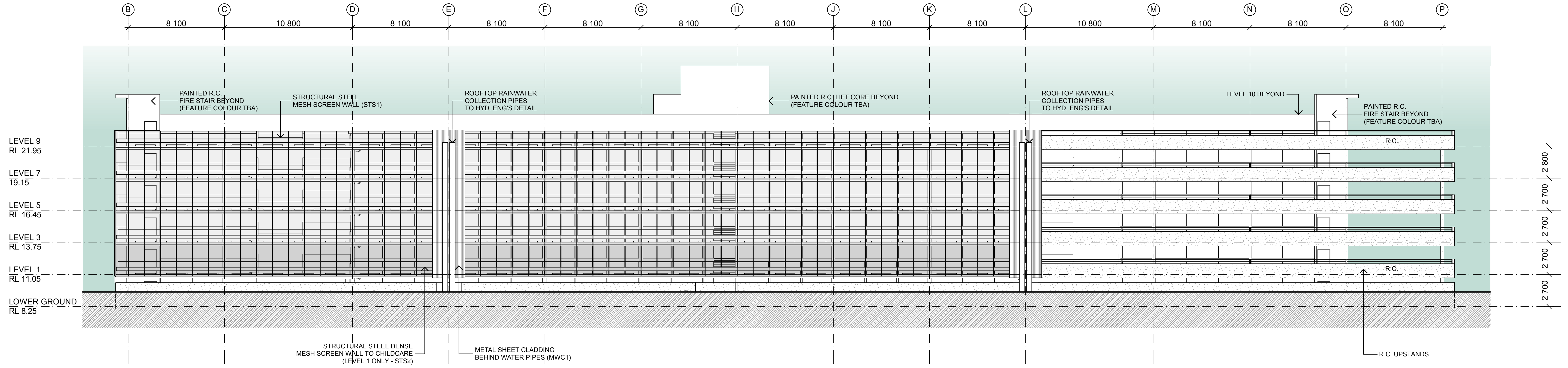


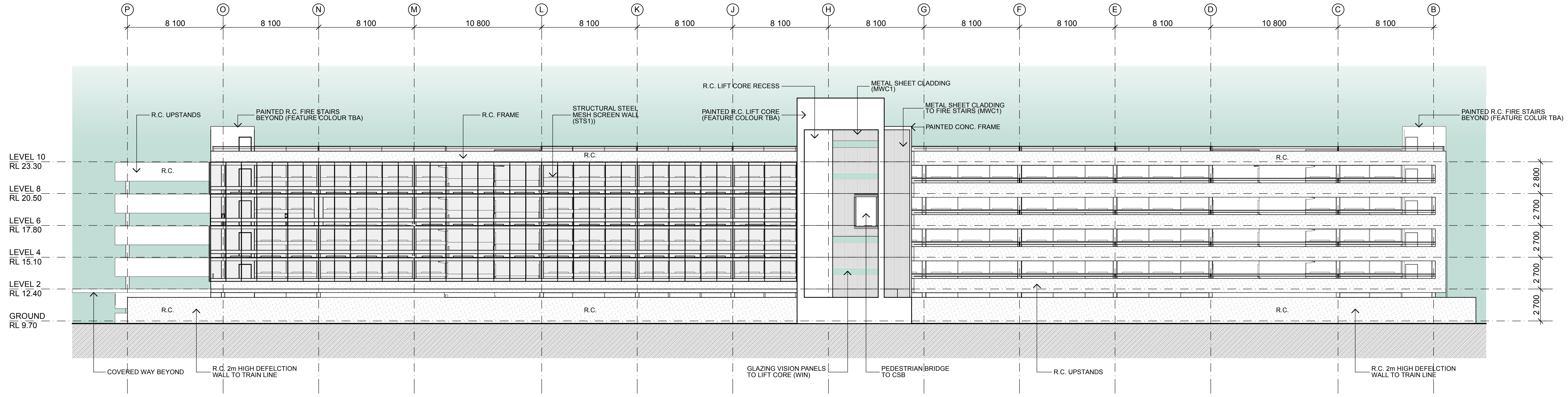
01 ELEVATION
NORTH 1:200



02 ELEVATION
SOUTH 1:200



03 ELEVATION
EAST 1:200



04 ELEVATION
WEST 1:200

PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
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2	PRELIMINARY SCHEME DESIGN	28.05.07	CY
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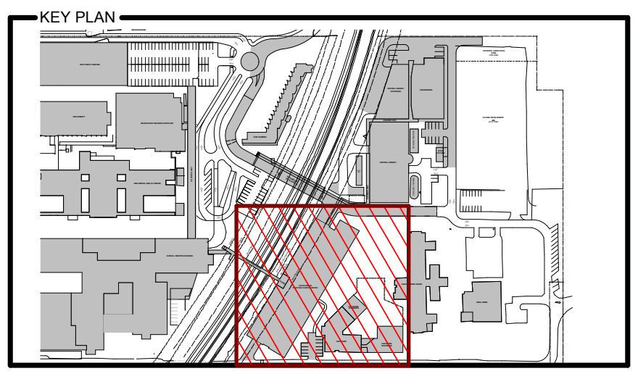
REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



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PROJECT
LIVERPOOL HOSPITAL
REDEVELOPMENT
STAGE 2 PHASE 1

SYDNEY

DRAWING TITLE
CONCURRENT WORKS
MULTI-DECK CARPARK
ELEVATIONS
SD ISSUE

DRAWING SCALE: AS SHOWN
DRAWN: LB
VERIFIED: CY
DATE: 09.08.07
PROJECT No: 07509
DRAWING No: MD-AR1500
ISSUE: 7

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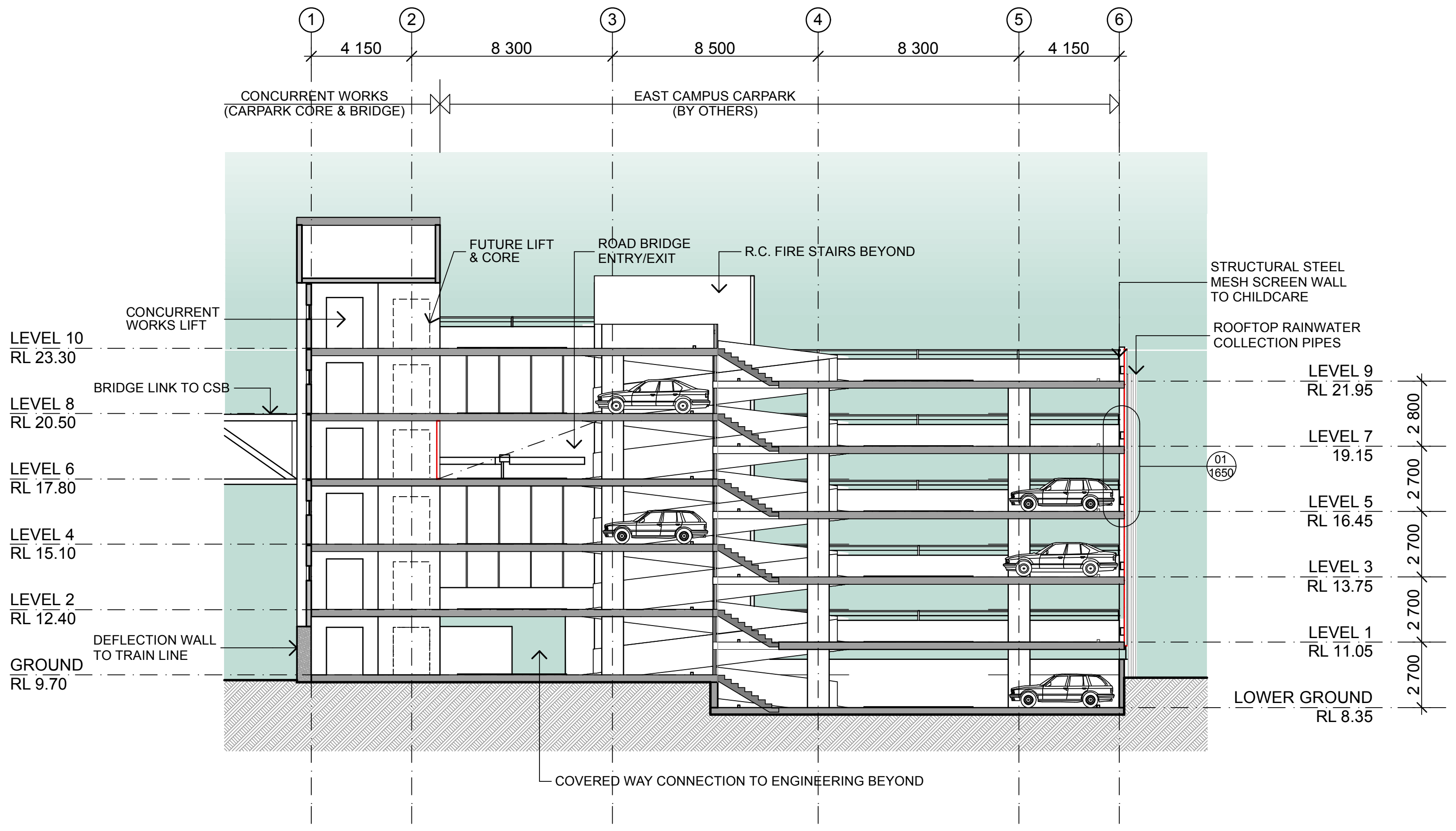
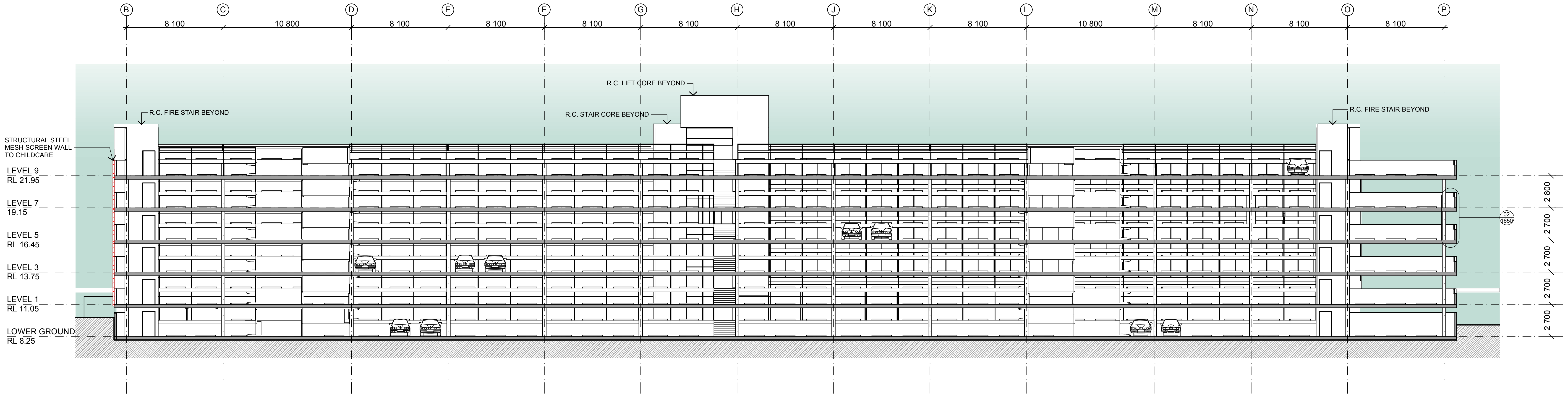


01 SECTION

SECTION 1 1:200



02 SECTION

SECTION 2 1:200

PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
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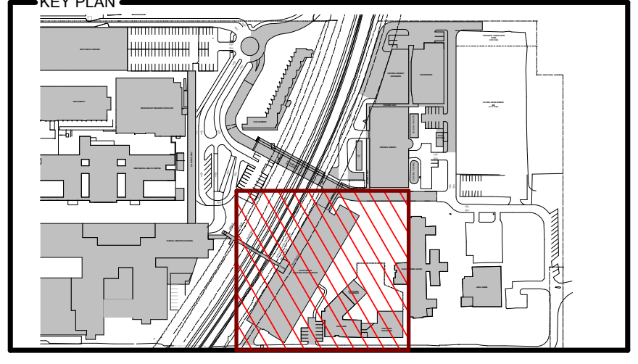
REVISION	DESCRIPTION	DATE	VERIFIED

REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



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PROJECT
LIVERPOOL HOSPITAL
REDEVELOPMENT
STAGE 2 PHASE 1
SYDNEY

DRAWING TITLE
CONCURRENT WORKS
MULTI-DECK CARPARK
SECTIONS
SD ISSUE

DRAWING SCALE	DRAWN	VERIFIED	DATE
AS SHOWN	LB	CY	09.08.07

PROJECT No	DRAWING No	ISSUE
07509	MD-AR1600	7

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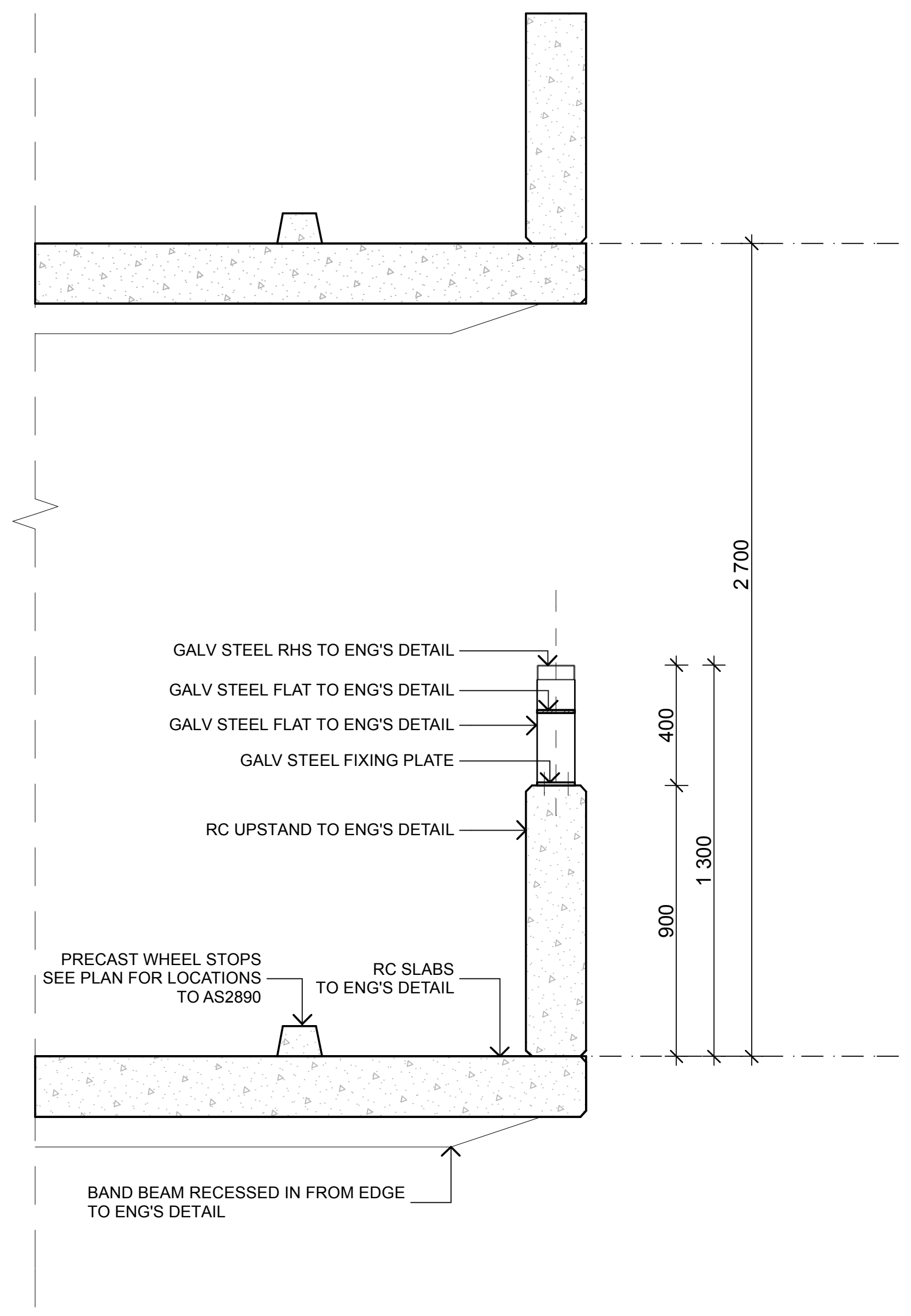
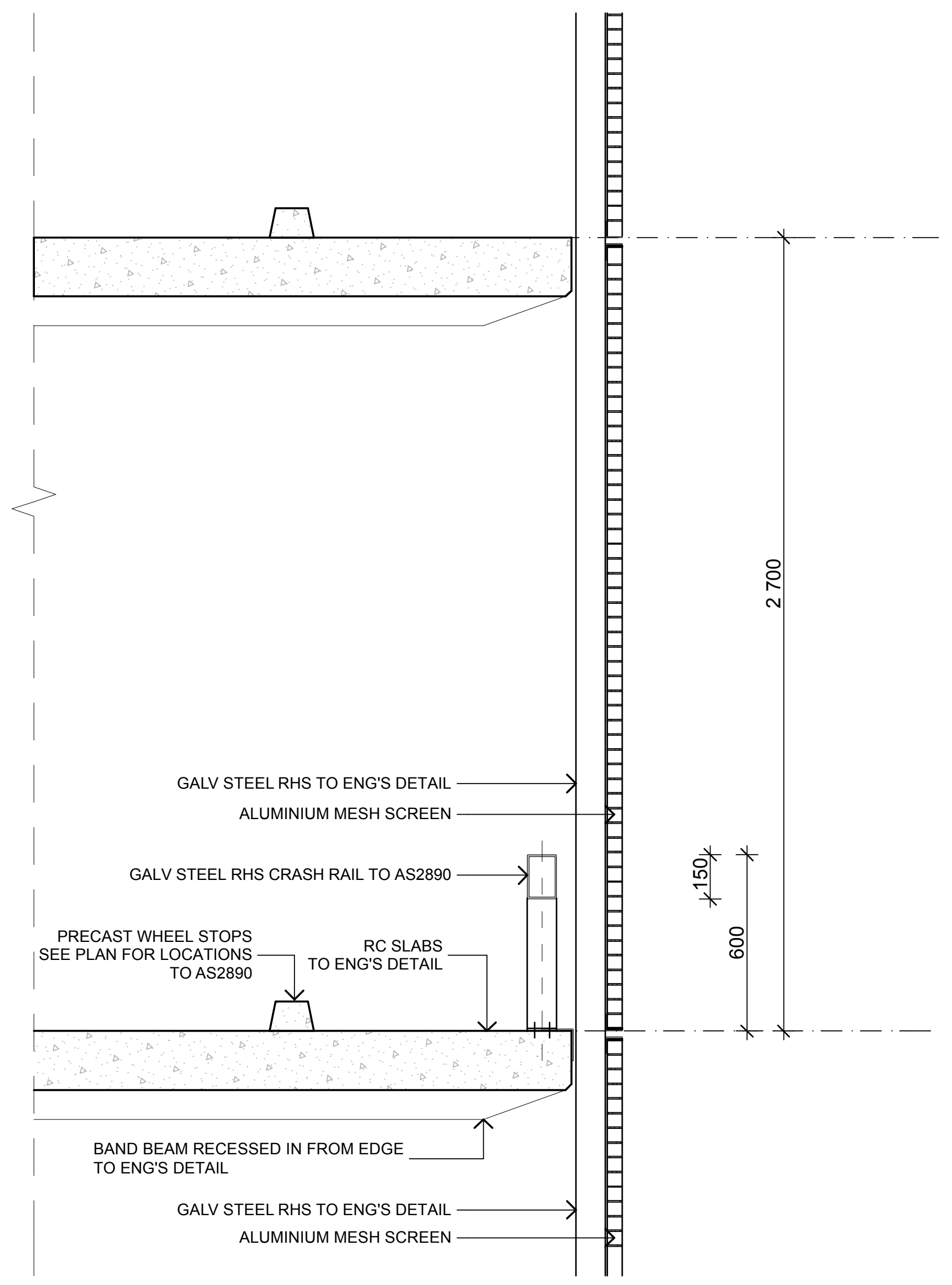


01 FACADE DETAIL 01 1:20



01 FACADE DETAIL 02 1:20

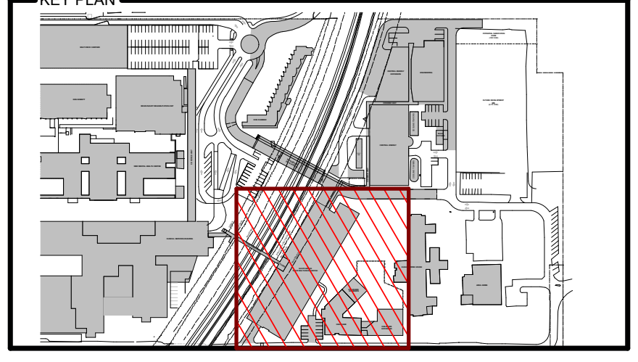
PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
1	SCHEME DESIGN (SELECTED ELEMENTS)	09.08.07	CY

REVISION	DESCRIPTION	DATE	VERIFIED

REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



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STAGE 2 PHASE 1

SYDNEY

DRAWING TITLE
CONCURRENT WORKS

FACADE DETAILS
SD ISSUE

DRAWING SCALE	DRAWN	VERIFIED	DATE
AS SHOWN	LB	CY	09.08.07

PROJECT No	DRAWING No	ISSUE
07509	MD-AR1650	1

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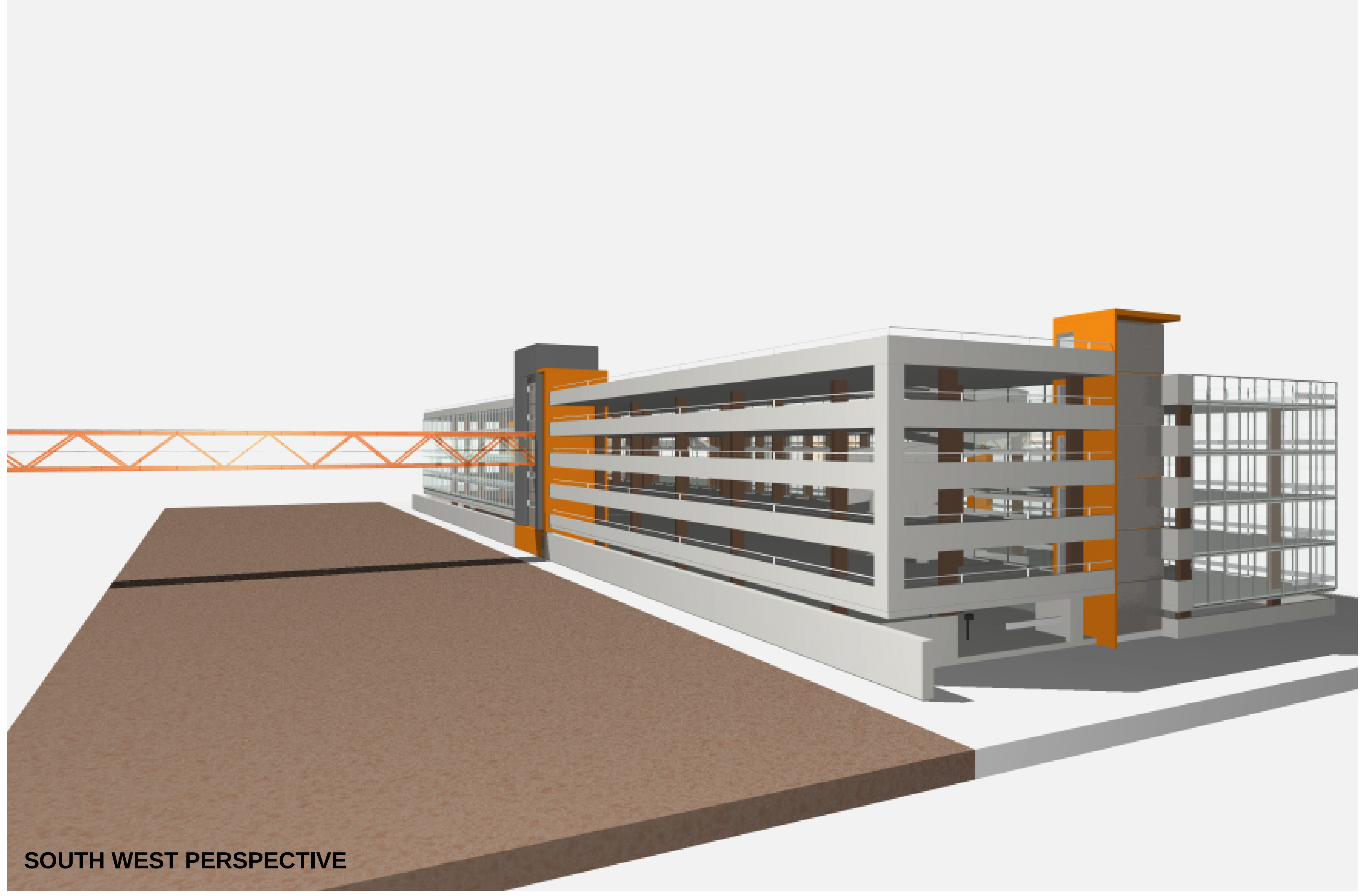
NORTH WEST PERSPECTIVE


NORTH EAST PERSPECTIVE


SOUTH WEST PERSPECTIVE


SOUTH EAST PERSPECTIVE

PRELIMINARY

REVISION	DESCRIPTION	DATE	VERIFIED
1	PRELIMINARY SCHEME DESIGN	10.05.07	CY
2	PRELIMINARY SCHEME DESIGN	28.05.07	CY
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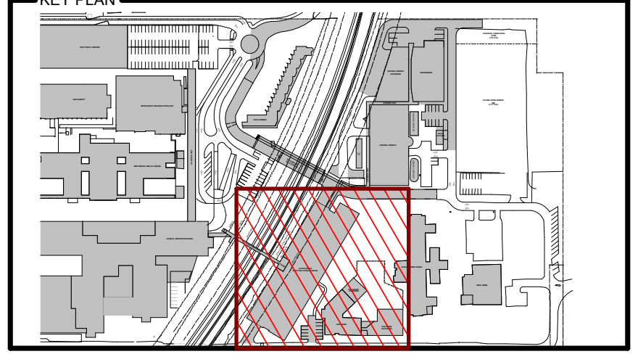
6	SCHEME DESIGN (SELECTED ELEMENTS)	09.08.07	RG

REVISION	DESCRIPTION	DATE	VERIFIED

REVISION	DESCRIPTION	DATE	VERIFIED

KEY PLAN



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PROJECT

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REDEVELOPMENT
STAGE 2 PHASE 1

SYDNEY

DRAWING TITLE

CONCURRENT WORKS
MULTI-DECK CARPARK
3D VIEWS
SD ISSUE

DRAWING SCALE	DRAWN	VERIFIED	DATE
AS SHOWN	LB	CY	09.08.07

PROJECT No	DRAWING No	ISSUE
07509	MD-AR1900	6