CONSULTING EARTH SCIENTISTS

REMEDIATION ACTION PLAN

SENOIRS HOUSING PROJECT, CROYDON

PREPARED FOR CATHOLIC HEALTHCARE LIMITED

REPORT ID: CES120209-CHC-01-D

Revision 1.0

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REMEDIATION ACTION PLAN
SENIORS HOUSING PROJECT
CROYDON AVENUE, CROYDON, NSW
PREPARED FOR CATHOLIC HEALTHCARE LIMITED

Report ID: CES120209-CHC-01-D

EXECUTIVE SUMMARY

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Catholic Healthcare Limited (CHC) to prepare a Remediation Action Plan (RAP) for the site located at Croydon Avenue, Croydon, NSW (referred to herein as the site), being Lot 4, DP 1073577. This site will be developed as a seniors housing complex, the first stage of which currently occupies the adjoining property to the north. The site is currently vacant. A site location plan is presented as Figure 1.

The RAP has been developed based on the 2002 reports prepared by Douglas Partners Pty Ltd (DP), the recent DP *Supplementary Contamination Assessment* (Feb 2012) and the CES soil investigations (March 2012) and has been prepared with reference to the requirements outlined in the NSW Environment Protection Authority (EPA), 1997 *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

The RAP provides a strategy for the remediation of the site to a standard suitable for the proposed residential land use (residential land use with minimal access to soils) and seeks to ensure that works will have a minimal impact on the surrounding environment with minimal human exposure to contaminants during the remediation works.

The site has been found to contain up to 2m depth of fill materials (primarily comprising clay, silt, sands and gravels but also with some demolition materials) overlying in-situ silty clay soils, which in turn overlie weathered shales and siltstones.

The DP investigations identified a ‘hot-spot’ of contamination by PAH and hydrocarbons (TRH) at one location in shallow fill materials (TP3). Further step-out sampling by CES showed this to be an anomalous result, however some elevated concentrations of PAH and TRH were present in that area (though they satisfy the site acceptance criteria for the proposed land use).

Because the proposed development of the site requires the excavation of basement car parking over the greater part of the site, the remediation of the hot-spot and surrounding fill material will be achieved as part of the site civil works. Therefore, further testing of the fill materials in the

vicinity of the hot-spot should be carried out during the process of excavations to allow waste classification of the fill in that area. However based on what we know now, that the fill materials across most of the site can be classified as General Solid Waste (non-putrescible), it is likely that the fill in the vicinity of the hot-spot will also classify as General Solid Waste by including TCLP testing at the time.

The underlying in-situ clay soils and weathered shales are uncontaminated and can be classified as virgin excavated natural materials (VENM) for excavation and removal.

A preliminary (outline) environmental management plan (EMP) and occupational health & safety plan for the remediation works are also included in the RAP, and will require to be formalised and adopted by the contractor prior to the work commencing.

CES consider that the remedial works outlined in this RAP, if implemented as required, will ensure that the site is made suitable for the intended residential land use proposed by the seniors housing project.

REMEDIATION ACTION PLAN
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LIST OF ABBREVIATIONS

ACM	Asbestos Containing Materials
AHD	Australian Height Datum
AMG	Australian Map Grid
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASS	Acid Sulphate Soils
ASSMAC	Acid Sulfate Soil Management Advisory Council
AST	Aboveground Storage Tank
BTEX	Benzene, Toluene, Ethylbenzene and Total Xylenes
CES	Consulting Earth Scientists Pty Ltd
CT	Contaminant Threshold
dBA	Average Decibel Pressure Level
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DLWC	Department of Land and Water Conservation
DNR	Department of Natural Resources
DO	Dissolved Oxygen
EIL	Ecological Investigation Levels
EMP	Environmental Management Plan
ENM	Excavated Natural Material
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HDPE	High Density Polyethylene
HIL	Health Based Investigation Levels
LGA	Local Government Area
mBGL	metres Below Ground Level
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NRMRC	National Health and Medical Research Council
NSW	New South Wales
OCP	Organochlorine Pesticides
OHS	Occupational Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlronated Biphenyls
PID	Photoionisation Detector
PPE	Personnel Protective Equipment

PSP	Project Safety Plan
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RDOP	Remediation Design Optimisation Programme
SAC	Site Assessment Criteria
SAS	Site Audit Statement
SCC	Specific Contaminant Concentrations
SREP	Sydney Regional Environmental Plan
SWMS	Safe Work Method Statement
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TOG	Total Oil and Grease
TSS	Total Suspended Solids
TPH	Total Petroleum Hydrocarbons
UST	Underground Storage Tank
VENM	Virgin Excavated Natural Material
VOC	Volatile Organic Compounds

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1 INTRODUCTION

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Catholic Healthcare Limited (CHC) to prepare a Remediation Action Plan (RAP) for the site located at Croydon Avenue, Croydon, NSW (referred to herein as the site), being Lot 4, DP 1073577. This site will be developed as a seniors housing complex, the first stage of which currently occupies the adjoining property to the north. A site location plan is presented as Figure 1.

The RAP has been developed based on the 2002 reports prepared by Douglas Partners Pty Ltd (DP), the recent DP *Supplementary Contamination Assessment* (Feb 2012) and our additional fieldwork and soil testing and has been prepared with reference to the requirements outlined in the NSW Environment Protection Authority (EPA), 1997 *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

2 OBJECTIVES AND SCOPE OF WORK

The RAP provides a strategy for the remediation of the site to a standard suitable for the proposed residential land use (residential land use with minimal access to soils) and seeks to ensure that works will have a minimal impact on the surrounding environment with minimal human exposure to contaminants during the remediation works.

The scope of works for the RAP is as follows:

- Identification of impacts on the site requiring remediation;
- Definition of remediation goals and acceptance criteria;
- Evaluation of remediation strategies and options;
- Provision of an outline of remediation methods for the site;
- Provision of an outline of validation procedures for the site;
- Preparation of an outline of an OH&S plan to minimise the risk of exposure of site staff to impacted materials; and
- Preparation of an outline of the Environmental Management Plan (EMP) to minimise the impact of remediation works on the surrounding environment.

Following the execution of the remediation works, an independent validation report will be prepared. The objective of the validation report is to document that the site has been remediated to a standard commensurate with the proposed land use.

3 SITE INFORMATION

Consistent with NSW EPA (1997) requirements, a summary of relevant site information is provided below. The site information has been obtained from the following reports:

- Douglas Partners Report on Contamination Assessment, Inner West Health Centre, 24 Liverpool Street, Croydon, May 2002 (Project reference: 20289B);
- Douglas Partners Report on Geotechnical Assessment, Proposed Inner West Health Centre, 24 Liverpool Street, Croydon, April 2002 (Project reference: 20289A);
- Douglas Partners Site Inspection Record, Seniors Housing Croydon Project, Croydon Avenue, Croydon, 19 December 2011 (Project reference: 20289.09);
- Douglas Partners Report on Supplementary Contamination Assessment, Seniors Housing Croydon Project, Croydon Avenue, Croydon, February 2012 (Project reference: 20289.10).CES (2009) *Environmental Site Assessment* (ESA); and
- CES fieldwork and soil testing conducted on 1 March 2012.

3.1 SITE IDENTIFICATION

The site is identified as Lot 4 in Deposited Plan (DP) 1073577 in the Burwood LGA. The site has street frontages to Croydon Avenue to the east and Brighton Street to the west and is located at Croydon, NSW in the Burwood local government area. The site location is shown on Figure 1. The site layout and the sample location is presented as Figure 2.

3.2 TOPOGRAPHY

The topography of the site falls from the north to the south. The natural topography of the site has been modified by historical site activities such as filling. The regional topography indicates a fall to the east of the site then changing to the north east. The site was predominantly covered by vegetated.

3.3 GEOLOGY

According to the Sydney 1:100 000 Geological Series Sheet 9130 (Edition 1, 1983), the site is underlain by Bringelly Shale of Triassic age which is the upper formation of the Wianamatta Group of sedimentary rock types. It also indicates that the Ashfield Shale unit, which is the basal formation of the Wianamatta Group and underlies the Bringelly Shale unit, outcrops nearby.

Bringelly Shale in this area typically comprises beds of shale, claystone, laminite and fine to medium grained lithic sandstone. The geological unit is prone to relatively shallow weathering, forming medium to high plasticity clays.

According to DP site investigation reports, the geology consists of sub-surface stratification comprising limited amounts of filling underlain by stiff, becoming hard, residual clays overlying extremely low to low strength, highly weathered siltstone/shale with the strength increasing with depth.

3.4 HYDROGEOLOGY

Based on the Douglas Partners Report on Contamination Assessment (May 2002, reference: 20289B), groundwater was found at a level comprised between 1.4 and 2.3 m below ground level (bgl) over a period of two months. This indicates the presence of a perched water table above the clay found in the natural soil.

According to the NSW Office of Water, a bore is registered within a 1 km radius of the subject site. This well has been constructed for monitoring purposes and the groundwater level was reported to be found at a depth of 31.0 m bgl. Groundwater is considered likely to flow in a generally north east direction towards Parramatta River.

3.5 ACID SULFATE SOIL RISK

Based on the review of the NSW Office of Environment and Heritage (NSW OEH formerly known as Department of Environment and Climate Change) 1:25,000 Acid Sulphate Soil Risk Mapping, 1994-1998, the site has a low probability of ASS.

3.6 SITE HISTORY

According to the Douglas Partners Report on Contamination Assessment (May 2002, reference: 20289B), the general chronological history of the site was as follows:

- The historical title deeds indicate that the site originally comprised various individually owned lots. These lots were incrementally passed to the Western Suburbs Hospital between 1931 and 1984, which was originally built in the north west of the site before expanding to the south and east of the site. The original lots were likely residential properties with a large manor type house present in the north east of the site;
- Between 1930 and 1951 aerial photographs show additional buildings were constructed on the site, likely to have been the expansion of the hospital;
- Between 1951 and 1970 considerable changes to the site occurred with many of the previous buildings appearing to have been demolished and the vacant area used for car parking;
- Between 1970 and 1991 three buildings had been constructed along the eastern portion of the site; and
- The hospital was demolished in 1994/1995 in preparation for the construction of the

nursing home in the northern portion of the original site. The site remained vacant until 2003 when major earthworks were conducted on the property altering the topography of the site.

Since the previous investigation, aerial photography and anecdotal evidence has determined the following changes on site:

- Between 2003 and 2005 the nursing home was constructed to the north of the site and the site was used for support infrastructure;
- A survey plan with contours of the site prepared following construction of the nursing home is provided in Appendix A and closely matches the contours currently present, with the contours different than those shown on the survey plan used in the previous contamination assessment;
- Between 2007 and 2009 the bund in the southern portion of the site was constructed.

4 SITE CONDITION AND SURROUNDING ENVIRONMENT

4.1 SITE DESCRIPTION

At the time of preparing the RAP, the site was vacant and no activities were being undertaken at the site. The site is almost square except for the south eastern corner, where a small rectangular residential property is situated. The site is predominantly covered by vegetation.

4.2 SURROUNDING LAND-USE

The site was surrounded by the following:

- North: Nursing home (Holy Spirit, Croydon);
- East: Croydon Avenue and then Residential;
- South: Residential; and
- West: Brighton Street and then Residential.

5 SITE CHARACTERISATION

The following section provides a discussion of the main findings of the DP Report on Contamination Assessment, Inner West Health Centre, 24 Liverpool Street, Croydon, May 2002 (Project reference: 20289B), the DP Report on Supplementary Contamination Assessment, Seniors Housing Croydon Project, Croydon Avenue, Croydon, February 2012 (Project reference: 20289.10) and the additional CES investigations conducted for this RAP (2012) described in the section below.

5.1 DOUGLAS PARTNERS INVESTIGATIONS (2002 AND 2012)

The scope of works of the DP 2002 investigations consisted of the excavation of 18 test pits to a depth of 1.0 m and 20 test pits to a depth of 3.0 m. across the entire site (including the adjoining northern part, which has now been developed) and included the collection of 89 soil samples for heavy metals, Total Recoverable Hydrocarbons, Monocyclic Aromatic Hydrocarbons (BTEX), Polycyclic Aromatic Hydrocarbons (PAH), Polychlorinated Biphenyls (PCB), Organochlorine Pesticides (OCP) and Phenols.

The geology encountered consisted of a superficial layer of filling up to 0.4 m bgl consisting of silty clay or silty sand with gravel onverlying a residual soil layer of silty clay between 0.6 and 1.2 m bgl overlying a weathered shale and siltstone layer.

All heavy metal, TRH, BTEX, PCB, OCP and phenol concentrations were below the adopted Site Acceptance Criteria (SAC), being for residential use with minimal access to soil. However, elevated concentrations of PAH and BaP were reported in two samples situated in the north-west corner of the adjoining site and were remediated as part of that development.

In 2012, DP completed the excavation of 14 test pits on the subject site to a depth of approximately 0.5 m into natural material, and samples were collected at regular intervals and tested for the same analytes as above. Filling comprising clay, silts, sands and gravels was observed across the entire site ranging in depth from 0.4 – 2.1 m. All concentrations were below the SAC with the exception of the soil sample TP3/0.0 - 0.4 m which contained:

- Total PAH (1,195.6 mg/kg compared to the HIL of 80 mg/kg);
- Benzo(a)pyrene (BaP - a PAH compound) (91 mg/kg compared to the HIL of 4 mg/kg);
- TRH C10-C36 (2,960 mg/kg compared to the HIL of 1,000 mg/kg);

The locations of the DP 2012 test pits are shown in Figure 2. DP recommended some further sampling in the area of TP3 and the completion of a Remediation Action Plan.

5.2 ADDITIONAL CES INVESTIGATIONS (MARCH 2012)

As part as this RAP, CES completed 4 hand auger holes (HA1to HA4) around the hot spot identified during the 2012 DP investigations at test pit TP3. Each hole was dug at 5 meters from TP3 and samples were collected from two depths in each (generally <0.3m and >0.3m). In total, 10 soil samples (including QA/QC samples) were collected and tested for TRH and PAH. The sample locations are shown in Figure 2.

The geology encountered consisted of fill material to a depth comprising between 0.2 m bgl (HA3) and 0.65 m bgl (HA4) consisting of clayey sand with demolition waste, and overlying in-situ sandy clays. Pieces of coal were found in borehole HA3.

Based on the laboratory results (see Appendix 1), no TRH concentrations (C_6-C_9 or C_{10}-C_{36}) were reported above the adopted SAC (residential with minimal access to soil). Concentrations of total PAH were below the SAC of 80 mg/kg, and those of BaP were below the SAC of 4 mg/kg. The levels of TRH and PAH in a two fill samples were elevated, though below the SAC, and suggest that this may be related to the observed pieces of coal or coke in the fill material.

5.3 CONCLUSION

The findings of both the DP and the CES soil sampling events indicate that there are some partly elevated levels of PAH and TRH in some of the shallow fill materials, notably in the vicinity of DP test pit TP3, though only one sample (DP TP3/0-0.4m) showed concentrations exceeding the SAC. This anomalous result is considered likely to have been produced by a small piece of coal or coke in the sample analysed.

6 REMEDIATION OPTIONS AND STRATEGY

6.1 REMEDIATION GOAL

The site is proposed to be redeveloped for the purpose of residential land use (residential with minimal access to soils) as part of the seniors housing complex which includes the adjoining block to the north, where development is already completed. The goal of remedial works is to provide sufficient engineering and management controls to make the site suitable (with respect to contamination) for the proposed residential redevelopment.

6.2 REMEDIATION ACCEPTANCE CRITERIA

To determine the success of the proposed remediation and to evaluate different site rectification options, it is necessary to define appropriate Remediation Acceptance Criteria (RAC). For the proposed residential land use, the RAC will need to assess aesthetics (including soil odour and colour) and potential human health and ecological issues. The RAC outlined also applies to the validation of any material which may be imported to the site. In this case the adopted RAC are the same as the SAC used in the site characterisation investigations referred to above.

6.2.1 Human Health Based Investigation Levels

To address potential human health and ecological impacts at the site, CES has adopted a set of soil investigation levels appropriate for the proposed residential land use. That is, the RAC have been set at a level that provides confidence that contaminant concentrations below the RAC will not adversely affect human health.

The proposed land use for the site is medium density residential with minimal access to soils. Therefore, CES have adopted the lower value from the following criteria:

- NEPC (1999) *National Environment Protection (Assessment of Site Contamination) Measure 1999,* Health Investigation Levels recommended for exposure setting 'D' which includes residential with minimal access to soils;
- With respect to hydrocarbons (TPH and BTEX), Threshold Levels outlined in the NSW EPA (1994) *Contaminated Sites: Guidelines for Assessing Service Station Sites*.

A summary of the RAC are provided in Table 1.

6.3 EXTENT OF REMEDIATION REQUIRED

The extent of remediation actually required is considered to be quite small and limited to the hot-spot of contamination at TP3. However, as the proposed development for the seniors housing

complex at the site requires the excavation of basement car parking over the greater part of the site, the remediation of the hot-spot will be achieved as part of the site civil works.

6.4 REMEDIATION OPTIONS AND RATIONALE FOR SELECTION

In accordance with the ANZECC/NHMRC (1992) *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* and as outlined in the NSW DEC (2006), the preferred order of options for site remediation and management are:

1. On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;
3. Removal of contaminated soil to an approved site or facility, followed, where necessary, by replacement with clean fill; and
4. Consolidation and isolation of the soil on-site by containment within a properly designed barrier.

It is normal practice to consider these options in determining a strategy for site remediation. However in this case, because most of the fill materials on the site are to be excavated and removed as part of the development, the only appropriate option is no. 3 above.

7 PROPOSED REMEDIATION METHODS

The proposed remediation methods are detailed below.

7.1 APPLICATIONS AND APPROVALS TO UNDERTAKE REMEDIAL WORKS

The remediation works would be designated as Category 2 works and would not require consent under State Environmental Planning Policy 55 – *Remediation of Land*. However, SEPP 55 requires that the local council be notified 30 days before category 2 remediation works commence.

In the event that significant quantities (ie. greater than 10 m^2) of bonded ACM are being collected, excavation will stop until the following measures can be implemented:

- Engage a n AS1 licensed contractor to obtain a permit from WorkCover NSW to carry out the collection works (this typically takes at least seven days); and
- Supervision of the collection works by an AS1 licensed contractor.

7.2 SITE PREPARATION

Prior to undertaking any excavation work, the nominated site supervisor will ensure that the necessary environmental management and safety controls are in place. These will include but are not limited to:

- A hazard assessment, Project Safety Plan (PSP) and inductions;
- The remediation contractor will implement all necessary environmental controls (including but not limited to sedimentation and erosion controls) and safety measures (including but not limited to site signage, security fencing);
- The remediation contractor and site supervisor will locate areas suitable for the designated stockpile placement areas;
- Ensure an adequate water supply is available to spray water on the excavated areas and stockpiled material to minimise dust generation;
- The remediation contractor will locate and arrange appropriately licensed trades people to temporarily disconnect or reroute all underground services which may be impacted by the remediation works;
- All personnel to be involved in the site works will be provided a full briefing and induction in accordance with the EMP and SWMS by the contractor. All personnel involved in the works and who have the potential to come into contact with contaminated fill must be equipped with appropriate PPE in accordance with the OH&S Plan.

A summary of the environmental management and occupational health and safety controls are provided in Sections 8 and 9.

7.3 REMEDIATION METHODOLOGY

The final basement car park level will be at RL 21.5; current ground surface levels at the site vary from RL 27 at the northern end to RL 22 in the south; the depths of excavation required for the basement will range from approximately 1m in the south to 4.5m in the north. In consideration of the test pit logs from the DP 2012 report, the locations of the test pits and the required depths of excavation, all of the fill materials present within the area of the basement will be excavated and removed as part of the development.

Because the excavated fill materials will be removed for off-site disposal at an appropriate landfill facility, they will require waste classification under the NSW DECC *Waste Classification Guidelines,* 2009. We concur with the findings and provisional waste classification in the DP 2012 report which considered that the bulk of the fill materials present on the site classify as General Solid Waste (non-putrescible), with the following exceptions:

- Material around TP3 was considered by DP as possibly classifying as Hazardous Waste, subject to confirmation of contaminant levels by further testing. The step-out testing by CES found much lower concentrations of TRH and PAH at this location, and without TCLP leach testing for PAHs the material would classify as Restricted Solid Waste. However, if the PAH (specifically BaP) was found not to leach then this material would also classify as General Solid Waste.

- It was noted by DP that the surface fill sample (0-0.2m) at TP2 contained asbestos, and that asbestos-cement fragments were noted in the surface layer. DP stated that this would therefore classify as Special Waste (asbestos) but it is quite possible that it can still be removed for disposal as General Solid Waste containing asbestos, to a landfill licensed to receive such waste.

At the time of excavation, fill materials in the area of TP3 (and HA1-3) will require to be sampled and tested for waste classification to confirm that they classify as General Solid Waste. This should be carried out after excavation and stockpiling, prior to removal from site.

As noted by DP, demolition materials were observed in fill materials in 12 of the 14 test pits over the site, which could indicate an elevated risk of asbestos contamination being more extensive, even though all samples were tested for asbestos and only the one (from TP2) was positive. This will require careful supervision and inspection during excavation works, and any indication of

asbestos-cement fragments within the excavated materials will require those materials to be segregated and stockpiled separately for disposal as asbestos-containing waste.

The in-situ clays and weathered shales are uncontaminated and can be excavated and removed as virgin excavated natural material (VENM).

7.4 EXCAVATION WORKS

To reduce and/or prevent the exposure of human receptors to the contamination detected within the on-site fill material, the following will need to be undertaken during excavation works:

- To reduce the area of disturbed material, the number of areas subject to excavation works at any one time should be minimised;
- If dust is observed, spraying of the excavation face should be undertaken to reduce fugitive dust emissions. The spraying should be undertaken on the face of existing excavations and within areas of active excavation (where dust is observed).
- Other unsuitable materials, where identified will be collected and placed into secure storage for later disposal off site;
- Record all relevant information on appropriate field data sheets.

7.5 CONTINGENCY PLAN

Depending on the ground conditions encountered during the remediation, additional volumes of material other than those outlined in this RAP may require remediation in accordance with the methods outlined in this RAP or instructions from a suitably qualified environmental consultant. Remediation not outlined within this RAP must meet the objectives and the RAC outlined within this plan. Contingency items may include:

- Further assessment, management and/or remediation of suspected impacted materials not identified during the aforementioned site investigations by DP and CES. Any obviously discoloured, odorous or suspect fill materials encountered during excavations should be inspected and (if necessary) sampled and tested by a qualified environmental consultant before work is allowed to proceed in that area;
- If significant quantities of asbestos (or suspected asbestos-containing) materials are discovered (ie more than simply a small number of fragments) then the works will need to be supervised by an AS1 licensed asbestos contractor in accordance with a Workcover NSW notification and removed by a licensed contractor.

8 PRELIMINARY ENVIRONMENTAL MANAGEMENT PLAN

No interim management requirements are recommended until the commencement of the excavation and remediation works. At this time the contractor will be required to implement an EMP including the provisions outlined below.

Remediation works shall be conducted in a manner that minimises environmental impacts and that meets statutory requirements. Site works should comply with the following legislation:

- *Contaminated Land Management Act* 1997 (NSW)*;*
- *Protection of the Environment Operations Act* 1997 (NSW)*;*
- *Environmentally Hazardous Chemicals Act* 1985 (NSW)*;*
- *Waste Avoidance and Resource Recovery Act* 2001 (NSW)*;*
- *Occupational Health and Safety Act* 2001 (NSW)*; and*
- *Local Government Act* 1993 (NSW).

The contractor shall:

- Minimise fugitive dust emissions;
- Minimise odour;
- Minimise the volume of water containing suspended sediment leaving the site;
- Prevent vehicles from tracking mud on local roads;
- Ensure that noise and vibration levels conform to legislative requirements; and
- Prepare their own EMP prior to mobilisation to site.

A preliminary EMP for the remediation works is provided below. A formal management plan should be prepared prior to commencement and reviewed by an appropriately qualified Environmental Scientist or Engineer.

8.1 SITE SECURITY, RESTRICTED ACCESS AND SIGNAGE

Access to the site will be restricted by means of a perimeter fence and locked gates outside operating hours. Any repairs required to the boundary fence will be undertaken prior to the commencement of remedial works.

Vehicular access to the site shall be through a single controlled entry and exit points. All loads shall be covered with a tarpaulin prior to leaving the site.

Warning signs will be posted to advise members of the public and employees not to enter sections of the site affected by remedial works. Contact information regarding site security including the details of the remediation contractor will be displayed on all access gates. Site security personnel will be advised of restricted access and contact procedures during remediation works.

During remediation works, the site will be designated as a construction area. Consequently, access will be restricted to authorised staff and contractors equipped with appropriate Personal Protective Equipment (PPE). Site access will be controlled by the site supervisor. All visitors will report to the site supervisor prior to entering the site. Persons entering the site will be required to be inducted into the EMP or will need to be accompanied at all times whilst on site by an inducted person.

8.2 DRAINAGE, SEEPAGE AND STORMWATER MANAGEMENT

Stormwater will be diverted away from areas of exposed soil by a series of bunds or other appropriate storm water controls. Provisions for stockpiles, below, relate to material awaiting placement in the clean soil barrier. Management measures for the site will include:

- Stormwater diversion bunds and appropriate erosion controls around any excavations (as required), areas of bare soil and stockpiles;
- Minimising surface disturbance and maximising the retention of existing surface cover during the works;
- Stockpiles to be located away from concentrated stormwater flow paths including drainage lines, gutters or storm water pits and inlets;
- No stockpiles to be placed on footpaths or nature strips unless prior Council approval has been obtained;
- Construction of sediment controls downstream of diversion bunds, stockpile and traffic areas to minimise the off-site migration of sediment; and
- Vehicular access is to be stabilised to prevent tracking of mud onto roads and footpaths. Soil, earth and mud shall be removed from the roadway by sweeping, shovelling or a means other than washing on a daily basis or as required.

Stormwater at site discharge points will be inspected on each day of discharge. Samples will also be collected during the works. Samples will be analysed for Total Suspended Solids (TSS) and Total Oil and Grease (TOG), or as required by Council.

Silt fences will be constructed around the site perimeter (as required). Hay bales will also be installed around stormwater pits in accordance with requirements outlined in Landcom (2004) *Managing Urban Stormwater – Soils and Construction*.

Visually contaminated seepage and ponded water will be removed by a licenced liquid waste contractor for disposal. Seepage without visible signs of contamination (eg. oily sheen) may be pumped onto stockpiles or bare areas for dust suppression or directly into the stormwater system subject to Council approval. Discharges to the stormwater system must be sampled and analysed for pH, concentrations of TSS, TOG and priority contaminants. Analytical results must comply with relevant NSW DECC and ANZECC standards for water quality prior to discharge. Limit concentrations for TSS and TOG of 50 and 10 mg L^{-1} respectively may be adopted. Council may impose additional discharge criteria for water released into the stormwater system at the site.

8.3 CONTROL OF DUST AND ODOUR

To reduce the potential for contaminants identified in on-site fill material being released into the atmosphere, all material to be excavated will be kept sufficiently damp, moist or wet to prevent any emissions of dust at the time of excavation, truck loading, transportation and placement.

The following measures shall be taken to control dust (where necessary):

- Placement of screening material (eg., Hessian) on perimeter fences where earthworks are being undertaken within 10 m of these fences;
- Spraying of excavation cuttings with water;
- Spraying during excavation and loading activities if fugitive dust emissions are observed;
- Use of a water cart along the designated truck route to maintain it dust free;
- Re-evaluation of work practices during periods of high wind or dry conditions (ie. increase dust suppression activities, location of works away from site boundaries) prior to continuation of activities; and
- Suitable covering of excavations and stockpiles (if left for periods of greater than one hour).

Where visual inspection indicates that dust levels may be unacceptable, work will cease until measures are taken to reduce emissions or until weather conditions improve. The contractor will be responsible for dust management.

Local Government requirements state that no odours shall be detected at the site boundary during remedial works by an authorised Council officer relying solely on the sense of smell.

8.4 NOISE CONTROL AND VIBRATION

Noise and vibration will be restricted to acceptable levels during remediation works. All plant and machinery will be fitted with mufflers to reduce noise. All machinery is to be operated in a manner that minimises noise emissions. Work shall comply with the NSW EPA (1994) *Environmental Noise Control Manual* for the control of construction site noise, such that:

- For a cumulative period of exposure to construction activity noise of up to 4 weeks, the LA10 (15 minute) noise level emitted by the works to specific residences should not exceed the LA90 background level by more than 20 dBA;
- For a cumulative construction noise exposure of between 4 and 26 weeks, the emitted LA10 noise level should not exceed the LA90 level by more than 10dBA; and
- For a cumulative construction noise exposure of greater than 26 weeks, the emitted LA10 noise level should not exceed the LA90 level by more than 5 dBA.

The use of any plant and machinery associated with the remediation works shall not cause vibrations to be felt or capable of being measured at any premises.

8.5 WORKING HOURS

Working hours will be restricted to:

- 7:00 am to 6:00 pm between Monday and Friday; and
- 8:00 am to 1:00 pm on Saturday (or as specified by Council consent conditions).

Work will not be undertaken on Sundays or Public Holidays.

8.6 TRAFFIC AND TRANSPORT

No major traffic disruptions are expected as a result of site remediation works. All machinery will be transported to the site in accordance with regulatory requirements.

All haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site are to be selected to meet the following requirements:

- Comply with all road traffic rules;
- Minimise noise, vibration and odour to adjacent properties; and
- Utilise State Roads and major roads and minimise the use of local roads.

The site supervisor shall ensure that all vehicles:

- Conduct deliveries of soil, materials, equipment or machinery during the hours of remediation work for the site;
- Securely cover all loads to prevent/minimise any dust or odour emissions during transport;
- Exit the site in a forward direction; and
- Do not track soil, mud or sediment onto the roads and footpaths.

8.7 UNDERGROUND SERVICES

Service diagrams will be obtained by the contractor prior to commencement of remediation works. Where encountered, services will be adequately supported, re-routed or disconnected as required. All work is to be carried out by trades-people with appropriate qualifications.

8.8 SITE DIARY AND SUPERVISION

The execution of the RAP will be supervised by an appropriately qualified environmental scientist in conjunction with any contractor/s. This person and contractors shall be responsible for monitoring excavations, truck loading and recording the truck movements and load characteristics.

Load information shall be verified by comparison with tip dockets. The supervising scientists shall also maintain a site diary containing the following information:

- Date;
- Weather conditions;
- Details of unusual materials or odours encountered during earthworks;
- Field instrument calibration details;
- Location and results of field measurements;
- Details of accidents or incidents on the site;
- Details of any environmental issues and any related corrective and preventive action taken;
- Details of any visitors in relation to environmental or health issues;
- Details of any contractors engaged for the removal of material;
- Record of soil volumes imported or removed from the site, truck movements including destination/source, volumes of material exported/imported to the site;
- Daily site sketches showing the location of stockpiles, excavations and sediment controls; and
- Record of soil sampling locations.

8.9 VALIDATION AND ENVIRONMENTAL EFFECTS REPORTING

Consistent with NSW DECCW requirements, a validation report will be prepared at the conclusion of remediation works. The validation report will be prepared in accordance with the requirements of NSW EPA (1997) guidelines and will confirm that the site has been remediated in accordance with the RAP.

9 PRELIMINARY OCCUPATIONAL HEALTH AND SAFETY PLAN

The purpose of the OHS plan is to ensure that the RAP is conducted in a controlled and safe manner with due regard for potential hazards and safe work practices. The OHS plan will be implemented and enforced by the appointed site supervisor following a brief induction by CES. The following preliminary plan contains minimum OHS requirements at the site. Contractors must be required to produce their own project-specific Project Safety Plans (PSP) prior to the commencement of any works at the site, which their employees are to operate, at all times whilst at the site.

9.1 PERSONNEL AND RESPONSIBILITY

All personnel will be made aware of the person responsible for implementing health and safety procedures. All personnel should read and understand the OHS plan prior to commencing work and have signed a statement to verify this understanding. Contractors shall be responsible for ensuring that their employees are aware of and comply with both the PSPs developed for each task and with all relevant statutes and regulations.

9.2 IDENTIFICATION OF POTENTIAL HAZARDS

9.2.1 Chemical Hazards

Chemicals or compounds that may be present at the site include, but are not limited to:

- Hydrocarbons; and
- Asbestos.

Potential risks to personnel associated with these compounds, if present at the site, include:

- Ingestion of soil or liquids;
- Dermal (skin) contact with contaminated soil or liquids; and
- Inhalation of dust, asbestos fibres, gas or aerosols containing contaminants.

9.2.2 Physical Hazards

The following physical hazards may exist at the site:

- Heavy equipment (mobile and stationary);
- Light vehicles, associated traffic and vehicle hazards;
- Cranes, hoisting and lifting equipment;

- Excavations;
- Heat exposure;
- Buried Services;
- Uneven, slippery ground;
- Noise;
- Dust;
- Electrical equipment; and
- Snakes, spiders.

9.3 MEDICAL SURVEILLANCE

It is expected that all personnel on the site have undergone specific training for working on contaminated sites or will be advised of potential contaminants and hazards. A site-specific medical surveillance scheme is not considered necessary for this project. Qualifications of personnel working on site will be verified by the contractor prior to the commencement of works.

9.4 SITE WORK PRACTICES

9.4.1 Personal Hygiene

No smoking, eating or drinking should be permitted on site in areas where the possibility of contamination exists. In particular, smoking should be prohibited in areas were flammable materials may be present and/or generated. In these areas, a designated clean location should be allocated for smoking and the consumption of food or drink. These areas should be equipped with hand washing facilities which must be used prior to engaging in these activities. Personnel should be made aware of the location of these facilities.

9.4.2 Decontamination

Contaminated equipment should not be removed from the work area. Removal of contaminated equipment should be undertaken with caution in order to avoid contaminating other parts of the site.

9.4.3 Restricted Access

Access to the site must be restricted by a perimeter fence. Signs should be erected to notify personnel of the presence of excavations on the site. Site visitors must report to the site office prior to entering the site.

All persons entering the site will require an induction into the OH&S plan or will need to be escorted by inducted personnel.

9.4.4 Personal protection

Personnel will take measures to avoid direct contact with contaminated material. Workers are to ensure that soil, surface water or groundwater are not ingested or swallowed and that direct contact with skin is avoided. Personnel should wear the following Personal Protective Equipment (PPE):

1. Steel-capped boots meeting AS2010 requirements;
2. Safety vest;
3. Hard hat meeting AS1801-1981 requirements when working within the site;
4. Hearing protection meeting AS1270-1988 requirements when working around machinery or plant and equipment if noise levels exceed exposure standards;
5. Safety glasses or goggles with side shields meeting AS1337-1992 requirements as necessary;
6. Disposable latex gloves for personnel involved in soil sampling; and
7. Breathing apparatus shall be used if required.

In the unlikely event that personnel are required to work in areas with highly contaminated soil or other hazardous materials additional PPE will be required. The contractor shall be responsible for ensuring that appropriate PPE is provided and used during site works.

9.5 EMERGENCY RESPONSE PLAN

9.5.1 Resources

The following emergency numbers can be called in the event that medical or other emergency services are required:

Hospital: Strathfield Private Hospital
3 Everton Road, Strathfield NSW 2135
(02) 9745 7444

Emergency: 000

Electrical: Ausgrid
131 388

Council: Burwood Council

Suite 1, Level 2,
1-17 Elsie Street,
BURWOOD NSW 2134
(02) 9911 9911

Water: Sydney Water
132 090

Gas: Jemena Gas Network
131 909

9.5.2 Responsibilities

The site supervisor will be responsible for ensuring that site personnel are aware of emergency services available. A site safety officer must be available during remedial works.

9.5.3 Contact Names and Numbers

Contact names and numbers for CES and the remediation contractor must be displayed on the site access gates during the works.

10 REFERENCES

Australian Medical Health & Research Council and Australian and New Zealand Environment & Conservation Council, 1992: *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*. January 1992.

Australian and New Zealand Environment and Conservation Council: 2000: *Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy*. October 2000.

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Douglas Partners Site Inspection Record, Seniors Housing Croydon Project, Croydon Avenue, Croydon, 19 December 2011 (Project reference: 20289.09).

Douglas Partners Report on Supplementary Contamination Assessment, Seniors Housing Croydon Project, Croydon Avenue, Croydon, February 2012 (Project reference: 20289.10).CES (2009) Environmental Site Assessment (ESA).

Department of Environment and Conservation, 2006: *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme, 2nd Edition.*

Environment Protection Authority NSW, 1994: *Contaminated Sites: Guidelines for Assessing Service Station Sites*.

Environment Protection Authority NSW, 1997: *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

Figures

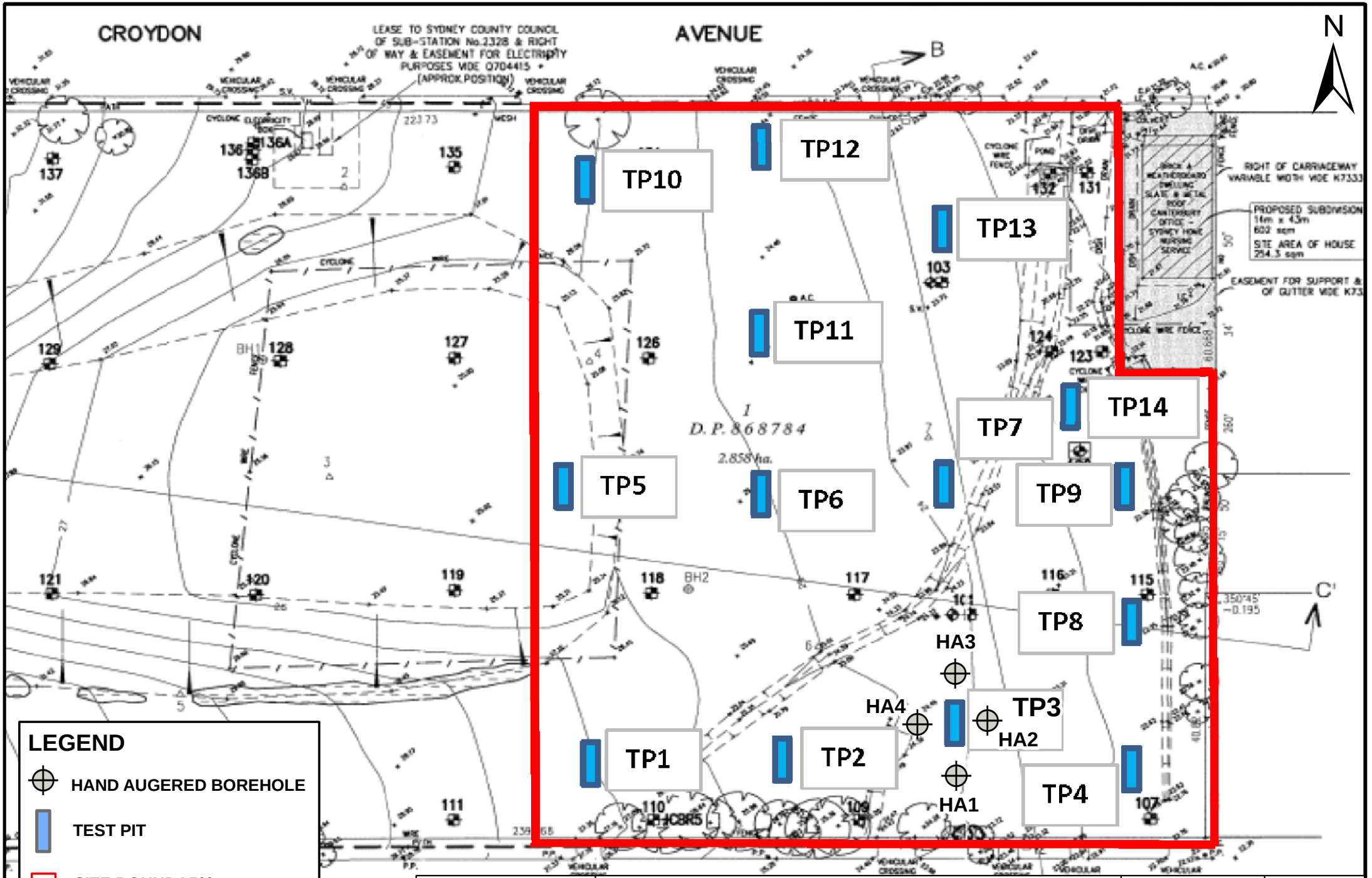
Source: NearMap

CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble, NSW, 2073
ph 8569 2200 fax 9983 0582

Title

Figure 1: Site Location Plan

CES Project ID:	Date:
CES120209-CHC-RAP	07/03/2012
Prepared By: M. Pickett	Checked By; G. Hauvespre



Source: Supplementary Contamination Report dated February 2012

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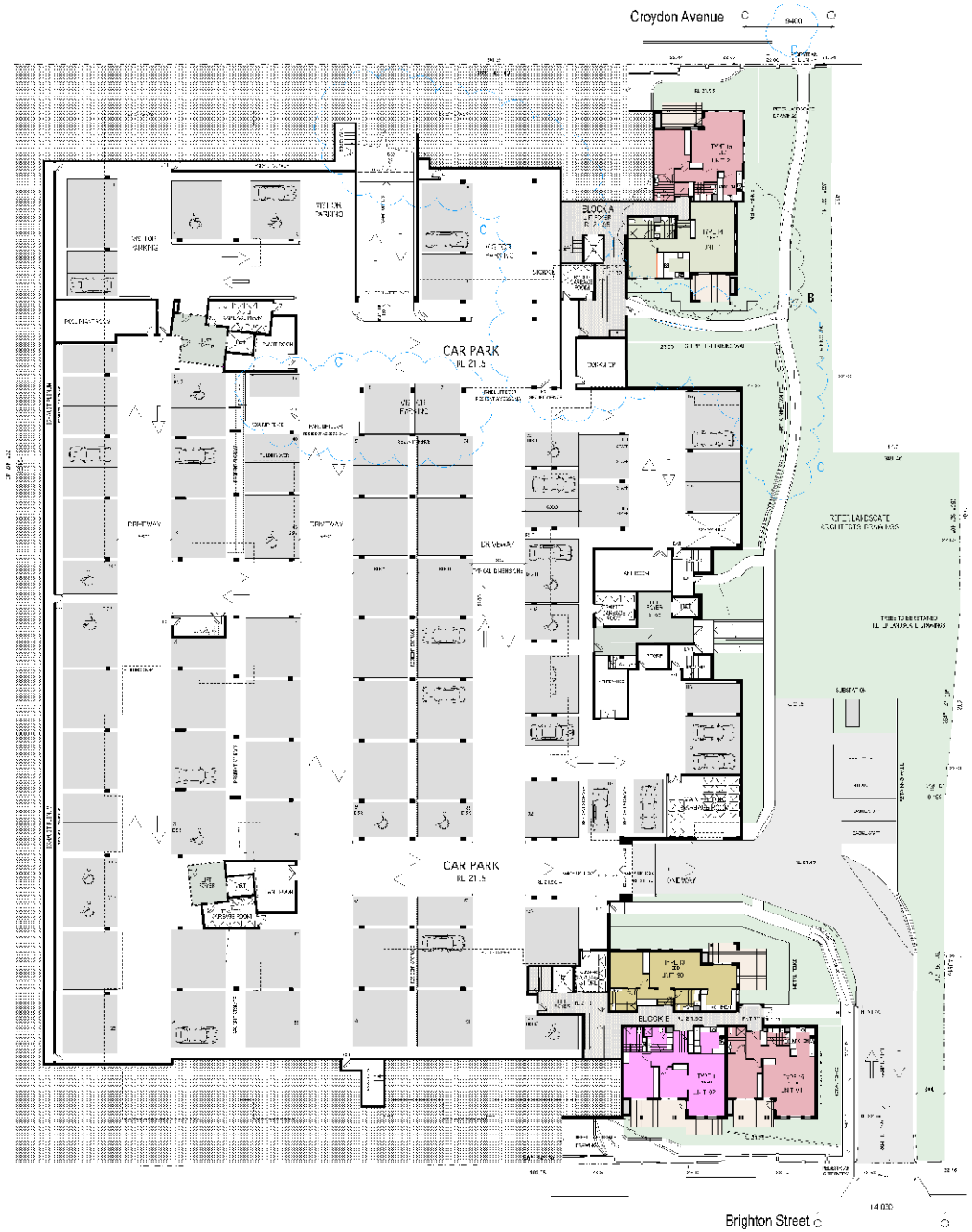
Title

Figure 2: Sample Location Plan

CES Project ID:	Date:
CES120209-CHC-RAP	07/03/2012
Prepared By: M. Pickett	Checked By; G. Hauvespre



Source: Campbell Luscombe Architects drawing entitled 'Basement Car Park Level Floor Plan RL21.5' Revision C dated 14/10/2011

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Title

Figure 3: Basement Car Park Level Floor Plan

CES Project ID:	Date:
CES120209-CHC-RAP	08/03/2012
Prepared By: M. Pickett	Checked By; G. Hauvespre

Tables

Table 1: Remediation Acceptance Criteria - Soil (mg kg^{-1})		
Contaminant	**HIL (Setting A)**	**Source**
Arsenic (total)	100	NEPC (1999) – Schedule (B1)
Cadmium	20	NEPC (1999) – Schedule (B1)
Chromium (III)	12%	NEPC (1999) – Schedule (B1)
Copper	1000	NEPC (1999) – Schedule (B1)
Lead	300	NEPC (1999) – Schedule (B1)
Mercury (inorganic)	15	NEPC (1999) – Schedule (B1)
Nickel	600	NEPC (1999) – Schedule (B1)
Zinc	7000	NEPC (1999) – Schedule (B1)
TPH C6-C9	65	NSW EPA (1994)
TPH C10-C40	1000	NSW EPA (1994)
Benzene	1	NSW EPA (1994)
Toluene	1.4	NSW EPA (1994)
Ethylbenzene	3.1	NSW EPA (1994)
Total Xylene	14	NSW EPA (1994)
Benzo (a) Pyrene	1	NEPC (1999) – Schedule (B1)
Total PAH	20	NEPC (1999) – Schedule (B1)
Aldrin + Dieldrin	10	NEPC (1999) – Schedule (B1)
Chlordane	50	NEPC (1999) – Schedule (B1)
DDT+DDD+DDE	200	NEPC (1999) – Schedule (B1)
Heptachlor	10	NEPC (1999) – Schedule (B1)
PCB	10	NEPC (1999) – Schedule (B1)
Asbestos	No detectable fibres	NSW Department of Health

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Table 2: Results of Soil Analysis (All results in mg/kg unless otherwise stated)

Sample ID	Sampling Date	Soil Type	Heavy Metals								Polycyclic Aromatic Hydrocarbons (PAH)		Total Petroleum Hydrocarbons (TPH) [2]		BTEX [2]				Asbestos	Polychlorinated Biphenyls (PCB)	Organochlorine Pesticides (OCP)[3]	Phenols
			Arsenic	Cadmium	Chromium[1]	Copper	Lead	Mercury	Nickel	Zinc	B(a)P	Total PAH	C6-C9	C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylene				
2002 DP Contamination Assessment Results																						
102/0.5	Mar-02	Fill	20	<1	39	15	120	0.12	4	160	0.92	10.99	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	1.2
102/0.9	Mar-02	Natural	14	<1	36	7	17	<0.05	<4	14	<0.05	<1.55	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	1.6
103/SS	Mar-02	Fill	10	<1	14	45	100	0.05	30	210	0.36	5.14	-	-	-	-	-	-	-	-	-	-
103/1.2	Mar-02	Natural	11	<1	16	17	14	<0.05	<4	16	<0.05	<1.55	-	-	-	-	-	-	-	-	-	-
107/SS	Mar-02	Fill	10	<1	23	130	180	0.09	40	220	2.8	36.97	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	0.76	1.3
107/1.1	Mar-02	Natural	7	<1	27	8	18	<0.05	<4	10	<0.05	<1.55	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	1.2
108/0.5	Mar-02	Natural	16	<1	34	4	26	<0.05	<4	23	<0.05	<1.55	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	
109/SS	Mar-02	Fill	230	<1	19	6	44	<0.05	<4	76	<0.05	0.25	-	-	-	-	-	-	-	-	-	-
109/0.5	Mar-02	Fill	22	<1	39	<3	22	<0.05	<4	24	<0.05	<1.55	-	-	-	-	-	-	-	-	-	-
110/0.5	Mar-02	Natural	11	<1	26	21	17	<0.05	<4	15	<0.05	<1.55	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	1.2
110/1.3	Mar-02	Natural	21	<1	9	24	16	<0.05	<4	19	<0.05	<1.55	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	1
115/0.5	Mar-02	Fill	38	<1	22	53	330	0.35	9	330	1.8	19.49	-	-	-	-	-	-	-	-	-	-
116/0.5	Mar-02	Fill	11	<1	24	9	51	0.06	<4	130	0.42	3.89	-	-	-	-	-	-	-	-	-	-
117/SS	Mar-02	Fill	14	<1	21	30	120	0.09	10	160	2.4	28.57	-	-	-	-	-	-	-	-	-	-
118/0.45	Mar-02	Natural	<5	<1	12	20	84	0.06	7	95	<0.05	<1.55	-	-	-	-	-	-	-	-	-	-
123/SS	Mar-02	Fill	7	<1	9	42	17	<0.05	21	120	<0.05	<1.55	-	-	-	-	-	-	-	-	-	-
124/0.5	Mar-02	Fill	6	<1	8	24	20	<0.05	<4	30	0.12	1.42	-	-	-	-	-	-	-	-	-	-
125/0.5	Mar-02	Fill	10	<1	22	25	160	0.06	12	100	0.17	2.17	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	1.1
125/1.3	Mar-02	Natural	15	<1	12	21	11	<0.05	<4	15	1.1	14.41	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	0.83
126/SS	Mar-02	Fill	12	<1	12	32	48	<0.05	7	58	<0.05	<1.55	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	-
131/0.5	Mar-02	Fill	8	<1	7	21	25	<0.05	<4	22	0.68	9.08	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	1.1
131/1.5	Mar-02	Natural	<5	<1	12	8	16	<0.05	<4	7	<0.05	<1.55	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	1.1
132/SS	Mar-02	Fill	9	<1	10	42	18	<0.05	26	150	<0.05	<1.55	-	-	-	-	-	-	-	-	-	-
133/0.5	Mar-02	Natural	31	<1	60	<3	32	<0.05	<4	38	<0.05	<1.55	<20	<120	<0.5	<0.5	<0.5	<1.5	-	<0.9	<0.5	-
134/SS	Mar-02	Fill	6	<1	22	41	85	<0.05	55	110	1.5	24.7	-	-	-	-	-	-	-	-	-	-
2012 DP Contamination Assessment																						
TP1 0.0-0.2	23/01/2012	Filling	6	<0.5	12	20	32	<0.1	4	29	1.6	12.7	<25	120	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP2 0.0-0.2	23/01/2012	Filling	13	<0.5	20	10	24	<0.1	2	14	0.12	1.62	<25	<250	<0.2	<0.5	<1	<3	Detected	<0.7	<2.0	<5
TP2 0.2-0.5	23/01/2012	Filling	17	<0.5	16	15	54	0.1	2	140	2.9	36.5	<25	200	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP2 0.9-1.2	23/01/2012	Natural	9	<0.5	18	10	14	<0.1	1	4	<0.05	1.55	<25	<250	<0.2	<0.5	<1	<3	ND	-	-	-
TP3 0.0-0.2	23/01/2012	Filling	11	<0.5	14	55	100	0.2	17	140	91	1195.5	<25	2960	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP3 0.5-0.7	23/01/2012	Filling	7	<0.5	23	10	27	<0.1	2	11	<0.05	<1.55	<25	<250	<0.2	<0.5	<1	<3	ND	-	-	-
TP4 0.3-0.5	23/01/2012	Filling	12	<0.5	21	9	19	<0.1	2	4	<0.05	<1.55	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP5 0.5-0.7	23/01/2012	Filling	10	<0.5	7	27	37	<0.1	9	51	0.4	5.7	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP5 2.1-2.2	23/01/2012	Natural	6	<0.5	5	22	26	<0.1	6	43	0.34	4.24	<25	<250	<0.2	<0.5	<1	<3	ND	-	-	-
TP6 0.2-0.4	23/01/2012	Filling	8	<0.5	17	6	23	<0.1	2	4	1.3	13.2	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP7 0.2-0.4	23/01/2012	Filling	7	<0.5	16	27	110	1.3	17	140	<0.05	<1.55	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP8 0.9-1.1	23/01/2012	Filling	11	<0.5	24	73	410	0.3	12	520	0.25	2.75	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	2.5	<5
TP8 1.3-1.5	23/01/2012	Natural	12	<0.5	28	7	22	<0.1	2	11	<0.05	<1.55	<25	<250	<0.2	<0.5	<1	<3	ND	-	-	-
TP9 0.5-0.7	23/01/2012	Filling	7	<0.5	9	32	50	<0.1	19	93	1.2	14.3	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP9 1.7-1.9	23/01/2012	Natural	6	<0.5	20	13	14	<0.1	1	4	<0.05	<1.55	<25	<250	<0.2	<0.5	<1	<3	ND	-	-	-
TP10 0.0-0.2	23/01/2012	Filling	6	<0.5	7	24	25	<0.1	7	40	0.13	2.03	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP11 0.3-0.5	23/01/2012	Filling	17	<0.5	21	32	140	0.2	4	98	0.98	9.68	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP11 0.9-1.1	23/01/2012	Natural	11	<0.5	23	15	21	<0.1	1	10	<0.05	<1.55	<25	<250	<0.2	<0.5	<1	<3	ND	-	-	-
TP12 0.0-0.2	23/01/2012	Filling	6	<0.5	6	39	30	0.1	21	91	0.05	<1.55	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP13 0.0-0.2	23/01/2012	Filling	7	<0.5	6	38	16	<0.1	10	77	<0.05	<1.55	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	<2.0	<5
TP14 0.0-0.2	23/01/2012	Filling	25	<0.5	15	33	100	1	7	110	1.1	11.7	<25	<250	<0.2	<0.5	<1	<3	ND	<0.7	2	<5
BD1/23012012	23/01/2012	Filling	9	<0.5	18	12	22	<0.1	2	15	0.21	2.71	-	-	-	-	-	-	-	-	-	-
BD6/23012013	24/01/2012	Filling	20	1	22	57	440	0.47	6.4	450	1.5	17	-	-	-	-	-	-	-	-	-	-
TB1/23012012	23/01/2012	-	-	-	-	-	-	-	-	-	-	-	<25	-	<0.2	<0.5	<1	<3	-	-	-	-
TS/23012012	23/01/2012	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	101%	100%	101%	-	-	-	-
Site Assessment Criteria																						
SAC			400	80	400,000	4,000	1,200	60	2,400	28,000	4	80	65	1000	1	1.4	3.1	14	ND	40	40/200/800/40	34,000

Notes

SAC	NSW EPA Contaminated Sites: Guidelines for the NSW Site Auditors Scheme, 2006. Health-based guidelines for resedential with accessible soil sites (HIL, Column 1)
	Result exceeding the SAC
1	Chromium is assumed to exist in the stable Cr(III) oxidation state, as Cr(VI) will be too reactive and unstable under the normal environment
2	SAC sourced from NSW EPA *Contaminated Sites Guidelines for Assessing Service Station Sites* (1994)
3	Aldrin+Dieldrin/Chlordane/ DDD+DDE+DDT/Heptachlor
Bold	Reported above laboratory PQL
<x.x	Below Laboratory Practical Quantification Limit for Analyte or sum of analytes
-	Not Tested
ND	None detected
BD1/23012012	Field Replicate of TP2 0.0-0.2m

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Table 3: Results of Laboratory Analysis for Waste Classification

Sample ID	Sampling Date	Soil Type	Heavy Metals									PAH				TPH		Benzene	Toluene	Ethyl-Benzene	Total Xylene	Total Phenols	PCB	OCP	asbestos
			As	Cd	Cr 1	Cu	Pb	Pb (TCLP)	Hg	Ni	Zn	Total PAH 2	Total PAH (TCLP)	Benzo(a) Pyrene	Benzo(a)pyrene (TCLP)	C6-C9	C10-C36								
TP1 0.0-0.2	23/01/2012	Filling	6	<0.5	12	20	32	-	<0.1	4	29	12.7	<0.016	1.6	<0.001	<25	120	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP2 0.0-0.2	23/01/2012	Filling	13	<0.5	20	10	24	-	<0.1	2	14	1.62	-	0.12	-	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	Detected
TP2 0.2-0.5	23/01/2012	Filling	17	<0.5	16	15	54	-	0.1	2	140	36.5	<0.016	2.9	<0.001	<25	200	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP2 0.9-1.2	23/01/2012	Natural	9	<0.5	18	10	14	-	<0.1	1	4	1.55	-	<0.05	-	<25	<250	<0.2	<0.5	<1	<3	-	-	-	ND
TP3 0.0-0.2	23/01/2012	Filling	11	<0.5	14	55	100	-	0.2	17	140	1195.5	**0.017**	91	<0.001	<25	2960	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP3 0.5-0.7	23/01/2012	Filling	7	<0.5	23	10	27	-	<0.1	2	11	<1.55	-	<0.05	-	<25	<250	<0.2	<0.5	<1	<3	-	-	-	ND
TP4 0.3-0.5	23/01/2012	Filling	12	<0.5	21	9	19	-	<0.1	2	4	<1.55	-	<0.05	-	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP5 0.5-0.7	23/01/2012	Filling	10	<0.5	7	27	37	-	<0.1	9	51	5.7	-	0.4	-	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP5 2.1-2.2	23/01/2012	Natural	6	<0.5	5	22	26	-	<0.1	6	43	4.24	-	0.34	-	<25	<250	<0.2	<0.5	<1	<3	-	-	-	ND
TP6 0.2-0.4	23/01/2012	Filling	8	<0.5	17	6	23	-	<0.1	2	4	13.2	<0.016	1.3	<0.001	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP7 0.2-0.4	23/01/2012	Filling	7	<0.5	16	27	110	**0.05**	1.3	17	140	<1.55	-	<0.05	-	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP8 0.9-1.1	23/01/2012	Filling	11	<0.5	24	73	410	**0.2**	0.3	12	520	2.75	-	0.25	-	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	2.5	ND
TP8 1.3-1.5	23/01/2012	Natural	12	<0.5	28	7	22	-	<0.1	2	11	<1.55	-	<0.05	-	<25	<250	<0.2	<0.5	<1	<3	-	-	-	ND
TP9 0.5-0.7	23/01/2012	Filling	7	<0.5	9	32	50	-	<0.1	19	93	14.3	<0.016	1.2	<0.001	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP9 1.7-1.9	23/01/2012	Natural	6	<0.5	20	13	14	-	<0.1	1	4	<1.55	-	<0.05	-	<25	<250	<0.2	<0.5	<1	<3	-	-	-	ND
TP10 0.0-0.2	23/01/2012	Filling	6	<0.5	7	24	25	-	<0.1	7	40	2.03	-	0.13	-	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP11 0.3-0.5	23/01/2012	Filling	17	<0.5	21	32	140	**0.3**	0.2	4	98	9.68	<0.016	0.98	<0.001	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP11 0.9-1.1	23/01/2012	Natural	11	<0.5	23	15	21	-	<0.1	1	10	<1.55	-	<0.05	-	<25	<250	<0.2	<0.5	<1	<3	-	-	-	ND
TP12 0.0-0.2	23/01/2012	Filling	6	<0.5	6	39	30	-	0.1	21	91	<1.55	-	0.05	-	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP13 0.0-0.2	23/01/2012	Filling	7	<0.5	6	38	16	-	<0.1	10	77	<1.55	-	<0.05	-	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	<2.0	ND
TP14 0.0-0.2	23/01/2012	Filling	25	<0.5	15	33	100	-	1	7	110	11.7	<0.016	1.1	<0.001	<25	<250	<0.2	<0.5	<1	<3	<5	<0.7	2	ND
BD1/23012012	23/01/2012	Filling	9	<0.5	18	12	22	-	<0.1	2	15	2.71	-	0.21	-	-	-	-	-	-	-	-	-	-	-
BD6/23012013	24/01/2012	Filling	20	1	22	57	440	-	0.47	6.4	450	17	-	1.5	-	-	-	-	-	-	-	-	-	-	-
Waste Classification Criteria [3]																									
Criteria for Waste Classification - No TCLP testing																									
General Solid Waste CT1 (mg/kg)			100	20	100	-	100	-	4	40	-	-	-	0.8	-	-	-	10	288	600	1000	288	-	-	-
Restricted Solid Waste CT2 (mg/kg)			400	80	400	-	400	-	16	120	-	-	-	3.2	-	-	-	40	1152	2400	4000	1152	-	-	-
Criteria for Waste Classification - with TCLP testing																									
General Solid Waste SCC1 and TCLP1 (mg/kg)			-	-	-	-	1500	5	-	-	-	200	-	10	0.04	650	10000	-	-	-	-	-	<50	<50	-
Restricted Solid Waste SCC2 and TCLP2 (mg/kg)			-	-	-	-	6000	20	-	-	-	800	-	23	0.16	10000	40000	-	-	-	-	-	<50	<50	-
Published Background Concentrations for Austrlian Soils																									
NEPC (1999) National Environment Protection Measure (Assessment of Site Contamination) Schedule B1, Table 5-A, Background Ranges			1-50	1	5-1000	2-100	2-200	-	0.03	5-500	10-300	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC/NHMRC (1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites, Environmental Soil Quality Guidelines Background A [ANZECC A];			0.2-30	0.04-2	0.5-110	1-190	<2-200	-	0.001-0.1	2-400	2-180	0.95-5	-	-	-	-	-	0.05-1	0.1-1	-	-	0.03-0.5	0.02-0.1	<0.001-0.97	-
ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3, Table 9.2.16 Datasets used to derive suggested upper background values for uncontaminated Australian soils			1-53	0.016-0.78	2.5-673	0.4-412	2-81	-	-	1-517	1-263	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

1	All Chromium are assumed to exist in the stable Cr(III) oxidation state, as Cr(VI) will be too reactive and unstable in normal environmental conditions
2	Concentrations of individual compounds less than PQL have been assumed equal to PQL
3	NSW DECC *Waste Classification Guidelines* (Table 2) April 2008, updated 2009
ND	Not detected at reporting limit of 0.1g/kg
-	Not analysed / Not applicable
BD1/23012012	Field Replicate of TP2 0.0-0.2m
BD6/23012012	Field Replicate of TP11 0.3-0.5m
	Exceeds General Solid Waste Criteria

Table 4: CES soil analysis results

			Sample ID	010312-01-GH	010312-05-GH	010312-06-SB	010312-07-SB	010312-08-TG	010312-09-TG	010312-10-GH	010312-11-GH	SAC
			Description	Western borehole HA1	Western borehole HA1	Southern borehole HA2	Southern borehole HA2	Western borehole HA3	Western borehole HA3	Northern borehole HA4	Northern borehole HA4	
			Depth	0.2-0.3 m bgl	0.4-0.7 m bgl	0.1-0.2 mbgl	0.3-0.4 m bgl	0.1 mbgl	0.2 mbgl	0.1-0.2 m bgl	0.5 m bgl	
			Soil description	Fill material consisting of light brown sand	Dark brown clay (natural soil)	Fill material consisting of sand with clay	Brown clay (natural soil)	Fill material consisting of light brown sand with clay	Fill material consisting of light brown sand with clay with pieces of coal	Fill material consisting of dark brown clay with sand	Fill material consisting of light bown clay	
			Laboratory report	69823	69823	69823	69823	69823	69823	69823	69823	
			Date sampled	01/03/2012	01/03/2012	01/03/2012	01/03/2012	01/03/2012	01/03/2012	01/03/2012	01/03/2012	
Parameters		Unit	PQL									
TPH	vTRH C6 - C9	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	65*
	TRH C10 - C14	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	
	TRH C15 - C28	mg/kg	100	130	<100	160	<100	<100	130	<100	<100	
	TRH C29 - C36	mg/kg	100	<100	<100	190	<100	<100	270	110	<100	
	sum	mg/kg	-	130	<PQL	350	<PQL	<PQL	400	110	<PQL	1 000*
PAH	Naphthalene	mg/kg	0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	<0.1	
	Acenaphthylene	mg/kg	0.1	1.6	<0.1	0.8	<0.1	<0.1	0.4	<0.1	<0.1	
	Acenaphthene	mg/kg	0.1	0.3	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Fluorene	mg/kg	0.1	1.5	<0.1	0.5	<0.1	<0.1	0.3	<0.1	<0.1	
	Phenanthrene	mg/kg	0.1	11	<0.1	5.7	0.3	0.9	3.9	0.4	<0.1	
	Anthracene	mg/kg	0.1	2	<0.1	1.2	<0.1	0.2	0.6	<0.1	<0.1	
	Fluoranthene	mg/kg	0.1	9.2	<0.1	6.3	0.4	0.9	4.4	0.7	<0.1	
	Pyrene	mg/kg	0.1	7.8	<0.1	5.9	0.4	0.9	3.9	0.7	<0.1	
	Benzo(a)anthracene	mg/kg	0.1	3.4	<0.1	2.7	0.2	0.4	1.8	0.3	<0.1	
	Chrysene	mg/kg	0.1	3.1	<0.1	2.8	0.2	0.4	1.8	0.4	<0.1	
	Benzo(b+k)fluoranthene	mg/kg	0.2	4.5	<0.2	5.1	0.3	0.6	3.1	0.6	<0.2	
	Benzo(a)pyrene	mg/kg	0.05	2.7	<0.05	3.3	0.2	0.4	**1.9**	0.42	<0.05	4**
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	1.5	<0.1	2.4	0.1	0.2	1.2	0.3	<0.1	
	Dibenzo(a,h)anthracene	mg/kg	0.1	0.2	<0.1	0.4	<0.1	<0.1	0.2	<0.1	<0.1	
	Benzo(g,h,i)perylene	mg/kg	0.1	1.5	<0.1	2.6	0.1	0.3	1.3	0.3	<0.1	
	PAHs total	mg/kg	-	50.3	<PQL	39.9	2.2	5.2	24.9	4.12	<PQL	80**

Note: * EPA Contaminated Sites Guidelines for Assessing Service Station Sites (1994)

** Guidelines for the NSW Site Auditor Scheme (2nd Edition) for residential land use with minimal access to soils (2006)

Appendix 1
CES Laboratory Certificates

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 69823

Client:

Consulting Earth Scientists Pty Ltd
Suite 3, Level 1
55 Grandview Street
Pymble
NSW 2073

Attention: Guillaume Hauvespre

Sample log in details:

Your Reference:	**CES120209-CHC**		
No. of samples:	12 Soils		
Date samples received / completed instructions received	01/03/12	/	01/03/12

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: / Issue Date:	8/03/12	/	5/03/12
Date of Preliminary Report:	Not issued		

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

Results Approved By:

Nancy Zhang
Chemist

TRH in Soil (C6-C9)						
Our Reference:	UNITS	69823-1	69823-3	69823-5	69823-6	69823-7
Your Reference	----------	010312-01-GH	010312-03-GH	010312-05-GH	010312-06-SB	010312-07-SB
Date Sampled	----------	01/03/2012	01/03/2012	01/03/2012	01/03/2012	01/03/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012	02/03/2012
Date analysed	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012	02/03/2012
vTRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Surrogate aaa-Trifluorotoluene	%	118	117	122	123	119

TRH in Soil (C6-C9)					
Our Reference:	UNITS	69823-8	69823-9	69823-10	69823-11
Your Reference	----------	010312-08-SB	010312-09-SB	010312-10-GH	010312-11-GH
Date Sampled	----------	01/03/2012	01/03/2012	01/03/2012	01/03/2012
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012
Date analysed	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012
vTRH C_6 - C_9	mg/kg	<25	<25	<25	<25
Surrogate aaa-Trifluorotoluene	%	122	121	123	118

sTRH in Soil (C10-C36)						
Our Reference:	UNITS	69823-1	69823-3	69823-5	69823-6	69823-7
Your Reference	----------	010312-01-GH	010312-03-GH	010312-05-GH	010312-06-SB	010312-07-SB
Date Sampled	----------	01/03/2012	01/03/2012	01/03/2012	01/03/2012	01/03/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012	02/03/2012
Date analysed	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012	02/03/2012
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	130	<100	<100	160	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	190	<100
Surrogate o-Terphenyl	%	99	100	99	100	98

sTRH in Soil (C10-C36)					
Our Reference:	UNITS	69823-8	69823-9	69823-10	69823-11
Your Reference	----------	010312-08-SB	010312-09-SB	010312-10-GH	010312-11-GH
Date Sampled	----------	01/03/2012	01/03/2012	01/03/2012	01/03/2012
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012
Date analysed	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	130	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	270	110	<100
Surrogate o-Terphenyl	%	99	103	99	99

PAHs in Soil						
Our Reference:	UNITS	69823-1	69823-3	69823-5	69823-6	69823-7
Your Reference	----------	010312-01-GH	010312-03-GH	010312-05-GH	010312-06-SB	010312-07-SB
Date Sampled	----------	01/03/2012	01/03/2012	01/03/2012	01/03/2012	01/03/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012	02/03/2012
Date analysed	-	03/03/2012	03/03/2012	03/03/2012	03/03/2012	03/03/2012
Naphthalene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Acenaphthylene	mg/kg	1.6	<0.1	<0.1	0.8	<0.1
Acenaphthene	mg/kg	0.3	<0.1	<0.1	0.1	<0.1
Fluorene	mg/kg	1.5	<0.1	<0.1	0.5	<0.1
Phenanthrene	mg/kg	11	<0.1	<0.1	5.7	0.3
Anthracene	mg/kg	2.0	<0.1	<0.1	1.2	<0.1
Fluoranthene	mg/kg	9.2	<0.1	<0.1	6.3	0.4
Pyrene	mg/kg	7.8	<0.1	<0.1	5.9	0.4
Benzo(a)anthracene	mg/kg	3.4	<0.1	<0.1	2.7	0.2
Chrysene	mg/kg	3.1	<0.1	<0.1	2.8	0.2
Benzo(b+k)fluoranthene	mg/kg	4.5	<0.2	<0.2	5.1	0.3
Benzo(a)pyrene	mg/kg	2.7	<0.05	<0.05	3.3	0.20
Indeno(1,2,3-c,d)pyrene	mg/kg	1.5	<0.1	<0.1	2.4	0.1
Dibenzo(a,h)anthracene	mg/kg	0.2	<0.1	<0.1	0.4	<0.1
Benzo(g,h,i)perylene	mg/kg	1.5	<0.1	<0.1	2.6	0.1
Surrogate p-Terphenyl-d_{14}	%	94	81	126	99	101

PAHs in Soil					
Our Reference:	UNITS	69823-8	69823-9	69823-10	69823-11
Your Reference	----------	010312-08-SB	010312-09-SB	010312-10-GH	010312-11-GH
Date Sampled	----------	01/03/2012	01/03/2012	01/03/2012	01/03/2012
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	02/03/2012	02/03/2012	02/03/2012	02/03/2012
Date analysed	-	03/03/2012	03/03/2012	03/03/2012	03/03/2012
Naphthalene	mg/kg	<0.1	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.4	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.3	<0.1	<0.1
Phenanthrene	mg/kg	0.9	3.9	0.4	<0.1
Anthracene	mg/kg	0.2	0.6	<0.1	<0.1
Fluoranthene	mg/kg	0.9	4.4	0.7	<0.1
Pyrene	mg/kg	0.9	3.9	0.7	<0.1
Benzo(a)anthracene	mg/kg	0.4	1.8	0.3	<0.1
Chrysene	mg/kg	0.4	1.8	0.4	<0.1
Benzo(b+k)fluoranthene	mg/kg	0.6	3.1	0.6	<0.2
Benzo(a)pyrene	mg/kg	0.40	1.9	0.42	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	1.2	0.3	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.2	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.3	1.3	0.3	<0.1
Surrogate p-Terphenyl-d_{14}	%	95	96	99	103

Moisture						
Our Reference:	UNITS	69823-1	69823-3	69823-5	69823-6	69823-7
Your Reference	----------	010312-01-GH	010312-03-GH	010312-05-GH	010312-06-SB	010312-07-SB
Date Sampled	----------	01/03/2012	01/03/2012	01/03/2012	01/03/2012	01/03/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	2/03/2012	2/03/2012	2/03/2012	2/03/2012	2/03/2012
Date analysed	-	5/03/2012	5/03/2012	5/03/2012	5/03/2012	5/03/2012
Moisture	%	13	23	18	15	18

Moisture					
Our Reference:	UNITS	69823-8	69823-9	69823-10	69823-11
Your Reference	----------	010312-08-SB	010312-09-SB	010312-10-GH	010312-11-GH
Date Sampled	----------	01/03/2012	01/03/2012	01/03/2012	01/03/2012
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	2/03/2012	2/03/2012	2/03/2012	2/03/2012
Date analysed	-	5/03/2012	5/03/2012	5/03/2012	5/03/2012
Moisture	%	14	13	20	23

Method ID	Methodology Summary
Org-016	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.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.

QUALITY CONTROL TRH in Soil (C6-C9)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			02/03/2012	69823-1	02/03/2012 || 02/03/2012	LCS-1	02/03/2012
Date analysed	-			02/03/2012	69823-1	02/03/2012 || 02/03/2012	LCS-1	02/03/2012
vTRH C_6 - C_9	mg/kg	25	Org-016	<25	69823-1	<25 || <25	LCS-1	132%
Surrogate aaa-Trifluorotoluene	%		Org-016	130	69823-1	118 || 121 || RPD: 3	LCS-1	132%
QUALITY CONTROL sTRH in Soil (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			02/03/2012	69823-1	02/03/2012 || 02/03/2012	LCS-1	02/03/2012
Date analysed	-			02/03/2012	69823-1	02/03/2012 || 02/03/2012	LCS-1	02/03/2012
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	69823-1	<50 || <50	LCS-1	97%
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	69823-1	130 || 200 || RPD: 42	LCS-1	112%
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	69823-1	<100 || 100	LCS-1	103%
Surrogate o-Terphenyl	%		Org-003	99	69823-1	99 || 105 || RPD: 6	LCS-1	103%
QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			02/03/2012	69823-1	02/03/2012 || 02/03/2012	LCS-1	02/03/2012
Date analysed	-			03/03/2012	69823-1	03/03/2012 || 03/03/2012	LCS-1	03/03/2012
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	<0.1 || 0.3	LCS-1	103%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	1.6 || 1.5 || RPD: 6	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	0.3 || 0.3 || RPD: 0	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	1.5 || 1.7 || RPD: 12	LCS-1	102%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	11 || 14 || RPD: 24	LCS-1	100%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	2.0 || 3.2 || RPD: 46	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	9.2 || 14 || RPD: 41	LCS-1	98%
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	7.8 || 12 || RPD: 42	LCS-1	101%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	3.4 || 5.7 || RPD: 51	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	3.1 || 5.0 || RPD: 47	LCS-1	107%
Benzo(b+k)fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	69823-1	4.5 || 7.1 || RPD: 45	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	69823-1	2.7 || 4.9 || RPD: 58	LCS-1	106%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	1.5 || 2.4 || RPD: 46	[NR]	[NR]

Client Reference: CES120209-CHC

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	0.2 || 0.4 || RPD: 67	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	69823-1	1.5 || 2.2 || RPD: 38	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		Org-012 subset	99	69823-1	94 || 99 || RPD: 5	LCS-1	95%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			[NT]
Date analysed	-			[NT]
Moisture	%	0.1	Inorg-008	[NT]

Report Comments:

PAH's in soil: The RPD for duplicate results is accepted due to the non homogenous nature of the sample/s.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

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

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