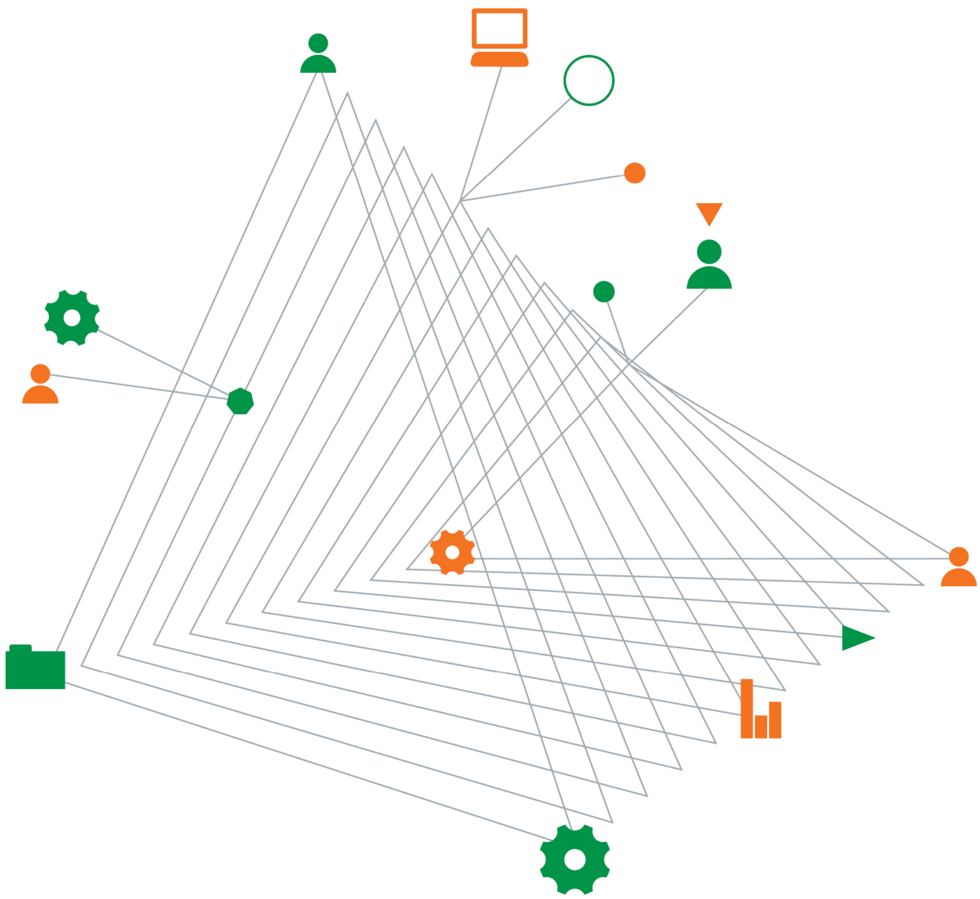
Root Projects Australia

Stage 2 Contamination Assessment

Proposed Forensic Pathology and Coroners Court, Lidcombe NSW

12 May 2016



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Stage 2 Contamination Assessment

Prepared for
Root Projects Australia

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Executive summary

Coffey Geotechnics Australia Pty Ltd was commissioned by Root Projects Australia Pty Ltd (hereby referred to as 'RPA') to investigate soil contamination in the northern portion of the site occupied by The site in Deposited Plan 85069 (hereafter refer to as 'The site') where development activity is proposed.

RCA required a Stage 2 Contamination Assessment and geotechnical assessment to obtain the contamination and geotechnical data to support the proposed development of The site. The objectives of this Stage 2 Contamination Assessment are to:

- investigate potential surface and subsurface contamination underlying The site to assess the suitability of the site for the proposed redevelopment; and
- assess what remediation works, if any, may be required to make The site suitable for the proposed redevelopment.

To address the objectives of this investigation, the following scope of works was undertaken:

- Intrusive site investigation works, including:
  - Drilling of three boreholes targeting the flammable goods and chemicals store located in The site and collection of representative soil samples from each borehole;
  - Collection of eight surface soil samples from the vicinity of the residential dwellings located in the northern part of The site;
  - Collection of representative soil samples from six boreholes drilled as part of the geotechnical assessment for waste classification purposes;
  - Laboratory analysis of selected soil samples for a suite of chemicals of potential concern (CoPC); and
  - Preparation of this analytical report.

This report has been prepared in general accordance with industry and NSW EPA guidelines, particularly the *Guidelines for Consultants Reporting on Contaminated Sites* (NSW OEH, 2011) and relevant sections of the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (the ASC NEPM) (NEPC 1999, amended 2013).

Results from of this Stage 2 contamination investigation indicated that:

- All samples collected during this investigation returned results below human and environmental assessment criteria for commercial/industrial land use. Sampling and analysis of the parts of the site with minimal potential for impact from previous use was sufficient to provide a representative assessment which was supplemented by judgemental sampling and analysis in areas where potential for impact was suspected.
- Asbestos was not detected in soil samples collected from around the cottages though asbestos containing material (one fibro fragment) was observed on ground surface near sample location SS01.
- Fill soils classify as GSW under the six step procedure documented within NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste.* A waste classification of GSW allows these soils to be reused onsite (subsequent to geotechnical classification) or exported offsite as GSW.
- Natural soil horizons below fill soils satisfy the definition of VENM allowing this material to be reused onsite or exported offsite as VENM.

On the basis of the above, Coffey concludes that the site will be suitable for the proposed development subject to:

- removal of the observed fibro fragment and any other fibro fragments that may be present or may result from demolition of buildings on the site; and
- implementation of an unexpected materials management protocol that is focussed on fibro/asbestos fragments and other potential contamination sources during earthworks.
- Surplus excavated surface soil can be disposed as GSW at a suitably licenced facility or reused onsite as construction fill provided that no asbestos impacts in that soil are discovered during earthworks. Analytical results for fill soil, in areas other than immediately surrounding the eastern two cottages, reported concentrations of contaminants below the CT1 waste thresholds. This finding indicates that the majority of fill soil may be disposed off-site to a licensed soil recycling facility.

Based on the above, Coffey recommends that:

- Before removing lead impacted topsoil surrounding the residential structures, engage an asbestos removal contractor (such as the demolition contractor) to conduct a systematic inspection of the area for collection of any fibro fragments. These fragments can be stored in a strong plastic bag (labelled as Asbestos Waste) and disposed with other ACM removed from the cottages as part of demolition.
- Implement an unexpected materials management protocol during earthworks that is focussed on identifying and managing fibro fragments and other potential contamination sources of contamination.
- Remove fill soil around the cottages as indicated on Figure 4 (before they have been demolished) to a maximum depth of 50mm under the direction of a Coffey environmental practitioner. Stockpile the soil on-site and cover for later reuse on site or removal to a licensed landfill. This fill soil is not suitable for recycling at a licensed facility.

This report should be read in conjunction with the attached “Important information about your Coffey Environmental Report”.

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Abbreviations

AHD	Australian Height Datum
C6-C36	Hydrocarbon chainlength fraction
bgs	below ground surface
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
COC	Chain of Custody
COPC	Chemical of potential concern
LOR	Limit of Reporting
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
NATA	National Association of Testing Authorities
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
OCP	Organochlorine Pesticide
OPP	Organophosphorus Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector
ppm	parts per million
ppmv	parts per million by volume
QA	Quality Assurance
QC	Quality Control
RL	Reduced Level
RPD	Relative Percent Difference
SOP	Standard Operating Procedures
TPH	Total Petroleum Hydrocarbon
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1. Introduction

1.1. General

This report presents the findings of a Stage 2 Contamination Assessment carried out by Coffey Geotechnics Pty Ltd (Coffey) for the Forensic Pathology and Coroner Court proposed for development on the land located on the corner of Weeroona Road and Joseph Street, Lidcombe NSW.

The site location is shown in Figure 1.

The assessment was commissioned by Root Projects Australia Pty Ltd (RPA) and undertaken in general accordance with Coffey's fee proposals dated 22 January 2016 (Ref: GEOTLCOV25551AA-AF), 25 January 2016 (Ref: GEOTLCOV25551AA-AE), and 24 February 2016 (Ref: GEOTLCOV25551AA-AH).

A geotechnical assessment is currently being carried out by Coffey Geotechnics Pty Ltd and will be reported separately.

In accordance with a request from RPA, this investigation has been limited to the western portion of the site located in Lot 3, Deposited Plan 85069 (hereafter refer to as 'The site') where development activity is proposed.

It is understood that the Stage 2 Contamination Assessment and geotechnical assessment are required to obtain the contamination and geotechnical data to support the proposed development of the site.

1.2. Project background

The site comprises the north-western portion of the NSW Government precinct, Lidcombe, which includes the NSW Health Forensic and Analytical Science Services, EPA Laboratories and the Motor Vehicle Testing unit, north of Weeroona Road. The proposed development is likely to include the construction of a three storey building cut into sloping ground and a ground level car parking lot to be used for NSW Health activities.

Coffey carried out a Phase 1 Initial Contamination Assessment of The site with the aim of assessing the potential for contamination resulting from current and historic land uses, and to assess disposal/reuse options for spoil generated during the development process.

The result of the Phase 1 assessment indicated that there was a low to moderate likelihood for localised land contamination to be present as a result of the historical and current land use. As such, it was recommended that a Stage 2 Contamination Assessment be carried out.

1.3. Objective

The objectives of the Stage 2 Contamination Assessment are to:

- investigate potential surface and subsurface contamination underlying the site to assess the suitability of the site for the proposed redevelopment; and
- assess what remediation works, if any, may be required to make site suitable for the proposed redevelopment.

1.4. Scope of work

To achieve the project objectives, Coffey carried out the following activities:

- Intrusive site investigation works, including:
  - Drilling of three boreholes targeting the flammable goods and chemicals store located in the site and collection of representative soil samples from each borehole;
  - Collection of eight surface soil samples from the vicinity of the residential dwellings located in the northern part of the site; and
  - Collection of representative soil samples from six boreholes drilled as part of the geotechnical assessment for waste classification purposes.
- Laboratory analysis of selected soil samples for a suite of chemicals of potential concern (CoPC) including heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn), total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), volatile halogenated compounds (VHC), organochlorine pesticides (OCP), polychlorinated biphenyls, and asbestos.
- Interpretation of the data and preparation of this Stage 2 Contamination Assessment report that summarises the results of the investigation works, and assesses the suitability of The site for the proposed redevelopment.

This report has been prepared in general accordance with industry and NSW EPA guidelines, particularly the *Guidelines for Consultants Reporting on Contaminated Sites* (NSW OEH, 2011) and relevant sections of the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (the ASC NEPM) (NEPC 1999, amended 2013).

2. Site identification

Site identification details are summarised in Table 2.1. The location and layout of The site is shown in Figures 1 and 2, respectively.

Table 2.1: Site Identification

Site Address:	1 Weeroona Road, Lidcombe NSW
Site Area:	Approximately 24,000m^2 (240m x 100m)
Site Identification:	Part of Lot 3 in Deposited Plan 850697
Current Zoning:	Zoned SP2 – Infrastructure under the Auburn Local Environmental Plan 2010
Current Land Use:	Vacant residential dwellings and areas of vacant undeveloped land
Proposed Land Use:	Commercial (offices), new three storey building with single level basement.

3. Site description

A site walkover survey was undertaken by an experienced Coffey environmental consultant as part of the Initial Contamination Assessment on 25 November 2015. The key observations made during the walkover survey are summarised below. Key site features are annotated within Figure 2.

3.1. Site features

The site is an irregular L-shaped parcel of land located within The site in Deposited Plan 850697 bount by Lots 1 and 2 to the south, Joseph Street to the west and Main Avenue to the north.

Access to the site is via a driveway off Weeroona Road, which is located to the south of Lot 1.

Four single storey residential dwellings of brick and timber construction are located in the northern portion of the site. The dwellings are currently vacant and were observed to be in a dilapidated condition with damaged facia boards and flaking paint. Based on the age of the dwellings, it is considered likely that fibre cement sheeting comprising the eaves and internal ceiling and walls of each house contains asbestos. A fragment of suspected asbestos containing material (ACM) was observed on the ground surface approximately 5m from the northwest corner of the western-most dwelling. Each dwelling has a separate garage of brick and timber construction.

A flammable goods and chemicals store with a footprint of approximately 112m^2 is located to the south of the residential dwellings, adjacent to the eastern boundary of The site. Access to the store was not available at the time of the site walkover, therefore the type and quantities of chemicals contained within is not known. No surface staining was visible around the perimeter of the store.

The remainder of the site is largely vacant grass covered land dissected by a shallow open concrete stormwater drain. At the time of the site walkover, no water was present within the drain.

Fill material was observed at the surface in the vicinity of the drainage line and comprised brown gravelly clayey sand with some concrete fragments, asphalt and blue metal.

A bitumen internal access road extends from Weeroona Road along the western and northern boundaries of the site. A side road allows vehicular access to the flammable goods store.

Vegetation comprises mature trees scattered over the site. Areas of overgrown grass were observed in the vicinity of the dwellings, however most of the grass was well maintained. At the time of the site walkover, no evidence of vegetative stress was observed.

No evidence of underground storage tanks (i.e. fill/dip points, vent pipes, etc) was observed during the site walkover. No evidence of stockpiles of wastes or fill material, surface staining or other evidence of potential contamination was noted.

3.2. Surrounding land use

Table 3.2 provides a summary of the land uses surrounding the site.

Table 3.2: Surrounding Land Uses

Direction	Land Uses
North	Main Avenue and Palm Circuit, divided by vegetated corridors that run parallel to the roadways, and low density residential land use beyond
East	NSW Government precinct which includes the NSW Health Forensic and Analytical Science Services, EPA Laboratories and Motor Vehicle Testing unit Several flammable goods storage cages are present around the perimeter of the main building, and a transformer and generator are located in the western part of the site
South	Lots 1 and 2 in Deposited Plan 850697 comprising a two storey concrete building and associated infrastructure, with Weeroona Road and a railway corridor and Juniperina Juvenile Justice Centre beyond
West	Joseph Street, with Carnarvon Golf Course beyond

3.3. Topography and drainage

The elevation profile shown on Google Earth (2015) indicates that site area lies at elevations between 37m and 44m Australian Height Datum (AHD) and exhibits an overall regional gradient from the south-east down towards the north-west. The site exhibits a slight overall gradient down towards the west.

A shallow open concrete stormwater drain run along the southern boundary of the site. The drain runs in a north-east / south-west direction, discharging to a larger branch located in Lot 1 which runs in a south-east / north-west direction and discharges to a culvert near the central western site boundary. It is expected that the drain would be fed by stormwater runoff from both the site and the surrounding area.

Surface water generated within the site is expected to infiltrate into the unsealed surfaces or create overland flow where impervious pavements are present. Surface runoff is likely to follow the gradient of the land and flow in a broadly north-westerly direction.

3.4. Hydrology

No creeks or rivers surround or dissect the site. The closest waterway to the site is upper reaches of the Cooks River which is located approximately 870m to the south-east. Cooks River flows in a broadly south-easterly direction, discharging to Botany Bay near Sydney Airport.

Two small lakes which appear to form part of a wetland area, are located adjacent to the Cooks River approximately 850m to the southeast of the site. Two constructed ponds are present on the golf course, approximately 200m to the west.

3.5. Regional geology and soils

The Penrith 1:100,000 Geological Series Sheet indicates the site is underlain by Bringelly Shale which typically comprises shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone and rare coal. The Bringelly Shale forms the uppermost unit of the Wianamatta Group and is derived from alluvial and estuarine environments.

3.6. Acid Sulfate Soil

The Botany Bay 1:25,000 Acid Sulfate Soil (ASS) Risk Map indicates that there is no known occurrence of ASS materials underlying the site.

3.7. Regional hydrogeology

A search of groundwater bore licences undertaken on 11 November 2015 using the NSW Office of Water continuous water monitoring network (http://allwaterdata.water.nsw.gov.au/water.stm) indicated that there are no registered groundwater bores located within a 500m radius of the site.

Groundwater underlying The site is expected to exist within the shale bedrock at depths greater than 3m below ground surface. However, it is common for groundwater to occur perched on the shale bedrock in localised pockets, in these types of geological settings.

4. Site history

4.1. Summary

The following sources of historical data were relied upon for assessment of the site history:

- New South Wales Environment Protection Authority (NSW EPA);
- NSW Department of Primary Industries – Office of Water;
- Aerial photographs provided by Lands Department (NSW Government) and Google Earth;
- Land title records;
- WorkCover NSW; and
- Observations made during the site walkover.

Historical photographs indicated that the residential dwellings located in the northern portion of The site were constructed prior to 1961.

Although the land title records indicate that the site was set aside for use as the Lidcombe State Hospital and Home Asylum, it appears that facility was never constructed and the site was not used for this purpose.

4.2. Initial Contamination Assessment (Coffey, 2015)

The objective of the Initial Contamination Assessment undertaken by Coffey and reported in December 2015 was to identify potential land contamination issues and assess whether a Stage 2 contamination investigation would be required.

The scope of work included a desktop review of available historical site use information, a site walkover to observe the current site condition and local environmental context, and preparation of a report.

The results of in the initial assessment identified the following potential areas of environmental concern (AECs):

- Fill material of unknown quality and origin;
- Flammable goods and chemical stores in two locations on-site;
- Hazardous building materials within near surface soils resulting from weathering or demolition of site structures, particularly in the northern portion of the site;
- Drainage lines containing potentially contaminated runoff water from up gradient locations;
- Possible use of pesticides / herbicides; and
- Adjacent land uses.

Based on the findings of the initial assessment, it was concluded there was a low to moderate likelihood for localised land contamination to be present on the site as a result of the historical and current land use.

Further investigation of the presence of land contamination was recommended for the site in accordance with assessment of site suitability considerations conforming to SEPP 55 - *Managing Land Contamination Planning Guidelines* (DUAP/EPA, 1998).

5. Assessment of data quality objectives

As stated in Section 5 of Schedule B2 – Guideline on Site Characterisation in the ASC NEPM, the data quality objectives (DQO) process is used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site.

The seven-step DQO process adopted for this assessment is provided below:

Step 1: State the Problem

The primary objectives of this assessment are to assess:

- Investigate potential surface and subsurface contamination in relation to the AECs identified by the Initial Contamination Assessment report (Coffey, 2015);
- Interpret investigation findings and provide an opinion on the suitability of The site for the proposed redevelopment; and
- Assess what remediation works may be required to make the site suitable for proposed future land use (if any).

Based on this, the main problems are:

- How many boreholes should be drilled, and where?
- Could access restrictions limit available location of boreholes, and the method(s) used for drilling?
- To what depths should the boreholes be drilled
- At what depth should soil samples be collected?

Step 2: Identify the Decision

Is the site suitable for the proposed redevelopment, and if not, then what is the type and extent of contamination that requires remediation or management?

Step 3: Identify Inputs to the Decision

The primary inputs to assessing the above include:

- Information gathered as part of the Initial Contamination Assessment (Coffey, 2015).
- Observations and soil headspace screening measurements made by Coffey during field investigations.
- Results of current soil investigations undertaken on the site.
- Relevant legislation and regulatory guidelines.
- Likely future land use as indicated by the concept design for redevelopment.

Step 4: Define the Study Boundaries

The study boundaries are defined by the boundaries of the site as shown in Figure 2.

The vertical boundary is defined by the maximum vertical extent of soil investigations.

Step 5: Develop a Decision Rule

The decision rule to assess the suitability of The site will be as follows:

- Quality Assurance / Quality Control (QA/QC) assessment indicates that the data is usable; and

- Where contaminant concentrations are reported to exceed the adopted investigation levels, then further consideration of the potential environmental and health risks in the context of the current and proposed future use of The site. Additional investigation and/or management (including remediation) may also be required.

Step 6: Specify Limits of Decision Errors

There are two sources of error for input to decisions:

- Sampling errors, which occur when the samples collected are not representative of the conditions within the investigation area; and
- Measurement errors, which occur during sample collection, handling, preparation, analysis and data reduction.

The null hypothesis for this study is:

- Contaminant concentrations within the soil beneath The site are more than the adopted investigation levels.

These errors may lead to the following decision errors:

- Type I - deciding that the soil is not contaminated and, therefore, The site is suitable for the proposed residential development when the reverse is true; and
- Type II - deciding that the soil is contaminated and, therefore, The site is not suitable for the proposed residential development when the reverse is true.

The acceptable limit on decision errors is a 5% probability of a false negative (i.e. assessing that the average concentrations of CoPC in are less than the adopted soil investigation levels when they are actually greater than the investigation levels).

Where data sets are sufficiently populated, the 95% Upper Confidence Limit (UCL) of the arithmetic mean will be used to calculate this probability. The 95% UCLs are to be less than the investigation level and standard deviation of the sample population shall be less than 50% of the investigation level.

The investigation levels for assessment are nominated in Section 7 of this report.

Step 7: Optimise the Design for Obtaining Data

Based on the previous Steps 1 to 6 of the DQO process, the optimal design for obtaining the required data is presented in the following sections (i.e. proposed field and laboratory programs).

6. Sampling plan and methodology

6.1. Soil sampling methodology

Soil sampling was undertaken on 18 February 2016 in accordance with the sampling methodology and QA / QC procedures summarised in Table 6.1.

Table 6.1: Soil Sampling Methodology

Activity	Details
Assessment Locations	Soil samples SS01 to SS08 were collected from the surface in the vicinity of the residential dwellings. Three boreholes, BH01, BH02 and BH03 (sampled on 18th March 2016) were drilled in the vicinity of the flammable goods and chemical store, while boreholes BH01, BH04 and BH08 (samples on 1/2 March 2016) were drilled within the footprint of the proposed excavation for waste classification purposes. Boreholes LDBH03, LDBH04 and LDBH05 (Sampled on 4th March 2016) were drilled to provide additional coverage of the site.
Drilling	Soil samples SS01 to SS08 were collected from the surface of the site using a trowel. Boreholes BH01 to BH03 were hand augered to depths between 0.6m and 1.0m below ground surface (bgs), which was sufficient to intercept natural material. Boreholes BH01, BH04, BH08, LDBH03, LDBH04 and LDBH05 were drilled as part of the geotechnical investigation using a mechanical drill rig equipped with solid flight rotary augers.
Soil Sampling	Soil samples were collected from the near surface (0.05-0.1m), and from depths of 0.5m and 1.0m bgs (from boreholes only). Soil samples were collected directly from the augers following removal of the outer layer of soil to minimise the potential for cross contamination of samples.
Soil Logging	Soil was logged in general accordance with the relevant Coffey Standard Operating Procedure (SOP) and the Unified Soil Classification System (USCS) by a suitably qualified and experienced scientist. The presence of visible fragments of material suspected to contain asbestos, staining or odours was also noted on the field logs. Borehole logs are presented in Appendix A.
Sample Handling and Transportation	Sample collection, storage and transport were in general accordance with the relevant Coffey SOP. Soil samples collected for chemical analysis were immediately placed into laboratory supplied jars and filled to capacity, with Teflon lined seals to limit volatile loss and placed into an ice chilled cooler. Soil samples collected for asbestos analysis were placed into ziplock plastic bags and securely sealed. Samples were dispatched to NATA accredited laboratories under chain of custody control.
Soil Screening	A portion of each soil sample collected for chemical analysis was placed inside a sealed

Activity	Details
	plastic bag for field headspace screening for VOCs using a Photoionisation Detector (PID). The PID was calibrated by the equipment supplier prior to the commencement of the investigation fieldworks using 100ppm isobutylene calibration gas. Calibration certificates are presented in Appendix B. The PID readings, together with other field observations, were used to assess which samples should be analysed for volatile contaminants. The field screening results are included on the borehole logs presented in Appendix A.
QA/QC Samples	To measure the accuracy and precision of the data generated by the field and laboratory procedures carried out in this assessment, the following additional samples were collected for QA / QC purposes: • one intra-laboratory duplicate soil sample analysed by the project laboratory; • one inter-laboratory triplicate soil sample analysed by a secondary laboratory; • one trip spike and one trip blank analysed by the project laboratory; and • one rinsate blank analysed by the project laboratory.
Decontamination of sampling equipment	Non-disposable sampling equipment (i.e. hand auger) was decontaminated with approximately 5% Decon 90 solution in potable water, and rinsed with potable water prior to use and between each sample location. Soil samples were collected from the sampling equipment using a new pair of nitrile gloves for each sample.
Disposal of soil cuttings	Soil cuttings were used as backfill to reinstate each borehole upon completion of sampling, therefore off-site disposal of excess soil was not required.

6.2. Laboratory analysis

Laboratory analysis of soil samples was carried out by NATA accredited laboratories as follows:

- Primary laboratory: Eurofins | MGT at Lane Cove West, NSW
- Secondary laboratory: Envirolab at Chatswood, NSW

A selection of primary soil samples were submitted for laboratory analysis for a suite of chemicals of potential concern (CoPCs) as summarised in Table 6.2.

Table 6.2: Summary of Analysis

Chemical of Potential Concern	Number of Surface Samples	Number of Borehole Samples
Total Recoverable Hydrocarbon (TRH)	9	3
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	9	3
Polycyclic Aromatic Hydrocarbons (PAH)	9	1
Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	9	3

Chemical of Potential Concern	Number of Surface Samples	Number of Borehole Samples
Volatile Halogenated Compounds (VHC)	2	1
Polychlorinated Biphenyls (PCB)	8	1
OC Pesticides	8	1
Asbestos	16	Not applicable
Lead (only)	8	Not applicable

Sample holding times were within acceptable range (Schedule B3 of the ASC NEPM) from collection to extraction:

- metals ≤ 6 months (except mercury & chromium VI – 28 days) for soil.
- TRH (C_6-C_9) and BTEX ≤ 14 days at 6°C for soil.
- TRH (C_{10}-C_{36}) ≤ 7 days at 6°C for soil.
- PAH ≤ 14 days at 6°C for soils.
- VHC ≤ 14 days at 6°C for soil.
- OCP ≤ 14 days at 6°C for soil.
- PCB ≤ 28 days at 6°C for soil.

7. Investigation levels

7.1. Soil investigation levels

The soil investigation levels presented in the following reference are the primary criteria used in NSW when establishing assessment criteria for chemical contaminants in soil:

- Schedule B1 'Guideline on the Investigation Levels for Soil and Groundwater' of the ASC NEPM.

This information is included along with laboratory analytical results in Table A

7.1.1. Health-based investigation and screening levels

For assessing contamination levels in soil in urban settings, Schedule B1 in the ASC NEPM presents health based investigation levels (HILs) and health screening levels (HSLs) for different generic land uses (e.g. industrial/commercial, residential, recreational etc).

Contaminant concentrations, excluding TRH, BTEX and naphthalene, were assessed against the HILs applicable to "commercial / industrial" land use (HIL D) from Schedule B1 of the ASC NEPM.

The HILs for heavy metals, PAH, OCP and PCBs in soils are summarised in Table 7.1.

Table 7.1: Summary of HILs in Soil

Analyte	HILs for Commercial / Industrial (mg/kg)
Arsenic (total)	3,000
Cadmium	900
Chromium (Total)[1]	3,600
Copper	240,000
Lead	1,500
Mercury (inorganic)	730
Nickel	6,000
Zinc	400,000
Carcinogenic PAHs[2]	40
Total PAHs	4,000
Aldrin + Dieldrin	45
Chlordane	530
DDT+DDD+DDE	3,600
Endosulfan	2,000
Endrin	100
Heptachlor	50
HCB	80
Methoxchlor	2,500
Toxaphene	160
PCB (any single compound)	7

1. HIL for hexavalent chromium used as a conservative level
2. Expressed as Benzo(a)pyrene Toxicity Equivalence Quotient (BaP TEQ)

TRH, BTEX and naphthalene concentrations were assessed against the soil HSLs for vapour intrusion from the depth and soil matrix relevant to The site and applicable to "commercial / industrial" land use (HSL D) from Table 1A(3) in Schedule B1 of the ASC NEPM.

The adopted screening levels were selected in consideration of the sandy soil texture which occurred commonly in the topsoil overlying natural clay residual soils.

The HSLs for TRH, BTEX and naphthalene in sand are summarised in Table 7.2.

Table 7.2: Summary of HSLs in Soil

Chemical	HSL D - commercial / industrial (sand) (mg/kg)	HSL D - commercial / industrial (sand) (mg/kg)
	0m to <1m	1m to <2m
Benzene	3	3
Toluene	NL	NL
Ethylbenzene	NL	NL
Xylenes	230	NL
Naphthalene	NL	NL
TRH C_6-C_{10} (less BTEX)	260	370
TRH >C_{10}-C_{16} (less naphthalene)	NL	NL

NL: non-limiting (i.e. contaminant is not considered to pose a risk to human health through vapour intrusion to indoor air).

7.2. Ecological investigation and screening levels

To assess the impact on ecosystems including site vegetation from contamination within the upper 2m of the subsurface, Schedule B1 of the ASC NEPM presents Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for different land uses (e.g. areas of ecological significance, urban residential/public open space, commercial).

EILs are listed for certain heavy metals, DDT and naphthalene in soils and those relevant to conditions in The site are summarised in Table 7.3.

Table 7.3: Summary of EILs in Soil

Chemical	Commercial / industrial (mg/kg)
Arsenic	160 [1]
Chromium	430 [2,7]
Copper	50 [3,7]
Lead	1,800 [4]
Nickel	580 [5]
Zinc	620 [6,7]
DDT	640 [1]
Naphthalene	370 [1]

1. Table 1B(5) - Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater of the ASC NEPM
2. The Added Contaminant Limit (ACL) selected for Chromium III conservatively assumes a clay content of 2.5%.
3. The ACL selected for Copper uses a soil pH of 5.7 and cation exchange capacity (CEC) of 28cmol$_c$/kg based on site specific data, and an estimated Total Organic Carbon of 0.1%.
4. Table 1B(4) - Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999).
5. The ACL selected for Nickel uses a CEC of 28cmol$_c$/kg based on site specific data.
6. The ACL selected for Zinc uses a soil pH of 5.7 and a CEC of 28cmol$_c$/kg based on site specific data.
7. Ambient Background Concentration (ABC) was adopted for NSW assuming an old suburb with high traffic volume, where relevant.

The ESLs for TRH, BTEX and benzo(a)pyrene in soils from Schedule B1 of the ASC NEPM are summarised in Table 7.4.

The adopted screening levels were selected in consideration of the sandy soil texture typical of the upper metre of the soil / fill profile.

Table 7.4: Summary of ESLs in Soil

Chemical	ESL – Commercial / Industrial (coarse grained soils) (mg/kg)
TRH C_6-C_{10} (less BTEX)	215
TRH >C_{10}-C_{16}	170
TRH >C_{16}-C_{34}	1,700
TRH >C_{34}-C_{40}	3,300
Benzene	75
Toluene	135
Ethylbenzene	165
Xylenes	95
Benzo(a)pyrene	1.4

7.3. Asbestos

Selected soils samples were submitted to the laboratory for identification of asbestos in accordance with AS4964-2004 ‘Method for the qualitative identification in bulk samples” which includes polarized light microscopy with dispersion staining for identification of asbestos mineral fibres.

For the purpose of this investigation, a conservative criterion of “no asbestos fibres or asbestos containing materials detected in soils” has been adopted as screening criteria.

7.4. Aesthetic criteria

Although no specific numeric aesthetic guideline values are provided, Schedule B1 of the ASC NEPM requires the consideration of aesthetic issues (as a result of contamination) arising from soils within The site. The following assessment criteria were adopted when considering soil aesthetics:

- no persistently malodourous soils, taking into consideration the natural state of the soil underlying The site;
- no staining or discolouration in soils, taking into consideration the natural state of the soil; and
- no large or frequently occurring anthropogenic materials present (to the extent practicable).

8. Quality assurance / quality control

The following QA / QC assessment addresses data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations and the processes for assessment of data quality provided in Section 19 (Appendix C) of Schedule B2 'Guideline on Site Characterisation' of the ASC NEPM.

8.1. Field QA/QC measures

The following QA / QC measures were implemented by Coffey in carrying out the investigation fieldworks described herein:

- All fieldworks were undertaken by experienced and appropriately qualified scientists / engineers.
- Fieldworks were undertaken in general accordance with Coffey's (SOP) which are based on guidance presented in relevant industry standards, including the relevant schedules of the ASC NEPM and AS4482 *Guide to the Investigation and Sampling of Site with Potentially Contaminated Soil* (Standards Australia, 2005; Parts 1 and 2).
- The PIDs were calibrated by the equipment supplier prior to use. Calibration records are provided in Appendix B.
- Quality control samples were collected and analysed as part of the sampling program. This included duplicate and triplicate samples, trip spike and trip blank samples. A discussion of these results is provided in the following sections.

8.2. Field duplicate and triplicate samples

20 primary soil samples were collected from the site and submitted for analysis. One duplicate and one triplicate soil samples were also collected and analysed.

The number of duplicate and triplicate soil samples achieved the target sampling rate of 5% of the total number of primary samples analysed.

Primary, duplicate and triplicate sample combinations are summarised in Table 8.1.

Table 8.1: Duplicate and Triplicate Samples

Primary Sample	Sample Type	Duplicate Sample	Laboratory	QAQC sample type
SS08	Surface soil	Dup1	Eurofins MGT	Duplicate
SS08	Surface soil	Dup1A	Envirolab	Triplicate

Relative Percentage Difference (RPD) results for the above samples were calculated as shown in Table B, attached.

Acceptable limits for RPD results are 30% - 50%, with results at the higher range expected for organic analytes. However, no RPD acceptance limit is considered to apply in the following situations where exaggerated RPD results may be expected:

- QC sample pairs where one sample reported a detectable concentration and the alternate sample reported a concentration below the laboratory LOR.

- QC sample pairs where one or more of the primary and/or secondary samples reported contaminant concentration less than, or equal to, ten times the laboratory LOR as no RPD acceptance limit applies.

The duplicate and triplicate pair reported RPD values below the acceptable limit of 50% for all soil samples.

Based on the above, the analytical results are considered acceptable for the purposes of this assessment.

8.3. Field QC samples

One trip blank sample was collected during fieldwork to assess whether contamination may have been introduced to samples during shipping and field handling activities. The trip blank sample reported concentrations below the laboratory LOR.

One trip spike sample was collected during fieldwork to assess loss of volatiles from samples during transit. The trip spike sample reported recoveries within the acceptable range.

One rinsate sample was collected during fieldwork to assess the effectiveness of field decontamination procedures. The rinsate blank reported concentrations below the laboratory LOR.

Laboratory results for field QC samples are summarised in Table C.

8.4. Laboratory QA/QC

In accordance with standard industry practice, the project laboratories performed an internal QA / QC assessment. The assessment is typically described as a multi-level approach whereby standard laboratory control procedures are implemented, including laboratory duplicates, method blanks, matrix spikes and surrogate spikes.

Laboratory QC analytical results are summarised below:

- Laboratory analysis of samples was undertaken by NATA accredited environmental testing laboratories.
- All samples were extracted and analysed within holding times.
- No target analytes were detected in any of the method blanks.
- RPDs for the laboratory duplicate samples were within the acceptable range for all samples, when the LOR was considered.
- Percentage recovery results for laboratory control samples were within the acceptable range for all samples.
- Percentage recovery results for surrogate samples were within the acceptable range for all samples.
- Percentage recovery results for matrix spikes were within the acceptable range for all samples.
- Percentage recovery results for internal duplicate samples were within the acceptable range with exception to the following:

  - o Arsenic and chromium concentrations in sample S16-Fe22813 from laboratory report 490340. Elevated duplicate RPDs were investigated by Eurofins MGT and were deemed to pass their internal acceptance criteria.

- The laboratory internal standards, calibration blanks and mid-range calibration verifications were all within the acceptable range.

8.5. Data quality assessment

Based on an assessment of the field and laboratory QA / QC data, Coffey considers that the data obtained is representative of subsurface conditions at the sampling locations, and the soil and groundwater results are acceptable for the purposes of this assessment.

9. Field observations and analytical results

The following provides a summary of the results of the fieldwork and laboratory analysis of soil samples collected from the site in February and March 2016.

9.1. Site specific geology

The inferred subsurface profile encountered on-site is summarised in Table 9.1.

Table 9.1: Subsurface Profile

Material	Description	Depth to Top of Unit² (m)	Approximate Thickness (m)
Fill	Fill soils encountered onsite were dominated by silty sand topsoil overlying sandy/gravelly clay.	0.0	0.3-1.0
Residual Soil	CLAY: High plasticity, red mottled, dry stiff.	0.3 – 1.0	1.3 – 2.1
Weathered Bedrock	Weathered SHALE: Very low strength, grey/brown mottled.	1.7 – 2.4	2.0 – 2.6
Bedrock	SHALE: Low strength, grey/brown	3.8 – 4.7	NA

Borehole logs are presented in Appendix A.

9.2. Field screening and observations

The number of samples recommended to represent an environmental setting is strongly influenced by historical activity on the site and the potential for such activity to result in land contamination. Coffey's assessment of the site recognised the large majority of the site was undisturbed land which had been cleared of natural vegetation. Given that parts of the site subject to previous development were identified and assessed using targeted investigation, Coffey concludes that sampling and analysis of the "unaffected" parts of the site is sufficient to provide a representative assessment. Thus, Coffey has used a broad assessment of parts of the site with minimal potential for impact from previous use, supplemented by judgemental sampling and analysis of areas where potential for impact was identified.

Soil samples collected from the site were assessed in the field using a PID for the presence of ionisable VOCs using procedures consistent with headspace testing described in Section 7.4.3 in Schedule B2 of the ASC NEPM.

PID readings ranged from 0.0ppm to 36.1ppm which suggests that there is a low potential for detectable concentrations of ionisable VOCs to be present within the soil samples collected from The site.

PID results are provided on borehole logs presented in Appendix A.

Field observations indicated that no staining or odours were apparent in materials brought to the surface during drilling.

No anthropogenic materials were observed within the subsurface during intrusive investigations, however a fragment of asbestos containing material (ACM) was noted on the surface of The site adjacent to the south-western corner of one of the residential dwellings (refer to Figure 3). In addition, as noted in the Initial Contamination Assessment (Coffey, 2015), a fragment of ACM was observed on the surface of the site approximately 5m from the northwest corner of the western-most dwelling.

9.3. Results

Soil analytical results are summarised in Table A. Laboratory certificates and chain of custody records are presented in Appendix C. Analytical data indicating impact from lead based paint on surface soils immediately surrounding cottages is displayed upon Figure 3.

9.3.1. Human health

In summary, the soil analytical results reported concentrations of the COPC below the adopted health investigation and screening levels for commercial / industrial land use.

Asbestos was not identified in any of the soil samples submitted for laboratory analysis.

9.3.2. Ecological health

In summary, the soil analytical results reported concentrations of the COPC below the adopted ecological investigation and screening levels for commercial / industrial land use.

9.3.3. Soil aesthetics

No hydrocarbon staining or odours were observed during investigation of the subsurface of the site.

No anthropogenic material was observed within the subsurface during drilling, however one fragment of suspected asbestos containing material (ACM) was observed on the ground surface near sampling location SS01, as indicated on Figure 3.

9.3.4. Preliminary waste classification

A preliminary waste classification of subsurface material that may require off-site disposal has been carried out using results from boreholes drilled during this investigation. The preliminary waste classification was made in general accordance with the six step process for classifying waste as described in NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*. Table 9.2 details the waste classification sampling regime undertaken at the site.

Table 9.2: Waste Classification Sampling Regime

Sample Location	Borehole IDs	Sampling Depths	Target Lithology
Proposed building footprint	BH01, BH04, BH08	0.05 – 0.2	Fill Soils
Proposed parking lot	LDBH03, LDBH04, LDBH05	0.05 – 0.2	Fill Soils
Flammable Goods Store	BH01, BH02, BH03	0.05 – 0.2, 0.4 – 0.5	Fill Soils
Residential Cottages	SS01 – SS08	0.05 – 0.2	Fill Soils

According to the waste classification procedure:

- Step 1: No asbestos was identified in any subsurface sample collected from the site, however one fragment of potential ACM was observed on the ground surface near a cottage. On this basis, the soils comprising the subsurface of proposed excavation area are not considered ‘special waste’, however the ground surface should be cleared of ACM fragments prior to the commencement of excavation.

- Step 2: The material assessed is not a ‘liquid waste’.

- Step 3: The excavated material will constitute mainly surface soil which does not fall into any NSW EPA pre-classified category of waste. The underlying natural clay and weathered shale horizons are pre-classified as virgin excavated natural material (VENM).
- Step 4: The material does not possess the hazardous characteristics listed in the guidelines based on the Transport of Dangerous Goods Code.
- Step 5: Given that the surface soil does not fall within pre-classified categories (Step 3) and does not possess hazardous characteristics as discussed in Step 4, this material has been assessed by chemical analyses. The reported concentrations of heavy metals, TPH, BTEX, PAH, PCBs and OCPs in the samples analysed were compared against the relevant contaminant threshold values (CT1 and CT2) listed in Table 1 of NSW EPA (2014). The following samples reported contaminant concentrations above the CT1 values:
    - SS01 and SS05 to SS08 collected from surface soils immediately surrounding the residential cottages recorded concentrations of lead above the CT1 threshold of 100 mg/kg, which applies when leachability testing using TCLP method has not been undertaken. If lead concentrations of the samples are below the SCC1 criterion for lead of 1500 mg/kg which applies when leachable concentrations for lead are also below the TCLP1 threshold of 5mg/L, then that soil may be classified as GSW. Samples SS06 and SS07 were subject to TCLP analysis for lead. Both samples recorded lead concentrations below the TCLP1 threshold therefore indicating that the surface soils classify as GSW.
- Step 6: The material comprises soil material. NSW EPA (2014) notes that materials that are generally not classified as putrescible include soils, timber, garden trimmings, agricultural, forestry and crop materials, and natural fibrous organic and vegetative materials. Based on observations by Coffey, the material is considered to be non-putrescible.

Summary of waste classification

In summary, all surface soils tested as part of this investigation classify as GSW, providing no asbestos impacts are discovered during earthworks. Subsequent natural clay and weathered soil horizons classify as VENM as the chemical characteristics of the overlying fill indicate low impact which should not have impacted natural soil and rock on the site. Thus, the expected surplus of circa $400m^3$ of soil would ideally be natural material which satisfies the definition of VENM and does not need to be disposed to landfill.

Analytical results for top soil, in areas other than surrounding the eastern two cottages, reported concentrations of contaminants were below the CT1 waste thresholds. This finding indicates that topsoil (except from around the eastern two cottages where lead impact was identified) may be disposed off-site to a licensed soil recycling facility.

Soils immediately surrounding the eastern two cottages reported concentrations of lead in excess of l background concentrations typically found in the Sydney metro area (Olszowy, H. et.al. 1995). As such, it is recommended that soils surrounding the eastern two cottages be scraped to 50mm below surface level, extending five metres out from the cottages, stockpiled and removed separately from other soils being removed from the site. The areas requiring scraping are depicted in Figure 4

Soils disturbed during future earthworks are environmentally suitable for reuse onsite with the exception of soils immediately around the eastern two cottages. The Geotechnical Investigation Report (Coffey, 2016) provides recommendations on the geotechnical suitability of soils located onsite.

Table 9.3 summarises the potential disposal and reuse options for soils encountered onsite.

Table 9.3: Potential Disposal and Reuse Options for Soils Encountered Onsite

Soil Type	Depth to top of Unit	Approximate Unit Thickness (m)	Offsite Disposal Options	Can Material be Reused Onsite?	Does the Material Qualify as VENM?
Fill soils (excluding soils surrounding the eastern two cottages)	0.0	0.3- 2.0	GSW	Yes	Potential, but additional sampling and analysis is required to comply with ENM Order 2014
Fill soils from a 5m wide strip around eastern two cottages	0.0	0.05	GSW	Yes	No
Residual soil horizons	0.1 – 1.1	1.0 – 2.4	VENM	Yes	No
Extremely Weathered shale horizons	1.5 – 2.5	0.3 – 4.9	VENM	Yes	No
Moderately weathered to fresh shale horizons	2.7 - 6.9	Not proven	VENM	Yes	No

10. Conceptual site model

10.1. Potential sources of contamination

Based upon the findings of this investigation, potential sources of contamination present within the site which have the potential to cause unacceptable risk to human or environmental health are as follows:

- One fragment of asbestos containing material (ACM) was identified on the ground surface and similar ACM is present in cottages due to be demolished. No ACM or loose asbestos fibre was identified in fill soils during this investigation.

As no asbestos impact was identified in fill soils across the site, it is considered unlikely that disturbance of fill soils will cause unacceptable risk to receptors.

All other parameters investigated were recorded at concentrations below the adopted assessment criteria.

10.2. Potential exposure pathway

ACM, once disturbed, has the potential to be deposited within the lungs by inhalation. For the purpose of this investigation, this is likely to occur during the demolition of the onsite residential structures where ACM were identified.

Notwithstanding fact that asbestos impacts were not detected in the soil, it is recommended that any disturbance of site soils is managed to minimise dust generation.

10.3. Potential receptors

For the purpose of this investigation, potential receptors to ACM are limited to contractors carrying out demolition and earthworks in the vicinity of the cottages.

11. Conclusions and recommendations

Results from of this Stage 2 contamination investigation indicated that:

- All samples collected during this investigation returned results below human and environmental assessment criteria for commercial/industrial land use. Sampling and analysis of the parts of the site with minimal potential for impact from previous use was sufficient to provide a representative assessment which was supplemented by judgemental sampling and analysis in areas where potential for impact was suspected.
- Asbestos was not detected in soil samples collected from around the cottages though asbestos containing material (one fibro fragment) was observed on ground surface near sample location SS01.
- Fill soils classify as GSW under the six step procedure documented within NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste.* A waste classification of GSW allows these soils to be reused onsite (subsequent to geotechnical classification) or exported offsite as GSW.
- Natural soil horizons below fill soils satisfy the definition of VENM allowing this material to be reused onsite or exported offsite as VENM.

On the basis of the above, Coffey concludes that the site will be suitable for the proposed development subject to:

- removal of the observed fibro fragment and any other fibro fragments that may be present or may result from demolition of buildings on the site; and
- implementation of an unexpected materials management protocol that is focussed on fibro/asbestos fragments and other potential contamination sources during earthworks.
- Surplus excavated surface soil can be disposed as GSW at a suitably licenced facility or reused onsite as construction fill provided that no asbestos impacts in that soil are discovered during earthworks. Analytical results for fill soil, in areas other than immediately surrounding the eastern two cottages, reported concentrations of contaminants below the CT1 waste thresholds. This finding indicates that the majority of fill soil may be disposed off-site to a licensed soil recycling facility.

Based on the above, Coffey recommends that:

- Before removing lead impacted topsoil surrounding the residential structures, engage an asbestos removal contractor (such as the demolition contractor) to conduct a systematic inspection of the area for collection of any fibro fragments. These fragments can be stored in a strong plastic bag (labelled as Asbestos Waste) and disposed with other ACM removed from the cottages as part of demolition.
- Implement an unexpected materials management protocol during earthworks that is focussed on identifying and managing fibro fragments and other potential contamination sources of contamination.
- Remove fill soil around the cottages as indicated on Figure 4 (before they have been demolished) to a maximum depth of 50mm under the direction of a Coffey environmental practitioner. Stockpile the soil on-site and cover for later reuse on site or removal to a licensed landfill. This fill soil is not suitable for recycling at a licensed facility.

This report should be read in conjunction with the attached “Important information about your Coffey Environmental Report”.

12. References

Australian Standards AS4964-2004. *Method for the qualitative identification of asbestos in bulk samples.*

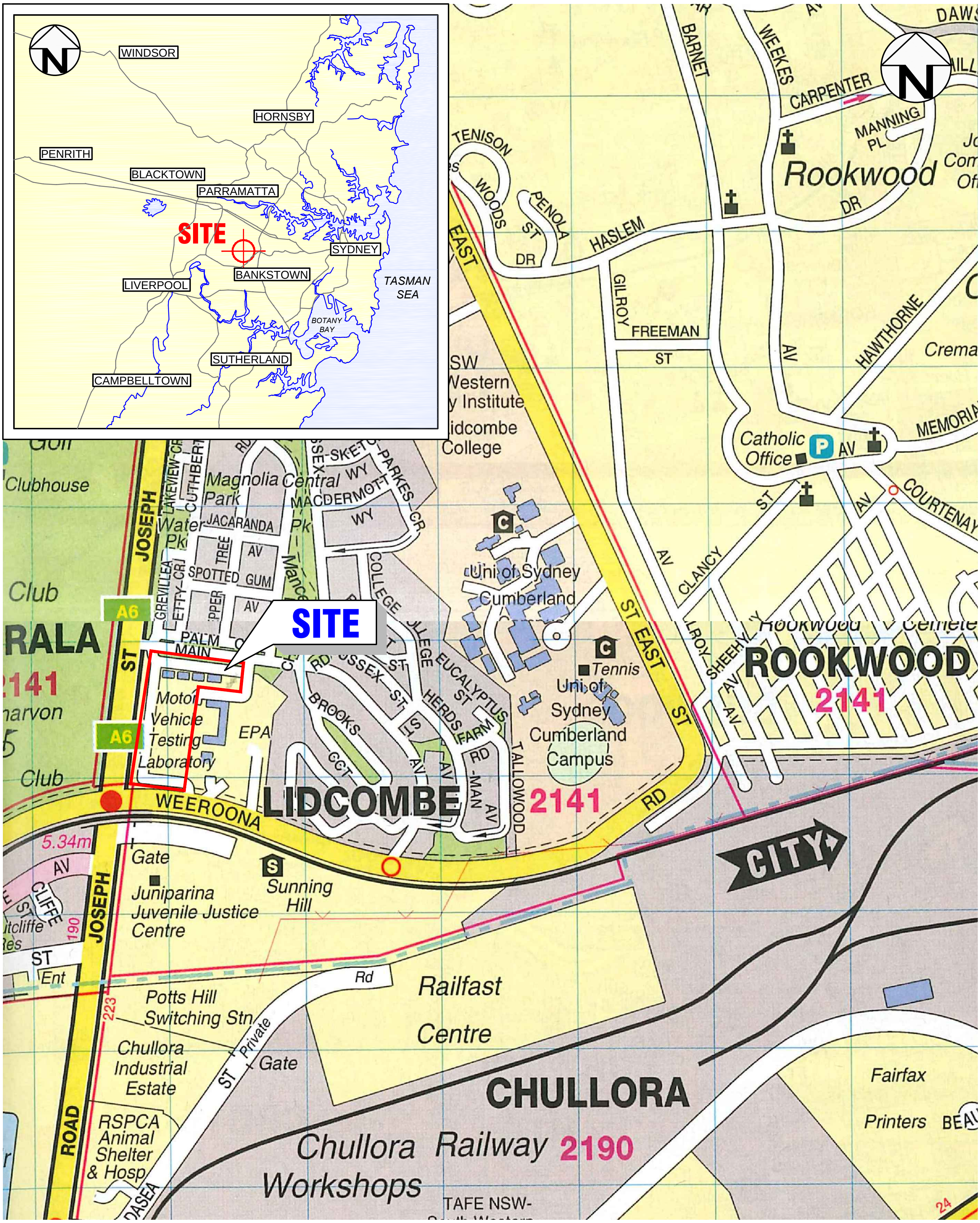
Coffey (2015). *Phase 1 Initial Contamination Assessment, Proposed Forensic Pathology and Coroners Court, Lidcombe NSW*. Coffey Environments Australia Pty Ltd.

NEPC (1999). *National Environmental Protection (Assessment of Site Contamination) Measure amended 2013*. National Environment Protection Council.

NSW EPA (2014). *Waste Classification Guidelines, Part 1: Classifying Waste*. New South Wales Environment Protection Authority.

NSW OEH (2011). *Guidelines for Consultants Reporting on Contaminated Sites*. New South Wales Office of Environment and Heritage.

Figures



0 0.1 0.2 0.3 0.4 0.5

SCALE 1:10000 (A3) KILOMETRES

SOURCE: UBD STREET DIRECTORY GREGORYS SYDNEY & BLUE MOUNTAINS, NEW SOUTH WALES EDITION 51, 2015, MAP: 232 & 252

drawn	FA	coffey	client:	NSW HEALTH INFRASTRUCTURE
approved	SK		project:	FORENSIC PATHOLOGY AND CORONERS COURT 480 WEEROONA ROAD, LIDCOMBE, NSW
date	22/04/16		title:	SITE LOCALITY PLAN
scale	AS SHOWN		project no:	GEOTLCOV25551AA-AH
original size	A4		figure no: FIGURE 1	rev: A

PLOT DATE: 22/04/2016 12:07:23 PM DWG FILE: F:\GEOTECHNICS\1 PROJECTS\GEOTLCOV255\GEOTLCOV25551AA FORENSIC PATHOLOGY & CORONERS COURT\CAD\GEOTLCOV25551AA-AH.DWG

PLOT DATE: 22/04/2016 12:07:25 PM DWG FILE: F:\GEOTECHNICS\1.PROJECTS\GEOTLCOV255\GEOTLCOV25551AA FORENSIC PATHOLOGY & CORONERS COURT\CAD\GEOTLCOV25551AA-AH.DWG

revision

no.	description	drawn	approved	date
A	ORIGINAL ISSUE			

LEGEND

- SURFACE SAMPLES (PART 1)
- ENVIRONMENTAL BOREHOLES (PART 1)
- SUPPLEMENTARY ENVIRONMENTAL BOREHOLES (PART 2)
- ENVIRONMENTAL BOREHOLES (PART 3)
- PROPOSED BUILDING LOCATION
- SITE BOUNDARY
- CONCRETE LINED DRAIN
- RETAINING WALL
- NATURAL GROUND SLOPE

10 0 10 30 50

Scale (metres) 1:1000

drawn	FA
approved	SK
date	22/04/16
scale	AS SHOWN
original size	A3

coffey

client:	NSW HEALTH INFRASTRUCTURE
project:	FORENSIC PATHOLOGY AND CORONERS COURT 480 WEEROONA ROAD, LIDCOMBE, NSW
title:	SITE FEATURES PLAN
project no: GEOTLCOV25551AA-AH	figure no: FIGURE 2
rev:	A

ANALYTE CONCENTRATIONS DEPICTED IN THIS FIGURE WERE DETECTED IN EXCESS OF THE ADOPTED ASSESSMENT LEVELS. ALL OTHER ANALYTES WERE RECORDED AT CONCENTRATIONS BELOW THE ADOPTED ASSESSMENT LEVELS.

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE			

LEGEND

- SURFACE SAMPLES (PART 1)
- ENVIRONMENTAL BOREHOLES (PART 1)
- SUPPLEMENTARY ENVIRONMENTAL BOREHOLES (PART 2)
- ENVIRONMENTAL BOREHOLES (PART 3)
- APPROXIMATE LOCATION OF FPCC BUILDING FOOTPRINT
- SITE BOUNDARY
- INFERRED POSITION OF CONCRETE LINED DRAIN

10 0 10 30 50

Scale (metres) 1:1000

drawn	FA
approved	SK
date	22/04/16
scale	AS SHOWN
original size	A3

coffey

client: NSW HEALTH INFRASTRUCTURE

project: FORENSIC PATHOLOGY AND CORONERS COURT
480 WEEROONA ROAD, LIDCOMBE, NSW

title: SOIL SAMPLING LOCATION PLAN

project no: GEOTLCOV25551AA-AH | figure no: FIGURE 3 | rev: A

PLOT DATE: 22/04/2016 12:07:27 PM DWG FILE: F:\GEOTECHNICS\1.PROJECTS\GEOTLCOV255\GEOTLCOV25551AA FORENSIC PATHOLOGY & CORONERS COURT\CAD\GEOTLCOV25551AA-AH.DWG

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.2
AERIAL IMAGE ©: 2015 AEROMETREX

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE			

LEGEND

- × SAMPLE LOCATION
- SAMPLE LOCATION WITH LEAD (>160mg/kg)
- SITE BOUNDARY
- AREA TO BE SCRAPED
- APPROXIMATE LOCATION OF FPCC BUILDING FOOTPRINT

5 0 5 10 15 20
Scale (metres) 1:400

drawn	FA
approved	SK
date	22/04/16
scale	AS SHOWN
original size	A3

coffey

client:	NSW HEALTH INFRASTRUCTURE
project:	FORENSIC PATHOLOGY AND CORONERS COURT 480 WEEROONA ROAD, LIDCOMBE, NSW
title:	COTTAGE SOIL SCRAPE ZONES
project no:	GEOTLCOV25551AA-AH
figure no:	FIGURE 4
rev:	A

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Tables

TABLE A
SOIL ANALYTICAL RESULTS
GEOTLCOV25551AA-AH
MARCH 2016

Field ID	Sample Code	Sample Date	BTEX: Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total	C6-C10 less BTEX (F1)	Inorganics: Moisture Content (dried @ 103°C)	pH (aqueous extract)	Metals: Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	pH_Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.1	0.1	0.1	0.2	0.1	0.3	20	1	0.1	2	0.4	5	5	5	0.05	5	5
CT1 NSW 2014 General Solid Waste (No Leaching)			10	600	288			1000				100	20	100		100	4	40	
CT2 NSW 2014 Restricted Solid Waste (No Leaching)			40	2400	1152			4000				400	80	400		400	16	160	
NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 0 to <1m, Sand			3					230	260										
NEPM 2013 ESLs Commercial and industrial, Coarse Soil			75	165	135			180											
NEPM 2013 HILs Commercial/Industrial D Soil												3000	900	3600	240000	1500	730	6000	400000
NEPM 2013 EILs Commercial/industrial D soil												160		430	50	1800		580	620
NEPM 2013 Mgmt Limits Commercial and industrial, Coarse Soil																			
SCC1 NSW 2014 General Solid Waste (leached)			18	1080	518			1800				500	100	1900		1500	50	1050	
Part 1: Flammable Goods Store Boreholes																			
BH01_0.05-0.2	S16-Fe22807	18/02/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	13	5.7	5.6	<0.4	14	14	19	<0.05	5.3	32
BH01_0.4-0.5	S16-Fe22808	18/02/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	15	-	8.4	<0.4	6.7	16	9	<0.05	<5	17
BH02_0.05-0.2	S16-Fe22809	18/02/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	12	-	6.7	<0.4	16	20	43	0.05	7.6	100
BH02_0.4-0.5	S16-Fe22810	18/02/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	17	-	7.2	<0.4	17	34	15	<0.05	12	79
BH03_0.05-0.2	S16-Fe22811	18/02/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	8.1	6.9	3.6	<0.4	18	36	17	<0.05	24	75
BH03_0.4-0.5	S16-Fe22812	18/02/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	16	-	5.9	<0.4	13	24	13	<0.05	7	42
Part 2: Building Footprint Boreholes																			
BH01_0.05-0.2	S16-Ma02245	2/03/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	10	-	9.2	<0.4	23	30	64	0.09	16	64
BH04_0.05-0.2	S16-Ma02246	1/03/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	6.4	-	9	<0.4	12	43	24	0.09	23	80
BH08_0.05-0.2	S16-Ma02247	1/03/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	9.7	-	7.7	<0.4	19	11	26	0.06	6.1	24
Part 3: Additional Borehole Locations																			
LDBH03_0.05-0.2	S16-Ma05968	4/03/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	8.6	-	<2	<0.4	5.2	<5	5.8	<0.05	8.4	15
LDBH04_0.05-0.2	S16-Ma05969	4/03/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	13	-	6.1	<0.4	12	10	23	<0.05	<5	23
LDBH05_0.05-0.2	S16-Ma05970	4/03/2016	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	11	-	7.6	<0.4	10	32	57	0.06	16	110
Part 1: Residential Building Surface Samples																			
DUP1	S16-Fe22821	18/02/2016	-	-	-	-	-	-	-	8.5	-	-	-	-	-	440	-	-	-
SS01	S16-Fe22813	18/02/2016	-	-	-	-	-	-	-	11	-	-	-	-	-	110	-	-	-
SS02	S16-Fe22814	18/02/2016	-	-	-	-	-	-	-	4.5	-	-	-	-	-	93	-	-	-
SS03	S16-Fe22815	18/02/2016	-	-	-	-	-	-	-	10	-	-	-	-	-	65	-	-	-
SS04	S16-Fe22816	18/02/2016	-	-	-	-	-	-	-	7.6	-	-	-	-	-	110	-	-	-
SS05	S16-Fe22817	18/02/2016	-	-	-	-	-	-	-	12	-	-	-	-	-	330	-	-	-
SS06	S16-Fe22818	18/02/2016	-	-	-	-	-	-	-	9.4	-	-	-	-	-	500	-	-	-
SS07	S16-Fe22819	18/02/2016	-	-	-	-	-	-	-	5.3	-	-	-	-	-	860	-	-	-
SS08	S16-Fe22820	18/02/2016	-	-	-	-	-	-	-	7.1	-	-	-	-	-	400	-	-	-
Statistical Summary																			
Number of Results			12	12	12	12	12	12	12	21	2	12	12	12	12	21	12	12	12
Number of Detects			0	0	0	0	0	0	0	21	2	11	0	12	11	21	5	10	12
Minimum Concentration			<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	4.5	5.7	<2	<0.4	5.2	<5	5.8	<0.05	<5	15
Minimum Detect			ND	ND	ND	ND	ND	ND	ND	4.5	5.7	3.6	ND	5.2	10	5.8	0.05	5.3	15
Maximum Concentration			<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	17	6.9	9.2	<0.4	23	43	860	0.09	24	110
Maximum Detect			ND	ND	ND	ND	ND	ND	ND	17	6.9	9.2	ND	23	43	860	0.09	24	110
Average Concentration			0.05	0.05	0.05	0.1	0.05	0.15	10	10		6.5	0.2	14	23	154	0.044	11	55
Median Concentration			0.05	0.05	0.05	0.1	0.05	0.15	10	10	6.3	6.95	0.2	13.5	22	57	0.025	8	53
Standard Deviation			0	0	0	0	0	0	0	3.4		2.3	0	5.1	12	224	0.026	7.4	34
Number of Guideline Exceedances			0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
Number of Guideline Exceedances(Detects Only)			0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0

Field ID	Sample Code	Sample Date	OCP: 4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Toxaphene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.05	0.05	0.05		0.05	0.1	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	1
CT1 NSW 2014 General Solid Waste (No Leaching)																									
CT2 NSW 2014 Restricted Solid Waste (No Leaching)																									
NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 0 to <1m, Sand																									
NEPM 2013 ESLs Commercial and industrial, Coarse Soil																									
NEPM 2013 HILs Commercial/Industrial D Soil						45		530				3600					100				50		80	2500	160
NEPM 2013 EILs Commercial/industrial D soil											640														
NEPM 2013 Mgmt Limits Commercial and industrial, Coarse Soil																									
SCC1 NSW 2014 General Solid Waste (leached)																									
Part 1: Flammable Goods Store Boreholes																									
BH01_0.05-0.2	S16-Fe22807	18/02/2016	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
BH01_0.4-0.5	S16-Fe22808	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.05-0.2	S16-Fe22809	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.4-0.5	S16-Fe22810	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.05-0.2	S16-Fe22811	18/02/2016	0.4	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	0.11	0.24	0.75	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
BH03_0.4-0.5	S16-Fe22812	18/02/2016	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
Part 2: Building Footprint Boreholes																									
BH01_0.05-0.2	S16-Ma02245	2/03/2016	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
BH04_0.05-0.2	S16-Ma02246	1/03/2016	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
BH08_0.05-0.2	S16-Ma02247	1/03/2016	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
Part 3: Additional Borehole Locations																									
LDBH03_0.05-0.2	S16-Ma05968	4/03/2016	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
LDBH04_0.05-0.2	S16-Ma05969	4/03/2016	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
LDBH05_0.05-0.2	S16-Ma05970	4/03/2016	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
Part 1: Residential Building Surface Samples																									
DUP1	S16-Fe22821	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS01	S16-Fe22813	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS02	S16-Fe22814	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS03	S16-Fe22815	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS04	S16-Fe22816	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS05	S16-Fe22817	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS06	S16-Fe22818	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS07	S16-Fe22819	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS08	S16-Fe22820	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistical Summary																									
Number of Results			9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Number of Detects			1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration			<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
Minimum Detect			0.4	ND	ND	ND	ND	ND	ND	0.11	0.24	0.75	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration			0.4	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	0.11	0.24	0.75	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
Maximum Detect			0.4	ND	ND	ND	ND	ND	ND	0.11	0.24	0.75	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration			0.067	0.025	0.025	0.05	0.025	0.05	0.025	0.034	0.049	0.15	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.5
Median Concentration			0.025	0.025	0.025	0.05	0.025	0.05	0.025	0.025	0.025	0.075	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.5
Standard Deviation			0.13	0	0	0	0	0	0	0.028	0.072	0.23	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE A
SOIL ANALYTICAL RESULTS
GEOTLCOV25551AA-AH
MARCH 2016

coffey
A TETRA TECH COMPANY

Field ID	Sample Code	Sample Date	PAH																			
			Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (lower bound) *	Benzo(a)pyrene TEQ (medium bound) *	Benzo(a)pyrene TEQ (upper bound) *	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Benzo[b+j]fluoranthene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAHs
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	MG/KG	MG/KG	MG/KG	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
CT1 NSW 2014 General Solid Waste (No Leaching)							0.8															200
CT2 NSW 2014 Restricted Solid Waste (No Leaching)							3.2															800
NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 0 to <1m, Sand																						
NEPM 2013 ESLs Commercial and industrial, Coarse Soil							1.4															
NEPM 2013 HILs Commercial/Industrial D Soil																						4000
NEPM 2013 EILs Commercial/industrial D soil																			370			
NEPM 2013 Mgmt Limits Commercial and industrial, Coarse Soil																						
SCC1 NSW 2014 General Solid Waste (leached)							10															200
Part 1: Flammable Goods Store Boreholes																						
BH01_0.05-0.2	S16-Fe22807	18/02/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH01_0.4-0.5	S16-Fe22808	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	-
BH02_0.05-0.2	S16-Fe22809	18/02/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH02_0.4-0.5	S16-Fe22810	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	-
BH03_0.05-0.2	S16-Fe22811	18/02/2016	<0.5	<0.5	<0.5	0.7	0.6	0.7	1	1.3	<0.5	<0.5	0.8	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	1	1.6	6.2
BH03_0.4-0.5	S16-Fe22812	18/02/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Part 2: Building Footprint Boreholes																						
BH01_0.05-0.2	S16-Ma02245	2/03/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH04_0.05-0.2	S16-Ma02246	1/03/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH08_0.05-0.2	S16-Ma02247	1/03/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Part 3: Additional Borehole Locations																						
LDBH03_0.05-0.2	S16-Ma05968	4/03/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
LDBH04_0.05-0.2	S16-Ma05969	4/03/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
LDBH05_0.05-0.2	S16-Ma05970	4/03/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Part 1: Residential Building Surface Samples																						
DUP1	S16-Fe22821	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS01	S16-Fe22813	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS02	S16-Fe22814	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS03	S16-Fe22815	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS04	S16-Fe22816	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS05	S16-Fe22817	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS06	S16-Fe22818	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS07	S16-Fe22819	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS08	S16-Fe22820	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistical Summary																						
Number of Results			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	12	10	10	10
Number of Detects			0	0	0	1	1	1	10	10	0	0	1	0	0	1	0	0	0	1	1	1
Minimum Concentration			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Minimum Detect			ND	ND	ND	0.7	0.6	0.7	0.6	1.2	ND	ND	0.8	ND	ND	1.5	ND	ND	ND	1	1.6	6.2
Maximum Concentration			<0.5	<0.5	<0.5	0.7	0.6	0.7	1	1.3	<0.5	<0.5	0.8	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	1	1.6	6.2
Maximum Detect			ND	ND	ND	0.7	0.6	0.7	1	1.3	ND	ND	0.8	ND	ND	1.5	ND	ND	ND	1	1.6	6.2
Average Concentration			0.25	0.25	0.25	0.3	0.29	0.3	0.64	1.2	0.25	0.25	0.31	0.25	0.25	0.38	0.25	0.25	0.25	0.33	0.39	0.85
Median Concentration			0.25	0.25	0.25	0.25	0.25	0.25	0.6	1.2	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Standard Deviation			0	0	0	0.14	0.11	0.14	0.13	0.032	0	0	0.17	0	0	0.4	0	0	0	0.24	0.43	1.9
Number of Guideline Exceedances			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Field ID	Sample Code	Sample Date	Polychlorinated Biphenyls								TPH									
			Arochlor 1221	Aroclor 1016	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	PCBs (Sum of total)	F2-NAPHTHALENE	C6 - C9	C10 - C14	C15 - C28	C29 - C36	C10 - C36 (Sum of total)	C10-C16	C16-C34	C34-C40	C6 - C10
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	50	20	20	50	50	50	50	100	100	20
CT1 NSW 2014 General Solid Waste (No Leaching)										50		650				10000				
CT2 NSW 2014 Restricted Solid Waste (No Leaching)										50		2600				40000				
NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 0 to <1m, Sand																				
NEPM 2013 ESLs Commercial and industrial, Coarse Soil																	170	1700	3300	215
NEPM 2013 HILs Commercial/Industrial D Soil										7										
NEPM 2013 EILs Commercial/industrial D soil																				
NEPM 2013 Mgmt Limits Commercial and industrial, Coarse Soil																	1000	3500	10000	700
SCC1 NSW 2014 General Solid Waste (leached)										50		650				10000				
Part 1: Flammable Goods Store Boreholes																				
BH01_0.05-0.2	S16-Fe22807	18/02/2016	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
BH01_0.4-0.5	S16-Fe22808	18/02/2016	-	-	-	-	-	-	-	-	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
BH02_0.05-0.2	S16-Fe22809	18/02/2016	-	-	-	-	-	-	-	-	<50	<20	<20	<50	68	68	<50	<100	<100	<20
BH02_0.4-0.5	S16-Fe22810	18/02/2016	-	-	-	-	-	-	-	-	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
BH03_0.05-0.2	S16-Fe22811	18/02/2016	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	52	490	540	<50	270	210	<20
BH03_0.4-0.5	S16-Fe22812	18/02/2016	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
Part 2: Building Footprint Boreholes																				
BH01_0.05-0.2	S16-Ma02245	2/03/2016	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
BH04_0.05-0.2	S16-Ma02246	1/03/2016	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
BH08_0.05-0.2	S16-Ma02247	1/03/2016	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
Part 3: Additional Borehole Locations																				
LDBH03_0.05-0.2	S16-Ma05968	4/03/2016	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
LDBH04_0.05-0.2	S16-Ma05969	4/03/2016	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
LDBH05_0.05-0.2	S16-Ma05970	4/03/2016	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	21	170	290	480	<50	440	<100	<20
Part 1: Residential Building Surface Samples																				
DUP1	S16-Fe22821	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS01	S16-Fe22813	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS02	S16-Fe22814	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS03	S16-Fe22815	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS04	S16-Fe22816	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS05	S16-Fe22817	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS06	S16-Fe22818	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS07	S16-Fe22819	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS08	S16-Fe22820	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistical Summary																				
Number of Results			3	9	9	9	9	9	9	9	12	12	12	12	12	12	12	12	12	12
Number of Detects			0	0	0	0	0	0	0	0	0	0	1	2	3	3	0	2	1	0
Minimum Concentration			<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	<20	<50	<50	<50	<50	<100	<100	<20
Minimum Detect			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	21	52	68	68	ND	270	210	ND
Maximum Concentration			<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<20	21	170	490	540	<50	440	210	<20
Maximum Detect			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	21	170	490	540	ND	440	210	ND
Average Concentration			0.05	0.25	0.25	0.25	0.25	0.25	0.25	0.25	25	10	11	39	89	109	25	101	63	10
Median Concentration			0.05	0.25	0.25	0.25	0.25	0.25	0.25	0.25	25	10	10	25	25	25	25	50	50	10
Standard Deviation			0	0	0	0	0	0	0	0	0	0	3.2	42	147	188	0	124	46	0
Number of Guideline Exceedances			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE A
SOIL ANALYTICAL RESULTS
GEOTLCOV25551AA-AH
MARCH 2016

			VHC																																
			1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2,3-trichloropropane	1,2-dibromoethane	1,2-dichlorobenzene	1,2-dichloroethane	1,2-dichloropropane	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene	Bromodichloromethane	Bromoform	Bromomethane	Carbon tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Dichloromethane	Iodomethane	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichlorofluoromethane	Vinyl chloride
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
CT1 NSW 2014 General Solid Waste (No Leaching)			200	600	26	24		14			86	10				150				10	2000		120					172		10	14				4
CT2 NSW 2014 Restricted Solid Waste (No Leaching)			800	2400	104	96		56			344	40				600				40	8000		480					688		40	56				16
NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 0 to <1m, Sand																																			
NEPM 2013 ESLs Commercial and industrial, Coarse Soil																																			
NEPM 2013 HILs Commercial/Industrial D Soil																																			
NEPM 2013 EILs Commercial/industrial D soil																																			
NEPM 2013 Mgmt Limits Commercial and industrial, Coarse Soil																																			
SCC1 NSW 2014 General Solid Waste (leached)			360	1080	46.8	43.2		25			155	18				270				18	3600		216					310		18	25.2				7.2
Field ID	**Sample Code**	**Sample Date**																																	
Part 1: Flammable Goods Store Boreholes																																			
BH01_0.05-0.2	S16-Fe22807	18/02/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH01_0.4-0.5	S16-Fe22808	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.05-0.2	S16-Fe22809	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.4-0.5	S16-Fe22810	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.05-0.2	S16-Fe22811	18/02/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH03_0.4-0.5	S16-Fe22812	18/02/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Part 2: Building Footprint Boreholes																																			
BH01_0.05-0.2	S16-Ma02245	2/03/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.05-0.2	S16-Ma02246	1/03/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08_0.05-0.2	S16-Ma02247	1/03/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Part 3: Additional Borehole Locations																																			
LDBH03_0.05-0.2	S16-Ma05968	4/03/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDBH04_0.05-0.2	S16-Ma05969	4/03/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDBH05_0.05-0.2	S16-Ma05970	4/03/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Part 1: Residential Building Surface Samples																																			
DUP1	S16-Fe22821	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS01	S16-Fe22813	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS02	S16-Fe22814	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS03	S16-Fe22815	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS04	S16-Fe22816	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS05	S16-Fe22817	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS06	S16-Fe22818	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS07	S16-Fe22819	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SS08	S16-Fe22820	18/02/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistical Summary

Number of Results	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Median Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

coffey
A TETRA TECH COMPANY

TABLE B
RELATIVE PERCENTILE DIFFERENCES
GEOTLCOV25551AA-AH
MARCH 2016

			SDG	1189-90	1189-90		1189-90	Interlab_D	
			Field ID	SS08	DUP1	**RPD**	SS08	Dup1A	**RPD**
			Sample Date	18/02/2016	18/02/2016		18/02/2016	18/02/2016	
Chem_Group	**ChemName**	**Units**	**EQL**						
Metals	Lead	mg/kg	5 (Primary): 1 (Interlab)	400.0	440.0	10	400.0	390.0	3

TABLE C
QAQC BLANK SAMPLE RESULTS
GEOTLCOV25551AA-AH
MARCH 2016

			Field ID	RB	TB	TS
			Sample Date	18/02/2016	18/02/2016	18/02/2016
			Sample Type	Rinsate	Trip_B	Trip_S
Chem_Group	ChemName	Units	EQL			
BTEX	Benzene	µg/l	1	<1	<1	93%
	Ethylbenzene	µg/l	1	<1	<1	105%
	Toluene	µg/l	1	<1	<1	97%
	Xylene (m & p)	µg/l	2	<2	<2	100%
	Xylene (o)	µg/l	1	<1	<1	93%
	Xylene Total	µg/l	3	<3	<3	98%
	C6-C10 less BTEX (F1)	mg/l	0.02	<0.02		
Metals	Arsenic	mg/l	0.005	<0.005		
	Cadmium	mg/l	0.0005	<0.0005		
	Chromium	mg/l	0.005	<0.005		
	Copper	mg/l	0.005	<0.005		
	Lead	mg/l	0.005	<0.005		
	Mercury	mg/l	0.0001	<0.0001		
	Nickel	mg/l	0.005	<0.005		
	Zinc	mg/l	0.005	<0.005		
PAH	Acenaphthene	µg/l	1	<1		
	Acenaphthylene	µg/l	1	<1		
	Anthracene	µg/l	1	<1		
	Benzo(a)anthracene	µg/l	1	<1		
	Benzo(a)pyrene	µg/l	1	<1		
	Benzo(g,h,i)perylene	µg/l	1	<1		
	Benzo(k)fluoranthene	µg/l	1	<1		
	Chrysene	µg/l	1	<1		
	Benzo[b+j]fluoranthene	mg/l	0.001	<0.001		
	Dibenz(a,h)anthracene	µg/l	1	<1		
	Fluoranthene	µg/l	1	<1		
	Fluorene	µg/l	1	<1		
	Indeno(1,2,3-c,d)pyrene	µg/l	1	<1		
	Naphthalene	µg/l	1	<10		
	Phenanthrene	µg/l	1	<1		
	Pyrene	µg/l	1	<1		
	Total PAHs	µg/l	1	<1		
TPH	F2-NAPHTHALENE	mg/l	0.05	<0.05		
	C6 - C9	µg/l	20	<20		
	C10 - C14	µg/l	50	<50		
	C15 - C28	µg/l	100	<100		
	C29 - C36	µg/l	100	<100		
	C10 - C36 (Sum of total)	µg/l	100	<100		
	C10-C16	mg/l	0.05	<0.05		
	C16-C34	mg/l	0.1	<0.1		
	C34-C40	mg/l	0.1	<0.1		
	C6 - C10	mg/l	0.02	<0.02		