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INQUIRY INTO ENROLMENT CAPACITY IN INNER CITY PUBLIC PRIMARY SCHOOLS

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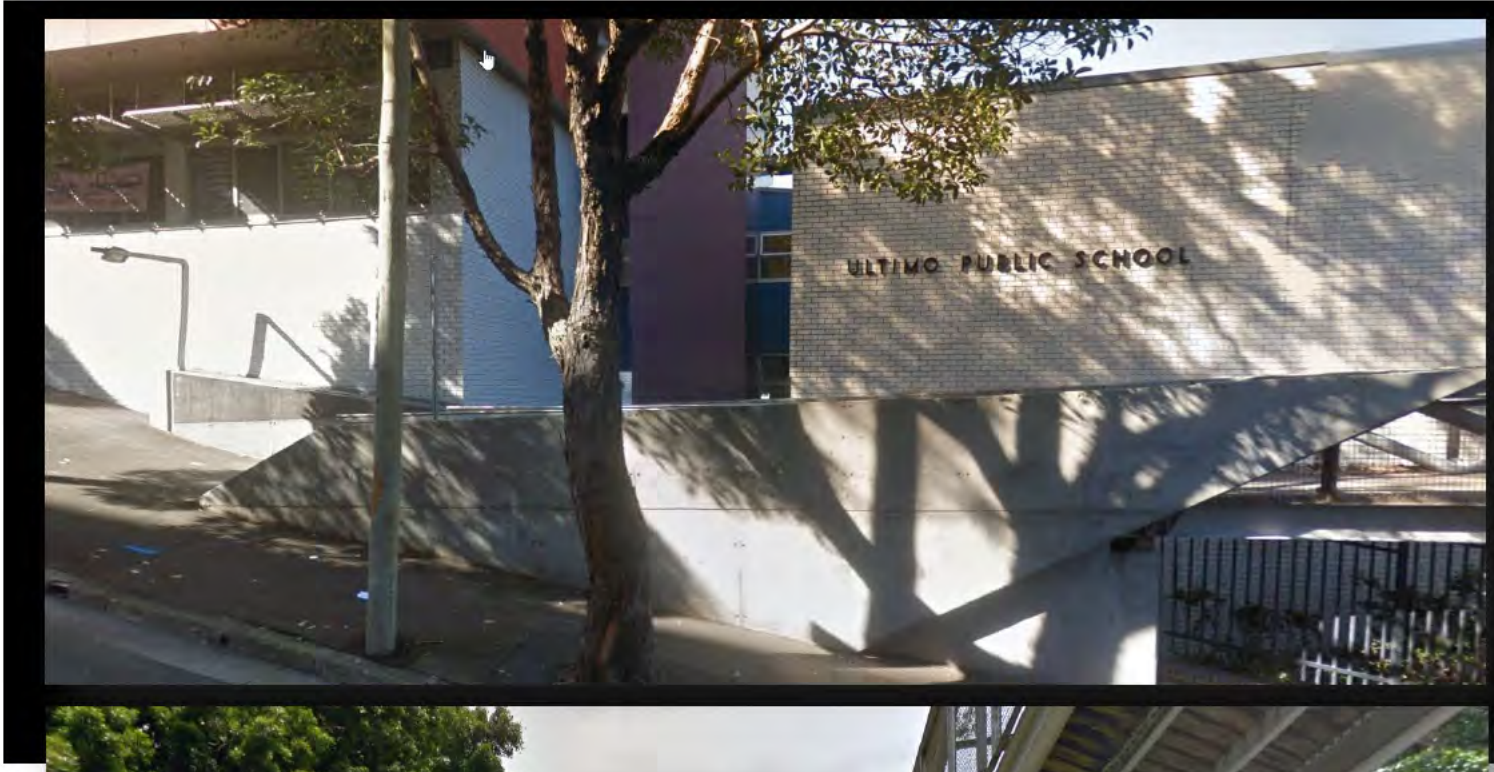

Human Health Risk Assessment – Temporary Public School, Ultimo, NSW

Prepared for: Tanner Kibble Denton Architects on behalf of NSW Department of Education

30 August 2016

EnRiskS

Document History and Status

Report Reference	EIS/16/ULTSCH001
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Limitations

Environmental Risk Sciences Pty Ltd has prepared this report for the use of Tanner Kibble Denton Architects and the NSW Department of Education in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

It is prepared in accordance with the scope of work and for the purpose outlined in the **Section 1** of this report.

The methodology adopted and sources of information used are outlined in this report. Environmental Risk Sciences has made no independent verification of this information beyond the agreed scope of works and assumes no responsibility for any inaccuracies or omissions. No indications were found that information contained in information provided for use in this assessment was false.

This report was prepared in July/August 2016 and is based on the information provided and reviewed at that time. Environmental Risk Sciences disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

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Executive Summary

The sampling of surface soil on the site of the proposed temporary school located in Ultimo identified the presence of elevated concentrations of lead and carcinogenic PAHs, as BaP TEQ. Both these chemicals are common contaminants in soil in urban areas in major cities like Sydney.

Carcinogenic PAHs in Soil

A detailed review was undertaken based on the concentrations of carcinogenic PAHs found in soil in areas and is documented on page 9 of this report. This review considered how the soil would be accessed when used as a temporary primary school, and the health effects that have been associated with exposure to carcinogenic PAHs. All risks evaluated were considered low and acceptable.

Lead in Soil

Elevated lead concentrations were found in soil at one location out of the 33 locations that were sampled during the investigation by Environmental Investigation Services (EIS). This location is annotated as BH10 on the plan provided in **Figure 2**. However, children and teachers will not be able to access soil at this location because it is underneath the proposed decking and outside the proposed school security fence.

An Environmental Management Plan (EMP) will be commissioned to ensure the soil at this location remains inaccessible to staff and children. The presence of these lead impacts at BH10 would need to be further considered once the temporary school is closed if the site is to be reused for recreational purposes.

No other concentrations of lead were reported that would be of concern for the proposed use of the site as a primary school.

Other Contaminants

The investigation at the site also evaluated whether volatile chemicals, landfill gas or asbestos were present. The investigation did not find asbestos to be present in any sample. No landfill gas was measured in any of the locations tested. A conservative screening approach for volatile chemicals found in soil vapour which assumed long term daily exposure has shown that none are present at levels that are of concern.

Overall Outcome

The assessment undertaken determined that the site is suitable for the proposed use as a temporary primary school.

Section 1 Introduction

1.1 Background

Environmental Risk Sciences Pty Ltd (enRiskS) has been commissioned by Tanner Kibble Denton Architects on behalf of the NSW Department of Education to conduct a quantitative human health risk assessment (HHRA) in relation to the presence of contamination in soil at the site of the proposed temporary school at Wentworth Park South, Off Wentworth Park Road, Ultimo, NSW (1 and 5 Wentworth Park Road, Glebe), including an area to the south on Wattle Street, Ultimo (the site) (**Figures 1a and 1b**).

Currently, it has been proposed to relocate Ultimo Public School temporarily to part of Wentworth Park while the school is rebuilt and expanded. It is understood that the temporary school will involve the placement of a number of single story demountable buildings on the park, including administration, library, hall, canteen and amenities buildings plus classrooms.

Historically, the park was a swamp that was infilled in the late 1800s. Since then it has been used for a variety of commercial/industrial purposes such as a wool store and an army camp.

EIS has undertaken a detailed site investigation of soils across the site. The work has included collection of soil samples for analysis in accordance with national and state guidance, assessment of soil vapour for hazardous ground gases like methane as well as volatile chemicals like petroleum hydrocarbons. The main source of contamination at the site is the fill that was brought onto the site to fill and level the land surface.

The investigations undertaken by EIS identified the presence of elevated concentrations of metals and polycyclic aromatic hydrocarbons (PAHs) in the soil at the site. Two locations have concentrations of lead above the most conservative health investigation level (HIL) specified in national guidance – HIL-A for low density residential land use. Slightly elevated levels of benzo[a]pyrene equivalents (which includes all the carcinogenic PAHs) are present in most surface soils at the site with two locations reporting more elevated levels. These chemicals are likely to be present in the fill due to the use of ash in fill historically. PAHs in ash are known to be highly bound up in the ash particles and not readily available to people even when they come into direct contact.

Low levels of some volatile chemicals relating to petroleum hydrocarbons were also detected in soil vapours.

1.2 Objectives

The overall objectives of the HHRA presented in this letter are to determine if the site is suitable for use as a temporary public school.

More specifically the HHRA has been undertaken to address the following:

- Review existing data to determine appropriate data for risk assessment;
- Estimate the risks posed to human health for the following exposure groups:
    - School Child
    - Teacher
    - Intrusive maintenance worker
- If required, determine the need to implement any risk management measures on the site to mitigate any risks identified.

The assessment has addressed on-site risks to human health only based on the proposed use of the site for a temporary school, where the buildings will comprise single level demountable buildings. This assessment has not addressed ecological risk issues or off-site human health risks.

1.3 Methodology

The methodology adopted for the conduct of this HHRA is in accordance with the relevant National protocols/ guidelines including:

- enHealth (enHealth 2012a) Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards;
- enHealth (enHealth 2012b) Australian Exposure Factor Guide;
- ASC NEPM National Environmental Protection Measure – Assessment of Site Contamination including:
    - Schedule B1 Investigation Levels for Soil and Groundwater (NEPC 1999 amended 2013a)
    - Schedule B4 Guideline on Site-Specific Health Risk Assessment Methodology (NEPC 1999 amended 2013b)
    - Schedule B7 Guideline on Derivation of Health-Based Investigation Levels (NEPC 1999 amended 2013c)
    - Toolbox Note – Key principles for the remediation and management of contaminated sites; and
- CRC CARE Technical Report no.23, Petroleum hydrocarbon vapour intrusion assessment - Australian guidance (CRC CARE 2013).

Where required, additional guidance has been obtained from relevant Australian and International guidance consistent with current industry best practice, such as that available from the USEPA and the World Health Organisation (WHO).

Section 2 Review of Data

2.1 Available Data

Information relevant to the nature and extent of contamination on the site is available from the following reports:

- EIS 2016a, Stage 1 and Preliminary Stage 2 Environmental Site Assessment for Proposed Temporary School at Wentworth Park South, Off Wentworth Park Road, Ultimo, NSW. Report prepared by EIS dated 2 June 2016.
- EIS 2016b, Additional Environmental Site Assessment for Proposed Temporary School at Wentworth Park South – Wattle Street, Ultimo, NSW. Report prepared by EIS dated 15 July 2016.

2.2 Site Details and Conceptual Site Model (CSM)

The temporary school will cover a portion of Wentworth Park and will access another portion of the Park for play during lunch and sporting activities. The combined site area is approximately 12000 m^2 in size and is essentially flat. The temporary school will occupy 4702 m^2. The extra area the children will be able to access covers 7030 m^2.

The temporary school will include demountable classrooms and play areas (refer to **Attachment A** for the proposed site layout).

Intrusive works undertaken at the site by EIS has identified that the subsurface comprises:

- Pavement: asphalt is present in some areas;
- Fill: surface to typical depths of 1.5 m, but extending to 4.8 m in some areas comprising silty clay and silty sand with gravel, ash, slag, glass, timber and plastic. These materials were noted to be poorly compacted; and
- Natural soil: beneath the fill and comprising estuarine soil described as silty clay, silty sandy clay, silty sand and sand. These materials were noted to have an organic odour in some location.

Groundwater was encountered at 2.3 to 4 m below ground level during the site investigations. No significant excavations are proposed in developing the temporary school. No other activities are proposed as part of the operation of the school which would allow people to come into contact with groundwater (i.e. no bores to extract groundwater are proposed). Any volatile issues that are present in the subsurface that may be derived from groundwater (and soil) will be addressed through the review of soil vapour data in **Section 2.4** of this report. Hence no further assessment of direct contact with groundwater is required.

Based on the available history for the site (EIS 2016a) potential sources of contamination at the site include the importation of fill materials (including importation of man-made fill materials), commercial use of parts of the site, off-site commercial uses and the presence of hazardous building materials.

Based on the available information on the former and proposed site uses, the following exposure populations and pathways require further consideration in this assessment.

Table 1 Potential Exposure Pathways and Populations: Proposed Use of Site

Source	Media	Potential Exposure Pathway	Potential Exposure Populations	Need for Assessment?
Historical placement of fill materials on the site Former commercial uses of the site	Soil	■ Direct contact (incidental ingestion and dermal contact) with contaminants in soil ■ Inhalation of dust from soil at ground surface (from wind erosion) ■ Inhalation of vapours if volatile chemicals are present in soil ■ Exposure to hazardous ground gases (posing explosive risk) generated from former fill materials placed on the site	■ Primary school students ■ Teachers ■ Construction and maintenance workers	Direct contact and inhalation of dust with soil has been assessed in **Sections 2.5, 2.6 and 2.7**. Hazardous ground gases (landfill gas) are assessed in **Section 2.3.** Inhalation of volatile chemicals assessed in **Section 2.4.**
	Groundwater	■ Inhalation of volatile chemicals if present in groundwater	■ Primary school students ■ Teachers ■ Construction and maintenance workers	No direct contact with groundwater is expected given the depth to groundwater and no extraction so no further assessment required. If volatile chemicals are present in groundwater, then soil vapour results will allow assessment of risk – See **Section 2.4**
Off-site sources	Groundwater	■ Inhalation of volatile chemicals if present in groundwater that has migrated beneath the site	■ Primary school students ■ Teachers ■ Construction and maintenance workers	No direct contact with groundwater is expected given the depth to groundwater and no extraction so no further assessment required. If volatile chemicals are present in groundwater, then soil vapour results will allow assessment of risk – See **Section 2.4**

The proposed development does not involve excavation works (other than minor works during construction) and hence in relation to future direct contact with soil at the site, the materials currently at ground surface are expected to remain at ground surface.

The school has been designed to be installed on decking, even the play areas and landscaped areas will be installed on top of decking. This means that children and teachers will not be able to access surface soils within the fenced school area. **Attachment A** includes diagrams showing the presence of this decking.

This assessment has, however, assumed that direct contact with the soil is possible for both children and teachers to ensure that the risks are appropriately understood even if the design is changed.

Intrusive investigations have been undertaken at the site to collect data to assist in characterising potential exposures that may occur at the site. These investigations involved the following:

- collection of soil samples targeting surface soil, consistent with the materials construction workers, teachers and children may be directly exposed to during the proposed use of the site;
- installation of ground gas wells and the sampling of ground gas to determine the presence, or otherwise, of landfill gases in the subsurface;
- installation of passive soil vapour samplers to determine the presence of volatile chemicals in the subsurface that may be derived from soil and/or groundwater impacts.

These data have been reviewed in the following sections in relation to potential risks to human health associated with the proposed use of the site.

2.3 Landfill Gas Investigations

Landfill gas was evaluated beneath the site as there some history of the importation of fill materials (man-made) onto the site. The investigations were undertaken by EIS and involved the installation of 4 landfill gas bores on the site (refer to **Figure 2**). These wells were sampled on the 5 May 2016 for levels of oxygen, carbon dioxide, methane, carbon monoxide, hydrogen sulfide, differential pressure and gas flow. Data quality was reviewed by EIS, which indicated the landfill gas data was suitable for interpretative purposes.

The landfill gas assessment undertaken by EIS (2016a) did not detect any concentrations of methane or gas flow from any of the wells installed. **Table 2** presents a summary of the stabilised landfill gas data reported. Field sheets for the monitoring are included in **Attachment B**.

Table 2 Summary of Landfill Gas Monitoring Data

LFG Well	Methane (%)	Carbon dioxide (%)	Oxygen (%)	Gas flow (L/hr)	Comments
BH6	0	14.4	1.7	0	No evidence of landfill gas. Carbon dioxide levels consistent with aerobic biodegradation processes occurring in the subsurface, likely as a result of organic matter from swampy and estuarine materials
BH8	0	9.1	11.6	0	
BH11	0	12.0	3.0	0	
BH15	0	8.1	13.0	0	

The available data does not indicate the presence of any landfill gas risk issues beneath the site.

2.4 Soil Vapour Investigations

Passive soil vapour samplers, Waterloo Membrane Samplers (WMS), were installed at 1 m depth at 4 locations (refer to **Figure 2**). These are passive soil vapour samplers that report the presence of volatile chemicals in soil vapour. The samplers were left in place from the 21 April 2016 to 5 May 2016. These samplers were analysed for volatile organic compounds (VOCs). Data quality was reviewed by EIS, which indicated the soil vapour data was suitable for interpretative purposes (EIS 2016a). **Attachment C** presents the soil vapour data for the site.

It is noted that the passive vapour samplers provide a semi-quantitative measure of soil vapour in the subsurface. This means that they should only be used to identify the presence of vapour in the subsurface and if there are any hotspots. However, if the data were to be used in a more quantitative manner experience with the specific samplers used in this investigation (Waterloo Membrane Samplers) indicates that they consistently under-report soil vapour concentrations in the subsurface (when compared with the active sampling of sol vapour) by a factor of approximately 10

fold. Hence when comparing soil vapour concentrations reported from passive samplers, the concentrations should be multiplied by a factor of 10 prior to any comparison with a quantitative guideline.

The passive soil vapour sampling undertaken at the site identified low concentrations of some petroleum hydrocarbons. These may be present due to the mixing of ambient air into the soil profile or from some low level soil or groundwater sources. The soil vapour concentrations reported have been further reviewed to determine if the presence of vapours in the subsurface is of potential concern for the proposed use of the site. The most conservative vapour criteria relevant to the proposed use of the site is low-density residential, which is noted by the NEPM to be protective of exposures of primary school children. These criteria have been adopted for the purpose of this review and are considered to be conservative. These guidelines are based on assuming school children are present inside buildings on the site for 20 hours per day, every day of the year, for up to 35 years.

Table 3 presents a summary of the maximum soil vapour concentrations reported by the passive samplers, the adjusted value to address the passive sampler method underreporting vapour concentrations and the adopted soil vapour criteria. The adopted soil vapour criteria are NEPM (NEPC 1999 amended 2013a) Health Screening Levels (HSL) for low-density residential land use, measured at 1 m depth with sand overlying.

Table 3 Review of Soil Vapour Data

VOC detected (in at least 1 sample)	Maximum Concentration Reported (mg/m^3)	Adjusted Maximum Concentration (mg/m^3)	Adopted Screening Criteria (mg/m^3)
Ethylbenzene	0.0035	0.035	1100
Toluene	0.0013	0.013	3800
Xylenes	0.0224	0.224	750
Naphthalene	0.057	0.57	3
Hexane	0.047	0.47	Included in TRH C6-C10 (F1) criteria
1,2,4-Trimethylbenzene	0.016	0.16	
TRH C6-C10 (F1)	2.8	28	640
TRH >C10-C16 (F2)	18	180	560

Review of **Table 3** indicates that none of the volatile chemicals detected were present at levels that would be of concern in relation to the proposed use of the site as a primary school. Hence no further detailed assessment of vapour inhalation risk issues is required.

2.5 Soil Investigations

EIS conducted soil investigations at 2 different times to characterise the nature and extent of contamination in soil at the site.

The first sampling event involved the collection of soil samples from 15 locations on the site (Area 1) selected on a grid basis (providing an approximated grid spacing of 20 m) on 20 April 2016 (refer to **Figure 2**). Samples were not collected from locations beneath existing buildings. Soil was sampled from the upper fill materials as well as underlying natural soil. Shallow fill soil samples were analysed for heavy metals, petroleum hydrocarbons as total recoverable hydrocarbons (TRH) and BTEXN (benzene, toluene, ethylbenzene, xylenes and naphthalene), polycyclic aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs) and asbestos (EIS 2016a).

The second sampling event involved the collection of additional soil samples from a portion of land located to the south of the school site (Area 2), which is expected to be accessed and used by

school students. This sampling occurred on 11 July 2016 to address all surface soil that may be accessible to students and staff across the wider site area. The work involved the sampling of surface soil/fill from 19 locations evenly spaced across the additional area (refer to **Figure 3**). These additional soil samples were analysed for lead, PAHs and asbestos (EIS 2016b).

Data quality was reviewed by EIS for both soil sampling events, which indicated the data was suitable for interpretative purposes.

Table 4 presents a summary of the maximum concentrations reported in soil (where detected in at least one sample). The maximum concentrations reported have been screened against current human health risk based investigation guidelines relevant to potential exposures that may occur on the site, as follows:

- For teachers, NEPM HILs and HSLs (or equivalent international guidelines) relevant to commercial/industrial workers are applicable and protective of direct contact exposures (should these occur) and vapour inhalation exposures (where volatile chemicals remain)
- For primary-school students attending the school, NEPM HILs and HSLs (or equivalent international guidelines) relevant to low density residential use are applicable and protective of direct contact exposures (should these occur) and vapour inhalation exposures (where volatile chemicals remain)
- For workers involved in construction, maintenance of subsurface services and gardening activities (where soil may be accessible) NEPM HILs and HSLs (or equivalent international guidelines) relevant to commercial/industrial workers are considered to be adequately protective.

For these uses of the site the guidelines relevant to commercial/industrial buildings and low-density residential uses have been presented in **Table 4**. Key chemicals that require further consideration in this assessment have been determined as those where the concentrations exceed the relevant health based investigation/screening level. It is noted that no asbestos was detected in any of the soil samples collected.

All the available soil data is included in **Attachment D** for reference.

Table 4 Summary and Review of Soil Data

Analyte detected	Maximum Reported (mg/kg)		Screening Level Guideline (mg/kg)		Identified as Key Chemical
	Area 1 - April 2016	Area 2 – July 2016	Commercial/ Industrial – Teachers, all individuals inside buildings and short-duration intrusive works	Low density residential - Primary school students in outdoor areas	
Arsenic	11	--	3000 [N]	100 [N]	N
Cadmium	9	--	900 [N]	20 [N]	N
Chromium	17	--	3600 [N]	100 [N]	N
Copper	220	--	240000 [N]	6000 [N]	N
Lead	1600	290	1500 [N]	300 [N]	Y
Mercury	0.8	--	730 [N]	40 [N]	N
Nickel	19	--	6000 [N]	400 [N]	N
Zinc	580	--	400000 [N]	7400 [N]	N
Carcinogenic PAHs as Benzo(a)pyrene TEQ	18	6.1	40 [N]	3 [N]	Y – primary school students only

Naphthalene	0.6	--	11000 [C]	3 [N]	N
Total PAH	130	38	4000 [N]	300 [N]	N, refer to Note 1
Aldrin & dieldrin	0.7	--	45 [N]	6 [N]	N
TRH >C16-C34	1000	--	27000 [C], 3500 [M]	5300 [C], 2500[M]	N
TRH >C34-C40	510	--	38000 [C], 10000 [M]	6300 [C], 10000[M]	N

Notes:

-- = not analysed in sampling round undertaken in July 2016 as key chemicals for the site identified in earlier sampling
N = NEPM (2013) HIL "A" relevant to low density residential land use (relevant to use of the site for a primary school) and HIL "D" relevant to exposures by teachers, and direct contact exposures during short term intrusive works. Where a HSL relevant to the vapour inhalation pathway is adopted the criteria is based on shallow soil impacts (0 to <1 m depth) in sand.
C = CRC CARE Health Screening Levels (HSLs) for (CRC CARE 2011) for direct contact exposures (as this is the only relevant exposure pathway and/or the vapour criteria outlined in the NEPM are not limiting).
Note 1: Total PAHs are not included as a key chemical. The total PAHs reported include the carcinogenic PAHs that have been assessed separately. The total PAH concentration reported is less than the adopted guideline and hence there is no requirement to assess any other individual PAH in this assessment.

On the basis of the above screening level review, only lead and carcinogenic PAHs in soil require further review. These exposures are further discussed in the following sections.

2.6 Evaluation of Lead in Soil

There are no concentrations of lead reported in surface soils in Area 2 that exceed the health based soil screening guideline presented in **Table 4**, relevant to the proposed use of the site.

The maximum concentration of lead in soil, 1600 mg/kg reported in Area 1 (a duplicate sample only), exceeds the adopted health based soil screening guideline for potential exposures of primary school students (significantly exceeding the guideline of 300 mg/kg) as well as teachers and intrusive workers (just exceeding the guideline of 1500 mg/kg). The sample from this location was analysed by split and sent to 2 laboratories for analysis. This is a normal part of checking the quality of the results.

It is noted that the primary sample for this sample location reported a significantly lower concentration of 260 mg/kg suggesting that either the fill materials in this area are heterogeneous (highly variable) or that a small piece of metal (lead flashing or other material (e.g. lead paint chip)) was present in the fill sample analysed in the duplicate sample (i.e. by the second laboratory). Regardless, it has been assumed that BH10 is associated with a lead hot-spot on the site.

The NHMRC recently reviewed lead exposure issues in the community and recommended (NHMRC 2015a, 2015b) the use of a lower blood lead goal for investigation (i.e. lower than that addressed in the NEPM). The NEPM has not been revised to change the lead soil investigation levels, however, given the NHMRC review it is prudent to adopt management measures to ensure the existing NEPM guideline can be met, rather than undertake a site-specific risk assessment.

The maximum concentration was reported at location BH10. This location is proposed to be beneath the future school building footprint. If lead impacts at BH10 are to remain beneath the building footprint (i.e. managed) then there is no potential for direct contact to occur, and consequently no risk.

Managing these impacts beneath the building would require a management plan for the site to ensure that these materials remain beneath the building and are not disturbed in the future. In addition, it does not address any future risk issues associated with exposures that may occur once the temporary school has been removed from the site and the site is reused for recreational purposes. The remediation of lead impacted soil at BH10 to a level that is suitable for low-density residential use would address these long-term risk issues.

Where lead impacts at BH10 were either managed or remediated, the maximum lead concentration that would remain on the site is 310 mg/kg at BH9. This concentration only just exceeds the adopted guideline relevant for primary school uses and is well below the guideline adopted for addressing exposures by teachers and intrusive workers. It is likely that the area of BH9 will be beneath synthetic turf, soft fall or other paved materials which would limit the potential for any direct contact to occur. However, where direct contact is assumed to occur for primary school children it is relevant to consider guidance in the NEPM in relation to the application of the guidelines. The NEPM guideline assumes that the children could be come into direct contact with the soil for 365 days per year for 6 years as children. There is only one location with this slightly elevated level and the rest of the locations tested had much lower levels of lead. Consideration of the average concentration and other statistical estimates is relevant to demonstrate that the risk posed at this site is low.

For soil that may be accessible to primary school children in Area 1 of the temporary school, **Table 5** presents a comparison of the relevant statistics for the lead concentrations against the NEPM guidance. The NEPM allows the use of these average and related statistics to demonstrate that a site complies with the guidelines. The NEPM states that the 95% UCL must be lower than the

guideline value (ensures a worst case estimate of the average is not above the guideline), the maximum value at a site is no more than 250% of the guideline (ensures no extreme concentrations are present) and the standard deviation is less than 50% of the guideline (ensures the results are not highly variable across the site which demonstrates that the statistical analysis is valid).

Table 5 Lead in Accessible Soil – Comparison with NEPM Guidance

Statistic	Value* (mg/kg)	Guideline – Primary School Children (mg/kg)
95th percentile upper confidence limit of the mean (UCL) (worst case estimate of average)	155	300 (HIL-A)
Mean (average)	117	NA
Maximum	310	750 (250% of HIL-A)
Standard deviation	81	150 (50% of HIL-A)

* Calculated using ProUCL (Version 5) for all surface soil samples collected in Area 1, excluding BH10. It is assumed that the surface soil samples reported from other locations is representative of the range of lead concentrations that may remain in surface soil in access ble areas of the site.

Review of **Table 5** indicates that where lead impacts reported at BH10 are managed or remediated, there are no further risk issues of concern in relation to lead concentrations reported in surface soil that may be accessible to primary school students, teachers or intrusive workers on the site.

2.7 Evaluation of PAHs in Soil

Polycyclic aromatic hydrocarbons (PAHs) are often found in soil in urban areas, particularly the older suburbs in larger cities. PAHs exist naturally in the environment and are also man-made. PAHs are produced during combustion processes (i.e. fires) and, as a result, are present in ash materials from fireplaces and from more industrial uses such as coal fired boilers and waste from power generation (coal fired power plants). In addition, PAHs are also present in many urban materials including asphalt used in roadways, sealants used in homes and products such as oils and creosote (e.g. creosote timber products in landscaping). PAHs are also present in vehicle exhaust.

The urbanisation of cities over time required the use of fill to level off low lying areas or fill in dips and hollows to make the area suitable for housing. In the past this often meant that waste from power stations was commonly used (with Bunnerong and White Bay Power Stations common sources in Sydney). Such fill contained ash materials that also included PAHs. Bitumen dust and sweepings from the construction and maintenance of urban roadways often ended up in soil in urban areas too. In addition, use of household products and the placement of ash from fireplaces in backyards all contribute to the PAHs concentrations commonly reported in urban soil.

Carcinogenic PAHs, as benzo(a)pyrene TEQ, in soil have been identified as a key chemical group that warrants further evaluation, in relation to potential exposures that may occur to primary school students accessing and using the outdoor areas. The maximum concentration reported in soil at the site is 18 mg/kg, well above the adopted screening guideline of 3 mg/kg.

This screening guideline assumes that an individual is exposed to these carcinogenic PAHs in soil continuously as a young child, older child and adult every day of the year (365 days), where they are directly exposed to contaminated soil every day over all these years. For the assessment of the exposures that may occur at a primary school these assumptions are highly conservative.

Where exposures only occur as an adult, the commercial/industrial screening criteria of 40 mg/kg is appropriate. The maximum soil concentration at this site is lower than this value.

Where exposures only occur as a primary school student the low density residential criteria is overly conservative. Primary school students are older than the young child assumed to be exposed in the calculation of the NEPM residential criteria (2.5 years). In addition, primary school children are not present at school every day of the year and exposure can only occur for the duration the temporary school is located on the site, up to 3 years. More specific assessment of exposures of primary school students at the temporary school on this site, not taking into account the use of any ground surface covering materials (such as paving or soft fall materials) (i.e. assuming the children directly access the site soil on every occasion they attend the site), the screening level guideline can be revised.

Such a guideline has been calculated using the equations and methodology outlined in the NEPM, for the derivation of the HILs. For this assessment the parameters and assumptions adopted for the development of the low-density residential HIL (HIL-A) have been adjusted to account for the following:

- No exposures occur as a very young child, only as a primary school aged child
- Exposure may only occur while the temporary school is located on the site, for a period of 4 years (conservative estimate, adding 2 extra years to the indicated duration of 2 years), where the most conservative receptor will be a child attending the school from kindergarten (aged 4 years) to Year 3 (aged 8 years)
- Exposure occurs on school days, which is taken to be 200 days per year (4 terms of 10 weeks, 5 days per week)
- The average body weight of a child aged 4-7 years is 24.2 kg (enHealth 2012b)
- The adjustment factor to address early-lifetime exposures for children aged 4 - 8 years = 3

The above still assumes that the soil contact assumed in the NEPM that occurs throughout the day all occurs at the school.

Where these changes are included a revised soil guideline of 30 mg/kg can be derived using the WHO toxicity reference value (TRV), and 60 mg/kg where the oral TRV recommended in the NEPM (NEPC 1999 amended 2013c) is adopted. To be conservative, the value of 30 mg/kg is adopted for this site. **Attachment E** provides the calculations.

The maximum concentration of BaP TEQ of 18 mg/kg is lower than the revised guideline of 30 mg/kg.

If it were assumed that the school includes vacation care such that a child may be at the school 5 days per week for 48 weeks of the year instead of 40 weeks, the soil guideline reduces to 20 mg/kg using the WHO TRV. The maximum concentration in soil remains lower than this value.

These revised guidelines assume site related soil is always accessible at the ground surface where students can come into direct contact with the soil every day when at school, and this soil is traced into the classrooms where children may come into direct contact with the contaminated dust every day they are at school.

It is important to also note that many areas of the site are to be covered with artificial grass, paving, soft fall materials, grass and garden areas that include the use of clean topsoil. Hence the actual potential for any direct contact with site related soil is expected to be negligible.

On the basis of the above there are no risk issues of concern in relation to the presence of BaP TEQ in soil where it is used for a temporary primary school.

Section 3 Conclusions

The sampling of surface soil on the site of the proposed temporary school located in Ultimo identified the presence of elevated concentrations of lead and carcinogenic PAHs, as BaP TEQ. Both these chemicals are common contaminants in soil in urban areas in major cities like Sydney.

Carcinogenic PAHs in Soil

A detailed review was undertaken based on the concentrations of carcinogenic PAHs found in soil in areas and is documented on page 9 of this report. This review considered how the soil would be accessed when used as a temporary primary school, and the health effects that have been associated with exposure to carcinogenic PAHs. All risks evaluated were considered low and acceptable.

Lead in Soil

Elevated lead concentrations were found in soil at one location out of the 33 locations that were sampled during the investigation by Environmental Investigation Services (EIS). This location is annotated as BH10 on the plan provided in **Figure 2**. However, children and teachers will not be able to access soil at this location because it is underneath the proposed decking and outside the proposed school security fence.

An Environmental Management Plan (EMP) will be commissioned to ensure the soil at this location remains inaccessible to staff and children. The presence of these lead impacts at BH10 would need to be further considered once the temporary school is closed if the site is to be reused for recreational purposes.

No other concentrations of lead were reported that would be of concern for the proposed use of the site as a primary school.

Other Contaminants

The investigation at the site also evaluated whether volatile chemicals, landfill gas or asbestos were present. The investigation did not find asbestos to be present in any sample. No landfill gas was measured in any of the locations tested. A conservative screening approach for volatile chemicals found in soil vapour which assumed long term daily exposure has shown that none are present at levels that are of concern.

Overall Outcome

The assessment undertaken determined that the site is suitable for the proposed use as a temporary primary school.

References

CRC CARE 2011, *Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document*, CRC for Contamination Assessment and Remediation of the Environment, CRC CARE Technical Report no. 10. Adelaide. <http://www.crccare.com/products-and-services/health-screening-levels>.

CRC CARE 2013, *Petroleum hydrocarbon vapour intrusion: Australian Guidance*, CRC CARE Technical Report no. 23, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia. <http://www.crccare.com/publications/technical-reports>.

enHealth 2012a, *Environmental Health Risk Assessment, Guidelines for assessing human health risks from environmental hazards*, Commonwealth of Australia. Canberra. <http://www.health.gov.au/internet/main/publishing.nsf/content/804F8795BABFB1C7CA256F1900045479/$File/DoHA-EHRA-120910.pdf >.

enHealth 2012b, *Australian Exposure Factors Guide*, Commonwealth of Australia. Canberra. <http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-publicat-environ.htm>.

NEPC 1999 amended 2013a, Schedule B1, Guideline on Investigation Levels For Soil and Groundwater, National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council. <http://scew.gov.au/nepms/assessment-site-contamination>.

NEPC 1999 amended 2013b, Schedule B4, Guideline on Health Risk Assessment Methodology, National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council. <http://scew.gov.au/nepms/assessment-site-contamination>.

NEPC 1999 amended 2013c, Schedule B7, Guideline on Health-Based Investigation Levels, National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council. <http://scew.gov.au/nepms/assessment-site-contamination>.

NHMRC 2015a, *NHMRC Information Paper: Evidence on the effects of lead on human health*, National Health and Medical Research Council, Canberra. <https://www.nhmrc.gov.au/guidelines-publications/eh58>.

NHMRC 2015b, *NHMRC Statement: Evidence on the effects of lead on human health*, National Health and Medical Research Council, Canberra. <https://www.nhmrc.gov.au/guidelines-publications/eh58>.

Figures

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

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

Title: **SITE LOCATION PLAN**

Location: WENTWORTH PARK SOUTH,
OFF WENTWORTH PARK ROAD, ULTIMO, NSW

Report No: E29319K

Figure No: 1a

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

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

Title: **SITE LOCATION PLAN**

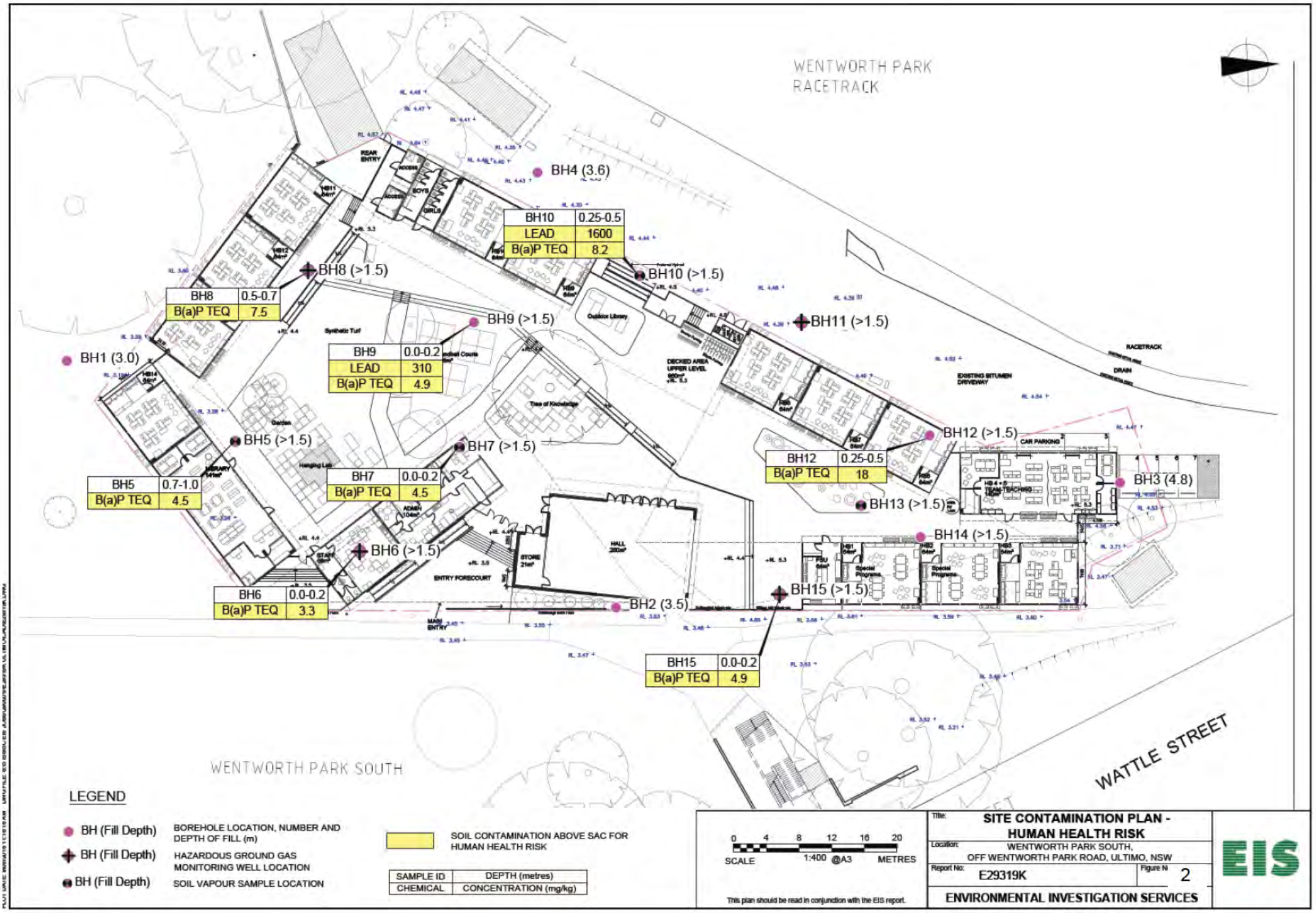
Location: LOT 679, DP729635 WENTWORTH PARK SOUTH, WATTLE STREET, ULTIMO, NSW

Report No: E29319K

Figure No: 1b

ENVIRONMENTAL INVESTIGATION SERVICES

EIS



Title: **SITE CONTAMINATION PLAN - HUMAN HEALTH RISK**

Location: WENTWORTH PARK SOUTH, OFF WENTWORTH PARK ROAD, ULTIMO, NSW

Report No: E29319K | Figure No: 2

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO, 7.1.5.1557, 2015.

LEGEND

APPROXIMATE SITE BOUNDARY

BH (Fill Depth) BOREHOLE LOCATION

SCALE 0 8 16 24 32 40 METRES 1:800 @A3

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

Title: **SAMPLE LOCATION PLAN**

Location: LOT 679, DP729635 WENTWORTH PARK SOUTH, WATTLE STREET, ULTIMO, NSW

Report No: E29319K

Figure No 3

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

Attachment A Proposed Development

ULTIMO TEMPORARY SCHOOL Gross Internal Area (GIA) Calculations			150874 29/08/2016
Building Type	**Area (m^2)**	**No. of Type**	**Total Area Type (m^2)**
Homebase Type 1	64	12	768
Homebase Type 2	140	1	140
Admin	104	1	104
Staff	69	1	69
Library	141	1	141
Hall incl. store and WC	226	1	226
FSU	35	1	35
Girls Toilet	17	1	17
Boys Toilet	17	1	17
Access Toilet	8	1	8
TOTAL GIA			**1525**

WENTWORTH PARK RACETRACK

WENTWORTH PARK SOUTH

WATTLE STREET

(E) SHED

(E) 2 STOREY RENDERED BUILDING

REAR ENTRY

BOYS 47m²

GIRLS 47m²

ACCESS 8m²

HB11 64m²

HB10 64m²

HB9 64m²

HB8 64m²

HB7 64m²

HB6 64m²

HB12 64m²

HB13 64m²

HB14 64m²

HB1 64m²

HB2 64m²

HB3 64m²

HB 4 + 5 TEAM-TEACHING 140m²

FSU 35m²

Special Programs

Special Programs

Productive Garden

Productive Garden

Synthetic Turf

PLAY AREA LOWER LEVEL 1320m² RL 4.4

Handball Courts 196m²

Outdoor Library

DECKED AREA UPPER LEVEL 960m² RL 5.3

Tree of Knowledge

Relaxation

SERVICE ENTRY

(E) BITUMEN DRIVEWAY

SERVICE VEHICLE TURNING AREA (refer to Traffic Management Plan)

RACETRACK

EXISTING METAL FENCE

DRAIN

EXISTING METAL FENCE

(E) BITUMEN DRIVEWAY

PARALLEL CAR PARKING

CAR PARKING (90° ANGLE)

Accessible Car Space

LIBRARY 141m²

ADMIN 104m²

STAFF 69m²

ACCESS 5m²

STORE 18m²

HALL 200m²

ENTRY FORECOURT

PARK ENTRY

MAIN ENTRY

RL 3.5

RL 4.4

RL 5.3

RL 4.5

2100mm high metal fence

2400mm high balustrade

1500mm high balustrade

Preferred Hydrant Booster Location

Existing stone wall retained

Foundation stone transplanted from (E) school

Macadamia nut tree transplanted from (E) school

(E) light pole

10 SINGLE STOREY BRICK BUILDING (SREP26 HERITAGE ITEM)

5000L RW TANK

Main switch

1 GROUND FLOOR PLAN
1:200

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BCA
Design Confidence
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5000L RW TANK — METAL RAINWATER TANK

FHR — FIRE HOSE REEL TO HYDRAULIC ENGINEERS DRAWINGS

FH — FIRE HYDRANT TO HYDRAULIC ENGINEER'S DRAWINGS

A/C AIR CONDITIONER
ACR ACRYLIC SHEET
AHD AUSTRALIAN HEIGHT DATUM
AL ALUMINIUM
AP ACCESS PANEL
AW ALUMINIUM WINDOW
BAL BALUSTRADE
BK BRICKWORK
BL BLOCKWORK
BOL BOLLARD
CHS CIRCULAR HOLLOW SECTION
D DOOR
DP DOWNPIPE
DPC DAMP PROOF COURSE
(E) EXISTING
EDB ELECTRICAL DISTRIBUTION BOARD
(E) EQUAL
F FIXED
FC FIBRE CEMENT SHEET
FCL FINISHED CEILING LEVEL
FFL FINISHED FLOOR LEVEL
FH FIRE HYDRANT
FHR FIRE HOSE REEL
FG FIXED GLASS
G GLASS
GL GLASS LOUVRES
G OB OBSCURE GLASS
HWU HOT WATER UNIT
JN JOINERY ITEM
MLF METAL LOUVRE - FIXED
MSF METAL SCREEN- FIXED
MRS METAL ROOF SHEETING
MWS METAL WALL SHEETING
(N) NEW
PC POWDER-COATED
PFC PARALLEL FLANGE CHANNEL
RHS RECTANGULAR HOLLOW SECTION
RL REDUCED LEVEL
RS ROLLER SHUTTER
RWH RAIN WATER HEAD
RWO RAIN WATER OUTLET
RWS RAIN WATER SUMP
S STEEL
SHS SQUARE HOLLOW SECTION
SKL SKYLIGHT
SSL STRUCTURAL SLAB LEVEL
SWP STORMWATER PIT
T TIMBER
TBC TO BE CONFIRMED
TME TO MATCH EXISTING
TOW TOP OF WALL
TUN TUNDISH
TYP TYPICAL
UB UNIVERSAL BEAM
UC UNIVERSAL COLUMN
U/S UNDERSIDE
VOS VERIFY ON SITE
VP VENT PIPE
W WINDOW
WSH WASHROOM

10 20 30 40 50

Rev	Date	Description	Checked	Auth.
A	05.08.16	REF ISSUE	CR	AK
B	22.08.16	ANNOTATIONS ADDED	CR	AK
C	29.08.16	HBs 11 TO 13 SHIFTED FOR TPZ	CR	AK

Project
ULTIMO TEMPORARY SCHOOL

Drawing Title
GROUND FLOOR PLAN

Proj. Dir	Proj. Arch	Drawn
AK	CR	RT
Job No.	**Date**	**Scale**
150874	APR 16	1:200

Drawing No. — Revision
AR.SK.2001 — **B**

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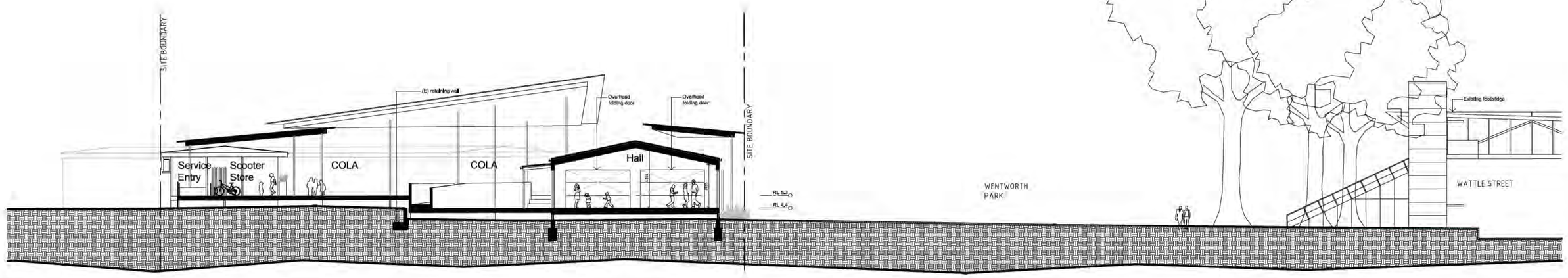
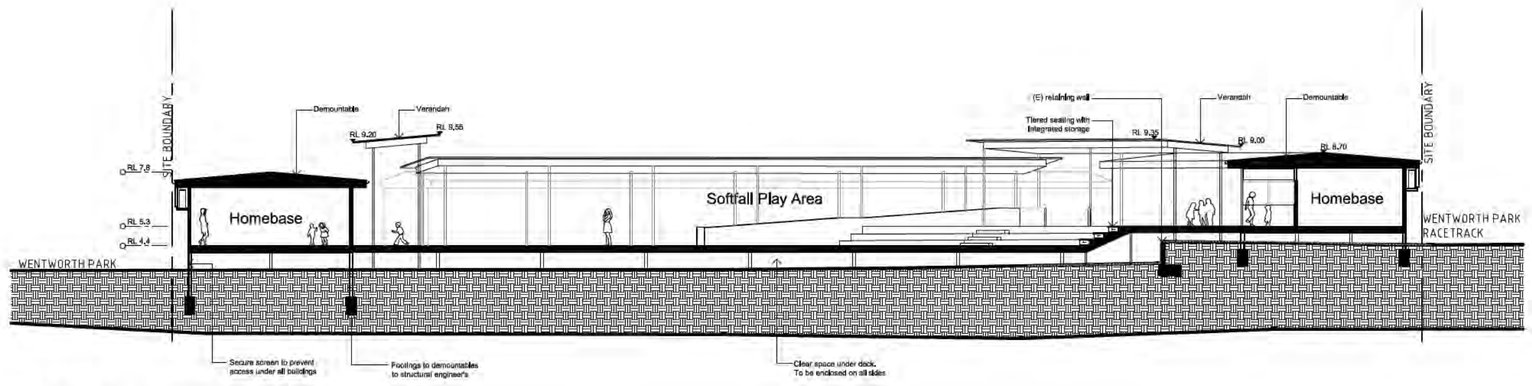
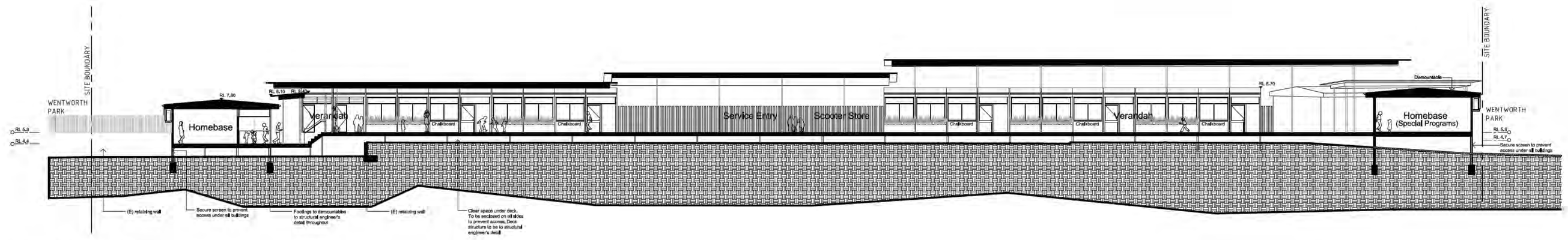


1 SECTION 1
2001 1:200



2 SECTION 2
2001 1:200



3 SECTION 3
2001 1:200

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NSW Nominated Architects: Robert Denton Reg. No. 5782, Alex Kibble Reg. No. 6015
Do not scale drawings. Verify all dimensions on site. Notify architect of all discrepancies
10 20 30 40 50

Rev	Date	Description	Checked	Auth.
A	05.08.16	REF ISSUE	CR	AK
B	22.08.16	ROOF UPDATE	CR	AK
C	30.08.16	TPZ UPDATE	CR	AK

Project
ULTIMO TEMPORARY SCHOOL

Drawing Title
SECTIONS

Proj. Dir	Proj. Arch	Drawn
AK	CR	CR
Job No.	Date	Scale
150874	JUL 16	1:200

Drawing No. — Revision
AR.SK.3101 — **C**

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TKDArchitects
Tanner Kibble Denton

Attachment B Landfill Gas Monitoring Data – Field Sheets

Job No: E29319K
Address: Wentworth Park South
Recorded by: GF
Monitoring Well No: 6
Weather Conditions:
SWL (m): DRY
PID (ppm): 0
Pressure (hPa): 1021

Date: 5/05/2016

EIS

Time	Pressure	CH4 %v/v	CO2 %v/v	O2 %v/v	CH4 %LEL	H2S ppm	CO ppm	DP Pa	Flow Measurements L/H
30 sec	1021	0	14.1	2.1	<	0	0	0	0
1min	-	0	14.3	2.0	<	0	0	0	0
1 min 30 sec	-	0	14.3	1.9	<	0	0	0	0
2 min	-	0	14.3	1.9	<	0	0	0	0
2 min 30 sec	-	0	14.3	1.8	<	0	0	0	0
3 min	-	0	14.3	1.8	<	0	0	0	0
3 min 30 sec	-	0	14.4	1.7	<	0	0	0	0
4min	-	0	14.4	1.7	<	0	0	0	0
4 min 30 sec	-	0	14.4	1.7	<	0	0	0	0
5 min	1021	0	14.4	1.7	<	0	0	0	0

Notes:
Standing Water Level (SWL) is in meters below ground level

Job No: E29319K
Address: Wentworth Park South
Recorded by: GF
Monitoring Well No: 8
Weather Conditions:
SWL (m): PM
PID (ppm): 0
Pressure (hPa): 1020

Date: 5/05/2016

EIS

Time	Pressure	CH4 %v/v	CO2 %v/v	O2 %v/v	CH4 %LEL	H2S ppm	CO ppm	DP Pa	Flow Measurements L/H
30 sec	1021	0	9.0	11.8	<	0	0	0	0
1min	-	0	9.1	11.7	<	0	0	0	0
1 min 30 sec	-	0	9.1	11.7	<	0	0	0	0
2 min	-	0	9.1	11.6	<	0	0	0	0
2 min 30 sec	-	0	9.1	11.6	<	0	0	0	0
3 min	-	0	9.1	11.6	<	0	0	0	0
3 min 30 sec	-	0	9.1	11.6	<	0	0	0	0
4min	-	0	9.1	11.6	<	0	0	0	0
4 min 30 sec	-	0	9.1	11.6	<	0	0	0	0
5 min	1020	0	9.1	11.6	<	0	0	0	0

Notes:
Standing Water Level (SWL) is in meters below ground level

Job No: E29319K
Address: Wentworth Park South
Recorded by: GF
Monitoring Well No: 11
Weather Conditions:
SWL (m): Dry
PID (ppm): 0.2
Pressure (hPa): 1023

Date: 5/05/2016

EIS

Time	Pressure	CH4 %v/v	CO2 %v/v	O2 %v/v	CH4 %LEL	H2S ppm	CO ppm	DP Pa	Flow Measurements L/H
30 sec	1023	0	11.7	3.5	<	0	0	0	0
1min	-	0	11.8	3.4	<	0	0	0	0
1 min 30 sec	-	0	11.8	3.2	<	0	0	0	0
2 min	-	0	11.9	3.1	<	0	0	0	0
2 min 30 sec	-	0	11.9	3.0	<	0	0	0	0
3 min	-	0	12.0	3.0	<	0	0	0	0
3 min 30 sec	-	0	12.0	3.0	<	0	0	0	0
4min	-	0	12.0	3.0	<	0	0	0	0
4 min 30 sec	-	0	12.0	3.0	<	0	0	0	0
5 min	1023							0	0

Notes:
Standing Water Level (SWL) is in meters below ground level

Job No: E29319K
Address: Wentworth Park South
Recorded by: GF
Monitoring Well No: 15
Weather Conditions:
SWL (m): —
PID (ppm): —
Pressure (hPa): 1022

Date: 5/05/2016

EIS

Time	Pressure	CH4 %v/v	CO2 %v/v	O2 %v/v	CH4 %LEL	H2S ppm	CO ppm	DP Pa	Flow Measurements L/H
30 sec	1022	0	8.9	11.0	<	0	0	0	0
1min	-	0	8.7	11.4	<	0	0	0	0
1 min 30 sec	-	0	8.6	11.8	<	0	0	0	0
2 min	-	0	8.5	12.0	<	0	0	0	0
2 min 30 sec	-	0	8.4	12.5	<	0	0	0	0
3 min	-	0	8.2	12.7	<	0	0	0	0
3 min 30 sec	-	0	8.2	12.9	<	0	0	0	0
4min	-	0	8.1	13.1	<	0	0	0	0
4 min 30 sec	-	0	8.1	13.1	<	0	0	0	0
5 min	1022	0	8.1	13.0	<	0	0	0	0

Notes:
Standing Water Level (SWL) is in meters below ground level

Attachment C Soil Vapour Data

SGS LEEDER CONSULTING

A.B.N. 44 000 964 278
3 - 5, 18 Redland Drive
Mitcham, Vic, 3132
Telephone: (03) 9874 1988
Fax: (03) 9874 1933

Chartered Chemists

19-May-2016

REPORT NUMBER: M160871R1
Site/Client Ref: Wentworth Park, Ultimo
Order No: E29319K

Environmental Investigation Services

115 Wicks Road
Macquarie Park

New South Wales 2113
Attention:

CERTIFICATE OF ANALYSIS

This report replaces previous report dated 17-May-2016

SAMPLES:	Five samples were received for analysis
DATE RECEIVED:	**9-May-2016**
DATE COMMENCED:	**9-May-2016**
METHODS:	See Attached Results
RESULTS:	Please refer to attached pages for results.

Note: Results are based on samples as received at SGS Leeder Consulting's laboratories

REPORTED BY:

Senior Chemist

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory Number: 14429

Accredited for compliance with ISO/IEC 17025.

The sampling for the samples in this report was carried out in accordance with SGS Leeder Consulting's NATA accredited sampling methods

ANALYTICAL RESULTS

Matrix: Passive Sampler
Method: MA-5.WL.04 Volatile Organics
Sample units are expressed in µg/m³

Test Started: 12/05/2016

Analyte Name	Sampled Date / PQL	Leeder ID: 2016013284 Client ID: PSV10 1601-AN-LU-052 5/05/2016	Leeder ID: 2016013285 Client ID: PSV13 1601-AN-LU-053 5/05/2016	Leeder ID: 2016013286 Client ID: PSV7 1601-AN-LU-054 5/05/2016	Leeder ID: 2016013287 Client ID: PSV5 1601-AN-LU-055 5/05/2016	Leeder ID: 2016013288 Client ID: PSV5 Field Dup 1601-AN-LU-056 5/05/2016
Benzene		<3.7	<3.7	<3.7	<3.7	<3.7
2-butanone(MEK)		<7.2	<7.2	<7.2	<7.2	<7.2
Carbon tetrachloride		<5.8	<5.8	<5.8	<5.8	<5.8
Chlorobenzene		<2.2	<2.2	<2.2	<2.2	<2.2
Chloroform		<4.6	<4.6	<4.6	<4.6	<4.6
12-Dichlorobenzene		<1.2	<1.2	<1.2	<1.2	<1.2
13-Dichlorobenzene		<1.4	<1.4	<1.4	<1.4	<1.4
14-Dichlorobenzene		<1.3	<1.3	<1.3	<1.3	<1.3
1,1-Dichloroethane		<9.3	<9.3	<9.3	<9.3	<9.3
12-Dichloroethane		<3.7	<3.7	<3.7	<3.7	<3.7
1,1-Dichloroethene		<11	<11	<11	<11	<11
cis-1,2-Dichloroethene		<4.7	<4.7	<4.7	<4.7	<4.7
trans-1,2-Dichloroethene		<4.9	<4.9	<4.9	<4.9	<4.9
Ethylbenzene		3.5	<2.0	<2.0	<2.0	<2.0
Hexane		47	<4.9	9.0	<4.9	5.7
Isopropylbenzene		<0.96	<0.96	<0.96	<0.96	<0.96
Naphthalene		<2.5	<2.5	57	<2.5	<2.5
Tetrachloroethene		<2.2	<2.2	<2.2	<2.2	<2.2
Toluene		11	3.8	13	3.5	3.8
111-Trichloroethane		<7.2	<7.2	<7.2	<7.2	<7.2
112-Trichloroethane		<2.8	<2.8	<2.8	<2.8	<2.8
Trichloroethene		<2.8	<2.8	<2.8	<2.8	<2.8
124-Trimethylbenzene		16	<1.4	2.7	<1.4	<1.4
Vinyl Chloride		<18	<18	<18	<18	<18
o-Xylene		7.4	<2.1	3.2	<2.1	<2.1
m&p-Xylenes		15	<2.1	5.6	<2.1	<2.1
Dichlorodifluoromethane		<49	<49	<49	<49	<49
Trichlorofluoromethane		<18	<18	<18	<18	<18
124-Trichlorobenzene		<2.0	<2.0	<2.0	<2.0	<2.0
123-Trichlorobenzene		<1.2	<1.2	<1.2	<1.2	<1.2
Halothane		<17	<17	<17	<17	<17

ANALYTICAL RESULTS

Matrix: Passive Sampler
Method: MA-5.WL.03 Volatile Organics
Sample units are expressed in µg total

Test Started: 12/05/2016

Analyte Name	Leeder ID / Client ID / Sampled Date / PQL	2016013289 Method Blank
Benzene	0.05	nd
2-butanone(MEK)	0.05	nd
Carbon tetrachloride	0.05	nd
Chlorobenzene	0.05	nd
Chloroform	0.05	nd
12-Dichlorobenzene	0.05	nd
13-Dichlorobenzene	0.05	nd
14-Dichlorobenzene	0.05	nd
1,1-Dichloroethane	0.05	nd
12-Dichloroethane	0.05	nd
1,1-Dichloroethene	0.05	nd
cis-1,2-Dichloroethene	0.05	nd
trans-1,2-Dichloroethene	0.05	nd
Ethylbenzene	0.05	nd
Hexane	0.05	nd
Isopropylbenzene	0.05	nd
Naphthalene	0.05	nd
Tetrachloroethene	0.05	nd
Toluene	0.05	nd
111-Trichloroethane	0.05	nd
112-Trichloroethane	0.05	nd
Trichloroethene	0.05	nd
124-Trimethylbenzene	0.05	nd
Vinyl Chloride	0.05	nd
o-Xylene	0.05	nd
m&p-Xylenes	0.05	nd
Dichlorodifluoromethane	0.05	nd
Trichlorofluoromethane	0.05	nd
124-Trichlorobenzene	0.05	nd
123-Trichlorobenzene	0.05	nd
Halothane	0.05	nd

ANALYTICAL RESULTS

Matrix: Passive Sampler
Method: MA-30.AIR.04 Total Recoverable Hydrocarbons
Sample units are expressed in mg/m³ Test Started: 12/05/2016

Analyte Name	Sampled Date / PQL	Leeder ID: 2016013284 Client ID: PSV10 1601-AN-LU-052 Sampled Date: 5/05/2016	Leeder ID: 2016013285 Client ID: PSV13 1601-AN-LU-053 Sampled Date: 5/05/2016	Leeder ID: 2016013286 Client ID: PSV7 1601-AN-LU-054 Sampled Date: 5/05/2016	Leeder ID: 2016013287 Client ID: PSV5 1601-AN-LU-055 Sampled Date: 5/05/2016
C6-C10 (ex BTEX)		2.8	<0.5	1.3	<0.5
>C10-C16 (less Naphthalene)		12	8.9	18	1.7

Matrix: Passive Sampler
Method: MA-30.AIR.03 Total Recoverable Hydrocarbons
Sample units are expressed in µg total Test Started: 12/05/2016

Analyte Name	Sampled Date / PQL	Leeder ID: 2016013289 Client ID: Method Blank
C6-C10 (ex BTEX)	5	nd
>C10-C16 (less Naphthalene)	5	nd

QA/QC RESULTS

Matrix: Passive Sampler
Method: MA-5.WL.03 Volatile Organics
Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 12/05/2016

Analyte Name	Leeder ID / Client ID / Sampled Date / PQL	2016013290 Method Spike	2016013291 Method Spike Dup
Benzene		99	101
Chlorobenzene		98	97
12-Dichlorobenzene		100	102
13-Dichlorobenzene		105	105
14-Dichlorobenzene		96	100
Ethylbenzene		97	97
Toluene		99	97
o-Xylene		98	99
m&p-Xylenes		99	99

QUALIFIERS / NOTES FOR REPORTED RESULTS

PQL	Practical Quantitation Limit
nd	Not Detected – The analyte was not detected above the reported PQL.
is	Insufficient Sample to perform this analysis.
T	Tentative identification based on computer library search of mass spectra.
NC	Not calculated and/or Results below PQL
NV	No Vacuum, Canister received above standard atmospheric pressure
nr	Not Requested for analysis.
R	Rejected Result – results for this analysis failed QC checks.
SQ	Semi-Quantitative result – quantitation based on a generic response factor for this class of analyte.
IM	Inappropriate method of analysis for this compound
U	Unable to provide Quality Control data – high levels of compounds in sample interfered with analysis of QC results.
UF	Unable to provide Quality Control data- Surrogates failed QC checks due to sample matrix effects
L	Analyte detected at a level above the linear response of calibration curve.
E	Estimated result. NATA accreditation does not cover estimated results.
C1	These compounds co-elute.
--	Parameter Not Determined
CT	Elevated concentration. Results reported from carbon tube analysis
**	Sample shows non-petroleum hydrocarbon profile

APPENDIX ONE.

CHAIN OF CUSTODY DOCUMENT

Passive Sample Collection

Unit 4, 18 Redland Drive
Mitcham VIC 3132
Ph: (03) 9874 1988 Fax: (03) 9874 1933

SGS LEEDER CONSULTING

Email report to:

Project Manager:
Sampled by: (Print and Sign)
Company EIS (JK Group)
Address City Macquarie Park
State NSW Post Code
Phone: Fax:
ABN:

Project Info
Purchase Order Number:
Suburb & State: Wentworth Park
Project Number: M160871
Project Name: Wentworth Park

Turn Around Time
Normal: ✓
Rapid:
(surcharges apply)
Specify: (days)

Lab ID	Field Sample I.D. (Location)	Sampler I.D (WMS Code)	Date of Deployment	Time of Deployment	Date of Retrieval	Time of Retrieval	Analysis Required	Indoor Air	Outdoor Air	Workplace Monitoring	Other (SILICA)
	PSV 10	160-AN-LU-052	21/4/16	10:55	5/5/16	07:44	VOC's				
	PSV 13	053	"	11:07	"	07:51	"				
	PSV 7	054	"	11:28	"	07:57	"				
	PSV 5	055	"	11:40	"	08:03	"				
	PSV 5 Dup	056	"	11:52	"	08:03	"				

Relinquished By: Name, Signature, Date/Time

Relinquished By: Name, Signature, Date/Time

Relinquished By: Name, Signature, Date/Time

Received by: Name, Signature, Date/Time

Received by: Name, Signature, Date/Time

Received by: Name, Signature, Date/Time

Air Temp and Weather Description: ~20°-26° Ambient Daily

Notes: Dry holes at all locations, good seals.

Attachment D Soil Data

TABLE A
SOIL LABORATORY RESULTS COMPARED TO HILs
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium VI [2]	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P TEQ [3]	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC) [1]			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	160	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH1	0.1-0.2	Fill: silty sandy clay	5	LPQL	10	29	100	0.2	3	140	8.6	1.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH2	0.1-0.2	Fill: sand	LPQL	LPQL	7	44	31	LPQL	8	41	1.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH3	0.1-0.2	Fill: sand	LPQL	9	10	48	100	0.1	12	150	3.3	0.5	LPQL	LPQL	LPQL	0.2	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH4	0.2-0.3	Fill: gravelly sand	LPQL	LPQL	6	22	10	LPQL	13	16	0.9	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	1.8	LPQL	LPQL	LPQL	Not Detected
BH5	0.0-0.2	Fill: sandy silty clay	LPQL	LPQL	9	28	57	0.1	10	66	1.4	0.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH5	0.7-1.0	Fill: silty sandy clay	6	LPQL	11	120	230	0.8	7	210	30	**4.5**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH6	0.0-0.2	Fill: sandy silty clay	6	LPQL	10	54	140	0.5	6	130	22	**3.3**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH7	0.0-0.2	Fill: sandy clay	5	LPQL	10	41	160	0.4	6	140	39	**4.5**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH8	0.0-0.2	Fill: sandy clay	5	0.5	11	50	190	0.4	8	160	12	1.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH8	0.5-0.7	Fill: gravelly sandy clay	6	1	11	220	180	0.8	17	460	46	**7.5**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH9	0.0-0.2	Fill: sandy clay	11	0.4	10	100	**310**	0.7	9	580	32	**4.9**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH10	0.25-0.5	Fill: sandy clay	6	LPQL	14	97	260	0.6	12	350	57	**8.2**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH10-Replicate	0.25-0.5	Fill: sandy clay	5	LPQL	14	170	**1600**	0.7	10	310	45	**6.1**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH11	0.05-0.3	Fill: sandy gravel	LPQL	LPQL	8	46	110	0.2	17	79	10	1.4	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH12	0.25-0.5	Fill: silty clay	10	LPQL	17	31	200	0.7	4	110	130	**18**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH13	0.0-0.2	Fill: gravelly sandy clay	LPQL	LPQL	9	23	18	LPQL	7	45	4.4	0.7	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH14	0.0-0.2	Fill: clayey silty sand	LPQL	LPQL	7	24	110	0.2	4	120	24	2.9	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH15	0.0-0.2	Fill: gravelly silty sand	4	LPQL	10	48	100	0.3	19	160	57	**4.9**	LPQL	LPQL	LPQL	0.7	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH15	0.5-0.8	Fill: sandy clay	7	0.4	12	110	230	0.8	10	150	16	2.2	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
Total Number of Samples			19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	18
Maximum Value			11	9	17	220	1600	0.8	19	580	130	18	LPQL	LPQL	LPQL	0.7	LPQL	1.8	LPQL	LPQL	LPQL	NC

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013, HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

2 - The results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.

3 - B(a)P TEQ - Benzo(a)pyrene Toxicity Equivalence Quotient has been calculated based on 8 carcinogenic PAHs and their Toxic Equivalence Factors (TEFs) outlined in NEPM 2013

Replicate - Laboratory replicate results have been adopted for anolytes with results above the SAC. Please see Envirolab Report 145327 for explannation

Concentration above the SAC **VALUE**

Abbreviations:

PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL
OPP: Organophosphorus Pesticides
OCP: Organochlorine Pesticides
PCBs: Polychlorinated Biphenyls
UCL: Upper Level Confidence Limit on Mean Value
HILs: Health Investigation Levels
NA: Not Analysed
NC: Not Calculated
NSL: No Set Limit
SAC: Site Assessment Criteria
NEPM: National Environmental Protection Measure

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

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID [2]
PQL - Envirolab Services					25	50	0.2	0.5	1	3	1	
HSL Land Use Category [1]					RESIDENTIAL WITH ACCESSIBLE SOIL							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH1	0.1-0.2	Fill: silty sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH2	0.1-0.2	Fill: sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH3	0.1-0.2	Fill: sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH4	0.2-0.3	Fill: gravelly sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH5	0.0-0.2	Fill: sandy silty clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH5	0.7-1.0	Fill: silty sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH6	0.0-0.2	Fill: sandy silty clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH7	0.0-0.2	Fill: sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH8	0.0-0.2	Fill: sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH8	0.5-0.7	Fill: gravelly sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH9	0.0-0.2	Fill: sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH10	0.25-0.5	Fill: sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH11	0.05-0.3	Fill: sandy gravel	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH12	0.25-0.5	Fill: silty clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH13	0.0-0.2	Fill: gravelly sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH14	0.0-0.2	Fill: clayey silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH15	0.0-0.2	Fill: gravelly silty sand	0m to < 1m	Sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
BH15	0.5-0.8	Fill: sandy clay	0m to < 1m	Clay	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0
Total Number of Samples					18	18	18	18	18	18	18	18
Maximum Value					LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	0

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013

2 - Field PID values obtained during the investigation

Concentration above the SAC **VALUE**

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

Abbreviations:

UCL: Upper Level Confidence Limit on Mean Value	NC: Not Calculated	PQL: Practical Quantitation Limit
HSLs: Health Screening Levels	NL: Not Limiting	LPQL: Less than PQL
NA: Not Analysed	SAC: Site Assessment Criteria	NEPM: National Environmental Protection Measure

SITE ASSESSMENT CRITERIA

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services					25	50	0.2	0.5	1	3	1
HSL Land Use Category [1]					RESIDENTIAL WITH ACCESSIBLE SOIL						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
BH1	0.1-0.2	Fill: silty sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH2	0.1-0.2	Fill: sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH3	0.1-0.2	Fill: sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH4	0.2-0.3	Fill: gravelly sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH5	0.0-0.2	Fill: sandy silty clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH5	0.7-1.0	Fill: silty sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH6	0.0-0.2	Fill: sandy silty clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH7	0.0-0.2	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH8	0.0-0.2	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH8	0.5-0.7	Fill: gravelly sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH9	0.0-0.2	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH10	0.25-0.5	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH11	0.05-0.3	Fill: sandy gravel	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH12	0.25-0.5	Fill: silty clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH13	0.0-0.2	Fill: gravelly sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH14	0.0-0.2	Fill: clayey silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH15	0.0-0.2	Fill: gravelly silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH15	0.5-0.8	Fill: sandy clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5

TABLE A
SOIL LABORATORY RESULTS COMPARED TO HILs
All data in mg/kg unless stated otherwise

				PAHs		
			Lead	Total PAHs	B(a)P TEQ [2]	ASBESTOS FIBRES
PQL - Envirolab Services			1	-	0.5	100
Site Assessment Criteria (SAC) [1]			300	300	3	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**				
SL101	0.0-0.05	Fill - Silty sandy clay	38	0.06	LPQL	Not Detected
SL102	0.0-0.05	Fill - Silty sandy clay	82	0.52	LPQL	Not Detected
SL103	0.0-0.05	Fill - Silty sandy clay	170	5	0.7	Not Detected
SL104	0.0-0.05	Fill - Silty sandy clay	140	1.8	LPQL	Not Detected
SL105	0.0-0.05	Fill - Silty sandy clay	150	5.2	0.7	Not Detected
SL106	0.0-0.05	Fill - Silty sandy clay	230	7.4	1.1	Not Detected
SL107	0.0-0.05	Fill - Silty sandy clay	9	0.14	LPQL	Not Detected
SL108	0.0-0.05	Fill - Silty sandy clay	290	38	**6.1**	Not Detected
SL109	0.0-0.05	Fill - Silty sandy clay	180	17	2.2	Not Detected
SL110	0.0-0.05	Fill - Silty sandy clay	190	12	1.8	Not Detected
SL111	0.0-0.05	Fill - Silty sandy clay	130	4.4	0.6	Not Detected
SL112	0.0-0.05	Fill - Silty sandy clay	150	6.4	1.1	Not Detected
SL113	0.0-0.05	Fill - Silty sandy clay	120	4.5	0.7	Not Detected
SL114	0.0-0.05	Fill - Silty sandy clay	200	8.2	1.3	Not Detected
SL115	0.0-0.05	Fill - Silty sandy clay	120	4.9	0.8	Not Detected
SL116	0.0-0.05	Fill - Silty sandy clay	180	12	2	Not Detected
SL117	0.0-0.05	Fill - Silty sandy clay	200	19	**3.1**	Not Detected
SL118	0.0-0.05	Fill - Silty sandy clay	110	4.9	0.8	Not Detected
SL119	0.0-0.05	Fill - Silty sandy clay	92	2.4	LPQL	Not Detected
Total Number of Samples			19	19	19	19
Maximum Value			290	38	6.1	NC
Statistical Analysis on Fill Samples						
Number of Fill Samples [4]			NC	NC	19	NC
Mean Value [4]			NC	NC	1.64	NC
Standard Deviation [4]			NC	NC	1.48	NC
% UCL [4]			NC	NC	95	NC
UCL Value [4]			NC	NC	2.5	NC

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013, HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

2 - B(a)P TEQ - Benzo(a)pyrene Toxicity Equivalence Quotient has been calculated based on 8 carcinogenic PAHs and their Toxic Equivalence Factors (TEFs) outlined in NEPM 2013

3 - Statistical calculation undertaken using ProUCL version 5.0 (USEPA). Statistical calculation has only been undertaken using data from fill samples

Concentration above the SAC VALUE

Standard deviation exceeds data assessment criteria VALUE

Abbreviations:

PAHs: Polycyclic Aromatic Hydrocarbons

B(a)P: Benzo(a)pyrene

PQL: Practical Quantitation Limit

LPQL: Less than PQL

Attachment E Revised Criteria for BaP TEQ: Primary School

Derivation of Investigation Levels
HIL - Revised for Primary School Exposures

Summary of Exposure Parameters		Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate	- Young children (0-5 years)	IR_{SC}	mg/day	100	Schedule B7, Table 5
Surface Area of Skin	- Young children (0-5 years)	SA_C	cm^2/day	2700	Schedule B7, Table 5
Soil to Skin Adherence Factor		AF	mg/cm^2/day	0 5	Schedule B7 Table 5
Time Spent Outdoors		ETo	hours	4	Schedule B7 Table 5
Time Spent Indoors		ETi	hours	20	Schedule B7 Table 5
Lung Retention Factor		RF	-	0.375	Schedule B7 Table 5
Particulate Emission Factor		PEFo	(m^3/kg)	2.9E+10	Calculated for scenario refer to Equations 19 and 20 and assumptions in Schedule B7
Indoor Air Dust Factor		PEFi	(m^3/kg)	2.6E+07	As per Equation 21 based assumptions presented in Schedule B7
Fraction of indoor dust comprised of outdoor soil		TF	-	0 5	Assume 50% soil concentration present in dust as noted in Schedule B7
Body weight	- Young children (0-5 years)	BW_C	kg	24.2	Mean body weight of child aged 4-7 years, enHealth 2012
	- Adults	BW_A	kg	70	Schedule B7, Table 5
Exposure Frequency		EF	days/year	200	Number of days attending primary school
Exposure Duration	- Young children (0-5 years)	ED_C	years	4	Duration of time at temporary school (conservative maximum)
Averaging Time (noncarcinogenic)		AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)		AT_{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Non-Threshold Effects - Lifetime Exposures [young child and adult]

Compound	Toxicity Reference Value Oral (TRV_O) ($mg/kg/day)^{-1}$	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SFd) ($mg/kg/day)^{-1}$	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV_I) ($mg/m^3)^{-1}$		Target Risk (TR)	Plant Uptake Factor (incl % intake) Adults (kg/day) (eqn 16)	Plant Uptake Factor (incl % intake) Children (kg/day) (eqn 16)	Pathway Specific HILs (mg/kg)				Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
												Soil Ingestion (eqns 4 and 5)	Home grown produce (eqns 17 and 18)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)			
benzo(a)pyrene	0 5	1	0 5	100%	0.06		1.43E-01		1E-05			5 2E+01		6.4E+01	1 2E+05	28.5	30	