

KELVINATOR AUSTRALIA PTY LIMITED

# Testing Trichloroethene in Ambient Air Lighting Showroom 29 Anzac Highway, Keswick South Australia



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Kelvinator Australia Pty Limited

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# EXECUTIVE SUMMARY

In January 2016, Kelvinator Australia Pty Limited (Kelvinator) engaged Parsons Brinckerhoff Australia Pty Limited (WSP | Parsons Brinckerhoff) to undertake testing of trichloroethene (TCE) in ambient air at and in the vicinity of a retail lighting showroom located on the corner of Anzac Highway and Everard Avenue, Keswick, South Australia. This report presents the findings of those investigations carried out in February and March 2016.

## INVESTIGATION OBJECTIVES

The objective of the air testing was to assess whether the possible intrusion of TCE, and possibly other compounds from sub-floor soil vapours, were causing an unacceptable health risk to commercial workers in the lighting showroom.

## BACKGROUND

WSP | Parsons Brinckerhoff understands that Kelvinator owned or operated a number of manufacturing facilities along Everard Avenue, Keswick. Kelvinator is currently not the owner or operator, nor tenant of any of the properties. Kelvinator sold the properties in or around 1985. At the time of the air testing the property on which the lighting showroom was located was owned by On The Run, part of the Peregrine Corporation. The lighting showroom formed the north-eastern section of one of the former industrial sites. Earlier investigations of the former industrial sites identified localised soil source areas of TCE beneath the building floors. The lighting showroom had not been part of the previous investigations.

## SCOPE OF WORK

Ambient air concentrations of volatile organic compounds (VOCs) were measured at five locations, three inside the showroom and two immediately outside. Measured concentrations were used to determine whether there was a health risk from VOCs (principally TCE) for commercial workers in the showroom.

## METHODS

Ambient air was sampled using Radiello code 130 solvent desorption tubes. The sorption tubes consist of activated carbon housed in a cylindrical steel gauze. The Radiello tubes were designed for passive sampling of volatile organics in ambient air. Sampling tubes were collected after 17 days and laboratory analysed by GC|MS to provide concentrations of VOCs averaged over the 17 day deployment period.

Analysis of the passive samplers was performed by solvent desorption and gas chromatography/mass spectrometry (GC-MS).

## RESULTS

All three locations within the showroom showed concentrations of TCE considerably greater than outdoor air concentrations indicating a source of TCE vapours beneath the showroom floor. One of the three locations tested showed noticeably high concentrations similar in magnitude to guidance values listed in the US EPA's IRIS data base which are provided as a basis for evaluating human health risks from inhalation of toxic vapours. However, when the measured concentrations were factored to account for standard worker exposure times, the adjusted concentrations did not represent an unacceptable risk.

## CONCLUSION

These calculations show that there was no indication of an unacceptable health risk from the vapour intrusion pathway into the lighting showroom. Nevertheless, the presence of sub-slab TCE vapours

would need to be considered and further investigated if the site were to be redeveloped. Such action is necessary because redevelopment may change the degree of vapour entry into a building built on the site.

# 1 INTRODUCTION

## 1.1 Purpose of this report

In January 2016, Kelvinator Australia Pty Limited (Kelvinator) engaged Parsons Brinckerhoff Australia Pty Limited (WSP | Parsons Brinckerhoff) to undertake testing of trichloroethene in ambient air at and in the vicinity of a retail lighting showroom located on the corner of Anzac Highway and Everard Avenue, Keswick, South Australia.

This report presents the findings of the investigations carried out in February and March 2016.

## 1.2 Background information

WSP | Parsons Brinckerhoff understands that Kelvinator owned or operated a number of manufacturing facilities along Everard Avenue, Keswick. Figure 1 shows the location of the former Kelvinator manufacturing sites, approximately 3 km south-west of the Adelaide CBD. Three former Kelvinator sites along Everard Avenue, Keswick have been designated K1, K2 and K3. Kelvinator sold the properties in or around 1985 and is currently not the owner or operator, nor tenant of any of the properties.

The present investigation comprised vapour investigations in a retail lighting showroom which forms the north-eastern section of the K2 site. At the time of the air testing the property was owned by On The Run, part of the Peregrine Corporation.

Earlier investigations of groundwater and soil vapour impacts on the K2 site, but not the area of the site occupied by the lighting showroom, were carried out by Mott MacDonald during February to May 2014 for the land owner at that time, Le Cornu Contractors Pty Ltd (Mott MacDonald, 8 August 2014). Results identified elevated concentrations of TCE in soil vapour and low concentrations in groundwater. To expand on the investigations on the K2 site, WSP | Parsons Brinckerhoff undertook further investigations of groundwater and soil vapour for Kelvinator. Those additional investigations, undertaken in August 2015, identified some localised soil source areas of TCE beneath the warehouse floor of the K2 site buildings (Parsons Brinckerhoff 30 September 2015).

Following the soil and groundwater investigations in the greater portion of the K2 site, potential impacts by trichloroethene (TCE) and other chlorinated volatile organic compounds (VOCs), remained unassessed in the north-eastern part of the K2 site, now occupied by a lighting showroom.

## 1.3 Objectives of the air testing

The overriding objective of the air testing in and around the lighting showroom was to provide an evaluation of whether TCE and other chlorinated VOCs that had been found in soil vapour and groundwater beneath the K2 warehouse buildings, were affecting the lighting showroom. That evaluation was carried out by ambient air sampling within the lighting showroom and immediately outside the building.

The evaluation included a health risk assessment, for commercial workers in the lighting showroom, relating to TCE and other chlorinated VOCs in the air of the showroom.

### 1.3.1 Contaminants of interest

Based on the findings of the investigations in the adjoining buildings of the K2 site (referenced above), the contaminants that may be present in the ambient air of the lighting showroom, that may originate from site contamination, were trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-1,2-DCE),

vinyl chloride, chloroform and carbon tetrachloride. These chemicals of interest were part of a suite of volatile organic compounds used in this and other investigations of the K1, K2 and K3 former industrial sites.

The chemical analysis suite can be found in the laboratory reports attached as Appendix A. The analytical suite also contains many compounds that may not be associated with the site. The additional analytes have been retained in the analytical suite because it is a standard analytical suite and because they may assist in the interpretation of the data.

## 1.4 Site information

The lighting showroom is a sectioned off portion of a former industrial building, understood to be part of the former Kelvinator manufacturing facilities operating prior to 1985 (approximately). The retail showroom is located along the north and north-eastern section of the former manufacturing building. Showroom entrance is at the corner of Anzac Highway and Everard Avenue, Keswick (see Figure 2 and Figure 3).

The lighting showroom has been fitted out internally for display and sale of lights. A northern section of the lighting facility serves as a storeroom.

## 1.5 Scope of works

Three ambient air environmental sampling tubes were deployed within the lighting showroom and two deployed outside the showroom building under the shop's awning. Sampling tubes were collected after 17 days and laboratory analysed by GC|MS to provide concentrations of VOCs averaged over the 17 day deployment period.

Measured concentrations were used to determine whether there was a health risk from VOCs (principally TCE) for commercial workers in the showroom.

## 2 SAMPLING PLAN

### 2.1 Rationale

Earlier investigations of VOCs in the former industrial building on the K2 site (see Figure 2) had found sub-floor concentrations of TCE at levels exceeding interim soil vapour health investigation levels published in NEPM 2013. It was considered possible that VOC impacts may have extended beneath the floor of the building now occupied by the lighting showroom.

The guidance criteria provide a screening level assessment such that if the criteria values are exceeded some further assessment of the potential risks are needed. One such further assessment method is to measure the indoor air concentrations of the compounds of interest since ambient air represents the end of the exposure pathway. In the case of the lighting showroom it was understood that TCE was not used or stored in the showroom. Thus, any TCE in the ambient air of the showroom was sourced from the sub-floor vapours or from outside ambient air.

### 2.2 Methods

Ambient air was sampled using Radiello code 130 solvent desorption tubes. The sorption tubes consist of activated carbon housed in a cylindrical steel gauze. The Radiello tubes were designed for the sampling of volatile organics in ambient air.

Sampling tubes located outside the building were placed within cassette holders and suspended under the awnings of the building outside the showroom, out of reach of the public. Sampling tubes inside the building were clipped to frames or placed on ledges or platforms.

Length of deployment period for ambient air sampling is not critical and for ambient air sampling is normally conducted over periods of days or weeks. Providing the tubes remain dry (sheltered from rain), the length of exposure is not crucial to effective sampling. For the investigations at the lighting showroom the ambient air sampling tubes were deployed for a period of 17 days.

At the completion of the sampling period, the sorption tubes were recovered from the Radiello cassette holders and placed into dedicated glass vials for transport to the analytical laboratory. Analysis of the passive samplers was performed by solvent desorption and gas chromatography/mass spectrometry (GC-MS). Detection limits are typically around 0.05 µg/tube which equates to about 0.03 µg/m<sup>3</sup> or less for the 17 day deployment times.

### 2.3 Data quality planning

Schedule B2 of the NEPM 2013, recommends that a systematic planning process is used for defining the objectives of the assessment and the sampling plan that can meet those objectives. The NEPM 2013 states:

“In its simplest form, the planning process should consider:

- the overall objective of the site assessment
- the decision(s) to be made on the basis of the site assessment findings
- the constraints on the assessment (financial, time and logistical) and
- the degree of flexibility to conduct follow-up investigations.”



The intent of the above planning process is to identify the methodologies needed to undertake measurements that are achievable and collect data that are adequate to meet the study objectives. A second aspect of data quality control is the process of assuring the quality of the data collected which in turn involves the controls on how samples are collected. A third aspect is the means by which the reliability of the analytical results is quantified.

### 2.3.1 Planning process

With regard to controls on project quality planning and design, the following comments are relevant.

The overall and principal objective of the air sampling undertaken in February and March 2016 by WSP | Parsons Brinckerhoff at lighting showroom on the K2 site, was to assess whether any health risk exists for commercial workers in the showroom, based on measurements of VOCs in the ambient air. The critical planning step was to select a methodology that was sufficient to accurately characterise the prevailing air concentrations of VOCs such that an exposure dose of possible VOCs could be estimated accurately.

With regard to the decisions to be made on the basis of the findings, the results may assist in any considerations of possible further work or in any control measures if unacceptable risks were indicated by the data.

### 2.3.2 Data quality control – field and laboratory

#### Ambient air measurements

Field data quality control for passive ambient air sampling tubes is a relatively simple process that involves:

- proper handling of the sampling tubes to avoid contaminating the tubes during deployment and collection from the sampling positions, and avoiding any exposure of the sampling tubes to contaminants other than during the deployment within the chambers. This process is easily achieved by the use of clean nitrile gloves when handling the tubes and avoiding any contact of the tubes by hand.
- taking duplicate samples at at least one location to provide a measurement of the precision of the measurements. For the current investigation duplicate tubes were taken at one indoor location. There are no Australian reference guidelines for the acceptable degree of difference (as measured as relative percent difference (RPD)) for air contaminant measurements. Acceptability of an RPD value is dependent on measured mass, relative to the detection limit. Generally, where the measured mass is more than one order of magnitude greater than the detection limit, RPDs within 100% are acceptable.

These actions to ensure the quality of the field samples are not difficult to achieve and certainty in their achievement is easy to verify at the time of the field sampling.

Laboratory quality control can be evaluated by the results from method blank testing and from recoveries from spiked samples. For the current investigation the analytical laboratory undertook one method blank analysis and one method spike analysis – conducted in duplicate.

### 3 REFERENCE GUIDANCE FOR CONTAMINANTS

There are no published Australian reference values for indoor ambient air concentrations of chlorinated VOCs other than reference concentrations published by the NSW Department of Environment, Climate Change and Water in the document *Vapour Intrusion: Technical Practice Note*, September 2010. The document lists a reference concentration for TCE of  $23 \mu\text{g}/\text{m}^3$ . The value is referenced as being sourced from WHO 2000 and is derived from a  $1 \times 10^{-5}$  risk level and a carcinogen unit risk of  $4.3 \times 10^{-7}$  per  $\mu\text{g}/\text{m}^3$ . Although not discussed in the reference document, the value of  $23 \mu\text{g}/\text{m}^3$  listed for acceptable ambient air, applies to a 24 hour per day exposure for a person's lifetime. Without adjustment for a typical commercial worker's period of exposure, this value is highly conservative.

In more recent times the US EPA has listed in its IRIS data base a reference dose for TCE of  $2 \mu\text{g}/\text{m}^3$  and a Unit Risk of  $4.1 \times 10^{-6}$ . Using an acceptable risk level of  $10^{-5}$  (one extra cancer per 100,000 people), the Unit Risk equates to an acceptable air concentration of  $2.4 \mu\text{g}/\text{m}^3$ . These numbers are 10 times lower than those derived from the WHO criterion. It should be noted that the ambient air concentrations listed in, or derived from the WHO and US EPA criteria need to be factored for receptor exposure, which, for the commercial worker's exposure is a factor of 0.08 for carcinogens and 0.22 for non-carcinogens.

Occupational hygiene air exposure limits do not apply for commercial workers who are not working with the chemicals of interest.

# 4 AIR SAMPLING RESULTS AND DISCUSSION

## 4.1 Fieldworks

Ambient air sampling tubes, Radiello solvent desorption tubes, code 130, were deployed on 16 February 2016 and collected for laboratory analysis on 4 March 2016, resulting in a sampling period of 17 days. The Radiello tubes were clipped to walls or structural posts within the showroom at heights of approximately 2 m. Outdoor samples, placed under the awnings above the street footpaths, were placed at heights of approximately 3 m to keep the tubes out of reach of the public.

## 4.2 Air testing results

Sampling locations of the three indoor and two outdoor ambient air test points are shown in Figure 3. Concentrations of TCE, the principal compound of interest, is also shown on the figure. A summary of results for all the contaminants of interest is presented in Table 4.1. A full listing of analytical results is provided in the laboratory report in Appendix A

**Table 4.1** Ambient air concentrations in the lighting showroom and outdoor air, 29 Anzac Highway, Keswick. Sample units are expressed in  $\mu\text{g}/\text{m}^3$

Analyte	Light Shop AA1 (inside)	Light Shop AA2 (inside)	Light Shop AA2 (inside) duplicate	Light Shop AA3 (inside)	Light Shop AA4 (outside)	Light Shop AA5 (outside)
Trichloroethene (TCE)	0.93	2.2	2.1	0.34	0.05	0.07
Tetrachloroethene (PCE)	0.17	0.16	0.14	0.17	0.24	0.21
Carbon tetrachloride	0.47	0.47	0.45	0.44	0.51	0.50
Tricloromethane (chloroform)	0.52	0.18	0.14	0.13	0.10	0.11

Note: results for duplicate sample AA2 have been highlighted in the table.

Concentrations of TCE were higher in the indoor air samples than in outdoor samples by a considerable factor – approximately 30 times greater in the case of indoor location AA2. This result indicates an indoor source of TCE. The source was assumed to be the intrusion of sub-floor vapours into the showroom. The indoor air concentrations varied substantially between locations indicating that the source of sub-floor vapours was localised – near to location AA2. The significance of the measured TCE concentrations in terms of health risk is discussed in section 4.4, Risk Evaluation.

The pattern of PCE, showing approximately equal concentrations inside and outside, indicates that the PCE detections were a result of local background concentrations with no notable contribution from the sub-floor vapours.

Carbon tetrachloride is ubiquitous throughout the atmosphere and its occurrence in the indoor air of the lighting showroom is a consequence of the background air concentrations. Chloroform is associated with carbon tetrachloride, as it is derived from the latter. Its occurrence in the indoor air of the showroom is likely

to be due to natural background levels, although the cause of slightly elevated concentration in AA1 is unknown. Nevertheless, the concentration is low and of no consequence.

### 4.3 Quality assurance evaluation

One of the ambient air samples was duplicated by placing two sample tubes in close proximity (See Photograph 4). Results of the relative percent differences for each analyte measured above its detection limit, are shown in Table 4.2. As is usual for this form of sampling, using Radiello Code 130 tubes, the RPDs were all very low for compounds where the measured concentrations were above trace levels (nominally 0.1  $\mu\text{g}/\text{m}^3$  or greater). The highest RPD for non-trace levels was 25% (trichloromethane). For the contaminant of greatest interest, TCE, the RPD was very low at 5%.

The laboratory performed a method blank and found no detection of any compound on the analyte list and performed one spike recovery (for BTEX) in duplicate. Recoveries varies over a very narrow range of 96% to 104%.

**Table 4.2. Relative per cent differences (RPDs) for VOCs at location AA2 in the lighting showroom**

COMPOUND	UNITS	LIGHT SHOP AA 2	LIGHT SHOP AA 2 DUP	RPD (%)
Benzene	$\mu\text{g}/\text{m}^3$	0.62	0.57	8%
2-butanone(MEK)	$\mu\text{g}/\text{m}^3$	0.19	0.18	5%
n-Butylbenzene	$\mu\text{g}/\text{m}^3$	0.08	0.05	46%
Carbon tetrachloride	$\mu\text{g}/\text{m}^3$	0.47	0.45	4%
Chloroethane	$\mu\text{g}/\text{m}^3$	<0.02	<0.02	-
Chloromethane	$\mu\text{g}/\text{m}^3$	<0.02	<0.02	-
Cyclohexane	$\mu\text{g}/\text{m}^3$	0.4	0.38	5%
n-Decane	$\mu\text{g}/\text{m}^3$	<0.05	<0.05	-
Dibromochloromethane	$\mu\text{g}/\text{m}^3$	<0.03	<0.03	-
1,2-Dibromoethane	$\mu\text{g}/\text{m}^3$	<0.03	<0.03	-
Dichlorodifluoromethane	$\mu\text{g}/\text{m}^3$	<0.02	<0.02	-
1,1-Dichloroethane	$\mu\text{g}/\text{m}^3$	<0.02	<0.02	-
1,2-Dichloroethane	$\mu\text{g}/\text{m}^3$	0.7	0.66	6%
1,1-Dichloroethene	$\mu\text{g}/\text{m}^3$	<0.02	<0.02	-
cis-1,2-Dichloroethene	$\mu\text{g}/\text{m}^3$	<0.02	<0.02	-
trans-1,2-Dichloroethene	$\mu\text{g}/\text{m}^3$	<0.02	<0.02	-
2,4-dimethylpentane	$\mu\text{g}/\text{m}^3$	0.06	0.06	0%
n-Dodecane	$\mu\text{g}/\text{m}^3$	7.7	7.7	0%
Ethylbenzene	$\mu\text{g}/\text{m}^3$	0.81	0.74	9%
Ethylcyclohexane	$\mu\text{g}/\text{m}^3$	<0.03	<0.03	-
n-Heptane	$\mu\text{g}/\text{m}^3$	0.3	0.29	3%

COMPOUND	UNITS	LIGHT SHOP AA 2	LIGHT SHOP AA 2 DUP	RPD (%)
n-Hexane	µg/m <sup>3</sup>	0.48	0.48	0%
Isopropanol	µg/m <sup>3</sup>	<3.9	<3.9	-
Isopropylbenzene	µg/m <sup>3</sup>	<0.03	<0.03	-
4-Isopropyltoluene	µg/m <sup>3</sup>	0.13	0.13	0%
2-Methyl butane	µg/m <sup>3</sup>	14	13	7%
Methyl tert-butyl ether	µg/m <sup>3</sup>	<0.03	<0.03	-
Methylcyclohexane	µg/m <sup>3</sup>	0.22	0.19	15%
2-Methylhexane	µg/m <sup>3</sup>	0.29	0.27	7%
3-Methylhexane	µg/m <sup>3</sup>	0.3	0.28	7%
2-Methylpentane	µg/m <sup>3</sup>	1.1	1.1	0%
3-Methylpentane	µg/m <sup>3</sup>	0.39	0.37	5%
Naphthalene	µg/m <sup>3</sup>	<0.08	<0.08	-
n-Nonane	µg/m <sup>3</sup>	<0.04	<0.04	-
n-Octane	µg/m <sup>3</sup>	0.19	0.23	19%
n-Pentane	µg/m <sup>3</sup>	1.3	1.2	8%
propylbenzene	µg/m <sup>3</sup>	0.09	0.1	11%
Tetrachloroethene	µg/m <sup>3</sup>	0.16	0.14	13%
Toluene	µg/m <sup>3</sup>	3.3	3.3	0%
1,1,1-trichloroethane	µg/m <sup>3</sup>	<0.03	<0.03	-
1,1,2-trichloroethane	µg/m <sup>3</sup>	<0.03	<0.03	-
Trichloroethene	µg/m <sup>3</sup>	2.2	2.1	5%
Trichloromethane	µg/m <sup>3</sup>	0.18	0.14	25%
1,2,4-Trimethylbenzene	µg/m <sup>3</sup>	0.73	0.68	7%
1,3,5-Trimethylbenzene	µg/m <sup>3</sup>	0.2	0.19	5%
n-Undecane	µg/m <sup>3</sup>	0.68	0.94	32%
Vinyl Chloride	µg/m <sup>3</sup>	<0.02	<0.02	-
o-Xylene	µg/m <sup>3</sup>	0.82	0.78	5%
m&p-Xylenes	µg/m <sup>3</sup>	2.2	2.2	0%
TRH C <sub>6</sub> -C <sub>10</sub>	µg/m <sup>3</sup>	30	30	0%
TRH > C <sub>10</sub> -C <sub>16</sub>	µg/m <sup>3</sup>	40	40	0%

All the data quality indicators showed sampling and data quality to be good and the results should be considered reliable.

#### 4.4 Risk evaluation

TCE was the only contaminant that was present in the ambient air of the showroom at concentrations requiring further consideration. However, compared to the acceptable air concentration derived from the toxicity values published by WHO (23  $\mu\text{g}/\text{m}^3$ ), the highest measured indoor air concentrations of TCE, of 2.2  $\mu\text{g}/\text{m}^3$  at AA2, was substantially less.

Subsequent to the earlier WHO guidance of 2000, the US EPA has listed in its toxicity and risk IRIS data base a reference dose for TCE of 2  $\mu\text{g}/\text{m}^3$  and a Unit Risk of  $4.1 \times 10^{-6}$ . Using an acceptable risk level of  $10^{-5}$  (one extra cancer per 100,000 people), the Unit Risk equates to an acceptable air concentration of 2.4  $\mu\text{g}/\text{m}^3$ . These numbers are 10 times lower (more stringent) than those derived from the WHO criterion. The measured indoor air concentration of TCE at AA2 (2.2  $\mu\text{g}/\text{m}^3$ ) was approximately equal to the acceptable concentrations published by US EPA, and therefore, further consideration of these measurement results is required.

Firstly, it needs to be noted that the published criteria for acceptable concentrations apply to a lifetime exposure. In calculating potential health risk to workers it is necessary to adjust the published criteria for exposure duration which, for the commercial workers, is a factor of 0.08 for carcinogens and 0.22 for non-carcinogens. The exposure adjusted highest measured TCE concentration becomes 0.18  $\mu\text{g}/\text{m}^3$  for carcinogenic risks and 0.48  $\mu\text{g}/\text{m}^3$  for non-carcinogenic health risks. Although these exposure adjusted concentrations are well below the guideline values, the following calculation of risk has been carried out to quantify the risk and demonstrate its acceptable status.

The carcinogenic risk resulting from the measured TCE indoor air concentration of 2.2  $\mu\text{g}/\text{m}^3$  is determined using the equation:

$$\text{Risk} = \text{the exposure adjusted concentration} \times \text{unit risk}$$

And risk of non-cancer health effects is determined by the equation:

$$\text{Risk} = \text{exposure adjusted concentration in air} / \text{Reference Dose}$$

The adjustment used in the risk calculations is in accordance with the referenced factors listed in Table 4.4 and the equation for the conversion of indoor air concentrations ( $C_{\text{air}}$ ) to exposure concentrations (EC) is:

$$\text{EC} = C_{\text{air}} \times \text{ET} \times \text{EF} \times \text{ED} / \text{AT}$$

Toxicity values are listed in Table 4.3 and exposure adjustment factors for indoor commercial/industrial workers are shown in Table 4.4.

**Table 4.3 Toxicity criteria for TCE and PCE**

COMPOUND	REFERENCE	UNIT RISK (CARCINOGENS) (RISK PER $\mu\text{g}/\text{m}^3$ )	REFERENCE DOSE (NON-CARCINOGENS) UNITS: $\mu\text{g}/\text{m}^3$
TCE	US EPA IRIS database	$4.1 \times 10^{-6}$	2
	WHO	$4.3 \times 10^{-7}$	not given

**Table 4.4 Exposure parameters – commercial/industrial indoor workers**

EXPOSURE PARAMETER	UNIT	VALUE	REFERENCE	NOTE
Exposure time (ET)	h/day	8	CRC CARE (2011)	
Exposure frequency (EF)	days/year	240	CRC CARE (2011)	Working days per year
Exposure duration (ED)	years	30	CRC CARE (2011)	Number of years in one occupation
Averaging time for carcinogenic effects (AT <sub>c</sub> )	years	82	CRC CARE (2011)	Life expectancy (enHealth (2012))
Averaging time for non-carcinogenic effects (AT <sub>nc</sub> )	years	30	CRC CARE (2011)	set equal to the exposure duration

In accordance with the exposure factors listed in Table 4.4, the factors to adjust the ambient air concentration to the exposure adjusted concentration are 0.08 for carcinogens and 0.22 for non-carcinogens. The measured indoor air concentration, i.e., 2.2 µg/m<sup>3</sup>, adjusted for exposure becomes 0.18 µg/m<sup>3</sup> for carcinogens and 0.48 µg/m<sup>3</sup> for non-carcinogens.

Using the WHO Unit Risk value of 4.3 x 10<sup>-7</sup>, the excess cancer risk from an exposure adjusted concentration of TCE of 0.18 µg/m<sup>3</sup> is 8.5 x 10<sup>-8</sup>, which is substantially below the acceptable risk level of 10<sup>-5</sup>. Using the US EPA IRIS data base Unit Risk of 4.1 x 10<sup>-6</sup> the resultant cancer risk is still very low and acceptable at 7.4 x 10<sup>-7</sup>.

The US EPA IRIS data base lists a reference dose for TCE of 2 µg/m<sup>3</sup>. WHO does not list a reference dose for non-cancer health effects. The non-cancer risk is thus: 0.48 µg/m<sup>3</sup> / 2 µg/m<sup>3</sup> which is 0.24, less than the reference dose and thus considered acceptable.

These calculations show that there is no indication of an unacceptable health risk from the vapour intrusion pathway into the lighting showroom. Nevertheless, the presence of sub-slab TCE vapours would need to be considered and further investigated if the site were to be redeveloped. Such action is necessary because redevelopment may change the degree of vapour entry into a building built on the site.

## 5 SUMMARY AND CONCLUSION

The ambient air sampling in the lighting showroom was an initial assessment of the concentrations of TCE in the indoor air of the showroom. Measurements were taken at three locations, one duplicated. All three locations showed concentrations of TCE considerably greater than outdoor air concentrations indicating a source of TCE vapours beneath the showroom floor. One of the three locations tested showed noticeably high concentrations similar in magnitude to guidance values listed in the US EPA's IRIS data base which are provided as a basis for evaluating human health risks from inhalation of toxic vapours. However, when the measured concentrations were factored to account for standard worker exposure times, the adjusted concentrations did not represent an unacceptable risk.

Australian guidance, including the primary reference source, NEPM 2013, sets an acceptable risk level for excess cancer at 1 in 100,000 (i.e.  $10^{-5}$ ). Using the WHO Unit Risk value, the measured indoor air concentration of  $2.2 \mu\text{g}/\text{m}^3$  produced a very low excess cancer risk of  $8.5 \times 10^{-8}$ . Using the US EPA IRIS data base Unit Risk of  $4.1 \times 10^{-6}$  the resultant cancer risk is still very low and acceptable at  $7.4 \times 10^{-7}$ .

The non-cancer risks were also low and acceptable. The US EPA's IRIS data base lists a non-cancer risk reference dose of  $2 \mu\text{g}/\text{m}^3$ . The WHO reference does not list a non-carcinogenic reference value. Using the IRIS data base criterion, the calculated value was just 24% of the reference value (i.e. the value at which further consideration of risk may be required).

These calculations show that there was no indication of an unacceptable health risk from the vapour intrusion pathway into the lighting showroom. Nevertheless, the presence of sub-slab TCE vapours would need to be considered and further investigated if the site were to be redeveloped. Such action is necessary because redevelopment may change the degree of vapour entry into a building built on the site.



## 6 LIMITATIONS

### ***Scope of Services***

This soil vapour measurement report ('the report') has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and PB ('scope of services'). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

### ***Reliance on Data***

In preparing the report, PB has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ('the data'). Except as otherwise stated in the report, PB has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ('conclusions') are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. PB will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to PB.

### ***Environmental Conclusions***

In accordance with the scope of services, PB has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

On all sites, varying degrees of non-uniformity of the vertical and horizontal soil or groundwater conditions are encountered. Hence no monitoring, common testing or sampling technique can eliminate the possibility that monitoring or testing results/samples are not totally representative of soil vapour, soil and/or groundwater conditions encountered. The conclusions are based upon the data and the environmental field monitoring and/or testing and are therefore merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of contaminants or emissions.

Also, it should be recognised that site conditions, including the extent and concentration of contaminants, can change with time.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

### ***Report for Benefit of Client***

The report has been prepared for the benefit of the Client and no other party. PB assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of PB or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

***Other Limitations***

PB will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

## 7 REFERENCES

Mott MacDonald, 8 August 2014, Draft Results from Environmental Testing, Lot 1 Anzac Highway, Keswick, SA. Report for Le Cornu Contractors Pty Ltd

National Environment Protection Council (NEPC) 2013, *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)*

Parsons Brinckerhoff, 26 February 2015, Soil Vapour and Groundwater Investigations for Identification of Trichloroethene –Everard Avenue, Keswick, South Australia [K2 site]

US EPA *Guidance for the Data Objective Process and Data Quality Objectives Process for Hazardous Waste Site Investigations*, January 2000, EPA/600/R-00/007

USEPA EPA On-line tools for Site Assessment Calculation <http://www.epa.gov/Athens/learn2model/part-two/onsite/esthenry.html>

World Health Organisation Regional Office for Europe, WHO guidelines for indoor air quality: selected pollutants, Denmark, 2010

World Health Organisation Regional Office for Europe, Air quality guidelines for Europe, second edition, WHO regional publications, European series, no 91, Copenhagen, 2000



## **FIGURES**

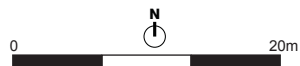





**Figure 1 Investigation areas, March 2016**  
29 Anzac Highway, Keswick, South Australia 5035



Note: Site boundaries are approximations and only indicative of the investigation areas.

Figure 2 Former industrial sites, March 2016  
29 Anzac Highway, Keswick, South Australia 5035



KEY:  
 Air sampling location  
 TCE concentrations  
 Lighting showroom  
 Units in  $\mu\text{g}/\text{m}^3$

**Figure 3 Trichloroethene (TCE) concentrations in ambient air (Lighting Showroom), March 2016**  
 29 Anzac Highway, Keswick, South Australia 5035

# Appendix A

LABORATORY ANALYTICAL REPORT



Chartered Chemists

**17-Mar-2016**

**WSP Parsons Brinckerhoff**

**Ernst & Young Centre  
Level 27/680 George Street  
Sydney  
NSW 2000  
Attention: Adrian Heggie**

**REPORT NUMBER: M160564**

Site/Client Ref: 2201557C

Order No: 2201557C

## CERTIFICATE OF ANALYSIS

**SAMPLES:** Six samples were received for analysis

**DATE RECEIVED:** **8-Mar-2016**

**DATE COMMENCED:** **8-Mar-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  
Results in airborne concentrations are calculated using data provided by the client

**REPORTED BY:**



**Evan Jones**

Laboratory Manager



WORLD RECOGNISED  
ACCREDITATION

NATA Accredited Laboratory Number: 14429

Accredited for compliance  
with ISO/IEC 17025.

Matrix: Radiello Tube

Method: MA-5.RAD.09 Volatile Organics (w/v)

Sample units are expressed in  $\mu\text{g}/\text{m}^3$

Test Started: 8/03/2016

Analyte Name	Leeder ID Client ID	2016008042 Light Shop AA1 (inside) 699SB 4/03/2016	2016008043 Light Shop AA2 (inside) 700SB 4/03/2016	2016008044 Light Shop AA2 dup (inside) 701SB 4/03/2016	2016008045 Light Shop AA3 (inside) 702SB 4/03/2016
Benzene		0.78	0.62	0.57	0.62
2-butanone(MEK)		0.62	0.19	0.18	0.23
n-Butylbenzene		0.090	0.080	0.050	0.050
Carbon tetrachloride		0.47	0.47	0.45	0.44
Chloroethane		<0.02	<0.02	<0.02	<0.02
Chloromethane		<0.02	<0.02	<0.02	<0.02
Cyclohexane		0.50	0.40	0.38	0.44
n-Decane		<0.05	<0.05	<0.05	<0.05
Dibromochloromethane		0.14	<0.03	<0.03	<0.03
1,2-Dibromoethane		<0.03	<0.03	<0.03	<0.03
Dichlorodifluoromethane		<0.02	<0.02	<0.02	<0.02
1,1-Dichloroethane		<0.02	<0.02	<0.02	<0.02
1,2-Dichloroethane		2.5	0.70	0.66	0.33
1,1-Dichloroethene		<0.02	<0.02	<0.02	<0.02
cis-1,2-Dichloroethene		<0.02	<0.02	<0.02	<0.02
trans-1,2-Dichloroethene		<0.02	<0.02	<0.02	<0.02
2,4-dimethylpentane		0.080	0.060	0.060	0.060
n-Dodecane		8.9	7.7	7.7	7.8
Ethylbenzene		0.80	0.81	0.74	1.6
Ethylcyclohexane		<0.03	<0.03	<0.03	<0.03
n-Heptane		0.37	0.30	0.29	0.32
n-Hexane		0.61	0.48	0.48	0.56
Isopropanol		<3.9	<3.9	<3.9	<3.9
Isopropylbenzene		<0.03	<0.03	<0.03	<0.03
4-Isopropyltoluene		0.25	0.13	0.13	0.12
2-Methyl butane		14	14	13	55
Methyl tert-butyl ether		<0.03	<0.03	<0.03	<0.03
Methylcyclohexane		0.43	0.22	0.19	0.21
2-Methylhexane		0.34	0.29	0.27	0.32
3-Methylhexane		0.34	0.30	0.28	0.31
2-Methylpentane		0.97	1.1	1.1	2.0
3-Methylpentane		0.39	0.39	0.37	0.72
Naphthalene		<0.08	<0.08	<0.08	<0.08
n-Nonane		<0.04	<0.04	<0.04	<0.04
n-Octane		0.21	0.19	0.23	0.31
n-Pentane		1.4	1.3	1.2	1.6
propylbenzene		0.12	0.090	0.10	0.12
Tetrachloroethene		0.17	0.16	0.14	0.17
Toluene		4.7	3.3	3.3	3.4
1,1,1-trichloroethane		<0.03	<0.03	<0.03	<0.03

Matrix: Radiello Tube

Method: MA-5.RAD.09 Volatile Organics (w/v)

Sample units are expressed in  $\mu\text{g}/\text{m}^3$

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008042	2016008043	2016008044	2016008045
		Client ID	Light Shop AA1 (inside) 699SB 4/03/2016	Light Shop AA2 (inside) 700SB 4/03/2016	Light Shop AA2 dup (inside) 701SB 4/03/2016	Light Shop AA3 (inside) 702SB 4/03/2016
PQL						
1,1,2-trichloroethane			<0.03	<0.03	<0.03	<0.03
Trichloroethene			0.93	2.2	2.1	0.34
Trichloromethane			0.52	0.18	0.14	0.13
1,2,4-Trimethylbenzene			0.92	0.73	0.68	0.65
1,3,5-Trimethylbenzene			0.30	0.20	0.19	0.20
n-Undecane			0.86	0.68	0.94	1.2
Vinyl Chloride			<0.02	<0.02	<0.02	<0.02
o-Xylene			0.92	0.82	0.78	1.4
m&p-Xylenes			2.4	2.2	2.2	3.9

Matrix: Radiello Tube

Method: MA-5.RAD.09 Volatile Organics (w/v)

 Sample units are expressed in  $\mu\text{g}/\text{m}^3$ 

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008046	2016008047
		Client ID	Light Shop AA4 (outside) Everard Ave 703SB 4/03/2016	Light Shop AA5 (outside) ANZAC Hwy 704SB 4/03/2016
PQL				
Benzene			1.1	1.1
2-butanone(MEK)			<0.03	<0.03
n-Butylbenzene			0.10	0.090
Carbon tetrachloride			0.51	0.50
Chloroethane			<0.02	<0.02
Chloromethane			<0.02	<0.02
Cyclohexane			0.62	0.62
n-Decane			<0.05	<0.05
Dibromochloromethane			<0.03	<0.03
1,2-Dibromoethane			<0.03	<0.03
Dichlorodifluoromethane			<0.02	<0.02
1,1-Dichloroethane			<0.02	<0.02
1,2-Dichloroethane			<0.03	<0.03
1,1-Dichloroethene			<0.02	<0.02
cis-1,2-Dichloroethene			<0.02	<0.02
trans-1,2-Dichloroethene			<0.02	<0.02
2,4-dimethylpentane			0.11	0.11
n-Dodecane			7.9	9.8
Ethylbenzene			0.66	0.65
Ethylcyclohexane			<0.03	<0.03
n-Heptane			0.44	0.45
n-Hexane			0.78	0.79
Isopropanol			<3.9	<3.9
Isopropylbenzene			<0.03	<0.03
4-Isopropyltoluene			0.11	0.11
2-Methyl butane			4.6	4.8
Methyl tert-butyl ether			<0.03	<0.03
Methylcyclohexane			0.27	0.28
2-Methylhexane			0.45	0.46
3-Methylhexane			0.48	0.47
2-Methylpentane			1.7	1.5
3-Methylpentane			0.52	0.51
Naphthalene			<0.08	<0.08
n-Nonane			<0.04	<0.04
n-Octane			0.24	0.18
n-Pentane			1.7	1.8
propylbenzene			0.13	0.12
Tetrachloroethene			0.24	0.21
Toluene			4.3	4.3
1,1,1-trichloroethane			<0.03	<0.03



Matrix: Radiello Tube

Method: MA-5.RAD.09 Volatile Organics (w/v)

Sample units are expressed in  $\mu\text{g}/\text{m}^3$

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008046	2016008047
		Client ID	Light Shop AA4 (outside) Everard Ave 703SB 4/03/2016	Light Shop AA5 (outside) ANZAC Hwy 704SB 4/03/2016
		PQL		
1,1,2-trichloroethane			<0.03	<0.03
Trichloroethene			0.050	0.070
Trichloromethane			0.10	0.11
1,2,4-Trimethylbenzene			0.97	0.96
1,3,5-Trimethylbenzene			0.29	0.28
n-Undecane			0.60	0.84
Vinyl Chloride			<0.02	<0.02
o-Xylene			0.82	0.78
m&p-Xylenes			2.1	2.1

Matrix: Radiello Tube

Method: MA-5.RAD.08 Volatile Organics

Sample units are expressed in µg total

Test Started: 8/03/2016

Analyte Name	Leeder ID Client ID	Sampled Date PQL	2016008042	2016008043	2016008044	2016008045
			Light Shop AA1 (inside) 699SB 4/03/2016	Light Shop AA2 (inside) 700SB 4/03/2016	Light Shop AA2 dup (inside) 701SB 4/03/2016	Light Shop AA3 (inside) 702SB 4/03/2016
Benzene		0.05	1.5	1.2	1.1	1.2
2-butanone(MEK)		0.05	1.2	0.38	0.35	0.45
n-Butylbenzene		0.05	0.12	0.11	0.07	0.07
Carbon tetrachloride		0.05	0.77	0.77	0.75	0.73
Chloroethane		0.05	nd	nd	nd	nd
Chloromethane		0.05	nd	nd	nd	nd
Cyclohexane		0.05	0.67	0.54	0.51	0.58
n-Decane		0.05	nd	nd	nd	nd
Dibromochloromethane		0.05	0.20	nd	nd	nd
1,2-Dibromoethane		0.05	nd	nd	nd	nd
Dichlorodifluoromethane		0.05	nd	nd	nd	nd
1,1-Dichloroethane		0.05	nd	nd	nd	nd
1,2-Dichloroethane		0.05	4.7	1.3	1.3	0.63
1,1-Dichloroethene		0.05	nd	nd	nd	nd
cis-1,2-Dichloroethene		0.05	nd	nd	nd	nd
trans-1,2-Dichloroethene		0.05	nd	nd	nd	nd
2,4-dimethylpentane		0.05	0.11	0.09	0.09	0.09
n-Dodecane		0.05	1.8	1.5	1.5	1.6
Ethylbenzene		0.05	1.4	1.4	1.2	2.8
Ethylcyclohexane		0.05	nd	nd	nd	nd
n-Heptane		0.05	0.53	0.43	0.41	0.46
n-Hexane		0.05	1.0	0.78	0.79	0.92
Isopropanol		0.05	nd	nd	nd	nd
Isopropylbenzene		0.05	nd	nd	nd	nd
4-Isopropyltoluene		0.05	0.35	0.18	0.18	0.17
2-Methyl butane		0.05	23	23	22	90
Methyl tert-butyl ether		0.05	nd	nd	nd	nd
Methylcyclohexane		0.05	0.70	0.35	0.30	0.34
2-Methylhexane		0.05	0.48	0.42	0.39	0.45
3-Methylhexane		0.05	0.49	0.43	0.40	0.44
2-Methylpentane		0.05	1.7	1.9	1.8	3.5
3-Methylpentane		0.05	0.68	0.67	0.64	1.3
Naphthalene		0.05	nd	nd	nd	nd
n-Nonane		0.05	nd	nd	nd	nd
n-Octane		0.05	0.28	0.25	0.31	0.40
n-Pentane		0.05	2.6	2.4	2.2	2.9
propylbenzene		0.05	0.17	0.13	0.14	0.17
Tetrachloroethene		0.05	0.25	0.23	0.21	0.25
Toluene		0.05	8.6	6.0	6.0	6.2
1,1,1-trichloroethane		0.05	nd	nd	nd	nd



Matrix: Radiello Tube

Method: MA-5.RAD.08 Volatile Organics

Sample units are expressed in µg total

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008042	2016008043	2016008044	2016008045
		Client ID	Light Shop AA1 (inside) 699SB 4/03/2016	Light Shop AA2 (inside) 700SB 4/03/2016	Light Shop AA2 dup (inside) 701SB 4/03/2016	Light Shop AA3 (inside) 702SB 4/03/2016
PQL						
1,1,2-trichloroethane	0.05		nd	nd	nd	nd
Trichloroethene	0.05		1.6	3.8	3.6	0.59
Trichloromethane	0.05		0.97	0.33	0.26	0.23
1,2,4-Trimethylbenzene	0.05		1.1	0.90	0.85	0.80
1,3,5-Trimethylbenzene	0.05		0.37	0.25	0.23	0.25
n-Undecane	0.05		0.51	0.40	0.56	0.68
Vinyl Chloride	0.05		nd	nd	nd	nd
o-Xylene	0.05		1.5	1.3	1.3	2.2
m&p-Xylenes	0.05		4.1	3.8	3.9	6.8

**Matrix: Radiello Tube**
**Method: MA-5.RAD.08 Volatile Organics**

Sample units are expressed in µg total

Test Started: 8/03/2016

Analyte Name	Leeder ID Client ID	2016008046 Light Shop AA4 (outside) Everard Ave 703SB 4/03/2016	2016008047 Light Shop AA5 (outside) ANZAC Hwy 704SB 4/03/2016	2016008048
				Method
Sampled Date	PQL			Blank
Benzene	0.05	2.2	2.2	nd
2-butanone(MEK)	0.05	nd	nd	nd
n-Butylbenzene	0.05	0.14	0.12	nd
Carbon tetrachloride	0.05	0.84	0.82	nd
Chloroethane	0.05	nd	nd	nd
Chloromethane	0.05	nd	nd	nd
Cyclohexane	0.05	0.83	0.83	nd
n-Decane	0.05	nd	nd	nd
Dibromochloromethane	0.05	nd	nd	nd
1,2-Dibromoethane	0.05	nd	nd	nd
Dichlorodifluoromethane	0.05	nd	nd	nd
1,1-Dichloroethane	0.05	nd	nd	nd
1,2-Dichloroethane	0.05	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd
cis-1,2-Dichloroethene	0.05	nd	nd	nd
trans-1,2-Dichloroethene	0.05	nd	nd	nd
2,4-dimethylpentane	0.05	0.15	0.16	nd
n-Dodecane	0.05	1.6	1.9	nd
Ethylbenzene	0.05	1.1	1.1	nd
Ethylcyclohexane	0.05	nd	nd	nd
n-Heptane	0.05	0.63	0.64	nd
n-Hexane	0.05	1.3	1.3	nd
Isopropanol	0.05	nd	nd	nd
Isopropylbenzene	0.05	nd	nd	nd
4-Isopropyltoluene	0.05	0.16	0.16	nd
2-Methyl butane	0.05	7.4	7.8	nd
Methyl tert-butyl ether	0.05	nd	nd	nd
Methylcyclohexane	0.05	0.45	0.45	nd
2-Methylhexane	0.05	0.65	0.66	nd
3-Methylhexane	0.05	0.68	0.68	nd
2-Methylpentane	0.05	3.0	2.5	nd
3-Methylpentane	0.05	0.90	0.88	nd
Naphthalene	0.05	nd	nd	nd
n-Nonane	0.05	nd	nd	nd
n-Octane	0.05	0.32	0.24	nd
n-Pentane	0.05	3.2	3.3	nd
propylbenzene	0.05	0.18	0.17	nd
Tetrachloroethene	0.05	0.35	0.30	nd
Toluene	0.05	7.9	7.8	nd
1,1,1-trichloroethane	0.05	nd	nd	nd



**Matrix: Radiello Tube**

**Method: MA-5.RAD.08 Volatile Organics**

Sample units are expressed in µg total

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008046	2016008047	2016008048
		Client ID	Light Shop AA4 (outside) Everard Ave 703SB 4/03/2016	Light Shop AA5 (outside) ANZAC Hwy 704SB 4/03/2016	Method
PQL					Blank
1,1,2-trichloroethane	0.05		nd	nd	nd
Trichloroethene	0.05		0.09	0.11	nd
Trichloromethane	0.05		0.18	0.21	nd
1,2,4-Trimethylbenzene	0.05		1.2	1.2	nd
1,3,5-Trimethylbenzene	0.05		0.36	0.35	nd
n-Undecane	0.05		0.36	0.50	nd
Vinyl Chloride	0.05		nd	nd	nd
o-Xylene	0.05		1.3	1.3	nd
m&p-Xylenes	0.05		3.7	3.7	nd

**Matrix: Radiello Tube**

**Method: MA-30.AIR.04 Total Recoverable Hydrocarbons**

Sample units are expressed in mg/m<sup>3</sup>

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008042	2016008043	2016008044	2016008045
		Client ID	Light Shop AA1 (inside) 699SB 4/03/2016	Light Shop AA2 (inside) 700SB 4/03/2016	Light Shop AA2 dup (inside) 701SB 4/03/2016	Light Shop AA3 (inside) 702SB 4/03/2016
PQL						
C6-C10			0.040	0.030	0.030	0.030
>C10-C16			0.060	0.040	0.040	0.050

**Matrix: Radiello Tube**

**Method: MA-30.AIR.04 Total Recoverable Hydrocarbons**

Sample units are expressed in mg/m<sup>3</sup>

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008046	2016008047
		Client ID	Light Shop AA4 (outside) Everard Ave 703SB 4/03/2016	Light Shop AA5 (outside) ANZAC Hwy 704SB 4/03/2016
PQL				
C6-C10			0.030	0.030
>C10-C16			0.020	0.020



**Matrix: Radiello Tube**

**Method: MA-30.AIR.03 Total Recoverable Hydrocarbons**

Sample units are expressed in µg total

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008042	2016008043	2016008044	2016008045
		Client ID	Light Shop AA1 (inside) 699SB 4/03/2016	Light Shop AA2 (inside) 700SB 4/03/2016	Light Shop AA2 dup (inside) 701SB 4/03/2016	Light Shop AA3 (inside) 702SB 4/03/2016
PQL						
C6-C10	5		55	36	35	40
>C10-C16	5		37	24	24	27

**Matrix: Radiello Tube**

**Method: MA-30.AIR.03 Total Recoverable Hydrocarbons**

Sample units are expressed in µg total

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008046	2016008047	2016008048
		Client ID	Light Shop AA4 (outside) Everard Ave 703SB 4/03/2016	Light Shop AA5 (outside) ANZAC Hwy 704SB 4/03/2016	Method
PQL					Blank
C6-C10	5		41	35	nd
>C10-C16	5		10	11	nd



**Matrix: Radiello Tube**

**Method: MA-5.RAD.08 Volatile Organics**

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008049	2016008050
		Client ID	Method	Method
		PQL	Spike	Spike Dup
Benzene			102	103
Ethylbenzene			99	96
Toluene			98	98

**Matrix: Radiello Tube**

**Method: MA-5.RAD.08 Volatile Organics**

Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 8/03/2016

Analyte Name	Sampled Date	Leeder ID	2016008049	2016008050
		Client ID	Method	Method
		PQL	Spike	Spike Dup
o-Xylene			99	102
m&p-Xylenes			104	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

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**APPENDIX ONE.**

CHAIN OF CUSTODY DOCUMENT



# Appendix B

**PHOTOGRAPHS**



Photograph 1. Lighting showroom frontage along Everard Avenue. Outdoor air sampling location AA4 was under the awning.

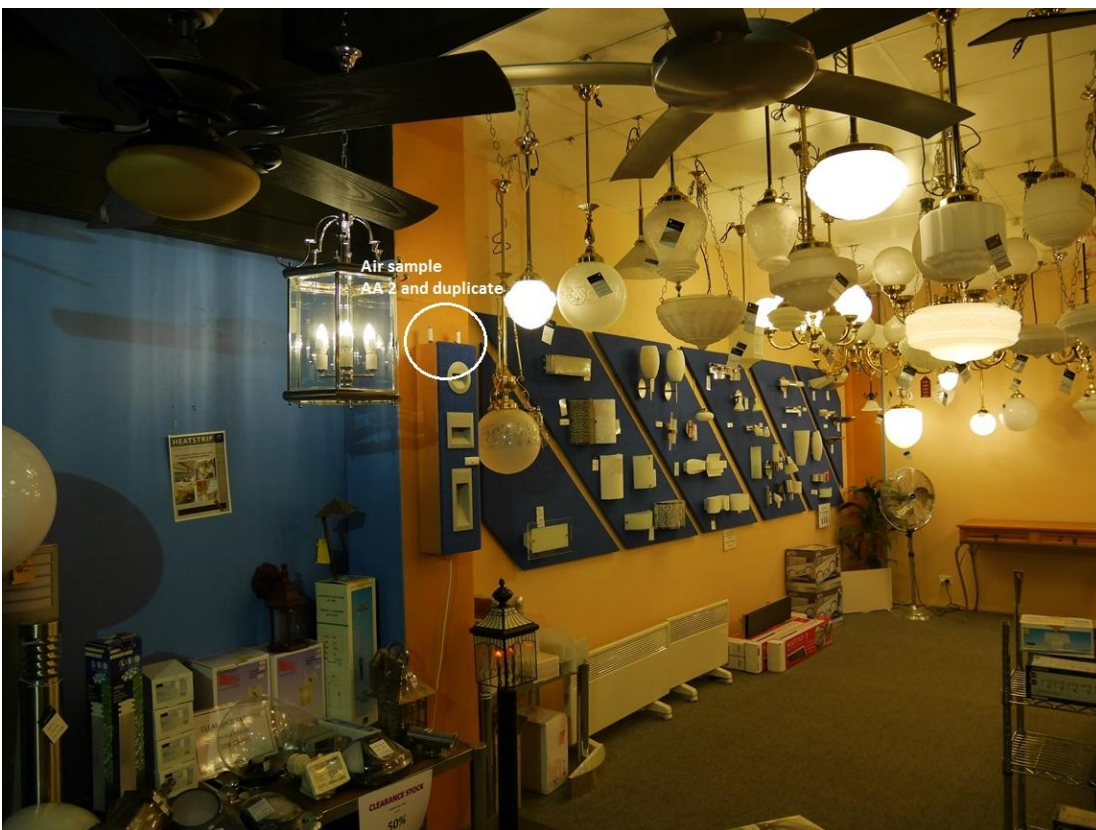


Photograph 2. Lighting showroom frontage along Anzac Highway. Air sampling location AA5 was under the awning.





Photograph 3. Lighting showroom with doorway to staff area. Air sample AA1 was inside the doorway.



Photograph 4. Innermost area of lighting showroom. Air sampling location AA2 and its duplicate sample are indicated in the centre of the photograph.



Photograph 5. Storeroom of the lighting showroom. Air sampling location AA3 is shown on the racking (foreground).