Table 7-3: Soil Results for Metals and Asbestos Against Residential NEPM 2013 Guidelines (Units mg/kg unless otherwise specified)

	Metals								Asbestos		
SAC	Arsenic	Cadmium	Chromium (VI)	Copper	Lead	Nickel	Zinc	Mercury	Bonded ACM	FA and AF	All Forms of Asbestos
HIL A	100	20	100	6,000	300	400	7,400	40	0.01 % w/w	0.001 % w/w	No visible
HIL A Market Gardens (#)	100	20	100	1,000	300	400	7,000	15	-	-	-
EIL (####)	100		580	220	1,100	220	630		-	-	-
LOR	5	1	2	5	5	2	5	0.1	-	-	-
Sample event ESP 2012											
S4	-	-	-	-	-	-	-	-	-	-	-
Sample event ESP 2016											
S-1	3.3	< 0.4	-	17	17	13	53	< 0.05	-	-	-
S-2	5	< 0.4	-	21	14	24	58	< 0.05	-	-	-
S-3	9.8	< 0.4	-	16	27	8.2	40	< 0.05	-	-	-
Sample event BE 2017											
A4-DISC1-SURF	9	< 1	22	25	28	8	88	< 0.1	-	-	-
A4-DISC2-SURF	8	< 1	20	22	23	9	64	< 0.1	-	-	-
A4-DISC3-SURF	7	< 1	21	18	20	9	50	< 0.1	-	-	-
A4-DISC4-SURF	9	< 1	21	27	19	8	48	< 0.1	-	-	-
A4-DISC5-SURF	9	< 1	23	32	21	8	87	< 0.1	-	-	-
A4-DISC6-SURF	8	< 1	22	29	23	10	94	< 0.1	-	-	-
A4-DISC7-SURF	12	< 1	22	27	20	7	59	< 0.1	-	-	-
A4-DISC8-SURF	11	< 1	20	29	22	8	78	< 0.1	-	-	-
A4-DISC9-SURF	9	< 1	21	24	18	10	59	< 0.1	-	-	-
A4-DISC10-SURF	9	< 1	19	22	19	11	60	< 0.1	-	-	-
STOCK 1	-	-	-	-	-	-	-	-	< 0.01	< 0.001	No
STOCK 2	-	-	-	-	-	-	-	-	0.44	< 0.001	Yes
STOCK 3	-	-	-	-	-	-	-	-	< 0.01	0.022	Yes

(#) NSW DEC 2005 Guidelines for assessing former Orchards and Market Gardens
(##) NSW DEC 2005 Guidelines for assessing former Orchards and Market Gardens with composite adjustment
(###) Clay, 0 to < 1m
(####) Urban residential, aged contamination, 7 pH, CEC 15 cmolc/kg, low traffic

Table 7-2: Soil Results for Phenols, PAHs, TRH, and BTEX Against Industrial/Commercial NEPM 2013 Guidelines (Units mg/kg unless otherwise specified)

	Phenols		PAH			TRH						BTEX			
SAC	Phenol	Pentachlorophenol	Naphthalene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (zero)	Sum of PAHs	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	F1 (C6 - C10 minus BTEX)	Benzene	Toluene	Ethylbenzene	Total Xylenes
HIL D	240,000	660	-	-	40	4,000	-	-	-	-	-	-	-	-	-
HIL D (adjusted)	80,000	220	-	-	13	1,333	-	-	-	-	-	-	-	-	-
HSL D (*)	-	-	NL	-	-	-	310	NL	-	-	1,000	4	NL	NL	NL
HSL D (*) (adjusted)	-	-	NL	-	-	-	103	NL	-	-	333	1	NL	NL	NL
EIL (**)	370	-	370	-	-	-	-	-	-	-	-	-	-	-	-
EIL (**) (adjusted)	123	-	123	-	-	-	-	-	-	-	-	-	-	-	-
ESL (***)	-	-	-	1.4	-	-	-	170	2,500	6,600	215	95	135	185	95
ESL (***) (adjusted)	-	-	-	0.6	-	-	-	57	833	2,200	72	32	45	62	32
Mgmt limits	-	-	-	-	-	-	800	1,000	5,000	10,000	-	-	-	-	-
Mgmt limits (adjusted)	-	-	-	-	-	-	267	333	1667	3333	-	-	-	-	-
LOR	0.5	2	0.5	0.5	0.5	0.5	10	50	100	100	10	0.2	0.5	0.5	0.5
Sample event ESP 2016 (cont.)															
BH04-0.1	-	-	-	-	-	-	-	-	-	-	< 20	-	-	-	-
BH04-0.3	-	-	-	-	-	-	-	-	-	-	< 20	-	-	-	-
Sample event BE 2017															
A1-COMP-SURF	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 10	< 50	< 100	< 100	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
A5-COMP-SURF	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 10	< 50	< 100	< 100	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5

(*) Clay, 0 to < 1m
(**) Commercial/industrial, aged contamination, 6 pH, CEC 5 cmolc/kg, low traffic
(***) Commercial/industrial, Fine
^ CCME Canadian Environmental Quality Guidelines Summary Table - Soil Quality Guidelines

Table 7-2: Soil Results for Phenols, PAHs, TRH, and BTEX Against Industrial/Commercial NEPM 2013 Guidelines (Units mg/kg unless otherwise specified)

	Phenols		PAH			TRH						BTEX			
SAC	Phenol	Pentachlorophenol	Naphthalene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (zero)	Sum of PAHs	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	F1 (C6 - C10 minus BTEX)	Benzene	Toluene	Ethylbenzene	Total Xylenes
HIL D	240,000	660	-	-	40	4,000	-	-	-	-	-	-	-	-	-
HIL D (adjusted)	80,000	220	-	-	13	1,333	-	-	-	-	-	-	-	-	-
HSL D (*)	-	-	NL	-	-	-	310	NL	-	-	1,000	4	NL	NL	NL
HSL D (*) (adjusted)	-	-	NL	-	-	-	103	NL	-	-	333	1	NL	NL	NL
EIL (**)	370	-	370	-	-	-	-	-	-	-	-	-	-	-	-
EIL (**) (adjusted)	123	-	123	-	-	-	-	-	-	-	-	-	-	-	-
ESL (***)	-	-	-	1.4	-	-	-	170	2,500	6,600	215	95	135	185	95
ESL (***) (adjusted)	-	-	-	0.6	-	-	-	57	833	2,200	72	32	45	62	32
Mgmt limits	-	-	-	-	-	-	800	1,000	5,000	10,000	-	-	-	-	-
Mgmt limits (adjusted)	-	-	-	-	-	-	267	333	1667	3333	-	-	-	-	-
LOR	0.5	2	0.5	0.5	0.5	0.5	10	50	100	100	10	0.2	0.5	0.5	0.5
Sample event ESP 2012															
S2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S3	< 1	< 0.2	< 0.5	< 0.5	-	< 0.5	< 10	< 50	< 100	< 100	-	-	-	-	-
S5	-	-	< 0.1	< 0.1	-	0.2	< 10	< 50	< 100	< 100	-	< 0.2	< 0.5	< 0.5	< 0.5
S6	-	-	< 0.1	0.2	-	2.4	-	-	-	-	-	-	-	-	-
Sample event ESP 2016															
BH01-0.2	-	-	< 0.5	-	-	-	-	-	-	-	< 20	< 0.1	< 0.1	< 0.1	< 0.3
BH01-0.5	-	-		-	-	-	-	-	-	-	-	-	-	-	-
BH02-0.2	-	-	< 0.5	-	-	-	-	-	-	-	< 20	< 0.1	< 0.1	< 0.1	< 0.3
BH02-0.5	-	-		-	-	-	-	-	-	-	-	-	-	-	-
BH03-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03-0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 7-1: Soil Results for Metals, PCBs, OCPs, and OPPs Against Industrial/Commercial NEPM 2013 Guidelines (Units mg/kg unless otherwise specified)

	Metals								PCB	OCP								OPP
SAC	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury	PCB	HCB	Heptachlor	Total Chlordane (sum)	Endrin	Endosulfan (sum)	Methoxychlor	Sum of DDD + DDE + DDT	Sum of Aldrin + Dieldrin	Chlorpyrifos
HIL D	3,000	900	3,600	240,000	1,500	6,000	400,000	730	7	80	50	530	100	2,000	2,500	3,600	45	2,000
HIL D (adjusted)	1,000	300	1,200	80,000	500	2,000	133,333	243	2	27	17	177	33	667	833	1,200	15	667
EIL (**)	160	22^	320	320	1,800	380	940	24	-	-	-	-	-	-	-	640	-	-
EIL (**) (adjusted)	53	7	107	107	600	127	313	8	-	-	-	-	-	-	-	213	-	-
LOR	5	1	2	5	5	2	5	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05
Sample event ESP 2012																		
S2	8	< 1	-	20	20	8	58	< 0.1	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	0.08	< 0.05	-
S3	12	< 1	<0.5	37	31	12	144	< 0.1	<0.1	< 0.03	< 0.03		< 0.03	< 0.03	< 0.03	-	-	-
S5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S6	11	< 1	-	33	25	10	97	< 0.1	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	< 0.05
Sample event ESP 2016																		
BH01-0.2	10	< 0.4	-	33	97	13	150	0.09	-	-	-	-	-	-	-	-	-	-
BH01-0.5	9.8	< 0.4	-	29	61	13	120	< 0.05	-	-	-	-	-	-	-	-	-	-
BH02-0.2	7.9	0.6	-	50	79	18	290	0.15	-	-	-	-	-	-	-	-	-	-
BH02-0.5	8	< 0.4	-	25	35	13	68	< 0.05	-	-	-	-	-	-	-	-	-	-
BH03-0.1	7.8	< 0.4	-	28	17	7.1	87	< 0.05	-	< 0.05	< 0.05	< 0.1	< 0.05	< 0.1	< 0.2	< 0.05	< 0.1	< 0.2
BH03-0.4	11	< 0.4	-	25	26	12	68	< 0.05	-	< 0.05	< 0.05	< 0.1	< 0.05	< 0.1	< 0.2	0.06	< 0.1	< 0.2
BH04-0.1	9.7	< 0.4	-	38	21	9.1	110	< 0.05	-	< 0.05	< 0.05	< 0.1	< 0.05	< 0.1	< 0.2	< 0.05	< 0.1	< 0.2
BH04-0.3	7.5	< 0.4	-	25	18	9.4	100	< 0.05	-	< 0.05	< 0.05	< 0.1	< 0.05	< 0.1	< 0.2	< 0.05	< 0.1	< 0.2
Sample event BE 2017																		
A1-COMP-SURF	13	< 1	23	29	22	10	64	< 0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	0.08	< 0.05	< 0.05
A5-COMP-SURF	7	< 1	22	34	35	18	83	< 0.1	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	0.41	< 0.05	< 0.05

(*) Clay, 0 to <1m
(**) Commercial/industrial, aged contamination, 6 pH, CEC 5 cmolc/kg, low traffic
(***) Commercial/industrial, Fine
^ CCME Canadian Environmental Quality Guidelines Summary Table - Soil Quality Guidelines

Figure 7-1: Bonded Asbestos Found on the Soil Surface at Pit STOCK 2 on the Stockpile in Area 4

Figure 7-2: Building Waste Found in sampling point STOCK 3 on the Stockpile in Area 4

7. RESULTS AND DISCUSSION

The combined analytical results of the substances tested in the soil samples (for all three sampling events, by Benbow Environmental and ESP) are presented for the proposed commercial/industrial areas (Areas 1-2 and 5-6) in Table 7-1 (for metals, PCBs, OCPs, and OPPs) and Table 7-2 (for phenols, PAHs, TRH, and BTEX). Results for the proposed residential area (Area 4) are presented in Table 7-3 (for metals and asbestos) and Table 7-4 (for OCPs and OPPs). Results are compared to the adopted SAC, as discussed in the previous section. Tabulated results which are presented in bold are those above the Limit of Reporting (LOR), while results highlighted in red colour indicate values that exceed one or more assessment criteria. The sample analysis report (Certificate of Analysis) from ALS laboratories is provided in Attachment 6.

The results show the concentrations of all tested analytes, except asbestos, as being well below the adopted SAC; i.e. no exceedances were found for Metals, PCB, OCP, OPP, Phenols, PAH, TRH and BTEX. The calculations of the average 95% UCL concentrations for each analyte were undertaken using Procedure D, normal distribution, as outlined in the *Sample Design Guidelines* (NSW EPA, 1995). All calculated 95% UCL values were found to be well below the site assessment criteria. As a result of these findings, no further testing for the above mentioned analytes is considered warranted.

However, asbestos concentrations in exceedance of the NEPM HIL A SAC was detected by the laboratory in two of the three soil samples from the fill stockpile, in the proposed residential area, Area 4 (Table 7-3).

Two pieces of suspected bonded asbestos (ACM) of approximately 10 cm x 5 cm were found in the immediate sub-surface of the stockpile material at sampling point STOCK 2, (Figure 7-1), which was confirmed to be bonded ACM by lab testing. No asbestos was visible in pit STOCK 3, however, lab results indicated the presence of fibrous asbestos (ACM in a degraded condition).

This indicates that the asbestos is most likely from building waste that has been either brought in with the fill or dumped in the soil stockpile at a later stage. Fragments of building waste, including brick and concrete ranging from 1 cm to 10 cm in diameter, were throughout sampling point STOCK 3 as shown in Figure 7-2, which supports this conclusion. No building waste was visible in pit STOCK 1 and no asbestos was detected by the lab in this sample, so asbestos contamination may be localised in hotspots throughout the stockpile. No other form of contamination was detected in the stockpile during previous sample testing by ESP.

During detailed sampling of Area 4, it was noted that the soil surface and soil samples taken from the sub-surface stratum, were free from any visible asbestos. Based on the site history and other collected samples, there is no reason to suspect of buried asbestos materials on site (excluding within the stockpile in Area 4). Additionally, none of the sample locations showed any olfactometry response to hydrocarbons or chemicals, and there was no evidence of soil discolouration caused by the potential presence of chemical wastes.

The SAC has also been adjusted for the assessment of composite samples, in accordance with NSW EPA (1995), Sampling Design Guidelines. The acceptable limit against which the samples results are to be compared were divided by the number of sub-samples making up the composite (three in this instance). The adjusted SAC are also presented in the results tables in Section 7, below their original value.

6. SITE ASSESSMENT CRITERIA

The analytical results from the laboratory testing have been assessed (as Tier 1 assessment) against the investigation and screening levels in Schedule B1 of NEPC (2013). These guidelines have been endorsed by the NSW EPA under the *Contaminated Land Management* (CLM) *Act*, 1997. Schedule B1, NEPC (2013) provides soil investigation and screening levels for commonly encountered contaminants which are applicable to four generic land use settings and include consideration of the soil type and the depth of contamination, where relevant. These soil investigation and screening levels are described as follows:

- **Health Investigation Level (HIL)**
  Health investigation levels (HILs) are generic assessment criteria designed to be used in the first stage of an assessment of potential risks to human health from chronic exposure to contaminants. HILs are generic to all soil types and generally apply to the top 3 m of soil.

- **Health Screening Level (HSL)**
  Health Screening Levels (HSLs) have been derived for BTEX, naphthalene and four carbon chain fractions, as adopted in NEPC (2013). HSLs have been calculated to account for depth (from below surface to >4 m), soil textures (sand, silt and clay) and the land use settings.

- **Ecological Investigation Level (EIL)**
  Ecological Investigation Levels (EILs) have been developed for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems. EILs depend on land use scenarios and specific soil physiochemical properties, such as pH, cation exchange capacity (CEC), iron and carbon content, etc. They generally apply to the top 2 m of soil.

- **Ecological Screening Level (ESL)**
  Ecological screening levels (ESLs) have been developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon (TPH) fractions and are applicable for assessing risk to terrestrial ecosystems. ESLs broadly apply to coarse- and fine-grained soils and various land uses. They are generally applicable to the top 2 m of soil.

- **Management Limits**
  Petroleum hydrocarbon management limits ('management limits') are only applicable to petroleum hydrocarbon compounds. They are valid as screening levels following evaluation of human health and ecological risks, and risks to groundwater resources. Management limits apply to all soil depth, based on site-specific considerations for land use and soil type.

The following site-specific inputs have been applied for the selection of the appropriate investigation and screening levels:

- Land use scenario: Commercial/industrial (D) for Areas 1 & 5, Residential (A) for Area 4.
- Soil texture and grain size: Clay; Fine.
- Soil depth: 0 to <1 m.
- Age of contamination: Aged.
- Soil physicochemical properties: CEC 15 cmolc/kg; pH 7; Organic carbon content 30%.
- Traffic volume: Low.

The adopted Site Assessment Criteria (SAC), based on site-specific inputs, are included in the tables presenting the analytical results (Table 7-1, Table 7-2, Table 7-3 and Table 7-4).

Table 5-1: QA/QC Data Evaluation

Data Quality Objectives	Frequency	Achieved?	Data Quality Indicator	Achieved?
Precision				
Blind field duplicates	5% of samples	Yes	<50% RPD	Yes
Laboratory duplicates	10% of samples	Yes	<50% RPD	Yes
Limit of reporting (LOR) appropriate	All Samples	Yes	No errors/inconsistencies in LOR	Yes
Accuracy				
Laboratory Control Spikes (LCS)	5% of samples	Yes	Within LCS recovery limits	Yes
Matrix Spikes (MS)	5% of samples	Yes	Within MS recovery limits	Yes
Trip Blanks (TB)	1 per cooler	No	Below LOR	N/A
Trip Spikes (TS)	1 per cooler	No	Within acceptable recovery limits	N/A
Representativeness				
Method Blanks (MB)	5% of samples	Yes	Variance between sample results and LOR	Yes
Sampling appropriate for media and analytes	All Samples	Yes	No errors in selection of media/analytes	Yes
Sample analysed within holding times	All Samples	Yes	General metals: 6 months - Others: 14 days	Yes
Comparability				
Standard operating procedures for sample collection and handling	All Samples	Yes	No errors in compliance with procedures	Yes
Standard analytical methods for analytes	All Samples	Yes	No errors in selection of analytical methods	Yes
Consistent field conditions and lab analysis	All Samples	Yes	No variations reported	Yes
Completeness				
Soil description and COC properly completed	All Samples	Yes	No errors in COC	Yes
Appropriate documentation	All Samples	Yes	No errors in documentation	Yes
Satisfactory QC sample results	All QA/QC Samples	Yes	No reported outliers in QC report	Yes
Data from critical samples is considered valid	Critical samples	Yes	Consistency in results from critical samples	Yes

5. QA/QC EVALUATION

The Quality Assurance and Quality Control (QA/QC) applied to this project was evaluated in accordance with AS 4482.1-2005 in regard to the following parameters:

- **Precision** – measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- **Accuracy** – measures the bias in a measurement system. The accuracy of the laboratory data that is generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** – expresses the degree to which sampled data accurately and precisely represents the media present on site or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** – expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is to obtain a sufficient amount of usable data from a data collection activity.

Analytical data reported by ALS was judged to have met the essential criteria for data quality for analysis of the samples. The data assessment examined laboratory results, COC documentation, and laboratory QA/QC, and is provided in Attachments 4 and 5. Evaluation of QA/QC parameters for both soil sampling and analysis are summarised in Table 5-1.

5.1.1 Duplicate Results

One field duplicate sample was taken to assess the homogeneity of the sample matrix. In order to compare results of the duplicate sample to the original sample (A4-DISC6-SURF and A4-DISC7-SURF), the Relative Percent Difference (RPD) is calculated for each analyte that had results above the LOR. The RPD equals:

$$\text{RPD (\%)} = 100 * \frac{| X_A - X_B |}{½ (X_A + X_B)}$$

where X_A and X_B are the analyte levels of original sample A and duplicate sample B, respectively.

The accuracy of RPD values for field duplicate samples are compared to a criteria of <50% RPD. No exceedance of the RPD was found.

Table 7-4: Soil Results for OCPs and OPPs Against Residential NEPM 2013 Guidelines (Units mg/kg unless otherwise specified)

	OCP								OPP
SAC	HCB	Heptachlor	Chlordane	Endrin	Endosulfan	Methoxychlor	Sum of DDD + DDE + DDT	Sum of Aldrin + Dieldrin	Chlorpyrifos
HIL A	10	6	50	10	270	300	240	6	160
HIL A Market Gardens (#)	-	10	50	-	-	-	200	10	-
LOR	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05
Sample event ESP 2012									
S4	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	-
Sample event ESP 2016									
S-1	< 0.05	< 0.05	< 0.1	< 0.05	< 0.1	< 0.2	< 0.05	< 0.1	< 0.2
S-2	< 0.05	< 0.05	< 0.1	< 0.05	< 0.1	< 0.2	0.08	< 0.1	-
S-3	-	-	-	-	-	-	-	-	-
Sample event BE 2017									
A4-DISC1-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	< 0.05
A4-DISC2-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	< 0.05
A4-DISC3-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	< 0.05
A4-DISC4-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	**0.06**	< 0.05	< 0.05
A4-DISC5-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	**0.07**	< 0.05	< 0.05
A4-DISC6-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	< 0.05
A4-DISC7-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	< 0.05
A4-DISC8-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	< 0.05
A4-DISC9-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	**0.09**	< 0.05	< 0.05
A4-DISC10-SURF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 0.05	< 0.05

(#) NSW DEC 2005 Guidelines for assessing former Orchards and Market Gardens
(###) Clay, 0 to < 1m
(####) Urban residential, aged contamination, 7 pH, CEC 15 cmolc/kg, low traffic

8. CONCLUSION AND RECOMMENDATIONS

The purpose of this study was to verify the presence of contaminants in the soil on site, within the identified areas of potential concern, and to determine whether the levels of site contamination pose an unacceptable risk to human health and/or the environment for the proposed use of the land.

Soil samples were collected from the subject site and tested by a NATA accredited laboratory for contaminants of concern in order to enable the assessment of potential contamination in soil. The analytical results were compared to the adopted site assessment criteria, extrapolated from NEPC (2013) and specific to the proposed land uses and physiochemical properties of the soil on site. No contamination was detected in relation to the following tested contaminants: metals, PCB, OC and OP pesticides, phenols, PAHs, TRHs and BTEX. However, asbestos contamination in soil was detected within the stockpile present on site.

When combined, the analytical results presented by ESP and Benbow Environmental indicate that the site *can* be suitable for its proposed future use following clean-up of asbestos contamination detected in the stockpile within Area 4.

A remediation action plan must be prepared to guide the removal of asbestos contamination. Benbow Environmental recommends that the whole stockpile is sent for disposal to an appropriate waste facility. Following the remediation works (i.e. removal of asbestos contaminated stockpiles), a validation programme would be undertaken to ensure that surface soil in the affected portion of the site (Area 4) is free from any form of asbestos potentially released during the removal of stockpile material. Soils in Areas 1, 2, 3, 5 and 6 do not require remediation/validation for presence of any chemicals of concern.

Therefore, upon removal of the stockpile and validation of Area 4, the site would be suitable for the proposed use.

This concludes the report.

Jessica M Roy	Lauren O'Brien	R T Benbow
Environmental Scientist	Environmental Intern	Principal Consultant

9. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Bethel Mar Thoma Church, Sydney Inc. & Fairfield City Council, as per our agreement for providing environmental services. Only Bethel Mar Thoma Church, Sydney Inc. & Fairfield City Council are entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Bethel Mar Thoma Church, Sydney Inc. & Fairfield City Council for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

10. REFERENCES

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BOREHOLE LOG

Benbow ENVIRONMENTAL

Borehole Nos:
A1-Comp-Surf
A5-Comp-Surf

Client:	Bethel Mar Thoma Church	Job Number:	171144
Project:	Contamination Report Addendum	Contractor:	N/A
Location:	1650 The Horsley Drive, Horsley Park	Logged by:	JR
Borehole Diam.:	150 mm	Borehole Depth:	0.2 m
Commenced:	22.08.2017	Completed:	22.08.2017

Depth	Visual	GEOLOGICAL DESCRIPTION Material Type: USCS Group, Colour, Particle Size, Moisture Content, Consistency (Geological Origin) PID (ppm)	COMMENTS (Field Rank, Odour, Visual Blow Count, Other)	PID (ppm)	Graphic Log	Method	Water	Monitor Well Details
0.0		GROUND SURFACE Sandy clay, very dry, light brown, firm consistency with gravel inclusions Borehole terminated at 0.2 m BGL				HA		
0.2								
1.0								
2.0								
3.0								

Method

SV – Solid Flight Auger with V-bit
ST – Solid Flight Auger with TC-bit
HT – Hollow Flight Auger with TC-bit
DC – Diamond Core
R – Roller/Tricore
VC – Vibra-core
AH – Air Hammer
W – Washbone
M – Mud Drilling
HA – Hand Auger
TP – Test Pit-excavator bucket

Sample Type

SP – Split Spoon
A – Auger (disturbed)
HA – Hand Auger
CY - Cyclone
SC – Scoop

BOREHOLE LOG

Benbow ENVIRONMENTAL

Borehole Nos:

A4-DISC1-SURF A4-DISC6-SURF
A4-DISC2-SURF A4-DISC7-SURF
A4-DISC3-SURF A4-DISC8-SURF
A4-DISC4-SURF A4-DISC9-SURF
A4-DISC5-SURF A4-DISC10-SURF

Client:	Bethel Mar Thoma Church	Job Number:	171144
Project:	Contamination Report Addendum	Contractor:	N/A
Location:	1650 The Horsley Drive, Horsley Park	Logged by:	JR
Borehole Diam.:	150 mm	Borehole Depth:	0.15 m
Commenced:	22.08.2017	Completed:	22.08.2017

Depth	Visual	GEOLOGICAL DESCRIPTION Material Type: USCS Group, Colour, Particle Size, Moisture Content, Consistency (Geological Origin) PID (ppm)	COMMENTS (Field Rank, Odour, Visual Blow Count, Other)	PID (ppm)	Graphic Log	Method	Water	Monitor Well Details
0.0		GROUND SURFACE Gravelly clay, dry brown colour, firm consistency with some gravel inclusions	No obvious odour			HA		
0.15		Borehole terminated at 0.15 m BGL						
1.0								
2.0								
3.0								

Method

SV – Solid Flight Auger with V-bit
ST – Solid Flight Auger with TC-bit
HT – Hollow Flight Auger with TC-bit
DC – Diamond Core
R – Roller/Tricore
VC – Vibra-core
AH – Air Hammer
W – Washbone
M – Mud Drilling
HA – Hand Auger
TP – Test Pit-excavator bucket

Sample Type

SP – Split Spoon
A – Auger (disturbed)
HA – Hand Auger
CY - Cyclone
SC – Scoop

BOREHOLE LOG

Benbow ENVIRONMENTAL

Borehole Nos: Stock.1

Client:	Bethel Mar Thoma Church	Job Number:	171144
Project:	Contamination Report Addendum	Contractor:	N/A
Location:	1650 The Horsley Drive, Horsley Park	Logged by:	JR
Borehole Diam.:	150 mm	Borehole Depth:	0.5 m
Commenced:	22.08.2017	Completed:	22.08.2017

Depth	Visual	GEOLOGICAL DESCRIPTION Material Type: USCS Group, Colour, Particle Size, Moisture Content, Consistency (Geological Origin) PID (ppm)	COMMENTS (Field Rank, Odour, Visual Blow Count, Other)	PID (ppm)	Graphic Log	Method	Water	Monitor Well Details
0.0		GROUND SURFACE Sandy clay, wet, brown colour, with foreign material inclusions (e.g. glass fragments) Borehole terminated at 0.5 mBGL	No obvious odour			HA		
0.5								
1.0								
2.0								
3.0								

Method

SV – Solid Flight Auger with V-bit
ST – Solid Flight Auger with TC-bit
HT – Hollow Flight Auger with TC-bit
DC – Diamond Core
R – Roller/Tricore
VC – Vibra-core
AH – Air Hammer
W – Washbone
M – Mud Drilling
HA – Hand Auger
TP – Test Pit-excavator bucket

Sample Type

SP – Split Spoon
A – Auger (disturbed)
HA – Hand Auger
CY - Cyclone
SC – Scoop

BOREHOLE LOG

Borehole Nos: Stock.2

Benbow ENVIRONMENTAL

Client:	Bethel Mar Thoma Church	Job Number:	171144
Project:	Contamination Report Addendum	Contractor:	N/A
Location:	1650 The Horsley Drive, Horsley Park	Logged by:	JR
Borehole Diam.:	150 mm	Borehole Depth:	0.5 m
Commenced:	22.08.2017	Completed:	22.08.2017

Depth	Visual	GEOLOGICAL DESCRIPTION Material Type: USCS Group, Colour, Particle Size, Moisture Content, Consistency (Geological Origin) PID (ppm)	COMMENTS (Field Rank, Odour, Visual Blow Count, Other)	PID (ppm)	Graphic Log	Method	Water	Monitor Well Details
0.0		GROUND SURFACE Sandy clay, wet, brown colour, with foreign material inclusions (e.g. fragments of cement sheeting/ potential ACM). Borehole terminated at 0.5 mBGL	No obvious odour			HA		
0.5								
1.0								
2.0								
3.0								

Method

SV – Solid Flight Auger with V-bit
ST – Solid Flight Auger with TC-bit
HT – Hollow Flight Auger with TC-bit
DC – Diamond Core
R – Roller/Tricore
VC – Vibra-core
AH – Air Hammer
W – Washbone
M – Mud Drilling
HA – Hand Auger
TP – Test Pit-excavator bucket

Sample Type

SP – Split Spoon
A – Auger (disturbed)
HA – Hand Auger
CY - Cyclone
SC – Scoop

BOREHOLE LOG

Borehole Nos: Stock.3

Benbow ENVIRONMENTAL

Client:	Bethel Mar Thoma Church	Job Number:	171144
Project:	Contamination Report Addendum	Contractor:	N/A
Location:	1650 The Horsley Drive, Horsley Park	Logged by:	JR
Borehole Diam.:	150 mm	Borehole Depth:	0.5 m
Commenced:	22.08.2017	Completed:	22.08.2017

Depth	Visual	GEOLOGICAL DESCRIPTION Material Type: USCS Group, Colour, Particle Size, Moisture Content, Consistency (Geological Origin) PID (ppm)	COMMENTS (Field Rank, Odour, Visual Blow Count, Other)	PID (ppm)	Graphic Log	Method	Water	Monitor Well Details
0.0		GROUND SURFACE Sandy clay, wet, brown colour, with foreign material inclusions (e.g. pieces of bricks and larger rocks) Borehole terminated at 0.5 mBGL	No obvious odour			HA		
0.5								
1.0								
2.0								
3.0								

Method

SV – Solid Flight Auger with V-bit
ST – Solid Flight Auger with TC-bit
HT – Hollow Flight Auger with TC-bit
DC – Diamond Core
R – Roller/Tricore
VC – Vibra-core
AH – Air Hammer
W – Washbone
M – Mud Drilling
HA – Hand Auger
TP – Test Pit-excavator bucket

Sample Type

SP – Split Spoon
A – Auger (disturbed)
HA – Hand Auger
CY - Cyclone
SC – Scoop

Attachment 3: Chain of Custody Forms