Technical Note 2

DRAFT

job name **Holgate Kingstone ALC, Barnsley**
job no *026077*
date May 2010
time

subject **Contaminated Land Review**

Buro Happold

Enclosure 9

Green Space Area

BHGE Assessment of US95 for Identified Exceedances for 'Subsoil'

Technical Note 2 DRAFT

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Introduction

Buro Happold are currently engaged on two further school sites in Barnsley which form part of Barnsley BSF Phase 3, namely:

- Holgate Kingstone ALC (NGR: SE 433088 406238) – Former SR Gent site.
- Foulstone Wombwell ALC (NGR: SE 440290 403880) – Former Darfield Main Colliery site.

For clarity and ease of reference, we propose to deal with the sites in separate technical notes with this one focussing on the proposed Holgate Kingstone ALC only.

Background

We have previously contacted the Local Authority EHO/CLO regarding the proposed Holgate Kingstone ALC site and been made aware of the existing data that was already available for the disused quarry area of the site. We have obtained most of this data and this along with the data provided by Barnsley MBC specifically for the scheme in respect of ground contamination is listed below:

- FWS Consultants Limited Report entitled "*Contamination and Geotechnical Investigation of the SR Gent Premises, Dodworth Road, Barnsley*" (ref: 1082), dated April 2006, on behalf of Price Waterhouse Coopers.
- Abatech Consulting Engineers Report entitled "*Former S.R. Gent Site, Dodworth Road, Barnsley: Groundwater Risk Assessment*" (ref: S6/033), dated January 2008, on behalf of Barratt Sheffield.
- White Young Green Report entitled "*Geo-Environmental Desk Study Report, Former S.R. Gent Site, Dodworth Road, Barnsley*" (ref: A051835-2), dated January 2009, on behalf of Price Waterhouse Coopers.
- CC Geotechnical Report entitled "*Geoenvironmental Report for a site at Holgate School, Barnsley*" (ref: 08/5373), dated June 2009, on behalf of Barnsley Metropolitan Borough Council.

The proposed scheme includes a former quarry, an area of existing playing fields and the existing Holgate School. The proposed overall development (Enclosure 1) stretches over all of these areas, although it is the quarry area which has been subject to the most previous development as indicated on the constraints drawing prepared for the scheme (Enclosure 2).

Given the contrast in previous land usage and thus the likely degree of ground contamination, the site has been subdivided into three broad segments as indicated on the thumbnail in Enclosure 2, namely:

- The Former Quarry Area.
- The Green Space Area.
- Existing School Site.

These are dealt with separately in the following paragraphs in reverse order with the simplest first.

The Existing School Site

The existing Holgate School site is to be subject to demolition of the existing buildings and associated activities followed by the placement of a 'clean' layer of 6F2 (processed demolition arisings) covered with layer of topsoil approximately 300 mm thick to form the proposed grass pitch. This proposed layers are required as part of the scheme and should be placed in accordance with the excavating and filling specification requirements thus providing a layer of 'clean' cover to the existing material for which there is currently no chemical data. This needs to be reviewed as the scheme advances.

The Green Space Area

The area of green space (ie the existing playing fields including tennis courts and running track) is essentially undeveloped other than the reprofiling to form the terraces upon which the existing pitches/courts are formed. The intention is to keep the existing pitches/courts unchanged as far as reasonably practical.

In order to ensure compliance with current guidance in respect of human health and environmental receptors for the green space area, an programme of shallow surface sampling of topsoil and substrate was undertaken to determine the nature and characteristics of the materials currently present. The factual data is presented Structural Soils Limited (SSL) Factual Report[1] and an exploratory hole location plan is provided in Enclosure 3.

Topsoil Review

The topsoil information has been reviewed and assessed and the following data summaries/ interpretation is provided:

- BHGE assessment of chemical results for topsoil – Enclosure 4.
- BHGE summary plan for topsoil exceedances of Phase 1 Earthworks Specification – Enclosure 5.
- BHGE assessment of US95 for identified exceedances for topsoil – Enclosure 6.

A review of the 65 No. topsoil samples available indicates there are some minor exceedances of the Earthworks Specification values agreed for the Barnsley BSF Phase 1 (Enclosure 5 refers) but when the US95 of these determinands are examined, they are all found to be below the relevant threshold value. As such, the topsoil can be considered to be uncontaminated and no further assessment for this material is necessary.

'Subsoil' Review

The 'subsoil' / substrate information has been reviewed and assessed and the following data summaries/ interpretation is provided:

- BHGE assessment of chemical results for 'subsoil' – Enclosure 7.
- BHGE summary plan for 'subsoil' exceedances of Phase 1 Earthworks Specification– Enclosure 8.
- BHGE assessment of US95 for identified exceedances for 'subsoil' – Enclosure 9.
- BHGE assessment of capping layer thickness for 'subsoil' – Enclosure 10.

A review of the exploratory hole records supports the theory that the upper terraces of the green space are 'cut platforms' in natural ground giving way to 'fill platforms' lower down the hillside as envisaged. As such, the expectation of topsoil overlying natural material on the upper platforms giving way to topsoil overlying fill/Made Ground on the lower platforms has been confirmed.

Further analyses of the 58 No. 'subsoil' samples indicates that the green space west of the cricket pitch (formed by terraces cut into natural ground) can be summarized as 'clean' topsoil overlying 'clean' natural ground whereas the 'subsoil' for the terraces east of the cricket pitch (the area clouded in red) can be summarized as 'clean' topsoil overlying Made Ground which required further statistical assessment. It should be noted that the area clouded in blue includes Made Ground requiring statistical assessment which has been included in the overall Made Ground analyses.

[1] Structural Soils Limited report entitled "*Factual report on the ground investigation at Holgate Kingstone, Barnsley*" (Ref:761493), dated April 2010, prepared on behalf of Laing O'Rourke" - Draft.

Statistical assessment (US95) was undertaken for the Made Ground in respect of arsenic, chromium, copper, lead, mercury, zinc, EPH and benzo(a)pyrene (see Enclosure 9). Chromium, Lead, EPH and benzo(a)pyrene US95 values are below the 'threshold' values selected but arsenic, copper, mercury and zinc US95 values still exceed the 'threshold' values selected thus consideration of a 'clean' cover thickness is required.

The only industry standard tool available to undertake a 'clean' cover assessment is designed for residential development[2] with plant uptake and, as such, is considered to be overly onerous for the assessment of playing fields at a school site. Given the conservative nature of the assessment, the following scenarios have been examined (Enclosure 10 refers):

- Standard model (based on 600 mm mixing zone) – critical determinand arsenic if target value of 35 mg/kg is used yielding a cover thickness requirement of 479 mm.
- Standard model (based on 600 mm mixing zone) – critical determinands copper and mercury if target value of arsenic of 79 mg/kg (as agreed on Phase 1) is used yielding a cover thickness requirement of 365 and 367 mm respectively.
- *Revised model (based on 300 mm mixing zone) – critical determinand arsenic if target value of* 35 mg/kg is used yielding a cover thickness requirement of 240 mm.
- Revised model (based on 300 mm mixing zone) – critical determinands copper and mercury if target value of arsenic of 79 mg/kg (as agreed on Phase 1) is used yielding a cover thickness requirement of 183 mm for both determinands.

As the 'standard' cover thickness model is considered overly onerous and the existing thickness of 'clean' topsoil is currently around 300 mm over the Made Ground area, it is considered that either reducing the mixing zone to 300 mm (which for turf is considered conservative) or resetting the target value from the arsenic SGV of 35 mg/kg to the previously agreed site specific value of 79 mg/kg both generate acceptable solutions in respect of human health risk as the only other determinands requiring a greater cover thickness are copper which is a phytotoxin and mercury for which the agreed earthworks value for Barnsley BSF Phase 1 is 15 mg/kg thus requiring no further action.

Geoenvironmental Review

In terms of geoenvironmental impact, all 58 No. leachate samples (Enclosure 11 refers) from the substrate were either below UK Drinking Water Values and/or EQS Values and, as such, are not considered to be significant in terms of geoenvironmental receptors. 10 No. leachate samples failed to comply with the Earthworks Specification for Barnsley BSF Phase 1 in respect of Zinc but this value is likely to be reviewed for Phase 3 works as it is considered to be overly onerous in this case.

Summary

Given the foregoing, it is considered that for the area of green space the elevated concentrations observed are either statistically insignificant in terms of US95 values or require a 'clean' cover thickness of less than that already present. This is based on either applying the site specific considerations of either the thickness of the mixing zone or revised target value for arsenic/mercury as used in Barnsley BSF Phase 1. As such, a 'do nothing' scenario is proposed for the green space area in respect of contaminated land requirements, that is to say the pitches could be left as they are.

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[2] BRE Report entitled "*Cover Systems for Land Regeneration – Thickness Design of Cover Systems for Contaminated Land*", dated March 2004, on behalf of the BRE, the Association of Geotechnical and Geoenvironmental Specialists (AGS), the Department of Trade and Industry (DTI) the and National House Building Council (NHBC).

The Quarry Area

The quarry area has been the subject of a significant degree of previous land usage including mineral extraction, backfilling and former SR Gent factory with a Shell PFS (Petrol Filling Station) to the northwestern boundary of the site (Enclosure 2 refers). It should be noted that the Shell PFS is to be decommissioned by others on behalf of Barnsley MBC prior to becoming part of the proposed development site and thus is not specifically addressed in this note.

The quarry area has also been the subject of a number of previous investigations including sampling and testing undertaken by others. This data has been reviewed in the context of the current development proposal in accordance with current guidance in respect of human health and geoenvironmental receptors. The following information is provided:

- Exploratory hole location plan – Enclosure 12.
- BHGE assessment of chemical results – Enclosure 13.
- BHGE assessment of US95 for identified exceedances for Made Ground – Enclosure 14.
- BHGE assessment of capping layer thickness for Made Ground – Enclosure 15.

A review of the soil samples available indicates there are some exceedances of the Earthworks Specification values agreed for the Barnsley BSF Phase 1 (Enclosure 13 Page 4 refers) namely chromium, lead, zinc, sulphate and TPH. In addition there are elevated concentrations benzene, BTEX (Sum) and PAH (as identified in Enclosure 13). These determinands required further consideration and statistical assessment.

Statistical assessment (US95) was undertaken for the Made Ground in respect of chromium, lead, zinc, sulphate, TPH, benzene, BTEX (Sum), aromatics >EC12-EC16 and PAH (Enclosure 14 refers). Chromium, lead, zinc, sulphate, aromatics >EC12-EC16 and two PAH US95 values are below the 'threshold' values selected but TPH, benzene, BTEX (Sum) and eight PAH plus Total PAH US95 values still exceed the 'threshold' values selected thus consideration of a 'clean' cover thickness is required.

A 'clean' cover assessment has been undertaken (Enclosure 15 refers) which is considered to be overly onerous for the assessment of a school site. Notwithstanding this, given the determinands concerned it is considered prudent to apply this conservative assessment for the quarry area as some of the non geoenvironmental design drivers will result in clean material (structural or landscape build-ups) being introduced to construct the development.

In terms of human health, the maximum thickness of clean cover required in accordance with 'cover systems for land regeneration – 2004' based on the most critical determinand, TPH, is 549 mm. The current development proposal typically includes surface build-ups of approximately 500 mm thus an additional layer of 'clean' earthworks material is considered necessary.

Due to the site setting in the base of a former quarry combined with the requirement to bring in all the standard utilities (typically occupying the surface 1 m), it is proposed that the layer of 'clean' earthworks material is thickened from the basic requirement for human health end use (to achieve 549 mm) to 1.50 m thick. This is to allow all future excavations for the standard utilities, pile caps and ground beams etc for the proposed scheme to be all undertaken in 'clean' material. It should also future-proof the scheme in respect of additional future minor developments that may be undertaken. This proposal is considered feasible for this scheme because a suitable quantity of 'clean' earthworks material can be sourced on site (upper terrace of green space area) in order to provide a holistic and sustainable engineering solution in respect of a number of ground related risks. It should be noted, however, that any piled foundations or deep drainage runs will penetrate the 'clean' earthworks material capping and

thus appropriate measures will need to be undertaken and any contaminated arisings will need to be managed accordingly.

Geoenvironmental Review

In terms of geoenvironmental impact, there are 5 No. leachate samples and 8 No. water samples from the quarry area which have been reviewed with reference to UK Drinking Water Values, EQS Values and the Barnsley BSF Phase 1 earthworks specification leachate requirements (Enclosure 16 refers). Examination of Enclosure 16 shows that most determinands are not significantly elevated although there is a marginal exceedance of phenol, an isolated exceedance of cyanide and a couple of significantly elevated TPH values. Given the geoenvironmental setting of the quarry area, the phenol and cyanide values are not considered to be sufficiently elevated to require further assessment but the TPH values do require further consideration.

The elevated TPH values are considered to have two potential geoenvironmental impacts, namely:

- Volatile vapour migration to the proposed development.
- Migration of contamination off site.

The likelihood of vapour migration into the proposed development is currently being reviewed. In the event that a significant risk is identified in this regard, the currently proposed DPM of 2000 gauge visqueen would be upgraded to hydrocarbon resistant membrane. This will require further discussion on completion of the vapour migration risk review.

The issue of the migration of contaminated (principally hydrocarbons) groundwater has been previously assessed by others. A copy of a detailed QRA prepared by Abatech international Limited is provided. The assessment includes the following key points:

- The environmental setting – poor quality fill materials previously placed.
- Coal Measure strata – low sensitivity receptor.
- No identified sensitive receptors in the general vicinity (within 500 m).
- Low mobility of ground water.
- Low risk of migration off site.

Overall, based on the information available, the overall geoenvironmental requirements in respect of ground contamination for the scheme are considered to be the incorporation of a hydrocarbon resistant membrane subject to a vapour migration risk review to be provided separately.

Summary

Given the foregoing, it is considered that for the quarry area the concentrations of the determinands observed are either below the appropriate threshold values or statistically insignificant in terms of US95 values with the exception of TPH and some speciated PAH concentrations which require a 'clean' cover thickness of approximately 550 mm. As such, there is a requirement for 'clean' earthworks material to be place below the proposed build-ups in respect of human health. It is proposed to thickened the 'clean' earthworks material to a thickness of 1.50 m to future proof the development and ensure the construction workforce are typically working within 'clean' material with the exception of any piling works or deeper parts of drainage runs.

In terms of groundwater, the petrochemical contamination identified is considered to be immobile and thus requires no further specific action based on the DQRA undertaken by Abatech International Ltd. The petrochemical contamination observed could well require a vapour proof membrane, this is under current under review and will be provided separately.

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Proposed Remediation Strategy

The proposed remediation strategy can basically be summarized as follows:

Existing Holgate School Area
Existing Holgate school site to be demolished with appropriately sorted and processed material spread on this area and then covered by final end use surface build-ups typically assumed to be between 300 mm and 500 mm in thickness. Further sampling and review is required in this specific area.

Existing Green Space Area
The existing green space area is considered to require no remedial action and thus is proposed to stay generally as is. The only currently proposed change is to remove the uppermost terrace in the southwestern corner to provide 'clean' material to be used in the quarry area as summarized below.

Existing Quarry Area
The quarry area is considered to require at least 549 mm of 'clean' cover in respect of human health guide lines. It is proposed to provide approximately 1.50 m of site won (upper terrace) 'clean' material as this has been determined to be a cost effective way of addressing a number of both physical and geoenvironment constraints in addition to advantages of practicality and buildability.

A hydrocarbon proof membrane is likely to be required beneath buildings but this is subject to further review.

Other issues which are currently being monitored or under review which will need to be submitted and agreed include:

- Review of volatile petrochemical fraction to assess requirement for hydro carbon resistant membrane.
- Gas regime and suitable protection measures for proposed buildings.
- Review of Barnsley BSF Phase 1 earthworks specification 'contamination' requirements, namely soil pH and leachate zinc, sulphate and TPH values

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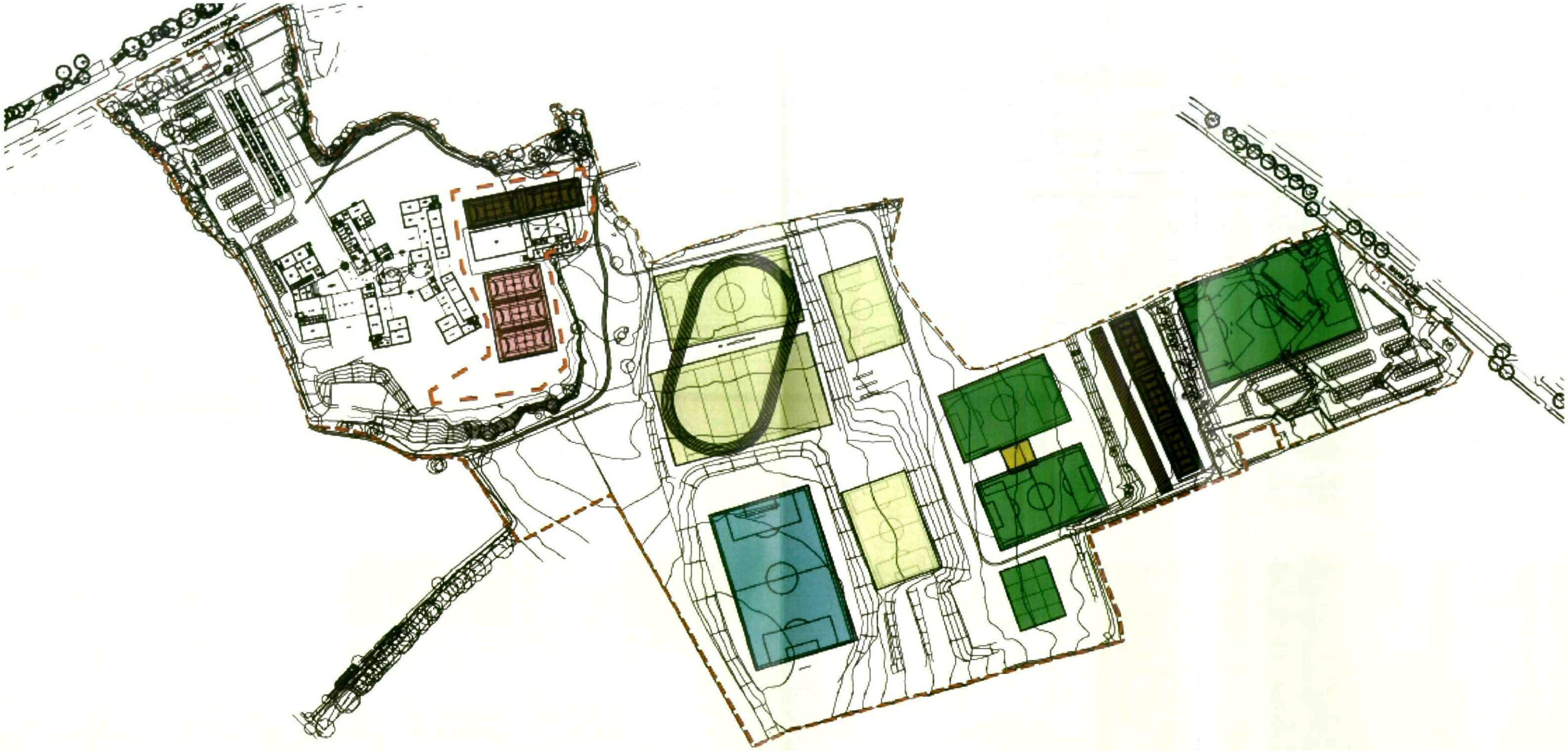
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Enclosure 1

Current Development Proposal



SPORT PITCH/AREA:	OUTPUT SPEC:	CURRENT SCHEME:
TENNIS COURT	6	8 (AS MUGA'S)
NETBALL COURT	3	8 (AS MUGA'S)
AWP SENIOR FOOTBALL PITCH	1	1
AWP MULTI USE GAMES	1	1 (3 MUGA'S WITH POLYMERIC SURFACE)
SENIOR FOOTBALL	2	1 (+ 1 AS STP)
JUNIOR FOOTBALL PITCH	1	3
SENIOR RUGBY PITCH	2	1
400M ATHLETICS TRACK	1	1 (WHITE LINED OVER PITCHES 300M)
TRAINING GRIDS	1	1
BASKET BALL COURT	0	8 (AS MUGA'S)
5 ASIDE FOOTBALL	0	8 (AS MUGA'S)

SURFACE MATERIAL:

- EXISTING GRASS PITCH RETAINED
- PROPOSED GRASS PITCH
- SYNTHETIC TURF PITCH
- POLYMERIC SURFACE
- MACADAM SURFACE
- ARTIFCIAL CRICKET WICKET
- CROSS COUNTRY/FITNESS TRAIL (400M LENGTH)

BB98:	REQUIRED:	PROPOSED:
PITCHES	87,315	101,873
HARD COURTS	5,018	5,477

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Enclosure 2

Site Constraints Schematic

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Enclosure 3

Green Space Area

Exploratory Hole Location Plan

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Enclosure 4

Green Space Area

BHGE Assessment of Chemical Results for Topsoil

Envirolab Job Number: 10/00524
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

Lab Sample ID	Units	Method	0/00524/5	0/00524/6	0/00524/6	0/00524/6	0/00524/6	0/00524/6	0/00524/6	0/00524/6	0/00524/6	0/00524/6	0/00524/6	0/00524/6	0/00524/7	0/00524/7	0/00524/7	0/00524/7	0/00524/7	0/00524/7	0/00524/7	0/00524/7	0/00524/7	0/00524/7	0/00524/8	0/00524/8	Residential Without Plant Uptake Guideline Value	Commercial/ Industrial	Other Screening Values (refer to notes under table for explanation)	EW Specification Soil concentration
Client Sample No			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				
Client Sample ID			PF01	PF02	PF03	PF04	PF05	PF06	PF07	PF08	PF09	PF10	PF11	PF12	PF13	PF14	PF15	PF16	PF17	PF18	PF19	PF20	PF21	PF22	PF23				
Depth to Top			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1				
Sample Type			Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil				
Sample Matrix Code			3	5A	3	3	5A	5A	5	5	3A	3	3	3	3A	3	3	5A	5A	5A	5A	5A	5A	5A	3A				
Arsenic	mg/kg	A-T-024	18	15	13	16	9	9	10	15	12	11	9	14	12	8	13	9	10	9	10	6	11	12	12	35	640		79
Cadmium	mg/kg	A-T-024	1.1	1.1	1.5	1.2	0.8	0.9	0.8	1.3	1.3	1.1	1.1	1	1	1	1.3	0.7	0.7	0.7	0.8	0.6	0.7	1	0.9	85	230		30
Chromium	mg/kg	A-T-024	20	16	17	19	11	13	11	21	17	17	19	21	15	15	21	14	14	17	20	15	16	17	19	200 (1)	5000 (1)		200
Copper	mg/kg	A-T-024	22	33	22	28	20	19	21	29	26	22	29	26	27	23	25	17	16	23	25	15	20	25	23	6200	72000	190 (2)	190
Lead	mg/kg	A-T-024	48	40	44	62	39	41	43	52	47	43	45	43	60	38	48	35	33	33	40	30	43	46	44	450	750		450
Mercury	mg/kg	A-T-024	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	1	26		15
Nickel	mg/kg	A-T-024	19	36	19	18	15	16	16	20	20	20	28	22	19	24	20	14	14	14	13	12	12	18	18	130	1800		130
Selenium	mg/kg	A-T-024	1	2	2	2	<1	2	<1	2	2	1	<1	2	2	1	2	1	1	<1	<1	<1	1	2	2	600	13000		260
Zinc	mg/kg	A-T-024	84	69	109	95	71	61	65	99	85	91	97	79	87	90	80	55	55	59	74	52	62	76	72	40000	670000	330 (2)	300
Other Determinands																													
Phenols - Total by HPLC	mg/kg	A-T-050s	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	520	3200		5
Cyanide (free)	mg/kg	T-042sTC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	760	16000		25
Asbestos Screen		Visual	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM			0.1% (3)	
pH	pH	A-T-031s	6.7	6.3	5.6	5.6	5.8	5.7	5.8	5.4	6	5.9	5.9	6.2	6.2	6.1	5.6	5.7	5.9	6.7	7.6	6.1	5.6	5.7	6			5<pH<9 (4)	6<pH<8
EPH total (C10-C36)	mg/kg	A-T-023s	<10	<10	<10	12	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	20	<10	<10	<10			500 (5)	
PAH 16																													
Naphthalene	mg/kg	A-T-019s	0.46	3.3	0.07	0.23	0.09	0.11	0.31	0.17	0.13	0.55	0.07	0.17	0.42	0.19	0.17	0.13	0.1	0.09	0.09	0.06	0.33	0.2	0.16	9.2	1100		9.2
Acenapthylene	mg/kg	A-T-019s	0.07	0.51	0.02	<0.01	<0.01	<0.01	0.02	0.02	0.06	0.02	<0.01	0.01	0.02	0.01	0.04	0.02	<0.01	<0.01	0.03	<0.01	0.04	0.03	0.02	850 (2)			
Acenapthene	mg/kg	A-T-019s	0.08	0.76	<0.01	0.01	<0.01	<0.01	<0.01	0.05	1.09	0.12	0.06	<0.01	0.03	0.02	0.02	0.02	0.02	<0.01	0.04	0.02	0.07	0.02	0.01	1000 (2)			
Fluorene	mg/kg	A-T-019s	<0.01	0.13	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.56	0.11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	780 (2)	9500 (2)		
Phenanthrene	mg/kg	A-T-019s	1.37	10	0.73	0.33	0.27	0.37	0.43	0.51	13.1	1.12	0.6	0.22	0.65	0.29	0.64	0.44	0.27	0.36	0.28	0.28	0.78	0.89	0.43	380 (2)			
Anthracene	mg/kg	A-T-019s	0.7	4.69	0.26	0.07	0.08	0.13	0.18	0.24	3.16	0.5	0.25	0.04	0.27	0.14	0.2	0.08	0.12	0.13	0.13	0.14	0.29	0.32	0.15	9200 (2)			
Benzo(a)anthracene	mg/kg	A-T-019s	0.71	2.41	0.07	0.08	0.03	0.05	0.1	0.07	4.19	0.21	0.11	0.04	0.08	0.05	0.13	0.13	0.02	0.03	0.08	0.03	0.09	0.09	0.09	670 (2)			
Fluoranthene	mg/kg	A-T-019s	1.73	6.21	0.12	0.19	0.08	0.14	0.22	0.29	10	0.38	0.28	0.16	0.26	0.21	0.33	0.25	0.09	0.14	0.14	0.09	0.22	0.33	0.2	1600 (2)			
Pyrene	mg/kg	A-T-019s	1.37	5.07	0.09	0.15	0.07	0.12	0.19	0.23	7.49	0.29	0.27	0.14	0.21	0.2	0.27	0.21	0.07	0.11	0.13	0.08	0.18	0.26	0.16	5.90 (2)			
Chrysene	mg/kg	A-T-019s	1.88	8.24	0.36	0.36	0.13	0.27	0.47	0.4	6.98	0.53	0.46	0.24	0.47	0.25	0.51	0.38	0.2	0.16	0.31	0.18	0.37	0.53	0.42	9.3 (2)			
Benzo(b)fluoranthene	mg/kg	A-T-019s	2.22	8.62	0.05	0.31	0.13	0.07	0.24	0.37	4.61	0.27	0.4	0.09	0.35	0.12	0.47	0.29	0.09	0.12	0.28	0.13	0.28	0.16	0.26	7 (2)			
Benzo(k)fluoranthene	mg/kg	A-T-019s	2.47	8.5	0.06	0.21	0.1	0.15	0.22	0.45	2.11	0.33	0.55	0.05	0.33	0.22	0.38	0.14	0.12	0.1	0.26	0.21	0.32	0.24	0.2	10 (2)			
Benzo(a)pyrene	mg/kg	A-T-019s	1.03	3.17	<0.01	0.04	<0.01	0.11	0.28	0.12	3.72	0.05	0.11	0.02	<0.01	0.11	0.12	0.08	<0.01	0.03	0.07	0.03	0.09	0.11	0.01	1	14		3.3
Indeno(123-cd)pyrene	mg/kg	A-T-019s	0.59	0.13	<0.01	<0.01	<0.01	0.03	0.03	0.01	0.93	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	4.2 (2)			
Dibenzo(ah)anthracene	mg/kg	A-T-019s	0.19	<0.01	<0.01	<0.01	0.06	<0.01	0.05	<0.01	0.32	0.04	<0.01	<0.01	0.04	<0.01	0.02	0.02	<0.01	0.04	<0.01	<0.01	<0.01	0.19	0.15			1.3 (2)	1.3*
Benzo(ghi)perylene	mg/kg	A-T-019s	1.17	1.78	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	3.43	<0.01	<0.01	<0.01	<0.01	<0.01	0.15	0.13	<0.01	<0.01	<0.01	<0.01	0.15	<0.01	0.04	47 (2)			
Coronene	mg/kg	A-T-019s	0.04	<0.01	0.02	0.02	<0.01	<0.01	<0.01	0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01				
Total PAH	mg/kg	A-T-019s	16.1	63.5	1.87	2.11	1.04	1.56	2.73	2.95	62	4.5	3.15	1.17	3.14	1.79	3.44	2.31	1.1	1.32	1.84	1.24	3.2	3.39	2.33			100 (5)	100
Classification Tests																													
Sulphate (water sol 2:1)	g/l	A-T-026s	0.02	0.02	0.01	0.01	0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.02	<0.01	0.03	<0.01	0.03				
% Stones >10mm~	% w/w	A-T-044	<0.1	1.1	<0.1	<0.1	27.2	21.8	22.6	<0.1	21.80	<0.1	<0.1	<0.1	17.8	<0.1	<0.1	35.6	32.1	26.8	25.4	35.8	32.1	8.4	2.1				

Project name:	**Barnsley BSF - Phase 3 - Holgate Kingstone ALC**
Report title:	**Ground Contamination Assessment**
Table title:	**Contamination Assessment - Topsoil**
Date: May 2010	**Job No. 026077**

Buro Happold
Ground Engineering

GENERAL NOTES:
All results reported on dry weight basis
No ACM = No Asbestos Containing Material
Numbers in red not currently part of earthworks specification
*Generic Assesment Criteria for Human Health Risk Assesment. Land Quality Management Ltd & The Chartered Institute of Environmental Health. Published by: Land Quality Press, a division of Land Quality Management Ltd (2007). Residential Without Plant Uptake.

SCREENING CRITERIA NOTES
(1) Former SGV retracted in 2007
(2) Generic Assesment Criteria for Human Health Risk Assesment. Land Quality Management Ltd & The Chartered Institute of Environmental Health. Published by: Land Quality Press, a division of Land Quality Management Ltd (2007). Residential Without Plant Uptake.
(3) Based on Environment Agency Technical Guidance WM2 'Hazardous Waste' (2003, version 1)
(4) Guidance on the Disposal of "Contaminated Soils". Environment Agency. Version 3, February 2001 (Now withdrawn).
(5) Based on Environment Agency 'Guidance on Sampling and Testing of Wastes to meet Landfill Acceptance Procedures' (2005, version 1) Inert waste criteria.
(6) ICRCL values

Envirolab Job Number: 10/00524
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

Lab Sample ID	Units	Method	0/00524/8	0/00524/8	0/00524/8	0/00524/8	0/00524/8	0/00524/8	0/00524/8	0/00524/8	0/00524/9	0/00524/9	0/00524/9	0/00524/9	0/00524/9	0/00524/9	0/00524/9	0/00524/9	0/00524/9	0/00524/9	0/00524/9	0/00524/10	0/00524/10	0/00524/10	0/00524/10	Residential Without Plant Uptake Guideline Value	Commercial/ Industrial	Other Screening Values (refer to notes under table for explanation)	EW Specification Soil concentration
Client Sample No			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Client Sample ID			PF24	PF25	PF26	PF27	PF28	PF29	PF30	PF31	PF32	PF33	PF34	PF35	PF36	PF37	PF38	PF40	PF41	PF43	PF44	PF46	PF47	PF49					
Depth to Top			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1				
Sample Type			Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil				
Sample Matrix Code			5A	5A	3A	3A	3A	3A	3A	3A	3A	3A	3A	3A	3A	3A	6A	3A	5A	5A	3	3	6E	3A				
Arsenic	mg/kg	A-T-024	7	7	11	8	9	8	12	5	11	7	12	13	15	15	24	11	7	7	8	15	35	10	35	640		79
Cadmium	mg/kg	A-T-024	0.7	0.7	1.1	0.8	0.7	0.7	1.1	<0.5	0.8	0.9	0.8	0.9	1	1	1.4	0.9	0.8	0.7	1.4	1.3	1.3	0.7	85	230		30
Chromium	mg/kg	A-T-024	12	11	20	14	16	13	24	7	20	30	22	21	26	26	33	30	22	25	38	36	33	19	200 (1)	5000 (1)		200
Copper	mg/kg	A-T-024	14	14	18	15	15	13	23	8	19	17	22	21	23	25	82	138	16	15	21	43	74	21	6200	72000	190 (2)	190
Lead	mg/kg	A-T-024	26	25	41	34	33	31	39	20	37	24	33	41	50	54	122	37	24	15	29	51	119	28	450	750		450
Mercury	mg/kg	A-T-024	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	0.31	<0.17	<0.17	<0.17	<0.17	<0.17	0.36	<0.17	1	26		15
Nickel	mg/kg	A-T-024	12	13	16	13	13	12	18	7	15	21	16	16	16	18	21	23	17	18	24	22	25	13	130	1800		130
Selenium	mg/kg	A-T-024	1	1	2	1	2	1	2	<1	1	<1	1	1	2	2	2	<1	<1	2	1	2	2	1	600	13000		260
Zinc	mg/kg	A-T-024	49	43	62	55	57	46	92	27	59	63	59	55	62	65	151	71	49	57	88	106	126	51	40000	670000	330 (2)	300
Other Determinands																												
Phenols - Total by HPLC	mg/kg	A-T-050s	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	520	3200		5
Cyanide (free)	mg/kg	T-042sTC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	760	16000		25
Asbestos Screen		Visual	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM			0.1% (3)	
pH	pH	A-T-031s	5.4	6.1	5.8	6.8	6.6	6.4	7.3	6.1	6	5.6	6.2	5	5	5	6.9	6.1	6.1	6.2	6.4	5.7	6.2	6.3			5<pH<9 (4)	6<pH<8
EPH total (C10-C36)	mg/kg	A-T-023s	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	93	<10	<10	<10	<10	<10	<10	<10			500 (5)	
PAH 16																												
Naphthalene	mg/kg	A-T-019s	0.1	0.07	0.08	0.08	0.08	0.08	0.33	0.08	0.25	0.39	0.22	0.09	0.19	0.12	0.44	0.11	0.1	0.05	<0.01	0.07	0.46	0.08	9.2	1100		9.2
Acenapthylene	mg/kg	A-T-019s	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	0.03	0.06	<0.01	<0.01	0.02	<0.01	0.16	<0.01	<0.01	<0.01	<0.01	<0.01	0.14	<0.01	850 (2)			
Acenapthene	mg/kg	A-T-019s	<0.01	0.02	0.08	0.02	0.02	0.01	0.14	0.01	0.11	0.03	0.05	0.02	0.07	0.02	0.32	<0.01	0.03	0.02	<0.01	<0.01	0.09	0.02	1000 (2)			
Fluorene	mg/kg	A-T-019s	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.06	0.02	0.02	<0.01	<0.01	<0.01	0.23	<0.01	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	780 (2)	9500 (2)		
Phenanthrene	mg/kg	A-T-019s	0.36	0.25	0.92	0.55	0.22	0.29	2.11	0.26	0.96	1.2	0.87	0.27	0.69	0.5	6.35	0.21	0.35	0.35	<0.01	0.23	2.15	0.21	380 (2)			
Anthracene	mg/kg	A-T-019s	0.19	0.12	0.3	0.28	0.08	0.12	1.01	0.11	0.28	0.42	0.33	0.13	0.31	0.15	1.7	0.08	0.08	1.95	<0.01	0.14	0.57	0.07	9200 (2)			
Benzo(a)anthracene	mg/kg	A-T-019s	0.57	0.05	0.19	0.07	0.03	0.04	0.1	0.04	0.09	0.09	0.08	0.05	0.09	0.07	2.63	0.02	0.05	0.02	0.04	<0.01	1.4	<0.01	670 (2)			
Fluoranthene	mg/kg	A-T-019s	0.82	0.08	0.4	0.09	0.05	0.08	0.38	0.07	0.26	0.23	0.19	0.09	0.2	0.11	4.78	0.06	0.11	<0.01	<0.01	<0.01	1.85	0.04	1600 (2)			
Pyrene	mg/kg	A-T-019s	0.63	0.07	0.3	0.08	0.06	<0.01	0.29	0.06	0.2	0.19	0.16	0.08	0.16	0.09	3.38	<0.01	0.1	0.05	<0.01	<0.01	1.44	0.03	5.90 (2)			
Chrysene	mg/kg	A-T-019s	1.47	0.22	0.65	0.23	0.12	0.19	0.47	0.13	0.68	0.46	0.39	0.14	0.32	0.24	5.33	0.07	0.18	0.15	0.04	0.05	2.46	0.02	9.3 (2)			
Benzo(b)fluoranthene	mg/kg	A-T-019s	1.13	0.14	0.54	0.08	<0.01	0.09	0.23	0.12	0.4	0.21	0.31	0.04	0.11	<0.01	3.35	0.02	0.05	0.12	<0.01	0.02	2.8	0.08	7 (2)			
Benzo(k)fluoranthene	mg/kg	A-T-019s	1.2	0.07	0.4	0.02	<0.01	0.07	0.2	0.12	0.34	0.14	0.3	<0.01	0.05	<0.01	3.01	<0.01	0.03	<0.01	<0.01	<0.01	1.93	0.09	10 (2)			
Benzo(a)pyrene	mg/kg	A-T-019s	0.64	<0.01	0.1	0.04	<0.01	<0.01	<0.01	0.01	0.16	0.13	<0.01	<0.01	0.12	<0.01	2.3	<0.01	0.09	<0.01	<0.01	0.08	1.75	0.02	1	14		3.3
Indeno(123-cd)pyrene	mg/kg	A-T-019s	0.35	<0.01	0.02	<0.01	<0.01	0.04	0.06	<0.01	<0.01	0.02	0.02	0.02	0.03	<0.01	0.98	0.04	0.03	<0.01	<0.01	0.04	1.21	0.05	4.2 (2)			
Dibenzo(ah)anthracene	mg/kg	A-T-019s	0.06	0.03	0.11	0.08	0.05	0.01	0.06	<0.01	0.02	0.13	0.02	<0.01	0.06	0.07	0.19	0.05	0.03	<0.01	<0.01	0.12	0.35	0.12			1.3 (2)	1.3*
Benzo(ghi)perylene	mg/kg	A-T-019s	0.76	0.08	0.01	<0.01	<0.01	0.06	0.13	0.05	<0.01	0.15	0.08	<0.01	0.08	0.02	2.32	0.01	0.03	0.02	<0.01	<0.01	1.61	0.02	47 (2)			
Coronene	mg/kg	A-T-019s	0.02	<0.01	0.01	0.04	<0.01	<0.01	0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	0.11	0.01	<0.01	<0.01	<0.01	0.02	0.05	0.02				
Total PAH	mg/kg	A-T-019s	8.32	1.2	4.13	1.69	0.73	1.1	5.64	1.09	3.84	3.89	3.05	0.94	2.49	1.39	37.5	0.68	1.27	2.74	0.07	0.79	20.3	0.9			100 (5)	100
Classification Tests																												
Sulphate (water sol 2:1)	g/l	A-T-026s	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.02	0.03	<0.01				
% Stones >10mm~	% w/w	A-T-044	38.5	40	10.6	30	24.6	38.9	3.9	69.8	29.6	17.7	25.8	26	18.3	12	23.5	4.5	25.9	23.4	<0.1	<0.1	4.4	30.7				

Project name:	**Barnsley BSF - Phase 3 - Holgate Kingstone ALC**
Report title:	**Ground Contamination Assessment**
Table title:	**Contamination Assessment - Topsoil**
Date: May 2010	**Job No. 026077**

Buro Happold
Ground Engineering

GENERAL NOTES:
All results reported on dry weight basis
No ACM = No Asbestos Containing Material
Numbers in red not currently part of earthworks specification
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(4) Guidance on the Disposal of "Contaminated Soils". Environment Agency. Version 3, February 2001 (Now withdrawn).
(5) Based on Environment Agency 'Guidance on Sampling and Testing of Wastes to meet Landfill Acceptance Procedures' (2005, version 1) Inert waste criteria.
(6) ICRCL values

Envirolab Job Number: 10/00524
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

Lab Sample ID	Units	Method	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	10/00524/1	Residential Without Plant Uptake Guideline Value	Commercial/ Industrial	Other Screening Values (refer to notes under table for explanation)	EW Specification Soil concentration
Client Sample No			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1				
Client Sample ID			PF50	PF52	PF53	PF54	PF56	PF57	PF58	PF59	PF60	PF62	PF63	PF64	PF65	PF66	PF67	PF68	PF69	GS01	GS02	GS03				
Depth to Top			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1				
Sample Type			Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil				
Sample Matrix Code			3A	3A	3	3	3A	6A	3	3	3	3	2AE	3AE	3AE	3	3AE	2A	3A	3	3A	3AE				
Arsenic	mg/kg	A-T-024	17	12	14	11	18	33	32	16	17	28	21	134	30	9	14	29	23	12	14	21	35	640		79
Cadmium	mg/kg	A-T-024	0.8	0.8	1.2	1.2	1	1.3	1.2	1.1	1.6	1.4	1.2	3	1.4	1.1	0.9	1.3	1	1.2	1	1.5	85	230		30
Chromium	mg/kg	A-T-024	18	23	28	30	24	30	31	30	33	30	24	40	25	27	19	25	21	30	23	29	200 (1)	5000 (1)		200
Copper	mg/kg	A-T-024	36	21	27	25	39	71	44	39	50	72	37	210	84	34	29	70	37	20	39	39	6200	72000	190 (2)	190
Lead	mg/kg	A-T-024	70	43	53	228	98	239	84	53	75	102	68	455	134	47	64	114	73	41	63	126	450	750		450
Mercury	mg/kg	A-T-024	<0.17	<0.17	<0.17	<0.17	<0.17	0.23	0.24	<0.17	<0.17	0.18	0.21	1.37	0.44	0.34	<0.17	0.22	0.46	<0.17	0.18	<0.17	1	26		15
Nickel	mg/kg	A-T-024	18	17	21	19	18	24	23	24	25	27	20	69	24	21	14	26	17	18	16	22	130	1800		130
Selenium	mg/kg	A-T-024	1	2	2	1	2	2	2	2	2	2	2	6	2	1	1	2	1	2	2	2	600	13000		260
Zinc	mg/kg	A-T-024	78	68	86	83	88	167	104	94	116	114	91	290	120	94	64	129	71	94	99	137	40000	670000	330 (2)	300
Other Determinands																										
Phenols - Total by HPLC	mg/kg	A-T-050s	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	520	3200		5
Cyanide (free)	mg/kg	T-042sTC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	760	16000		25
Asbestos Screen		Visual	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM			0.1% (3)	
pH	pH	A-T-031s	5.7	6	6.9	6.4	6.2	4.8	5.8	6.2	6.1	6.1	5.8	6.1	7.1	8.4	7.1	7.7	5.7	6.7	6.6	6.3			5<pH<9 (4)	6<pH<8
EPH total (C10-C36)	mg/kg	A-T-023s	<10	<10	<10	<10	48	20	13	27	<10	88	61	29	92	<10	28	104	33	<10	<10	<10			500 (5)	
PAH 16																										
Naphthalene	mg/kg	A-T-019s	0.09	0.06	0.27	0.06	0.68	0.81	0.21	0.2	0.11	1.75	0.6	0.98	0.83	0.16	0.03	0.48	0.24	0.08	0.16	1.87	9.2	1100		9.2
Acenapthylene	mg/kg	A-T-019s	0.02	<0.01	0.04	<0.01	0.07	0.02	<0.01	0.02	<0.01	0.05	0.09	0.28	0.11	0.04	0.02	0.07	0.04	<0.01	<0.01	<0.01	850 (2)			
Acenapthene	mg/kg	A-T-019s	0.04	<0.01	0.01	<0.01	0.04	0.08	<0.01	0.05	0.01	0.05	0.06	0.12	0.34	0.09	0.03	0.08	0.05	0.03	0.01	0.36	1000 (2)			
Fluorene	mg/kg	A-T-019s	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.07	0.01	0.17	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.21	780 (2)	9500 (2)		
Phenanthrene	mg/kg	A-T-019s	0.92	0.32	1.25	0.3	3.06	0.93	0.61	0.67	0.16	1.04	7.95	4.54	4.23	1.55	0.39	1.26	0.72	0.05	0.23	2.07	380 (2)			
Anthracene	mg/kg	A-T-019s	0.31	0.16	0.39	0.19	0.77	0.39	0.27	0.28	0.07	0.65	4.93	1.48	1.28	0.45	0.2	0.64	0.34	<0.01	0.06	0.57	9200 (2)			
Benzo(a)anthracene	mg/kg	A-T-019s	0.05	0.03	0.04	0.04	2.5	0.15	0.09	0.17	0.05	0.3	<0.01	1.62	2.35	0.99	0.12	0.82	0.17	0.04	0.07	0.86	670 (2)			
Fluoranthene	mg/kg	A-T-019s	0.13	0.1	<0.01	<0.01	3.36	0.25	0.22	0.62	0.05	0.47	1.09	3.7	3.85	2.11	0.25	1.59	0.44	0.13	0.43	2.08	1600 (2)			
Pyrene	mg/kg	A-T-019s	0.11	0.09	0.15	<0.01	2.37	0.21	0.17	0.51	0.05	0.36	0.52	2.68	2.97	1.86	0.19	1.26	0.35	0.08	0.33	1.61	5.90 (2)			
Chrysene	mg/kg	A-T-019s	0.2	0.15	0.16	0.14	4.83	0.49	0.33	0.67	0.08	0.74	<0.01	2.95	3.69	2.51	0.41	2.18	0.59	0.08	0.19	1.11	9.3 (2)			
Benzo(b)fluoranthene	mg/kg	A-T-019s	0.13	0.14	0.13	0.15	4.08	0.55	0.35	0.78	0.07	0.71	<0.01	2.75	3.4	2.36	0.36	2.43	0.61	<0.01	0.12	0.14	7 (2)			
Benzo(k)fluoranthene	mg/kg	A-T-019s	0.15	0.1	0.15	0.15	2.15	0.43	0.32	0.54	0.04	0.74	<0.01	2.89	1.46	2.32	0.42	2.32	0.51	<0.01	0.1	0.25	10 (2)			
Benzo(a)pyrene	mg/kg	A-T-019s	0.06	0.06	0.11	0.05	1.67	0.12	0.04	0.27	0.01	0.29	<0.01	1.42	1.79	1.14	0.08	1.12	0.23	<0.01	0.59	0.74	1	14		3.3
Indeno(123-cd)pyrene	mg/kg	A-T-019s	0.02	0.01	0.04	0.04	1.22	0.02	0.05	0.02	0.01	<0.01	<0.01	1.1	1.47	0.92	<0.01	0.65	<0.01	<0.01	<0.01	<0.01	4.2 (2)			
Dibenzo(ah)anthracene	mg/kg	A-T-019s	0.05	0.03	0.04	0.1	0.33	0.02	0.07	0.07	0.03	0.07	<0.01	0.18	0.23	0.47	0.03	0.21	<0.01	<0.01	<0.01	<0.01			1.3 (2)	1.3*
Benzo(ghi)perylene	mg/kg	A-T-019s	<0.01	0.03	0.01	0.12	1.57	<0.01	0.04	0.48	0.03	0.01	<0.01	1.57	1.78	1.51	0.16	1.27	0.13	<0.01	0.29	0.44	47 (2)			
Coronene	mg/kg	A-T-019s	<0.01	0.01	0.02	0.01	0.05	<0.01	0.01	<0.01	<0.01	0.04	<0.01	0.05	0.12	0.08	<0.01	0.04	<0.01	<0.01	<0.01	<0.01				
Total PAH	mg/kg	A-T-019s	2.29	1.31	2.82	1.33	28.7	4.47	2.78	5.37	0.76	7.33	15.3	28.3	30.1	18.6	2.68	16.5	4.42	0.45	2.59	12.3			100 (5)	100
Classification Tests																										
Sulphate (water sol 2:1)	g/l	A-T-026s	0.01	<0.01	0.03	0.02	0.03	0.08	0.02	<0.01	0.03	0.02	0.91	0.05	0.02	0.02	<0.01	<0.01	0.03	0.02	<0.01	<0.01				
% Stones >10mm~	% w/w	A-T-044	32.6	7.3	<0.1	<0.1	20.4	5.2	<0.1	<0.1	<0.1	<0.1	32.3	5.3	23.7	<0.1	30.8	7.9	29.4	<0.1	17.6	0.1				

Project name:	**Barnsley BSF - Phase 3 - Holgate Kingstone ALC**
Report title:	**Ground Contamination Assessment**
Table title:	**Contamination Assessment - Topsoil**
Date: May 2010	**Job No. 026077**

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GENERAL NOTES:
All results reported on dry weight basis
No ACM = No Asbestos Containing Material
Numbers in red not currently part of earthworks specification
*Generic Assesment Criteria for Human Health Risk Assesment. Land Quality Management Ltd & The Chartered Institute of Environmental Health. Published by: Land Quality Press, a division of Land Quality Management Ltd (2007). Residential Without Plant Uptake.

SCREENING CRITERIA NOTES
(1) Former SGV retracted in 2007
(2) Generic Assesment Criteria for Human Health Risk Assesment. Land Quality Management Ltd & The Chartered Institute of Environmental Health. Published by: Land Quality Press, a division of Land Quality Management Ltd (2007). Residential Without Plant Uptake.
(3) Based on Environment Agency Technical Guidance WM2 'Hazardous Waste' (2003, version 1)
(4) Guidance on the Disposal of "Contaminated Soils". Environment Agency. Version 3, February 2001 (Now withdrawn).
(5) Based on Environment Agency 'Guidance on Sampling and Testing of Wastes to meet Landfill Acceptance Procedures' (2005, version 1) Inert waste criteria.
(6) ICRCL values

Envirolab Job Number: 10/00524
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

Buro Happold
Ground Engineering

Determinand	Number of Tests	Exceedances of Residential	Exceedances of Commercial (No)	Exceedances of Earthworks Specification (No)	Comments
Metals					
Arsenic	65	1	0	1	Check US95
Cadmium	65	0	0	0	Not significantly elevated
Chromium	65	0	0	0	Not significantly elevated
Copper	65	0	0	1	Check US95
Lead	65	1	0	1	Check US95
Mercury	65	1	0	0	Not significantly elevated
Nickel	65	0	0	0	Not significantly elevated
Selenium	65	0	0	0	Not significantly elevated
Zinc	65	0	0	0	Check US95
Other Determinands					
Phenols Monohydric	65	0	0	0	Not significantly elevated
Cyanide (free)	65	0	0	0	Not significantly elevated
Asbestos Presence Screen	65	NFD	NFD	NFD	Not significantly elevated
pH Value	65	0	0	26	Revise EW Spec to 5.5<pH<9.5
EPH total (C10-C36)	65	0	0	0	Not significantly elevated
PAH 16					
Naphthalene	65	0	0	0	Not significantly elevated
Acenaphthylene	65	0	0	0	Not significantly elevated
Acenaphthene	65	0	0	0	Not significantly elevated
Fluorene	65	0	0	0	Not significantly elevated
Phenanthrene	65	0	0	0	Not significantly elevated
Anthracene	65	0	0	0	Not significantly elevated
Fluoranthene	65	0	0	0	Not significantly elevated
Pyrene	65	0	0	0	Not significantly elevated
Benzo(a)anthracene	65	0	0	0	Not significantly elevated
Chrysene	65	0	0	0	Not significantly elevated
Benzo(b)fluoranthene	65	0	0	0	Not significantly elevated
Benzo(k)fluoranthene	65	0	0	0	Not significantly elevated
Benzo(a)pyrene	65	10	0	1	Check US95
Indeno(123cd)pyrene	65	0	0	0	Not significantly elevated
Dibenzo(ah)anthracene	65	0	0	0	Not significantly elevated
Benzo(ghi)perylene	65	0	0	0	Not significantly elevated
Coronene	65	0	0	0	Not significantly elevated
PAH 16 Total	65	0	0	0	Not significantly elevated
Classification Tests					
Sulphate (extractable SO4 2:1)	65	0	0	0	6 >DS2 Geotechnical Test
% Stones Greater then 10mm	65	0	0	0	Not significantly elevated

Technical Note 2

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

Buro Happold

Enclosure 5

Green Space Area

BHGE Summary Plan for Topsoil Exceedances of Phase 1 Earthworks Specification.

Technical Note 2

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

Buro Happold

Enclosure 6

Green Space Area

BHGE Assessment of US95 for Identified Exceedances for Topsoil

Determinand	US95 Chebychev	US95 T-Test	Residential without plant uptake	BP1 Earthworks Spec Threshold	Comments
Metals					
Arsenic	24.6	19.2	35	79	Remedial action unnecessary.
Copper	51	41	6200	190	Remedial action unnecessary.
Lead	69.9	57.3	450	450	Remedial action unnecessary.
Mercury	0.3	0.2	1	15	Remedial action unnecessary.
Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene	0.8	0.5	1	3.3	Remedial action unnecessary.

US95 less than threshold

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Contamination End Use Assessment - Playing Fields:Topsoil US95 Summary**
Date: May 2010	**Job No: 026077**

Buro Happold
Ground Engineering

Arsenic input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) "

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis' **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

18	5	18	5.0	18.0	1.6
15	6	134	6.0	134.0	1.8
13	7	35	7.0	35.0	1.9
16	7	33	7.0	33.0	1.9
9	7	32	7.0	32.0	1.9
9	7	30	7.0	30.0	1.9
10	7	29	7.0	29.0	1.9
15	8	28	8.0	28.0	2.1
12	8	24	8.0	24.0	2.1
11	8	23	8.0	23.0	2.1
9	8	21	8.0	21.0	2.1
14	9	21	9.0	21.0	2.2
12	9	18	9.0	18.0	2.2
8	9	17	9.0	17.0	2.2
13	9	17	9.0	17.0	2.2
9	9	16	9.0	16.0	2.2
10	9	16	9.0	16.0	2.2
9	9	15	9.0	15.0	2.2
10	10	15	10.0	15.0	2.3
6	10	15	10.0	15.0	2.3
11	10	15	10.0	15.0	2.3
12	10	15	10.0	15.0	2.3
12	11	14	11.0	14.0	2.4
7	11	14	11.0	14.0	2.4
7	11	14	11.0	14.0	2.4
11	11	14	11.0	14.0	2.4
8	11	13	11.0	13.0	2.4
9	11	13	11.0	13.0	2.4
8	12	13	12.0	13.0	2.5
12	12	12	12.0	12.0	2.5
5	12	12	12.0	12.0	2.5
11	12	12	12.0	12.0	2.5
7	12	12	12.0	12.0	2.5
12	12	12	12.0	12.0	2.5
13	12	12	12.0	12.0	2.5
15	12	12	12.0	12.0	2.5
15	13	12	13.0	12.0	2.6
24	13	11	13.0	11.0	2.6
11	13	11	13.0	11.0	2.6
7	14	11	14.0	11.0	2.6
7	14	11	14.0	11.0	2.6
8	14	11	14.0	11.0	2.6
15	14	11	14.0	11.0	2.6
35	15	10	15.0	10.0	2.7
10	15	10	15.0	10.0	2.7
17	15	10	15.0	10.0	2.7
12	15	10	15.0	10.0	2.7
14	15	9	15.0	9.0	2.7
11	16	9	16.0	9.0	2.8
18	16	9	16.0	9.0	2.8
33	17	9	17.0	9.0	2.8
32	17	9	17.0	9.0	2.8
16	18	9	18.0	9.0	2.9
17	18	9	18.0	9.0	2.9
28	21	8	21.0	8.0	3.0
21	21	8	21.0	8.0	3.0
134	23	8	23.0	8.0	3.1
30	24	8	24.0	8.0	3.2
9	28	7	28.0	7.0	3.3
14	29	7	29.0	7.0	3.4
29	30	7	30.0	7.0	3.4
23	32	7	32.0	7.0	3.5
12	33	7	33.0	7.0	3.5
14	35	6	35.0	6.0	3.6
21	134	5	134.0	5.0	4.9

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	7.211	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 134 Arithmetic mean 16

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	4.444	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn > Tcrit YES**

US95 using Chebychev or t-test

US95	**US95**
Chebychev	***t-test***
24.6	**19.2**

Buro Happold
Ground Engineering

Copper input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95

If the test signifies the data to be normally distributed use t-test result

22	8.0	210.0	2.1
33	13.0	138.0	2.6
22	14.0	84.0	2.6
28	14.0	82.0	2.6
20	15.0	74.0	2.7
19	15.0	72.0	2.7
21	15.0	71.0	2.7
29	15.0	70.0	2.7
26	16.0	50.0	2.8
22	16.0	44.0	2.8
29	17.0	43.0	2.8
26	17.0	39.0	2.8
27	18.0	39.0	2.9
23	19.0	39.0	2.9
25	19.0	39.0	2.9
17	20.0	37.0	3.0
16	20.0	37.0	3.0
23	20.0	36.0	3.0
25	21.0	34.0	3.0
15	21.0	33.0	3.0
20	21.0	29.0	3.0
25	21.0	29.0	3.0
23	21.0	28.0	3.0
14	22.0	28.0	3.1
14	22.0	27.0	3.1
18	22.0	27.0	3.1
15	22.0	26.0	3.1
15	23.0	26.0	3.1
13	23.0	25.0	3.1
23	23.0	25.0	3.1
8	23.0	25.0	3.1
19	23.0	25.0	3.1
17	25.0	25.0	3.2
22	25.0	23.0	3.2
21	25.0	23.0	3.2
23	25.0	23.0	3.2
25	25.0	23.0	3.2
82	26.0	23.0	3.3
138	26.0	22.0	3.3
16	27.0	22.0	3.3
15	27.0	22.0	3.3
21	28.0	22.0	3.3
43	29.0	21.0	3.4
74	29.0	21.0	3.4
21	29.0	21.0	3.4
36	33.0	21.0	3.5
21	34.0	21.0	3.5
27	36.0	20.0	3.6
25	37.0	20.0	3.6
39	37.0	20.0	3.6
71	39.0	19.0	3.7
44	39.0	19.0	3.7
39	39.0	18.0	3.7
50	39.0	17.0	3.7
72	43.0	17.0	3.8
37	44.0	16.0	3.8
210	50.0	16.0	3.9
84	70.0	15.0	4.2
34	71.0	15.0	4.3
29	72.0	15.0	4.3
70	74.0	15.0	4.3
37	82.0	14.0	4.4
20	84.0	14.0	4.4
39	138.0	13.0	4.9
39	210.0	8.0	5.3

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	5.674	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 210 Arithmetic mean 34

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	3.498	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn > Tcrit YES**

US95 using Chebychev or t-test

US95 *Chebychev*	US95 *t-test*
50.9	**40.5**

Buro Happold
Ground Engineering

Lead input & calcs sheet!!

Data entry column for individual contaminant →

Step 1: Data entry & preparation

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Step 3.2: If the statistical analysis indicates the second/third etc highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95

If the test signifies the data to be normally distributed use t-test result

			LN	LOG10
48	15.0	455.0	2.7	1.2
40	20.0	239.0	3.0	1.3
44	24.0	228.0	3.2	1.4
62	24.0	134.0	3.2	1.4
39	25.0	126.0	3.2	1.4
41	26.0	122.0	3.3	1.4
43	28.0	119.0	3.3	1.4
52	29.0	114.0	3.4	1.5
47	30.0	102.0	3.4	1.5
43	31.0	98.0	3.4	1.5
45	33.0	84.0	3.5	1.5
43	33.0	75.0	3.5	1.5
60	33.0	73.0	3.5	1.5
38	33.0	70.0	3.5	1.5
48	34.0	68.0	3.5	1.5
35	35.0	64.0	3.6	1.5
33	37.0	63.0	3.6	1.6
33	37.0	62.0	3.6	1.6
40	38.0	60.0	3.6	1.6
30	39.0	54.0	3.7	1.6
43	39.0	53.0	3.7	1.6
46	40.0	53.0	3.7	1.6
44	40.0	52.0	3.7	1.6
26	41.0	51.0	3.7	1.6
25	41.0	50.0	3.7	1.6
41	41.0	48.0	3.7	1.6
34	41.0	48.0	3.7	1.6
33	43.0	47.0	3.8	1.6
31	43.0	47.0	3.8	1.6
39	43.0	46.0	3.8	1.6
20	43.0	45.0	3.8	1.6
37	43.0	44.0	3.8	1.6
24	44.0	44.0	3.8	1.6
33	44.0	43.0	3.8	1.6
41	45.0	43.0	3.8	1.7
50	46.0	43.0	3.8	1.7
54	47.0	43.0	3.9	1.7
122	47.0	43.0	3.9	1.7
37	48.0	41.0	3.9	1.7
24	48.0	41.0	3.9	1.7
15	50.0	41.0	3.9	1.7
29	51.0	41.0	3.9	1.7
51	52.0	40.0	4.0	1.7
119	53.0	40.0	4.0	1.7
28	53.0	39.0	4.0	1.7
70	54.0	39.0	4.0	1.7
43	60.0	38.0	4.1	1.8
53	62.0	37.0	4.1	1.8
228	63.0	37.0	4.1	1.8
98	64.0	35.0	4.2	1.8
239	68.0	34.0	4.2	1.8
84	70.0	33.0	4.2	1.8
53	73.0	33.0	4.3	1.9
75	75.0	33.0	4.3	1.9
102	84.0	33.0	4.4	1.9
68	98.0	31.0	4.6	2.0
455	102.0	30.0	4.6	2.0
134	114.0	29.0	4.7	2.1
47	119.0	28.0	4.8	2.1
64	122.0	26.0	4.8	2.1
114	126.0	25.0	4.8	2.1
73	134.0	24.0	4.9	2.1
41	228.0	24.0	5.4	2.4
63	239.0	20.0	5.5	2.4
126	455.0	15.0	6.1	2.7

1st Outlier check

			at level of significance 0.01	0.05	0.1
Tn	6.088	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? — Tn > Tcrit: **YES**

Maximum concentration: 455 — Geometric mean: 49

Normality check

	yes	no
Is the data normally distributed?		
Use Pro UCL to determine	☐	☐

2nd Outlier check based on "ln" transferred data

			at level of significance 0.01	0.05	0.1
Tn	3.680	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier — Tn > Tcrit: **YES**

US95 using Chebychev or t-test

US95 *Chebychev*	US95 *t-test*
70	57

Buro Happold
Ground Engineering

Mercury input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation
Enter data in data entry column & remove '<' signs
"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

0.17	0.2	1.4	-1.8
0.17	0.2	0.5	-1.8
0.17	0.2	0.4	-1.8
0.17	0.2	0.4	-1.8
0.17	0.2	0.3	-1.8
0.17	0.2	0.3	-1.8
0.17	0.2	0.2	-1.8
0.17	0.2	0.2	-1.8
0.17	0.2	0.2

Bap input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation
Enter data in data entry column & remove '<' signs
"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

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Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

1.03	0.0	3.7	-4.6
3.17	0.0	3.2	-4.6
0.01	0.0	2.3	-4.6
0.04	0.0	1.8	-4.6
0.01	0.0	1.8	-4.6
0.11	0.0	1.7	-4.6
0.28	0.0	1.4	-4.6
0.12	0.0	1.1	-4.6
3.72	0.0	1.1	-4.6
0.05	0.0	1.0	-4.6
0.11	0.0	0.7	-4.6
0.02	0.0	0.6	-4.6
0.01	0.0	0.6	-4.6
0.11	0.0	0.3	-4.6
0.12	0.0	0.3	-4.6
0.08	0.0	0.3	-4.6
0.01	0.0	0.2	-4.6
0.03	0.0	0.2	-4.6
0.07	0.0	0.1	-4.6
0.03	0.0	0.1	-3.9
0.09	0.0	0.1	-3.9
0.11	0.0	0.1	-3.5
0.01	0.0	0.1	-3.5
0.64	0.0	0.1	-3.2
0.01	0.0	0.1	-3.2
0.1	0.0	0.1	-3.2
0.04	0.1	0.1	-3.0
0.01	0.1	0.1	-3.0
0.01	0.1	0.1	-2.8
0.01	0.1	0.1	-2.8
0.01	0.1	0.1	-2.7
0.16	0.1	0.1	-2.5
0.13	0.1	0.1	-2.5
0.01	0.1	0.1	-2.5
0.01	0.1	0.1	-2.4
0.12	0.1	0.1	-2.4
0.01	0.1	0.1	-2.3
2.3	0.1	0.1	-2.2
0.01	0.1	0.1	-2.2
0.09	0.1	0.0	-2.2
0.01	0.1	0.0	-2.2
0.01	0.1	0.0	-2.2
0.08	0.1	0.0	-2.1
1.75	0.1	0.0	-2.1
0.02	0.1	0.0	-2.1
0.06	0.1	0.0	-2.1
0.06	0.1	0.0	-2.0
0.11	0.2	0.0	-1.8
0.05	0.2	0.0	-1.5
1.67	0.3	0.0	-1.3
0.12	0.3	0.0	-1.3
0.04	0.3	0.0	-1.2
0.27	0.6	0.0	-0.5
0.01	0.6	0.0	-0.4
0.29	0.7	0.0	-0.3
0.01	1.0	0.0	0.0
1.42	1.1	0.0	0.1
1.79	1.1	0.0	0.1
1.14	1.4	0.0	0.4
0.08	1.7	0.0	0.5
1.12	1.8	0.0	0.6
0.23	1.8	0.0	0.6
0.01	2.3	0.0	0.8
0.59	3.2	0.0	1.2
0.74	3.7	0.0	1.3

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	4.434	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 3.72 Arithmetic mean 0

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.141	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

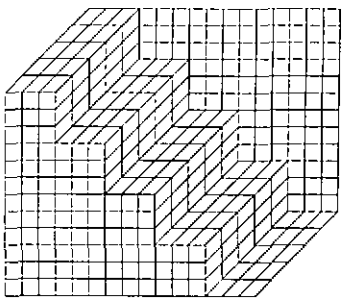
US95	US95
Chebychev	*t-test*
0.8	0.5

Buro Happold
Ground Engineering

Technical Note 2

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**



Buro Happold

Enclosure 7

Green Space Area

BHGE Assessment of Chemical Results for 'Subsoil'

Envirolab Job Number: 10/00524
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

Lab Sample ID	Units	Method	10/00524/1	10/00524/2	10/00524/3	10/00524/4	10/00524/5	10/00524/6	10/00524/7	10/00524/8	10/00524/9	10/00524/10	10/00524/11	10/00524/12	10/00524/13	10/00524/14	10/00524/15	10/00524/16	10/00524/17	10/00524/18	10/00524/19	10/00524/20	10/00524/21	10/00524/22	10/00524/23	10/00524/24	10/00524/25	10/00524/26	10/00524/27	10/00524/28	10/00524/29	10/00524/30	10/00524/31	10/00524/32	Residential Without Plant Uptake Guideline Value	Commercial/ Industrial	Other Screening Values (refer to notes under table for explanation)	EW Specification Soil concentration
Client Sample No			3	2	3	2	2	2	2	2	3	2	3	2	2	2	3	2	2	3	2	2	3	3	2	2	1	2	2	2	2	1				
Client Sample ID			PF1	PF2	PF3	PF4	PF5	PF6	PF7	PF8	PF9	PF10	PF11	PF12	PF13	PF14	PF17	PF20	PF21	PF22	PF24	PF29	PF30	PF31	PF38	PF39	PF39	PF40	PF43	PF44	PF45				
Depth to Top			0.8	0.4	0.8	0.4	0.4	0.4	0.4	0.4	0.8	0.4	0.8	0.4	0.3	0.3	0.8	0.4	0.8	0.4	0.4	0.5	0.8	0.4	0.4	0.1	0.3	0.4	0.4	0.4	0.3				
Sample Type			Clay	Sand	Clay	Clay	Clay	Clay	Sand	Clay	Clay	Clay	Clay/Sand	Clay	Clay	Clay	Clay	Sand	Clay	Clay	Clay	Clay	Sand	Clay	Clay	Sand	Clay	Clay	Sand	Clay	Clay				
Sample Matrix Code			Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil				
Arsenic	mg/kg	A-T-024	34	4	6	6	7	5	6	7	8	6	7	11	6	4	4	7	5	4	4	5	4	5	30	3	10	3	7	4	5	35	640		79
Cadmium	mg/kg	A-T-024	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	85	230		30
Chromium	mg/kg	A-T-024	65	13	22	32	28	27	23	40	27	40	35	34	18	35	11	23	31	12	19	11	28	29	29	21	36	22	29	31	27	200 (1)	5000 (1)		200
Copper	mg/kg	A-T-024	22	20	10	19	18	15	16	25	16	24	25	22	12	26	8	24	21	8	8	11	18	16	78	17	28	17	18	17	21	6200	72000	190 (2)	190
Lead	mg/kg	A-T-024	28	21	25	25	31	27	20	28	27	16	19	34	30	17	25	37	24	13	22	20	16	24	268	17	50	12	12	15	17	450	750		450
Mercury	mg/kg	A-T-024	0.32	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	0.58	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	1	26		15
Nickel	mg/kg	A-T-024	20	145	19	26	25	26	25	30	23	30	41	25	16	40	10	25	19	11	18	13	20	21	26	26	25	28	26	23	26	130	1800		130
Selenium	mg/kg	A-T-024	3	1	3	1	2	2	1	2	1	2	2	2	1	2	1	1	2	1	3	<1	2	3	2	<1	2	1	1	<1	1	600	13000		260
Zinc	mg/kg	A-T-024	48	142	78	85	79	95	64	87	66	87	99	98	66	103	41	112	87	36	71	43	67	107	162	66	105	49	64	62	74	40000	670000	330 (2)	300
Other Determinands																																			
Phenols - Total by HPLC	mg/kg	A-T-050s	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	520	3200		5
Cyanide (free)	mg/kg	T-042sTC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	760	16000		25
Asbestos Screen		Visual	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM			0.1% (3)	
pH	pH	A-T-031s	7.6	6.2	6.9	6.9	6.6	6.7	6.6	7.1	6.3	7.1	7.5	7.1	6.2	6.4	6.7	7.2	7.5	7.3	6.9	7.1	8.1	8	6.9	7.1	6.7	7.3	7.1	6.9	7.7			5<pH<9 (4)	6<pH<8
EPH total (C10-C36)	mg/kg	A-T-023s	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	57	<10	<10	<10	<10	<10	<10			500 (5)	
PAH 16																																			
Naphthalene	mg/kg	A-T-019s	0.07	0.18	0.11	0.11	0.34	0.25	0.19	0.58	0.08	0.15	0.75	0.14	0.11	0.22	0.1	0.08	0.14	0.06	0.51	0.11	0.15	0.13	0.15	0.05	0.16	0.08	0.14	0.4	0.29	9.2	1100		9.2
Acenapthene	mg/kg	A-T-019s	<0.01	0.01	<0.01	<0.01	0.01	0.06	1.28	0.12	0.06	<0.01	0.02	0.02	0.02	0.02	0.01	<0.01	0.05	0.02	0.09	0.01	0.01	0.01	0.04	0.06	0.02	0.01	0.02	0.14	0.05	850 (2)			
Acenaphthylene	mg/kg	A-T-019s	0.04	0.01	<0.01	0.02	0.02	0.05	0.07	0.02	<0.01	0.01	0.02	0.01	0.02	0.03	<0.01	0.01	0.04	<0.01	0.05	0.02	0.02	0.03	<0.01	<0.01	<0.01	<0.01	0.01	0.07	0.03	1000 (2)			
Fluorene	mg/kg	A-T-019s	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.65	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.04	<0.01	780 (2)	9500 (2)		
Phenanthrene	mg/kg	A-T-019s	0.79	0.31	0.38	0.48	0.57	0.78	16.1	1.13	0.69	0.22	0.74	0.31	0.46	0.7	0.25	0.48	0.46	0.27	1.25	0.62	0.46	0.64	0.41	0.72	0.74	0.32	0.48	2.28	1.12	380 (2)			
Anthracene	mg/kg	A-T-019s	0.28	0.07	0.13	0.18	0.23	0.38	3.88	0.51	0.28	0.05	0.32	0.14	0.15	0.13	0.11	0.17	0.24	0.13	0.47	0.23	0.15	0.33	0.2	0.24	0.36	0.12	0.2	1.09	0.48	9200 (2)			
Fluoranthene	mg/kg	A-T-019s	0.12	0.18	0.11	0.17	0.29	0.43	12.3	0.38	0.32	0.15	0.3	0.21	0.23	0.39	0.08	0.18	0.24	0.08	0.36	0.23	0.22	1.47	0.14	0.32	0.13	0.08	0.13	0.41	0.29	670 (2)			
Pyrene	mg/kg	A-T-019s	0.09	0.15	0.1	0.15	0.24	0.35	9.18	0.3	0.31	0.13	0.24	0.2	0.19	0.32	0.06	0.14	0.2	0.07	0.28	0.18	0.18	1.11	0.12	0.23	0.11	0.08	<0.01	0.32	0.25	1600 (2)			
Benzo(a)anthracene	mg/kg	A-T-019s	0.08	0.07	0.06	0.06	0.1	0.11	4.51	0.2	0.09	0.03	0.09	0.05	0.09	0.19	0.01	0.03	0.11	0.03	0.13	0.05	0.1	0.88	0.08	0.15	0.08	0.04	0.06	0.11	0.15	5.90 (2)			
Chrysene	mg/kg	A-T-019s	0.38	0.33	0.17	0.34	0.54	0.6	7.52	0.51	0.44	0.19	0.51	0.25	0.34	0.54	0.17	0.2	0.43	0.16	0.53	0.31	0.39	2.3	0.39	0.52	0.26	0.14	0.28	0.46	0.54	9.3 (2)			
Benzo(b)fluoranthene	mg/kg	A-T-019s	0.05	0.31	0.16	0.09	0.26	0.51	5.13	0.23	0.34	0.08	0.36	0.09	0.32	0.44	0.08	0.14	0.38	0.11	0.41	0.1	0.24	1.83	0.25	0.42	0.11	0.01	0.16	0.26	0.49	7 (2)			
Benzo(k)fluoranthene	mg/kg	A-T-019s	0.07	0.21	0.05	0.1	0.18	0.03	4.22	0.1	0.33	0.08	0.24	0.2	0.26	0.19	0.03	0.12	0.36	0.05	0.41	0.11	0.21	1.31	0.14	0.29	0.04	<0.01	0.07	0.12	0.45	10 (2)			
Benzo(a)pyrene	mg/kg	A-T-019s	<0.01	0.04	<0.01	0.13	0.32	0.16	4.15	0.03	0.09	0.02	<0.01	0.09	0.08	0.13	<0.01	0.03	0.1	0.03	0.13	0.06	<0.01	1.03	<0.01	0.09	0.05	<0.01	<0.01	0.01	0.06	1	14		3.3
Indeno(123-cd)pyrene	mg/kg	A-T-019s	<0.01	<0.01	<0.01	0.03	0.03	0.02	1.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.56	0.01	0.02	<0.01	<0.01	0.06	0.06	0.03	4.2 (2)			
Dibenzo(ah)anthracene	mg/kg	A-T-019s	<0.01	<0.01	0.07	<0.01	0.07	<0.01	0.37	0.02	<0.01	<0.01	0.04	<0.01	0.02	0.02	<0.01	0.06	<0.01	<0.01	<0.01	0.12	0.15	0.09	0.05	0.09	0.1	0.07	0.02	0.07	0.05			1.3 (2)	1.3*
Benzo(ghi)perylene	mg/kg	A-T-019s	<0.01	0.12	0.01	<0.01	<0.01	<0.01	3.83	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	0.2	<0.01	<0.01	<0.01	<0.01	0.22	<0.01	0.04	1.23	0.13	<0.01	0.01	<0.01	0.11	0.13	0.22	47 (2)			
Coronene	mg/kg	A-T-019s	0.04	0.04	0.02	0.01	<0.01	0.03	0.13	<0.01	0.01	0.01	0.02	<0.01	0.02	0.03	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.05	<0.01	<0.01	0.01	<0.01				
Total PAH	mg/kg	A-T-019s	2.05	2.04	1.36	1.89	3.24	3.73	74.6	4.24	3.06	1.13	3.66	1.73	2.41	3.56	0.93	1.66	2.76	1.02	4.86	2.17	2.3	13.1	2.07	3.2	2.24	0.96	1.75	5.96	4.48			100 (5)	100
Classification Tests																																			
Sulphate (water sol 2:1)	g/l	A-T-026s	0.08	<0.01	0.01	<0.01	0.03	<0.01	0.02	<0.01	0.03	<0.01	0.02	<0.01	0.01	<0.01	<0.01	0.02	0.02	0.01	0.02	<0.01	0.01	0.02	0.06	0.03	0.03	0.01	0.02	0.01	0.02				
% Stones >10mm~	% w/w	A-T-044	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	29	<0.1	39.9	<0.1	<0.1	41.1	<0.1	36.8	<0.1	2.7	7.7	30.9	3.3	<0.1	<0.1	<0.1	<0.1				

Project name:	**Barnsley BSF - Phase 3 - Holgate Kingstone ALC**
Report title:	**Ground Contamination Assessment**
Table title:	**Contamination Assessment - Subsoil**
Date: May 2010	**Job No. 026077**

Buro Happold
Ground Engineering

GENERAL NOTES:
All results reported on dry weight basis
No ACM = No Asbestos Containing Material
Numbers in red not currently part of earthworks specification
*Generic Assesment Criteria for Human Health Risk Assesment. Land Quality Management Ltd & The Chartered Institute of Environmental Health. Published by: Land Quality Press, a division of Land Quality Management Ltd (2007). Residential Without Plant Uptake.

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(5) Based on Environment Agency 'Guidance on Sampling and Testing of Wastes to meet Landfill Acceptance Procedures' (2005, version 1) Inert waste criteria.
(6) ICRCL values

Envirolab Job Number: 10/00524
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

Lab Sample ID			0/00524/3	0/00524/3	0/00524/3	0/00524/3	0/00524/3	0/00524/3	0/00524/3	0/00524/3	0/00524/3	0/00524/3	0/00524/3	0/00524/4	0/00524/4	0/00524/4	0/00524/4	0/00524/4	0/00524/4	0/00524/4	0/00524/4	0/00524/4	0/00524/4	0/00524/4	0/00524/5	0/00524/5	0/00524/5	0/00524/5	0/00524/5	0/00524/5	0/00524/5	0/00524/5				
Client Sample No			1	3	1	2	3	2	3	2	2	1	3	2	3	2	3	2	2	2	3	3	2	3	2	3	2	2	3	2	3	2				
Client Sample ID			PF46	PF47	PF48	PF49	PF50	PF51	PF52	PF53	PF54	PF55	PF55	PF56	PF57	PF58	PF59	PF60	PF61	PF61	PF62	PF63	PF64	PF65	PF66	PF67	PF68	PF69	GS01	GS02	GS03				
Depth to Top			0.4	0.8	0.1	0.4	0.8	0.3	0.8	0.4	0.25	0.1	0.8	0.4	0.8	0.4	0.4	0.4	0.4	0.8	0.8	0.4	0.8	0.4	0.8	0.4	0.4	0.8	0.8	0.8	0.4				
			Clay	Clay	Clay	Clay	Sand	Ashy	Clay	Clay	Clay	Ashy	Ashy	Ashy	Ashy	Ashy	Ashy	Ashy	Sand	Ashy	Ashy	Ashy	Ashy	Clay	Clay	Clay	Ashy	Ashy	Clay	Clay	Clay				
Sample Type			Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil	Subsoil				
Sample Matrix Code	Units	Method	3A	6E	3	5A	3	2A	3	3	3	5A	5A	4A	4A	4A	6A	4A	5A	4A	4A	4A	4A	3	3CE	3	4A	4AED	3	3	3A	Residential Without Plant Uptake Guideline Value	Commercial/ Industrial	Other Screening Values (refer to notes under table for explanation)	EW Specification Soil concentration
Arsenic	mg/kg	A-T-024	11	28	9	13	6	40	5	5	4	11	10	68	79	93	34	111	30	62	61	109	77	10	20	5	65	79	27	20	19	35	640		79
Cadmium	mg/kg	A-T-024	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.4	1.1	1.3	2.1	2	2.2	1	2.9	1.3	1.7	1.6	2.6	2.2	0.6	1.1	1.3	1.8	1.7	1.8	1.3	1.3	85	230		30
Chromium	mg/kg	A-T-024	22	29	31	20	28	33	31	29	26	74	295	37	30	37	25	36	24	50	29	32	30	11	21	19	20	25	22	25	21	200 (1)	5000 (1)		200
Copper	mg/kg	A-T-024	21	94	35	30	20	142	30	18	20	42	46	410	158	209	64	385	61	135	226	682	308	30	63	26	351	165	55	25	22	6200	72000	190 (2)	190
Lead	mg/kg	A-T-024	41	124	37	40	17	285	24	14	22	60	60	394	209	246	75	412	80	548	580	276	235	60	98	27	244	195	52	29	26	450	750		450
Mercury	mg/kg	A-T-024	<0.17	0.3	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	0.22	<0.17	2.04	0.31	0.32	0.21	0.34	0.24	0.27	0.36	<0.17	0.18	0.61	0.21	<0.17	0.23	4.98	1.22	<0.17	<0.17	1	26		15
Nickel	mg/kg	A-T-024	21	32	32	21	24	49	26	22	19	21	26	54	54	56	29	64	26	52	43	62	58	9	26	23	42	48	46	28	29	130	1800		130
Selenium	mg/kg	A-T-024	2	2	2	2	1	2	1	<1	1	2	3	3	3	2	2	2	3	2	2	3	2	<1	2	1	2	2	2	3	3	600	13000		260
Zinc	mg/kg	A-T-024	67	136	95	74	67	229	72	55	75	110	123	591	385	262	88	389	113	167	304	376	284	49	112	75	302	181	85	119	110	40000	670000	330 (2)	300
Other Determinands																																			
Phenols - Total by HPLC	mg/kg	A-T-050s	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	520	3200		5
Cyanide (free)	mg/kg	T-042sTC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	760	16000		25
Asbestos Screen		Visual	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM	No ACM			0.1% (3)	
pH	pH	A-T-031s	5.9	6	8.2	6.6	7.1	6.4	7.6	7.9	7.2	8.8	9	6.1	6	6	7.7	5.4	6.1	6.1	6.4	6.6	6	8.4	7.6	7.5	7.2	6.5	6.3	6.5	6.8			5<pH<9 (4)	6<pH<8
EPH total (C10-C36)	mg/kg	A-T-023s	<10	<10	<10	<10	<10	48	<10	<10	<10	233	166	37	16	186	609	<10	<10	39	151	61	<10	86	13	30	10	77	<10	<10	<10			500 (5)	
PAH 16																																			
Naphthalene	mg/kg	A-T-019s	0.37	0.65	0.36	0.13	0.25	0.15	0.48	0.14	0.12	0.11	<0.01	0.08	0.37	0.12	0.11	0.08	0.25	0.05	0.61	0.77	0.15	0.21	0.13	1.81	0.54	0.91	0.45	0.19	0.06	9.2	1100		9.2
Acenapthene	mg/kg	A-T-019s	0.14	0.04	0.07	0.02	0.08	0.02	0.38	<0.01	0.05	0.02	<0.01	<0.01	0.08	0.04	0.05	<0.01	0.01	<0.01	0.03	0.07	<0.01	0.05	0.02	0.05	0.05	0.09	0.38	0.11	0.03	850 (2)			
Acenapthylene	mg/kg	A-T-019s	0.04	0.08	<0.01	<0.01	0.02	<0.01	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	0.13	0.01	0.03	<0.01	0.03	<0.01	0.05	0.02	<0.01	0.02	<0.01	0.06	0.08	0.22	0.12	0.05	0.02	1000 (2)			
Fluorene	mg/kg	A-T-019s	0.07	0.02	0.02	<0.01	<0.01	<0.01	0.28	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	0.03	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.07	<0.01	0.19	0.02	<0.01	780 (2)	9500 (2)		
Phenanthrene	mg/kg	A-T-019s	1.3	1.54	1.16	0.41	0.74	0.6	7.96	0.22	0.5	0.47	<0.01	0.26	1.94	0.34	1.22	0.26	1.28	0.25	2.23	0.87	0.51	0.7	0.21	1.06	7.68	3.86	4.68	1.5	0.46	380 (2)			
Anthracene	mg/kg	A-T-019s	0.37	0.54	0.44	0.19	0.33	0.18	2.13	0.08	0.11	0.21	<0.01	0.16	0.52	0.12	0.42	0.15	0.41	0.16	0.56	0.36	0.22	0.29	0.09	0.67	4.76	1.26	1.41	0.43	0.24	9200 (2)			
Fluoranthene	mg/kg	A-T-019s	0.35	0.29	0.25	0.14	0.21	0.13	5.99	0.06	0.15	<0.01	<0.01	<0.01	1.68	0.07	0.18	0.09	<0.01	<0.01	2.45	0.24	0.18	0.64	0.07	0.49	1.05	3.15	4.26	2.04	0.29	670 (2)			
Pyrene	mg/kg	A-T-019s	0.28	0.23	0.22	0.11	0.16	0.11	4.24	<0.01	0.13	0.07	<0.01	<0.01	1.31	0.05	0.15	0.08	0.15	<0.01	1.73	0.2	0.14	0.53	0.05	0.37	0.5	2.27	3.29	1.8	0.23	1600 (2)			
Benzo(a)anthracene	mg/kg	A-T-019s	0.11	0.12	0.09	0.08	0.13	0.07	2.94	0.02	0.07	0.05	<0.01	<0.01	1.27	<0.01	0.05	0.03	0.03	0.03	1.54	0.13	0.06	0.17	0.07	0.28	<0.01	1.18	2.33	1.11	0.12	5.90 (2)			
Chrysene	*mg/kg*	*A-T-019s*	*0.8*	*0.59*	*0.46*	*0.19*	*0.46*	*0.27*	*5.97*	*0.07*	*0.27*	*0.2*	*<0.01*	*0.06*	*2.23*	*0.04*	*0.24*	*0.15*	*0.14*	*0.11*	*2.98*	*0.41*	*0.24*	*0.7*	*0.11*	*0.68*	*<0.01*	*2.15*	*3.67*	*2.8*	*0.4*	9.3 (2)			
Benzo(b)fluoranthene	mg/kg	A-T-019s	0.56	0.28	0.42	0.07	0.15	<0.01	3.66	0.03	0.08	0.1	<0.01	0.02	2.46	0.11	0.16	0.14	0.12	0.12	3.03	0.48	0.24	0.85	0.09	0.66	<0.01	2.23	3.8	2.49	0.38	7 (2)			
Benzo(k)fluoranthene	mg/kg	A-T-019s	0.07	0.29	0.21	0.02	0.08	<0.01	2.48	<0.01	0.06	0.04	<0.01	0.03	1.82	0.1	0.17	0.14	0.09	0.16	2.57	0.32	0.23	0.3	0.04	0.57	<0.01	2.09	3.4	1.38	0.43	10 (2)			
Benzo(a)pyrene	mg/kg	A-T-019s	0.21	0.16	<0.01	<0.01	0.18	<0.01	2.52	<0.01	0.13	<0.01	<0.01	0.08	1.54	0.04	0.07	0.05	0.1	0.05	1.23	0.1	0.03	0.29	0.02	0.28	<0.01	1.15	2	1.2	0.08	1	14		3.3
Indeno(123-cd)pyrene	mg/kg	A-T-019s	0.01	0.02	0.03	0.03	0.04	<0.01	1.06	0.03	0.04	0.01	<0.01	0.03	1.06	0.07	0.02	0.02	0.03	0.03	0.91	0.02	0.04	0.02	0.02	<0.01	<0.01	0.9	1.65	0.97	<0.01	4.2 (2)			
Dibenzo(ah)anthracene	mg/kg	A-T-019s	0.02	0.16	0.02	0.01	0.08	0.07	0.21	0.05	0.04	0.02	<0.01	0.13	0.31	0.17	0.06	0.04	0.03	0.08	0.24	0.02	0.05	0.07	0.03	0.07	<0.01	0.15	0.26	0.5	0.03			1.3 (2)	1.3*
Benzo(ghi)perylene	mg/kg	A-T-019s	<0.01	0.2	0.1	<0.01	0.11	0.02	2.55	0.01	0.05	<0.01	<0.01	<0.01	1.42	0.04	<0.01	0.03	0.01	0.11	1.16	<0.01	0.03	0.51	0.03	0.01	<0.01	1.27	2	1.59	0.16	47 (2)			
Coronene	mg/kg	A-T-019s	0.01	0.04	0.01	<0.01	0.01	<0.01	0.13	0.01	0.01	0.02	<0.01	0.02	0.05	0.02	<0.01	0.01	0.02	0.02	0.04	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	0.04	0.13	0.08	<0.01				
Total PAH	mg/kg	A-T-019s	4.73	5.24	3.87	1.42	3.02	1.62	43.2	0.74	1.85	1.34	<0.01	0.86	18.3	1.37	2.97	1.26	2.73	1.18	21.4	4	2.12	5.36	0.96	7.13	14.8	22.9	34	18.2	2.93			100 (5)	100
Classification Tests																																			
Sulphate (water sol 2:1)	g/l	A-T-026s	<0.01	0.06	0.08	0.02	<0.01	0.03	0.01	<0.01	0.01	0.3	0.34	0.21	0.07	0.07	0.08	0.06	0.15	0.14	0.09	1.07	0.13	0.03	0.05	0.03	0.13	0.05	0.05	0.07	0.03				
% Stones >10mm~	% w/w	A-T-044	10.8	0.2	<0.1	2.8	<0.1	5	<0.1	<0.1	<0.1	12.4	4.6	9.7	6.9	1.8	14.1	20.5	9.1	20.1	39.9	22.2	31	<0.1	9.9	<0.1	36.5	23.1	<0.1	<0.1	13.5				

Project name:	**Barnsley BSF - Phase 3 - Holgate Kingstone ALC**
Report title:	**Ground Contamination Assessment**
Table title:	**Contamination Assessment - Subsoil**
Date: May 2010	**Job No. 026077**

Buro Happold
Ground Engineering

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(6) ICRCL values

Envirolab Job Number: 10/00524
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

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Ground Engineering

Determinand	Number of Tests	Exceedances of Residential	Exceedances of Commercial (No)	Exceedances of Earthworks Specification (No)	Comments
Metals					
Arsenic	58	11	0	3	Check US95
Cadmium	58	0	0	0	Not significantly elevated
Chromium	58	1	0	1	Check US95
Copper	58	7	0	7	Check US95
Lead	58	2	0	2	Check US95
Mercury	58	3	0	0	Check US96
Nickel	58	1	0	1	Not significantly elevated
Selenium	58	0	0	0	Not significantly elevated
Zinc	58	4	0	6	Check US95
Other Determinands					
Phenols Monohydric	58	0	0	0	Not significantly elevated
Cyanide (free)	58	0	0	0	Not significantly elevated
Asbestos Presence Screen	58	0	0	0	Not significantly elevated
pH Value	58	0	0	7	Revise EW Spec to 5.5<pH<9.5
EPH total (C10-C36)	58	0	0	0	Check US95
PAH 16					
Naphthalene	58	0	0	0	Not significantly elevated
Acenaphthylene	58	0	0	0	Not significantly elevated
Acenaphthene	58	0	0	0	Not significantly elevated
Fluorene	58	0	0	0	Not significantly elevated
Phenanthrene	58	0	0	0	Not significantly elevated
Anthracene	58	0	0	0	Not significantly elevated
Fluoranthene	58	0	0	0	Not significantly elevated
Pyrene	58	0	0	0	Not significantly elevated
Benzo(a)anthracene	58	0	0	0	Not significantly elevated
Chrysene	58	0	0	0	Not significantly elevated
Benzo(b)fluoranthene	58	0	0	0	Not significantly elevated
Benzo(k)fluoranthene	58	0	0	0	Not significantly elevated
Benzo(a)pyrene	58	8	0	1	Check US95
Indeno(123cd)pyrene	58	0	0	0	Not significantly elevated
Dibenzo(ah)anthracene	58	0	0	0	Not significantly elevated
Benzo(ghi)perylene	58	0	0	0	Not significantly elevated
Coronene	58	0	0	0	Not significantly elevated
PAH 16 Total	58	0	0	0	Not significantly elevated
Classification Tests					
Sulphate (extractable SO4 2:1)	58	0	0	0	6 >DS2 Geotechnical Test
% Stones Greater then 10mm	58	0	0	0	Not significantly elevated

Technical Note 2

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

Buro Happold

Enclosure 8

Green Space Area

BHGE Summary Plan for 'Subsoil' Exceedances of Phase 1 Earthworks Specification

Determinand	US95 Chebychev	US95 T-Test	Residential without plant uptake	BP1 Earthworks Spec Threshold	Comments
Metals					
Arsenic	97.6	76.3	35	79	Cover thickness to be considered
Chromium	129	83	200	200	Remedial action unnecessary.
Copper	423.6	305.6	6200	190	Cover thickness to be considered
Lead	445.8	335.0	450	450	Remedial action unnecessary.
Mercury	2.1	1.3	1	15	Cover thickness to be considered
Zinc	416.0	323.2	40000	300	Cover thickness to be considered
Petroluem Hydrocarbons					
EPH	*286.6*	*181.9*	*500*	*N/A*	*Remedial action unnecessary.*
Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene	0.9	0.5	1	3.3	Remedial action unnecessary.

US95 less than threshold

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Contamination End Use Assessment - Playing Fields**
Date: May 2010	**Job No: 026077**

Buro Happold
Ground Engineering

Arsenic input & calcs sheet

Data entry column for individual contaminant →

40	10.0	111.0	2.3
11	11.0	109.0	2.4
10	30.0	93.0	3.4
68	34.0	79.0	3.5
79	40.0	79.0	3.7
93	61.0	77.0	4.1
34	62.0	68.0	4.1
111	65.0	65.0	4.2
30	68.0	62.0	4.2
62	77.0	61.0	4.3
61	79.0	40.0	4.4
109	79.0	34.0	4.4
77	93.0	30.0	4.5
65	109.0	11.0	4.7
79	111.0	10.0	4.7

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	1.551	Tcrit	2.658	2.372	2.213
Is the maximum concentration an outlier?			Tn < Tcrit NO	**Tn < Tcrit NO**	Tn < Tcrit NO

Maximum concentration 111

Normality check

S^2	b^2	W
14016.93	13361.97	0.953

	at level of significance	
	0.01	0.05
critical values	0.835	0.881

Is the data normally distributed? W < critical value YES **W > critical value YES**

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	1.042	Tcrit	2.658	2.372	2.213
Is the maximum concentration an outlier			Tn < Tcrit NO	**Tn < Tcrit NO**	Tn < Tcrit NO

US95 using Chebychev or t-test

Use t-test

US95	**US95**
Chebychev	***t-test***
97.6	**76.3**

Buro Happold
Ground Engineering

Chromium input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

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If the test signifies the data to be normally distributed use t-test result

33	20.0	295.0	3.0
74	24.0	74.0	3.2
295	25.0	50.0	3.2
37	25.0	37.0	3.2
30	29.0	37.0	3.4
37	30.0	36.0	3.4
25	30.0	33.0	3.4
36	32.0	32.0	3.5
24	33.0	30.0	3.5
50	36.0	30.0	3.6
29	37.0	29.0	3.6
32	37.0	25.0	3.6
30	50.0	25.0	3.9
20	74.0	24.0	4.3
25	295.0	20.0	5.7

1st Outlier check

			at level of significance 0.01	0.05	0.1
Tn	3.548	Tcrit	2.658	2.372	2.213

Is the maximum concentration *an outlier?* — Tn > Tcrit YES

Maximum concentration 295

Normality check

S^2	b^2	W
65766.40	28364.62	0.431

	at level of significance 0.01	0.05
critical values	0.835	0.881

Is the data normally distributed? — W < critical value NO

2nd Outlier check based on "ln" transferred data

			at level of significance 0.01	0.05	0.1
Tn	3.160	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier — Tn > Tcrit YES

US95 using Chebychev or t-test

Use Chebychev as the distribution of the data shows evidence of non-normality

US95	**US95**
Chebychev	***t-test***
129.0	**83.0**

Buro Happold
Ground Engineering

Copper input & calcs sheet

Data entry column for individual contaminant →

142	42.0	682.0	3.7
42	46.0	410.0	3.8
46	61.0	385.0	4.1
410	64.0	351.0	4.2
158	135.0	308.0	4.9
209	142.0	226.0	5.0
64	158.0	209.0	5.1
385	165.0	165.0	5.1
61	209.0	158.0	5.3
135	226.0	142.0	5.4
226	308.0	135.0	5.7
682	351.0	64.0	5.9
308	385.0	61.0	6.0
351	410.0	46.0	6.0
165	682.0	42.0	6.5

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"*Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL).....*"

Step 2: Press **'Enter/refresh data for statistical analysis**

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Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	2.595	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier? NO | **Tn > Tcrit YES** | YES

Maximum concentration 682

Normality check

S^2	b^2	W
433115.60	381899.28	0.882

	at level of significance	
	0.01	0.05
critical values	0.835	0.881

Is the data normally distributed? YES | **W > critical value YES**

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	1.659	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier NO | **Tn < Tcrit NO** | NO

US95 using Chebychev or t-test

Use t-test

US95	US95
Chebychev	***t-test***
423.6	**305.6**

Buro Happold Ground Engineering

Lead input & calcs sheet

Data entry column for individual contaminant →

285	60.0	580.0	4.1
60	60.0	548.0	4.1
60	75.0	412.0	4.3
394	80.0	394.0	4.4
209	195.0	285.0	5.3
246	209.0	276.0	5.3
75	235.0	246.0	5.5
412	244.0	244.0	5.5
80	246.0	235.0	5.5
548	276.0	209.0	5.6
580	285.0	195.0	5.7
276	394.0	80.0	6.0
235	412.0	75.0	6.0
244	548.0	60.0	6.3
195	580.0	60.0	6.4

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

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Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

1st Outlier check

			at level of significance 0.01	0.05	0.1
Tn	1.938	Tcrit	2.658	2.372	2.213
Is the maximum concentration an outlier?			Tn < Tcrit NO	**Tn < Tcrit NO**	Tn < Tcrit NO
Maximum concentration			580		

Normality check

S^2	b^2	W
381812.93	349433.49	0.915

	at level of significance 0.01	0.05
critical values	0.835	0.881
Is the data normally distributed?	A > critical value YES	**W > critical value YES**

2nd Outlier check based on "ln" transferred data

			at level of significance 0.01	0.05	0.1
Tn	1.357	Tcrit	2.658	2.372	2.213
Is the maximum concentration an outlier			Tn < Tcrit NO	**Tn < Tcrit NO**	Tn < Tcrit NO

US95 using Chebychev or t-test

Use t-test

US95 ***Chebychev***	**US95** ***t-test***
445.8	**335.0**

Buro Happold Ground Engineering

Mercury input & calcs sheet

Data entry column for individual contaminant →

0.17	0.2	5.0	-1.8
0.22	0.2	2.0	-1.8
0.17	0.2	0.4	-1.8
2.04	0.2	0.3	-1.7
0.31	0.2	0.3	-1.6
0.32	0.2	0.3	-1.5
0.21	0.2	0.3	-1.5
0.34	0.2	0.2	-1.4
0.24	0.3	0.2	-1.3
0.27	0.3	0.2	-1.2
0.36	0.3	0.2	-1.1
0.17	0.3	0.2	-1.1
0.18	0.4	0.2	-1.0
0.23	2.0	0.2	0.7
4.98	5.0	0.2	1.6

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	3.365	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier? YES | **Tn > Tcrit YES** | YES

Maximum concentration 4.98

Normality check

S^2	b^2	W
22.85	10.23	0.448

	at level of significance	
	0.01	0.05
critical values	0.835	0.881

Is the data normally distributed? NO | **W < critical value NO**

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.799	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier YES | **Tn > Tcrit YES** | YES

US95 using Chebychev or t-test

Use Chebychev as the distribution of the data shows evidence of non-normality

US95	US95
Chebychev	***t-test***
2.1	**1.3**

Buro Happold
Ground Engineering

Zinc input & calcs sheet

Data entry column for individual contaminant →

229	88.0	591.0	4.5
110	110.0	389.0	4.7
123	113.0	385.0	4.7
591	123.0	376.0	4.8
385	167.0	304.0	5.1
262	181.0	302.0	5.2
88	229.0	284.0	5.4
389	262.0	262.0	5.6
113	284.0	229.0	5.6
167	302.0	181.0	5.7
304	304.0	167.0	5.7
376	376.0	123.0	5.9
284	385.0	113.0	6.0
302	389.0	110.0	6.0
181	591.0	88.0	6.4

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

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Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

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1st Outlier check

			at level of significance 0.01	0.05	0.1
Tn	2.391	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier? NO | **Tn > Tcrit YES** | YES

Maximum concentration 591

Normality check

S^2	b^2	W
267874.93	248468.35	0.928

	at level of significance 0.01	0.05
critical values	0.835	0.881

Is the data normally distributed? YES | **W > critical value YES**

2nd Outlier check based on "ln" transferred data

			at level of significance 0.01	0.05	0.1
Tn	1.709	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier NO | **Tn < Tcrit NO** | NO

US95 using Chebychev or t-test

Use t-test

US95 *Chebychev*	**US95** *t-test*
416.0	**323.2**

Buro Happold Ground Engineering

EPH input & calcs sheet

Data entry column for individual contaminant →

48	10.0	609.0	2.3
233	10.0	233.0	2.3
166	10.0	186.0	2.3
37	10.0	166.0	2.3
16	16.0	151.0	2.8
186	37.0	77.0	3.6
609	39.0	61.0	3.7
10.00	48.0	48.0	3.9
10.00	61.0	39.0	4.1
39	77.0	37.0	4.3
151	151.0	16.0	5.0
61	166.0	10.0	5.1
10.00	186.0	10.0	5.2
10	233.0	10.0	5.5
77	609.0	10.0	6.4

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)….."

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red text = <detection limit entered as a value

1st Outlier check

			at level of significance 0.01	0.05	0.1
Tn	3.191	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier? YES — **Tn > Tcrit YES** — YES

Maximum concentration 609

Normality check

S^2	b^2	W
341251.73	228787.15	0.670

	at level of significance 0.01	0.05
critical values	0.835	0.881

Is the data normally distributed? NO — **W < critical value NO**

2nd Outlier check based on "ln" transferred data

			at level of significance 0.01	0.05	0.1
Tn	1.863	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier NO — **Tn < Tcrit NO** — NO

US95 using Chebychev or t-test

Use Chebychev as the distribution of the data shows evidence of non-normality

US95	**US95**
Chebychev	***t-test***
286.6	**181.9**

Buro Happold
Ground Engineering

Benzo(a)pyrene input & calcs sheet

Data entry column for individual contaminant →

0.01	0.0	1.5	-4.6
0.01	0.0	1.2	-4.6
0.01	0.0	1.2	-4.6
0.08	0.0	0.1	-4.6
1.54	0.0	0.1	-3.5
0.04	0.0	0.1	-3.2
0.07	0.1	0.1	-3.0
0.05	0.1	0.1	-3.0
0.1	0.1	0.1	-2.7
0.05	0.1	0.0	-2.5
1.23	0.1	0.0	-2.3
0.1	0.1	0.0	-2.3
0.03	1.2	0.0	0.1
0.01	1.2	0.0	0.2
1.15	1.5	0.0	0.4

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual *model and soil descriptions* (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

1st Outlier check

			at level of significance 0.01	0.05	0.1
Tn	2.349	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier? — Tn < Tcrit: NO | Tn < Tcrit: **NO** | Tn > Tcrit: YES

Maximum concentration 1.54

Normality check

S^2	b^2	W
3.91	2.27	0.582

	at level of significance 0.01	0.05
critical values	0.835	0.881

Is the data normally distributed? — W < critical value: NO | **W < critical value: NO**

2nd Outlier check based on "ln" transferred data

			at level of significance 0.01	0.05	0.1
Tn	1.789	Tcrit	2.658	2.372	2.213

Is the maximum concentration an outlier — Tn < Tcrit: NO | Tn < Tcrit: **NO** | Tn > Tcrit: NO

US95 using Chebychev or t-test

Use Chebychev as the distribution of the data shows evidence of non-normality

	US95	**US95**
	Chebychev	***t-test***
	0.9	**0.5**

Buro Happold
Ground Engineering

Technical Note 2

DRAFT

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

Buro Happold

Enclosure 10

Green Space Area

BHGE Assessment of Capping Layer Thickness for 'Subsoil'

Table 7: Capping Layer Thickness Calculation

Calculations based on mixed zone (M)	600	mm

Contaminant	Site Data				Expressed as a Factor of Target Guideline Value				Cover Thickness Required for Compliance to Specified Target Guideline Value	
	Contamination of Ground (Cg)	Contamination of Cover (Cc)	Target Guideline Value 1	Target Guideline Value 2	Target Guideline Value Soil / 1	Target Guideline Value Cover / 1	Target Guideline Value Soil / 2	Target Guideline Value Cover / 2	Target Guideline Value 1	Target Guideline Value 2
	Units		Units		Fraction				(mm)	
Arsenic	97.6	19.2	35	35	2.8	0.5	2.8	0.5	479	479
Copper (phytotoxic)	423	40.5	190	190	2.2	0.2	2.2	0.2	365	365
Mercury	2.1	0.3	1	1	2.1	0.3	2.1	0.3	367	367
Zinc (phytotoxic)	416	83.8	300	300	1.4	0.3	1.4	0.3	210	210

Summary		
	Target Guideline Value 1	Target Guideline Value 2
Number of contaminants	4	4
Number of contaminants **with no** thickness calculation	0	0
Breakdown - Number for which no TV specfied	0	0
Breakdown - Number for which no soil specified	0	0
Breakdown - Number for which no cover specified	0	0
Breakdown - Number for which cover > TV	0	0
Number of contaminants **with** thickness calculation	4	4
Breakdown - Number for which no cover required	0	0
Breakdown - Number for which cover required	4	4
Overall thickness of cover required	**479**	**479**

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Contamination End Use Assessment - Playing Fields**
Date: May 2010	**Job No: 026077**

Buro Happold
Ground Engineering

Table 7: Capping Layer Thickness Calculation

Calculations based on mixed zone (M)	600	mm

Contaminant	Site Data				Expressed as a Factor of Target Guideline Value				Cover Thickness Required for Compliance to Specified Target Guideline Value	
	Contamination of Ground (Cg)	Contamination of Cover (Cc)	Target Guideline Value 1	Target Guideline Value 2	Soil / Target Guideline Value 1	Cover / Target Guideline Value 1	Soil / Target Guideline Value 2	Cover / Target Guideline Value 2	Target Guideline Value 1	Target Guideline Value 2
	Units		Units		Fraction				(mm)	
Arsenic - EW value BP1	97.6	19.2	79	79	1.2	0.2	1.2	0.2	142	142
Copper (phytotoxic)	423	40.5	190	190	2.2	0.2	2.2	0.2	365	365
Mercury	2.1	0.3	1	1	2.1	0.3	2.1	0.3	367	367
Zinc (phytotoxic)	416	83.8	300	300	1.4	0.3	1.4	0.3	210	210

Summary		
	Target Guideline Value 1	Target Guideline Value 2
Number of contaminants	4	4
Number of contaminants **with no** thickness calculation	0	0
Breakdown - Number for which no TV specfied	0	0
Breakdown - Number for which no soil specified	0	0
Breakdown - Number for which no cover specified	0	0
Breakdown - Number for which cover > TV	0	0
Number of contaminants **with** thickness calculation	4	4
Breakdown - Number for which no cover required	0	0
Breakdown - Number for which cover required	4	4

Overall thickness of cover required	**367**	**367**

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Contamination End Use Assessment - Playing Fields**
Date: May 2010	**Job No: 026077**

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Table 7: Capping Layer Thickness Calculation

Calculations based on mixed zone (M)	300	mm

Contaminant	Site Data				Expressed as a Factor of Target Guideline Value				Cover Thickness Required for Compliance to Specified Target Guideline Value	
	Contamination of Ground (Cg)	Contamination of Cover (Cc)	Target Guideline Value 1	Target Guideline Value 2	Target Guideline Value Soil / 1	Target Guideline Value Cover / 1	Target Guideline Value Soil / 2	Target Guideline Value Cover / 2	Target Guideline Value 1	Target Guideline Value 2
	Units		Units		Fraction				(mm)	
Arsenic	97.6	19.2	35	35	2.8	0.5	2.8	0.5	240	240
Copper (phytotoxic)	423	40.5	190	190	2.2	0.2	2.2	0.2	183	183
Mercury	2.1	0.3	1	1	2.1	0.3	2.1	0.3	183	183
Zinc (phytotoxic)	416	83.8	300	300	1.4	0.3	1.4	0.3	105	105

Summary		
	Target Guideline Value 1	Target Guideline Value 2
Number of contaminants	4	4
Number of contaminants **with no** thickness calculation	0	0
Breakdown - Number for which no TV specfied	0	0
Breakdown - Number for which no soil specified	0	0
Breakdown - Number for which no cover specified	0	0
Breakdown - Number for which cover > TV	0	0
Number of contaminants **with** thickness calculation	4	4
Breakdown - Number for which no cover required	0	0
Breakdown - Number for which cover required	4	4
Overall thickness of cover required	**240**	**240**

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Contamination End Use Assessment - Playing Fields**
Date: May 2010	**Job No: 026077**

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Table 7: Capping Layer Thickness Calculation

Calculations based on mixed zone (M)	300	mm

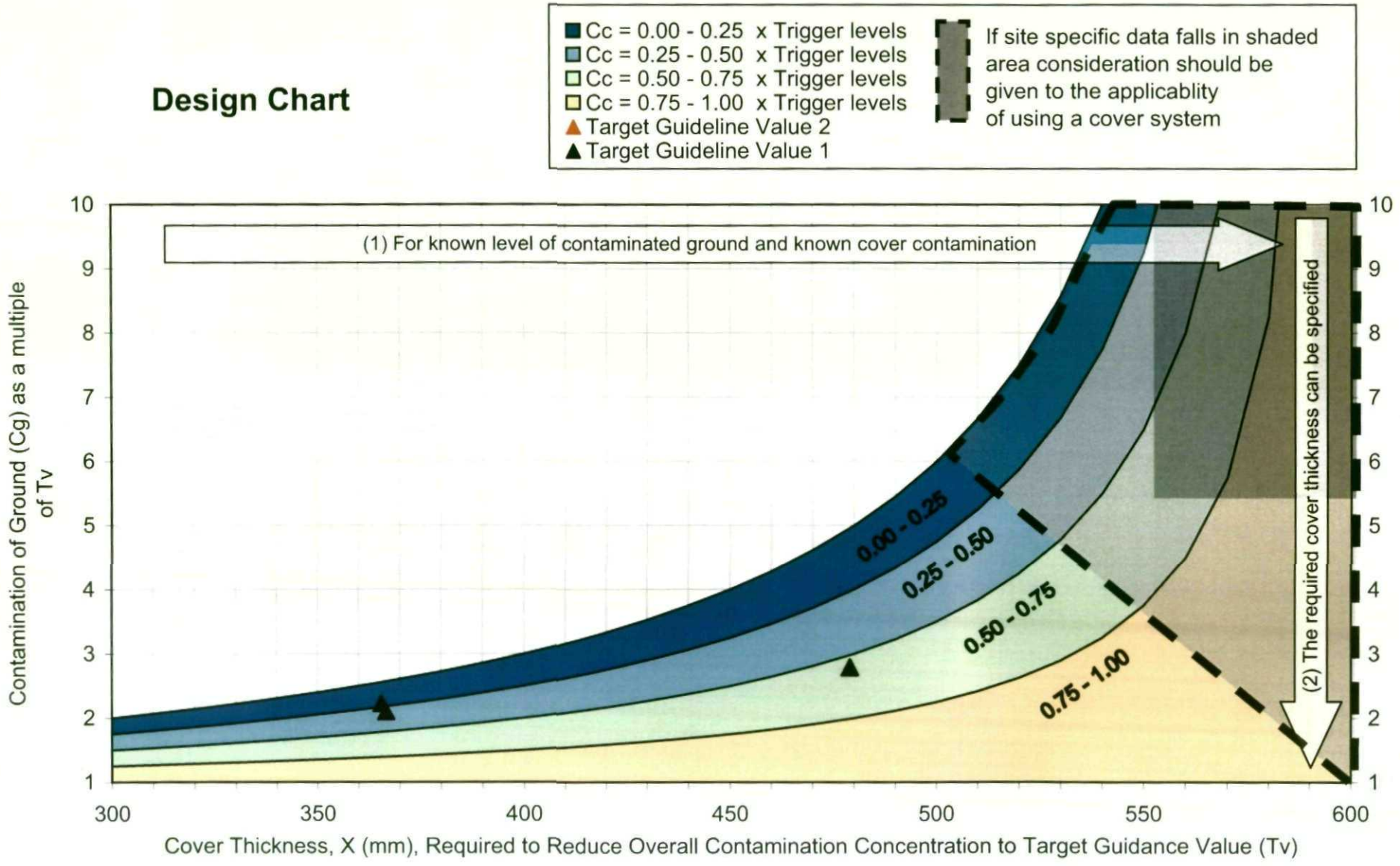
Contaminant	Site Data				Expressed as a Factor of Target Guideline Value				Cover Thickness Required for Compliance to Specified Target Guideline Value	
	Contamination of Ground (Cg)	Contamination of Cover (Cc)	Target Guideline Value 1	Target Guideline Value 2	Soil / Target Guideline Value 1	Cover / Target Guideline Value 1	Soil / Target Guideline Value 2	Cover / Target Guideline Value 2	Target Guideline Value 1	Target Guideline Value 2
	Units		Units		Fraction				(mm)	
Arsenic - EW value BP1	97.6	19.2	79	79	1.2	0.2	1.2	0.2	71	71
Copper (phytotoxic)	423	40.5	190	190	2.2	0.2	2.2	0.2	183	183
Mercury	2.1	0.3	1	1	2.1	0.3	2.1	0.3	183	183
Zinc (phytotoxic)	416	83.8	300	300	1.4	0.3	1.4	0.3	105	105

Summary		
	Target Guideline Value 1	Target Guideline Value 2
Number of contaminants	4	4
Number of contaminants **with no** thickness calculation	0	0
Breakdown - Number for which no TV specfied	0	0
Breakdown - Number for which no soil specified	0	0
Breakdown - Number for which no cover specified	0	0
Breakdown - Number for which cover > TV	0	0
Number of contaminants **with** thickness calculation	4	4
Breakdown - Number for which no cover required	0	0
Breakdown - Number for which cover required	4	4
Overall thickness of cover required	**183**	**183**

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Contamination End Use Assessment - Playing Fields**
Date: May 2010	**Job No: 026077**

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Design Chart



Technical Note 2

DRAFT

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

Buro Happold

Enclosure 11

Green Space Area

BHGE Assessment of Leachate Testing

Envirolab Job Number: 10/00525
Client: Laing O Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 76493

Lab Sample ID			10/00525/1	10/00525/2	10/00525/3	10/00525/4	10/00525/5	10/00525/6	10/00525/7	10/00525/8	10/00525/9	10/00525/10	10/00525/11	10/00525/12	10/00525/13	10/00525/14	10/00525/15	10/00525/16	10/00525/17	10/00525/18	10/00525/19	10/00525/20	10/00525/21	10/00525/22	10/00525/23	10/00525/24	10/00525/25	10/00525/26	10/00525/27	UK Drinking Water Standards (The Water Supply (Water Quality) Regulations 2000)	Other Thresholds	Earthwork specification
Client Sample No			3	2	3	2	2	2	2	2	3	2	3	2	2	2	2	3	2	2	2	3	3	2	2	1	2	2	2			
Client Sample ID			PF1	PF2	PF3	PF4	PF5	PF6	PF7	PF8	PF9	PF10	PF11	PF12	PF13	PF14	PF17	PF20	PF21	PF22	PF24	PF29	PF30	PF31	PF38	PF39	PF39	PF40	PF43			
Depth to Top			0.8	0.4	0.8	0.4	0.4	0.4	0.4	0.4	0.8	0.4	0.8	0.4	0.3	0.3	0.8	0.4	0.8	0.4	0.4	0.5	0.8	0.4	0.4	0.1	0.3	0.4	0.4			
Depth to Bottom																																
Date Sampled																																
Sample Type	Units	Method	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code																																
Leachate Prep NRA (10:1)		A-T-047																														
Arsenic (leachable)	µg/l	A-T-025	2	1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	4	<1	1	<1	<1	10	50 (1)	50
Cadmium (leachable)	µg/l	A-T-025	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	5	5 (1)	5
Chromium (leachable)	µg/l	A-T-025	2	<1	2	<1	<1	<1	<1	1	2	<1	2	<1	2	<1	1	3	<1	2	<1	<1	3	<1	3	<1	2	2	2	50	150 (1)	50
Copper (leachable)	µg/l	A-T-025	5	4	2	4	3	3	2	3	3	5	3	5	3	7	2	2	2	2	3	4	3	4	3	19	<1	10	5	4	2000	1 (1)	2000
Lead (leachable)	µg/l	A-T-025	1	2	1	5	<1	<1	<1	3	1	1	2	4	3	1	2	2	2	2	<1	<1	<1	<1	9	<1	2	1	1	25	4 (1)	50
Mercury (leachable)	µg/l	A-T-025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.2	0.2	0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	1 (1)	1
Nickel (leachable)	µg/l	A-T-025	2	9	2	2	1	1	<1	1	1	3	2	2	1	3	1	3	<1	2	<1	2	1	2	3	6	2	3	1	20	50 (1)	50
Selenium (leachable)	µg/l	A-T-025	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	10		10
Zinc (leachable)	µg/l	A-T-025	94	229	48	7	16	137	52	33	39	124	66	60	16	139	34	28	7	22	75	25	92	83	31	25	146	130	32	3000**	8 (1)	75
Boron (leachable)	µg/l	A-T-025	49	90	22	10	14	25	11	21	15	47	<10	23	18	45	21	16	23	25	29	15	36	29	37	<10	61	46	17	1000	2000 (1)	
Other Determinands																																
Phenols (total by HPLC) (leachable)	mg/l	A-T-050w	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1**	30 (1)*	100
pH (leachable)	pH	A-T-031w	6.7	6.3	6.8	6.1	6.1	6	6.2	6.6	6.2	6.3	6.7	6.6	6.8	5.8	6.8	7.7	7	6.5	6.3	6.6	7.4	7.2	7.4	6.1	6.4	6.5	6.6			5.5<pH<9.5
Sulphate (leachable)	mg/l	A-T-026w	11	<1	6	8	<1	2	<1	2	1	2	<1	5	<1	1	1	4	7	<1	<1	2	3	2	12	8	5	5	<1	250**	400 (1)*	250
EPH Total (>C10-C36) (leachable)	µg/l	A-T-023w	<50	<50	52	55	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	256	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50**	600 (2)	
PAH																																
Naphthalene (leachable)	µg/l	A-T-019w	0.39	0.12	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.09	0.08	<0.02	0.06	<0.02	0.93	0.07	<0.02	<0.02	0.07	<0.02	0.04	0.02	0.08	0.03		10 (1)	
Acenapthylene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	0.04	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04			
Acenapthene (leachable)	µg/l	A-T-019w	0.11	0.05	0.2	0.18	0.08	0.03	0.37	0.07	0.22	<0.02	0.04	0.03	0.94	0.04	0.22	0.69	0.02	0.48	0.13	0.18	<0.02	0.03	0.03	0.03	0.04	0.03	0.42			
Fluorene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.07	<0.02	<0.02	0.02	<0.02	0.06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03			
Phenanthrene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Anthracene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Fluoranthene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Pyrene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(a)anthracene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Chrysene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(b)fluoranthene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(k)fluoranthene (leachable)	µg/l	A-T-019w	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(a)pyrene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	0.05 (2)	
Indeno(123-cd)pyrene (leachable)	µg/l	A-T-019w	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Dibenzo(ah)anthracene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(ghi)perylene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Total PAH (leachable)	µg/l	A-T-019w	0.55	0.2	0.2	0.19	0.12	0.03	0.41	0.07	0.24	0.16	0.04	0.03	1.14	0.12	0.38	0.81	0.02	1.52	0.21	0.18	<0.02	0.1	0.03	0.07	0.06	0.11	0.51			10

Project name:	**Barnsley BSF - Phase 3 - Holgate Kingstone ALC**
Report title:	**Ground Contamination Assessment**
Table title:	**Contamination Assessment - Leachate**
Date: May 2010	**Job No. 026077**

Buro Happold
Ground Engineering

GENERAL NOTES:
(1) Freshwater Environmental Quality Standard. For hardness-related determinands, worse-case hardness band adopted 0 - 50 mg/l CaCO3
(2) Dutch Intervention Value for groundwater, from 'Circular on target values and intervention values for soil remediation' (2000)
*EA non-statutory (operational)
**From The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 (DW-1)

Envirolab Job Number: 10/00525
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

Lab Sample ID			10/00525/2	10/00525/2	10/00525/3	10/00525/3	10/00525/3	10/00525/3	10/00525/3	10/00525/3	10/00525/3	10/00525/3	10/00525/3	10/00525/3	10/00525/4	10/00525/4	10/00525/4	10/00525/4	10/00525/4	10/00525/4	10/00525/4	10/00525/4	10/00525/4	10/00525/4	10/00525/5	10/00525/5	10/00525/5	10/00525/5	10/00525/5	10/00525/5	10/00525/5	10/00525/5	UK Drinking Water Standards (The Water Supply (Water Quality) Regulations 2000	Other Thresholds	Earthwork specification
Client Sample No			2	1	1	3	1	2	3	1	3	2	2	1	3	2	3	2	2	3	3	2	3	2	3	2	2	3	2	3	2			
Client Sample ID			PF44	PF45	PF46	PF47	PF48	PF49	PF50	PF51	PF52	PF53	PF54	PF55	PF55	PF56	PF57	PF58	PF59	PF60	PF61	PF61	PF62	PF63	PF64	PF65	PF66	PF67	PF68	PF69	GS01	GS02	GS03			
Depth to Top			0.4	0.3	0.4	0.8	0.1	0.4	0.8	0.3	0.8	0.4	0.25	0.1	0.8	0.4	0.8	0.4	0.4	0.4	0.4	0.8	0.8	0.4	0.8	0.4	0.8	0.4	0.4	0.8	0.8	0.8	0.4			
Depth to Bottom																																			
Date Sampled																																			
Sample Type			Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	Units	Method																																	
Leachate Prep NRA (10:1)		A-T-047																																	
Arsenic (leachable)	µg/l	A-T-025	<1	<1	2	1	<1	2	<1	1	<1	<1	<1	<1	1	2	<1	2	3	4	2	<1	1	<1	<1	1	1	<1	5	2	<1	<1	<1	10	50 (1)	50
Cadmium (leachable)	µg/l	A-T-025	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	5	5 (1)	5
Chromium (leachable)	µg/l	A-T-025	2	1	2	2	<1	1	1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	2	<1	22	<1	<1	1	18	3	<1	1	<1	1	<1	1	50	5 (1)	50
Copper (leachable)	µg/l	A-T-025	2	2	7	10	4	6	3	11	3	<1	<1	4	3	3	<1	3	13	3	9	5	3	1	2	4	9	2	10	10	4	2	2	2000	1 (1)	2000
Lead (leachable)	µg/l	A-T-025	1	<1	1	4	<1	3	<1	2	<1	<1	<1	<1	<1	1	<1	<1	2	1	12	<1	<1	<1	<1	5	4	<1	1	2	3	2	2	25	4 (1)	50
Mercury (leachable)	µg/l	A-T-025	<0.1	0.4	0.3	0.2	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.3	0.2	0.2	0.1	0.1	0.2	<0.1	<0.1	<0.1	1	1 (1)	1
Nickel (leachable)	µg/l	A-T-025	2	2	3	2	1	3	<1	2	3	<1	<1	<1	<1	1	3	<1	4	<1	3	<1	<1	2	2	2	2	<1	2	2	2	1	<1	20	50 (1)	50
Selenium (leachable)	µg/l	A-T-025	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	10		10
Zinc (leachable)	µg/l	A-T-025	70	119	79	131	18	86	46	44	34	16	9	4	3	63	84	39	81	30	100	75	67	43	99	30	34	15	72	153	80	28	6	3000**	8 (1)	75
Boron (leachable)	µg/l	A-T-025	33	43	45	75	35	26	29	17	14	12	14	40	36	14	14	22	62	17	19	35	40	57	18	17	32	28	51	82	22	12	24	1000	2000 (1)	
Phenols (total by HPLC) (leachable)	mg/l	A-T-050w	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1**	30 (1)*	100
pH (leachable)	pH	A-T-031w	6.7	7.9	5.9	5.8	7.8	5.7	7	6.4	6.6	6.4	6.7	7.6	7.7	6.9	6.6	6.4	7.6	7.3	6.1	7.8	7	7.2	7.3	7.9	7.3	7.3	7.1	6.8	6	6.5	7			5.5<pH<9.5
Sulphate (leachable)	mg/l	A-T-026w	5	4	2	12	10	4	5	<1	<1	<1	<1	38	41	15	15	9	25	6	15	30	12	180	15	3	8	3	32	6	12	16	4	250**	400 (1)*	250
EPH Total (>C10-C36) (leachable)	µg/l	A-T-023w	<50	<50	<50	<50	<50	<50	122	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50**	600 (2)	
PAH 16MS (leachable)																																				
Naphthalene (leachable)	µg/l	A-T-019w	<0.02	0.09	<0.02	0.27	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	0.05	<0.02	<0.02	0.38	<0.02	<0.02	0.06	0.08	<0.02	<0.02	0.29		10 (1)	
Acenapthylene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Acenapthene (leachable)	µg/l	A-T-019w	0.11	0.03	0.52	0.07	0.07	<0.02	0.05	0.13	0.23	<0.02	0.77	0.05	<0.02	<0.02	<0.02	0.06	0.02	0.08	0.02	<0.02	<0.02	<0.02	0.05	0.06	<0.02	<0.02	<0.02	0.04	<0.02	<0.02	0.06			
Fluorene (leachable)	µg/l	A-T-019w	<0.02	<0.02	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Phenanthrene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Anthracene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.12	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Fluoranthene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.42	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Pyrene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.31	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(a)anthracene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.36	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Chrysene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(b)fluoranthene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.15	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(k)fluoranthene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.15	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(a)pyrene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.19	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	0.05 (2)	
Indeno(123-cd)pyrene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.17	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Dibenzo(ah)anthracene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Benzo(ghi)perylene (leachable)	µg/l	A-T-019w	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.12	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Total PAH (leachable)	µg/l	A-T-019w	0.12	0.12	0.58	0.34	0.07	<0.02	0.05	0.13	0.27	<0.02	0.85	0.05	<0.02	<0.02	<0.02	0.06	2.39	0.08	0.04	0.04	0.05	<0.02	0.05	0.44	<0.02	<0.02	0.08	0.12	<0.02	<0.02	0.38		10 (1)	10

Project name:	**Barnsley BSF - Phase 3 - Holgate Kingstone ALC**
Report title:	**Ground Contamination Assessment**
Table title:	**Contamination Assessment - Leachate**
Date: May 2010	**Job No. 026077**

Buro Happold
Ground Engineering

GENERAL NOTES:
(1) Freshwater Environmental Quality Standard. For hardness-related determinands, worse-case hardness band adopted 0 - 50 mg/l CaCO3
(2) Dutch Intervention Value for groundwater, from 'Circular on target values and intervention values for soil remediation' (2000)
*EA non-statutory (operational)
**From The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 (DW-1)

Envirolab Job Number: 10/00525
Client: Laing O'Rourke
Client Project Name: Kingstone Holgate ALC
Client Project Ref: 761493

Buro Happold
Ground Engineering

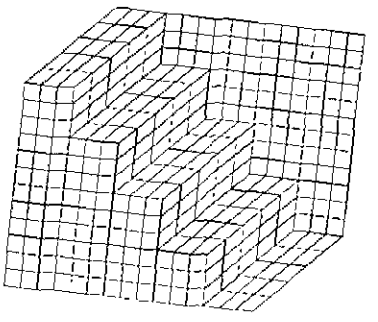
Determinand	Number of Tests	Exceedances of DWS	Other thresholds	Exceedances of Earthworks Specification (No)	Comments
Metals					
Arsenic	58	0	0	0	Not significantly elevated
Cadmium	58	0	0	0	Not significantly elevated
Chromium	58	2	0	0	Not significantly elevated
Copper	58	0	54	0	Not significantly elevated
Lead	58	0	4	0	Not significantly elevated
Mercury	58	0	0	0	Not significantly elevated
Nickel	58	0	0	0	Not significantly elevated
Selenium	58	0	0	0	Not significantly elevated
Zinc	58	0	5	10	Not significantly elevated
Boron	58	0	0	0	Not significantly elevated
Other Determinands					
Phenols Monohydric	58	0	0	0	Not significantly elevated
pH Value	58	0	0	0	Not significantly elevated
Sulphate	58	0	0	0	Not significantly elevated
EPH total (C10-C36)	58	4	0	0	Not significantly elevated
PAH 16					
Naphthalene	58	0	0	0	Not significantly elevated
Acenaphthylene	58	0	0	0	Not significantly elevated
Acenaphthene	58	0	0	0	Not significantly elevated
Fluorene	58	0	0	0	Not significantly elevated
Phenanthrene	58	0	0	0	Not significantly elevated
Anthracene	58	0	0	0	Not significantly elevated
Fluoranthene	58	0	0	0	Not significantly elevated
Pyrene	58	0	0	0	Not significantly elevated
Benzo(a)anthracene	58	0	0	0	Not significantly elevated
Chrysene	58	0	0	0	Not significantly elevated
Benzo(b)fluoranthene	58	0	0	0	Not significantly elevated
Benzo(k)fluoranthene	58	0	0	0	Not significantly elevated
Benzo(a)pyrene	58	0	0	0	Not significantly elevated
Indeno(123cd)pyrene	58	0	0	0	Not significantly elevated
Dibenzo(ah)anthracene	58	0	0	0	Not significantly elevated
Benzo(ghi)perylene	58	0	0	0	Not significantly elevated
Coronene	58	0	0	0	Not significantly elevated
PAH 16 Total	58	0	0	0	Not significantly elevated

Technical Note 2

DRAFT

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

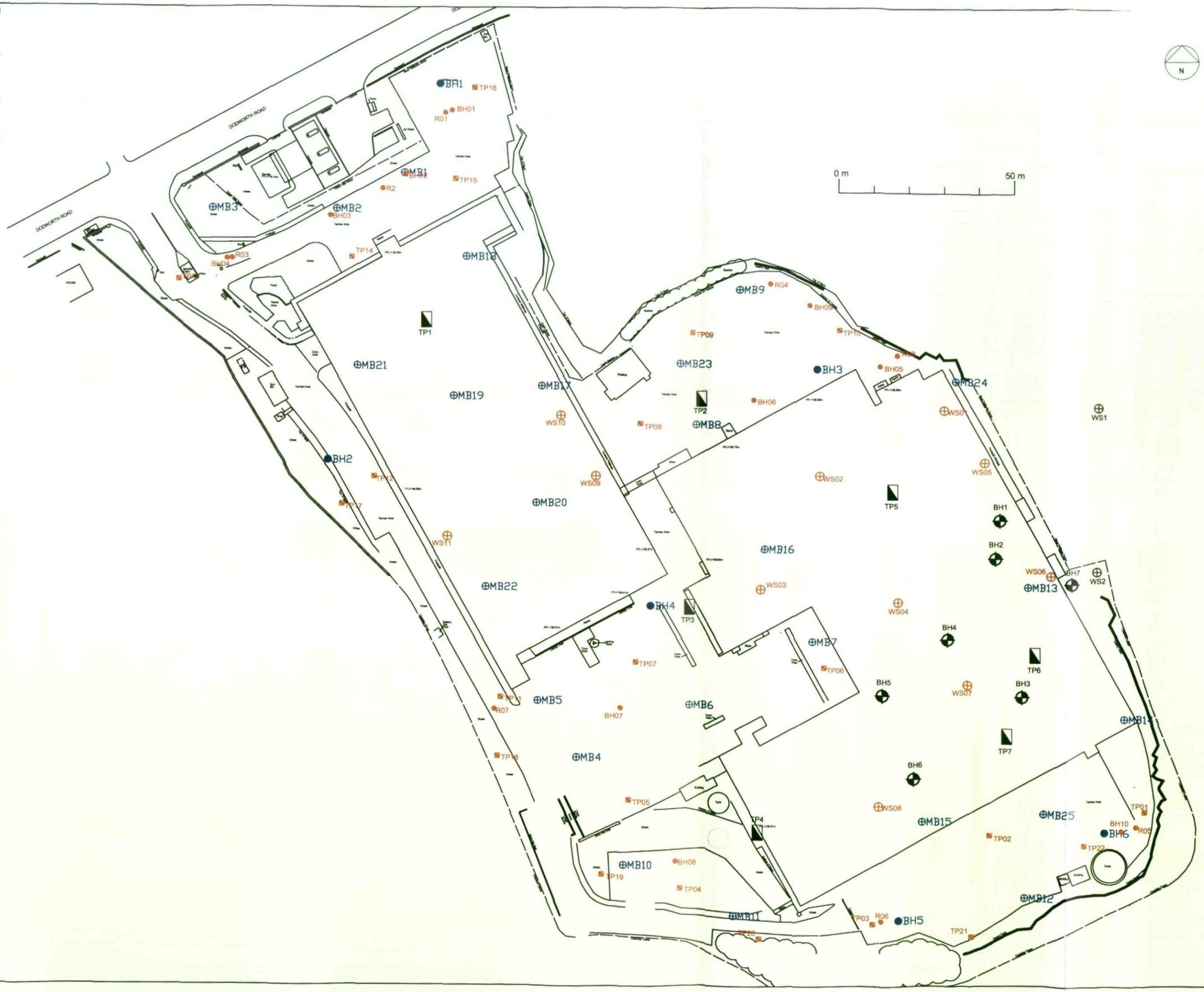


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Enclosure 12

The Quarry Area

Exploratory Hole Location Plan



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HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Notes

The following drawing has been annotated by BHGE. All changes are for information only. Buro Happold does not accept any liability for any of the information.

- FWS Window Samples
- FWS Boreholes
- Abatech Window Samples
- Abatech Trial Pits
- Abatech Boreholes
- CC Geotechnical Trial Pits
- CC Geotechnical Window Samples
- CC Geotechnical Boreholes

Notes:
Background drawing from Abatech 2007
S7-033-100-101.dwg

CC Geotechnical exploratory hole locations have not been surveyed in. BHGE have estimated their locations

Rev	Description	Date	Drn

FOR INFORMATION

Status of drawing

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Buro Happ
Consulting Engi

Architect: ATKINS

Project: Barnsley BSF - Holgate Kingstone ALC

Drg Title: Historical Ground Information

Scales@A1: NTS	Job No. 026077
Drawn by: RLW	Drawing No. BHG_KIN_BUR_DR_NSE06 RE01
Checked by: DPN	Rev 01
Date: 10/05/2010	

Technical Note 2

DRAFT

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

Buro Happold

Enclosure 13

The Quarry Area

BHGE Assessment of Chemical Results

Sample Identity			MB 1/2	MB 1/3	MB 1/4	MB 2/1	MB 2/2	MB 2/3	MB 2/5	MB 3/1	MB 3/3	MB 3/4	MB 4/1	MB 4/2	MB 5/1	MB 5/2	MB 5/3	MB 6/1	MB 7/2	MB 8/2	MB 8/4	MB 8/5	MB 9/1	MB 9/3	MB 9/4	MB 9/5	MB 10/1	MB 10/2	MB 10/3	MB 10/4	MB 11/2	MB 12/2	MB 12/3	MB 12/4	MB 13/3	MB 13/4	MB 14/1	MB 14/2	MB 15/1	MB 15/2	Guidance Without Plant Uptake		Other Screening Values (refer to notes under table for explanation)	Earthworks Specification
Sample No.			3121614	3121615	3121616	3121617	3121618	3121619	3121620	3121621	3121622	3121623	3121624	3121625	3121626	3121627	3121628	3121629	3121630	3121631	3121632	3121633	3121634	3121635	3121636	3121637	3121638	3121639	3121640	3121641	3121642	3121643	3121644	3121645	3121646	3121647	3121648	3121649	3121650	3121651	3121652				
Depth			0.50-1.2	1.0-2.3	3.0-3.9	0.2-0.45	0.50-1.2	2.0-3.0	4.0-5.5	0.0-0.17	0.0-0.17	0.20-0.50	0.50-1.1	0.20-1.2	1.2-2.0	0.2-1.2	1.2-2.5	0.20-0.5	0.3-0.5	0.3-1.0	2.0-3.2	2.0-3.2	0.2-0.45	1.2-2.0	2.0-3.0	3.0-3.9	3.0-3.9	0.07-0.4	0.4-0.7	0.7-1.2	1.2-1.75	0.45-1.2	0.20-1.2	1.0-1.45	1.45-3.0	1.0-1.8	1.8-2.1	0.4-1.0	2.0-3.0	0.4-1.3	1.3-1.5				
Sample Type			SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID				
Material			MG	MG	MG	ASH FILL	MG	MG	NAT	MG	MG	MG	MG	NAT	MG	MG	NAT	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	NAT	MG	MG	MG	MG	MG	MG	MG	NAT				
Location			Quarry	Quarry	Quarry	Quarry	Quarry	Quarry	MUDSTONE	TOPSOIL	ASHY SAND	GRAVEL	GRAVEL FILL	MUDSTONE	DOLOMITE	GRAVEL	MUDSTONE	BRICK RUBBLE	MUDSTONE	CLAY FILL	GRAVEL FILL	MUDSTONE	DOLOMITE	GRAVEL	MUDSTONE	CLAY FILL	CLAY FILL	DOLOMITE	CLAY	MUDSTONE	NAT	SILT & MST	CLAY FILL	SOLID	CLAY	CLAY FILL	GRAVEL	CLAY FILL	CLAY FILL	MUDSTONE				
Determinand	Units	Method																																									
Metals																																											
Arsenic	mg/kg	TM129	15	14	12	19	18	7.8	3.2	31	23	13	8.7	3.9	7.6	4.3	3.7	9.5	1.8	1.2	1.4	9.1	12	12	11	5.7		8.3	4.1	3.6	4.4	2.4	4.3	3.6	4.2	4.6	11	10	5.2	3.9	0.4	55	640		79
Boron	mg/kg	TM129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			3 [15]	
Cadmium	mg/kg	TM129	0.3	0.2	<0.2	0.6	<0.2	<0.2	<0.2	0.5	0.2	<0.2	<0.2	0.2	0.4	<0.2	0.3	0.3	<0.2	<0.2	<0.2	0.7	<0.2	0.3	0.1	<0.2	0.2	<0.2	0.4	<0.2	0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	85	230		30
Chromium	mg/kg	TM129	700	33	33	78	27	32	25	32	23	19	27	19	15	19	12	47	22	21	10	28	22	37	65	26		29	16	27	23	20	22	23	11	27	27	14	19	20	16	200 [19]	5600 [19]		200
Hexavalent Chromium	mg/kg	TM151	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	35		
Copper	mg/kg	TM129	43	49	21	59	37	20	44	75	55	24	30	47	17	28	52	41	26	33	33	9	39	34	37	37		25	3	40	63	17	33	38	14	32	36	110	37	28	30	6200	72000	190 [25]	190
Lead	mg/kg	TM129	310	99	19	1100	110	27	44	190	87	60	29	35	36	21	33	130	20	64	22	44	87	110	100	58		35	12	23	48	16	28	29	16	41	100	49	36	22	21	450	750		450
Mercury	mg/kg	TM129	0.14	0.09	<0.06	0.06	0.16	<0.06	<0.06	0.32	0.93	0.07	0.06	0.06	<0.06	<0.06	<0.06	0.12	<0.06	0.23	<0.06	<0.06	0.16	0.15	0.15	<0.06		0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.10	0.09	0.24	<0.06	<0.06	<0.06	1	26		15
Nickel	mg/kg	TM129	54	56	39	17	23	30	40	27	29	16	44	50	7	31	47	15	33	18	13	14	23	31	99	48		26	9	65	100	36	43	41	23	40	34	27	43	42	35	130	1800		130
Selenium	mg/kg	TM129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	600	13000		260
Zinc	mg/kg	TM129	120	60	49	310	100	63	110	160	76	72	87	110	46	78	100	54	86	82	40	67	95	99	110	100		88	51	130	100	87	86	87	66	91	90	81	120	95	28	40000	670000	330 [25]	300
Barium	mg/kg																																								1300 [18]	22000 [18]		
Beryllium	mg/kg																																								84.9 [18]	1950 [18]		
Vanadium	mg/kg																																								190	3300		
Other determinand																																												
Acid Soluble Sulphide	mg/kg	TM181	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-			250 [18]	
Sulphur (free)	mg/kg																																									5000 [18]		
Sulphate (total)	mg/kg		1300.0	1100.0	410.0	2600.0	520.0	200.0	140.0	1100.0	1100.0	1600.0	1300.0	280.0	2800.0	360.0	340.0	1400.0	<100	1200.0	150.0	920.0	960.0	820.0	810.0	430.0		330.0	250.0	610.0	270.0	190.0	300.0	140.0	160.0	300.0	580.0	1500.0	150.0	410.0	140.0			2000	5000
Sulphate (total TRL report 447)	%																																										
Elemental sulphur	mg/kg																																									5000 [18]		
Phenols Monohydric	mg/kg	TM062	<1	<1	<1	<1	<1	<1	<1	1.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	520	3200		5
Total Cyanide	mg/kg	TM153	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	560	16000		35
Cyanide (free)	mg/kg																																								760	16000		
Cyanide (complex)	mg/kg																																								760	16000		
Easily Liberatable Cyanide	mg/kg	TM153																																							760	16000		
Thiocyanate	mg kg-1																																										
Asbestos Presence Screen	NONE	TM001																																								0.1% [17]		
Loss on Ignition	%	TM018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-		10%		
pH Value	pH Units	TM133	10.1	6.7	7.3	9.5	8.5	7.4	8.5	7.9	8.1	9.3	8.3	8.3	9.6	8.7	8	9.4	9	7.9	8.6	8.6	8.7	9.2	8.8	8.1		7.1	9.6	6.9	6.6	7.1	6.8	7.9	7.8	8.5	8.2	9	9.3	8.5	8.8			5<pH<9 [18]	6<pH<8
Petroleum Hydrocarbon																																											
TPH	mg/kg		300			32000															9100					4100															500 [18]	500
Benzene	mg/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	1	95		
Toluene	mg/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	2,700	6,400		
Ethyl benzene	mg/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	640	2,900		
m & p Xylene	mg/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	0.22		-	-	-	-	-	-	-	-	-	-	-	-	-	290	2,900		
o Xylene	mg/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01		-	-	-	-	-	-	-	-	-	-	-	-	-				
Sum of BTEX	mg/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-			6 [19]	
Aliphatics C5-C6	ug/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	110,000	18,000,000		
Aliphatics >C6-C8	ug/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	370,000	42,000,000		
Aliphatics >C8-C10	ug/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	110,000	11,000,000		
Aliphatics >C10-C12	ug/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	490,000	34,000,000		
Aliphatics >C12-C16	ug/kg	TM173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	2,300,000	60,000,000		
Aliphatics >C16-C35	ug/kg	TM173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	77,000,000	1,600,000,000		
Aliphatics >C35-C44	ug/kg	TM173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	617,000,000	26,000,000		
Aromatics C6-C7	ug/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	1000	95000		
Aromatics >C7-C8	ug/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	2700000	6400000		
Aromatics >EC8-EC10	ug/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	180,000	14,000,000		
Aromatics >EC10-EC12	ug/kg	TM089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	670,000	28,000,000		
Aromatics >EC12-EC16	ug/kg	TM173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	1,600,000	37,000,000		
Aromatics >EC16-EC21	ug/kg	TM173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	1,300,000	28,000,000		
Aromatics >EC21-EC35	ug/kg	TM173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	1,300,000	28,000,000		
Polycyclic Aromatic Hydrocarbon																					SVOC suite					SVOC suite																	
Naphthalene	mg/kg	TM142	1.3	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	4.1	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	9.2	1,100		33
Acenaphthylene	mg/kg	TM142	<1	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	<1	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	850 [18]			
Acenaphthene	mg/kg	TM142	1.5	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	1.4	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	1000 [18]			
Fluorene	mg/kg	TM142	1.2	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	2.5	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	780 [18]	9600 [18]		
Phenanthrene	mg/kg	TM142	8.3	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	8.3	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	380 [18]			
Anthracene	mg/kg	TM142	2.5	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	2.1	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	9200 [18]			
Fluoranthene	mg/kg	TM142	11	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	9.7	4.7	-	-	-	-	-	-	-	-	-	-	-	-	-	670 [18]			
Pyrene	mg/kg	TM142	11	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	8.8	4.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1600 [18]			
Benzo(a)anthracene	mg/kg	TM142	5.9	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	3.7	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	5.90 [18]			
Chrysene	mg/kg	TM142	5.2	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	2.9	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3 [18]			
Benzo(b)fluoranthene	mg/kg	TM142	6.2	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	2.8	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	7 [18]			
Benzo(k)fluoranthene	mg/kg	TM142	2.7	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	1.3	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	10 [18]			
Benzo(a)pyrene	mg/kg	TM142	5.1	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	2.2	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	1	14		3.3
Indeno(123cd)pyrene	mg/kg	TM142	3.6	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	2	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2 [18]			
Dibenz(ah)anthracene	mg/kg	TM142	<1	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	<1	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3 [18]			
Benzo(ghi)perylene	mg/kg	TM142	3.2	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	1.4	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	47 [18]			
PAH 16 Total	mg/kg	TM142	68.6	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52.2		-	-	-	-	-	-	-	-	-	-	-	-	-			100 [17]	100
Classification Test																																											
Sulphate (extractable SO4 2:1)	g/l	TM09it	<0.1	-	0.11	0.24	-	-	-	-	-	0.23	-	-	0.88	-	-	0.19	-	-	-	-	-	-	-	-		0.15	-	-	-	-	0.35	-	-	-	-	-	-	-	-	>DS2	>DS2		
Nitrate	mg/kg																																									10 [18]		
Water soluble nitrate	mg/kg																																									10 [18]		
Total Organic Matter	%	TM132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-				
% Stones Greater then 10mm	%	TM098	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-				
Chloride	mg/kg		130	720	53	130	480	180	20	35	47	35	250	100	510	370	37	730	<10	80	14	19	47	36	33	33		140	97	70	25	22	96	69	56	28	35	80	16	37	46			100	
Calorific Value	kJ/kg					2960											1110		<100			<100								1790.00													
Moisture content	%		17	31	21	16	19	16	13	19	12	8	10	11	7	12	11	9	4	18	8	8	15	13	11	18		5	19	21	29	8	15	14	23	13	16	8	17	12	11				
Toluene Extractable Matter	mg/kg		3600	<430	<430	33000	1200	<430	<430	880	<430	<430	<430	<430	<430	<430	<430	1600	<430	960	<430	560	2200	1600	1800	8000		<430	<430	<430	<430	<430	<430	<430	<430	<430	1100	<430	<430	<430				

Project name	Barnsley BSF - Holgate Kingstone ALC
Report title	Ground Engineering
Table title	Contamination End Use Assessment - Soil results
Date: April 2010	Appendix No. N/A

Buro Happold Ground Engineering

GENERAL NOTES
All results reported on dry weight basis
NFD = No Fibres Detected
123 = SGVs
123 = Conservative Generic Assessment Criteria derived in house using C.L.E.A.U.K (v.1.06), assuming SOM 6%
Exceeds Phase One EW Specification values

SCREENING CRITERIA NOTES
(1) Former SGV retracted in 2007
(2) Generic Assessment Criteria for Human Health Risk Assessment. Land Quality Management Ltd & The Chartered Institute of Environmental Health. Published by Land Quality Press, a division of Land Quality Management Ltd (2007). Residential Without Plant Uptake
(3) Based on Environment Agency Technical Guidance WM2 'Hazardous Waste' (2003, version 1)
(4) Guidance on the Disposal of "Contaminated Soils". Environment Agency. Version 3, February 2001 (Now withdrawn)
(5) Based on Environment Agency 'Guidance on Sampling and Testing of Wastes to meet Landfill Acceptance Procedures' (2005, version 1) Inert waste criteria
(6) ICRCL values
(7) CL:AIRE Generic Assessment Criteria.
(8) USEPA defined maximum contaminant level for human consumption

Numbers in red not currently part of earthworks specification

Barnsley BSF - Holgate Kingstone (026077)

| | | FWS data (2006) | | |

Barnsley BSF - Holgate Kingstone (526077)

| | | FWS data (2006) | | | | | | | CCG - 2006 | | | CCG - 2009 | | | | | | |

Barnsley BSF - Holgate Kingstone (026077)

| Determinand | Units | Abatech 2007 | | |

Technical Note 2

DRAFT

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

Buro Happold

Enclosure 14

The Quarry Area

BHGE Assessment of US95 for Identified Exceedances for Made Ground

Determinand	US95 Chebychev	US95 T-Test	Residential without plant uptake Threshold	BP1 Earthworks Spec Threshold	Comments
Metals					
Chromium	57.0	40.6	200	200	Remedial action unnecessary.
Lead	56	46	450	450	Remedial action unnecessary.
Mercury	0.3	0.2	1	15	Remedial action unnecessary.
Zinc	122.5	107.9	40000	300	Remedial action unnecessary.
Other Determinands					
Total sulphate	1006.7	784.2	2000	2000	Remedial action unnecessary.
Petroluem Hydrocarbons					
TPH	5833.4	3592.5	500	500	Cover thickness to be considered
Benzene	3.1	2.0	1	-	Cover thickness to be considered
Sum of BTEX	24.3	15.1	6	-	Cover thickness to be considered
EC12-16	371576.0	191205.7	1,600,000	n/a	Remedial action unnecessary.
Polycyclic Aromatic Hydrocarbons					
Napthalene	31.4	17.4	9.2	9.2	Cover thickness to be considered
Phenanthrene	113.4	61.8	380	-	Remedial action unnecessary.
Fluoranthene	82.7	46.4	670	-	Remedial action unnecessary.
Benzo(a)anthracene	25.3	14.8	5.2	-	Cover thickness to be considered
Chrysene	23.7	14.0	9.3	-	Cover thickness to be considered
Benzo(b)fluoranthene	23.0	13.5	7	-	Cover thickness to be considered
Benzo(k)fluoranthene	11.4	7.1	10	-	Cover thickness to be considered
Benzo(a)pyrene	21.8	12.9	1	3.3	Cover thickness to be considered
Indendo(123cd)pyrene	10.3	5.9	4.2	-	Cover thickness to be considered
Dibenzo(ah)anthracene	4.7	3.2	1.3	1.3	Cover thickness to be considered
Total PAH 16	192.9	120.6	100	100	Cover thickness to be considered

Blue text = LQM value

US95 less than threshold

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Contamination End Use Assessment - Quarry Area US95 Summary**
Date: May 2010	**Job No: 026077**

Buro Happold
Ground Engineering

Chromium input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation
Enter data in data entry column & remove '<' signs
"Where the proportion of non-detects within the dataset is less than 10 to 15% non detected values should simply be replaced by a small number (e.g. MDL or 0.5MDL)..."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'**Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

700	4.0	700.0	1.4
33	6.8	200.0	1.9
33	7.0	78.0	1.9
78	7.9	71.0	2.1
27	9.0	65.0	2.2
32	9.0	55.0	2.2
25	9.6	52.0	2.3
32	9.9	49.0	2.3
23	10.0	47.0	2.3
19	10.7	42.0	2.4
27	11.0	42.0	2.4
19	11.0	41.0	2.4
13	11.0	39.0	2.4
19	11.0	34.0	2.4
12	12.0	33.0	2.5
47	12.0	33.0	2.5
22	12.0	33.0	2.5
21	12.0	32.0	2.5
10	13.0	32.0	2.6
28	13.0	31.0	2.6
22	13.0	31.0	2.6
27	14.0	30.0	2.6
65	14.0	29.0	2.6
26	14.6	29.0	2.7
29	15.0	29.0	2.7
16	15.0	29.0	2.7
27	15.0	29.0	2.7
23	16.0	28.0	2.8
20	16.0	28.0	2.8
22	16.0	27.0	2.8
23	16.0	27.0	2.8
31	16.0	27.0	2.8
27	16.0	27.0	2.8
27	16.0	27.0	2.8
14	17.0	27.0	2.8
19	17.0	27.0	2.8
20	18.0	27.0	2.9
16	18.0	27.0	2.9
18	18.0	26.0	2.9
16	18.0	25.0	2.9
42	18.2	25.0	2.9
20	19.0	25.0	2.9
27	19.0	25.0	2.9
42	19.0	24.0	2.9
21	19.0	24.0	2.9
13	19.0	23.0	2.9
52	19.0	23.0	2.9
55	20.0	23.0	3.0
12	20.0	23.0	3.0
4	20.0	23.0	3.0
22	20.0	23.0	3.0
19	20.0	22.0	3.0
15	20.0	22.0	3.0
13	20.0	22.0	3.0
29	20.0	22.0	3.0
20	20.0	22.0	3.0
11	21.0	21.0	3.0
9	21.0	21.0	3.0
15	21.0	21.0	3.0
200	21.0	21.0	3.0
21	21.0	21.0	3.0
12	22.0	20.0	3.1
16	22.0	20.0	3.1
20	22.0	20.0	3.1
14	22.0	20.0	3.1
21	22.0	20.0	3.1
71	23.0	20.0	3.1
49	23.0	20.0	3.1
24	23.0	20.0	3.1
20	23.0	20.0	3.1
29	23.0	19.0	3.1
39	23.0	19.0	3.1
33	24.0	19.0	3.2
34	24.0	19.0	3.2
41	25.0	19.0	3.2
30	25.0	19.0	3.2
33	25.0	18.2	3.2
10 7	25.0	18.0	3.2
18 2	26.0	18.0	3.3
14 6	27.0	18.0	3.3
28	27.0	18.0	3.3
20	27.0	17.0	3.3
9	27.0	17.0	3.3
23	27.0	16.0	3.3
25	27.0	16.0	3.3
7	27.0	16.0	3.3
23	27.0	16.0	3.3
29	27.0	16.0	3.3
18	28.0	16.0	3.3
16	28.0	16.0	3.3
18	29.0	15.0	3.4
20	29.0	15.0	3.4
24	29.0	15.0	3.4
27	29.0	14.6	3.4
27	29.0	14.0	3.4
23	30.0	14.0	3.4
29	31.0	13.0	3.4
16	31.0	13.0	3.4
25	32.0	13.0	3.5
7	32.0	12.0	3.5
16	33.0	12.0	3.5
10	33.0	12.0	3.5
11	33.0	12.0	3.5
8	34.0	11.0	3.5
12	39.0	11.0	3.7
10	41.0	11.0	3.7
11	42.0	11.0	3.7
19	42.0	10.7	3.7
21	47.0	10.0	3.9
17	49.0	9.9	3.9
22	52.0	9.6	4.0
15	55.0	9.0	4.0
18	65.0	9.0	4.2
11	71.0	7.9	4.3
25	78.0	7.0	4.4
17	200.0	6.8	5.3
20	700.0	4.0	6.6

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	10.193	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 700 Arithmetic mean 31

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	5.590	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn > Tcrit YES**

US95 using Chebychev or t-test

US95	US95
Chebychev	*t-test*
57.0	40.6

Buro Happold
Ground Engineering

Lead input & calcs sheet!!

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a small number (e.g. MDL or 0.5MDL)..."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

			LN	LOG10
210	7.3	1100.0	2.0	0.9
77	9.0	210.0	2.2	1.0
19	10.9	190.0	2.4	1.0
1100	11.0	190.0	2.4	1.0
110	12.0	176.0	2.5	1.1
21	13.0	148.0	2.6	1.1
44	14.0	140.0	2.6	1.1
190	14.0	130.0	2.6	1.1
85	15.0	130.0	2.7	1.2
60	15.0	122.0	2.7	1.2
29	16.0	120.0	2.8	1.2
35	16.0	120.0	2.8	1.2
26	17.0	110.0	2.8	1.2
21	17.0	110.0	2.8	1.2
31	17.0	110.0	2.8	1.2
130	17.0	110.0	2.8	1.2
20	19.0	105.0	2.9	1.3
64	19.0	100.0	2.9	1.3
22	19.0	100.0	2.9	1.3
44	20.0	100.0	3.0	1.3
82	20.4	87.0	3.0	1.3
110	21.0	85.0	3.0	1.3
100	21.0	82.0	3.0	1.3
38	21.0	80.0	3.0	1.3
35	21.0	80.0	3.0	1.3
12	21.0	77.0	3.0	1.3
23	21.0	68.0	3.0	1.3
48	22.0	64.0	3.1	1.3
16	22.0	64.0	3.1	1.3
28	22.0	64.0	3.1	1.3
29	22.0	64.0	3.1	1.3
16	23.0	60.0	3.1	1.4
41	23.0	58.0	3.1	1.4
100	25.0	57.0	3.2	1.4
49	26.0	56.0	3.3	1.4
36	27.0	53.0	3.3	1.4
22	27.0	52.4	3.3	1.4
21	28.0	52.0	3.3	1.4
29	29.0	50.0	3.4	1.5
17	29.0	50.0	3.4	1.5
44	29.0	50.0	3.4	1.5
130	29.0	49.0	3.4	1.5
21	29.0	48.0	3.4	1.5
57	31.0	46.0	3.4	1.5
87	31.0	45.0	3.4	1.5
14	31.0	44.0	3.4	1.5
53	31.0	44.0	3.4	1.5
34	32.0	44.0	3.5	1.5
29	33.0	44.0	3.5	1.5
7	33.0	43.0	3.5	1.5
27	34.0	42.0	3.5	1.5
29	34.0	41.0	3.5	1.5
44	34.0	41.0	3.5	1.5
23	35.0	40.0	3.6	1.5
52	35.0	39.0	3.6	1.5
64	35.0	38.0	3.6	1.5
36	36.0	38.0	3.6	1.6
33	36.0	36.0	3.6	1.6
41	36.0	36.0	3.6	1.6
34	36.0	36.0	3.6	1.6
31	38.0	36.0	3.6	1.6
45	38.0	35.0	3.6	1.6
32	39.0	35.0	3.7	1.6
64	40.0	35.0	3.7	1.6
39	41.0	34.0	3.7	1.6
15	41.0	34.0	3.7	1.6
17	42.0	34.0	3.7	1.6
42	43.0	33.0	3.8	1.6
35	44.0	33.0	3.8	1.6
120	44.0	32.0	3.8	1.6
46	44.0	31.0	3.8	1.6
22	44.0	31.0	3.8	1.6
80	45.0	31.0	3.8	1.7
110	46.0	31.0	3.8	1.7
58	48.0	29.0	3.9	1.7
31	49.0	29.0	3.9	1.7
56	50.0	29.0	3.9	1.7
52	50.0	29.0	3.9	1.7
20	50.0	29.0	3.9	1.7
11	52.0	28.0	4.0	1.7
140	52.4	27.0	4.0	1.7
122	53.0	27.0	4.0	1.7
50	56.0	26.0	4.0	1.7
176	57.0	25.0	4.0	1.8
105	58.0	23.0	4.1	1.8
17	60.0	23.0	4.1	1.8
33	64.0	22.0	4.2	1.8
36	64.0	22.0	4.2	1.8
43	64.0	22.0	4.2	1.8
9	64.0	22.0	4.2	1.8
50	68.0	21.0	4.2	1.8
25	77.0	21.0	4.3	1.9
15	80.0	21.0	4.4	1.9
148	80.0	21.0	4.4	1.9
21	82.0	21.0	4.4	1.9
36	85.0	21.0	4.4	1.9
110	87.0	20.4	4.5	1.9
68	100.0	20.0	4.6	2.0
64	100.0	19.0	4.6	2.0
40	100.0	19.0	4.6	2.0
19	105.0	19.0	4.7	2.0
22	110.0	17.0	4.7	2.0
17	110.0	17.0	4.7	2.0
21	110.0	17.0	4.7	2.0
50	110.0	17.0	4.7	2.0
19	120.0	16.0	4.8	2.1
38	120.0	16.0	4.8	2.1
13	122.0	15.0	4.8	2.1
14	130.0	15.0	4.9	2.1
31	130.0	14.0	4.9	2.1
100	140.0	14.0	4.9	2.1
11	148.0	13.0	5.0	2.2
190	176.0	12.0	5.2	2.2
80	190.0	11.0	5.2	2.3
120	190.0	10.9	5.2	2.3
27	210.0	9.0	5.3	2.3
34	1100.0	7.3	7.0	3.0

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	9.842	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 1100 Geometric mean 37

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	4.183	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn > Tcrit YES**

US95 using Chebychev or t-test

US95	US95
Chebychev	*t-test*
56	46

Buro Happold
Ground Engineering

Mercury input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)' "

Step 2: Press '**Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis' **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

0.14	0.1	1.5	-2.8
0.09	0.1	1.0	-2.8
0.06	0.1	0.9	-2.8
0.06	0.1	0.5	-2.8
0.16	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.32	0.1	0.5	-2.8
0.93	0.1	0.5	-2.8
0.07	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.12	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.21	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.06	0.1	0.5	-2.8
0.16	0.1	0.5	-2.8
0.15	0.1	0.4	-2.8
0.15	0.1	0.3	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.10	0.1	0.2	-2.8
0.09	0.1	0.2	-2.8
0.24	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.06	0.1	0.2	-2.8
0.10	0.1	0.1	-2.8
0.15	0.1	0.1	-2.8
0.36	0.1	0.1	-2.8
0.09	0.1	0.1	-2.8
0.21	0.1	0.1	-2.8
0.06	0.1	0.1	-2.8
0.07	0.1	0.1	-2.8
0.06	0.1	0.1	-2.7
0.06	0.1	0.1	-2.7
0.06	0.1	0.1	-2.5
0.06	0.1	0.1	-2.4
0.06	0.1	0.1	-2.4
0.10	0.1	0.1	-2.4
0.06	0.1	0.1	-2.3
0.11	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.12	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.15	0.1	0.1	-2.3
0.10	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.10	0.1	0.1	-2.3
0.08	0.1	0.1	-2.3
0.19	0.1	0.1	-2.3
0.06	0.1	0.1	-2.3
0.06	0.1	0.1	-2.2
0.12	0.1	0.1	-2.1
0.19	0.1	0.1	-2.1
0.06	0.1	0.1	-2.1
0.06	0.1	0.1	-2.1
0.06	0.1	0.1	-2.0
1.00	0.2	0.1	-1.9
1.50	0.2	0.1	-1.9
0.50	0.2	0.1	-1.9
0.50	0.2	0.1	-1.9
0.50	0.2	0.1	-1.9
0.50	0.2	0.1	-1.8
0.50	0.2	0.1	-1.8
0.50	0.2	0.1	-1.8
0.50	0.2	0.1	-1.8
0.50	0.2	0.1	-1.7
0.50	0.2	0.1	-1.7
0.50	0.2	0.1	-1.6
0.50	0.2	0.1	-1.6
0.50	0.2	0.1	-1.6
0.50	0.2	0.1	-1.6
0.50	0.2	0.1	-1.4
0.50	0.2	0.1	-1.4
0.50	0.3	0.1	-1.1
0.50	0.4	0.1	-1.0
0.16	0.5	0.1	-0.7
0.15	0.5	0.1	-0.7
0.12	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.20	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.16	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.24	0.5	0.1	-0.7
0.10	0.5	0.1	-0.7
0.20	0.9	0.1	-0.1
0.10	1.0	0.1	0.0
0.51	1.5	0.1	0.4

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	5.887	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? Tn > Tcrit **YES**

Maximum concentration 1.5 Arithmetic mean 0

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.988	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier Tn > Tcrit **YES**

US95 using Chebychev or t-test

US95	US95
Chebychev	*t-test*
0.3	0.2

Buro Happold
Ground Engineering

Zinc input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a small number (e.g. MDL or 0.5MDL) ..."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

120	8.0	373.0	2.1
60	18.0	340.0	2.9
49	28.0	310.0	3.3
310	29.0	297.0	3.4
100	40.0	280.0	3.7
63	40.0	210.0	3.7
110	40.0	174.0	3.7
160	43.0	170.0	3.8
76	43.0	160.0	3.8
72	46.0	157.0	3.8
87	46.0	150.0	3.8
110	49.0	150.0	3.9
46	49.0	143.0	3.9
78	50.0	140.0	3.9
100	50.0	140.0	3.9
54	51.0	140.0	3.9
86	52.0	140.0	4.0
82	53.0	130.0	4.0
40	54.0	130.0	4.0
67	58.0	120.0	4.1
95	60.0	120.0	4.1
99	60.0	120.0	4.1
110	61.0	120.0	4.1
100	62.0	120.0	4.1
88	62.8	120.0	4.1
51	63.0	120.0	4.1
130	63.0	120.0	4.1
100	63.0	110.0	4.1
87	65.0	110.0	4.2
86	66.0	110.0	4.2
87	66.0	110.0	4.2
66	66.0	110.0	4.2
91	67.0	110.0	4.2
90	67.3	110.0	4.2
81	68.0	110.0	4.2
120	69.0	110.0	4.2
95	70.0	106.0	4.2
28	70.0	100.2	4.2
120	70.0	100.0	4.2
43	71.0	100.0	4.3
60	72.0	100.0	4.3
210	73.0	100.0	4.3
100	75.0	100.0	4.3
62	76.0	100.0	4.3
150	78.0	100.0	4.4
40	81.0	100.0	4.4
170	82.0	100.0	4.4
140	82.0	100.0	4.4
100	85.0	99.0	4.4
8	86.0	98.0	4.5
71	86.0	96.0	4.5
100	86.0	96.0	4.5
140	87.0	95.0	4.5
140	87.0	95.0	4.5
50	87.0	93.0	4.5
100	88.0	93.0	4.5
100	89.0	93.0	4.5
110	89.0	91.0	4.5
70	90.0	90.0	4.5
69	91.0	89.0	4.5
120	93.0	89.0	4.5
110	93.0	88.0	4.5
100	93.0	87.0	4.5
280	95.0	87.0	4.6
110	95.0	87.0	4.6
150	96.0	86.0	4.6
82	96.0	86.0	4.6
63	98.0	86.0	4.6
61	99.0	85.0	4.6
50	100.0	82.0	4.6
120	100.0	82.0	4.6
89	100.0	81.0	4.6
93	100.0	78.0	4.6
140	100.0	76.0	4.6
120	100.0	75.0	4.6
68	100.0	73.0	4.6
98	100.0	72.0	4.6
100.2	100.0	71.0	4.6
67.3	*100.0*	*70.0*	*4.6*
62.8	100.2	70.0	4.6
157	106.0	70.0	4.7
373	110.0	69.0	4.7
40	110.0	68.0	4.7
174	110.0	67.3	4.7
143	110.0	67.0	4.7
18	110.0	66.0	4.7
110	110.0	66.0	4.7
106	110.0	66.0	4.7
58	110.0	65.0	4.7
29	110.0	63.0	4.7
89	120.0	63.0	4.8
66	120.0	63.0	4.8
66	120.0	62.8	4.8
297	120.0	62.0	4.8
96	120.0	61.0	4.8
96	120.0	60.0	4.8
85	120.0	60.0	4.8
93	120.0	58.0	4.8
73	130.0	54.0	4.9
75	130.0	53.0	4.9
52	140.0	52.0	4.9
130	140.0	51.0	4.9
49	140.0	50.0	4.9
120	140.0	50.0	4.9
70	143.0	49.0	5.0
110	150.0	49.0	5.0
43	150.0	46.0	5.0
93	157.0	46.0	5.1
65	160.0	43.0	5.1
70	170.0	43.0	5.1
86	174.0	40.0	5.2
46	210.0	40.0	5.3
340	280.0	40.0	5.6
53	297.0	29.0	5.7
120	310.0	28.0	5.7
63	340.0	18.0	5.8
110	373.0	8.0	5.9

1st Outlier check

				at level of significance	
			0.01	0.05	0.1
Tn	4.692	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? — **Tn > Tcrit YES**

Maximum concentration: 373 — Arithmetic mean: 99

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

				at level of significance	
			0.01	0.05	0.1
Tn	2.738	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier — **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	**US95**
Chebychev	***t-test***
122.5	**107.9**

Buro Happold
Ground Engineering

Total Sulphate input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration; remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and us Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

1300.0	0.0	6300.0	-4.6
1100.0	0.0	3300.0	-4.6
410.0	0.0	2800.0	-3.9
2600.0	0.1	2800.0	-2.7
720.0	0.1	2600.0	-2.4
200.0	0.1	2600.0	-2.1
140.0	0.1	2300.0	-2.0
1100.0	0.1	2200.0	-2.0
1100.0	0.2	2100.0	-1.8
1600.0	*0.2*	*1800.0*	*-1.8*
1300.0	0.2	1700.0	-1.7
280.0	0.2	1600.0	-1.7
2800.0	0.2	1600.0	-1.6
260.0	0.2	1500.0	-1.5
230.0	0.2	1500.0	-1.5
1400.0	0.2	1465.0	-1.5
100.0	0.2	1400.0	-1.5
1200.0	0.3	1400.0	-1.1
150.0	0.3	1300.0	-1.1
920.0	0.5	1300.0	-0.6
960.0	0.8	1300.0	-0.2
820.0	54.0	1200.0	4.0
810.0	81.0	1200.0	4.1
430.0	100.0	1180.0	4.6
330.0	100.0	1100.0	4.6
230.0	100.0	1100.0	4.6
610.0	100.0	1100.0	4.6
270.0	100.0	1100.0	4.6
190.0	100.0	960.0	4.6
200.0	100.0	960.0	4.6
140.0	100.0	920.0	4.6
160.0	100.0	830.0	4.6
300.0	110.0	820.0	4.7
580.0	130.0	810.0	4.9
1500.0	140.0	790.0	4.9
350.0	140.0	720.0	4.9
410.0	140.0	720.0	4.9
140.0	150.0	610.0	5.0
200.0	150.0	580.0	5.0
130.0	150.0	531.0	5.0
3300.0	160.0	500.0	5.1
1700.0	162.0	500.0	5.1
150.0	170.0	470.0	5.1
2600.0	190.0	470.0	5.2
2100.0	190.0	460.0	5.2
500.0	200.0	430.0	5.3
2600.0	200.0	430.0	5.3
2200.0	200.0	420.0	5.3
420.0	230.0	410.0	5.4
960.0	230.0	410.0	5.4
1100.0	230.0	410.0	5.4
290.0	260.0	390.0	5.6
470.0	270.0	340.0	5.6
100.00	270.0	337.0	5.6
1600.0	273.0	330.0	5.6
1600.0	280.0	320.0	5.6
150.0	290.0	320.0	5.7
190.0	290.0	320.0	5.7
500.0	300.0	300.0	5.7
2300.0	320.0	290.0	5.8
320.0	320.0	290.0	5.8
270.0	330.0	280.0	5.8
340.0	330.0	273.0	5.8
1200.0	337.0	270.0	5.8
320.0	340.0	270.0	5.8
100.00	350.0	260.0	5.9
720.0	410.0	230.0	6.0
6300.0	410.0	230.0	6.0
1300.0	410.0	230.0	6.0
430.0	420.0	200.0	6.0
110.0	430.0	200.0	6.1
170.0	430.0	200.0	6.1
1400.0	460.0	190.0	6.1
1800.0	470.0	190.0	6.2
830.0	470.0	170.0	6.2
290.0	500.0	162.0	6.2
320.0	500.0	160.0	6.2
61.0	531.0	150.0	6.3
1465.0	580.0	150.0	6.4
54.0	610.0	150.0	6.4
531.0	720.0	140.0	6.6
162.0	720.0	140.0	6.6
100.00	790.0	140.0	6.7
273.0	810.0	130.0	6.7
337.0	820.0	110.0	6.7
100.00	830.0	100.0	6.7
100.00	920.0	100.0	6.8
470.0	960.0	100.0	6.9
100.00	960.0	100.0	6.9
100.00	1100.0	100.0	7.0
410.0	1100.0	100.0	7.0
460.0	1100.0	100.0	7.0
230.0	1100.0	100.0	7.0
1180.0	1180.0	100.0	7.1
100.00	1200.0	81.0	7.1
790.0	1200.0	54.0	7.1
0.2	1300.0	0.8	7.2
0.2	1300.0	0.5	7.2
0.3	1300.0	0.3	7.2
0.5	1400.0	0.3	7.2
0.8	1400.0	0.2	7.2
0.1	1465.0	0.2	7.3
0.2	1500.0	0.2	7.3
0.2	1600.0	0.2	7.4
0.2	1600.0	0.2	7.4
0.2	1600.0	0.2	7.4
0.2	1700.0	0.2	7.4
0.0	1800.0	0.2	7.5
0.1	2100.0	0.2	7.6
0.1	2200.0	0.1	7.7
0.2	2300.0	0.1	7.7
0.0	2600.0	0.1	7.9
0.3	2600.0	0.1	7.9
0.1	2600.0	0.1	7.9
0.1	2800.0	0.0	7.9
0.01	3300.0	0.0	8.1
0.2	6300.0	0.0	8.7

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.342	Tcrit	3.216	2.846	2.772

Is the maximum concentration *an outlier?* — Tn > Tcrit **YES**

Maximum concentration 6300 Arithmetic mean 647

Normality check

Is the data normally distributed? yes no

Use Pro.UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	1.234	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier — Tn < Tcrit **NO**

US95 using Chebychev or t-test

US95 *Chebychev*	US95 *t-test*
1006.7	**784.2**

Buro Happold
Ground Engineering

TPH input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)...."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

300	1.0	32000.0	0.0	
32000	1.0	10000.0	0.0	
9100	1.0	10000.0	0.0	
4100	1.0	9600.0	0.0	
400	1.0	9100.0	0.0	
9600	1.0	7500.0	0.0	
7400	2.0	7400.0	0.7	
10000	2.0	4100.0	0.7	
70	5.0	2693.0	1.6	
7500	5.0	1300.0	1.6	
5.0	5.0	400.0	1.6	
5.0	6.0	300.0	1.8	
5.0	7.0	300.0	1.9	
25	18.0	220.0	2.9	
18	20.0	180.0	3.0	
2693	20.0	168.0	3.0	
1	20.0	141.0	3.0	
141	20.0	112.0	3.0	
112	20.0	89.0	3.0	
168	25.0	70.0	3.2	
6	32.0	65.0	3.5	
2	37.0	37.0	3.6	
1	37.0	37.0	3.6	
1	65.0	32.0	4.2	
1.0	70.0	25.0	4.2	
1	89.0	20.0	4.5	
7	112.0	20.0	4.7	
2	141.0	20.0	4.9	
1.0	168.0	20.0	5.1	
220	180.0	20.0	5.2	
180	220.0	18.0	5.4	
65	300.0	7.0	5.7	
10000	300.0	6.0	5.7	
300	400.0	5.0	6.0	
37	1300.0	5.0	7.2	
20	2693.0	5.0	7.9	
20	4100.0	2.0	8.3	
37	7400.0	2.0	8.9	
20	7500.0	1.0	8.9	
32	9100.0	1.0	9.1	
20	9600.0	1.0	9.2	
89	10000.0	1.0	9.2	
20	10000.0	1.0	9.2	
1300	32000.0	1.0	10.4	

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	5.368	Tcrit	3.282	2.906	2.722

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 32000 Arithmetic mean 2182

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.003	Tcrit	3.282	2.906	2.722

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	US95
Chebychev	***t-test***
5833.4	**3592.5**

Buro Happold
Ground Engineering

sum BTEX input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) ... "

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

0.01	0.0	6.1	-4.6
0.01	0.0	3.1	-4.6
0.01	0.0	1.8	-4.6
0.01	0.0	1.3	-4.6
0.12	0.0	1.1	-4.6
0.01	0.1	1.0	-2.1
6.10	1.0	1.0	0.0
1.10	1.0	1.0	0.0
1.00	1.0	0.1	0.0
1.30	1.1	0.0	0.1
3.10	1.3	0.0	0.3
1.80	1.8	0.0	0.6
1.00	3.1	0.0	1.1
1.00	6.1	0.0	1.8

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	2.940	Tcrit	2.607	2.331	2.176

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 6.1 Arithmetic mean 1

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	1.315	Tcrit	2.607	2.331	2.176

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	US95
Chebychev	*t-test*
3.1	2.0

Buro Happold
Ground Engineering

sum BTEX input & calcs sheet

Data entry column for individual contaminant →

0.010
0.059
0.416
0.010
29.600
1.100
14.300
2.300
25.600
10.200

0.0	29.6	-4.6	
0.0	29.6	-4.6	
0.1	14.3	-2.8	
0.4	10.2	-0.9	
1.1	2.3	0.1	
2.3	1.1	0.8	
10.2	0.4	2.3	
14.3	0.1	2.7	
25.6	0.0	3.3	
29.6	0.0	3.4	

Step 1: Data entry & preparation
Enter data in data entry column & remove '<' signs
"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a "small number (e.g. MDL or 0.5MDL) . .."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc) is advisable Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3 1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	1.844	Tcrit	2.410	2.176	2.036

Is the maximum concentration an outlier? — Tn < Tcrit: NO

Maximum concentration 29.6 Arithmetic mean 8

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	1.103	Tcrit	2.410	2.176	2.036

Is the maximum concentration an outlier — Tn < Tcrit: NO

US95 using Chebychev or t-test

US95 *Chebychev*	US95 *t-test*
24.3	15.1

Buro Happold
Ground Engineering

EC12-16 input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number' (e.g. MDL or 0.5MDL) ...."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

1000		100.0	2100000.0	4.6
1000		100.0	190000.0	4.6
14000		100.0	17000.0	4.6
1000		100.0	14000.0	4.6
3000		100.0	11000.0	4.6
1000		100.0	6000.0	4.6
1000		200.0	4500.0	5.3
1000		1000.0	3000.0	6.9
1000		1000.0	2100.0	6.9
1000		1000.0	1800.0	6.9
1000		1000.0	1000.0	6.9
1000		1000.0	1000.0	6.9
1000		1000.0	1000.0	6.9
1000		1000.0	1000.0	6.9
1000		1000.0	1000.0	6.9
1000		1000.0	1000.0	6.9
11000		1000.0	1000.0	6.9
4500		1000.0	1000.0	6.9
6000		1000.0	1000.0	6.9
2100000		1000.0	1000.0	6.9
17000		1000.0	1000.0	6.9
1800		1800.0	1000.0	7.5
100		2100.0	1000.0	7.6
100		3000.0	1000.0	8.0
100		4500.0	200.0	8.4
100		6000.0	100.0	8.7
200		11000.0	100.0	9.3
100		14000.0	100.0	9.5
100		17000.0	100.0	9.7
2100		190000.0	100.0	12.2
190000		2100000.0	100.0	14.6

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	5.366	Tcrit	3.119	2.760	2.579

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 2100000 Arithmetic mean 76265

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	3.319	Tcrit	3.119	2.760	2.579

Is the maximum concentration an outlier **Tn > Tcrit YES**

US95 using Chebychev or t-test

US95	US95
Chebychev	***t-test***
371576.0	**191205.7**

Buro Happold
Ground Engineering

TPH input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)."

Step 2: Press **'Enter/refresh data for statistical analysis'**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

1.3	0.1	260.0	-2.3
1	0.1	120.0	-2.3
1	0.1	14.0	-2.3
4.1	0.1	9.4	-2.3
7.5	0.1	7.5	-2.3
1.1	0.1	7.3	-2.3
3.7	0.1	4.4	-2.3
7.3	0.1	4.2	-2.3
260	0.1	4.1	-2.3
120	0.1	3.7	-2.3
0.75	0.1	3.1	-2.3
1	0.1	1.9	-2.3
1	0.1	1.8	-2.3
9.4	0.1	1.6	-2.3
0.1	0.1	1.6	-2.3
0.1	0.1	1.6	-2.3
0.1	0.2	1.5	-1.6
0.1	0.2	1.3	-1.6
0.1	0.2	1.2	-1.6
0.1	0.2	1.1	-1.6
0.2	0.3	1.1	-1.2
0.1	0.4	1.0	-0.9
1	0.5	1.0	-0.7
0.1	0.7	1.0	-0.4
0.1	0.7	1.0	-0.4
0.1	0.8	1.0	-0.3
0.1	0.8	0.9	-0.2
0.1	0.9	0.8	-0.1
0.1	1.0	0.8	0.0
0.2	1.0	0.7	0.0
0.2	1.0	0.7	0.0
0.1	1.0	0.5	0.0
0.1	1.0	0.4	0.0
3.1	1.1	0.3	0.1
4.4	1.1	0.2	0.1
1.8	1.2	0.2	0.2
14	1.3	0.2	0.3
0.9	1.5	0.2	0.4
1.6	1.6	0.1	0.5
0.3	1.6	0.1	0.5
1.2	1.6	0.1	0.5
0.2	1.8	0.1	0.6
1.1	1.9	0.1	0.6
0.7	3.1	0.1	1.1
0.5	3.7	0.1	1.3
0.7	4.1	0.1	1.4
1.6	4.2	0.1	1.4
1.5	4.4	0.1	1.5
0.1	7.3	0.1	2.0
0.8	7.5	0.1	2.0
0.4	9.4	0.1	2.2
1.6	14.0	0.1	2.6
1.9	120.0	0.1	4.8
4.2	260.0	0.1	5.6

1st Outlier check

			at level of significance 0.01	0.05	0.1
Tn	6.532	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? — Tn > Tcrit: YES

Maximum concentration 260 Arithmetic mean 9

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance 0.01	0.05	0.1
Tn	3.220	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier — Tn > Tcrit: YES

US95 using Chebychev or t-test

US95 *Chebychev*	US95 *t-test*
31.4	17.4

Buro Happold
Ground Engineering

Phenanthrene input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) ...."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

8.3	0.1	980.0	-2.3
2.3	0.1	240.0	-2.3
1.0	0.1	44.0	-2.3
8.3	0.1	28.0	-2.3
12.0	0.1	26.0	-2.3
2.2	0.1	24.0	-2.3
3.6	0.1	22.1	-2.3
8.5	0.1	20.0	-2.3
980	0.1	16.0	-2.3
3	0.1	16.0	-2.3
1.00	0.1	13.0	-2.3
240	0.2	12.0	-1.6
0.10	0.3	11.0	-1.2
0.10	0.3	8.5	-1.2
0.10	0.4	8.3	-0.9
3.5	0.8	8.3	-0.2
22.1	1.0	7.0	0.0
0.1	1.0	6.6	0.0
3.1	1.3	4.2	0.3
1.3	1.6	3.6	0.5
6.6	1.8	3.6	0.6
0.10	2.2	3.5	0.8
0.3	2.2	3.1	0.8
0.10	2.2	3.1	0.8
0.10	2.3	3.0	0.8
0.2	2.9	3.0	1.1
0.10	3.0	2.9	1.1
0.1	3.0	2.3	1.1
2.9	3.1	2.2	1.1
0.10	3.1	2.2	1.1
0	3.5	2.2	1.3
24	3.6	1.8	1.3
44	3.6	1.6	1.3
13	4.2	1.3	1.4
26	6.6	1.0	1.9
28	7.0	1.0	1.9
3	8.3	0.8	2.1
1.6	8.3	0.4	2.1
2.2	8.5	0.3	2.1
3.1	11.0	0.3	2.4
2.2	12.0	0.2	2.5
3.6	13.0	0.1	2.6
0.4	16.0	0.1	2.8
0.8	16.0	0.1	2.8
16	20.0	0.1	3.0
11	22.1	0.1	3.1
0.3	24.0	0.1	3.2
16	26.0	0.1	3.3
4.2	28.0	0.1	3.3
20	44.0	0.1	3.8
1.8	240.0	0.1	5.5
7	980.0	0.1	6.9

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.861	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 980 Arithmetic mean 30

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.780	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	US95
Chebychev	***t-test***
113.4	**61.8**

Buro Happold
Ground Engineering

Fluoranthene input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) ..."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

12	0.1	680.0	-2.3
1.6	0.1	210.0	-2.3
1.0	0.1	41.0	-2.3
9.7	0.1	35.0	-2.3
4.2	0.1	32.0	-2.3
2.0	0.1	28.0	-2.3
1.00	0.1	26.4	-2.3
1.0	0.1	26.0	-2.3
680	0.1	19.0	-2.3
1	0.2	16.0	-1.6
1.00	0.2	13.0	-1.6
210	0.3	12.0	-1.2
0.10	0.5	9.7	-0.7
0.10	0.6	8.3	-0.5
0.10	0.6	7.3	-0.5
5.4	0.8	7.1	-0.2
26.4	1.0	6.1	0.0
4.4	1.0	5.8	0.0
2.6	1.0	5.4	0.0
3.2	1.0	5.0	0.0
5	1.0	4.4	0.0
0.10	1.0	4.2	0.0
0.2	1.6	3.6	0.5
0.10	2.0	3.2	0.7
0.10	2.4	3.2	0.9
0.6	2.6	3.0	1.0
0.2	3.0	2.6	1.1
0.1	3.2	2.4	1.2
6.1	3.2	2.0	1.2
0.10	3.6	1.6	1.3
0	4.2	1.0	1.4
28	4.4	1.0	1.5
41	5.0	1.0	1.6
16	5.4	1.0	1.7
8.3	5.8	1.0	1.8
35	6.1	1.0	1.8
3.2	7.1	0.8	2.0
3.6	7.3	0.6	2.0
3	8.3	0.6	2.1
7.1	9.7	0.5	2.3
2.4	12.0	0.3	2.5
5.8	13.0	0.2	2.6
0.3	16.0	0.2	2.8
0.6	19.0	0.1	2.9
13	26.0	0.1	3.3
19	26.4	0.1	3.3
0.5	28.0	0.1	3.3
26	32.0	0.1	3.5
7.3	35.0	0.1	3.6
32	41.0	0.1	3.7
0.8	210.0	0.1	5.3
1	680.0	0.1	6.5

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.731	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 680 Arithmetic mean 24

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.668	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	US95
Chebychev	*t-test*
82.7	46.4

Buro Happold
Ground Engineering

Benzo(a)anthracene input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) ..."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

5.9	0.1	190.0	-2.3
3.3	0.1	81.0	-2.3
1.0	0.1	19.0	-2.3
3.7	0.1	15.0	-2.3
1.0	0.1	14.0	-2.3
1.0	0.1	12.0	-2.3
1.00	0.1	12.0	-2.3
2.2	0.1	10.6	-2.3
190	0.1	8.8	-2.3
1.0	0.1	6.9	-2.3
1.00	0.1	5.9	-2.3
81	0.1	5.5	-2.3
0.10	0.2	4.9	-1.6
0.10	0.2	3.8	-1.6
0.10	0.2	3.7	-1.6
3.2	0.4	3.5	-0.9
10.6	0.6	3.2	-0.5
2.2	0.7	2.7	-0.4
1	0.8	2.4	-0.2
1.6	1.0	2.2	0.0
2.4	1.0	2.2	0.0
0.10	1.0	1.7	0.0
0.2	1.0	1.6	0.0
0.10	1.0	1.4	0.0
0.10	1.0	1.1	0.0
0.10	1.0	1.0	0.0
0.10	1.0	1.0	0.0
0.10	1.1	1.0	0.1
4.9	1.4	1.0	0.3
0.10	1.6	1.0	0.5
0	1.7	1.0	0.5
12	2.2	1.0	0.8
15	2.2	1.0	0.8
6.9	2.4	0.8	0.9
0.6	2.7	0.7	1.0
14	3.2	0.6	1.2
1.4	3.5	0.4	1.3
1.7	3.7	0.2	1.3
1	3.8	0.2	1.3
3.8	4.9	0.2	1.6
0.8	5.5	0.1	1.7
2.7	5.9	0.1	1.8
0.1	6.9	0.1	1.9
0.2	8.8	0.1	2.2
5.5	10.6	0.1	2.4
8.8	12.0	0.1	2.5
0.2	12.0	0.1	2.5
12	14.0	0.1	2.6
3.5	15.0	0.1	2.7
19	19.0	0.1	2.9
0.4	81.0	0.1	4.4
0.7	190.0	0.1	5.2

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.440	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? — Tn > Tcrit **YES**

Maximum concentration 190 Arithmetic mean 8

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.651	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier — Tn < Tcrit **NO**

US95 using Chebychev or t-test

US95	**US95**
Chebychev	***t-test***
25.3	**14.8**

Buro Happold
Ground Engineering

Chrysene input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) ...."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

5.2	0.1	180.0	-2.3
1.5	0.1	64.0	-2.3
1.0	0.1	17.0	-2.3
2.9	0.1	17.0	-2.3
1.0	0.1	14.0	-2.3
1.0	0.1	13.0	-2.3
1.0	0.1	11.0	-2.3
1.0	0.1	11.0	-2.3
180	0.1	9.1	-2.3
1.0	0.1	7.9	-2.3
1.00	0.1	6.9	-2.3
64	0.2	6.4	-1.6
0.10	0.3	5.6	-1.2
0.10	0.3	5.2	-1.2
0.10	0.4	4.8	-0.9
2.9	0.4	3.7	-0.9
9.1	0.5	3.4	-0.7
5.6	1.0	2.9	0.0
1.2	1.0	2.9	0.0
1.6	1.0	2.8	0.0
2.8	1.0	2.1	0.0
0.10	1.0	1.8	0.0
0.3	1.0	1.6	0.0
0.10	1.0	1.5	0.0
0.10	1.2	1.5	0.2
0.10	1.2	1.4	0.2
0.10	1.4	1.2	0.3
0.10	1.5	1.2	0.4
4.8	1.5	1.0	0.4
0.10	1.6	1.0	0.5
0.1	1.8	1.0	0.6
13	2.1	1.0	0.7
17	2.8	1.0	1.0
7.9	2.9	1.0	1.1
1.4	2.9	1.0	1.1
17	3.4	0.5	1.2
1.8	3.7	0.4	1.3
2.1	4.8	0.4	1.6
1.5	5.2	0.3	1.6
6.4	5.6	0.3	1.7
1.2	6.4	0.2	1.9
3.4	6.9	0.1	1.9
0.2	7.9	0.1	2.1
0.4	9.1	0.1	2.2
6.9	11.0	0.1	2.4
11	11.0	0.1	2.4
0.3	13.0	0.1	2.6
14	14.0	0.1	2.6
3.7	17.0	0.1	2.8
11	17.0	0.1	2.8
0.4	64.0	0.1	4.2
0.5	180.0	0.1	5.2

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.586	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 180 Arithmetic mean 8

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.612	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	US95
Chebychev	***t-test***
23.7	**14.0**

Buro Happold
Ground Engineering

Benzo(b)fluoranthene input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

6.2	0.1	170.0	-2.3
1.00	0.1	78.0	-2.3
1.0	0.1	20.0	-2.3
2.8	0.1	13.0	-2.3
1.1	0.1	12.0	-2.3
2.6	0.1	11.0	-2.3
1.00	0.1	9.4	-2.3
1.4	0.1	9.0	-2.3
170	0.1	6.2	-2.3
1.0	0.2	5.6	-1.6
1.00	0.2	5.5	-1.6
78	0.3	5.1	-1.2
0.10	0.3	4.5	-1.2
0.10	0.3	4.3	-1.2
0.10	0.3	3.9	-1.2
1.9	0.4	3.8	-0.9
5.5	0.5	3.5	-0.7
5.6	0.6	3.0	-0.5
1.1	0.9	2.8	-0.1
1.6	1.0	2.6	0.0
1.8	*1.0*	*1.9*	*0.0*
0.10	1.0	1.8	0.0
0.2	1.0	1.6	0.0
0.10	1.0	1.5	0.0
0.10	1.1	1.4	0.1
0.3	1.1	1.3	0.1
0.3	1.3	1.1	0.3
0.10	1.4	1.1	0.3
3.9	1.5	1.0	0.4
0.10	1.6	1.0	0.5
0.1	1.8	1.0	0.6
9.4	1.9	1.0	0.6
12	2.6	1.0	1.0
4.5	2.8	0.9	1.0
0.6	3.0	0.6	1.1
20	3.5	0.5	1.3
1.5	3.8	0.4	1.3
3	3.9	0.3	1.4
1.3	4.3	0.3	1.5
5.1	4.5	0.3	1.5
0.9	5.1	0.3	1.6
3.5	5.5	0.2	1.7
0.2	5.6	0.2	1.7
0.5	6.2	0.1	1.8
4.3	9.0	0.1	2.2
9	9.4	0.1	2.2
0.3	11.0	0.1	2.4
11	12.0	0.1	2.5
3.8	13.0	0.1	2.6
13	20.0	0.1	3.0
0.4	78.0	0.1	4.4
0.3	170.0	0.1	5.1

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.361	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 170 Arithmetic mean 8

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.710	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	US95
Chebychev	*t-test*
23.0	13.5

Buro Happold
Ground Engineering

Benzo(k)fluoranthene input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

**Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) .... **

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis' **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

2.7	0.1	77.0	-2.3
1.00	0.1	31.0	-2.3
1.0	0.1	14.0	-2.3
1.3	0.1	13.0	-2.3
1.0	0.1	11.0	-2.3
2.4	0.1	11.0	-2.3
1.00	0.1	9.1	-2.3
1.1	0.1	9.0	-2.3
77	0.1	7.2	-2.3
1.0	0.1	5.1	-2.3
1.00	0.1	3.8	-2.3
31	0.1	3.7	-2.3
0.10	0.2	3.4	-1.6
0.10	0.2	2.9	-1.6
0.10	0.2	2.8	-1.6
2.9	0.3	2.7	-1.2
9	0.3	2.5	-1.2
3.7	0.3	2.4	-1.2
0.7	0.4	2.1	-0.9
2.1	0.5	1.9	-0.7
1.9	0.7	1.8	-0.4
0.10	0.7	1.3	-0.4
0.1	1.0	1.1	0.0
0.10	1.0	1.1	0.0
0.10	1.0	1.0	0.0
0.2	1.0	1.0	0.0
0.2	1.0	1.0	0.0
0.10	1.0	1.0	0.0
5.1	1.1	1.0	0.1
0.10	1.1	1.0	0.1
0.1	1.3	0.7	0.3
9.1	1.8	0.7	0.6
11	1.9	0.5	0.6
0.2	2.1	0.4	0.7
0.3	2.4	0.3	0.9
13	2.5	0.3	0.9
0.7	2.7	0.3	1.0
1.8	2.8	0.2	1.0
1.1	2.9	0.2	1.1
3.8	3.4	0.2	1.2
0.5	3.7	0.1	1.3
2.5	3.8	0.1	1.3
0.1	5.1	0.1	1.6
0.3	7.2	0.1	2.0
3.4	9.0	0.1	2.2
7.2	9.1	0.1	2.2
0.1	11.0	0.1	2.4
11	11.0	0.1	2.4
2.8	13.0	0.1	2.6
14	14.0	0.1	2.6
0.4	31.0	0.1	3.4
0.3	77.0	0.1	4.3

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.281	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 77 Arithmetic mean 4

Normality check

Is the data normally distributed? yes ☐ no ☐

Use Pro UCL to determine

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	*2.465*	*Tcrit*	*3.216*	*2.846*	*2.772*

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	US95
Chebychev	***t-test***
11.4	**7.1**

Buro Happold
Ground Engineering

Bap input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another *population of soil concentration, remove the outlier concentration from* the data entry column and press 'Enter/refresh data for statistical analysis' **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

5.1	0.1	160.0	-2.3
1	0.1	67.0	-2.3
1	0.1	23.0	-2.3
2.2	0.1	18.0	-2.3
1	0.1	13.0	-2.3
2.6	0.1	12.0	-2.3
1	0.1	10.0	-2.3
1.5	0.1	9.3	-2.3
160	0.1	7.5	-2.3
1	0.1	5.8	-2.3
1	0.1	5.6	-2.3
67	0.2	5.1	-1.6
0.1	0.2	4.6	-1.6
0.1	0.2	4.6	-1.6
0.1	0.3	4.4	-1.2
2.8	0.3	3.8	-1.2
7.5	0.4	3.3	-0.9
4.6	0.5	2.8	-0.7
1	*0.7*	*2.6*	*-0.4*
1.4	1.0	2.4	0.0
1.5	1.0	2.2	0.0
0.1	1.0	1.7	0.0
0.3	1.0	1.5	0.0
0.1	1.0	1.5	0.0
0.1	1.0	1.4	0.0
0.3	1.0	1.2	0.0
0.1	1.2	1.0	0.2
0.1	1.4	1.0	0.3
4.6	1.5	1.0	0.4
0.1	1.5	1.0	0.4
0.1	1.7	1.0	0.5
10	2.2	1.0	0.8
13	2.4	1.0	0.9
5.6	2.6	0.7	1.0
0.1	2.8	0.5	1.0
23	3.3	0.4	1.2
1.7	3.8	0.3	1.3
2.4	4.4	0.3	1.5
1.2	4.6	0.2	1.5
5.8	4.6	0.2	1.5
0.7	5.1	0.2	1.6
3.3	5.6	0.1	1.7
0.2	5.8	0.1	1.8
0.4	7.5	0.1	2.0
4.4	9.3	0.1	2.2
9.3	10.0	0.1	2.3
0.2	12.0	0.1	2.5
12	13.0	0.1	2.6
3.8	18.0	0.1	2.9
18	23.0	0.1	3.1
0.5	67.0	0.1	4.2
0.2	160.0	0.1	5.1

1st Outlier check

			at level of significance 0.01	0.05	0.1
Tn	6.414	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 160 Arithmetic mean 7

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance 0.01	0.05	0.1
Tn	2.598	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95 *Chebychev*	**US95** *t-test*
21.8	**12.9**

Buro Happold
Ground Engineering

Indendo(123cd)pyrene input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) ....."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

2.5	0.1	<0.1	-2.3
1.00	0.1	80.0	-2.3
1.0	0.1	28.0	-2.3
1	0.1	5.1	-2.3
1.5	0.1	5.0	-2.3
1.0	0.1	4.9	-2.3
1.00	0.1	4.1	-2.3
1.0	0.1	3.4	-2.3
80	0.1	2.5	-2.3
1.0	0.1	2.3	-2.3
1.00	0.1	1.9	-2.3
28	0.1	1.9	-2.3
0.10	0.1	1.6	-2.3
0.10	0.1	1.6	-2.3
0.10	0.1	1.5	-2.3
1.9	0.1	1.2	-2.3
5.1	0.2	1.2	-1.6
4.1	0.2	1.0	-1.6
0.8	0.3	1.0	-1.2
1.2	0.3	1.0	-1.2
1.2	0.4	1.0	-0.9
0.10	0.4	1.0	-0.9
0.1	0.4	1.0	-0.9
0.10	0.6	1.0	-0.5
0.10	0.7	1.0	-0.4
0.10	0.8	0.8	-0.2
<0.1	0.8	0.8	-0.2
0.10	1.0	0.7	0.0
3.4	1.0	0.6	0.0
0.10	1.0	0.4	0.0
0.1	1.0	0.4	0.0
1.6	1.0	0.4	0.0
1.9	1.0	0.3	0.0
0.2	1.0	0.3	0.0
0.3	1.0	0.2	0.0
4.9	1.2	0.2	0.2
0.4	1.2	0.1	0.2
0.8	1.5	0.1	0.4
0.4	1.6	0.1	0.5
0.4	1.6	0.1	0.5
0.2	1.9	0.1	0.6
0.3	1.9	0.1	0.6
0.1	2.3	0.1	0.8
0.1	2.5	0.1	0.9
0.7	3.4	0.1	1.2
1.6	4.1	0.1	1.4
0.1	4.9	0.1	1.6
2.3	5.0	0.1	1.6
0.6	5.1	0.1	1.6
5	28.0	0.1	3.3
0.1	80.0	0.1	4.4
0.1	<0.1	0.1	####

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.580	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? Tn > Tcrit **YES**

Maximum concentration 80 Arithmetic mean 3

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	#VALUE!	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **#VALUE! #VALUE!**

US95 using Chebychev or t-test

US95 *Chebychev*	US95 *t-test*
10.3	5.9

Buro Happold
Ground Engineering

Dibenzo(ah)anthracene input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL)."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or evidence suggests that outlier concentrations is a result of another population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2: If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

1.00	0.1	23.0	-2.3
1.00	0.1	11.0	-2.3
1.0	0.1	9.5	-2.3
1.00	0.1	8.8	-2.3
1.0	0.1	8.8	-2.3
1.0	0.1	8.7	-2.3
1.00	0.1	7.1	-2.3
1.0	0.1	6.6	-2.3
23	0.1	3.8	-2.3
1.0	0.1	2.9	-2.3
1.00	0.1	2.7	-2.3
8.8	0.1	1.6	-2.3
0.10	0.1	1.3	-2.3
0.10	0.1	1.3	-2.3
0.10	0.2	1.0	-1.6
0.5	0.2	1.0	-1.6
1.3	0.3	1.0	-1.2
0.6	0.3	1.0	-1.2
0.3	0.3	1.0	-1.2
0.3	0.3	1.0	-1.2
0.5	0.5	1.0	-0.7
0.10	0.5	1.0	-0.7
0.10	0.5	1.0	-0.7
0.10	0.6	1.0	-0.5
0.10	0.6	1.0	-0.5
0.10	0.6	0.9	-0.5
0.10	0.9	0.6	-0.1
0.10	1.0	0.6	0.0
1	1.0	0.6	0.0
0.10	1.0	0.5	0.0
0	1.0	0.5	0.0
7.1	1.0	0.5	0.0
8.7	1.0	0.3	0.0
3.8	1.0	0.3	0.0
0.3	1.0	0.3	0.0
9.5	1.0	0.3	0.0
0.9	1.0	0.2	0.0
1.6	1.0	0.2	0.0
1.3	1.3	0.1	0.3
0.6	1.3	0.1	0.3
0.5	1.6	0.1	0.5
0.6	2.7	0.1	1.0
0.2	2.9	0.1	1.1
0.1	3.8	0.1	1.3
2.9	6.6	0.1	1.9
6.6	7.1	0.1	2.0
0.2	8.7	0.1	2.2
8.8	8.8	0.1	2.2
2.7	8.8	0.1	2.2
11	9.5	0.1	2.3
0.3	11.0	0.1	2.4
0.1	23.0	0.1	3.1

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	5.063	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 23 Arithmetic mean 2

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	2.266	Tcrit	3.216	2.846	2.772

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95	**US95**
Chebychev	***t-test***
4.7	**3.2**

Buro Happold
Ground Engineering

PAH 16 input & calcs sheet

Data entry column for individual contaminant →

Step 1: Data entry & preparation

Enter data in data entry column & remove '<' signs

"Where the proportion of non-detects within the dataset is less than 10 to 15%, non detected values should simply be replaced by a 'small number (e.g. MDL or 0.5MDL) ..."

Step 2: Press **'Enter/refresh data for statistical analysis**

Step 3.1: Where the analysis signifies the maximum value to represent statistical outliers, a check for errors and/or a review of the conceptual model and soil descriptions (borehole logs etc.) is advisable. Where on the basis of identified errors outlier concentrations can be deleted or *evidence suggests that outlier concentrations is a result of another* population of soil concentration, remove the outlier concentration from the data entry column and press 'Enter/refresh data for statistical analysis'. **Note: The deletion of statistical outliers has to be justifiable**

Step 3.2. If the statistical analysis indicates the second/third etc. highest concentrations as outliers proceed as in Step 3.1

Step 4: Check normality of data. If the normality test signifies non-normality, check for outliers on the basis of LN transferred data and use Chebychev US95.

If the test signifies the data to be normally distributed use t-test result

red text = <detection limit entered as a value

68.6	0.1	1196.2	-2.3
9	0.1	260.0	-2.3
52.2	0.1	240.0	-2.3
11.4	0.1	230.0	-2.3
1.00	0.1	190.0	-2.3
1196.2	0.1	170.0	-2.3
0.10	0.2	160.0	-1.6
0.10	0.3	128.9	-1.2
0.10	0.4	120.0	-0.9
33.6	1.0	88.0	0.0
128.9	1.0	82.0	0.0
42.1	1.7	68.6	0.5
17.2	2.4	52.2	0.9
19.6	3.1	48.0	1.1
33.3	3.4	46.3	1.2
0.2	6.0	45.0	1.8
1.7	8.8	42.1	2.2
0.10	9.0	35.0	2.2
0.10	11.4	33.6	2.4
2.4	16.0	33.3	2.8
1	17.2	26.0	2.8
0.4	19.0	23.0	2.9
46.3	19.6	20.0	3.0
0.10	20.0	19.6	3.0
0.3	23.0	19.0	3.1
170	26.0	17.2	3.3
240	33.3	16.0	3.5
88	33.6	11.4	3.5
260	35.0	9.0	3.6
230	42.1	8.8	3.7
23	45.0	6.0	3.8
26	46.3	3.4	3.8
20	46.0	3.1	3.9
48	52.2	2.4	4.0
16	68.6	1.7	4.2
35	82.0	1.0	4.4
3.4	88.0	1.0	4.5
6	120.0	0.4	4.8
82	*128.9*	*0.3*	*4.9*
120	160.0	0.2	5.1
3.1	170.0	0.1	5.1
160	190.0	0.1	5.2
45	230.0	0.1	5.4
190	240.0	0.1	5.5
8.8	260.0	0.1	5.6
19	1196.2	0.1	7.1

1st Outlier check

			at level of significance		
			0.01	0.05	0.1
Tn	6.125	Tcrit	3.301	2.924	2.739

Is the maximum concentration an outlier? **Tn > Tcrit YES**

Maximum concentration 1196.2 Arithmetic mean 75

Normality check

Is the data normally distributed? yes no

Use Pro UCL to determine ☐ ☐

2nd Outlier check based on "ln" transferred data

			at level of significance		
			0.01	0.05	0.1
Tn	1.820	Tcrit	3.301	2.924	2.739

Is the maximum concentration an outlier **Tn < Tcrit NO**

US95 using Chebychev or t-test

US95 *Chebychev*	US95 *t-test*
192.9	120.6

Buro Happold
Ground Engineering

Determinand	Average value	Detection limit	Residential without plant uptake threshold	BP1 Earthworks Spec threshold	Comments
Chromium	28	-	200	200	Average value used as Cc in cover thickness calculation
Lead	24.6	-	450	450	Average value used as Cc in cover thickness calculation
Mercury	0.17	-	1	15	Average value used as Cc in cover thickness calculation
Zinc	78.7	-	40000	300	Average value used as Cc in cover thickness calculation
Total sulphate	Not tested	100	2000	2000	Detection limit used as Cc in cover thickness calculation
TPH	Not tested	0.1	500	500	Detection limit used as Cc in cover thickness calculation
Benzene	Not tested	0.01	1	-	Detection limit used as Cc in cover thickness calculation
Sum BTEX	Not tested	0.01	6	-	Detection limit used as Cc in cover thickness calculation
EC12-16	Not tested	1000	1,600,000	-	Detection limit used as Cc in cover thickness calculation
Napthalene	0.228	-	9.2	9.2	Average value used as Cc in cover thickness calculation
Phenanthracene	0.536	-	380	-	Average value used as Cc in cover thickness calculation
Fluoranthene	0.231	-	670	-	Average value used as Cc in cover thickness calculation
Benzo(a)anthracene	0.076	-	5.2	-	Average value used as Cc in cover thickness calculation
Chrysene	0.34	-	9.3	-	Average value used as Cc in cover thickness calculation
Benzo(b)fluoranthene	0.204	-	7	-	Average value used as Cc in cover thickness calculation
Benzo(k)fluoranthene	0.178	-	10	-	Average value used as Cc in cover thickness calculation
Benzo(a)pyrene	0.045	-	1	3.3	Average value used as Cc in cover thickness calculation
Indendo(123cd)pyrene	0.011	-	4.2	-	Average value used as Cc in cover thickness calculation
Dibenzo(ah)anthracene	0.044	-	1.3	1.3	Average value used as Cc in cover thickness calculation
Total PAH	2.364	-	100	100	Average value used as Cc in cover thickness calculation

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Average Values - Grassy Knoll**
Date: May 2010	**Job No: 026077**

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Notes:
Subsoil exceedences - NONE
All values in mg/kg

Technical Note 2

DRAFT

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

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Enclosure 15

The Quarry Area

BHGE Assessment of Capping Layer Thickness for Made Ground

Table 7: Capping Layer Thickness Calculation

Calculations based on mixed zone (M)	600	mm

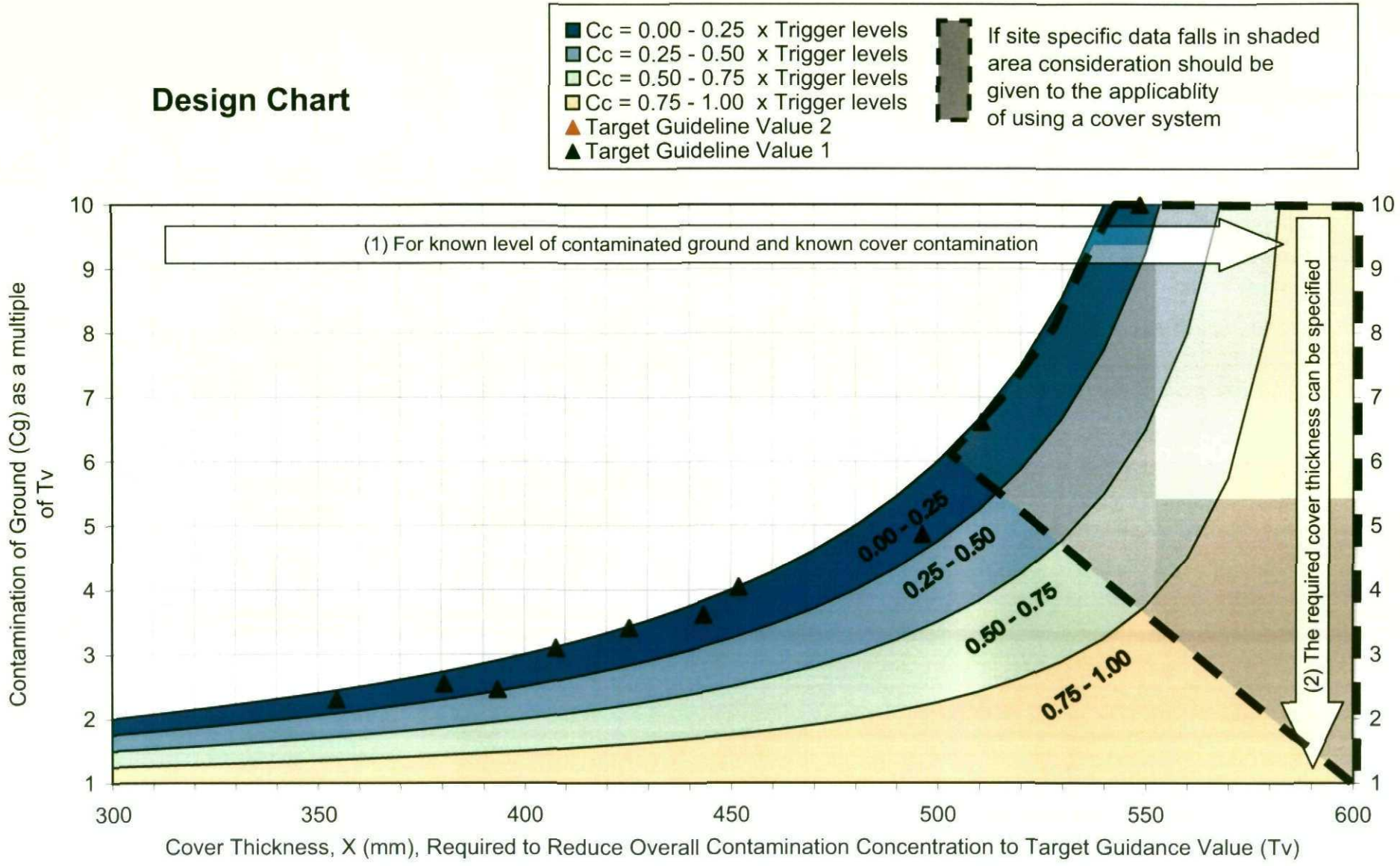
Contaminant	Site Data				Expressed as a Factor of Target Guideline Value				Cover Thickness Required for Compliance to Specified Target Guideline Value	
	Contamination of Ground (Cg)	Contamination of Cover (Cc)	Target Guideline Value 1	Target Guideline Value 2	Target Guideline Value 1 Soil	Target Guideline Value 1 Cover	Target Guideline Value 2 Soil	Target Guideline Value 2 Cover	Target Guideline Value 1	Target Guideline Value 2
	Units		Units		Fraction				(mm)	
TPH	5833.4	0.1	500	500	11.7	0.0	11.7	0.0	549	549
Benzene	3.1	0.01	1	1	3.1	0.0	3.1	0.0	408	408
Sum BTEX	24.3	0.01	6	6	4.1	0.0	4.1	0.0	452	452
Napthalene	31.4	0.1	9.2	9.2	3.4	0.0	3.4	0.0	426	426
Benz(a)anthracene	25.3	1	5.2	5.2	4.9	0.2	4.9	0.2	496	496
Chrysene	23.7	1	9.3	9.3	2.5	0.1	2.5	0.1	381	381
Benzo(b)fluoranthene	23	1	10	10	2.3	0.1	2.3	0.1	355	355
Benzo(k)fluoranthene	11.4	1	10	10	1.1	0.1	1.1	0.1	81	81
Benzo(a)pyrene	21.8	0.06	3.3	3.3	6.6	0.0	6.6	0.0	511	511
Indendo(123cd)pyrene	10.3	1	4.2	4.2	2.5	0.2	2.5	0.2	394	394
Dibenzo(ah)anthracene	4.7	0.1	1.3	1.3	3.6	0.1	3.6	0.1	443	443
PAH 16	192.9	0.1	100	100	1.9	0.0	1.9	0.0	289	289

Summary		
	Target Guideline Value 1	Target Guideline Value 2
Number of contaminants	12	12
Number of contaminants **with no** thickness calculation	0	0
Breakdown - Number for which no TV specfied	0	0
Breakdown - Number for which no soil specified	0	0
Breakdown - Number for which no cover specified	0	0
Breakdown - Number for which cover > TV	0	0
Number of contaminants **with** thickness calculation	12	12
Breakdown - Number for which no cover required	0	0
Breakdown - Number for which cover required	12	12
Overall thickness of cover required	**549**	**549**

Project name	**Barnsley Phase 3 - Holgate Kingstone**
Report title	**PRELIMINARY - FOR INFORMATION**
Table title	**Cover thickness Calculation - Quarry Area**
Date: May 2010	**Job No: 026077**

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Design Chart



Technical Note 2

DRAFT

job name **Holgate Kingstone ALC, Barnsley**
job no 026077
date May 2010
time

subject **Contaminated Land Review**

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Enclosure 16

The Quarry Area

BHGE Assessment of Leachate Testing

Barnsley BSF - Holgate Kingstone (026077)

FWS 2006 and CCG 2009 Leachate and GW data

			FWS data (2006)												CCG data (2009)								
Sample Identity			3127688	3127689	3127690	3127691	3127692	3121684	3123907	3123908	3123909	3123910	3123911	3123912	3123913	21211	21212	21213					
Sample No.			MB 1/2	MB 3/3	MB 8/4	MB 22/3	BH1	MB 9/W	BH1	BH2	BH3	BH4	BH6	MB2	MB8	BH1	BH4	BH6					
Depth			-	-	-	-	0.3-0.8	-	-	-	-	-	-	-	-	-	-	-					
Sample Type			LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	Minimum Value	Maximum Value	UK Drinking Water Standards (The Water Supply (Water Quality) Regulations 2000	Other Thresholds	Earthworks Specification values
Material			MG	MG	MG	MG	MG	Unknown	MG	MG/MST	MG/MST	MST	MG	MG/MST	MG/MST	Unknown	Unknown	Unknown					
			CLAY FILL	ASHY SAND	GRAVEL FILL	GRAVEL FILL	GRAVEL FILL																
Determinand	**Method**	**Units**																					
Metals																							
Arsenic Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	0.029	0.031	<0.003	0.028	0.009	0.006	0.028	0.005	0.01	0.051	<0.003	0.004	0.007	<0.05	<0.05	<0.05	<0.003	0.051	0.1	0.5 (1)	0.5
Boron Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	1.33	0.94	1.74	0.94	1.74	10	20 (1)	
Cadmium Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.02	0.005	0.05 (1)	0.05
Chromium Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.03	<0.05	0.5	0.05 (1)	0.5
Copper Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.44	<0.03	<0.03	<0.03	<0.05	0.06	0.13	<0.03	0.44	20	0.01 (1)	20
Lead Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.01	<0.01	<0.01	<0.01	<0.13	0.25	0.04 (1)	0.5
Mercury Dissolved (CEN 10:1C) (CVAF)	TM183	mg/kg	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.001	<0.001	<0.001	<0.0008	<0.001	0.01	0.01 (1)	0.01
Nickel Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	<0.05	<0.05	0.12	<0.05	<0.05	0.28	<0.05	0.063	<0.05	0.14	<0.05	<0.05	<0.05	<0.05	0.07	0.05	<0.05	0.28	0.2	0.5 (1)	0.5
Selenium Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.1		0.1
Zinc Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	<0.04	<0.04	0.089	<0.04	<0.04	<0.04	<0.04	0.15	<0.04	<0.04	<0.04	<0.04	<0.04	0.06	2.15	0.14	<0.04	2.15	30**	0.08 (1)	0.75
Barium Dissolved (CEN 10:1C) (ICP-MS)	TM152	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	0.67	1.18	0.63	0.63	1.18	1**		
Vanadium		mg/kg														<0.05	<0.05	<0.05	<0.05	<0.05			
Other Determinands																							
Sulphate (CEN 10:1C)	TM098	mg/kg	590	89	1200	260	2500	55	240	820	1100	1300	1100	320	700	860	890	580	55	2500	2500	4000 (1)*	2500
Sulphur (elemental)		mg/kg														<1	<1	<1	<1	<1			
Phenols Monohydric (CEN 10:1C)	TM062	mg/kg	<0.2	<0.2	<0.2	1.1	0.8	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	<0.2	<0.2				<0.2	1.1	0.01**	0.3 (1)*	1
Total Cyanide		mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	1.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	1.4	0.5		0.5
Cyanide (free)		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.5		
Cyanide (complex)		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.5		
pH			9.2	8.1	7.4	10.5	10.2	8	7.7	7.4	7.6	10.2	7.3	7.7	7.3	7.9	7.7	7.8	7.3	10.5		6<pH<9 (1)	5.5<pH<9.5
Petrolium Hydrocarbons																							
TPH (CEN 10:1C)	TM172	mg/kg	34	0.86	13	100	68	42000	17	0.14	1.6	16	190	0.7	49000	<0.1	<0.1	<0.1	<0.1	49000	0.1	6 (2)	0.1
PAH by GCMS																							
Naphthalene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		0.1 (1)	
Acenaphthylene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Acenaphthene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Fluorene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Phenanthrene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Anthracene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Fluoranthene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Pyrene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Benzo(a)anthracene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Chrysene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Benzo(b)fluoranthene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Benzo(k)fluoranthene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Benzo(a)pyrene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0005 (2)	
Indeno(123cd)pyrene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Dibenzo(ah)anthracene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
Benzo(ghi)perylene (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
PAH 16 Total (CEN 10:1C)	TM178	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		0.1 (1)	0.1
Classification Tests																							
Nitrate		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	500	250 (1)	
Chloride (CEN 10:1C)	TM097	mg/kg	75	40	34	30	110	1300	1400	390	460	2500	2800	1200	1800	-			30	2800	2500		
Hardness		mg caco3/l	-	-	-	-	-	-	-	-	-	-	-	-	-	1668	3052	1649	1649	3052	>60		

Determinand	Number of Tests	Exceedances of DWS	Other thresholds	Exceedances of Earthworks Specification (No)	Comments
Metals					
Arsenic Dissolved (CEN 10:1C) (ICP-MS)	16	0	0	0	Not significantly elevated
Boron Dissolved (CEN 10:1C) (ICP-MS)	3	0	0	0	Not significantly elevated
Cadmium Dissolved (CEN 10:1C) (ICP-MS)	16	0	0	0	Not significantly elevated
Chromium Dissolved (CEN 10:1C) (ICP-MS)	16	0	0	0	Not significantly elevated
Copper Dissolved (CEN 10:1C) (ICP-MS)	16	0	16	0	Not significantly elevated
Lead Dissolved (CEN 10:1C) (ICP-MS)	16	0	13	0	Not significantly elevated
Mercury Dissolved (CEN 10:1C) (CVAF)	16	0	0	0	Not significantly elevated
Nickel Dissolved (CEN 10:1C) (ICP-MS)	16	1	0	0	Not significantly elevated
Selenium Dissolved (CEN 10:1C) (ICP-MS)	3	0	0	0	Not significantly elevated
Zinc Dissolved (CEN 10:1C) (ICP-MS)	16	0	4	0	Not significantly elevated
Barium Dissolved (CEN 10:1C) (ICP-MS)	3	1	0	0	Not significantly elevated
Vanadium	3	0	0	0	Not significantly elevated
Other Determinands					
Sulphate (CEN 10:1C)	16	0	0	0	Not significantly elevated
Sulphur (elemental)	3	0	0	0	Not significantly elevated
Phenols Monohydric (CEN 10:1C)	13	13	3	1	Not significantly elevated
Total Cyanide	16	1	0	1	Isolated exceedence
Cyanide (free)	3	0	0	0	Not significantly elevated
Cyanide (complex)	3	0	0	0	Not significantly elevated
pH	16	0	4	3	Revise EW Spec to 5.5<pH<9.5
Petrolium Hydrocarbons					
TPH (CEN 10:1C)	16	13	9	13	Elevated
PAH by GCMS					
Naphthalene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Acenaphthylene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Acenaphthene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Fluorene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Phenanthrene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Anthracene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Fluoranthene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Pyrene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Benzo(a)anthracene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Chrysene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Benzo(b)fluoranthene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Benzo(k)fluoranthene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Benzo(a)pyrene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Indeno(123cd)pyrene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Dibenzo(ah)anthracene (CEN 10:1C)	3	0	0	0	Not significantly elevated
Benzo(ghi)perylene (CEN 10:1C)	3	0	0	0	Not significantly elevated
PAH 16 Total (CEN 10:1C)	3	0	0	0	Not significantly elevated
Classification Tests					
Nitrate	3	0	0	0	Not significantly elevated
Chloride (CEN 10:1C)	13	1	0	0	Not significantly elevated
Hardness	3	0	0	0	Not significantly elevated

Project name	Barnsley BSF - Holgate Kingstone ALC
Report title	Ground Engineering
Table title	Contamination End Use Assessment - Historical Leachate and GW results
Date: April 2010	Appendix No. N/A / Job No: 026077

Buro Happold Ground Engineering

GENERAL NOTES:
(1) Freshwater Environmental Quality Standard. For hardness-related determinands, worse-case hardness band adopted 0 - 50 mg/l CaCO3
(2) Dutch Intervention Value for groundwater, from 'Circular on target values and intervention values for soil remediation' (2000)
*EA non-statutory (operational)
**From The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 (DW-1)
Red box - exceeds earthworks specification value for leachate

Barnsley BSF - Holgate Kingstone (026077)

Abatech groundwater data

| | | | 45076 (Aug 2007) | | | | | | | | | | | | | 45246 (Sept 2007) | | | | | | | | | | 45661 (Nov 2007) | | | | | | | | | | | | |