SLR

Harding's Pits and Former Harbour Branch Line Additional Risk Assessment
King's Lynn, Norfolk

Quantitative Human Health Risk Assessment

Borough Council of KING'S LYNN & WEST NORFOLK

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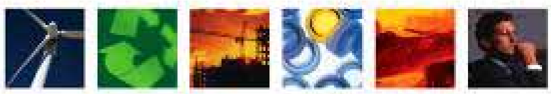

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1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been retained by the Borough Council of King's Lynn and West Norfolk (KLWN) to undertake a quantitative human health risk assessment (QHHRA) in support of evaluations under Part 2A EPA 1990 of contaminant levels in the land comprising Harding's Pits and the Former Harbour Branch Line (the whole area commonly being referred to as Hardings Pits).

This report presents a summary of the findings of a staged QHHRA undertaken by SLR between February and October 2009 and provides an assessment of the on site conditions. The earlier stages of the QHHRA, including the derivation of Site Specific Assessment Criteria (SSACs) were reported in February and July 2009[1] but are summarised in this report.

1.1 Background

KLWN's Part 2A inspection strategy has identified Hardings Pits (the Site) as being of very high priority due to the presence of a former landfill and railway line on site and potentially sensitive receptors. The Site has been the subject of earlier desk top and intrusive investigations, with the most recent work having been undertaken by Mouchel as part of the King's Lynn's Waterfront Regeneration Project.

Mouchel's assessment reported that lead and arsenic concentrations are high relative to their selected critical concentrations and a basis for intervention under Part 2A potentially exists. This assessment was based on a comparison of statistically-derived representative soil contaminant concentrations to soil guideline values (SGVs) for a generic residential scenario. Use of these SGVs could reasonably be considered to be overly conservative and would not meet the requirements of Part 2A. Additional risk assessment is therefore being undertaken to assist KLWN in deciding if the site should be designated as Contaminated Land under Part 2A.

The Site is currently public open space and used for recreation (dog walking and ball games) and is also known to be used for blackberry picking. Whilst the current risks to site users from lead and arsenic in soil are recognised as being by direct contact with soil, together with ingestion of soil or soil dust, the Site is well vegetated with little soil exposure. The risks from the consumption of wild blackberries has however not been evaluated and forms the primary basis of this project.

1.2 Objectives

The primary objective of the project is to assist KLWN in evaluating whether the Site could potentially be determined as Contaminated Land under Part 2A. This is to be achieved by assessment of the following objectives:

- Analysis of the previous soil sampling locations to determine if they are likely to be representative of lead and arsenic concentrations across the Site.

[1] Hardings Pits and former Harbour Branch Line Additional Risk Assessment, King's Lynn, Norfolk. Quantitative Human Health Risk Assessment. Interim Report. March 2007.
Hardings Pits and former Harbour Branch Line Quantitative Human Health Risk Assessment. Soil Analysis Data Review Addendum. July 2009.

- Derivation of site specific assessment criteria for lead and arsenic to reflect the recreational use of Hardings Pits.
- Derivation of site specific assessment criteria for lead and arsenic to reflect the likely consumption of blackberries grown on Hardings Pit.
- Collection and analysis of plant (fruit) samples to determine if contaminants are being taken up by blackberry plants growing on Hardings pit.
- Statistical analysis of laboratory test results and comparison with the derived critical concentrations.

1.3 Scope of Work

The scope of work for this additional risk assessment was devised by SLR in consultation with KLWN and outlined in a proposal to KLWN dated 28th January 2009. The scope of work comprised five main tasks:

- Task 1 - a desk based review of the existing ground investigation reports, analytical data, and the conceptual site model and the significant contamination exposure pathways.
- Task 2 - derivation of Site Specific Assessment Criteria (SSACs) for lead and arsenic using CLEA v1.04 for the current recreational use of the site.
- Task 3 - derivation of SSACs for consumption of wild soft fruit.
- Task 4 - sampling and analysis of wild blackberries from Hardings Pit.
- Task 5 - evaluation of laboratory data with SSACs.

Following the review of the existing analytical data SLR identified that only a limited number of soil samples had been recovered and analysed from the near surface soils (i.e. ground level to 0.20/0.30m) and with a poor coverage across the Site area. Further soil sampling and analyses were recommended in order to allow:

1) a more thorough risk assessment of people using the Site recreationally or working as volunteers;
2) a calibration of plant uptake calculations from the blackberry root zone in the fruit exposure scenario.

1.3.1 Data Review

Hardings Pits falls within the King's Lynn Waterfront Regeneration Area and copies of previous reports for this area have been provided by KLWN. SLR has reviewed the Interpretative Report prepared by Mouchel[2] in 2008 and a supplementary assessment[3]

[2] Mouchel (2008) Interpretative Report – Waterfront Regeneration King's Lynn. Report No. 721217/OR/001. Produced for Borough Council of King's Lynn and West Norfolk, November 2008

[3] Letter dated 25 November 2008 from Mouchel to KLWN. 'Waterfront Regeneration, King's Lynn: Potential Statutory Part 2A Liabilities'. (Ref. 721217/1/2/MH)

("Mouchel's Letter Report") which specifically considered the level of contamination in the area comprising Hardings Pits and the Former Harbour Branch Line.

The review has focussed on assessment of the CSM underpinning the human health risk assessment and the distribution and depth of soil sampling locations to determine if the sampling regime has generated representative results for near surface soil across the Site.

1.3.2 SSACs

SSACs have been calculated for lead and arsenic using the Environment Agency's (EA) CLEA model (CLEA v1.04) for the current use of the Site, considering both a child making recreational use of Hardings Pits and a volunteer undertaking maintenance work at the site. The CLEA model has also been used to derive SSAC for the exposure scenario of members of the public consuming wild blackberries growing at Hardings Pits based on calculation of the concentration of contaminants in blackberries following root uptake from the soil.

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2.0 DATA REVIEW - PREVIOUS INVESTIGATIONS AND EXISTING REPORTS

2.1 Previous Reports

A number of site investigations have been carried out across the wider Waterfront Regeneration Project area within which Hardings Pits falls. The main investigations are summarised below, identified by the consultant and report date;

- Parkman, 1996
- WSP, 2001
- Norfolk County Council, 2002
- Mouchel Parkman, 2003
- Mouchel, 2008

Mouchel's 2008 investigation report has been used as the main source of background information for this additional risk assessment.

2.2 Historical Information Sources of Contamination

During the mid 19th Century a significant quantity of Kimmeridge Clay was extracted from Hardings Pits, primarily for brick-making. There was also significant industrial activity on the wider area around Hardings Pits during the latter half of the 20th Century, including garage services, coachworks, flour and corn mills, timer yard and saw mills, builder's and boat yards and a railway good's yard on the Site boundary. Landfilling of Hardings Pits took place following extraction of the clay; informal tipping from nearby industrial activities is thought to have taken place from the late 19th century until 1928 and Hardings Pits were also used as an official municipal waste disposal tip during the 1950s and 1960s. Material disposed of in Hardings Pits is thought to include domestic waste, fire grate ash, demolition and industrial wastes.

The northern part of Hardings Pits was covered by dredged material of up to 1m thickness with a thin layer of topsoil also being applied across the whole area. Hardings Pits was subsequently adopted as an area of open public space and partially landscaped following the award of a Heritage Lottery Grant in 2004. This re-development received planning permission but no conditions were attached specifically dealing with contamination. Mouchel speculate that this limited landscaping work at Hardings Pits may have actually resulted in the cover layer being reduced or removed in some areas of the Site.

2.3 Sources of Contamination and Contaminants of Concern

The made ground present across Hardings Pits was identified by Mouchel as a potential source of contamination. Potential sources of contamination from historical site activities were identified as:

- Landfill material;

- Made ground along former railway line (containing steam coal ash & fly tipped material);

- Made ground associated with former industrial activities (e.g. soil contaminated by leakage from fuel tanks associated with Harbour area); and

- Potential contamination with sediments arising from former boat building industry.

Based on the potential sources of contamination listed above Mouchel identified the following potential contaminants of concern:

- Metals and metalloids, including arsenic, lead, zinc, copper and chromium;
- Polycyclic aromatic hydrocarbons (PAHs);
- Petroleum hydrocarbons, including BTEX compounds; and
- Asbestos.

2.4 Ground Conditions

The thickness and composition of made ground is variable over Hardings Pits, ranging from 0.4 to 5.7m and averaging 3.0m. The natural strata beneath the made ground is Basal Sands which vary between 0.3 and 8.0m in thickness and averaging 0.2m in the Hardings Pits area. Made ground within Hardings Pits predominantly consists of dark brown or orange brown clayey gravelly sand with fragments of sub-angular to angular brick, asbestos containing materials (cement board), glass, ash and ceramics. At a number of locations the ground conditions consisted of a black ash with fragments of wood, brick and bones and in one isolated zone (Mouchel's BH19), silty fine sandy clay with fragments of brick, wood, concrete and bands of peat.

2.5 Investigation Results Summary

Visual and olfactory evidence of hydrocarbon contamination was encountered in the northern area of Hardings Pits (TP5), along the former railway land (TP13A, TP25), in the central area of the Pits (BH16) and southern area (BH28). Following laboratory analysis, benzene, toluene and trimethylbenzenes were detected at only two locations in the south of Hardings Pits (BH16, BH28).

Significantly elevated concentrations of metals were found in all parts of Hardings Pits rather than in localised hotspots. Laboratory analysis also indicated that concentrations of total petroleum hydrocarbons, PAHs and cyanide were elevated on the southern boundary of Hardings Pits and in the northern third of this area.

2.6 Human Health Risk Assessment

2.6.1 Interpretative Report

Mouchel undertook a human health risk assessment (HHRA) for the wider Waterfront Regeneration Project area using sampling data from their 2008 investigation and earlier reports of the Site. The stated objective of this risk assessment was to provide an evaluation of the likely chronic risks posed to *future* users assuming that they will come into direct contact with site soils and soil vapours. This risk assessment was conducted in four stages, which are summarised and discussed below.

Stage 1 comprised an initial screening phase in which all data was pooled into a single dataset. All sample data from depths greater than 1.5m were removed from the dataset as were all contaminant concentrations less than the laboratory limit of detection (LoD) and data for those contaminants not considered relevant to an assessment of human health.

Stage 2 of the HHRA broke the dataset down in averaging areas, which were delineated based on the predicted end use of different areas of the Site as envisaged by the regeneration project. Areas to be left as 'public open space' were deemed equivalent to a 'CLEA allotment' when considering the delineation and future use of an averaging area. Contaminant concentrations were compared to generic assessment criteria (GACs) taken from published soil guideline values (SGVs) and LQM/CIEH GACs and for contaminants where these values were not available GACs were derived by Mouchel using the CLEA UK (beta) version of the EA's CLEA model.

Stage 3 of the Mouchel HHRA comprised statistical analysis of the data for each averaging area using the CIEH/CLAIRE statistical guidance (CIEH/CLAIRE, 2008) and comparison of the representative concentrations against SGVs/GACs used in Stage 2. Statistical analysis was carried out under the 'planning scenario' (as opposed to Part 2A) based on the anticipated future use of the averaging area but used a 90% confidence level based on 'tolerable risk' rather than the 95% confidence level usually used in assessing the absence of unacceptable risk in the planning scenario.

Stage 4 entailed statistical analysis and comparison to SSAC calculated on the basis of site specific parameters such as ground conditions for each averaging area and the predicted end use of the averaging area. Averaging areas designated to public open space were modelled as 'allotment with the vegetable uptake exposure pathway turned off'. Contaminant concentrations lower than the LoD were not entered so as not to skew the dataset, thereby making it non-normally distributed[4].

Averaging Area 7, which makes up a large proportion of Hardings Pits, is stated to contain contaminated soils very close to the current ground surface and Mouchel recommended that consideration should be given to removing materials near the surface that contain contaminant concentrations at statistical outlier concentrations or are 1 to 2 orders of magnitude greater than the relevant assessment criteria (GAC or SSAC).

Asbestos in the form of chrysotile cement was recorded at 0-0.8m in TP27 in averaging area 8 and BH14A although it was acknowledged that there was no pollutant linkage at present as the asbestos is buried. However, it was stated to be a potential issue during any development works on this area of the site.

2.6.2 Part 2A Letter November 2008

The HHRA undertaken as part of Mouchel's Interpretative Report assessed contaminant levels against future uses of the wider Waterfront Regeneration Project area. It was stated that the report did not include specific reference to Part 2A in respect to the current condition of the Site.

The HHRA in Mouchel's subsequent November 2008 Letter Report describes areas of the Site that could potentially be designated as Contaminated Land under Part 2A legislation due to elevated concentrations of arsenic and lead and the fact that the land is easily accessible to the public. Statistical analysis was undertaken using the Part 2A hypothesis and derivation of a 51% confidence limit as an indication of the balance of probabilities. 51% confidence levels for contaminants were compared to SGVs for the 'residential with plant uptake' generic scenario. The Letter Report does not specify which data (in terms of sample location and depth) were used in the assessment and statistical analysis. SLR has not therefore been able to review the data and discuss its suitability for use in assessing a Part 2A designation on the basis described (i.e. exposure to members of the public).

On the basis of its evaluations Mouchel recommended that in the short-term the vegetative cover on the Site should be maintained to minimise dermal contact with soil and dust-generation and the eating of blackberries growing in Hardings Pits should be discouraged by

[4] The primary consideration in this approach is the fact that upper confidence limit (UCL) calculated by Chebychev statistics for non-normal distribution are greater than those calculated by T-test statistics used for q normally distributed dataset.

cutting back bramble bushes close to footpaths or covering the plants in netting, particularly when fruiting. The preferred long-term remedial option outlined was the covering of contaminated soil with 0.6m of low permeability material.

3.0 CONCEPTUAL SITE MODEL AND EXPOSURE SCENARIOS

3.1 Conceptual Site Model

In accordance with current best practice, the Site has been considered in terms of a conceptual site model (CSM) using the principles of risk assessment comprising the Source – Pathway – Receptor model of potential pollutant linkages.

The Mouchel Interpretative Report identifies the main exposure pathways as:

- Inhalation of vapours/dust;
- Oral ingestion; and
- Dermal contact.

However, the Interpretative Report was concerned with the potential future usage of the wider Waterfront Redevelopment area rather than the current condition of Hardings Pits and its use as public open space. The current use of Hardings Pits is considered in Mouchel's November 2008 Letter Report, which also highlights the potential for exposure arising from ingestion of fruits from plants rooting in contaminated soil (e.g. blackberries). The letter also considers the potential for dust generation and dermal contact with contaminated soil but states that the magnitude of exposure resulting from these pathways will be limited by the extensive vegetative cover on site. Receptors are considered to be members of the public making recreational use of the Site. The human health risk assessment summarised in the letter uses residential SGVs and does not incorporate site-specific factors or receptor characteristics.

Based on the reports prepared by Mouchel and information provided by KLWN, Table 3-1 below lists the potential sources, pathways and receptors identified at the Site within the context of possible pollutant linkages, i.e. a situation where the source(s), pathway(s) and receptor(s) are all present and, therefore, a real (as opposed to a perceived) risk of potential impact exists. The CSM is based on the current use of the Site as a public open space.

Table 3-1
Conceptual Site Model

S-P-R Linkage	Notes		
Sources	**Contaminant**	**Investigation Conclusions**	
	History	Use of the site as a landfill from the 19th Century until the 1960s. Former Harbour Branch Railway Line. Industrial activity in surrounding area.	
	Heavy metals	Elevated concentrations identified across whole area of the Site, including in surface soils.	
	PAHs	Ashy material encountered and elevated PAHs recorded.	
	Petroleum hydrocarbons	Laboratory analysis indicated only limited presence of BTEX and trimethylbenzenes.	
	Asbestos Containing Materials	Identified beneath surface in several locations.	
Receptors	**Receptor**	**Description**	**Likelihood**
	Dog walkers & public using area as a thoroughfare	Dog walkers and people passing through Hardings Pits using the established footpaths.	Low

S-P-R Linkage	Notes		
	Receptor	**Description**	**Likelihood**
	Volunteer workers	A team of volunteers are responsible for maintaining the vegetation on the part of the Site designated a 'Doorstep Green'.	Low-Medium
	Children	Children regularly use the Site as a recreational area.	Medium
Pathways	**Pathway**	**Linkage**	**Likelihood**
	Dermal contact	Possible during site maintenance work but easily mitigated by using measures such as wearing gloves. Children may have dermal contact with contaminated soil while playing on the Site.	Low-Medium
	Inhalation of dust	Possible pathway during extended dry weather conditions but minimised by extensive vegetative cover across the Site.	Low
	Direct ingestion of soil	Involuntary ingestion of contaminated soil is unlikely for volunteer workers if wearing gloves but children may not wash their hands before eating snacks on site or returning home.	Low-Medium
	Plant uptake and consumption of wild fruit	A large number of blackberry plants grow across Hardings Pits and the fruit are picked and consumed by members of the public.	Medium-High
Pollutant Linkages	**Exposure Pathway**	**Assessment**	
	Dermal contact and dust inhalation	The extent of both pathways is expected to be minimised by the well developed on-site vegetation	
	Direct ingestion of soil and consumption of wild fruit	Both exposure pathways are likely although the extent is uncertain. Children may inadvertently ingest soil during/after playing on the Site and it is possible that individuals may pick large amounts of blackberries that could be preserved for future consumption over a long period of time (i.e. frozen foods, jams, preservatives etc).	
Overall risk assessment	**LOW-MEDIUM**		

The CSM identifies the three main receptors and exposure scenarios as:

- Child making recreational use of Hardings Pits;
- Volunteer worker undertaking site maintenance activities; and
- Member of public picking and consuming wild blackberries growing on Hardings Pits.

These scenarios are discussed in detail below and exposure parameters quantified for the purpose of deriving SSACs for use in a refined HHRA.

3.2 Exposure Scenarios and Receptor Characteristics

The manner in which the Hardings Pits and the Former Harbour Branch Line open space is used by members of the public requires evaluation in order to estimate exposure to potentially contaminated soil present on the Site. Therefore to derive SSACs three plausible scenarios have been proposed involving:

1) recreational use of the Site by a female child (aged eight to fourteen years old);

2) an adult volunteer undertaking site maintenance activities (e.g. litter picking and path clearance) from spring to autumn; and

3) an adult or child consuming wild blackberries harvested from plants growing on Hardings Pits.

These scenarios form the basis of detailed quantitative risk assessment (DQRA) and the assumptions used in derivation of SSACs using the CLEA v1.04 model to represent them are detailed in Tables 3-2 to 3-4. The scenarios themselves are as follows:-

3.2.1 Scenario 1 – Child Recreational User

Scenario 1 represents an unsupervised female child visiting the Site on a regular basis (1 hour at a time, 180 days a year for average receptor) and playing in the areas with limited exposed soil. This scenario is considered plausible given the proximity of the Site to residential areas and the extensive use of the paths through the Site as a thoroughfare by members of the public of all ages. The receptor is a child female (lower bodyweight than male and therefore more sensitive) aged 8-14 years old (CLEA age classes 9-14). Time spent on the Site is considered active, with a correspondingly high respiration rate.

3.2.2 Scenario 2 – Adult Volunteer Worker

Scenario 2 considers an adult volunteer from the Hardings Pits Community Association who carries out litter picking and other maintenance activities on a rota basis from March to October and may also visit the Site to pick blackberries on a number of occasions (i.e. 3 hour visits, nine times per year for average receptor). An average of 3 hours per visit is spent on activities such as litter picking and maintenance duties such as keeping paths and site lines clear of brambles and mowing, again with an appropriate respiration rate and relatively high potential for soil contact.

3.2.3 Scenario 3 – Consumption of Wild Blackberries

Average and high consumption rates of wild blackberries are taken from MAFF Food Surveillance Information Sheet No.199 (MAFF, 2000); mean consumption rate taken as 19 g blackberries per person per day and 97.5th percentile consumption taken as 68 g person per day. The CLEA model v1.04 requires consumption rates in terms of g FW kg^{-1} bw day^{-1} for each age class; calculation of these values is detailed in Appendix A.

3.3 Exposure Parameters

Values for exposure parameters used in the CLEA model have been selected based on the receptor characteristics discussed above. Tables 3-2 to 3-4 below detail exposure parameters for the three scenarios, considering both average and reasonable worst case receptor characteristics.

CLEA default values have been used for the physiological characteristics of the receptors, e.g. body weight, height, exposed skin fraction and inhalation rate (see CLEA report Tables 4.6-4.15, EA 2009b).

Arsenic and lead are both inorganic compounds with no appreciable volatility. The dominant exposure pathways to these contaminants are therefore direct ingestion of soil and dermal contact with a potential contribution from inhalation of soil-derived dust.

Table 3-2
Exposure Scenario 1 – Recreation Child User

	Average	Reasonable worst case
Gender	Female	
Age Group	8-14 yr old child	
CLEA Start Age Class	9	
CLEA End Age Class	14	
Exposure Duration	6 years	
Averaging Time	6 years	
Soil ingestion rate	50 $mg.day^{-1}$ Moderate potential for soil contact – conservatively taken as half the default CLEA residential soil ingestion rate on the basis that only one hour is spent on the site and not the potential 24 hours spent at a residential site.	100 $mg.day^{-1}$ CLEA residential default for child.
Exposure frequency (all pathways)	180 $days.year^{-1}$ On the basis that the site is visited regularly, up to every other day.	300 $days.year^{-1}$ On the basis that the site could be visited on most days by the receptor.
Soil to skin adherence factor outdoors	1.0 $mg.cm^{2}$ Default value for child (see CLEA report Table 8.1)	
Occupancy period (outdoors)	1 $hour.day^{-1}$ One hour per day spent playing on site	
Exposure pathways	<u>Oral</u> • Direct soil and dust ingestion <u>Dermal</u> • Outdoors <u>Inhalation</u> • Outdoor dust	

Table 3-3
Exposure Scenario 2 – Adult Volunteer

	Average	Reasonable worst case
Gender	Female	
Age Group	16-75 yr old adult	
CLEA Start Age Class	17	
CLEA End Age Class	18	
Exposure Duration	59 years	
Averaging Time	59 years	
Soil ingestion rate	50 $mg.day^{-1}$ Moderate potential for soil contact as volunteers wear gloves during site work – conservatively taken as the default CLEA adult residential soil ingestion rate.	100 $mg.day^{-1}$ Assumes moderate to high potential for soil contact, e.g. if volunteer works for some of the time without gloves in warm weather – conservatively taken as double the CLEA residential default for adult.
Exposure frequency (all pathways)	9 $days.year^{-1}$ On the basis that volunteers work on a rota basis and may also visit the same areas of the site to pick blackberries on several occasions.	18 $days.year^{-1}$ On the basis that the volunteer undertakes more than average number of site visits.
Soil to skin adherence factor outdoors	0.3 $mg.cm^{2}$ Default value for adult (see CLEA report Table 8.1)	
Occupancy period (outdoors)	3 $hour.day^{-1}$ Assumption that three hours per day spent on site during each visit.	
Exposure pathways	<u>Oral</u> • Direct soil and dust ingestion <u>Dermal</u> • Outdoors <u>Inhalation</u> • Outdoor dust	

Table 3-4
Exposure Scenario 3 – Consumption of Wild Blackberries

Scenario 3			
	Average	**Reasonable worst case**	**Worst case**
Gender	Female	Female	Female
Age Group	16-75 yr old adult	8-14 yr old child	0-6 yr old child
CLEA Start Age Class	17	9	1
CLEA End Age Class	18	14	6
Exposure Duration	59 years	6 years	6 years
Averaging Time	59 years	6 years	6 years
Blackberry consumption	19 g day^{-1} Mean consumption rate (MAFF, 2000)	68 g day^{-1} 97.5th percentile consumption	34 g day^{-1} Half of 97.5th percentile consumption for adult
Percentage of wild blackberries consumed[5]	100%	100%	100%
Exposure pathways	Oral • Consumption of wild shrub fruit • Consumption of soil attached to wild soft fruit		

3.4 Site Characteristics

Hardings Pits is considered as a public open space. Site and soil characteristics for use in the derivation of SSAC have been selected based on the information detailed in the Mouchel Interpretative report and are detailed below.

- 95% vegetative cover
- Soil type: SANDY CLAY LOAM (based on observation of predominantly sand and clay reported by Mouchel)
- Soil Organic Matter: 11% (based on average 'total organic carbon' (TOC) of 6.5% for averaging areas 5-7
- Air dispersion factor at 0.8m – 68 g.m-2.s-1 per kg.m-3
- Air dispersion factor at 1.6m – 160 g.m-2.s-1 per kg.m-3 (values for default location with source area >2 ha used in derivation of SGVs, see CLEA report Table 9.2)

[5] In the CLEA model this is the fraction of produce that is considered home grown

4.0 RISK ASSESSMENT INPUT PARAMETERS

4.1 CLEA Model Input

The CLEA model requires chemical specific input parameters for health criteria values (HCVs) to define the level of 'acceptable/tolerable' intake and for physico-chemical parameters in order to predict how a chemical will behave in the soil environment. The input parameters used in Section 5 to derive SSAC are discussed below.

4.1.1 Chemical specific input parameters

HCVs and mean daily intakes (MDIs) were selected based on the principles outlined in the EA's technical guidance on toxicology (EA, 2009a). Where possible, HCVs were adopted from UK sources and for arsenic the existing Index Doses (IDs) currently used in human risk assessment of contaminated land were used in this exercise (TOX 1 report; EA/Defra, 2002). HCVs for lead have not previously been recommended in the form of intake doses and the previous soil guideline value (SGV) for lead was based on empirical observation of the relationship between soil lead concentrations and blood lead levels. However, the EA has indicated that the new SGV for lead will be based on intake doses (for consistency with other contaminants and in order to better facilitate site specific risk assessment) but it is currently unclear whether these will be in the form of index doses or tolerable daily intakes (TDI) for oral/dermal and inhalation exposure pathways. HCVs for lead were selected from UK recommendations on the risk assessment of other media (i.e. food and air quality).

Oral and inhalation mean daily intakes (MDIs) for lead have been estimated from a literature review. Data were obtained from authoritative sources including the UK National Air Quality Information Archive (DEFRA, 2009) and Food Standards Agency Total Diet Study (FSA, 2009). MDIs are not required for arsenic as it is non-threshold carcinogen and is represented by an Index Dose in conjunction with the ALARP principle, i.e. exposure should be maintained to a level 'as low as reasonably practicable'.

Physico-chemical data were selected based on the principles outlined in the EA's CLEA report (EA, 2009b) which recommends the use of values routinely used by scientists within the field and from peer-reviewed databases. For arsenic, physico-chemical data were largely taken from the values used in derivation of the previous SGV and detailed in the earlier version of the CLEA model, CLEA UK (beta; EA, 2005). Physico-chemical parameter values for lead were taken from peer-reviewed data handbooks and the primary scientific literature.

Parameter values input to CLEA v1.04 for arsenic and lead are detailed in Tables 4-1 and 4-2 below and these data are used in the calculation of SSAC based on the exposure scenarios detailed in Section 3. It should be noted that the EA intend to publish revised toxicological reports and SGVs for priority contaminants in the near future and it likely that arsenic and lead will be among these contaminants. When new HCVs, MDIs or physico-chemical data are published for these contaminants these values will supersede the input data used in this interim report. SLR recommends that following publication of the new HCVs and MDIs the risk assessment models are re-run to up date the SSACs detailed in Section 5.

Table 4-1
Arsenic Toxicological and Physico-chemical Input Parameters for CLEA v1.04

Model Parameter	Input value	Reference/comment
HCV_{oral} (Index Dose)	0.3 µg.kg^{-1} bw.day^{-1}	TOX 1 (EA/Defra, 2002)
HCV_{inh} (Index Dose)	0.002 µg.kg^{-1} bw.day^{-1}	TOX 1 (EA/Defra, 2002)
Oral MDI	NR	Not relevant as arsenic is considered as non-threshold contaminant
Inh MDI	NR	Not relevant as arsenic is considered as non-threshold contaminant
Water Solubility	4.41 x10^{5} mg.L^{-1}	CLEA UK (EA, 2005)
Kd	1800 cm^{3}.g^{-1}	CLEA UK (EA, 2005)
Dermal Absorption Factor	0.03	SR3 (EA, 2009b)
Soil-Plant availability correction	5	SR3 (EA, 2009b)
Internal plant distribution correction factors (f_{int})		
Root-Shoot f_{int}	0.5	SR3 (EA, 2009b)
Root-Root f_{int}	0.5	SR3 (EA, 2009b)
Root-Tuber f_{int}	0.5	SR3 (EA, 2009b)
Root-Fruit f_{int}	0.5	SR3 (EA, 2009b)
Soil-plant concentration factor (CF)		
Green vegetables CF	0.009	CLEA UK (EA, 2005)
Root vegetables CF	0.009	CLEA UK (EA, 2005)
Tuber vegetables CF	0.009	CLEA UK (EA, 2005) Assumed to be equal to concentration factor for root vegetables
Herbaceous fruit CF	0.009	CLEA UK (EA, 2005) Assumed to be equal to concentration factor for green/leafy vegetables
Shrub fruit CF	0.009	CLEA UK (EA, 2005) Assumed to be equal to concentration factor for green/leafy vegetables
Tree fruit CF	0.009	CLEA UK (EA, 2005) Assumed to be equal to concentration factor for green/leafy vegetables
Soil-dust transport factor	0.5	CLEA default. SR3 (EA, 2009b)
Bioaccessible fraction (soil)	1	Default, assuming 100% bioavailability
Bioaccessible fraction (dust)	1	Default, assuming 100% bioavailability

Table 4-2
Lead Toxicological and Physico-chemical Input Parameters for CLEA v1.04

Model Parameter	Input value	Reference
HCV_{oral} – TDI[6]	3.6 µg.kg^{-1} bw.day^{-1}	Based on WHO (1982) PTWI of 25 µg.kg^{-1} bw. This value is used in UK food risk assessment (MAFF, 2000; FSA, 2009)
HCV_{inh} – TDI	0.07 µg.kg^{-1} bw.day^{-1}	Based on 70 kg adult inhaling 20 m^3 per day and EPAQs air quality guideline of 0.25 µg.m^{-3}, recommended as annual average (DETR, 1998).
Oral MDI	6.0 µg.day^{-1}	2006 Total Diet Study (FSA, 2009)[7]
Inh MDI	0.3 µg.day^{-1}	Calculated from Defra (2009) air quality archive - overall average from NPL Metals Data for UK in 2007 was 15 ng.m^{-3}.
Water Solubility	4.35 x10^5 mg.L^{-1}	Pb proportion of lead nitrate solubility (565 g L^{-1} at 20 deg C – Lide, 2005)
Kd	1800 cm^3.g^{-1}	Table 38 (Thorne et al, 2005)
Dermal Absorption Factor	0.003	Danish EPA
Soil-Plant availability correction	5	SR3 (EA, 2009b)
Internal plant distribution correction factors (f_{int})		
Root-Shoot f_{int}	0.2	Thorne et al (2005). 20% of soil absorbed lead is translocated to shoots, the rest remains in the roots.
Root-Root f_{int}	0.8	Thorne et al (2005). 20% of soil absorbed lead is translocated to shoots, the rest remains in the roots.
Root-Tuber f_{int}	0.8	Thorne et al (2005). 20% of soil absorbed lead is translocated to shoots, the rest remains in the roots.
Root-Fruit f_{int}	0.06	Thorne et al (2005). Observation reported of grain:stem:root ratios of approx. 1:2:13 in grain on dry weight basis.
Soil-plant concentration factor (CF)		
Green vegetables CF	0.0038	Samse-Peterson et al (2002); highest reported value for lettuce/beans
Root vegetables CF	0.05	Samse-Peterson et al (2002); highest reported value for carrot with peel
Tuber vegetables CF	0.003	Samse-Peterson et al (2002); highest reported value for potato with peel
Herbaceous fruit CF	0.0038	Samse-Peterson et al (2002); assumed equal

[6] Lead may be considered to be a non-threshold contaminant and therefore represented by an index dose. However the WHO recommendation for safe intake is presented as a 'provisional tolerable weekly intake' and consideration of the HCV as a TDI and subsequent subtraction of MDI is a more conservative approach.

[7] Background exposure to lead has only been considered on a dietary basis; a literature review to identify additional exposure sources is beyond the scope of this study.

Model Parameter	Input value	Reference
		to green vegetables
Shrub fruit CF	0.0038	Samse-Peterson et al (2002); assumed equal to green vegetables
Tree fruit CF	0.0038	Samse-Peterson et al (2002); assumed equal to green vegetables
Soil-dust transport factor	0.5	CLEA default. SR3 (EA, 2009b)
Bioaccessible fraction (soil)	1	Default, assuming 100% bioavailability
Bioaccessible fraction (dust)	1	Default, assuming 100% bioavailability

4.1.2 Plant Uptake

Plant roots can take up contaminants from soil and the contaminants can then move to other compartments within the plant including the fruit, which may be consumed by people harvesting them. Different plants will take up and translocate contaminants to varying extents and the degree of uptake will also vary from contaminant to contaminant and depend on the soil conditions. The CLEA model predicts the chemical concentration in edible portions of fruits and vegetables from the relationship between the soil and plant known as the soil-to-plant concentration factor (CF).

The generic approach to estimate uptake of inorganic chemicals within the CLEA model is consistent with the approach used by the FSA within PRISM Version 2, a model designed to model the transport of radionuclides in the terrestrial foodchain (Thorne et al., 2005). The model distinguishes between broad categories of plants rather than individual species or varieties. A single generic soil-to-root concentration factor is adopted for an inorganic chemical based on Kd (the soil-water partition coefficient) and a proportionality constant, the 'soil-plant availability correction', guideline values for which are provided in the CLEA report (EA, 2009b). Transport of inorganic elements within the plant from the root zone to edible fruits etc. is estimated by correcting the calculated value of CR for the fraction reaching the internal plant system (f_{int}). Therefore, the CLEA model requires four different f_{int} values to account for the different internal plant partitioning behaviour. Input values for arsenic and lead for the distribution fractions reaching different plants compartments were taken from the CLEA Report (EA, 2009b) and the PRISM Model Report (Thorne et al, 2005).

As indicated above, the CLEA model's treatment of the relationship between soil and plant concentrations is relatively complex and the choice of input parameters for estimating this relationship is very important, particularly with regard to the 'shrub fruit' category within the CLEA model that would include blackberries. A literature review was undertaken to identify suitable plant uptake data for arsenic and lead, particularly with regard to soft/shrub fruit and specifically for blackberries. A number of papers were identified that demonstrated the uptake of lead and arsenic by a number of plant species with the most significant uptake observed for root vegetables, such as carrots, and lettuce (Samse-Peterson et al, 2002; Pendergrass and Butcher, 2006). Tomato and bean plants were observed to mainly accumulate metals in their roots with little being translocated to the fruits (Cobb et al, 2000). No soil-to-plant concentration factors specifically for blackberries or soft fruit were identified during this review and the conservative approach was taken of adopting the maximum values recorded for uptake in above ground fruit or vegetables as input to the CLEA model for shrub fruit.

The Food Standards Agency (FSA) has monitored the concentrations of metals and other elements in allotment produce around the UK (FSA, 2006). They also monitored soil concentrations and presented the mean concentrations of arsenic and lead in urban allotment soil as 13.15 and 464.72 mg kg^{-1}, respectively (NB. the lead concentration is very similar to that detailed by Mouchel for Hardings Pits). No directly correlated data are presented that would enable the calculation of soil-to-plant concentration factors for blackberries but the FSA detail the mean concentrations of arsenic and lead in two samples of allotment grown blackberries as <0.004 and 0.008 mg kg^{-1}, respectively, indicating that there is minimal uptake and translocation of these contaminants to blackberry fruit. Newcastle City Council has also monitored the concentrations of lead and arsenic in blackberries growing in soils of varying degrees of contamination on allotments and found no correlation between contaminant concentrations and plant uptake (personal communication). Arsenic was only detected in 1/15 blackberry samples at a concentration of 0.21 mg kg^{-1} (washed sample); soils within a 30m radius had arsenic concentrations ranging from 24-6,100 mg kg^{-1}. Lead was only detected in 2/15 blackberry samples at concentrations of 0.031 mg kg^{-1} (unwashed sample) and 0.91 mg kg^{-1} (washed sample); soils within a 30m radius had lead concentrations ranging from 2,700-7,200 mg kg^{-1} and 180-2,100 mg/kg for the two samples, respectively.

5.0 SITE SPECIFIC ASSESSMENT CRITERIA

5.1 Site Specific Assessment Criteria

SSAC were derived using the CLEA v1.04 model populated with receptor characteristics based on the exposure scenarios detailed in Section 3 and the chemical input parameters for arsenic and lead detailed in Section 4.

5.1.1 Scenario 1 – Child Recreational User

Table 5-1 below details SSAC for a child using the Hardings Pits and Former Harbour Branch Line site for recreational purposes based on Exposure Scenario 1 as described in Table 3-2. CLEA input and output sheets are included as Appendix B.

Table 5-1
SSAC for Exposure Scenario 1 – Recreational Child User

Contaminant	'Average Scenario' SSAC	'Reasonable Worst Case Scenario' SSAC
Arsenic	336	116
Lead	5060	1550

The dominant exposure pathways for arsenic in this scenario are direct soil ingestion (74-85% contribution) and dermal contact (15-26%), whereas for lead the dominant pathway is direct ingestion (93-95%) with smaller contributions from dermal contact (2-3%) and background oral intake (4%).

This 'reasonable worst case' exposure scenario is very similar to the generic 'residential without home grown produce' scenario used in the CLEA model although the child considered here is older (i.e. 8-14 yrs old as opposed to the 0-6 yr old used for the calculation of SGV/GAC) and this is the major factor in generating an assessment criteria that is considerably higher than the generic residential GAC. GACs for the 'residential without home grown produce' scenario are calculated by CLEA v1.04 as 25 mg/kg and 370 mg/kg for arsenic and lead, respectively[8] based on consideration of Age Classes 1-6. GAC using the same input parameters and default settings for Age Classes 9-14, as in Exposure Scenario 1, are 95 and 1,270 mg/kg for arsenic and lead, respectively, thus demonstrating the influence of the age of the receptor on the calculated assessment criteria. The additional difference in the values calculated for Exposure Scenario 1 compared to a residential scenario are due to variation in the exposure frequency and the contribution of inhalation of indoor dust to the residential scenario. Exposure duration on site is relatively difficult to gauge but the value selected for this parameter has no influence on the SSAC which is determined by the values selected for soil ingestion rate and dermal exposure settings.

5.1.2 Scenario 2 – Adult Volunteer Worker

Table 5-2 below details SSAC for an adult volunteer working at the Site based on Exposure Scenario 2 as described in Table 3-3. CLEA input and output sheets are included as Appendix C

[8] Using the same chemical input parameters as used in the derivation of the SSAC for Exposure Scenario 1.

Table 5-2
SSAC for Exposure Scenario 2 – Adult Volunteer

Contaminant	'Average Scenario' SSAC	'Reasonable Worst Case Scenario' SSAC
Arsenic	12,300	3,820
Lead	179,000	47,900

SSAC generated for Exposure Scenario 2 are relatively high due to the low exposure frequency estimated for this scenario (9 days for average scenario and 18 days for reasonable worst case). As for Exposure Scenario 1 the dominant exposure pathways for arsenic are direct ingestion (contributing 88-96% of exposure) and dermal contact (3-12%) and direct ingestion for lead (96-97%).

5.1.3 Scenario 3 – Consumption of Wild Blackberries

Table 5-3 below details SSAC for adults, children and young children eating wild blackberries picked from the Site based on Exposure Scenario 3 as described in Table 3-4. CLEA input and output sheets are included as Appendix D

Table 5-3
SSAC for Exposure Scenario 3 – Consumption of Wild Blackberries

Contaminant	'Adult Scenario' SSAC	'Reasonable Worst Case Scenario' SSAC	'Worst Case Scenario' SSAC
Arsenic	617[9]	103	62
Lead	15,800[10]	2,600	1,470

The only pathway considered in Exposure Scenario 3 is consumption of shrub fruit (i.e. blackberries) as all other pathways in the CLEA model were turned off and consumption of other plant food types was set to zero. The CLEA model calculated the concentration of arsenic in soft fruit as 0.92 $mg.kg^{-1}$ fresh weight and of lead as 9.9 mg kg^{-1} FW.; these are likely to be over-estimates as the soil-to-plant concentration factor for shrub fruits was conservatively set at the maximum literature value as for green/leafy vegetables. Additionally, SSAC are also likely to be very conservative as it is assumed that the receptor consumes the same amount of blackberries every day of the year.

5.1.4 Integrated Assessment Criteria

Because it is possible that people may be exposed to contaminants from playing or working on Hardings Pits and also by consuming wild blackberries it is necessary to derive combined SSAC that consider the contribution from multiple scenarios using the equation below.

$1 / SSAC_{combined} = 1 / SSAC_{play\ or\ work} + 1 / SSAC_{blackberry}$

Integrated SSAC for combinations of Exposure Scenarios 1 and 2 with Scenario 3 are presented below in Table 5-4.

[9] Arsenic SSAC for adult 97.5th percentile consumer (68 g blackberries per day) is 145 mg/kg
[10] Lead SSAC for adult 97.5th percentile consumer (68 g blackberries per day) is 3,670 mg/kg

Table 5-4
Integrated Site Specific Assessment Criteria

Combined Exposure Scenarios	Integrated SSAC As (mg kg^{-1})	Integrated SSAC Pb (mg kg^{-1})
1 + 3 (average)	180	3300
1 + 3 (reasonable worst case)	55	970
2 + 3 (average)	587	14,500
2 + 3 (reasonable worst case)	140	3400

5.2 Discussion of SSAC Results

The SSAC (based on minimal risk) derived for all three exposure scenarios are considerably higher than the UCL_{51} concentrations of 35.8 mg kg^{-1} for arsenic and 477 mg kg^{-1} for lead previously calculated for by Mouchel and detailed in their letter of November 2008. On the basis of Mouchel's UCL_{51} values and the above findings of this assessment, SLR considers that there is no apparent theoretical risk from the contaminant concentrations present in soil at Hardings Pits. However, this assumes that the existing soil analysis data set is adequate and sufficiently representative of the site conditions.

Significantly, even when the most conservative exposure scenarios considered in this exercise are integrated to derive combined assessment criteria, the hazard quotients (HQ = intake/SSAC) are less than unity, i.e. HQ = 0.68 for arsenic and 0.49 for lead. This conservative scenario assumes that a child is making regular recreational use of the Site with 'reasonable worst case exposure' and eating 68 g of blackberries per day.

The exposure scenarios used in this HHRA are considered to sufficiently conservative to be protective of human health for users of the Site and the parameter values selected for the estimation of plant uptake within the CLEA are also conservative. A more accurate estimate of plant uptake of lead and arsenic from soil by blackberry bushes and the amount of these contaminants present in fruit is presented in section 7.0.

6.0 REVIEW OF EXISTING SOIL DATA

6.1 Scope

This Section presents a review of soil sampling and analysis data from previous investigations of Harding's Pits, together with the representative concentrations previously derived from it, to determine if they are likely to be representative of lead and arsenic concentrations across the Site and specifically at depths relevant to the exposure scenarios considered in the QHHRA. This review of the analytical data focuses on three items:

- Vertical (depth) distribution of contaminant data;
- Surface (aerial) distribution of data;
- Statistical analysis and calculation of representative concentrations.

This review is based on the analytical chemistry data provided to SLR by KLWN on 2nd June 2009. These data, provided in a spreadsheet are a compilation of soil sample data from various investigations at the Site and surrounding area undertaken from 1996 to 2008. It should be noted that the investigations were generally concerned with the King's Lynn Waterfront Regeneration project and did not have the specific objective of providing data for the human health risk assessment of Harding's Pits. This review assesses the available soil contaminant data in conjunction with sample location plans and Mouchel's supplementary assessment of November 2008[11].

6.2 Sample Depth

The CSM identified three sensitive receptors and exposure scenarios:

- Child making recreational use of the site;
- Volunteer worker undertaking site maintenance activities; and
- Member of public picking and consuming wild blackberries growing on site.

Children making recreational use of the site and volunteer workers undertaking maintenance activities will be primarily be exposed to surface soil via exposure pathways such as incidental ingestion of soil and soil-derived dust, dermal exposure and inhalation of soil-derived dust. In order to make an accurate assessment of exposure resulting from these pathways it is important to measure concentrations of contaminants in exposed surface soil or within the uppermost 200mm.

Blackberry roots are most extensive within the upper 500mm of soil and extend to a depth of up to 1m[12]. Soil samples should therefore be taken at various intervals over the uppermost metre of soil in order to model the potential plant uptake of contaminants and resultant exposure for those picking and eating the fruit.

Table 6-1 details the number of soil samples for which contaminant data are available at different depth ranges.

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[11] Letter dated 25 November 2008 from Mouchel to KLWN. 'Waterfront Regeneration, King's Lynn: Potential Statutory Part 2A Liabilities'. (Ref. 721217/1/2/MH)

[12] Missouri State University (2003) http://mtngrv.missouristate.edu/publications/b39.pdf ;

Crandall (1995) Bramble Production: The Management and Marketing of Raspberries and Blackberries.

Ohio State University Bulletin 782-99; viewed on-line at http://ohioline.osu.edu/b782/b782_3.html July 2009

Table 6-1
Number of Samples in Near Surface Soil

Depth range	Arsenic data points	Lead data points
0 – 0.1m	9	3
>0.1 – 0.3 m	15	14
>0.3 – 0.5 m	20	17
>0.5 – 1.0 m	29	26

Harding's Pits covers an area of approximately 650m^2 and it is apparent that very few samples have been taken from surface and near surface soil; within the uppermost 100 mm there are only 9 samples with data for arsenic and 3 with data for lead. A further 15 samples are available from a depth of 300mm but it is less likely that people using this public open space will be exposed to soil from this depth.

There are a total of 44 samples with data for arsenic and 34 for lead in the uppermost 500mm and 73 samples with data arsenic and 60 for lead in the top metre of soil. This quantity of data is considered sufficient to determine a representative concentration of soil contaminant concentrations for the modelling of plant uptake but it is not known if the soil samples were taken from the locations where blackberry bushes are growing.

Mouchel's supplementary assessment to investigate the potential need for intervention under the Part 2A regime included statistical analysis of the soil data that was based on 108 data points for arsenic and 99 for lead. The depth range of the soil samples is unclear and it appears that data from greater than 1 m (the maximum considered in the Environment Agency's CLEA model) were included in this analysis.

6.3 Site Sample Coverage

SLR considers that a basic but adequate number of samples have been taken to provide representative contaminant data for the 0.5 to 1.0m depth range over the Site area. As a consequence this review has focussed on the extent of the Site area for which surface and near surface data are available and the spatial distribution of the data sets.

The following samples were taken from the uppermost 100 mm of soil and have analytical data available for arsenic and/or lead. Details are also provided of their approximate location within the individual averaging areas (AAs).

Table 6-2
Sampling Coverage for Near Surface Soil

Sample id	Depth (m)	Contaminant data	Area of site
TP6 (TP6A)^	0	As	S boundary of AA7
TP7	0	As	S of AA7
TP9	0	As	S boundary of AA6
TP1	0	As	Centre of AA10
TP10A	0	As	SW of AA5
TP11^	0	As	NW of AA5
AWS3	0.1	As + Pb	S of centre of AA7
AWS4	0.1	As + Pb	Centre of AA7
AWS5	0.1	As + Pb	SW of AA7

Very limited surface and near surface soil data are available for the south and northwest of Harding's Pits, with lead data only being available for the south of the Site

6.4 Soil data statistics

Analytical chemistry data from Harding's Pits have been input to the ESI Stats Calculator software in accordance with *Guidance on Comparing Soil Contamination Data with a Critical Concentration* (CIEH & CL:AIRE, 2008); a summary of the data and statistical analysis for arsenic and lead at depth ranges relevant to the QHHRA are provided in Tables 6-3 and 6-4, below. Statistical summary pages from the Stats Calculator (for Part 2A scenario) are provided in Appendix E for arsenic and lead from each depth range (taken from the surface).

Table 6-3
Arsenic Data Summary

Depth (m)	n	Concentration range (mg/kg)	Mean (mg/kg)	LCL_{51} (mg/kg)	UCL_{95} (mg/kg)	Outliers[13]/ Distribution[14]
0 – 0.1 m	9	7.4 – 46	23	22	32	N / NN
0 – 0.3 m	24	7.4 – 110	29	24	50	N / NN
0 – 0.5 m	44	7.4 – 130	31	27	48	N / NN
0 – 1.0 m	73	3.5 – 130	30	27	34	N / NN

[13] Y (yes) or N (no), indicates the presence or absence, respectively of statistical outliers within the dataset for each depth range.

[14] Normal (N) or non-normal (NN) distribution of data.

Table 6-4
Lead Data Summary

Depth (m)	n	Concentration range (mg/kg)	Mean (mg/kg)	LCL_{51} (mg/kg)	UCL_{95}	Outliers/ Distribution
0 – 0.1 m	3	9.5 – 7600	2600	-	-	-
0 – 0.3 m	17	1.2 – 7600	540	94	2500	Y / NN
0 – 0.5 m	34	1.2 – 7600	330	100	1300	Y / NN
0 – 1.0 m	60	1.2 – 7600	340	200	490	N / NN

According to *Guidance on Comparing Soil Contamination Data with a Critical Concentration* (CIEH & CL:AIRE, 2008) an assessment of contaminant concentrations under Part 2A regulations should involve the comparison of a lower confidence limit (LCL) to the relevant critical concentration for the exposure scenario being assessed. The 51st percentile LCL (LCL_{51}) is the lowest centile (i.e. the balance of probabilities) that should be used in a Part 2A assessment. The 95th centile upper confidence limit (UCL_{95}) is used in planning regime assessments and the UCL_{95} for the various depth ranges is also included here to provide information on the distribution of the data.

The LCLs derived by SLR are lower than the UCLs calculated by Mouchel previously (36mg/kg for arsenic and 480mg/kg for lead) and even the highest LCL_{51} for arsenic (27mg/kg for the top metre) is lower than the revised Soil Guideline Value for residential land use (32 mg/kg) recently published by the EA. Arsenic concentrations are similar at all depth ranges and there is little variation in the mean or LCL_{51} calculated for each depth range.

There are insufficient lead data in near surface soil (only 3 samples) to generate meaningful statistics and one of these concentrations is a statistical outlier in the dataset for each depth range; sample AWS5 at 0.1 m, in the southwest of AA7 contained lead at a highly elevated concentration of 7,600 mg/kg. This is probably an isolated hotspot as the next highest lead concentrations are 140 mg/kg in the upper 100 mm, 310 mg/kg in the upper 300 mm and 3700 mg/kg between 0.5 and 1.0m. Lead concentrations appear to be relatively consistent, increasing slightly with depth.

6.5 Soil Data Review Conclusions

All LCL_{51}s calculated from existing soil data for Harding's Pits are significantly lower than the critical concentrations (SSAC) previously derived for recreational, volunteer activity and blackberry consumption exposure scenarios. Where the spatial distribution of sampling and analysis data vertically and laterally across the Site is adequate this would provide confidence that there is not a significant possibility of significant harm due to arsenic and lead concentrations in soil at Harding's Pits. However, very few samples have been taken from near surface soil (only 9 for arsenic and 3 for lead) and there is insufficient analysis coverage across all parts of the Site to generate adequate data for a risk assessment of people using the site recreationally or working as volunteers.

It was therefore recommended that additional near surface soil samples (~20 from upper 200mm) were taken for arsenic and lead analysis from across the site at the same time as fruit samples are taken from blackberry bushes. It was also recommended that a smaller number of soil samples (~6-8) are taken from the root zone (0.3-0.5m) around the specific blackberry bushes from where fruit are sampled, in order to accurately calibrate the plant uptake calculations within the CLEA model.

7.0 FRUIT AND SOIL SAMPLING AND DETAILED QUANTITATIVE RISK ASSESSMENT

7.1 Sampling of Soil and Blackberries

SLR undertook sampling of soil and wild blackberries from Hardings Pits on 20th August 2009 in order to determine whether the exposure scenarios detailed earlier in this report could lead to an unacceptable risk to human health. The scope of the sampling work included the following:

- 21 shallow soil samples (upper 200mm);
- Duplicate fruit samples from 5 blackberry bushes;
- Duplicate soil samples from root zone of blackberry bushes (200-600mm).

SLR's review of the available soil contaminant data for Harding's Pits detailed in section 6 concluded that very few samples had been taken from near surface soil (only 9 for arsenic and 3 for lead) and that there was insufficient coverage across all parts of the Site to generate adequate data for a risk assessment of people using the subject property recreationally or working as volunteers. In order to provide more detailed coverage of lead and arsenic concentrations in near surface soil across the site SLR took 21 near surface soil samples (0-200mm). Sample locations are detailed in Drawing 1. Soil samples were submitted to ALcontrol laboratories (Hawarden) for analysis of total concentrations of arsenic and lead only.

The soil samples were collected from hand excavated trial pits and placed in laboratory supplied containers and transported under chain of custody to the respective laboratories. The soil samples were from locations on site where blackberry plants were growing ("S" locations) and areas of open land with varying degrees of grass cover between the blackberry plants ("MS" locations). The deeper soil samples from the root zone of the blackberry bushes (0.30 to 0.60m) are identified as "FS" soil samples.

Two samples of blackberry fruit were taken from each of 5 bushes located across the Site. These 10 fruit samples were submitted, unwashed to EUROFINS laboratory for analysis of arsenic and lead concentrations. Two soil samples were also taken from the root zone (2/300-600mm) beneath each blackberry bush to enable estimation of the soil:plant concentration factor (CF). This empirically-determined CF value for blackberries growing on Harding's Pits can then be compared to the generic value for soft fruits used in the CLEA model to determine assessment criteria for this exposure pathway (Scenario 3).

7.2 Results

7.2.1 Shallow soil

The soil exposed in the hand excavated trial pits comprised made ground ranging from granular ash to a very dry and friable cohesive subsoil. The made ground contained a range of subordinate man made materials fragments which included brick, ash, concrete and ceramic.

The detailed results of the laboratory analyses for individual shallow soil samples are presented in Appendix F and are summarised below in Table 7-1.

Table 7-1
Soils Analytical Chemistry Results – Near Surface, August 2009

Contaminants	Number of samples	Range (mg/kg)		Average	UCL (95th)	Highest
		Min	Max			
Arsenic	21	<3	70	21	27	S2B
Lead	21	14	420	150	197	MS5

Arsenic and lead were measured at relatively moderate concentrations in near surface soil samples taken from Harding's Pits. From 21 samples the average concentrations were 21 mg kg^{-1} for arsenic and 150 mg kg^{-1} for lead. There is no distinct pattern to the distribution of contaminant concentrations across the Site although lead and arsenic concentrations are generally lower in the northern part of the Site (i.e. AA5). The highest concentrations of lead (390-470 mg kg^{-1}) and arsenic (35-70 mg kg^{-1}) were encountered in the southern half of AA7 (i.e. sample locations MS5 and S2a-2b).

7.2.2 Fruit and Root Zone Soil

The blackberry bushes were widespread across large areas of the Site and formed a dense network of bushes between 1 and 2m in height. In August 2009 the bushes were noted to have an abundant crop of berries and the plants did not show any evidence of foliation discolouration or poor growth.

The detailed results of the laboratory analyses for individual blackberry fruit samples and root zone soil are presented in Appendix F and are summarised below in Tables 7-2 and 7-3.

Table 7-2
Blackberry Fruit Analytical Chemistry Results

Contaminants	Number of samples	Range (µg/kg FW[15])		Average	UCL (95th)	Highest
		Min	Max			
Arsenic	10	<2	19	6.2	9.9	FS1A
Lead	10	6	40	20	27	FS1A

Table 7-3
Soils Analytical Chemistry Results – Root Zone

Contaminants	Number of samples	Range (µg/kg)		Average	UCL (95th)	Highest
		Min	Max			
Arsenic	10	12	94	34	49	FS2B
Lead	10	19	650	210	339	FS2B

The levels of arsenic and lead measured in blackberry fruit appear to be relatively low. The 95th UCL for both contaminants are considerably lower than the appropriate statutory limits (1 mg kg^{-1} for arsenic in all foods and 0.2 mg kg^{-1} for lead in small fruits and berries; FSA, 2006).

[15] Fresh weight basis

Concentrations of arsenic and lead appear to increase slightly with depth as the average and maximum concentrations of both contaminants are higher in the depth range 200-600mm compared with those determined in shallower soil (see Table 7-1).

7.3 Statistical Analysis and DQRA

7.3.1 Shallow soil

All analytical chemistry data for near surface soil from Harding's Pits, including data from samples taken by SLR in August 2009 and that determined by previous studies of the Site, were input to the ESI Stats Calculator software in accordance with Guidance on Comparing Soil Contamination Data with a Critical Concentration (CIEH & CL:AIRE, 2008). A summary of the data and statistical analysis for arsenic and lead in relation to the Part 2A risk assessment are provided in Table 7-4. Output from the ESI Stats Calculator is reproduced in Appendix G.

Table 7-4
Shallow Soil DQRA

Contaminant	n	Selected SSAC	Conc range (mg kg^{-1})	LCL_{51} (mg kg^{-1})	Outliers[16]/ Distribution[17]	No. over SSAC	Hazard Quotient	Pass or Fail
Arsenic	30	116	7-70	17.9	Y/NN	0	0.15	Pass
Lead	24	1550	19-650	132	Y/NN	0	0.085	Pass

The Lower Confidence Limit (LCL; 51st centile) for both arsenic and lead in shallow soil from Harding's Pits are considerably lower than the most conservative SSAC derived for exposure to shallow soil ('reasonable worst case scenario' for recreational child user on site). Significantly, the arsenic LCL (17.9 mg kg^{-1}) is lower than the recently published SGV for residential land use with consumption of home grown produce (32 mg kg^{-1}; EA, 2009c) and the lead LCL (132 mg kg^{-1}) is lower than the GAC for residential land use with consumption of home grown produce (290 mg kg^{-1}) calculated with the CLEA model using the input parameters detailed in Section 4. It is therefore considered that exposure to arsenic and lead in shallow soil at Harding's Pits would be unlikely to result in significant harm and this site would not be considered as contaminated land under Part 2A.

It should be noted that both the arsenic and lead datasets contain outliers. While the out-lying arsenic concentration (70 mg kg^{-1} at S2B) is not highly elevated the highest lead concentration (7660 mg kg^{-1} at AWS5, sampled during a previous investigation) is nearly 20 times higher than the next highest concentration and indicates the presence of an isolated hot-spot of lead contamination in shallow soil at this location.

7.3.2 Arsenic and Lead in Wild Fruit

The potential risk from the consumption of fruit growing at Harding's Pits can be assessed in a number of ways based the soil and fruit data available. The first approach is to compare the measured root zone soil concentrations (processed in ESI Stats Calculator) to the SSAC generated for this exposure scenario. The results of this assessment are presented in Table 7-5 below.

[16] Y (yes) or N (no), indicates the presence or absence, respectively of statistical outliers within the dataset for each depth range.

[17] Normal (N) or non-normal (NN) distribution of data.

Table 7-5
Blackberry Root Zone Soil DQRA

Contaminant	n	Selected SSAC	Conc range (mg kg^{-1})	LCL_{51} (mg kg^{-1})	Outliers[11]/ Distribution[12]	No. over SSAC	Hazard Quotient	Pass or Fail
Arsenic	10	62	12-94	24.9	Y/NN	2	0.40	Pass
Lead	10	1470	9.5-7660	134	N/NN	0	0.091	Pass

The results of this DQRA indicate that exposure resulting from the plant uptake of arsenic and lead in soil and the subsequent consumption of wild blackberries is unlikely to result in significant harm. However, there are a number of limitations to the accuracy of this assessment, primarily due to uncertainty in the selected value for soil:plant uptake for 'shrub fruit' within the CLEA model. This uncertainly is overcome by undertaking a dietary risk assessment using data for contaminant levels in fruit growing on the Site.

The highest concentrations of both arsenic and lead recorded in blackberries sampled from Harding's Pits are considerably lower than the most relevant statutory limits (1 mg kg^{-1} for arsenic in all foods and 0.2 mg kg^{-1} for lead in small fruits and berries; FSA, 2006). Such a comparison is informative but these limits are intended for use in the assessment of retail produce and are not applicable to wild-growing fruits. A dietary risk assessment was therefore undertaken for consumption of blackberries growing at Harding's Pit based on the assumptions used in the derivation of SSAC for Scenario 3 which were taken from a study undertaken by the Ministry for Agriculture, Fisheries and Food (MAFF, 2006).

Table 7-6
Consumption of Wild Blackberries – Dietary Risk Assessment

Scenario 3			
	Average	**Reasonable worst case**	**Worst case**
Receptor	16-75 yr old adult (70kg)	8-14 yr old child (37.1 kg)	0-6 yr old child (13.3 kg)
Blackberry consumption	19 g day^{-1}	68 g day^{-1}	34 g day^{-1}
Arsenic concentration (mg kg^{-1})	0.0062 (average)	0.019 (max)	0.019 (max)
As intake (µg kg^{-1} bw day^{-1})	0.0017	0.035	0.049
Index Dose (µg kg^{-1} bw day^{-1})	0.3	0.3	0.3
Hazard Quotient	5.6 x10^{-3}	0.12	0.16
Lead concentration (mg kg^{-1})	0.020 (average)	0.040 (max)	0.040 (max)
Pb intake (µg kg^{-1} bw day^{-1})	0.0054	0.073	0.10
Tolerable Daily Intake (µg kg^{-1} bw day^{-1})	3.6	3.6	3.6
Hazard Quotient	1.5 x10^{-3}	0.020	0.028

The results of the dietary risk assessment indicate that there is no significant risk to health from the consumption of wild blackberries growing on Harding's Pits, even when considering the highest recorded contaminant levels and daily consumption of wild blackberries from this one location. For arsenic, hazard quotients ranged from 0.0056 to 0.16, indicating a greater than 6-fold margin of safety, even in the potentially unrealistic worst case scenario of an infant with daily consumption of 34 g of wild blackberries. For lead, hazard quotients range from 0.0015 to 0.028, indicating the presence of a 35-fold safety factor in the worst case scenario.

7.3.3 Estimation of soil:plant concentration factor for blackberries

The SSAC derived for exposure from consumption of wild blackberries (scenario 3) were calculated using the CLEA model based on selected values that had been input for the parameter 'soil:plant concentration factor – shrub fruit'. For arsenic this value (CF = 0.009 DW[18]; equivalent to 1.5 x10^{-3} FW)) was assumed to be the same as a published value for green/leafy vegetables (EA, 2005) and for lead (CF = 0.0038 DW; equivalent to 6.3 x10^{-4} FW) it was assumed that the degree of uptake was the same as measured for lettuce and beans (Samsøe-Petersen et al, 2002).

Since the development of SSAC at an earlier stage in this project the EA has published soil guideline values (SGVs) for arsenic which include a CF value for shrub fruit of 2.0 x10^{-4} FW[19].

The calculation of soil:plant concentration factors for arsenic and lead in wild blackberries (unwashed) growing at Harding's Pits is detailed in Table 6-7 below. The two fruit and soil samples from each blackberry bush sampled were averaged the ratio between the two values was calculated to determine the CF for both arsenic and lead on a fresh weight basis (i.e. fresh weight (FW) plant per mg kg^{-1} DW soil).

Table 7-7
Calculation of Soil:Plant Concentration for Arsenic and Lead in Wild Blackberries

Sample id	Soil conc. (mg kg^{-1} DW)	Fruit conc. (mg kg^{-1} FW)	CF (FW)	Soil conc. (mg kg^{-1} DW)	Fruit conc. (mg kg^{-1} FW)	CF (FW)
	Arsenic			**Lead**		
FS1	12.5	0.0125	1.0 x10^{-3}	21	0.04	1.9 x10^{-3}
FS2	59.5	0.003	5.0 x10^{-5}	405	0.0225	5.6 x10^{-5}
FS3	49.5	0.017	3.4 x10^{-4}	440	0.0075	1.7 x10^{-5}
FS4	18	0.004	2.2 x10^{-4}	91	0.017	1.9 x10^{-4}
FS5	28	0.002	7.1 x10^{-5}	27	0.012	4.5 x10^{-4}
			3.4 x10^{-4}			**5.2 x10^{-4}**

There is considerable variation in the soil:plant concentration factors calculated from the data from Harding's Pits. This is likely to be due to the relatively low levels of contamination that were observed in both soil and fruit in this small scale study. It should also be noted that the blackberries were unwashed so the potential exists for a contribution from surface dust to the levels of arsenic and lead measured in the fruit.

[18] Dry weight basis

[19] Fresh weight (FW) plant per mg kg^{-1} DW soil. CLEA Report (Environment Agency, 2009a) details a dry weight conversion factor of 0.166 d DW g^{-1} FW for shrub fruit.

The average CF determined for arsenic (3.4 x 10^{-4}) is less conservative than the value input to the CLEA model to derive the SSAC for Scenario 3 (1.5 x10^{-3}); using this empirically determined site-specific value would therefore result in a higher SSAC for Scenario 3 but would not affect the conclusions of the risk assessment. Surprisingly, the average CF determined using the above data for blackberries from Harding's Pits is remarkably similar to the CF value for arsenic in shrub fruit (2.0 x10^{-4}) recently published by the EA (2009c) and used in deriving the arsenic SGVs.

The average CF determined for lead (5.2 x 10^{-4}) is extremely similar to the value selected for input to CLEA (6.3 x10^{-4}) and use of the value determined from Harding's Pits would have very little effect on the SSAC derived for Scenario 3.

8.0 CONCLUSIONS

The additional site investigation and analysis of soil and fruit samples from Harding’s Pits by SLR has revealed relatively low levels of arsenic and lead contamination in both shallow soil and wild blackberries growing on the Site.

SLR considers that the detailed quantitative risk assessment findings indicate an absence of significant risk to recreational users of the Site, volunteer workers undertaking maintenance work and those consuming wild blackberries growing on the subject property.

9.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data provided by the client and has been accepted in good faith as being accurate and valid.

Should additional data become available for review, the analyses and assumptions herein should be reviewed, as a different conclusion may be reached. The evaluation and conclusions will not preclude the existence of variation of conditions between test holes or the existence of other chemical compounds. Hence, this report should be used for information purposes only and should not be construed as a comprehensive characterisation of all site conditions.

This report is for the exclusive use of Borough Council of King's Lynn and West Norfolk; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

10.0 REFERENCES

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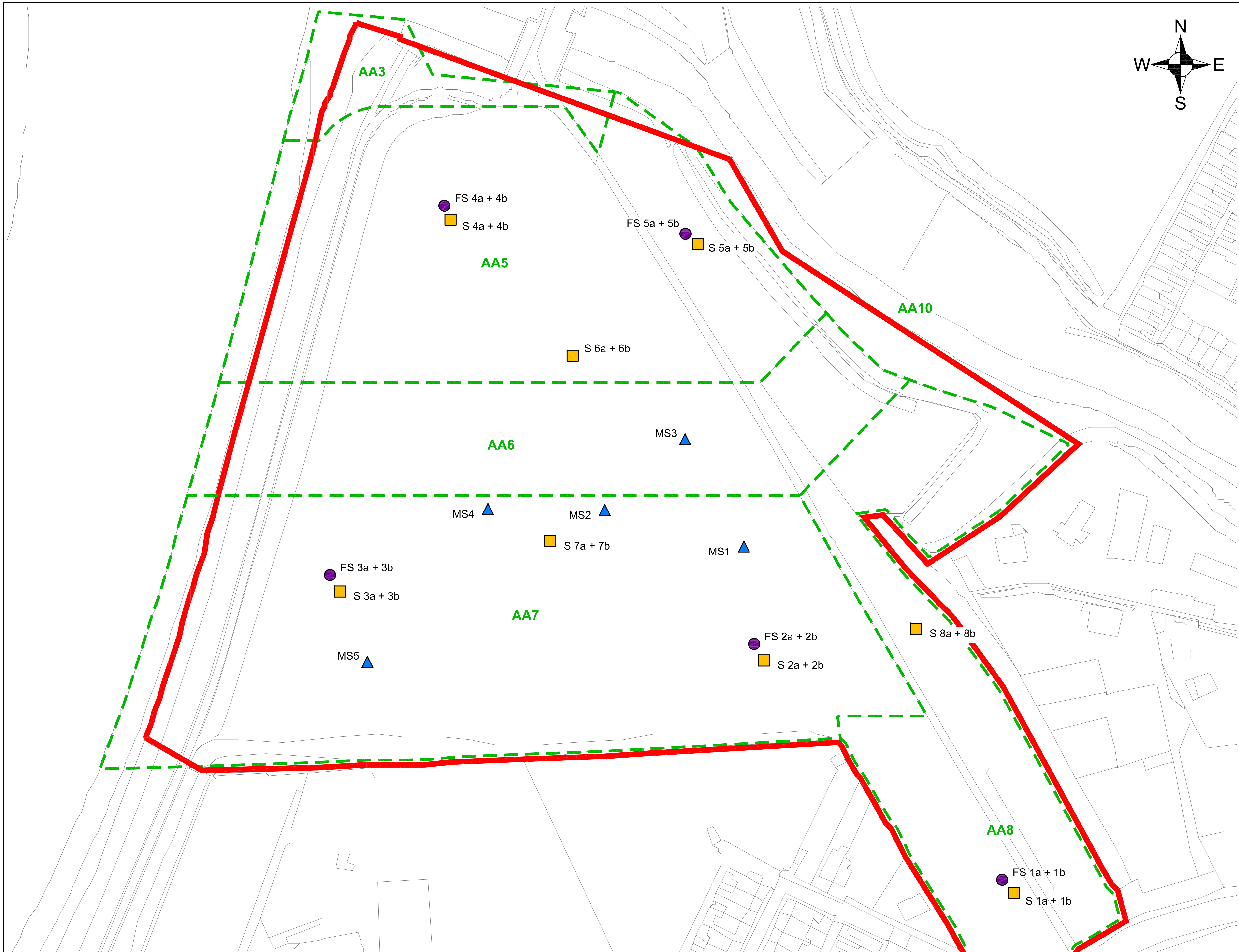

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LEGEND

Approximate site Boundary

AA7 Mouchel Average Areas

SLR Sample Locations - August 2009

Blackberry Fruit Sample

Soil sample

Meadow Soil Sample

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HARDINGS PITS & FORMER HARBOUR BRANCH LINE

HUMAN HEALTH RISK ASSESSMENT

SAMPLE LOCATION PLAN

DWG No. 1

Scale	Date
NTS	OCTOBER 2009

APPENDIX A

Table A-1
Calculation of blackberry consumption rate on bodyweight basis for input to CLEA v1.04

Age Class	Bodyweight[1] (kg)	Daily Consumption[2] (g day^{-1})	Consumption rate (g $FW.kg^{-1}$ $BW.day^{-1}$)
1	5.6	34	6.1
2	9.8	34	3.5
3	12.7	34	2.7
4	15.1	34	2.3
5	16.9	34	2.0
6	19.7	34	1.7
7	22.1	68	3.1
8	25.3	68	2.7
9	27.5	68	2.5
10	31.4	68	2.2
11	35.7	68	1.9
12	41.3	68	1.6
13	47.2	68	1.4
14	51.2	68	1.3
15	56.7	68	1.2
16	59	68	1.2
17	70	68 (19)[3]	1.0 (0.27)
18	70	68 (19)	1.0 (0.27)

[1] Female bodyweight taken from Environment Agency (2009b) CLEA Report – Table 4.6.
[2] 97.5th percentile consumption rate for adult (68 g per day) taken from MAFF (2000); this value was halved for age classes 1-6.
[3] Mean consumption rate (19 g per day) from MAFF (2000) used for ‘average’ scenario considering adult (age classes 17-18).

APPENDIX B

CLEA INPUT SUMMARY:

EXPOSURE SCENARIO 1 – RECREATIONAL CHILD USER

CLEA Software Version 1.04

Report generated	11/03/2009
Report title	Hardings Pits (child) - recreational use (average scenario)
Created by	EDS at SLR

BASIC SETTINGS

Land Use	Open space (child)							
Building	No building							
Receptor	Female (allot)	Start age class	9	End age class	14	Exposure Duration	6	years
Soil	Sandy clay loam							

Exposure Pathways

Direct soil and dust ingestion	✓	Dermal contact with indoor dust	✗	Inhalation of indoor dust	✗
Consumption of homegrown produce	✗	Dermal contact with soil	✓	Inhalation of soil dust	✓
Soil attached to homegrown produce	✗			Inhalation of indoor vapour	✗
				Inhalation of outdoor vapour	✓

Land Use Open space (child)

Age Class	Exposure Frequencies (days yr^{-1}): Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Occupation Periods (hr day^{-1}): Indoors	Outdoors	Soil to skin adherence factors (mg cm^{2}): Indoor	Outdoor	Direct soil ingestion rate (g day^{-1})
1	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
2	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
3	**0**	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
4	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
5	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
6	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
7	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
8	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
9	180	0	0	180	0	180	23.0	1.0	0.00	1.00	0.05
10	180	0	0	180	0	180	23.0	1.0	0.00	1.00	0.05
11	180	0	0	180	0	180	23.0	1.0	0.00	1.00	0.05
12	180	0	0	180	0	180	23.0	1.0	0.00	1.00	0.05
13	180	0	0	180	0	180	23.0	1.0	0.00	1.00	0.05
14	180	0	0	180	0	180	23.0	1.0	0.00	1.00	0.05
15	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
16	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
17	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
18	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00

Receptor Female (allot)

Age Class	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor: Indoor (m^2 m^{-2})	Max exposed skin factor: Outdoor (m^2 m^{-2})	Total skin area (m^2)	Consumption rates (g FW kg^{-1} BW day^{-1}): Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	5.60	0.7	10.3	0.32	0.26	3.43E-01	7.12	10.69	16.03	1.83	2.23	3.82
2	9.80	0.8	18.8	0.33	0.26	4.84E-01	6.85	3.30	5.46	3.96	0.54	11.96
3	12.70	0.9	20.7	0.32	0.25	5.82E-01	6.85	3.30	5.46	3.96	0.54	11.96
4	15.10	0.9	19.1	0.35	0.28	6.36E-01	6.85	3.30	5.46	3.96	0.54	11.96
5	16.90	1.0	21.3	0.35	0.28	7.04E-01	3.74	1.77	3.38	1.85	0.16	4.26
6	19.70	1.1	24.9	0.33	0.26	7.94E-01	3.74	1.77	3.38	1.85	0.16	4.26
7	22.10	1.2	0.0	0.22	0.15	8.73E-01	3.74	1.77	3.38	1.85	0.16	4.26
8	25.30	1.2	0.0	0.22	0.15	9.36E-01	3.74	1.77	3.38	1.85	0.16	4.26
9	27.50	1.3	0.0	0.22	0.15	1.01E+00	3.74	1.77	3.38	1.85	0.16	4.26
10	31.40	1.3	0.0	0.22	0.15	1.08E+00	3.74	1.77	3.38	1.85	0.16	4.26
11	35.70	1.4	0.0	0.22	0.14	1.19E+00	3.74	1.77	3.38	1.85	0.16	4.26
12	41.30	1.4	0.0	0.22	0.14	1.29E+00	3.74	1.77	3.38	1.85	0.16	4.26
13	47.20	1.5	0.0	0.22	0.14	1.42E+00	3.74	1.77	3.38	1.85	0.16	4.26
14	51.20	1.6	0.0	0.22	0.14	1.52E+00	3.74	1.77	3.38	1.85	0.16	4.26
15	56.70	1.6	0.0	0.21	0.14	1.60E+00	3.74	1.77	3.38	1.85	0.16	4.26
16	59.00	1.6	0.0	0.21	0.14	1.63E+00	3.74	1.77	3.38	1.85	0.16	4.26
17	70.00	1.6	0.0	0.33	0.27	1.78E+00	2.94	1.40	1.79	1.61	0.22	2.97
18	70.90	1.6	0.0	0.33	0.27	1.80E+00	2.94	1.40	1.79	1.61	0.22	2.97

Building No building

Building footprint (m^2)	0.00E+00
Living space air exchange rate (hr^{-1})	0.00E+00
Living space height (above ground, m)	0.00E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	0.00E+00
Foundation thickness (m)	0.00E+00
Floor crack area (cm^2)	0.00E+00
Dust loading factor (μg m^{-3})	0.00E+00

Soil Sandy clay loam

Porosity, Total (cm^3 cm^{-3})	5.30E-01
Porosity, Air-Filled (cm^3 cm^{-3})	1.60E-01
Porosity, Water-Filled (cm^3 cm^{-3})	3.70E-01
Residual soil water content (cm^3 cm^{-3})	1.50E-01
Saturated hydraulic conductivity (cm s^{-1})	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density (g cm^{-3})	1.20E+00
Threshold value of wind speed at 10m (m s^{-1})	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02

Soil pH	8.00E+00
Soil Organic Matter content (%)	1.10E+01
Fraction of organic carbon (g g^{-1})	6.38E-02

Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	50
Default soil gas ingress rate?	No
Soil gas ingress rate (cm^3 s^{-1})	0.00E+00
Building ventilation rate (cm^3 s^{-1})	0.00E+00
Averaging time surface emissions (yr)	6
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m (m s^{-1})	5.00
Air dispersion factor at height of 0.8m *	68.00
Air dispersion factor at height of 1.6m *	169.00
Fraction of site cover (m^2 m^{-2})	0.05

* Air dispersion factor in g m^{-2} s^{-1} per kg m^{-3}

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	Homegrown fraction High	Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type None

Report generated	11/03/2009
Report title	Hardings Pits (child) - recreational use (reasonable worst case scenario)
Created by	EDS at SLR

BASIC SETTINGS

Land Use	Open space (child)							
Building	No building							
Receptor	Female (allot)	Start age class	9	End age class	14	Exposure Duration	6	years
Soil	Sandy clay loam							

Exposure Pathways

Direct soil and dust ingestion	✓	Dermal contact with indoor dust	✗	Inhalation of indoor dust	✗
Consumption of homegrown produce	✗	Dermal contact with soil	✓	Inhalation of soil dust	✓
Soil attached to homegrown produce	✗			Inhalation of indoor vapour	✗
				Inhalation of outdoor vapour	✓

Land Use Open space (child)

Age Class	Exposure Frequencies (days yr^{-1}): Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Occupation Periods (hr day^{-1}): Indoors	Outdoors	Soil to skin adherence factors (mg cm^2): Indoor	Outdoor	Direct soil ingestion rate (g day^{-1})
1	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
2	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
3	**0**	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
4	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
5	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
6	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
7	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
8	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
9	**300**	0	0	**300**	0	**300**	23.0	1.0	0.00	1.00	**0.10**
10	**300**	0	0	**300**	0	**300**	23.0	1.0	0.00	1.00	**0.10**
11	**300**	0	0	**300**	0	**300**	23.0	1.0	0.00	1.00	**0.10**
12	**300**	0	0	**300**	0	**300**	23.0	1.0	0.00	1.00	**0.10**
13	**300**	0	0	**300**	0	**300**	23.0	1.0	0.00	1.00	**0.10**
14	**300**	0	0	**300**	0	**300**	23.0	1.0	0.00	1.00	**0.10**
15	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
16	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
17	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
18	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00

Receptor Female (allot)

Age Class	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor: Indoor (m^2 m^{-2})	Max exposed skin factor: Outdoor (m^2 m^{-2})	Total skin area (m^2)	Consumption rates (g FW kg^{-1} BW day^{-1}): Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	5.60	0.7	10.3	0.32	0.26	3.43E-01	7.12	10.69	16.03	1.83	2.23	3.82
2	9.80	0.8	18.8	0.33	0.26	4.84E-01	6.85	3.30	5.46	3.96	0.54	11.96
3	12.70	0.9	20.7	0.32	0.25	5.82E-01	6.85	3.30	5.46	3.96	0.54	11.96
4	15.10	0.9	19.1	0.35	0.28	6.36E-01	6.85	3.30	5.46	3.96	0.54	11.96
5	16.90	1.0	21.3	0.35	0.28	7.04E-01	3.74	1.77	3.38	1.85	0.16	4.26
6	19.70	1.1	24.9	0.33	0.26	7.94E-01	3.74	1.77	3.38	1.85	0.16	4.26
7	22.10	1.2	0.0	0.22	0.15	8.73E-01	3.74	1.77	3.38	1.85	0.16	4.26
8	25.30	1.2	0.0	0.22	0.15	9.36E-01	3.74	1.77	3.38	1.85	0.16	4.26
9	27.50	1.3	0.0	0.22	0.15	1.01E+00	3.74	1.77	3.38	1.85	0.16	4.26
10	31.40	1.3	0.0	0.22	0.15	1.08E+00	3.74	1.77	3.38	1.85	0.16	4.26
11	35.70	1.4	0.0	0.22	0.14	1.19E+00	3.74	1.77	3.38	1.85	0.16	4.26
12	41.30	1.4	0.0	0.22	0.14	1.29E+00	3.74	1.77	3.38	1.85	0.16	4.26
13	47.20	1.5	0.0	0.22	0.14	1.42E+00	3.74	1.77	3.38	1.85	0.16	4.26
14	51.20	1.6	0.0	0.22	0.14	1.52E+00	3.74	1.77	3.38	1.85	0.16	4.26
15	56.70	1.6	0.0	0.21	0.14	1.60E+00	3.74	1.77	3.38	1.85	0.16	4.26
16	59.00	1.6	0.0	0.21	0.14	1.63E+00	3.74	1.77	3.38	1.85	0.16	4.26
17	70.00	1.6	0.0	0.33	0.27	1.78E+00	2.94	1.40	1.79	1.61	0.22	2.97
18	70.90	1.6	0.0	0.33	0.27	1.80E+00	2.94	1.40	1.79	1.61	0.22	2.97

Building No building

Building footprint (m^2)	0.00E+00
Living space air exchange rate (hr^{-1})	0.00E+00
Living space height (above ground, m)	0.00E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	0.00E+00
Foundation thickness (m)	0.00E+00
Floor crack area (cm^2)	0.00E+00
Dust loading factor ($\mu g\ m^{-3}$)	0.00E+00

Soil Sandy clay loam

Porosity, Total ($cm^3\ cm^{-3}$)	5.30E-01
Porosity, Air-Filled ($cm^3\ cm^{-3}$)	1.60E-01
Porosity, Water-Filled ($cm^3\ cm^{-3}$)	3.70E-01
Residual soil water content ($cm^3\ cm^{-3}$)	1.50E-01
Saturated hydraulic conductivity ($cm\ s^{-1}$)	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density ($g\ cm^{-3}$)	1.20E+00
Threshold value of wind speed at 10m ($m\ s^{-1}$)	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02

Soil pH	8.00E+00
Soil Organic Matter content (%)	1.10E+01
Fraction of organic carbon ($g\ g^{-1}$)	6.38E-02

Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	50
Default soil gas ingress rate?	No
Soil gas ingress rate ($cm^3 s^{-1}$)	0.00E+00
Building ventilation rate ($cm^3 s^{-1}$)	0.00E+00
Averaging time surface emissions (yr)	6
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m ($m s^{-1}$)	5.00
Air dispersion factor at height of 0.8m *	68.00
Air dispersion factor at height of 1.6m *	169.00
Fraction of site cover ($m^2 m^{-2}$)	0.05

* Air dispersion factor in $g m^{-2} s^{-1}$ per $kg m^{-3}$

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	Homegrown fraction High	Soil loading factor	Preparation correction factor
	$g DW g^{-1} FW$	dimensionless		$g g^{-1} DW$	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type None

CLEA RESULTS RECORD:

EXPOSURE SCENARIO 1 – RECREATIONAL CHILD USER

Report generated	11-Mar-09
Report title	Hardings Pits (child) - recreational use (average scenario)
Created by	EDS at SLR

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Arsenic	3.36E+02	NR	3.36E+02	1.00	0.00	1.00	NR	No	No
2	Lead	5.06E+03	NR	5.06E+03	1.00	0.00	1.00	#VALUE!	No	No
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	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
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		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic	100.0	0.0	0.0	100.0	3.36E+02	NR	NA	1.92E-05	7.71E-06	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2	Lead	100.0	0.0	0.0	100.0	5.06E+03	NR	NA	2.89E-04	1.16E-04	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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Clea hardings open space

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic	2.22E-04	0.00E+00	7.75E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	74.15	0.00	25.85	0.00	0.00	0.00	0.00	0.00
2	Lead	3.35E-03	0.00E+00	1.17E-04	0.00E+00	0.00E+00	1.30E-04	6.42E-06	93.15	0.00	3.25	0.00	0.00	0.00	3.60	0.00
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)								
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)	
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		Oral Health Criteria Value (μg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (μg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (μg day^{-1})	Inhalation Mean Daily Intake (μg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
1	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	0	1	1
2	Lead	TDI	3.6	TDI	0.07	6	0.3	NR	NR	NR	NR	NR	0.003	0.5	0	1	1
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	Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
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		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic	1.80E+03	NR	4.41E+05	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw
2	Lead	1.00E+03	0.00E+00	4.35E+05	0.0038 dw	0.05 dw	0.003 dw	0.0038 dw	0.0038 dw	0.0038 dw
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	Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for root vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for tuber vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for herbaceous fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for shrub fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for tree fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)
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CLEA Software Version 1.04

Report generated	11-Mar-09
Report title	Hardings Pits (child) - recreational use (reasonable worst case scenario)
Created by	EDS at SLR

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Arsenic	1.16E+02	NR	1.16E+02	1.00	0.00	1.00	NR	No	No
2	Lead	1.55E+03	NR	1.55E+03	1.00	0.00	1.00	#VALUE!	No	No
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	Assessment Criterion (mg kg-1)			Ratio of ADE to HCV			Saturation Limit (mg kg-1)	50% rule?	
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
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		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic	100.0	0.0	0.0	100.0	1.16E+02	NR	NA	6.61E-06	2.66E-06	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2	Lead	100.0	0.0	0.0	100.0	1.55E+03	NR	NA	8.82E-05	3.55E-05	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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Clea hardings open space

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic	2.55E-04	0.00E+00	4.45E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	85.16	0.00	14.84	0.00	0.00	0.00	0.00	0.00
2	Lead	3.41E-03	0.00E+00	5.94E-05	0.00E+00	0.00E+00	1.30E-04	6.42E-06	94.75	0.00	1.65	0.00	0.00	0.00	3.60	0.00
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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		Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
1	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	0	1	1
2	Lead	TDI	3.6	TDI	0.07	6	0.3	NR	NR	NR	NR	NR	0.003	0.5	0	1	1
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	Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
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		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic	1.80E+03	NR	4.41E+05	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw
2	Lead	1.00E+03	0.00E+00	4.35E+05	0.0038 dw	0.05 dw	0.003 dw	0.0038 dw	0.0038 dw	0.0038 dw
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	Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for root vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for tuber vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for herbaceous fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for shrub fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for tree fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)
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CLEA INPUT SUMMARY:

EXPOSURE SCENARIO 2 – ADULT VOLUNTEER

CLEA Software Version 1.04

Report generated	11/03/2009
Report title	Hardings Pits (adult volunteer - average scenario)
Created by	EDS at SLR

BASIC SETTINGS

Land Use	Open space (adult volunteer)							
Building	No building							
Receptor	Female (com)	Start age class	17	End age class	18	Exposure Duration	58	years
Soil	Sandy clay loam							

Exposure Pathways

Direct soil and dust ingestion	✓	Dermal contact with indoor dust	✗	Inhalation of indoor dust	✗
Consumption of homegrown produce	✗	Dermal contact with soil	✓	Inhalation of soil dust	✓
Soil attached to homegrown produce	✗			Inhalation of indoor vapour	✗
				Inhalation of outdoor vapour	✓

Land Use Open space (adult volunteer)

Age Class	Exposure Frequencies (days yr^{-1}): Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Occupation Periods (hr day^{-1}): Indoors	Outdoors	Soil to skin adherence factors (mg cm^2): Indoor	Outdoor	Direct soil ingestion rate (g day^{-1})
1	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
2	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
3	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
4	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
5	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
6	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
7	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
8	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
9	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
10	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
11	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
12	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
13	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
14	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
15	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
16	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
17	**9**	0	0	17	0	17	21.0	3.0	0.00	0.30	0.05
18	**9**	0	0	17	0	17	21.0	3.0	0.00	0.30	0.05

Receptor Female (com)

Age Class	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor: Indoor (m^2 m^{-2})	Max exposed skin factor: Outdoor (m^2 m^{-2})	Total skin area (m^2)	Consumption rates (g FW kg^{-1} BW day^{-1}): Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	5.60	0.7	8.5	0.00	0.00	3.43E-01	7.12	10.69	16.03	1.83	2.23	3.82
2	9.80	0.8	13.3	0.00	0.00	4.84E-01	6.85	3.30	5.46	3.96	0.54	11.96
3	12.70	0.9	12.7	0.00	0.00	5.82E-01	6.85	3.30	5.46	3.96	0.54	11.96
4	15.10	0.9	12.2	0.00	0.00	6.36E-01	6.85	3.30	5.46	3.96	0.54	11.96
5	16.90	1.0	12.2	0.00	0.00	7.04E-01	3.74	1.77	3.38	1.85	0.16	4.26
6	19.70	1.1	12.2	0.00	0.00	7.94E-01	3.74	1.77	3.38	1.85	0.16	4.26
7	22.10	1.2	12.4	0.00	0.00	8.73E-01	3.74	1.77	3.38	1.85	0.16	4.26
8	25.30	1.2	12.4	0.00	0.00	9.36E-01	3.74	1.77	3.38	1.85	0.16	4.26
9	27.50	1.3	12.4	0.00	0.00	1.01E+00	3.74	1.77	3.38	1.85	0.16	4.26
10	31.40	1.3	12.4	0.00	0.00	1.08E+00	3.74	1.77	3.38	1.85	0.16	4.26
11	35.70	1.4	12.4	0.00	0.00	1.19E+00	3.74	1.77	3.38	1.85	0.16	4.26
12	41.30	1.4	13.4	0.00	0.00	1.29E+00	3.74	1.77	3.38	1.85	0.16	4.26
13	47.20	1.5	13.4	0.00	0.00	1.42E+00	3.74	1.77	3.38	1.85	0.16	4.26
14	51.20	1.6	13.4	0.00	0.00	1.52E+00	3.74	1.77	3.38	1.85	0.16	4.26
15	56.70	1.6	13.4	0.00	0.00	1.60E+00	3.74	1.77	3.38	1.85	0.16	4.26
16	59.00	1.6	13.4	0.00	0.00	1.63E+00	3.74	1.77	3.38	1.85	0.16	4.26
17	70.00	1.6	14.8	0.08	0.08	1.78E+00	2.94	1.40	1.79	1.61	0.22	2.97
18	70.90	1.6	12.0	0.00	0.00	1.80E+00	2.94	1.40	1.79	1.61	0.22	2.97

Building No building

Building footprint (m^2)	0.00E+00
Living space air exchange rate (hr^{-1})	0.00E+00
Living space height (above ground, m)	0.00E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	0.00E+00
Foundation thickness (m)	0.00E+00
Floor crack area (cm^2)	0.00E+00
Dust loading factor (μg m^{-3})	0.00E+00

Soil Sandy clay loam

Porosity, Total (cm^3 cm^{-3})	5.30E-01
Porosity, Air-Filled (cm^3 cm^{-3})	1.60E-01
Porosity, Water-Filled (cm^3 cm^{-3})	3.70E-01
Residual soil water content (cm^3 cm^{-3})	1.50E-01
Saturated hydraulic conductivity (cm s^{-1})	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density (g cm^{-3})	1.20E+00
Threshold value of wind speed at 10m (m s^{-1})	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02

Soil pH	8.00E+00
Soil Organic Matter content (%)	1.10E+01
Fraction of organic carbon (g g^{-1})	6.38E-02

Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	50
Default soil gas ingress rate?	No
Soil gas ingress rate (cm^3 s^{-1})	0.00E+00
Building ventilation rate (cm^3 s^{-1})	0.00E+00
Averaging time surface emissions (yr)	58
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m (m s^{-1})	5.00
Air dispersion factor at height of 0.8m *	68.00
Air dispersion factor at height of 1.6m *	169.00
Fraction of site cover (m^2 m^{-2})	0.05

* Air dispersion factor in g m^{-2} s^{-1} per kg m^{-3}

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	Homegrown fraction High	Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type None

CLEA Software Version 1.04

Report generated	11/03/2009
Report title	Hardings Pits (adult volunteer - reasonable worst case scenario)
Created by	EDS at SLR

BASIC SETTINGS

Land Use	Open space (adult volunteer)						
Building	No building						
Receptor	Female (com)	Start age class	17	End age class	18	Exposure Duration	58 years
Soil	Sandy clay loam						

Exposure Pathways

Direct soil and dust ingestion	✓	Dermal contact with indoor dust	✗	Inhalation of indoor dust	✗
Consumption of homegrown produce	✗	Dermal contact with soil	✓	Inhalation of soil dust	✓
Soil attached to homegrown produce	✗			Inhalation of indoor vapour	✗
				Inhalation of outdoor vapour	✓

Land Use Open space (adult volunteer)

Age Class	Exposure Frequencies (days yr^{-1}): Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Occupation Periods (hr day^{-1}): Indoors	Outdoors	Soil to skin adherence factors (mg cm^2): Indoor	Outdoor	Direct soil ingestion rate (g day^{-1})
1	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
2	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
3	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
4	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
5	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
6	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
7	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
8	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
9	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
10	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
11	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
12	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
13	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
14	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
15	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
16	0	0	0	0	0	0	24.0	0.0	0.00	0.00	0.00
17	**18**	0	0	**18**	0	**18**	21.0	3.0	0.00	0.30	**0.10**
18	**18**	0	0	**18**	0	**18**	21.0	3.0	0.00	0.30	**0.10**

Receptor Female (com)

Age Class	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor: Indoor (m^2 m^{-2})	Max exposed skin factor: Outdoor (m^2 m^{-2})	Total skin area (m^2)	Consumption rates (g FW kg^{-1} BW day^{-1}): Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	5.60	0.7	8.5	0.00	0.00	3.43E-01	7.12	10.69	16.03	1.83	2.23	3.82
2	9.80	0.8	13.3	0.00	0.00	4.84E-01	6.85	3.30	5.46	3.96	0.54	11.96
3	12.70	0.9	12.7	0.00	0.00	5.82E-01	6.85	3.30	5.46	3.96	0.54	11.96
4	15.10	0.9	12.2	0.00	0.00	6.36E-01	6.85	3.30	5.46	3.96	0.54	11.96
5	16.90	1.0	12.2	0.00	0.00	7.04E-01	3.74	1.77	3.38	1.85	0.16	4.26
6	19.70	1.1	12.2	0.00	0.00	7.94E-01	3.74	1.77	3.38	1.85	0.16	4.26
7	22.10	1.2	12.4	0.00	0.00	8.73E-01	3.74	1.77	3.38	1.85	0.16	4.26
8	25.30	1.2	12.4	0.00	0.00	9.36E-01	3.74	1.77	3.38	1.85	0.16	4.26
9	27.50	1.3	12.4	0.00	0.00	1.01E+00	3.74	1.77	3.38	1.85	0.16	4.26
10	31.40	1.3	12.4	0.00	0.00	1.08E+00	3.74	1.77	3.38	1.85	0.16	4.26
11	35.70	1.4	12.4	0.00	0.00	1.19E+00	3.74	1.77	3.38	1.85	0.16	4.26
12	41.30	1.4	13.4	0.00	0.00	1.29E+00	3.74	1.77	3.38	1.85	0.16	4.26
13	47.20	1.5	13.4	0.00	0.00	1.42E+00	3.74	1.77	3.38	1.85	0.16	4.26
14	51.20	1.6	13.4	0.00	0.00	1.52E+00	3.74	1.77	3.38	1.85	0.16	4.26
15	56.70	1.6	13.4	0.00	0.00	1.60E+00	3.74	1.77	3.38	1.85	0.16	4.26
16	59.00	1.6	13.4	0.00	0.00	1.63E+00	3.74	1.77	3.38	1.85	0.16	4.26
17	70.00	1.6	14.8	0.08	0.08	1.78E+00	2.94	1.40	1.79	1.61	0.22	2.97
18	70.90	1.6	12.0	0.00	0.00	1.80E+00	2.94	1.40	1.79	1.61	0.22	2.97

Building No building

Building footprint (m^2)	0.00E+00
Living space air exchange rate (hr^{-1})	0.00E+00
Living space height (above ground, m)	0.00E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	0.00E+00
Foundation thickness (m)	0.00E+00
Floor crack area (cm^2)	0.00E+00
Dust loading factor (μg m^{-3})	0.00E+00

Soil Sandy clay loam

Porosity, Total (cm^3 cm^{-3})	5.30E-01
Porosity, Air-Filled (cm^3 cm^{-3})	1.60E-01
Porosity, Water-Filled (cm^3 cm^{-3})	3.70E-01
Residual soil water content (cm^3 cm^{-3})	1.50E-01
Saturated hydraulic conductivity (cm s^{-1})	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density (g cm^{-3})	1.20E+00
Threshold value of wind speed at 10m (m s^{-1})	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02

Soil pH	8.00E+00
Soil Organic Matter content (%)	1.10E+01
Fraction of organic carbon (g g^{-1})	6.38E-02

Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	50
Default soil gas ingress rate?	No
Soil gas ingress rate ($cm^3\ s^{-1}$)	0.00E+00
Building ventilation rate ($cm^3\ s^{-1}$)	0.00E+00
Averaging time surface emissions (yr)	58
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m ($m\ s^{-1}$)	5.00
Air dispersion factor at height of 0.8m *	68.00
Air dispersion factor at height of 1.6m *	169.00
Fraction of site cover ($m^2\ m^{-2}$)	0.05

* Air dispersion factor in $g\ m^{-2}\ s^{-1}$ per $kg\ m^{-3}$

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	High	Soil loading factor	Preparation correction factor
	$g\ DW\ g^{-1}\ FW$	dimensionless		$g\ g^{-1}\ DW$	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type None

CLEA RESULTS RECORD:

EXPOSURE SCENARIO 2 – ADULT VOLUNTEER

Report generated	11-Mar-09
Report title	Hardings Pits (adult volunteer - average scenario)
Created by	EDS at SLR

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Arsenic	1.48E+04	7.20E+04	1.23E+04	0.83	0.17	1.00	NR	No	No
2	Lead	1.94E+05	2.36E+06	1.79E+05	0.92	0.08	1.00	#VALUE!	No	No
3										
4										
5										
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	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
21									
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30									

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	$mg\ kg^{-1}$	$mg\ m^{-3}$	$mg\ kg^{-1}$	$mg\ m^{-3}$	$mg\ m^{-3}$	$mg\ m^{-3}$	$mg\ m^{-3}$	$mg\ m^{-3}$	$mg\ kg^{-1}$ FW	$mg\ kg^{-1}$ FW	$mg\ kg^{-1}$ FW	$mg\ kg^{-1}$ FW	$mg\ kg^{-1}$ FW	$mg\ kg^{-1}$ FW
1	Arsenic	100.0	0.0	0.0	100.0	1.23E+04	NR	NA	7.00E-04	2.82E-04	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2	Lead	100.0	0.0	0.0	100.0	1.79E+05	NR	NA	1.02E-02	4.12E-03	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic	2.19E-04	0.00E+00	2.95E-05	3.41E-07	0.00E+00	0.00E+00	0.00E+00	88.01	0.00	11.85	0.14	0.00	0.00	0.00	0.00
2	Lead	3.21E-03	0.00E+00	4.32E-05	4.98E-06	0.00E+00	8.70E-05	4.35E-06	95.83	0.00	1.29	0.15	0.00	0.00	2.60	0.13
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

		Oral Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Inhalation Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
1	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	0	1	1
2	Lead	TDI	3.6	TDI	0.07	6	0.3	NR	NR	NR	NR	NR	0.003	0.5	0	1	1
3																	
4																	
5																	
6																	
7																	
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	Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
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		Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for root vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for tuber vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for herbaceous fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for shrub fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for tree fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)
1	Arsenic	1.80E+03	NR	4.41E+05	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw
2	Lead	1.00E+03	0.00E+00	4.35E+05	0.0038 dw	0.05 dw	0.003 dw	0.0038 dw	0.0038 dw	0.0038 dw
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	Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
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CLEA Software Version 1.04

Report generated	11-Mar-09
Report title	Hardings Pits (adult volunteer - reasonable worst case scenario)
Created by	EDS at SLR

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Arsenic	4.05E+03	6.80E+04	3.82E+03	0.94	0.06	1.00	NR	No	No
2	Lead	4.90E+04	2.23E+06	4.79E+04	0.98	0.02	1.00	#VALUE!	No	No
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	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
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		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic	100.0	0.0	0.0	100.0	3.82E+03	NR	NA	2.18E-04	8.78E-05	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2	Lead	100.0	0.0	0.0	100.0	4.79E+04	NR	NA	2.74E-03	1.10E-03	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic	2.73E-04	0.00E+00	9.75E-06	1.12E-07	0.00E+00	0.00E+00	0.00E+00	96.52	0.00	3.44	0.04	0.00	0.00	0.00	0.00
2	Lead	3.43E-03	0.00E+00	1.22E-05	1.41E-06	0.00E+00	8.70E-05	4.35E-06	97.11	0.00	0.35	0.04	0.00	0.00	2.46	0.04
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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		Oral Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Inhalation Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
1	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	0	1	1
2	Lead	TDI	3.6	TDI	0.07	6	0.3	NR	NR	NR	NR	NR	0.003	0.5	0	1	1
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	Oral Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Inhalation Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
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		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic	1.80E+03	NR	4.41E+05	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw
2	Lead	1.00E+03	0.00E+00	4.35E+05	0.0038 dw	0.05 dw	0.003 dw	0.0038 dw	0.0038 dw	0.0038 dw
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	Soil-to-water partition coefficient ($cm^3\ g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg\ L^{-1}$)	Soil-to-plant concentration factor for green vegetables ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for root vegetables ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for tuber vegetables ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for herbaceous fruit ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for shrub fruit ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)	Soil-to-plant concentration factor for tree fruit ($mg\ g^{-1}$ plant DW or FW basis over $mg\ g^{-1}$ DW soil)
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APPENDIX D

CLEA INPUT SUMMARY:

EXPOSURE SCENARIO 3 – CONSUMPTION OF WILD BLACKBERRIES

CLEA Software Version 1.04

Report generated	12/03/2009
Report title	Hardings Pits (blackberry consumption by adult)
Created by	EDS at SLR

BASIC SETTINGS

Land Use	Blackberries							
Building	No building							
Receptor	Female (com)	Start age class	17	End age class	18	Exposure Duration	58	years
Soil	Sandy clay loam							

Exposure Pathways

Direct soil and dust ingestion	✗	Dermal contact with indoor dust	✗	Inhalation of indoor dust	✗
Consumption of homegrown produce	✓	Dermal contact with soil	✗	Inhalation of soil dust	✗
Soil attached to homegrown produce	✓			Inhalation of indoor vapour	✗
				Inhalation of outdoor vapour	✗

Land Use Blackberries

Age Class	Exposure Frequencies (days yr^{-1}): Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Occupation Periods (hr day^{-1}): Indoors	Outdoors	Soil to skin adherence factors (mg cm^{2}): Indoor	Outdoor	Direct soil ingestion rate (g day^{-1})
1	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
2	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
3	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
4	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
5	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
6	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
7	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
8	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
9	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
10	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
11	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
12	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
13	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
14	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
15	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
16	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
17	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
18	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00

Receptor Female (com)

Age Class	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor: Indoor (m^2 m^{-2})	Max exposed skin factor: Outdoor (m^2 m^{-2})	Total skin area (m^2)	Consumption rates (g FW kg^{-1} BW day^{-1}): Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	5.60	0.7	8.5	0.00	0.00	3.43E-01	**0.00**	**0.00**	**0.00**	**0.00**	**6.07**	**0.00**
2	9.80	0.8	13.3	0.00	0.00	4.84E-01	**0.00**	**0.00**	**0.00**	**0.00**	**3.47**	**0.00**
3	12.70	0.9	12.7	0.00	0.00	5.82E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.68**	**0.00**
4	15.10	0.9	12.2	0.00	0.00	6.36E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.25**	**0.00**
5	16.90	1.0	12.2	0.00	0.00	7.04E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.01**	**0.00**
6	19.70	1.1	12.2	0.00	0.00	7.94E-01	**0.00**	**0.00**	**0.00**	**0.00**	**1.73**	**0.00**
7	22.10	1.2	12.4	0.00	0.00	8.73E-01	**0.00**	**0.00**	**0.00**	**0.00**	**3.08**	**0.00**
8	25.30	1.2	12.4	0.00	0.00	9.36E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.69**	**0.00**
9	27.50	1.3	12.4	0.00	0.00	1.01E+00	**0.00**	**0.00**	**0.00**	**0.00**	**2.47**	**0.00**
10	31.40	1.3	12.4	0.00	0.00	1.08E+00	**0.00**	**0.00**	**0.00**	**0.00**	**2.17**	**0.00**
11	35.70	1.4	12.4	0.00	0.00	1.19E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.90**	**0.00**
12	41.30	1.4	13.4	0.00	0.00	1.29E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.65**	**0.00**
13	47.20	1.5	13.4	0.00	0.00	1.42E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.44**	**0.00**
14	51.20	1.6	13.4	0.00	0.00	1.52E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.33**	**0.00**
15	56.70	1.6	13.4	0.00	0.00	1.60E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.20**	**0.00**
16	59.00	1.6	13.4	0.00	0.00	1.63E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.15**	**0.00**
17	70.00	1.6	14.8	0.08	0.08	1.78E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.00**
18	70.90	1.6	12.0	0.00	0.00	1.80E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.00**

Building No building

Building footprint (m^2)	0.00E+00
Living space air exchange rate (hr^{-1})	0.00E+00
Living space height (above ground, m)	0.00E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	0.00E+00
Foundation thickness (m)	0.00E+00
Floor crack area (cm^2)	0.00E+00
Dust loading factor (μg m^{-3})	0.00E+00

Soil Sandy clay loam

Porosity, Total (cm^3 cm^{-3})	5.30E-01
Porosity, Air-Filled (cm^3 cm^{-3})	1.60E-01
Porosity, Water-Filled (cm^3 cm^{-3})	3.70E-01
Residual soil water content (cm^3 cm^{-3})	1.50E-01
Saturated hydraulic conductivity (cm s^{-1})	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density (g cm^{-3})	1.20E+00
Threshold value of wind speed at 10m (m s^{-1})	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02

Soil pH	8.00E+00
Soil Organic Matter content (%)	1.10E+01
Fraction of organic carbon (g g^{-1})	6.38E-02

Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	50
Default soil gas ingress rate?	No
Soil gas ingress rate ($cm^3 s^{-1}$)	0.00E+00
Building ventilation rate ($cm^3 s^{-1}$)	0.00E+00
Averaging time surface emissions (yr)	58
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m ($m s^{-1}$)	5.00
Air dispersion factor at height of 0.8m *	0.00
Air dispersion factor at height of 1.6m *	0.00
Fraction of site cover ($m^2 m^{-2}$)	0

* Air dispersion factor in $g m^{-2} s^{-1}$ per kg m^{-3}

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	Homegrown fraction High	Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	**0.01**	**0.02**	1.00E-03	2.00E-01
Root vegetables	0.103	**0.01**	**0.02**	1.00E-03	1.00E+00
Tuber vegetables	0.210	**0.01**	**0.02**	1.00E-03	1.00E+00
Herbaceous fruit	0.058	**0.01**	**0.02**	1.00E-03	6.00E-01
Shrub fruit	0.166	**1.00**	**1.00**	1.00E-03	6.00E-01
Tree fruit	0.157	**0.01**	**0.02**	1.00E-03	6.00E-01

Gardener type High

CLEA Software Version 1.04

Report generated	12/03/2009
Report title	Hardings Pits (blackberry consumption by child/teenager)
Created by	EDS at SLR

BASIC SETTINGS

Land Use	Blackberries							
Building	No building							
Receptor	Female (allot)	Start age class	9	End age class	14	Exposure Duration	6	years
Soil	Sandy clay loam							

Exposure Pathways

Direct soil and dust ingestion	✗	Dermal contact with indoor dust	✗	Inhalation of indoor dust	✗
Consumption of homegrown produce	✓	Dermal contact with soil	✗	Inhalation of soil dust	✗
Soil attached to homegrown produce	✓			Inhalation of indoor vapour	✗
				Inhalation of outdoor vapour	✗

Land Use Blackberries

Age Class	Exposure Frequencies (days yr^{-1}): Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Occupation Periods (hr day^{-1}): Indoors	Outdoors	Soil to skin adherence factors (mg cm^2): Indoor	Outdoor	Direct soil ingestion rate (g day^{-1})
1	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
2	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
3	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
4	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
5	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
6	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
7	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
8	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
9	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
10	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
11	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
12	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
13	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
14	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
15	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
16	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
17	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
18	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00

Receptor Female (allot)

Age Class	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor Indoor (m^2 m^{-2})	Max exposed skin factor Outdoor (m^2 m^{-2})	Total skin area (m^2)	Consumption rates (g FW kg^{-1} BW day^{-1}) Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	5.60	0.7	10.3	0.32	0.26	3.43E-01	**0.00**	**0.00**	**0.00**	**0.00**	**6.07**	**0.00**
2	9.80	0.8	18.8	0.33	0.26	4.84E-01	**0.00**	**0.00**	**0.00**	**0.00**	**3.47**	**0.00**
3	12.70	0.9	20.7	0.32	0.25	5.82E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.68**	**0.00**
4	15.10	0.9	19.1	0.35	0.28	6.36E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.25**	**0.00**
5	16.90	1.0	21.3	0.35	0.28	7.04E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.01**	**0.00**
6	19.70	1.1	24.9	0.33	0.26	7.94E-01	**0.00**	**0.00**	**0.00**	**0.00**	**1.73**	**0.00**
7	22.10	1.2	0.0	0.22	0.15	8.73E-01	**0.00**	**0.00**	**0.00**	**0.00**	**3.08**	**0.00**
8	25.30	1.2	0.0	0.22	0.15	9.36E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.69**	**0.00**
9	27.50	1.3	0.0	0.22	0.15	1.01E+00	**0.00**	**0.00**	**0.00**	**0.00**	**2.47**	**0.00**
10	31.40	1.3	0.0	0.22	0.15	1.08E+00	**0.00**	**0.00**	**0.00**	**0.00**	**2.17**	**0.00**
11	35.70	1.4	0.0	0.22	0.14	1.19E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.90**	**0.00**
12	41.30	1.4	0.0	0.22	0.14	1.29E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.65**	**0.00**
13	47.20	1.5	0.0	0.22	0.14	1.42E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.44**	**0.00**
14	51.20	1.6	0.0	0.22	0.14	1.52E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.33**	**0.00**
15	56.70	1.6	0.0	0.21	0.14	1.60E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.20**	**0.00**
16	59.00	1.6	0.0	0.21	0.14	1.63E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.15**	**0.00**
17	70.00	1.6	0.0	0.33	0.27	1.78E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.00**
18	70.90	1.6	0.0	0.33	0.27	1.80E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.00**

Building No building

Building footprint (m^2)	0.00E+00
Living space air exchange rate (hr^{-1})	0.00E+00
Living space height (above ground, m)	0.00E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	0.00E+00
Foundation thickness (m)	0.00E+00
Floor crack area (cm^2)	0.00E+00
Dust loading factor ($\mu g\ m^{-3}$)	0.00E+00

Soil Sandy clay loam

Porosity, Total ($cm^3\ cm^{-3}$)	5.30E-01
Porosity, Air-Filled ($cm^3\ cm^{-3}$)	1.60E-01
Porosity, Water-Filled ($cm^3\ cm^{-3}$)	3.70E-01
Residual soil water content ($cm^3\ cm^{-3}$)	1.50E-01
Saturated hydraulic conductivity ($cm\ s^{-1}$)	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density ($g\ cm^{-3}$)	1.20E+00
Threshold value of wind speed at 10m ($m\ s^{-1}$)	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02

Soil pH	8.00E+00
Soil Organic Matter content (%)	1.10E+01
Fraction of organic carbon ($g\ g^{-1}$)	6.38E-02

Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	50
Default soil gas ingress rate?	No
Soil gas ingress rate (cm^3 s^{-1})	0.00E+00
Building ventilation rate (cm^3 s^{-1})	0.00E+00
Averaging time surface emissions (yr)	6
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m (m s^{-1})	5.00
Air dispersion factor at height of 0.8m *	0.00
Air dispersion factor at height of 1.6m *	0.00
Fraction of site cover (m^2 m^{-2})	0

* Air dispersion factor in g m^{-2} s^{-1} per kg m^{-3}

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	High	Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	**0.01**	**0.02**	1.00E-03	2.00E-01
Root vegetables	0.103	**0.01**	**0.02**	1.00E-03	1.00E+00
Tuber vegetables	0.210	**0.01**	**0.02**	1.00E-03	1.00E+00
Herbaceous fruit	0.058	**0.01**	**0.02**	1.00E-03	6.00E-01
Shrub fruit	0.166	**1.00**	**1.00**	1.00E-03	6.00E-01
Tree fruit	0.157	**0.01**	**0.02**	1.00E-03	6.00E-01

Gardener type High

CLEA Software Version 1.04

Report generated	12/03/2009
Report title	Hardings Pits (blackberry consumption by young child)
Created by	EDS at SLR

BASIC SETTINGS

Land Use	Blackberries							
Building	No building							
Receptor	Female (allot)	Start age class	1	End age class	6	Exposure Duration	6	years
Soil	Sandy clay loam							

Exposure Pathways

Direct soil and dust ingestion	✗	Dermal contact with indoor dust	✗	Inhalation of indoor dust	✗
Consumption of homegrown produce	✓	Dermal contact with soil	✗	Inhalation of soil dust	✗
Soil attached to homegrown produce	✓			Inhalation of indoor vapour	✗
				Inhalation of outdoor vapour	✗

Land Use Blackberries

Age Class	Exposure Frequencies (days yr^{-1}): Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Occupation Periods (hr day^{-1}): Indoors	Outdoors	Soil to skin adherence factors (mg cm^2): Indoor	Outdoor	Direct soil ingestion rate (g day^{-1})
1	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
2	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
3	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
4	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
5	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
6	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
7	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
8	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
9	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
10	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
11	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
12	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
13	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
14	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
15	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
16	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
17	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00
18	0	365	0	0	0	0	24.0	0.0	0.00	0.00	0.00

Receptor Female (allot)

Age Class	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor Indoor (m^2 m^{-2})	Max exposed skin factor Outdoor (m^2 m^{-2})	Total skin area (m^2)	Consumption rates (g FW kg^{-1} BW day^{-1}) Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	5.60	0.7	10.3	0.32	0.26	3.43E-01	**0.00**	**0.00**	**0.00**	**0.00**	**6.07**	**0.00**
2	9.80	0.8	18.8	0.33	0.26	4.84E-01	**0.00**	**0.00**	**0.00**	**0.00**	**3.47**	**0.00**
3	12.70	0.9	20.7	0.32	0.25	5.82E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.68**	**0.00**
4	15.10	0.9	19.1	0.35	0.28	6.36E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.25**	**0.00**
5	16.90	1.0	21.3	0.35	0.28	7.04E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.01**	**0.00**
6	19.70	1.1	24.9	0.33	0.26	7.94E-01	**0.00**	**0.00**	**0.00**	**0.00**	**1.73**	**0.00**
7	22.10	1.2	0.0	0.22	0.15	8.73E-01	**0.00**	**0.00**	**0.00**	**0.00**	**3.08**	**0.00**
8	25.30	1.2	0.0	0.22	0.15	9.36E-01	**0.00**	**0.00**	**0.00**	**0.00**	**2.69**	**0.00**
9	27.50	1.3	0.0	0.22	0.15	1.01E+00	**0.00**	**0.00**	**0.00**	**0.00**	**2.47**	**0.00**
10	31.40	1.3	0.0	0.22	0.15	1.08E+00	**0.00**	**0.00**	**0.00**	**0.00**	**2.17**	**0.00**
11	35.70	1.4	0.0	0.22	0.14	1.19E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.90**	**0.00**
12	41.30	1.4	0.0	0.22	0.14	1.29E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.65**	**0.00**
13	47.20	1.5	0.0	0.22	0.14	1.42E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.44**	**0.00**
14	51.20	1.6	0.0	0.22	0.14	1.52E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.33**	**0.00**
15	56.70	1.6	0.0	0.21	0.14	1.60E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.20**	**0.00**
16	59.00	1.6	0.0	0.21	0.14	1.63E+00	**0.00**	**0.00**	**0.00**	**0.00**	**1.15**	**0.00**
17	70.00	1.6	0.0	0.33	0.27	1.78E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.00**
18	70.90	1.6	0.0	0.33	0.27	1.80E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.00**

Building No building

Building footprint (m^2)	0.00E+00
Living space air exchange rate (hr^{-1})	0.00E+00
Living space height (above ground, m)	0.00E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	0.00E+00
Foundation thickness (m)	0.00E+00
Floor crack area (cm^2)	0.00E+00
Dust loading factor (μg m^{-3})	0.00E+00

Soil Sandy clay loam

Porosity, Total (cm^3 cm^{-3})	5.30E-01
Porosity, Air-Filled (cm^3 cm^{-3})	1.60E-01
Porosity, Water-Filled (cm^3 cm^{-3})	3.70E-01
Residual soil water content (cm^3 cm^{-3})	1.50E-01
Saturated hydraulic conductivity (cm s^{-1})	2.37E-03
van Genuchten shape parameter *m* (dimensionless)	3.10E-01
Bulk density (g cm^{-3})	1.20E+00
Threshold value of wind speed at 10m (m s^{-1})	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02

Soil pH	8.00E+00
Soil Organic Matter content (%)	1.10E+01
Fraction of organic carbon (g g^{-1})	6.38E-02

Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm^2)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm^2)	1.83E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	50
Default soil gas ingress rate?	No
Soil gas ingress rate ($cm^3 s^{-1}$)	0.00E+00
Building ventilation rate ($cm^3 s^{-1}$)	0.00E+00
Averaging time surface emissions (yr)	6
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m ($m s^{-1}$)	5.00
Air dispersion factor at height of 0.8m *	0.00
Air dispersion factor at height of 1.6m *	0.00
Fraction of site cover ($m^2 m^{-2}$)	0

* Air dispersion factor in g $m^{-2} s^{-1}$ per kg m^{-3}

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	Homegrown fraction High	Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	**0.01**	**0.02**	1.00E-03	2.00E-01
Root vegetables	0.103	**0.01**	**0.02**	1.00E-03	1.00E+00
Tuber vegetables	0.210	**0.01**	**0.02**	1.00E-03	1.00E+00
Herbaceous fruit	0.058	**0.01**	**0.02**	1.00E-03	6.00E-01
Shrub fruit	0.166	**1.00**	**1.00**	1.00E-03	6.00E-01
Tree fruit	0.157	**0.01**	**0.02**	1.00E-03	6.00E-01

Gardener type High

CLEA RESULTS RECORD:

EXPOSURE SCENARIO 3 – CONSUMPTION OF WILD BLACKBERRIES

Report generated	12-Mar-09
Report title	Hardings Pits (blackberry consumption by adult)
Created by	EDS at SLR

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Arsenic	6.17E+02	NR	6.17E+02	1.00	0.00	1.00	NR	No	No
2	Lead	1.58E+04	NR	1.58E+04	1.00	0.00	1.00	#VALUE!	No	No
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	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
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		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic	100.0	0.0	0.0	100.0	6.17E+02	NR	NA	NA	NA	NA	NA	NA	5.33E-01	5.72E-01	1.17E+00	3.22E-01	9.22E-01	8.72E-01
2	Lead	100.0	0.0	0.0	100.0	1.58E+04	NR	NA	NA	NA	NA	NA	NA	5.75E+00	8.12E+01	9.93E+00	3.47E+00	9.94E+00	9.40E+00
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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22																		
23																		
24																		
25																		
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27																		
28																		
29																		
30																		

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic	0.00E+00	3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Lead	0.00E+00	3.51E-03	0.00E+00	0.00E+00	0.00E+00	8.70E-05	4.35E-06	0.00	97.58	0.00	0.00	0.00	0.00	2.42	0.00
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

		Oral Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Inhalation Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
1	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	0	1	1
2	Lead	TDI	3.6	TDI	0.07	6	0.3	NR	NR	NR	NR	NR	0.003	0.5	0	1	1
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5																	
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	Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
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		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic	1.80E+03	NR	4.41E+05	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw
2	Lead	1.00E+03	0.00E+00	4.35E+05	0.0038 dw	0.05 dw	0.003 dw	0.0038 dw	0.0038 dw	0.0038 dw
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	Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables ($mg g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables ($mg g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables ($mg g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit ($mg g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit ($mg g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit ($mg g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)
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CLEA Software Version 1.04

Report generated 12-Mar-09

Report title Hardings Pits (blackberry consumption by child/teenager)

Created by EDS at SLR

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Arsenic	1.03E+02	NR	1.03E+02	1.00	0.00	1.00	NR	No	No
2	Lead	2.60E+03	NR	2.60E+03	1.00	0.00	1.00	#VALUE!	No	No
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	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
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		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic	100.0	0.0	0.0	100.0	1.03E+02	NR	NA	NA	NA	NA	NA	NA	8.91E-02	9.55E-02	1.95E-01	5.38E-02	1.54E-01	1.46E-01
2	Lead	100.0	0.0	0.0	100.0	2.60E+03	NR	NA	NA	NA	NA	NA	NA	9.49E-01	1.34E+01	1.64E+00	5.73E-01	1.64E+00	1.55E+00
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic	0.00E+00	3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Lead	0.00E+00	3.47E-03	0.00E+00	0.00E+00	0.00E+00	1.30E-04	6.42E-06	0.00	96.40	0.00	0.00	0.00	0.00	3.60	0.00
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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		Oral Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Inhalation Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
1	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	0	1	1
2	Lead	TDI	3.6	TDI	0.07	6	0.3	NR	NR	NR	NR	NR	0.003	0.5	0	1	1
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	Oral Health Criteria Value (μg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (μg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (μg day^{-1})	Inhalation Mean Daily Intake (μg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
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		Soil-to-water partition coefficient ($cm^3\ g^{-1}$)	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic	1.80E+03	NR	4.41E+05	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw
2	Lead	1.00E+03	0.00E+00	4.35E+05	0.0038 dw	0.05 dw	0.003 dw	0.0038 dw	0.0038 dw	0.0038 dw
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	Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for root vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for tuber vegetables ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for herbaceous fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for shrub fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)	Soil-to-plant concentration factor for tree fruit ($mg g^{-1}$ plant DW or FW basis over $mg g^{-1}$ DW soil)
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CLEA Software Version 1.04

Report generated	12-Mar-09
Report title	Hardings Pits (blackberry consumption by young child)
Created by	EDS at SLR

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Arsenic	6.20E+01	NR	6.20E+01	1.00	0.00	1.00	NR	No	No
2	Lead	1.47E+03	NR	1.47E+03	1.00	0.00	1.00	#VALUE!	No	No
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	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
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		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic	100.0	0.0	0.0	100.0	6.20E+01	NR	NA	NA	NA	NA	NA	NA	5.36E-02	5.75E-02	1.17E-01	3.24E-02	9.27E-02	8.77E-02
2	Lead	100.0	0.0	0.0	100.0	1.47E+03	NR	NA	NA	NA	NA	NA	NA	5.37E-01	7.58E+00	9.27E-01	3.24E-01	9.28E-01	8.78E-01
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	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic	0.00E+00	3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Lead	0.00E+00	3.26E-03	0.00E+00	0.00E+00	0.00E+00	3.38E-04	1.82E-05	0.00	90.62	0.00	0.00	0.00	0.00	9.38	0.00
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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		Oral Health Criteria Value (μg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (μg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (μg day^{-1})	Inhalation Mean Daily Intake (μg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
1	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	0	1	1
2	Lead	TDI	3.6	TDI	0.07	6	0.3	NR	NR	NR	NR	NR	0.003	0.5	0	1	1
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	Oral Health Criteria Value (μg kg^{-1} BW day^{-1})	Inhalation Health Criteria Value (μg kg^{-1} BW day^{-1})	Oral Mean Daily Intake (μg day^{-1})	Inhalation Mean Daily Intake (μg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Bioaccessible fraction in soil (unitless)	Bioaccessible fraction in airborne dust (unitless)
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		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic	1.80E+03	NR	4.41E+05	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw	0.009 dw
2	Lead	1.00E+03	0.00E+00	4.35E+05	0.0038 dw	0.05 dw	0.003 dw	0.0038 dw	0.0038 dw	0.0038 dw
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	Soil-to-water partition coefficient ($cm^3\ g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg\ L^{-1}$)	Soil-to-plant concentration factor for green vegetables ($mg\ g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables ($mg\ g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables ($mg\ g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit ($mg\ g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit ($mg\ g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit ($mg\ g^{-1}$ plant DW or FW basis over mg g^{-1} DW soil)
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APPENDIX E

APPENDIX

SUMMARY STATISTICS: UPPER 100mm

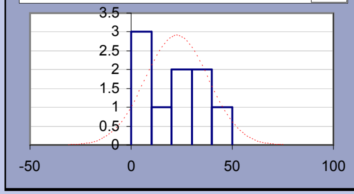
Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits
Project ref: 408.1291.00007 Data description:

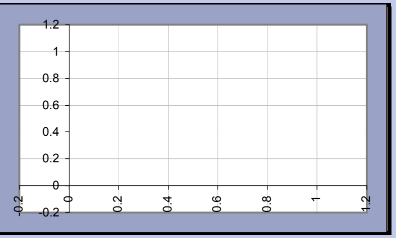
Date: 8th July 2009
User details: Jon Parry

Dataset:	Arsenic
Sample mean, $\overline{X}$	22.6
Sample standard deviation, s	15.54
Sample size, n	9
Critical concentration, Cc	180

Use Normal distribution to test for

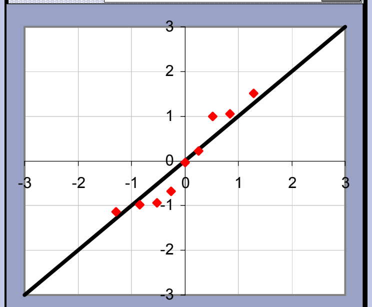


Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	1

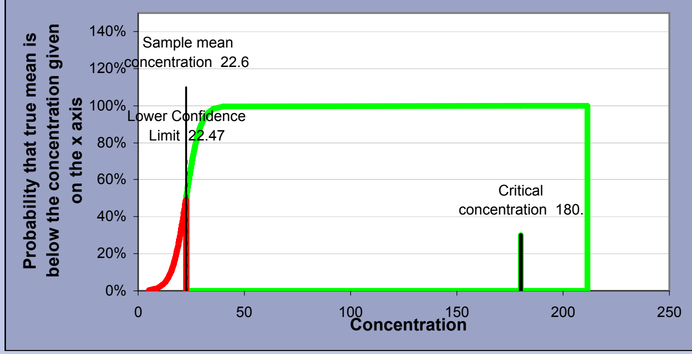


Normality test

Significance level:	5%
Normal distribution	
Use:	Auto: One-sample t-test



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	0%
Base decision on:	evidence level
Evidence level required:	51%
Balance of probability?	51%
Reject Null Hypothesis?	No

μ ≤ Cc

Back to data | Back to summary | Go to outlier test | Go to normality test

Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits

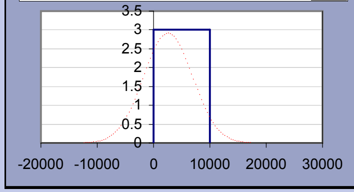
Project ref: 408.1291.00007 Data description:

Date: 8th July 2009

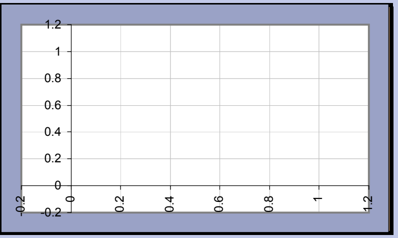
User details: Jon Parry

Dataset:	Lead
Sample mean, $\overline{X}$	2583.2
Sample standard deviation, s	4345.2
Sample size, n	3
Critical concentration, Cc	3300

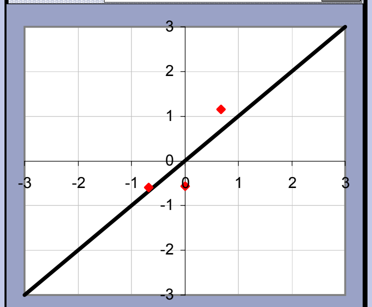
Use Normal distribution to test fo



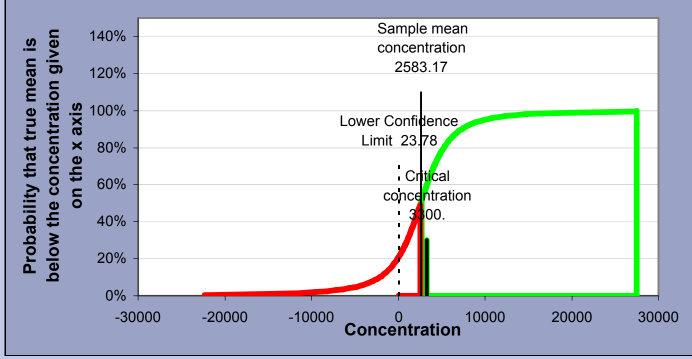
Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0



Normality test	
Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	40%
	lower bound	0%
Base decision on:	upper bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?		No

μ ≤ Cc

Back to data | Back to summary | Go to outlier test | Go to normality test

APPENDIX

SUMMARY STATISTICS: UPPER 300mm

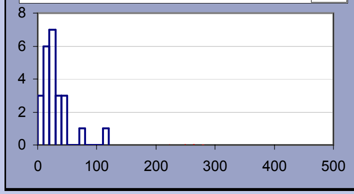
Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits
Project ref: 408.1291.00007 Data description:

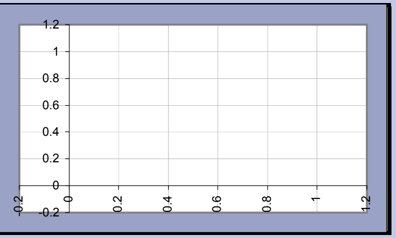
Date: 8th July 2009
User details: Jon Parry

Dataset:	Arsenic
Sample mean, $\overline{X}$	29.225
Sample standard deviation, s	23.156
Sample size, n	24
Critical concentration, Cc	180

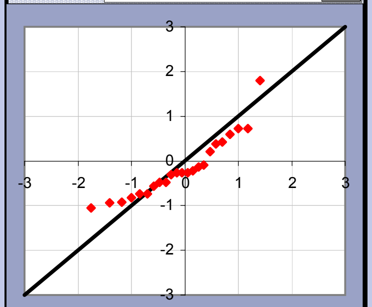
Use Log-Normal distribution to te



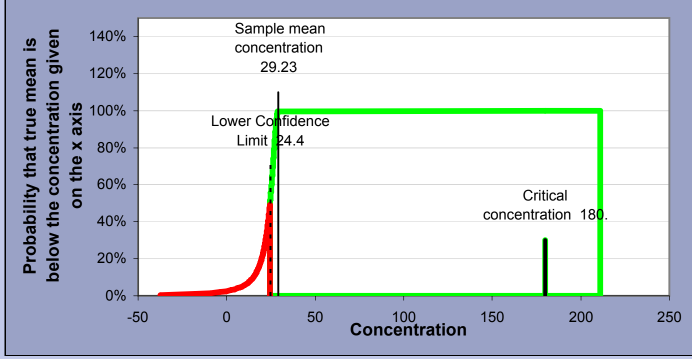
Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	1



Normality test	
Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	0%
	lower bound	0%
Base decision on:	lower bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?	No	

μ ≤ Cc

Back to data | **Back to summary** | **Go to outlier test** | **Go to normality test**

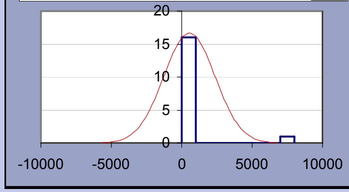
Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits Date: 8th July 2009

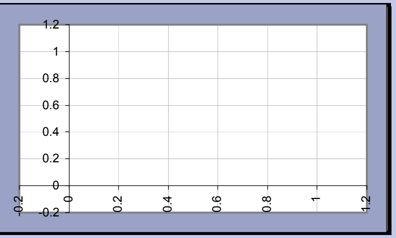
Project ref: 408.1291.00007 Data description: User details: Jon Parry

Dataset:	Lead
Sample mean, $\overline{X}$	544.28
Sample standard deviation, s	1820.4
Sample size, n	17
Critical concentration, Cc	3300

Use Normal distribution to test fo

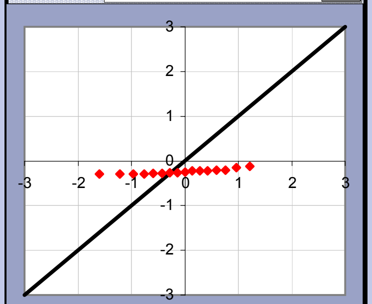


Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0

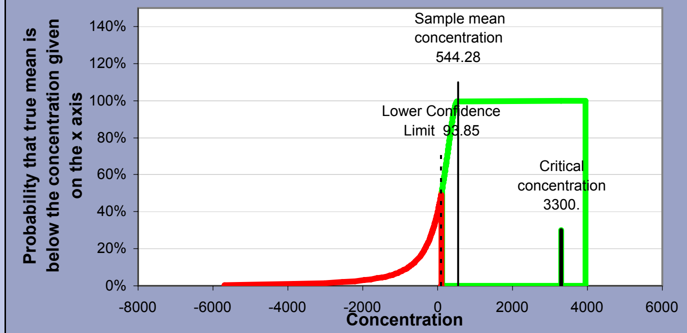


Normality test

Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	0%
	lower bound	0%
Base decision on:	lower bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?		No

μ ≤ Cc

Back to data | Back to summary | Go to outlier test | Go to normality test

APPENDIX

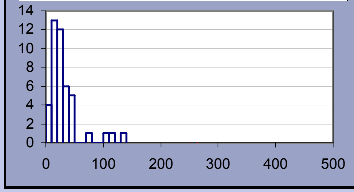
SUMMARY STATISTICS:
UPPER 500mm

Test Results

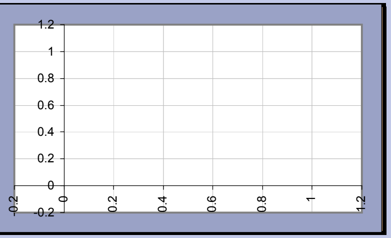
Client/client ref: King's Lynn & W Site ref: Harding's Pits
Project ref: 408.1291.00007 Data description:
Date: 8th July 2009
User details: Jon Parry

Dataset:	Arsenic
Sample mean, $\bar{X}$	30.684
Sample standard deviation, s	26.441
Sample size, n	44
Critical concentration, Cc	180

Use Log-Normal distribution to te



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	1

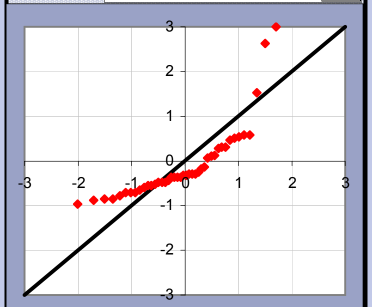


Normality test

Significance level: 5%

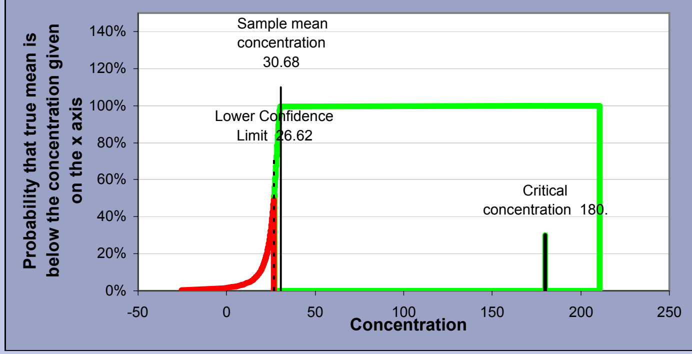
Non-normal distribution

Use: Auto: Chebychev



Test scenario: Part 2A: is true mean higher than critical concentration (μ > Cc)?

Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound / lower bound	0% / 0%
Base decision on:	lower bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?	No	

μ ≤ Cc

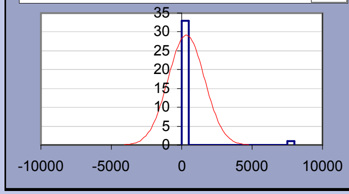
Back to data | Back to summary | Go to outlier test | Go to normality test

Test Results

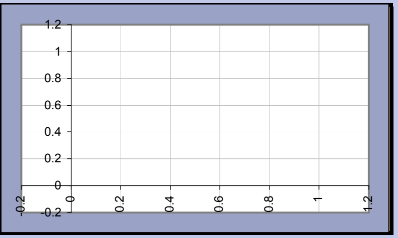
Client/client ref: King's Lynn & W Site ref: Harding's Pits | Date: 8th July 2009
Project ref: 408.1291.00007 | Data description: | User details: Jon Parry

Dataset:	Lead
Sample mean, $\overline{X}$	327.6
Sample standard deviation, s	1288.5
Sample size, n	34
Critical concentration, Cc	3300

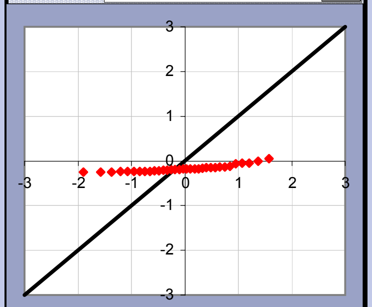
Use Normal distribution to test fo



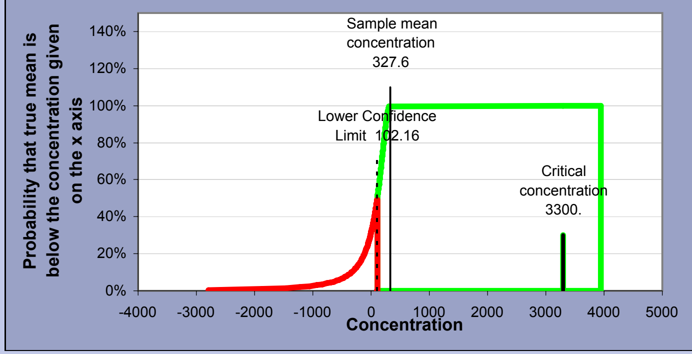
Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0



Normality test	
Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	0%
	lower bound	0%
Base decision on:	lower bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?	No	

μ ≤ Cc

Back to data | Back to summary | Go to outlier test | Go to normality test

APPENDIX

SUMMARY STATISTICS: UPPER 1m

Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits

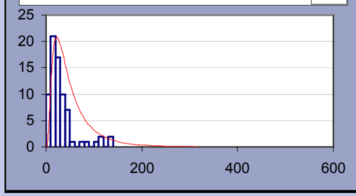
Project ref: 408.1291.00007 Data description:

Date: 8th July 2009

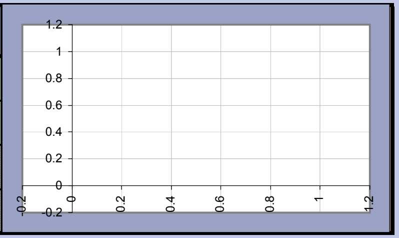
User details: Jon Parry

Dataset:	Arsenic
Sample mean, $\overline{X}$	30.466
Sample standard deviation, s	27.969
Sample size, n	73
Critical concentration, Cc	180

Use Log-Normal distribution to te



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	2

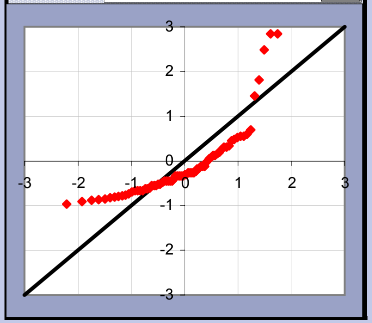


Normality test

Significance level: 5%

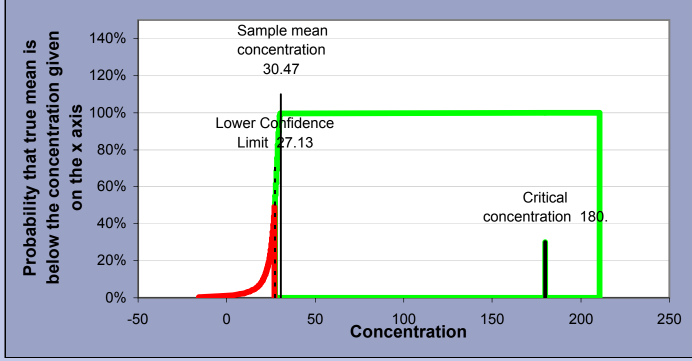
Non-normal distribution

Use: Auto: Chebychev



Test scenario: Part 2A: is true mean higher than critical concentration (μ > Cc)?

Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	**0%**
	lower bound	**0%**
Base decision on:	lower bound	
Evidence level required:		**51%**
Balance of probability?		51%
Reject Null Hypothesis?		No

μ ≤ Cc

Back to data | **Back to summary** | **Go to outlier test** | **Go to normality test**

Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits

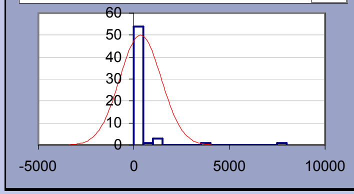
Project ref: 408.1291.00007 Data description:

Date: 8th July 2009

User details: Jon Parry

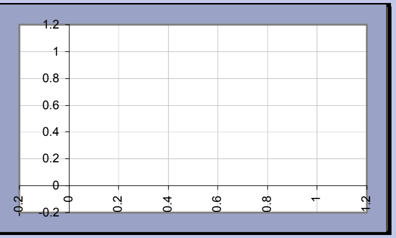
Dataset:	Lead
Sample mean, $\overline{X}$	342.91
Sample standard deviation, s	1083.3
Sample size, n	60
Critical concentration, Cc	3300

Use Normal distribution to test fo



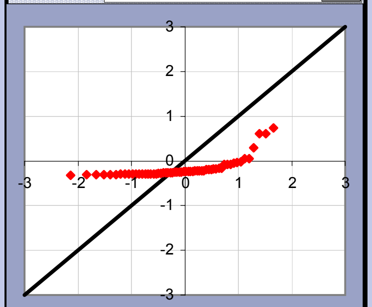
Outliers & non-detects

Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0

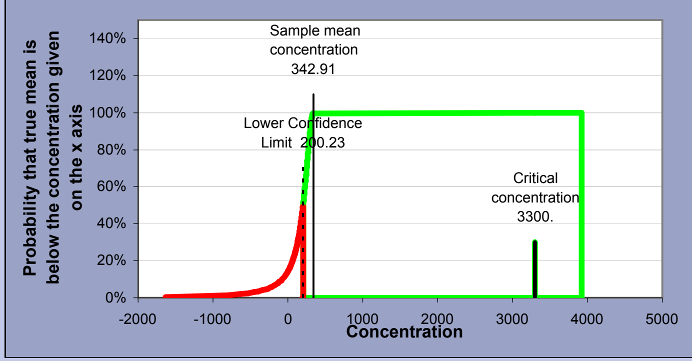


Normality test

Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound lower bound	0% 0%
Base decision on:	lower bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?	No	

μ ≤ Cc

Back to data

Back to summary

Go to outlier test

Go to normality test

APPENDIX F

ALcontrol Laboratories Analytical Services
Sample Descriptions

Job Number: 09/09815/02/01
Client: SLR Consulting Ltd
Client Ref : 408.1291.00007

Grain sizes

<0.063mm	Very Fine
0.1mm - 0.063mm	Fine
0.1mm - 2mm	Medium
2mm - 10mm	Coarse
>10mm	Very Coarse

Sample Identity	Depth (m)	Colour	Grain Size	Description	Batch
MS1	0.00-0.20	Dark Brown	0.1mm - 0.063mm	Loam (topsoil) with some Vegetation	1
MS2	0.00-0.20	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Vegetation	1
MS3	0.00-0.20	Brown	0.1mm - 0.063mm	Silt Loam	1
MS4	GL-0.20	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1
MS5	GL-0.20	Brown	0.1mm - 0.063mm	Sandy Silt Loam with some Stones	1
S1A	GL-0.20	Brown	0.1mm - 0.063mm	Loamy Sand with some Stones	1
S1B	GL-0.20	Brown	0.1mm - 0.063mm	Sandy Loam with some Stones	1
S2A	GL-0.20	Dark Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1
S2B	GL-0.20	Brown	0.1mm - 0.063mm	Sandy Clay Loam with some Stones	1
S3A	GL-0.20	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1
S3B	GL-0.20	Dark Brown	0.1mm - 0.063mm	Loam (topsoil) with some Vegetation	1
S4A	GL-0.20	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1
S4B	GL-0.20	Brown	0.1mm - 0.063mm	Clay Loam with some Stones	1
S5A	GL-0.20	Brown	0.1mm - 0.063mm	Silt Loam with some Stones	1
S5B	0.00-0.20	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1
S6A	GL-0.20	Brown	0.1mm - 0.063mm	Clay Loam with some Stones	1
S6B	GL-0.20	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1
S7A	GL-0.20	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1
S7B	GL-0.20	Brown	0.1mm - 0.063mm	Silt Loam with some Stones	1
S8A	GL-0.20	Brown	0.1mm - 0.063mm	Sandy Silt Loam with some Stones	1
S8B	GL-0.20	Brown	0.1mm - 0.063mm	Loamy Sand with some Stones	1

* These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials-whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.
Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
[1] Sample Description supplied by client

Validated ✓
Preliminary ☐

ALcontrol Laboratories Analytical Services
Table Of Results

$^{\#}$ ISO 17025 accredited
^{M} MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 09/09815/02/01
Matrix: SOLID
Client: SLR Consulting Ltd
Location: HARDINGS PITS
Client Ref. No.: 408.1291.00007
Client Contact: Peter Warland

Sample Identity	MS1	MS2	MS3	MS4	MS5	S1A	S1B	S2A	S2B	**Method Code**	**LoD/Units**
Depth (m)	0.00-0.20	0.00-0.20	0.00-0.20	GL-0.20	GL-0.20	GL-0.20	GL-0.20	GL-0.20	GL-0.20		
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID		
Sampled Date	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09		
Sample Received Date	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09		
Batch	1	1	1	1	1	1	1	1	1		
Sample Number(s)	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**		
Arsenic	30	34	12	10	35	7	17	49	70	$TM129^{\#}_{M}$	<3.0 mg/kg
Lead	330	330	18	14	420	32	72	390	350	$TM129^{\#}_{M}$	<2 mg/kg

All results expressed on a dry weight basis.

Date 09.10.2009

Validated ✓

Preliminary

ALcontrol Laboratories Analytical Services
Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 09/09815/02/01 **Matrix:** SOLID
Client: SLR Consulting Ltd **Location:** HARDINGS PITS
Client Ref. No.: 408.1291.00007 **Client Contact:** Peter Warland

Sample Identity	S3A	S3B	S4A	S4B	S5A	S5B	S6A	S6B	S7A	**Method Code**	**LoD/Units**
Depth (m)	GL-0.20	GL-0.20	GL-0.20	GL-0.20	GL-0.20	0.00-0.20	GL-0.20	GL-0.20	GL-0.20		
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID		
Sampled Date	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09		
Sample Received Date	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09		
Batch	1	1	1	1	1	1	1	1	1		
Sample Number(s)	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**		
Arsenic	16	16	11	10	7	9	16	13	10	$TM129^{\#}_{M}$	<3.0 mg/kg
Lead	210	180	59	83	21	28	91	93	150	$TM129^{\#}_{M}$	<2 mg/kg

All results expressed on a dry weight basis.

Date 09.10.2009

Validated ☑
Preliminary ☐

ALcontrol Laboratories Analytical Services
Table Of Results

\# ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 09/09815/02/01 **Matrix:** SOLID
Client: SLR Consulting Ltd **Location:** HARDINGS PITS
Client Ref. No.: 408.1291.00007 **Client Contact:** Peter Warland

Sample Identity	S7B	S8A	S8B							Method Code	LoD/Units
Depth (m)	GL-0.20	GL-0.20	GL-0.20								
Sample Type	SOLID	SOLID	SOLID								
Sampled Date	20.08.09	20.08.09	20.08.09								
Sample Received Date	02.09.09	02.09.09	02.09.09								
Batch	1	1	1								
Sample Number(s)	**31**	**29**	**30**								
Arsenic	<3	54	<3							TM129$^{\#}_{M}$	<3.0 mg/kg
Lead	36	130	15							TM129$^{\#}_{M}$	<2 mg/kg

All results expressed on a dry weight basis.

Date 09.10.2009

ALcontrol Laboratories Analytical Services
Table Of Results - Appendix

Job Number: 09/09815/02/01
Client: SLR Consulting Ltd
Client Ref. No.: 408.1291.00007

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP	No Determination Possible	*	Subcontracted test
ACM	Asbestos Containing Materia	»	Result previously reported (Incremental reports only)
#	ISO 17025 accredited	M	MCERTS Accredited
		EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample ¹	Surrogate Corrected
TM129	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Metal Cations by IRIS Emission Spectrometer	✓	✓	DRY	

¹ Applies to Solid samples only. **DRY** indicates samples have been dried at 35°C. **NA** = not applicable.
WET indicates samples analysed as submitted.

ALcontrol Laboratories Analytical Services
Table Of Results - Appendix

Job Number: 09/09815/02/01
Client: SLR Consulting Ltd
Client Ref. No.: 408.1291.00007

Summary of Coolbox temperatures

Batch No.	Coolbox Temperature (°C)
1	12*C

ALcontrol Laboratories Analytical Services
Sample Descriptions

Job Number: 09/09815/02/01
Client: SLR Consulting Ltd
Client Ref : 408.1291.00007

Grain sizes

<0.063mm	Very Fine
0.1mm - 0.063mm	Fine
0.1mm - 2mm	Medium
2mm - 10mm	Coarse
>10mm	Very Coarse

Sample Identity	Depth (m)	Colour	Grain Size	Description	Batch
FS1A	0.30-0.60	Brown	0.1mm - 0.063mm	Loamy Sand with some Stones	1
FS1B	0.30-0.60	Brown	0.1mm - 0.063mm	Clay Loam	1
FS2A	0.30-0.60	Brown	0.1mm - 0.063mm	Loamy Sand with some Stones	1
FS2B	0.30-0.60	Brown	0.1mm - 0.063mm	Silt Loam with some Stones	1
FS3A	0.30-0.60	Brown	0.1mm - 0.063mm	Silt Loam with some Stones	1
FS3B	0.30-0.60	Brown	0.1mm - 0.063mm	Sandy Loam with some Stones	1
FS4A	0.20-0.60	Brown	0.1mm - 0.063mm	Loamy Sand with some Stones	1
FS4B	0.20-0.60	Brown	0.1mm - 0.063mm	Sandy Silt Loam with some Stones	1
FS5A	0.20-0.60	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1
FS5B	0.20-0.60	Brown	0.1mm - 0.063mm	Loam (topsoil) with some Stones	1

* These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials-whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.
Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
[1] Sample Description supplied by client

Validated ✓

Preliminary ☐

ALcontrol Laboratories Analytical Services
Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 09/09815/02/01 **Matrix:** SOLID
Client: SLR Consulting Ltd **Location:** HARDINGS PITS
Client Ref. No.: 408.1291.00007 **Client Contact:** Peter Warland

Sample Identity	FS1A	FS1B	FS2A	FS2B	FS3A	FS3B	FS4A	FS4B	FS5A	**Method Code**	**LoD/Units**
Depth (m)	0.30-0.60	0.30-0.60	0.30-0.60	0.30-0.60	0.30-0.60	0.30-0.60	0.20-0.60	0.20-0.60	0.20-0.60		
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID		
Sampled Date	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09	20.08.09		
Sample Received Date	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09	02.09.09		
Batch	1	1	1	1	1	1	1	1	1		
Sample Number(s)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		
Arsenic	13	12	25	94	67	32	17	19	37	TM129#M	<3.0 mg/kg
Lead	23	19	160	650	560	320	71	110	120	TM129#M	<2 mg/kg

All results expressed on a dry weight basis.

Date 16.09.2009

Validated ✓

Preliminary

ALcontrol Laboratories Analytical Services
Table Of Results

$^{\#}$ ISO 17025 accredited
^{M} MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 09/09815/02/01
Client: SLR Consulting Ltd
Client Ref. No.: 408.1291.00007
Matrix: SOLID
Location: HARDINGS PITS
Client Contact: Peter Warland

Sample Identity	FS5B									Method Code	LoD/Units
Depth (m)	0.20-0.60										
Sample Type	SOLID										
Sampled Date	20.08.09										
Sample Received Date	02.09.09										
Batch	1										
Sample Number(s)	**10**										
Arsenic	19									TM129$^{\#}_{M}$	<3.0 mg/kg
Lead	40									TM129$^{\#}_{M}$	<2 mg/kg

All results expressed on a dry weight basis.

Date 16.09.2009

ALcontrol Laboratories Analytical Services
Table Of Results - Appendix

Job Number: 09/09815/02/01
Client: SLR Consulting Ltd
Client Ref. No.: 408.1291.00007

Report Key :

			Results expressed as (e.g.) 1.03E-07 is equivalent to $1.03x10^{-7}$
NDP	No Determination Possible	*	Subcontracted test
ACM	Asbestos Containing Materia	»	Result previously reported (Incremental reports only)
#	ISO 17025 accredited	M	MCERTS Accredited
		EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample ¹	Surrogate Corrected
TM129	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Metal Cations by IRIS Emission Spectrometer	✓	✓	DRY	

¹ Applies to Solid samples only. **DRY** indicates samples have been dried at 35°C. **NA** = not applicable.
WET indicates samples analysed as submitted.

ALcontrol Laboratories Analytical Services
Table Of Results - Appendix

Job Number: 09/09815/02/01
Client: SLR Consulting Ltd
Client Ref. No.: 408.1291.00007

Summary of Coolbox temperatures

Batch No.	Coolbox Temperature (°C)
1	12*C

Peter Warland

Copy

Analysis commisioned by:
Matthew Jones, SLR Consulting Ltd

AR-09-UD-056893-01

Report generated on 01.09.2009

Date received : 24.08.2009

Purchase Order : CS-408-0982

Certificate Of Analysis

Lab. sample no/ Your references	Arsenic UD401 ICPMS/005* mg/kg	Cadmium UD033 ICPMS/010* mg/kg	Lead UD032 ICPMS/010* mg/kg	Mercury UD579 ICPMS/010* mg/kg
400-2009-20045064 **Hardings Pits (408.1291.00007) FS1a**	0.019	<0.001	0.040	<0.001
400-2009-20045065 **Hardings Pits (408.1291.00007) FS1b**	0.006	<0.001	0.040	<0.001
400-2009-20045066 **Hardings Pits (408.1291.00007) FS2a**	0.003	<0.001	0.027	<0.001
400-2009-20045067 **Hardings Pits (408.1291.00007) FS2b**	0.003	<0.001	0.018	<0.001
400-2009-20045068 **Hardings Pits (408.1291.00007) FS3a**	<0.002	<0.001	0.006	<0.001

Unless stated, all results are expressed on a sample as received basis.
† Indicates that this test was subcontracted
Opinions and/or interpretations within this report are outside our accreditation scope.
* Indicates that this determination is not included in the UKAS accreditation schedule for the laboratory.

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Lab. sample no/ Your references	Arsenic UD401 ICPMS/005* mg/kg	Cadmium UD033 ICPMS/010* mg/kg	Lead UD032 ICPMS/010* mg/kg	Mercury UD579 ICPMS/010* mg/kg
400-2009-20045069 **Hardings Pits (408.1291.00007) FS3b**	0.017	<0.001	0.009	<0.001
400-2009-20045070 **Hardings Pits (408.1291.00007) FS4a**	0.006	<0.001	0.021	<0.001
400-2009-20045071 **Hardings Pits (408.1291.00007) FS4b**	<0.002	<0.001	0.013	<0.001
400-2009-20045072 **Hardings Pits (408.1291.00007) FS5a**	<0.002	<0.001	0.012	<0.001
400-2009-20045073 **Hardings Pits (408.1291.00007) FS5b**	<0.002	<0.001	0.012	<0.001

Report Validated by: Keith Way

Unless stated, all results are expressed on a sample as received basis.
† Indicates that this test was subcontracted
Opinions and/or interpretations within this report are outside our accreditation scope.
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APPENDIX G

APPENDIX

SUMMARY STATISTICS: UPPER 200mm

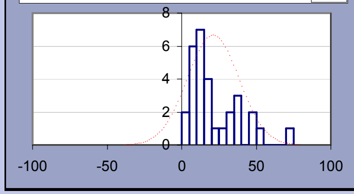
Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits
Project ref: 408.1291.00007 Data description:

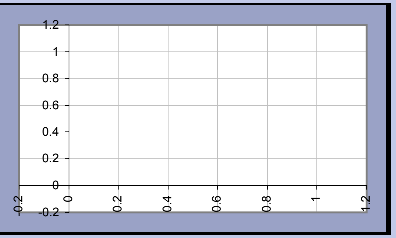
Date: 13th October 2009
User details: Jon Parry

Dataset:	Arsenic
Sample mean, $\overline{X}$	21.08
Sample standard deviation, s	17.291
Sample size, n	30
Critical concentration, Cc	180

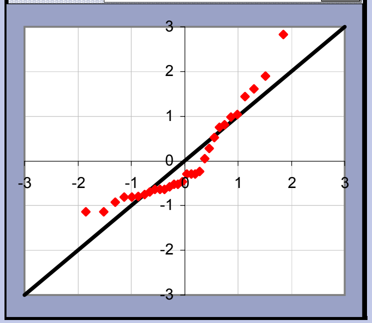
Use Normal distribution to test fo



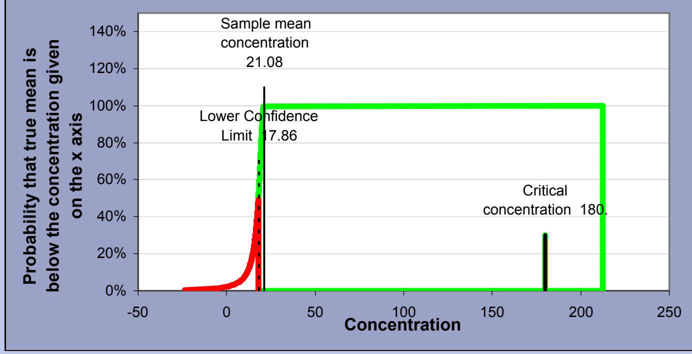
Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	3



Normality test	
Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	0%
	lower bound	0%
Base decision on:	lower bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?	No	

μ ≤ Cc

Back to data | Back to summary | Go to outlier test | Go to normality test

Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits

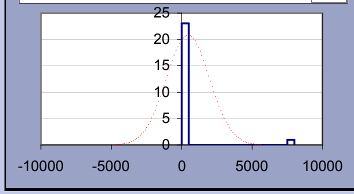
Project ref: 408.1291.00007 Data description:

Date: 13th October 2009

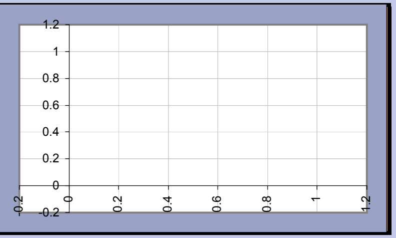
User details: Jon Parry

Dataset:	Lead
Sample mean, $\overline{X}$	450.06
Sample standard deviation, s	1528.6
Sample size, n	24
Critical concentration, Cc	3300

Use Normal distribution to test fo

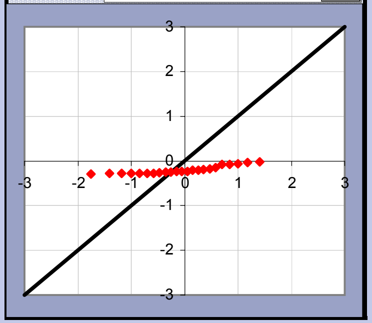


Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0

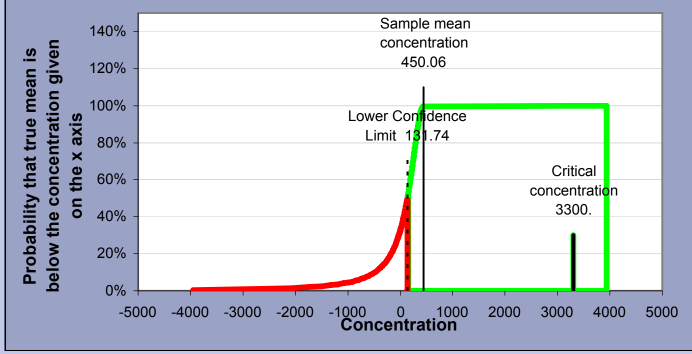


Normality test

Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	**0%**
	lower bound	**0%**
Base decision on:	lower bound	
Evidence level required:		**51%**
Balance of probability?		51%
Reject Null Hypothesis?	No	

μ ≤ Cc

Back to data | **Back to summary** | **Go to outlier test** | **Go to normality test**

APPENDIX

SUMMARY STATISTICS:
200-600mm Root Zone

Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits

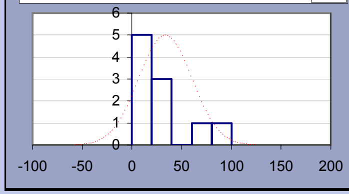
Project ref: 408.1291.00007 Data description:

Date: 13th October 2009

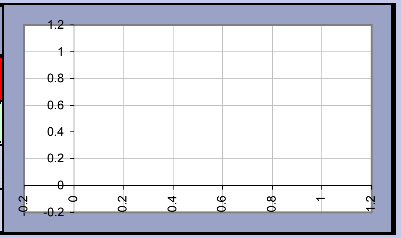
User details: Jon Parry

Dataset:	Arsenic
Sample mean, $\overline{X}$	33.5
Sample standard deviation, s	26.759
Sample size, n	10
Critical concentration, Cc	62

Use Normal distribution to test fo

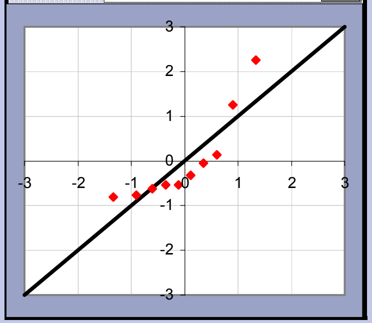


Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0

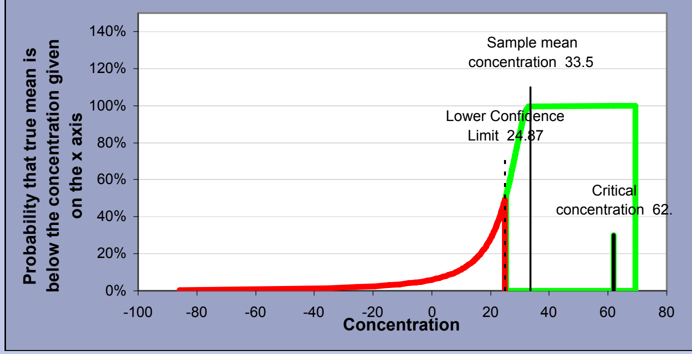


Normality test

Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	0%
	lower bound	0%
Base decision on:	lower bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?	No	

μ ≤ Cc

Back to data | Back to summary | Go to outlier test | Go to normality test

Test Results

Client/client ref: King's Lynn & W Site ref: Harding's Pits

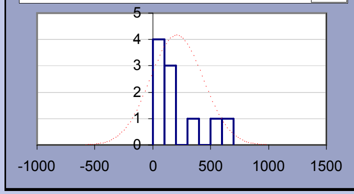
Project ref: 408.1291.00007 Data description:

Date: 13th October 2009

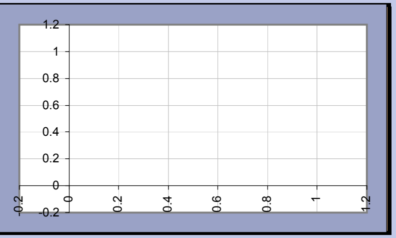
User details: Jon Parry

Dataset:	Lead
Sample mean, $\overline{X}$	207.3
Sample standard deviation, s	228.13
Sample size, n	10
Critical concentration, Cc	1470

Use Normal distribution to test fo

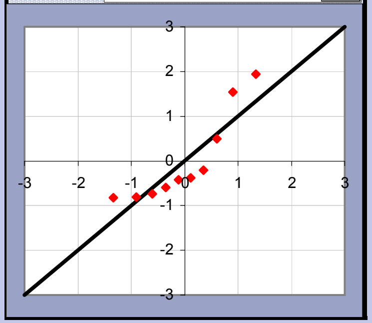


Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	0

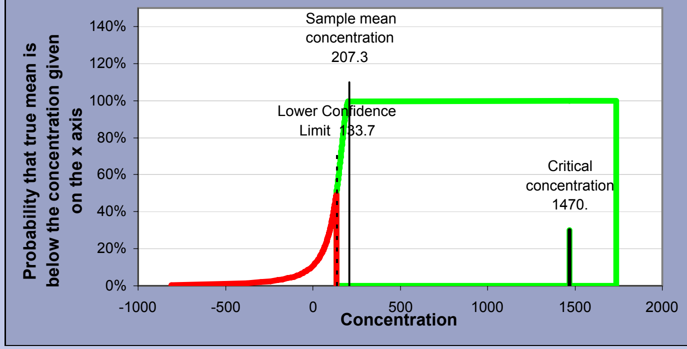


Normality test

Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Part 2A: is true mean higher than critical concentration (μ > Cc)?
Null hypothesis:	The true mean concentration is equal to or less than the critical concentration: μ≤ Cc
Alternative hypothesis:	The true mean concentration is greater than the critical concentration: μ > Cc



Evidence against Null hypothesis:	upper bound	0%
	lower bound	0%
Base decision on:	lower bound	
Evidence level required:		51%
Balance of probability?		51%
Reject Null Hypothesis?	No	

μ ≤ Cc

Back to data | Back to summary | Go to outlier test | Go to normality test