



Use of Potentially Contaminated Residential Land, Gardens and Allotments – Public Health Factsheet

Key Points

- to date there is very limited data linking any health effects with land contamination in England
- continue to enjoy using your garden space as you normally would, including grassed areas, planted areas, decking, patios and other areas of hardstanding
- follow normal hygiene precautions and wash hands thoroughly after working or playing in the garden or allotment, especially when in contact with soil and before handling food, drink or when smoking
- wash and peel any produce grown in the soil in order to remove any soil or dust

1. Background

As with many other industrialised nations, the UK has a legacy of contaminated sites, including former factories, mines, steelworks, refineries and landfills. At these sites, there can be a variety of potentially harmful substances such as oils and tars, waste metals, organic compounds, gases and mining materials that are left over from, or created by, historical activities on site. DEFRA, in their Statutory Guidance (DEFRA 2012), note that on all land there are background levels of substances, including substances that are naturally present as a result of the varied and complex geology in England (eg metals) and also substances resulting from diffuse human pollution (eg road traffic pollution). However, there are greater concentrations of contaminants in some areas, often associated with historic industrial use and waste disposal, and in a minority of cases these may be sufficient to pose a risk to public health or the environment.

The legal framework established to deal with contaminated land in England is Section 57 of the Environment Act 1995 which created Part 2A of the Environmental Protection Act 1990

("Part 2A"). Land is only considered to be "contaminated land" in the legal sense, if it poses a sufficiently high risk to justify action, and meets the criteria for Part 2A. Land has to pose a "significant harm" or a "significant possibility of significant harm" to human health (see box below). Other terms, such as "land affected by contamination" or "land contamination", are used to describe the much broader categories of land where contaminants are present but not sufficient to be determined as a public health risk to meet the legal definition for contaminated land. On the large majority of potential sites investigated, there may be some contamination but the risks will be low as there is no link between the contamination and the public potentially at risk from it, or the concentrations are not high enough to cause harm.

Thus, there has to be a "contaminant linkage" for harm to occur (sometimes referred to as "pollutant linkage"). There needs to be a source of contamination at a concentration that could potentially cause harm, there has to be public that are present and there needs to be a pathway of exposure. Consequently, a site may be heavily contaminated, but if it cannot be accessed by the public it cannot pose a risk. All 3 parts of the linkage – source - pathway- receptor - must be present.

The Statutory Guidance (2012) states that:

The following health effects should always be considered to constitute significant harm to human health: death; life threatening diseases (eg cancers); other diseases likely to have serious impacts on health; serious injury; birth defects; and impairment of reproductive functions.

Other health effects may be considered by the local authority to constitute significant harm. For example, a wide range of conditions may or may not constitute significant harm (alone or in combination) including: physical injury; gastrointestinal disturbances; respiratory tract effects; cardio-vascular effects; central nervous system effects; skin ailments; effects on organs such as the liver or kidneys; or a wide range of other health impacts.

In deciding whether or not a particular form of harm is significant harm, the local authority should consider the seriousness of the harm in question: including the impact on the health, and quality of life, of any person suffering the harm; and the scale of the harm. The authority should only conclude that harm is significant if it considers that treating the land as contaminated land would be in accordance with the broad objectives of the regime.

Under Part 2A, local authorities have a legal obligation to inspect their areas to identify and remove unacceptable risks to public health and the environment, and act as a regulator to ensure that contaminated land is made suitable for its current use. The Environment Agency acts as a secondary regulator responsible for "special sites" (eg relating to specified types of pollution and water pollution). The Part 2A regime covers both non-radioactive and radioactive contamination. For current sites where there is the possibility of pollution that is not historic, such sites are regulated by the Environment Agency under the Environmental Permitting Regulations (EPR) and land, air and water (and thus public health) is protected.

The process of assessing a site for land contamination takes time. The soil, any ground or surface water, and in some cases, gas and vapour originating from the ground, should be

sampled, analysed and the hazards identified. A risk assessment is then carried out to see if the sampled concentrations could impact on public health; the identification of a contaminant linkage, linking the contamination source to a receptor such as a human is considered. Many contaminating substances accumulate or persist in the soil, and the public can become exposed to these substances by direct contact with the soil itself, by inhalation of dust outdoors or indoors from soil tracked into the house or by inhalation of gases and vapours indoors and outdoors. Exposure can also occur by directly ingesting soil by hand-to-mouth contact after gardening or playing outside and substances may also enter the human food chain when we consume produce grown in the soil.

To date, there is little conclusive evidence of serious health effects from the types and levels of land contamination found in England. However, some sites could pose significant risks to health from long-term exposure based on the known toxicology of contaminants. Equally the likely chance and amount of the dose, depends on the potential exposure pathways from which the public could be exposed. In light of these potential risks there is good reason to take a precautionary approach to dealing with land potentially affected by contamination.

Following the precautionary approach, Public Health England (PHE) is regularly asked by local authorities to provide generic health advice for members of the public whose homes, gardens and allotment plots are being investigated as potentially contaminated land under Part 2A of the Environmental Protection Act 1990.

However, one of the general principles of the precautionary principle is that there should be proportionality between the measures taken and the chosen level of protection. The Statutory Guidance supports this by noting that it is for the local authority to determine that the burdens faced by individuals, companies and society from actions such as remediation are proportionate, manageable and compatible with the principles of sustainable development.

PHE has no specific statutory role in relation to contaminated land, but plays an advisory role in the overall health risk assessment process. We work alongside other government agencies (e.g. Environment Agency) on the development of contaminated land policy including provision of expert advice such as the toxicology of chemicals. We also provide advice to local authorities on matters including risk assessment and risk communication. PHE has provided some generic 'Do's and Don'ts' advice in Section 4 below for local authorities to use when communicating with members of the public.

2. Chemicals involved

Sites with the potential to be contaminated are areas of historic industrial use that have been used for waste disposal, military or mining purposes, or had an accidental or deliberate release of chemicals in the past. A report carried out in 2014 for DEFRA indicated that between 2000 and 2013, most sites found to have a reasonable possibility of impacting public health were driven by chemicals such as arsenic, lead, nickel, chromium and the

polycyclic aromatic hydrocarbons (PAHs) especially benzo[a]pyrene, all found in soil or water. A small proportion of sites were impacted by vapour/gas, generally related to carbon dioxide or methane. Asbestos may also be present on sites.

Although sites which might have a historic source on them may seem numerous, the Environment Agency (2005) estimated that only around 300,000 hectares (ha) of contaminated land potentially existed on 325,000 sites; about 2% of land use. This applied however to England and Wales, with a separate report identifying 3,720 ha or 725 sites for Wales, which results in approximately 296,000 ha in England. This was based on past activities which could have led to contamination (i.e. a historic source), but only a very small proportion of this land would be “contaminated land” in the legal sense.

Where areas of land have been investigated by the local authority or the Environment Agency under Part 2A, and identified land as *potentially* contaminated by historic practices and industry, this does not mean that the site is legally defined as contaminated, but does mean that there is potential for contamination which *could* impact on public health. The number of sites actually determined as contaminated land is unknown as all councils hold their own information on <https://data.gov.uk/>, but based on estimates from the 2005, 2009 and 2016 reports, the number of determinations is probably 10% of the 11,000 sites investigated in detail, which is a small percentage of the sites inspected.

3. Public health implications

Revised Statutory Guidance to support Part 2A of the Environmental Protection Act 1990 was published in April 2012 (DEFRA 2012). This Guidance introduced a new four-category system for classifying land under Part 2A for cases of a “Significant Harm” or “Significant Possibility of Significant Harm” to human health which would both give rise to “unacceptable risk”, where supported by robust science-based evidence, and the determination of the site as “Contaminated Land” under Part 2A.

Category 1 includes land where the level of risk is clearly unacceptable (“significant harm”) and Category 4 includes land where the level of risk posed is acceptably low. The Category 2/3 border defines the point at which land is determined as contaminated land under the legislation.

The following definitions apply:

Category 1:

- a) The authority is aware that similar land or situations are known, or are strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere; or
- b) the authority is aware that similar degrees of exposure (via any medium) to the contaminant(s) in question are known, or strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere;
- c) the authority considers that **significant harm** may already have been caused by contaminants in, on or under the land, and that there is an unacceptable risk that it might continue or occur again if no action is taken

Category 2:

- a) There is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a **significant possibility of significant harm**;
- b) land where there is little or no direct evidence that similar land/situations/exposure have caused harm before, but the authority considers on the basis of the available evidence, including expert opinion, that there is a strong case for taking action under Part 2A on a precautionary basis

Category 3: (Not designated as Contaminated Land)

- a) A strong case does not exist, and therefore the legal test for significant possibility of significant harm is not met.
- b) Land where the risks are not low, but nonetheless the authority considers that regulatory intervention under Part 2A is not warranted.
(This recognises that placing land in Category 3 would not stop others, such as the owner or occupier of the land, from taking action to reduce risks outside of the Part 2A regime if they choose).

Category 4: (Not designated as Contaminated Land)

- a) There is no risk or the level of risk posed is low.
- b) Land where no relevant contaminant linkage has been established.
- c) Where there are only normal levels of contaminants in soil.

The process of determination or not can take considerable time and has the potential to cause public anxiety over the health risks and disruption caused. Because of this, it's important that risk communication is undertaken early, and the status and potential likelihood of risks of the site are discussed with affected members of the public.

Once a desk based study is complete and the local authority has identified the site as potentially contaminated, the local authority will need to seek permission from the current land owner to take samples, and avoid as much disruption as possible. Work may be tendered by the local authority increasing the time period. The samples will need to be analysed for relevant chemicals, the toxicity assessed along with the likely ways that the public could come into contact with the substance. These form the first part of the risk assessment; the assessment of "source-pathway-receptor", or the "contaminant linkage". As stated in section 1, all need to be present for a risk to be present.

The risk assessment will determine if the risk is likely to be unacceptable to whoever is living on, or using the land. If unacceptable, and remediation of some sort is required, then this will have to be assessed before remediation commences. However it should be noted that:

- intervention can cause public anxiety over possible health risks and effects on house prices, property blight, and high levels of inconvenience and disruption for affected people (often for many months or years) while sites are investigated or remediated
- there is growing evidence (DEFRA 2009, 2014a) that stress related health impacts of regulatory intervention might outweigh any health benefits of investigating and remediating land where there is only a low/hypothetical risk
- remediation can create risks if contaminants are mobilised during remediation works; there are various environmental impacts from heavy engineering works; and remediation often destroys soil or sees it removed to landfills
- remediation of land is also expensive and any costs to individuals, businesses and the taxpayer need to be justified

There may be a period before remediation when a residential area or allotment is determined as contaminated land and all landowners notified but is not immediately being remediated. Where the site is a Category 1, use of outdoor spaces may need to be avoided. However, under Category 2 or 3 the land can be used, but good hygiene practices should be followed.

4. Public health advice

Public health advice on contaminated sites is aimed at reducing contact with the soil by taking sensible measures, until solutions to remove or decrease the risk can be found and implemented.

Exposure pathways may be by direct contact with contaminated soil during gardening or playing, inhalation of contaminated dust and/or vapour and gasses or the direct ingestion (eating) of contaminated soil by eating or drinking with soil-stained hands. Other pathways might include the eating of vegetables or fruit grown in contaminated soil. If the pathway is removed, then exposure by that pathway is removed. Children are especially vulnerable to contaminants due to their physique and their behaviour. In relation to their size, they eat more and breathe more air than adults. They do not have the necessary experience to identify dangers and sources of harm, and often investigate things, such as dirt, by putting it into their mouths.

Gardens, allotments and green space are beneficial for mental health and wellbeing, physical activity and in some cases access to healthy food. Therefore, precautions are aimed at exposure reduction, allowing the home owner/occupier to still enjoy their garden, allotment or green space (see NHS Choices).

The issue of soil contamination in relation to food growing is complex. Some vegetables or cultivars can uptake contaminants more than others, and some may retain any contaminants in residual soil engrained in the surface of the produce. Generally the growing of produce is of health benefit due to the physical activity and the consumption of fresh fruit and vegetables. The Food Standards Agency provides advice on food consumption and can provide advice to the local authority.

These are some Dos and Don'ts to be aware of until the local authority has resolved any potential contamination issues (Category 2), and which can be retained as good advice where a site is categorised as Category 3. They provide some general advice about using your garden, local green space or allotment plot. For information on vegetables and fruits, the Food Standard Agency (FSA) can provide advice: www.food.gov.uk/

DO

1. Continue to enjoy using all of your garden space as you normally would, including grassed areas, decking, patios and other areas of hardstanding. Reduce dust in your garden or allotment by covering bare soil with ground cover, compost, bark or mulch, which will reduce the impact of air-borne contamination (ie dust) and the spread of contamination by wind. This is particularly important if children play at this location as it reduces the risk of getting soil on their hands and feet.
2. Flower beds could be planted with plants which cover the soil.
3. Wear gloves when gardening. If you have cuts or sores, be especially attentive to avoiding any direct contact with the soil.
4. Follow normal hygiene precautions and wash hands thoroughly after working or playing in the garden or allotment and before handling food, drinking or smoking.
5. Remove and clean your outdoor gardening shoes before entering your home; indoor dust may become contaminated if you don't wipe your feet or take off your shoes.
6. Talk to your local authority before undertaking building works.
7. If you grow vegetables or fruit in your garden or on your allotment then there are also a number of things you can do to reduce exposure. These are:
 - Wash produce thoroughly under a running tap and rub them in a bowl of fresh water. For many contaminants, soil and dirt will splash onto the outer surfaces of fruit and vegetables, so removing the outer leaves of green vegetables and washing well will remove contamination before consumption
 - Peeling root vegetables acts in the same way as washing to reduce the adhered soil

- Soil and dirt on the outer surfaces of vegetables and fruit makes a significant contribution to overall levels of contamination of the crop, often more than from uptake of the contaminants from the soil into the plant.
- If you are concerned you may wish to consume fruit and vegetables from a variety of sources in addition to produce grown in your garden or allotment as part of a balanced diet
- Lower the concentrations of contaminants by adding clean soil and organic matter (clean compost and manure) to the existing soil to dilute the contamination.
- Grow vegetables and fruit in containers of clean (imported) soil, or in raised beds (600mm) with geotextile membrane at the base to prevent soil mixing, but allowing rainwater to infiltrate the soil, will prevent contamination of vegetables and fruit

DON'T

1. Let children play directly with the soil or put it in their mouths, children should be supervised when playing in gardens or allotments where there is contaminated soil.
2. Take tools, gloves and shoes into your car or home without cleaning them first.
3. Let children bite their nails.
4. Let pets dig holes in your allotment or garden.
5. Dig holes for building works without talking to your local authority first.

5. Links and further guidance

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Environment Agency 2009. Dealing with contaminated land in England and Wales. A review of progress from 2000-2007 with Part 2A of the Environmental Protection Act Environment Agency. Environment Agency. Found at:
www.gov.uk/government/publications/contaminated-land-reports

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Environmental Protection UK Growing Edible Crops:
www.environmental-protection.org.uk/policy-areas/land-quality/papers/growing-edible-crops/ accessed August 2018

Environmental Protection UK Contaminated Land and Your Home:
www.environmental-protection.org.uk/policy-areas/land-quality/papers/contaminated-land-and-your-home/ accessed August 2018

Grow your own Scotland - Guide for Growing on land that may be contaminated:
www.growyourownsotland.info/wp-content/uploads/images/Guide-for-growing-on-contaminated-land.pdf

NHS Choices at: www.nhs.uk/news/lifestyle-and-exercise/

NHS – Eat Well, How to wash fruit and vegetables: www.nhs.uk/live-well/eat-well/how-to-wash-fruit-and-vegetables/ (accessed January 2019)

Royal Horticultural Society 'Minimising health risks in the garden' at:
www.rhs.org.uk/advice/profile?pid=541 (accessed January 2019)

Toronto Public Health. Assessing Urban Impacted Soil for Urban Gardening: Decision Support Tool - Technical Report and Rationale. Toronto: City of Toronto, May 2011.

USEPA 2011 Reusing Potentially Contaminated Landscapes: Growing Gardens in Urban Soils Report No. EPA/542/F-10/011, Office of Superfund Remediation and Technology Innovation: www.epa.gov/sites/production/files/2014-03/documents/urban_gardening_fina_fact_sheet.pdf accessed August 2018
WHO 1999 Contaminated Soil in Gardens. How to avoid the harmful effects. Report EUR/ICP/LVNG 03 01 02(A) E64737. WHO:
www.euro.who.int/__data/assets/pdf_file/0009/119187/E64737.pdf

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