

## BRITISH GEOLOGICAL SURVEY (BGS) GLASGOW SOIL QUALITY SURVEY

### QUESTIONS AND ANSWERS

#### What is the G-BASE Glasgow Soil Survey?

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The Glasgow Soil Survey is part of a national programme known as the Geochemical Baseline Survey of the Environment (G-BASE) to measure and map the chemical status of the UK surface environment.

Through this survey, the BGS quantifies variations in the chemistry of the surface environment including the soils beneath our cities.

#### Results

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Results from the Glasgow Soil project provide unique information on soil chemistry in the urban environment. Characterising the soil quality of Glasgow will enhance our understanding of interactions between people, ecosystems and the environment.

The Glasgow Soil Survey results are indicative in character; therefore, where they are being used to inform land use planning and development, a further full site-specific investigation should be carried out.

The survey data provide baseline soil element concentrations to set the context for site specific investigations.

#### Method

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The Glasgow Soil Survey collected samples at a density of four sites per square kilometre in urban areas and one per two square kilometres in peri-urban areas around Glasgow between 2001 and 2002. The dataset comprises over 1620 soil samples across the Greater Glasgow urban and peri-urban area.

At each site over 50 inorganic chemical element concentrations and soil properties were measured.

The survey used a systematic approach, which was not modified or targeted to particular land uses, ensuring that the survey was not biased and measured what we term the *geochemical baseline*. This indicates the regional trends in soil chemistry caused by natural processes and human activity.

Mapping in this way means that our results are robust and can be compared to other city-wide and national surveys.

#### Soil Data Q and A

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##### Where do chemicals in soil come from?

There are many sources of chemicals in the environment, some that are natural and some introduced as a result of human activities especially in the built environment. The Glasgow Soil Survey detected the background geological signature that we term the natural geochemical baseline. Even this can display much variation in the concentration of some chemical elements. A few examples of human activities that can change these background levels include industry, construction projects, traffic and agriculture.

##### How long have you known about the concentrations of these chemical elements in the Glasgow area?

The provisional data were available in 2004 and a complete dataset has been available since November 2010. The BGS is reporting this dataset as quickly as possible and will work together with Local Authorities and researchers to better understand the results.

### How does the chemistry of soil in Glasgow compare with other cities?

The datasets the British Geological Survey hold on urban soil chemistry show that the concentrations of many chemical elements in Glasgow are similar to other UK cities. Each city shows characteristic variations based on its natural setting and industrial past - Glasgow sits within this range of variation.

The Glasgow soil geochemical maps show areas with higher element concentrations relative to their surroundings but such areas are not necessarily contaminated.

### I'm a developer. Can I use the Glasgow Soil data for a site specific investigation, or in place of a site investigation?

No. The Glasgow Soil dataset is a regional survey intended to measure and map the **baseline concentrations** of a range of inorganic chemical elements in soil. It is not intended to be used as a site-specific tool or to replace site investigations. However, it can be used to set the wider context around more detailed site investigations.

### How can I find out what is in my garden?

The Glasgow Soil Survey is designed as a regional-scale, baseline survey and not for the assessment of single sites. However, if you wish to assess the Glasgow Soil data in your area, you can download the Glasgow Soil Report at <http://nora.nerc.ac.uk/18009/>

### I remember the British Geological Survey sampling my garden. Surely that data point can give a good indication of what is in my garden?

The sample taken in your garden gives an indication of the concentration of many chemical elements in the soil and, since the data are accurate, would allow you to compare this sample point to the range of data across Glasgow. However, due to the complex history of many urban soils (as a result of the intensity of their use) there are often big differences in the concentrations of chemical elements over a short distance. Therefore, one data point in a garden is not enough to give a true reflection of the range of chemical element concentrations over the whole area of the garden.

### What does mg kg<sup>-1</sup> mean?

A kilogram (kg) is one thousand grams. A milligram (mg) is one-thousandth part of a gram. For example, a concentration of 1 mg kg<sup>-1</sup> copper in a soil sample means that a kilogram of soil contains one milligram of copper. This could be compared to approximately 5 grains of sugar in a 1 kg bag.

### How could I be exposed to chemical elements in the soil?

It is possible to be exposed to small amounts of soil. For example, in dust within the air we breathe and via soil adhering to food products, especially vegetables and fruit (particularly if grown at home). Hens' eggs from domestic/free range poultry may also potentially carry chemicals absorbed from the soil. It is also possible to directly eat soil accidentally; however, young children are more likely to do this since they have more regular hand-to-mouth contact with soil during play. Many chemical elements are essential for human health and only have the potential to cause problems at very high concentrations. As a precautionary measure, there is UK legislation in place to protect soil quality and human health. For answers to health related questions, please contact your Local Authority or your local NHS Board Health Protection Team.

### Can my children and pets play in the garden?

The Survey was not designed to provide advice on individual gardens or plots of land. However, the concentrations of chemical elements measured by the Glasgow Soil Survey are consistent with other UK cities and do not indicate any problems specific to Glasgow.

### Is it safe to grow your own food in Glasgow?

Previous studies based on our datasets for other cities (similar to Glasgow) looking for evidence of elevated chemical concentrations in foodstuffs grown on urban soils showed no need for concern. You can access more details on these studies in the following publication: Fordyce, F.M.; Brown, S.E.; Ander, E.L.; Rawlins, B.G.; O'Donnell, K.E.; Lister, T.R.; Breward, N.; Johnson, C.C.. 2005 GSUE: urban geochemical mapping in Great Britain. *Geochemistry: Exploration, Environment, Analysis*, 5 (4). 325-336. <http://nora.nerc.ac.uk/883/>.

The BGS makes information on the environment available so that individuals and organisations can make informed decisions. There may be instances where Local Authorities may wish to do follow-up studies on the basis of the Glasgow data.

### What are the elements that could be harmful to us?

Under current UK contaminated land guidance (CLEA, 2009) - the following elements are of possible concern to human health in soils:

CLEA (2009). Contaminated Land Exposure Assessment Model. Environment Agency, Bristol. <http://www.environment-agency.gov.uk/research/planning/33714.aspx>

#### Arsenic

Arsenic (As) is an element which has a reputation as a poison, but it occurs widely at concentrations of a few tens of  $\text{mg kg}^{-1}$  in rocks and soils and at these levels has no harmful effects. Some areas affected by industry and other human activities may have elevated arsenic concentrations, and in such cases, further investigations of the potential for harmful effects may be carried out.

#### Cadmium

Cadmium (Cd) is a rare metal, usually present in soils at less than  $1 \text{ mg kg}^{-1}$ . It is used in industrial processes and in some rechargeable batteries. Since cadmium is potentially toxic, further investigations into possible soil-human pathways may be carried out. Examples of poisoning even in cadmium-rich soils derived from lead and zinc mine waste and industrial wastes are very rare.

#### Chromium

Chromium (Cr) is a relatively common silvery metal, typically used in chrome and stainless steel. The metal is an essential trace element for health in small doses and most of its compounds are generally not harmful. Some chemical forms of chromium found especially in industrial wastes can present a potential risk to health.

#### Lead

Lead (Pb) is a metal that has no known biological function in humans and is potentially harmful if it enters the body. Even so, examples of lead poisoning from contaminated soils are very rare. Other sources of lead exist in the environment and in some of our homes; for example, leaded paint and lead water pipes.

#### Nickel

Nickel (Ni) is a relatively common metal present at a few tens of  $\text{mg kg}^{-1}$  in many soils. It is essential to health in small doses. Some areas affected by industry and other human activities may have raised

nickel concentrations, and in such cases, further investigations of the potential for harmful effects may be carried out.

### **Selenium**

Selenium (Se) is a rare element which is essential for life in trace amounts but potentially harmful at very high concentrations. The Glasgow Soil dataset shows that very high levels of selenium are not likely to be present in Glasgow.

### **How can I get access to the Glasgow Soil data?**

All the British Geological Survey soil data are available for use under licence. For further information and how to get the results see:

<http://www.bgs.ac.uk/products/home.html>

### **I have some questions that have not been answered here, who can I contact?**

Please contact the British Geological Survey's enquiry service on:

[enquiries@bgs.ac.uk](mailto:enquiries@bgs.ac.uk)

Tel: 0115 936 3143.