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## The Brownfield Ground Risk Calculator: A new spatial decision support tool for estimating ground risk and remediation costs for site located in Greater Manchester, UK

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The Greater Manchester Brownfield Ground Risk Calculator (BGR\_calc) is a Geographical Information System (GIS) spatial decision support tool designed to provide an early indication of potentially abnormal ground conditions and the indicative costs of mitigating them. This is important because abnormal ground conditions can affect the viability of the constructing of new homes on post-industrial brownfield sites. Multi-criteria decision analysis methods were used process and utilise over 30 input dataets. BGR\_calc comprises four primary outputs, each represents a different set of ground risk or cost mitigation characteristics that occur within the Greater Manchester area, presented alongside their associated input data. Each output comprises risk scores (scored between 0 to 1) or risk mitigation cost estimates (£) presented as 50 m grid cells and site based summaries for over 2000 individual sites. BGR\_calc makes the assumption that all brownfield land evaluated will be used to develop two storey residential housing at a density of 30 houses per hectare. Ground risk scores reflect the nominal risk that soil and groundwater contamination and soil and rock hazards might pose to human health, controlled waters and the structural integrity of new homes. The scores are derived from data on sources of contamination or ground conditions resulting from previous land-uses and/or natural processes, the presence of exposure pathways and sensitive receptors (residents, water resources and homes). For there to be a risk, the source, pathway and receptor components must be linked. Risk mitigation cost estimates represent the amount that might need to be paid to develop a brownfield site over and above 'normal' development costs. No allowance is made in BGR\_calc for the financial benefits of pre-existing infrastructure, proximity to services and employment that brownfield land usually have but these ought to be considered within the overall economic evaluation of individual sites.