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Gateway to the Earth

The Greater Manchester Brownfield Ground Risk Calculator (BGR_calc)

Institute of Environmental Sciences, Land Condition Symposium
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British Geological Survey



@BGSBrownfields
@IES_UK #LCS19

- Introduction
- Methodology and results
 - Ground risk scores
 - Risk mitigation cost estimates
- Conclusions



Brownfield Ground Risk Calculator

Introduction

Greater Manchester Combined Authority vision

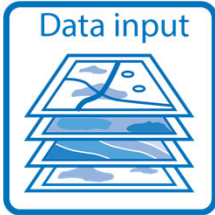
- Ambitious targets for new homes (GMSF, 2019)
- Many sites are brownfields
- Ground conditions are a key abnormal
- Evidence for bringing sites forward using benefit / cost ratios
- Andy Burnham's "brownfields first" policy (GMSF, 2019)



Brownfield Ground Risk Calculator

Introduction

GIS spatial decision support tool



Where does BGR_calc fit in the planning process?



1. Greater Manchester Spatial Framework
2. Local plans (districts)
3. Pre-application discussion
4. Planning application
5. Planning permission and conditions
6. Development and discharge of condition

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DO'S and DON'TS



- Inform investment decision/ viability assessment
- Indicative 'abnormals'
- Early project screening of ground risk and cost
- Prioritisation of further investigation
- Identification of uncertainties

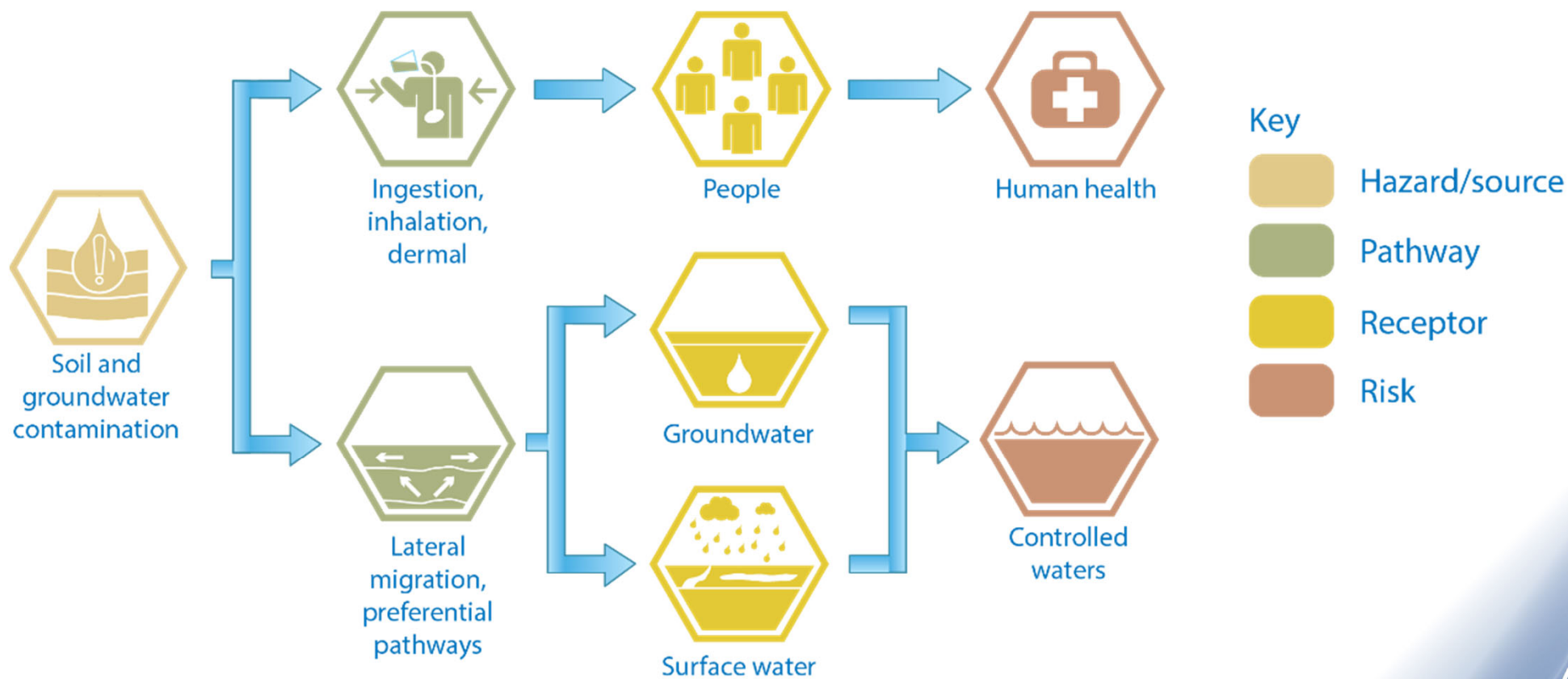


- NOT a NPPF compliant site investigation
- NOT a Phase 1 desk study
- NOT local authority search results (e.g. CON29)

Brownfield Ground Risk Calculator

Methodology

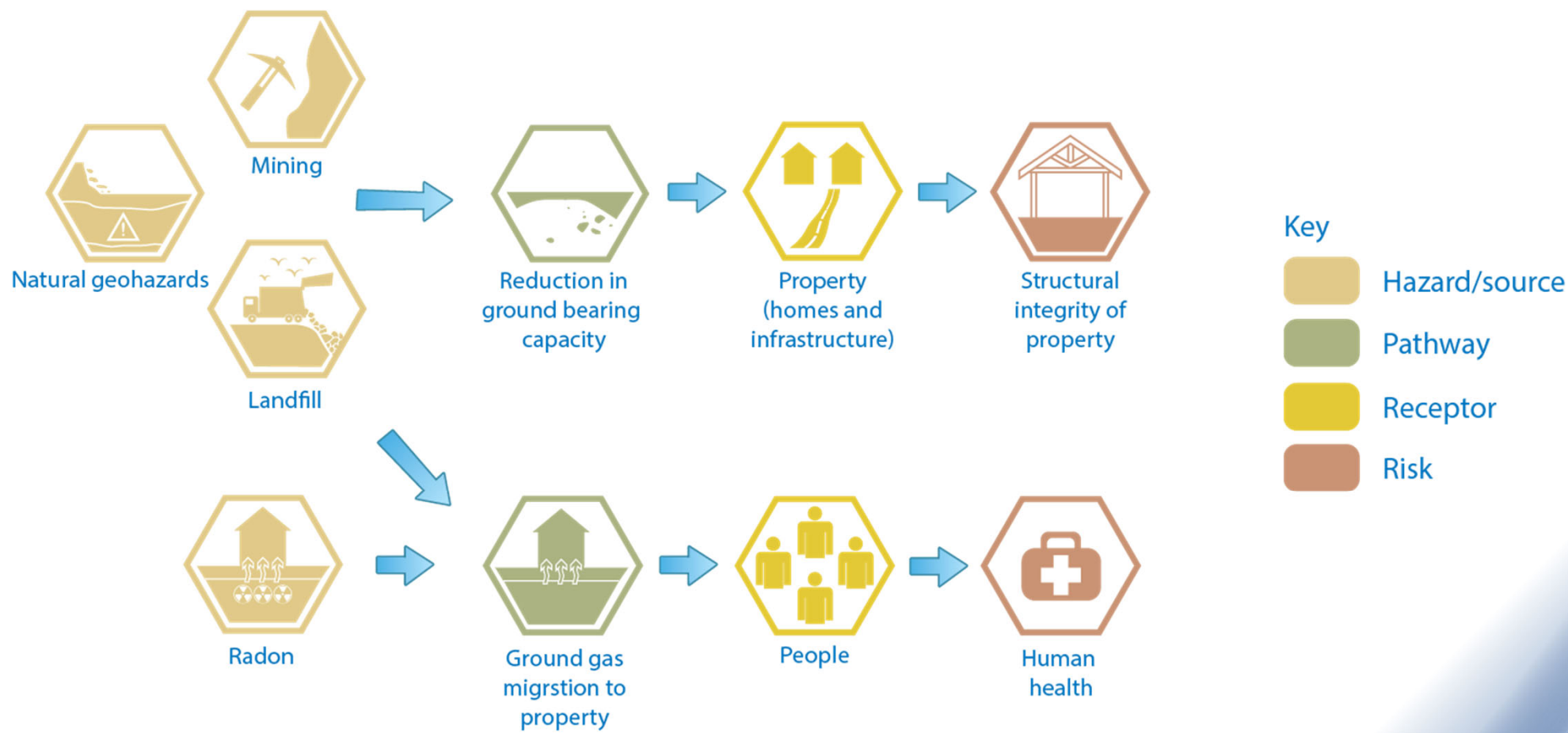
Conceptual model – soil and groundwater contamination



Brownfield Ground Risk Calculator

Methodology

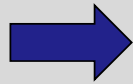
Conceptual model – soil and rock hazards



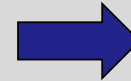
Brownfield Ground Risk Calculator

Methodology

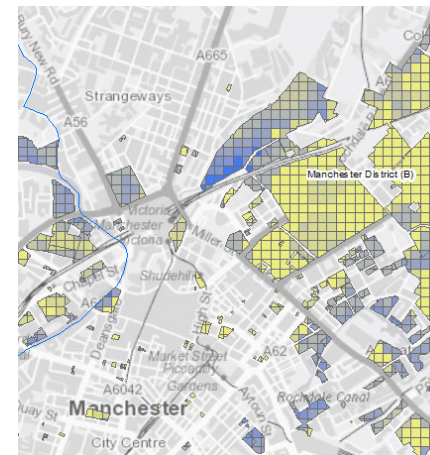
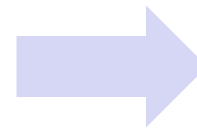
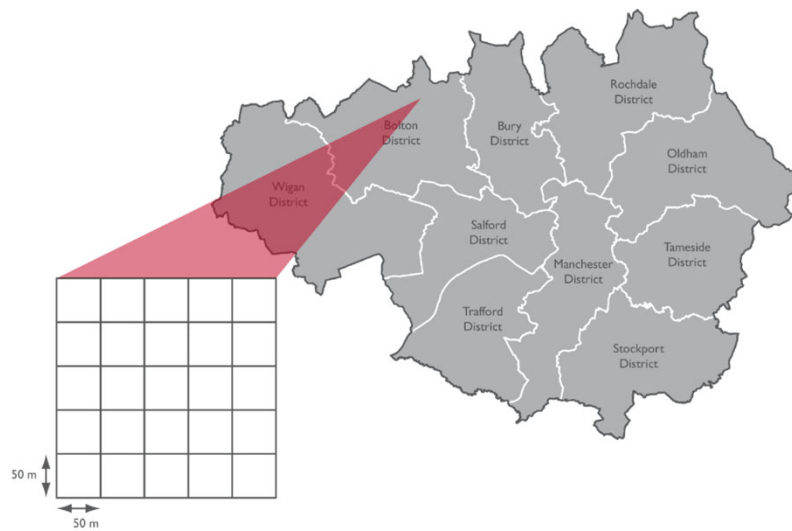
Data selection
and
collection



Geo-processing

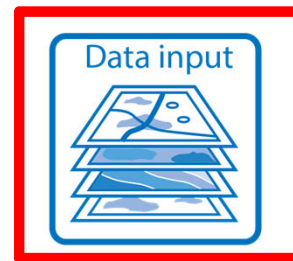


Mapping and attribution of
GMCA Land Supply sites
(n=4770, >7400 ha)



Brownfield Ground Risk Calculator

Methodology



Soil and groundwater contamination

Soil and rock hazards

Soil and groundwater contamination

Soil and rock hazards

Brownfield Ground Risk Calculator

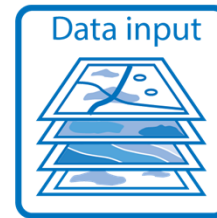
Methodology

Data used in the tool

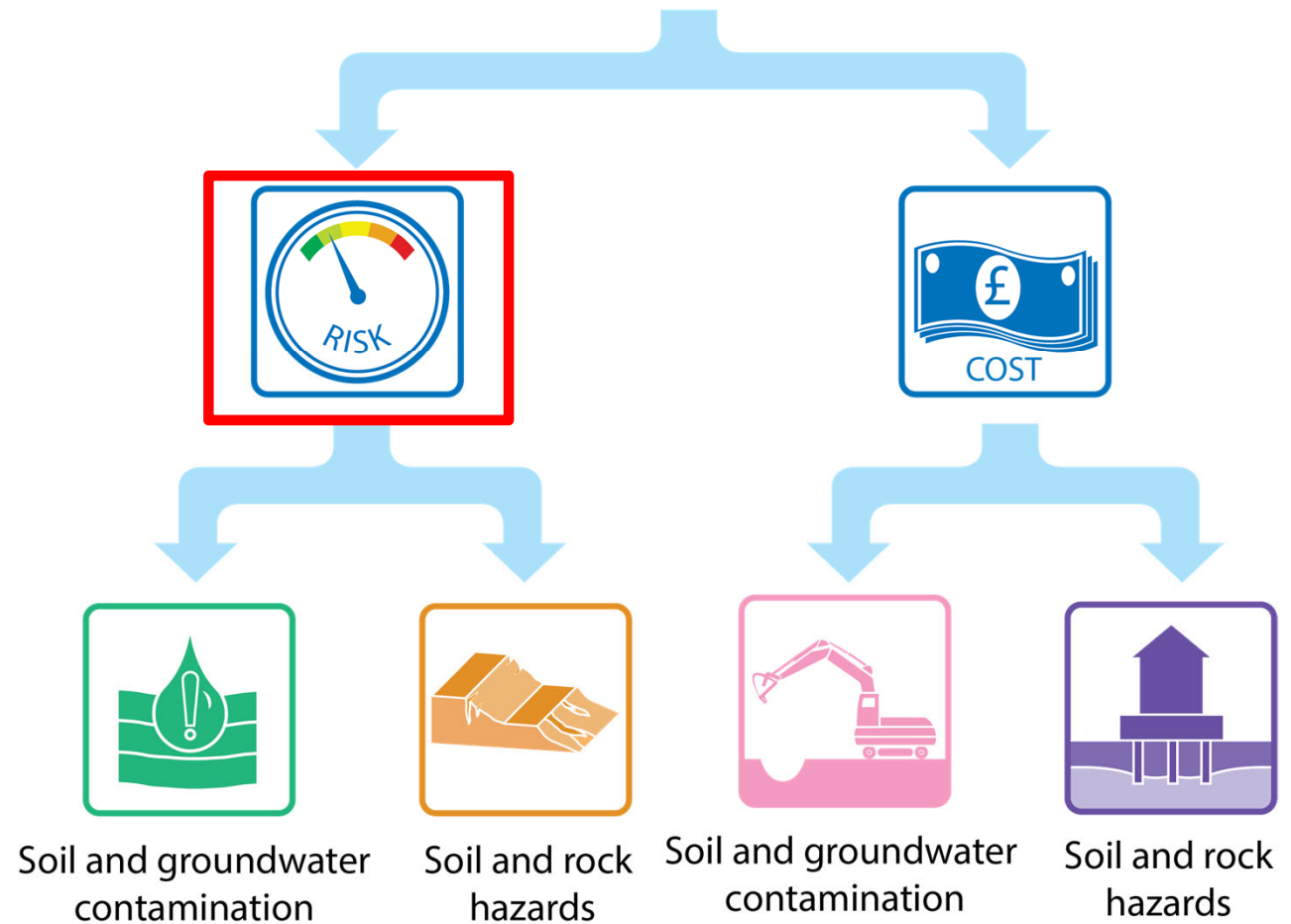


Brownfield Ground Risk Calculator

Methodology



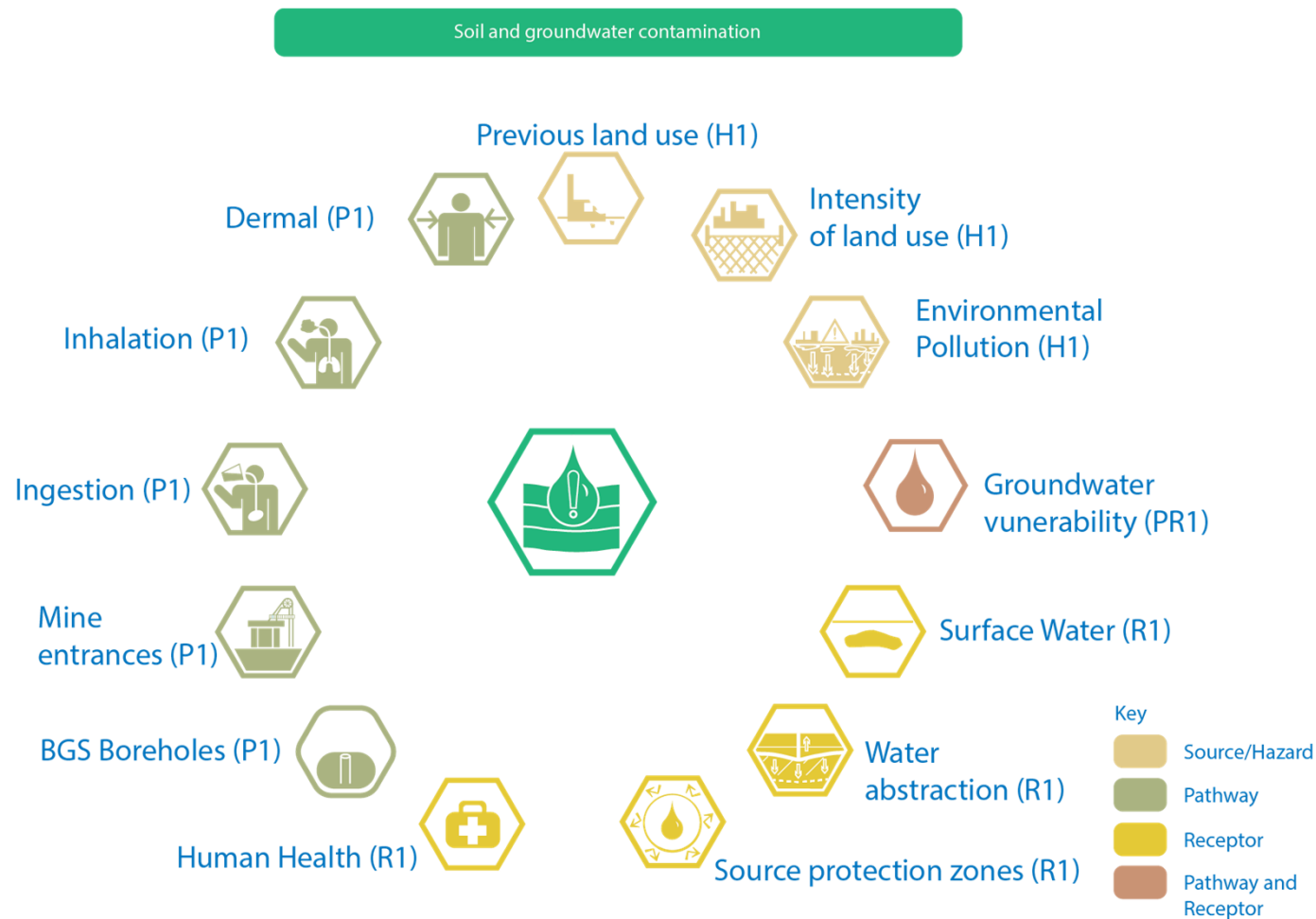
Ground risk scores – weighted sum model



Brownfield Ground Risk Calculator

Methodology

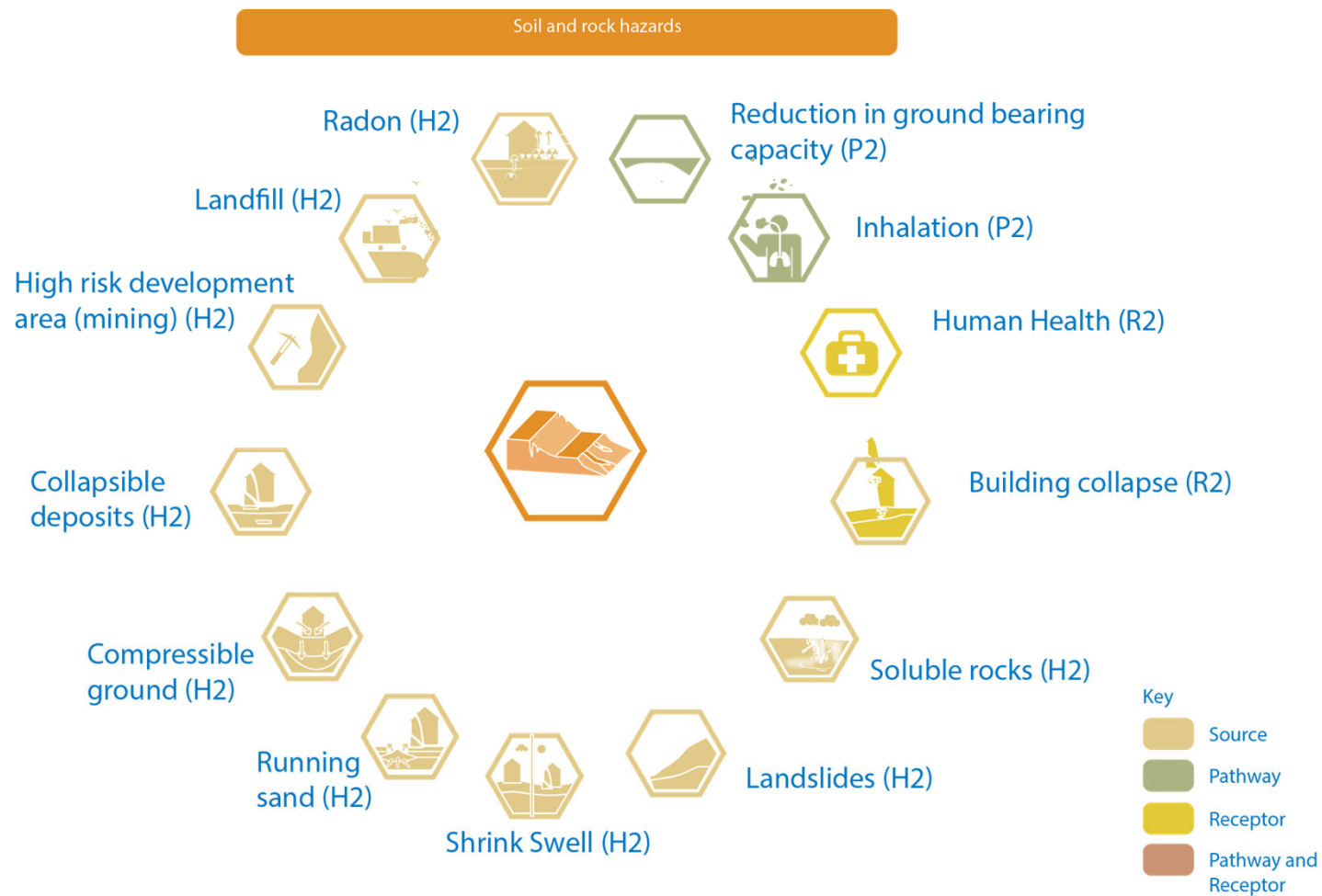
Soil and groundwater contamination Ground risk score



Brownfield Ground Risk Calculator

Methodology

Soil and rock hazards Ground risk score



Brownfield Ground Risk Calculator

Methodology



Ground risk scores uses a weighted sum model



Normalised sum
of hazard scores



Normalised sum of pathway
and receptor scores



Sum of hazard scores
—————
Maximum hazard score



Sum of pathway and receptor scores
—————
Maximum pathway and receptor score



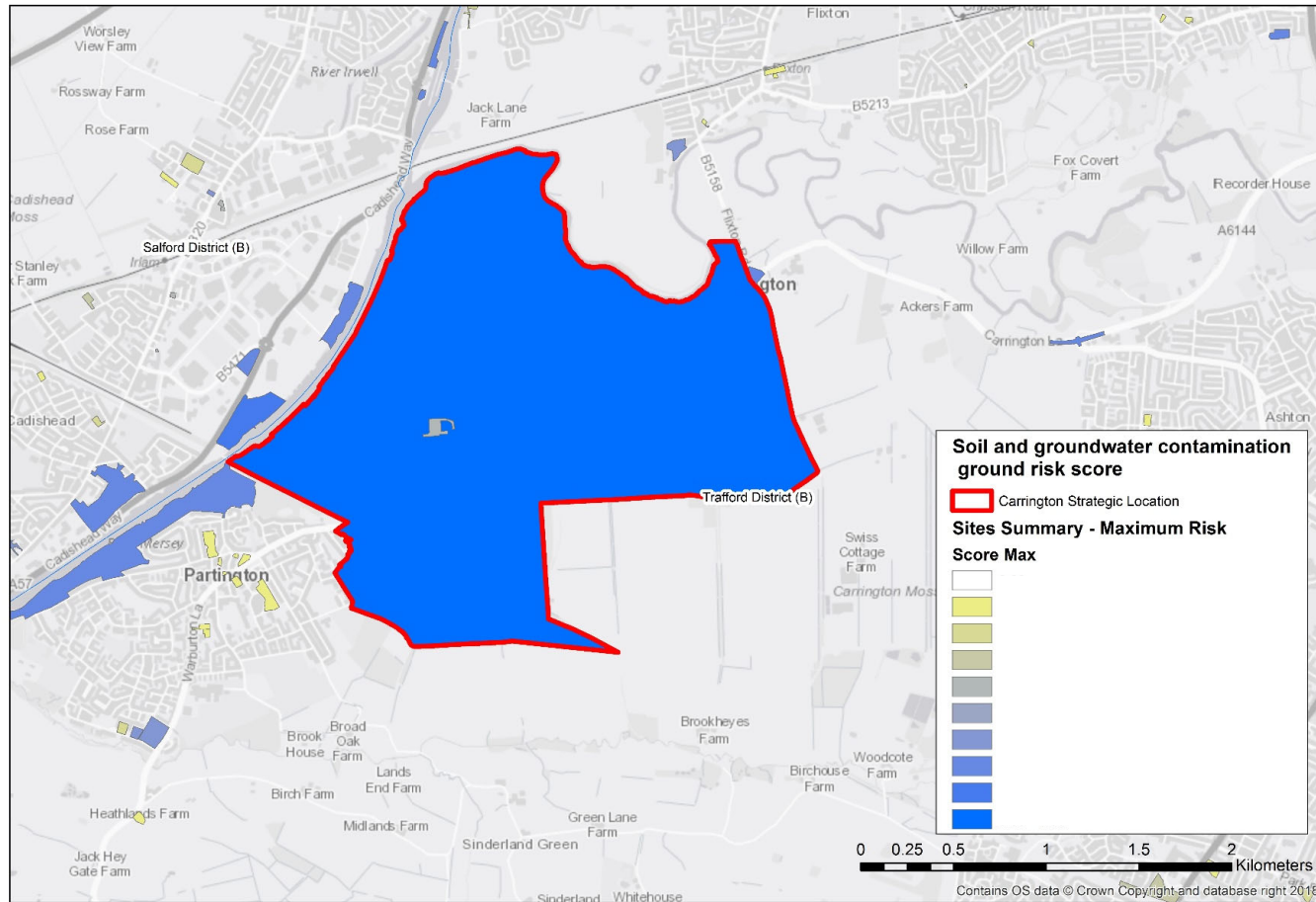
Value between 0 and 1

Brownfield Ground Risk Calculator

Results



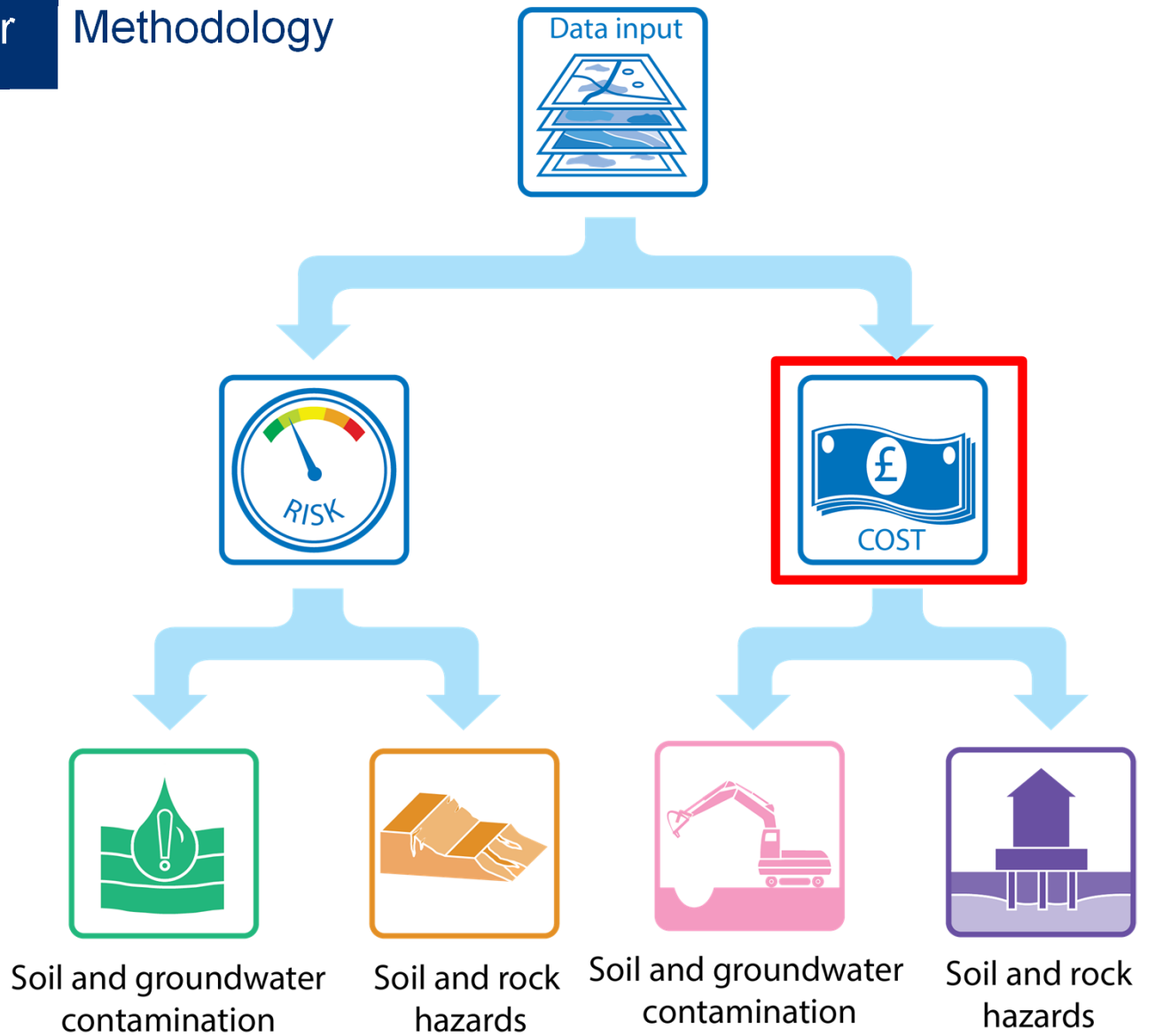
Soil and groundwater contamination ground risk scores



Brownfield Ground Risk Calculator

Methodology

Risk mitigation cost estimate



Brownfield Ground Risk Calculator Methodology

Risk mitigation cost estimate – soil and groundwater contamination



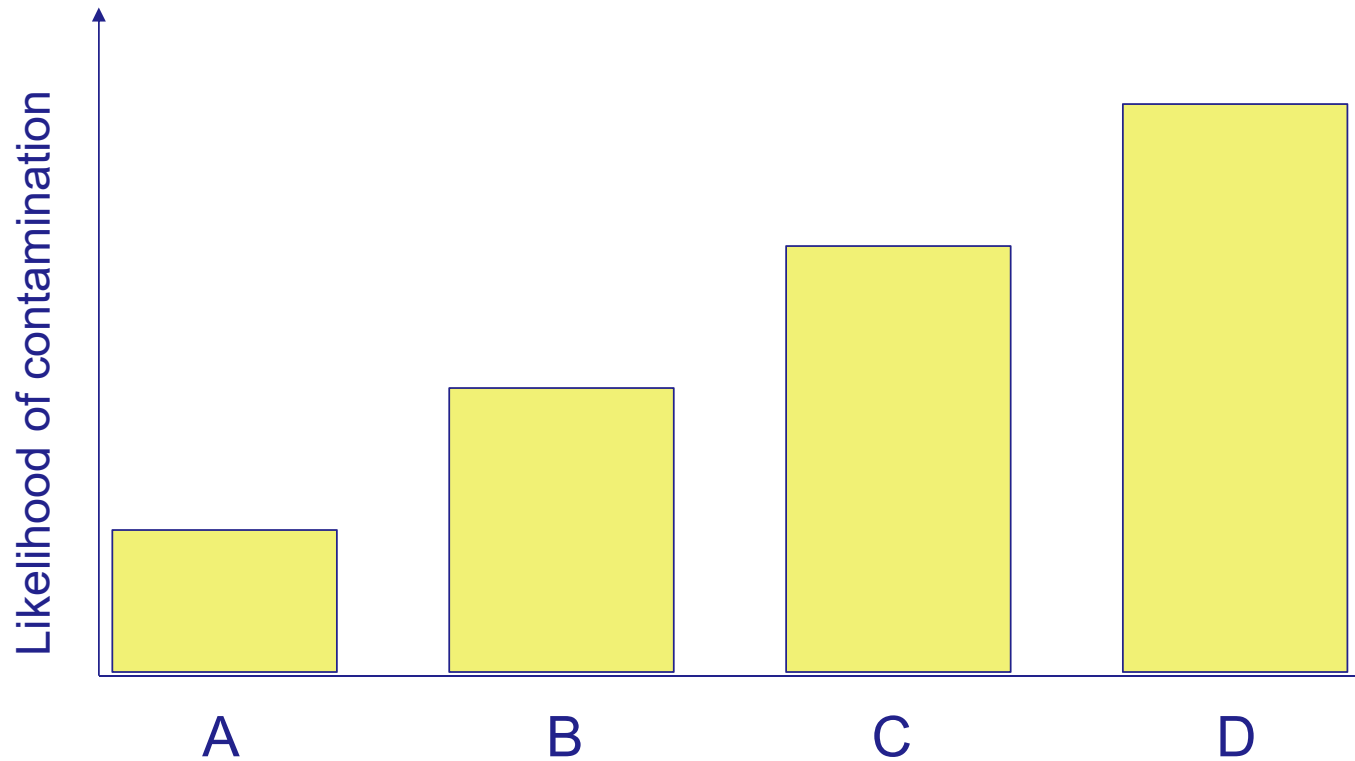
Brownfield Ground Risk Calculator

Methodology

Soil and groundwater contamination cost estimate matrix (HCA, 2015)

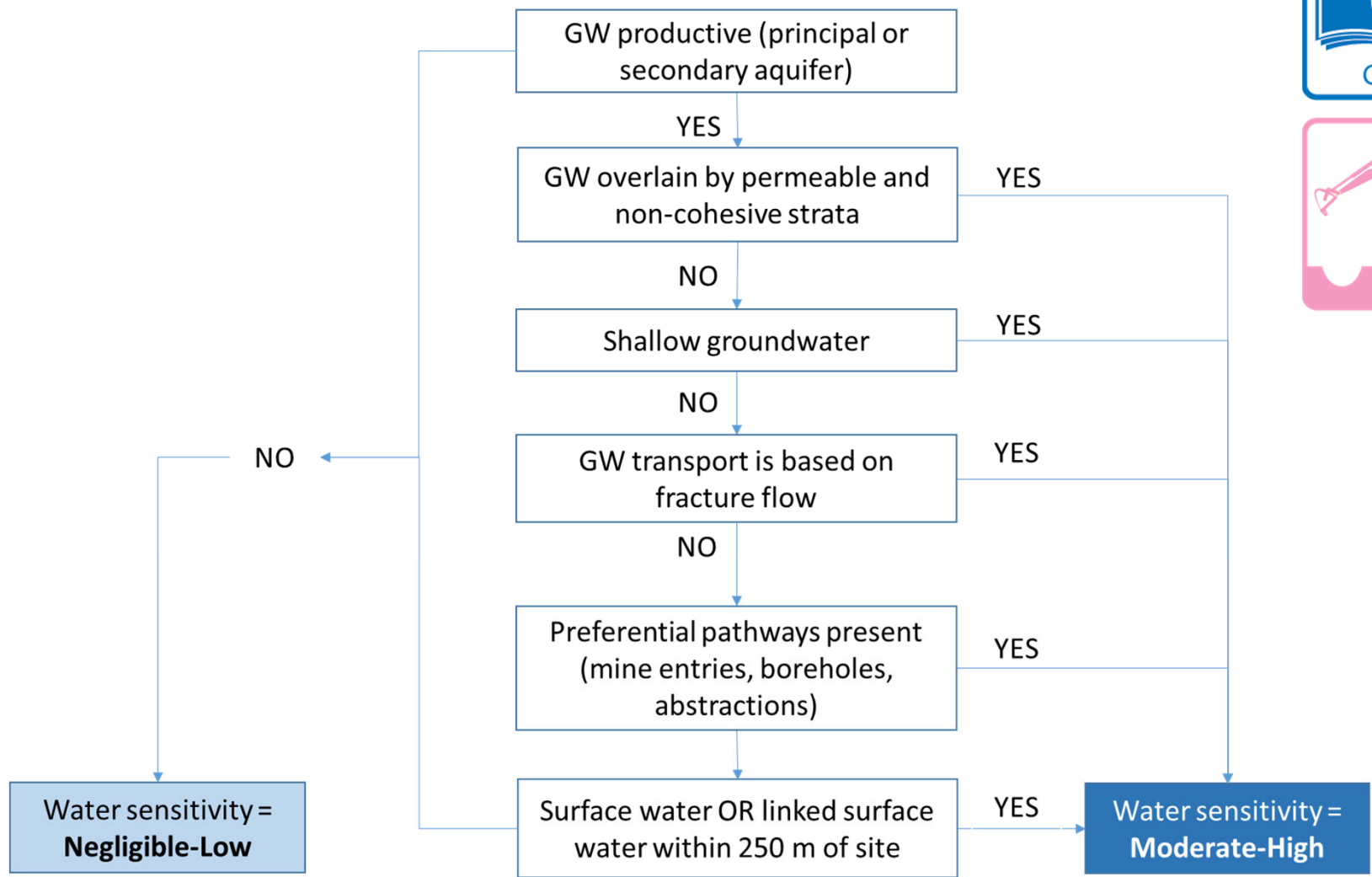


Soil and groundwater contamination remediation cost estimate for residential with gardens end-use		Potential for contamination to be present at a site			
		Previous Landuse Class A	Previous Landuse Class B	Previous Landuse Class C	Previous Landuse Class D
Ground and surface water sensitivity	Negligible-Low	£75k to £205k / ha	£255k to £640k / ha	£305k to £740k / ha	£335k to £845k / ha
	Moderate-High	£180k to £410k / ha	£410k to £1.05m / ha	£540k to £1.46m / ha	£715k to £1.76m / ha



Brownfield Ground Risk Calculator

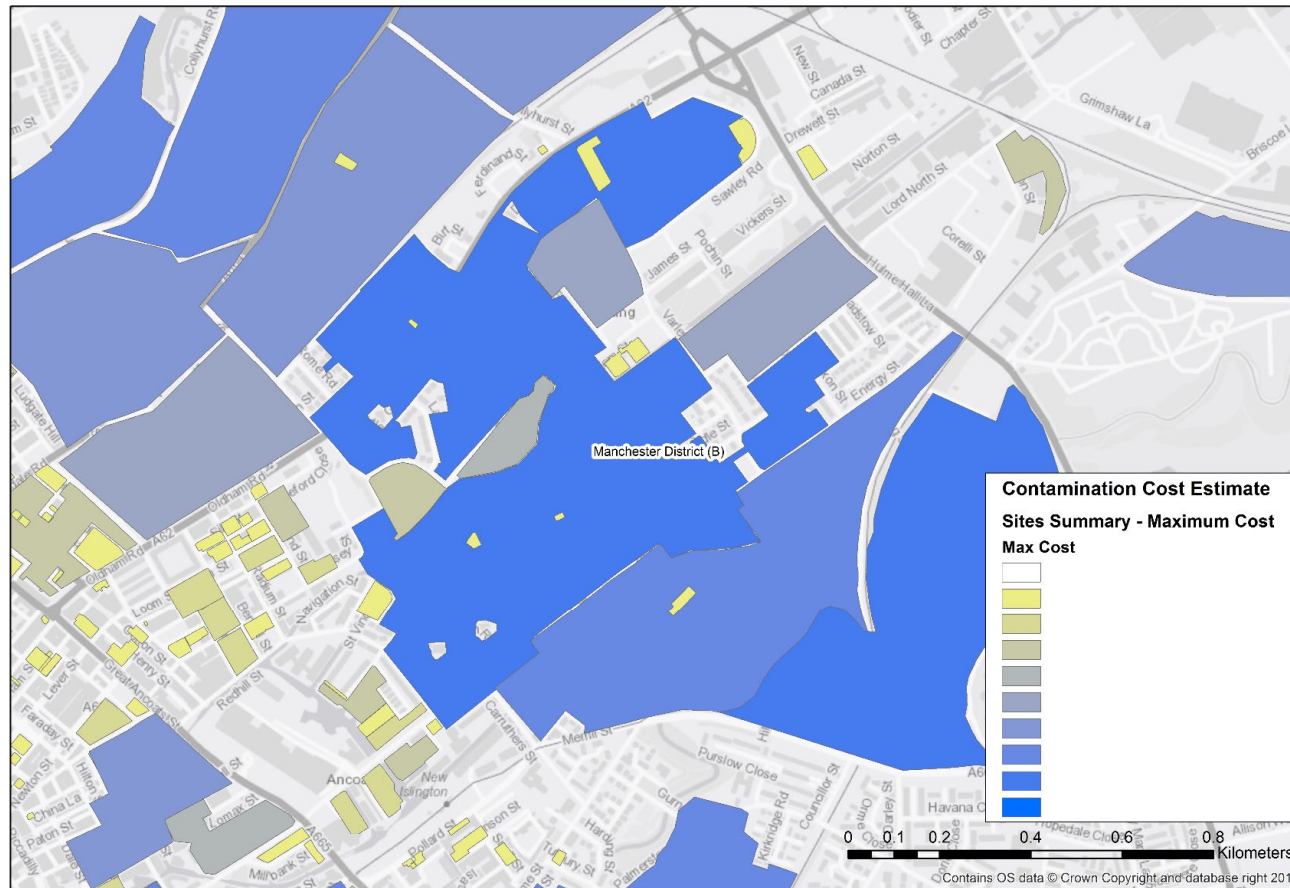
Water risk



Brownfield Ground Risk Calculator

Methodology

Soil and groundwater contamination risk mitigation cost estimates



Brownfield Ground Risk Calculator

Methodology

Risk mitigation cost estimate – soil and rock hazards



Brownfield Ground Risk Calculator

Methodology

Soil and rock mitigation cost estimate



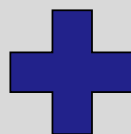
Risk mitigation cost estimate =



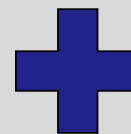
Mining (£)



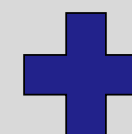
Compressible Ground (£)



Landslide (£)



Radon (£)



Landfill gas (£)

Cost sources:

SPONS, 2018

LABC, 2018

House Beautiful, 2017

Radon Association, 2019

PAG, Atchinson (Pers comm, 2018)

AECOM (2018)

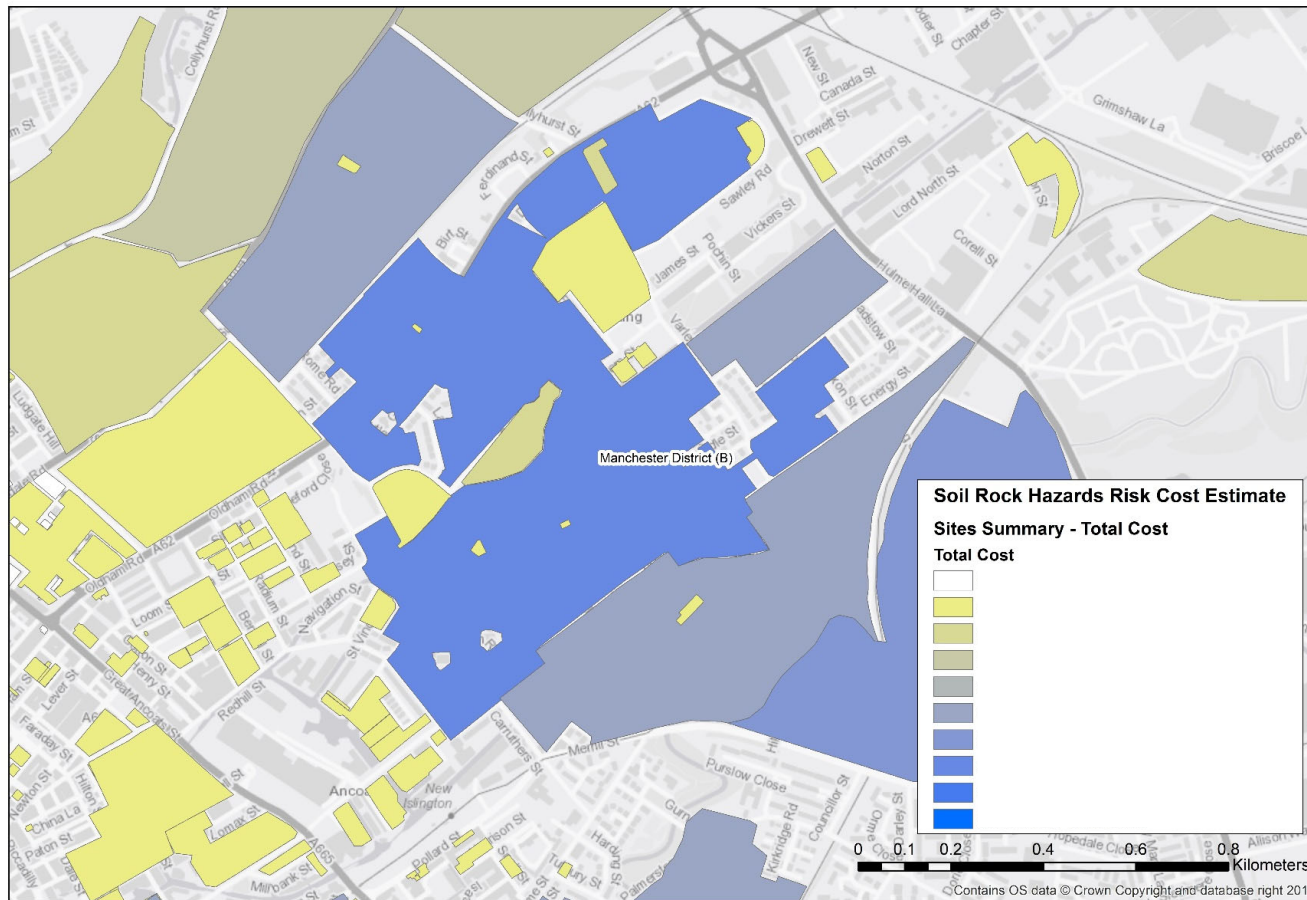
Building Research Establishment (2019)



Brownfield Ground Risk Calculator

Results

Soil and rock hazard risk mitigation cost estimates



- BGR_calc is a spatial decision support tool
- BGR_calc synthesises a range of datasets to provide an early indication of abnormalities for ground risks and mitigation cost estimates
- Designed to assist early stage viability planning for GMCA and districts
- Dynamic tool that will be improved over time with GMCA and Local Authorities



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THANK YOU



QUESTIONS



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LinkedIn

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