

“ previously developed ground is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground ”

The geological map shows a wide range of geoscientific information, including bedrock geology, superficial geology and artificial ground. The emphasis has traditionally been on ‘bedrock geology’ and ‘superficial geology’, but an improved understanding of the nature and distribution of artificial ground is becoming increasingly important for engineering and environmental assessments. Information about previously developed ground is especially important, as it is often

on 1:50 000 scale maps. However, this basic approach to mapping artificial ground allows only limited information to be recorded. For example, it has not been possible to distinguish between land-raising domestic refuse fill and a road embankment.

In response to the increased emphasis on mapping artificial ground and the limitations of the five classes, a new scheme has been developed for mapping purposes that extends the existing

Artificial ground

Mapping our impact on the surface of the Earth

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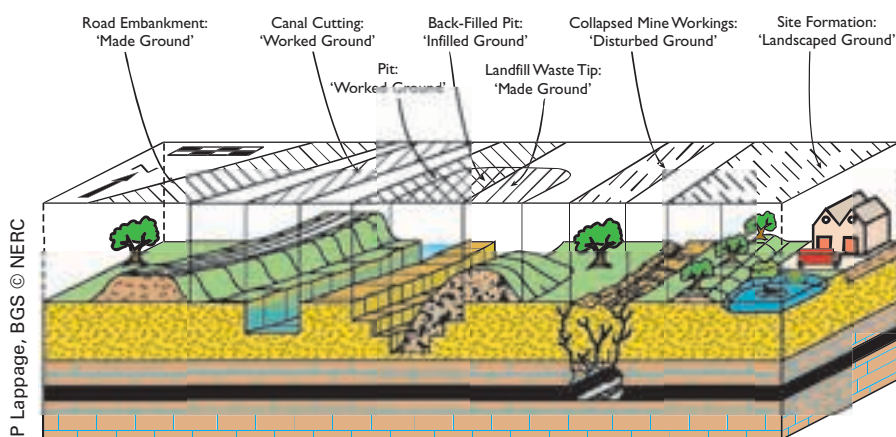
associated with potentially contaminated material, unpredictable engineering conditions and unstable ground. The mapping and classification of artificial deposits using borehole information, historical maps and field visits provides valuable information to a variety of users.

Artificial ground is classified into Made Ground (including engineered and non-engineered material), Worked Ground, Infilled Ground, Disturbed Ground and Landscaped Ground. These five classes are shown by hatching on current 1:10 000 scale BGS maps and selectively

classification. The new scheme allows more meaningful information to be captured by offering a three-tier classification of artificial ground based on the origin and landform of the deposit or excavation. The new scheme uses a hierarchy of Class, Type and Unit, with Class being the most basic level of information (equivalent to the five existing classes) and Unit being the most detailed, similar to the way the BGS Stratigraphical Lexicon is ordered by Group, Formation and Member. A complementary scheme for the material type is currently being developed.

Each level in the hierarchy can be subdivided to give progressively more detail. Consequently, either basic or detailed information can be captured, depending on the scale of survey, project resources or available information or knowledge.

An example of the new scheme, in the case of Worked Ground, may be a quarry where limestone has been extracted. This may be mapped as ‘Worked Ground’ at Class level, ‘Mineral Excavation’ at Type level or ‘Quarry (Hard Rock)’ at Unit level. Similarly for Made Ground, raised fill comprising domestic refuse can be mapped as ‘Made Ground’ at Class



The main types of artificial ground and how they are shown on the geological map.

level, 'Raised Fill (Undivided)' at Type level, and 'Land Raising Domestic Refuse Fill' at Unit level.

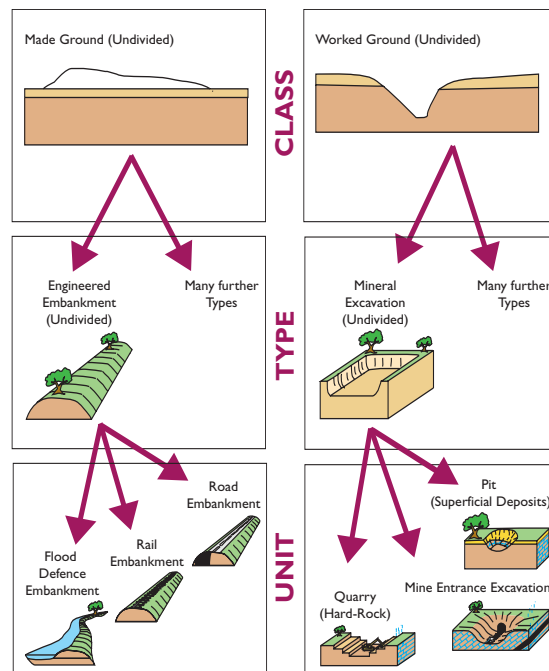
Three other classes of artificial ground are included in the new scheme. Disturbed Ground includes those areas where the ground surface is affected by near-surface workings or subsidence, for example, caused by shallow coal mine workings. Landscaped Ground is mapped where the ground has been extensively remodelled, for example, closely associated made and worked ground for site formation.

Infilled Ground is extremely important and can arise from a number of complex processes of removal and deposition of material. Infilled Ground can be thought of as the combination of one or more phases of excavation where material has been extracted (Worked Ground) and one or more phases of deposition of material on the excavated surface (Made Ground) has taken place.

Therefore Infilled Ground is defined during surveying and map compilation by coincident areas of Worked Ground and Made Ground. The hierarchical nature of the new scheme allows the surveyor to combine any Class, Type or Unit of Worked Ground and Made Ground to derive a corresponding classification for Infilled Ground. For example, where detailed information is available concerning both the 'cut' and the 'fill', appropriate Unit level descriptions may be used. Where only partial information is available for the 'cut', and more detailed information known about the 'fill', a Class level description for the 'cut' may be combined with a Unit level description for the 'fill'.

The new scheme is designed to be compatible with the existing artificial

ground classification and the BGS digital map and Lexicon data structure (see the BGS Lexicon on our website at: www.bgs.ac.uk/lexicon/lexicon.html). It also provides a framework into which additional types of artificial ground can be added as required. Improved characterisation of artificial ground is potentially useful to a wide range of users, including land-use planners, developers, engineers and environmental scientists. The scheme could become the industry standard for recording such deposits. The detailed information also supports several BGS science programmes.

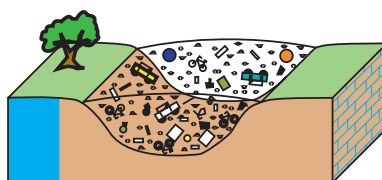


P Lappage, BGS © NERC

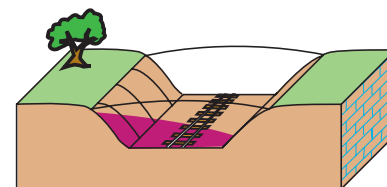
Selected examples of branches of the artificial ground hierarchy.

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Selected examples of the many types of Made Ground and Worked Ground that can be combined to derive Infilled Ground. Left: no detail known about 'cut' but detail known about 'fill'; for example, Worked Ground (Undivided) filled with Landfill Waste Tip (Domestic Refuse). Right: detail known about 'cut' but no detail known about 'fill'; for example, Rail Cutting filled with Made Ground (Undivided).

Made Ground: Areas where material is known to have been placed by man on the pre-existing (natural or artificial) land surface (including engineered fill).

Infilled Ground: Areas where the pre-existing (natural or artificial) land surface has been excavated (Worked Ground) and subsequently partially or wholly backfilled (Made Ground).

Worked Ground: Areas where the pre-existing (natural or artificial) land surface is known to have been excavated by man.

Landscaped Ground: Areas where the pre-existing land surface (natural or artificial) has been extensively remodelled, but where it is impracticable to delineate separate areas of Made Ground, Worked Ground or Disturbed Ground.

Disturbed Ground: Areas of ill-defined surface disruption associated with surface or near-surface development or collapse. The disturbance is typically complex, dominated by zones of subsidence, and includes areas of Worked Ground and Made Ground.

After McMillan, A A and Powell, J H. 1999. BGS Rock Classification Scheme Volume 4. BGS Research Report RR99-04.