

Chapter 7

Encouraging appropriate construction activity

Damage to buildings, roads and other infrastructure from instability events is a common problem but much can be done to try and mitigate against damage caused by ground movements. Some of these measures have been described earlier, for example with respect to management of slopes, walls and drainage systems. Having established the planning framework, which will provide a basis for decision-making in terms of the general suitability of a site for development, it is usually the developer who will undertake appropriate investigations and studies to demonstrate that the particular site concerned is suitable to accommodate the proposed construction activity. In some locations local authorities hold more detailed maps and reports which can assist in this process first by guiding development to the most suitable areas in terms of ground stability and second by giving advice on the type of further survey or investigation that may be required to support the development proposal.

It is clear, therefore, that the local authority, the developer, the architect and the builder and in due course the occupier of the building, all have a role to play in terms of ensuring that the development is constructed in a most suitable manner to take account of ground conditions and is maintained adequately in the future to try and reduce the impact of any ongoing ground movements.

What the Developer can do

The developer does, of course, have a key interest in ensuring that the site can support his development and that any ongoing or subsequent ground movement will not adversely affect the site and, therefore, reduce its value or marketability. Unfortunately, in many cases proper site investigation does not commence until problems have arisen, often during the construction stage. The undertaking of investigation and remedial works during construction as opposed to prior to commencement can be extremely costly in terms of delays, contractual claims and adverse publicity which may affect the future marketability and insurance of the development. The developer must, of course, take account of not just the ground conditions on the development site itself but also the possible impact of the development in terms of adjacent sites which may be adversely affected by the proposal. Again this is a matter which must be addressed at the planning stage and the development proposal must be supported by sufficient information that will allow the local authority to undertake a proper review of the proposal. Studies of this kind should be undertaken by a competent geotechnical specialist who is likely to be registered with an appropriate professional institution in the country concerned. The Planning Authority may wish to receive details of the competence of the person undertaking the survey and complete a check list of important issues that must be addressed in the stability report as an aid to assessing the development application.



Existing development is not always most suited to accommodating ground movement. However there are measures that homeowners can take in order to reduce the impact of ground instability on their properties.

In terms of construction techniques there are a number of opportunities for minimising the impacts of ground movement through appropriate design. The foundations of buildings are particularly important. Traditional strip foundations can easily fracture causing significant structural damage. Rafts are able to accommodate slight movements and span minor fissures and voids that may form beneath the raft over the lifetime of the building.

In general, simple designs are preferable to more complex structures, with some degree of interlocking or articulation which can accommodate slight movements being most desirable. Light weight framed buildings which may be of timber with brick or concrete infill or sheet construction materials are likely to be least problematic in the future. Tile or slate hung features can cover minor damage whereas more rigid construction methods or rendering tend to show cracking quite quickly. If movements do occur that affect the raft foundation, this can be accommodated in some situations through the provision of adjustable jacking points as part of the ring beam or foundation design. This method creates the possibility of re-levelling the raft at some time in the future.

In summary, therefore, a residential property on unstable ground could be constructed on a raft foundation with jacking points and should be light weight, low rise, and composed of materials which will not be prone to visible cracking and damage.

Particular attention should be paid to the use of concrete. This should be constructed in small bays with frequent use of expansion joints, and should contain reinforcing mesh. For paths and hard standings areas of blocked paving may be appropriate. Externally, particular attention should be paid to the design of guttering and rainwater down-pipes to ensure that these are of sufficient capacity to accommodate more intense rainfall events and to take account of possible changes in climate which may result in more prolonged winter rainfall. Ideally, roof water and surface water run-off from hard areas should be connected to sealed drainage systems or existing ditches. Some of these issues may well be set out by the planning authority as "conditions for approval" for the development.

During the course of construction, the developer needs to pay particular attention to on-site management, proper control of earth works in sequence to avoid inappropriate excavations or leaving slopes inadequately supported; unsupported trenches, for example for service supply pipes, should be avoided. Many instability problems arise from poor site management and lack of proper earth works control generally. During the course of construction ground water should not be allowed to pond on site as this may cause problems during construction or at a later date.

What the Homeowner can do

Whilst individual property owners may be able to have only a minimal influence on ground instability problems, the cumulative effect of efforts by many homeowners on the landslide system may be significant. Activities such as vegetation clearance, slope regrading, cut and fill operations, lack of maintenance or inattention to leaking pipes can all adversely affect ground stability. Residents, both individually or in groups (by area or by road), can work together to ensure that issues such as maintenance of drainage systems are addressed. A good time for inspections is in the early autumn before the onset of the autumn/winter rainfall period when guttering and downpipes should be checked for blockages and leakage and road drainage systems and ditches must be cleared. For properties not in the ownership of individuals there is an individual but also a collective responsibility to contribute towards management of the building and its grounds. It is sometimes more difficult for tenants, particularly in large buildings that have been divided into apartments, to ensure that a co-ordinated approach is taken to addressing structural maintenance and drainage problems, this may be addressed through a residents' management committee. Lack of maintenance will make the building all the more susceptible to slight ground movement and so regular maintenance is particularly important. Figure 7.2 illustrates some of the practical problems associated with maintenance of properties in an area of instability and provides guidance with respect to key issues; further information may be obtained from the references at the end of this report.

DON'Ts

1. Don't block or alter ditches or drains.
2. Don't allow water to collect or pond.
3. Don't shift your water or soil problems downslope to your neighbours.
4. Don't landscape the slope without notifying the Local Authority.
5. Don't clear vegetation off slopes without replanting.

DOs

6. Check roof drains, gutters and downspouts to make sure they are clear.
7. Clear drainage ditches and check them frequently, before and during winter.
8. Make inspections during winter - this is when problems can occur.
9. Watch out for water back-up inside the house at sump drains and toilets, since this indicates drain or sewer blockages.
10. Watch for wet spots on the property
11. Consult an expert if unusual cracks, settling or land slippage occurs. Inform Local Authority of any problems.
12. Regularly inspect scarp slopes for potential rockfalls or loose debris.
13. Regularly inspect swimming pools and ponds for leaks and repair if necessary.



Figure 7.2 'Advice for homeowners in areas of instability'.



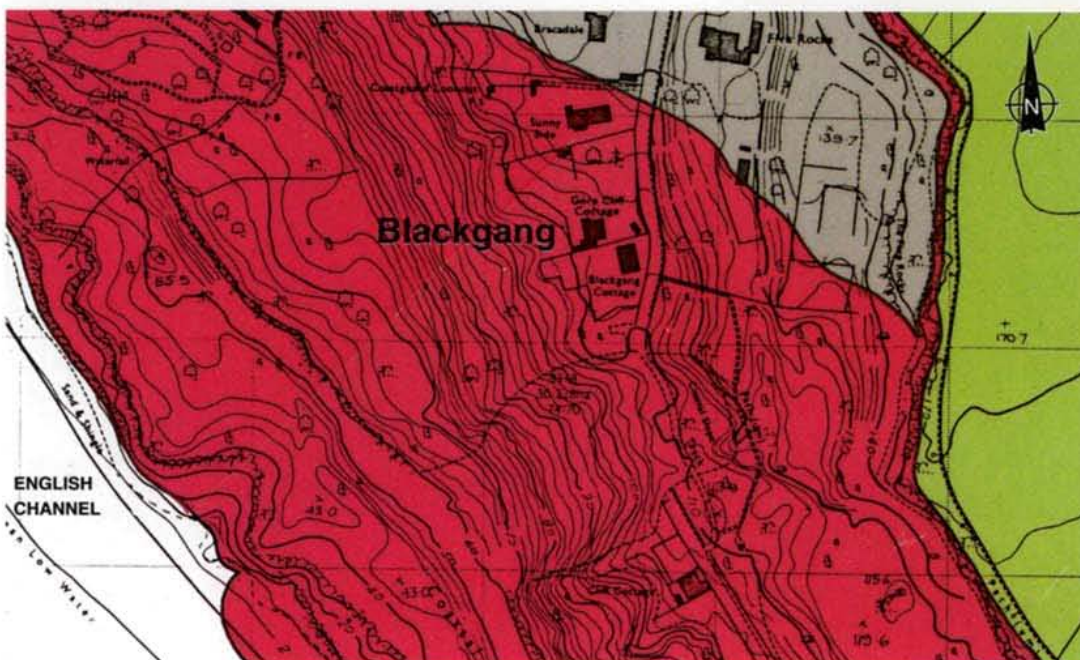
Defining Appropriate uses for Various Categories of Land

Some areas of land are quite clearly less suitable for development and should be avoided. A range of organisations and individuals may be involved in this decision-making process which could include the planning authority, mortgage lenders, insurance companies, as well as the purchaser. In most cases the responsibility is for the owner to ensure that the property or site is safe to develop. However, increasingly information is being made available by local authorities to aid planning, and in addition vendors are required to provide any information they may have on ground conditions relating to the land or property that they are selling.

A balance needs to be struck between avoiding development in certain areas and being too restrictive. A decision-making process has been outlined whereby following a geomorphological appraisal it is possible to assess the impact of ground conditions on development and thereby allocate land in terms of suitability or unsuitability for development; some decisions cannot be finalised until further site investigations or studies have been undertaken. Examples have been illustrated of areas where past movements have ruled out re-development because of their severity or where damage to property and infrastructure has required demolition and clearance of sites thereby taking the land out of the "development area". It may then be allocated for other purposes such as amenity land or public open space.



This beach cafe near Sandown, Isle of Wight was destroyed by a cliff fall. A range of stabilisation measures have been carried out following a detailed risk assessment of the cliffline.



New development on the coastline at Blackgang would be inappropriate because of the extent of coastal erosion and landslide activity. A form of 'managed retreat' has been practiced for many years.

Near right:

In the village of Luccombe, Isle of Wight the planning policy is to prevent further development on account of ground conditions. A co-ordinated programme of drainage and maintenance works has prolonged the life of most, (but not all), of the existing properties.

*Far right:*

At Newport Road, Upper Ventnor, Isle of Wight the main road crosses an area of instability settlement (called a graben). It has been necessary for the Council to acquire and demolish some properties as they became dangerous structures. The sites were not suitable for re-development because of the extent of ground movement and so the plots were landscaped to become amenity areas.



At Roquevaire to the north of Marseille in southern France parts of the town are affected by subsidence resulting from collapse of gypsum mines. This has led to the relocation of some property owners. Detailed technical studies and a programme of remedial works has been prepared in an attempt to resolve the problem. Some property owners may be eligible for state compensation under the Law Barnier, which although primarily applicable to losses arising from natural hazards, may be applied in this case.

