OPPORTUNITIES FOR CREATIVE RECLAMATION FOLLOWING SAND AND GRAVEL EXTRACTION[1]

by

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Abstract. Public acceptance of sand and gravel extraction in Britain is largely dependent on the creation of a suitable self-sustaining afteruse for the quarries. Planning authorities often insist on restoration of the land to its former use, i.e. agriculture or sometimes forestry, and with modern techniques this can be successfully accomplished. Restoration to agriculture frequently involves an unpopular landfill operation with imported, domestic or other wastes which can cause problems of ground water pollution and escapes of landfill gases. Also, agricultural restoration is often demanded where there are such severe locational disadvantages that a viable agricultural operation cannot be sustained. Alternative afteruses include land or water for recreation, ranging from low intensity uses such as sailing or angling to prestigious theme parks or sporting facilities. There is also increasing interest in positive restoration to provide wildlife habitats. Successful restoration to a beneficial afteruse, however, often requires a more imaginative and creative approach on the part of the planning authorities and a greater commitment by the industry than has previously been shown.

Introduction

Public acceptance of sand and gravel extraction in Britain is largely dependent on the creation of a suitable self-sustaining afteruse for the quarries. A range of afteruses is possible, including agriculture, forestry, amenity (both land and water based), fisheries (on wet sites), nature conservation or development for urban uses. Yet all too often the chosen afteruse is unrealistic, unimaginative or unfeasible. There are, however, examples of creative and successful reclamation to these afteruses which should serve as a stimulus for decision makers to be more adventurous in the future.

Restoration to Agriculture

Sand and gravel extraction mainly affects agricultural land and release of such land for any development including mineral extraction is subject to the provisions of various Town & Country Planning Acts. Government policy is to defend high grade agricultural land against development and so the Ministry of Agriculture very frequently objects to planning applications on the basis of land quality and agricultural impact. In the case of mineral workings they can withold their objection if the land can subsequently be restored to its original quality.

The sand and gravel operator has therefore either to find land of lower quality - but this is often visually or ecologically attractive and generates objections from other parties, e.g. the Council for the Preservation of Rural England or the Nature Conservancy Council, or has to convince the Ministry of Agriculture and the planners that he can and will return the site to productive agriculture at the end of his operations. A sand and gravel quarry can then be regarded as 'Borrowed Land' yielding first food, then 'borrowed' to exploit the sand and gravel resources, and then returned to its original food producing role. Unfortunately many of the sites given to the industry for which restoration to agriculture is demanded are inherently difficult to restore, and the expectations of the planners and Ministry of Agriculture are unrealistically high. Also many of the sites are in locations close to urban areas which pose practical problems in farming any land be it virgin or restored, and so it tends eventually to drift out of agricultural use.

Nevertheless, the sand and gravel industry has made great strides in recent years to show that it is capable of good agricultural restoration (Anon. 1982a,b; McRae, 1983a). The techniques are now well understood. A restoration scheme is drawn up based on a thorough understanding of the soils, geology and hydrogeology of the site. The various different soil types and horizons have to be separately stripped and stored for re-use, or can be directly moved and respread as part of the progressive restoration of the quarry. Soil

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handling has to take account of the likelihood of damage to the soils, especially compaction caused by earthmoving machinery trafficking over them when they are too wet, and any compaction caused relieved by a soil loosening operation. Finally installation of underdrainage and a five year aftercare programme of recuperative cropping completes the cycle of productive farmland back to productive farmland (Department of the Environment, 1982; McRae & Heywood, 1983). The productivity of well restored land is unquestionable, with consistently high yields achieved with normal inputs of seed, fertiliser etc. Unfortunately the Ministry of Agriculture remains sceptical and maintains that assessments of the physical land quality (by a system based on Land Capability Classification) show the land to be inferior to that which existed prior to mineral extraction, although practical farming evidence says otherwise.

Agricultural restoration can be carried out at 'low level' on the floor of the worked out quarry if self-draining or if a permanent pump-drainage system can be guaranteed. Frequently, however, the quarry is refilled to approximately original levels with imported wastes, with doming to help site drainage. Infilling is sometimes with relatively inert materials such as pulverised fuel ash from power stations. More frequently domestic and industrial wastes are used which can lead to groundwater pollution and overall or differential settlement of the site which can affect the drainage. These can generally be avoided by suitable landfill engineering. A more recent problem has been how to cope with escapes of landfill gases, chiefly carbon dioxide and methane which can affect the soils and crops over landfills, and can also migrate offsite. Successful venting systems have, however, been developed.

There is thus little doubt that if agricultural restoration is required, then it can successfully be achieved. For years it has been a 'safe option' afteruse in that no-one could object to agricultural land, that potentially it was economically self-sustaining and that it complied with government policy to ensure that Britain could continue to provide food from its own land resources. However, it is now being questioned whether the high costs of returning worked out land to agriculture, perhaps several times its market value, is justified when Britain is more than self-sufficient in most temperate crops, and the EEC has vast surpluses due to overproduction. Also many locations where agricultural restoration is sometimes demanded are unsuitable for farming (e.g. close to urban areas with vandalism etc.) or where because of past mistakes the soil resources necessary for adequate restoration are not available. It is particularly in these cases that a more imaginative afteruse for the land is needed.

Trees and Forestry

Restoration to commercial forestry is a possibility only on the worked out floor of quarries but not over landfill. There are, however, frequently problems with drainage and with compact layers produced by earth-moving machinery and there has been considerable experimentation to find solutions (Binns & Crowther, 1983).

The adverse effects of the flat topography on soil drainage can be overcome by constructing a system of ridges somewhat like the old-style agricultural ridge and furrow. Ridges 30m across and 1.5m high in the centre produce local gradients which allow water to drain to the furrows where it can be channelled away. When supplemented by deep loosening of the soil with tractor-mounted rippers this system has proved much superior to ripping alone where, in the absence of sufficient gradients to move water laterally within the loosened soil, the effect was to produce a 'porridge-like' mass on which it was very ill-advised to walk or drive.

Tree planting schemes are often part of the landscaping proposals for sand and gravel quarries and can help redress the balance of tree and hedgerow loss, much of which is due to so-called agricultural improvements to the English countryside.

Recreational Uses

Playing fields are sometimes constructed on former quarries and the same general principles apply as for agricultural restoration, though adequate drainage may be much more expensive to obtain in these circumstances where deliberate doming is not acceptable. Playing fields on the worked out floors of suitable quarries are probably more satisfactory than over landfill and can have the additional advantage of being like a natural amphitheatre with the surrounding unworked margins providing vantage points for spectators.

Since the general public like open spaces both visually and as places to walk and exercise their pets, positive amentity restoration to provide interesting walks could make a former sand and gravel quarry into an asset to the community, but perhaps after-uses for noisy leisure activities like motorcycle scrambling are less likely to be favourably received. Conversely restoration for a golf-course can be a highly popular and lucrative afteruse.

Hundreds of small wet pits used for sailing, windsurfing and angling, one of Britains most popular participatory sports (Greater London & South East Council for Sport and Recreation, 1981). From this, it is a short step to fish-farming chiefly rainbow trout and carp, but only those sites which can maintain supplies of clean, high quality well-oxygenated water are suitable (Johnson, 1978). Returns on invested capital can be high, but so too are the risks, especially in marketing and losses of stock by pollution, disease and vandalism.

One of the best known afteruses for a wet gravel working is Thorpe Park near Egham, Surrey. Of the 200ha, about 150 are water, split into four main lake areas with an average depth of 4m. The site has been developed into a theme park with a central theme featuring the origins, history and achievements of the British people as a maritime nation. In addition there is a show farm, childrens' amusements, go-kart track, lakes for sailing, boating and windsurfing as well as competition-standard facilities for rowing and water-skiing.

A major international watersports centre is based on former gravel working at Holme-Pierrepont in Central England, with a 200m rowing course, facilities for canoes and windsurfing as well as power-boating and water-skiing.

Nature Conservation

At the opposite end of the spectrum from the large, expensively developed and heavily publicised theme park are many small, quiet stretches of water where nature has been allowed or encouraged to take over and heal the scars of the mineral workings (although a Nature Reserve has been established in a quiet corner of Thorpe Park). Several good examples are in Kent with one wet pit now a major wildfowl reserve (Harrison, 1974), another in a coastal location one of the most important reserves of the Royal Society for the Protection of Birds and a third the home of the human leech, one of Britains rarest animals.

Usually nature conservation sites tend to happen more by accident than initial design, although to the credit of the gravel companies, once the nature conservation potential of a site is realised, active steps are taken to encourage the most valuable features, and wardens appointed and/or management teams set up (Street, 1985). At Attenborough in Nottingham a full time warden looks after a nature reserve which is still partly an active quarry. Besides being a popular recreational facility it has also been designated a Site of Special Scientific Interest. On a smaller scale Amwell in Hertfordshire has attracted much local attention, and is home for several species of plants and animals found nowhere else in that county (St. Albans Sand & Gravel Company, 1985; Spreull, 1985).

Urban Uses

Urban development on former sand and gravel quarries is attractive because of the frequent proximity to existing towns and because the agricultural objection to 'green field' sites is avoided. What is particularly galling to the industry is to see gravel-bearing land taken out of agriculture and built over without the valuable gravel being extracted first, and thousands of acres of gravel-bearing land in South East England have been very effectively sterilised by such urban developments.

Establishment of housing developments or industrial estates on the worked out floors of dry sand and gravel quarries poses few real problems other than modification of the uneven topography left after extraction, ensuring that banks and slopes are stable and for housing developments, that a source of topsoil for the gardens can be obtained.

Developments over landfill are much more problematical. Almost certainly special foundations on concrete rafts or pile-driven through the landfill to a solid base will be necessary. Thereafter subsidence should not affect the buildings but may cause 'interesting' micro-topographic effects on roads and gardens, and there is likely to be a continuing source of interest in the material dug up while cultivating gardens. On a more serious note, however, there can be major problems with gases eminating from the fill which can at worst be hazardous to health or at best extremely unpleasant and in several cases actual explosions of hydrocarbon gases (methane etc.) from the fill have occurred.

Conclusions

The sand and gravel industry has proved over the years that its worked out quarries can be restored to a wide range of afteruses. Unfortunately the afteruse is often the result of a lack of imagination, e.g. return to agriculture simply because that is what existed previously, or because no one was really interested in what became of the site e.g. a nature conservation afteruse resulting from neglect rather than a positive commitment.

What is needed is an awareness that mineral extraction 'wipes the slate clean' as far as the previous land use is concerned, and that a positive creative and imaginative choice of afteruse can be made to the overall benefit of the community.

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