**Application | Overall Restoration**

Ref: [CHECKED]

Please see Annex AP5 for supporting information, and the "Introduction" for Health and Safety considerations and advice on the use of the guidance.

1. **What is the proposed after-use**
   If the after-use is agriculture, is it proposed to keep the restored site in grass or in an arable rotation?

2. **Check that the landform is appropriate**
   a. for BMV land, gradients are 1 in 8 (7 degrees) or less; for grade 3b, 1 in 5 (11 degrees) or less
   b. even slopes without backfalls
   c. site boundaries merge appropriately with adjoining land
   d. no “dead - end” valley features
   e. reasonably shaped/sized enclosures
   f. low level restoration - special considerations

3. **Are the restoration proposals generally acceptable**
   Most sites of any size will be progressively restored on a phased basis. Check the following:
   a. is the phasing logical, generally working through the site and back to the plant site and exit
   b. does the phasing reduce the need to have haul roads across unworked/restored land
   c. are the plant site/processing/storage areas appropriately located
   d. do the proposals minimise disturbed areas throughout the life of the working
   e. are impacts upon access, drainage and water supplies taken into account
   f. are impacts upon the water environment in the area taken into account
   g. will dust on agricultural crops be prevented
   h. are there provisions to prevent the spread of plant or animal diseases

4. **Where putrescible waste is to be landfilled, check that the following have been considered**
   a. has scheme been produced holistically
   b. is interim restoration proposed
   c. what are the implications of landfilling on the proposed after-use
   d. has an appropriate allowance been made for settlement
   e. is the site to be managed as a biological reactor
f. if clay is to be used for cell construction, where is it sourced from and stored

gh. have the EA and the applicant’s agricultural advisers been involved in the design process and are there likely to be conflicts between Waste Management Licence and planning conditions

d. what material is to be used for daily cover

e. does the design and siting of the environmental controls minimise their impact on the proposed after-use

fh. have appropriate access arrangements been proposed for monitoring and maintenance of wellheads etc

**COMMENTS**

For more detailed information see:

- The Reclamation of Mineral Workings to Agriculture (DoE 1996)
- Guidance on Good Practice for the Reclamation of Mineral Workings to Agriculture (DoE 1996)
- Good Practice Guide for Handling Soils (MAFF April 2000)
- MPG7 The Reclamation of Mineral Workings (DoE 1996)
- Low Level Restoration of Sand and Gravel Workings (DoE 1989)
- Town and Country Planning Act 1990 Schedule 5
- Landfill Gas and Leachate Control Applied to Arable After-use (MAFF 1998 PR4869)

Cross references:

- AP 3, 7, 10
- SW 3, 6, 10
- RN 3, 4, 7, 9, 10
- AC 3, 4, 9
1. What is the proposed after-use

If the proposed after-use is agriculture, is this to be to grassland or arable? Extensive grassland may be less demanding in terms of the standard of restoration, depth of restored soil profile and drainage, although where grass is to be part of an arable rotation the requirements are more demanding, as for arable. Arable crops ideally require at least 1 metre of rootable soil depth with good drainage characteristics. A drainage scheme may therefore be needed, which will normally require a minimum of 0.6 metres of soil cover above the top of drainage pipes. The aim should be to restore at least 1 metre of soil profile wherever possible. Generally, BMV agricultural land should be restored to the 3(1) standard set out in Schedule 5 of the 1990 Act, even where the after-use is not agriculture. This will safeguard the long-term agricultural potential of the land in accordance with the principles of sustainability, providing the proposed after-use does not degrade the soil.

2. Check that the landform is appropriate

a. for BMV land, gradients are 1 in 8 (7 degrees) or less; for grade 3b, 1 in 5 (11 degrees) or less

BMV land cannot be steeper than 1 in 8 (7 degrees), and grade 3b, 1 in 5 (11 degrees) (MPG7 The Reclamation of Mineral Workings (DoE 1996) Table 1). For sites filled with putrescible waste, post settlement gradients should be no flatter than 1 in 25 to ensure adequate drainage and minimise surface ponding of water in the event of localised differential settlement (Waste Management Paper (WMP) 26B Landfill Design, Construction and Operational Practice (DoE 1995) paragraph 6.5).

b. even slopes without backfalls

Even slopes facilitate the use of agricultural machinery. Backfalls can lead to difficulties with drainage schemes and also to surface ponding of water.

c. site boundaries merge appropriately with adjoining land

Site boundaries should tie in with adjoining land levels to prevent potential problems with ponding of surface water. This is essential where the restored land may in the future form a larger enclosure when combined with adjoining land.

d. no “dead-end” valley features

Restored landforms should not include valley features forming “dead-ends”, as this may lead to drainage problems and surface water ponding.

e. reasonably shaped/sized enclosures

Modern farm machinery tends to be large and is designed to operate in straight lines as far as possible. Restored field enclosures, particularly where arable crops are to be grown, should therefore be reasonably large (e.g. >8 ha, depending upon the part of the country) and square or rectangular. Hedgerows, particularly where it is proposed that they are allowed to grow tall, should be planted in a
north - south orientation to reduce crop shading. However, these requirements represent ideals and will need to be modified in line with site constraints and landscape requirements.

f. low level restoration - special considerations
Where restoration is to a low (er) level it is important to consider the landform and the implications for land drainage. Is provision for an underdrainage system necessary and if so, is there a gravity outfall? If not, a perpetually pumped drainage scheme may be required, together with a balancing pond. The sides of the site may need to be sealed to reduce the ingress of groundwater. (Low Level Restoration of Sand and Gravel Workings (DoE 1989) Chapters 3, 5, 8 and 9). The applicants should provide details on the above matters prepared by appropriately qualified persons to demonstrate that their proposals are sound and practical.

3. Are the restoration proposals generally acceptable
Phased restoration is generally a requirement for most sites to limit the amount of land taken for development and left unrestored at any one time. This often requires soil from the plant and stockpile areas and the first phase to be stripped at the start of the development and put into store to open up the site. From then on, soil is stripped and restored progressively as earlier phases are worked out. Exceptions to this may be chalk and rock quarries, where the mineral is worked to a considerable depth, often in a series of benches. In these cases, the soil may need to be stripped and put into long-term storage from a relatively large part of the site, with restoration being delayed for many years until the area is worked out. In these circumstances, it is particularly important that there are good records of the location, soil type and volume of the different soil bunds and that they are well managed.

a. is the phasing logical, generally working through the site and back to the plant site and exit
Phased working and restoration should be planned as a logical sequence as far as possible to work through the site finishing back at the site entrance/exit. Changes to the routing of haul roads should be avoided wherever possible, minimising the need for the additional disturbance of the site. Phase boundaries should, as far as is practical, reflect the different soil units that need to be handled separately.

b. does the phasing reduce the need to have haul roads across unworked/restored land
Phasing arrangements should avoid, as far as possible, the need for haul roads to cross unstripped or restored soil necessitating further soil stripping and possibly, delaying restoration and aftercare. This is important where the site is to be landfilled and large quantities of waste need to be brought into the site.
c. are the plant site/processing/storage areas appropriately located
   The location of the plant site/processing/storage areas should be such that they are the last areas to be restored prior to the full reinstatement and closure of the site and do not, therefore, delay the restoration of other areas.

d. do the proposals minimise disturbed areas throughout the life of the working
   The working and restoration phasing should minimise the area of land not in cultivation either pre-working or post restoration. This is important as the soil is best conserved by being farmed rather than stored where some deterioration may occur. Also, where land is being actively farmed, this reduces the likelihood of the land becoming derelict or used for storage or trafficked upon.

e. are impacts upon access, drainage and water supplies taken into account
   Proposals which interfere with agricultural drainage, water supplies (including irrigation) and access will require appropriate remedial works and/or temporary accommodation works to be provided by the applicants. The interruption of irrigation supplies, for example, can have very serious consequences for the profitability of root crops in particular.

f. are impacts upon the water environment in the area taken into account
   Where working is to take place below the water table and de-watering is carried out, this may have significant impacts on the water table of land in the area, and potentially on irrigation supplies from boreholes. Generally, the water table of agricultural land should be at least 1 metre below ground level and maintained at this level by an underdrainage scheme, where necessary. But mineral extraction requiring de-watering may also lower the water table of neighbouring land significantly, leading to increased droughtiness, reduced crop yields and water available for irrigation from boreholes. Low level restoration of mineral sites may require lining of the void and perpetual pumping: this may interrupt the movement of groundwater also leading to the problems identified above (Low Level Restoration of Sand and Gravel Workings (DoE 1989) Chapters 3 and 4). Where proposals may affect the water environment significantly, the applicants should provide an assessment of the effects of the development on the water environment, together with details of any remedial works proposed, prepared by appropriately qualified hydrologists/hydrogeologists.

g. will dust on agricultural crops be prevented
   Dust from mineral sites may be a problem, particularly when soil handling operations are taking place in dry conditions and adjacent to haul roads. In severe cases, dust may limit the palatability of grass to livestock and lead to problems with marketability where vegetable or fruit crops are affected.

h. are there provisions to prevent the spread of plant or animal diseases
   Plant and animal diseases may be spread from one agricultural holding to another through contaminated soil carried on plant and machinery, or through imported soil or soil forming materials and amendments. Seagulls may be
attracted to landfill sites and to mineral sites which have large water bodies. They often use “loafing areas” on adjoining agricultural land, which can lead to crop damage and potentially to the spread of animal diseases. Seagulls can pick up waste food from landfill sites and drop it on outdoor pig units in the vicinity, which can lead to the spread of diseases such as Swine Fever. Landfill sites may also attract vermin, such as rats and flies, which can spread animal diseases. Applicants and contractors should follow the advice given in “Preventing the Spread of Plant and Animal Diseases – A Practical Guide” (MAFF 1991 PB0486).

4. Where putrescible waste is to be landfilled check that the following have been considered

Sites which are to be landfilled with waste require additional matters to be considered to achieve a satisfactory standard of restoration to agriculture.

a. has scheme been produced holistically

In order to achieve the best standard of restoration, particularly where putrescible waste is involved, it is necessary that the requirements of the after-use are planned for from the very outset of site design. This is particularly important when arable after-uses are proposed, and advice on this is set out in “Landfill Gas and Leachate Control Applied to Arable After-use” (MAFF November 1998 PB4869).

b. is interim restoration proposed

Interim restoration may have advantages, particularly where BMV land and putrescible waste are involved. It requires delaying the restoration of some of the subsoil and all of the topsoil until after the worst of the settlement has occurred and repairs to the landfill gas and leachate control infrastructure have been carried out. A major advantage is that the majority of the soil is not trafficked over or contaminated when excavations are necessary to lay new pipework or drill new wells. (Waste Management Paper (WMP) 26E Landfill Restoration and Post Closure Management Consultation Draft (Environment Agency August 1996) paragraphs. 7.18 - 7.25). A grass cover crop is sown and managed on the subsoil to help prevent surface erosion, damage to soil structure and the build up of weeds.

c. what are the implications of landfilling on the proposed after-use

If putrescible waste is to be landfilled the Waste Management Licence will require the site to be constructed as a series of cells, on a fully contained basis, with infrastructure to collect both landfill gas and leachate. The pipework, wellheads and other controls may interfere with the agricultural after-use, particularly if this is to be arable (Landfill Gas and Leachate Control Applied to Arable After-use (MAFF November 1998 PR4869)). Surface landfill gas pipework may be proposed for a number of years, in which case a grass crop for grazing is the most that can normally be achieved as an agricultural after-use. Surface features, such as wellheads and controls, should be sited as far as practical on field boundaries and in straight, parallel lines when within the cropped area. Pipework
should be at a depth to give a minimum of 1 metre of clear soil in which to install an underdrainage scheme, which will almost certainly be required on a capped site. Where it is not proposed to utilise the gas initially but at some future date, this may have implications for the after-use, as additional gas wells may need to be drilled and the rate of settlement may increase once gas abstraction/utilisation begins. Where inert waste is being landfilled, it will be necessary to ensure that there is a sufficient depth of soil (ideally > 1 metre) above the waste to allow for deep cultivations and the installation of a drainage scheme.

d. has an appropriate allowance been made for settlement

The majority of settlement takes place in the first 5 years following landfilling with putrescible waste. Post settlement gradients should be no flatter than 1 in 25 to aid drainage and limit surface ponding of water due to localised differential settlement. To take account of settlement, sites are typically surcharged by 15 - 20% (Waste Management Paper (WMP) 26B Landfill Design, Construction and Operational Practice (DoE 1995) paragraphs 6.5, 6.12 and 6.13). However, recent studies have shown that settlement may exceed 20%. Pre-settlement contours should also be suitable for the agricultural after-use, both to take account of the agricultural requirements at the start of the aftercare period, and also in the event that settlement is significantly less than predicted.

e. is the site to be managed as a biological reactor

Sites to be managed as bio-reactors for accelerated stabilisation have special design requirements with intensive landfill gas and leachate controls enabling leachate to be re-circulated (Waste Management Paper (WMP) 26B Landfill Design, Construction and Operational Practice (DoE 1995) Appendix D). The management of these sites may bring advantages, such as more rapid stabilisation in terms of settlement and landfill gas production, but disadvantages in terms of rapid settlement and the need for remedial works to the sub-cap irrigation system requiring major site disturbance. These problems may be reduced with interim restoration and careful design, monitoring and liaison between staff involved in engineering, restoration and aftercare (Waste Management Paper (WMP) 26E Landfill Restoration and Post Closure Management Consultation Draft (Environment Agency August 1996) paragraphs 7.37 - 7.45).

f. if clay is to be used for cell construction, where is it sourced from and stored

Where landfill cell and cap construction are to use clay sourced from the site, it will be necessary to check that this does not form part of the soil resources needed for the restoration. For example, in some circumstances, clay subsoil stripped as part of the soil profile and needed for the restoration may also be suitable for engineering of the landfill cells, and proposals may be put forward for its use as such. Where this happens, the applicants must demonstrate that they have an appropriate subsoil substitute available at the right time and in sufficient quantities, to ensure that the long-term agricultural potential of the restored land is safeguarded. A further consideration in these circumstances is that the
excavation and storage of the clay material/subsoil substitute may prejudice the phased restoration of the site and require a greater area of land for storage.

g. have the EA and the applicant’s agricultural advisers been involved in the design process and are there likely to be conflicts between Waste Management Licence and planning conditions
To facilitate a holistic approach to the design of the site, all interested parties should be involved from the very beginning, in pre-application consultations for example. This should include the EA and the applicant’s agricultural advisers, to minimise the potential for conflicting requirements of Waste Management Licence and planning permission conditions. The liaison should be on-going, as amendments to design and engineering of the site may be necessary following planning approval.

h. what material is to be used for daily cover
The source of “daily cover” should be identified to ensure that soil resources are not used which are needed for the agricultural restoration, thus compromising standards and the long-term agricultural potential of the land. The applicants should demonstrate that they are making the most sustainable use of all soil and soil-forming materials on site.

i. does the design and siting of the environmental controls minimise their impact on the proposed after-use
If putrescible waste is to be landfilled the Waste Management Licence will require the site to be constructed in a series of cells, on a fully contained basis, with infrastructure to collect both landfill gas and leachate. The pipework, wellheads and other controls may interfere with the agricultural after-use, particularly if this is to be arable crops (Landfill Gas and Leachate Control Applied to Arable After-use (MAFF November 1998 PR4869)). Surface landfill gas pipework may be proposed for a number of years, in which case a grass crop for grazing is the most that can normally be achieved as an agricultural after-use. Surface features such as wellheads and controls should be sited as far as practical on field boundaries, and in straight parallel lines when within the cropped area. Ideally pipework should be at a depth to give a minimum of 1 metre of clear soil in which to install an underdrainage scheme, which will almost certainly be required on a capped site. A minimum of 0.6 metres of clear soil cover is necessary above the top of the underdrainage pipes to allow for deep cultivations such as subsoiling. Where it is not proposed to utilise the gas initially but at some future date, this may have implications for the after-use as additional gas wells may need to be drilled, and the rate of settlement may increase once gas abstraction/utilisation begins. Where inert waste is being landfilled, it will be necessary to ensure that there is a sufficient depth of soil (ideally > 1 metre) above the waste to allow for the installation of a drainage scheme and deep cultivations such as subsoiling.
j. have appropriate access arrangements been proposed for monitoring and maintenance of wellheads etc

Wellheads, pipework controls and sampling points will require access for vehicles for monitoring and maintenance purposes. These access routes should be designed and laid out to minimise disruption to the after-use and damage to the land surface. Dedicated haul routes should reduce the incidence of vehicles driving randomly over the site, and should, wherever possible, satisfy the needs of agricultural access and be routed along boundaries.