Please see Annex AC8 for supporting information, and the “Introduction” for Health and Safety considerations and advice on the use of the guidance.

1. Are appropriate details included in the annual aftercare report
2. Have samples been taken for soil analysis
   a. is it up to date
   b. does it identify samples for specific fields
   c. do the results include any recommendations
3. Has a suitably trained person prepared the reports
   a. have they been able to verify the fertiliser applications made to the crops
   b. are they able to ensure that organic fertilisers have been taken account of
   c. are they aware of the current and proposed cropping details
4. Have details of current nitrogen (N), phosphorous (P), potassium (K), magnesium (Mg) and pH status been provided
   a. what are the target indices
5. What are the recommended rates and types of fertiliser application
6. Have the results and recommendations been made available to all with an interest in the land
7. Who has the responsibility to apply the fertilisers
8. What checks are possible
9. Other environmental aspects
   a. proximity to watercourses or boreholes
   b. ecological areas
   c. potential leaching
   d. application of other wastes
   e. nitrate vulnerable zones
10. What are fertilisers
    a. organic fertilisers
    b. inorganic fertilisers
    c. importance of pH
### Comments

For more detailed information see:

- [Fertiliser Recommendations for Agricultural and Horticultural Crops](The Stationary Office 2000 RB209)
- [Waste Management Licensing Regulations 1994](SI 1056)
- [Code of Good Agricultural Practice for the Protection of Water](MAFF 1998 PB0585)
- [Code of Good Agricultural Practice for the Protection of Air](MAFF 1998 PB0618)
- [Code of Good Agricultural Practice for the Protection of Soil](MAFF 1998 PB0617)

### Cross References

- AC 6, 7, 9
1. Are appropriate details included in the annual aftercare report

The purpose of the annual meetings is to assess progress towards achieving the required standards of restoration. These meetings are more effective for all parties if the information required to be discussed has been circulated and considered a month prior to the meeting. Typically, a scheme would include details of land management: cropping, cultivations, seed mixes, fertiliser rates, stocking levels and grazing periods; soil analysis, land drainage proposals, secondary treatments e.g. sub-soiling and mole drainage and, for subsequent years, any remedial work. The fertiliser requirements of replaced soil that may have been in storage for a number of years need individual consideration. Soluble compounds may have been leached during the storage of soil and therefore, the fertiliser and liming characteristics could have altered. Soil pH and available nutrient contents, especially phosphorus, can fall if soil is stored for a long time. As it is important to establish crop cover as quickly as possible, lime or nutrient deficiencies should be corrected by applying lime, fertilisers and organic manures. To ensure appropriate applications, the soil should be analysed immediately after soil replacement and repeated every two years throughout the aftercare period.

2. Have samples been taken for soil analysis

For most nutrients, laboratory analysis of soil and/or plant tissue can be used to predict nutrient shortages or diagnose crop deficiencies. For some nutrients (e.g. soil P analysis), different analytical methods may be used by different laboratories. The interpretation of analytical data requires knowledge of the analytical method used as well as many other factors.

a. is it up to date
The soil analysis results are needed primarily as tools to use for land management - they are not merely a requirement of the planning process. Therefore the results must be reported and acted upon.

b. does it identify samples for specific fields
There is variability of nutrient levels in agricultural fields and it is, therefore, essential that representative samples are taken in a standard manner for submission to the laboratory. Key points of soil sampling are to ensure no sample should represent more than 10 ha. The area must have a uniform history and soil type. Do not sample within 3 months of lime, fertiliser or manure application. Avoid headlands and unusual areas (e.g. trees, feeding areas) and sample to correct depth for the crop.

c. do the results include any recommendations
In drawing up the details for the aftercare for the forthcoming year, the basis for decisions should be clearly understood.
3. Has a suitably trained person prepared the reports

A knowledge of the soil characteristics and the local climate is essential when assessing the growth and yield potential of crops, and when giving fertiliser recommendations. Consultants providing plant nutrition advice should be FACTS qualified.

a. have they been able to verify the fertiliser applications made to the crops
   The person providing the advice is reliant on information being forthcoming from other parties, such as the mineral operator and farmer. Good records are important to develop a picture as to the applications and take-up of the fertilisers in each field. Good records may assist in identifying particular problems.

b. are they able to ensure that organic fertilisers have been taken account of
   The nutrient content of organic manures is extremely variable even for the same type of manure. The livestock feeding regime and the manure handling and storage system both have large influences of the nutrient content. Refer to the Defra publication *Fertiliser Recommendations for Agricultural and Horticultural Crops* (The Stationery Office 2000 RB209), for values of the nutrient content of different types of organic manures.

c. are they aware of the current and proposed cropping details
   Any proposed fertiliser recommendation given by a qualified person would take into account the existing and proposed cropping regimes. This should be as detailed in the aftercare programme and should not be deviated from, unless for good reason and with the full understanding of all parties. The responsibility for verifying the application, quantity and timing of fertiliser application should rest with the mineral operator.

4. Have details of current nitrogen (N), phosphorous (P), potassium (K), magnesium (Mg) and pH status been provided

Soil analysis should be carried out for soil pH, P, K and Mg nutrient levels. Soil nutrient concentrations change only very slowly. Large quantities of surplus nutrient above crop off-take are needed to raise the soil nutrient status. The Soil Index system for P, K and Mg provides a simple classification of the precise laboratory value (mg/litre). Indices range from 0 (deficient) to 9 (very high). For outdoor crops, it is rare to encounter Indices above 5. For nitrogen, there are 3 Indices. These are not based on soil analysis, but rather on previous cropping and manuring. For full details, refer to Defra’s *Fertiliser Recommendations for Agricultural and Horticultural Crops* (The Stationery Office 2000 RB209), or other similar publications.

a. what are the target indices
   The necessary soil nutrient indices provided by the soil nutrient and pH analysis should be considered against the target indices that will be related to the soil type and after-use as described in *Fertiliser Recommendations for Agricultural and Horticultural Crops* (The Stationery Office 2000 RB209). Defra experience is that
a target index of 2 for phosphate and potash is reasonable for most soil, except very sandy soil or amenity grassland, where an index of 1 may be all that can be achieved.

5. What are the recommended rates and types of fertiliser application

The report will specify the quantity of nutrient required for the crop. Fertiliser may be applied to a crop for one of two purposes - either to obtain extra yield and/or quality of the crop being grown, or to maintain or improve the existing level of soil fertility. A good fertiliser policy developed for a restoration scheme will aim at building up or maintaining satisfactory soil nutrient levels. However, nutrients such as nitrogen that can be readily leached from the soil must be applied at rates and at the time of year appropriate to the crop. Advice should be sought from FACTS qualified advisers.

6. Have the results and recommendations been made available to all with an interest in the land

The results must be provided to and understood by those who are responsible for applying the fertiliser to the land.

7. Who has the responsibility to apply the fertilisers

The objective of applying fertiliser during the aftercare period is to achieve good crop establishment, as protection against soil erosion, assist root development to aid soil structural recovery, and build up nutrient reserves to levels suitable for normal cropping at the end of the aftercare period. The mineral operator should not discharge his responsibility merely by paying a lump sum to the tenant or landowner to apply fertilisers as they see fit. The quantities being applied may be in excess of the annual crop requirements. Whilst this may build up nutrient levels, it may not be economically viable in the short-term, except as part of an agreed aftercare programme.

8. What checks are possible

Appropriate records of fertiliser applications should be provided. An additional check might be the visual condition of the crop, the crop yield and subsequent soil analysis results.

9. Other environmental aspects

It is necessary to be aware of the responsibility to ensure that the site is being managed during aftercare in an environmentally responsible manner. For some of the operations set out below, a risk assessment may be appropriate.
a. **proximity to watercourses or boreholes**
   There are recommended distances that should separate watercourses (10 metres) and boreholes (50 metres) from areas spread with organic manure. There are situations in which the farmer should not spread slurries or fertilisers, e.g. frozen or sloping ground. Care must be taken to prevent any fertiliser from polluting watercourses, ditches and surface water bodies.

b. **ecological areas**
   Special requirements are necessary near areas of ecological interest. Raising the fertility of soil in natural or semi-natural habitats, or altering the pH, may reduce the range of species living there. This should be avoided on all protected sites and, wherever possible, in other sensitive habitats. Advice should be sought from English Nature or other similar organisation as necessary.

c. **potential leaching**
   On restored sites, water may move quickly to the drains rather than going slowly through the soil profile. This could lead to potential leaching/loss of fertilisers and pesticides via drain-flow, as well as the more obvious surface run-off. Management of the aftercare programme of fertiliser and pesticide applications should take this factor into account by following agricultural good practices.

d. **application of other wastes**
   Sewage sludge and industrial wastes can provide fertiliser nutrients and improve soil physical conditions. Ensure the relevant legislation is followed when wastes are applied, and that the wastes and the soil is monitored by full analysis.

e. **nitrate vulnerable zones**
   These zones cover surface as well as groundwater sources of drinking water. There is a single compulsory national prescription that must be followed in such designated areas.

10. **What are fertilisers**
   There are many different types of fertiliser each with their own characteristics, advantages and disadvantages.

   a. **organic fertilisers**
      These contain variable quantities of nutrients that should be effectively utilised. Careful application to land will reduce the risk of environmental pollution and can lead to substantial savings on purchased fertilisers. There are numerous types of organic manures including dirty water, neat or diluted excreta, farmyard manure, poultry manures, sewage sludge, and industrial wastes. Industrial wastes include materials such as abattoir waste, ink sludge waste and vegetable-washing waste, which are commonly applied to land. The nutrient and toxic element content of these materials will vary and each material needs to be assessed individually before application to land. Industrial waste materials must be shown to be
beneficial before they can be applied to land. Full details can be found in the

Fertilisers should be applied during periods of rapid crop growth and nutrient
uptake. Applications of materials with a high available N content (e.g. poultry
manures, pig/cow slurries) should be avoided during autumn and winter, since
losses of N through nitrate leaching will be high, particularly on sandy and shallow
soil.

b. inorganic fertilisers
Most nutrients can be applied relatively easily as inorganic fertilisers. Compound
fertilisers contain more than one nutrient and straight fertilisers contain only a
single nutrient. The physical quality of fertilisers is very important and the
analysis of all European Union fertilisers is declared in a prescribed manner.
Therefore, following soil analysis, the most appropriate fertiliser to apply to the
land can be determined.

c. importance of pH
The pH of a soil is a way of expressing how acidic or alkaline it is. It is usually
measured using a water extract. A pH of 7 is neutral; soil with lower values are
said to be acid and those above pH 7 are alkaline. Most agricultural soil, other
than peats, are maintained at a pH of between 6.0 and 7.5. Although 5.5 is
adequate for grass and some crops, clovers are more sensitive to acid conditions.
If growing clover, other legumes or cereals, a pH of at least 6.0 is required. Peat
soil may be maintained at a rather lower pH than the majority of soil. The correct
pH is important as it influences the availability of many plant nutrients. Some soils
are naturally rich in lime (e.g. chalky soils) and may never need liming. Others
may gradually become acid due to natural processes and the use of high levels of
nitrogen fertiliser, and may require applications of lime to correct acidity.