

Chapter 17: Procedures for Recovery

17.1 Scope

17.1.1 Procedures and arrangements for recovery were considered on a number of occasions in the mid to late 1990s at Workshops and Seminars following off-site exercises for civil nuclear sites. This chapter builds on the lessons learned from a number of Recovery Exercises in 2003/04/05.

17.2 Summary

17.2.1 This chapter recommends procedures to be applied to the recovery phase following UK civil nuclear accidents and recommends that, insofar as appropriate, the general principles of UK nuclear emergency response for intervention following nuclear accidents should apply equally to the recovery phase.

17.3 Background

17.3.1 It is proposed that the period following an accident should be supported by a Recovery Working Group (RWG), which would be established as soon as practicable after it became clear that off-site contamination was going to occur. A detailed description of how the RWG might work is expanded at Annex 17.1. This would aim to ensure continuity between the acute and recovery phases. The RWG would support the work of the main Strategic Co-ordinating Group (SCG) at the Off-Site Facility (OSF) on which the GTA and SGLR would be represented. The RWG would draw on international and national guidance concerning intervention following nuclear accidents in undertaking its work.

17.4 Implementing monitoring, decontamination and restricted access measures

17.4.1 The task of assessing the need for and implementing off-site recovery following an accident should be managed from the OSF, under the auspices of the body chairing Strategic Co-ordination Meetings at the appropriate time (i.e. either the police or later the local authority). In practice decontamination may need to be coupled with access restriction measures in order to control doses to the public.

17.4.2 For more serious contamination resulting from larger accidents the responsibility for management of the recovery responsibilities should be carried out directly from the OSF under local authority auspices (assuming that by this time it will have taken over from the police), drawing on relevant operator expertise and resources as appropriate. This may need to include arrangements for coordination of activities between local authorities where more than one was responsible for the area surrounding a nuclear site. In these circumstances, a local authority in England or Wales would be acting in accordance with powers arising under the Civil Contingencies Act.

- 17.4.3 Both personnel and specialist equipment would need to be brought/bought in to handle monitoring, decontamination and clean-up work, although some use of local authority staff and contractors might be possible after training.
- 17.4.4 The specialist personnel and equipment necessary to undertake the work could come from a variety of sources. These will have been identified in the site plans and should include GDS. They are most likely to come from the nuclear industry, specialist contractors and, possibly, military sources. Overseas assistance might also be drawn upon if necessary.
- 17.4.5 There would also be other personnel requirements. These could include the police or armed forces to control access to contaminated areas, accommodation officers to deal with those displaced from their homes, counsellors and legal advisers. Such activities would need to be undertaken alongside, and co-ordinated with, the countermeasures themselves. Again the sources of such personnel will be set out in off-site plans.
- 17.4.6 In the event of a large-scale accident, Defra would have responsibility for decontamination of agricultural land. FSA would have responsibility for imposing food restrictions and FEPA (Food and Environmental Protection Act 1985) enforcement officers (usually local authority staff – either trading standards or environmental health officers) would enforce these restrictions.

17.5 Disposal of radioactive waste

- 17.5.1 The disposal of any radioactive waste arising from decontamination and clean-up following a nuclear accident shall be handled on the basis of advice from the EA/SEPA, with the close involvement of the HM NII in view of the implications for workers. EA/SEPA will advise on the most appropriate means of dealing with the waste and, where necessary, arranging for its disposal. Storage and/or disposal of the waste in the vicinity of the accident may be appropriate to avoid transport problems and doses to workers. Annex 17.3 sets out guidance from the EA/SEPA on the legal and practical considerations to be taken into account on the disposal of radioactive waste arising from a nuclear accident.
- 17.5.2 FSA will also help to advise on the disposal of contaminated foodstuffs. In the event of a large design basis accident, key interested parties including FSA, Defra and local authorities would propose an appropriate disposal strategy based on scientific analysis. This strategy would be finalised in conjunction with the food and farming industries, interested Government departments and other response agencies. Annex 17.4 is an FSA paper which assesses the potential impact on foodstuffs from a nuclear accident, describes the conclusions of relevant research and outlines ongoing work and studies to develop options in advance of an accident.

17.6 Financial provisions

- 17.6.1 Under the Nuclear Installations Act 1965, as amended, liability to pay compensation for injury caused to any person or damage caused to the property of any person other than the licensee by an occurrence involving nuclear matter at a site or in transit falls to the site operator up to a limit of £140 million for any one occurrence. The operator is obliged to ensure, through insurance or some other means, that funds are made available to cover its liability.
- 17.6.2 Between this "operator limit" and the sterling equivalent of 300 million Special Drawing Rights (SDR) of the International Monetary Fund (approximately £280 million), claims are to be satisfied out of moneys provided by Parliament. Such moneys may be partly offset by contributions received from other states party to the 1963 Convention Supplementary to the Paris Convention (the "Brussels Supplementary Convention"), to which the UK is a party.
- 17.6.3 Beyond 300 million SDR, claims may be covered by a discretionary vote from Parliament. DTI, as the sponsoring department for the nuclear industry, has responsibility for administering the provisions of the Nuclear Installations Act 1965, including payments in respect of damage.
- 17.6.4 In the event of a nuclear accident occurring in the UK, the SGLR shall have the responsibility for providing advice on the enactment of these provisions.

Annex 17.1

GUIDANCE ON THE RECOVERY WORKING GROUP MEMBERSHIP AND TERMS OF REFERENCE

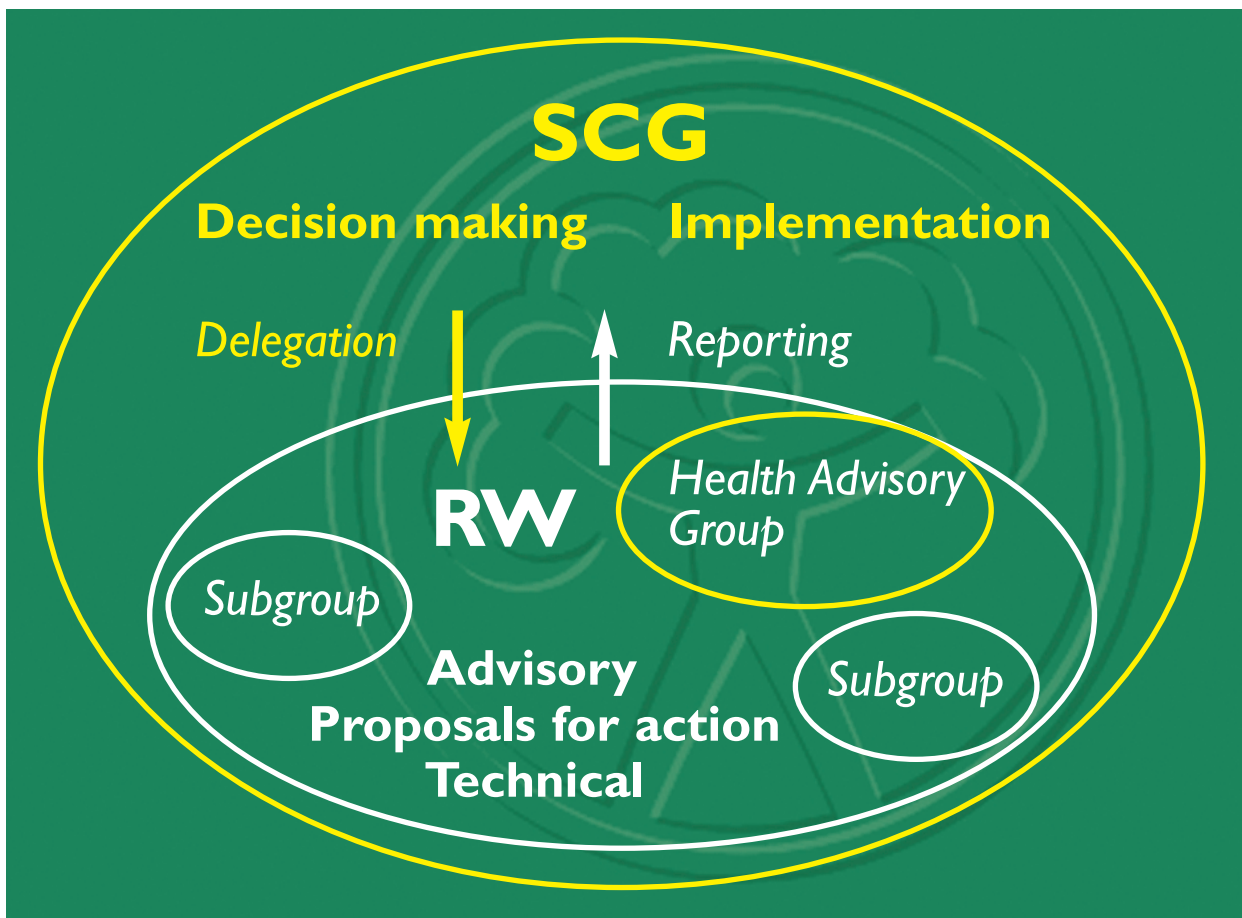
Introduction

1. It is for the operator working in conjunction with the local authority/authorities to decide the precise form the necessary plans should take. A preferred "best practice" organisational structure for recovery is set out in this chapter. This has been developed in the light of recent level 2 and level 3 civil nuclear exercises and exercises undertaken by the MOD.
2. If it becomes clear that off-site contamination is going to occur, the Recovery Working Group (RWG) should be convened as soon as practicable. This would be likely to be in the early stages of an accident, shortly after the off-site contamination is detected. It is foreseen that this Group would operate from the OSF although other locations in proximity of the OSF would potentially be possible and thought should be given to appropriate space in a convenient location for the RWG. The responsibility for ensuring that the RWG is convened rests with the OSF police co-ordinator, in consultation with the GTA.

Reporting Arrangements

3. The RWG should normally be chaired by a senior local authority representative and would report to the main Strategic Co-ordinating Group at the OSF. In practice, the RWG would be a Sub-Group of the Strategic Co-ordinating Group. This would apply irrespective of whether the Strategic Co-ordinating Group was chaired initially by the police, or later on by the local authority.
4. The Strategic Co-ordinating Group could be expected to delegate specific problems to the RWG for consideration, but the RWG would also be expected to act on its own initiative within parameters agreed by the SCG. The RWG would consider possible courses of action and make proposals for action. It should also have authority to set up specialist sub groups to consider specific issues, or action individuals to take particular matters forward. All detailed, technical discussion would take place in the RWG. The RWG would remit its advice to the SCG which would be responsible for all decision making and the implementation of measures. It might sanction, support, or reject, the advice of the RWG. The RWG would not be expected to become involved in advising on all the wider strategic responsibilities of the SCG such as media handling and public health.

5. The diagram below represents how the reporting arrangements for the RWG might work. N.B. In practice RWG is a subgroup of the SCG, and NEPLG has a clear view of its relationship to the SCG:
SCG - concerned with strategic decision-making; RWG - addresses more detailed technical issues and develops recovery proposals for consideration by the SCG. RWG has a strictly advisory role. It can also set up specialist subgroups. The SCG would be expected to delegate specific problems to the RWG for consideration although the RWG may act on its own initiative within parameters agreed by the SCG.



Terms of Reference

6. There should be clear terms of reference for the RWG, which should be drawn up as part of the planning process and be available in advance of any emergency.
7. These should include coverage of:
 - * characterisation of the extent and nature of off-site contamination from the accident
 - * identifying options and strategies for remediation, including clean-up of contamination and disposal of wastes, taking due account of the principles of justification and optimisation for intervention;
 - * identifying priorities, timescales and costs for the options being considered;
 - * proposing options for consideration by the SCG and preparing plans for their implementation;
 - * advising on and assessing recovery monitoring so as to ensure that objectives and targets have been achieved;
 - * maintaining records of recovery actions and providing briefings and information as necessary;
 - * advising on communications;
 - * advising on the close of the RWG.
8. The RWG would consist of representatives of both local and central Government bodies, the latter supplying specialist advice and assistance to support the local response. The local bodies represented would probably include:
 - * County Council(s)
 - * District Council(s)
 - * Unitary Council(s)
 - * Police
 - * Water authorities
 - * Health authority/board
 - * Government Office Representation

National body representation could include:

- * HPA-RP
- * the Environment Agency (EA) or Scottish Environment Protection Agency (SEPA)
- * Health and Safety Executive (HSE)
- * Department of Environment, Food and Rural Affairs (Defra)
- * Food Standards Agency (FSA)
- * Scottish Executive Environment and Rural Affairs Department or the National Assembly's Agriculture Department (NAWAD)
- * Ministry of Defence (MOD)
- * Operator
- * Government Decontamination Service (GDS)

9. A Recovery Liaison Officer should be tasked with reporting to the SCG.
10. It is expected that the police and local authority would provide administrative support to the RWG until formal arrangements were put into place.
11. The GTA and SGLR, or their representatives, should also be invited to participate in RWG activities. It might also be necessary to bring in other Agencies as appropriate e.g. Railtrack, Forestry Commission and the Marine and Coastguard Agency (MCA).
12. In the initial stages of an emergency, the RWG should also consider and advise the SCG on the recovery phase implications of decisions being considered at the time to protect the public.
13. All those with statutory or other legal responsibility for the implementation or financing of the recovery plans should be consulted before the final plan of action is agreed. The public should also be consulted about the final plan of action. Where possible, this should be done through existing consultation machinery.
14. Membership of the RWG will need to be kept under review, as the number of organisations needing to be involved may decrease as work progresses.

Annex 17.2

PRACTICAL GUIDANCE TO ASSIST THE OPERATION OF THE RECOVERY WORKING GROUP

The following tables and checklist provide a framework to guide the Recovery Working Group's considerations.

a. Framework for developing recovery options

Overall advantages and disadvantages of proposed recovery programme

Advantages	Disadvantages
<ul style="list-style-type: none"> * Improved public perception * Return to "normality" – however defined * Public reassurance * Public dose savings * Consideration of and protection for wildlife * Limiting damage to people's livelihood 	<ul style="list-style-type: none"> * Remediation workers receive radiation doses * Waste generation and associated issues of volumes, activities, transport, storage, disposal * Societal disruption * Environmental damage * Loss of earnings/livelihood * Monetary costs/claims for compensation * Reduction in flexibility to apply subsequent remediation options

Geographical zones and land use types within a recovery programme (There may be more than one land use type for each geographical zone)

Geographical zone	Examples of land use types
<ul style="list-style-type: none"> * Accident site (Usually the responsibility of the operator) * Near Field (approx 0-5 km beyond accident site) * Intermediate (approx 5-10 km) * Far Field (10 km – 100 km) 	<ul style="list-style-type: none"> * Residential areas; e.g. roofs and interiors * Community open space; e.g. gardens, parks * Public buildings; e.g. hospitals, schools * Commercial properties; e.g. Shops, offices, business parks, golf courses * Urban uninhabited areas * Agricultural areas * Rural uninhabited areas

The following template table may be edited by the RWG, to assist the development of recovery options according to geographical zone and land use.

Evaluation of recovery options – table to be completed for each relevant:

- * ZONE : e.g. *accident site, near field, intermediate field, far field*; and
- * LAND USE : e.g. *Urban residential areas*

Note: a chosen option might be subject to controlled *in situ* trials before extensive use.

Criterion	Option 1 (give details)	Option 2 (give details)	Option 3 (give details)	Option 4 (give details)
Approximate Amount of Contamination Removed				
Approximate dose reduction				
Waste generation				
Resources required				
Other advantages				
Other disadvantages				
Timescale				

b. Checklist of actions and issues for consideration by the Recovery Working Group

1. Short term – waste management issues
2. Storage of contaminated material
3. Determine the "local" organisation and personnel required to advise on environmental containment and remediation.
4. Determine interim responsibilities for operational control in respect of tie-down, containment and initial remediation.
5. Identify the significant environmental effects of the incident for each of the receiving media, identify potential exposure pathways and initiate preparation of a register of environmental effects.
6. Advise on and record containment and tie-down measures undertaken and assess their implications for long term remediation for radioactive and conventional pollutants.
7. Provide briefings to crisis management executives (and PR staff) as required.
8. Maintain records of environmental and remediation actions taken.
9. Identify interim site remediation options and propose an interim remediation plan (including priorities and timescales).
10. Identify waste management issues associated with the incident and with the interim remediation plan.
11. Propose remediation objectives and targets to higher authorities.
12. Initiate preparation of a register of regulations that are pertinent to the remediation of the site, including the identification of the roles and responsibilities of each of the regulatory bodies involved.
13. Co-ordinate environmental reviews, audits and reports undertaken at the request of higher authorities.

Annex 17.3

GUIDANCE FROM THE ENVIRONMENT AGENCIES ON THE DISPOSAL OF RADIOACTIVE WASTE ARISING FROM A NUCLEAR ACCIDENT

Introduction

1. The following notes apply to the disposal and accumulation of solid and liquid radioactive wastes of all descriptions - whether soil, foodstuffs, non-food plants and animal carcasses, man-made contaminated substances and items from the built environment. UK Legislation
2. The Environment Agencies have statutory powers to authorise the accumulation and disposal of 'radioactive waste' as defined under the Radioactive Substances Act 1993 (RSA 93), and to issue consents for the discharge of the non-radioactive components of liquid effluents to controlled waters under the Water Resources Act 1991 (WRA 91), and a duty to license the disposal of controlled waste on land under Part II of the Environmental Protection Act 1990 (EPA 90). The Agencies have an overarching duty under the Environment Act 1995 to protect and enhance the environment, and specific duties under the EC Habitats Directive to protect certain key habitats and species.
3. In the event of an environmental incident involving radioactive substances, including a nuclear accident, the Environment Agency and SEPA are responsible for regulating the safe accumulation and safe disposal of radioactive waste arising. In some circumstances where statutory authorisation is not applicable, the Environment Agencies would provide regulatory advice within the UK's emergency response arrangements: in England and Wales, Defra has given this responsibility to the EA. Some observations on the statutory position are given in the following paragraphs.
4. Materials contaminated as a result of an uncontrolled discharge of radioactivity may not meet the strict legal definition of 'radioactive waste' as set down in RSA 93. There are other issues such as whether a private garden on which radioactivity was deposited could be deemed to be a 'premises which is used for the purposes of an undertaking' and could thus be subject to an authorisation issued under RSA 93. Therefore, for example, the Agencies' powers under S30 of RSA 93, to require radioactive waste to be disposed of as the relevant Agency thinks fit, may be of limited applicability.

5. If contaminated food arisings are not radioactive waste within the meaning of RSA 93, they would then, with the exception of waste from private gardens, be agricultural waste. As such, they would not be a controlled waste subject to statutory regulation under Part II of EPA 90 (including the associated system of transfer notes and the requirement to use registered carriers). It may further be noted that specific regulations applying to agricultural waste - namely the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 as amended 1997 - do not apply to waste foodstuffs.
6. If contaminated liquid wastes - including milk - were to be disposed of directly to controlled waters, this would need to be subject to a discharge consent issued by the Agency under WRA 91. In the case of disposal to sewer, there may be a defence available to the sewerage undertaker against prosecution if the undertaker received an effluent to its sewerage system which it was not bound to receive into its sewerage system.
7. In regard to non-radioactive aspects of liquid disposals to controlled waters, the Agency has powers under WRA 91 to issue prohibition notices to prevent further environmental damage for discharges of other matter (i.e. neither sewage nor trade effluent alone) and may use them to promote a preferred disposal option. The Agency has powers to serve enforcement notices for discharges of sewage or trade effluent regulated by a discharge consent.
8. In the event of major emergency, Regulations may be made under the Civil Contingencies Act 2004 for securing the essentials of life to the community. Within such Regulations, the Secretary of State might authorise or direct that particular actions be taken, for example in regard to protecting water supplies or requisitioning buildings or land for waste storage.
9. FSA will, if appropriate, exercise control under the Food and Environmental Protection Act 1985 to restrict the sale and movement of contaminated food or anything from which food can be derived.

International Obligations: OSPAR

10. The OSPAR Convention, which the UK has ratified, is concerned with the protection of an area of the marine environment which includes the sea surrounding the UK. Defra has confirmed that the requirements of the Convention relating to dumping do not necessarily apply in the case of force majeure, subject to the provision that such dumping is conducted in such a way as to minimise the likely impact and the OSPAR Commission is notified immediately. Therefore, UK contingency plans should be designed to sensibly minimise any likely impact on the marine environment, and provision included to notify OSPAR immediately after the event.

Practical Guidelines

11. Much is likely to depend on the circumstances of a particular accident. In some instances it might be better to leave the contamination in place and control site access. Whatever is decided will be subject to advice from the Environment Agency or SEPA regarding the disposal and accumulation of solid and liquid radioactive wastes of all descriptions, as noted above.
12. The overall guiding principle is that the waste management should be considered in the round. This means that a total system for dealing with a particular waste arising should be defined at the outset, such that, so far as possible:
 - * As with other aspects of the Recovery Working Group's considerations, available options are identified and evaluated, and the best practicable environmental option is selected;
 - * The consequences of available options - whether technical or involving social consequences such as public opinion - are foreseen; and hence;
 - * Action is not taken in haste which would subsequently lead to unnecessary problems.
13. An example of the considerations which would apply within this principle could involve the removal of loose contamination from roads. There may be a pressing need to decontaminate certain roads promptly, on logistical grounds. An available option which is known to be relatively effective is that of high-pressure washing. Before selecting that option, one would need to consider how to manage the secondary liquid waste arising of contaminated wash water: if this were to be recovered, how would it be stored and ultimately disposed of? If it were to be released to surface water drains, what would be the fate of the (dissolved/suspended) contamination? Would this cause problems of radiological impact or of public reassurance?
14. The need to avoid hasty action which may subsequently be regretted may favour a decision to remove radioactive wastes for interim storage, rather than prompt disposal - especially where the wastes:
 - * are of relatively small volume;
 - * are not readily dispersible, or can be made not readily dispersible by simple means such as in situ fixing/sealing of contamination, or containment in drums or ISO freight containers; or
 - * require further characterisation prior to disposal.

15. In terms of optimising radioactive waste management, consideration should be given to whether segregation of more-contaminated waste from probably greater volumes of less-contaminated waste would be worthwhile.
16. Before selecting a disposal option for radioactive wastes, an environmental impact assessment should always be undertaken and considered, both in terms of the radiological impact and any other environmental detriment which may result. A balance may need to be struck between the urgency of disposal and the level of detail which can be included in the assessment. In the case of putrescible or chemically-toxic wastes, the non-radiological environmental impact may be the dominant consideration.
17. In the selection of disposal options for solid radioactive wastes, regard may be had to the following practices for routine (non-accident) arisings of radioactive wastes, subject to advice from the relevant environment agency in the circumstances of a particular accident:
 - * Wastes containing no alpha emitters, and not more than 400 kBq total activity in any 0.1m³ of the waste, and not more than 40kBq in any one item of the waste, may be authorised by the Agency for disposal with ordinary refuse to a landfill site;
 - * Wastes containing not more than 4 GBq/t of alpha emitters, and not more than 12 GBq/t of other radionuclides - that is, within the UK definition of 'Low Level Waste' - may be authorised by the Agency for disposal either by controlled burial at a local sanitary landfill site, or to Drigg; and
 - * Wastes which exceed these limits for Low Level Waste should generally be removed for storage.
18. The following points may also contribute to the selection of a management option for solid wastes arising from an accident: On logistical grounds it may be preferable to dispose of wastes to a local sanitary landfill site, rather than to Drigg, particularly if the wastes are of large volume. In terms of radiological impact, the predominance of radionuclides of relatively short half-lives would also tend to favour local landfill disposal;
 - * There should be a presumption that any long-term storage of intermediate level waste would be undertaken at a nuclear licensed site. Long term storage of low level wastes may be undertaken elsewhere; and
 - * Public perception may be a key factor to include in the decision.

Annex 17.4

GUIDANCE FROM THE FSA ON THE CURRENT UK POSITION ON THE DISPOSAL OF FOOD CONTAMINATED WITH RADIOACTIVITY

Introduction

1. A major nuclear accident could result in agricultural land becoming contaminated to the extent that some food could exceed European Union intervention levels¹³. There would be a legal requirement to prevent such food from being sold, and there could be a need for disposal. The choice of disposal option will depend on a number of factors, for example, the volumes and types of food, the time over which the problem is likely to persist and the nature of the contamination. The problem is scenario specific and this means that it is not possible to plan in advance which disposal options will be used in the event of a nuclear accident. However, a large amount of work has been carried out to assess these options and this note summarises the work.
2. The FSA would work in conjunction with the appropriate environment authority (EA or SEPA) and other agencies to identify the most appropriate disposal options. The FSA has a responsibility to ensure that the public are protected from contaminated food and, therefore, has a responsibility to know that contaminated food has been disposed of safely and there is no risk of it entering the food chain. However, the Agency are not responsible for actually disposing of contaminated food.

The potential problem

3. In the event of a nuclear accident, milk is likely to be a large-scale disposal issue, especially if short-lived radionuclides such as iodine-131 are released. These isotopes readily transfer to cow's milk, reaching peak levels in 3 days, leading to an immediate problem for milk disposal. To put this into perspective, it has been predicted that a severe, beyond design-basis, accident affecting could lead to more than 9 millions litres of milk requiring disposal in the first few weeks after a food restriction order is placed.
4. For accidents where longer lived isotopes are released, milk and crops could require disposal. Again, the quantities involved will be dependent upon the foodstuffs produced in the area, the radionuclides involved, the soil type, the time of year in which the accident took place etc.

Current situation

5. There have been several reviews of agricultural countermeasures, and the latest UK research can be found in the HPA-RP's Recovery Handbook (see Annex 16.4).
6. It is appreciated that stakeholder involvement is essential in determining the appropriate waste disposal options for contaminated foodstuffs following a nuclear accident. The choice of options will not be based purely on scientific assessment. It is essential that other factors, such as the social acceptability and economic implications of the method be taken into consideration.
7. In 1997, the then MAFF and NRPB jointly set up the Agricultural and Food Counter Measures Working Group (AFCWG). The FSA and HPA-RP now jointly run the AFCWG. Membership comprises senior representatives from the food retail, farming and water industries, academia, consumer groups and government agricultural departments. These stakeholders have been actively involved in assessing acceptability of the agricultural and domestic production and free food countermeasures and disposal options in the Recovery Handbook. The members of the AFCWG would also be available for consultation on the options presented in the recovery strategy in the event of a nuclear emergency.
8. The AFCWG set up a number of sub-groups to particularly investigate waste disposal issues associated with milk following a nuclear emergency. The outcome of these investigations and discussions has been compiled within the AFCWG Guidance Document "Dealing with Milk Following a Nuclear Emergency", which is currently available through AFCWG members.