PROCEDURES FOR THE DISPOSAL OF RADIOACTIVE WASTE

General Requirements

All disposals of radioactive waste from the University are subject to the conditions and limits laid down by the Environment Agency (EA), in the Certificate of Authorisation for the Accumulation and Disposal of Radioactive Materials. All disposals must be made using the EA Guidance on Best Practicable Means (BPM).

RADIOACTIVE SOLID WASTE

ALL solid waste produced during the course of experiments in a radiation area must be treated as Low Level Waste or Very Low Level Waste (VLLW).

All radioactive solid waste must be transferred to the URPO prior to disposal. Persons wishing to dispose of such waste should contact the URPO by telephone or email to arrange a time for the transfer. Transfer times are advertised on the ISIS Home page.

For certain items of waste (e.g. bulky redundant equipment contaminated with low levels of radioactive materials), it may be necessary to utilise the Very Low Level Waste (Radioactive) route after consultation with and approval by the URPO.

Radioactive Solid Waste should be decontaminated in order to minimise, as far as reasonably practicable, the activities disposed of via this route. This is particularly important in the case of radioisotopes with half-lives of >90 days (e.g. 3H & 14C) which cannot be subjected to decay storage in order to significantly reduce the activity when final disposal takes place. It is not necessary to decontaminate waste items contaminated with isotopes with a half life less than 15 days (\(^{32}\)P, \(^{18}\)F)

Schools and Radiation User Groups wishing to dispose of redundant closed sources must contact the URPO for advice.

Radioactive Solid Waste containers must be marked with a unique ID number and clearly marked with the radiation hazard trefoil. The start date of the waste bin should be clearly displayed when the bin is started. When the bin is sealed it must again be dated with the end date in addition to a label stating the isotopes present and the activity for all isotopes present. Yellow bags may only be used for paper (e.g. dried gels) and glove waste. No other types of waste container (e.g. for normal Clinical Waste, glass, or domestic black bags) may be located in radiation areas to avoid putting contaminated waste into the wrong waste stream.

Radioisotopes with half lives of less than 90 days (short half-life radioisotopes, e.g. 32P, 33P, 35S, 125I) should segregated from those with long half-lives (>90 days, e.g. 3H & 14C).

A record of all radioactive materials placed within a given container must be made on the Isotope Stock Inventory System (ISIS). Bins must be sealed to prevent dispersal of the contents, yellow bags must be closed by use of cable ties or suitable tape.

After transfer to the Radioactive Waste store in Cookson Basement, bins containing short half-life radioisotopes will be placed in decay storage to allow a sufficient reduction in activity prior to disposal. Longer half-life radioisotopes will go directly to one of the designated radioactive clinical waste skips. Waste must NOT be stored in laboratories for decay purposes.
The University's Permit places a limit on the maximum activities that can be held in decay storage and an extremely restrictive annual limit on the maximum activity that can be disposed of as Radioactive Solid Waste. When a School or Radiation User Group is (or is likely to) produce radioactive clinical waste in excess of the limits below, the URPO must be contacted for advice on waste minimisation.

<table>
<thead>
<tr>
<th>Isotope</th>
<th>Column 1 Maximum Activity per Item</th>
<th>Column 2 Maximum Activity in any one full bag (0.1m³) prior to disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Half life Radioisotopes (&lt;90 days)</td>
<td>10 MBq / month</td>
<td></td>
</tr>
<tr>
<td>Long Half life Radioisotopes (&gt;90 days)</td>
<td>1 MBq / month</td>
<td></td>
</tr>
</tbody>
</table>

The disposal of activities greater than these limits may necessitate a change to the University's Permit and therefore incur very high costs for which the user(s) will be responsible. In the event that an existing limit within the Permit is likely to be exceeded, it may be necessary to enforce a temporary suspension of waste producing activities by users within those laboratories producing large quantities of waste.

**Very Low Level Radioactive Waste (VLLW)**

Very Low Level Waste (VLLW) can be disposed of via the regular black bag or clinical waste refuse route. The EPR10 Permit places limits on this as laid out in table 1. There are certain conditions of this. Materials disposed must non-Hazardous or if hazardous clinical waste must be neutralised (not via Autoclave) prior to disposal.

“Very Low Level Waste” means waste in the form of solid, which can be disposed of with municipal, commercial or industrial waste within the limits in table 1 of this document.

<table>
<thead>
<tr>
<th>Isotope</th>
<th>Column 1 Maximum Activity per Item</th>
<th>Column 2 Maximum Activity in any one full bag (0.1m³) prior to disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>3H &amp; 14C</td>
<td>400 kBq or 10 µCi</td>
<td>4 MBq or 100 µCi</td>
</tr>
<tr>
<td>All other isotopes</td>
<td>40 kBq or 1 µCi</td>
<td>400 kBq or 10 µCi</td>
</tr>
</tbody>
</table>

The time limit for accumulation of this waste is 14 days for the main Campus and the Human Genetics site and one month on the Campus for Ageing & Vitality from the date the bag was first used until its final disposal via the refuse collection.

You should avoid mixing 3H/14C waste with those of other isotopes.

Users may dispose of VLLW as defined in Schedule 1 of the Permit at any suitable location

**Summary of Schedule 1 of the Authorisation**

- There must be written operating procedures (This document)
- Adequate supervision by a suitably qualified and experienced person (URPO / RPS)
- Use Best Practicable Means to:
  - Minimise the activity
  - Minimise the volume
- Minimise the environmental impact from radiological hazards
  - Radioactive waste is held in a suitable container and in a suitable store
  - Maintain and retain records on the day of accumulation / disposal

Even though waste is disposed of as VLLW records must be made to show this. Activities can be readily measured for some isotopes but for 3H (Tritium) it is acceptable to follow the guidance described below.
All records of isotope disposals must be recorded on ISIS as far as is reasonably possible.

**Procedure for dealing with VLLW**

For disposal of solid waste as VLLW you should follow the procedure for disposal of all radioactive solid waste.

Following a suitable decay storage time as set out in the Permit URPO will determine whether the waste can be disposed of as VLLW. For Isotopes with a half life of less than 30 days then this will be the most likely route for disposal. Isotopes with a half life greater than 30 days (but not 3H/14C) will be disposed of as solid radioactive waste.

ISIS records for bin usage will be checked by URPO / RPS and only bins where single disposals are currently less than 40kBq and total activity does not exceed 400 kBq per 0.1m$^3$ (100 litres) will be seen as VLLW.
All records of isotope disposals must be recorded on ISIS.

**Additional Procedure for 3H (Tritium) and 14C Wastes**

3H and 14C wastes are not as readily detectable as contamination on gloves and tissues. It is therefore necessary to introduce a system to ensure that the limits above are not exceeded.

If the total activity used in your experiment (session) is less than that specified in column 1 of table 1 then you may proceed as normal. You must still perform wipe tests at the conclusion of your session.

For other isotopes a suitable contamination monitor should be used to determine the activity of items prior to disposal. See the Contamination Response Tables for information.

If the total activity used in your experiment (session) is greater than that in table 1 and you are using Tritium and or Carbon 14 then you must follow the procedure:

1. Perform and complete wipe testing of your workstation and any equipment used to confirm no spillages and that you have not inadvertently used an excess quantity of material.

2. If the results of the wipe test show a very high contamination level (greater than the contamination limits for that isotope) then you must calculate the activity of waste you have produced and if necessary wash any towels or paper to reduce contamination. You may have to undertake a further assessment of any contamination on the waste.

3. If the results of the wipe test show below contamination threshold levels then the waste can be regarded as being below the VLLW threshold values and is safe to dispose of.
When a bag containing VLLW is ready for disposal to an external skip or to the refuse contractor then a record identifying the waste and date of disposal must be made and retained for future reference for at least two years (ISIS).

ALL waste containers used for radioactive wastes will be regarded as solid waste and must be labelled as such URPO will determine the final disposal.

**LIQUID WASTE**

**Aqueous**

The normal disposal route for aqueous liquid wastes which are radioactive but otherwise innocuous is via one of the designated disposal sinks in the radioisotope laboratories, and wherever possible radioactive waste should be disposed of by this method. Each laboratory is given a monthly allocation for disposal into the drains via such sinks. This limit must not be exceeded unless prior permission is obtained from the URPO. All disposals via this route should be accompanied by a plentiful supply of running water, to ensure adequate dilution.

**Liquid Scintillant**

**Biodegradable** liquid scintillation fluids should be used at all times, preferably in disposable plastic vials, unless express permission to use other types (e.g. xylene or toluene based) has been obtained from the URPO. There are two alternative methods for the disposal of vials containing biodegradable scintillation fluids:

**Disposal via Designated Sink**

The vials may be emptied into a designated disposal sink; the fluid washed away with a plentiful supply of running water; and the vials disposed of as solid waste.

**Non-biodegradable liquid scintillation fluid**

The disposal of non-biodegradable solvent based fluids will require special arrangements and all associated costs will have to be met by the user. Non-Biodegradable fluids can NOT be disposed of to the drains. For disposal arrangements contact URPO. Disposal is via the Solid Waste contractor at a cost. All records made on ISIS must be made as Organic Liquid waste.
GASEOUS WASTE

Small quantities of carbon-14 gaseous waste may be discharged to atmosphere via fume cupboards on the main campus only. All discharges must be within authorised limits and approved in advance by the URPO. Check your permit for details.

ANIMAL CARCASSES

Small animal carcasses may be disposed of by maceration. Departmental limits for aqueous disposal must be observed. For incineration the requirements relating to the disposal of clinical or biologically contaminated waste must be observed, and additionally the URPO must be informed that the contents of the bags are putrescible so that early collection may be arranged. If it is necessary to delay disposal to allow activity to decay the carcasses should be clearly labelled and deep-frozen during this period.

Miscellaneous Waste

Any waste not falling within one of the above categories may only be disposed of after consultation with the URPO and is likely to incur considerable expense. This will relate to redundant sealed sources.

RECORDS OF RADIOACTIVE STOCK & WASTE DISPOSAL

Each user has a responsibility to keep clear and accurate records for each pot of radioisotope (Parent Stock) received. These stock records shall include: a unique ID number (which should also be written on the pot), date of receipt, the radionuclide present, and activity at time of receipt, activity per unit volume, and location. For each dispensation, a stock record must be made that includes: name of user; date; quantity dispensed; quantity remaining. Disposal records must also be kept giving details of: the activities disposed of via each radioactive waste route; used to make up a Secondary Stock solution (for which a similar separate stock record must be made); transferred to another radiation group (or organisation); and/or kept for a period of time as a Retained Sample. Users must keep a record of all Retained Samples, mark such samples appropriately, and dispose of them as soon as is practicable via an appropriate route. Recording of this is via the Isotope Stock Inventory System (ISIS). For further information on this please go to http://www.ncl.ac.uk/ohss/assets/documents/ISISmanual.pdf

Any suspected loss of radioactive material must be reported immediately to the URPO.