University of Sussex

Environmental Permitting Regulations 2010

Compliance Document and Operator's Procedures for Sealed and Open Sources

EPR2011 Compliance Document and Operator's Procedures –Sealed and Open Sources

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1. Endorsement

The University of Sussex will comply with the conditions attached to both the University's permit to use radioactive material in the form of open sources and to accumulate and dispose of radioactive waste, and the permit to use radioactive material in the form of sealed sources containing specified radionuclides in carrying out specified practices on the premises. This document and associated supporting documents have been formulated to enable the University to fulfil these conditions through a clear management structure and defined roles and responsibilities of those involved.

This management document will be reviewed regularly and revised whenever significant changes are necessary due to changes in legislation, guidance or activities within schools.

Signature

2.6.2014

Vice-Chancellor

2. Compliance Statement

The University of Sussex is committed to achieving compliance with the Environmental Permitting (England and Wales) Regulations 2010 and will, so far as is reasonably practicable, protect employees, members of the public and the environment from its activities involving the use of radioactive substances.

The University has appointed competent persons to assist in the discharge of its statutory duties under the EPR 2010 as detailed in section 4. "Responsibilities", in particular a qualified expert to advise on all aspects of EPR and RSR compliance and suitably qualified staff to supervise and undertake the duties required to achieve compliance with the conditions set out in the permits.

3. Responsibilities under EPR2010

3.1 University Council

The University Council is responsible for ensuring that overall management arrangements will meet the requirements of EPR 2010.

3.2 Vice-Chancellor

The Vice Chancellor is responsible for implementation of the University's Health and Safety Policy and as the most senior manager of the University is identified as the Operator under EPR 2010 and is therefore responsible for ensuring overall compliance with EPR 2010.

3.3 Heads of School

Heads of School are responsible for the implementation of EPR 2010 Operator Procedures within their schools, appointing any necessary Radiation Protection Supervisors in writing and for ensuring the provision of adequate resources to fulfil statutory requirements and university policy.

3.4 Heads of Department / Clinical Director

Heads of Department are responsible for ensuring that departmental staff under their management control, including faculty staff, technicians, students and visiting academics/researchers who use radioactive substances comply with EPR 2010 by following the relevant Operator procedures.

3.5 Director of Estate Services

The Director of Estate Services is responsible for the provision of the University Radiation Protection Service (URPS) which is managed by the University Radiation Protection Officer.

3.6 University Radiation Protection Service/University Radiation Protection Officer

The University Radiation Protection Service (URPS) is provided through the service level agreement with Sussex Estates and Facilities LLP (SEF), and is managed by

the University Radiation Protection Officer (URPO). The SEF QSHE and Compliance Manager will fulfil the functions of the URPO.

The URPO shall:

- Liaise with the Environment Agency on behalf of the Operator on all matters relating to EPR2010, including applications for permits and variations, the annual Pollution Inventory return and reporting breaches and any other notifiable occurrences.
- Liaise with the appointed Radiation Protection Adviser with regard to risk assessments, including risk assessments for new and expectant mothers, dosimetry requirements and the design and commissioning or alteration of radiation facilities.
- Supervise the training and licensing of radiation workers and other people with duties under these operating procedures.
- Liaise with University appointed Radiation Protection Supervisors and ensure that local operating procedures are developed to fulfil the requirements of these procedures.
- Perform regular inspections of radiation facilities and report deficiencies to the relevant school and the Radiation protection Committee.
- Organise and deliver an emergency response for all radiation emergencies occurring upon the campus.
- Maintain all necessary records for statutory compliance.

3.7 Radiation Protection Supervisors

Heads of School must appoint a Radiation Protection Supervisor (RPS) to oversee all work with ionising radiations within their school. The RPS is responsible for the authorisation of purchases of radioactive substances, maintenance of local records required by EPR2010, overseeing the accumulation and transfer of solid and organic liquid waste to the radioactive waste decay store and the disposal of aqueous waste. They will also be required to assist the RPO in the event of any emergency involving ionising radiations on the campus.

3.8 Sussex Estates and Facilities LLP

Sussex Estates and Facilities LLP (SEF) is responsible for implementing procedures to ensure that all work areas where radioactive materials are used follow the Environment Agency guidance on the design of radiation facilities and meet the standards required under EPR2010. To achieve this SEF is required to consult with the Radiation Protection Advisor (RPA) on behalf of the Operator, at the planning stage, for advice on best practice including design, fixtures, fittings and security. SEF must ensure sufficient on-going consultation with the RPA to ensure new or refurbished radiation work areas are completed and handed over in a condition that satisfies statutory requirements.

3.9 Principal Investigators/Research Team Leaders

Principal Investigators/Research Team Leaders are responsible for the supervision and safety of radiation workers engaged on projects involving ionising radiations and must ensure that radiation workers adhere to the relevant operator procedures. They are also responsible for the use, storage and disposal of radioactive substances used within their areas of control.

3.10 Head of Radiography

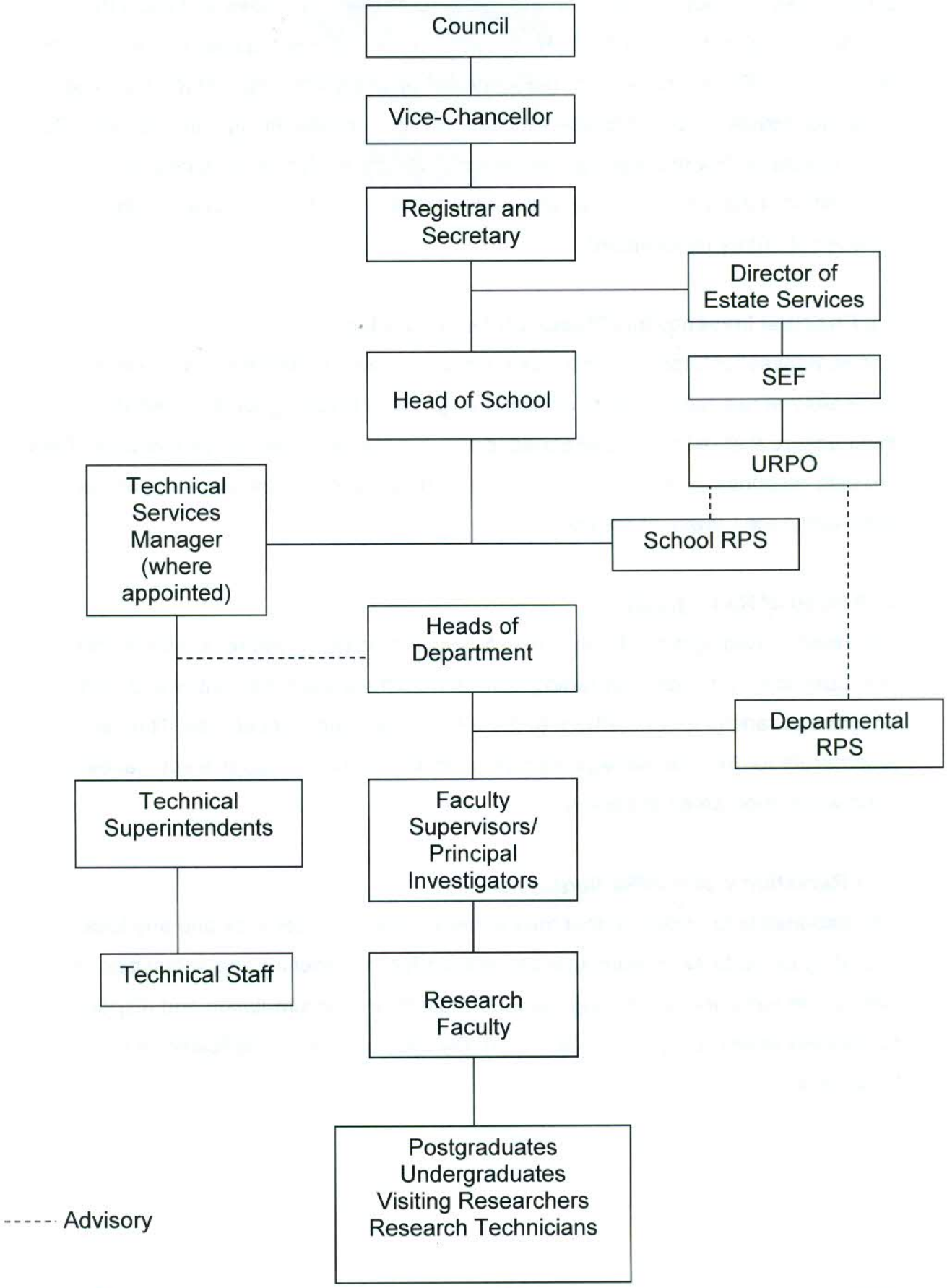
The Head of Radiography for the Clinical Imaging Science Centre is responsible for the supervision and safety of radiographers working under their control and must ensure that radiographers adhere to the relevant operator procedures. They are also responsible for the use, storage, security and disposal of radioactive substances used within their areas of control.

3.11 Radiation workers/Radiographers

Are responsible for ensuring that they adhere to these procedures and any local operating procedures, in particular procedures for the ordering and acquisition of radioactive substances, keeping required records and accumulation and disposal of radioactive waste. They must also report any discrepancies or deficiencies to the local RPS.

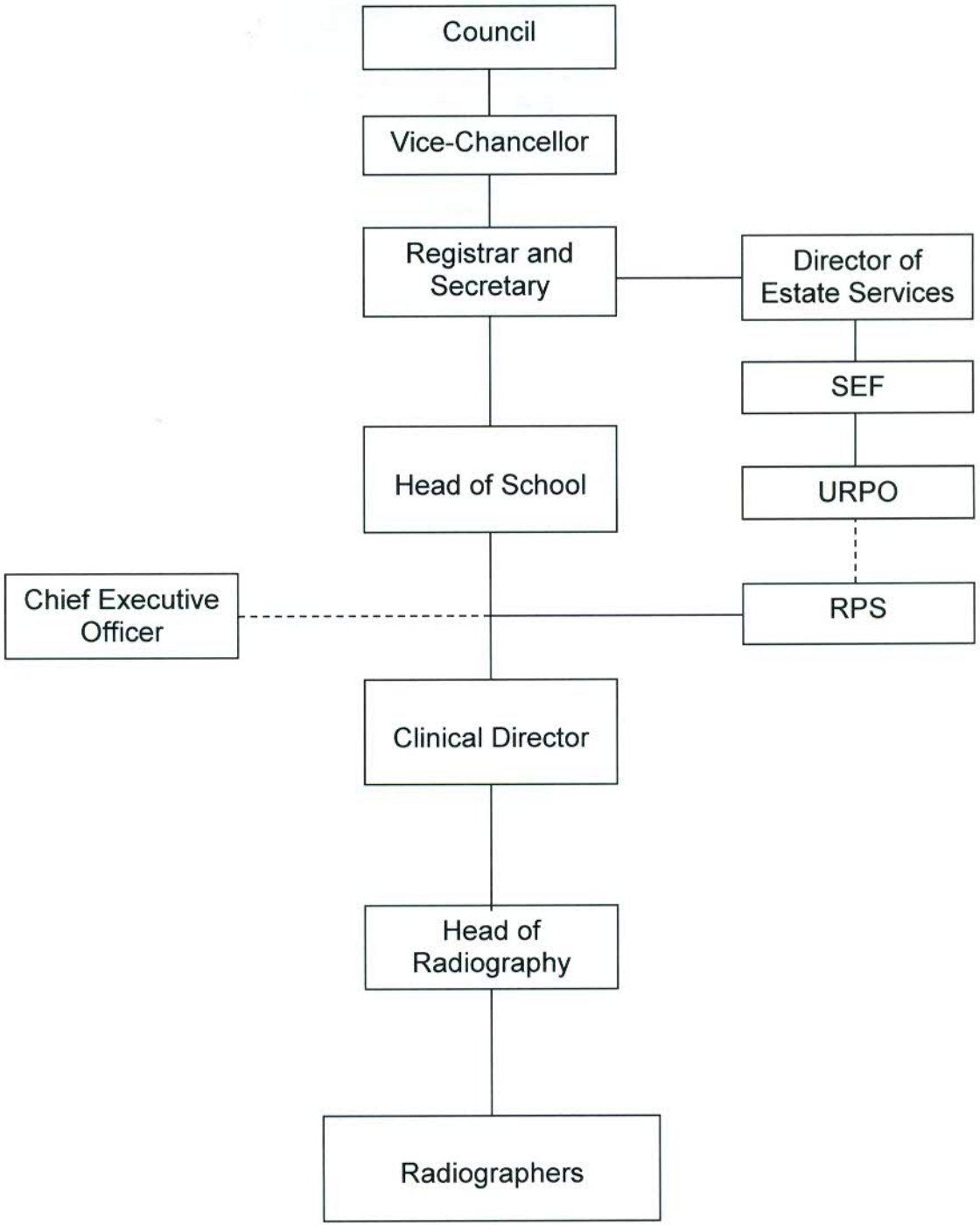
4.1 Organisational Chart - Radiation Management Structure;

University of Sussex



Line Management

4.2 Organisational Chart - Radiation Management Structure;
Brighton and Sussex Medical School



5. Financial Statement

5.1 The University is committed to provide sufficient financial and other resources to ensure compliance with the requirements of EPR2010 and in particular those conditions imposed on the Operator by the University's environmental permits to hold sealed sources, open sources and to accumulate and dispose of radioactive waste.

5.2 In particular resources will be made available to meet the following;

5.2.1 Fees for applications for new EPR2010 permits.
5.2.2 Fees for variations to existing EPR2010 permits.
5.2.3 Annual EPR2010 permit subsistence charges.
5.2.4 Cost of radioactive waste disposal.
5.2.5 Fees for RPA/RWA (Qualified Expert) advice with regard to compliance with EPR2010.
5.2.6 The maintenance of radiation facilities.
5.2.7 Refurbishment of radiation facilities to meet Environment Agency guidelines.
5.2.8 Financial provision to meet the cost of future disposal of any HASS.

6. Compliance Summary; Sealed source Permit No. EPR/TB3333DN

Condition	Procedure
Management Systems	
1.1.1	Whole Document
1.1.2	Operator's Procedures section 2
1.1.3	EPR(SS)CD5;Use, section 11
Staff Competency and Training	
1.2.1	EPR(SS)CD2;Staff competency and training, section 1
1.2.2	EPR(SS)CD2;Staff competency and training
1.2.3	EPR(SS)CD2;Staff competency and training, sections 2,3,4
1.2.4	EPR(SS)CD2;Staff competency and training, section 4
Maintenance	
1.3.1	EPR(SS)CD11; Leak tests, section 6
1.3.2	EPR(SS)CD11; Leak tests, section 7
Incident Prevention and Response	
1.4.1	EPR(SS)CD8;Security and fire precautions, EPR(SS)CD5;Use, sections 6-11
1.4.2	EPR(SS)CD4;Storage, EPR(SS)CD5; Use EPR(SS)CD9; Identification of radiation areas, sections 3,4,5,6
1.4.3	EPR(SS)CD7;Loss etc. section 2
1.4.4	EPR(SS)CD7;Loss etc. Section 3
1.4.5	EPR(SS)CD8;Security and fire precautions, section 1.2
1.4.6	EPR(SS)CD8;Security and fire precautions, sections 3,4
1.4.7	EPR(SS)CD8;Security and fire precautions
1.4.8	EPR(SS)CD7;Loss etc. section, sections 3.3, 4.2

Disused Sources	
1.5.1	EPR(SS)CD10;Disused sources, section 2
1.5.2	EPR(SS)CD10;Disused sources, section 1
1.5.3	EPR(SS)CD3; Ordering sealed sources, section 5,6
1.5.4	EPR(SS)CD10;Disused sources, section 4
1.5.5	EPR(SS)CD10;Disused sources, section 4
Transfer of Sources	
1.6.1	EPR(SS)CD10;Disused sources, section 3
Use of Sources	
2.1.1	EPR(SS)CD5;Use of sealed sources, section 1
2.1.2	EPR(SS)CD5;Use of sealed sources, section 4
2.1.3	EPR(SS)CD5;Use of sealed sources, section 3
2.1.4	EPR(SS)CD10;Disused sources, section 3
2.1.5	EPR(SS)CD5;Use of sealed sources, section15 EPR(SS)CD11; Leak tests, section, 6,7
Marking of Sources	
2.2.1.	EPR(SS)CD3; Ordering sealed sources, section 7
2.2.2	EPR(SS)CD12; Identification of sources, section 1
2.2.3	EPR(SS)CD12; Identification of sources, section 2
2.2.4	EPR(SS)CD12; Identification of sources, section 5
2.2.5	EPR(SS)CD12; Identification of sources, section 1.4
2.2.6	EPR(SS)CD3; Ordering sealed sources, section 7
2.2.7	EPR(SS)CD12; Identification of sources, section 6
Restriction on Sources Held	
3.1.1.	EPR(SS)CD1;Restrictions on sources held, all sections
3.1.2	EPR(SS)CD1;Restrictions on sources held, all sections
3.1.3	EPR(SS)CD1;Restrictions on sources held, section 1
Records	
4.1.1	EPR(SS)CD6; Keeping of required records, section 1,2
4.1.2	EPR(SS)CD6; Keeping of required records, section 3

4.1.3	EPR(SS)CD6; Keeping of required records, all sections
4.1.4	EPR(SS)CD6; Keeping of required records, section 10 EPR(SS)CD12; Identification of sources, sections 1.3, 2
4.1.5	EPR(SS)CD6; Keeping of required records, section 10
4.1.6	EPR(SS)CD12; Identification of sources, section 3
Notifications	
4.2.1	EPR(SS)CD10;Disused sources, section 5
4.2.2.	EPR(SS)CD10;Disused sources, section 6
4.2.3	EPR(SS)CD13;Reporting, section 1
4.2.4	EPR(SS)CD7;Loss etc., sections 2.1, 2.2, 3.4, 4.3
4.2.5	EPR(SS)CD7;Loss etc., section2.1, 2.2
4.2.6	EPR(SS)CD4;Storage, section 5
4.2.7	EPR(SS)CD10; Loss etc., section 2.3
4.2.8	EPR(SS)CD5;Use, section 16
4.2.9	EPR(SS)CD10;Disused sources, section 7
4.2.10	EPR(SS)CD7: Loss, etc., section 3.5
Reporting	
4.3.1	EPR(SS)CD13;Reporting, section 1
4.3.2	EPR(SS)CD13;Reporting, section 2

7.1 Sealed Source Operating Procedures.

EPR(SS)CD1	Restrictions on Sources Held
EPR(SS)CD2	Staff Competency and Training
EPR(SS)CD3	Ordering Sealed Sources
EPR(SS)CD4	Storage of Sealed Sources
EPR(SS)CD5	Use of Sealed Sources
EPR(SS)CD6	Keeping of Required Records
EPR(SS)CD7	Loss, Damage, Theft or Unauthorised Use
EPR(SS)CD8	Security and Fire Precautions
EPR(SS)CD9	Identification of Radiation Areas
EPR(SS)CD10	Disused Sources
EPR(SS)CD11	Leak Tests
EPR(SS)CD12	Marking of Sources
EPR(SS)CD13	Reporting

Appendix 1

Sealed Source Operating Procedures.

EPR(SS)CD1	Restrictions on Sources Held
EPR(SS)CD2	Staff Competency and Training
EPR(SS)CD3	Ordering Sealed Sources
EPR(SS)CD4	Storage of Sealed Sources
EPR(SS)CD5	Use of Sealed Sources
EPR(SS)CD6	Keeping of Required Records
EPR(SS)CD7	Loss, Damage, Theft or Unauthorised Use
EPR(SS)CD8	Security and Fire Precautions
EPR(SS)CD9	Identification of Radiation Areas
EPR(SS)CD10	Disused Sources
EPR(SS)CD11	Leak Tests
EPR(SS)CD12	Marking of Sources
EPR(SS)CD13	Reporting

Restrictions on Sources Held

1. The University is authorised under Environment Agency permit No. EPR/TB3333DN, to hold and use sealed sources in accordance with the terms and conditions in the permit. The permit will be held by the URPO, who shall ensure that all persons with duties under the permit have access to a copy and are made aware of any limits imposed by the permit.

2. Heads of School must ensure that any newly appointed member of staff or visitor to the school, intending to bring or transport a radioactive substance onto university premises, has completed an Incoming Materials and Equipment Declaration form to seek prior permission from the Head of School.

3. The Incoming Materials Declaration form must identify any radioactive substances or equipment containing radioactive substances that it is proposed to bring to the University.

4. The Head of School must consult the URPS before granting permission for any person to bring or transfer a radioactive substance to the University, to ensure that Environment Agency permit limits will not be exceeded.

5. The Head of School is responsible for responding to requests for permission to bring or transfer a radioactive substance to the University, to inform them whether or not permission has been granted.

6. Any existing member of staff wishing to acquire a radioactive substance or equipment containing a radioactive substance for storage or use on University premises, without using the normal procurement system, must also obtain prior permission from their Head of School by submitting an Incoming Materials Declaration form to their head of school.

11. The Head of School shall not grant permission to bring or transfer a radioactive substance onto University premises to any person that does not possess

sufficient competency to safely manage the risks involved in the storage, use or disposal of the substance.

EPR(SS)CD1

12. The Head of School shall not grant permission to bring or transfer any radioactive substance or equipment containing a radioactive substance onto University premises unless there is either:
    a. sufficient financial provision within the school for the eventual disposal of the equipment or substance when it comes to the end of its useful life or there is no further justification for keeping the equipment or radioactive substance, or
    b. A written arrangement for returning the equipment or substance to the supplier when it is no longer required.

Staff Competency, Information and Training

1. All radiation workers who use sealed sources shall be competent to do so by virtue of their training and experience. Managers who are responsible for sealed sources must understand their duty to supervise the safe use of ionising radiations.

The following competencies are required;

2. Ionising Radiations Source Holders/Radiation Workers

2.1 Knowledge of;

- Basic physics of radiation
- Radiation dose and biological effects of ionising radiation
- Dose rates, limits and methods of dose rate monitoring
- Precautions in handling sealed sources – time, distance and shielding
- Leak testing and transport safety requirements
- Local arrangements for the control of sealed sources
- Emergency procedures
- Project risk assessments

2.2 Awareness of;

- The conditions contained within the University's sealed source permit
- The University's Radiation (Ionising) Safety Policy

3. Managers

3.1 Knowledge of;

- Sources held within their school or department
- Operator procedures
- Their responsibilities for the management of sources as defined in the Operator procedures

3.2 Awareness of;

- The conditions contained within the University's sealed source permit

Ordering Sealed Sources

No radioactive sealed source may be purchased without authorisation from the URPS.

1. Should a new source be required, a request must be submitted to the URPS together with a completed Project Approval form. This will require justification of the purchase, the proposed security arrangements and an indication of how the source will be disposed of, including financial provision, when the source is no longer required. Please note that the cost of disposal of sealed sources can often exceed the purchase price.

2. Procurement of any new sealed sources not permitted by the university's current Environment Agency permit will require a variation to the permit before the new source can be delivered to the university premises. Some suppliers will require evidence of an appropriate permit before they will accept a procurement order for certain sources. All applications for permits or variations will be conducted by the URPO. Please note that approval is not automatic and can take several months. The initiating School/Department or Project will be liable for the financial cost of any necessary permit or variation. This should be determined by the URPO before any order is placed for a new sealed source.

3. The delivery point for radioactive substances will normally be the Life Sciences Stores, but an alternative delivery point will be agreed with the URPO for higher activity sealed sources where heavy shielding is necessary to restrict the surface dose (see EPR(SS)CD6).

4. Contact the URPS if a supplier requests a copy of the university's Environment Agency permits.

5. Sources delivered to the Life Sciences Stores will be secured in a locked cabinet inside the store and the addressee contacted to inform them that their source has arrived. The source must be collected the same day and taken to a secure location, and both the outer container and source housing wipe tested for leakage (see local rules).

EPR(SS)CD3

6. Any sources remaining in the Life Sciences Stores at the end of the day of delivery will be transferred to the sealed source store, and collection must then be arranged through the URPS. No radioactive sources will be stored overnight in the Life Sciences Stores.

13. The source must be stored in one of the designated locations and the source holder must provide original documents for the source test report and delivery note to the URPS.

Storage of Sealed Sources

1. All sealed sources must be secured so that they can only be accessed by authorised persons. Where they are secured within a container that is portable, when not in use, it must be locked within a cupboard/cabinet or room that can only be accessed by authorised persons. Cupboards and cabinets containing sealed sources must be secured so that they cannot be easily removed from the room, e.g bolted to the floor/wall.

2. Category 5 sealed sources may only be kept in the following locations:
   - Pevensey 1 sealed source store
   - Clinical Imaging Sciences Centre
   - Chichester Lab 14 (Antistatic source only)
   - Richmond 4B 11/12

3. An inventory must be maintained for each sealed source storage location, and sources must be logged out and in each time they are removed or replaced, with a comment to show who took them and where they were going.

3. A separate restricted document contains the storage and security arrangements for the High Activity Sealed Source. Access to this document is restricted to a limited number of persons authorised by the University Registrar. Permission to view this document can be requested through the URPO.

4. Where sources are not used regularly they must be checked monthly to ensure their continued presence and a record kept (see RSACD7). The URPS will undertake an annual audit of all sealed radioactive sources on the campus.

5. Source holders must inform the URPS immediately of any changes to the arrangements for the storage of sealed sources, whether permanent or temporary; for example plans to change the location of sources or to alter the security arrangements.

6. The URPS will notify the Environment Agency if there is any increase in the security group of the premises, arising from changes to the storage

EPR(SS)CD4

arrangements or any external factors such as source A/D values. The URPS will monitor the named storage locations and regularly audit the source record sheets.

Use of Sealed Sources

1. All employees with duties under the sealed source permit must have reasonable access to the permit. As the permit is a restricted document, this will be fulfilled by providing a copy only to those persons that supervise sealed source and senior managers fulfilling the duties of the operator. A copy of the permit is also held in the University Safety Office.

2. Regulated sealed sources may only be used for purposes authorised by the University's sealed source permit.

3. Sealed sources must not be modified. Any intention to modify the housing or source carrier must be submitted the URPO for approval beforehand.

4. Any proposed new use of regulated sealed sources must be submitted, using the Project Approval form, to the URPS for approval by the Radiation Protection Sub-Committee. This will include consultation with the RPA.

5. Regulated sealed sources must be stored in secure locations and access strictly controlled and limited to authorised operators only (see EPR(SS)CD4 Storage of Sealed Sources).

6. The source holder is responsible at all times for the security of the source, and for ensuring access is limited to authorised persons with an appropriate University of Sussex Radiation License.

7. Authorised operators are restricted to UoS radiation licence holders and must be approved by the source holder.

8. All staff using sealed sources must be provided with written operating instructions in addition to any additional training required for the source or equipment. Training and the receipt of instructions must be recorded; staff

should be required to sign to acknowledge that they have received and understood their instruction and training.

9. All sources, including exempt sources, must be signed for in the source log on removal from the storage area and signed back in on return.

10. Sealed sources must not be left unattended whilst removed from their permanent store and in use. If they cannot be returned to their permanent storage location, they must be secured in a temporary container such as a lockable cupboard, drawer or box which is marked with the radiation trefoil. It is insufficient to depend upon locking the door to the room containing the source unless key or access codes are limited to the source holder and authorised operators only. Sources must be returned to their permanent store as soon as they are no longer being used.

11. Sealed sources must be identified by the radiation trefoil at all times. Where a source is incorporated into a piece of apparatus, the apparatus the radiation trefoil must be displayed to prevent anybody from inadvertently accessing the source or being exposed to harmful ionising radiations.

12. Sealed sources must be kept in their shielded containers at all times when not in use.

13. The radiation dose received by radiation workers and members of the public from the storage and use of sealed sources must be as low as is reasonably practicable. This must be achieved by selecting the lowest activity source necessary for the purpose and the use of shielding, position (distance) and minimising the time of possible exposure. A prior risk assessment must be submitted to the URPS identifying the control measures necessary to achieve this.

14. If it is suspected that a sealed source is damaged or leaking, the source must be removed from use and the URPS immediately informed (see Loss, Damage, and Theft etc -EPR(SS) CD).

15. Where sources are not in regular use the source holder must ensure that a monthly check is made to verify the presence of each source under their control. This must be recorded (see EPR(SS)F1). This will include a visual examination of the source (where reasonably practicable) and the source container and any associated equipment.

Keeping of Required Records

1. All records required by the permit, unless otherwise indicated, will be retained until notified by the Environment Agency that they may be destroyed.

2. Any written record must be legible. If it is necessary to amend any record, a single line must be drawn through the original entry so that it remains legible and the amended entry must be signed and dated. Electronic records must be protected by an automatic back up system that will prevent loss of data and allow recovery in the event of damage or failure of the storage equipment.

3. The URPS will provide any copies of records to the Environment Agency on request within 14 days of receipt of the request.

4. The following records must be kept;

    4.1 Receipt or transportation of any sealed source
    4.2 Checks to confirm the continued presence of all sources
    4.3 Disposal of any sealed source
    4.4 Sealed source leak tests
    4.5 All training provided to source holders and operators

5. Receipt of Sources
   Low activity sources or those transported as excepted packages will normally be delivered to the Life Sciences Stores and the above procedure will apply. Those sources of higher activities or where shielding is required to restrict the surface dose should be delivered directly to the building where they are to be stored. The source holder will take delivery and sign for the source. Receipt will be recorded in the source log book and a copy of the entry or delivery note forwarded to the Health, Safety and Environment Office without delay together with the source test certificate.

6. A check must be made monthly to verify that all sources are present in their designated locations and a record made using form RSAF7. This should be

undertaken by the source holder or designated deputy. The RPS for the appropriate area should ensure that this check has been undertaken.

7. Any discrepancies must be notified immediately to the URPS and investigated by the source holder.

8. All records of disposals will be made at the time of disposal and kept on file in the Health and Safety Office (see EPR(SS)CD10; Disused sources).

9. Copies of all leak test certificates for regulated sources and the log for exempt sources will be held by the URPS at least until the next test or for two years after disposal (see EPR(SS)CD11;Leak tests).

10. Records of the training undertaken by those affected by the requirements of the registration will be kept by the school or department. The URPS will audit training records periodically.

11. Information on the HASS will be kept on the HASS Record Form (form RSA10) and updated as soon as reasonably practicable by the URPS if any of the details change. The revised form will be sent to the Environment Agency without delay.

Loss, damage, theft or unauthorised use of radioactive sources

1. If a source is discovered to be lost, damaged or stolen then the registered source holder and the Head of School and Head of Department must be informed without delay. The source holder must immediately inform the URPO who will take the following action;

2. Missing source

2.1 The URPO and source holder will instigate an investigation to ascertain the whereabouts of the source. As soon as it has been established that the source is lost or stolen, Security and the Head of School will be informed. The Head of School shall instruct the URPO to inform the Police and the Environment Agency by telephone giving the following details;

- The radionuclide
- Activity
- Physical characteristics – form, size, appearance
- Distinguishing marks – source number, serial number

2.2 These details and the circumstances and subsequent actions taken will be reported by the URPO to the Environment Agency, in writing, as soon as is practicable.

2.3 Photographs of the source will be provided where available together with photographs of the source container, housing or associated equipment as appropriate.

2.4 The source log will indicate the last known date when the source was present.

2.5 The RPA will be contacted to ascertain the risks to members of the public and any likely doses that might be received either by handling the source or through dispersal into the environment.

3. Source Integrity

3.1 A leak test in accordance with the requirements of ISO 9978:1992 must be performed on all sealed sources at least every two years. Leak tests must also be conducted whenever a sealed source is despatched to or received from another operator. If a leak test indicates a loss of integrity that is not sufficiently serious to require the source to be withdrawn from use, leak testing frequency should be increased to ensure any further deterioration will be detected before loss of integrity and contamination can occur.

3.2 If a source is suspected of being damaged it must be rendered safe before any further action is taken. This will usually mean that it is replaced or left in its shielded container and the immediate area cordoned off to prevent the possibility of spreading contamination.

3.3 Only authorised personnel shall enter the cordoned area wearing appropriate PPE in order to check for contamination using an appropriate monitor. If significant contamination is found the area will be isolated to a distance sufficient to reduce any dose rate to below 2.5uSv/hr. The URPO, following consultation with the RPA if necessary, will organise decontamination of the area. Any contaminated materials will be treated as radioactive waste and an estimation made of the activity present.

3.4 If the source is found to be damaged and leaking radioactive material the URPO must ensure that it is contained so that there is no subsequent escape and possibility of contamination. The Environment Agency must be informed of the action taken and that the source is declared as waste. Arrangements must be made to dispose of the source through a licensed waste contractor as soon as practicable but in any event within 12 weeks.

3.5 In the event of any suspected contamination of the water table, Southern Water must be contacted without delay.

EPR(SS)CD7

3.6 In the event of any gaseous emissions from a leaking source, immediate precautions must be taken to protect people from inhalation risks, including preventing any discharges to atmosphere from re-entering any building.

4. Unauthorised Use

4.1 In the event that a sealed source is used for a purpose that is not listed in the sealed source permit, the Head of School and Head of Department must be informed of the circumstances immediately this is discovered. This information must be passed to the RPS and URPO as soon as practicable and the integrity of the source ascertained by performing a wipe test. If the source is found to be damaged then the procedure for a damaged source shall be followed EPR(SS)CD7.

4.2 The URPO must inform the Environment Agency by telephone followed up by letter detailing the incident and actions taken.

4.3 The Head of School will instigate an investigation to ascertain the identity of the individuals concerned and/or the circumstances of any breach of procedure.

4.4 Any person using a sealed source for an unauthorised purpose will be subject to the University's disciplinary procedure and will have their radiation licence suspended until the investigation is complete and any actions resulting have been implemented.

Source Security

1. General

1.1 Regulated sealed sources must be stored securely in accordance with the NaCTSO requirements specified for the security groups listed in table S1.3 on schedule 1 of the sealed source permit, and the advice contained in HSE information sheet IRP8, Control of radioactive substances. Information on the NaCTSO requirements and copies of IRP8 are available from the University Safety Office.

1.2 Source holders must ensure that the necessary security requirements are maintained at all times.

Identification of Radiation Areas

1. Sealed sources may only be used or stored in designated areas approved by the URPS. If it is necessary to use an area other than an existing designated area for work with or storage of sealed sources then a request must be made to the URPS together with justification for the requirement.

2. The RPA must be consulted on the construction or any new radiation working areas and the refurbishment of any existing radiation working areas.

3. Laboratories where sealed sources are used must be identified with the radiation trefoil, the designation* of the area and appropriate signage indicating the nature of the radionuclides and contact details of the RPS and URPO.

   *The designation of an area as Supervised or Controlled is determined from the prior risk assessment.

4. Sealed source stores must similarly be identified but note that in public areas consideration must be given to the security aspect of advertising the presence of radioactive substances.

5. Within laboratories specific areas where sealed sources are used will be demarcated with radiation hazard warning tape and signage indicating the radionuclide, activity and the designation of the area if appropriate.

6. Any temporary storage must be identified as for a permanent store.

7. Radiation warning signage must be removed from any area that ceases to be a radiation store or working area, provided any necessary decontamination and monitoring has demonstrated that no radiation risk remains.

8. It is the responsibility of whoever is in charge of the laboratory or store to adequately identify radiation areas within their control. The URPS will monitor

the effectiveness of signage as part of the regular radiation audits.

Disused Sources

1. Source holders must inform the URPO as soon as any sealed source is no longer required or has come to the end of its useful life. It will then become a disused source.

2. Disused sources must be disposed of as soon as practicable and in any case within 12 weeks from the date they were declared. For a HASS, this period is 26 weeks.

3. The University is financially responsible in full for the costs of disposal of all disused sources. Individual schools must ensure that they make adequate financial provision for the eventual disposal of all sealed sources in their charge.

4. The University will maintain a suitable financial provision for the disposal of any HASS, in accordance with Environment Agency requirements.

5. Where it is intended that the University will cease to keep or use sealed sources or to vacate the premises the Environment Agency will be informed in writing without delay by the URPS. Where possible this will be at least 21 days in advance.

6. Any change of name or address or intention to dissolve the University or merge with another institution will be communicated to the Environment Agency in writing without delay. Where possible this will be at least 21 days in advance.

Leak Tests for Sealed Sources

1. All sealed sources will be tested for leakage of radioactive material annually by the URPS to ISO 9978:1992 using either the direct or indirect wipe method as appropriate and a test certificate (see RSAF6) issued for each registered source signed by the person undertaking the test. For low activity exempt sources a log is kept detailing the results for each source.

2. The signed record contains information that will identify, the source, the person carrying out the test, the date, reason for the test, test method, numerical result, test result (pass/fail) and in the case of a failure, the remedial action taken.

3. Copies of all leak test certificates for registered sources and the log for unregistered sources will be held by the URPS at least until the next test or for two years after disposal of the source.

4. Should sources fail the leak test the URPS will arrange for the appropriate remedial action. Where possible, without exposing personnel to doses >2.5uSvhr^{-1}, the surface of the source will be inspected to ascertain the extent of any damage.

5. Where the leakage is <5 x the acceptance limit (i.e. 1kBq) the source will be decontaminated and retested.

6. Where decontamination to an acceptable level (<185Bq) is not possible or the leakage is >5x the acceptance limit then the source will be declared as waste and disposed of accordingly (see EPR(SS)CD)10.

7. Sealed source containers and shielding must be inspected annually when the leak test is performed and any deficiencies noted and rectified as necessary.

Identification of Sources

1. Any sealed source or equipment containing a sealed source manufactured after 31 December 2005 brought to the University shall;

    1.1 Be identified with a unique serial number by the manufacturer or supplier,

    1.2 Be suitably permanently marked with the serial number, as "Radioactive" and the radiation trefoil to BS 3510:1968 or ISO 361:1975,

    1.3 Be supplied with written information detailing the serial number, how it is marked, details of the source (to include radionuclide, activity, reference date, chemical and physical form, special form certificate if applicable) and any identification number of the source container.

    1.4 The information specified in 1.3 shall be retained by URPS while the source is on University premises and the information provided to the recipient should the source be transferred.

2. Where a source has not been provided with the above details a unique source number will be allocated by the URPS and where reasonably practicable that number will be attached to the source. The written information will be prepared as above on the day of the event.

3. Sources already owned by the University shall have as much of the information specified in 1.3 as is known documented and the records held by the URPS.

4. Source containers are, in addition, marked with the date of receipt of the source, the activity on the date of receipt or other reference date if receipt date is not known, the radionuclide, and the radiation trefoil.

5. The source and container markings are checked for legibility annually at the time of the leak test.

Reporting

1. The URPO will report to the Environment Agency on behalf of the University any notifications required by the permit.

2. Failure to comply with any of the limitations and conditions of the permit or where it is believed that such a failure has occurred will be reported by the URPO to the Environment Agency by telephone and confirmed in writing, without delay as soon as that failure is known.

3. The results of the investigation into the breach of the permit including actions taken will be communicated to the Environment Agency by the URPO in writing as soon as is practicable.

4. The source holder and Head of School are responsible for reporting any breach or possible breach to the URPS as soon as they become aware of the failure to comply.

See also EPR(SS)CD7; Loss damage, theft or unauthorised use

8. Permit to use open source radioactive material and accumulate and dispose of radioactive material: permit no.EPR/XP3393SR

Compliance summary

Condition	Procedure
1 Management	
1.1.1 (a)	Whole document
1.1.1 (b)	EPR(OS)CD2; Staff competency etc.
1.1.2	EPR(OS)CD6; Keeping of required records
1.1.3	EPR(OS)CD1;Restrictions on sources held, section 1 EPR(OS)CD5;Use of open sources, section 1;
1.1.4	Compliance statement, section 2
2 Operations	
2.1 Permitted activities	
2.1.1	EPR(OS)CD5; Use of open sources, section 1
2.1.2	EPR(OS)CD1; Restrictions on sources held, section 1
2.1.3	EPR(OS)CD1; Restrictions on sources held, section 1
2.2 The site	
2.3 Operating techniques	
2.3.1 (a)	EPR(OS)CD3; Use of open sources, section 3(i)
2.3.1 (b)	EPR(OS)CD17; Use of BAT, section 6
2.3.1 (c)	EPR(OS)CD17; Use of BAT, sections 4 & 6
2.3.1(d)	EPR(OS)CD17; Use of BAT, section 7
2.3.1(e)	EPR(OS)CD7; Storage, sections 1,2 & 3(i) EPR(CD)6; Keeping of required records, section3.2
2.3.2 (a)	EPR(OS)CD17; Use of BAT
2.3.2 (b)	EPR(OS)CD17; Use of BAT
2.3.2 (c)	EPR(OS)CD10;
2.3.3 (a)	EPR(OS)CD9;
2.3.3 (b)	N/A
2.3.4 (a)	EPR(OS)CD
2.3.4 (b)	EPR(OS)CD
2.3.5	EPR(OS)CD
2.3.6	EPR(OS)CD4; Storage, section 3(ii)
2.3.7	EPR(OS)CD4;
2.3.8	EPR(OS)CD4; Storage of open sources
2.3.9 (a)	EPR(OS)CD6; Keeping of required records, sections 1,2 and 4

2.3.9 (b)	EPR(OS)CD6; sections 1 and 3
2.3.9 (c)	EPR(OS)CD9; sections
2.3.9.(d)	EPR(OS)CD
2.4 Pre-operational conditions	N/A
2.5 Improvement programme	N/A
2.6 Receipt of radioactive waste	N/A
2.7 **Accumulation of radioactive waste**	
2.7.1	EPR(CD)8; Accumulation and disposal, section 1
2.7.2	EPR(CD)8; Accumulation and disposal, section 1
3.**Disposals of radioactive waste and monitoring**	
3.1 Disposals of radioactive waste	
3.1.1	EPR(CD)8; Accumulation and disposal, section 2
3.1.2	EPR(CD)8; Accumulation and disposal, section 2
3.1.3 (a)	EPR(OS)CD10; Accumulation and disposal, sections 14.2, 14.3, 14.4
3.1.3 (b)	EPR(OS)CD10; Accumulation and disposal, section 14.2
3.1.3 (c)	EPR(OS)CD10; Accumulation and disposal, section 14.6
3.1.4 (a)(i)	EPR(OS)CD10; Accumulation and disposal, section 14.3
3.1.4 (a)(ii)	EPR(OS)CD10; Accumulation and disposal, section 14.3
3.1.4 (b)(i)	EPR(OS)CD10; Accumulation and disposal, section 14.4
3.1.4 (b)(ii)	EPR(OS)CD10; Accumulation and disposal, section 14.4
3.1.4.(c)	EPR(OS)CD10; Accumulation and disposal, section 14.5
3.1.5(a)	EPR(OS)CD10; Accumulation and disposal, section 16
3.1.5(b)	EPR(OS)CD10; Accumulation and disposal, section 16
3.1.6	EPR(OS)CD6; Accumulation and disposal, section 17
3.2 Monitoring	
3.2.1(a)	EPR(OS)CD18; Provision of information, sampling etc., sections 2&3
3.2.1(b)	EPR(OS)CD18 Provision of information, sampling etc., section 5
3.2.2	EPR(OS)CD6 EPR(OS)CD18; Provision of information, sampling etc.,

	section 4
3.2.3(a)	EPR(OS)CD14; Monitoring for contamination, section
3.2.3(b)	EPR(OS)CD
4 Information	
4.1 Records	
4.1.1(a)	EPR(OS)CD6; Keeping of required records, sections 3.5, 4.3.(ii), 5.4 EPR(OS)CD14; Monitoring for contamination, section 3
4.1.1(b)	EPR(OS)CD6;
4.1.1(c)	EPR(OS)CD6;
4.1.1(d)	EPR(OS)CD6; Keeping of required records, section 4.2.(vii), 4.3.(ix)
4.1.2(a)	EPR(OS)CD6; Keeping of required records, section 6
4.1..2(b)	N/A
4.1.3	EPR(OS)CD6; keeping of required records, section 6
4.2 Reporting	
4.2.1	EPR(OS)CD16; Reporting, sections 1,2,3 & 5
4.2.2(a)	EPR(OS)CD16; Reporting, section 1
4.2.2(b)	EPR(OS)Cd18; sections 2 & 4
4.3 Notifications	
4..3.1(a)	EPR(OS)CD16; Reporting, section 2
4.3.1(b)	EPR(OS)CD16; Reporting, section 2
4.3.1(c)	EPR(OS)CD16; Reporting, section 2
4.3.1(d)	EPR(OS)CD16; Reporting, section 2
4.3.2	EPR(OS)CD16; Reporting, section 1
4.3.3	EPR(OS)CD16; Reporting, section 5
4.3.4(a)	N/A
4.3.4(b)	EPR(OS)CD16; Reporting, section5
4.3.4(c)	N/A
4.3.5(a)	EPR(OS)CD7; Loss, Damage, Theft etc. section 2 .1
4.3.5(b)	EPR(OS)CD6; Loss, Damage, Theft etc. section 2.1
4,3,5(c)	EPR(OS)CD6; Loss, Damage, Theft etc. section 2.2

9.1 Open Source Operating Procedures.

EPR(OS)CD1	Restrictions on Sources Held
EPR(OS)CD2	Staff Competency and Training
EPR(OS)CD3	Ordering Open Sources
EPR(OS)CD4	Storage of Open Sources
EPR(OS)CD5	Use of Open Sources
EPR(OS)CD6	Keeping of Required Records
EPR(OS)CD7	Loss, Damage, Theft or Unauthorised Use
EPR(OS)CD8	Accumulation of Radioactive Waste
EPR(OS)CD9	Aqueous Waste Disposal
EPR(OS)CD10	Solid waste Accumulation and Disposal
EPR(OS)CD11	VLLW Accumulation and Disposal
EPR(OS)CD12	Organic Waste Accumulation and Disposal
(EPR(OS)CD13	Gaseous Waste Disposal) N/A
EPR(OS)CD14	Monitoring for contamination
EPR(OS)CD15	Identification of Radiation Areas
EPR(OS)CD16	Reporting
EPR(OS)CD17	Use of Best Available Techniques
EPR(OS)CD18	Provision of Information, Sampling and Analysis of Waste

Appendix 1

Open Source Operating Procedures.

EPR(OS)CD1	Restrictions on Sources Held
EPR(OS)CD2	Staff Competency and Training
EPR(OS)CD3	Ordering Open Sources
EPR(OS)CD4	Storage of Open Sources
EPR(OS)CD5	Use of Open Sources
EPR(OS)CD6	Keeping of Required Records
EPR(OS)CD7	Loss, Damage, Theft or Unauthorised Use
EPR(OS)CD8	Accumulation of Radioactive Waste
EPR(OS)CD9	Aqueous Waste Disposal
EPR(OS)CD10	Solid waste Accumulation and Disposal
EPR(OS)CD11	VLLW Accumulation and Disposal
EPR(OS)CD12	Organic Waste Accumulation and Disposal
EPR(OS)CD13	Gaseous Waste Disposal
EPR(OS)CD14	Monitoring for contamination
EPR(OS)CD15	Identification of Radiation Areas
EPR(OS)CD16	Reporting
EPR(OS)CD17	Use of Best Available Techniques
EPR(OS)CD18	Provision of Information, Sampling and Analysis of Waste

Restrictions on Sources Held

1. The University is permitted by the Environment Agency to hold open sources as listed in schedule 1, table S1.2 of permit number EPR/XP3393SR. The schedule lists the permitted radionuclides with the maximum activity of each that may be held at any time. Copies of the permit are displayed in areas where registered materials are kept and used and a copy is also held in the Health, Safety and Welfare Office.

2. **To ensure that permit limits are not exceeded, employees and visitors, are prohibited from causing any radionuclide to be brought or delivered to the University campus without prior written authorisation from the URPS.**

2. Any person intending to bring or cause radionuclides to be delivered to the University campus must declare this intention by completing section 4 of the *Incoming Materials and Equipment Declaration Form* (EPRF8), available from the University Human Resources department. These forms are normally included with the letter of appointment sent to all new employees.

3. The declaration must identify every radionuclide, including sealed and open sources, sources incorporated into items of equipment and nuclear material, stating the nuclide, activity and the reference date, where applicable, or the mass of nuclear material. No transfer or delivery may be made without the written permission of the University Radiation Protection Officer. Permission will normally be given where:
   - 3.1 The incoming radionuclides are exempted sources or are already included in the existing University's Environment Agency permits.
   - 3.2 The activity of the incoming radionuclides can be accommodated without exceeding EPR permit limits, taking into account the nature of the work and any consequent radioactive waste it creates, and the current quantities of radioactive stock, procurement orders and waste material.

3.3 Suitable facilities are available for the storage and use of any incoming radionuclides, and any expected radioactive waste.

EPR(OS)CD1

3.4 A suitable and sufficient risk assessment has been conducted for the transfer, storage, use and waste management for the incoming radionuclides.

4. Where a radionuclide is not permitted by the University's permits, permission will be dependent upon a successful application to the Environment Agency for a variation to the relevant permit (see EPR(OS)CD3;Ordering). Applications for variations to permits are the responsibility of the URPS but the cost of such variations must be met from the relevant school/department/project budget.

5. The implications in terms of costs, facilities and training must be explained to any person making a request for permission to bring or cause radionuclides or nuclear material to be delivered to the University campus, before they sign section 4 on form EPRF8. The relevant Head of School is responsible for ensuring that this information is provided and must countersign the form to show that they are aware of the request. A copy of the declaration form must be kept on the personal file held in the school.

6. No person will be permitted to work with any new radioactive material without obtaining a University of Sussex radiation license that is endorsed for the work involved (see EPR(OS)CD2).

Staff Competency, Information and Training

1. All radiation workers who work with radioactive sources shall be competent to do so by virtue of their knowledge, training and experience. Managers of departments working with radioactive sources and the supervisors of projects involving radioactive sources must understand their delegated statutory responsibilities and possess sufficient competency to discharge them effectively.

2. Radiation Licenses

2.1 No person will be permitted to work unsupervised with radioactive sources unless they have been issued with a University of Sussex Radiation License.

2.2 Radiation licenses will be issued by the USRPO to persons who can demonstrate the competencies described in section 3.

2.3 To be fully effective, radiation licenses must be endorsed by the relevant Radiation Protection Supervisor for each project that a radiation worker will be involved with.

2.4 Radiation licenses will remain valid for a maximum period of five years. Revalidation will be subject to attendance on refresher training to confirm the minimum competency requirements.

2.5 A radiation license will be suspended following:

2.5.1 A failure to adhere to University policies or procedures that does or could lead to a breach of the University's EPR permit requirements

2.5.2 A failure to follow local procedures that does or could result in radioactive contamination or the temporary or permanent loss of any source.

3. Competency requirements for Radiation Workers

3.1 Knowledge of;

Basic physics of radiation

Biological effects of ionising radiation

Monitors, measurement of contamination and dose rate

Dose limitation

Precautions in handling sealed and open sources

Local arrangements for the control of sealed and open sources

Waste disposal procedures

Emergency procedures

3.2 Awareness of;

The University Health, Safety and Wellbeing Policy

The University Radiation (Ionising) Safety Policy

The conditions and limitations imposed by the Environment Agency Permit for sealed and open sources

The regulatory enforcement regime and potential consequences of any breach of statutory duties

4. Competency requirements for Managers

4.1 Knowledge of;

The type of radioactive sources held within their school or department and the risks they pose

Local procedures for managing radiation risks

Their responsibilities for the management of sources and waste as defined in the Operator procedures

4.2 Awareness of;

The University Health, Safety and Wellbeing Policy

The University Radiation (Ionising) Safety Policy

The conditions and limitations imposed by the Environment Agency Permit for open sources

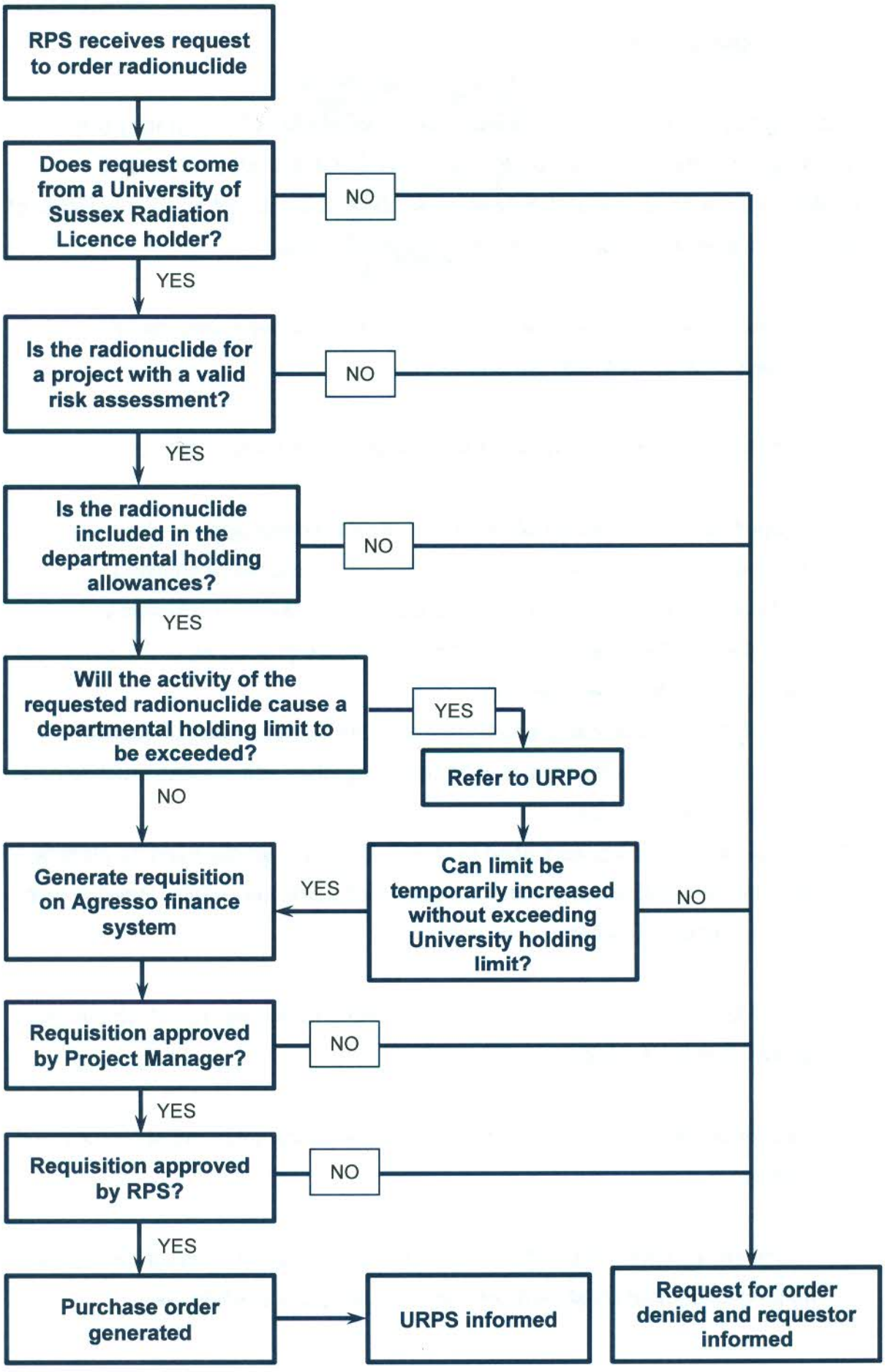
The regulatory enforcement regime and potential consequences of any breach of statutory duties

The requirement for laboratory local procedures and supervision by Radiation protection Supervisors

Ordering open sources

The following procedure must be adhered to in order to ensure that radionuclide holdings do not exceed the type and activity authorised by the University's Environment Agency permits:

1. Only persons holding a valid University of Sussex Radiation Licence are permitted to request an order for radioactive substances.
2. All orders for open sources must be generated through the Agresso finance system.
3. Only Radiation Protection Supervisors (RPS) and their deputies are authorised to submit requisitions for radioactive substances.
4. All requisitions for radioactive substances must be approved by the relevant project manager and the University Radiation Protection Service (URPS).
5. Requests for radioactive orders must be entered into Isostock and submitted to the local RPS by email.
6. The flowchart below shows the process for approving a request and generating a purchase order.
7. The person submitting a requisition cannot approve their own order, another person designated by the Head of School must check whether an order can be delivered without exceeding a University permit limit before approving the order.
8. Deputy Radiation Protection Supervisors are authorised to generate a requisition for radioactive substances in the absence of their RPS.
9. Any order for a radioactive substance that is created without following this procedure will be impounded upon delivery into the custody of the RPS or URPO.
10. The URPO will automatically receive notification by email for every order for radionuclides that is approved on Agresso.


RPS receives request to order radionuclide
Does request come from a University of Sussex Radiation Licence holder?
NO
YES
Is the radionuclide for a project with a valid risk assessment?
NO
YES
Is the radionuclide included in the departmental holding allowances?
NO
YES
Will the activity of the requested radionuclide cause a departmental holding limit to be exceeded?
YES
Refer to URPO
NO
Generate requisition on Agresso finance system
YES
Can limit be temporarily increased without exceeding University holding limit?
NO
Requisition approved by Project Manager?
NO
YES
Requisition approved by RPS?
NO
YES
Purchase order generated
URPS informed
Request for order denied and requestor informed

Storage of open sources

Research group leaders, Principal Investigators and Head of Radiography are responsible for supervising the use of open source radionuclides within their laboratory or area of control and their name(s) shall be displayed on the certificate of registration posted where open sources are kept and used.

1. All radioactive sources must be stored so that only authorised radiation workers (licence holders) are allowed access.

2. Radiation laboratories should be kept locked when unoccupied.

3. (i) Open source stocks should kept in lockable (combination preferred) refrigerators and freezers when not in use, in appropriately shielded containers. The plastic/lead containers in which they were supplied will normally be adequate but note that gamma emitters such as I-125 and Na-22 may require additional shielding.
   (ii) As far as is reasonably practicable all open sources must be labelled "radioactive" and carry the radiation trefoil together with the radionuclide and activity (date referenced).
4. Refrigerators and freezers used to store radioactive stocks must be identified with the radiation trefoil and the radionuclides contained within, together with their maximum activities.

5. Each stockpot must be labelled with the unique radiochemical stock number allocated to by Isostock.

6. Each time material is removed from stock the activity taken must be recorded in Isostock.

7. Those stocks where the radionuclide has decayed to an unusable level or are no longer required must be disposed of as radioactive waste (see

EPR(OS)CD9/10) as soon as possible and not allowed to accumulate in laboratories.

8. The plastic/lead outer containers must be disposed of separately and not included in solid waste.

9. Unless used regularly all radioactive stocks must be checked monthly to ensure their continued presence and a record kept (see EPR(OS)CD6). The URPO will undertake an annual audit of stocks.

Use of Open Sources

1. Registered open sources may only be used for purposes authorised by the University's Permit; see permit no. EPR/XP3393SR, Schedule 1, "Operations".

2. A copy of the schedule is held by the URPS at the Health and Safety Office.

3. Any proposed new use of registered open sources must be submitted, using the Project Approval form, to the URPS for approval by the Radiation Protection Sub-Committee.

4. Any proposal to transfer registered material to a third party must be approved in advance by the URPO and can only be to a person who holds a permit to keep the material. The URPO will ensure that a copy of the recipient's permit is obtained.

5. Open source stocks must be stored in secure locations; access to these is strictly controlled and limited to authorised users only (see EPRA(OS)CD4 Storage of Open Sources).

6. The research group leader/PI is responsible at all times for the security of the source.

7. Authorised users are restricted to UoS radiation licence holders or appropriately trained workers supervised by a radiation licence holder.

8. The use of all open sources, both registered and non-registered, must be recorded in Isostock. Sources must be returned to secure storage as soon as they are no longer being used and open source stocks must be kept in their shielded containers when not in use.

9. In use radiation doses received by radiation workers and members of the public must be as low as is reasonably practicable. This is achieved by the use of shielding, position (distance) and minimising the time of possible exposure. A prior risk assessment must be submitted to the URPS identifying the control measures necessary to achieve this.

10. Where sources are not in regular use the source holder must ensure that a monthly check is made to verify the presence of each source under their control. This must be recorded (see EPR(SS)F1).

11. If a radiation worker or member of the public is exposed to or it is suspected that they have been exposed to a significant radiation dose or contamination from an open source the source holder must conduct an immediate investigation and the circumstances notified by the URPS to the Environment Agency and the Health and Safety Executive without delay. The Radiation Protection Adviser will be informed and an estimate made of the possible doses received.

Keeping of Required Records

Isostock must be used to record the following;

1. Receipt of open sources
2. The continued presence of those sources
3. Accumulation of solid and organic liquid waste
4. Disposal of waste

Monitoring for contamination of work areas must be recorded on form RSAF5.

1. Receipt of Sources

1.1 The delivery of all open sources ordered by the School of Life Sciences is recorded in the receipt logbook held at the Life Sciences stores using form EPRF1. Note that the **actual** activity supplied (in Becquerels) must be recorded.

1.2 A fresh record must be started **on the first working day of each month** and a copy of the record for the previous month's deliveries sent to the Health, Safety and Environment Office, **without delay**. This will help to ensure accurate record keeping for all of the University's radiochemical stocks.

1.3 On collection from stores the licence holder must immediately record the delivery in Isostock and label the stock bottle with the unique Isostock reference no.

1.4 Deliveries of ^{18}F, delivered directly to the CISC building are recorded in the receipt log kept in the dispensing laboratory.

2. Source Audit

2.1 Where open sources are not in regular use a check must be made monthly to verify that all sources are present in their designated locations. This should be undertaken by the person responsible for the laboratory or store. The RPS for the appropriate area should ensure that this check has been undertaken.

2.2 Any discrepancies must be notified immediately to the URPS and investigated.

2.3 Where a source is in regular use (more frequently than once a month) that will provide sufficient evidence of its presence.

3. Accumulation of waste.

3.1 Waste may only be accumulated in accordance with the conditions specified in the university's authorisation.

Note that the University is only authorised to accumulate solid and organic liquid waste except for aqueous ^{18}F waste in the CISC.

3.2 Solid waste must be collected and placed in the radioactive waste boxes provided in each laboratory as it is generated. Boxes must be kept locked when not in use.

3.3 The disposal of all solid waste must be recorded in Isostock. And must ensure that the waste is allocated to the correct bin reference. Radiation workers disposing of solid waste are responsible for ensuring the accuracy

of the record so far as is reasonably practicable and undertake that to the best of their knowledge the declaration is a true record.

3.4 All potentially contaminated items e.g. gloves, benchcoat, tissues, should be treated as radioactive waste and placed in the solid waste disposal box; unless grossly contaminated an activity does not need to be declared.

3.5 Isostock will automatically calculate solid waste activity and apply decay correction.

3.7 Organic liquid waste disposals must be recorded in Isostock and the container correctly labelled with the unique Isostock reference no.

3.9 All non flammable organic liquid waste, including scintillation fluid, must be transferred to the 50l yellow plastic bins in the RA waste store and the above information transferred to that container.

3.10 Flammable radioactive waste must be transferred to the solvent store.

4. Disposal of Waste

4.1 Liquid (Aqueous) waste

All aqueous liquid waste disposals must be recorded in Isostock, taking care to select the correct radiation sink when making the entry.

4.2 Solid waste

4.2.(i) All low level solid waste is disposed of by removal by an authorised waste contractor for subsequent incineration.

4.2(ii) The Life Sciences RPA will monitor the quantities of radioactive waste placed in the store to ensure that waste is disposed of within the limits set in the University's authorisation.

4.2.(iii) Full waste boxes must be sealed and transferred to rear of the store for decay, until removal off site for incineration. Each box must be correctly labelled with the unique reference number allocated by Isostock.

4.2.(iv) Records of the activity, date of consignment to the box, radionuclide and the name of the producer of the waste are recorded on the solid waste disposal chart to ensure that;

a) short half life radionuclides will have decayed to a level where the waste can be designated VLLW or SOLA,

b) waste is not stored for longer than 6 months,

c) the volume of waste accumulated does not exceed 2.5m^3.

4.2.(v) The Life Sciences RPA will arrange for decayed waste to be removed off-site for incineration within the permitted six month retention period or when the volume reaches 2.0 m^3 (40 std. boxes at 0.05 m^3 each). The waste transfer note must be completed and signed by an officer of the University.

4.2.(vi) A record of all disposals off-site must be kept on file in the Health & Safety Office.

4.3 Organic Liquid Waste

4.3.(i) All organic liquid waste disposals must be recorded in Isostock. Radiation workers disposing of organic liquid waste are responsible for ensuring the accuracy of the record so far as is reasonably practicable.

4.3.(ii) Organic liquid waste containers must be correctly labelled with the unique reference number allocated by Isostock.

4.3.(iii) All organic liquid waste is disposed of by removal by an authorised waste contractor for subsequent incineration.

4.3.(iv) The Life Sciences RPS will monitor the quantities of radioactive waste placed in the store to ensure that waste is disposed of within the limits set in the University's authorisation.

4.3.(v) Waste will be removed off site at appropriate intervals so that;

waste is not stored for longer than 6 months

the volume of waste accumulated does not exceed $0.5m^3$

4.3.(viii)The Life Sciences RPS will arrange for organic liquid waste to be removed off site for incineration when it has been stored for a period of 5 months or when the volume reaches 0.4 m3. The waste transfer note will be completed and signed by an officer of the University.

4.3.(ix) A record of all disposals off-site must be kept on file in the Health & Safety Office.

5. Monitoring of work areas

5.1 All work areas must be monitored regularly (see EPR(OS)CD14) to ensure that they are free from radioactive contamination and that if contamination is present it may be dealt with before it is spread.

5.2 It is good practice to monitor the working area before use as reassurance for the absence of contamination.

5.3 Each radiation worker is responsible for monitoring bench tops, perspex shields, working trays and immediate floor area after use and recording the results on a contamination monitoring record sheet (EPRF5) held in the laboratory. Records must be made of background, actual count rates measured, any action taken if significant contamination is found, and the results of repeat monitoring.

5.4 **All records must be clear and legible.**

5.5 The RPS will ensure that contamination monitoring is being carried out.

5.6 Radiation workers must ensure that the appropriate monitor for the radionuclide in use is available - see local rules.

Procedure in the event of loss, damage, theft or unauthorised use of radioactive material

1. If registered radioactive material or accumulated waste is discovered to be lost or stolen or it is suspected that radioactive material has leaked from its container or location the registered source holder and the Head of School and Head of Department must be informed without delay. The source holder must immediately inform the URPO who will take the following action;

2. Missing radioactive material

2.1 The URPO and source holder will instigate an investigation to ascertain the whereabouts of the source. As soon as it has been established that the source is lost or stolen the Head of School will be informed and will instruct the URPO to inform the Police and the Environment Agency by telephone giving the following details;

The radionuclide
Activity
Physical characteristics of material and container – form, size, appearance
Distinguishing marks – batch number, serial number

2.2 These details and the circumstances and subsequent actions taken will be reported by the URPO to the Environment Agency, in writing, as soon as is practicable.

2.4 Entries in the radiochemical stock book will indicate the last known date when the source was present.

2.5 The RPA will be contacted to ascertain the risks to members of the public and any likely doses that might be received either by handling the source or through its being dispersed into the environment.

3. Leaking radioactive material

3.1 If it is suspected that radioactive material is leaking or has escaped from its container the priority is to prevent the spread of contamination and further release. Other workers in the vicinity must be warned and the immediate area cordoned off to prevent the possibility of spreading contamination.

3.3 Only authorised personnel shall enter the cordoned area wearing appropriate PPE in order to monitor for contamination using an appropriate monitor. If significant contamination is found the area will be isolated to a distance sufficient to reduce any dose rate to below 2.5uSv/hr. The RPO, following consultation with the RPA if necessary, will organise decontamination of the area. Any contaminated materials will be treated as radioactive waste and an estimation made of the activity present.

4. Unauthorised Use

4.1 In the event of unauthorised* use of a source the Head of School and Head of Department must be informed of the circumstances immediately this is discovered. This information must be passed to the RPS and URPO as soon as practicable and the integrity of the source ascertained by performing a wipe test. If the source is found to be damaged then the above procedure for a damaged source shall be followed.

4.3 The URPO will inform the Environment Agency by telephone followed up by letter detailing the incident and actions taken as soon as reasonably practicable.

4.4 The Head of School will instigate an investigation to ascertain the identity of the individuals concerned and/or the circumstances of any breach of procedure.

4.5 Unauthorised use may be subject to the University's disciplinary procedure and those individuals concerned will have their radiation licences suspended until the investigation is complete and any actions resulting have been implemented.

*Note: Practices for which the registered sources may be used are listed in table S1.1 at schedule 1 to permit no. EPR/XP3393.

Accumulation and Disposal of Radioactive Waste

The University will apply the principles of best practical means to ensure that the quantities of radioactive waste accumulated and disposed of are minimised and that doses to the public and releases to the environment are as low as is reasonably practicable.

1. Accumulation

The University is authorised to *accumulate the following types of radioactive waste;

Aqueous Waste (**CISC only**)
Organic Liquid Waste
Very Low Level Waste
Solid Waste

2. Disposal

The University is authorised to *dispose of the following types of radioactive waste;

Gaseous Waste **(Accelerator Building only**)
Aqueous Waste
Organic Liquid Waste
Very Low Waste
Solid Waste

*See the Permit for the use of radioactive material in the form of open sources and to accumulate and dispose of radioactive waste no.EPR/XP3393SR schedules 1,2 and3 for the maximum activities permitted.

2.1 Disposal of aqueous radioactive waste is carried out in laboratories by authorised radiation workers and supervised by the Research Group leader/PI named on the certificate of authorisation.

2.2 Aqueous wastes arising in the Clinical Imaging Science Centre (CISC) are from patient excreta so are unsupervised at the point of disposal. Patient toilets are monitored regularly for contamination by radiographers and decontaminated as appropriate.

2.3 Accumulation of solid and organic liquid waste accumulated in laboratories is supervised by the named person as for 2.1. The accumulation of solid and organic liquid waste and its disposal off-site is supervised by the URPO.

2.4 The URPS monitors the accumulation and disposal of all forms of radioactive waste through monthly returns and inspections of facilities.

2.5 Any deficiencies in the facilities provided for the disposal of radioactive will be reported to Estates and Facilities Management for rectification.

2.6 Any deficiencies in the implementation of systems adopted for the disposal of radioactive waste will be notified to the responsible person who will ensure that the areas of concern are addressed. The RPS for that area will monitor the effectiveness of such systems.

3. Security

3.1 Unauthorised access to radioactive waste must be prevented; all radioactive waste must be stored securely so that only authorised radiation workers (licence holders) are allowed access.

3.2 Waste accumulated in laboratories must be stored in lockable (shielded where necessary) containers that are secured to prevent the removal of the container.

3.3. Radiation laboratories should be kept locked when unoccupied.

3.4 Access to the radiation store is controlled by key issue from the Life Sciences stores.

Disposal of Aqueous waste

1. Aqueous waste cannot be accumulated but must be disposed of immediately, except for the CISC where ^{18}F waste may be accumulated for a maximum of 10 days (see the CISC local procedures).

2. Only sinks designated for the disposal of radioactive waste may be used. Such sinks will be identified with the radiation trefoil and the legend "Caution, this sink is suitable for the disposal of radioactive waste". Designated sinks must not have any stored items underneath and must be provided with a tray or equivalent to catch any liquid that may leak from the sink trap.

3. A sink disposal chart must be located at each sink.

4. Designated sinks should be used solely for the disposal of aqueous radioactive waste wherever possible. They should only be used for other purposes if monitoring shows them to be contamination free.

5. Waste must be further diluted with running water and care must be taken to avoid splashing and so contaminating the surrounding areas. Taps should be fitted with a length of rubber tubing to avoid this.

6. The decay corrected activity of the waste must be recorded at the time of disposal in both the Stock Record Book and on the sink disposal chart.

7. Sink disposal charts must be sent to the USRPS at the end of each month, including zero returns.

8. The URPS will enter the disposals on the radiochemical stocks spreadsheet monthly.

Solid waste accumulation and disposal

The University is only authorised to dispose of solid radioactive waste through incineration.

1. Solid waste may be accumulated for a maximum of 6 months to a maximum volume of 2.5m3

   The accumulation period starts from when the radioactive material is first declared as waste in the laboratory.

2. Any radioactive waste that is not organic liquid or aqueous waste is designated as solid waste; this includes contaminated pipette tips, syringes and gels as well as gloves, tissues and, benchcote.

   Lead and large amounts of glass, are not permitted. Contact the USRPS if these contaminated items need to be disposed of.

3. Wherever possible radioactive waste should be segregated into the following categories;

Short half life radionuclides:	$^{32}P/^{33}P$
Medium half life radionuclides:	$^{35}S/^{125}I$
Long half life radionuclides:	$^{3}H/^{14}C$ and $^{22}Na/^{36}Cl$

4. Solid waste may be stored in laboratories for no longer than one week in designated lockable radioactive waste bins.

5. The decay corrected activity of all waste is recorded both in the radiochemical stock book and on the solid waste disposal chart attached to the bin at the time the waste is generated.

6. At least weekly or when the bin is full the waste is transferred to the radioactive waste store according to the above classification.

   6.1 Full boxes are sealed and placed on the pallet closest to the entrance.

   6.2 Partial loads are transferred to the shielded open box located here and the activities transferred to the waste disposal chart affixed to the side of the box.

   6.3 When this box is full it should be removed from the perspex shielding and replaced with a new lined box.

   Activity limits per box must not be exceeded.

7. Only licensed radiation workers can access the radiation store. The key is held in the Life Sciences Stores and must be signed out and in by the recipient and their licence number recorded.

8. The USRPS will arrange for final disposal off-site within the terms of the University's Authorisation (see EPR?XP3393/SR).

9. The URPS will monitor the radiation waste store weekly and transfer full waste boxes to the rear of the store to await disposal off-site. Boxes will be numbered consecutively and the corresponding number transferred to the chart which is removed and held in the HSO.

10. Waste containing short lived radionuclides such as ^{32}P and ^{33}P is stored until the activity has decayed to a level where it can be classified as VLLW or SOLA and then disposed of through the normal waste stream.

11. VLLW and SOLA will be disposed of within the 6 month accumulation period and this date recorded on the disposal chart.

12. The URPS will remove the waste from the box and provided that there are no visible radiation markings bag it in a black waste bag closed with the appropriate numbered tag before transfer to the 1100 l waste bins.

13. The date of disposal and activity at disposal is recorded on the spreadsheet managed by the URPS.

Very low level waste (VLLW) accumulation and disposal

1. May be accumulated for a maximum of 2 weeks with no volume limit.

2. VLLW is radioactive waste where the activity is less than 400kBqm^{-3} and no single item exceeds 40kBq or for tritium and carbon-14, 4MBqm^{-3} with no single item exceeding 400kBq.

3. VLLW is disposed of along with the normal non-hazardous waste by the University's contracted waste disposal company following the University's "bag and tag scheme", provided that there are no visible radiation markings.

4. The URPS will be responsible for the disposal of VLLW where this arises from the decay of solid waste.

5. All disposals of VLLW are recorded in the same way as for solid waste.

Disposal of Organic Waste

1. Organic waste may be accumulated for 6 months to a maximum volume of 2.5 m3

2. Any liquid waste that is not aqueous (i.e. cannot be disposed of into the drains) is designated as organic liquid waste. The disposal route for this type of waste is by incineration through an authorised waste disposal contractor.

3. Waste must not be stored in laboratories for longer than one week.

4. Flammable solvents, such as HPLC mobile phases containing acetonitrile and methanol, are transferred to the Biology Flammables Store and identified with the radiation trefoil the radionuclide present, the decay corrected activity, date of disposal, volume of solvent, composition of solvent, name of disposer.

5. Mini vials containing scintillation fluid are treated as organic liquid waste and transferred to the 50l yellow UN plastic drums in the Radiation Store.

6. An Organic Liquid Waste Disposal Chart attached to the bin must be filled in with the volume of scintillant, radionuclide present, decay corrected activity, date of disposal, name of disposer.

7. The decay corrected activity must also be entered in the Stock Record Book at the time of disposal

8. The USRPO will arrange for final disposal off-site within the terms of the permit (see EPR/XP3393SR).

Disposal of Gaseous Waste

The University does not currently dispose of any gaseous waste.

Monitoring for contamination of work areas

1. All work areas must be monitored regularly to ensure that they are free from radioactive contamination and that if contamination is present it may be dealt with before it is spread.

2. It is good practice to monitor the working area before use as reassurance for the absence of contamination.

3. Each radiation worker is responsible for monitoring bench tops, perspex shields, working trays and immediate floor area after use and recording the results on a contamination monitoring record sheet (EPRF5) held in the laboratory. Records must be made of actual count rates measured, any action taken if significant contamination is found, and the results of repeat monitoring.

   All records must be clear and legible.

4. The RPS will ensure that contamination monitoring is being carried out.

5. Radiation workers must ensure that the appropriate monitor for the radionuclide in use is available - see local rules.

Identification of Radiation Areas

1. Radioactive substances must only be used or stored in designated areas approved by the URPO. If it is necessary to use an area other than an existing designated area for work with or storage of radioactive substances then a request must be made to the RPO together with justification for the requirement.

2. The RPO will inspect the proposed area to ensure its suitability.

3. Laboratories where radioactive substances are used must be identified with the radiation trefoil, the designation* of the area and appropriate signage indicating the nature of the radionuclides, the maximum activities allowable and contact details of the RPS and RPO.

   *The designation of an area as Supervised or Controlled is determined from the prior risk assessment.

4. The Radioactive waste store must similarly be identified but note that, in public areas, consideration must be given to the security aspect of advertising the presence of radioactive substances.

5. Within laboratories specific areas where radioactive substances are used will be demarcated with radiation hazard warning tape. Refrigerators and freezers used for storage of radioactive stocks and samples will be marked with the radiation trefoil and information on the nature and maximum activities of the radionuclides contained within.

6. Sinks used for the disposal of aqueous radioactive waste will be identified with the radiation trefoil and a sign indicating that "This sink is suitable for the disposal of radioactive waste". So far as is reasonably practicable all associated waste traps and pipes carrying radioactive waste will be identified

as radioactive up to the point where the pipework joins the waste downpipe for that area of the building.

7. It is the responsibility of whoever is in charge of the laboratory or store to adequately identify radiation areas within their control. The RPO will monitor the effectiveness of signage as part of the regular radiation audits.

Reporting

1. The URPO will report to the Environment Agency on behalf of the University any notifications required by permit number EPR/XP3393SR.

2. Failure to comply with any of the limitations and conditions of the registration or where it is believed that such a failure has occurred will be reported by the URPO to the Environment Agency by telephone and confirmed in writing, without delay as soon as that failure is known.

3. The results of the investigation into the breach of the registration including actions taken will be communicated to the Environment Agency by the URPO in writing as soon as is practicable.

4. The named supervisor of the registered materials the and Head of School are responsible for reporting any breach or possible breach to the URPS as soon as they become aware of the failure to comply.

5. The URPO will, on behalf of the University, notify the Environment Agency in writing giving not less than 21 days notice where it is the intention to change the name of the University, cease to occupy the existing premises or dispose of all registered stocks and cease to use registered substances.

See also EPR(OS)CD7; Loss damage, theft or unauthorised use.

Summary of measures to ensure Best Available Techniques are employed to minimise the accumulation and disposal of radioactive waste at the University of Sussex

The following document demonstrates the University of Sussex will ensure that so far as is reasonably practicable, the disposal of radioactive waste is carried out in such a manner as to;

minimise the activity of all disposals

minimise the volume of all disposals, and

dispose of waste at times, in a form and in a manner so as to minimise the radiological effects on members of the public and the environment.

Note that there is no *de minimis* below which BAT does not apply

1. **Types of waste**

1.1 Aqueous waste

Disposal data show that the University discharges an average of 10,400 MBq per month of radioactive waste into the foul water drains per month. The majority of this (97%) is fluorine-18 from the Clinical Imaging Science Centre resulting from patient excreta; the Genome Centre and School of Life Sciences. account for the remaining 3% as phosphorus-32, phosphorus-33, sulphur-35, carbon-14 and tritium. Radiological assessment indicates that the maximum committed effective dose received by the most vulnerable target group would not exceed 0.14 uSv/year.

Aqueous waste disposals are monitored both locally, by the school RPSs and centrally by the URPS. Disposals are only permitted at designated sinks within radiation laboratories. Maximum activities allowable for disposal at each sink are specified; all disposals are recorded on a sink disposal form and completed sheets collected by the RPS and sent to the URPS at the end of each month. The URPS will enter and total disposals for all sites on a central database monthly to ensure that authorisation limits are not exceeded.

1.2 Solid waste

The University is authorised to dispose of low level solid waste solely by incineration off-site.

Very low level waste can be disposed of through the normal waste route taken off-site to landfill by the university's approved contractor. To reduce the environmental impact of sending waste to landfill currently all VLLW is disposed of together with solid waste by incineration.

Solid waste is generated by the Genome Centre and School of Life Sciences and comprises predominantly of sulphur-35 and phosphorus-32. Solid waste is accumulated in laboratories and transferred to the radioactive waste store either when full or weekly, whichever occurs sooner. Dependant on the volume of solid waste generated it is accumulated either in bench-top boxes or 0.05 m^3 cardboard boxes lined with heavy duty polythene bags, both appropriately shielded.

The activity is recorded on a waste disposal form at the time of accumulation and this information transferred along with the waste when it is taken to the waste store.

The waste store is monitored weekly by the URPS. Each waste box is assigned a unique identification number which is recorded on the waste disposal form. Full details of the radionuclide(s), activity, laboratory of origin, person generating waste and date are transferred from the record sheet onto the central database. This allows the URPS to arrange disposal off-site within the six month accumulation period or to use the VLLW disposal route when waste has decayed to VLLW level if necessary.

By using decay storage for short half life (P-32, P-33) and medium half life (S-35) the activity of solid radioactive waste sent for incineration and hence the release of radionuclides to the environment is significantly reduced.

1.3 Organic liquid waste

This type of waste is generated in small quantities and is generally in the form of scintillation fluid contained in plastic mini-vials. The use of a water miscible, biodegradable fluid such as "Ecoscint" is encouraged to enable disposal to drain as aqueous liquid waste. Other non-biodegradable scintillation fluids or where there are large volumes of fluid are transferred to the waste store into separate liquid waste containers to be sent for incineration.

By using decay storage for short half life (P-32, P-33) and medium half life (S-35) the activity of radioactive organic liquid waste sent for incineration and hence the release of radionuclides to the environment is significantly reduced.

2. Management System to ensure compliance with the Authorisation

2.1 Central management

Management of Radiation Safety within the University is achieved through the line management of structure as detailed in the EPR User procedures. The University Radiation Protection Service (URPS) provides support, guidance and undertakes certain duties on behalf of the individual schools such as the management of the radiation waste store, application for variations to registrations and authorisations, maintenance of a central record of usage and disposals of radioactive substances.

The Radiation Protection Sub Committee, which comprises the School RPSs, the Radiation Protection Adviser (RPA), and a Chairperson appointed by the university Health and Safety Committee advises the Health and Safety Committee on all aspects concerning compliance with legislation governing the keeping and use of sources of ionising radiation, and the protection of persons liable to be exposed to radiation hazards. The sub committee meets twice per year to review compliance with the Ionising Radiations Regulations 1999, the Environmental Permitting Regulations 2010, and other issues relating to the management and implementation of radiological safety on campus.

The University as the radiation employer and the user of Radioactive substances has appointed a Radiation Protection Adviser (RPA) who also acts as the Qualified Expert to advise the measures required to ensure compliance with EPR2010 and the conditions the permits. The RPO supported by the URPS is responsible for the administration and development of systems of control relating to radiological protection, in order to ensure compliance with all legislation governing radiation work (including IRR99, EPR201 and the Health and Safety at Work Act 1974).

2.2 Local management

Heads of School

Heads of School are responsible for the safe use of ionising radiations within their school. This includes ensuring compliance with the limitations and conditions of the University's registrations and authorisation within their school, compliance with User Procedures and Local Rules and that all members of staff and research students are aware of the hazards and risks associated with the use of ionising radiations.

Radiation Protection Supervisors (RPS)

Radiation protection supervisors are appointed by the head of school to ensure compliance with the local rules and EPR2010 operator procedures and advise the head of school on any compliance issues arising from the use of ionising radiation within their school. All such appointments are subject to the approval of the URPS and advice on suitability may be sought from the RPA. Heads of Schools are required to confirm each such appointment in writing, with a copy being sent to the URPS. The duties required of RPSs are stipulated in the local rules; Heads of Schools are responsible for ensuring that these duties are carried out.

Research Group Leaders/Principal Investigators

In accordance with the University's health and safety policy Research Group Leaders/Principal Investigators and academic supervisors are responsible for providing such supervision as is necessary to ensure the safety of all staff and

students under their control. This includes both postgraduate and undergraduate students and visiting research workers. They have the management responsibility for work with ionising radiation and adherence to local rules and EPR operator procedures within their areas of control.

3. Provision of Information and Instruction to potential users of radioactive materials: minimization of volumes and activities

All staff members and postgraduate students of the university involved in work with radioactive materials are required to attend a one-day course in Radiation Safety Awareness, organised and delivered by the URPS in conjunction with the RPA. The course includes the IRC principles of Justification and Optimisation of Practices, implicit in which is the requirement to minimise the amount of radionuclide used in any given work activity. Having attended such a course, and completed a course assessment, participants are permitted to work with specified radionuclides under supervised conditions where they receive further training in local procedures by the RPS and supervisor. Within-laboratory instruction and training are thus designed to lead to the attainment of competency in the local arrangements for the acquisition, storage and handling of radioactive materials, and the transfer or disposal of radioactive waste.

4. Risk Assessments and Project Registrations

All new procedures that involve the use of radioactive materials are required to be submitted to the radiation protection sub-committee for approval. This involves the initial submission of a project registration form, which specifies the quantities of radionuclides to be used, and the amounts of waste, of all forms, expected to be generated. Individual project registrations must be supported by one or more Risk Assessments and a commitment to minimising the use of each specified radionuclide with the consequent generation of all forms of waste.

5. Active promotion of radionuclides with lower radiotoxicities, or substitution by non-radioactive materials

Wherever possible the use of lower energy less radiotoxic radionuclides is employed. For example, the use of phosphorus-33 should always be considered as an alternative to the much higher energy phosphorus-32 where the required radiochemicals are available and experimental results will not be compromised. The risk assessment will address the benefits of a reduction in radiation dose from phosphorus-33 compared to the increased activities that may be required generating more waste and a higher activity of radionuclide remaining at disposal of solid waste due to the longer half life. Following risk assessment the use of the highly radiotoxic radionuclide iodine-125 has virtually ceased and fluorescent or enzyme-linked markers are now used in immunoassay and related procedures involving labelled proteins and peptides.

6. Minimisation of amount of radioactive arising

Once generated the release of solid radioactive waste to the environment is minimised by decay storage for 6 months of short and medium half life radionuclides before off-site disposal. Phosphorus-32 and Phosphorus-33 releases are therefore extremely low, down to VLLW or SOLA levels, whilst sulphur-35 waste reduces to 25% of its original activity. Activities of tritium and carbon-14 solid waste are routinely around the VLLW level.

7. Facilities for storage and use of materials; inspection and maintenance procedures; checks for loss, leakage etc.

All refurbished and new laboratory facilities are and will be designed following the Environment Agency "Guidance on Standards for Radiochemical Laboratories in non-nuclear premises" and AURPO guidance contained in the publication "Guidance on working with ionising radiations in research and teaching".

All equipment used in the handling of unsealed radioactive materials (fume hoods, centrifuges and rotors, workstations, pipettes etc) is subject to periodic inspection and contamination monitoring, as specified within Area Local Rules. In particular, the airflows within fume hoods used to handle volatile radionuclides such as ^{125}I are regularly checked and recorded. Any necessary remediation is undertaken by university Estates personnel under direct supervision by, or following issue of a clearance certificate by, the RSU. The security and integrity of containment measures within laboratory refrigerators and freezers designated for the storage of radioactive materials is checked by the RSU during the annual School inspection. RPSs are required to conduct a monthly audit of radioactive materials within their areas; written details of isotope stock holdings are submitted to the RSU for addition to the central university database of such materials.

8. Inspection and maintenance of waste storage and disposal facilities; holding areas for Low level Solid Waste, designated sinks, associated drains and risers

Laboratories where open source radioactive materials are used have designated sinks for the disposal of aqueous radioactive waste. Procedures for discharging aqueous waste through designated sinks are specified and users are required to record the radionuclide, activity, volume, date, and identity of disposer at the time of disposal. The drainage runs and pipework leading from each designated sink are marked with warning tape marked "radioactive". All such accessible structures are checked for physical and structural integrity, and freedom from leaks at the time of annual inspection by the URPS; areas immediately adjacent to such pipework are also inspected to ensure freedom from leaks of radioactive waste. Work on any such pipework carried out by the University's Estates department or external contractors is subject to a permit to

work issued by the URPS or local RPS following assessment and radiological survey if necessary.

9. Procedures for dealing with spillages and losses: incorporation into Risk Assessments and Local Rules

All risk assessments undertaken by university research groups or individuals are required to include a specific Contingency Plan, drawn up in compliance with the Ionising Radiations Regulations 1999 where the generic emergency plan detailed in the local rules is not adequate. Reasonably foreseeable occurrences such as spillages of an open source of radioactivity are covered by the emergency plan and include measures to be implemented that will (a) minimize the external radiation dose to individuals, and (b) limit or prevent dispersion of the material. Specific information relating to the radionuclides in use within a given laboratory is also required to be included within the local rules for that area, and thus made available to all individuals therein.

Provision of information, sampling and analysis of waste and other substances

1. The URPO will complete the annual pollution inventory return on behalf of the University within the time specified (currently 28th February).

2. The URPO will collate and provide any additional information required by the Environment Agency within such time specified and in a format as specified.

3. At the request of the Environment Agency the URPO will coordinate the sampling and analysis of any samples of waste and undertake any further tests and surveys that may be requested by the Agency.

4. The results of any such tests, analysis or survey will be recorded and the records retained in the Health and Safety Office.

5. At the direction of the Agency any samples required to be retained will be stored securely in the Pevensey1 radiation store.

6. The URPO will arrange for the provision of samples of waste and arrange their dispatch to a specified laboratory in accordance with the relevant transport regulations.

7. The URPO will ensure that samples and residues from the tests will be returned to the University within three months of receiving written notification that testing and repackaging in accordance with the relevant transport regulations are complete.

8. The URPO will, after consultation with the Environment Agency, arrange for the disposal of any such samples and residues.

Appendix 3

Forms

RSAF1	Radionuclude Receipt Form
RSAF2	Solid Waste Disposal Chart
RSAF3	Aqueous Waste Disposal Chart
RSAF5	Laboratory Contamination Monitoring Record
RSAF6	Radiation Emergency Report Form
RSAF7	Monthly Contamination Monitoring Record
RSAF8	Radioactive Sealed Source Movement Log
EPRF6	Sealed Source Leak Test Record Sheet
EPRF7	Sealed Source Record Sheet
EPRF8	Incoming Materials Declaration