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LITTLE FOREST LEGACY SITE 'POSSESS OR CONTROL' LICENCE RADIATION PROTECTION PLAN

Document LFBG-PC-LA-D3

(Rev 0)

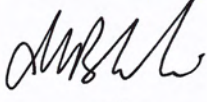
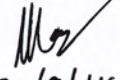
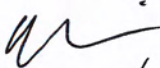
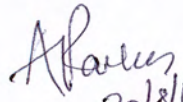

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Radiation Protection Plan for 'Possess or Control' Phase of the LFLS

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1 PURPOSE AND SCOPE

1.1 Purpose

The purpose of this *Radiation Protection Plan* is to describe the organisational arrangements and procedures that are to be implemented for the purposes of controlling exposure to ionising radiation at the 'Little Forest Legacy Site' (LFLS) in Lucas Heights, NSW.

This plan outlines the systems and the processes that will ensure compliance with standards and regulatory requirements on radiation protection and the application of optimisation of protection measures at the LFLS.

This plan has been prepared to ensure safe management of the LFLS and is part of the 'Possess or Control' licence application made to ARPANSA, for which ANSTO is seeking approval for. The licence application was originally submitted to ARPANSA in 1999 and ANSTO is updating all the documentation and providing additional information and clarifications to the original licence application. This plan forms the part of that supporting information of the 'possess or control' licence application.

This plan is compliant with current Australian National Standards and Codes and, also, the ARPANS Act and Regulations. The plan is consistent with international best practice and is in accordance with the International Atomic Energy Agency (IAEA) standards and guidelines on protection against the effects of ionising radiation (IAEA Safety Series No. 115, 1996 and Safety Guide No RS-G-1.1, ICRP 103).

1.2 Scope

This plan applies to all activities associated with the 'Possess or Control' of the LFLS.

This plan should be read in conjunction with the other plans and supporting documents comprising the 'Possess or Control' licence application.

2 RESPONSIBILITIES

The CEO of ANSTO is the applicant to ARPANSA for the 'Possess or Control' licence authorisation being sought. The CEO of ANSTO has delegated responsibility for the safe management of the LFLS to the Nominee who is the Head, Nuclear Services.

The organisational arrangements, with organisational structure, roles, responsibilities and delegations, are described in detail in *Effective Control Plan*, LFBG-PC-LA-D1 [12.1.4].

Only a summary relating to radiation protection is given in this plan.

2.1 Organisational Responsibilities for the LFLS

All workers have responsibility to apply the ANSTO WHS (Work, Health and Safety) management system and to follow the related procedures and instructions such that radiation exposures are as low as reasonably achievable (ALARA) and are within the applicable limits and constraints.

2.1.1 Health Physicist and Radiation Protection Workers

ANSTO's Nuclear Services will provide Radiation Protection Services (RPS) workers, namely a Health Physicist (HP), Health Physics Surveyor (HPS) and related services for the 'Possess or Control' of the LFLS. Throughout this plan and the supporting documentation, Health Physicist and Radiation Protection Advisor (RPA) are interchangeable.

The HP is an experienced professional trained in radiation protection who advises the workers for the 'Possess or Control' of the LFLS on radiation protection issues, safe working practices, relevant standards and the optimisation of radiation protection measures.

The HP assists workers with improvements in radiation safety by advising on the development, application and modification of procedures, instructions and written work systems for all activities where radiological safety assessment is required for the 'Possess or Control' of the LFLS.

Monitoring programs and their implementation are advised upon and reviewed by the HP. Advice on licensed source handling and storage, the management of radioactive waste and the transport of radioactive material is also available from the HP.

The HP will be supported, at an operational level, by the provision of HPS from ANSTO Nuclear Services. The HPS will perform radiation monitoring surveys of areas identified by the HP. The results of these surveys will be reported, for review as per Section 11 of this document, to the HP and to the Head, Nuclear Services, or their nominated delegates.

The HP and the HPS will have the authority to suspend work if the radiological conditions have significantly deviated from the expected operational levels and it is believed that these conditions present an intolerable risk to either staff or to members of the public.

3 RADIATION PROTECTION PRINCIPLES

ANSTO is committed to maintaining standards of radiation safety recommended by the International Atomic Energy Agency, (IAEA), the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), and through the application of its radiation safety management systems. ANSTO is committed to keeping all radiological exposures to As Low as Reasonably Achievable (ALARA), social and economic factors being taken into account.

The ANSTO WHS Radiation Safety Standard AS2310 [12.1.3] is applicable to the 'Possess or Control' of the LFLS that either introduces a radiological hazard (potential or otherwise) or where existing radiological materials have the potential to become an operational hazard.

The ANSTO WHS Standard for Radiation Safety AS2310 [12.1.3] is implemented through the application of the guides and practices as listed in Section 12.2.

3.1 Justification of Radiological Exposures

Radiological exposures are anticipated to be received by workers during the 'Possess or Control' of the LFLS. The exposures received during general inspection, monitoring and sample collection activities over the trench area have been estimated as being negligible.

These exposures are considered to be justified on the basis that the continued safe management of the facility occurs.

3.2 Optimisation of Radiation Protection

ANSTO is committed to the fundamental radiation protection principle of optimisation, by keeping the magnitude of individual doses, the number of people who are exposed, and the likelihood of incurring exposures to radiation, As Low as Reasonably Achievable (ALARA), taking into account economic and social factors.

The ALARA principle will be formally applied, as appropriate, by:

- Use of dose constraints for individual tasks where radiological exposures have the potential to become significant (i.e. an effective dose in excess of a pro rata dose limit or dose constraint) due to siting activities.
- Identification of radiological hazards and optimisation and implementation of the associated controls within the safe work method and environmental statements (SWMES) and risk assessments used to manage 'Possess or Control' activities at the LFLS.

3.3 Radiation Dose Limits

Individual doses due to the combination of exposures from the LFLS and all other ANSTO activities must not exceed the specified annual effective dose limits and equivalent dose limits recommended by the national standard, IAEA Basic Safety Standard, ARPANS Regulations and the International Commission on Radiation Protection (ICRP).

ANSTO is committed to ensure that, for all 'Possess or Control' activities at the LFL site, effective radiation doses (including committed effective radiation doses) to occupationally exposed persons and members of the public do not exceed any dose constraints set by ANSTO. Doses received will be subject to the dose limits and constraints in accordance with the ANSTO WHS Radiation Safety Standard AS2310 [12.1.3] and is summarised in Table 1 of this plan.

Appropriate dose constraints across shorter time periods and for specific tasks will be defined by the

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HP in consultation with the Head, Nuclear Services, or their nominated delegate.

The plans and arrangements for managing potential environmental impacts identify the relevant discharge limits required to ensure that the exposure to members of the public remain below the relevant dose limits and dose constraints.

Radiological exposures received by workers during the 'Possess or Control' phase of the LFLS have been estimated to be negligible.

Table 1 Dose Limits and Constraints

Class	Occupationally Exposed Personnel	Public
Effective Dose Limit	<ul style="list-style-type: none">• 20 mSva⁻¹, averaged over five consecutive years.• 50 mSv in any single year.	<ul style="list-style-type: none">• 1 mSva⁻¹ effective dose.
Effective Dose Constraint	<ul style="list-style-type: none">• 15 mSva⁻¹	<ul style="list-style-type: none">• 0.3 mSva⁻¹ effective dose.
Equivalent Dose Limit	<ul style="list-style-type: none">• 150 mSva⁻¹ to the lens of the eye.• 500 mSva⁻¹ to the hands and feet.• 500 mSva⁻¹ to the skin (average dose received by any one square centimetre of skin).	<ul style="list-style-type: none">• 15 mSva⁻¹ equivalent dose to the lens of the eye.• 50 mSva⁻¹ equivalent dose to the hands and feet.
Investigation levels	<ul style="list-style-type: none">• 1 mSv month⁻¹ effective dose• 40 mSv month⁻¹ for skin or hand doses	<ul style="list-style-type: none">• N/A
ALARA Assessment	<ul style="list-style-type: none">• 2mSva⁻¹	<ul style="list-style-type: none">• 0.02mSva⁻¹

*Note the ICRP issued a statement on lowering the threshold for the eye lens on 21st April 2011. The statement is as follows: ***“For occupational exposure in planned exposure situations the Commission now recommends an equivalent dose limit for the lens of the eye of 20 mSv in a year, averaged over defined periods of 5 years, with no single year exceeding 50 mSv.”*** ANSTO will work to this guidance.

3.4 Defence in Depth

The defence in depth measures applied at the LFLS, during the 'Possess or Control' phase, are described in, but not limited to the ANSTO WHS Radiation Safety Standard AS2310 [12.1.3].

3.5 Safety Culture

A strong Safety Culture within ANSTO will contribute towards radiation protection. This will be done by demonstrating a commitment towards the following elements:

- ANSTO Radiation Safety Standard
- Well-defined nuclear safety roles and responsibilities
- Nuclear and radiological safety performance monitoring and reporting
- Motivation and commitment by management and employees
- Conservative decision-making
- Review and application of operational experience

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4 RADIOLOGICAL HAZARDS AND CONTROLS

The LFLS is a legacy waste disposal facility which is currently closed and no waste emplacement works have been carried out in this facility since 1968.

During the 'possess or control' phase of the facility, there will be no on-going operational tasks to be undertaken in the facility other than routine monitoring and inspection works.

Data from the surveillance program, as detailed in section 7, have generally indicated that detected levels of radioactivity within the region of the LFLS have not been elevated appreciably relative to background levels. Surface soil contamination has been detected above and in the immediate locality of the trenched areas; however, there has not been evidence of wind dispersion of radionuclides from the monitoring of airborne dust suspension samples. In summary, there has not been any off-site radionuclide migration detected, other than low levels of tritium, from the wastes buried at the LFLS (Payne et al., 2013).

A model has been developed taking into account different pathways by which the worker, the public and the environment could be exposed to the radionuclides present in the waste, to assess the radiological consequence. This model is described in detail in *Safety Assessment of the LFLS*, ANSTO/T/TN/2013-10 [12.3.1]. The data used to conservatively calculate exposures, was obtained from sampling which occurred in areas of subsidence and has since been top coated with ~200mm of clean top soil returning the immediate surface activity levels to back ground. Annual exposures calculated using this conservative method was extremely low.

Current data from routine dose rate monitoring of the site indicate that measured dose rates at 1 meter above the ground over the disposal trenches, indicate that annual exposure from external radiation is indistinguishable from background levels.

5 RADIOLOGICAL CLASSIFICATION OF AREAS

The Classification of Contamination and Radiation areas shall be done according to the process described in [12.2.6] and in compliance to the ANSTO WHS Radiation Safety Standard AS2310 [12.1.3]. These define the system of radiological classification of areas employed to control, prevent, limit and review occupational exposure (actual or potential) to ionising radiation. This system of radiological classification ensures that occupational dose limits and dose constraints are not exceeded, and is part of the process of ensuring that doses to individuals are kept ALARA.

The area classification for the LFLS is White Contamination and White Radiation.

The LFLS is deemed a Supervised Area and has a perimeter that is secured by a high cyclone wire fence with cable reinforcement. Bollards have been placed at the gate entrance and along a section of the north fence to prevent the unauthorised entry of vehicles by force.

6 SAFETY HAZARD NOTIFICATION

The LFLS is a white contamination and white radiation area and through the history of radiological monitoring at the facility no dose rates or airborne contamination have been measured above background levels. Due to these reasons, there are no hazard notice boards located at the LFLS facility. General notice boards identifying the area as Commonwealth land and prohibiting access are displayed

6.1 Personal Protective Equipment

Personal Protective Equipment (PPE) for working in radiological classified areas shall be supplied and worn according to the guidelines given in [12.2.8] and [12.2.9].

The PPE shall be determined against the nature of the hazard and the work that is being undertaken.

No Personal Protective Equipment is required during the 'Possess or Control' phase at the LFLS.

7 RADIATION MONITORING PROGRAMS

Monitoring programs that demonstrate adequate protection and optimisation of protection measures are described in two parts. The first is based on the collection of information, through measurements about radiological conditions in the workplace and the evaluation of this information. The second is based on measuring individual exposure to radiation using personal dosimetry.

The type of monitoring which takes place at the LFLS, which forms part of the surveillance program under the maintenance plan is:

- Soil Survey,
- Ground Water Survey,
- Radiation Monitoring,
- Airborne Contamination Monitoring and
- Soil Sampling.

Detailed descriptions of the above components which form part of the surveillance program are given in *Safe Storage and Maintenance Arrangement of LFLS*, LFBG-PC-LA-SS [12.3.3].

Because the LFLS is classified white contamination and white radiation, there is no requirement for individual monitoring to be performed.

7.1 Monitoring of the Environment

Monitoring of the environment occurs as part of the surveillance program under the maintenance plan which has been described above and precautions taken to avoid or minimise disturbance to the waste disposal trenches. Biota samples are also taken for research purposes.

During the 'possess or control' phase of the facility, there are no identifiable exposure pathways to wildlife in their natural habitats.

8 TRAINING

Basic training in Radiation Safety is carried out in accordance with ANSTO WHS Standards and Practices. Training is commensurate with the responsibilities of the role an individual is performing. The minimum requirement for training of a radiation classified worker at ANSTO is the Basic Radiation Safety course and the Radiation Protection Workshop. Health physics monitoring at the LFLS is performed by HPS, and hence, the level of training for those workers is more detailed than that for other workers. Other workers are provided radiation safety training in line with the current training programs at ANSTO.

All HPS at ANSTO undergo a training program that includes theoretical and practical training. This training program is concluded with an assessment to determine if the individual is competent to perform the duties of a HPS. HPS will be trained in the operations and radiological requirements of the LFLS.

9 TRANSPORT AND MOVEMENT OF RADIOACTIVE MATERIALS

The movement of radioactive materials onsite at ANSTO, including the LFLS will be carried out in accordance with the Safe Movement and Transport of Radioactive Material (Guide) AG 2515 [12.2.12].

Radioactive materials leaving the site will be transported in accordance with the ARPANSA Radiation Protection Series RPS No.2 [12.1.2].

10 SUPPLEMENTARY INFORMATION

This plan should be read in conjunction with the other plans and supporting documents comprising the 'Possess or Control' licence application.

11 REVIEW AND AUDIT OF THE RADIATION PROTECTION PLAN

11.1 Performance Indicators

11.1.1 Occupational Exposure

Reference levels for occupationally exposed workers are defined in the form of Investigation Levels in accordance with The ANSTO WHS Radiation Safety Standard AS2310 **[12.1.3]** and is summarised in Table 1 of this plan. Dose results will be reviewed at an appropriate periodicity (taking into account the issue period for dosimetry) and will be compared to dose constraints and to these investigation levels.

The Investigation Levels have been defined to ensure that, where pro rata doses suggest a dose constraint may be challenged, a formal investigation is performed by the HP. The results of such investigations and associated recommendations for future management of exposure will be discussed with the Facility Officer, LFLS.

11.1.2 Monitoring Results

The HP will review the radiological conditions at the facility, as measured during routine or special surveys and, where the conditions suggest that either:

- The Radiological Classification of the Area is incorrect
- There is a trend towards increasing radiation or contamination levels in an area
- There is a specific radiological concern

The HP will make recommendations for any rectifications required.

11.1.3 Event / Incident Reports

Events that are assessed as incidents or events against the ANSTO Event System (AG2372) **[12.2.1]** will be investigated by the LFLS Facility Manager (with additional expertise made available from ANSTO LHSTC, as required). The frequency and magnitude of radiological events will be considered an indicator of the effectiveness of this plan (and its' implementation).

12 REFERENCES

12.1 Standards, Regulations and Plans

Ref No	Doc No	Document Title
12.1.1	ARPANSA Radiation Protection Series RPS No.1	Recommendations for Limiting Exposure to Ionizing Radiation and National Standard for Limiting Occupational Exposure to Ionizing Radiation; 2002
12.1.2	ARPANSA Radiation Protection Series RPS No.2	Safe Transport of Radioactive material
12.1.3	AS 2310	ANSTO Radiation Safety Standard
12.1.4	LFBG-PC-LA-D1	LFLS Effective Control Plan
12.1.5	LFBG-PC-LA-D2	LFLS Safety Management Plan
12.1.6	LFBG-PC-LA-D4	LFLS Waste Management Plan
12.1.7	LFBG-PC-LA-D5	LFLS Security Plan
12.1.8	LFBG-PC-LA-D6	LFLS Emergency Plan

12.2 Guidelines and Process Documents

Ref No	Doc No	Document Title
12.2.1	AG 2372	Event Response Process (Guide)
12.2.2	AG 2505	ALARA Assessment (Guide)
12.2.3	AG 2506	Risk Assessment and ALARA Cost-benefit Analysis
12.2.4	AG 2471	Safe Management of Licensable Sources (Guide)
12.2.5	AG 2508	Radiation Safety Data (Guide)
12.2.6	AG 2509	Classification of Radiation and Contamination Areas (Guide)
12.2.7	AG 2510	Entry to and Exit from Classified Radiation Areas (Guide)
12.2.8	AG 2511	Clothing to be worn in Classified Radiation Areas (Guide)
12.2.9	AG 2512	Clothing Change Procedures When Entering or Leaving Classified Areas (Guide)
12.2.10	AG 2513	Contamination Clearance Levels (Guide)
12.2.11	AG 2514	Clearance of Radiation Classified or Radioactive Contamination (Guide)
12.2.12	AG 2515	Safe Movement and Transport of Radioactive Material (Guide)
12.2.13	AG 2521	Personal Dosimetry (Guide)

12.3 **Supplementary Information**

Ref No	Doc No	Document Title
12.3.1	ANSTO/T/TN/2013-10	Safety Assessment of the LFLS
12.3.2	LFBG-PC-LA-FD	Purpose and Description of the Facility
12.3.3	LFBG-PC-LA-SS	Safe Storage and Maintenance Arrangement of LFLS