REPORT OF THE

RADIOLOGICAL COUNCIL

for the year ended

31 December 2019

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RADIATION SAFETY ACT 1975

STATUTORY RESPONSIBILITIES OF THE COUNCIL

The Radiological Council is appointed under Section 13 of the Radiation Safety Act to assist the Minister to protect public health and to maintain safe practices in the use of radiation.

In its position as an independent regulatory authority, the Council is required to administer the Act and to —

- implement the scheme of licensing and registration;
- conduct inquiries into alleged contraventions of the Act and, where necessary, to suspend or cancel licences and registrations;
- advise the Minister and make recommendations with respect to the technical aspects of radiation safety requirements, the methods that may be used to prevent or minimise the dangers arising from the use of radioactive substances, irradiating apparatus and electronic products, including the preparation of regulations;
- investigate and prosecute offences.

The Council is also required to keep under review manufactured or assembled devices which emit radiation to determine if control of these devices is necessary under the Act.

Section 10 requires the Minister at all times to have regard to the expressed views of the Council.

MEMBERSHIP OF THE COUNCIL

The Council comprises —

- a medical practitioner appointed by the Governor on the recommendation of the Executive Director Public Health;
- a medical practitioner who is a specialist in radiology or radiotherapy;
- a physician specialising in nuclear medicine;
- a person who possesses relevant qualifications or experience as a physicist;

- a person who possesses relevant qualifications or experience as a radiation engineer or electronic engineer;

- a representative of the interests of tertiary educational institutions;

- two other persons with special expertise in radiation protection may be nominated by the Minister on the advice of the other members of the Council;

- a medical radiation technologist.

The present members, approved by the Governor, are listed in attachment 1.

The Council met nine times in 2019.

ADVISORY COMMITTEES

The Council may appoint committees under Section 19 of the Act to investigate and advise on any aspect of its functions, or to carry out any function other than those relating to licences and registrations. The present policy is to create, when necessary, short-term working parties which address a specific issue and report back to the Council.

No advisory committees are currently appointed.

ADMINISTRATIVE SUPPORT

Section 10(4) of the Act provides for the administration of the Act to be paid out of monies appropriated by Parliament for the purpose. However, the Council is not funded directly and relies on the Department of Health's Radiation Health Unit for administrative and scientific support. While the greater part of the Unit's duties are directly concerned with supporting the Council's needs, and many of the staff are appointed authorised officers under Section 4(1) of the Act for this purpose, the Unit also provides separate advice to the Department on a range of radiation issues.

The Radiation Health Unit also provides the Secretary of the Council. The position has been held by Ms H Upton (Managing Health Physicist) since February 2002, with Mr D Surin (Health Physicist) performing these duties in Ms Upton's absence.

STATE ELECTORAL ACT

For the purposes of Section 175ZE of the State Electoral Act, the Radiological Council has no expenditure to report. Council's functions are supported from within the budget assigned by the Department of Health to the Radiation Health Unit. The Council does not have a budget in its own right.

STATE RECORDS ACT

The Radiological Council's record keeping systems are managed by the Radiation Health Unit of the Department of Health, and thus the Council's compliance with the State Records Commission Standard 2, Principle 6 is linked to compliance by the Department of Health.

REGISTRATIONS, LICENCES AND TEMPORARY PERMITS

Registration and licensing are the principal means by which the use of radiation is regulated. A summary of the legislative system for registration and licensing in Western Australia is included in appendix 1.

QUALIFICATIONS AND TRAINING OF RADIATION USERS

A summary of the legislative scheme for ensuring the appropriate qualifications and competence of persons applying for licences is included in appendix 2.

CHANGES TO LEGISLATION

No amendments were made to the Radiation Safety Act or the Radiation Safety (Transport of Radioactive Substances) Regulations in 2019.

Amendments made to the Radiation Safety (General) Regulations and the Radiation Safety (Qualifications) Regulations are listed in attachment 2.

RADIATION INCIDENTS

Reported incidents involving radiation rarely pose a major health risk to the individuals exposed. Regulation 19A of the Radiation Safety (General) Regulations requires registrants to notify the Council in writing as soon as practicable should any of the abnormal or unplanned radiation exposures specified in that regulation occur. In addition to Regulation 19A, the medical incident reporting condition requires medical incidents specified in that condition to be reported to Council within 7 days. This has resulted in an increase in the number of reported incidents.

Although there is no certainty that all incidents are reported, Council encourages reporting and rigorous investigation of the cause as this provides a forum for improving work practices and minimising the risk of recurrence of such incidents.

The Council was notified of 82 incidents during 2019 which are presented in the tables below. The majority of incidents relate to human error and a failure to follow protocols. All reported incidents are followed up by Council and its officers and attention is given to analysing the root cause and ensuring procedures and protocols are amended where necessary in order to minimise the chance of reoccurrence.

Incident	**Occurrences**	**Category**
Radiology		
Error in CT equipment requiring repeat imaging	1	Equipment malfunction
Patient injury – observable acute radiation effect	1	Interventional fluoroscopy procedure
Incorrect patient imaged – failure to correctly identify patient against request form	19	Human error – failure to follow protocol
Incorrect patient imaged due to incorrect patient name being entered on request form	5	Human error – other
Incorrect examination/anatomical site imaged – failure to image as per request form	16	Human error – failure to follow protocol
Incorrect examination/anatomical site imaged – failure to refer for correct examination/anatomical site	1	Human error – failure to follow protocol
Incorrect modality selected by MIT	1	Human error – failure to follow protocol
Duplication of imaging due to duplication of request form for inpatient and outpatient systems	1	Human error – failure to follow protocol
Exposure whilst persons other than patient unintentionally in the room	2	Human error – failure to follow protocol

Incident	Occurrences	Category
Radiotherapy		
Incorrect treatment site for superficial radiotherapy	1	Human error
Nuclear Medicine		
Incorrect activity of radiopharmaceutical administered	2	Human error - failure to follow protocol
Incorrect patient imaged due to incorrect patient name being entered on request form	1	Human error – other
Extravasation of radiopharmaceutical	8	Protocol followed – IV administration failed after successful cannulation flush.
Radiopharmaceutical administered but scan not performed	5	Protocol followed – patient did not proceed with procedure.
Radiopharmaceutical administered but scan not performed - team requested a different diagnostic test or cancelled the original test.	2	Human error – communication between treating teams needed improvement
Radiopharmaceutical administered but scan not performed – patient's status changed and the diagnostic test was no longer required.	4	Protocol followed
Duplicate scan required - failure to image as per request form	3	Human error – failure to follow protocol
Malfunction of equipment – poor efficacy of radiopharmaceutical dispensing kit	1	Product recalled. 9 patients across 3 sites affected.
Industrial		
Potential for exposure of persons during industrial radiography	1	Failure to follow protocol and check exclusion zone was vacant before exposures.
Potential for exposure of persons – industrial radiography source disconnect	1	Human error – use of incompatible radiography accessory and parts with excessive wear.
Vehicle incident whilst mineral sands on board	1	Protocol followed – unintentional collision and spill cleaned up.
Vehicle incident whilst radioactive source on board	1	Protocol followed – vehicle rolled after accident.
Unintentional exposure of persons – fixed gauge not isolated	1	Human error - failure to follow protocol

Incident	Occurrences	Category
Unintentional x-ray exposure of persons	1	Child passed through baggage cabinet x-ray equipment.
Other		
Disposal of radioactive source to scrap metal yard	1	Human error - other
Unintended release of radioactive substances – radiopharmaceutical manufacturing	1	Equipment malfunction

PROSECUTIONS

No prosecutions were initiated or finalised in 2019.

MEDICAL AND RELATED RADIATION MATTERS

Medical Compliance Testing

Council's compliance testing program, which commenced in 1997, applies to diagnostic x-ray equipment used on living humans for medical radiography, fluoroscopy, chiropractic radiography, dental radiography and computed tomography.

No such x-ray equipment may be used for human diagnostic purposes unless it has a current certificate of compliance, a certificate of conditional compliance or an exemption from compliance.

Through conditions imposed on registrations under Section 36 of the Act, registrants are legally responsible for satisfying the requirements of the compliance testing program.

A summary of the compliance tests assessed in 2019 is included in attachment 3

X-Ray Operator Course

X-ray operators are approved by the Radiological Council to perform basic radiography of the chest and extremities in remote and rural areas where radiology services are otherwise not available. A Radiological Council approved training course suitable as a prerequisite for approval of an x-ray operator has been run successfully by Curtin University of Technology since 2013.

Approvals for Exposure to Radiation for Human Subjects in Medical Research

In Western Australia, all research projects involving exposure of human participants to ionising radiation must be evaluated by the Radiation Safety Officer. When the estimated radiation dose exceeds prescribed levels, Council approval must be obtained in addition to the approval by an Ethics Committee.

In keeping with the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Radiation Protection Series # 8 (2005) *Exposure of Humans to Ionizing Radiation for Research Purposes*, the Council assesses research projects which involve exposing humans to ionising radiation without proven benefits to the irradiated subjects and where the dose to any individual adult subject exceeds 5 mSv in any year.

Council assessed and approved the radiation component of the following research applications or amendments in 2019.

Research Project Title
A randomized, Multicenter, Open-Label, Phase 3 Study to Comapre the Efficacy and Safety of Acalabrutinib (ACP-196) in Combination with Venetoclax with and without Obinutuzumab Compared to Investigator's Choice of Chemoimmunotherapy in Subjects with Previously Untreated Chronic Lymphocytic Leukemia Without del(17p) or TP53 Mutation.
Effect of high-dose fish oil supplementation on arterial inflammation in patients with elevated lipoprotein (a).
Towards visualising and understanding patient-specific biomechanics of abdominal aortic aneurysms (AAA).
A randomized, double-blind, placebo-controlled, phase III study evaluating the efficacy and safety of pembrolizumab plus platinum-based doublet chemotherapy with or without canakinumab as first line therapy for locally advanced or metastatic non-squamous and squamous non-small cell lung cancer subjects.
A Phase 3 Randomised, Placebo-controlled, Double-blind Study of Niraparib in Combination with Abiraterone Acetate and Predisone Versus Abiraterone Acetate and Prednisone for Treatment of Subjects with Metastatic Prostate Cancer.
A multicenter, randomized, double-blind, placebo controlled, two-arm, phase 2 study of ME-401 in subjects with follicular lymphoma after failure of two or more prior systemic therapies.
A Randomised Open-Label, Phase 1b Study of the Safety of Pirfenidone Solution for Inhalation (AP01) in Patients with Idiopathic Pulmonary Fibrosis
A Randomised, Controlled Phase 3 Study of Cabozantinib (XL184) in Combination with Atezolizumab verus Sorafenib in Sorafenib in Subjects with Advanced Hepatocellular Carcinoma Who Have Not Received Previous Systemic Anticancer Therapy
A Phase 3, Randomised, Double-blind Trial of Pembrolizumab (MK-3475) Plus Enzalutamide Versus Placebo Plus Enzalutamide in Participants with Metastatic Castration-Resistant Prostate Cancer (mCRPC)
A Phase 2, Open-Label, Single-Arm Study of Pamiparib (BGB-290) for the Treatment of Patients with Metastatic Castration-Resistant Prostate Cancer (mCRPC) with Homologous Recombination Deficiency (HRD)
A Phase III Prospective Double Blind Placebo Controlled Randomised Study of Adjuvant MEDI4736 in Completely Resected Non-Small Cell Lung Cancer
Effectiveness of a Fast Track Giant Cell Arteritis Clinic in Western Australia
Exploring the role of androgen receptor blockade in increasing the expression of prostate specific membrane antigen (PSMA) and enhancing 68Ga-PSMA-11-PET/CT imaging in patients with metastatic prostate cancer.
A Phase 3, Randomised, Double –blind study of Pembrolizumab (MK-3475) Plus Docetaxel Plus Prednisone verus Placebo Plus Docetaxel Plus Prednisone in Participants with Chemotherapy-naïve Metastatic Castration –Resistant Prostate Cancer (mCRPC) who have progressed on a Next Generation Hormonal Agent (NHA) (KEYNOTE-921)

Research Project Title
A Phase 2, 24-Week Randomised, Double-blind, Placebo-Controlled Multicenter Study, with an 80-Week Active Treatment Extension, to evaluate the Efficacy and Safety of CC-90001 in Subjects with Idiopathic Pulmonary Fibrosis
NHL 31 TREB-L - An Open label, Multicentre, Phase I study of Ibrutinib, Rituximab, Valaciclovir and 3rd Party EBV specific T cells in Patients with immunosuppression related EBV-positive Brain and/or Systemic B cell lymphomas, that are relapsed/refractory or unsuitable for standard first-line treatments
A Phase III Open-Label, Multi-Centre, randomised Study Comparing NUC-1031 plus Cisplatin to Gemcitabine plus Cisplatin in Patients with Previously Untreated Locally Advanced or Metastatic Biliary Tract Cancer.
A Phase II, Open-Label, Multicenter, Randomized Study Of The Efficacy And Safety Of RO7198457 In Combination With Pembrolizumab Versus Pembrolizumab In Patients With Previously Untreated Advanced Melanoma.
A Phase 2, Open-Label, Randomized, Multicenter Trial of Encorafenib + Binimetinib Evaluating a Standard-dose and a High-dose Regimen in Patients With BRAFV600-Mutant Melanoma Brain Metastasis
A Phase 3, Randomized Open-label Study of Pembrolizumab (MK-3475) Plus Olaparib Versus Abiraterone Acetate or Enzalutamide in Participants with Metastatic Castration-resistant Prostate Cancer (mCRPC) Who are Unselected for Homologous Recombination Repair Defects and Have Failed Prior Treatment with One Next-generation Hormonal Agent (NHA) and Chemotherapy (KEYLYNK-010)
REGENERON 1788: A Randomized, Placebo-Controlled, Double-Blind Study of Adjuvant Cemiplimab Versus Placebo after Surgery and Radiation Therapy in Patients with High Risk Cutaneous Squamous Cell Carcinoma
A phase I/II, open-label, dose escalation and expansion study to evaluate safety, tolerability, and clinical activity of the antibody-drug conjugate GSK2857916 administered in combination with Lenalidomide plus dexamethasone (Arm A), or Bortezomib plus Dexamethasone (Arm B) in participants with relapsed/refractory multiple myeloma.
A Phase 1, Open-Label, Dose-Escalation and Cohort Expansion First-in-Human Study of the Safety, Tolerability, Activity and Pharmacokinetics of REGN3767 (anti-LAG-3 mAb) Administered Alone or in Combination with REGN2810 (anti-PD-1 mAb) in Patients with Advanced Malignancies.
Differentiating Renal Oncocytoma from Renal Cell Carcinoma Using Sestamibi Imaging
An open-label randomized phase 2 trial of SAR439859, versus endocrine monotherapy as per physician’s choice in premenopausal and post-menopausal patients with estrogen receptor-positive, HER2-negative locally advanced or metastatic breast cancer with prior exposure to hormonal therapies
A randomized, multi-arm study platform to compare the efficacy of experimental therapies versus standard of care in patients with acute myeloid leukaemia in first remission

Research Project Title
A Phase 2 Study of Erdafitinib in Subjects with Advanced Solid Tumors and Fibroblast Growth Factor Receptor Gene Alterations
Global clinical study of renal denervation with Symplicity SpyralTM multi-electrode renal denervation system in patients with uncontrolled hypertension on standard medical therapy.
A Phase II/III Randomised, Double-Blind, Placebo-Controlled, Cognitive Endpoint, Multicenter Study of Potential Disease Modifying Therapies in Individuals at Risk for and with Dominantly Inherited Alzheimer's Disease
FASTRACK II: Focal Ablative Stereotactic Radiosurgery for Cancers of the Kidney – A Phase II Trial
Colchicine for Coronary Plaque Modification in Acute Coronary Syndrome Study
Investigation into the Influence of Patient Ambulation and Components Alignment on Medium – Term Patient Outcomes after Total Knee Arthroplasty

INDUSTRIAL, ENVIRONMENTAL and MINING RADIATION

Industrial Compliance Testing

The Council's compliance testing program for fixed radiation gauges commenced in 1999. Gauges are not approved for use without a current certificate of compliance. A summary of the compliance tests assessed in 2019 is included in attachment 3.

Standards for Council Examinations

In 2002, the Council agreed that greater control should be exercised over industrial radiation safety examinations and decided that while course providers may continue to invigilate examinations, all industrial papers would be returned to Council's officers for marking. In 2019, Council officers marked 510 industrial examination papers. The number of examinations marked in each category is listed in attachment 4.

Mining and Milling of Radioactive Ores

The mining, milling, processing, certain exploration activities and the transport of radioactive ores are subject to the Radiation Safety Act and subsidiary legislation.

The Council has an independent role to ensure the appropriate oversight of the radiation safety aspects of the mining and milling of radioactive ores and this includes –

- the review of radiation management plans.
- approvals of Radiation Safety Officers.
- the review of occupational and environmental reports.
- conducting independent monitoring and surveillance.
- conducting inspections and audits.

The mining and milling of radioactive ores are also subject to Part 16 of the Mines Safety and Inspection Regulations under the Mines Safety and Inspection Act. These regulations are administered through the Department of Mines, Industry Regulation and Safety (DMIRS).

Low Level Radioactive Waste Facility

Council has been continuing to liaise and review documentation associated with a proposal for a low level radioactive waste facility in Western Australia. A formal application for the registration of the premises for storage (only) of naturally occurring radioactive material was received and granted in 2019. The assessment process is continuing with assessment of the first stage of disposal expected to be completed in 2020.

MISCELLANEOUS

Integrated Regulatory Review Service (IRRS) Mission to Australia

The Radiological Council in Western Australia participated in the International Regulatory Review Service (IRRS) offered by the International Atomic Energy Agency (IAEA) through the Commonwealth's Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). The purpose of the IRRS mission was to perform a peer review of Australia's regulatory frameworks for nuclear and radiation safety. The scope of the review included all facilities and activities regulated in Australia, with the exception of the uranium mining industry and the management of waste containing naturally occurring radioactive material (NORM).

In the initial phase of the review, prior to the visit from the IRRS team of international radiation safety experts, a self-assessment was conducted in 2017-2018. The self-assessment process allowed for an internal analysis, benchmarking the regulatory framework for radiation against international best practice IAEA safety standards.

The IRRS team recognised that many of its recommendations and suggestions confirmed or elaborated on the actions identified by Australia's jurisdictions as a result of their self-assessments.

As part of the IRRS, the Council identified that the Western Australian regulatory framework generally conforms to the requirements outlined under the IRRS modules undertaken. The key findings against each module are being used in the ongoing development of an action plan.

Radiation Health Committee

The Radiation Health Committee (RHC) is a body established to advise the Chief Executive Officer of ARPANSA and its Radiation Health & Safety Advisory Council on matters relating to radiation protection, formulating draft national policies, codes and standards for consideration by the Commonwealth, States and Territories.

Western Australia has representation on the RHC through the Secretary of the Radiological Council who attends the committee meetings tri-monthly.

A list of publications approved by the RHC and published by ARPANSA in 2019 is in attachment 5.

Environmental Health Standing Committee (enHealth)

The Environmental Health Standing Committee (enHealth) is a standing committee of the Australian Health Protection Principal Committee (AHPPC).

Under its Terms of Reference, enHealth is responsible for providing agreed environmental health policy advice, implementation of the *National Environmental Health Strategy*, consultation with key stakeholders, and the development and coordination of research, information and practical resources on environmental health matters at a national level. The development of national advice by enHealth is based on significant collaboration and consultation with federal and state and territory agencies, departments and organisations that deal with environmental health matters.

Consequently a Radiation Health Expert Reference Panel (RHERP) has been established under enHealth to provide expert advice on specific issues as directed by the Environmental Health Standing Committee (enHealth). This will include the development of a National Strategy for Uniformity of Radiation Protection and Nuclear Safety Regulation in Australia.

National Directory for Radiation Protection

At the Australian Health Ministers' Conference held in June 2004, the Ministers endorsed the adoption of the National Directory for Radiation Protection, Edition 1, as the Framework for National Uniformity in Radiation Protection.

Further development of the National Directory continued in 2019 through the national Radiation Health Committee and the Radiation Health Expert Review Panel under enHealth.

Council continued its participation in the development of the National Directory and provided comment to both committees.

Personal Radiation Monitoring Services

Council currently recognises six organisations for the provision of a personal radiation monitoring service in accordance with the Regulations –

- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)
- Global Dosimetry Solutions
- Global Medical Solutions Australia
- Landauer Australasia
- National Radiation Laboratory, New Zealand
- SGS Radiation Services Pty Ltd

Appendix 1: Registration and Licensing

Registrations

Section 28 of the Act requires prescribed radioactive substances, x-ray equipment and electronic products, together with the associated premises, to be registered. Registrants may include individuals, companies, organisations or institutions.

All x-ray equipment is prescribed while prescribed electronic products include lasers and transilluminators.

Radioactive substances that exceed the exempt quantities prescribed in the regulations are subject to registration. A small number of devices containing radioactive substances in excess of the exempt limits, but which pose a minimal hazard to users, have been exempted by regulation from control under the Act.

The numbers of devices and sealed radiation sources registered as at 31 December 2019 are included in attachment 6.

Licences

Section 25 of the Act requires persons who manufacture, store, transport, sell, possess, install, service, maintain, repair, use, operate or otherwise deal with prescribed radioactive substances, x-ray equipment or electronic products to be licensed or, where permitted, work under the direction and supervision of a licensee.

Section 29 of the Act also creates an offence for a person to sell any prescribed substances or devices unless they require the purchaser to produce evidence that they hold a relevant licence or are otherwise exempted by the Act or regulations. Sales also must be notified in writing to the Council, without delay, identifying the purchaser and the particulars of the relevant licence or exemption.

Exemptions from Licence

A licence is not required where a general exemption is provided by the regulations or where a person has been granted an individual exemption from licence. Although exempt from licensing, the regulations nevertheless specify the minimum qualifications or training required for these radiation workers.

Temporary Permits

The shortest period for which a licence or registration can be granted is 12 months. However, for shorter periods an application may be made for a Temporary Permit. Permits cannot exceed a duration of 3 months. 106 Temporary Permits were current as at 31 December 2019.

Conditions, Restrictions and Limitations

A range of performance and safety requirements for radioactive substances, x-ray equipment and the prescribed electronic products are specified in the regulations. However, additional safety measures may be applied by the Council under Section 36 of the Act through conditions, restrictions and limitations applied to registrations, licences, temporary permits and exemptions.

Failure to comply with a condition is an offence.

Attachment 7 shows the types and numbers of licences and registrations (or individual exemptions) granted or renewed in 2019.

Commonwealth Government Agencies and Contractors

The Radiation Safety Act does not apply to Commonwealth agencies or to their employees (or contractors) who might use radiation in Western Australia. Those agencies are regulated by ARPANSA under the Commonwealth Government's Australian Radiation Protection and Nuclear Safety Act 1999.

Appendix 2: Licence Prerequisites

Before a licence may be granted, the Council has an obligation to ensure that an applicant has appropriate qualifications, competence and experience (Section 33).

Protocols have been developed which prescribe the prerequisite qualifications and experience necessary for a wide range of radiation uses. Some qualifications are recognised by the Council because an appropriate degree of radiation safety training is inherent in gaining those qualifications. However, other applicants may be required to attend a recognised radiation safety course and pass an examination. The Council has authority to impose examinations under the Radiation Safety (Qualifications) Regulations.

Persons who are not required to hold a licence themselves but who must work under the direction and supervision of a licensee may also be required to hold certain qualifications or to have undergone additional radiation safety training. These requirements may be imposed by regulation or through conditions, restrictions and limitations imposed under Section 36. The registrant for the premises where the individual works is primarily responsible for ensuring compliance with these criteria.

Courses in various aspects of radiation safety are offered by both the government and private sectors, for example –

Bone Densitometry
Fluoroscopy – Medical
Fixed Radioactive Gauges
Industrial Radiography
Lasers – Medical and Industrial
Portable Radioactive Gauges
Transport of Radioactive Substances
Unsealed Radioisotope Handling
Well (Borehole) Logging
X-ray Operator

Attachment 1: Radiological Council

MEMBERS OF THE RADIOLOGICAL COUNCIL

Members	Qualification or Designation	Deputy
Appointment under Sections 13(2)(a) and 13(3) of the Act		
Dr A Robertson (Chairman)	Medical Practitioner	Dr G Groom (until 28/02/2019) Dr R Bangor Jones (from 28/5/2019…)
Appointment under Sections 13(2)(b), 15(1) and 17 (1) of the Act		
Dr C Hewavitharana	Radiologist	Dr D Dissanayake
Dr G Groom (until 28/02/2019)	Nuclear Medicine Physician	Dr E Thomas
Dr E Thomas (from 28/05/2019)	Nuclear Medicine Physician	Vacant
Dr R Fox (until 14/06/2019)	Physicist	Dr R Price
Dr R Price (from 20/09/2019)	Physicist	Mr C Storm
Mr D Kwiatkowski	Electronic Engineer	Not appointed
A/Prof R Francis	Tertiary Institutions representative	Not appointed
Mr C Whennan	Medical Radiation Technologist	Ms H Parry
Mr N Tsurikov	Co-opted member	Not applicable
Vacant	Expert in Mining Radiation Hazards	Vacant

2019 MEETING ATTENDANCE

	12 FEB	9 APR	14 MAY	9 JUL	13 AUG	10 SEP	8 OCT	12 NOV	10 DEC
Dr A Robertson	✓	✓	✓	✓	A	✓	✓	✓	✓
Dr R Bangor-Jones	NA	NA	NA	O	D	D/O	A	O	O
Dr R Fox	✓	✓	A	NA	NA	NA	NA	NA	NA
A/Prof R Francis	NA	✓	✓	✓	✓	✓	A	✓	A
Dr G Groom	✓	NA	NA	NA	NA	NA	NA	NA	NA
Dr C Hewavitharana	A	✓	✓	NA	✓	✓	✓	✓	A
Mr D Kwiatkowski	NA	✓	✓	✓	✓	✓	✓	A	A
Ms H Parry	NA	NA	NA	NA	NA	NA	NA	O	NA
Dr R Price	NA	NA	NA	NA	NA	NA	NA	✓	✓
Mr C Storm	NA	NA	NA	NA	NA	NA	NA	NA	O
Dr E Thomas	NA	NA	NA	✓	✓	✓	✓	✓	✓
Mr N Tsurikov	NA	✓	✓	✓	A	A	✓	✓	✓
Mr C Whennan	A	✓	✓	NA	NA	NA	NA	✓	✓

✓ attended D deputy A apology NA not appointed at the time O observer

Attachment 2: Legislation Amendments

RADIATION SAFETY ACT

None

RADIATION SAFETY (GENERAL) REGULATIONS

Health Regulations Amendment (Fees and Charges) Regulations 2019 Pt.9

Amendment to fees (Schedule XV).

Government Gazette 14 June 2019 pages 1883-94.

RADIATION SAFETY (QUALIFICATIONS) REGULATIONS

Health Regulations Amendment (Fees and Charges) Regulations 2019 Pt.9

Amendment to fees for examinations (Schedule 2).

Government Gazette 14 June 2019 pages 1883-94

RADIATION SAFETY (TRANSPORT OF RADIOACTIVE SUBSTANCES) REGULATIONS

None

Attachment 3: Compliance Testing

Medical

- **A** *Compliant*
- **B** *Conditionally compliant*
- **C** *Non-compliant*[1]

Category	A	B	C	Total
CT	107	1	-	108
Dental – cone beam CT	31	-	-	31
Dental – intraoral	985	2	10	997
Dental – panoramic and/or cephalometric	227	1	1	229
Fluoroscopic – fixed	45	-	3	48
Fluoroscopic – fixed C or U arm	37	-	3	40
Fluoroscopic – mobile	126	-	10	136
Mammography	76	-	3	79
Radiographic – fixed	137	-	16	153
Radiographic – mobile	69	-	1	70
Total	1840	4	47	1891

Industrial – Fixed Gauges

- **A** *Compliant*
- **B** *Non-compliant*[2]

Category	A	B	Total
Density	509	7	516
In-stream analysis	21	-	21
Level	38	-	38
Total	568	7	575

[1] Equipment deemed to be non-compliant may continue to be used for a further three months while the problem is being addressed provided that the reason for non-compliance does not significantly increase the radiation dose to the patient. A re-test is then required. Of the 55 re-tests conducted during 2019, 100% resulted in the equipment being granted either a compliance or conditional compliance certificate.

[2] Equipment that has been assessed as non-compliant cannot be used until it has been re-tested and issued with a certificate of compliance.

Attachment 4: Industrial Radiation Safety Examinations

Current at 31 December 2019

Category	2019	2018	2017	2016	2015
Borehole Logging	46	24	29	20	13
Fixed Gauges	119	83	109	68	125
Industrial Radiography	33	30	49	46	63
Industrial Radiography (Advanced)	1	0	0	4	19
Industrial Radiography (Assistant)	97	109	57	78	129
Portable Gauges	80	61	50	18	23
Portable Gauges (WA Requirements)	14	8	3	2	1
Transport	54	25	42	22	32
Service – Cabinet X-ray	16	2	5	1	4
Service – Industrial Radiography (X-ray)	1	0	0	0	0
Service – X-ray Analysis	2	0	0	1	3
X-ray Analysis – Use	0	0	0	0	0
X-ray Analysis – Use and Restricted Service	47	111	48	30	47
Total	510	453	392	290	459

Attachment 5: List of Australian Radiation Protection and Nuclear Safety Agency publications for 2019

	Title
RPS C-2	Code for the Safe Transport of Radioactive Material (2019)
RPS C-5	Code for Radiation protection in Medical Exposure (2019)
RPS 11	Code of Practice for the Security of Radioactive Sources (2019)
RPS G-3	Guide for Radiation Protection in Emergency Exposure Situations

Attachment 6: Registered Irradiating Apparatus, Electronic Products and Radioactive Substances (sealed sources)

Current at 31 December 2019

A *Irradiating apparatus and electronic products*[3]
B *Radioactive substances (sealed sources only)*

Category	A	B
Bone densitometry	64	-
Cabinet x-ray equipment	190	-
Calibration	2	694
CT	130	-
CT/SPECT	35	-
Dental – intraoral	2391	-
Dental – panoramic and/or cephalometric	492	-
Dental – cone beam CT	41	-
Education and research	20	1166
Fluoroscopic – fixed	81	-
Fluoroscopic – mobile	135	-
Gauges – density/level	7	3634
Gauges – in stream analysis	2	78
Gauges – logging	34	408
Gauges – neutron moisture/density portable	-	420
Gauges – other	-	321
Irradiator	-	48
Isotope Production	1	-
Laser – entertainment	228	-
Laser – industrial	205	-
Laser – medical	363	-
Laser – other medical	341	-
Laser – podiatry	14	
Laser – research	183	-
Linear accelerator	22	-
Mammography	70	-
Non-destructive testing	212	126
Non-destructive testing – crawler control	-	17
Portable mineral analyser	-	8
Radiographic – fixed	356	-
Radiographic – mobile	399	-

[3] This data column specifically excludes x-ray equipment that is no longer operable but for which compliance testing data is held.

Category	A	B
Sealed Sources – other	-	135
Simulator	7	-
Special purpose x-ray	46	-
Static detection/measurement	-	3
Static elimination	-	16
Storage	-	314
Superficial radiotherapy	2	-
Test source	2	-
Therapy	5	26
Therapy – HDR brachytherapy	-	2
Transilluminator	127	-
Tracer Studies	-	131
X-ray analysis	648	-
Total	6856	7548

Attachment 7: Licences and Registrations

Current at 31 December 2019

Including individual exemptions granted under Section 6 of the Act.

	X-ray and/or Electronic Products		Radioactive Substances		TOTAL	
	2019	2018	2019	2018	2019	2018
Licences	6195	5819	2228	2137	8423	7956
Registrations	2127	2057	432	445	2559	2502
TOTAL	8322	7876	2660	2582	10982	10458
Change from 2018	+ 5.7%		+ 3.0%		+ 5.0%	

Attachment 7 (cont)

Purposes for Licences and Exemptions from Licence – total current as at 31 December 2019

Note: A *single licence may be granted for one or more purposes.*

Total	Purpose
20	Bone Densitometry
3	Bone Densitometry (Exemption)
105	Cabinet X-ray Equipment
1	Cobalt Teletherapy Maintenance
60	Compliance Testing - Diagnostic X-ray Equipment
540	Compliance Testing - Radioactive Gauges
12	Cyclotron Operation
5	Cyclotron Servicing
4	Education (Apparatus)
29	Education (Substances)
469	Fluoroscopy - Medical
92	Fluoroscopy - Medical (Exemption)
37	Fluoroscopy - Medical (Non-Specialist Exemption)
17	Fluoroscopy - Podiatry (Exemption)
2	Fluoroscopy - Veterinary
5	Gamma Irradiator - Use
539	Gauges - Industrial
7	Gauges - Industrial (Installation)
1	Gauges - Level (CO2)
289	Gauges - Logging
469	Gauges - Moisture and/or Density (Portable)
5	Gauges - Other (Apparatus)
44	Gauges - Other (Substances)
2	Installation of X-ray Equipment
2	Installation of X-ray Equipment - Dental
5	Lasers - Acupuncture
1	Lasers - Astronomy
12	Lasers - Chiropractic
206	Lasers - Dental
5	Lasers - Educational
28	Lasers - Entertainment
253	Lasers - Hair Removal (Exemption)
68	Lasers - Industrial
324	Lasers - Medical
11	Lasers - Other
126	Lasers - Physiotherapy

Total	Purpose
38	Lasers - Podiatry (Exemption)
60	Lasers - Research
82	Lasers - Service
60	Lasers - Superficial Cosmetic (Exemption)
19	Lasers - Tattoo Removal (Exemption)
21	Lasers - Veterinary
2	Manufacture of X-ray Equipment
3	Medical Physics
23	Medical Physics - Radiotherapy (Apparatus)
13	Medical Physics - Radiotherapy (Substances)
85	Medical Radiation Technology - Diagnostic Nuclear
1209	Medical Radiation Technology - Medical Imaging
23	Medical Radiation Technology - Nuclear Medicine - Diagnostic CT
219	Medical Radiation Technology - Radiation Therapy Irradiating Apparatus
287	Medical Radiology
5	Non-Medical Irradiation
5	Nuclear Medicine - Calibration and QC Sources
41	Nuclear Medicine - Diagnostic
34	Nuclear Medicine - Therapeutic
1	Nuclear Medicine - Therapy (Endocrinology)
4	Nuclear Medicine - Veterinary
6	Pathology Tests
23	Portable Mineral Analysers
379	Portable Mineral Analysers (X-ray)
5	Possession of X-ray Equipment - Diagnostic Medical
5	Possession of X-ray Equipment - Diagnostic Medical and Dental
3	Quality Assurance Procedures
31	Radioactive Ores - Analytical Laboratories
12	Radioactive Ores - Exploration
18	Radioactive Ores - Mining and/or Processing
13	Radioactive Substances - Calibration Sources
1	Radioactive Substances - Medical
40	Radioactive Substances - Sale
42	Radioactive Substances - Service of Devices
19	Radioactive Substances - Tracer Studies (Industry)
27	Radiography - Chiropractic (Extended)
165	Radiography - Chiropractic (Restricted)
429	Radiography - Industrial (Gamma)
444	Radiography - Industrial (X-ray)
1	Radiography - Mammography Screening (Exemption)

Total	Purpose
1	Radiography - Medical (Direction and Supervision)
3	Radiography - Security
838	Radiography - Veterinary
3	Radioguidance - Medical (Radioactive Substances)
92	Radiology - Dental
13	Radiology - Veterinary
20	Radiopharmaceutical Manufacture and Dispensing
27	Radiotherapy - Medical (Apparatus)
23	Radiotherapy - Medical (Substances)
1	Radiotherapy - Medical Superficial
12	Research
43	Research - Unsealed Radioactive Substances
12	Research - X-ray
42	Sale of Electronic Products
101	Sale of X-ray Equipment
32	Service of X-ray Equipment - Analytical
42	Service of X-ray Equipment - Cabinet
29	Service of X-ray Equipment - Dental
136	Service of X-ray Equipment - Diagnostic
3	Service of X-ray Equipment - Diagnostic (Extended)
3	Service of X-ray Equipment - Industrial NDT
28	Service of X-ray Equipment - Linear Accelerators
6	Service of X-ray Equipment - Other
6	Service of X-ray Equipment - Superficial X-ray Therapy
16	Special Purpose Enclosed X-ray Equipment
1	Static Detection
1	Static Electricity Measurement
1	Static Elimination
5	Storage (Apparatus)
26	Storage (Substances)
20	Transilluminators
173	Transport
95	X-ray Analysis - Use
296	X-ray Analysis - Use and Service (Restricted)
3	X-ray Irradiator
5	X-ray - Industrial

Attachment 7 (cont)

Purposes for Registrations and Exemptions from Registration – total current as at 31 December 2019

Note: A *single registration may be granted for one or more purposes.*

Total	Purpose
25	Bone Densitometry
13	Bone Densitometry (Exemption)
85	Cabinet X-ray Equipment
2	Cyclotron Operation
2	Disposal of Radioactive Waste
9	Education (Apparatus)
18	Education (Substances)
27	Education – Demonstration Radioactive Sources (Exemption)
6	Fluoroscopy – Medical
1	Fluoroscopy – Podiatry
2	Gamma Irradiator
146	Gauges – Industrial
3	Gauges – Level (CO2)
21	Gauges – Logging
48	Gauges – Moisture and/or Density (Portable)
16	Gauges – Other (Apparatus)
9	Gauges – Other (Substances)
3	Lasers – Acupuncture
10	Lasers – Chiropractic
126	Lasers – Dental
2	Lasers – Educational
44	Lasers – Entertainment
53	Lasers – Hair Removal
37	Lasers – Industrial
1	Lasers – Manufacture
154	Lasers – Medical
1	Lasers – Osteopathy
5	Lasers – Other
43	Lasers – Physiotherapy
12	Lasers – Podiatry
7	Lasers – Research
6	Lasers – Sale, Service, Maintenance and Testing
8	Lasers – Storage
27	Lasers – Superficial Cosmetic
3	Lasers – Tattoo Removal

Total	Purpose
3	Lasers – Veterinary
2	Manufacture of X-ray Equipment
131	Medical Radiology
2	Non-Medical Irradiation
22	Nuclear Medicine – Diagnostic
18	Nuclear Medicine – Non-diagnostic CT X-ray
9	Nuclear Medicine – Therapeutic
3	Nuclear Medicine – Veterinary
6	Pathology Tests
6	Portable Mineral Analysers
210	Portable Mineral Analysers (X-ray)
13	Radioactive Ores – Analytical Laboratories
8	Radioactive Ores – Exploration
40	Radioactive Ores – Mining and/or Processing
11	Radioactive Substances – Calibration Sources
1	Radioactive Substances – Medical
7	Radioactive Substances – Sale
2	Radioactive Substances – Service of Devices
2	Radioactive Substances – Tracer Studies (Industry)
14	Radiography – Chest Screening
45	Radiography – Chiropractic
791	Radiography – Dental
1	Radiography – Forensic
29	Radiography – Industrial (Gamma)
34	Radiography – Industrial (X-ray)
13	Radiography – Mammography Screening
44	Radiography – Medical (Operator)
17	Radiography – Medical (Unrestricted)
93	Radiography – Medical Ancillary (Referrals)
1	Radiography – Security
272	Radiography – Veterinary
3	Radioguidance – Medical (Radioactive Substances)
27	Radiology – Dental
3	Radiology – Veterinary
2	Radiopharmaceutical Manufacture and Dispensing
9	Radiotherapy – Medical (Apparatus)
6	Radiotherapy – Medical (Substances)
2	Radiotherapy – Veterinary (Apparatus)
2	Regulatory Authority
5	Research (Substances)
11	Research – Unsealed Radioactive Substances
7	Research – X-ray

Total	Purpose
5	Sale of Electronic Products
25	Sale of X-ray Equipment
53	Security of Radioactive Sources
16	Service of X-ray Equipment
12	Special Purpose Enclosed X-ray Equipment
1	Static Electricity Measurement
2	Static Elimination
50	Storage (Apparatus)
44	Storage (Substances)
13	Transilluminators
15	Transport
120	X-ray Analysis
1	X-ray Irradiator

ABBREVIATIONS

General Terminology

ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
CT	Computed Tomography
CT/SPECT	Computed Tomography/Single-Photon Emission Computed Tomography
DMIRS	Western Australian Department of Mines, Industry Regulation and Safety
enHealth	Environmental Health Standing Committee
HDR	High Dose Rate
IRRS	International Regulatory Review Service
MIT	Medical Imaging Technologist
MRT	Medical Radiation Technologist
MoU	Memorandum of Understanding
NDT	Non-Destructive Testing
PET	Positron Emission Tomography
RHC	Radiation Health Committee
RHERP	Radiation Health Expert Reference Panel

Units of Activity

Bq	Becquerel (1 disintegration per second)
MBq	megabecquerel (1,000,000 Becquerels)
GBq	gigabecquerel (1,000,000,000 Becquerels)

Units of Effective Dose

Sv	Sievert (1 joule per kilogram multiplied by a modifying factor for the type of radiation and the radiological sensitivities of the organs and tissues being irradiated)
mSv	millisievert (one thousandth of a Sievert)
µSv	microsievert (one millionth of a Sievert)