Top End Health Service
Environmental Management Plan (EMP)
Clinical Waste Autoclave RDH
2018

Acronyms

ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS	Australian Standard
BWI	Bio hazardous Waste Industry
DHF	NT Department of Health and Families (now Department of Health)
DOH	NT Department of Health
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environment Protection Authority
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NT	Northern Territory
NTC	National Transport Commission
RDH	Royal Darwin Hospital
SDS	Safety Data Sheet

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1 Introduction

1.1 Purpose and Scope

This Environmental Management Plan (EMP) aims to guide and enhance good environmental management of the Waste Management Facility at Royal Darwin Hospital (RDH). It also outlines how RDH will comply with the monitoring, reporting, plant maintenance and waste minimisation requirements of the:

- Environment Protection License (EPL 100; see **Appendix B**) issued to RDH by the Environment Protection Authority (EPA) for operation of the Facility in accordance with the Northern Territory (NT) *Waste Management and Pollution Control Act*; also the
- Trade Waste Agreement issued to RDH by Power and Water Corporation (PWC; see **Appendix C**) for the discharge of trade waste to sewer in accordance with the NT *Water Supply and Sewerage Services Act*.

The RDH Waste Management Facility provides an essential service in the safe treatment, storage and disposal of clinical and related wastes generated at Royal Darwin Hospital (RDH), Darwin Private Hospital (DPH), Menzies School of Health Research, as well as community health centres and other healthcare facilities and health-related businesses across the Top End of the Northern Territory (NT). It includes an autoclave (sterilizer) and waste grinding system that treats waste prior to disposal to landfill. The steam autoclave sterilises clinical waste using high temperature steam. The sterilised waste is then shredded, compacted and is safe for disposal.

Waste treated by the autoclave includes sharps and "materials saturated with or containing free-flowing or expressible blood or body fluids" and also containers contaminated with clinical waste residues (see categories of waste defined in **Table 1** below). This is the only facility of its type in the NT. The autoclave however, is not suitable for treating clinical and related waste types defined as anatomical, cytotoxic and pharmaceutical wastes. The cytotoxic wastes are stored in the refrigeration unit within the Waste Management Facility building prior to transport to an approved incineration facility in Adelaide.

This EMP deals only with the management of waste handled through the Waste Management Facility. That is, clinical waste types treated by the autoclave, as well as anatomical, cytotoxic and pharmaceutical wastes stored in the refrigerated unit within the facility prior to transport to Adelaide.

This EMP does not include the management of chemical, radioactive, and non-clinical liquid waste; as well as general, recyclable, and confidential waste, which are handled through separate respective waste streams, as outlined in Section 1.5 below, and the RDH Waste Management Plan; provided as **Appendix A**.

1.2 Objectives

The RDH *Infection Control Manual* and RDH *Waste Management Plan* (see **Appendix A**) state that management of clinical and related waste will conform to NT, Australian and the *National Guidelines for Waste Management in the Health Care Industry* (NHMRC 1999). Waste will be segregated at the point of generation and *standard* and/or *additional* precautions will be used. The stated aims of both these documents are to:

- Protect public health and safety
- Provide a safe working environment
- Minimise waste generation and environmental impact of waste treatment and disposal
- Comply with legislative requirements

Complimentary to the RDH Waste Management Plan, this EMP focuses on environmental management of the Waste Management Facility, and aims to outline:

- General operation and management of the Facility
- Sources (generators of waste) and volumes of different waste types sent to the Facility for treatment and storage
- How waste is segregated at its source and then handled and transported to and from the Facility
- Regulatory requirements of the Facility and how it complies with these requirements

- Responsibilities of management, staff and contractors
- Measures being undertaken to prevent contamination of the environment
- Measures being undertaken to minimise waste generation, water usage and energy usage
- Environmental monitoring and reporting being undertaken to comply with regulatory requirements
- Emergency procedures and contingencies

This EMP also then provides a framework (checklist) for annual reporting and auditing against specified environmental objectives.

1.3 Life of this EMP

This EMP is a working document to be reviewed and updated throughout the life of the Waste Management Facility and associated autoclave. As such, this EMP will be

- Reviewed and updated following any major changes to the facility or its operation, regulatory or licencing requirements, volume, type or source of waste received, or the way waste is delivered to and from the facility.
- Reviewed every 2 years to incorporate any minor changes to the facility, its operation, regulatory or licencing requirements, volume, type or source of waste received, or the way waste is delivered to and from the facility.

All staff who work at the RDH Waste Management Facility are to be aware of this EMP and its contents, and have ready access to the latest copy. Staff are also to input into its development and subsequent updates.

1.4 Waste Categories and Appropriate Disposal

Table 1 defines waste categories as stated in the RDH *Infection Control Manual* and *Waste Management Plan* (see **Appendix A**). See this Plan for more specific detail on these waste types in the context of RDH. Further detailed information on these waste categories is also provided in the *National Guidelines for Waste Management in the Health Care Industry* (NHMRC 1999), as well as the *Industry Code of Practice for the Management of Clinical and Related Wastes* (BWI 2010).

"Clinical waste" has previously been referred to as *pathological*, *bio-hazardous*, *contaminated*, *infectious* or *medical waste*. Clinical waste comprises waste that has the potential to cause disease, including for example:

- Discarded sharps
- Body parts, organs and bones
- Human tissue waste (including items saturated with or containing free-flowing or expressible blood and material saturated with blood or body fluid, but excluding faeces, urine, teeth, hair, nails)
- Laboratory and specimen waste.

Clinical waste includes any material that is saturated with or containing free-flowing or expressible blood or body fluids. "Free flowing" is defined as blood, blood products or body fluid that is flowing, dripping, oozing, liquid or able to be squeezed from a material.

The term "clinical and related waste" includes clinical waste, as well as "related" wastes such as cytotoxic, pharmaceutical, chemical and radioactive wastes (see NHMRC 1999 and BWI 2010).

Table 1 lists the best practice disposal method for each different waste type; as given in the NHMRC 1999 Guidelines and BWI 2010 Industry Code of Practice, and which is adopted at RDH through its Waste Management Plan.

Table 1 Waste categories as defined By DOH Clinical and related Waste management TEHS Guidelines

Preferred Term	Description
Anatomical Waste	Recognisable organs, bones and gross body parts such as limbs/digits and must be treated/disposed of by incineration
Clinical Waste	Clinical waste is that which has the potential to cause sharps injury, infection or public offence, and includes: Discarded sharps; human tissue and materials with expressible blood.
Confidential	Paperwork containing any department, staff or patient identifying information must be shredded to maintain confidentiality.
Cytotoxic Waste	Waste that is generated by the use of antineoplastic drugs, intended for treatment of cancer, but not limited to.
General Waste	Waste that is not contaminated with free flowing or expressible blood and body fluids or can not cause a cut or penetrating injury. e.g. incontinence pads, paper, flowers, plastics, cardboard and dressing wrappers. This waste is disposed of in landfill.
Pharmaceutical	Excluding cytotoxic waste, may include expired pharmaceuticals, those from contaminated packaging, patient returns or waste generated during the manufacture and administration of pharmaceuticals.
Recyclable Waste	Materials that can be recovered reprocessed and prepared into raw commodities for manufacturing. These include cardboard/paper, glass, cans and some plastic bottles, printer and toner cartridges
Sharps Waste	Equipment that has points, edges or protuberances capable of penetrating or piercing the skin.

1.5 Waste Management not covered by this EMP

Waste types not handled through the RDH Waste Management Facility include chemical, radioactive, non-clinical liquid waste, and general, recyclable, organic and confidential waste.

Chemical wastes are disposed of in accordance with relevant State/Territory and Commonwealth legislation (e.g. *Dangerous Goods Act*), Guidelines and Codes of Practise (e.g. NHMRC 1999; BWI 2010), and the Material Safety Data Sheet (MSDS) for each particular chemical.

Radioactive material is handled within RDH by a privately owned Nuclear Medicine Department (NT Medical Imaging), which is licensed under the NT *Radiation Protection Act*. NT Medical Imaging has a spill and waste management policy in place and radioactive waste is monitored by the NT Medical Imaging radiation safety officer prior to disposal in accordance with the *Radiation Protection Regulations* and latest advice from the Radiation Protection Unit within the NT Department of Health.

Liquid waste that is not handled through the Waste Management Facility is disposed of in accordance with the NT *Waste Management and Pollution Control Act*. Liquid waste discharged to sewer is in accordance with pre-treatment and other conditions set out in the *Trade Waste Agreement* with Power and Water Corporation (PWC).

General waste, recyclable waste, organic waste and confidential waste types are managed through separate respective waste streams and disposed of as outlined in **Table 1** above.

This EMP provides no further detail on the management of waste types not handled by the Waste Management Facility. For more information on these, refer to the RDH *Waste Management Plan* (see **Appendix A**).

1.6 Location and Surrounding Land Use

The RDH Waste Management Facility is a single dedicated building located within the RDH Campus adjacent to the “Services and Stores” building (see **Figure 1**). The Services and Stores building houses the boilers, which provide energy, hot water and steam requirements to the RDH Campus. The tall chimney stack adjacent to the Waste Management Facility emits diesel fumes from operation of the boilers and is *not* associated with the Waste Facility.

Figure 2 shows the zoning for RDH and surrounding land taken from the NT Planning Scheme Map for *Darwin*. Zoning of the RDH Campus is “Community Purpose”. Surrounding land use includes the Casuarina Coastal Reserve on the western side; zoned as “Conservation”. To the south and east, land use mainly comprises

"Single Dwelling" Residential, with some smaller areas of "Multiple Dwelling", "Medium Density" and "High Density" Residential. To the south and east there are also areas of "Public Open Space", "Organised Recreation" and "Commercial"; i.e. the Casuarina Shopping Centre. The Leanyer Sewage Ponds, zoned as "Utilities", is located east of RDH.

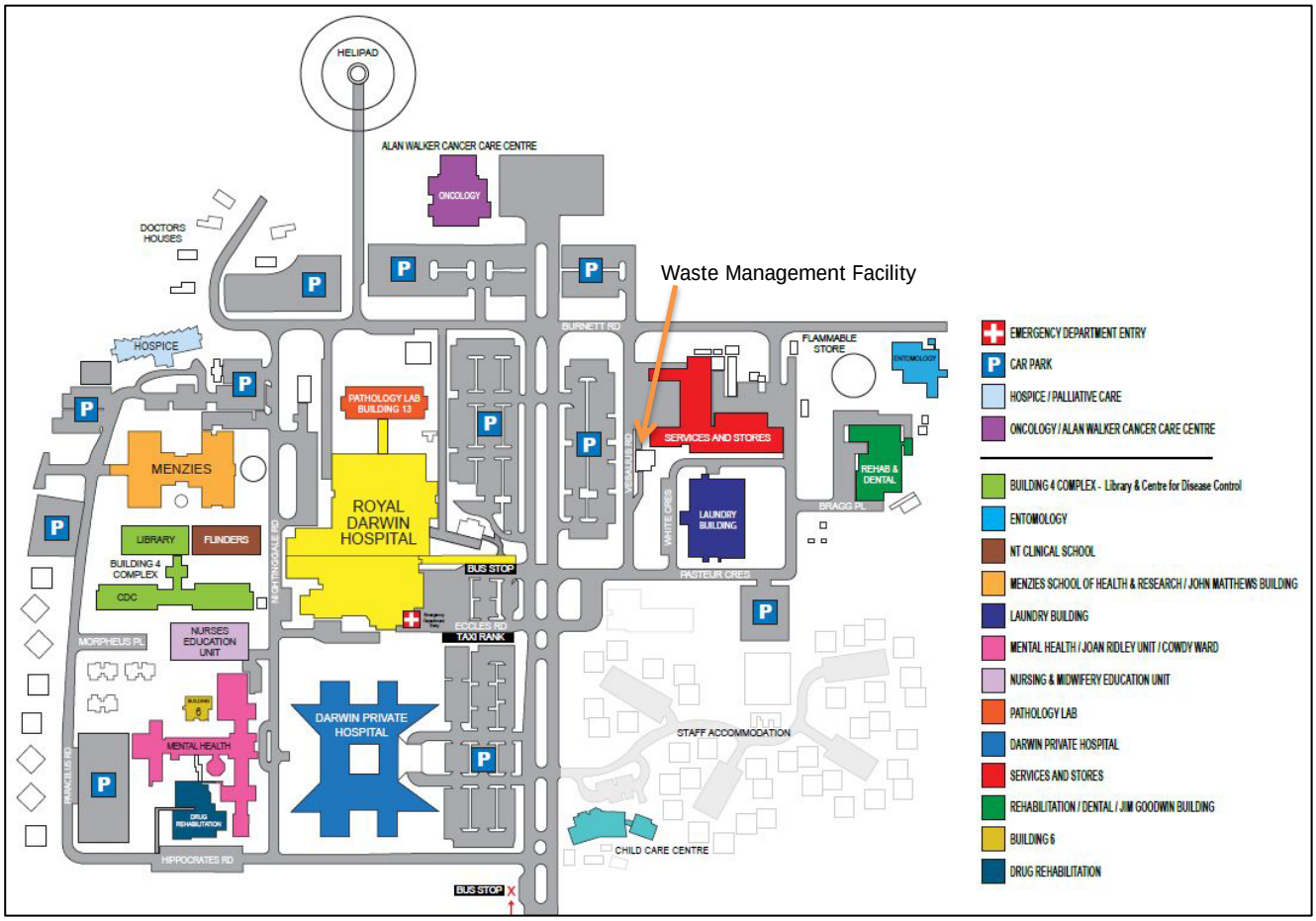


Figure 1: Location of Waste Management Facility within RDH Campus

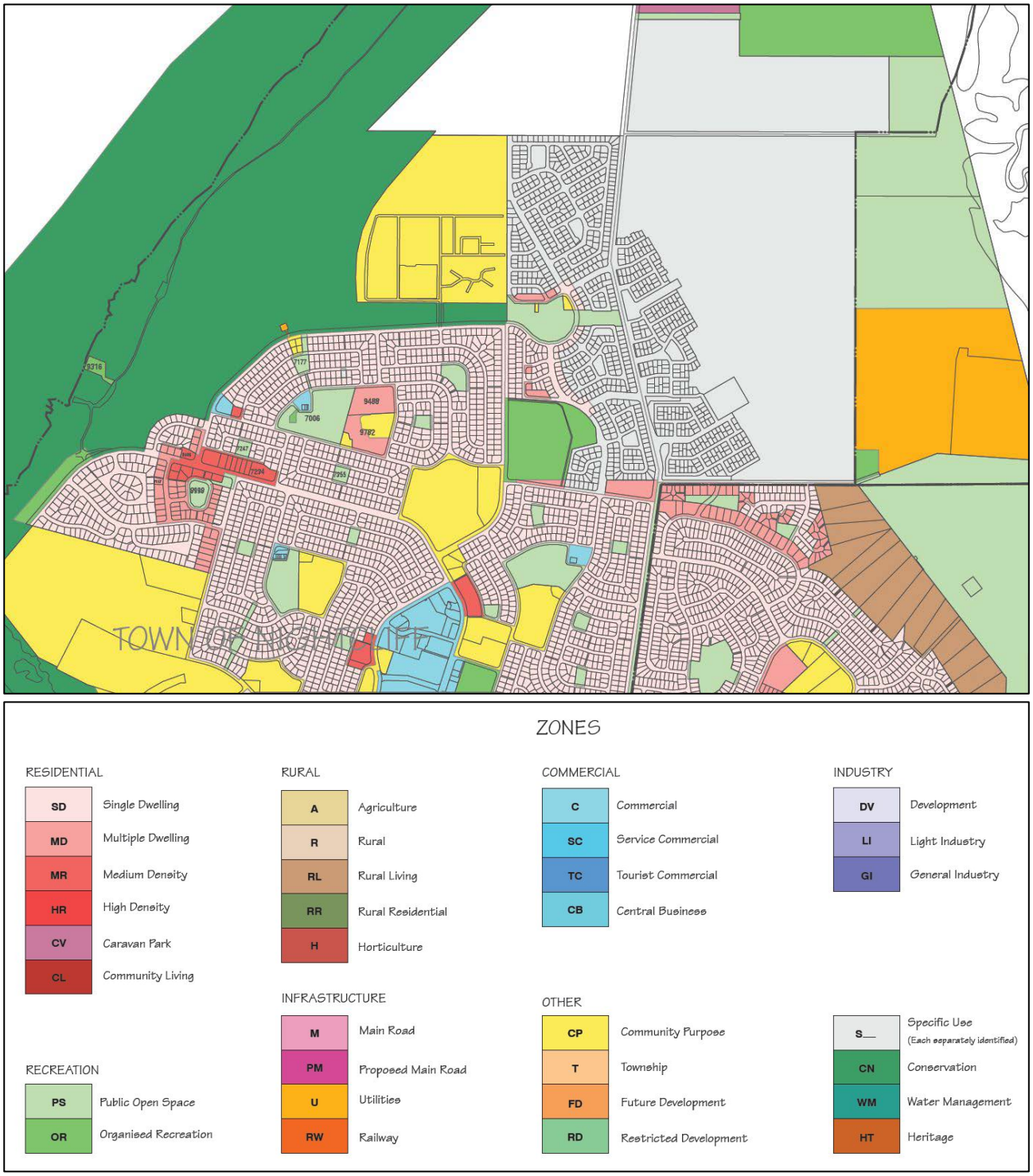


Figure 2: Zoning surrounding RDH taken from NT Planning Scheme *Darwin* Map

1.7 Stakeholders

Stakeholders and those with a potential interest in the Waste Management Facility include:

- All clinical waste generators such as hospitals, regional health centres and other health care providers, health research organisations and businesses that generate clinical waste; as well as the staff working in these organisations who generate clinical waste
- Cleaners and facilities staff that empty and replace clinical waste bins and transfer the waste to and from the Facility
- Staff operating the autoclave system and other responsibilities within the Waste Management Facility
- Contractors that collect and transport clinical waste to and from the Facility
- The NT EPA in regards to licensing and regulating in accordance with the *Waste Management and Pollution Control Act*
- PWC in regards to approving and ensuring compliance with the Trade Waste Agreement for the RDH Campus
- Landfill operators receiving the autoclaved waste
- Incinerator operators in Adelaide
- Staff, patients and visitors to the RDH precinct
- Residents in neighbouring suburbs

2 Legislative and Other Requirements

2.1 Legislative Requirements

Legislation	Summary (as relevant to clinical waste treatment)
Northern Territory Legislation	
Building Act and regulations	Provides for the establishment of technical standards for buildings, the registration of building practitioners and certifiers, the regulation of building matters, the granting of building and occupancy permits, and the establishing of a building appeal process.
Dangerous Goods Act and regulations	Provides for the safe storage and handling of dangerous goods. Clinical and related wastes are classified as hazardous waste under this Act.
Environmental Offences and Penalties Act and regulations	This Act establishes and describes penalties for certain offences relating to the protection of the environment. The Regulations schedule which particular Acts prescribe such offences.
Notifiable Diseases Act	This Act requires doctors and laboratories to notify diseases, which are scheduled under the Act, immediately to the Department of Health's Centre for Disease Control.
Planning Act and regulations	Provides for appropriate and orderly planning and control of the use and development of zoned land. For example, RDH is zoned as "Community Purposes", which under the NT Planning Scheme, provides for community services and facilities such as hospitals and related facilities such as the autoclave.
Medicines Poisons and Therapeutic Goods Act 2012 and regulations	Regulates the manufacture, supply, use, handling and disposal of medicines, poisons and therapeutic goods.
Public and Environmental Health Act 2011 Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations	Establishes public health nuisances as offences. Defines them as anything that puts, has put or will put at risk or damages, has damaged or will damage public health. Public health means the physical, mental and social wellbeing of the community. Relates to dust, fumes, vapour or other emissions, water, and refuse. Part II of these regulations relates to general sanitation (including food waste, protection of water supplies, and installation of septic tanks). Part III pertains to mosquito prevention.
Radiation Protection Act and regulations	Provides for the safe control of all radiation sources to protect the public and environment from radiation impacts. The use, transport, handling and disposal of radiation sources and related equipment require licensing and certification under this Act.
Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act and regulations	Regulates the transport of dangerous goods by road and rail. Most clinical and related waste falls under the *UN Recommendations on the Transport of Dangerous Goods Classification* Class 6: *Toxic and Infectious Substances*. Radioactive waste, which is Class 7: *Radioactive Substances* is regulated under the *Radiation Protection Act* (NT) and *Australian Radiation Protection and Nuclear Safety Act 1998* (Commonwealth).
Waste Management and Pollution Control Act	Provides for protection of the environment by encouraging effective waste management and pollution prevention and control practices; including

	noise, air and water pollution. Establishes environmental nuisances as an offence. Any water discharge or waste management must comply with relevant sections of the Act. Environment Protection Authority (EPA) approval may also be required. Under Schedule 2 of the Act: Clinical Waste is a listed waste and Activities that Require Approval or Licence includes *Collecting, transporting, storing, re-cycling, treating or disposing of a listed waste on a commercial or fee for service basis, other than in or for the purpose of a sewerage treatment plant*.
Water Supply and Sewerage Services Act	Provides for the protection of the NT's water supply system, or any water source from which water is drawn for human consumption. Any abstraction or diversion of water from the NT's supply system must not be undertaken unless authorized by the appropriate authorities. Penalties are in place for pollution of any water supply or source. Under section 47(6) of this Act, RDH is required to have a *Trade Waste Agreement* with Power and Water Corporation. This Act defines "trade waste" as "liquid or liquid borne waste generated from any industry, business, trade, manufacturing process of similar that is approved for discharge to sewer but does not include wastewater from a toilet, shower, hand basin or similar fixture". Waste water discharged from the autoclave to sewer is classed as trade waste and is included in the RDH Trade Waste Agreement with Power and Water. Requirements of this Trade Waste Agreement are outlined in Section 2.3 below, and the actual Agreement is provided in **Appendix C**.
Work Health and Safety (National Uniform Legislation) Act 2011	Aims to secure the health and safety of workers and workplaces. This includes a primary duty of care requiring employers to, so far as is reasonably practicable, ensure the health and safety of workers and others who may be affected by the carrying out of work e.g. ensuring that healthcare staff are not exposed to the risks presented by clinical and related wastes.
Commonwealth Legislation	
National Environment Protection Council Act 1994	Section 14 of this Act and the equivalent provision of the corresponding Act of each participating State and Territory provides for the making of National Environment Protection Measures (NEPMs) by the National Environment Protection Council (NEPC) and the matters to which they may relate. The NEPM relating to the *Movement of Controlled Waste between States and Territories* relates to the matters set out in paragraphs 14(1)(a), (b), (e), and (f) of this Act. Clinical and related waste is a "controlled waste" under this NEPM, and as such, its handling and transport must comply with the provisions in this NEPM.
Energy Efficiency Opportunities Act 2006 and regulations	Requires energy consuming businesses to undertake an assessment of their energy efficiency opportunities to a minimum standard (with a view to improving the way in which opportunities are identified and evaluated); and to report publicly on the outcomes of that assessment.
National Greenhouse and Energy Reporting Act 2007	Introduces a single national reporting framework for the reporting and dissemination of information about the greenhouse gas emissions, energy consumption, and energy production of businesses that meet a particular emission threshold.
Therapeutic Goods Act 1989	Regulates the manufacture, supply, use, handling and disposal of medicines, poisons and therapeutic goods.

Australian Radiation Protection and Nuclear Safety Act 1998 and regulations	Regulates the use, transport, handling and disposal of radiation sources and related equipment.

2.2 Management Plans, Standards, Codes of Practice and Guidelines

Guideline/Code/Standard	Summary (as relevant to clinical waste treatment)
NT Department of Health Guidelines	
RDH *Infection Control Manual - Infection Control policy and procedures*	This Manual outlines RDH's policies, procedures and precautions for infection control to be carried-out by Hospital staff. This includes the management of clinical and related waste (see Section 15 of the Manual). Appendix 2 of this Manual contains the RDH Waste Management Plan, which aims to assist managers and personnel of RDH to implement waste management standards and comply with relevant NT legislation and national guidelines. The Plan also provides a basis for achieving continuous improvement in waste management at RDH.
Standardised Guideline for Network-Waste Management	This Standardised Guideline (provided as **Appendix D**) is a summary of the waste management procedures expected of staff in safely handling all waste streams generated by healthcare facilities in the NT.
Remote Health Atlas	The Remote Health Atlas website enables Remote Health Workers across the NT and visitors to the website to access comprehensive health resources online. Relevant documents in this Atlas include: - *Waste Management* - *Standard Precautions* - *Additional Precautions* - *Sharps Handling* - *Personal Protection Equipment* - *Biohazard Exposure Management* - *Cytotoxic Therapy* - *Return of Unwanted Medicines*
National Codes of Practice	
Industry Code of Practice for the Management of Clinical and Relates Wastes, 6th Edn, June 2010, Biohazard Waste Industry (BWI); a division of Waste Management Association of Australia (WMAA)	This Code aims to progress towards Environmental Best Practice and achieving consistency in Industry practice through uniform guidelines on the classification, handling, transportation, treatment and disposal of clinical and related waste in Australia.
National Guidelines for Waste Management in the Health Care Industry 1999, National Health and Medical Research Council (NHMRC), rescinded 31/12/2005.	These guidelines for health industry waste management aim to enhance and protect public health and safety; to provide a safer working environment; to minimise waste generation and the environmental impact of waste treatment and disposal and to facilitate compliance with regulatory requirements. The guidelines outline procedures for the classification, segregation, safe packaging (containment), labelling, storage, transport and disposal of clinical and related wastes. They are intended to assist authorities and practitioners, as well as other people involved (whether directly or indirectly), in determining an appropriate waste management strategy. The unique and specific factors applicable to each situation, the local conditions, requirements and regulations, and the type and volume of

	waste generated, should all be taken into account when formulating policy. These guidelines recommend that generators of clinical and related waste develop and periodically review a comprehensive waste management strategy and plan. The RDH Waste Management Plan serves this purpose (see **Appendix A**).
Australian Guidelines for the Prevention and Control of Infection in Healthcare 2010, National Health and Medical Research Council (NHMRC)	These guidelines provide recommendations that outline the critical aspects of infection prevention and control. The recommendations were developed using the best available evidence and consensus methods by the Infection Control Steering Committee. They have been prioritised as key areas to prevent and control infection in a healthcare facility. It is recognised that the level of risk may differ according to the different types of facility and therefore some recommendations should be justified by risk assessment. When implementing these recommendations all healthcare facilities need to consider the risk of transmission of infection and implement according to their specific setting and circumstances.
National Environment Protection (Movement of Controlled Waste between States and Territories) Measure (NEPM), as varied November 2010, National Environment Protection Council (NEPC)	This NEPM ensures that controlled wastes moved between States and Territories are properly identified, transported, and handled in ways that are consistent with environmentally sound practices. These management systems include tracking systems to ensure controlled wastes are directed to and reach appropriate facilities, prior notification systems to assess the appropriateness of proposed movements of controlled wastes in terms of transportation and a facility selection process, and the licensing and regulation of generators, transporters and facilities so that tracking and notification functions are compatible with participating State and Territory requirements.
Australian Code for the Transport of Dangerous Goods by Road & Rail 1997, 7th Edn, National Transport Commission (NTC)	This Code sets out the requirements for transporting dangerous goods by road or rail. The Code has no force by itself, but is given force in each Australian State and Territory by laws that incorporate the Code as law by stating that it applies as law i.e. in the NT, the relevant Act is the *Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act* (NT) and regulations. Clinical and related waste falls under the *UN Recommendations on the Transport of Dangerous Goods Classification* Class 6: Toxic and Infectious Substances; except for radioactive waste, which is Class 7: Radioactive Substances.
Code of Practice for the Safe Transport of Radioactive Material, Radiation Protection Series Publication No. 2, 2008 Edition, Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)	The regulation of the transport of radioactive material in Australia is based on international requirements published by the International Atomic Energy Agency (IAEA). The regulatory frameworks of the Commonwealth, State and Territory jurisdictions currently apply the *Code of Practice for the Safe Transport of Radioactive Material* which, in turn, adopts the IAEA's *Regulations for the Safe Transport of Radioactive Material*, 1996 Edition (Revised) (No. TS-R-1 (ST-1, Revised)). The Code establishes requirements for adoption by Commonwealth, State and Territory jurisdictions that will maintain a system for the safe transport of radioactive material by road, rail and waterways.
Standards	
Australian/New Zealand Standard AS/NZS 3816:1998. *Management of clinical and related wastes*	
Australian Standard AS 4031:1992/Amdt 1-1996. *Non-reusable containers for the collection of sharp medical items used in health care areas*	

Australian/New Zealand Standard AS/NZS 4261:1994/Amdt 1-1997. *Reusable containers for the collection of sharp items used in human and animal medical applications*
Australian/New Zealand Standard AS/NZS 4478:1994. *Guide to the reprocessing of reusable containers for the collection of sharp items used in human and animal clinical/medical applications*
Australian Standard AS 1210:1997. *Pressure vessels*
Australian Standard AS 1657-1992, *Fixed platforms, walkways, stairways and ladders – Design, construction and installation*
Australian Standard AS1319-1994, *Safety signs for the Occupational Environment*
National Standard for Occupational Noise [NOHSC:1007(2000)]

2.3 Environment Protection Licence

The NT Environment Protection Authority (EPA) grants environment protection approvals and licences for activities listed under *Schedule 2* of the *Waste Management and Pollution Control Act*. Activities that require an environment protection licence include:

- Operating premises for the disposal of waste by burial that service, or are designed to service, the waste disposal requirements of more than 1 000 persons.
- Collecting, transporting, storing, re-cycling, treating or disposing of a *listed waste* on a commercial or fee for service basis, other than in or for the purpose of a sewerage treatment plant.
- Operating premises, other than a sewerage treatment plant, associated with collecting, transporting, storing, re-cycling, treating or disposing of a *listed waste* on a commercial or fee for service basis.

Listed waste includes clinical and related waste.

As such, the RDH Waste Management Facility requires an Environment Protection License. The current License (EPL 100) is provided in **Appendix B**. This license was issued on 8th April 2012 and will expire on 8th April 2018. The License authorises the Waste Management Facility to treat (autoclave) clinical and related waste (other than radioactive material, cytotoxic drugs, chemicals, pharmaceuticals and anatomical waste). It also authorises the facility to store all clinical and related waste types, including cytotoxic, pharmaceutical and anatomical waste. The facility is also licensed to store and treat containers that are contaminated with residues of clinical and related waste.

2.4 Power and Water Trade Waste Agreement

The autoclave process produces a small amount of liquid waste requiring disposal to sewer. This waste is considered "trade waste" since it results from an industrial process. It is however, relatively benign and comprises condensed vapour removed from the sterilisation chamber and captured in the condensing tank. This condensate passes through a filter basket and settling pit (capacity 2000 L) prior to release to sewer.

Power and Water Corporation (PWC) accepts trade waste into the sewerage system provided the discharger holds an approval to do so and complies with the conditions of the approval and the *Trade Waste Code*. The Trade Waste Code, published by PWC pursuant to Section 83 of the *Water Supply and Sewerage Services Act*, sets out the conditions under which PWC approves the discharge of trade waste to its sewerage system.

RDH is considered a *Category C* discharger under the Trade Waste Code. This category applies where discharge predominantly comprises characteristics other than those listed in Table 1 of the Code (see the Trade Waste Code for this Table).

The current Trade Waste Agreement covering the RDH Campus is provided as **Appendix C**. This Trade Waste Agreement was issued by PWC on 28th August 2012, and applies for a term of 4 years; terminating on 27th August 2016. The agreement allows for the discharge of trade waste at any time of day and on any day of the week.

PWC calculates Service Charges for the discharge of trade waste to sewer based on the volume of trade waste effluent and its level of contaminants (e.g. concentration of BOD and suspended solids).

The autoclave unit is one of 14 discharge points within the RDH Campus included in the Trade Waste Agreement; namely discharge point DG-6 [Settling Pit (STP-1)]. The corresponding trade waste sampling point for the autoclave discharge is [SP14].

The concentration of contaminants in trade waste discharged to sewer must comply with the *Trade Waste Acceptance Guidelines* contained within the Trade Waste Code, as well as the Standards set out in Schedule 3 of the RDH Trade Waste Agreement (see **Appendix C**).

Prohibited wastes not to be discharged to sewer are:

- Trade waste that does not comply with the Standards set out in Schedule 3 of the Agreement
- Prohibited discharge as defined in Section 88 of the Water Supply and Sewage Services Act
- Substances prohibited under the Trade Waste Code

- Substances that are, or potentially are, inhibitory or toxic to treatment processes
- Substances that will, or are reasonably believed will damage Power and Water's Sewerage Services Infrastructure, endanger Power and Water personnel, the public or adversely affect the environment.

RDH must notify PWC within one hour of becoming aware of any incident which may:

- Give rise to a breach of the Trade Waste Agreement (e.g. significant breach of the Performance Standards in Schedule 3 of the Agreement)
- Have a significant effect on the health and safety of any person, the environment, any of Power and Water's works, or the operation of any sewerage plant.

All compliance monitoring and reporting requirements undertaken for the autoclave discharge point DG-6 [Settling Pit (STP-1)] in the Trade Waste Agreement are outlined in Section 3.10 *Regulatory Monitoring and Reporting.*

3 Operations and Management

3.1 Operations

The Waste Management Facility is a dedicated building (location shown in **Figure 1**) comprising the autoclave, loading dock and refrigeration units. This facility was completed in 2003 and replaced the need for the diesel-fired incinerator located in the basement of RDH that was shut down due to concerns the emissions pose a potential air pollution risk.

The Waste Management Facility is located away from main public areas of the hospital and is only accessible to authorised personnel. It has a lockable door and ridged imperious flooring. Clean-up facilities, spill kits, appropriate drainage and bunding are part of the building structure and ensure that no liquid or solid waste is uncontained and leaks from the facility. A specific area with appropriate drainage for washing equipment is also part of the building structure.

Waste is delivered to the facility contained within wheelie bins of 240 L capacity. After arriving at the facility's loading dock, the origin and weight of each bin is recorded and the bin is then stored under refrigeration until its contents are either autoclaved or transported to Adelaide for incineration in the case of clinical and related wastes not suitable for autoclaving such as anatomical, cytotoxic and pharmaceutical waste.

All bins are secure and remain locked while they are in storage and until they are emptied.

The autoclave and associated shredding and compacting system was built and installed by AWS Clinical Waste. It consists of a steam steriliser, automated loading robot and waste drawer, MGB tipper, tilt hopper and document destruction tipper and shredder. It also includes a condensate cooling tank and electronic waste tracking system. A waste compaction, storage and removal plant is also installed. **Appendix E** shows the layout and components of the autoclave system.

The autoclave uses steam and pressure to sterilise waste at a temperature of 140°C for 40 minutes, which well exceeds the recommended minimum temperature of 132°C for 30 minutes. The steam is provided to the autoclave from the RDH boilers located in the building adjacent to the Waste Management Facility. After treatment, the waste is shredded, compacted and is safe for disposal to landfill.

Steps in the treatment process are as follows:

- Untreated waste arrives at the Waste Management Facility loading dock in sealed bins, which are weighed and their ID code recorded
- The bins are then emptied into the waste drawer via a hydraulic tipper (once emptied, bins are washed in an automated bin washer and returned to their respective unit or department within RDH or health care facility or business outside RDH)
- The steriliser door is closed and locked
- A pulse of steam is introduced to ensure the chamber air is sterile
- The steriliser chamber is evacuated to near -100 kPa, or whatever vacuum determines all air is removed (verified by NATA testing and certification)
- Steam is introduced into the steriliser chamber until the set temperature is reached (140°C or as required by relevant Licensing Authority)
- The timed sterilisation stage maintains this set temperature for 40 minutes (or as required by relevant Licensing Authority)
- At the end of sterilisation, the chamber pressure is relieved to atmospheric and then evacuated to near -100 kPa or whatever vacuum determines that vapour has been removed from the chamber and load. The chamber is returned to atmospheric pressure and the door safety interlock opens automatically followed by the door
- The drawer full of waste is removed automatically from the chamber and tipped onto the tilt hopper

- The tilt hopper transfers waste to a shredder, the waste is shredded, then transferred to a compactor
- Once the compactor is full, a warning light will flash and a waste contractor notified to take the sealed bulk compactor container to landfill, empty it, wash it and return it.

The autoclave treatment process does not involve release of contaminants or noxious odour to the atmosphere. This is due to:

- Condensing of vapour prior to release to sewer via a condensing tank/energy reclaim system for all discharged vapour
- Removal of vapour from the steriliser chamber and from the treated waste prior to opening the chamber door by means of a vacuum stage at the end of the treatment cycle
- Containment of emissions in a negative pressure enclosure and treatment of the small discharge from the enclosure by filtration

No hazardous materials are required for the autoclave treatment process. Therefore no hazardous materials (other than the clinical and related waste) are stored within the Waste Management Facility.

Testing of the effectiveness of sterilisation is undertaken periodically, where samples of treated waste from the autoclave are analysed for bacteriological parameters, spores and viruses. Periodic certified thermocouple testing and recording is also conducted.

Only treated (autoclaved) waste is dispatched from the facility to landfill. The non-autoclavable waste (i.e. anatomic, cytotoxic and pharmaceutical) is kept in refrigeration storage until dispatch to Adelaide for incineration. The transport of autoclaved and non-autoclaved waste from the facility is undertaken by waste contractors who are licensed to carry this type of waste and who comply with the *Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act*, also the *Dangerous Goods Act* and *Australian Code for the Transport of Dangerous Goods by Road & Rail*.

For detailed standard operating procedures outlining the management and steps for handling waste through the Waste Management Facility see the Waste Management Plan in **Appendix A**. See also **Appendix F** for detailed procedures in operating the AWS autoclave and **Appendix G** for routine maintenance requirements.

3.2 Waste Types, Volume and Source

The RDH Waste Management Facility receives clinical and related waste (excluding chemical and radioactive waste) from a wide range of sources. It is the only facility for receiving this type of waste in the Northern Territory. Sources include the following:

- All Departments of RDH
- Darwin Private Hospital
- Katherine Hospital
- Gove Hospital
- Menzies School of Health Research
- Red Cross Blood Bank
- Pathology Laboratories
- Health Centres servicing regional and remote areas such as Adelaide River, Bachelor, Belyuen, Borroloola, Daly River, Elcho Island, and Pine Creek
- Medical Centres and General Practitioners
- Dental Clinics
- Veterinary hospitals and clinics
- Acupuncturists, Physiotherapists, Podiatrists
- Forensics
- Funeral parlours and mortuaries
- Needle exchange programs and sharps collection from public areas
- Tattooists and body piercers

Table 2 shows the sources and volumes of waste treated by the autoclave during the 2012/12 financial year. A total of 261 tonnes of waste was treated; equating to around 22 tonnes per month. Around 47% of this

comes from RDH; with the Pathology, Intensive Care, Theatre, and 7th Floor Departments generating the most waste. The next largest producers of clinical waste were other hospitals and health care facilities in the NT such as the Darwin Private Hospital (14%), Nightcliff Renal Unit (12%) and Pathology Centres (over 4%). Smaller hospitals such as Katherine and Gove, and Regional Health Centres produce relatively low amounts of clinical waste; each contributing less than 3% to the total.

Other health care facilities and businesses for example, GPs, vets, acupuncturists, and needle exchanges, that have clinical waste collected by contractors, such as Cleanaway and Veolia, account for 16% of the clinical waste treated by the autoclave. This equates to an annual amount of around 40 712 kg. This proportion of the waste is classified as "fee for service" waste, which must be remain below 60 000 kg per year in accordance with the Environment Protection License (EPL 100).

Most anatomical, cytotoxic and pharmaceutical waste is generated at RDH. This waste is stored at the Waste Management Facility within refrigerated units until enough is collected for a load to be sent to Adelaide; that is, around 32 bins-worth, or around 890 kg. It usually takes between 4 to 6 weeks to accumulate this amount of waste; although this time is expected to decrease as the level of cytotoxic treatment at RDH increases. Most of the waste sent to Adelaide is cytotoxic (around 56%), followed by anatomical (around 24%) and pharmaceutical (around 20%).

Table 2 Waste volumes treated by the autoclave for the 2011/12 financial year

Source	Average per month (kg)	Total for 11/12 FY (kg)	% of Total Waste
Royal Darwin Hospital			
RDH Infection Control	4	50	0.02
RDH Loading Dock	10	114	0.04
TB Clinic	12	138	0.05
RDH 8th Floor	21	253	0.10
Oncology	21	255	0.10
RDH Building 9	54	643	0.25
Ambulance Bay	59	711	0.27
RDH 5th Floor	154	1843	0.71
RDH 4th Floor	207	2481	0.95
RDH 3rd Floor	230	2759	1.06
RDH 6th Floor	240	2875	1.10
RDH Medical Records	286	3434	1.32
RDH 2nd Floor	376	4508	1.73
Emergency Department	718	8613	3.31
RDH Paper	812	9747	3.74
RDH 7th Floor	1195	14337	5.50
RDH Theatre	1721	20650	7.93
RDH Intensive Care Unit	1909	22909	8.79
Pathology	2112	25346	9.73
Sub-Total	***10141***	***121666***	***46.70***
Regional Health Centres			
Belyuen Health Centre	0	0	0.00
Borroloola Health Centre	0	0	0.00
Pine Creek Health Centre	0	0	0.00
Daly River Health Centre	2	28	0.01
Elcho Island	2	29	0.01
Adelaide River Health Centre	5	55	0.02
Bachelor Health Centre	6	66	0.03
Sub-Total	***15***	***178***	***0.07***
Other Hospitals and Government/Public Facilities			
NT Aids	0	0	0.00
Police	20	234	0.09
Hospice	26	308	0.12
RAPU	122	1460	0.56
Gove Hospital	156	1556	0.60
Menzies School of Health Research	235	2821	1.08
Red Cross	394	4725	1.81
Katherine Hospital	587	7049	2.71
Western Pathology	879	10545	4.05
Nightcliff Renal Unit	2698	32372	12.43
Darwin Private Hospital	3075	36904	14.16
Sub-Total	***8192***	***97974***	***37.61***
Other Health Care Businesses using contractors to collect their clinical waste			
Perkins Shipping	3	35	0.01
Waste Solutions	49	589	0.23
Veolia	368	4415	1.69
Cleanaway/Transpacific	2973	35673	13.69
Sub-Total	***3393***	***40712***	***15.63***
Total	**21711**	**260530**	**100.00**

3.3 Waste Tracking

A waste tracking system ensures that all waste handled through the Waste Management Facility is recorded. The source, volume and type of all waste arriving at the facility, as well as the time and date of its arrival is logged. The treatment applied is also recorded i.e. either autoclaving, shredding and compacting, or storage in refrigeration for transport to Adelaide.

As waste bins arrive at the loading dock, their weight and unique ID code is logged. The source of each bin is known from the unique ID code (bar code sticker) that links each bin to a particular area or department of RDH. The source of each bin arriving from health care facilities and businesses outside of RDH is also recorded.

Additionally, records are kept of the type and volume of all waste leaving the facility; i.e. treated waste taken to landfill and un-treated waste taken to Adelaide. This includes records of the contractors transporting waste from the facility.

The Waste Management Plan (**Appendix A**) outlines the detailed step-by-step procedures undertaken for tracking waste received and handled through the facility.

3.4 Waste Segregation, Storage and Handling

All waste segregation, storage and handling must comply with the following standards:

Australian/New Zealand Standard AS/NZS 3816:1998. *Management of clinical and related wastes*

Australian Standard AS 4031:1992/Amdt 1-1996. *Non-reusable containers for the collection of sharp medical items used in health care areas*

Australian/New Zealand Standard AS/NZS 4261:1994/Amdt 1-1997. *Reusable containers for the collection of sharp items used in human and animal medical applications*

Australian/New Zealand Standard AS/NZS 4478:1994. *Guide to the reprocessing of reusable containers for the collection of sharp items used in human and animal clinical/medical applications*

Important principals in the proper segregation, storage and handling of clinical and related wastes includes:

- Waste is segregated at the point of generation
- Suitably ridged and colour-coded (see **Table 3**) waste disposal containers that meet Australian Standards are provided in accessible and appropriate locations at the point of waste generation
- Clinical waste is kept in puncture-resistant, leak-proof containers that are either lockable and/or kept in secure areas at all times
- Bags/containers of waste are labelled with the unit/department where the waste comes from and the date of collection to aid in waste tracking and monitoring
- Areas storing clinical waste bins must be dedicated areas that are refrigerated, have an impervious floor and spill containment bunding and spill kits available, be vermin-proof, and access limited to authorised persons only
- Personnel that generate clinical waste are educated and trained in the proper procedures for its disposal at their particular work area; this includes procedures for proper spill containment

In accordance with the above standards and principals, the RDH Waste Management Plan (**Appendix A**) provides detailed procedures for separating, storing and handling the different clinical waste types generated at RDH. Specific procedures are given for each unit and department within the Hospital. Similarly, specific procedures for clinical waste disposal at regional hospitals and health centres are provided in the NT Department of Health's *Remote Area Atlas* (see Section 2.4.1 above). Additionally, generalised guidance on the appropriate handling of waste in all healthcare facilities across the NT is provided in the Department of Health's *Standardised Guideline Network-Waste Management* (see **Appendix D**).

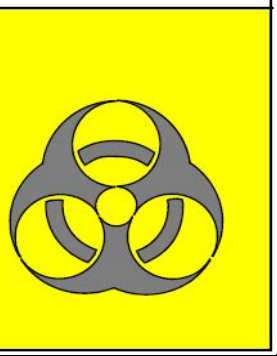
Please refer to the above documents for details of how clinical and related waste is segregated, stored and transported prior to arriving at the Waste Management Facility.

Table 3 Appropriate clinical waste labelling

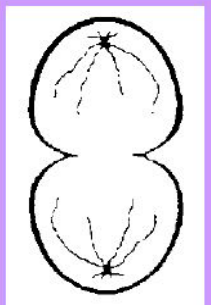
Clinical Waste (excluding anatomical, cytotoxic and pharmaceutical waste)

Colour code	Wording on container	Sign	Symbol
Yellow	**Clinical waste** (displayed on at least two sides)	Black biological hazard	

Anatomical and Pharmaceutical Waste (excluding cytotoxic waste)

Colour code	Wording on container	Sign	Symbol
Yellow body & orange lid	**Clinical waste** (displayed on at least two sides)	Black biological hazard	

Cytotoxic Waste

Colour code	Wording on container	Sign	Symbol
Purple	**Cytotoxic waste** (displayed on at least two sides)	Cell undergoing telophase in white	

3.5 Waste Minimisation

Waste minimisation is a major aim of the RDH Waste Management Plan (see **Appendix A**). Waste minimisation strategies outlined in the Waste Management Plan include:

- Waste avoidance
- Waste reduction
- Product Substitution

- Product Changes
- Re-use
- Recycling

In regards to each of these strategies, please refer to the Waste Management Plan in **Appendix A** for the specific actions being undertaken at RDH.

3.6 Energy and Water-Use Minimisation

The Waste Management Facility uses minimal water. Steam for the autoclave sterilisation chamber is sourced from the boilers located in the adjacent building and the resultant condensate water is released to sewer. There is little scope to recycle this water, given its contamination risk.

The only other water used within the facility is the washing of bins used to transport clinical waste from its source to the Facility. This washing is undertaken in a dedicated bin-washer that minimises water usage. Similarly, there is little scope to recycle this water, given its contamination risk.

Both water and energy usage is reduced by reducing the amount of material requiring autoclaving and requiring refrigeration and transport to Adelaide. The effective segregation of waste at its point of generation minimises the potential for general and other non-clinical waste inadvertently being placed into the clinical waste stream and thereby unnecessarily increasing the amount of waste being treated and taken to landfill or refrigerated and transported to Adelaide. The waste segregation policies and procedures outlined in Section 3.4 above and the RDH Waste Management Plan (**Appendix A**); combined with staff training and education, aim to ensure proper waste segregation.

Similarly, the waste minimisation strategies listed above in Section 3.5, reduce the amount of waste requiring treatment and transport; thereby reducing energy and water usage.

3.7 Health and Safety

The risk to health and safety of staff, patients and the public is minimised through the comprehensive procedures, training and education as outlined in the RDH Infection Control Manual, Waste Management Plan, Regional Health Atlas and the other relevant policies and procedures developed by RDH and the NT Department of Health.

The autoclave and associated shredder and compacting system was designed, built and installed by AWS Clinical Waste; a well-recognised company specialising in the manufacture of biohazardous waste treatment systems. The sterilising chamber meets Australian Standard AS 1210:1997. *Pressure vessels*, and the system has many in-build safety features such as a control system to prevent accidental opening of the steriliser door whilst under pressure. Sensors also ensure that steam cannot be introduced into the chamber unless the door is closed and sealed.

Of particular note for staff operating the autoclave is that the sterilisation, shredding and compaction process is fully automated. This minimises the risk of staff coming into contact with the potentially infectious waste and also minimises the need for staff to be near the autoclave while it is operating and potentially risking injury from moving parts. Testing of the effectiveness of sterilisation is also undertaken periodically, where samples of treated waste from the autoclave are analysed for bacteriological parameters, spores and viruses.

Step-by-step standard procedures for operating the autoclave, shredder and compactor are in place (see Waste Management Plan in **Appendix A**) and all staff involved in operations are fully trained and experienced in operating and maintaining the system and what to do in the case of a spill, mechanical fault, or emergency. All staff are also familiar with, and refer to when required, the *AWS Treatment System Manual*, which provides comprehensive operational and maintenance instructions.

There are no air emissions from the autoclave. Negative pressure is maintained within the sterilisation chamber. This ensures that all vapour remains contained within the chamber. Also, all vapour is removed from the chamber prior to opening by means of a vacuum stage at the end of the treatment cycle. The removed vapour is then condensed in a condensing tank and released to sewer.

The autoclave, shredder and compactor are designed to keep noise levels at less than 10 dB(A) above background noise. With the negative pressure enclosure, this can reduce to 5 dB (A) above background level. The automated handling also allows for quieter operation.

No hazardous materials are required for the autoclave treatment process. Therefore no hazardous materials (other than the clinical and related waste) are stored within the Waste Management Facility.

The site is placarded and labelled according to legislative requirements and Australian Standards including the *Dangerous Goods Act and Regulations* and Australian Standard AS1319-1994 *Safety signs for the Occupational Environment.*

3.8 Emergency Response and Contingencies

An *Emergency Response Plan* has been developed to communicate the requirements of personnel during emergencies. The plan covers instances such as the release of pressure, and escape of vapour from the sterilising chamber, and spillage of waste of any type; either from the autoclave system or within the refrigeration units or on the loading dock. All personnel are required to undertake training in this Emergency Response Plan.

Additionally, the AWS autoclave treatment system has automatic, in-built safety locks, warning lights and alarms to alert staff to any problems with the plant.

Any problems with the autoclave or any other machinery are reported during Business Hours to Engineering Services on 28556. After-hours, the Switchboard is contacted on 999 and is asked to be put through to the Airducter On-Call person. The details of all problems are recorded in the Waste Management Facility Diary, including what happened, what time and how it was fixed.

All pollution incidents must be reported immediately to the NT EPA by contacting the Pollution Hotline on telephone number 1800 064 567 and emailing environmentops.nretas@nt.gov.au.

Similarly, PWC must be notified on (08) 8995 5808 or 0401 118 123 within one hour of becoming aware of any incident which may:

- Give rise to a breach of the Trade Waste Agreement (e.g. significant breach of the Performance Standards in Schedule 3 of the Agreement)
- Have a significant effect on the health and safety of any person, the environment, any of Power and Water's works, or the operation of any sewerage plant.

Clear and legible signage is displayed in a prominent location at the entrance to the Facility that includes the Environment Protection License (EPL) number and 24-hour emergency contact details. A copy of the EPL is available at all times on the website and to staff at the Facility.

In the event of autoclave malfunction or break-down and a delay in its continued operation, clinical waste will be stored in the refrigeration units within the Facility until the autoclave resumes operation. There are also an additional three refrigerated containers located nearby for extra cold storage if required.

3.9 Handling of Complaints

RDH maintains a record of any complaints made in relation to the Waste Management Facility as is required by the Environment Protection License (EPL 100). Details recorded include:

- The date and time of the complaint
- The contact details of the complainant if known, or where no details are provided a note to that effect
- The nature of the complaint
- The nature of events giving rise to the complaint
- Prevailing weather conditions at the time of the complaint
- The action taken in relation to the complaint, including any follow-up contact with the complainant
- if no action was taken, why no action was taken.

3.10 Regulatory Monitoring and Reporting

EPA Environment Protection License

RDH maintains records of the following in accordance with the requirements of EPA Environment Protection License (EPL 100; see **Appendix B**):

- The source, type and volume of all waste handled through the Waste Treatment Facility; as outlined in Section 3.3 *Waste Tracking*.
- How all waste is treated and/or stored prior to transport to landfill or to Adelaide for incineration; as outlined in Section 3.1 *Operations*.
- The details of any complaints made in relation to the Facility; as outlined in Section 3.9 *Handling of Complaints*.
- Details of any non-compliances with the Licence; as outlined in Section 3.8 *Emergency Response and Contingencies*.

This data and information is used to complete the *Annual Audit and Compliance Report* (AACR) that must be provided annually to the NT EPA at least 20 working days prior to the anniversary of the commencement date of the EPL Licence (i.e. 8th April each year). A template for this report is provided in **Appendix B**.

PWC Trade Waste Agreement

The Trade Waste Agreement with PWC incorporates 14 trade waste discharge points across the RDH Campus (see **Appendix C**). The discharge point referring to the autoclave facility is DG-6 [Settling Pit (STP-1)]; and the associated sampling point is [SP14]. This settling pit receives condensate derived from the condensing tank that collects vapour removed from the sterilising chamber.

RDH samples, monitors, analyses, records and reports data and information relating to the quality and quantity of trade waste discharged from the 14 discharge points in accordance with the requirements contained in Schedule 5 of the Trade Waste Agreement.

RDH collects a representative sample from each discharge point every 26 weeks. These samples are sent for analysis at a NATA registered laboratory. The following parameters are analysed in each sample and the results compared against the Standards in Schedule 3:

Ammonia	Calcium	Sulphide
Chloride	Temperature	TDS
pH	BOD 5	Potassium
Suspended Solids	Sodium	Oil & Grease

The date and time of sampling is recorded; as well as the rate of discharge at the time of sampling.

RDH subsequently provides PWC with a statement of the results within 14 days of receiving the results from the laboratory. Follow-up and investigative sampling may be required to check any results that exceed the Standards and to investigate the cause, or validate that corrective actions have decreased contaminant levels.

Where a discharge-metering device is fitted, RDH records the cumulative volume (in litres or kilolitres) at the end of each day; as well as the date of these readings and the average and maximum discharge rate during each daily period in litres/second. This information is collated and reported to PWC.

Pre-treatment equipment (i.e. the filter basket and settling pit in the case of the autoclave) is cleaned and maintained by an approved contractor on a regular basis. RDH maintains records of dates and particulars of cleaning, maintenance and servicing, and provides evidence of this, such as an invoice, docket or similar from the contractor.

Testing of the effectiveness of sterilisation is also undertaken periodically, where samples of treated waste from the autoclave are analysed for bacteriological parameters, spores and viruses. Periodic certified thermocouple testing and recording is also conducted. The results of these tests are made available to PWC is required.

RDH also maintains and regularly calibrates monitoring equipment, such as flow gauges and water quality meters used to measure contaminant levels in discharge water. RDH maintains records of dates and particulars of monitoring equipment maintenance, servicing and calibration, and provides evidence of this, such as an invoice, docket or similar from the contractor.

RDH will notify Power and Water on (08) 8995 5808 or 0401 118 123 within one hour of becoming aware of any incident which may:

- Give rise to a breach of the Trade Waste Agreement (e.g. significant breach of the Performance Standards in Schedule 3 of the Agreement)
- Have a significant effect on the health and safety of any person, the environment, any of Power and Water's works, or the operation of any sewerage plant.

Trade waste samples from the autoclave are collected from a dedicated sampling point [SP14] located between the settling pit and sewer inflow. The most recent sampling of trade waste from the autoclave was undertaken on 13th December 2012. **Table 4** presents the water quality analysis of this sample. All parameters met the PWC Performance Standards listed in Schedule 3 (see **Appendix C**), except for temperature, which was slightly above the standard.

Table 4: Laboratory analysis of trade waste collected 13th December 2013

Parameter	Unit	Limit of Reporting	PWC Performance Standard	Result
Ammonia (as N)	mg/L	0.01	100	12
BOD-5	mg/L	5	600	300
Chloride	mg/L	1	10	3.7
Oil & Grease	mg/L	5	-	150
pH	units	0.1	6-10	8.1
Sulfide (as S)	mg/L	0.05	1	<0.05
Suspended Solids	mg/L	1	600	21
Total Dissolved Solids	mg/L	10	2000	410
Temperature	°C	0.1	40	44
Calcium	mg/L	0.5	-	7.1
Magnesium	mg/L	0.5	-	4.0
Potassium	mg/L	0.5	-	1.4
Sodium	mg/L	0.5	-	110

4 Responsibilities

The responsibilities of staff and contractors in relation to the Waste Management Facility are outlined below. Further more detailed responsibilities of staff in each unit and division of RDH as well as remote and rural health centres and hospitals are outlined in the RDH *Infection Control Manual*, *Waste Management Plan* (**Appendix A**), DOH *Standardised Guideline for Network-Waste Management* (**Appendix D**) and DOH *Remote Health Atlas*.

In general, employers and contractors are responsible for:

- Providing appropriate information
- Providing education
- Providing training
- Ensuring safe work environment is developed and maintained.

In general employees and contractors are responsible for:

- Compliance with health and safety instructions
- Correct use of all personal protective equipment
- Avail themselves of relevant information and training programs.

The RDH Infection Control Manual states that:

- Managers of each unit have a responsibility to ensure correct management of clinical waste is being undertaken.
- The Infection Control Unit reviews the effectiveness of waste management in consultation with all levels of waste collection, handling and disposal.
- The Infection Control Unit is responsible for initial waste management education for every employee at orientation and that on-going education is also provided in response to problems being identified.
- Every employee has a responsibility to provide a safe work place and safe systems of work in accordance with the *Work Health and Safety (National Uniform Legislation) Act 2011*.

Campus Facilities Manager

The Campus Facilities Manager is responsible for overseeing the overall management of facilities across the RDH Campus; including the Waste Management Facility. The Campus Facilities Manager also ensures the regulatory compliance of all facilities, such as applications for Environment Protection Licenses and Trade Waste Agreements as well as the on-going monitoring, reporting, auditing and compliance of facilities in relation to these licenses and agreements.

The Campus Facilities Manager is the primary contact for all public and government enquiries regarding RDH facilities.

Transport, Yard and Waste Management Manager

The Transport, Yard and Waste Management Manager is responsible for overseeing the day-to-day operations of the Waste Management Facility. This includes overseeing operations and on-going maintenance of the autoclave and other equipment and plant within the Facility. Also, managing the collection and transfer of waste from its source to the Facility and collection and transport of waste from the facility to landfill or to Adelaide for incineration.

The Transport, Yard and Waste Management Manager ensures that staff are trained in their tasks and that they are performing their tasks effectively and in accordance with policies and procedures; including those outlined in this EMP.

The Transport, Yard and Waste Management Manager is responsible for delegating monitoring and reporting requirements and for ensuring that all environmental inspections, monitoring and reporting are completed to the best possible standard. This includes the recording of all required data and information for the Environment Protection License and Trade Waste Agreement and any other regulatory requirements.

The Transport, Yard and Waste Management Manager also ensures the on-going management of any identified hazards and risks, together with the introduction of processes for the elimination and/or control of these risks by:

- Carrying out a review of a hazard and/or risk when it is identified
- Ensuring that each new employee receives induction training and as necessary, refresher training, for the management of occupational health and safety
- Consulting with employees to enable employees to contribute to the making of decisions affecting their health, safety and welfare at work, and recording those arrangements.

All Generators of Clinical Waste

All employees of RDH, as well as other healthcare facilities and generators of clinical waste must segregate the waste at its source to ensure only clinical waste is sent to the Waste Management Facility in the appropriate containers and is not mixed with general or other waste not permitted for treatment and storage at the Facility.

All Contractors Transporting Clinical Waste

All contractors transporting waste to and from the Facility must ensure they have the required licenses and comply with all relevant legislation; see Section 2 *Legislative and other Requirements*.

5 Environmental Management Plan

The Table below sets out the commitments and measures undertaken by RDH in minimising potential environmental risks and impacts from operation of the Waste Management Facility. This Table provides a framework (checklist) for annual reporting and auditing against specified environmental objectives.

Potential Risk/Impact	Objectives	Management Measures	Monitoring and Reporting
Waste Handling			
Spillage or loss of waste during transfer from its source within RDH or healthcare facility to the Waste Management Facility by staff.	All waste fully contained and secure and no spillage of waste.	All waste is handled in accordance with procedures as outlined in Section 3.1 and Section 3.4 above, as well as the RDH Waste Management Plan. All staff operating the facility are trained in the waste handling procedures.	Auditing and inspection of waste handling from its source to the Facility. Quizzing staff on their waste handling procedures.
Spillage of waste during transport to and from the Waste Management Facility by contractors.	All waste fully contained and no spillage of waste.	All contractors transporting waste to and from the Facility must be Licensed and comply with relevant NT and National legislation and Guidelines.	Evidence of License provided by contractor.
Waste treated in the autoclave is not adequately sterilised	All treated waste leaving the Facility to landfill is sterilised	The Autoclave restarts the sterilising cycle if it interrupted part way through. This is an automatic control feature of the Waste Autoclave ensuring the product has always been sterilised prior to the cycle ending.	The Waste autoclave has a log and graphical display for temperature, pressure and time of each sterilising cycle
Extra waste is being treated and/or stored and taken to Adelaide unnecessarily due to mixing of general and other non-clinical waste into the clinical waste stream.	Only clinical and related waste types (excluding chemical, and radioactive) are sent to the Facility for treatment and/or storage and transport to Adelaide.	All waste is handled in accordance with procedures as outlined in Section 3.1 and Section 3.4 above, as well as the RDH Waste Management Plan. This includes the segregation and disposal of waste into specified containers. All relevant staff are trained in the waste handling procedures. Waste source, type and volume is tracked using the system outlined in Section 3.3 above.	Auditing and inspection of waste handling from its source to the Facility including asking staff to demonstrate their waste handling procedures to identify any training gaps. Inspection of waste tracking records.
Autoclave is not maintained properly.	Autoclave marinated in good working order.	Regular maintenance and servicing as outlined in Section 3.1 above.	Evidence of maintenance records and invoices from maintenance contractors held in Engineering Services against the asset
Waste Water			
Settling pit receiving waste water from the autoclave not maintained regularly.	Settling pit maintained regularly and no discharge of waste water to sewer that exceeds the PWC Performance Standards.	Regular maintenance and servicing as outlined in Section 3.1 and Section 3.10 above.	Evidence of maintenance records and invoices from maintenance contractors. Records kept of water quality analysis conducted on the waste water every 26 wks as required for the Trade Waste Agreement with PWC. All maintenance record kept in Engineering Services.
Spillage or leakage of water from the autoclave to	No release of water from the Facility.	The Facility has a hard impervious floor and floor wastes are piped to the stage 3 settling pit	All uncontained spills are to be reported to the EPA and records

surrounding environment.			of spill details maintained.
Spillage or leakage of water from the washing of waste bins to surrounding environment.	No release of water from the Facility.	The Facility has a hard impervious floor and floor wastes are piped to the stage 3 settling pit including bin washer discharge.	All uncontained spills are to be reported to the EPA and records of spill details maintained.
Air and Noise			
Release of noxious odours from the Facility causing complaints from staff and/or the public.	No release of noxious odours from the Facility.	Negative pressure is maintained within the sterilisation chamber. This ensures all vapour remains contained within the chamber. Also, all vapour is removed from the chamber prior to opening by means of a vacuum stage at the end of the treatment cycle. The Facility is also located away from public areas of the hospital. Recent upgrade of exhaust fan and ducted system further reduces unwanted odours.	The details of any complaints from staff or the public are recorded and the issue investigated.
Excessive noise from the Facility causing complaints from staff and/or the public.	No complaints from staff or the public regarding excessive noise from the Facility.	The autoclave, shredder and compactor are designed to keep noise levels at less than 10 dB(A) above background noise. With the negative pressure enclosure, this can reduce to 5 dB (A) above background level. The automated handling also allows for quieter operation. The Facility is also located away from public areas of the hospital.	The details of any complaints from staff or the public are recorded and the issue investigated.

6 References

ARPANSA 2008, *Code of Practice for the Safe Transport of Radioactive Material*, Radiation Protection Series Publication No. 2, 2008 Edition, Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), Commonwealth Government, Canberra, ACT.

BWI 2010, *Industry Code of Practice for the Management of Clinical and Relates Wastes*, 6th Edition, June 2010, Biohazard Waste Industry (BWI); a division of Waste Management Association of Australia (WMAA), Burwood, NSW.

NEPC 2010, *National Environment Protection (Movement of Controlled Waste between States and Territories) Measure* (NEPM), as varied November 2010, National Environment Protection Council (NEPC), Commonwealth Government, Canberra, ACT.

NHMRC 1999, *National Guidelines for Waste Management in the Health Care Industry*, National Health and Medical Research Council (NHMRC), rescinded 31/12/2005, Commonwealth Government, Canberra, ACT.

NHMRC 2010, *Australian Guidelines for the Prevention and Control of Infection in Healthcare*, National Health and Medical Research Council (NHMRC), Commonwealth Government, Canberra, ACT.

NTC 2007, *Australian Code for the Transport of Dangerous Goods by Road & Rail*, 7th Edition, National Transport Commission (NTC), Commonwealth Government, Canberra, ACT.

Appendix A – RDH Waste Management Plan

ROYAL DARWIN HOSPITAL
WASTE MANAGEMENT PLAN

Appendix B – NT EPA Licence

ntepa Northern Territory Environment Protection Authority

ENVIRONMENT PROTECTION LICENCE

(Pursuant to section 34 of the *Waste Management and Pollution Control Act*)

Licence Details

Licence Number:	**EPL100**
Commencement Date:	8 April 2013
Expiry Date	8 April 2018

Licensee Details

Legal Entity Name:	Department of Health, Royal Darwin Hospital
ABN:	84 085 734 992
Registered Business Address:	RDH Rocklands Drive TIWI NT 0810
Postal Address:	PO Box 41326 CASUARINA NT 0811
Contact Person:	Adam Walding
Position Title:	Campus Facility Manager
Contact Details:	
b/h:	08 8922 8176
mobile:	0428 577 919
email:	adam.walding@nt.gov.au

Location of Premises

Name:	Royal Darwin Hospital- Waste Facility
Address:	Vesalius Road TIWI NT 0810
Telephone Numbers:	
b/h:	08 8922 8173
mobile:	0428 577 919

24 hour emergency response

Contact Person:	RDH Switch | Ask for Engineering
Telephone Numbers:	
b/h:	08 8922 8888

Licensed Activity Storing and treating of a listed waste (as per Table 1) on a commercial or fee for service basis, other than in or for the purpose of a sewerage treatment plant.

Appendix C - Power and Water Trade Waste Agreement

Record No: D2015/
Container No: LD550/9731-01

PowerWater

Royal Darwin Hospital
Ms Johanna Kieboom
A/Director Facilities
PO Box 41326
CASUARINA NT 0811

RE: TRADE WASTE AGREEMENT ROYAL DARWIN HOSPITAL

Dear Johanna,

This letter confirms the extension of the Trade Waste Agreement on the terms as set out below.

In consideration of the parties mutual promises and for the good and valuable consideration, the parties agree to vary the Agreement, provided under clause 17.1 and that the parties agree to extend the term of the Contract until the 31 December 2016.

All other terms and conditions of the Contract remain unchanged.

Please confirm your acceptance of the terms and conditions by countersigning in the space below.

Yours sincerely,

Bill Bracken
Manager Trade Waste

17 October 2016

Appendix D – Standardised Guideline: Network-Waste Management

Appendix E – Design Diagram of the AWS Autoclave Treatment System

Appendix F – Basic Automatic Operation of the AWS Autoclave

Appendix G – Basic Maintenance of the AWS Autoclave