

OPERATIONAL ENVIRONMENTAL MANAGEMENT

The Site's Environmental Management Plan (SEMP) will address all relevant issues in accordance with the Waste Management Association of Australia's, *Industry Code of Practice for the Management of Biohazardous Waste (including Clinical and Related Wastes)*, 7th edition, July 2014, including the following:

- appropriate and secure packaging, storage, containment and handling procedures will be developed in consultation with clients for all waste types accepted by the facility;
- membership and participation in the Waste Management Association of Australia's initiatives concerning biohazardous, clinical and related wastes;
- contractual obligations that prohibit certain inappropriate wastes and impose obligations and penalties on the suppliers in the event of non-compliance;
- requirement for all wastes to be fully and accurately documented and the source labelled by the client;
- transport documents to contain a statement of the contents by the waste provider including contact details and signature;
- record retention policy and systems that retain these records for the life of the facility;
- information sheets and local awareness-raising and relationship building initiatives with clients, including waste audits;
- effective and regular staff training, competency assessment and recordkeeping;
- up-to-date operating manual with clear instructions and corrective actions; and
- regular external audits of compliance;

Further details are described below.

Waste acceptance

Documentation will be obtained and retained for all wastes accepted at the facility in accordance with EPA's waste transport certificate requirements. Non-compliant wastes will be returned to the supplier or otherwise sent to a facility where those wastes can be treated in accordance with EPA requirements.

Waste disposal contracts with clients will clearly define acceptable wastes and exclude inappropriate waste types from MAGS treatment.

Where necessary waste audits will be conducted and training provided to waste generators and institutions to ensure that their staff understand waste acceptability criteria and are able to appropriately classify and segregate wastes for disposal by the MAGS without introducing wastes that could cause problems. Further on-going advice and consultation with waste generators will ensure appropriate waste segregation and classification, where required.

The suppliers of waste within the greater Alice Springs region are relatively few and the people involved will quickly get to know each other. Strong relationships with waste generator's staff and their institutions will further assist compliance with waste acceptability requirements and compliance.

Through these mechanisms the proposed facility will ensure that it does not knowingly accept or process: any flammable solvents; waste chemicals and biocides; bulk liquid wastes; fluorescent light tubes, e-wastes; dental amalgam or other wastes likely to contain mercury and other heavy metals; batteries; and other wastes that may compromise the integrity (e.g. damage to the gasifiers) and/or performance (e.g. emission compliance) of the incineration facility.

Waste storage

Secure undercover refrigerated storage at $<4^{\circ}\text{C}$ will be maintained for clinical and related wastes, quarantine wastes and animal carcasses. The cool room will be:

- Locked, except when a batch of waste is being selected;
- Accessible only by authorised persons;
- Adequately lit;
- Hygienically managed and maintained; and
- Labelled appropriately.

Non-biodegradable wastes such as pharmaceuticals, drugs and medicines, contraband (which may also include drugs), and confidential documents will be stored in an undercover secure area only accessible by authorised senior staff.

The storage areas will be co-located with the delivery vehicle pad within a shared spill containment bund integrated into the concrete surface. The bund will drain to a sump to collect any wash waters or spills.

No liquid waste, wash down waters or contaminated stormwater will be disposed of to the stormwater system or surface run-off.

Waste handling

It is expected that clinical and related wastes will be supplied pre-bagged and contained within 240L yellow mobile garbage bins (MGBs). Some MGBs will also contain sharps containers.

The required number of MGBs will be taken from the cool room to the waste loading area of the MAGS shortly before operations commence.

The bags of waste and sharps containers are then transferred from the MGBs to the MAGS when it tells the operator to load wastes. MGBs will be cleaned and sanitised prior to being returned to the waste generator.

Material inputs

Natural gas

Natural gas will be sourced from the gas mains passing the boundary of the site. Natural gas consumption/year based on processing 90 tonne of waste over 250 days is estimated to be in the order of 206 GJ/year.

Electricity

Electricity will be sourced from the power lines passing the front of the site. Electricity consumption of the MAGS is estimated to be in the order of 55 MWh/y. Emergency power generation capability will be suitable to maintain refrigerated storage and the operation of MAGS during a power failure. A 45 KVA generator will be used for this.

Water

Rainfall will be collected from the facility's roof (60 m x 18 m). The average annual rainfall (measured at Alice Springs Airport) is 284.5 mm per year (BoM 2015), so 307.26 kL of water can be collected.

It is estimated that the total facility water consumption will be approximately 1500 L/d based on estimates for facility and bin cleaning. The MAGS unit itself consumes little water with the condenser returning water to the MAGS reticulation system.

Rainwater should therefore be sufficient for about 200 operational days per year. The facility is intended to operate for only 250 days per year, so rainwater will meet about 80% of water operational requirements

The sump serving the bunded areas will collect and store wash waters which can be reused in MAGS operations.

Potable water can be sourced from mains supply. The objective is to use as little mains supplied potable water as possible, and generate as little waste water as possible.

Cleaning chemicals

Hypochlorite solution will be required for cleaning and sanitising MGBs, loading and unloading areas, and general cleaning (including spill management). Hypochlorite will be delivered to site in containers as 12.5 % (w/w) hypochlorite and stored undercover in a bunded area adjacent the waste storage and bin cleaning area.

Hypochlorite solution will be diluted to approximately 2-5 % (w/w) solution, as appropriate, for use in cleaning tasks.

Bin cleaning is estimated to require up to 750 L per day. If using a 2.5% (w/w) hypochlorite solution for this purpose, then bin cleaning would require 3 x 200 L drums of 12.5% to be delivered to site every 2 months (40 operational days). Hypochlorite solutions slowly degrade so regular small deliveries are preferable to buying and storing in bulk.

Waste generation

The proposed facility will generate residual gaseous, solid, and liquid wastes and noise as a consequence of processing clinical and related wastes in the MAGS.

Gaseous waste

The MAGS will discharge waste gases to atmosphere as previously detailed.

Solid waste

The proposed facility will generate char from the gasification process, and any metal and glass that was originally in the waste. Glass and metal in the waste will not burn and will therefore be present in the gasifier residues. The glass and metal may be able to be recovered and recycled. This is important if the char is to be used as a carbon sequester/soil improver. Investigations into removing glass and metal from the char will occur once the plant is operating (such as sieve screening).

The mass of char produced can be as little as 8% of the mass of wastes incinerated. However, glass and metal items in the waste will add to the amount of residual material produced. This assessment will assume that char and residues will be about 10% of the mass of waste burnt.

Therefore, MAGS processing of 360 kg of waste per day will produce about 36 kg/day of char and residues daily. If the proposed facility processes 90 tonnes of waste per year then about 7.2 tonnes of char and 1.8 tonnes of glass and metal residues are expected to be generated.

The char is automatically transferred from the gasifier to a char cooling zone periodically, with the operator controlling the process. Then the char can be removed any time by simply momentarily shutting down the system.

If the operator uses the system for 8 hours per day, then he can program it so that it preheats automatically before his arrival, stop the system for a few minutes to remove the previous day's char from the char box, restart the system and start processing waste. At the end of the shift the operator transfers the remaining char out of the gasifier to the cooling zone and the whole process repeats itself the next day.

For an 8 hour operating shift it is expected that the char bin will require emptying once.

Staff will then place the bin's contents into an adjacent storage skip. The char will have also cooled overnight and does not have the same properties as incineration ash which is very fine and readily generates fine particulates, so water sprays will not be required to suppress dust generation during discharge from the unit. After the char and residues have been removed and placed in the skip, the skip will be covered. These operations will occur undercover on a bunded concrete area.

The char will initially be subject to Australian Standard Leachate Potential (ASLP) or the Toxicity Characteristic Leaching Procedure (TCLP) testing requirements to determine whether it can be reused/recycled as a carbon sequester/soil improver.

Leachate quality will be determined through ASLP/TCLP testing of the char. This testing regime can allow different reagents to be used in the extraction process to better mimic the fate of the waste than previous methods, but at a liquid to solid ratio of 20:1. This is inherently conservative as in the field this elevated ratio of liquids to solids will not usually occur.

A representative sample of the daily char generated will be collected each morning during the commissioning period. These samples will be submitted to a NATA accredited laboratory for relevant ASLP testing.

The potential for reuse/recycling and other disposal options can be further evaluated at that time.

Chars from different feed materials are currently being tested for growing plants in Canada. The idea is that heat and CO₂ from the MAGS can be used in a greenhouse to grow plant food using the char generated in disposing of waste in isolated Northern Canadian indigenous communities.

The char is currently not deemed a hazardous material and can be disposed of as general waste to landfill in Canada. To date no char has required specialised disposal.

It is estimated that a 4 m³ skip could take about 100 days' worth of ash and residues. On this basis only 3 to 4 skips of this size would be required each year.

Char will typically be black in colour, insoluble in water, and of a neutral nature. The adsorptive nature of the carbonaceous char is also expected to preclude the ready leaching of many potential contaminants of concern.

Some solid (absorbent) wastes may be generated during spill management and these will also be processed in the MAGS, however these absorbent materials are inert and non-toxic.

MAGS generated bio-char composition and TCLP results (Terragon 2017b) are shown below.

Table 1 – MAGS-generated Bio-char Composition and TCLP Characteristics

Species	MAGS Char TCLP	NSW ¹ TCLP (General Waste)	Quebec TCLP Limits	Units
Arsenic	<0.01	5	5	mg/L
Barium	1.5	N/A	100	mg/L
Boron	<0.7	N/A	500	mg/L
Cadmium	<0.01	1	0.5	mg/L
Chromium	0.06	5	5	mg/L
Fluoride	1	150	150	mg/L
Lead	1.1	5	5	mg/L
Mercury	<0.0004	0.2	0.1	mg/L
Nitrite	<0.07	N/A	100	mg/L
NO ₂ /NO ₃	<0.07	N/A	1000	mg/L
Selenium	<0.01	1	1	mg/L
Uranium	<0.005	N/A	2	mg/L
Carbon	72	N/A	N/A	Wt% (dry)
Hydrogen	1	N/A	N/A	Wt% (dry)
Oxygen	7	N/A	N/A	Wt% (dry)
Ash	20	N/A	N/A	Wt% (dry)
Calorific Value	11431	N/A	N/A	BTU/lb

Note: The char tested was generated from a MAGS processing municipal solid waste.

¹ NSW EPA 2014 Waste Classification Guidelines

Liquid wastes

Potable water use will be minimised via rainwater collection. Rainwater will be used for cleaning MGBs and loading and unloading areas, for MAGS scrubber water, and for the heat recovery system to generate hot water.

Liquid wastes are generated from washing down MGBs and loading and unloading areas, and potentially during spill management. Waste water generated in this fashion will be pumped from the collection sump and stored in a tank to be used in conjunction with collected rainwater for MAGS operations and heat recovery.

All water generated by the condenser is returned to the MAGS closed water loop reservoir.

All operations are undercover and contained within bunded concrete areas. As such there will be no issues associated with management of rainwater potentially becoming contaminated within bunds.

The practices of containment and on-site utilisation will ensure that no liquid wastes or contaminated stormwater will be discharged off-site.

Some waste waters may not be able to be reused/recycled and may require a trade waste agreement with the local authority for intermittent batch discharge to sewer. Once the characteristics of waste waters arising from the facility are better understood options for reuse, recycling or disposal to sewer can be evaluated.

Noise

Noise will mainly be generated by the burner, pumps, compressors and fans.

The MAGS unit generates less than **75** dB within 1.5 m.

Due to the size and hours of operation of the facility and its location in an industrial estate, noise is not expected to be of nuisance to nearby occupiers.

Non-conformance and emergency response

The EPA will be informed of any facility malfunction or upset condition that leads to emissions non-compliance within 24-hours of the occurrence, including the reasons for and the measures being taken to manage this risk in the future.

A standby power generator and fuel will be available for emergency power to the facility in the event of a power failure.

Training

Appropriate training (e.g. incinerator operations, spill management, etc.) and personal protective equipment will be provided to staff, and an occupational health and safety plan developed and implemented.

Training will be provided in order for all employees to fulfil their duties in an efficient and safe manner. The Site's Environmental and Occupational Health and Safety Management Plans (SEMP/OHSMP) will document operational management requirements and procedures, and require documented staff training in them.

Training will be provided to staff in a range of areas, including:

- Occupational Health and Safety; (e.g.);
 - Manual Handling,
 - Confined Space Entry,
 - Heat Stress and Hydration,
 - First Aid,
 - Emergency Management,
 - Personal Protection Equipment.
- Environmental Management; (e.g.);
 - Code of Practice for the Management of Clinical and Related Wastes,
 - EPA Licensing Requirements,
 - Waste selection/blending, handling and loading,
 - Bin Cleaning,
 - Spill Management,
 - Char and Residue Management.
- MAGS Operation and Maintenance;
- Monitoring Equipment Operation, Maintenance and Calibration;
- Waste Acceptance/Rejection Procedures;
- General Housekeeping; and
- Record Keeping.

Regular training programs will be based on the facility's SEMP/OHSMP which will incorporate the relevant provisions of the WMAA's *Industry Code of Practice (CoP) for the Management of Biohazardous Waste (including Clinical and Related Wastes)*.

Record keeping

All collected information will be available on-site for inspection by an authorised officer of the EPA at any time.

Documentation, in the form of EPA Waste Transport Certificates (WTCs) will be required for all wastes accepted from clients at the facility. This documentation includes:

- Waste generator's name, address, contact number, authorised individual;
- Date of waste generation;
- Waste type and quantity (mass);
- Transporter's name, registration and authorisation number and contact person;
- Date of delivery to waste management facility;
- Waste management facility authorised acceptance signatory;
- Date of waste destruction; and
- Any other information required by the EPA.

All waste fed in to the incinerator will be weighed before loading and the mass of each batch of waste incinerated will be recorded. Collecting this information will enable operator compliance with the Industry Code of Practice (CoP).

EPA regulations require a person who holds a licence for a facility managing a listed waste to retain accurate records of the amount (calculated in tonnes) of listed waste that is collected, transported, stored, and disposed of in each successive 12 month period for a period of 2 years. These records will be held for the life of the facility.

All wastes generated by the facility (e.g. char/residues, etc.), and safely disposed of off-site, will have the amount (mass) and type of waste recorded along with the date and the details of the premises at which they were disposed to.

All operational, emission data and calibration records from continuous monitoring and stack testing will be retained for the life of the facility.

Maintenance records for the incinerator and monitoring equipment will be retained the life of the facility.

All staff training records will be retained for the life of the facility.

Proposed facility management framework

In accordance with EPA guideline requirements a range of documentation will be produced prior to construction and commissioning/operation of the proposed facility, the major elements of which are presented below.

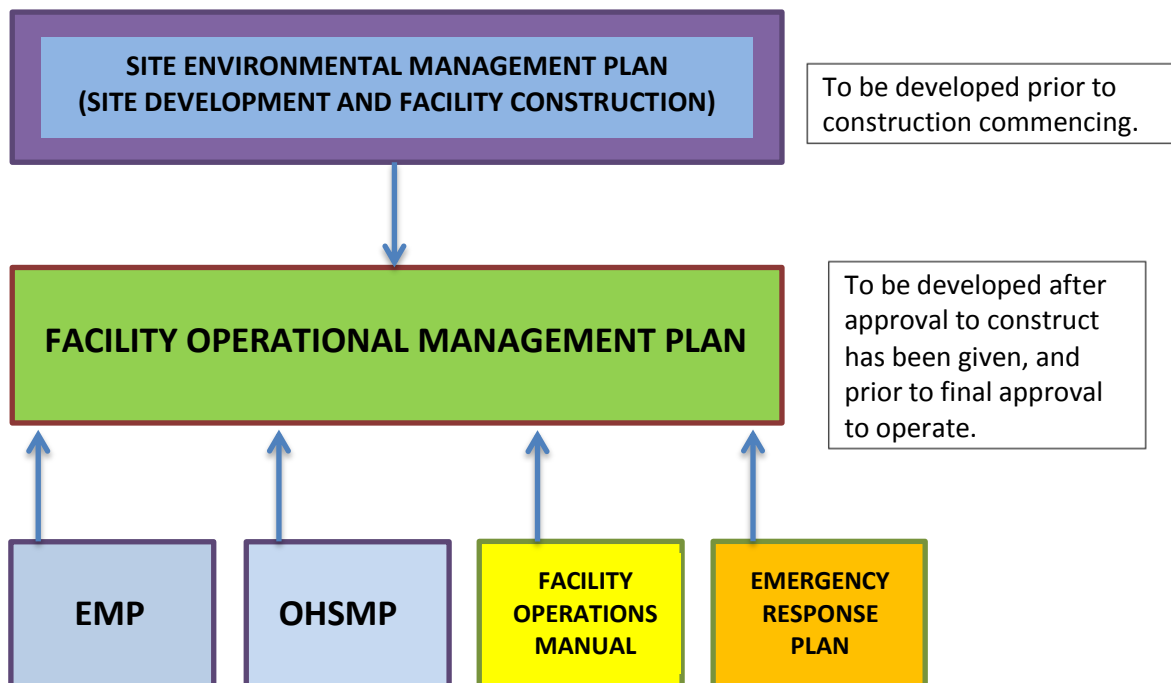


Figure - Proposed Facility Management Framework