Chapter 3

Proposal description

3 Proposal description

3.1 Overview

The proposed Western Sydney Energy and Resource Recovery Centre (WSERRC) (the proposal) is an Energy from Waste (EfW) facility designed to thermally treat up to 500,000tpa of residual Municipal Solid Waste (MSW) and residual Commercial and Industrial (C&I) waste streams that would otherwise be sent to landfill. This process would generate up to 58MW of base load electricity some of which would be used to power the facility itself with up to 55MW exported to the grid. A proportion of the electricity generated would be categorised as renewable.

The proposal involves building of all onsite infrastructure needed to support the facility including site utilities, internal roads, weighbridges, parking and hardstand areas, stormwater infrastructure, fencing and landscaping.

The facility will use established and proven EfW technology. Moving grate technology has been chosen as the means to thermally treat incoming waste to recover energy and advanced flue gas treatment technology will be installed as the means to clean air emissions. Moving grate technology has been used globally for over 50 years and in that time the technology has been improved continually, responding to regulatory, industry and public demands.

The NSW EfW Policy Statement[1] (NSW EfW policy) states that

'to ensure emissions are below levels that may pose a risk of harm to the community, facilities proposing to recover energy from waste will need to meet current international best practice techniques.'

This proposal has been designed to meet the European Industrial Emissions Directive (IED) (directive 2010/75/EU of the European Parliament)[2] and the associated Best Available Techniques (BAT) Reference document for Waste Incineration[3] (BREF) which sets the European Union environmental standards for waste incineration as published on 3 December 2019. The EU Commission Implementing Decision (2019/2010) on the 12 November 2019 states the best available techniques (BAT) conclusions as the main element of the BREF and prescribes them to be adopted by Member States. Additionally, the facility will comply with the technical criteria set out in the NSW EfW policy (refer to **Chapter 5 EfW policy**).

[1] https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/epa/150011enfromwasteps.pdf
[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0075
[3] https://eippcb.jrc.ec.europa.eu/sites/default/files/2020-01/JRC118637_WI_Bref_2019_published_0.pdf

The BREF sets emission limits for several emission parameters which are more stringent than previous versions of the BREF responding to continuous improvements to emission control technology and practices. The BREF limits are also considered more stringent than existing NSW POEO requirements. This proposal has been designed to, at a minimum, meet the limits set in the IED and associated BREF. Compliance with the newly published BREF is world's best practice regarding environmental performance of EfW facilities. To future proof the facility against more stringent standards in the future, the proposal will use a wet scrubber which is a sophisticated flue gas treatment technology able to clean the flue gases to a level that surpasses currently accepted best-practice standards. The distributed control system (DCS) and continuous emissions monitoring system (CEMS) design will allow the flue gas treatment process to respond to variations in the flue gas to maintain stack emissions within regulated emission limits.

As part of the maintenance of the facility, the proposal will consider adopting new and proven technologies that may provide an improvement to the facility when technically and commercially applicable. As such the design has been developed to allow for such improvements during the facility's lifetime and thus allowed for ongoing continual improvement.

For example, the facility has been designed in a way that allows components to be upgraded in response to advancements in EfW technology and equipment, so the facility can continue to operate in line with leading best practice. The design also includes enough space and flexibility to maintain, remove and replace components easily and safely that may differ in dimensions from the original equipment. The modular nature of the design means that components can be removed and replaced without removing the entirety of the process plant and equipment. The equipment specified in the design is suitably sized to allow some changes in the process control. The process design can also accommodate enhanced treatment consumables should they become available.

This chapter describes the proposal, including the construction, site layout and operation of the facility. Key design drawings and plans are included in **Appendix C**. The key components of this proposal are outlined in **Table 3.1**.

The proposal, as described in this EIS, has been designed to achieve a high level of environmental performance consistent with the BAT as described in the EU BREF 2019. The international design team has significant experience in the design and environmental assessment of EfW facilities overseas and in Australia.

A contractor, or series of contractors, will be appointed to develop the detailed design and build the proposal consistent with the development consent.
The contractor(s) will be needed to demonstrate experience designing similar facilities and must comply with conditions of consent and an ISO 14001 certified Environmental Management System.

In addition, a suitable operator with experience in managing an EfW facility in compliance with environmental performance standards will be appointed to partner with Cleanaway to operate the proposal.

The selected operator must demonstrate that they are eligible to hold an EPL, having regard to the requirements of the *Protection of the Environment Operations Act 1997* (POEO Act). The operator will also need to operate the proposal in line with Cleanaway's Environmental Policy and independently certified ISO 14001 Environmental Management System, reflecting Cleanaway's commitment to achieving a high level of environmental performance at its facilities. It is the intention for Cleanaway to hold the EPL who will be supported by the specialist contractor also capable of holding an EPL.

Table 3.1: Key components of the proposal

Key Component	Description
Proposal area	The entire site totals 8.23ha which is split into a 2.04ha northern section and a 6.19ha southern section, divided by a strip of land not part of the proposal site but which includes a 'right of carriageway' benefiting the site. The proposal area will be fully contained in the 6.19ha southern portion of the site as shown in **Figure 3.3.** Works to occur on the 2.04ha northern section of the site include the clearing of weeds and exotic vegetation within the existing overland flow channel which is confined to the eastern section of this parcel of land. The northern section will also be used temporarily to support construction works. It is not currently expected that any other works will occur on the 2.04ha northern section of the site as part of this proposal.
EfW facility infrastructure	The main civil and structural elements of the proposal will include the EfW building housing the waste bunker and all process plant and equipment, administration building and visitor and education centre, substation, utilities connections, drainage, foundation design, internal roads and hard standing.
Waste feedstock	The proposal would thermally treat up to 500,000tpa of residual Municipal Solid Waste (MSW) and residual Commercial and Industrial (C&I) waste streams that would otherwise go to landfill. The bunker will have enough capacity to store up to a maximum 17,000t of waste feedstock on site at any one time.

Key Component	Description
Energy	The proposal is designed to generate about 58MW of electricity on a gross basis. Some of the electricity generated will be used to power the facility itself. This is expected to be in the range of 3MW to 5MW of electricity which means that the facility is designed to output between 53MW and 55MW of electricity to the electricity grid. A proportion of the electricity generated would be categorised as renewable.
Ash management	The EfW process creates the following ash by-products: • Incinerator Bottom Ash (IBA): to be captured on site with ferrous metals recovered. The remaining IBA will be collected and transported to a dedicated offsite IBA processing facility and may be incorporated into construction products such as road base, subject to further investigation. This IBA processing facility is under investigation for consideration only and would be subject to a separate development application process and does not form part of the scope of this application. See **Chapter 22 Related development.** • Flue gas treatment residues (FGTr): to be captured, transported for pre-treatment at a hazardous solid waste treatment facility before being disposed of to a licenced restricted solid waste landfill facility. • Boiler fly ash: part of this ash stream is captured with the IBA and part of this ash stream is captured with the FGTr and transported for disposal according to the ash type it is collected with as noted above.
Waste feedstock transport	Waste feedstock will be transported to the site by heavy vehicles either from a pre-processing facility such as the Cleanaway Erskine Park Waste Transfer Station (85–87 Quarry Road, Erskine Park) or direct deliveries from kerbside collections. The expected route between the Cleanaway Erskine Park Waste Transfer Station and the proposal site would be via Lenore Drive and Old Wallgrove Road (also known as the Erskine Park Link Road) which has had significant recent upgrades.
Thermal treatment technology (moving grate)	Moving grate technology is a common form of EfW technology where the waste is passed through the combustion chamber by a moving grate to enable the complete combustion of the waste material.
Construction and operating hours	Construction: works generally carried out in standard working hours or subject to specific conditions that may be included in the EPL: Monday to Friday: 7am to 6pm Saturday: 8am to 1pm No work on Sundays or public holidays Any works taking place outside of the standard working hours would be in line with the Interim Construction Noise Guideline (ICNG, DECC, 2009). Operation: 24 hours per day, 7 days a week.

Key Component	Description
Workforce	Construction: it is estimated that the proposal will create 900 direct construction jobs over the 3-year construction period and in addition between 700–1200 indirect construction jobs. Operations: about 50 full-time equivalent employees and contractors at peak operations.
Site access	Existing access to the site is via a dedicated access road off Austral Bricks Road adjacent to the site's southern boundary. The road crosses over the Warragamba Pipeline Corridor to enter the site from the south. The site access needs to be upgraded to accommodate the traffic movements associated with the proposal. The proposed solution for site access is widening the existing site access on the Eastern side with no additional covering of the pipelines and improving the tie-in to the Austral Bricks Road. The preferred access solution has been agreed in principle with Water NSW. Ongoing consultation will continue with WaterNSW to agree the detailed design and construction method. Site access works do not form part of this EIS and is discussed in **Chapter 22 Related development**.
Water supply	Potable water mains will provide clean water supply to the WSERRC. Potable water mains will serve the external fire and water tanks. A separate pressurised pipe network will connect the fire and water tanks to the relevant systems within the EfW building and visitor and education centre. To supply the proposal site with water, connections to offsite utilities and services is needed, these connections do not form part of this proposal and are discussed in **Chapter 22 Related development**.
Water and wastewater management	Water handled onsite, including process water from the EfW process, will be reused onsite. A gravity sewer system will convey wastewater from welfare facilities in the EfW building and visitor and education centre to a pump station located within the site. A pressurised pipe will discharge flows from the pump station to the Sydney Water sewer outside of the proposal site boundary. The connection offsite does not form part of this proposal and are discussed in **Chapter 22 Related development.**
Communications	A comprehensive Control and Monitoring System which supports the automated operation of the facility will be installed. The operation of the CEMS requires an extensive communication network. To enable the continuous operation of the EfW facility and to mitigate the effect of external factors, a hard-wired telecommunications connection has been proposed via a Fibre to the Premises (FTTP) NBN connection. This is discussed further in **Chapter 22 Related development.**

<table>
<tr><th>Key Component</th><th>Description</th></tr>
<tr><td>Electricity supply</td><td>Electricity reticulation infrastructure, including underground high voltage cables for distribution, switching equipment and low-voltage infrastructure will be installed.

The WSERRC is designed to generate about 58MW of electricity on a gross basis (between 53MW and 55MW of this electricity will be exported to the electricity grid). Some of the electricity generated will be used to power the facility itself (3MW to 5MW).

To allow generated energy to be exported to the electricity grid and to allow electricity to be supplied by the electricity grid when the facility is not operating (for example in facility start-up or shut-down for maintenance) a substation will be constructed on site and a new connection to the electricity grid is needed.

Different options for connection have been discussed with network operators. Three feasible route options to connect the WSERRC to the grid have been identified by Endeavour Energy. This comprises two 33kV options and one 132kV option. All options have been deemed to be technically feasible offering a viable connection to the local transmission network.

An electrical connection to the high voltage network is related development (refer to Chapter 22 Related development).</td></tr>
<tr><td>Related development</td><td>This EIS seeks approval for the construction and operation of the WSERRC as described in this chapter. A few additional developments referred to as related development, are needed to support the operation of the WSERRC or may be subject to further investigation. These will be assessed and determined through separate approval processes under Part 4 or Part 5 of the Environmental Planning & Assessment Act 1979.

The additional proposals that comprise related development are discussed in Chapter 22 Related development and include:
• Processing facility for the pre-processing of waste before delivery to the WSERRC
• IBA processing and secondary metals recovery facility
• An electrical connection to the high-voltage network
• Water and sewer connections
• Telecommunications connections
• Site access works.</td></tr>
</table>

3.2 Construction

This section indicates how the proposal would be constructed, including the likely method, staging, workforce, plant and equipment. Detailed construction plans, consistent with the indicative plans described here, will be prepared following the appointment of a contractor and prior to any demolition or construction works. The proposal would be built and managed by a contractor in accordance with an approved Construction Environmental Management Plan (CEMP) prepared in response to the conditions of consent, and in line with relevant safety management requirements. The CEMP will cover environmental performance, management and monitoring requirements supplemented by aspects such as building demolition, vegetation removal and protection of biodiversity, contamination management, farm dam management, stockpile management, erosion and sediment control and protection of the Warragamba pipeline corridor.

A Community management strategy will also be developed through the construction phase, which will include the set-up of a Community Reference Group (CRG), contact protocols and communication strategy with nearby neighbours, residents and businesses.

3.2.1 Construction overview

Pending approval, design and construction activities are expected to start in Q4-2021 and it would take up to 3 1/4 years (39 months) to complete, subject to any unforeseen delays.

The proposal would likely be built in five phases to reflect contractor requirements, material and equipment availability, and program and delivery schedules. Constructing in phases would also allow for effective site and environmental management. The main phases of construction comprise:

- Phase 1: Demolition
- Phase 2: Site establishment and enabling works
- Phase 3: Main construction works
- Phase 4: Testing and commissioning works
- Phase 5: Finishing and landscaping works.

Although construction works are likely to occur in phases, the operational phase of the proposal would not be staged. Full operations will begin once construction (along with testing and commissioning) is complete.

3.2.2 Construction methodology

3.2.2.1 Phase 1: Demolition

The demolition phase will begin at the start of the construction process and take about three months.

In the demolition phase, initial works would include the construction of site perimeter fencing and security, sediment and erosion control measures to protect the pipeline corridor, realignment of the overland flow path, provision of truck wheel-wash facility and set-up of initial site sheds. The public, businesses, Council and other stakeholders would be notified before work starts. Demolition work would be carried out in line with Australian Standard AS 2601—2001 The Demolition of Structures.

Demolition equipment, including excavation machinery and trucks, will be used to remove existing vegetation, buildings, tanks and services. Specialist equipment and methods will be used where hazardous and/or contaminated materials are encountered. General building and demolition waste, as defined under the NSW *Protection of the Environment Operations Act 1997* (NSW Government, 1997), would be managed in line with the NSW EPA guidelines.

3.2.2.2 Phase 2: Site establishment and enabling works

Following initial clearing and demolition, site establishment and enabling works would be carried out to prepare the site for construction. This phase is likely to start before completion of Phase 1 with some Phase 2 activities to occur concurrently with demolition.

The main site establishment and enabling works comprise:

- Environmental protection works
- Site establishment, including construction of site compounds, hardstand and laydown areas, temporary internal and external roads and car parks
- Site remediation in line with the RAP
- Permanent site security fencing
- Bulk earthworks across the site
- Services location and reticulation
- Stormwater management
- Piling and foundations.

Each of the above elements are described in more detail below.

Environmental protection works

The Contractor must carry out environmental protection works and environmental management activities to meet the requirements of the approved CEMP. Construction mitigation measures to mitigate and manage the potential environmental effects in construction are consolidated in **Chapter 24 Summary of management and mitigation measures.**

Site establishment

Site establishment works will be carried out before the start of substantial construction to make the construction site ready and will include construction of ancillary facilities as well as ensuring protection of the public. An initial rudimentary site establishment for the demolition and clearing works may include portable sheds and facilities. For the main site, construction site establishment works are expected to include the following:

- Removal of redundant services
- Construction site fencing and hoardings
- Installation of sediment and erosion control
- Site offices, crib rooms and services
- Site access roads, hardstands, security fencing, gates, locks and signage
- Construction car park and site support buildings
- Set up of construction monitoring equipment
- Relocation and protection of utilities which run through the site.

Site remediation

A desktop review of the proposal site history and site investigations in 2015, 2019 and 2020 have been completed. This is reported in the due diligence investigations (**Technical report G3**) and a Detailed Site (contamination) Investigation (DSI) (**Technical report G**).

The DSI concludes that the proposal site is considered to have a low water and vapour contamination risk and a low to moderate risk for soil contamination, primarily in the form of soil asbestos.

A draft Remediation Action Plan (RAP), included as **Technical report G2**, was prepared for the site and will be applied to render the site suitable, from a contamination risk perspective, for the proposed land use before construction and in line with the State Environment Planning Policy No 55 – Remediation of Land (SEPP 55).

Permanent site security fencing

The permanent site security fence will be erected as soon as practical, wherever it will not need to be removed for access. In those locations where access is needed, a temporary security fence will be set-up.

Bulk earthworks and spoil disposal

The major components of construction waste to be extracted from the site will include waste materials from demolition as well as clean and contaminated soil from site clearing, bulk earthworks and piling. It is intended that all suitable excavated material, excluding weeds and rubbish, will be reused onsite as fill material.

Bulk earthworks will include stripping topsoil and bulk cut to fill activities, excavation for the waste bunker and preparation and compaction of working platforms, typically limestone sub-base. Topsoil will be stockpiled onsite for later use.

Preliminary design suggests that the proposal will need a small net volume of imported fill. The preliminary material volumes for bulk earthworks are shown in **Table 3.2**.

Table 3.2: Preliminary earthworks material quantities

Material Classification	Approx. volume
Reuse of in-situ materials	50,000m^3
Imported fill material	11,000m^3
Unsuitable Material removed from site	4,000m^3

Material designated suitable for reuse comprises a mix of excavated rock, excavated cut to fill and residual soils. Any excavated materials reused onsite, or imported from another proposal, would be subject to testing and exemption provisions defined under the Waste Classification Guidelines (NSW EPA, 2014). Should the material be classified as a controlled or restricted waste or found to contain contaminants of concern at elevated concentrations, it would not be classified for exemption and reuse and instead be stored in a contained separate location onsite before being transported offsite to a licenced facility. Refer to **Chapter 10 Waste management** for further details.

Stormwater management

The existing overland flow path which runs from south to north along the eastern site boundary will be maintained but realigned and formalised as a revegetated trapezoidal channel with a 300mm deep low-flow meander in the base. It is anticipated that the use of 40t excavators, backhoes and pipe laying teams would be employed to facilitate construction of the stormwater management system.

The detail of water management in construction will be included in the CEMP in response to a condition of consent.

Piling and foundations

Piled foundations will be required for several areas of the proposal. Before starting the piling, the site will be prepared, including construction of temporary ground stabilisation works and hardstand areas to allow all-weather access for piling rigs, mobile cranes and delivery trucks.

While final pile design is not complete, a continuous flight auger (CFA) piling rig is likely to be used to install 600mm to 900mm diameter piles. Piling is likely to be undertaken concurrently in more than one location, and later slab foundations, bunker walls and building works will begin progressively as completed pile areas become available.

3.2.2.3 Phase 3: Main construction works

This phase is likely to start progressively and proceed concurrently in Phase 2 activities as areas of the prepared site become available.

The main construction works will comprise:

- Structures works (concrete and structural steel)
- Process halls, process plant delivery, installation, testing and commissioning
- Fuel and water storage and reticulation
- Materials handling (conveyors)
- Stack
- Finishes, including facades, roofing and internal finishes
- Ancillary services, including mechanical, electrical, HCAC, external substation and in-ground services
- Visitor and education centre
- Internal operational roads and carparks.

Details of the above elements are described below.

Structures works (concrete and structural steel)

Concrete construction will typically be used for pile caps and building foundations, ground slabs, machine foundations, bunker and boiler house walls, stair cores, suspended slabs and buttress walls. The bulk of the concrete structure will be constructed using standard concrete placing methods and will occur regularly throughout the construction period in standard hours.

Concrete will be delivered by agitator trucks and placed using concrete boom pumps to access the location.

Structural steel columns and beams will form the main frame for each section of the facility with steel roof trusses and secondary steelwork erected to support roof, wall cladding, operating plant and equipment.

All waste receival, handling, processing and storage area floors will be impermeable.

Process halls and materials handling conveyors

Elements of the specialised operating plant to be installed include boilers, flue gas treatment equipment, air-cooled condensers, ash handling equipment, tanks, silos and generators and transformers. These will typically be installed on pre-prepared equipment foundations built to supplier specifications.

Some elements are complex and require a specific assembly sequence and temporary supports or fixings to maintain stability. As some of these operations must proceed to completion in a continuous process and cannot be completed within a single working day, out-of-hours construction may be needed.

Fuel and water storage reticulation

A series of above-ground tanks, pipework and ancillary spaces will be incorporated within the site for fuel and water storage. Prefabricated tanks will be delivered to site, and in some cases will entail large loads requiring special road access permits. They will be placed on pre-prepared foundations using mobile cranes.

Stack

The proposed stack would be approximately 75m in height and comprise an outer steel structure with two separate flues (fibreglass inner linings). This will be constructed using mobile cranes and specialist access equipment and ideally will proceed as a continuous operation until the overall stability of the structure is achieved. For this reason, erection and stabilising of the stack structure cannot necessarily be completed within a single working day and out-of-hours construction may be needed for 2 to 3 days.

Finishes, including facades, roofing and internal finishes

The façade comprises a mix of solid elements (concrete and brick finishes), perforated metal cladding and glazed elements, as well as green walls and timber elements. Urban design treatments will be incorporated in elements of the final design.

Facades will arrive as prefabricated components to be assembled and installed on site. Other walls include the rammed earth wall, double brick walls and blockwork walls which will generally be constructed in-situ using scaffolds to allow safe access to work areas.

Ancillary services

The substation will be constructed on a piled raft foundation to avoid unnecessary excavation of and concomitant materials handling.

Construction of the substation foundation and pads will utilise general earthworks machinery, including excavators, dozers for spreading, compactors, grader and smooth-drum roller with water carts used to assist with watering for compaction when required.

Concrete construction using standard concrete placing methods will typically be used for pile caps, ground slab and equipment foundations. Concrete will be delivered by agitator trucks and placed using concrete boom pumps to access the required location.

The substation building will be constructed with double skin blockwork and outer layer brick walls using traditional low-rise building techniques with use of access scaffolds, backhoes and excavator.

In-ground service mains (stormwater, water, process water, fire, piping) will typically be installed in concrete trenches cast within the structure slabs and buried in conduit in trenches or directly buried external to the main building. Installation of services will be done by subcontractors and coordinated on site to suit the overall construction program and other activities.

Visitor and education centre

The visitor and education centre comprises a mix of architectural and construction types, including timber construction supported on a ground bearing slab, concrete lift core and a rammed earth blade wall.

Internal roads and carparks

Internal roads, carparks and truck coupling and de-coupling areas will be constructed using general earthworks machinery. Concrete and asphalt pavements will require delivery and placing of concrete using agitator trucks and asphalt delivered by road and placed by a specialist subcontractor. Incoming and outgoing weighbridges are incorporated within the external hard standing and will be installed into pre-prepared concrete pits within the concrete pavements using mobile cranes.

3.2.2.4 Phase 4: Testing and commissioning of works

This phase will start progressively on completion of the relevant main construction works and proceed concurrently with Phase 5. On completion of installation, testing of all major process components, including emission control systems, will be done. The main testing and commissioning activities include:

- Preparation of a Proof of Performance Plan
- Input/Output (I/O) testing
- Commissioning of individual pieces of equipment
- Commissioning of systems
- Commissioning and functional testing of whole facility
- Testing and commissioning of CEMS
- Proof of performance trials.

After commissioning has been successfully completed and signed off by the engineering team, a series of performance tests can begin. The exact testing regime and proof of performance trials will be consistent with a proof of performance (PoP) plan prepared in response to the conditions of consent, but will likely include:

- Testing performance of all major process component, including emission control systems, to make sure that the facility is operating within the specified emissions limits
- Set-up of all criteria for operation, control and management of the abatement equipment to assure compliance with the emission limit values specified in the EPL
- Confirming that all measurement equipment of devices used for the purpose of forming compliance have been subjected, in situ, to normal operating temperatures to prove their operation under such conditions
- Noise testing to make sure approved noise limits are achieved
- General performance testing to make sure that the facility is operating within the expected parameters
- Demonstrating that the proposal is compliant with the relevant licences and approvals as well as environmental and safety criteria.

The intention of all commissioning, testing and proof of performance trials is to facilitate environmental performance and that the facility will operate as designed and approved.

3.2.2.5 Phase 5: Finishing and landscaping works

Some aspects of this phase are likely to start before completion of Phase 3 as site areas become available. The main finishing and landscaping works elements include:

- Completion of internal roads and carparks
- Truck coupling and decoupling areas
- Landscaping.

Operational roads will have largely been completed in Phase 3 before testing and commissioning. Outstanding internal roads and visitor carpark will be completed as areas become available.

Nearing completion of construction, the final fit-out and landscaping phases will include minimal plant such as bobcats, backhoes, and smaller excavators. Trucks importing soil may also be needed.

3.2.3 Indicative construction timeline

The overall construction timeframe is expected to be 3 and ¼ years (39 months). **Figure 3.1** outlines the main stages of construction and an indicative timeframe for each stage.

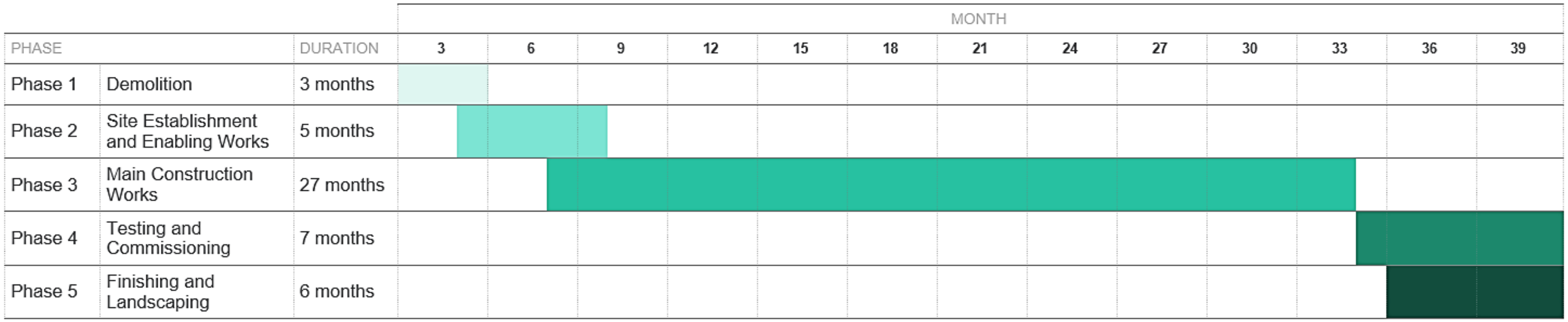


Figure 3.1: Indicative timeframe of construction stages

3.2.4 Workforce

The construction workforce will comprise trades and construction personnel, subcontract construction personnel and engineering, functional and administrative staff. Workforce size will vary across the day and throughout the phases of construction. It is estimated that the proposal will create 900 direct construction jobs over the 3-year construction period and between 700–1200 indirect construction jobs.

Table 3.3 shows assessed peak and average workforce numbers for each construction phase (accounting for workforce distribution and overlapping of some phases).

Table 3.3: Peak and average workforce predictions

Phase	Peak	Average
Demolition	20	20
Site preparation and enabling works	40	40
Main construction	600	300
Testing and commissioning	200	130
Finishing and landscaping	40	40

3.2.5 Construction hours

Construction would largely be carried out in standard working hours or subject to specific conditions that may be allowed within a consent:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sundays and public holidays: no work.

For any activities where longer work hours are required, requests for construction work to be undertaken outside of the above hours will be made, such as for:

- Utility diversions or upgrades, where effects to existing services cannot be otherwise reasonably managed within standard working hours
- Large concrete pours (for example, bunkers) where concrete is poured continuously over periods of 24-hour operation over several days
- Delivery of oversized plant and equipment (tanks, stacks, crawler cranes and large earthmoving equipment) which need to travel on New South Wales roads outside of EPA recommended construction hours. Such activities will be conducted in line with NSW Police and TfNSW requirements which many include out-of-hours movements when vehicle numbers on the network are lower.

- Installation of oversized plant which needs to be installed safely and sequentially, using cranes in a very specific order to maintain stability and safety at all stages of installation and assembly
- Safety works, including mandatory safety inspections, carried out before operatives starting work on a daily and ongoing basis. These inspections will also occur after the operatives have completed works each day.
- Emergency works to avoid the loss of life, property and/or to prevent environmental harm.
- Maintenance and utility works where out-of-hours work is specified by the Utility stakeholder
- Maintenance of specialist construction plant.

Any works taking place outside of the standard working hours would be done in accordance with the Interim Construction Noise Guideline[4].

3.2.6 Plant and equipment

The plant and equipment needed to build the proposal would be finalised by the contractor, with details included in the CEMP. The plant and equipment that would be used, and is typical to any major construction proposal, would likely include:

- Backhoe loader
- Bulldozer (Cat D8 to Cat D10 or similar)
- Chain saws
- Concrete saws
- Diesel generator
- Dump truck
- Excavator
- Excavator hammers
- Mobile crane
- Pumps
- Truck and dogs
- Water cart
- Hand tools
- Compactors (Cat 835 or similar)
- Concrete boom pump
- Concrete trucks

[4] ICNG, DECC, 2009.

- Concrete vibrator
- Front end loaders (FEL)
- Graders (Cat 14G to Cat 16G or similar)
- Piling rigs (bored piles)
- Padfoot roller
- Vibration roller
- Forklifts and road profiler.

3.2.6.1 Water consumption

A high-level assessment of the likely water demand in the construction phase has been completed. Major water usage on site would arise from:

- Construction staff (potable water)
- Construction staff (non-potable water)
- Water to support earthworks and road construction, including dust control and embankment conditioning
- Washdown of trucks and other plant before leaving site
- Miscellaneous usage.

In the construction phase the average monthly water use is estimated to be 630m^3 with a maximum of 1,240m^3 and minimum 30m^3. Total expected water demand for the construction phase is about 22,500m^3 (22.5ML).

To meet the non-potable demand, there is potential for some water to be retained onsite, given the location and site drainage characteristics of the existing site and proposals to fill in an existing pond and install alternative site drainage paths and storage. It is likely that retained stormwater would be used for civil activities such as dust control.

3.2.7 Traffic management

There are temporary traffic management and access controls needed in construction. These controls would be installed at various points depending on location and staging. The final controls would be developed in the detailed design and applied under a Construction Traffic Management Plan (CTMP). A draft CTMP including heavy vehicle movements is available in Appendix A to **Technical report K Traffic and Transport Assessment Report**.

A mix of vehicles will be used to build and service the construction works, including heavy vehicles, cranes, cars, utes and trucks. It is expected that all vehicles will be able to park onsite.

It is estimated that an average of about 45 heavy vehicles per day (88 daily heavy vehicle movements) are expected to travel to the site across the three-year construction period. Isolated construction activities, including major concrete pours, would result in an absolute peak of 75 heavy vehicles (150 heavy vehicle movements) for up to 10 days. Heavy vehicles would include rigid trucks, truck and dogs and semi-trailers.

Heavy vehicle movements on local roads will be minimised as much as possible and restricted to designated haulage routes which would be via Wallgrove Road and the Westlink M7 Motorway.

Generally, no specific temporary traffic control or pedestrian arrangements are expected to be needed on the public road network. However, specific controls for special deliveries, such as for cranes, may be needed and would be done in accordance with NSW Police and Transport for NSW requirements.

3.2.8 Site compounds

Areas for site compounds, initial construction laydown, hardstand areas and workforce parking will be included at the site.

The main site compound will be located to the eastern side of the site, so that it is clear of the overland flow path. In later stages of construction, part of this area will become the construction site for the visitor and education centre and air-cooled condenser (ACC).

An area for temporary stockpiles in the bulk earthworks and detailed excavation works is designated on the northern portion of the site. Part of this area may be retained as a temporary stockpile area until later in the construction period and will eventually be used for construction of road pavements.

3.2.9 Construction footprint

The detailed layout of the construction site will be developed for the proposal before construction. **Figure 3.2** shows an indicative construction site layout and footprint**.**

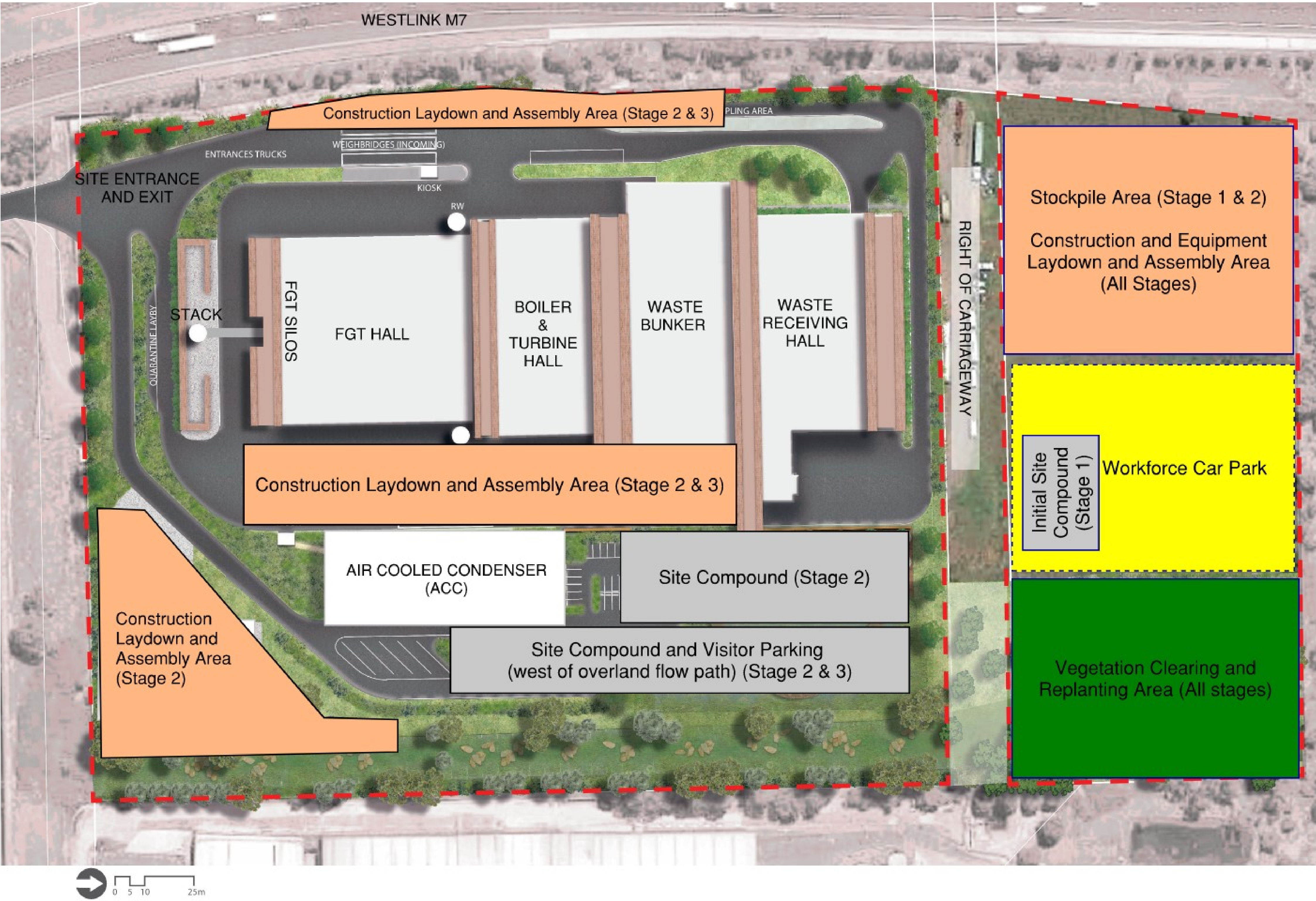


Figure 3.2: Indicative Construction Site Layout

3.3 Site layout and design

As shown in **Figure 1.3** of **Chapter 1 Introduction**, the proposal site of 8.23ha is split into two parts (a 2.04ha northern portion and a 6.19ha southern portion) divided by a small strip of land not part of the site but which includes a 'right of carriageway' that benefits the site. The WSERRC will be developed and fully contained on the southern 6.19ha portion. Works to occur on the 2.04ha northern section of the site include the clearing of weeds and exotic vegetation within the existing overland flow channel which is confined to the eastern section of this parcel of land. The northern section will also be used temporarily to support construction works. It is not currently expected that any other works will occur on the 2.04ha northern section of the site as part of this proposal.

Table 3.4 describes the key features of the site layout. The numbers within column 1 of **Table 3.4** correspond to the numbers within **Figure 3.3** for easy cross-reference.

Table 3.4: Site layout description

#	Key element	Description
1	Site entrance/exit	The site will be enclosed by a fence with perimeter control. All entrances to the site will have automated gates with video monitoring. All vehicles will enter via the gated entrance off Austral Bricks Road. A Waste Vehicle Inspection bay will be located adjacent to the weighbridges. On entry, two vehicle streams are created. Circulation around the site will be for heavy vehicles such as waste delivery trucks and residue collection trucks. The road to the visitor and education centre and parking will be for visitors and staff in light vehicles (cars, motorbikes) and for buses exclusively. This allows separation of site traffic and public/staff traffic. Pedestrian access will be installed adjacent to the vehicle access. Pavement will carry on through the site, taking pedestrians directly to the visitor and education centre safely separated from light or heavy vehicle traffic. Bike racks/sheds will also be installed on site to allow cyclists access to the site.
2	Incoming weighbridges	The incoming weighbridges will weigh the trucks on entry to monitor the tonnage of waste entering the facility. The weighbridge location has been selected to make sure that no queuing is required onto the Austral Bricks Road even at the busiest times of day.

#	Key element	Description
3	Truck decoupling and coupling area	The truck decoupling area allows the site to accept higher mass vehicles such as B-doubles. The B-double trailer would have to be decoupled in the designated area and tipped one section at a time. The site traffic design allows this to happen in a one-way system, thus not disrupting traffic flow around site.
4	Waste receiving hall	The waste receiving hall is part of the main EfW facility. Trucks will enter the enclosed receiving hall via fast moving roller shutter doors. The receiving hall will be kept under negative pressure to prevent odour escape and is where trucks unload waste directly into the waste bunker. Negative pressure will be achieved by drawing air from the tipping hall and bunker to the boiler (combustion air). For boiler downtime (for example in maintenance), an odour control system will be installed to prevent odour escape.
5	Bypass	This bypass allows vehicles for the collection of spent consumables and maintenance to bypass the waste receiving hall for safety.
6	Waste bunker	The bunker is used to temporarily store the waste feedstock, which would include overhead cranes to mix and load the process lines via the feed hopper. The bunker will have enough capacity to store up to a maximum 17,000t of waste feedstock on site at any one time. The bunker will have enough capacity to store between 5 and 7 days of waste, roughly 12,600t of waste feedstock onsite at any one time in normal operations. If there is a need for extended storage, for example due to a public holiday, the facility can close 50% of its tipping bays and thus store up to a theoretical maximum of 17,000t of waste onsite.
7	Boiler hall	Comprising the boiler plant for the combustion of waste.
8	Steam turbine hall and generator set	Comprising a steam turbine and generator to recover electricity from the steam.
9	Incinerator Bottom Ash (IBA) building	A drive through style IBA building will allow vehicles to collect the IBA, including a short-term storage of IBA and recovered metals onsite. The IBA building has been sized to store about 5 days' worth of IBA and metals, which is roughly 1,800t of IBA and about 250m^3 of recovered metals at any one time.
10	Flue Gas Treatment (FGT) hall and FGTr silos	Comprising the FGTr plant for treatment of flue gases. The FGTr silos are used to safely, securely and temporarily store FGTr before collection and transportation offsite for disposal at a licenced facility. The FGTr silos have been sized to store at least 6 days' worth of FGTr equivalent to about 360t of FGTr.

#	Key element	Description
		Vehicles will enter dedicated bays for the delivery of consumables and collection of FGTr, through an internalised vehicle corridor. Also included here will be FGT silos housing FGT consumables.
11	Outgoing weighbridges	Outgoing weighbridges will be used to monitor the amount of residue (for example ash and metals) taken offsite for treatment and disposal at external licenced facilities. Waste vehicles will be weighed on both arrival and departure and electronically catalogued.
12	Tank storage area	The tank storage area will be used to store tanks for auxiliary fuel. Auxiliary fuel is used for the auxiliary burners within the boilers and the emergency diesel generator. Ammonia and sodium hydroxide will also be stored in this area.
13	Stack	The stack will be about 75m high and will allow the cleaned flue gases to leave the facility and be fully dispersed to the atmosphere.
14	Parking	Staff parking and visitor parking is located within the segregated roadway adjacent to the visitor and education centre.
15	Visitor and education centre	The visitor and education centre is located on the eastern section of the site adjacent to the roadway for cars and buses. This location has been chosen so that pedestrians do not have to cross operational roads on site. A high-level enclosed walkway will be constructed for pedestrian passage to the main EfW facility. The visitor and education centre will allow tours and help educate and inform the community on the circular economy, recycling, resource recovery and EfW process.
16	Substation	To allow generated energy to be exported to the electricity grid.
17	Air Cooled Condenser (ACC)	To condense used steam back to water for reuse in the closed loop water/steam cycle.
18	Onsite detention (OSD) and bioretention basin	The OSD and bioretention basin are two interconnected basins. The western portion of the basin will act as a bioretention water quality basin which is landscaped depressions or shallow basins used to slow and treat onsite stormwater runoff. The eastern portion will act as an onsite detention (OSD) basin and include an outlet structure and emergency overflow spillway. Site stormwater runoff will be discharged from the OSD basin to the overland flow path.
-	Diesel generator and Uninterruptable Power Supply (UPS)	To allow emergency back-up power in case of failure of the electrical grid so the facility can react in a safe and controlled manner.

#	Key element	Description
-	Continuous Emissions Monitoring System (CEMS)	To continually monitor flue gases so the facility is compliant with statutory emissions limits as set out in this document. CEMS gives real time feedback to the facilities control systems enabling automatic control of emissions. Activities in the reception hall will also be monitored by operators in the control room directly. The control room will overlook the bunker to allow visual inspection.
-	Other ancillary equipment	Other ancillary equipment necessary to operate the facility, including utilities, civil works, drainage, water treatment and recycling plant, compressed air systems, fire safety equipment and small electrical and mechanical systems such as pumps, conveyors, cranes and instrumentation and controls.
-	Maintenance entrances	There are a variety of doors around the main building to allow access for maintenance vehicles.
-	Traffic control	A traffic control system will be installed onsite to safely control the flow of traffic both around site and for access to the tipping hall and each individual tipping bay.
-	Fencing	Fencing will be installed around the facility perimeter to secure the perimeter of the facility.
-	CCTV	CCTV will be installed at strategic locations throughout the facility and will be monitored for both safety and security of staff and visitors.

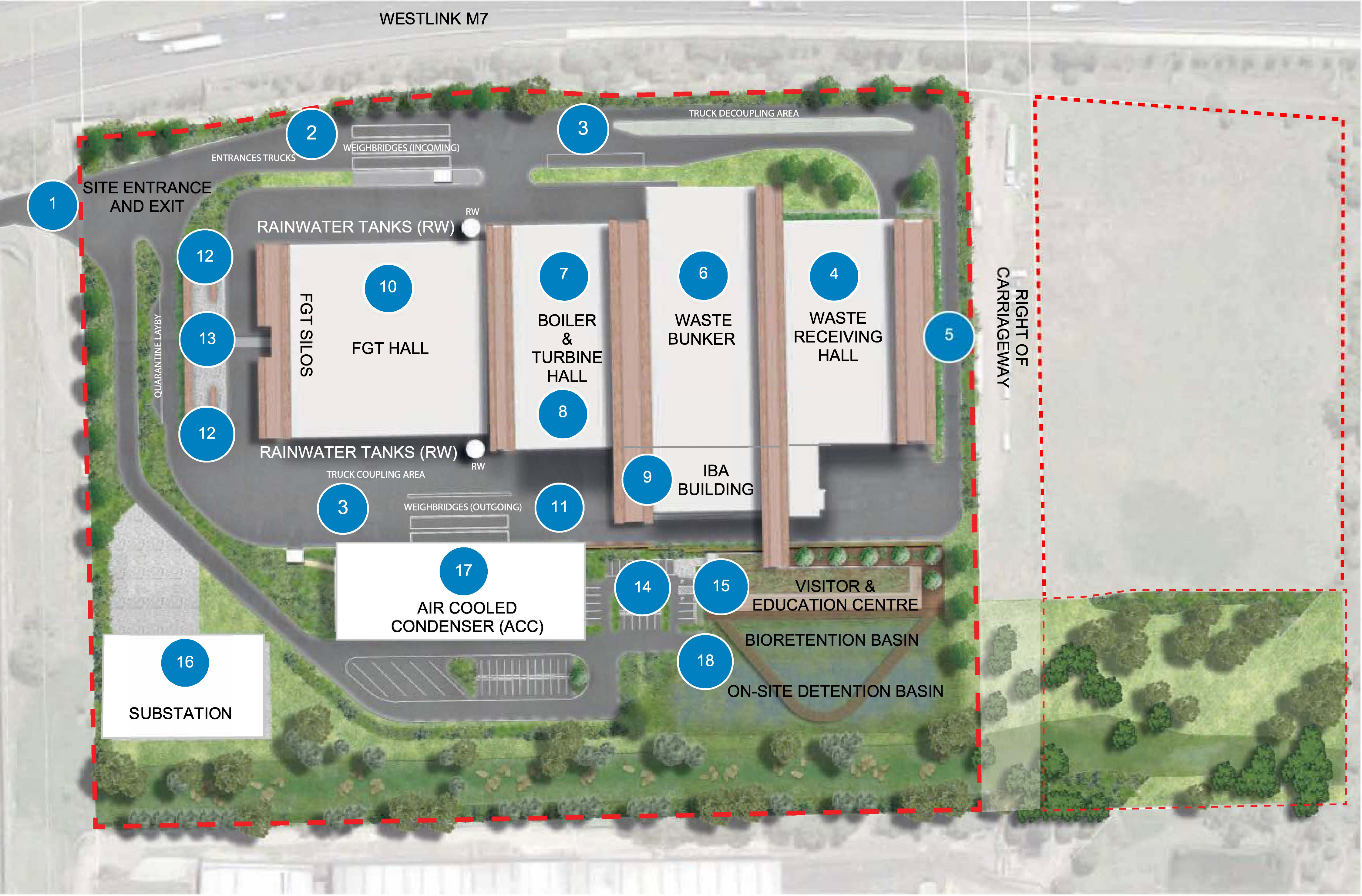


Figure 3.3: Proposed facility layout

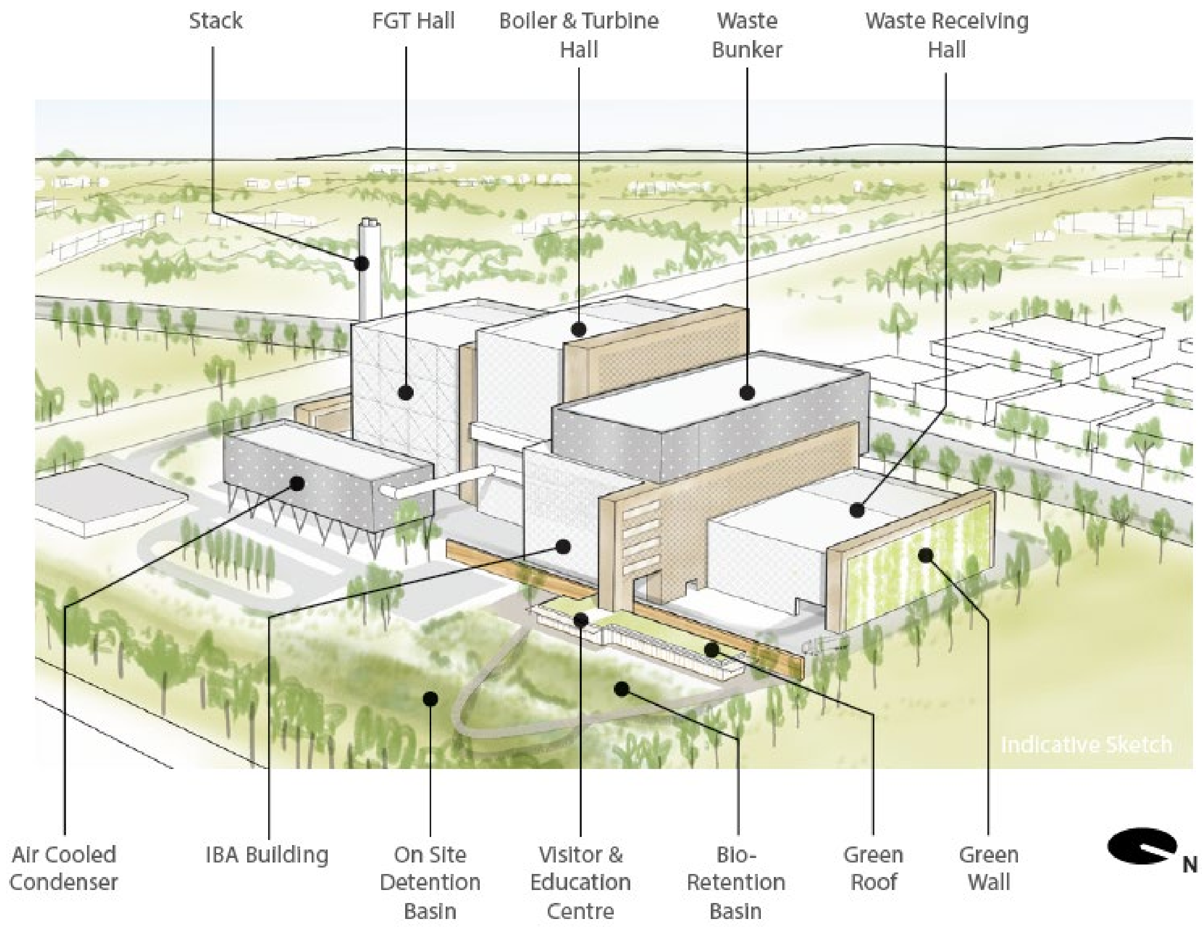


Figure 3.4: Indicative 3D facility dimensions

3.3.1 Approach to architecture and landscape design

One of the objectives of this proposal is to:

'Develop a facility which integrates the built form into the existing context, including adopting architecture which minimises visual bulk, and provides opportunities to enhance the appearance of the building'.

The approach to architecture and landscape design was driven by this objective of integrating the built form of the proposed facility into the local and district wide context, ensuring measures to mitigate the visual bulk of the building, and focus on the human experience for passers-by, employees and visitors.

The architectural design work completed to date represents the beginning of the design process and sets the direction for further refinement.

The architectural team has worked closely with the wider technical specialists to understand the technical parameters of the facility so that these operational requirements of the facility are fully integrated into the overall design.

The design responds to the SEARs and has been influenced through engagement with stakeholders such as Blacktown City Council (BCC) and Western Sydney Parklands Trust (WSPT). Following feedback from the Western Sydney Parklands Trust, the design also enables the continuation of green areas through the site.

Initially, four main design aspirations were identified and described which set the priorities for the design outcome. All design refinements are driven by and critiqued against these aspirations to make sure they are in alignment. The design aspirations are as follows:

1. Embrace innovation:

- Lead the way in the use of world-class sustainable technologies
- Become a catalyst for high-quality design and innovation in Western Sydney
- Promote a circular economy
- Create an exemplar facility.

2. Integrate with the context:

- Positively contribute to and integrate with existing and the emerging local character of the area
- Ground the building into the unique local context
- Shape the built form to mitigate visual effect
- Select materials which complement and align with the local environment.

3. Invigorate the wider ecosystem:

- Benefit the local ecosystem and microclimate
- Responsibly manage the site through the handling of stormwater and the reuse of collected rainwater
- Focus the landscape planting strategy around the use of native trees and shrubs to reinvigorate native biodiversity.

4. Provide a generous human interface:

- Be honest and transparent about the purpose of the facility
- Carefully consider the buildings appearance from main public viewing points
- Offer an excellent visitor experience to educate and inspire.

The aspirations are addressed through the design of the building's orientation, form, massing, perceived bulk, façade articulation, materials selection and the integrated landscape design approach. The experience of passers-by, visitors and employees has been carefully analysed to develop an informed and considered design outcome.

Based on the above aspirations and site constraints, the building footprint is designed to be consolidated within the southern section of the site, clustering smaller buildings into one area to limit sprawl, while decreasing height towards the north and south extents of the site to minimise negative visual as.

The physical bulk of the building was broken down by using vertical blades. The use of the 'blades' interrupts the large façades, so they are more visually interesting and less bulky as well as breaking up the mass from main viewing corridors on the M7 in the north and south directions. To further soften the building's appearance from the road and connect it to the landscape, the northern and southern ends of the building will be covered in living green walls, to help blend it into the vegetated backdrop. The landscape design also includes screening around the perimeter of the site to block direct views and increase density of roadside vegetation. The design tightly wraps the building, eliminating any wasted space. Once the building is subdivided in this manner, the facades in between the blades will be clad in materials to break up mass.

The areas in-between the blades are to be clad in materials which become increasingly transparent as you move along the building. This expression follows the internal process, supporting the WSERRC's function as an educational resource. To support the circular economy aspiration, material selection will incorporate renewable or recovered materials where possible.

An EfW facility allows baseload power and is not intended to be set up as a modular design. However, there are elements of modularity associated with the WSERRC proposal.

For example, the proposal uses two boiler lines and so is flexible in being able to operate a single boiler line at a time or both boiler lines together. Additionally, the facility can operate between 70% and 100% of full thermal load which give additional flexibility to operations.

3.3.2 Civil and structural considerations

Civil and structural elements will be fully detailed in the design stage. The main civil and structural elements under thought are:

- Main EfW building housing all process plant and equipment and administration/office space
- Visitor and education centre
- Substation
- Utilities connections (water, power, telecommunications, wastewater)
- Waste bunker
- Stormwater drainage
- Foundation design including stack
- Earthworks and suitability of existing soils/rock for reuse.

Additional considerations that have been made for this proposal include the allowance of ancillary items such as:

- Tanks and suitable bunds
- Roads and hard standing
- Fencing, gates, kiosks and security
- Landscaping.

It is noted that works relating to the main road access and crossing of Warragamba pipelines are considered related development (refer to **Chapter 22 Related development**).

3.3.3 Next steps in the design process

Design process will be further developed in the detailed design. The community will be consulted in the detailed design phase of the proposal by setting up the WSERRC Community Reference Group (CRG). It is envisioned that the CRG will give feedback and input into features of the visitor and education centre, aspects of the green wall and landscaping, and, where possible, final materials selection. Wider community engagement will be encouraged where appropriate – for example, in selecting a local artist to contribute to specific design elements.

3.4 Operation

The following section describes the day-to-day operational characteristics of the EfW facility.

3.4.1 Waste Feedstock

The WSERRC will thermally treat both residual MSW and C&I waste, that meet the requirements of the waste acceptance protocol as described in **Chapter 5 EfW Policy**. The facility will not receive Construction and Demolition (C&D) waste. MSW is household red bin waste whereas C&I waste comes from a variety of commercial and industrial sources, including offices, schools, shopping centres, warehouses and manufacturing. MSW and C&I waste streams are similar in composition. Further detail on the composition of MSW and C&I, what constitutes residual waste and the types of wastes which the facility will not accept is provided in **Chapter 5 EfW Policy** and **Technical Report C – Waste Management** of this EIS.

Figure 3.5 and **Figure 3.6** show images of samples of MSW and C&I wastes respectively, taken at Cleanaway's existing Erskine Park Waste Transfer Station.

Figure 3.5: Sample image of MSW

Figure 3.6: Sample image of C&I waste

3.4.2 Key technical parameters

Table 3.5 shows an overview of the key technical parameters for the operation of the proposed facility.

Table 3.5: Key technical parameters

Parameter	Unit	Value/Description
Annual throughput of waste	t	500,000
Maximum hourly throughput of waste	t	37.5 per boiler line (75 total)
Target annual facility availability	t	≥ 8,000
Guaranteed electrical efficiency	%	≥ 25% (for compliance with NSW EfW Policy Statement)
Expected electrical efficiency (gross)[5]	%	30.5%
Expected electrical efficiency (net)[5]	%	27.8%
Expected facility R1 efficiency[6]	%	81%
Gross electricity generated	MW	Roughly 58

[5] Electrical efficiency (gross and net) will be confirmed in detailed design, so expected values may change. WSERRC will however be compliant with the needed electrical efficiency of greater than 25% as set out in the NSW EfW Policy Statement in all cases.

[6] The facility R1 efficiency is a factor set out by the European Union to help recognise whether a facility is characterised as incineration or recovery. Recovery is the desired status, which WSERRC will achieve. To classify as recovery, the facility must have an R1 efficiency of equal to or greater than 65%. 81% is indicative and will depend on the detailed design.

Parameter	Unit	Value/Description
Wastes treated	#	Residual Municipal Solid Waste (MSW) and Commercial and Industrial (C&I) waste
Calorific value of waste for design	MJ/kg	11.0
Calorific value design range	MJ/kg	7.70 to 14.30
Emissions limits	#	See **Technical report A Air Quality and Odour Assessment Report**
Expected IBA quantity per annum (wet)	t	80,000
Expected FGTr quantity per annum (dry)	t	20,000
Expected boiler fly ash quantities	t	Incorporated into the IBA and FGTr tonnages above.

3.4.3 Throughput

The facility will have a normal operational throughput of up to 500,000tpa of waste, providing about 58MW of electricity per year on a gross basis. A throughput of up to 500,000tpa necessitates the use of two boilers, each boiler having an annual throughput of 250,000t. This is known as having two boiler lines. Each line will have its own dedicated feed hopper, boiler and flue gas treatment. However, the stack and steam turbine will be common to each line meaning there is only a single stack (with two separated flues) and a single steam turbine servicing the facility. The waste bunker, ash system and crane system will also be common and service the entire facility.

The composition of waste feedstock is variable compared to traditional fuels such as coal and gas. Waste composition audits of target MSW and C&I waste streams have been carried out to understand the calorific value, or energy content, of the waste feedstock and the variability over time.

This has allowed a calorific value to be nominated as the design point for the facility with the thermal treatment technology capable of managing variation in the energy content either side of this design point.

An EfW facility must be designed to operate based on such variations in calorific value. For this reason, each EfW facility is designed using a firing diagram as shown in **Figure 3.7**. The firing diagram sets out the range of calorific values over which a facility can operate.

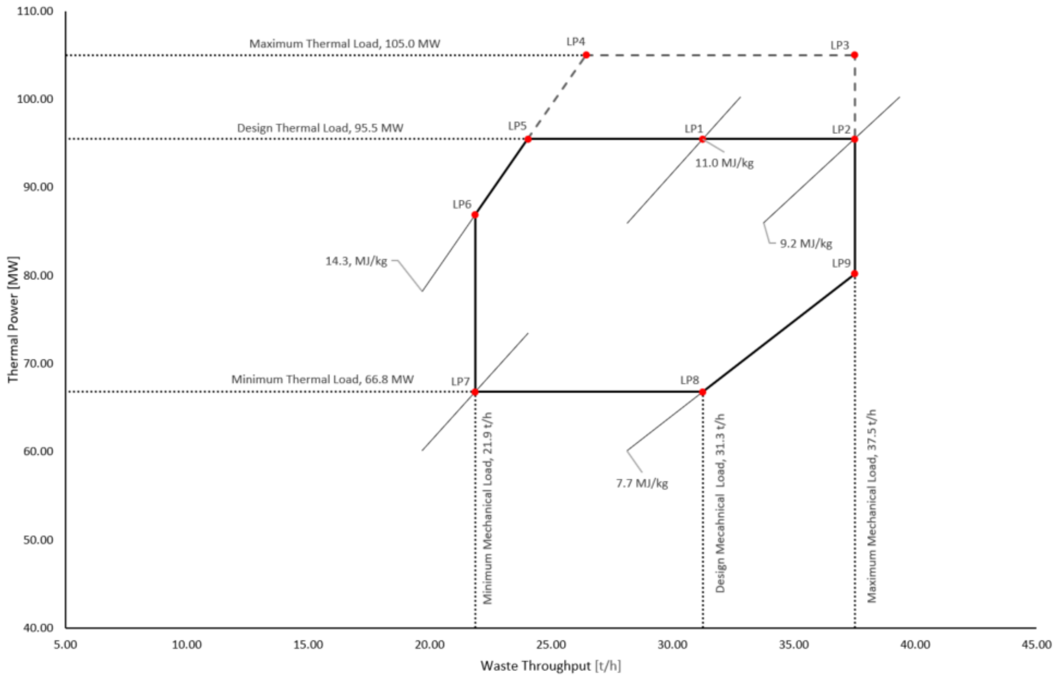


Figure 3.7: Firing diagram

The firing diagram is identical for both boilers. Note that **Figure 3.7** displays the firing diagram for one boiler only.

WSERRC is designed to operate in the region of 8,000 hours per year. It cannot operate all the time (8,760 hours per year) as it needs to be taken offline around twice per year for scheduled maintenance. The design point for the facility is a calorific value of 11MJ/kg, shown by point LP1 in **Figure 3.7**. This is based on analysis of the waste streams (both MSW and C&I) currently received at the Erskine Park Waste Transfer Station. To achieve an electrical gross output of 58MW, the facility must maintain a constant thermal input of 95.5MWth per boiler. The facility aims to achieve a constant boiler load of 100%, hence the amount (mass) of waste loaded into the boiler on an hourly basis can change (via automatic combustion control) as calorific value varies.

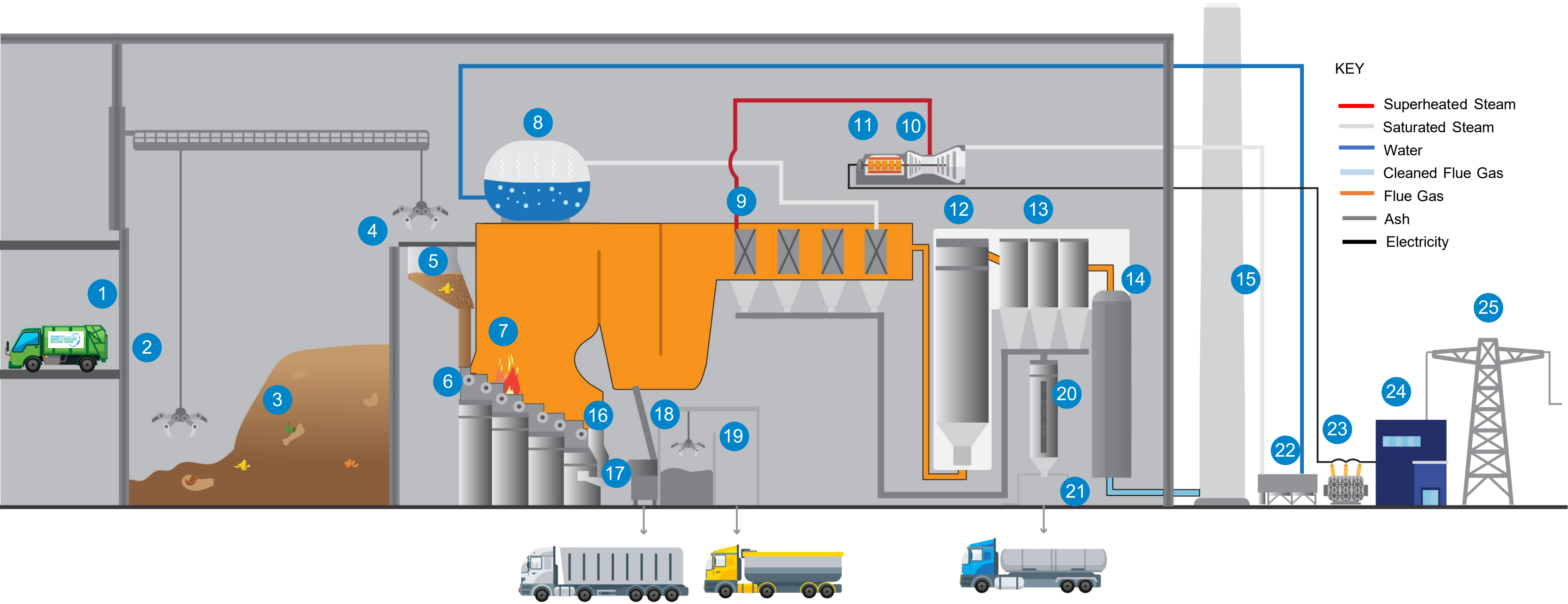
For example, at the design point of 11MJ/kg (LP1), the facility will consume 31.3tph of waste per line which equates to 500,000t of waste (250,000t per line). To achieve 100% boiler load the facility can safely treat waste with a range of calorific values between 9.2MJ/kg and 14.3MJ/kg which have an equivalent mass of between 37.5tph and 24.0tph respectively (LP5 – LP2).

To deal with short-term fluctuations in waste calorific value, the facility has been designed to also accommodate a boiler load of between 70% and 110% of the design boiler load. This is illustrated by the extreme points on the firing diagram (LP7, LP3).

The EfW facility is expected to process 500,000tpa of waste (LP1) per annum. However, within the absolute technical limits of the firing diagram, to allow for short term variation in waste calorific value the minimum volume of waste that could be combusted is 21.9tph, equating to a theoretical minimum of 175,200tpa (operating on one boiler line, LP6 and LP7). To allow for short term fluctuation in the calorific value of the waste, the maximum volume of waste that could be combusted is 75tph (both boiler lines operating at lower than design calorific value, LP2, LP3 and LP9) however the project still commits to a maximum throughput of 500,000tpa. This EIS has considered operation of the facility from an environmental perspective within all possible operating parameters. Approval is sought for a maximum annual throughput for the facility of 500,000t, reflecting the design point of the system.

3.4.4 Process flow

A schematic process diagram of the facility, depicting the main steps in the EfW process from receival of waste through to FGT and residue management is shown in **Figure 3.8**. The main steps in the EfW process for the proposal are further discussed in the following sections.



LEGEND

1	Waste Receiving hall	7	Boiler	13	Bag filters	20	Flue gas treatment residues (FGTr) and boiler fly ash silo
2	Tipping bay	8	Steam drum	14	Wet scrubber	21	FGTr and boiler fly ash collection for treatment and disposal
3	Waste bunker	9	Superheaters	15	Stack	22	Air cooled condenser
4	Waste crane	10	Steam turbine	16	Incinerator bottom ash (IBA) handling	23	Transformer
5	Feed hopper (chute)	11	Generator	17	Ferrous metals recovery	24	Substation
6	Moving grate	12	Semi dry reactor	18	IBA bunker and separate metals bunker	25	Local electricity grid
				19	IBA collection and separate metals collection		

Figure 3.6: Schematic of the EfW operational process

3.4.5 Energy Balance

Figure 3.9 shows the indicative energy balance for WSERRC. The case shown is the design case, point LP1 on the firing diagram provided in **Figure 3.7**. The values provided in the mass and energy balance will be optimised and confirmed during the detailed design process therefore may vary slightly. Design values have been provided here to show that the facility's energy efficiency significantly exceeds that required by the NSW EfW Policy Statement (25% efficiency criteria and an R1 factor of greater than 0.65), although these figures will be confirmed during detailed design, WSERRC commits to meet or exceed the efficiency requirements under the NSW EfW Policy Statement in all cases.

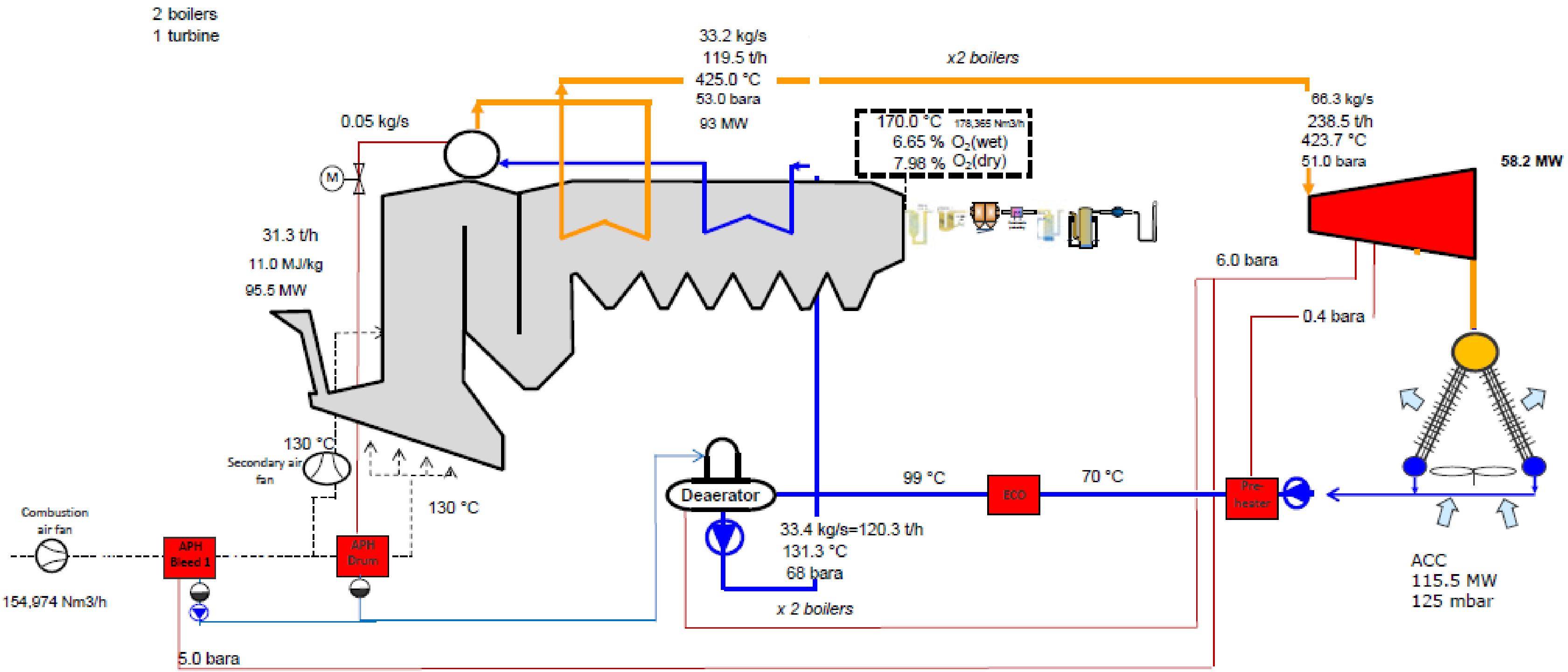


Figure 3.9: Indicative WSERRC energy balance

Note 1 – The figures for a single boiler are shown prior to the turbine. The proposal includes two boilers.

3.4.6 Waste deliveries

Waste will be delivered to the site in enclosed waste delivery vehicles. The route taken to site will depend on the origin of the waste, however all vehicles would enter the site via Wallgrove Road.

WSERRC will include clear traffic signage and signage at the site entrance to identify wastes that can and cannot be accepted at the facility e.g. no asbestos, no hazardous waste, etc.

The vehicles will be weighed via the weighbridge on arrival and electronically catalogued. The weighbridges will be equipped with CCTV, card reader, licence plate scanner and intercom equipment. Weighbridges have been located inside the site at a position that gives sufficient queuing space onsite to manage the peak volume of vehicles expected to arrive on site during any one-hour period. All ingoing and outgoing traffic will be registered by automated licence plate recognition and linked to the truck management system. Trucks regularly visiting the facility can be pre-registered via the management system.

Radiation detection will be installed which will detect radioactive materials and prevent their thermal treatment at the facility. The radiation detection system will trigger an alarm if the level of radiation is 5 standard deviations above background radiation levels. This threshold will be tested and adjusted, if necessary, during commissioning to maintain proper operation. If a radiation alarm is raised, the vehicle will be directed to quarantine for inspection and assessment. A portable survey meter will be used to inspect the load. If a load is found to contain a source of radiation, that load will be rejected and will remain the responsibility of the supplier for proper disposal at a suitably licensed facility.

Once registered in the truck management system, the waste delivery trucks will be allocated to a dedicated tipping bay and will be directed to the tipping hall.

All waste deliveries will come from approved suppliers. This means that all suppliers will have to pre-qualify before they can enter the site. Pre-qualification will include steps so that the waste being delivered:

- Is an acceptable waste stream
- Is suitable for combustion within the facility
- Complies with licence and legislation conditions.

There will be no acceptance of waste at the site from suppliers that have not been through the prequalification process. The prequalification process can be found in **section 5.8** of **Chapter 5 EfW Policy**.

3.4.7 Waste receival

The tipping hall is located on ground level and arranged for unidirectional traffic. Enclosed waste delivery trucks will drive into the waste receiving hall, through fast-acting roller shutter doors, located on the southern elevation of the building.

The waste receiving hall will be kept under negative pressure to prevent odour escape. Negative pressure will be achieved by drawing air from the tipping hall and bunker to the boiler (combustion air). Waste delivery trucks will reverse into the assigned tipping bay. Protection will be given so that delivery trucks do not fall into the waste bunker while tipping.

Waste will be unloaded using either a tipper type or walking floor type trailer into chutes which convey the waste to the storage bunker. The number of tipping bays will be optimised for efficient and convenient turnaround time for delivery trucks in peak hours.

Empty vehicles would exit the receival hall, circulate around the site and exit over the outbound weighbridge back onto the unnamed road.

The facility has been designed to accept waste deliveries from:

- Compactor type vehicles
- Semi-trailer type vehicles
- B-doubles.

The facility can accept walking floor type vehicles or tipping type vehicles.

The design of the weighbridge and tipping hall configuration has been optimised based on the traffic scenario which is described further in **Technical report K Traffic and Transport Assessment** of this EIS.

3.4.8 Waste inspection, quarantine and rejection procedures

The EfW facility will apply procedures for the inspection, quarantine and rejection of unacceptable waste which will include:

- Radiation detection equipment at each of the weighbridges.
- A Waste Vehicle Inspection bay to be located adjacent to the weighbridges. This will be used to divert any vehicle for temporary holding. This will allow a site representative to conduct a close visual inspection of the chain of custody documentation. The waste itself cannot be inspected in this area as it will be housed within an enclosed waste vehicle.
- If there are obvious inconsistencies in the paperwork or other problems noted by facility personnel, the load will be immediately rejected and returned to the supplier.

- If an inspection of the waste itself is needed, there is a dedicated area within the waste receiving hall where the waste can be segregated and tipped on to the floor for inspection. Samples can also be taken for laboratory testing if required. If the waste is found to be unacceptable, it will be reloaded into the truck using a front-end loader and rejected from site and returned to the supplier. If the waste is found to be compliant, it can be loaded into the bunker by the front loader.
- If an unacceptable waste item of sufficient size is identified in the waste bunker by the crane operator (for example a large metal component), the operator can use the crane to pick the item out and deliver it to the segregated quarantine area for further inspection and removal from site if appropriate. Acceptable waste that is oversized can be picked out and shredded in the shredder located adjacent to the bunker. Shredded waste is placed back into the bunker.

In addition to the procedures on site to control the quality of waste combusted in the facility, the pre-qualification procedure will reduce the risk of delivery of unacceptable waste to the site.

3.4.9 Waste storage

Waste feedstock will be temporarily stored in the waste bunker. The bunker will have enough capacity to store about five to seven days' throughput of waste over normal operations.

Cranes will be positioned above the bunker and used for:

- Mixing and distribution of waste within the bunker
- Feeding waste into the boiler feed hopper
- Extracting any items of waste that are out of specification or oversized. Oversized material will be processed in a shredder adjacent to the bunker and fed back into the bunker after shredding.

Crane parking bays will be located inside the facility, adjacent to the bunker and will be used for maintenance of the cranes.

Activities in the waste receiving hall will be monitored by operators in the control room directly. The control room will overlook the bunker to allow visual inspection. Waste will be fed by the waste cranes into the feed hopper.
The purpose of the feed hopper is to control the delivery of waste into the boiler. Each boiler will have its own dedicated feed hopper with each waste crane able to feed each hopper.

The facility is designed to operate two boiler lines. If one is down for maintenance, the other can continue to process waste. The facility has enough redundancy that in most circumstances a single boiler could be used safely to combust waste left in the bunker. The exception to this is maintenance of the turbine or an unexpected shutdown of the entire facility. Odour will be controlled using a dedicated odour filtration system. If there is an unforeseen shutdown, the facility would take steps so that waste is not held in the bunker for an extended period, including:

- Spare parts will be stored on site to minimise downtime from breakdowns.
- In the worst case, if the facility must be offline for an extended period, the facility is designed to be able to empty the bunker of waste using the crane to load vehicles and be removed offsite and disposed of safely to a licenced facility and in line with legislation.

In all scenarios, the facility can always manage odour and waste.

All waste receival and waste storage areas will be impermeable (including flooring and bunker). The waste itself is not liquid but will have a moisture content. Any moisture run-off (which is expected to be minimal) will be absorbed back into the waste itself and fed through the boilers thus a dedicated leachate system is not required. Any sweepings through cleaning of the tipping hall floor, including any run-off from vehicles (such as rainwater deposited on the tipping hall floor) will be swept into the waste bunker to be thermally treated.

3.4.9.1 Waste Mixing

The waste bunker is used for receiving, mixing and temporary storage of waste until the waste is fed to the waste hopper. The size and shape of the bunker has been refined to allow for these activities to be managed successfully. As such, enough space has been provided to allow for a dedicated mixing zone, and the capacity of the waste cranes have been designed to allow for effective mixing.

Waste is a non-homogenous fuel by nature and the process of mixing in the waste bunker is designed so the waste is as homogenous as reasonably practicable when it is combusted. This process seeks to avoid significant variation in the properties of waste and thus the properties of combustion of the waste. In most facilities globally, including the reference facilities, waste is mixed using the waste crane.

When the waste is tipped, it is deposited into the front of the waste bunker into a channel that is made by moving and stacking tipped waste. After the waste falls into the channel, it is moved towards the rear of the waste bunker by the crane into the stacking and mixing position.

The waste will be mixed either by spreading the waste in the grab over a large area by slowly releasing the grab as it moves across the waste pile (when the waste level is flat) or by dropping the waste on the parts of the waste that is stacked at an angle (typically 60 degrees) causing the waste to slide and mix with the waste already in that position. This process will occur several times before being fed to the boiler feed hopper in order to make sure proper mixing has been carried out. Only once properly mixed will the waste be deposited into the waste hopper.

The facility will include at least two cranes, to allow receiving, stacking, mixing and feeding to occur simultaneously. Overall, approximately 66% of the time the waste cranes will be dedicated to stacking, mixing and receiving with the remaining time for feeding. Computer control systems can be used to effectively section the waste bunker and undertake crane operations appropriately so waste is mixed.

Although the cranes can operate automatically, trained operators will be able to implement manual control. Operators will be trained to visually assess the waste bunker and incoming waste to understand how best to operate the cranes and achieve optimal mixing. This is typical for facilities globally, including the reference facilities.

3.4.10 Combustion

Waste is fed from the feed hopper to the combustion grate at a variable rate, depending on the calorific value of the waste. The grate will employ advanced moving grate technology which is the most commonly used technology for the thermal treatment of municipal solid waste.

Waste combustion will take place as it slowly moves along the grate which slopes away from the waste feed chute. The movement of the grate floor components and the slope of the grate will cause the waste, as it burns, to move forward and downwards from the feed point to the ash discharge point. Movement of the grate floor components will also agitate the waste so that new surfaces will be continuously exposed to the flames. The rate at which the waste moves will be controlled to optimise combustion. Typically waste takes about 90 minutes to fully combust.

Waste combustion would be automatically controlled via the facility Distributed Control System (DCS) utilising the advanced combustion control systems and feedback from the CEMS.

3.4.11 Boilers, superheaters and economisers

Figure 3.10 shows the main components of a waste boiler system.

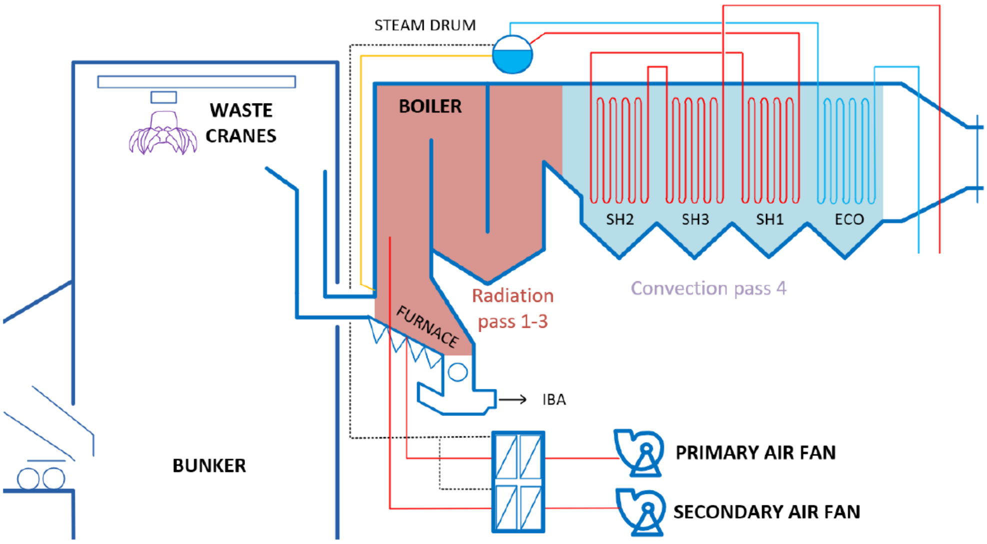


Figure 3.10: Waste boiler system

In the boiler, heat from the combustion of waste is transferred to the feedwater to generate steam. Combustion gases will be held at a minimum temperature of 850°C for at least 2 seconds to comply with the conditions set out in the NSW EfW policy and IED. A series of boiler sections, including several superheater bundles and an economiser pass, which are used to transfer heat at varying temperatures, will enable efficient transfer of heat between the combustion gases and the feedwater. Safety in design in detailed design will consider enough levels of insulation and separation to protect operators working near the boiler. Additionally, the design will consider suitable fire safety practices such that compliance with NSW fire regulations is achieved.

Steam will flow from the boiler section to the steam turbine. The steam will be superheated and will be of sufficient quality (suitable temperature and pressure) for use in the steam turbine without damage to the turbine. Given the high temperature and pressure environment, the steam system will be equipped with appropriate safety features such as temperature gauges, pressure gauges, level gauges and pressure relief valves. The DCS will be able to control and shut down the facility in case of emergency depending on set limits. It will also include the capability for manual intervention for emergency shutdown.

Within the furnace of each boiler, auxiliary burners will be installed for start-up of the boiler and temperature control in the case of receiving low calorific value waste, to enable continuous compliance with the temperature limits set out in the NSW EfW Policy and IED.

Auxiliary burners will use liquid fuel (diesel) that will be stored in bunded tanks on site, the same process that is used at the Dublin reference facility. The auxiliary burners specified will be low NO_x and will be suitably designed within practicable means to minimise air emissions. The flue gases generated by the diesel burners will pass through the waste boiler FGT system which will be operational (except for the SNCR system during start-up). The purpose of the burners is to heat the flue gases to 850°C, the point at which the SNCR system can function. Therefore, low NO_x burners coupled with the boiler FGT system and DCS minimises the air emissions during start up and shut down as far as practicable. Additionally, during shut down the SNCR system will be operational, further reducing NO_x emissions from the diesel burners. All cleaned flue gases from the diesel burners will be discharged from the stack.

The boilers will be cleaned offline in the annual maintenance shutdown. Mechanical rapping systems will be included alongside a water shower for online cleaning.

3.4.12 Steam turbine and air-cooled condenser

A modern, high-efficiency condensing type steam turbine will be installed to generate electricity using steam from each boiler. The steam turbine will service both boilers. Conversion of energy contained within the steam to electrical energy is allowed by a generator. The EfW facility is designed to generate about 58MW of electricity on a gross basis. Some of the electricity generated by the turbine will be used to power the facility itself (known as parasitic load). This is expected to be in the range of 3MW to 5MW of electricity, which means that the facility is designed to output between 53MW and 55MW of electricity to the electricity grid.

The proposal will comply with the NSW EfW policy and achieve a gross electrical efficiency of greater than 25% (note that if heat is recovered as part of the EfW process in the future, the proposal will meet an equivalent level of recovery for facilities generating Combined Heat and Power). The proposal is expected to achieve an electrical efficiency significantly greater than the minimum 25% as outlined in **Table 3.5**, subject to finalisation in detailed design by the equipment supplier.

If the turbine is not operating, for example due to facility start-up or shutdown for maintenance, electricity can be imported from the electricity grid. This is needed to make sure safe start-up and shutdown procedures are followed.

In the unlikely event of failure of the electricity grid, an Uninterruptable Power Supply (UPS) and emergency onsite diesel generator will operate to allow electricity to the facility so that critical safety and control systems remain online, and that the facility can be safely shut down (from both an environmental and personnel safety perspective). The diesel generator will only be operated in an emergency or for testing purposes and will likely only operate for c. 25 hours per year (for testing). The diesel generator will meet the requirements outlined in the NSW POEO legislation. To achieve this, the diesel generator will use a two-stage catalyst, an oxidation catalyst followed by a particle catalyst as is typical for emergency diesel generators installed in NSW. In the case of a power outage where the turbine was unable to continue to operate, the generator will start up and power the facility until a shutdown has been achieved. This shutdown process will take approximately 1 to 1.5 hours. The generator will be started periodically (typically once a week) for testing for a period of 15 to 30 minutes.

Steam will exit the turbine at low temperature and low pressure and condensed to generate feedwater that can then be recycled and reused in the boilers. To condense steam to a useable feedwater, the facility will incorporate an Air-Cooled Condenser (ACC). Use of an ACC is standard operation within many power plants globally and allows water within the steam cycle to be reused.

3.4.13 Combined Heat and Power (CHP)

The WSERRC is designed to be capable of operating either in electricity-only mode or combined heat and power mode.

- Electricity-only mode means that the turbine operates such that only electricity is produced.
- Combined Heat and Power model means that the turbine operates such that heat is extracted at the expense of electricity to be used as process heating.

The WSERRC is described as CHP ready. The facility will primarily operate in electricity-only mode. However, a turbine connection for a future heat offtake will be installed. This is beneficial as it allows the facility to be flexible to future potential changes in energy demand. While the proposal has no immediate plans to operate in a CHP scenario, there is possibility in the future that steam could be used in the nearby industrial areas for direct process use or for absorption cooling.

The construction works associated with any future heat network connection is not part of this application and would be dealt with under a separate application, should the need arise.

3.4.14 Flue Gas Treatment

Combustion gases created through the combustion of waste must be cleaned before released from the stack. This section gives an overview of the treatment systems employed. Further technical detail can be found in **Technical report D Best Available Techniques Assessment Report**.

This facility will be capable of cleaning the flue gases in line with the emissions limits as set out in the Industrial Emissions Directive (IED) and the associated Best Available Techniques Reference (BREF) document for waste incineration as published on 3 December 2019.

Emission Limit Values (ELVs) have not been duplicated in this section of the EIS, these can be found in **Technical report A Air Quality and Odour Assessment Report**. This chapter only gives an overview of the cleaning systems proposed.

An overview of the proposed treatment system for the facility is in **Figure 3.11**

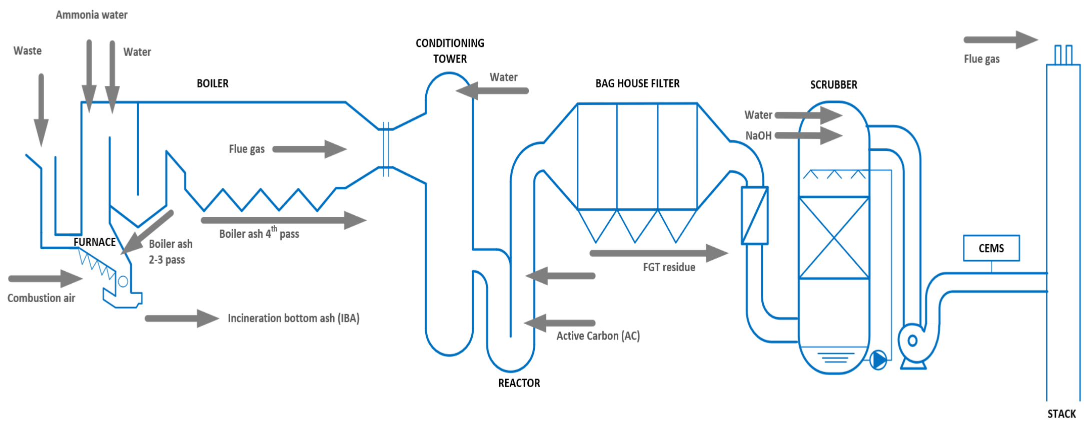


Figure 3.11: Proposed treatment system

The key components of the FGT system and the purpose of each of the components are outlined in **Table 3.6** below.

Table 3.6: Key components of the flue gas treatment system

#	Function	Description
1	Selective Non-Catalytic Reduction (SNCR)	SNCR is the technology that has been chosen for the reduction of oxides of nitrogen (NO_x) within the flue gases. Ammonia is injected into the flue gas path and reacts with NO_x to create nitrogen and water, both of which are not harmful to the environment.
2	Reactor (conditioning tower)	Hydrated lime and activated carbon are injected into the flue gas stream in the reactor. This reduces levels of acid gases and filters out harmful pollutants. Water is also injected for conditioning of the flue gases for optimum conditions for treatment.

#	Function	Description
3	Bag house filter	The bag house filter removes the mixture of activated carbon, hydrated lime, reaction products from the reactor stage and remaining boiler fly ash that is entrained within the flue gas from the reactor stage. They remove the pollutants from the exhaust gas that have been adsorbed into the treatment reagents. The resulting mixture captured within the filter bags and removed is termed Flue Gas Treatment residues (FGTr).
4	Wet scrubber	The wet scrubber acts as a final stage to further absorb acid gases, reduce ammonia and reduce volumes of particles and heavy metals within the flue gas. A wet scrubber has been chosen due to the significantly improved emissions performance when compared to a fully dry or semi-dry system. An additional benefit of the wet scrubber is the possible reduction in hydrated lime usage that can be achieved in the reactor stage.
5	Induced Draft (ID) fan	The ID fan is used to allow the flue gases to flow through the treatment process.
6	Continuous Emissions Monitoring System (CEMS)	To monitor compliance with the emissions limits set out in the IED and Waste Incineration BREF, and to inform use of reagents, a CEMS system will be installed. This is discussed further below in this chapter.
7	Stack	The stack is used to disperse cleaned flue gases from the facility. The stack height and stack parameters are discussed further in the Air Quality chapter of this EIS (see **Technical report A Air Quality and Odour Assessment Report**).

The reagents used for flue gas cleaning are:

- Hydrated lime
- Ammonia water
- Activated carbon
- Sodium lye (a solution of sodium hydroxide).

Reagent dosing will be controlled using real time feedback from the emissions monitoring system. This will allow operational optimisation of consumable use to meet the emissions limits.

The only output from the FGT equipment will be FGTr. The wet scrubber will not generate a separate residue as the residue from the wet scrubber will be re-used within the reactor stage. Any residue from the wet scrubber will therefore be removed in the bag filter system and disposed of as FGTr. Further information is provided in **Technical Report D Best Available Techniques Assessment**.

3.4.15 Continuous Emissions Monitoring System (CEMS)

Each line will be equipped with a dedicated CEMS. The CEMS allows continuous online monitoring of flue gas properties, content of pollutants and composition, thus allowing the control system to track those pollutants which can feasibly be measured online, to make automatic adjustments to the combustion system and the injection rates for the various FGT system reagents (hydrated lime, activated carbon and ammonia water). The systems will track trends over time and will give a system response automatically to the operators at various set points to allow action to be taken if needed to make sure approved emission limit values are not breached. The system also generates reports at a user defined frequency to demonstrate environmental performance.

The emissions monitoring will comply with the conditions of the NSW EfW policy, the IED and the BREF document for waste incineration. Continuous monitoring will then be installed for all pollutants that must be continuously monitored, including:

- Oxides of nitrogen (NOx)
- Carbon monoxide (CO)
- Particulates (dust)
- Total Volatile Organic Compounds (TVOCs)
- Hydrogen chloride (HCl)
- Hydrogen fluoride (HF) if needed under the provisions of the NSW EfW Policy Statement
- Sulphur dioxide (SO2)
- Ammonia (NH3)
- Mercury (Hg).

Additionally, the CEMS will monitor auxiliary parameters such as:

- Flue gas flow rate
- Temperature
- Pressure
- Moisture content
- Oxygen
- Carbon dioxide.

For those pollutants with levels so small that they are below any possible limits of detection and/or for which online measurement is not technically possible or sufficiently accurate, a periodic sampling and testing regime will instead be created as part of the facilities standard operating procedures and likely EPL requirements, to make sure that the facility is constantly in compliance with its environmental obligations. Such pollutants are:

- Heavy metals with the exception of Mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V)
- Nitrous Oxide (N_2O)
- Dioxins and Furans.

3.4.16 Ash management

Combustion of solid fuel (including waste) that contains an incombustible fraction will always create ash that must be managed. The proposal will produce three types of ash:

1. Incinerator Bottom Ash (IBA) – the inert, non-combustible component of the waste that is left on the grate at the end of the combustion process and is collected at the bottom of the grate.
2. Boiler Fly Ash – some of the ash from the combustion process that becomes entrained in the flue gases and makes its way up into the main boiler section. It is then deposited in the boiler sections before any flue gas treatment reagents are injected into the process.
3. Flue Gas Treatment residues (FGTr) – FGTr is the name given to any residues that are extracted from the process after the addition of flue gas treatment reagents. FGTr is a combination of spent reagents and the leftover entrained ash within the flue gases that did not become deposited in the boiler section. FGTr will be extracted from the flue gases within the bag house section of the treatment plant.

The following section describes the strategy for management of each of the ash streams.

3.4.16.1 Incinerator Bottom Ash (IBA)

The IBA contains much of the ash generated by the facility. IBA is discharged from the end of the combustion grate into a water bath which will quench the ash to reduce the temperature. During the quenching process, any gases generated will end up in the combustion chamber and be thermally treated. Wet IBA is about 20% moisture content but will not be a sludge as it is not saturated with water. The low level of moisture will be sufficient to prevent dust generation.

After quenching, the IBA is carried along a vibrating conveyor with a 'scalper' which removes oversized items into skips. Oversized items from the skips will be manually transferred to the ferrous metal bunker. Cleaning of bulky material is not required.

The remaining portion of IBA is transferred along conveyors to the IBA hall for intermediate storage. An over-belt magnet is fitted to the conveyors which removes ferrous metals during this process.

The WSERRC will therefore include two recovery systems before the IBA is conveyed to the storage bays:

1. A scalper which is a device to remove and recover any bulky items entrained within the IBA. These will be deposited in a storage bunker onsite for storage before being removed offsite for recovery.
2. A ferrous metal separator to recover ferrous metal from the IBA. This will be deposited into a storage bunker and removed offsite for recovery.

IBA will be stored in a bunker with a minimum of five days storage capacity. The IBA hall will be ventilated mechanically. Mechanical ventilation is provided by a dust extraction system that extracts from the bunkers with replacement air supplied via inlet dampers in the façade. The facility will have a fully enclosed ash handling system for IBA and no ash treatment or long-term ash storage will occur on site.

IBA will then be transferred offsite to a separate IBA processing facility (to be developed) where further metals recovery will also take place. Options for the offsite recovery and reuse of IBA in construction products are being investigated, building on experience in other jurisdictions where ash is used in construction materials. Recovery and use of IBA would be undertaken in accordance with the EPA's resource recovery framework. Further details regarding the offsite IBA processing facility and secondary metals recovery can be found in **Chapter 22 Related development**.

Waste classification will be conducted in accordance with relevant NSW EPA guidelines and periodic composition testing of ash (at least every 3 months in line with BAT) will be undertaken. It is typical to begin testing of ash during the commissioning process to confirm properties and waste classification. This will be done in conjunction with the requirements of the NSW EPA under the Protection of the Environment Operations (Waste) Regulations 2014.

3.4.16.2 Boiler fly ash

Boiler fly ash is the name given to ash that becomes entrained in the flue gases and makes its way through the boiler and treatment system. Along the way, this ash can condense and fall out of the air flow and into the different sections of the boiler. Boiler fly ash that collects in the radiant boiler passes 2 and 3 will be disposed of alongside the IBA. This boiler fly ash is substantially similar in properties to IBA, so to increase the amount of ash that can be recycled, the proposal will divert this proportion of boiler fly ash to the IBA bunker.

Boiler fly ash recovered downstream of pass 3 is not suitable for disposal with the inert IBA due to its higher concentration of heavy metals. So, it will be diverted to the FGTr stream to be transported for pre-treatment at Cleanaway's hazardous solid waste treatment facility at St Mary's. Then it will be disposed of to a licenced restricted solid waste landfill facility such as at Kemps Creek.

3.4.16.3 Flue Gas Treatment residues (FGTr)

Flue gas treatment residues (FGTr) contain spent flue gas treatment reagents as well as residual boiler fly ash that has remained entrained within the flue gases through the flue gas treatment stages. FGTr is collected within the bag house filters and will be conveyed to silos for temporary storage. The current design includes two silos to allow for redundancy in the system. FGTr are classified as hazardous waste due to their ecotoxicity and physical characteristic, so they cannot be reused in the same way that IBA can. Sealed pneumatic tankers designed in accordance with AS/NZS 1210 will be used to transport FGTr. The tankers will securely connect to the silo outlet via a hose connection and FGTr will be deposited from the silo into the tanker in a controlled manner. The most credible scenario for the release of FGTr onsite is a failure of the hose during transfer of the FGTr from the silo to the sealed vehicle. Safe operation and maintenance of systems such as spill management procedures will be implemented to limit failure.

FGTr will be transported for pre-treatment at Cleanaway's hazardous waste treatment facility located at St Mary's before being disposed of to a licenced restricted solid waste landfill facility such as at Kemps Creek. The St Mary's facility has the capacity and is licenced to treat FGTr material. There is no limit on the annual processing capacity at St Mary's as stipulated in the facility's EPL (EPL 20271). However, there is a limit on storage at the facility i.e. the quantity of waste, treated or otherwise, stored on the premises must not exceed 5000 tonnes at any one time. In the case that the St Mary's facility is not available, FGTr will be sent to another suitably licenced facility.

Waste classification will be conducted in line with relevant NSW EPA guidelines and periodic testing of FGTr will be undertaken. It is typical to begin testing of ash during the commissioning process to confirm properties and waste classification. This will be done in conjunction with the requirements of the NSW EPA under the Protection of the Environment Operations (Waste) Regulations 2014. Given the ash is likely to be classified as hazardous (and therefore a 'trackable' waste), engagement will be required with the NSW EPA to put in place a tracking system, including allowances for consignment authorisations and tracking certificates.

About dix days of storage will be installed on site for collection of FGTr across the silos.

3.4.17 Water use

There are a variety of uses for water within the facility. Water uses include:

- Boiler make-up water to compensate for boiler blow-down and other losses
- Flue gas conditioning pre-treatment and SNCR
- IBA quenching
- Other small water consumption from general facilities, such as toilets and kitchen, alongside wash-down water used for maintenance.

Additionally, in commissioning of the boiler plant, water will be used for the first fill of the system.

The main objective regarding water use is to reuse as much water as possible.

The following water-saving techniques have been identified:

- Water from the wet scrubber outlet will be captured and used within the flue gas conditioning stage.
- Rejected water from the make-up plant and from boiler blow-down will be used within the IBA quench.

This means that no process wastewater generated onsite will require treatment outside of the facility in normal operation. A water treatment plant will be installed so that the water quality of feedwater is suitable for use within the boiler.

Cleaning water from the process hall (boiler/FGT hall) will be collected in drain trenches in the floor and used within the process.

If for any reason wastewater from the process must be exported offsite, which is not currently foreseen, tankers will be used to collect the water and deliver it to a suitably licensed treatment facility.

The exact facility to be used for disposal would depend on the specification of the water which would have to be tested prior to disposal. WSERRC commits to testing any wastewater prior to disposal (if any) and selecting a suitable facility in compliance with legislation in NSW. Further information is provided under BAT 3 in **Technical Report D Best Available Techniques Assessment**.

3.4.18 Summary of Stored Waste Volumes on Site

Table 3.7 provides a summary of the maximum volume of different wastes that can be stored on site for licensing purposes. These figures include a level of contingency and the site is not expected to operate at maximum capacity for a prolonged period.

Table 3.7: Maximum quantity of on-site waste storage

Parameter	Maximum Tonnage (T)	Estimated Volume (m^3)
Incoming waste bunker storage capacity	17,000	38,000
Waste water for process use storage capacity	300	300
Incinerator bottom ash storage capacity	1,800	1,800
Metals and oversize storage capacity	250	250
FGTr storage capacity	360	360

The facility has been suitably designed to allow for the storage of the waste streams identified above. With respect to the waste bunker, the maximum volume provided in **Table 3.7** includes closure of 50% of the tipping bays which would only be required during an extended public holiday period. For most of the time, all tipping bays will be open, and the bunker will have a capacity of 12,600 tonnes. The design allows for this variation.

Volumes of consumable material held on site is included in **Chapter 14 Hazards and Risks** of this EIS.

3.4.19 Operating modes and Upset Conditions

The facility has been designed to operate in several operating modes which have all been considered as part of this EIS. Each of the modes has been listed below with a general description of each.

- **Normal operation** – Normal operation is defined by operation of the facility within the limits of the firing diagram, combusting waste and generating electricity. This will be the main operating mode for the facility. In normal operation, no fuel source other than waste will be needed.

- **Start-up** – Start-up of the facility is expected several times per year after planned maintenance has taken place. Each boiler line can be started up individually. In a normal start-up sequence, a small amount of electricity is imported from the electricity grid. Auxiliary burners using diesel fuel heat the boiler. This heating process typically lasts 8 to 12 hours. Only when the boiler is heated to 850°C, is waste fed on to the grate. At all times in start-up, the flue gas treatment equipment will be operational. When steam quality (temperature and pressure) is sufficient, the turbine will start up.
- **Shutdown** – In a shutdown sequence waste will stop being fed onto the grate. The auxiliary diesel burners will fire so that the boiler is always heated to 850°C until all waste on the grate has been burnt out and none remains. Then the auxiliary burners will shut down and the boiler will cool. At all times when waste is on the grate, the flue gas treatment system will continue to operate.
- **Upset conditions** – Abnormal operating conditions could occur in operation, for example if there was a component failure or an electricity failure.

The proposal has been designed so that in all cases, the facility can be brought to a safe, controlled stop that adheres to environmental requirements.

- Normal operation is defined as operation within the firing diagram envelope shown in **Figure 3.7**. All points within this envelope have been fully assessed within the **Air Quality and Odour Assessment (Technical Report A)**.
- There will be no operation outside of the firing diagram envelope with the exception of start-up and shut down during which times the facility has been designed to minimise emissions.
- Any upset condition that means it is not possible to maintain operation within the limits of normal operation will lead to an immediate shut down of the facility to rectify the problem. This will be facilitated by both automatic control from the DCS and CEMS as well as the ability for manual shut down by the operator. Thus, the only activities that will take place outside the limits of the firing diagram will be start up and shut down under which cases the facility has been designed to minimise emissions.

Table 3.8 outlines the operating conditions that could be encountered at the facility alongside the design embedded mitigation measures and potential impact to the environment.

Table 3.8: Operating conditions (including upset conditions)

Condition	Mitigation	Impact
Normal operation within the bounds of the firing diagram	The facility is designed to control the combustion air, waste feed, grate speed and FGT system for different volumes of waste and waste quality. At all times, any failure of the FGT system that cannot be corrected by the site wide DCS or the operator will cause the respective line to close-down safely. In case of a licensed emission limit value exceedance, the facility will be immediately shut down by the operator.	At all times during operation, the hourly and 24-hourly average emission limit values as set out in **Chapter 8 Air Quality and Odour,** will be met.
Operation with high or low calorific value (outside of normal operational limits)	In case of high calorific value waste, the waste throughput will be reduced. In case of low calorific value waste, either increase of the waste throughput or auxiliary burners will sustain the combustion to make sure the requirement for 2 seconds residence time at 850ºC is respected. Mixing of the waste in the bunker will mitigate against this risk.	Quantity of flue gases will change depending on the amount of waste. Emission limit values will be met. The worst-case conditions (highest possible flue gas flow rate) have been modelled in **Technical report A: Air Quality and Odour Assessment**.
Changes in waste composition	The facility has been designed to accommodate different waste compositions. This is achieved with a well-designed combustion diagram and flexible equipment throughout. Operationally, mixing of the waste in the bunker will mitigate against significant changes in waste composition.	No impact, emission limit values will be met.
Single line operation	The facility utilises two independent boiler lines each with its own dedicated FGT system. Each line can operate independently of the other and the facility has been designed to accommodate the operation of one or two lines. The only time that operation on a single line would occur is if the second line is shut down (for example, for maintenance).	No impact, emission limit values will be met.
Plant operating - Turbine failure and/or Turbine transformer failure – Bypass mode	The facility can continue to operate and, if necessary, shut down safely in turbine bypass mode using electricity from the grid or the emergency power systems.	No impact, emission limit values will be met.
Plant operating – Island mode (grid failure)	The facility can continue to operate and, if necessary, shut down safely in island mode using electricity from the steam turbine to sustain power load.	No impact, emission limit values will be met.

Condition	Mitigation	Impact
Start-up sequence to normal operation	The start-up sequence uses auxiliary diesel burners over an 8 to 12-hour period to heat the boiler to 850°C. This is the point where the SNCR section of the FGT system becomes operational. Only when the furnace is heated to 850°C can the waste be fed onto the grate. Once waste is being fed, the combustion of the waste produces enough energy to sustain the process temperature. The FGT system is always operational during start up with the exception of the SNCR system which must be heated to 850°C for successful operation. This is why auxiliary burners, without waste, are used during start up. Waste will never be combusted without the full FGT system (including SNCR) being operational. Additionally, at all times, the advanced combustion control system, reagent dosing system and CEMS will be operational to monitor and control the process to minimise emissions.	The design of the FGT system is such that, even if the flue gas conditions change during start-up, emissions are minimised.
Facility shutdown (normal operation)	In the event of a complete facility shutdown the facility will cease to combust waste. Waste being fed onto the grate will cease and the auxiliary burners will activate so the boiler temperature remains at 850°C until no waste remains on the grate. This process usually takes 1 to 1.5 hours. When there is no more waste on the grate, the auxiliary burners and FGT system will shut down. Waste will never be combusted without the full FGT system (including SNCR) being operational. Additionally, at all times the advanced combustion control system, reagent dosing system and CEMS will be operational to monitor and control the process to minimise emissions. During shut down, the SNCR system will be fully operational until all waste remaining on the grate has been combusted and the auxiliary burners have shut-off.	The design of the flue gas treatment system is such that, even if the flue gas conditions change during shutdown, emissions are minimised.
Plant operating, failure on one line (emergency shutdown)	The process for shut down under emergency situations is exactly the same as a normal shut down.	The design of the flue gas treatment system is such that, even if the flue gas conditions change during shutdown, emissions are minimised.

Condition	Mitigation	Impact
Black-out (safe shutdown with emergency power)	In the case of a grid blackout and plant failure the facility will be shut down using emergency power systems, the UPS and a diesel generator. The shutdown sequence is exactly the same as a normal shutdown.	The design of the flue gas treatment system is such that, even if the flue gas conditions change during shutdown, emissions are minimised.
Presence of unacceptable waste (e.g. hazardous waste)	There are a variety of quality assurance and quality control procedures designed to mitigate the risk of receiving unacceptable waste at site. If a small fraction of unacceptable waste is not identified, there are additional design contingency measures in place. Mixing of the waste on site means that any item of unacceptable waste will not be concentrated. If combusted, the FGT system is designed to appropriately deal with the pollutants formed.	No impact, emission limit values will be met.
High load of pollutants	Combustion of waste with a high content of pollutants may give rise to increased emissions. This will be mitigated by using the waste acceptance (QA/AQ) protocol, mixing waste within the bunker to develop a more homogeneous waste, a well-designed FGT system and CEMS so that emission limit values are not breached.	No impact, emission limit values will be met.
Large waste items	Large waste items may cause blockage of the waste feed funnel leading to poor control of air flow and therefore poor combustion characteristics. WSERRC includes a shredder to mitigate against oversized waste.	No impact, emission limit values will be met.
Failure of essential equipment	Failure of a variety of essential equipment, including boiler feedwater pumps, FGT equipment and scrubber pumps could lead to a facility shutdown and short-term increase in emissions. This is mitigated by including a sufficient level of redundancy within the installed equipment. Failure of one component of the FGT system will not lead to failure of the entire system. For example, bag filters will include redundant rows such that any damage caused to one row activates the standby, while that row is repaired. This philosophy is followed as far as reasonably practicable throughout the design. The shutdown period, during which all FGT is still operational will take 1 to 1.5 hours, this is the time taken for waste that is on the grate at the point of shut down, when the waste feed stops, to fully burn out.	No impact, emission limit values will be met or the facility would enter shutdown.

3.5 Ancillary equipment and Balance of Plant

There is a variety of ancillary equipment and Balance of Plant (BoP) that is needed to enable the safe and reliable operation of an EfW facility. This includes:

- Electrical connection
- Electrical equipment and controls such as transformers, low and high voltage switchgear and circuit boards
- Small power such as lighting and power for the administration and visitor and education centre
- Mechanical equipment such as pumps, motors, safety valves, conveying systems
- Compressed air systems
- Fire safety systems
- Tanks (both water and fuel storage)
- Weighbridges
- Silos for storage of treatment reagents and FGTr
- Small plant such as front loaders.

The exact specifications of the balance of plant and ancillary equipment will be decided in the detailed design phase. However, all equipment installed will be designed to comply with standards and legislation in New South Wales.

3.6 Fire and emergency procedures

Fire and emergency measures and procedures have been developed at a concept level, including space proofing. These measures include:

- Enough space in the site layout for emergency response vehicles to circulate around the site
- Designated emergency exit routing with appropriate signage and guidance in line with local fire regulations
- Site wide fire alarm (audio and visual)
- Thermal imaging cameras to detect hotspots in the waste in the bunker hall
- Fire damper within the boiler feed hopper if there is a fire passing from the boiler to the feed hopper
- CCTV installed at strategic locations throughout the facility to monitor for both safety and security of staff and visitors

- Strategically located fire suppression at main points around the facility, including fire hydrants, fire extinguishers, water cannons and sprinkler systems
- Fire detection systems throughout the facility
- Hardstanding for fire trucks to park adjacent to the fire tanks. Exact configurations will be agreed with FireNSW
- A facility-wide vacuum cleaning system to reduce the likelihood of dust build-up
- Appropriate ventilation of the IBA building to prevent the build-up of hydrogen causing an explosive atmosphere
- Equipping the IBA building with hydrogen gas sensors and alarms
- Storage of acids and bases in line with AS 3780-2008, and the obligations under the Work Health and Safety Regulations 2011
- Correct separation of dangerous goods in line with AS/NZS 3833-2017
- Enough bunding and storage capacity for dangerous goods
- Real-time monitoring to recognise leaks within the ammonium hydroxide silos
- Preparation of a notification and evacuation procedure
- Preparation of a pollution incident response management plan (PIRMP) which is to include coordination with local response organisations such as FRNSW and NSW Ambulance services
- Lighting of the stack in line with the Federal Aviation Administration’s (FAA) AC 70/7460-1L: Obstruction Marking and Lighting
- Fire water tanks for the availability of firefighting water alongside a fire water pumping station. The tanks that will always have a minimum 4hr supply of water held per line, which is enough should the facility need to shut down. The minimum volume of water needed will always be held onsite.

These measures will be further developed in the detailed design.