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Appendix D

Woodlawn ARC
Process Overview

Woodlawn ARC Process Overview

Woodlawn Advanced Energy Recovery Centre

Report for Veolia Environmental Services (Australia) Pty Ltd
00288-Z-02-F01-0001

31080 | Issue Number E | Date 1-Jul-22

Customer:

Veolia Environmental Services (Australia) Pty Ltd

Customer reference:

00288-Z-02-F01-0001

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Date prepared:

01 July 2022

Ricardo Energy Environment & Planning reference:

Ref: 31080-Woodlawn ARC-Process Overview-V5.0- / Issue Number E

Issue History		
Issue No	Date Issued	Document Status
A	4/03/2022	DRAFT
B	24/03/2022	DRAFT
C	21/06/2022	DRAFT
D	30/06/2022	Final
E	1/7/2022	Final

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1 Introduction

Ricardo Energy Environment and Planning Pty Ltd (Ricardo) has been engaged by Veolia Environmental Services (Australia) Pty Ltd (Veolia) to prepare a report that describes the energy recovery facility (ERF) thermal treatment technology to be used at Veolia's Woodlawn Advanced Energy Recovery Centre (Woodlawn ARC).

1.1 Purpose

The purpose of this document is to act as reference document for the Environmental Impact Statement (EIS) by providing a technical overview and engineering description of the thermal treatment technology to be used at the Woodlawn ARC.

1.2 Background

The Woodlawn ARC will be located within Veolia's Eco Precinct, which is situated 250km south of Sydney in regional New South Wales (NSW), near the town of Tarago approximately 40km south-west of Goulburn. The Eco-Precinct currently processes 40% of Sydney's residual waste.

The Woodlawn ARC will divert and thermally treat up to 380 kilotonnes per annum (ktpa) of residual waste from landfill in line with the NSW EfW Policy Statement[1]. The feedstock will consist predominately of residual municipal solid waste (MSW) with up to 20% residual commercial and industrial (C&I) waste.

[1] NSW EPA, NSW Energy from Waste Policy Statement, June 2021

2 Woodlawn ARC Layout

The layout of the Woodlawn ARC is presented in **Figure 2-1**: Woodlawn ARC Site Plan**,** with a detailed plan of the energy recovery facility (ERF) presented in **Figure 2-2.**

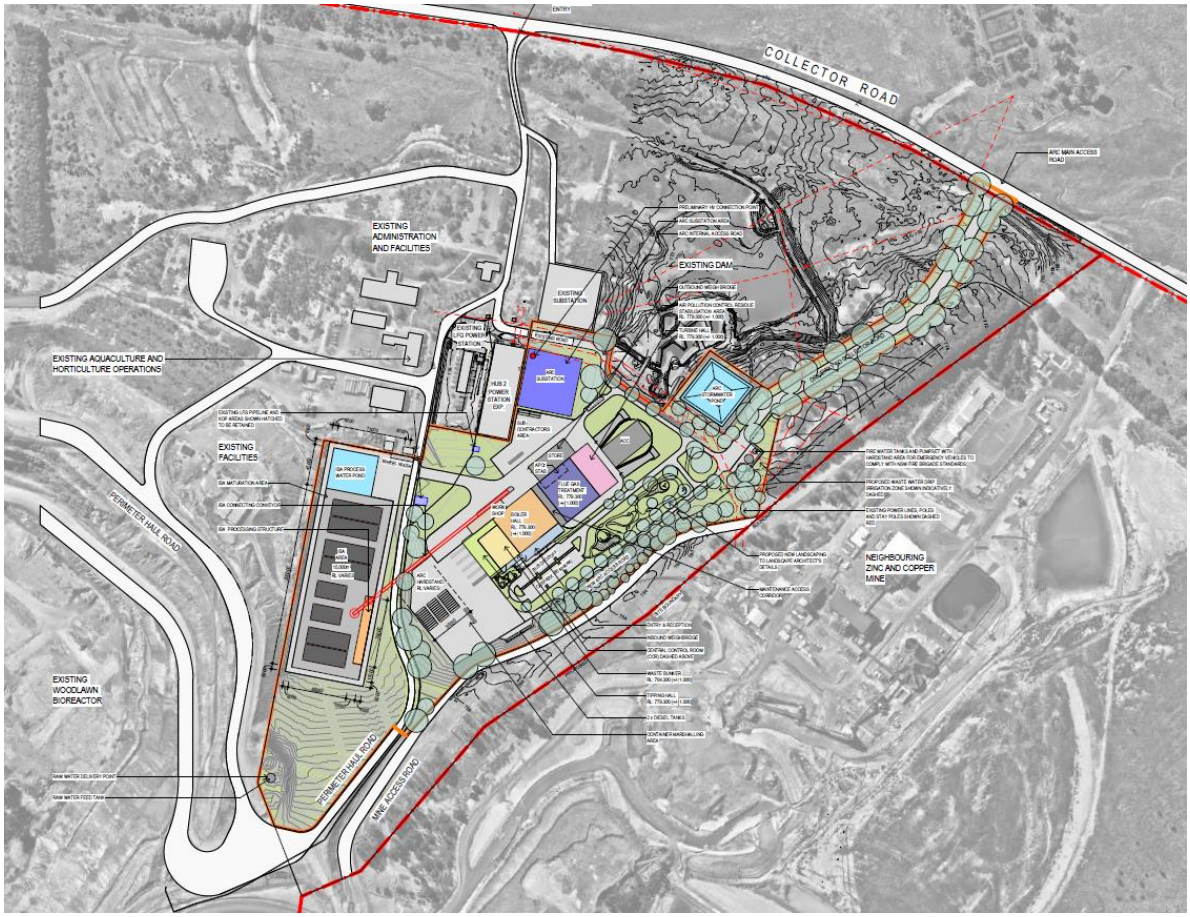

Figure 2-1: Woodlawn ARC Site Plan[2]

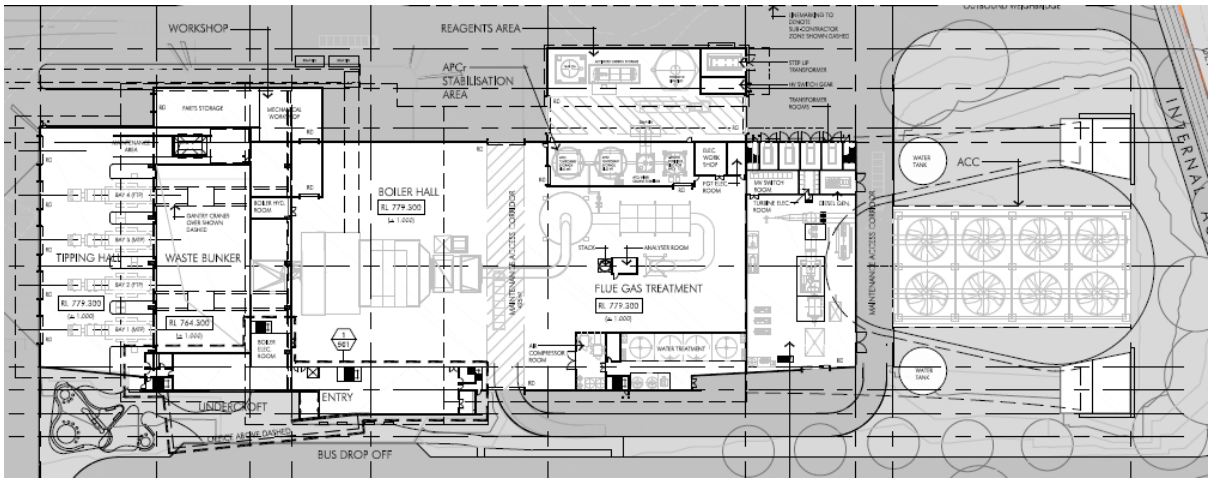

Figure 2-2: Woodlawn ARC General Arrangement of ARC Building[3]

[2] 11987_DA-101[B] Site Plan (Preliminary drawing that may change in detailed design)

[3] 11987_DA-111[B] Ground Floor GA Plan (Preliminary drawing that may change in detailed design)

3 Woodlawn ARC Process Design

3.1 Overview

The Woodlawn ARC will be a single combustion line plant utilising conventional inclined moving grate technology to thermally treat waste and generate electricity.

Waste will be delivered to the Woodlawn ARC in containers that will be emptied directly into the Waste Bunker where waste will be mixed thoroughly to improve its quality by achieving more homogeneous conditions. A grapple crane will then progressively feed the waste from the Waste Bunker to the feeder hopper. The waste will then be fed onto the inclined moving grate, where combustion occurs in a controlled environment.

A steam boiler will recover the heat from the combustion system. Steam from the boiler will be harnessed by a steam turbine to generate electricity. Provisions will be in place to allow for the offtake and use of waste heat from the steam turbine in future. Expended steam from the turbine will be cooled by an air-cooled condenser using forced ambient air and the condensate will be returned into the process.

The incinerator bottom ash (IBA) produced by the combustion system will pass through an ash quencher and then be collected by the bottom ash extraction system. The quenched IBA will then be transferred via conveyor to the IBA Area. The IBA will be processed on site to produce valuable IBA aggregate (IBAA). Initially, the IBAA material will be disposed of to landfill. However, the intention is to conduct trials, with the approval from EPA, to use the IBAA as a substitute to daily cover in the landfill and eventually reuse it as recycled aggregate in the construction industry, subject to EPA approval of beneficial reuse.

A semi-dry Flue Gas Treatment (FGT) system will treat the combustion gases to ensure that emissions are in line with the NSW Energy from Waste (EfW) Policy Statement[4] and comply with the Industrial Emissions Directive (IED). Selective non-catalytic reduction (SNCR) will be utilised through the injection of ammonia water into the flue gas to control and abate NOx emissions. Hydrated lime and powdered activated carbon (PAC) will also be injected downstream of the furnace to control acid gases, dioxins, furans and heavy metals in the flue gas. Emissions will be monitored at all times using a continuous emission monitoring system (CEMS). Air pollution control residue (APCr) comprised of combustion particulates or fly ash, reaction products from the FGT process and excess reagents from the FGT system will be collected separately and stabilised onsite with solid binding agents and disposed of to a purposely designed and built encapsulation cell on site.

A simplified process flow diagram (PFD) showing the key stages of a typical EfW plant, similar to the Woodlawn ARC, is presented in **Figure 3-1**.

[4] NSW EPA, *NSW Energy from Waste Policy Statement*, June 2021

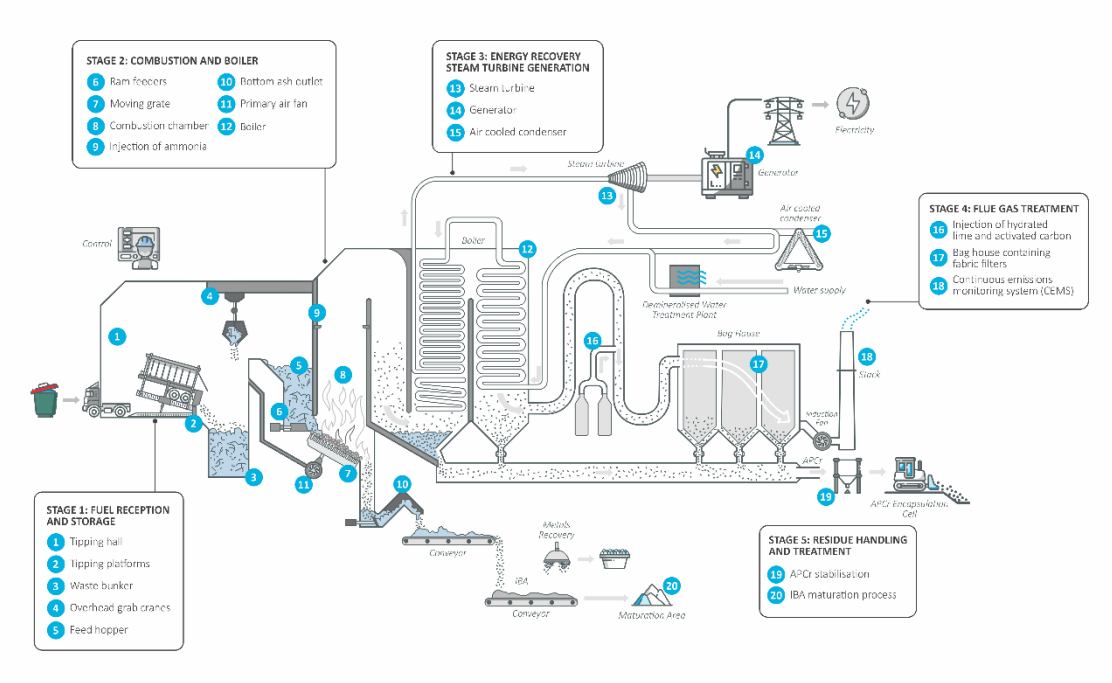

Figure 3-1: Woodlawn ARC Process Schematic

3.2 Plant Capacity

The Woodlawn ARC will have a nominal waste throughput of 43.75 tonnes per hour (tph). The expected initial annual availability of the plant will be 8,000 hours of operation, giving a nominal annual capacity of 350,000tpa. Veolia's experience has shown that the availability of the plant will increase over time as more efficient maintenance regimes that require fewer planned shutdowns are implemented. Hence, the availability in a year would increase above 8,000 hours.

It is Veolia's intention to increase plant availability over time as operations become more efficient. Therefore, regulatory approval for an annual capacity of 380,000tpa is being sought to allow for these future increases in plant availability and efficiency.

3.3 Key Performance Parameters

The key performance parameters for the Woodlawn ARC at the nominal plant availability are summarised in **Table 3-1**.

Table 3-1: Key Performance Parameters

Parameter	Unit	Value (Initial plant availability)
Nominal waste throughput	tph	43.75
Nominal waste capacity	tpa	350,000
Nominal operating hours	tpa	8,000
Nominal availability	%	91
Estimated net power output[5]	MWe	25.3
Estimated gross power output (design target)	MWe	28.4
Estimated parasitic load of the ARC	MWe	3.1
Required thermal efficiency[6]	%	>25
Estimated thermal efficiency (refer to **Section 3.5**)	%	>25
Feedstock	N/A	80%-100% residual MSW with the balance made up of residual C&I waste
Estimated Incinerator Bottom Ash (IBA) produced	tpa	70,000
Estimated Air Pollution Control Residue (APCr) produced	tpa	14,000

3.4 Operational Envelope

The operational envelope for the Woodlawn ARC is defined by the waste characteristics, developed from targeted waste composition audits, and the required throughput capacity. The operational envelope values are detailed in **Table 3-2.**

Table 3-2: Operational Envelope

Parameter	Unit	Reference Point	Min	Max
Net calorific value	MJ/kg	9.0	7.0	12.0
Mechanical throughput	tonnes per hour	43.75	30.6	47.5
Thermal input	MWth	109.4	76.5	118.75

[5] Based on EPA NSW Energy from Waste Policy Statement on thermal efficiency criteria
[6] NSW EPA, NSW Energy from Waste Policy Statement

A reference firing diagram based on the above values is shown in **Figure 3-2**. This firing diagram represents the narrowest acceptable operational envelope for the Woodlawn ARC.

The reference point for the Woodlawn ARC is a net calorific value (NCV) of 9MJ/kg as shown in **Figure 3-2**. This value is based on sampling and auditing of residual MSW and C&I waste sourced from Greater Sydney, which will supply the Woodlawn ARC's feedstock.

To accommodate for fluctuations in the calorific value of the waste feedstock during the lifetime of the ERF, the plant has been designed to accept loads between 70% and 108.5% of the design load[7]. This is represented by the minimum and maximum load points on the firing diagram in **Figure 3-2**.

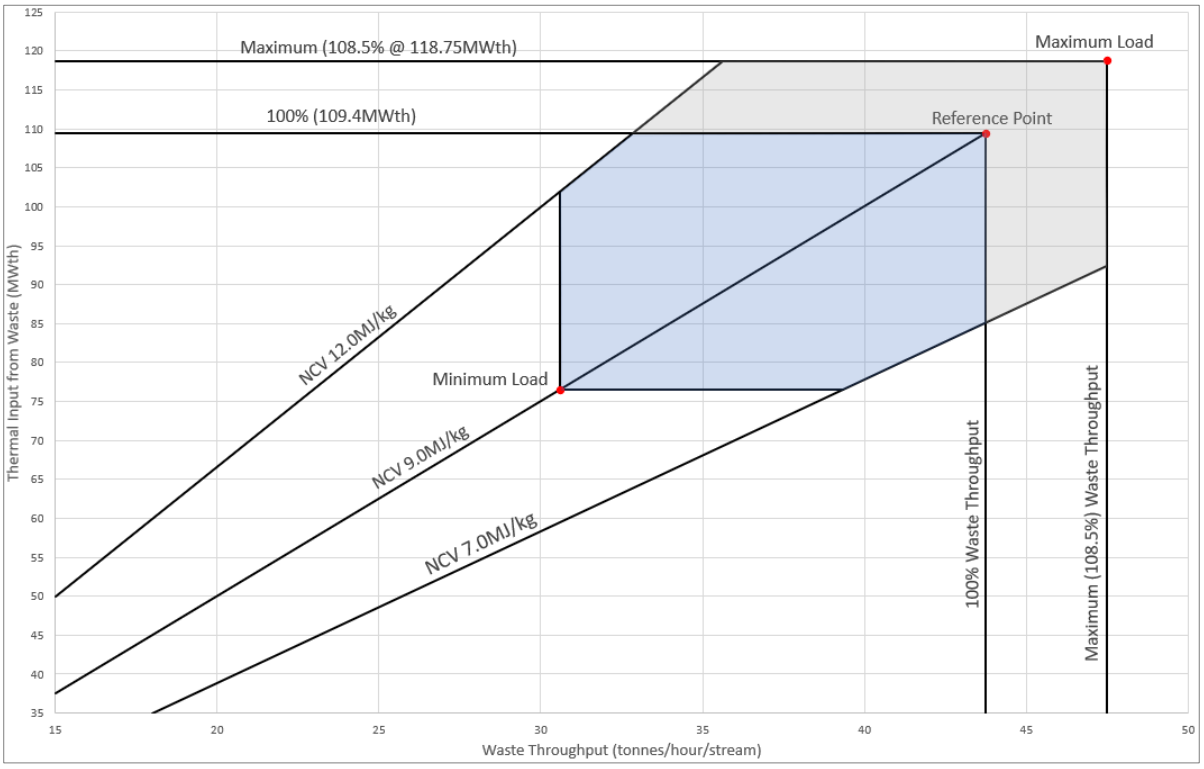

Figure 3-2: Woodlawn ARC Reference Firing Diagram

[7] The maximum design load will not exceed the sought approval limit of 380ktpa

3.5 Energy Balance

The indicative energy balance for the Woodlawn ARC is shown in **Figure 3-3**. The reference point shown in **Figure 3-2** was used as the basis of the energy balance. The reference point scenario has been provided to demonstrate that the Woodlawn ARC's thermal efficiency exceeds the requisite 25% as stipulated in the NSW EfW Policy Statement[8], as shown by the following calculation:

$$\frac{Electrical\ Power\ Output\ (MWe)}{Thermal\ Power\ Input\ (MWth)} \times 100\% = Thermal\ efficiency\ (\%)$$

$$\frac{28.4MWe}{109.4MWth} \times 100\% \approx 26\%$$

This energy balance is indicative, and values may vary slightly during detailed design.

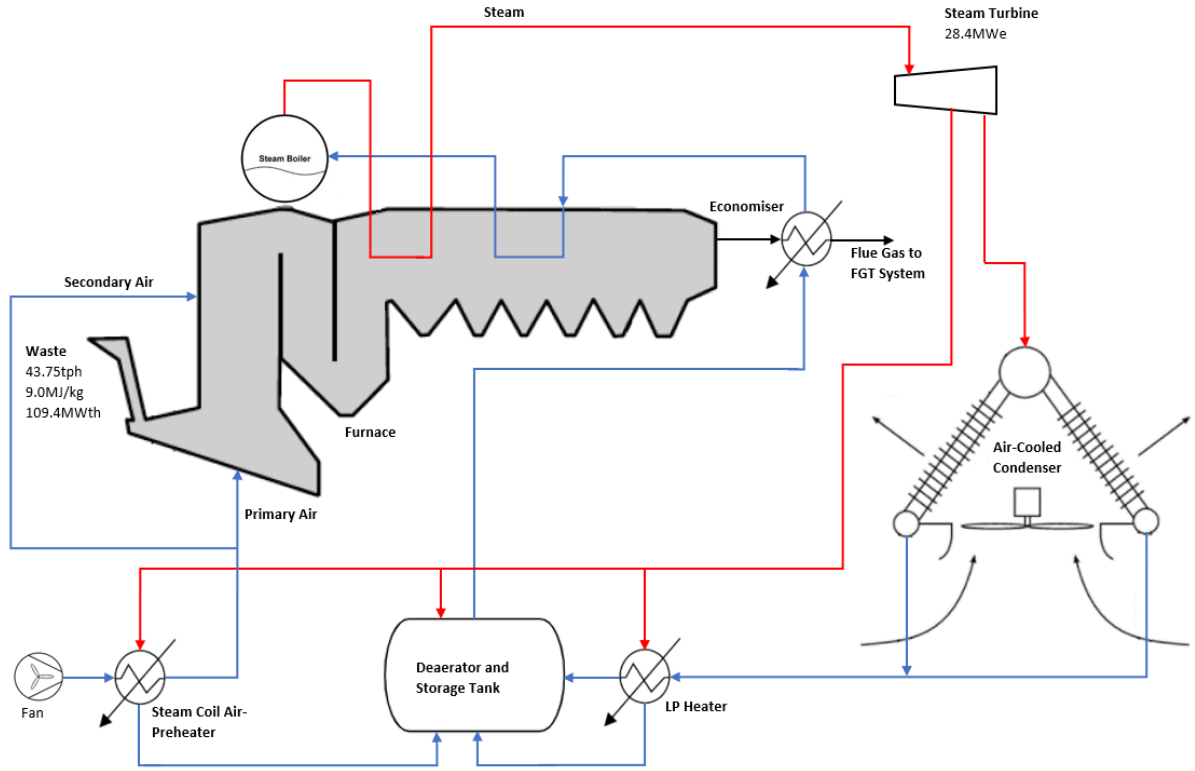

Figure 3-3: Woodlawn ARC Energy Balance

[8] NSW EPA, NSW Energy from Waste Policy Statement, June 2021

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