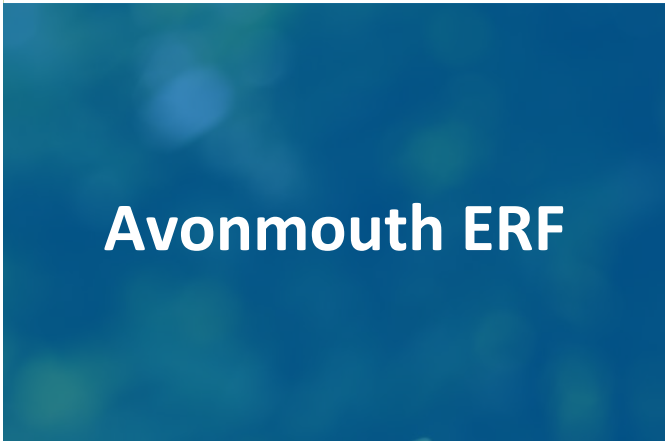


# FICHTNER

Consulting Engineers Limited



## Viridor Avonmouth Waste Services Limited

Supporting Information – EP Variation

## Document approval

	Name	Signature	Position	Date
Prepared by:	James Sturman		Lead Consultant	10/11/2023
Checked by:	Stephen Othen		Technical Director	10/11/2023

## Document revision record

Revision no	Date	Details of revisions	Prepared by	Checked by
00	03/10/2023	For Client	JRS	SMO
01	10/11/2023	Update for Variation type	JRS	SMO

© 2023 Fichtner Consulting Engineers. All rights reserved.

This document and its accompanying documents contain information which is confidential and is intended only for the use of Viridor Avonmouth Waste Services Limited. If you are not one of the intended recipients any disclosure, copying, distribution or action taken in reliance on the contents of the information is strictly prohibited.

Unless expressly agreed, any reproduction of material from this document must be requested and authorised in writing from Fichtner Consulting Engineers. Authorised reproduction of material must include all copyright and proprietary notices in the same form and manner as the original and must not be modified in any way. Acknowledgement of the source of the material must also be included in all references.

## Non-technical Summary

Viridor Avonmouth Waste Services Limited (Viridor) operates a two-stream Energy Recovery Facility (the Facility) at Severn Road Resource Recovery Centre in Avonmouth. An Environmental Permit (EP) for the operation of the Facility was originally granted on 27 September 2010. Subsequently, there have been two variations to the EP.

Within this application, Viridor applying for a variation to the EP to allow for an increase in capacity of the Facility from 376,500 tonnes per annum to 427,050 tonnes per annum of waste, and introduce a limited number of additional EWC codes into the EP.

Due to the proposed increase in capacity, Viridor understands that the application should be determined as a Substantial Variation.

An Air Quality Assessment (AQA) has been undertaken to determine the changes in impact of emissions to air associated with operating at the increased capacity. This has concluded that, *“the change in air quality impact associated with the proposed EP variation is marginal and emissions would not have a significant impact on local air quality, the general population or the local community. As such, there should be no air quality constraint in granting a variation to the existing EP for the increased throughput as proposed”*.

# Contents

Non-technical Summary .....	3
<b>1 Introduction.....</b>	<b>5</b>
1.1 Background .....	5
1.2 Proposed changes .....	5
1.3 Type of variation .....	5
<b>2 Proposed changes to capacity.....</b>	<b>7</b>
2.1 Changes to combustion control system.....	7
2.2 Permitted capacity.....	7
2.3 Proposed capacity.....	8
<b>3 Additional EWC codes .....</b>	<b>10</b>
<b>4 Environmental Risk Assessment.....</b>	<b>12</b>
4.1 Air Quality .....	12
4.2 Raw material consumptions .....	12
4.3 Residue generation .....	12
4.4 Energy efficiency .....	13
4.5 Fire prevention plan.....	14
4.6 Noise .....	14
4.7 Odour .....	14
4.8 Environmental management .....	14
<b>Appendices .....</b>	<b>15</b>
A Firing Diagram (2017).....	16
B Revised Firing Diagram.....	17
C Air Quality Assessment.....	18
D Dioxin Pathway Assessment.....	19
E Abnormal Emissions Assessments .....	20

# 1 Introduction

## 1.1 Background

Viridor Avonmouth Waste Services Limited (Viridor) operates a two-stream Energy Recovery Facility (the Facility) at Severn Road Resource Recovery Centre in Avonmouth. An Environmental Permit (EP) for the operation of the Facility was originally granted on 27 September 2010. Subsequently, there have been two variations to the EP.

Viridor applying for a variation to the EP to allow for an increase in capacity of the Facility from 376,500 tonnes per annum to 427,050 tonnes per annum of waste, and incorporating additional EWC codes into the EP.

Section 1 of this document provides a brief overview of the applicant/application, including the proposed changes and type of variation, whilst sections 2 and 3 describe the proposed changes in further detail. Section 4 provides a high level review of the environmental impacts associated with the proposed changes, including the air quality impacts.

## 1.2 Proposed changes

Within this application, Viridor is proposing the following changes to the EP:

- Increase the processing capacity of the Facility from 376,500 tonnes per annum to 427,050 tonnes per annum of waste, based on continuous operation at the 110% MCR point on the firing diagram.
- The introduction of a limited number of additional EWC codes which are representative of non-hazardous into the EP.

## 1.3 Type of variation

The Environment Agency's guidance on Charging Schemes states that there are four types of variations – administrative, minor technical, normal and substantial.

Viridor acknowledges that the proposed changes will not constitute either an administrative or minor technical variation.

The Environment Agency has published guidance (Regulatory Guidance Note 8 – Substantial Change) which defines a substantial change. It is acknowledged that the guidance has subsequently been withdrawn but any replacement guidance is not as prescriptive. The guidance defined a substantial change as:

*'... a change in operation of installations or mining waste facilities, which in our opinion may have significant negative effects on human beings or the environment. Certain changes are automatically regarded as substantial, namely:*

*a. a change in operation of a Part A installation which in itself meets the thresholds, if any, set out in Part 2 of Schedule 1 EPRs; or*

*b. a change in operation of an incineration or co-incineration plant for non-hazardous waste which would involve the incineration or co-incineration of hazardous waste.'*

As explained in sections 2.2 and 2.3, the hourly waste processing capacity is expected to increase from 22.16 tonnes per hour per line (at the design point of 100%) with an NCV of 9.3 MJ/kg, to approximately 24.375 tonnes per hour per line (at the maximum capacity) with an NCV of

9.3 MJ/kg. As the Facility is designed as a two stream facility, the total increase in the hourly waste processing capacity is approximately 4.44 tonnes per hour per line.

The threshold for a non-hazardous waste incineration facility within Part 2, Schedule 1, Section 5.1 (b) of the Environmental Permitting Regulations is 3 tonnes per hour. Therefore, the total increase in the hourly waste processing capacity for each line is more than the threshold in 'Part 2 of Schedule 1 EPRs'. Therefore, Viridor understands that the application should be determined as a Substantial Variation.

## 2 Proposed changes to capacity

Viridor is applying to increase the annual waste processing capacity of the Facility to allow for operation at the 110% Maximum Continuous Rating (MCR) thermal capacity point on the firing diagram.

Continuous operation at the 110% point on the firing diagram would be achieved through changes to the combustion control system. The changes to the combustion control system will enable the Facility to process a higher waste throughput on an hourly basis.

The proposed changes are described in further detail in section 2.1. The design basis for the maximum waste throughput is presented in section 2.2, and is based on the firing diagram for the Facility.

The proposed changes to the combustion control system will not change the site layout, the Installation Boundary, the location of the emissions points or the concentrations of emissions to air from the Facility.

### 2.1 Changes to combustion control system

The technology provider for the Facility has modified the settings for the combustion control system to optimise the waste feed control and improve the stability of combustion. The settings have been demonstrated on a number of other operational waste incineration sites and have been implemented with minor changes to the settings within the combustion control system, without changing the principles of the combustion control system.

The changes to the settings ensure that the performance of the combustion control system is maintained even with the increased thermal throughput. For the Facility, the changes to the combustion control system will enable the thermal capacity of the Facility to be increased from 57.25 MWth to 63 MWth.

### 2.2 Permitted capacity

The permitted capacity was based on the application to vary the EP submitted to the EA in May 2017 (the 2017 EP application). Within the 2017 EP application it was explained that the capacity of the Facility was based on the following design parameters:

1. it will have a throughput of 22.16 tonnes per hour per stream with the design point being waste with an NCV of 9.3 MJ/kg;
2. it is capable of processing waste with an NCV of 7 – 13 MJ/kg;
3. the thermal capacity of the Facility is 57.25 MWth; and
4. the operational availability will be 97% (8,500 hours per annum).

On this basis, the permitted capacity of the Facility was calculated as follows:

$$\begin{aligned} \text{Capacity} &= \text{Hourly throughput} \times \text{operational availability} \\ &= 22.16 \times 8,500 \\ &= 188,360 \text{ tonnes per annum per line} \\ &\approx 376,500 \text{ tonnes per annum} \end{aligned}$$

This design parameters utilised to determine the capacity are consistent with the firing diagram submitted provided in Appendix A of the 2017 EP application, which is provided in Figure 1 for reference (a larger copy is provided in Appendix A).

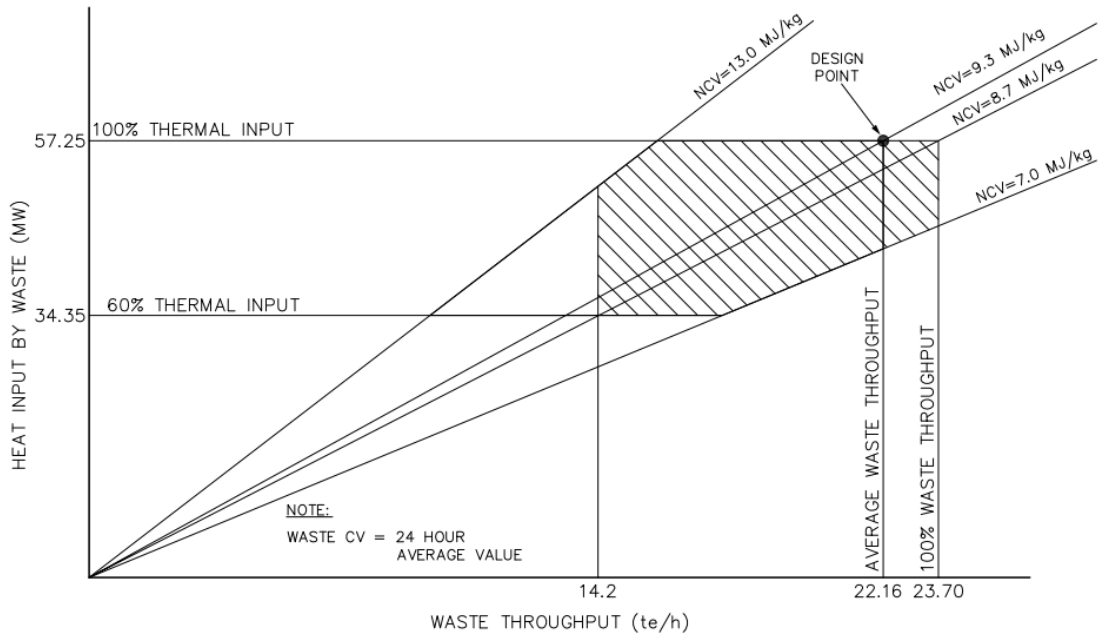


Figure 1 – Firing diagram (2017)

### 2.3 Proposed capacity

Due to the changes to the combustion control system, the as-built Facility is able to operate at a higher throughput than shown in the 2017 EP application. The revised firing diagram allowing for the changes to the combustion control system is provided in Figure 2 (a larger copy is provided in Appendix B):

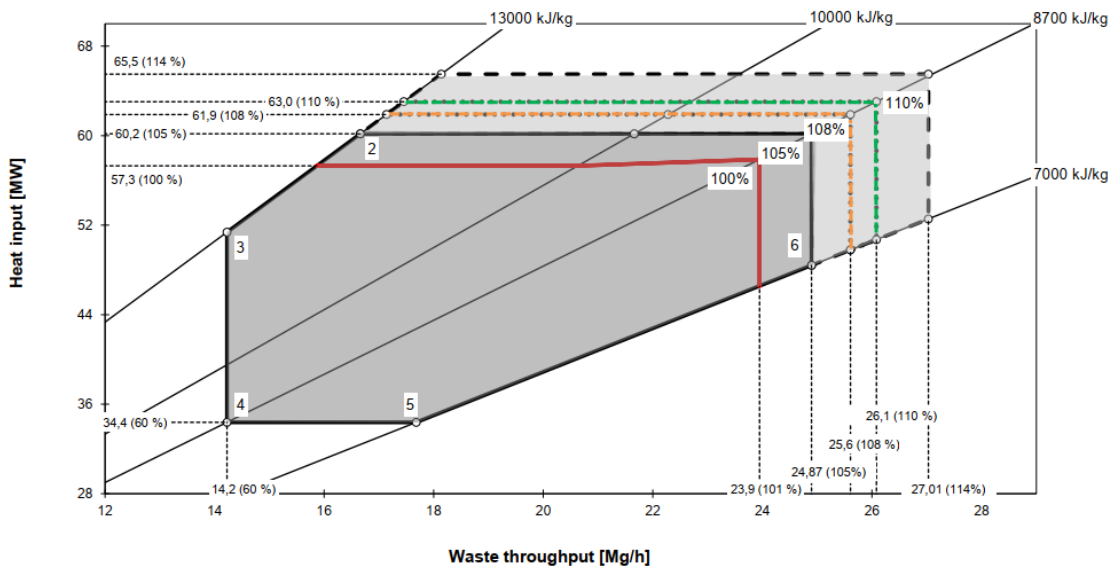


Figure 2 – Revised firing diagram

As shown in the as-built firing diagram, the design parameters for the Facility are as follows:



1. the Facility can process fuels with a range of 7 – 13 MJ/kg;
2. allowing for the lower end NCV of the fuels that it is designed to process, the Facility is capable of processing 24.4 tonnes per hour per line with the 'design waste' of an NCV of 9.3 MJ/kg; and
3. the nominal thermal capacity is 57.3MW per line, but allowing for the overload capacity, it is capable of operating at up to 63 MWth per line allowing for the Maximum Continuous Rating (110%) within the firing diagram.

The Facility has a theoretical maximum availability of 8,760 hours per annum, assuming maintenance outages are scheduled once every 18 months.

Therefore, allowing for the full range of design constraints of the as-built firing diagram and theoretical maximum availability, the maximum annual processing capacity can be calculated as follows:

$$\begin{aligned} \text{Maximum Capacity} &= \text{Hourly throughput} \times \text{operational availability} \\ &= 24.38 \times 8,760 \\ &= 213,525 \text{ tonnes per annum per line} \\ &= 427,050 \text{ tonnes per annum} \end{aligned}$$

Therefore, the theoretical maximum annual waste processing capacity of the Facility is approximately 427,050 tonnes per annum.

### 3 Additional EWC codes

In addition to the proposed increase in capacity, Viridor would request that the additional EWC codes presented in Table 1 are incorporated into the EP:

Table 1: Additional EWC codes

Waste code	Description
<b>02</b>	<b>WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING</b>
02 02	<i>wastes from the preparation and processing of meat, fish and other foods of animal origin</i>
02 02 02	animal-tissue waste
02 02 03	materials unsuitable for consumption or processing
02 03	<i>wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation</i>
02 03 02	wastes from preserving agents
02 03 03	wastes from solvent extraction
02 07	<i>wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)</i>
02 07 04	materials unsuitable for consumption or processing
<b>03</b>	<b>WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD</b>
03 03	<i>wastes from pulp, paper and cardboard production and processing</i>
03 03 10	fibre rejects, fibre-, filler- and coating-sludges from mechanical separation
<b>04</b>	<b>WASTES FROM THE LEATHER, FUR AND TEXTILE INDUSTRIES</b>
04 01	<i>wastes from the leather and fur industry</i>
04 01 09	wastes from dressing and finishing
<b>18</b>	<b>WASTES FROM HUMAN OR ANIMAL HEALTH CARE AND/OR RELATED RESEARCH (except kitchen and restaurant wastes not arising from immediate health care)</b>
18 01	<i>wastes from natal care, diagnosis, treatment or prevention of disease in humans</i>
18 01 09	medicines other than those mentioned in 18 01 08
18 02	<i>wastes from research, diagnosis, treatment or prevention of disease involving animals</i>
18 02 08	medicines other than those mentioned in 18 02 07
<b>19</b>	<b>WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE</b>
19 03	<i>stabilised/solidified wastes</i>
19 03 05	stabilised wastes other than those mentioned in 19 03 04
19 03 07	solidified wastes other than those mentioned in 19 03 06
19 08	<i>wastes from waste water treatment plants not otherwise specified</i>
19 08 01	screenings
19 09	<i>wastes from the preparation of water intended for human consumption or water for industrial use</i>
19 09 01	solid waste from primary filtration and screenings

Waste code	Description
20	<b>MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS</b>
20 01	<i>separately collected fractions (except 15 01)</i>
20 01 32	medicines other than those mentioned in 20 01 31

## 4 Environmental Risk Assessment

There are a number of different environmental impacts to consider as a result of the increase in the capacity of the Facility. These are discussed further in the sections below.

### 4.1 Air Quality

An Air Quality Assessment (AQA) has been undertaken to determine the changes in impact of emissions to air associated with operating at the increased capacity. Furthermore, a Dioxin Pathway Assessment (DPA) and Abnormal Emissions Assessment (AEA) have been undertaken in support of the application. All three of these assessments are presented within Appendix C.

As concluded in the AQA, *“the change in air quality impact associated with the proposed EP variation is marginal and emissions would not have a significant impact on local air quality, the general population or the local community. As such, there should be no air quality constraint in granting a variation to the existing EP for the increased throughput as proposed”*.

Furthermore, the DPA concludes that *“the impact of emissions of dioxins and dioxin-like PCBs from the proposed increase in capacity of the Facility on human health is predicted to be not significant”*.

Finally, the AEA concludes that *“periods of abnormal operation as permissible under the IED (Article 46) are not predicted to give rise to an unacceptable impact on air quality or the environment”*.

### 4.2 Raw material consumptions

The proposed increase in the waste processing capacity of the Facility will result in the consumption of additional raw materials. Estimates are provided in Table 2 of the quantities of raw materials consumed as a result of operating at the increased capacity based on the performance guarantees offered by the EPC Contractor.

Table 2: Estimated raw material consumption

Raw material	Unit	Permitted capacity consumption <sup>1</sup>	Permitted capacity consumption <sup>2</sup>
Auxiliary fuel	tpa	230	260
Urea	tpa	640	730
Lime	tpa	4,600	5,210
Activated Carbon	tpa	150	150
Notes:			
1. Based on 2017 EP application.			
2. Scaled to allow for the processing of approximately 427,050 tpa of waste.			

It should be noted that the proposed increase in capacity will not result in any changes to the arrangements for the storage and handling of raw materials, or any additional types of raw materials being consumed at the Facility.

### 4.3 Residue generation

The proposed increase in waste processing capacity will result in the generation of additional residues. Estimates are provided in Table 3 of the increased quantities of residues generated as a result of operating at the increased capacity.

Table 3: Estimated residue generation

Residue	Unit	Permitted capacity generation <sup>1</sup>	Permitted capacity generation <sup>2</sup>
Incinerator Bottom Ash (IBA)	tpa	99,396	112,700
Air Pollution Control Residues (ACPr)	tpa	12,161	13,800
Notes:			
1. Based on 2017 EP application.			
2. Scaled to allow for the processing of approximately 427,050 tpa of waste.			

It should be noted that the proposed increase in annual capacity will not result in any changes to the arrangements for the storage and handling of residues, or any additional types of residues to be generated at the Facility.

#### 4.4 Energy efficiency

As stated in the 2017 EP application, at the nominal design capacity the Facility is designed to generate 37.2 MWe and export 34.1 MWe. Due to the higher waste processing capacity, the Facility will generate 39.2 MWe and export 35.1 MWe.

The proposed increase in capacity has been considered against the relevant energy efficiency requirements of the waste incineration sector guidance (EPR5.01) and the Waste Incineration BREF (referred to as the WI BREF) utilising the design parameters set out within this application.

As presented in Table 4, the Facility compares favourably with the relevant benchmarks at the proposed capacity. Whilst the additional waste processing capacity will increase the electrical output Furthermore, the increase in the waste processing capacity of the Facility will result in an increase in the amount of power exported in MWh per year, displacing the marginal generation source.

Table 4: Energy efficiency parameters

Parameter	Unit	Proposed capacity	Benchmark	Source
Net power generation	MWh/t waste	0.80	0.6-0.9	BREF
Internal power consumption	MWh/t waste	0.08	0.06-0.19	BREF
Power generation (assumed gross) for 100,000 tpa of waste	MWe	9.18	5-9	EPR5.01
Gross electrical efficiency	%	31.11	20-35	BREF Implementation Plan

#### 4.5 Fire prevention plan

The proposed changes will not result in any changes to the quantity or arrangements for the storage of waste at the Facility. As such, there will be no increased fire risk associated with the storage of waste at the Facility. Taking this into consideration, the approved Fire Prevention Plan does not need to be amended for the purposes of this variation application.

#### 4.6 Noise

The proposed changes will not result in an increased risk of noise from the Facility. Therefore, an updated noise assessment considering the change in noise impacts associated with the proposed changes is not required to be submitted in support of this application.

#### 4.7 Odour

The proposed changes will not result in an increased risk of odour or dust from the Facility. Therefore, it is not Odour Management Plan is not required to be submitted in support of this application.

#### 4.8 Environmental management

The proposed changes will not result in any changes to the management systems associated with the operation of the Facility.

# Appendices

## A Firing Diagram (2017)



## B Revised Firing Diagram

## C Air Quality Assessment

## D Dioxin Pathway Assessment

## E Abnormal Emissions Assessments

ENGINEERING  CONSULTING

**FICHTNER**

Consulting Engineers Limited

Kingsgate (Floor 3), Wellington Road North,  
Stockport, Cheshire, SK4 1LW,  
United Kingdom

t: +44 (0)161 476 0032

f: +44 (0)161 474 0618

[www.fichtner.co.uk](http://www.fichtner.co.uk)