

Swadlincote Energy Recovery Facility (SERF)

Odour Management Plan

on behalf of R&P Clean Power Limited

Application for Environmental Permit

May 2024

Prepared by Stantec

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1 Introduction

1.1 Site Location

The proposed SERF (the ‘Facility’) is located on agricultural land, approximately 2 km west of Swadlincote town centre. The Facility is located just off the A444 (Burton Road) and surrounded by a mixed agricultural, residential, and industrial area. Figure 1 highlights the development site.

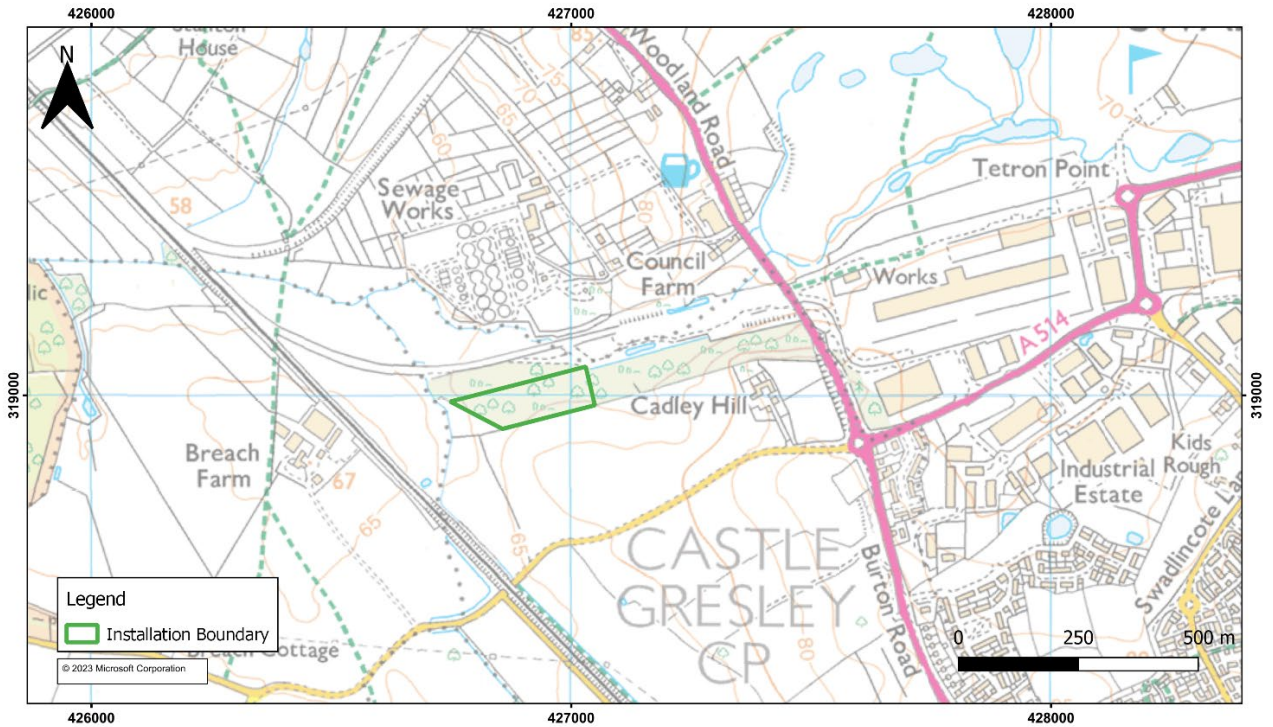


Figure 1: Swadlincote Site Location

1.2 Proposals

In summary, the proposal comprises of:

- An Energy Recovery Facility (ERF) with an annual throughput of 230,000 tpa and a stack of 60m height above ground level;
- The ERF will comprise of a single line mass incineration system, linked to a dual burner system. The fuel used in the plant will be sourced and delivered to the Facility by a third party on a contracted basis;
- A steam turbine driven power generation capacity of approximately 20.5 MW of electricity;
- Grid connection cables, plant and equipment including a high voltage power distribution system to enable electricity to be supplied to the public supply network;
- Infrastructure to enable CHP including the provision of a steam take off; and
- Installation of weighbridges, access and internal roads and parking facilities.

The energy recovery operation will run on a 24/7 basis, and the Facility will be permanently staffed. The acceptance of fuel will be restricted to specified hours.

1.3 Role of this Report

This Odour Management Plan (OMP) has been prepared in order to support the required permit application for the Facility.

2 Objectives of this Odour Management Plan (OMP)

In accordance with the Environment Agency (EA) H4 guidance¹, an OMP should be designed to:

- Employ appropriate methods, including monitoring and contingencies, to control and minimise odour pollution;
- Prevent unacceptable odour pollution at all times; and
- Reduce the risk of odour releasing incidents or accidents by anticipating them and planning accordingly.

An effective OMP should consider the sources of odour associated with the relevant process, how odour may be released as a result of activities taking place and what the related impacts might be. The OMP should demonstrate the competence and commitment of the operator to controlling these potential odour releases, through a range of measures.

It should also be noted that an OMP is a working document which requires continuous review and, where necessary, revision.

¹ Environment Agency (2011) H4 Odour Management: How to Comply with your Permit

3 Facility and Process Description

3.1 Site Location

The SERF would form a western extension to the immediately adjacent existing Willshee’s MRF. The Site is currently vacant, having been formerly agricultural land.

The Facility is surrounded by a mixed industrial, commercial, and residential land user, however, there are residential properties to the north and east within a 500m boundary. The main areas of residential receptors are located to the north-east and south-east in the villages of Castle Gresley and Stanton. Figure 2 highlights the residential receptors within a 2 km radius of the Facility.

The Facility is located adjacent to numerous industrial receptors, primarily to the east of the Facility extending towards Swadlincote town centre. Commercial receptors are located sporadically around the Facility, primarily within residential areas. Figure 3 highlights the commercial and industrial receptors within a 2km radius of the Facility.

Sensitive receptors representing education, health care and leisure are not located in the immediate area surrounding the Facility. These locations have been highlighted in Figure 4.

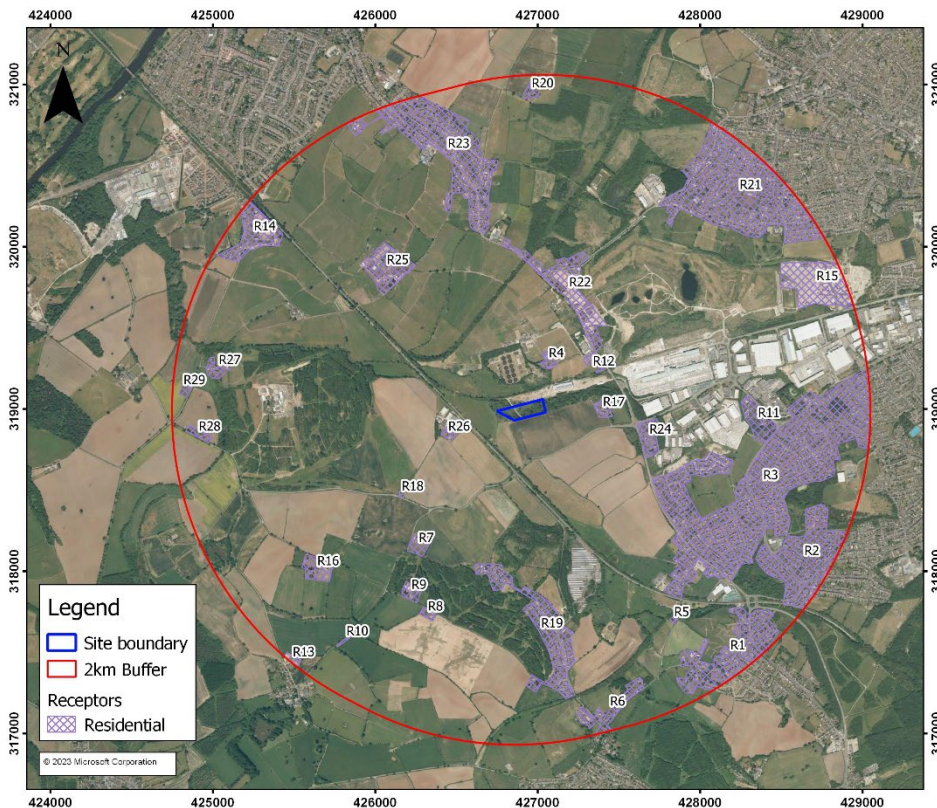


Figure 2: Location of Sensitive Receptors (residential)

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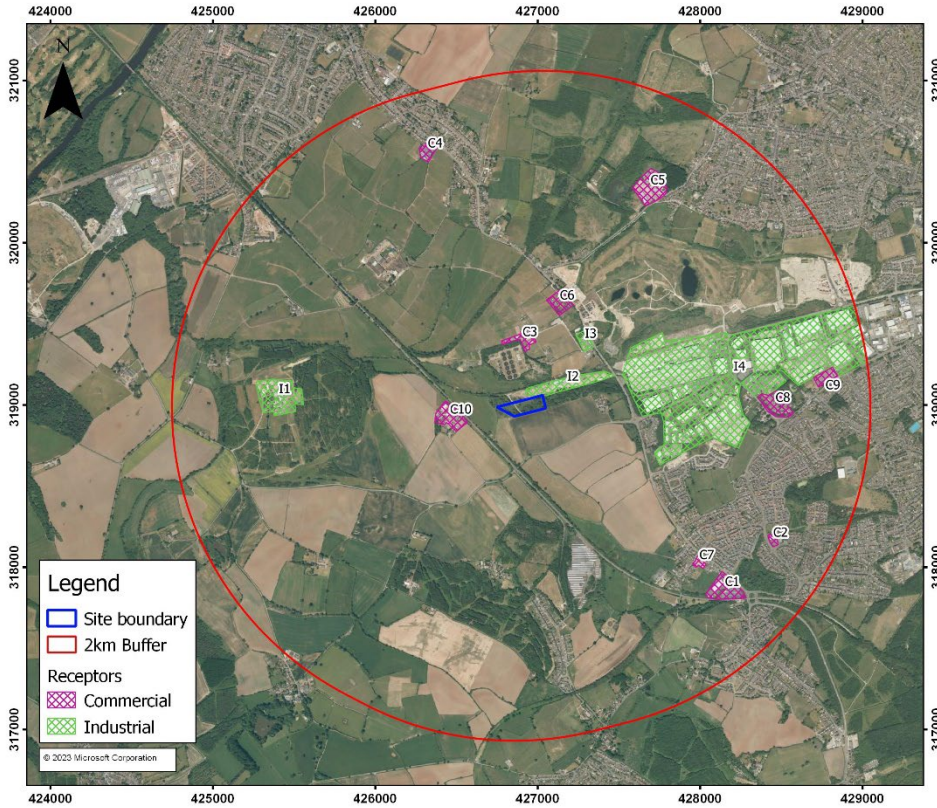


Figure 3: Location of Sensitive Receptors (commercial / industrial)

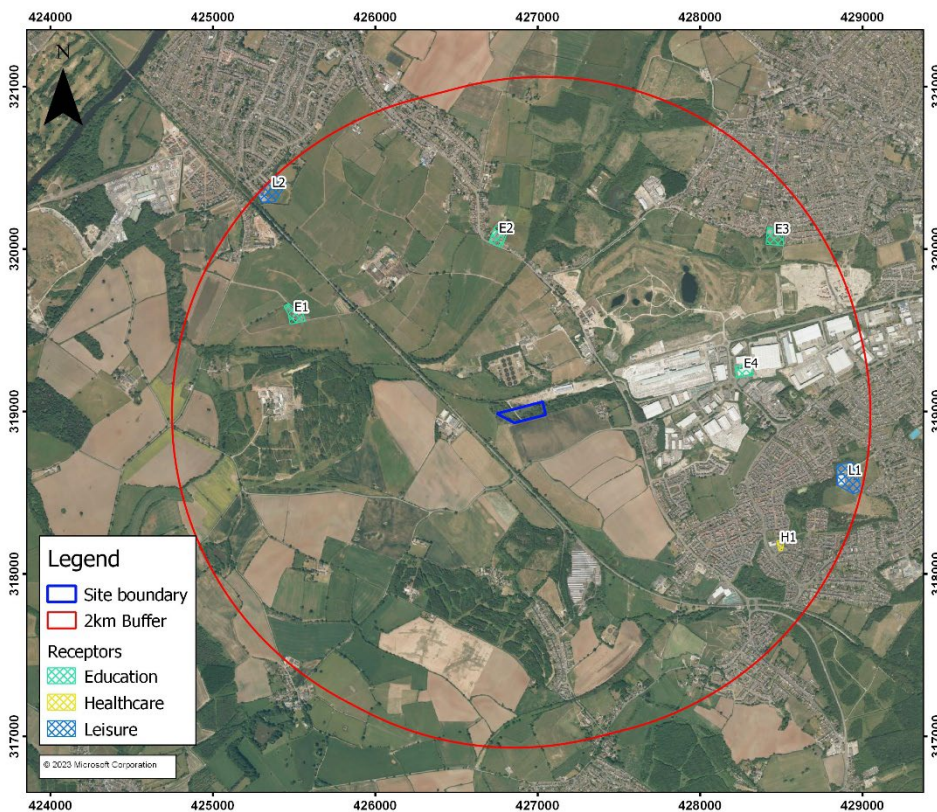


Figure 4: Location of Sensitive Receptors (education / healthcare / leisure)

Table 1: Swadlincote ERF Sensitive Receptors

Receptor Name	Receptor Map Reference	Distance from the SERF (m)	Receptor Type	Receptor Sensitivity
Residential properties to south-east	R1	1,645	Residential	High
Residential properties to south-east	R2	1,550	Residential	High
Residential properties to south-east	R3	760	Residential	High
Residential properties to north	R4	185	Residential	High
Residential properties to south-east	R5	1,480	Residential	High
Residential properties to south	R6	1,750	Residential	High
Residential properties to south-west	R7	880	Residential	High
Residential properties to south-west	R8	1,280	Residential	High
Residential properties to south-west	R9	1,180	Residential	High
Residential properties to south-west	R10	1,620	Residential	High
Residential properties to south-west	R11	1,945	Residential	High
Residential properties to west	R12	1,880	Residential	High
Residential properties to west	R13	1,660	Residential	High
Residential properties to north-west	R14	1,665	Residential	High
Residential properties to north-west	R15	1,960	Residential	High
Residential properties to south-west	R16	1,375	Residential	High
Residential properties to east	R17	280	Residential	High
Residential properties to south-west	R18	765	Residential	High
Residential properties to west	R19	1,800	Residential	High
Residential properties to north	R20	1,855	Residential	High
Residential properties to north-east	R21	1,320	Residential	High
Residential properties to north-east	R22	430	Residential	High
Residential properties to north	R23	1,040	Residential	High
Residential properties to east	R24	555	Residential	High
Residential properties to north-west	R25	965	Residential	High
Residential properties to west	R26	290	Residential	High
Residential properties to south	R27	890	Residential	High
Residential properties to north-west	R28	1,970	Residential	High
Residential properties to east	R29	1,660	Residential	High
Residential properties to north-east	R30	350	Residential	High
Residential properties to east	R31	1,195	Residential	High
Commercial businesses to south-east	C1	1,465	Commercial	Medium
Commercial businesses to south-east	C2	1,565	Commercial	Medium
Commercial businesses to north	C3	275	Commercial	Medium
Commercial businesses to north	C4	1,515	Commercial	Medium
Commercial businesses to north-east	C5	1,325	Commercial	Medium
Commercial businesses to north	C6	500	Commercial	Medium
Commercial businesses to south-east	C7	1,295	Commercial	Medium
Commercial businesses to east	C8	1,290	Commercial	Medium
Commercial businesses to east	C9	1,640	Commercial	Medium
Commercial businesses to west	C10	210	Commercial	Medium
Industry to west	I1	1,205	Industrial	Low
Industry to north-east	I2	0	Industrial	Low
Industry to north-east	I3	360	Industrial	Low
Industry to east	I4	495	Industrial	Low

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Schools to the north-west	E1	1,290	Education	High
Schools to the north	E2	950	Education	High
Schools to the north-east	E3	1,670	Education	High
Schools to the east	E4	1,180	Education	High
Leisure to the south-east	L1	1,810	Leisure	Medium
Leisure to the north-west	L2	1,930	Leisure	Medium
Healthcare to the south-east	H1	1,605	Healthcare	High

3.2 Process Overview

The following section provides an overview of the process that will be used within the ERF, with a focus on the identification of potential sources of odour release.

3.2.1 Delivery of Waste

The accepted wastes from the List of Wastes (LoW) are the following, hereafter referred to as the 'fuel':

- 19 12 10 - Combustible Waste (Refuse Derived Fuel)
- 19 12 12 - Other Wastes (Including Mixtures of Materials) from Mechanical Treatment of Wastes other than those mentioned in 19 12 11
- 20 03 01 - Mixed Municipal Waste
- Other wastes listed in Table 1b of Form B3

Waste will be delivered to the Facility by tipping or walking floor bulk haulage vehicles as well as ram-ejectors, accessing the Facility via Keith Willshees Way.

Vehicles will enter the Facility and pass over the weighbridge. Following acceptance, they will travel to the Waste Reception Hall and will be directed to an area for tipping.

The process of vehicles accessing the Waste Reception Hall, to deliver their waste load, is one of the main potential sources of odour associated with the operation of the Facility. To minimise the potential for odour releases, the delivery door will open only as the vehicle reverses into the Waste Reception Hall. Once the vehicle is fully within the Waste Reception Hall, the door will close immediately to minimise any escape of air from within the fully enclosed building. This should ensure that the potential for odour releases is minimised.

Once the vehicle has discharged its load and has been cleared to leave the Waste Reception Hall by the Mobile Plant Operator or Operations Technician, the driver will be directed to exit the Facility via the weighbridge by Facility signage.

The reception hall is kept at negative pressure by the operation of the combustion air fan feeding the combustion process. In situations where this may not be available due to breakdown or maintenance, a separate emergency extraction system is provided which consists of an appropriately sized air extraction fan passing through a wet scrubbing unit and/or activated carbon filters.

3.2.2 Storage

Incoming waste will be stored in a waste storage bunker of a capacity of approximately 8,500 m³ and in a storage area within the reception hall. The bunker and storage area will facilitate the

continuous operation of the plant, as it enables material delivered during the day to be stored and used on a 24-hour basis. The bunker will also provide sufficient storage to allow weekend and bank holiday operation when there are no waste deliveries, and for deliveries to continue during maintenance or plant shutdown.

The total storage of fuel on-site is therefore estimated to be between ca. 2,000 and 3,000 tonnes (depending on fuel density) at any one time, sufficient to operate the plant for 4-5 days under normal operating conditions. The annual throughput of fuel to the plant is to be up to 230,000 tonnes per year.

3.2.3 Fuel Feeding

The fuel in the bunker will be handled by an overhead crane that automatically spreads out and mixes the fuel, improving its homogeneity and optimising the space for pit replenishment. The overhead crane is also used to load the boiler hopper. The operation of the overhead crane is fully automated via a PLC system, though it may be manually controlled if required.

From the hopper the fuel falls onto the feeder table and is pushed onto a reciprocating combustion grate by hydraulically driven rams. Fuel throughput at full capacity (100% MCR) will 23.2 tonnes per hour (assuming fuel with an NCV of 10.5 MJ/kg).

3.2.4 Combustion Process

Once within the grate, waste is combusted in the combustion chamber with excess air, i.e. sufficient oxygen is supplied to the combustion process to allow full stoichiometric combustion and realise complete combustion of the waste. Air is fed through the bottom of the grate into the fuel bed. This air serves as primary combustion air and to keep the grate bars cool to prevent undue heat damage. As the fuel moves down the length of the grate it goes through drying, volatilization, combustion and ash burn out before being discharged as bottom ash at the other end.

Secondary air is injected near the gas exit from the chamber to complete the combustion of combustible components in the gases. The gas temperature in the combustion chamber is maintained by the DCS by adjusting the flow of primary and secondary air; this aids the control of thermal NO_x created by high temperatures in the chamber.

Oil-fired auxiliary burners are installed for start-up and shut down of the plant and to maintain the combustion space temperatures at 850°C as required for compliance with the Industrial Emissions Directive on the rare occasions when it becomes necessary to use auxiliary fuel to do so.

The hot gases from combustion process pass through a boiler where the heat is transferred to the water circuit and where steam is raised.

The end products are flue gases exiting the boiler are cleaned and discharged to atmosphere.

Two systems are used to extract ash from the combustion chamber and boiler surfaces. Bottom ash (from the combustion grate) is collected within a wet quenched system from hoppers beneath the grate and conveyed to a dedicated storage. Boiler ash (from radiant and conductive parts of the boiler) is dislodged by the boiler cleaning system, collected in hoppers at the bottom of the boiler passes and conveyed to the bottom ash handling system. In addition, the Facility is equipped with a Selective Non-Catalytic Reduction system that can dose an aqueous solution of

urea at 40% to reduce flue NO_x.

The combustion of fuel takes place within a controlled enclosed environment where there is no potential for odour release.

3.2.5 Power Generation

The combustion gases will enter the boiler, where they will transfer the heat to the evaporating boiler. The steam is “superheated” via the exchanger in the boiler to a temperature in excess of 400°C, and the superheated steam is then delivered to the steam turbine for electrical power production.

Steam enters the turbine through a hydraulic emergency stop valve, and the rate of flow into the turbine is controlled via a hydraulic throttle valve.

The gross electricity generation is 20.5 MWe, with a gross electrical efficiency is 30.3%. The net electricity generation (taking into account the parasitic load of the plant, other auxiliary consumptions, and electrical losses) is 18.5 MWe, an equivalent net electrical efficiency of 27.3%.

The electricity, produced at 33kV is connected to the electricity substation, as per the Connection Agreement with National Grid Electricity Distribution.

Steam from the steam turbine exhaust, flows into the main steam duct to the air-cooled condenser. The steam is condensed inside a heat exchanger using air as the cooling medium. The cooling air is forced through the heat exchanger by axial fans, driven by electric motors and speed reducing gearboxes. The condensate formed is collected by gravity into the condensate tank, from where it is pumped to a de-aerator to be recycled to the steam boiler for a new cycle.

A back-up diesel generator will provide power to shut-down the plant in safety operation mode in an emergency scenario.

3.2.6 Exhaust Emissions

Exhaust gases from the fuel combustion are mixed with lime and activated carbon in the vertical reaction tower. Following this process, exhaust gases are sent to a dust separator system that consists of filter bags to ensure the emissions comply with the limits specified in the Best Available Techniques (BAT) Reference for Waste Incineration and Industrial Emission Directive (IED).

Exhaust gases are discharged through a flue with a height of 60m. A Continuous Emission Monitoring System (CEMS) (with redundancy) is installed on the chimney to ensure compliance with the Waste Incineration BREF and IED limits at the point of discharge.

Table 2: Proposed emission limit values (ELVs)

Parameter	Half Hour Average (mg/Nm ³)	Daily Average (mg/Nm ³)	Periodic Limit
Continuously monitored pollutants			
Particulate matter	30	5	-
VOCs as Total Organic	20	10	-

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Carbon (TOC)			
Hydrogen chloride	60	6	-
Carbon monoxide	100	50	-
Sulphur dioxide	200	30	-
Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	400	120	-
Ammonia	-	10	-
Periodically monitored pollutants			
Hydrogen fluoride*	-	-	1
Cadmium & thallium and their compounds (total)	-	-	0.02
Mercury and its compounds**	-	-	0.02
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	-	-	0.3
PCDD/F***	-	-	0.04
PCDD/F + dioxin-like PCBs***	-	-	0.06
<i>All expressed at 11% oxygen in dry flue gas at standard temperature and pressure.</i>			

All values in the table above are at reference conditions of 173K temperature, 1.013bar pressure and 11% oxygen, dry.

3.2.7 Water Treatment

A demineralised water production plant will be installed to make up the small amount of water lost in the steam cycle. The process requires a potable water supply of approx. 5 m³ per hour on average, with a peak demand of 25 m³ per hour (only during Start-up).

3.2.8 Facility Control Systems

Process control at the Facility will be an important factor in odour control. The Facility will be equipped with a distributed control system (DCS), which measures and records various process parameters that indicate whether the process is operating within design parameters. The facility operator can control the process via the Human Machine Interface (HMI) which delivers a complete overview of the process components, reports system status and shows any alarms.

In addition, an emergency shutdown system is provided as a separate system that can be used to detect emergency situations and perform the required shutdowns.

3.2.9 End Products

As described above, the end products associated with these processes are flue gases, bottom ash and Air Pollution Control (APC) residues.

- Exhaust gases from the combustion process are normal products of gas combustion and are not considered to be a source of odour.
- The bottom ash is an inert material resulting from the full combustion of the fuel at high temperatures in the furnace and as such it has no potential for odour nuisance. Once it has been treated it may be used as an aggregate replacement.
- The APC residues are transported off-site for disposal under the relevant regulations, as this is considered to be a hazardous waste. These residues are not considered to be a source of odour.

4 Odour Management and Risk Assessment

4.1 Introduction

This section sets out the control measures/operational procedures that will be put in place at the Facility in order to reduce the potential for odour releases and associated nuisance for local residents. In addition, a risk assessment has been undertaken to consider the effectiveness of these measures and procedures. Table 4, drawn from the relevant EA guidance², sets out the measures and procedures to be put in place, as well as the residual risk of odour nuisance, during normal operational practices. Table 5 includes the same details, but for abnormal operational practices.

The risk assessment indicates that the residual risk of odour nuisance should not be significant, provided that the management procedures are correctly implemented.

² Environment Agency (2011) Horizontal Guidance Note H1, Annex A: Amenity and Accident Risk from Installations and Waste Activities

4.1.1 Odour Risk Assessment and Management Plan – for normal operational conditions

Table 3: Odour Risk Assessment and Management Plan – for normal operational conditions

Hazard	Receptor	Pathway	Risk Management	Probability of exposure	Consequence	What is the overall risk?
<i>What has the potential to cause harm?</i>	<i>What is at risk? What do I wish to protect?</i>	<i>How can the hazard get to the receptor?</i>	<i>What measures will you take to reduce the risk? (Who is responsible?)</i>	<i>How likely is this contact?</i>	<i>What is the harm that can be caused?</i>	<i>What is the risk that still remains?</i>
Odour from waste being delivered to the reception hall	Residential and commercial properties bordering the Facility	Air	Physical Control Procedures: <ul style="list-style-type: none"> • Ensure that all vehicles delivering waste to the Facility are fully enclosed • Ensure that roller doors on the Waste Reception Hall are only opened for the arrival of a delivery vehicle and that they are closed once the vehicle is fully within the building Procedural/Managerial Control Measures: <ul style="list-style-type: none"> • Continuous monitoring of the process using the automatic process control • A complaints procedure will be put in place to ensure that potential issues are identified and rectified as soon as possible • A preventative maintenance programme will include the regular inspection of all plant and control measures 	Unlikely	Odour annoyance	Not significant, if management effective

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Hazard	Receptor	Pathway	Risk Management	Probability of exposure	Consequence	What is the overall risk?
Odour from waste being held in the storage bunker	Residential and commercial properties bordering the Facility	Air	<p>Physical Control Procedures:</p> <ul style="list-style-type: none"> • Ensure that waste is only held within the reception hall storage areas which is held at negative pressure and is utilised as combustion air within the furnace where odours are combusted • Ensure that all waste is physically managed to minimise the time between initial receipt of waste and input into the grate <p>Procedural/Managerial Control Measures:</p> <ul style="list-style-type: none"> • Continuous monitoring of the process using the automatic process control • A complaints procedure will be put in place to ensure that potential issues are identified and rectified as soon as possible • A preventative maintenance programme will include the regular inspection of all plant and control measures 	Unlikely	Odour annoyance	Not significant, if management effective

4.1.2 Odour Risk Assessment and Management Plan – for abnormal conditions

Table 4: Odour Risk Assessment and Management Plan – for abnormal operational conditions

Hazard	Receptor	Pathway	Risk Management	Probability of exposure	Consequence	What is the overall risk?
<i>What has the potential to cause harm?</i>	<i>What is at risk? What do I wish to protect?</i>	<i>How can the hazard get to the receptor?</i>	<i>What measures will you take to reduce the risk? (Who is responsible?)</i>	<i>How likely is this contact?</i>	<i>What is the harm that can be caused?</i>	<i>What is the risk that still remains?</i>
Odour from an accidental spillage or leak of odorous material outside designated storage areas	Residential and commercial properties bordering the Facility	Air	Procedural/Managerial Control Measures: <ul style="list-style-type: none"> • Continuous monitoring of the process using the automatic process control and daily visual inspection • A complaints procedure in place to ensure that potential issues are identified and rectified as soon as possible • A preventative maintenance programme to include the regular inspection of structures, plant, and control measures 	Very unlikely	Odour annoyance	Potentially significant

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Odour from unplanned downtime	Residential and commercial properties bordering the Facility	Air	<p>Physical Control Procedures</p> <ul style="list-style-type: none"> • Operation of emergency air extraction and wet scrubber and/or activated carbon filters to maintain negative pressure in the reception hall <p>Procedural/Managerial Control Measures:</p> <ul style="list-style-type: none"> • Robust contingency planning in place for unplanned shutdowns • A preventative maintenance programme to include the regular inspection of structures, plant, and control measures to minimise the risk of unplanned shutdown. 	Unlikely	Odour nuisance	Not significant
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Hazard	Receptor	Pathway	Risk Management	Probability of exposure	Consequence	What is the overall risk?
Odour associated with ammonia slip	Residential and commercial properties bordering the Facility	Air	Monitoring of ammonia emission etc. Should elevated emissions of ammonia be detected in the exhaust stream. Investigation to identify the cause of the ammonia slip will be undertaken by on-site management and rectified at earliest opportunity.	Unlikely	Local nuisance	Not significant

5 Repairs, Maintenance, and Monitoring

5.1 Maintenance Strategy

The Facility will be inspected daily by the operator by means of a visual check and will be serviced and maintained by competent Facility staff and third-party providers at regular intervals in accordance with the operational manual and manufacturer's instructions. Results of the daily visual check will be recorded in the on-site log book. Records of all servicing and maintenance visits will be held on-site.

5.2 Monitoring

It is proposed to undertake olfactory monitoring once the Facility is operational. This will be undertaken by a trained surveyor and records will be recorded the results daily in a log book. The route of the survey will be along the Facility boundary. Log book entries will comprise the following details:

- Time and date of test;
- Name of surveyor;
- Weather conditions, including wind direction; and
- Intensity of the odour at various test locations. This should include notes on the duration of the test and whether odour was constant or intermittent during that period, as well as a description of the odour and the likely source.

It will be important that the surveyors have not spent significant time in waste processing areas before carrying out odour monitoring activities, as the testers sense of smell must not have become accustomed to the odours arising. The individuals undertaking the monitoring should avoid strong foods or drinks for at least half an hour before conducting the monitoring. Furthermore, strongly scented toiletries and the use of deodorisers within vehicles will be avoided.

6 Neighbourhood Engagement

The Facility operator is committed to developing a good relationship with the public and is committed to deal with any complaints, including those with regard to odour, in an open and timely manner. Visitors, customers, and neighbours expressing dissatisfaction with the facilities or operations carried out at the Facility will be invited to enter a record in the Complaints File. The complaint will be dealt with by the facility operator for analysis and actions required, engaging specialist third parties wherever needed. The complainant will be informed of the results of the investigation and any corrective actions proposed.

7 Staff Competency and Training

The facility operator will be fully trained by the technology provider, or a chosen training provider, in the correct operation of all elements of the ERF. The facility operator will be equipped with an operations manual which will support them during the day to day running of the plant. It will also contain all necessary details regarding inspection and maintenance intervals and contact details of contractors.

In addition, all Facility staff will be trained in emergency and incident response relating to the operation of the facility. Training records will be held on-site as part of the operations manual.

8 Summary and Conclusions

The Swadlincote Energy Recovery Facility will be located to the east of Swadlincote adjacent to an existing industrial and commercial estate that contains sensitive receptors.

The Facility will utilise non-hazardous municipal solid waste (MSW) and commercial and industrial (C&I) refuse derived waste to generate electricity for export into the national grid. The additional end products include flue gases, bottom ash, and residues from flue gas treatments.

The main source of odour at the Facility is associated with the delivery and storage of waste prior to treatment. Waste will be delivered by bulk haulage vehicles, which will access the Waste Reception Hall through roller shutter doors. These doors will only open to allow vehicles to enter and exit the building. The reception hall is kept at negative pressure by the operation of the combustion air fan feeding the combustion process, thus minimising the potential for odour releases.

An odour abatement system will be installed to provide, if required, secondary odour abatement within the waste reception and storage areas during plant outages (i.e. when combustion air is not extracted from the bunker area). Incoming waste will be stored in an enclosed storage bunker and will be managed in accordance with strict management procedures. It is therefore not considered likely that there will be a significant potential for odour releases.

The remainder of the process will take place in an enclosed controlled environment and is therefore not considered likely to have the potential to lead to odour emissions.

The Facility will be equipped with an automatic process control unit, which measures and records various process parameters that indicate whether the process is operating within design parameters. In addition, a separate emergency shutdown system is used to detect emergency situations and perform required shutdowns.

The odour management plan presented in this report, comprising physical control measures combined with management procedures, is considered to reduce the risk of odour emissions so that odour nuisance is considered to be not significant.