Mitchell Laithes Sludge Treatment Facility Odour Management Plan

September 2024

YorkshireWater

Stantec

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2	March 2023	Gillian Baichoo / Antony Saunders (Stantec)	Ed Sutherland	Inclusion of SAS assets, additions as detailed in the EA's Schedule 5
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Contents

1 Introduction

This Odour Management Plan (OMP) for Mitchell Laithes sludge treatment facility (STF) has been developed by Stantec on behalf of Yorkshire Water Services Ltd (YW). YW have developed this OMP as a live working document that forms part of the operational management system of the site. The OMP demonstrates how odours shall be managed and controlled to prevent odour impacts from activities during normal operation and also during abnormal events.

The OMP has been developed to meet the Environment Agency's (EA) H4 Odour Management Guidance.

The OMP has been prepared in support of the permit variation for Mitchell Laithes STF.

These activities fall under Environmental Permit reference EPR/VP3730GB.

The OMP provides sufficient detail to allow operators and maintenance staff to understand clearly the operational procedures for both normal and abnormal conditions. It is intended to be used as a reference document by operational staff on a day-to-day basis. The OMP includes the following:

- A description of the site and catchment, including sources of odour on the site, and location of sensitive receptors;
- A brief history of received complaints and measures taken to date;
- YW Operation and Management (O and M) procedures for the site, including good housekeeping measures to minimise odour generation and release;
- The mitigation procedures which should be implemented when foreseeable situations that may compromise the ability to prevent and minimise odorous releases occur. These can include both breakdowns and external conditions such as extreme weather;
- An Action Procedure for complaints;
- An odour risk assessment identifying any odorous or potentially odorous areas of the works and immediate and longer-term actions required to eliminate odour complaints; and
- The management and operator training requirements and records with respect to odour.

1.1 Yorkshire Water Odour Management

YW acknowledges that high levels of odour arising from wastewater and sludge treatment are not acceptable and that reasonable measures must be taken to minimise any inconvenience to the general public. YW does not operate under a single defined odour exposure standard. Each site is considered individually taking into account the relevant legislation and local authority's conditions. Site specific factors such as site history with regard to odour complaints, potential future encroachment by residential or business developments, and the presence of particularly odour sensitive receptors within the vicinity of the works / facility are also taken into consideration.

2 Site Information

2.1 Site Location

Mitchell Laithes STF is located adjacent to Mitchell Laithes WwTW. The site is located approximately 2 km south-east of the junction of Dewsbury Ring road and Bradford road near the Dewsbury town centre and on the north bank of the River Calder. The site is immediately bordered by uninhabited land in all directions. Industrial, residential, and commercial receptors are located to the west, north-west and primarily residential receptors in the other directions. The works location is highlighted in Figure 1.

Figure 1 Mitchell Laithes STF Site Location

2.2 Site Receptors

Mitchell Laithes STF is located as part of Mitchell Laithes WwTW. The site is primarily bordered by farmland and grassland. The nearest receptors are located on the north-west / west boundary of the works and consists of a mixture or residential, commercial and industrial zoning. The north of the works is predominantly farmland with a boundary before a large cluster of residential zoning. The east of the works is farmland followed by residential areas to the north-east / east with industrial food processing plant to the south east.

Mitchell Laithes WwTW has received 6 odour complaints in the last 5 years. These complaints are of an infrequent nature and were associated with a site level and not narrowed down to a specific issue.

A summary of the areas of interest and receptors local to the work are highlighted in Figures 2 - 4, complete with receptor description and sensitivity in Table 1.

Figure 2 Location of Sensitive Receptors (Residential)

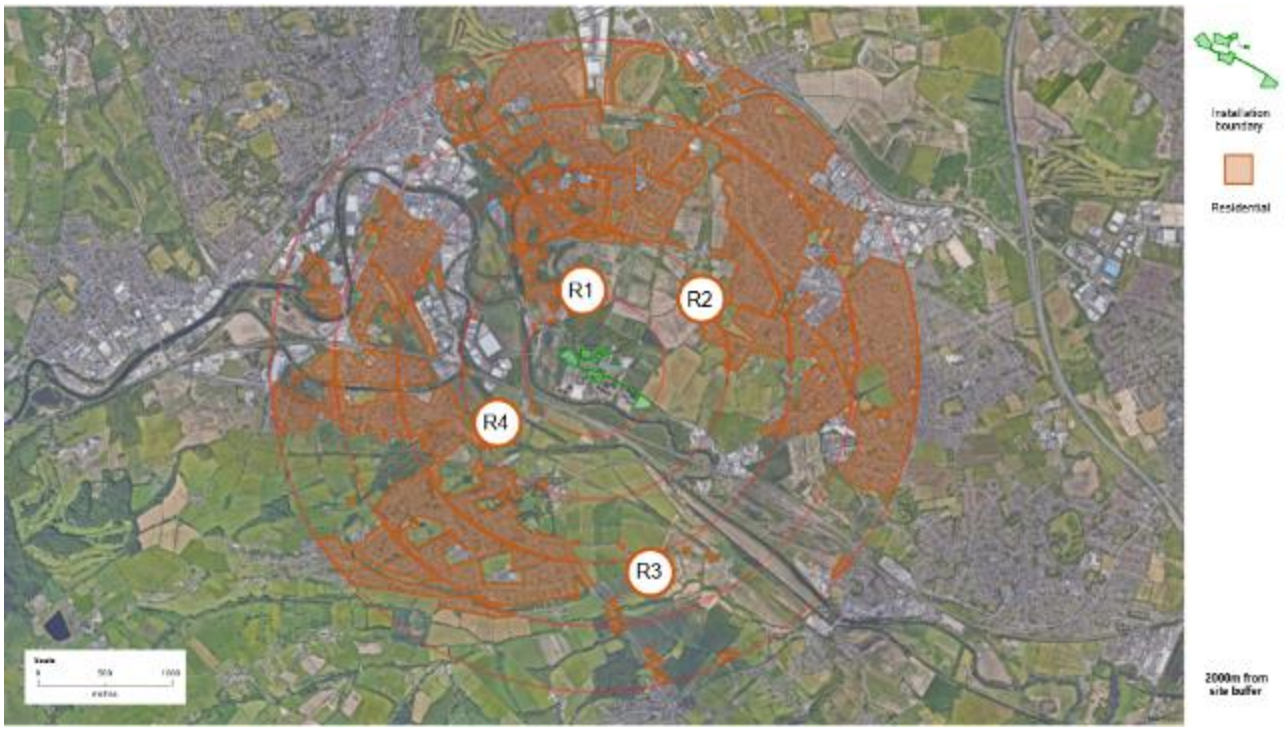


Figure 3 Location of Sensitive Receptors (Commercial / Industrial)

Figure 4 Location of Sensitive Receptors (Education / Leisure)

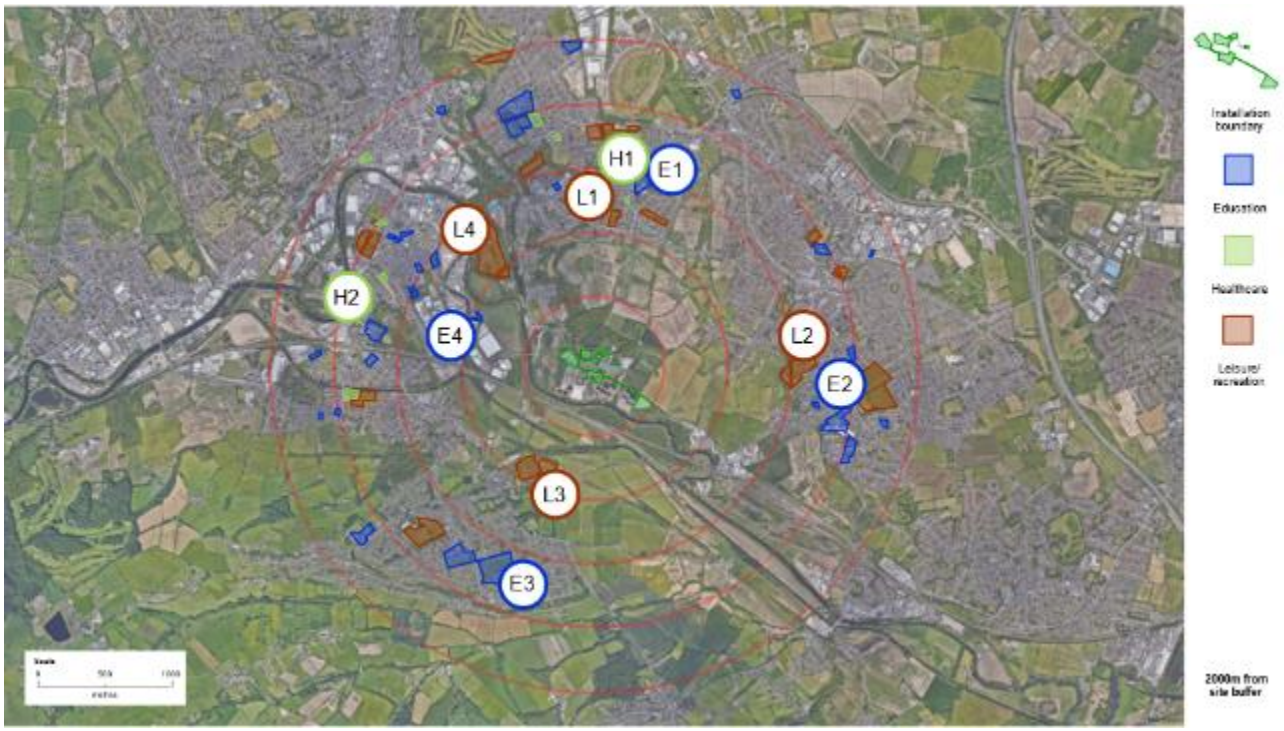


Table 1 Mitchell Laithes Receptor sensitivities

Receptor Name	Receptor Map Reference	Distance from Site (m)	Receptor Type	Receptor Sensitivity
Residential properties to north	R1	235	Residential	High
Residential properties to east	R2	620	Residential	High
Residential properties to south	R3	1,060	Residential	High
Residential properties to west	R4	450	Residential	High
Commercial businesses to north	C1	1,230	Commercial	Medium
Commercial businesses to east	C2	1,345	Commercial	Medium
Commercial businesses to south	C3	750	Commercial	Medium
Commercial businesses to west	C4	1,035	Commercial	Medium
Industry to north	I1	220	Industrial	Low
Industry to east	I2	275	Industrial	Low
Industry to south	I3	810	Industrial	Low
Industry to west	I4	385	Industrial	Low
Schools to the north	E1	1,250	Education	High
Schools to the east	E2	1,250	Education	High
Schools to the south	E3	1,460	Education	High
Schools to the west	E4	695	Education	High
Leisure/recreation to the north	L1	980	Leisure/recreation	Medium
Leisure/recreation to the east	L2	1,045	Leisure/recreation	Medium
Leisure/recreation to the south	L3	700	Leisure/recreation	Medium
Leisure/recreation to the west	L4	750	Leisure/recreation	Medium
Healthcare to the north	H1	1,170	Healthcare	Medium
Healthcare to the west	H2	1,500	Healthcare	Medium

Mitchell Laithes STF does not have a history of odour nuisance. The whole site, include wastewater operations, have only received 6 odour complaints in the last 5 years.

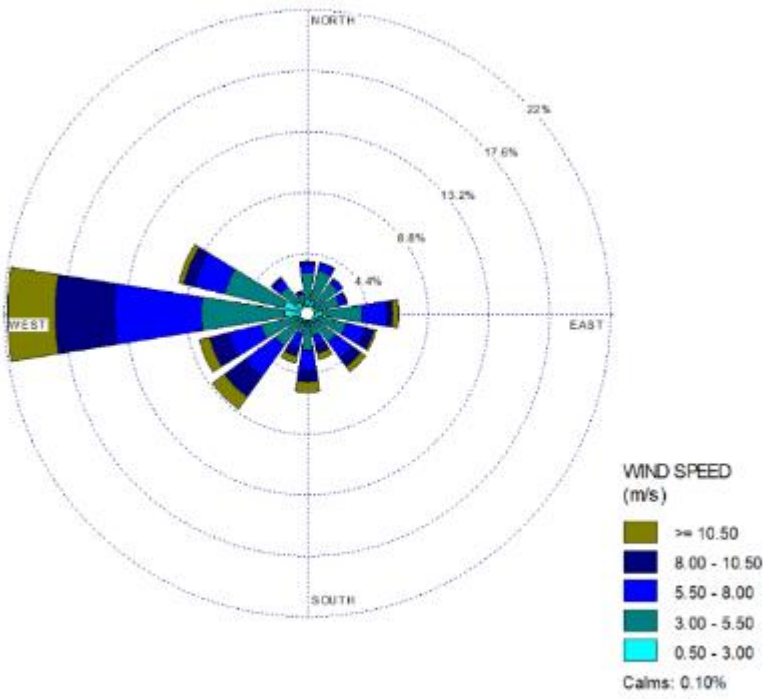
2.3 Meteorological Conditions

In the UK, the prevailing wind directions are commonly from the west and south-west. The wind direction and speed will impact the dispersion of odour emissions from site. There is currently no wind station on site to measure meteorological conditions.

Emley Moor meteorological station is the closest representative station for Mitchell Lathes STF. The meteorological station is located approximately 8km south-west of the site and is to be considered comparable to the meteorological conditions on site. The meteorological data from Emley Moor meteorological station has been incorporated into the site's odour risk assessment whereby wind direction and frequency are used to determine the "pathway effectiveness" from source to receptor. Wind direction and speed is also included as part of the on-site sniff testing (see Section 5.1 Sniff Testing).

The wind rose plot for Emley Moor meteorological station is included in Figure 5.

Figure 5 Emley Moor Windrose Plot



2.4 Process Description

Sewage sludges treated within the STF originates from two sources:

- Indigenous sewage sludges including indigenous primary sludge and indigenous surplus activated sludge (SAS) arising from sewage treatment processes operated within the wider Mitchell Laithes WwTW are piped directly to the STF.
- Liquid sludges generated by other Yorkshire Water sewage works (with lower capacity or capability for treating sludges on-site) are imported to Mitchell Laithes STF for additional treatment.

The associated waste code and description of these sludges are represented in table 2.

Table 2 Waste Description and EWC codes accepted

Waste Code	Description of the waste
19	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
19 02	Wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)

19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05, specifically sewage sludge
19 06	Wastes from anaerobic treatment of waste
19 06 06	Digestate from anaerobic treatment of animal and vegetable waste
19 08	Wastes from waste water treatment plants not otherwise specified
19 08 05	Sludges from treatment of urban waste water

Imported liquid sludge is delivered to site by tanker. The tanker unloads at the dedicated sludge import area and sludge is pumped (using vehicle mounted pumps) into the sludge screen feed tank. At the sludge screen feed tank imported liquid sludge is mixed with indigenous primary sludge, which is piped directly from the wider Mitchell Laithes WwTW. The sludge is then screened using two Huber ROTAMAT enclosed rotating screens. Screenings drop into a skip and are disposed of off-site.

After screening, liquid sludge is pumped via a sub-surface concrete sump, initially above ground and then underground to the sludge primary storage tanks. The liquid sludge is mixed (using air injection compressors); the tanks operate in parallel. These tanks are covered and the headspace air is extracted to an odour dispersion stack (Stack 1).

In the event of a loss of the sludge screening facility, a bypass line is provided to allow unscreened liquid sludge to be pumped direct to the storage tanks. This would be sub-optimal but provides operational flexibility and enhanced process control.

Liquid sludge from the primary storage tanks is transferred to the gravity belt thickener (GBT) building via a dedicated pipeline. Within the GBT building, polymer is mixed with the primary indigenous and imported sludge within the GBT hopper to aid in sludge thickening process. From here the sludge enters the GBT and migrates down the moving, porous belt where excess liquid is able to drain away leaving the thickened sludge on the belt. There are five GBTs on site, each of which is capable of processing approximately 20 m^3 / hr of sludge. Three GBTs are normally operating at any one time with the remaining two units on standby. Air from the GBT units is extracted by twin (duty / stand by) fans into ductwork and dispersed via Stack 1. Thickener liquor from the GBTs is piped back to the Mitchell Laithes WwTW for treatment. The thickened sludge is then transferred to the covered digester feed blend tank.

Liquid surplus activated sludge (SAS) is pumped directly from the co-located Mitchell Laithes WwTW to two SAS tanks (uncovered concrete tanks). These tanks are mixed and operate on a fill/draw basis over a 24 hour period.

Sludge from the SAS tanks is transferred to the drum thickener building, via above and below ground pipework. There are three pairs of two drum thickeners (i.e. 6 in total) located within the building. Each pair of drums operates as a single unit with common feed and offload pipework. Polymer solution, transferred via above and below ground pipework from the adjacent GBT building, is injected into the sludge stream within the flocculation tank (one flocculation tank per pair of drum thickeners) with final treated effluent added as a ‘carrier’ before being transferred to thickener drums. The polymer encourages separation of water from the sludge as the sludge is rotated in the drum to remove excess liquid. The thickener liquors are returned to the WwTW for full treatment.

The drum thickeners are equipped with automatic spray bars which provide continual self-cleaning. The automatic spray bars operate using treated final effluent. A manual jet wash is also available for additional cleaning requirements; this system utilises potable water.

Air is extracted from the drum thickeners and dispersed via an approximately 7 m high stack (Stack 2). Ambient air from the building is passively dispersed via louvre vents; ambient building air is not odorous under normal operating conditions due to the direct drum extraction.

The thickened indigenous SAS is then transferred to the covered digester feed tank (concrete tank), where it is joined by thickened imported and primary indigenous sludges. Sludge within the digester feed tank is mixed via an air mixing system. Air is extracted from the digester feed tank and dispersed via Stack 1.

Thickened sludges are pumped from the digester feed blend tank to the anaerobic digesters. The anaerobic digesters operate as a continuous process with sludge being added via a feed pump and treated sludge extracted. The digesters have a typical combined feed rate of around 383m^3 / day; the maximum feed rate is 767m^3 / day giving a 12-day retention time as required by Hazard Analysis and Critical Control Points (HACCP) controls. The digesters are mixed by gas mixing systems, which utilise biogas from the headspace of each digester; the gas is compressed and then reintroduced using an array of mixing nozzles on the floor of the digester.

Digested sludge spills over the limpet chamber bell mouths and piped to the uncovered digested sludge balance tank, also referred to as the degassing tank prior to onward processing.

Biogas generated by the digesters is piped via a common biogas discharge line to the biogas holder (1,350m^3 capacity) and from there to the CHP, boiler plant and/or waste gas burner (flare). The biogas holder provides gas buffering capability in order to allow for fluctuations in gas production.

The gas holder is formed of two bags; the outer bag is inflated with air and the inner bag rises and fills in line with biogas production and usage. Excess liquids within the biogas are removed via condensate traps on the biogas system. These are located at the inlet to the biogas holder, in the pipeline leading to the flare and in the pipeline leading to the CHP/Boilers. These collected liquids are transferred to the WwTW for treatment.

On leaving the holder, the biogas will pass via a condensate trap to the gas boosters, which increase the pressure of the biogas prior to use by the CHP engines and boilers.

Pressure relief valves are located on the crown of the roof of the digesters (2 no. at each digester), and on the inlet pipe to the biogas holder. These valves are an essential safety mechanism and will release gas to atmosphere in the event of a build of pressure preventing damage to equipment e.g. the gas holder. The valves are also an 'anti-vacuum' design to prevent tank damage from negative pressures.

The biogas fuel is combusted using CHP units. The following CHP units are located on site:

- Two older Perkins engines with a thermal input rating of 1.4 MWth located within the CHP Engine Building; and
- One newer Edina engine with a thermal input rating of 1.4 MWth located outside adjacent to the digesters.

The CHP engines generate electricity which is used to power essential site processes; excess electricity may be exported to the national grid. Heat from the combustion process is used to maintain the required temperature of the sludge in the anaerobic digesters (via the heat exchange system), with any excess being discharged using air cooled radiators.

Combustion products from the two older CHP engines (Perkins) are discharged via two stacks, approximate height 8m high stacks located adjacent to the engines, on the outside of the CHP Engine Building. The newer CHP unit (Edina) is housed within a dedicated enclosure which is located adjacent to the digesters; this has its own 7m high stack located on the enclosure roof. Gas passes through a siloxane scrubber before it enters the Edina engine; siloxane monitoring upstream and downstream of the scrubber identifies when the scrubber media needs replacing. A further siloxane filter serves the older CHP engines.

Two dual fuel boilers are used to provide alternative heat source for the digesters in the event that the CHPs are unavailable. These are fired by biogas with gas oil available as a back up fuel source, and each have a thermal input capacity of approximately 2.7 MW. Combustion products from the boilers are discharged via two stacks, approximate height 12m, located adjacent to the boilers, on the outside of the CHP Engine Building. The gas oil is stored outside the CHP engine building within a fully bunded 50m^3 steel tank.

In periods where both the CHP engines and boilers are unavailable biogas is directed to the waste gas burner. This flare facility comprises a 1,296m^3/hr enclosed thermal combustor with approximately 7.5m high exhaust stack and is located at a safe distance from the digesters and other biogas handling and treatment activities. Flare stack operation is automated based on the gas level in the biogas holder. If the gas level is high then the flare will operate, however utilisation of the gas is preferred over flaring. The flare provides 0.3 second retention time at 1,000 deg. C.

Digested sludge is pumped via below ground pipes from the digested sludge balance tank located adjacent to the anaerobic digesters to the centrifuge feed tanks. These tanks are uncovered and the digestate is air mixed within the tanks, to prevent settlement and inhibit generation of methane.

From the feed tanks, the digestate is piped to the centrifuge building which contains two centrifuges. A polymer solution is added to the digestate in order to aid dewatering. The polymer type used may be in the form of either a powder or liquid. In both cases the polymer is mixed with potable water within a polymer mixing tank and is introduced to the digestate stream. The digested sludge is macerated prior to the injection of the polymer solution and passed to the centrifuge where the sludge coagulates and supernatant liquor is removed by centrifugal forces. The liquor drops from the centrifuges into a sump and is pumped back to the WwTW for treatment.

The final digested and dewatered sludge cake is transferred via centreless screw conveyers from the centrifuges and onto the cake pad. In addition to the cake pad located directly adjacent to the centrifuges, there are two further areas where sludge cake may be stored. The whole area under the conveyer and all three sludge cake pads is an engineered impermeable surface, with water runoff being returned back to the WwTW for treatment.

Sludge cake is moved by mechanical loaders into storage rows on one of the three cake pad areas. There is no lime addition at Mitchell Laithes; instead, cake is stored in piles according to age and is left to mature for a minimum of four weeks in accordance with HACCP requirements. Once maturation is complete, sludge cake is removed from site and landspread in accordance with legislative requirements. Samples of digested, matured cake are taken every 3 months and analysed for metals and pathogens to ensure HACCP standards are being met.

There are no odour control units at Mitchell Laithes STF. There is an extraction and dispersion system that extracts odours from the GBT building, primary sludge storage tanks and digester feed blend tank. The untreated emissions are dispersed via a 3m tall stack located to the west end of the SAS thickener building (referred to as Stack 1). There is also an extraction and dispersion system that extracts odours from the drum thickeners. The untreated emissions are dispersed via an approximately 7 m high stack (referred to as Stack 2) located to the east end of the SAS thickener building.

The process flow diagram for the site is highlighted in Figure 6. The location of site sources are included in Figures 7.

Figure 6 Mitchell Laithes STF Process Flow Diagram

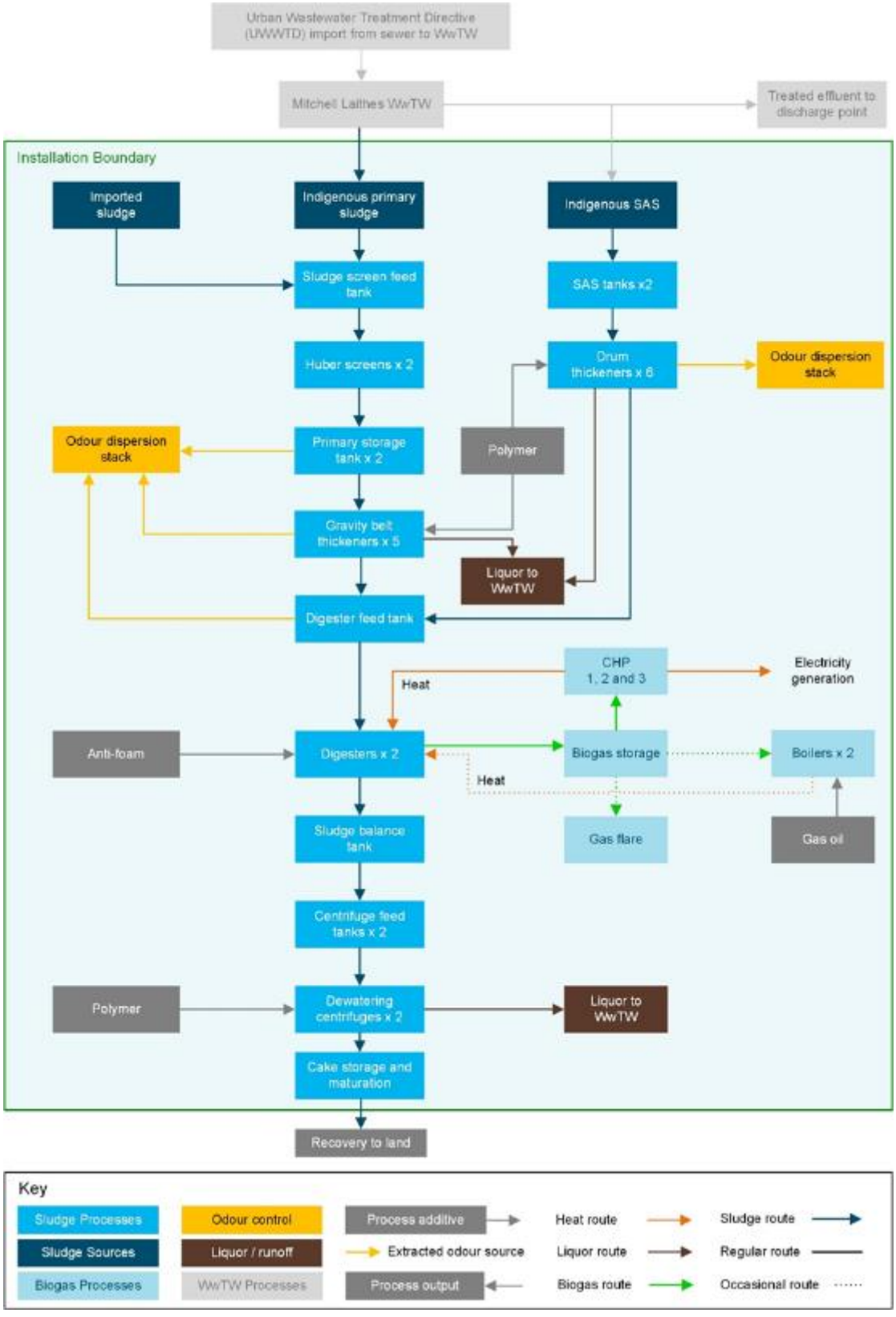
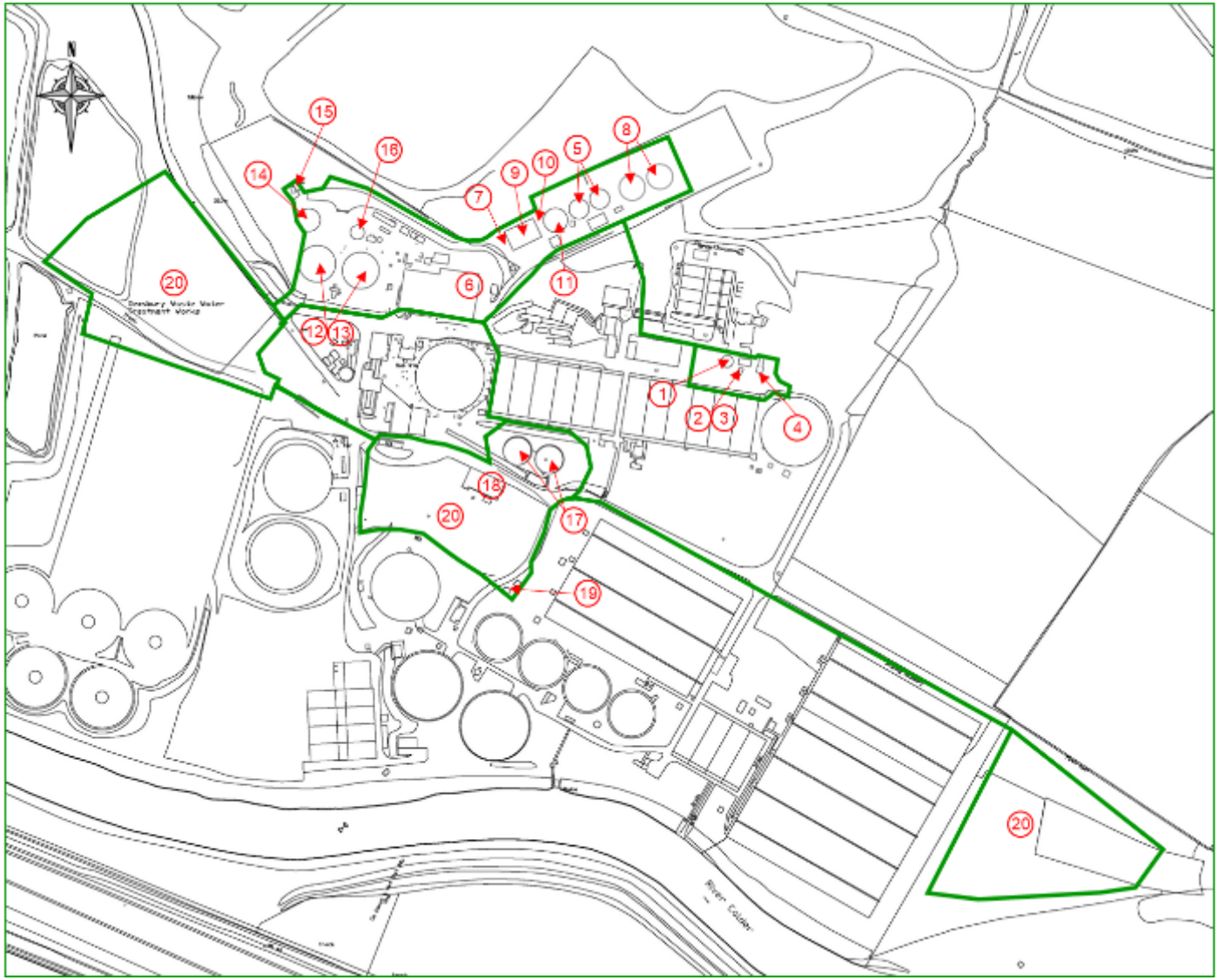


Figure 7 Mitchell Laithes STF Source Locations



Key

Installation boundary

Source locations

1	Sludge Screen Feed Tank
2	2 No. Huber Screens
3	Screenings Skip
4	Screened sludge pumping station
5	2 No. Primary Storage Tanks
6	Gravity Belt Thickeners
7	Dispersal stack 1
8	2 No. SAS tanks
9	Drum thickeners
10	Dispersal stack 2
11	Digester Feed Tank
12	2 No. Digesters
13	Biogas Relief Valves
14	Biogas Holder
15	Flare
16	Sludge balance tank
17	2 No. Centrifuge Feed Tanks
18	Dewatering Centrifuges
19	Return liquor pumping station
20	Cake Storage and Maturation

Type of waste accepted at Mitchell Laithes STF are provided in the environmental permit.

2.5 Process Odour Sources

The odour potential of a source can be broken down into three key considerations:

- How inherently odorous the compounds present are.
- The unpleasantness of the odour.
- The magnitude of the odour release.

When trying to determine the offensiveness of an odour source, site-specific odour sampling should be considered in the first instance. In the absence of source odour emission data, the assessment criteria will consider the Environment Agency's Horizontal Guidance Note (H4). H4 looks to categorise how offensive odours are with sources/processes/activities that are considered 'most offensive' odours include septic effluent or sludge and biological landfill odours. All raw sludge treatment processes would be considered to have a high odour offensiveness unless source-specific odour sampling is undertaken demonstrating a low level of odorous compounds. Processes containing the below material are considered to represent a high odour offensiveness:

- Indigenous primary sludge
- Sludge imports (liquid and solid)
- Sludge liquors

Processes containing the below material are considered to represent a medium odour offensiveness:

- Rags and screenings
- Surplus Activated Sludge (SAS)
- Digested sludge
- Digested sludge liquors
- Digested sludge cake (stored)

No processes on an STF are considered to store material that represents a low odour offensiveness unless supported by source-specific odour sampling.

The unpleasantness of an odour can be used in defining the source odour offensiveness. This is typically achieved through source material hedonic tone assessments, however; these types of assessments are not typically available for a site without source-specific sampling.

The risk source odour potential critical risk scoring for odour offensiveness and mitigation / control adopted is summarised in Table 3.

Table 3 Source Odour Potential Risk Scoring

Source	Risk Rating		
	High	Medium	Low
Odour Offensiveness	Very odorous compounds (H2S, Mercaptans) with low odour threshold. Unpleasant odour - "Most Offensive". Unpleasant hedonic tone. Large, permitted process / Surface Area.	Compounds involved are moderately odorous. Unpleasantness - process classed in H4 as "Moderately Offensive" or where odours have neutral or slightly unpleasant hedonic tone. Smaller permitted process / Surface Area.	Compounds involved are only mildly offensive. Unpleasantness - process classed in H4 as "Less Offensive". Neutral to positive hedonic tone.
Mitigation / Control	Open air operation with no containment. Reliance solely on good management techniques and best practice.	Some mitigation measures in place but significant residual odour remains.	Effective mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.

Table 4 displays the site sludge odour sources, with an inventory of material, quality, and storage capacity, and goes on to explore the odour offensiveness and emission risk. The location of each odour source (asset ID) is shown in Figure 7 above.

Table 4 Mitchell Laithes STF Sludge Inventory of odorous materials

Source	Asset ID	Source Type	Storage Capacity (m^3)	Average Retention Time (hrs)	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Sludge Screen Feed Tank	1	Indigenous, Imports	165	30 minutes	Continuous	Septic sludge, sulphide	Unpleasant	High	Open to atmosphere	Diffuse	High
2 No. Huber Screens	2	Indigenous, Imports	N/A	N/A	Continuous	Septic sludge, sulphide	Unpleasant	High	Covered	Fugitive	Medium
Screenings Skip	3	Sludge Screenings	N/A	N/A	Continuous	Septic sludge, sulphide	Unpleasant	Unpleasant	Open to atmosphere	Diffuse	Medium
Screened Sludge PS	4	Indigenous, Imports	N/A	N/A	Continuous	Septic sludge, sulphide	Unpleasant	High	Open to atmosphere	Diffuse	High
2 No. Primary Storage Tanks	5	Indigenous, Imports	2 x 1,000	24 hours	Continuous	Septic sludge, sulphide	Unpleasant	High	Covered and extracted to odour dispersion stack	Abnormal – fugitive only from source as off-gases extracted to dispersion stack in normal operation	Low
Gravity Belt Thickeners	6	Indigenous, Imports	20 m^3/hr	N/A	Continuous	Septic sludge, sulphide	Unpleasant	High	Covered and extracted to odour dispersion stack	Abnormal – fugitive only from source as off-gases extracted to dispersion stack in normal operation	Low
Dispersion Stack 1	7	Indigenous, Imports emissions	N/A	N/A	Continuous	Septic sludge, sulphide	Unpleasant	High	Untreated emissions dispersed direct to atmosphere	Point	High
2 No SAS Tanks	8	SAS sludge	2 x 1,960	1 day per tank	Continuous	Treated sewage / Earthy	Mildly Unpleasant	Medium	Open to atmosphere	Diffuse	Medium

Source	Asset ID	Source Type	Storage Capacity (m^3)	Average Retention Time (hrs)	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Drum Thickeners	9	SAS sludge	N/A	N/A	Intermittent daily	Treated sewage / Earthy	Mildly Unpleasant	Medium	Covered and extracted to ventilation stack	Abnormal - fugitive only as off-gases ducted to ventilation stack in normal operation	Low
Dispersion stack 2	10	SAS sludge	N/A	N/A	Continuous	Treated sewage / Earthy	Mildly Unpleasant	Medium	Extraction and ventilation to atmosphere	Point	Medium
Digester Feed Tank	11	Indigenous, Imports	1,530	4 days	Continuous	Septic sludge, sulphide	Unpleasant	High	Covered and extracted to odour dispersion stack	Abnormal – fugitive only from source as off-gases extracted to dispersion stack in normal operation	Low
2 No. Digesters	12	Indigenous, Imports	2 x 4,897	16 days	Continuous	Biogas, Methane/ sulphide	Unpleasant	High	Covered and extracted to biogas storage Full containment of biogas is a critical safety consideration	Abnormal - fugitive only as biogas is collected for use on site.	Low
Biogas Relief Valves	13	Digested Sludge	N/A	N/A	Emergency operation	Biogas, Methane/ sulphide	Unpleasant	High	Critical process safety requirement. Operates only as required under abnormal process conditions	Point	Low

Source	Asset ID	Source Type	Storage Capacity (m^3)	Average Retention Time (hrs)	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Biogas Holder	14	Biogas	1,580	2 days	Continuous	Biogas	Unpleasant	High	Enclosed vessel. Full containment of biogas is a critical safety consideration	Abnormal - fugitive only as biogas is collected for use on site.	Low
Flare	15	Combusted biogas	N/A	N/A	Emergency Operation	Combustion	Acceptable	Low	Biogas is combusted	Point	Low
Sludge Balance Tank	16	Digested	334	12 hours	Continuous	Digested sludge / Earthy	Acceptable	Medium	Open to atmosphere	Diffuse	High
2 No. Centrifuge Feed Tanks	17	Digested	1 x 1,185 1 x 1,885	4 days	Continuous	Digested sludge / Earthy	Acceptable	Medium	Open to atmosphere	Diffuse	High
Dewatering Centrifuges	18	Digested	N/A	N/A	Intermittent Daily	Digested sludge / Earthy	Acceptable	Medium	Covered and within a building	Diffuse	Medium
Return Liquor PS (Centrate return)	19	Digested Sludge Liquors	39.5 m^3	Average 20 mins (rainfall dependent)	Intermittent Daily	Digested sludge / Earthy	Acceptable	Medium	Open to atmosphere	Diffuse	Medium
Cake Storage and Maturation	20	Digested	Max 9,750 tonnes	6 weeks	Continuous	Digested sludge / Earthy	Acceptable	Medium	Open to atmosphere	Diffuse	High

2.6 Odour Control Units

There are no odour control systems within the installation boundary. There are two odour extraction systems summarised below;

- Stack 1 is an odour extraction and ventilation system that extracts 4,154 m3/hr foul air from the GBT building, primary sludge storage tanks and digester feed blend tank and discharges this via a 3m (approximately) high stack.
- Stack 2 - is an odour extraction and ventilation system that extracts 904 m3/hr foul air from the drum thickeners and discharges this via a 7m (approximately) high stack.

3 Odour Critical Plant Operation

3.1 Odour Critical Sources

Given the control measures that are in place during operation of the facility, these contributions (if any) are unlikely to increase the odour impact on the receptors outside of the site boundary.

Management of releases includes reducing turbulence, containment and abatement. Where odorous gasses are finally released, controlling the height of release through a stack or the timing of releases through management of activities can influence dispersion before there is an impact on people. Potential on site odour releases associated with Mitchell Laithes STF are given in Table 5 below.

Table 5 Mitchell Laithes STF Odour Critical Sources

Asset	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person
Sludge Screen Feed Tank	1	Liquid Sludge	Regular throughput maintained. Risk assessment and odour plan in place before cleaning of any tank.	Potential odour risk if odours are elevated.	Increase in complaint frequency / odour sniff test identifies indigenous sludge odours off-site.	Dose sludge with odour control chemical	Within 5 working days of incident	Product and Process Engineer
2 No. Huber Screens	2	Liquid sludge	Sludge screen is contained asset	Unlikely given control measures in place	Screens missing cover sections / odour sniff test identifies sludge odours off-site.	Dose sludge with odour control chemical	Within 5 working days of incident	Product and Process Engineer
Screenings Skip	3	Screenings	Minimal handling and stockpiling of screenings.	Unlikely given control measures in place	Screenings spill local to skip. Increase in complaint frequency / odour sniff test identifies sludge screenings off-site.	Early removal / replacement of skip	Within 5 working days of incident	Product and Process Engineer
Screened Sludge PS	4	Liquid Sludge	Planned maintenance of pumps	Unlikely given the control measures in place	Increase in complaint frequency / odour sniff test identifies sludge odours off-site.	Failures are investigated and reactive maintenance undertaken.	Same day as incident	Product and Process Engineer
2 No. Primary Storage Tanks	5	Liquid sludge	Tank covered and extracted to odour dispersion stack. Inspection hatches kept closed. Sludge is mixed and regular throughput is maintained	Unlikely given control measures in place	Failure of extraction fans & increase in complaint frequency / odour sniff test identifies sludge odours off-site.	Dose sludge with odour control chemical	Within 5 working days of incident	Product and Process Engineer

Asset	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person
Gravity Belt Thickeners	6	Liquid sludge	Sludge thickeners are enclosed, and air extracted to odour dispersion stack. Building doors are kept closed, except when access is required.	Unlikely given the control measures in place	Failure of extraction fans & increase in complaint frequency / odour sniff test identifies sludge odours off-site.	Dose sludge with odour control chemical	Within 5 working days of incident	Product and Process Engineer
Dispersion Stack 1	7	Liquid Sludge	Duty / Standby extraction fan to be available. Prevent increase of fugitive emissions risk from covered processes. Odours are extracted and dispersed to atmosphere.	Potential odour risk if odours are elevated.	Standby Fan Failure. Increase in complaint frequency / odour sniff test identifies indigenous sludge odours off-site.	Dose sludge with odour control chemical	Within 5 working days of incident	Product and Process Engineer
2 No SAS Tanks	8	SAS Sludge	Risk assessment and odour plan in place before cleaning of any tank.	Unlikely given control measures in place	Increase in complaint frequency / odour sniff test identifies sludge odours off-site.	Dose sludge with odour control chemical	Within 5 working days of incident	Product and Process Engineer
Drum Thickeners	9	SAS Sludge	Drum Thickeners are contained assets	Unlikely given control measures in place	Increase in complaint frequency / odour sniff test identifies sludge odours off-site.	Dose sludge with odour control chemical	Within 5 working days of incident	Product and Process Engineer
Dispersion stack 2	10	SAS Sludge	Duty / Standby extraction fan to be available. Prevent increase of fugitive emissions risk from covered processes.	Unlikely given control measures in place	Standby Fan Failure	Standby extraction fan to be in service. Investigate cause of limited extraction.	Support from supplier to be arranged next availability	Product and Process Engineer

Asset	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person
Digester Feed Tank	11	Liquid sludge	Tank covered and odour controlled. Inspection hatches kept closed. Sludge is mixed and regular throughput is maintained	Unlikely given control measures in place	Failure of extraction fans & increase in complaint frequency / odour sniff test identifies sludge odours off-site.	Dose sludge with odour control chemical	Within 5 working days of incident	Product and Process Engineer
2 No. Digesters	12	Liquid sludge / biogas	Tank is covered and biogas extracted. Risk assessment and odour plan in place before cleaning of any tank.	Unlikely given control measures in place	Loss of digester performance (see Table 12 for monitoring parameters)	Investigate digester performance and schedule reactive maintenance.	Same day as incident	Product and Process Engineer
Biogas Relief Valves	13	Biogas	Planned maintenance on equipment. Monitoring of digester pressures. Flare available to burn excess gas.	Unlikely given the control measures in place. Critical safety system.	Prolonged / frequent use of safety valve.	Failures are investigated and reactive maintenance undertaken.	Same day as incident	Product and Process Engineer
Biogas Holder	14	Biogas	Planned maintenance on equipment. Monitoring of digester pressures. Flare available to burn excess gas.	Unlikely given the control measures in place. Critical safety system.	Prolonged / frequent use of safety valves.	Failures are investigated and reactive maintenance undertaken.	Same day as incident	Product and Process Engineer
Flare	15	Biogas	Planned maintenance on equipment.	Unlikely given the control measures in place. Critical safety system.	Prolonged / frequent use of flare.	Failures are investigated and reactive	Same day as incident	Product and Process Engineer

Asset	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person
Sludge Balance Tank	16	Liquid digested sludge	Risk assessment and odour plan in place before cleaning of any tank.	Reduced risk due to lower odour potential from digested sludge	Increase in complaint frequency / odour sniff test identifies digested sludge odours off-site.	Review the digester performance	Immediately	Product and Process Engineer
2 No. Centrifuge Feed Tanks	17	Liquid digested sludge	Risk assessment and odour plan in place before cleaning of any tank.	Reduced risk due to lower odour potential from digested sludge	Increase in complaint frequency / odour sniff test identifies digested sludge odours off-site.	Review the digester performance	Immediately	Product and Process Engineer
Dewatering Centrifuges	18	Digested sludge cake	Centrifuges are contained asset	Unlikely given control measures in place	Increase in complaint frequency / odour sniff test identifies sludge cake storage odours off-site.	Check digester performance. Check poly dosing / mixing system	Same week as incident	Product and Process Engineer
Return Liquor PS (Centrate return)	19	Sludge Liquors	Planned maintenance of pumps	Unlikely given the control measures in place	Increase in complaint frequency / odour sniff test identifies sludge odours off-site.	Failures are investigated and reactive maintenance undertaken.	Same day as incident	Product and Process Engineer
Cake Storage	20	Digested sludge cake	Cake to be handled by the loader only twice (once to move from conveyor to pad, and once to load into the export wagon) to minimise disturbance and odour release.	Unlikely given control measures in place	Increase in complaint frequency / odour sniff test identifies sludge cake storage odours off-site.	Restrict process and reduce storage volumes.	Same week as incident	Centrifuge unit operator
						Ensure cake is removed from site for disposal at the earliest opportunity.	Arrange for compliant cake to be removed from site same week	Centrifuge unit operator

Asset	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person
						Root cause analysis and resolution.	Immediately	Product and Process Engineer
Sludge cake export	20	Digested sludge cake	Cover the wagon before leaving site.	Unlikely given control measures in place	Wagon uncovered when leaving site	Ensure wagon is covered before leaving site	Immediately	Centrifuge unit operator

3.2 OCU Performance Investigation

OCUs installed on site shall be monitored and maintained by site operations and the product and process engineer. Whereby there is an issue with an OCU's operability or treatability that cannot be resolved by site operations, a 3rd party specialist shall be engaged as a priority to arrange for support. In the event that the 3rd party specialist cannot directly mobilise to site, the product and process engineer shall manage the OCU's operation to reduce the risk of compromised performance.

The 3rd party specialist shall be commissioned to undertake an asset condition and performance assessment. The assessment shall include as a minimum the tasks outlined in Appendix 3 but shall extended to any additional tasks to include the highlighted issues by operations.

As part of the assessment, the 3rd party specialist with support from YW operational staff shall work to resolve any issues to ensure the OCU is returned to normal operating conditions. Any issues that cannot be resolved on the day or requires additional parts shall be raised as an action to be manged by the produce and process engineer.

At the end of the asset condition and performance assessment the 3rd party specialist shall provide a summary report that documents findings and associated actions / recommendations to return the OCU to normal operating conditions.

3.3 Protocol for Dosing Odour Control Chemical

In the event that there is failure of process mitigation measures that could lead to increased risk of elevated odours, chemical can be dosed directly into the sludge to mitigate this risk.

4 Odour Impact

4.1 Odour Dispersion Model

An odour dispersion model has not been developed for Mitchell Laithes STF as part of this OMP due to the infrequency of historic odour complaints associated with the WwTW / STF and perceived low risk of potential odour impact.

Odour dispersion modelling including site specific olfactometric surveys shall be undertaken in the event of increased frequency of odour complaints or operational changes with a perceived increase in odour impact risk.

Any odour sampling shall be undertaken in accordance with EN standards (e.g. dynamic olfactometry according to EN 13725 in order to determine the odour concentration or EN 16841-1 or -2 in order to determine the odour exposure).

4.2 Odour Survey Results

An odour survey has been undertaken on selected processes as part of the qualitative odour risk assessment. The odour survey was undertaken during July 2021 to assess the odour emissions from the uncovered and treated emission source. Table 6 includes a summary of the survey results.

Table 6 Mitchell Laithes STF Odour Survey Results

Source	Odour Concentration	Odour Emission Rate	Hydrogen Sulphide	Ammonia
	(ou_E/m^3)	($ou_E/m^2/s$)	(ppm)	(ppm)
Sludge Screen Feed Tank	7,550	78	2.140	< 0.1
Sludge Screening Skip	6,565	68	0.808	< 0.1
SAS Tanks	454	4.7	0.022	< 0.1
Ventilation Stack 1	69,327	-	13.5	< 0.1
Ventilation Stack 2	32,845	-	5.0	< 0.1
Digested Sludge Tanks	487	5.1	0.020	2.0
Fresh Digested Cake	692	7.2	0.014	12.0
Stored Digested Cake	344	3.6	0.008	3.3
Centrifuge / GBT Building	957	-	0.085	< 0.1

A site-specific odour survey local to the STF was undertaken which included boundary monitoring and sniff tests around key locations on site. As part of the odour survey, hydrogen sulphide was identified above the recognition concentration threshold of 0.0047 ppm north of the sludge import tanks. This has been attributed to tankers discharging and the hydrogen sulphide is below the recognition concentration when these events are not occurring. The odour description for the majority of samples was “no odour” or “faint”. A few samples were associated with a “strong” or “v strong” odour from sludge import areas, located on the east of the main treatment area. However, the cake area exhibited no samples above a “faint” odour.

The results of the boundary monitoring and sniff tests indicate that it is unlikely that the STF odours have an adverse effect on surrounding sensitive receptors.

4.3 Qualitative Odour Risk Assessment

A qualitative odour risk assessment of Mitchell Laithes STF has been undertaken by Stantec to determine the odour impact risk at sensitive receptors local to the works. The assessment relies on subjective professional judgement but uses the generic guidance methodologies provided and referenced in documents such as the Institute of Air Quality Managements (IAQM) Guidance on the Assessment of Odour for Planning, the Scottish Environmental Protection Agency (SEPA) Odour Guidance 2010, the Environment Agency's Horizontal Guidance Note H1 Environmental Risk Assessments for Permits, and Annex A of H1 – Amenity & accident risk from installations and waste activities.

These guidelines use the Source-Pathway-Receptor concept in which it evaluates the relationship between source(s) of odour, the pathway or transmission route by which exposure may occur at a given receptor(s) who may be affected/impacted.

How well a qualitative odour risk assessment predicts the odour impact for a scenario is dependent on how well the Source-Pathway-Receptor approach can be assessed and scored. This type of assessment is based on subjective judgement and therefore, robust assessment criteria are required. Where subjective judgement for a criterion could be considered broad, sub-criteria have been determined to provide a more detailed judgement.

The odour offensiveness of the have adopted the risk ratings included in Table 4. The pathway from source to receptor considers the distance, local terrain and meteorological conditions, as highlighted in Section 2.3.

The sensitive receptors considered in the assessment are documented in Figure 8 and Table 7.

Figure 8 Mitchell Laithes STF Odour Risk Assessment Sensitive Receptor Locations

Table 7 Mitchell Laithes STF Odour Risk Assessment Sensitive Receptors

Receptor Name	Receptor ID	Receptor Type	Distance to site (m)	Receptor Sensitivity
Silverwood Grange	D01	Residential	661	High
Kerry Foods	D02	Industrial	389	Low
Lodge Farm (farm), Lock Street	D03	Farm	475	Low
RZ Automotive Body Repairs	D04	Commercial	535	Medium
Bretton Park Industrial Estate	D05	Industrial	377	Low
Paradise Primary School	D06	Education Centre	702	High
Scarr End Mill, Headlands Lane	D07	Industrial	286	Low
Pump House Cottages	D08	Residential	243	High
Mitchell Laithes Farm (residence)	D09	Residential	327	High
Woodburn Avenue	D10	Residential	478	High
Mitchell Laithes Farm (farm)	D11	Farm	332	Low
Pavillion Court	D12	Residential	806	High
Runtings Lane	D13	Residential	741	High
Livery Yard Stables	D14	Farm	577	Low
Thornhill Cricket and Tennis Club	D15	Recreational	812	Medium

4.4 Results

The results of the qualitative odour risk assessment are summarised in Table 8.

Table 8 Mitchell Laithes STF Odour Risk Assessment Results

Receptor ID	Receptor Type	Source Odour Potential	Pathway Effectiveness	Odour Exposure	Receptor Sensitivity	Likely Odour Effect
D01	Residential	Medium	Ineffective Pathway	Negligible Risk	High	Negligible Effect
D02	Industrial	Medium	Ineffective Pathway	Negligible Risk	Low	Negligible Effect
D03	Farm	Medium	Ineffective Pathway	Negligible Risk	Low	Negligible Effect
D04	Commercial	Medium	Ineffective Pathway	Negligible Risk	Medium	Negligible Effect
D05	Industrial	Medium	Moderately Effective Pathway	Low Risk	Low	Negligible Effect
D06	Education Centre	Medium	Ineffective Pathway	Negligible Risk	High	Slight Adverse Effect
D07	Industrial	Medium	Highly Effective Pathway	Medium Risk	Low	Negligible Effect

Receptor ID	Receptor Type	Source Odour Potential	Pathway Effectiveness	Odour Exposure	Receptor Sensitivity	Likely Odour Effect
D08	Residential	Medium	Highly Effective Pathway	Medium Risk	High	Moderate Adverse Effect
D09	Residential	Medium	Moderately Effective Pathway	Low Risk	High	Moderate Adverse Effect
D10	Residential	Medium	Moderately Effective Pathway	Low Risk	High	Moderate Adverse Effect
D11	Farm	Medium	Moderately Effective Pathway	Low Risk	Low	Negligible Effect
D12	Residential	Medium	Ineffective Pathway	Negligible Risk	High	Negligible Effect
D13	Residential	Medium	Ineffective Pathway	Negligible Risk	High	Negligible Effect
D14	Farm	Medium	Ineffective Pathway	Negligible Risk	Low	Negligible Effect
D15	Recreational	Medium	Ineffective Pathway	Negligible Risk	Medium	Negligible Effect

The qualitative odour risk assessment for Mitchell Laithes STF has indicated that all considered sensitive receptors are exposed to either a negligible or slight adverse odour effect with three exceptions that are classified as a moderate adverse odour effect. The primary driver for the moderate adverse odour classification is the ranking of the cake storage area as a medium odour potential and high dispersion risk.

Mitchell Laithes WwTW has received complaints log recorded only six odour complaints over the last five years. Five of the six recorded complaints are reported to be from receptors located in the north-west, north or east of the site, whilst one complaint came from the south-west. The inconsistent and infrequent nature of these complaints coupled with irregularity of timing throughout the year, suggests the complaints are likely to be attributed to ad hoc events and are not associated with “normal” operation of the site.

The site-specific odour survey has highlighted that whilst the sludge cake is stored outside, it represents a lower odour potential source when compared to indigenous untreated sludges and is more akin to wastewater odours. As a measure of conservatism in the odour risk assessment, the cake storage pads have been considered with a medium risk odour offensiveness and high dispersion risk due to the 3 No. storage areas occupied by digested cake. The digested sludge cake emissions are typical of those observed on other sites which do not generate odour risk or complaints. There is the potential that this assessment has been overly conservative when considering the digested sludge cake odour potential and a low-risk odour potential would be more suitable. A low-risk odour potential for the digested sludge cake would result in no sensitive receptors with a risk score above slight adverse and therefore, not present a significant odour risk to any receptor. As long as the site is operated in accordance to the site’s odour management plan and the process is healthy with good management of sludge cake stockpiling, there would be a limited future risk of odour impacting surrounding receptors.

For the overall site, taking into consideration of the findings of the odour survey and the odour risk assessment, it is considered that Mitchell Laithes STF does not have an adverse odour effect on its surrounding receptors.

4.5 BAT Conclusions

BAT Conclusion 14 describes specific measures which may be appropriate for the prevention or reduction of diffuse emissions to air. BAT Section 14d is associated with the "containment, collection and treatment of diffuse emissions" and includes techniques such as:

- Storing, treating, and handling waste and materials that may generate diffuse emissions in enclosed buildings and/or enclosed equipment (e.g., conveyor belts);
- Maintaining the enclosed equipment or buildings under adequate negative pressure;
- Collecting and directing emissions to an appropriate abatement system via an air extraction system and/or air suction systems close to the emission sources.

In terms of the applicability of this technique it is noted that: "The use of enclosed equipment or buildings may be restricted by safety considerations such as the risk of explosion or oxygen depletion. The use of enclosed equipment or buildings may also be constrained by the volume of waste."

An assessment of STF processes carried out at Mitchell Laithes has been undertaken against BAT 14d.

Table 9 BAT Compliance / Alternative Techniques

Source	Source ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions
Sludge Screen Feed Tank	1	Tank is not covered.	Odour management techniques in use rather than specific BAT containment measures YW commits to improvements – refer to proposed improvement programme for further details.	None
2 No. Huber Screens	2	Sludge screens contained process without foul air extraction. Sludge screens, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Enclosed process, but without extraction and abatement of process air. Small size of source, intermittent use. No sensitive receptors in close proximity. Adequate measures considered to be in operation.	None
Screenings Skip	3	Skips open to atmosphere with no containment or treatment of emissions.	Although the odour is considered to be very localised, with no ability to generate off site odours, YW is committed to improvements – refer to proposed improvement programme for further details.	None
Screened Sludge PS	4	Chamber open to atmosphere with no containment or treatment of emissions.	Odour management techniques in use rather than specific BAT containment measures. YW commits to improvements – refer to proposed improvement programme for further details.	None

Source	Source ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions
2 No. Primary Storage Tanks	5	Tank covered with air mechanically extracted. Odour emissions dispersed direct to atmosphere via dispersion stack 1.. Primary storage tanks negative differential pressure measured between -50 to -299 Pa, indicating full containment of emissions with no risk of fugitive emissions under current operation.	BAT partially in place. Odour emissions minimised due to extraction and emissions dispersed direct to atmosphere. Refer also to comments in relation to dispersion stack.	None
Gravity Belt Thickeners	6	Thickeners covered with foul air mechanically extracted. Odour emissions dispersed direct to atmosphere. Thickeners negative differential pressure measured at -1 Pa, indicating good containment of emissions with limited risk of fugitive emissions under current operation.	BAT partially in place. Odour emissions minimised due to extraction and emissions dispersed direct to atmosphere. Refer also to comments in relation to dispersion stack.	None
Dispersal stack 1	7	No OCU installed; stack provides emissions dispersion function.	BAT partially in place. Odour emissions dispersed to atmosphere. YW commits to improvements – refer to proposed improvement programme for further details.	None
SAS Tanks x2	8	Tank is open to atmosphere with no containment or treatment of emissions.	Odour management techniques in use rather than specific BAT containment measures. YW commits to improvements – refer to proposed improvement programme for further details.	None
Drum Thickeners	9	Thickeners are extracted and ventilated to atmosphere.	BAT partially in place. Odour emissions minimised due to extraction and emissions dispersed direct to atmosphere. Refer also to comments in relation to dispersion stack.	None

Source	Source ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions
Dispersal stack 2	10	No OCU installed; stack provides emissions dispersion function.	BAT partially in place. Odour emissions dispersed to atmosphere. YW commits to improvements – refer to proposed improvement programme for further details.	None
Digester Feed Tank	11	Tank covered with foul air mechanically extracted. Odour emissions dispersed direct to atmosphere. Digester feed blend tank negative differential pressure measured at -98 Pa, indicating full containment of emissions with no risk of fugitive emissions under current operation.	BAT partially in place. Odour emissions minimised due to extraction and emissions dispersed direct to atmosphere. Refer also to comments in relation to dispersion stack.	None
Digesters	12	Tank is covered and biogas captured and utilised. LDAR in place.	N/A	N/A
Biogas relief valves	13	N/A – emergency use only	N/A	N/A
Biogas holder	14	Biogas is fully contained. LDAR in place.	N/A	N/A
Flare	15	Used only as required. Biogas is combusted.	N/A	N/A
Sludge Balance Tank	16	Tank open to atmosphere with no containment or treatment of emissions.	Tank contains digested sludge only which is inherently less odorous. No sensitive receptors in close proximity. YW commits to improvements – refer to proposed improvement programme for further details.	None
2 No. Centrifuge Feed Tanks	17	Tank open to atmosphere with no containment or treatment of emissions.	Tank contains digested sludge only which is inherently less odorous. No sensitive receptors in close proximity. YW commits to improvements – refer to proposed improvement programme for further details.	None

Source	Source ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions
Dewatering Centrifuges	18	Centrifuges, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Source is enclosed and small footprint. Area subject to regular inspection and management, source not considered to contribute to off-site odour nuisance potential. No sensitive receptors in close proximity. Adequate measures considered to be in operation.	None
Return Liquor PS (Centrate return)	19	Chamber open to atmosphere with no containment or treatment of emissions.	Liquors arise from digested sludge only which is inherently less odorous. No sensitive receptors in close proximity. YW commits to improvements – refer to proposed improvement programme for further details.	None
Cake Storage	20	Cake Pad open to atmosphere with no containment or treatment of emissions.	Odour management techniques in use rather than specific BAT containment measures. Digested sludge only, which is inherently less odorous, during normal operating conditions. Adequate measures considered to be in operation, as supported by odour measurements and impact assessment.	The use of enclosed equipment or buildings is constrained by the volume of cake stored.

A number of odour sources on site do not adopt the specific conclusions outlined in BAT 14d. The sludge screens, thickeners, centrifuges, primary sludge tanks and digester feed tank would be considered to be partially compliant due to being contained processes. A number of these sources are also a small area source and therefore would not typically be considered to be a significant source of site odours. Odour surveys at other sites within the YWS catchment have identified that post digestion emissions are more akin to wastewater emissions than sludge emissions and therefore are unlikely to have the same odour offensiveness as indigenous / untreated sludges and may not warrant the same level of odour mitigation.

Odour emissions from the primary sludge tanks, digester feed tank and thickeners are extracted however emissions are not treated.

The cake pad is currently uncovered and does not utilise specific measures outlined in BAT 14d. The cake pad odour emissions are more akin to secondary treated wastewater than raw sludge emissions. Covering the cake pad would require a significantly sized building with air extraction / ventilation, odour treatment and dispersion to atmosphere. Given the infrequent nature of odour complaints and no significant odour detectable at the boundary during the odour survey, the risk of odour impact from this area would be limited and does not warrant additional mitigation measures beyond adherence to measures, established in the odour management plan and limiting cake double handling. These measures are considered adequate and equivalent to the specified provisions in BAT 14d. As part of the odour survey, both odour dispersion stacks were assessed and found to be exceeding the BAT-AEL of 1,000 ou_E/m^3. This is to be expected as the odour dispersion stacks were designed without any treatment capacity. YW commits to install OCUs at these locations.

5 Monitoring and Control of Odours

All monitoring should clearly relate to the assessment of odour control and complete records must be kept in an auditable format. The only way to determine whether the processes on site are under control, and to keep them under control, is to do appropriate monitoring.

As far as possible, Mitchell Laithes STF is operated to minimise odour generation and release. As long as the treatment process satisfies the normal design criteria, odour should be minimal. To minimise odour nuisance, it is important to ensure that Mitchell Laithes STF is operating at its optimum. Covers and hatches should always be replaced to maintain the integrity of enclosures provided to collect odorous air.

5.1 Sniff Testing

Sniff testing is recognised by Yorkshire Water as a useful technique to build up a picture of the impact the odour has on the surrounding environment over time. Sniff testing shall be used to support profiling site odour impact, investigate odour complaints and to introduce temporary odour mitigation measures.

Sniff testing shall be undertaken on site on a weekly basis by site operational staff. It is accepted that operational staff may not be ideal for sniff testing of site odours as they have adapted to odours from the site. However, this will provide a baseline for routine observations. The weekly operator sniff tests shall assess the installation boundary and focus on the detection of any odours that could potentially be leaving site.

Monthly sniff tests shall be carried out by non-site-based staff (Technically Competent Manager) who are not adapted to site odours. For Mitchell Laithes STF, due to a lack of odour complaints, the routine sniff-testing shall be site based only.

In the event of odour complaints being received, site operators shall undertake a sniff test including off-site sniff testing local to the complaint location(s). In the occurrence of a significant odour event or repeated complaints, a third-party shall be engaged for an additional odour investigation including on and off-site sniff testing.

A third-party odour sniff test is scheduled to be undertaken twice a year for comparison with Yorkshire Water (operator and monthly tester) observations. The third-party sniff test shall include both on and off-site locations based on surrounding sensitive receptors and complaint locations. The off-site locations shall be reviewed prior to any third-party testing to ensure any recent changes to sensitive receptors are considered.

The location of weekly and monthly on-site sniff testing locations has been included in Figure 9 Routine off-site locations have not been included due to a lack of odour contacts. In the event that odour complaint frequency increase, off-site locations shall be incorporated into the routine sniff testing.

Figure 9 Mitchell Laithes STF On-Site Sniff Testing Locations

5.2 Channelled Emissions

There are no odour control units within the permitted area. Future installed odour control units shall be monitored once every six months for H_2S and NH_3. The sampling shall be undertaken by a third-party Assessor. OCU performance shall be monitored in accordance with the OCU performance checklist provided in Appendix 3.

5.3 Imports/Exports

The Site Operating Procedures include instructions on how sludge must be imported. The YW Safe Loading & Discharging of Sludge Road Tankers is available in Appendix 5. Tankers shall be filled and emptied in a way that minimises odour discharge.

5.4 Sludge Treatment and Disposal

Raw or co-settled sludges always smell objectionable, but the odour becomes stronger during storage, as anaerobic decomposition occurs, leading to high concentrations of malodorous compounds in sludges and sludge liquors. Digested sludges are less odorous, particularly after they have cooled. To minimise the generation of odours, where possible, fresh sludge shall be processed and sent to digestion as quickly as possible before further treatment and removal from site. Raw sludges stored upstream of digestion would never be stored for more than 2 days in normal plant operation.

5.5 Sludge Thickening and Storage

Accumulation of sludge in the system can cause increased odour release in storage tanks, as well as from sludges and liquors when thickening takes place. To minimise odours from the Mitchell Laithes STF, the works should be operated as follows:

- Minimise retention prior to thickening, dewatering or digestion;
- Prevention of sludge accumulation in off-line tanks; and
- Proactive identification of potential problems and tankering of sludges to other sites with odour abatement.

5.6 Anaerobic Digestion

The digestion process breaks down a wide range of odorous compounds, which may be released if care is not taken to avoid turbulence of the sludge after digestion. Odour problems may be caused by:

- Saline intrusion (or industrial wastes) leading to elevated sulphate concentrations of raw sludge, giving a greater sulphide potential;
- Emissions of biogas resulting in significant odour problems; and
- Incomplete digestion leading to odour release from secondary digestion tanks.

Suggested remedial measures include:

- Check seals and valves to prevent the release of biogas;
- Ensure gas handling system is balanced and that pressure relief valves do not operate prematurely;
- Ensure all excess gas is flared and that flare stack ignition is immediate and reliable;
- Addition of iron salts or other chemicals to precipitate or inhibit the formation of sulphide.

There are odour checklists for both YW Operators and Team Leaders in Appendix 2.

5.7 Site Operation and Management Procedures

All operating practices should be compliant with the site O&M manuals. The Integrated Management System (IMS) developed by YW to cover Environmental, Health & Safety and Quality elements of all aspects of YW activities will also apply.

The IMS identifies the environmental aspects and impacts of all YW plants, including the facility at Mitchell Laithes. The facility will operate under the IMS which shall include:

- Quality management procedures for operational aspects, for example: preventative electrical and mechanical maintenance, safe working procedures, accident / incident response and emergencies;
- Specialist contractors shall be employed by YW to undertake any non-routine or specialised maintenance tasks;
- Use of only YW approved contractors. YW maintain an approved contractors list which is used for appointment of all YW contractors. This requires contractors to achieve a high level of environmental competence / performance. YWS Framework Contractors are required to operate an EMS in accordance with ISO 14001;
- Preparation/issue of risk assessments and method statements by all contractors before starting work. These risk assessments and method statements will include consideration of odour and measures in place to control odour releases. These are prepared as part of the ‘hand - over’ and ‘hand – back’ certificate or ‘permit to work’; and
- Regular environmental and quality audits to be carried out. These shall include a review of potential odour and identify any additional control measures which may be required.

5.7.1 Procedures for Operation Plant

All operating practices should be compliant with the site O&M manuals, YW company practice and the OMP.

5.7.2 Routine Inspection and Recording

Visual inspection of facility processes will be carried out on regular basis as part of staff duties. If abnormal odour is witnessed, YW staff shall record details in the Odour Log Spreadsheet of the observation and immediately investigate. During any such recording carried out as part of this OMP, it is important to document any potential contribution from other off-site sources of potential odour nuisance located outside of the facility boundary. An odour monitoring record sheet to be used in the event of site odours is included in Appendix 3.

5.7.3 Maintenance by Engineering Reliability Staff

Engineering Reliability staff (Mechanical Fitters, Electricians and ICA Technicians) carry out routine maintenance of plant and equipment.

Routine maintenance requirements are included within YW's Work Management System (WMS) task lists for the site and are forwarded to members of this team via their Toughbook. Feedback on planned maintenance carried out is recorded in WMS by the Engineering Reliability staff member via their Toughbook and transferred to SAP for storage.

5.7.4 Reporting Faults and Identifying Maintenance Needs

For faults requiring immediate attention, the Product and Process Engineer raises a SAP notification and calls it through to the Scheduling & Planning Team. If it meets a high priority according to the Risk Assessment Matrix (RAM), it will be attended as a scheduling buster for the relevant YW Engineer to attend site.

For less urgent faults the Product and Process Engineer raises a SAP notification. It will be converted into a SAP job and picked up by the Scheduling & Planning Team and progressed accordingly. If at any time the situation changes, and the job becomes more urgent, the Product and Process Engineer (PPE) would re-prioritise the SAP job in line with the RAM and call through to the Scheduling & Planning Team.

Routine maintenance requirements are fed to YW's maintenance team via SAP.

5.7.5 Replenishing Chemicals / Consumables

Not applicable. There are currently no odour control units within the permitted area.

5.7.6 Initiating OCU Media Replacement

Not applicable. There are currently no odour control units within the permitted area.

5.8 Changing Dispersion Conditions

Site activities that could lead to increased site emissions will be avoided when there are poor dispersion conditions or during sensitive periods (hot days, when people are more around). If not possible to be avoided, additional monitoring in the form of sniff testing and monitoring of site performance shall be undertaken. In the event that site activities are resulting in increased off-site odours or customer complaints, the activity shall be rescheduled / undertaken during low-risk times / weather conditions.

Table 10 Mitchell Laithes STF Changing Dispersion Risk

Asset	Changing Dispersion Condition	Mitigation Trigger	Mitigation Action	Time scale	Responsible Person
Screening skip	Hot Days, School Holidays (summer)	Temperature - >26°C and significant odour complaints	Increase frequency of skip export from site	Forecast in advance – 5-day weather forecast	Product and Process Engineer
Sludge cake export	Hot Days, School Holidays (summer)	Temperature - >26°C and significant odour complaints	Cake export between 8am to 6pm only	Forecast in advance – 5-day weather forecast	Product and Process Engineer

6 Emergency and Incident Response

This section addresses the issue of appropriate response to odour incidents caused by process failure or equipment breakdown. These emergency procedures include the:

- Foreseeable situation that may compromise the ability to prevent and minimise odorous releases from the process;
- Actions to be taken to minimise the impact; and
- Person responsible for initiating the action.

Where abnormally high odour levels are observed – indicating odour pollution a PPE will be required to take appropriate contingency measures. These measures should include:

- Investigating the odour incident and its cause(s);
- Bringing the process back under control; and
- Minimising exposure or annoyance effects.

Table 11 below summarises incident / emergency control measures in place. The YW odour emergency contact details for Mitchell Laithes STF are available in Appendix 1.

Table 11 Mitchell Laithes STF Incident/Emergency Control Measures

Failure/Abnormal Situation	Potential Odour Source	Potential Impact	Mitigation Measures	Actions to be Taken	Timescale for Rectification	Responsible Person
Failure of the odour dispersion stack(s)	Untreated air	High – odour dispersion stack provides high level of odour dispersion. Failure of extraction fans would result in release of abnormal operational fugitive odours direct to atmosphere	Routine maintenance. Regular monitoring of equipment performance. Duty standby functionality.	For plant failure - investigate and repair.	Site operator to investigate on same working day. Support from supplier to be arranged for next availability	Site Operator
Liquid sludge import spillage	Liquid sludge	Medium – low volume spillage likely to go directly to drain which returns to the WwTW for treatment.	Pipework and tanks undergo regular inspections. Planned maintenance on equipment	Stop source of spill and immediately wash down area.	Immediate	Tanker Driver
				Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
				Record spillage and actions taken in site diary.	Same day as incident	Site Operator
Sludge cake spillage	Sludge Cake	Medium to High depending on volume of spill	Regular inspection and planned maintenance	Stop source of spill and immediately wash down area.	Immediate	Tanker Driver
				Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
				Record spillage and actions taken in site diary.	Same day as incident	Site Operator
				If there is likely to be any offsite impact inform manager and technically competent manager immediately.	Same day as incident	Site Operator
		Medium - Biogas would be vented at	Gas pressure is regulated and monitored	Diversion of biogas to Waste Gas Burner	Immediate	Site Operator

Failure/Abnormal Situation	Potential Odour Source	Potential Impact	Mitigation Measures	Actions to be Taken	Timescale for Rectification	Responsible Person
High pressure conditions in digesters	Release from Pressure Relief Valve	high pressure to aid dispersion		Investigate likely sources of high pressure in the digester and resolve (e.g. blocked outlet)	Immediate	Site Operator
Loss of Biogas containment	Leaks from gas holder membrane	Medium	Double gas holder membrane system with gas pressure between the membranes regulated and monitored. Methane detectors operated with alarms to alert operators of any leakage between membranes.	Diversion of biogas to CHP plant or Waste Gas Burner. Inspection maintenance and repairs of gas holder as appropriate	Immediate	Site Operator
				Record details and Actions taken in site diary	Immediate	Site Operator
Staff unavailability	Risk of increase to site odours due to limited operational resources	Low	Staff replacement	Operator replacement from another site Remote monitoring from Control Room / off-site / another site	Same day / For next working day	Product and Process Engineer / Site Manager
Asset Fire	Risk of increase to site odours due to limited access and inability to operate assets	Medium	Regular inspection and planned maintenance	Remote monitoring from Control Room / off-site / another site	Immediate	Product and Process Engineer
Loss of water supply	Inability to wash down spillages. Inability to make liquid polymer causing thinner sludges to enter digesters	Low	YW has access to jetting fleet to assist in sludge clean up Bowser will be used to import water.	Contact duty manager and request assistance Consider closing site to imports if necessary Investigate cause for no water	Site operator to investigate on same working day.	Product and Process Engineer

Failure/Abnormal Situation	Potential Odour Source	Potential Impact	Mitigation Measures	Actions to be Taken	Timescale for Rectification	Responsible Person
				Record details and Actions taken in site diary		
Power Failure	Risk of increased site odours due to inability to operate assets	Low	Dual high voltage electricity supplies into site.	Site imports to be stopped Check back up UPS for operation Contact Electricity provider and report site power fail	Immediate	Product and Process Engineer

7 Inspection/Monitoring/Maintenance Schedules and Records

7.1 Inspection/Monitoring/Maintenance Schedules for Odour Abatement Equipment

There are currently no odour control units within the permitted area. Where installed, OCU performance shall be monitored in accordance with the OCU performance checklist provided in Appendix 3.

7.2 Key Process Monitoring

The site is operated under a full PLC SCADA control with data logging and interrogation of key parameters to maintain safe, efficient, and low emissions operation. Table 12 includes the key process monitoring provisions for processes associated with emissions to air.

Table 12 Key Process Monitoring Provisions

Emission point / description	Parameter	Monitoring approach	Monitoring frequency
Sludge intake	Intake volume	SCADA	Continuous during unloading operations
	% dry solids	SCADA	Continuous during unloading operations
CHP (A1)	Operating hours	SCADA	Continuous data logging
	Electricity generated	SCADA	Continuous data logging
	Load required / actual (%)	SCADA	Continuous data logging
	Biogas flow / pressure to CHP	SCADA	Continuous data logging
	Heat circuit temperatures (deg. C)	SCADA	Continuous data logging
Boilers (A2, A3)	Load required / actual (%)	SCADA	Continuous data logging
	Biogas / natural gas flow / pressure to boiler	SCADA	Continuous data logging
	Heat circuit temperatures (deg. C)	SCADA	Continuous data logging
	Heat circuit flow	SCADA	Continuous data logging
Flare compound (A4)	Biogas to flare (m^3)	SCADA	Continuous data logging
	Run hours	SCADA	Continuous data logging
Biogas storage	Gas level (%)	SCADA	Continuous data logging
	Gas pressure (mb)	SCADA	Continuous data logging
	Methane %	SCADA	Continuous data logging
Digesters	Volume	SCADA	Continuous data logging
	Volatile Fatty Acids (VFAs)	Manual	Periodic
	Alkalinity	Manual	Periodic
	Process temperature	SCADA	Continuous data logging
	% solids (intake)	SCADA	Continuous data logging
	Retention (hours)	SCADA	Continuous data logging
	Heat exchanger temperatures (deg. C)	SCADA	Continuous data logging
	H_2S (ppm)	SCADA	Continuous data logging
Centrifuges and thickeners	Dry solids (%)	Manual	Periodic

8 Customer Communications

8.1 External Complaints

External odour complaints are received by Loop, which is the external company YW uses for all customer contacts. The call handler will work with the caller to understand the source of the issue. They will explore where the caller experienced the odour, whether it is a repeat or a singular issue, when and where it's most noticeable, what site the odour may be coming from, a description of the smell and if it's the first time it's been noticed. Loop record all complaints on the ICE system and contact the appropriate site owner, via the YW Control Room, to manage the complaint. The complaint will be passed to the Site Manager within 30 minutes or next working day if out of hours. The issue will be dealt with as a matter of priority. ICE is a computer program used to record and manage customer contact. The complainant may or may not request feedback of the cause and resolution of the issue. The odour contact form is included in Appendix .

When a complaint has been received, Site will undertake an investigation using the Site Checklist and record details of the investigation in the Odour Investigation Form (Appendix 8).

Odour complaints will be investigated at this site on the same working day (where practicable) and ideally within 2 working days of being aware of the issue. The investigation must not be carried out any later than 5 working days after being aware of the issue.

The Technical Optimiser should then put a note in the site diary and odour diary to record the complaint and inform the TCM and Site Manager of their findings.

Any actions will be resolved as a matter of priority. If immediate resolution of the odour issue can't be carried out, and where reasonably practicable, mitigation measures will be undertaken. Actions will be recorded on the investigation form. Feedback of the issue and the actions undertaken will be sent to the Customer Case Manager to communicate to the Complainant (if requested).

In the event of multiple complaints, and / or the potential for multiple complaints to occur, the Duty Manager will be informed and an incident response will be instigated.

8.2 Internal Complaints

If the PPE or any YW staff identify an abnormal odour release, the PPE will undertake an investigation using the Operator Site Checklist and complete any actions the investigation suggests. The PPE should then put a note in the site diary and the odour site dairy and inform the Technical Optimiser and Site Manager of their findings.

The odour complaint process is included in Appendix 7.

8.3 Community Engagement

Customers are at the heart of what we do at Yorkshire Water. In the event of an odour issue affecting multiple customers within the community, Yorkshire Water's communication team will decide the level of response that is required. This could include, but not be restricted to, stakeholder liaison (communication through local councillors, MPs and affected businesses), local media liaison and/or community meetings to discuss the issues and actions that will be undertaken to rectify the issue. Customer engagement events would be held if the odour severity dictated this level of response. Customers may be encouraged to keep an odour diary to record when odour is perceived to be a greater issue.

9 Training

9.1 Training Requirement

All staff receive training to cover operation of the site, assessment of odour and monitoring and maintenance of any odour abatement assets on the site. The training requirements for key staff at Mitchell Laithes STF are displayed in Table 13 below.

Table 13 Mitchell Laithes STF Training Requirements

Post	Training Requirement
Product and Process Site Manager	• Awareness of the responsibilities for avoiding odour nuisance. • Monitoring / maintenance of odour abatement equipment. • Odour control procedures during start-up / shut down. • Procedures for abnormal conditions. • Requirements of the OMP and Environmental Permit.
Product and Process Engineer / Operator	• Awareness of the responsibilities for avoiding odour nuisance. • Monitoring / maintenance of odour abatement equipment. • Odour control procedures during start-up / shut down. • Procedures for abnormal conditions. • Requirements of the OMP and Environmental Permit.
Sampler	• Awareness of responsibilities for avoiding odour nuisance and reporting. • Monitoring of odour abatement equipment.

9.2 Training Received

YW maintains processes to ensure that all those working for or on behalf of YW are suitably trained to fulfil their roles efficiently. Assessment of competence and identification of individual training needs is carried out through mutual discussion between the individual and their manager as part of the company performance management process, a fundamental part of which is the competency framework and progression plans which are available for every role in the organisation.

All YW employees receive IMS awareness training, delivered online at induction and periodically thereafter. This includes awareness of the environmental policy and understanding key environmental hazards and risks and the need to comply with IMS requirements.

Staff who work at the Mitchell Laithes STF receive specific training in the plant's operation and the potential environmental impact of the process as well as health and safety. Plant operators have a detailed understanding of the operational procedures for the site for both normal and abnormal operation. As part of the training, operators will receive specific instructions relating to those aspects of plant operation that have the potential for a negative impact on the environment. Toolbox talks are used to provide information and training to site staff, including information about environmental requirements/activities and legislative and compliance requirements. Training records for programmes and courses managed centrally are held on the company Learning Management System. Records for specific training managed locally at the Esholt site is held by individual managers and/or on the Leaning Management System.

Appendix 1 Emergency Contacts

Table 14 Mitchell Laithes STF Contacts

Area	Contact
Kirklees Council	01484 414739
Odour Abatement Systems Suppliers	Greenacre Environmental Systems
OCU Maintenance Provider	Greenacre Environmental Systems
Mitchell Laithes STF Odour related Yorkshire Water Contacts	Site Manager: Darren Gorner Site Optimiser: James Sutcliffe

Appendix 2 Odour Checklist

CHECKLIST FOR SITE ODOUR INVESTIGATION

AREA OF WORKS	POTENTIAL PROBLEM		FOLLOW UP ACTION REQUIRED
ODOUR MANAGEMENT PLAN (OMP)	Does the site have an OMP?	YES / NO	
	Is the site operated according to the OMP?	YES / NO	Inform Treatment Team Leader
SITE - GENERAL	Are all covers in place?	YES / NO	Replace covers and close hatches as required
	Are all access hatches closed?	YES / NO	
INLET WORKS	Is the crude sewage black and / or smelly?	YES / NO	Inform Treatment Team Leader
Screening	Are there any spilled screenings?	YES / NO	Clean up spills
	Are the compacted screenings clean?	YES / NO	Inform Treatment Team Leader if screenings are not clean
Grit Removal	Is there any spilled grit?	YES / NO	Clean up spills
	Is the grit clean?	YES / NO	Inform Treatment Team Leader if grit is not clean
Screening and Grit Skips	Do the screenings skips smell?	YES / NO	Inform Treatment Team Leader
	Do the grit skips smell?	YES / NO	Inform Treatment Team Leader
	Are the screenings skips too full?	YES / NO	Empty skips as needed
	Are the grit skips too full?	YES / NO	Empty skips as needed
Storm Tanks	Have the storm tanks been left full following a storm?	YES / NO	Empty and clean out tanks as needed
	Is there any sludge left in the bottom of the tanks?	YES / NO	
PRIMARY TANKS	Are the tanks black and / or smelly?	YES / NO	Inform Treatment Team Leader
	Are the tanks gassing?	YES / NO	
	Is there excess scum on the surface?	YES / NO	
BIOLOGICAL FILTRATION	Are the aeration vents blocked?	YES / NO	Inform Treatment Team Leader
	Is there any ponding?	YES / NO	
ACTIVATED SLUDGE	Do the dissolved oxygen levels in the aeration lanes match the setpoint(s)?	YES / NO	Adjust dissolved oxygen levels as required
	Do the MLSS fall within the tramlines for the site?	YES / NO	Increase / decrease RAS rate as needed
FINAL TANKS	Are the tanks black and / or smelly?	YES / NO	Inform Treatment Team Leader
	Are the tanks gassing?	YES / NO	
	Is there excess scum on the surface	YES / NO	
TERTIARY TREATMENT	Any there any site specific issues?	YES / NO	Inform Treatment Team Leader
SLUDGE TREATMENT	Are there any sludge spills?	YES / NO	Clean up spills
Imports and Exports	Does the tanker filling and emptying process cause significant release of odour?	YES / NO	Inform Treatment Team Leader
Sludge Thickening and Storage	Are all covers are in place?	YES / NO	Replace covers and close hatches as required
	Are all access hatches closed?	YES / NO	
	Are the doors to sludge treatment buildings / sludge cake stores kept closed?	YES / NO	Close doors as required
Anaerobic Digestion	Is all excess gas flared?	YES / NO	Inform Treatment Team Leader
	Is flare stack ignition immediate and reliable?	YES / NO	
	Are the whesso valves / PRVs operating prematurely?	YES / NO	
	Are the seals on the condensate traps intact?	YES / NO	
ODOUR ABATEMENT	Is there any detectable odour downwind of the stack?	YES / NO	Inform Treatment Team Leader
	Is the fan(s) working?	YES / NO	Arrange for fan to be repaired
GENERAL	Are there any outstanding actions from a previous investigation?	YES / NO	Complete actions

NAME: _____ DATE: _____

CHECKLIST FOR SITE ODOUR INVESTIGATION
PRODUCT + PROCESS OPTIMISER / TREATMENT TEAM LEADER

AREA OF WORKS	POTENTIAL PROBLEM		FOLLOW UP ACTION REQUIRED
ODOUR MANAGEMENT PLAN (OMP)	· Does the site have an OMP?	YES / NO	
	· If the site is not operated according to the OMP	YES / NO	Make changes to site operation to minimise odour production and release
SITE - GENERAL	· Are all covers in place?	YES / NO	Replace covers and close hatches as required
	· Are all access hatches closed?	YES / NO	
INLET WORKS	· If the crude sewage black and / or smelly	YES / NO	Check incoming sewage for septicity (in conjunction with Operations Support team) Contact Industrial Waste to check for potential septic discharges
Screening	· Are there any spilled screenings?	YES / NO	Clean up spills
	· If the compacted screenings are not clean	YES / NO	Optimise operation of screenings handling equipment
Grit Removal	· Is there any spilled grit?	YES / NO	Clean up spills
	· If the grit is not clean	YES / NO	Optimise operation of grit handling equipment
Screening and Grit Skips	· If the screenings skips smell	YES / NO	Check that screenings are clean and free from organic material: optimise screenings handling equipment if needed Empty skip(s)
	· If the grit skips smell	YES / NO	Check that grit is clean and free from organic material, optimise grit cleaning system if needed Empty skip(s)
	· Are the screenings skips too full?	YES / NO	Empty skips as needed
	· Are the grit skips too full?	YES / NO	Empty skips as needed
Storm Tanks	· Have the storm tanks been left full following a storm?	YES / NO	Empty and clean out tanks as needed
	· Is there any sludge left in the bottom of the tanks?	YES / NO	
PRIMARY TANKS	· If the tanks are black and / or smelly	YES / NO	Check inlet for septicity: Check levels of sludge in the tank and increase desludge rate if needed
	· OR If the tanks are gassing	YES / NO	
	· If there is excess scum on the surface	YES / NO	Remove excess scum
BIOLOGICAL FILTRATION	· If the aeration vents are blocked	YES / NO	Unblock aeration vents
	· If there is ponding	YES / NO	Consider increasing flushing rate and / or forking media
ACTIVATED SLUDGE	· Do the dissolved oxygen levels in the aeration lanes match the setpoint(s)?	YES / NO	Adjust dissolved oxygen levels as required
	· Do the MLSS fall within the tramlines for the site?	YES / NO	Increase / decrease RAS rate as needed
FINAL TANKS	· If the tanks are black and / or smelly	YES / NO	Check inlet of tanks for septicity. Check levels of sludge in the tank and increase desludge rate if needed
	· OR If the tanks are gassing	YES / NO	
	· If there is excess scum on the surface	YES / NO	Remove excess scum
TERTIARY TREATMENT	· If there are any site specific issues	YES / NO	Investigate and rectify
[illegible] TREATMENT	· Are there any sludge spills?	YES / NO	Clean up spills
Imports and Exports	· If the tanker filling and emptying process causes significant release of odour	YES / NO	Investigate whether the process can be modified to reduce odour emissions Consider changing timing of tanker operations to reduce nuisance potential
Sludge Thickening and Storage	· Are all covers are in place?	YES / NO	Replace covers and close hatches as required
	· Are all access hatches closed?	YES / NO	
	· Are the doors to sludge treatment buildings / sludge cake stores kept closed?	YES / NO	Close doors as required
Anaerobic Digestion	· If all excess gas is not flared	YES / NO	Contact ER to investigate
	· If flare stack ignitions not immediate and reliable	YES / NO	Contact ER to investigate
	· If the whesso valves / PRVs operate prematurely	YES / NO	Contact ER to investigate
	· If the seals on the condensate traps leak or are damaged	YES / NO	Contact ER to investigate
ODOUR ABATEMENT	· If there is any detectable odour downwind of the stack	YES / NO	Check OCU using additional checklist
	· Is the fan(s) working?	YES / NO	Arrange for fan to be repaired
GENERAL	· If there are any outstanding actions from a previous investigation	YES / NO	Complete actions

NAME: _____ DATE: _____

Appendix 3 OCU Performance Check List

Task	Frequency	Performance Indicators	Method	Actions to be Taken	Responsible Person
Odour Abatement Plant – Biofilter					
Gas flow rate	Continuous	+/- 15% design value (21,260 m^3/hr)	Gas flow meter / EN 16911-1 and MID for EN 16911-1	Odour abatement plant shall be regularly checked and maintained to ensure appropriate performance. Odour abatement plant shall be managed in accordance with permit conditions, the odour management plan and manufacturer's recommendations. Carbon filter(s) to be replaced in accordance with manufacturers recommendations. Equipment shall be regularly calibrated.	Operations
Temperature (inlet)	Daily	For information only	Temperature probe /Traceable to national standards		Operations
Thatching / compacting	Weekly	As per O&M	Back pressure		Operations
Hydrogen sulphide	Continuous	Max 172 ppm	Electrochemical monitor		Operations
pH (biofilter drainage effluent)	Continuous	pH 6 – 8	pH metre		Operations
Differential pressure	Continuous	+/- 15% design value (-224 Pa)	Recognised industry method		Operations
Check irrigation rates of biological OCU	As per O&M	As per O&M	Monitor flow on the unit.	Adjust wetting rate as required.	Operations
Check and clean the irrigation nozzles on the biological OCU	As per O&M	As per O&M	As per O&M	Clean as required	Operations
Efficiency assessment	Every 6 months	Hydrogen Sulphide – 98% removal rate Ammonia – 90% removal rate Mercaptans – 95% removal rate Dimethyl Sulphide – 20% removal rate VOCs – 50% removal rate	Media health, air-flow distribution and emission removal efficiency (BS EN 13725 for odour removal)	Third party survey to assess performance of the OCU including contaminant removal rates, media health, channelling of media.	3rd Party Specialist
Odour Abatement Plant – Carbon Filters					
Moisture / humidity	Daily	For information only	Moisture meter	Odour abatement plant shall be managed in accordance with permit conditions, the odour management plan and manufacturer's recommendations. Carbon filter(s) to be replaced in accordance with manufacturers recommendations. Equipment shall be regularly calibrated.	Operations
Differential pressure	Continuous	+/- 15% design value (-1,278 Pa)	Recognised industry method		Operations
Efficiency assessment	Annual	99% removal of contaminants	Emission removal efficiency (BS EN 13725 for odour removal)		3rd Party Specialist

Task	Frequency	Performance Indicators	Method	Actions to be Taken	Responsible Person
Odour Abatement Plant – Outlet Stack					
Temperature	Continuous	For information only	Temperature probe /Traceable to national standards	N/A	Operations
Hydrogen sulphide	Continuous	0.5 ppm	Electrochemical monitor	Investigate OCU performance. Arrange third party specialist support. Replace OCU media	Operations
Hydrogen sulphide	Every 6 months or as agreed in writing by the Environment Agency.	As per BAT 8 / BAT 34	CEN TS 13649 for sampling NIOSH 6013 for analysis	Action levels to be achieved in accordance with permit conditions.	3rd Party Specialist
Ammonia	Every 6 months or as agreed in writing by the Environment Agency.	As per BAT 8 / BAT 34 (0.3 – 20 mg/Nm^3)	EN ISO 21877	Action levels to be achieved in accordance with permit conditions.	3rd Party Specialist
Containment and Extraction System					
Extraction fan visual inspection	Monthly	No damage / leakage/ signs of corrosion	Visual inspection	If fans are damaged raise a job with ER	Operations
Extraction fan noise	Monthly	Increase noise or vibration from the fan motor	Listen	If fan is in fault or running noisy raise a job with ER	Operations
Check fan drive belt condition and tension	Annually	As per O&M	As per O&M	Check / Repair. Raise a job with ER	Operations
Check fan motors	Annually	As per O&M	As per O&M	Check / Repair. Raise a job with ER	Operations
Check physical integrity of ducting	Monthly	No signs of degradation or other damage and no holes	Visual Inspection	Raise a job with ER	Operations
Check duct supports	Monthly	No damage or corrosion	Visual Inspection	Raise a job with ER	Operations

Task	Frequency	Performance Indicators	Method	Actions to be Taken	Responsible Person
Process covers visual inspection	Monthly	Good cover integrity. No damage / gaps allowing for fugitive emission leakage.	Visual inspection	If process covers are damaged raise a job with ER	Operations

Appendix 4 Odour Monitoring Record Sheet

Odour Monitoring Record Sheet

																	Sheet No:	
				METEROLOGICAL CONDITIONS							ODOUR[1]		SOURCE		SITE STATUS	CORRECTIVE ACTION		
Date	Location	Time	Staff Name	Weather Temp	General air quality	General air stability	Wind Strength	Wind Direction	Bar Pressure	cloud cover	Intensity 0-6	Offensiveness / Nature	Source within facility	External source	Facility Activities	Action required	Action implemented	

[1] *Intensity: 0 No odour, 1 Very faint odour, 2 Faint odour, 3 Distinct odour, 4 Strong odour 5, Very strong odour, 6 Extremely strong odour

Appendix 5 Sniff Testing Record Sheet

Test by		Start Time	
Date		End Time	
Weather Condition		Temperature	
Wind Strength		Wind Direction	

Location No. / Name	Nearest Receptor Sensitivity	Intensity	What does it smell like?	Frequency of odour?	Is the source evident?	Other comments / observations
1. Primary Digesters	Low / Medium / High	0 No odour 1 Very faint 2 Faint odour 3 Distinct odour 4 Strong odour 5 Very strong odour 6 Extremely strong odour.		Constant / Intermittent	Yes / No Source area / name to be provide. Might be that maintenance work if occurring and you can detect increased odours due to that activity, or call smell cake import wagon etc	Are there odours detected from other sources? Farm / Landfill / other industry etc
2. Sludge Thickening Building						
3. Primary Sludge Tanks						
4. SAS Tanks						

5. South-East Cake Pad						
6. Central Cake Pad						
7. North-West Cake Pad						

Appendix 6 Safe Loading and Discharge of Sludge Road Tankers

KeldaGroup

Occupational Health & Safety Management System

Safe Working Procedure SWP 007

Safe Loading & Discharging of Sludge Road Tankers

Document Control Ref:	SWP 007
Document Location:	OH&S Database / Safe Working Procedures
Document Custodian:	OH&S Department
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Revision History

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1	31/12/2013	D. Ross	New document
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3	12/10/2016	S. Ross, C. Birkenshaw, M. Blanchard, J. Pell	Updated to reflect current practice
4	30/10/2018	J. Pell, M Blanchard	Updated gas monitor requirements & reviewed document

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Safe Loading & Discharging of Sludge Road Tankers

The following notes are for your guidance. For further information, or if in doubt, contact your line manager / Safety Advisor who will give further help or advice.

Minimum Number of Persons Required:	**Major Hazards:**
1	• Hydrogen sulphide • Slips, trips and falls • Manual Handling • Stored energy • Pressure systems • Noise • Falls from height
Essential Safety Equipment Required: • Personal gas monitor • Safety footwear • Hand protection • Hi-Vis jacket/vest • Eye protection • Head protection (hard hat) • Hearing protection • First aid kit (Include. Eyewash) • Task lighting	
Training and/or Documentation required: • Please see Section 6 – Further Guidance.	

1. Introduction

1.1 Sludge tanker 'barrels' are classed as pressure vessels and are subject to annual examination by a competent person. Only fully trained YW personnel, or authorised persons who understand how all the controls pressure relief valves etc. function, may operate this equipment.

Note: Do not use pressure vessels that you are not familiar with or have not been trained on and seek advice and support.

1.2 Pressurised vessels are potentially hazardous under working conditions, and daily checks should be made of the satisfactory operation of safety critical devices such as the Pressure Relief Valve. Follow the detailed supplier's instructions regarding operator's daily checks.

1.3 Sewage and sewage sludge are substances that are potentially hazardous to health. Avoid skin contact, ingestion and inhalation of aerosols. Always wear your personal protective equipment and follow good hygiene practices.

1.4 Experience has shown that during the operation of a vacuum tanker, hydrogen sulphide can be vented from the tanker barrel. The use of suitable portable gas monitors is therefore a mandatory requirement at all times whilst on-site.

1.5 Avoid leaving pressure vessels containing sludge parked overnight. (Where this cannot be avoided ensure that the vessels are adequately vented by the means of leaving the vent valve open).

1.6 Follow designated traffic routes, one way systems etc. and comply with site speed restrictions.

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Safe Loading & Discharging of Sludge Road Tankers

Task

2. Loading the Tanker (Vacuum Transfer)

2.1 On arrival on site, check that your personal gas monitor is turned on – has been calibrated (in a clean air environment) - and is worn on your person at all times whilst on-site (near your breathing zone).

2.2 Complete a 360° check of the tanker/loading area. Consider the environment around you – hazard identification, wind direction, vehicle movements, people in close proximity to the vehicle e.g. operators/contractors etc. Ensure all inlet and outlet valves are closed and then open the vent breaker valve before removing the end-cap.

2.3 Where practicable attach sufficient 'vent bagging' to the compressor exhaust extension pipe to vent any hydrogen sulphide away from the work area to ensure a safe working area is provided. Also consider the positioning or repositioning of your vehicle to reduce the potential of H2S in the working zone.

Note: Ensure that any gases being vented away from the tanker are not creating additional hazards to other people or processes and are not likely to enter a confined space.

2.4 If loading from a hose already connected to sludge holding tank, check hose for weight kick and gently lift (hose may possibly still have liquid left in it). Never assume any hose is sound - check for splits and excessive wear. Also check that couplings are in good condition and the correct sealing ring is in place before using the tanker hose. If the tanker hose is found to have faults, the tanker hose must never be used and be disposed of correctly.

2.5 Connect the hose between the tanker inlet valve and the loading point. Check that all connections are correctly fitted and all air taps are closed.

Note: The use of gloves in couplings is an unacceptable practice – do not use to create a seal in the bauer coupling.

2.6 Ensure that the changeover valves are in the vacuum/suck position.

2.7 Open the travel valve (if not automatic where fitted).

2.8 Once connections to vehicle and sludge tanks are made and vehicle power take off (PTO) is engaged if applicable, the driver should carefully monitor the loading operation. This may be achieved by standing in a safe location outside of the vehicle, observing the loading procedure.

Note: Keep clear of the exhaust area when loading and venting the barrel.

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2.9 Yorkshire Water vehicles predominantly use a hydraulic pack. If using a donkey engine, do not engage the PTO as this will damage the hydraulic pack.

2.10 Start the vacuum pump and check that vacuum starts to develop.

2.11 Monitor the dial gauge to ensure the vacuum develops.

2.12 Open inlet valve on tanker.

2.13 If loading from sludge tank open outlet valve on loading point slowly.

2.14 Look and listen for air or product leaks.

2.15 On tankers fitted with sight glass, check isolation valves are open.

2.16 Feel the hose for sludge going through it and check the sight glass when loading for sludge rising in the barrel.

2.17 You may not always get a full load on the first attempt.

2.18 If this happens, vent the barrel and ensure the dump tank is empty and then re-start vacuum pump and check that vacuum starts to develop.

2.19 Monitor the dial gauge to ensure the vacuum develops.

2.20 When tanker is nearly full (sight glass and dial gauge) close the valve on sludge tank and then open the air release valve to enable the tanker hose to be emptied safely on completion of loading.
Note: Sight glasses should be clearly marked to the correct level for vehicle weight.

2.21 Close inlet valve on tanker.

2.22 Turn off vacuum pump and vent tank.

2.23 Disconnect tanker hose and put away in a safe place ensuring site is left in a clean and safe state.

2.24 Connect end cap and ensure relevant valves, such as vent valves, are closed before moving vehicle.

2.25 In addition to the vacuum loading of tankers, barrels may also be loaded by external pumping. Please refer to the pump loading safe working procedure.

2.26 Complete a 360° walk-around check of the vehicle, equipment and immediate work area.

Note: At sites where there are no fixed tanker points, sludge (or sewage), may have to be drawn directly from an asset which is not a sludge holding tank. Ensure that steps are taken to minimise risk by using the correct tools, considerations are made for working at height, avoid confined spaces and other hazards. If in any doubt about the safety of the operation, consult your line manager.

3 Discharging the Tanker (Pressure)

3.1 Yorkshire Water vehicles predominantly use a hydraulic pack. If using a donkey engine, do not engage the PTO as this will damage the hydraulic pack.

3.2 On arrival on site, check that your personal gas monitor is turned on – has been calibrated (in a clean air environment) - and is worn on your person at all times whilst on-site (near your breathing zone).

3.3 Complete a 360° check of the tanker/loading area. Consider the environment around you – hazard identification, wind direction, vehicle movements, people in close proximity to the vehicle e.g. operators/contractors etc. Ensure all inlet and outlet valves are closed and then open the vent breaker valve before removing the end-cap.

3.4 Open air tap on barrel before removing end cap.

3.5 If discharging from a tanker hose already connected to sludge holding tank, check hose for weight, kick and gently lift (it is possible that the hose may still have liquid left in it). Never assume any tanker hose is sound - check for splits and excessive wear. Also check that couplings are in good condition and the correct sealing ring is in place before using the hose.

3.6 Connect hose between the tanker outlet valve and the off-loading point. Check that all connections are correctly fitted and all air taps are closed.

Note 1: Ensure that tanker hoses are securely connected before operating the V5, rotork valves or manual valves at the off-loading point.

Note 2: The use of gloves in couplings is an unacceptable practice – do not use to create a seal in the bauer coupling.

3.7 Ensure that the discharge point rotork or manual operating valve is fully open before opening the tanker rear outlet valve.

3.8 Open the outlet valve on tanker.

3.9 Ensure that the changeover valves are in the pressure/blow position.

3.10 Open travel valve (if fitted and not automatic).

3.11 Start pump.

3.12 Monitor the Dial Gauge for pressure.

3.13 Feel the hose for sludge going through and where possible visually check the V5 machine or sight glass to make certain liquid is discharging (no blockages).

3.14 Where ever possible it's always better to turn the pump off before the last of the sludge is discharged as this helps to reduce odour, prevent the bagging from bouncing and H2S.

3.15 Be aware that when discharging under pressure the load can be "discharged" with significant force and sludge can spray over a wide area, especially in windy conditions.

3.16 If discharging to a level below the barrel outlet, the preferred method is by gravity as it is a safer but possibly slower operation. Ensure that you have left the pipe work clear of the product.

3.17 Close tanker outlet valve (and ensure any manual/rotork valves at the discharge point are left closed).

3.18 Turn off pump and vent tank in a suitable location to prevent H2S exposure to all parties.

3.19 Open air tap and release remaining air pressure within the tanker hose slowly.

3.20 Disconnect tanker hose and replace end cap.

3.21 Store the tanker hose in a safe place.

3.22 Clean out dump tank and clean up any spillages.

3.23 Ensure all valves are in the correct position. Connect end cap and ensure relevant valves, such as vent valves, are closed before moving vehicle.

3.24 Complete a 360° walk-around check of the vehicle, equipment and immediate work area.

4 Action in the Event of a Gas Monitor Alarm

4.1 The gas monitor is designed to alarm at any reading above 10 parts per million of hydrogen sulphide with a pre warning at 5ppm.

4.2 If an alarm is activated, the driver must immediately shut down the load/discharge operation and walk away from the vehicle. This will remove you from the immediate gas hazard as detected by the monitor.

4.4 Advise any person in the local area that there is hydrogen sulphide present and ask them to leave the area until you give the all clear.

4.5 Check your gas monitor – the reading will start to decrease as you move out of the gaseous atmosphere.

4.6 Periodically check the reading of the monitor, when the reading has dropped to a safe level and press the reset button on the monitor. Walk back towards the working area, checking gas levels.

4.7 If the alarm sounds again, repeat the above process.

4.8 Once the alarm indicates it is safe at the vehicle controls – re-start the load/unload process.

4.9 All gas monitor alarms over 10ppm must be reported as 'Near Misses'.

4.10 The alarm will indicate the presence of hydrogen sulphide and you must follow the SWP if the alarm sounds.

4.11 Multiple alarm activations may occur at a site during a load/unload. If this occurs for a prolonged period stop work at this site and seek immediate advice from your line manager.

4.12 Time Weighted Average alarm means that you should inform your line manager and stop working with sludge for the day when using a gas monitor.

5 Incident and Hazard Reporting

5.1 Report all Accidents to your line manager immediately and complete an accident report on Safeguard.

5.2 Report all Near Misses using the YW incident reporting system on Safeguard.

5.3 Report all Hazards using the YW Hazard Reporting System on Safeguard.

5.4 Report any vehicle defects promptly in accordance with the YW Fleet defect reporting procedures.

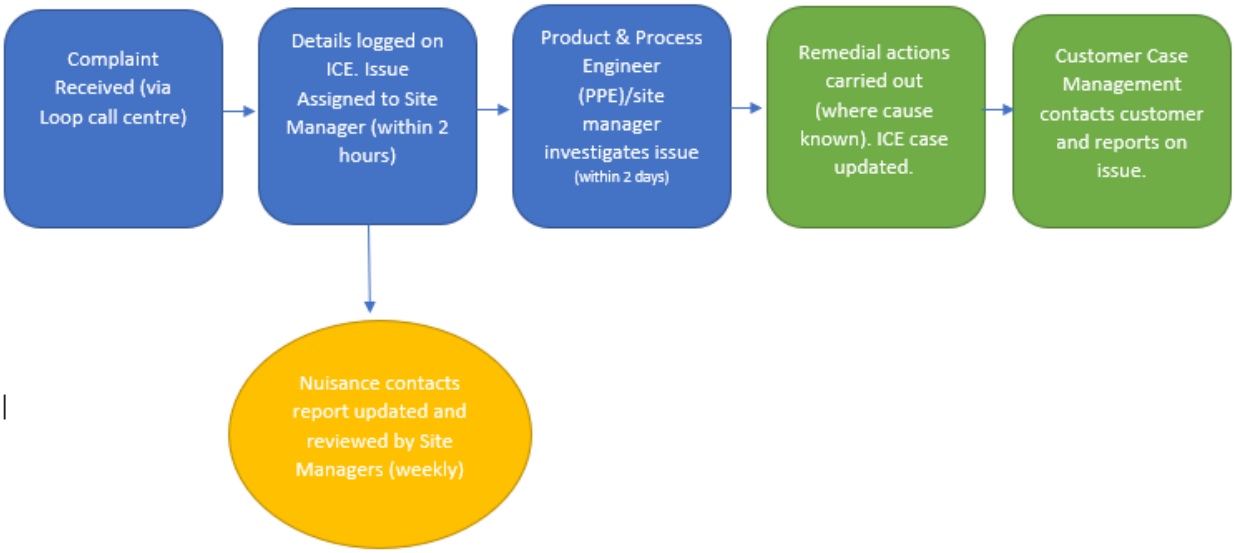
6 Further Guidance

Management Procedures / Safe Working Procedures / Technical Specifications (held on Safeguard) that are also relevant include:

- SWP 053 – Personal Safety & Security
- SWP 078 – Safe Use of Mobile Phones
- MP 05 – Lone Work
- MP 34 – Manual Handling

REMEMBER: IF IN DOUBT - ASK YOUR LINE MANAGER / SAFETY ADVISOR

Appendix 7 Odour Complaint Process



Appendix 8 STF Odour Complaint Form

Loop handle customer complaints being reported to Yorkshire Water. The call Handler will work with the complainant to try and locate the odour. Loop uses a software system called ICE to record the issue. If the issue is believed to be arising from a sewage works, the call handler will work through the following forms to pinpoint the issue.

Customer's details (name and address, if provided)	
When did the odour occur	
Time when the odour occurred	
Where was the location of the odour	
Is the odour happening now or was it in the past	
Does the customer know what is causing the smell	
What is a description of the odour (sewage / drains / eggy / sweet composting)	
Is this the first time the odour has been noticed	
Where is the odour at its worst (inside/outside house/boundary)	
Any other comment	

Appendix 9 Odour Investigation Form

The following investigation form will be used by Operational staff in the event of an odour complaint being received.

Date of odour complaint	
Time of odour (if known)	
Name of YW colleague investigating issue	
Postcode where the issue was identified (if known)	
Weather at the time of odour complaint (including temperature)	
Wind Direction (from onsite wind monitor) and strength (no wind, light, gusty, heavy)	
Description of smell from Complainant (if known)	
Is this linked with other complaints	
Do you know what asset is causing the issue	
Can the asset be identified through sniff testing (follow sniff testing monitoring programme in the odour management plan)	
Can the issue be resolved immediately	
If no, what actions are needed to resolve the issue	
If the issue is going to take >2 days to resolve, can the issue be mitigated to reduce the odour effect	
Does the odour management plan need updating to discuss the cause/action/mitigation	
Date when resolved	