Application PPN-00003

Environmental Permit
for

Maelor Foods Limited
Pickhill Lane
Cross Lanes
Wrexham
LL13 0UE

February 2017

Application PPN-00003
Environmental Permit
for

Maelor Foods Limited
Pickhill Lane
Cross Lanes
Wrexham
LL13 0UE

February 2017

Prepared by:
Adrian Kesterson CEnv, MIEMA
Director
Expirea Environmental Consultancy Ltd.

516
Nottingham One
Canal Street
Nottingham
NG1 7HP
☎ 07845 668696
✉ adrian@expirea.co.uk
www.expirea.co.uk

1 Non-Technical Summary

Maelor Foods Limited have acquired the former Maelor Creamery near Wrexham and are converting the site into a poultry slaughterhouse and meat processing facility. The planning permission for the site allows the slaughter of 400,000 birds per week but the plant is designed to process up to 1 million birds per week, subject to attaining revised planning permission.

Slaughtering is expected to commence around September 2017, subject to all approvals and equipment being in place. The meat cutting plant will be operational during the pre-permit phase but well below the 75T/day prescribed activity threshold until an environmental permit is issued. The wastewater from the cutting plant during this period will be collected and tankered away for off-site disposal. The effluent treatment plant is being installed during this pre-permit phase but will not be used until the permit is issued.

1.1 Process Description

A summary of the process is provided below:

Bird Reception and Lairage Area

Live chickens from broiler production farms will arrive at the plant in modules on HGV trailers. The HGV trailers will enter a lairage area, before moving to the intake area where the modules will be unloaded. Birds will be transferred from the intake area to the preliminary processing area where the modules will be loaded onto the intake line.

Stunning

The birds will be gas stunned in an enclosure located within the lairage area. The stunned birds will be removed from the modules and hung-on to shackles on an overhead conveyor line for transfer to kill and bleeding.

Kill and Bleed

As the birds move around the conveying system the throats of the birds will be mechanically slit and the blood drained from the birds as they pass above the blood trough. Blood will be pumped from the trough to the blood tank in the offal collection bay.

Scalding and Defeathering

After bleeding the birds will be conveyed into the scalding unit where moist hot air is applied to loosen feathers to facilitate their removal. Defeathering will be conducted mechanically, with feathers transferred from the defeathering machines via a recirculating water flume into the waste removal building. The feathers will be pressed to remove excess water prior to collection in a vehicle trailer situated in one of the offal collection bays.

Evisceration

After defeathering, the birds' heads will be removed and the carcasses eviscerated to remove intestines and other internal organs. Inedible offal will be transferred to a vehicle trailer in the offal bay for collection. Edible offal (heart, lungs, necks, gizzards and feet) will be recovered

to maximise product and minimise the volume of waste offal generated by the process. Edible offal will be transferred to cold store awaiting distribution.

Chilling

The eviscerated birds will continue along the shackle conveyor into a chiller, passing through at a controlled rate to ensure they leave the chiller at less than 4°C. The chiller air will be continuously recirculated via the refrigeration system to maintain the desired temperature.

Weighing, Packaging, Meat Processing and Dispatch

Chilled birds will be weighed and either despatched to the meat processing plant or trussed prior to modified atmosphere gas packing and despatching to retail or wholesale customers. In the meat portioning plant whole birds will be cut into various portions on automated and manual processing lines and packaged ready for dispatch to customers.

Animal By-Product Collection Bays

Dead on arrival birds, inedible offal (heads, viscera, feathers and other waste chicken flesh) and solid waste filtered from the drainage system will be stored in trailers in the offal collection bays before collection for rendering at a licensed off-site facility. Blood will be stored in a tank inside the offal collection bay before collection by tanker for off-site processing at a licensed facility.

Module and Vehicle Wash

The empty modules will be washed and transferred to the module return service area for loading back onto washed HGV trailers. The HGV trailers will be washed at the vehicle washing area before being reloaded with cleaned modules for return to farms for bird collection.

Process Cleaning Systems

At the end of each shift the work areas will be fully cleaned with trigger operated lances.

Effluent Treatment Plant

Wastewater will arise from cleaning process areas and from discharges from the feather flume and scalding unit. The wastewater will be treated at the on-site effluent treatment plant using physical and biological treatment. The high quality treated effluent will be re-used for cleaning non-process areas such as vehicle and module washing. Excess treated effluent will be discharged to the River Dee.

Odour Control and Abatement

Good housekeeping and working practices will be employed to minimise odours. The air from the most odorous process stages (scalding and de-feathering, inedible offal stores and blood storage) will be extracted and treated in a chemical scrubber before discharge to air. The airspace from the less odorous process areas will be extracted and dispersed directly to air by roof mounted fans or short stacks. Carbon filters will be used to abate some of the odours from the effluent treatment plant.

Waste Storage

Waste packaging materials such as broken pallets, cardboard, plastic and metal will be segregated and recycled. Sludge from the effluent treatment plant will be sent offsite for application to land for agricultural benefit. Non-recyclable waste such as engineering waste will be segregated and sent for offsite disposal.

Site Utilities

Hot water for workplace heating, process applications and cleaning will initially be provided by the existing small boilers from the creamery. Additional or replacement plant is being evaluated to provide the additional hot water demands for when the production rate is increased.

Water use will be minimised and water recycled where possible. Water used in the process will be drawn from a combination of mains and borehole supplies, subject to abstraction licence approval.

Energy efficient equipment and lighting will be installed. Utility sub-metering will enable consumption to be monitored and optimised.

All clean site drainage will discharge to surface water drains feeding into the River Dee.

1.2 Environmental Setting

The Maelor Foods installation is approximately 50,000m^2 in area and is located on the former Maelor Creamery site, Pickhill Lane, off the A525 near Wrexham. Approximately 1 km to the south east is the village of Bangor-on-Dee and approximately 700m to the north west is the residential area of Cross Lanes. There are five residential properties close by, located off Pickhill Lane, to the west of the proposed main poultry processing building and site entrance. See the site location map in Appendix A, Figure 1.

The installation boundary is shown on a site plan in Appendix A, Figure 2.

The environmental receptors nearby are shown on the location map in Appendix A, Figure 3. These are discussed further below.

1.2.1 Habitats and Conservation Sites

The following habitats and conservation sites have been identified within search distances based on no emissions to air from the installation of any significance.

Habitats Directive sites within 1km of the installation
The River Dee and Llyn Tegid, Special Area of Conservation (SAC) is designated for its Atlantic salmon and water plantain populations and is around 120m to the south west of the installation. See map (Appendix B, Figure 1) and search results (Appendix B, Figure 2).

CROW sites within 2km of the installation
The River Dee is also a designated Site of Special Scientific Interest (SSSI) within 1km of the installation. See map (Appendix B, Figure 3) and search results (Appendix B, Figure 4).

1.2.2 Aquifers

The installation is within a groundwater source protection zone (SPZ) (Zone III, total catchment). See the groundwater SPZ map (Appendix B, Figure 5). The installation is also located within the 'Middle Dee Groundwater Management Unit' of the Dee Catchment Abstraction Management Strategy (CAMS).

Maelor Foods have undertaken successful borehole pumping trials and have made a separate application for a water abstraction permit to allow them to use borehole water for process applications.

1.2.3 Receiving Water Quality

The effluent treatment plant will discharge to the River Dee which is of the highest quality, Class A for both chemical and biological quality at the monitoring locations upstream and downstream of the installation. See 2009 Water Quality data (Appendix B, Figure 6).

Clean site drainage will discharge into surface water culverts which join the land drainage system flowing northeast, then east before joining the River Dee further downstream.

1.2.4 Air Quality Management Zones (AQMZ)

The installation is not within an AQMZ.

1.2.5 Flooding

The installation is just outside a designated flood plain. The point of discharge to the River Dee is within the flood plain. See floodplain map (Appendix B, Figure 7).

2 The Permit Installation

2.1 Plans and drawings

The installation plan showing the layout of the process areas, installation boundary (marked in green) and emission points to air and water is in Appendix A – Figure 2.

2.2 Licensing History

The Maelor Foods installation was a creamery from 1936 and was initially operated by Cadburys and later Dairy Crest. The SDI plant was completed in 1986 on a green field part of the Maelor site and was used to make whey syrups. SDI was built when the site was expanded to enable the drying of lactose and lactose based products.

Water Resources Act discharge consents were held for the site:

- Dairy Crest held a permit WE/CM0078801/001, issued 26/06/1985 and revoked 05/01/1995.

- Dairy Crest's permit WE/CM0078801/002 was issued 06/01/1995 and revoked 19/08/2002.

Site ownership transferred to First Milk Ltd in October 2006.

- First Milk Cheese Company Ltd. held permit WE/CM0078801/003, issued 20/08/2002 and revoked 16/03/2009.

First Milk Cheese Company Ltd. then held an installation environmental permit EPR/UP3031IW, issued 10/01/2008, for the SDI plant. The permitted activities were:

- S6.8A1 (e) Treating and processing of milk
- S5.3 A1 (c)(i) Treatment of process effluent at on site biological treatment plant.

When production levels dropped the S6.8A1 (e) prescribed activity threshold was no longer exceeded and the permit was surrendered on 09/02/2012.

First Milk then obtained a water discharge environmental permit, EPR/AP3429XK/A001, issued 03/08/2010 for the effluent treatment plant serving their SDI Plant. The SDI plant closed and this permit was surrendered on 16/06/2015.

The new Maelor Foods installation will be permitted for the first time. The company have recently acquired a water discharge environmental permit, EPR/WB3990HT, issued 15/12/2015, for the sewage treatment plant that will serve the offices and workplace toilets and wash facilities. This will not form part of the permitted installation covered by this permit application.

2.3 Proposed activities at the Installation

This application is being made to obtain a bespoke installation environmental permit for the Maelor Foods installation.

Maelor Foods Limited have acquired the former Maelor Creamery near Wrexham and are converting the site into a poultry slaughterhouse and meat processing facility. The planning permission for the site allows the slaughter of 400,000 birds per week but the plant and associated activities are designed to process up to 1 million birds per week.

This permit application and plant design is based on 1 million birds per week but initially we will only be able to operate at the lower level until we obtain revised planning permission.

The average live bird weight will be 2.4kg. The carcass yield is typically 68% - see poultry yield schematic in Appendix C, Figure 1.

Regulatory Guidance Series, No RGN 2 states that where head and offal are removed at point of slaughter (e.g. for mammals and birds), such material is generally excluded from the production capacity calculation.

The carcass production capacity, based on this average live bird weight, per day = (0.0024T x 1 million) / 6 days) x 0.68 = 272T/day.

2.3.1 Prescribed Activities

The prescribed activities to be undertaken at Maelor Foods Installation are shown in Table 1:

Table 1: Prescribed Activities

EPR Schedule 1 references	Description of the installation activity	Capacity and limits of specified activity
Section 6.8A(1) (b)	Poultry slaughterhouse Slaughtering animals at a plant with a carcass production capacity of more than 50 tonnes per day.	Planning consent for 400,000 birds / week – plan to begin slaughter around August 2017. This equates to 109T carcass / day (based on 6 days/week) Once established and proven, planning consent will be sought to increase slaughter capacity to the plant design capacity of up to 1 million birds/week. This equates to 272T carcass / day (based on 6 days/week) Covers, bird receipt, lairage, stun, kill, bleed,

		de-feather, evisceration, chilling, packing, storage for dispatch and animal by-products storage and handling.
Section 6.8A(1) (d)(i)	Meat cutting plant Treatment and processing of meat with a finished product capacity (excluding packaging) of more than 75 tonnes per day	158T/day Receipt of whole birds, cutting and portioning, packaging, chilling and storage prior to dispatch.
Section 5.4A(1) (a) (i)	Effluent treatment plant Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day, involving (i) biological treatment.	Up to 1,500m^3/day. Includes sludge tanker loading and discharge point to watercourse.

2.3.2 Directly Associated Activities

The directly associated activities, those which are technically connected and may potentially have an adverse environmental impact are shown in Table 2:

Table 2: Directly Associated Activities

Name of DAA	Description
Odour abatement plant	Chemical scrubber. Serves the Section 6.8 A(1) (b) activities - scalding and de-feathering, offal stores and blood storage
Refrigeration Plants	Serves both Section 6.8 A(1) activities – main chiller plus additional chillers serving chiller room for whole birds, edible offal and meat products storage
Hot water heating – aggregated net thermal input of initial and / or additional boilers or other heating system will be <20MWth	Serves both Section 6.8 A(1) activities – hot water supply to slaughtering and cutting plants and workplace heating. Includes fuel receipt and storage.
Waste arisings handling and storage	Serves all the Part A(1) activities. Scrap packaging, pallets, drums and other containers are segregated, stored in skips or bays awaiting disposal or recovery.
Site surface water drainage discharges	Site drainage for rainwater, including oil interceptors and discharge to watercourse

3 Emissions to the Environment

The emissions from the installation are itemised by the receiving environmental medium below. The proposed monitoring for these discharge points is shown in Section 12.1 and the environmental impact assessment of these discharges is provided in Section 13.

3.1 Emissions to Air

Point source emissions to air will arise from the sources listed below in Table 3 along with the parameters emitted and estimated amounts. The locations of these emission points are marked on the installation plan in Appendix A - Figure 2.

Table 3: Air emission points

Emission Point Ref.	Source	Parameter	Estimated emission concentration	Estimated emission rate	Estimated annual emission
A1	Rehema P200 series No1 & No2 boiler exhausts	Particulate		10mg/kWh	48.73kg
		Oxides of nitrogen	<230mg/m^3	<200mg/kWh	974.55kg
		Sulphur dioxide	4.3mg/m^3	3.7mg/kWh	18.03kg
		Carbon monoxide		<40mg/kWh	194.91kg
A2	Chemical scrubber stack	Odour	2,000ouE/m^3	17,000ouE/sec	
A3	Bird hang on area dust arrestor stack	Particulate	<10mg/m^3	Negligible	
A4 Note 1	Additional or replacement hot water heating plant	Note 1	Note 1	Note 1	Note 1

Note 1: Details to be provided before permit determined or else by pre operational condition or permit variation application if required

A1

There is no historical air emissions data available for the existing boilers from the former creamery. The technical data for the boiler burners and supplementary information from the manufacturers is shown in Appendix F4.

To calculate the estimated annual mass emissions, the emission rates per kWh have been multiplied by the aggregate thermal input of the 2 existing boilers which is 556kWh.

e.g. for NOx emissions
For 1 hour: 556kW x 200mg/kWh = 111200mg = 111.2g/hr = 2.67kg/day.
365 x 2.67kg = 974.55kg/year.

Further details of the boilers are provided in Section 5.13.

A2
The air in the buildings of the most odorous processing stages (scalding and de-feathering, offal stores and blood storage) is to be treated in the odour abatement plant. The chemical scrubber will discharge treated air via a vertical stack. See details of this in Section 6.

The indicative odour unit emissions are taken from similar systems employed across the sector.

A3
There may be some dust from the bird hang on area and this will be filtered in a dust arrestor unit (bag filter) which will exhaust to air via a stack. Dust arrestors commonly used for this purpose achieve design particulate emission levels of <10mg/m^3 in the treated air discharge when maintained as per manufacturer's instructions. The technical details for the dust arrestor are not yet available but can be provided during the permit determination phase if required.

A4
Additional hot water demand will need to be met by replacement or further water heating plant. We are currently researching options available and will confirm the details of the systems to be used and the air emissions from them. If this information is not available in time for the permit to be issued we will provide this, either as a pre-operating condition or permit variation application if necessary.

Other release points
To meet animal welfare and hygiene requirements the building air from the low odour risk processing stages will be discharged direct to air via a series of roof mounted fans / short stacks to provide adequate dispersion. These fans have not been itemised in Table 3 above.

3.2 Emissions to Water

Point source emissions to surface waters will arise from the sources listed below in Table 5. Their locations are marked on the installation plan, Appendix A - Figure 2.

Table 5: Water emission points

Emission Point Ref. on Installation Plan	Source	Receiving Watercourse
W1	Effluent treatment plant - final treated effluent outlet	River Dee Nat Grid Ref SJ38918 46577
W2*	Installation surface water drainage	Land Drainage Ditch Nat Grid Ref SJ38815 46691
W3	Installation surface water drainage	Land Drainage Ditch Nat Grid Ref SJ38630 46540

* The package sewage treatment plant discharges into surface water drain W2 under permit number EPR/WB3990HT.

The proposed emission levels from these emission points are shown below in Table 6:

Table 6: Water discharge emissions

Emission Point	Determinand	Discharge Limit	Units	Expressed as
W1	Average daily volume	1,200	m^3/day	mean
	Maximum daily volume	1,500	m^3/day	maximum
	Biochemical oxygen demand (BOD)	20	mg/l	maximum
	Total suspended solids	30	mg/l	maximum
	Ammonia	5	mg/l	maximum
	Phosphate	2.5	mg/l	maximum
	pH range	6 to 9	N/A	maximum & minimum
	Temperature	30	°C	maximum
	Oil	None visible	None	Visual test
W2	Oil	None visible	None	Visual test
W3	Oil	None visible	None	Visual test

See details of the effluent treatment plant process in Section 5.10 and the effluent discharge modelling report in Appendix E3 which assesses the impact on the river.

3.3 Emissions to Land

There will be no point source releases to land from the installation.

3.4 Emissions to Sewer

There is no foul sewer serving the installation. Sewage from the offices and workplace will be treated in the on-site sewage treatment plant covered by environmental permit EPR/WB3990HT.

4 Management Systems

The installation and facilities are still under construction at the time of this permit application and most staff are not yet appointed. The company intends to install a suitable and appropriate environmental management system (EMS) in time for the commissioning of the installation. A summary of this can be provided as a pre-operational condition.

Our EMS will address the environmental aspects for our installation which are:

- Odour
- Water consumption
- Energy
- Effluent treatment
- Discharges to water
- Raw materials and resource efficiency
- Waste minimisation and waste hierarchy
- Noise
- Protection of the land / underlying aquifer
- Accidents and emergency preparedness

The initial EMS will meet the permit conditions, as outlined in “How to Comply with your Environmental Permit.” We are likely to aim to have it certified to ISO140001-2015 but have no timescales or costings for this yet.

Our EMS will include a policy and programme which:

- commits to continual improvement and prevention of pollution
- commits to comply with relevant legislation and other requirements that the Company subscribes (such as quality schemes)
- identifies, sets, monitors and reviews environmental objectives and key performance indicators independently of the permit.

Procedures will be documented to cover environmental, operational and health and safety requirements. All staff will undergo induction training prior to starting work and then will receive training relevant to their specific tasks. Staff are to be trained against the relevant procedures (by use of a training matrix) and the training records will be held in the employee’s files, available for audit (internally and by third party).

Once established, audits of the system will be carried out annually by a third party as well as a schedule of internal audits. Progress on meeting targets and objectives will be reviewed at management meetings and scheduled management reviews.

A documented preventative maintenance system will be in place, with key plant and equipment, alarms and key spares also documented. Issues will be discussed at the scheduled management review meetings. Contractors will also go through an induction prior to working on site to ensure the instructions and company policy relating to health and safety and environmental concerns are understood.

A management structure detailing key responsibilities under the environmental permit will be produced and reviewed. A copy of our permit will be displayed in a prominent position such as in reception or SH&E noticeboard.

A written procedure within the EMS will detail the investigation and reporting on of incidents or near misses, including complaints. This will include the corrective action and follow up procedures. Details of such investigations will be reviewed using the scheduled Management Review meetings.

An accident management plan will also be prepared, outlining the potential for accidents and contingency procedures in place to deal with or prevent such an accident. This is in addition to our qualitative Environmental Risk Assessment (see Appendix E1) that looks at hazards and risks at the installation. A system will also be in place for reporting and acting on adverse results from routine monitoring and testing or abnormal emissions or spillages. Section 10 of this application covers Accidents & Emergencies further.

The EMS will be reviewed annually and will evolve as the key staff are appointed and the systems and procedures are established. At the moment, the Company do not plan to undergo certification of the EMS to ISO14001-2015 but will keep this under review.

An odour management plan (OMP) has been prepared for the installation which includes key procedures for preventing and minimising odour and for investigating and reporting of incidents and complaints. See the OMP in Appendix E2.1.

The effluent treatment plant and odour abatement plant will be commissioned by the suppliers and they will prepare operational and monitoring procedures and maintenance tasks and schedules.

Similarly, the equipment suppliers for the slaughterhouse process stages will commission their plant and provide maintenance, training and operating instructions.

5 Operating Techniques and BAT Assessment

We have referred to the following Technical Guidance Notes to assess the operating techniques for the prescribed and associated activities.

'How to comply with your environmental permit'
Slaughterhouse & Animal By Products BREF
Food Drink & Milk BREF
Environment Agency Guidance EPR 6.11 Treating & Processing Poultry

We note that "How to comply with your environmental permit" was withdrawn on 1 Feb 2016 mid way through our application preparation. We have therefore also referred to the replacement guidance on developing a management system and controlling and monitor your emissions for an environmental permit.

This is the most recent and applicable guidance for our installation.

We note that the SA BREF is due for review in the next year or so and understand that the BAT conclusions in the SA BREF will apply to the installation within the defined period after its publication. In anticipation of this we have also referred to the Environment Agency's Slaughterhouses & Animal By-Products Industries Sector Performance Review, May 2010.

The process stages to be employed at the Maelor Foods installation are described in the following sections and compared against indicative BAT. The environmental aspects for poultry slaughterhouses and meat processors are assessed.

In the BAT summary tables for each section we have indicated the associated aspects using the following key:

Aspect
A = air
O = odour
W = water
E = energy
Eff = effluent
Ws = waste
R = resources

An overview of the primary process stages for the slaughterhouse is shown in Appendix C, Figure 2. The proposed layout of the slaughterhouse is shown in Appendix C, Figure 4. The layout of the meat processing process is shown in Appendix C Figure 5.

5.1 Delivery & Lairage

Live chickens from broiler production farms will arrive at the plant in modules on HGV trailers. The HGV trailers will enter the enclosed lairage via fast acting doors before moving to the intake area where the modules will be unloaded by fork lift truck.

Slaughterhouses using gas stunning such as ours do not have a traditional lairage. We will be using an automated module handling system in the intake area. Once the modules are unloaded from the HGVs they are loaded onto a live bird handling system, delivering modules directly into the gassing unit to kill the birds.

Our lairage / intake area will be fully enclosed and air will be drawn in to provide natural ventilation and expelled though a series of roof mounted vertical discharge fans which will disperse emissions vertically at high level. There will also be fans to blow air in and re-circulate it within the building and around the modules to provide enhanced cooling for the birds in warmer weather.

This type of lairage is likely to produce low level odours associated with faecal contamination and this is generally controlled by good housekeeping and scheduling of deliveries.

The live bird handling systems area will be cleaned every night and briefly in between kills but faecal contamination of the area is minimal.

The lairage will be cleaned daily with the manure manually scraped into collection bins and floors washed using trigger operated HPLV spray lances. The lairage floor has been designed to allow dry scraping and easy cleaning.

The level of faecal contamination produced during transportation, and hence the amount requiring cleaning in the lairage will be reduced by not feeding the birds or animals before shipping. Delays in processing the birds or animals can mean they are held in the lairage longer than normal and this will increase the amount of faeces. Our deliveries will be scheduled to ensure that birds are offloaded and processed as quickly as possible. Should the slaughter line be non-operational for some reason HGV's will be moved into the lairage building where space is available and deliveries of live birds pushed back until the plant is operational again.

Our odour impact assessment and odour management plan (Appendices E2 and E2.1) concluded that the lairage building will be a low odour risk area so we do not propose to feed the lairage building extraction systems into an abatement plant.

The Poultry Meat Hygiene Regulations require poultry processors to provide separate facilities for cleaning and disinfecting the crates, modules and vehicles in which birds are delivered.

To prevent odour accumulating, empty modules will be transferred to the washing area. Modules will be washed in automated washers and water recycled in the system.

"Grey water" from the treated effluent stream will be used in the crate wash and for washing the lairage floor as well. Cleaning water temperatures will be controlled and monitored to prevent energy wastage.

Washed modules will be transferred to the return service area where they will be loaded onto washed HGV trailers for return to farms for bird collection. Unloaded HGV trailers will be washed at the vehicle washing area before being reloaded with cleaned modules.

Table 7 below outlines the BAT measures for the lairage:

Table 7: Lairage BAT

	Indicative BAT	Maelor Foods	Aspect
Management	Time of last feed at farms should be optimised to minimise faeces produced during transit.	Yes	O
	Deliveries should be managed to minimise processing and wait time in lairage.	Yes	O
Lairage Design	Fully enclosed but ventilated - effective dispersion if ventilated via a point source, or	Yes N/A	O
	Covered and enclosed with natural ventilation	No	
	Easy clean design	Yes	O, W
	Drainage to effluent treatment	Yes	Eff
	Ingress of clean surface water and roof drainage should be prevented	Yes – fully enclosed	Eff
Cleaning	Minimise wash down and use dry clean methods where possible.	Yes	W, E, Eff
	Use grey water or rainwater harvesting for wash down of floors.	Yes – recycle from ETP	W
	Minimise temperature of cleaning water	Yes	E
	Use HPLV sprays for cleaning floors	Yes	W
	Prompt cleaning of empty poultry crates	Yes	O
	Effective cleaning schedule to include regular removal of manure	Yes, and will be reviewed and amended accordingly	O, W, E, Eff
Unloading of birds	Automated live bird handling systems at gas stun sites eliminates some of the issues associated with lairages.	Yes	O, W, Eff, E
Crate washing	Automated crate washers using re-circulated water.	Yes	W, Eff
	Use of grey water from effluent treatment plant.	Yes	W
Slurry / manure storage	Manure and slurry storage skips or tanks should be covered with regular emptying and removal from site, typically 2-3 times per week.	Yes	O

5.2 Stunning and Bleeding

The birds will be stunned using oxygen deficient gas stunning technique. Electric stunning is an alternative method but gas stunning using carbon dioxide / nitrogen or nitrogen / argon blends is now more favoured for animal welfare reasons.

Modules of birds will be placed by fork lift truck onto an automated feed conveyor system into the gassing chamber. This reduces handling of the birds as they are put in the modules at the farm and stay inside until dead. This is a very efficient, quick killing method as there is no handling of live birds. There is reduced stress on birds as they are not flapping around and handled and this is reported to improve product quality and so less product is rejected.

Dead birds will be removed from the modules as they emerge from the gassing chamber and hung-on to the shackles on an overhead conveyor line for transfer for de-heading and bleeding. There is no residual flapping of wings with gas killing so emissions of dust will be lower and less blood is likely to splash outside of the trough compared to electric stun lines.

There may still be some dust emissions from the bird hang area so we will install a local extraction system over this area, with extracted air being treated/filtered through a dust filtration system prior to discharge to air.

The birds will be throat cut and bled by gravity as they move around the conveying system. The blood will be drained into the bleed trough from where it will be pumped to the blood tank in the offal collection bay building.

The blood trough will be long enough to capture blood for the specified bleed time of around four minutes. The blood trough has a narrow steep sided design and requires less rinsing.

Only low intensity odour emissions are likely in this area because:

- there will only be a small number of birds in the stunning and hang-on areas at any one time
- there will be no significant changes to the state or composition of the chickens within this area
- fresh blood has a low odour

The building headspace air from the preliminary processing area will be extracted and dispersed through roof mounted, vertical discharge extraction fans.

The blood tank will be served by a screw feed to prevent the blood coagulating and it is then pumped to the blood tank.

The tank will be cleaned down at the end of each shift. The trough will have a double drain feeding to the blood tank during killing and will be diverted to the effluent system before the end of production rinse.

Valve interlocks and / or tight procedures will be in place to ensure blood is not discharged to the effluent system in error. Rinse water will be minimised by using restricted flow nozzles and by re-circulating some of the rinse water. Anti-coagulants may be added in the blood trough to minimise coagulation if necessary.

Table 8 below outlines the BAT measures for stunning and bleeding:

Table 8: Stun & Bleed BAT

	Indicative BAT	Maelor Foods	Aspect
Kill technique	Gassing method and Live bird handling systems Electric stun lines still common practice at older sites however	Gas stun & automatic module transfer	O, W, Eff
Building odour control	None specified – low odour risk area	Good housekeeping Roof mounted fans to extract building air and disperse vertically. Bird hang-on area will have extraction / filter system to filter dust prior to discharge to air.	O, A
Blood trough	Long enough to capture over required bleed period. Design to facilitate easy cleaning and minimisation of rinse water. Dry cleaning of coagulated blood using squeegee or vacuum systems with final rinse at end of shift Anti-coagulants added to trough to prevent coagulation. Rinse water minimised by restricted flow nozzles and recirculation of rinse. Double drain to divert to effluent for rinsing with tight controls to prevent accidental discharge of blood to effluent drain	Yes, bleed time 4 minutes Yes, steep sided. Yes - squeegees to be used and final rinse at shift end. If required Yes Yes, operating procedures will be in place	Eff, O O, W, Eff W W, Eff, O W, E, Eff Eff

5.3 Scalding

After bleeding the birds will be scalded by a saturated hot air system. The birds will be conveyed through the scalding unit to loosen their feathers to facilitate mechanical plucking in the de-feather area.

Traditional scalders use a mixture of water and air to scald the birds. The disadvantage of this system is the loss of energy through escaping odorous warm air cannot be avoided. Moreover, the heat exchange in this type of scalder is not optimal. Another disadvantage is the high maintenance requirement of the blowers.

We have therefore investigated the saturated hot air scalding technique, a non-immersion method which is relatively new and not used elsewhere in the UK sector we understand. It offers advantages over the traditional techniques in that the water and energy use are much less and odour emissions are lower.

Given these benefits, we have chosen to use an “AeroScalder” scalding system. See the Technical Details for this system in Appendix C, Figure 3 and watch a video of one in operation.

AeroScalder is entirely enclosed and consists of two chambers; an air conditioning chamber where the moisturised hot air is prepared and, next to it, the scalding chamber itself through which birds are conveyed and into which the scalding air is blown.

Moisturised hot air is blown forcefully onto the most critical parts of the broiler, preventing over scalding of fragile parts. It penetrates and separates the feather pack, transferring heat effectively to the feather follicle. Air temperature depends on whether products are to be hard, medium or soft scalded.

After having been blown over the birds, air is drawn back into the conditioning chamber and re-conditioned for re-circulation. Precise temperature control ensures a perfectly scalded product in all situations.

The benefits of the AeroScalder are:

- A perfect scald with no immersion
- Substantial savings in water and energy
- Virtually smell-free
- Much lower risk of cross-contamination with pathogens
- A visually much cleaner scalding process
- Quick start-up

Scald vapours are enclosed inside the unit but any escape of odorous air will be extracted directly into a chemical scrubber for abatement before discharge to air via a stack.

The scalding unit will be designed to accommodate the required bird size and throughput whilst minimising water use.

Dedicated water and energy meters will be fitted to enable consumption to be recorded and regularly monitored.

The spent scald water within the air scalder is filtered and recirculated in the system. Separated waste and overflow water may have a high organic content but the volume for discharge to effluent is low so it is unlikely that the effluent treatment system will be overloaded by these discharges. The effluent treatment plant will have holding and balancing tanks in any case which would handle any significant discharge loads.

All pipe-work is automatically flushed through after production has finished. The conditioning chamber is cleaned automatically through the integrated CIP system using a program with detergent and rinsing cycles.

Table 9 below outlines the BAT measures for scalding:

Table 9: Scalding BAT

	Indicative BAT	Maelor Foods	Aspect
Scald technique & tank design	Saturated air scalding uses less water and energy than immersion scalding.	Yes	W, E, O, Eff
	For immersion systems, Use conveyor system to drag the carcass through.	NA – we are using none immersion technique	W, E
	Use longer tank with counter current water filtration and recycling, to reduce the requirement for make-up water.		W, E, Eff, O
	Optimal volume to accommodate bird throughput and facilitate capture of drag out water.		W, E, O, Eff
	Fully enclosed and insulated to conserve heat and prevent build-up of misty odorous air in building	Aeroscalder is fully enclosed and made of insulated panels	E, O
Controls	Water level and temperature controls to be fitted and maintained.	Yes	W, E
	Sub meter to monitor and record energy and water consumption regularly	Yes	W, E
Cleaning	End of shift discharge of scald tank contents to effluent system in controlled manner to prevent shock COD loading of ETP	Low volume of discharge water prevents shock loading of ETP	O, Eff
Building odour control	Enclosed scald tanks.	Yes – Aeroscalder is an enclosed unit.	O
	Air extracted to odour abatement before discharge to air via a stack of sufficient height and efflux velocity to minimise ground level odour concentrations	Yes – chemical scrubber	
		Discharge stack > 3m above roof apex	O
		Cone on stack to give efflux velocity of 15m/sec	

5.4 De-feathering

After scalding the birds will be conveyed to the de-feather area where mechanical defeathering will be undertaken in defeathering machines.

Dry feather collection techniques are rarely used in the UK poultry slaughterhouse sector and wet feather flume systems are standard practice. We note the additional energy and compressed air required for dry systems which we wish to avoid.

Removed feathers will be rinsed from the machines with re-circulated water fed via nozzles and transported via a recirculating water flume into the offal storage building. The feathers will be pressed to remove excess water before collection in a vehicle trailer in an offal collection

bay. The feather trailer will be collected on daily basis for offsite processing so odours will be minimised here.

The feather flume water will be drained down at the end of each day in a controlled manner to prevent overloading the effluent treatment plant. The defeathering process will be sub metered to control and monitor water and energy consumption.

Wall or ceiling mounted fans will introduce cooling air into the building. The headspace air in the de-feather area will be odorous so it will be extracted directly to the chemical scrubber odour abatement system.

Table 10 below outlines the BAT measures for de-feathering:

Table 10: De-feathering BAT

	Indicative BAT	Maelor Foods	Aspect
Feather collection	Dry collection systems will minimise water consumption but require compressed air and vacuum.	Not widely used in UK so opted for standard industry practice.	W, E
	For wet feather flumes, water should be re-circulated within the flume and used to flush out the machines.	Yes	W, Eff
	Use nozzles instead of irrigation pipes	Yes	W, Eff
	Filter and re-circulate flume water and use recycled water to flush feathers from machines	Yes	W, Eff
	Sub meter flume to monitor and record water consumption.	Yes	W, Eff
Feather storage / disposal	Pressing of feathers to remove water.	Yes	O
	Transfer to rendering or another reprocessing route	Yes	O
	Feather trailer covered or stored inside and collected daily to minimise odour potential	Yes – inside and daily collection	O
Cleaning	End of shift discharge of flume water to effluent system in controlled manner to prevent shock COD loading of ETP	Yes – balance and diversion tanks on ETP plus operational procedures	O, Eff
Building odour control	Air extracted to odour abatement before discharge to air via a stack of sufficient height and efflux velocity to minimise ground level odour concentrations	Yes – chemical scrubber Discharge stack > 3m above roof apex Cone on stack to give efflux velocity of 15m/sec	O

5.5 Evisceration

After defeathering, the heads will be removed and transported via vacuum system to the offal collection bay building.

The birds will be automatically eviscerated to remove intestines and other internal organs (heart, lungs livers etc.) Edible offal will be separated, dry chilled and packed for retail markets. It will be transferred to a cold store awaiting distribution. The cold store building will be kept refrigerated to prevent decay, and will be largely “sealed” by means of a cold-store type door.

Inedible offal will be transferred by vacuum lines to the animal by-products trailer in the offal collection bay where it will be collected daily for offsite processing.

Carcasses will be rinsed during evisceration using round nozzle showers with the rinse flow rate optimised and water consumption monitored. We intend to fit a solenoid valve on the main ring to stop water flow when not in production and the bird washer will have an individual valve to ensure there is no wash when no bird.

Scraps of meat and tissue that spill onto floors will be collected into bins for transfer to ABPs trailer and any machinery causing spillage will be prioritised for repair.

Two stage meshes will be fitted on internal drains to prevent scraps being washed into the effluent system and increasing the organic loading of the effluent.

Odours from evisceration are less offensive than scalding and defeathering areas as the intestines are unbroken and the innards are still fresh. At most slaughterhouses, these buildings are usually vented direct to atmosphere via a stack of sufficient height and efflux velocity to minimise ground level odour concentrations.

Where this is insufficient to prevent offsite odour problems the extracted air needs to be abated in the odour abatement plant.

Our odour impact assessment and odour management plan (Appendices E2 and E2.1) show that the evisceration building air is a low odour risk area so we do not propose to feed this building’s air extraction system into the odour abatement plant. Building air extracted from this area will be discharged vertically to air by roof mounted fans.

Table 11 below outlines the BAT measures for evisceration:

Table 11: Evisceration BAT

	Indicative BAT	Maelor Foods	Aspect
Carcass Rinse	Warm water rinses operated on a non-continuous basis. Optimised flow efficient shower heads for rinsing during EV. Automatic rinse control depending on bird size to minimise water consumption. Spray nozzle wear incorporated into preventative maintenance system. Interlocks to automatically switch showers off when no birds are moving along line, e.g. during outages & breaks. Sub meter to monitor and record water consumption regularly.	Yes Yes Yes Will be on PM system Yes Yes	E, W, Eff E, W, Eff E, W, Eff E, W, Eff E, W, Eff E, W, Eff
Product maximisation	Utilise the maximum saleable product from the carcass by exploiting alternative markets and minimise amounts sent for rendering	We will segregate edible offal and other marketable parts of the carcass and minimise the amounts collected as ABPs	R, Ws
ABP storage / disposal	Vacuum lines direct into covered trailer or stored inside. ABPs collected daily.	Yes – vacuum lines, offal trailers inside building with daily collections	O O
Cleaning	Two stage meshes fitted on internal floor drains Dry collection of spilt scraps. Procedures to ensure use of meshes and dry cleaning methods	Yes Yes – transfer to ABPs store Yes	Eff W, Eff, O W, Eff, O
Odour control	Building air extracted through an abatement unit if required before final discharge via a stack of sufficient height and efflux velocity to minimise ground level odour concentrations.	Low odour risk area - building air to be discharged direct to air with no odour abatement	O

5.6 Chilling

There will be several chilling applications at the installation, serving the whole bird slaughter and meat cutting areas.

5.6.1 Whole bird chilling

Several chilling techniques are commonly used in chicken slaughterhouses:

- **Immersion chilling**:
  Carcasses are moved through a counter-flow current so they are constantly moving into cleaner water. This system may lead to a build-up of blood and carcass material.

- **Spray chillers**: Avoid problems of contamination build-up, but may give rise to spread of bacteria through aerosols. This method also uses high volumes of water.

- **Combi Air Chilling System**: This technique uses two phases with several short dips in cold water tanks, followed with air chilling. The reported bacteriological properties are excellent.

- **Air chillers**: Generally used for carcasses for fresh sale. Tests have shown that air chilling can reduce the contamination rate by up to three times more than immersion chilling. No water consumption.

Most UK chicken producers have switched to air chilling to reduce water consumption and improve bacteriological control.

At Maelor Foods we will be using air chilling for our whole bird chilling. See technical details for a typical air chiller in Appendix F3.

This method is chosen in many applications as it is very clean (and thus assures minimal risk of cross contamination) and uses no water. Air chilling can only be applied when processing fresh products. The process works by passing the birds through an air chilling tunnel. The tunnel can be designed to accommodate up to four layers of birds, thus saving space and energy.

Birds, hanging from the overhead conveyor in special chilling shackles, are conveyed through the tunnel. In this example design, special air coolers and fan outlets within the tunnel produce a top to bottom line flow of chilled air.

These air chilling systems are efficient with optimum airflow and evaporator design resulting in maximum chilling effect and reducing weight loss to a minimum. Refrigeration components such as evaporators and fans are all PLC controlled for easy and reliable operation.

Many sites in the sector have moved towards a central glycol unit or ammonia refrigerant system but these do not always have scope for heat recovery which we are interested in for meeting some of the extra hot water capacity we require. Ammonia and glycol systems do not fall under the F Gas and ODS Regulations but we note the hazardous properties of ammonia which would need to be managed safely.

CO_2 systems are not widely used in the sector and are much more expensive to install we note.

We will most likely select an ammonia based system but we will confirm the details during the permit determination phase.

The chiller we will install will have capacity for 13,500 birds per hour which equates to 1million birds per week. The chill time will be sufficient to reduce carcass temperature to <4°C and by products to < 4°C.

We may opt for an integrated by-products tunnel chilling or an independent one using less coolers, to chill up to 5,000kg of by-product per hour.

The chilling tunnel(s) will include controls to monitor a range of parameters such as pressure and temperature and will be linked to the PLC for external read out and analysis of data. All pipework will be insulated.

Sub metering of electricity is good practice on new refrigeration systems and this will be specified on our chiller so we can monitor energy consumption and optimise the system.

5.6.2 Cut meat chilling

We will use several smaller chiller units in the cutting plant which are served by air cooled condensers. There will be no heat recovery on the initial units we have installed as some were existing. We will consider heat recovery on any additional units we install as the plant throughput increases to its design capacity.

These chillers will all use R407F refrigerant, (also called Performax LT). This is a blend of HFC refrigerants designed to replace R22, R404A and R507 in low temperature refrigeration applications. Major compressor manufacturers have endorsed its use in their equipment.

R407F comprises of HFC-32, HFC-125 and HFC-134a. It is non-toxic and non-flammable meeting the highest A1/A1 classification. It has a zero ozone depletion potential so does not fall under the Ozone Depleting Substances Regulations.

HFCs have a high Global Warming Potential (GWP) however and they must be used with care. The GWP for R407F is 1824. The constituents of R407F are specified in the Fluorinated Greenhouse Gases Regulations 2015 (SI 2015/310).

Companies that operate or service and maintain equipment containing F gas must meet the requirements of the Regs. These include leak checks on equipment, record keeping, labelling, recovery of F Gases and use of appropriately qualified maintenance personnel.

We will prepare a refrigeration management plan and will use specialist external contractors to perform planned inspection and maintenance work on all our refrigeration systems. Records will be kept of such works along with inventories and labelling of equipment. Maintenance intervals will be as required by the F Gas Regs for our inventories.

Our cold stores temperatures will be monitored and displayed on our HACCP systems which will report any deviations which may indicate doors being open. We also have CCTV cameras to monitor the stores and display in the control room so if cold store doors are not closed this will be noticed and quickly addressed.

5.6.3 Offal Cold Store

Offal material which is fit for human consumption will be transferred to chillers and cold storage areas where it will be stored before transport off-site. The cold storage buildings will be kept refrigerated to prevent decay, and will be largely "sealed" by means of a cold-store type door. This is a low odour risk area.

Table 12 below outlines the BAT measures for chilling:

Table 12: Chilling BAT

	Indicative BAT	Maelor Foods	Aspect
Management	Refrigeration management plan, preventative maintenance programme for refrigeration to include mandatory leak tests and record keeping as required by F Gas & ODS Regs.	Yes – contracts to be set up with refrigeration engineers and records kept accordingly. F Gas Regs apply ODS Regs do not apply.	E, A
	Sub metering of electricity and water use for refrigeration to monitor consumption per bird.	Yes – no water consumption for air chiller.	E, W
	PLC control of refrigeration units to monitor temperatures / load	Yes	E
	Fast closing doors/alarms on chilled storage areas	HACCP monitoring systems	E
	Procedures and controls to close doors to chill rooms and report faulty doors or sensors	Yes – CCTV to warn of doors open. Operational procedures / signage	E
Heat Recovery & Efficiency	Heat recovery for water heating applications.	Options being considered for main chiller / hot water supply.	E
	Energy efficient technology.	Yes	E
	Reduce loadings during cooler weather and consider utilising cool ambient air.	Yes No ambient air use.	E
	Optimise chill temperatures to the maximum temperature to minimise loading whilst retaining sufficient chilling of product.	Yes – by design and PLC control	E
Chill techniques	Air chillers use less water than spray or immersion chillers and should be used where carcasses are for sale fresh and where compliance with statutory carcass chill criteria is achievable by this technique.	Yes	W
	For immersion / spin chillers the volume of water supplied should be controlled, so that the required amount is maintained and not exceeded.	NA	W

5.7 Cutting and Packing

Packing criteria is driven by the customer and consumer requirements and expectations. We understand our obligations under the Packaging Regulations and will work with our customers and packaging suppliers to identify packaging which meets their needs while minimising materials and maximising recycling. For example, full birds are usually tray and polythene wrapped but some customers now accept wrapped birds without a tray.

Maelor Foods do not plan to add flavouring rubs or undertake cooking of whole birds at the moment but may introduce this in future depending on market demands.

The portioning lines undertake a range of further cutting and trimming and these operations will be performed by a combination of automated and manual methods.

The main issues are water consumption for cleaning and energy use of machinery. The same controls will be used as described earlier - interlocks to shut off machinery and showers when the line stops, dry cleaning of meat scraps and 2 stage meshes on internal drains.

We will use vacuum packing with a gas flush to extend shelf life. Packing units will be insulated to conserve heat and will also have interlocks to switch them off when no product is passing through.

Table 13 below outlines the BAT measures for cutting and packing:

Table 13: Cutting & Packing BAT

	Indicative BAT	Maelor Foods	Aspect
Management	Sub meter, record and monitor water and energy consumption on portioning lines.	Yes	W, E
	Use interlocks / sensors to automatically switch off machinery or rinse water when process line is stopped.	Yes	W, E
	Solenoids should be maintained in working order via preventative maintenance system	Yes	W, E
Cleaning	Use dolavs, dry cleaning of floors to collect meat scraps.	Yes	W
	Repair machines causing spillages quickly.	Yes	R, Ws,
	2 stage meshes on drains.	Yes	Eff
Packing	Recycle clean cardboard, plastic and metal packing waste.	Yes	W
	Minimise packaging and consider thinner, lighter materials.	Yes, segregated, re-used or recycled. We will work with our customers and packaging suppliers on this.	E, R, Ws

5.8 Cleaning

To comply with the Meat Hygiene Regulations, all process floor areas, equipment, containers etc. will be washed down and sanitised at least once a day and in accordance with our “clean as you go” policy. The floor and equipment surface area will affect water, energy and chemical consumption associated with cleaning and the plant layout and surfaces have been designed to facilitate easy cleaning.

The cleaning will be undertaken by in-house staff who will manage the purchase of chemicals. Information on our expected chemical consumption is shown in Appendix D, Figure 1. The product information and SDS’s for the typical chemicals we will use is provided in Appendix D, Figures 2, 3, 4 and 5.

Water for cleaning will circulate via a ring main and chemicals will be supplied by a mobile foaming and sanitation units. Chemical dosage will be automated to minimise chemical additions to cleaning water and this will be monitored and consumption reviewed on a regular basis.

Trigger operated high pressure low volume (HPLV) lance sprays will be used.

Sub metering of the cleaning systems, module wash and vehicle wash consumption will be installed to allow for closer monitoring and control of consumption.

The appropriate water temperature will be used for each cleaning application to ensure hot water is not wasted unnecessarily.

Operating procedures will specify that dry cleaning techniques should be used to shovel, scrape or vacuum spilt meat scraps into bins during production. Spillages should not be washed into drains. Operatives will be trained on these measures and supervisors will make routine checks to ensure the procedures are followed.

Operatives will be trained to report any faulty plant causing spillages onto floors. Containers will be used to collect material until a repair is made.

Internal drains will have 2 stage mesh (a coarse and a fine mesh cover) plus catch traps to prevent solids entering the effluent system and adding extra organic loading to the effluent.

Treated effluent will be used for cleaning non-production areas such as lairage and vehicles.

The module / crate washer will re-circulate water within the washer and will also be supplied with treated effluent. Low intensity odour emissions may arise from handling of the empty modules so building air in this area will be extracted directly by roof mounted extraction fans for high level dispersion.

Personal hygiene stations will have timers or sensors to switch off taps and boot washers after use and water temperatures will be set to the minimum required.

Table 14 below outlines the BAT measures for cleaning:

Table 14: Cleaning BAT

	Indicative BAT	Maelor Foods	Aspect
Management	Procedures and training of operatives to ensure: Meat wastes and blood are kept out of drains Floor-drain meshes are not bypassed during cleaning trays collect waste to prevent it falling on floor Machinery causing spillage repaired quickly Catch pots and meshes are cleaned into waste bins and replaced afterwards Dry pre-clean of process areas before wet cleaning, e.g. scraping, shovelling and vacuuming	Operating procedures, training, auditing and monitoring will address these points. Yes Yes Yes Yes, but not vacuuming	Eff, W, Ws,
Wet cleaning methods	Two stage meshes on internal drains. Fit spray nozzles to hoses and optimise water pressure. Use HPLV sprays for non-production areas and post production cleaning. Review and minimise water temperatures. Monitor consumption rates with sub metering where practicable.	Yes Yes Yes No cold initial rinse. Cleaning temperatures to be set at commissioning & reviewed. Sub metering to be added and consumption monitored.	Eff W, E W, E E W, E W, E
Chemicals	Use automated chemical dosing to minimise consumption, optimise concentrations, record and monitor consumption and audit cleaning contractors. Review whether better chemicals are available with less environmental impact.	Yes – consumption will be recorded, optimised, monitored and reviewed. The EMS will include a procedure to review raw materials at a set frequency.	R R, W
Lairage & vehicle washing	Use HPLV hoses. Use treated effluent water if the risk of cross contamination is acceptable or consider rain water harvesting	Trigger operated HPLV lances Recycled water from ETP to be used	W, E W, E

	Indicative BAT	Maelor Foods	Aspect
Hygiene stations	Timers or sensors to switch off taps and boot washers after use. Water temperature should be minimised	Yes Will be set at commissioning and reviewed.	W, E E
Crate washing	Automated crate washers using re-circulated water. Water supplied with grey water from effluent treatment plant	Yes Treated effluent water will be used	W

5.9 Animal By-Products and Blood Storage and Handling

Non-useable innards and other ABPs will be transferred by vacuum lines into a trailer(s) located inside the offal storage building. Feathers will be transferred in a water flume to the offal bay building where they will be separated from the flume water and pressed. The pressed feathers will be loaded into bulk trailers inside the building awaiting collection for further processing off-site.

The offal bay waste removal building will be fully enclosed and will have fast closing automated doors to allow vehicle access and doors will be kept closed at all other times. The building is a medium odour risk area according to our odour impact assessment and odour management plan (Appendices E2 and E2.1) so the building headspace air will be extracted directly to the chemical scrubber for odour abatement.

The ABPs and feather trailers will be collected every day to minimise degradation and odours. Dolavs and other small containers used for collecting ABPs around the process will be emptied into the ABPs trailer and then washed out.

The building where the ABP waste trailers are stored will be large enough to accommodate the collection vehicle. The trailers will be sheeted up inside before being driven out.

The blood tank will be located inside the offal storage building which has internal drains to the effluent treatment plant.

Poultry blood is not sold on for further processing into foodstuffs for human consumption or pharmaceutical applications so the blood tank will not be refrigerated.

The blood tank will be sealed and fitted with a high level interlocked alarm to prevent overfill. It will have capacity to hold at least 110% of the maximum kill capacity of blood to cover contingencies such as transport delays. Our EMS accident management plan will address blood spillages.

The blood tank will be fully emptied at least daily and regularly cleaned to prevent build-up of odorous residues. The blood tank will have facilities for internal cleaning and a bottom drain valve to enable the tank to be fully emptied and cleaned out, preventing odorous residues building up.

The blood tank is a high odour risk area so the tank vent will be connected directly to extraction ducting and fed into the chemical scrubbing odour treatment system.

Displaced air from road tankers collecting blood will be fed back into the blood tank by back venting the tanker exhaust.

Table 15 below outlines the BAT measures for ABPs storage and handling:

Table 15: ABPs storage & handling

	Indicative BAT	Maelor Foods	Aspect
ABP storage / disposal	Store in covered skips or trailer and inside if no cross-contamination issues.	Inside offal / ABPs building with air extracted to odour abatement unit.	O
	Collect daily to minimise odour potential	Daily collection of ABPs and blood.	O
	Design waste storage buildings to accommodate the collection vehicle and fit automated doors and keep closed	Trailers will be in dedicated bays – lorry cab inside, fast close doors	O
	Wash down floors in storage area regularly.	Yes, as per our cleaning procedures – internal drains.	O, Eff
	Odour neutralisers may provide an additional degree of odour control but are not a primary measure	No plans to use odour neutralisers.	O
Blood Storage	Bunded tanks.	No, tank is inside building, internal drains to ETP, spill procedures / divert tank	Eff
	Interlocked high level alarms.	Yes	Eff
	Procedures for offloading to road tanker.	Yes – tanker exhausts back vented to blood tank	Eff, O
	Tanks internals should be cleansed after each emptying and CIP points should be fitted.	Yes, with bottom drain to fully empty tank	O, W
	Tank capacity should be greater than maximum kill within blood collection contingency.	Yes	O, Eff
	Accident management plans should address blood spillages.	Yes, to be included in the AMP.	Eff
	Further odour control measures and abatement.	Yes – building air and tank vent abated in chemical scrubber	O
Animal By-Products segregation	Utilise the maximum saleable product from the carcass by exploiting alternative markets and minimise amounts sent for rendering.	Edible offal (heart, lungs livers etc.) feet will be separated, for retail markets.	R
	Segregate ABP's into categories 2 and 3.	Cat 3 ABP's mostly, Cat 2 for dead on arrivals	R

5.10 Wastewater Emissions and Effluent Treatment

It is best practice, even where a foul sewer is available, to treat effluent on-site. Where surface waters are suitable to receive the treated effluent, this saves on trade effluent fees.

On-site effluent treatment offers opportunities to recycle treated water for some cleaning and non-process area activities such as vehicle and module washing.

At the Maelor Foods installation there is no foul sewer available. Effluent will be treated in our on-site effluent treatment plant. The River Dee is close by and of suitable size to discharge treated effluent into if the water quality standards and impact on the river are deemed acceptable. See our environmental impact assessment for the water discharge in Section 13.3 and Appendix E3.

The effluent treatment plant design is based on a flow when processing 1million birds per week, the capacity covered by this permit application. The plant would be able to be upgraded to treat the flow when processing 2 million birds per week by the installation of some additional pumps, an additional standby blower, a membrane system and an additional sludge tank, along with the option of thickening the waste activated sludge with a drum thickener. Should this be required in future we will apply to vary our permit accordingly.

Our effluent treatment plant will comprise of several treatment stages which are summarised below. Full details of the ETP design and layout are included in Appendix F1.

5.10.1 Effluent reception and balance tanks

All domestic effluent will be segregated from the trade effluent. The factory trade effluent will flow by gravity to the rear of the site where the effluent treatment plant is to be installed. Raw materials and product will be kept out of the wastewater system wherever possible by use of dry clean-up, installation of drain catch pots and screens. The drainage systems will have grease traps and gratings to prevent sewer blockage and these will be included on a schedule of regular inspections to ensure they are emptied and maintained.

Raw effluent will drain to a raw effluent pump sump and will be pumped to the balance tank. Energy efficient duty and standby pumps with inverters will be fitted, with good solids handling characteristics. An ultra-sonic level sensor will be installed to monitor the level in the sump and used to automatically control the operation of the above pumps.

The balance tank will have a maximum capacity of 1,500m^3. If operated on average at 50% volume, the retention time at peak flow will be 12 hours and at average flow 19.2 hours (this is at 1 million birds/week operation). This will allow waste streams of high and low organic loading to be combined and will help to reduce consumption of reagents by making the flow rate less variable. This also means that the plant will only need to handle the average flow and not the peak flow, such as the discharge of feather flume contents. The balance tank will provide contingency to complete the slaughtering shift if the subsequent effluent treatment plant stages develop operational problems or mechanical failures.

Contingency measures will be included in our EMS, operating procedures, spillage procedures and our accident management plan, to prevent accidental discharges from overloading or damaging the treatment plant. We will be able to divert potentially damaging wastewater such as large blood spillages to a diversion tank with the same capacity as the balance tank.

There is little variation the effluent and the slaughterhouse process so we do not plan to monitor the influent to the ETP. Should the diversion tank be used the contents will be gradually re-introduced into the balance tank, or removed for off-site treatment.

Interlocked level controls will prevent these tanks being overfilled and we will have duty and standby pumps with alarms to warn of failure. Low level alarms will shut off pumps to avoid excessive solids being pumped into the treatment plant and overloading the system.

The balance and diversion tanks will be agitated by 2 venturi mixers to mix and aerate the contents to maintain aerobic conditions and prevent them from going septic and becoming odorous.

The balance and diversion tanks are existing tanks from the former First Milk effluent treatment plant installation. The tanks have been inspected and will be re-lined for re-use. As these tanks are open topped we have assessed the likelihood of odours from them contributing to offsite odours. Our odour impact assessment and odour management plan (Appendices E2 and E2.1) suggest that the effluent treatment plant may be the predominant odour source at the installation. Nonetheless, the estimated offsite odour concentrations for the installation are still found to be negligible.

Based on these assessments we do not propose to retrofit covers over these tanks. Assuming this is possible from an engineering viewpoint, this would be very expensive. The divert tank will only be used in abnormal occasional circumstances and will be cleaned out after use

Drainage from the ETP hardstanding areas will collect in a sump and will be pumped back into the balance tank so any spillages will be treated in the plant. The hardstanding area will be sloped and kerbed to retain drainage within the ETP and prevent any run off to land.

The balance and reception tanks will be included on our preventative maintenance programme with regular checks of their structural integrity.

5.10.2 Primary Treatment - Screening

Primary effluent treatment usually consists of initial screening (drainage traps) at the point of collection to remove gross solids before proceeding to primary treatment, consisting of screening for the removal of further solids and fat separation. Mechanical screens vary from aqua rakes to drum screens.

Our ETP will use an enclosed rotary drum screen on top of the balance tank to screen the effluent prior to treatment. The primary screenings will fall into a skip and full skips will either be covered to minimise odour and keep rainwater out or else be stored inside.

Primary screenings have not undergone any biological or other treatment so must be disposed of in accordance with the ABP Regs. The screenings will be transferred into the ABP's trailer in the offal bays.

5.10.3 Primary Treatment - DAF

After screening, Dissolved Air Floatation (DAF) treatment is the next treatment stage. DAF uses very fine air bubbles to remove suspended solids. The suspended solids stick to the bubbles and float to the top of the liquid where the foam is skimmed off. Other flotation methods include dispersion flotation, which involves the injection of "dispersion water"

produced with compressed air, or mechanical flotation, where the water is agitated to produce air bubbles. These tend to be used when there are no further secondary treatment stages.

To maximise the level of COD removal across the DAF plant ferric chloride will be used to coagulate the solids. The pH of the coagulated effluent will be monitored and sodium hydroxide added to correct the pH to the desired value. Both reagents will be injected into a flocculator to ensure the efficient mixing of these chemicals. The flocculated solids will quickly rise to form a floating sludge in the clarifier. Scrapers will draw this sludge into a sludge compartment from where it would be pumped into a 200 m^3 DAF sludge storage vessel.

The size of the DAF is such that it has a large flotation area which requires less chemical use. We do not intend to automate chemical dosage as the influent is a consistent stream from the balance tanks.

Ferric chloride and sodium hydroxide will be stored in 25m^3 double skinned bulk chemical storage vessels with ultra-sonic level sensors to monitor the level in the tanks and provide a re-order level alarm. Duty / standby dosing pumps will be provided for each duty.

A small phosphoric acid dosing system will be used to supplement the phosphorus levels in the DAF effluent after coagulant dosing to control phosphate levels.

There will also be provision to add antifoam into the aeration tank if foaming occurs.

The smell of DAF plants is quite offensive. Ours will be fitted with a stainless-steel cover with removable inspection hatches and vent connections to direct odorous gases to a passive carbon filter for odour removal.

5.10.4 Secondary Treatment

The most common secondary treatment is biological treatment in an activated sludge plant.

Aerobic digestion is the most common and is an effective technique for slaughterhouse waste water treatment. It removes principal inorganic nutrients such as nitrogen, phosphorus and sulphur as well as minor nutrients such as copper and zinc.

The aerobic digestion process uses an activated sludge mass of micro-organisms, capable of stabilising a waste aerobically in an aerated tank. During endogenous respiration, bacterial cells react with oxygen to produce CO_2, water, NO_x and heat. Nitrifying bacteria convert ammoniacol nitrogen into nitrate and de-nitrifying bacteria covert nitrate into nitrogen gas.

The addition of oxygen to the system is essential for the oxidation of the organic matter and nutrients and for maintaining good physical mixing and air is fed into the tank or channel. The organic matter acts as the essential carbon source for the micro-organisms, but they also require inorganic nutrients for their growth.

After a period of time a mixture of old and new cells, from the aerobic digester, is passed to a settling tank. Here the cells are separated from the treated waste water. The degree of settling / separation is crucial to the overall success of the treatment. This relies on the good design and operation of the system and prevention of “bulking”. Bulking is controlled by preventing excessive growth of the filamentous bacteria which would create bulky, loosely packed flocs which do not settle well and which lead to excessive BOD in the treated water. Nitrogen and phosphorus present in slaughterhouse waste water helps to inhibit the growth of filamentous bacteria.

Activated sludge treatment is sensitive to cold weather when the bacteria tend to hibernate and become less active and also to shock high organic loads such as large spillages of blood. If the bacterial mass is lost the plant will need to be re-seeded with sludge from another plant and this can take around a week to get the plant performing back to normal. Contingencies will be made in our emergency response plan to deal with these scenarios when treated effluent will be unsuitable to discharge to river.

The odour from activated sludge tanks is much less offensive than DAF plants and odour complaints are not usually attributable to them unless the system has been overloaded and affected the treatment.

Our activated sludge plant will consist of:

Anoxic Tank

The DAF clarified effluent will be pumped into an anoxic vessel along with the returned sludge from the final clarifier. The effluent and sludge will enter tangentially at the bottom of the vessel and will gently mix before overflowing by gravity into the aeration tank. The anoxic zone will be installed for denitrification and sludge conditioning purposes to help prevent filamentous bacteria growth. The anoxic tank will have a mixer installed to maximise contact time and prevent streaming and will have a caustic dosing facility to trim the pH prior to the aeration tank.

Aeration Tank

Conditioned mixed liquor will pass from the anoxic tank to the main aeration tank. Fine bubble air diffusion manifolds will be installed on the base of the vessel. This manifold will be fed by two blowers, configured to operate on a duty, standby basis. The blowers are high energy consumers so we will use high diffuser density specification which is the lowest energy use compared to alternative diffusers. The blowers will also be inverter driven, the speed controlled by a DO (Dissolved Oxygen) probe to maximise energy efficiency.

A turbidity meter would also be provided to monitor the MLSS in the aeration vessel.

Pre-mixed anti foam will be dosed into the aeration tank if foaming occurs in the aeration tank.

The blowers are noisy so they will be housed in an acoustic enclosure, sited between the large tanks to provide shielding of noise. The ETP is also downhill beyond the factory buildings, well away from the Pickhill Lane residencies.

Final Clarifier

A final settling clarifier tank will receive mixed liquor from the aeration tank. The clarifier vessel will have a sloped base feeding a central hopper. The clarifier will be provided with a half bridge scraper to direct settled solids to the outlet point. The clarifier will be fitted with scum boards and a scum removal system. A sludge transfer tank will be provided to receive the settled sludge and floating scum. Centrifugal type pumps will draw the sludge from this vessel and deliver it either to the anoxic tank or to the balance tank when sludge has to be wasted. An automatic valve on a timer will be used to control the rate of sludge wasting.

It is proposed to return the surplus biological sludge to the balance tank. This will create some biological activity to reduce the COD of the raw effluent. Also, when the effluent is passed through the DAF plant, all waste sludge would be thickened to 6% dry solids.

A rotary disc ultrafilter will take out any residual solids in the final effluent to guarantee that the quality meets the BOD and suspended solids limits for discharge to river and the standard for recycling.

5.10.5 Tertiary Treatment

The plant has been designed to meet the treated effluent quality that has been modelled in our environmental impact assessment for the discharge to river, in Appendix E3. The treated effluent quality is shown in Table 16 below:

Table 16: Treated effluent quality

Parameter	Maximum
BOD	20mg/l
pH range	6 - 9
Suspended solids	30mg/l
Ammonia	5mg/l

Recycle Water Holding Tank

Around 40% of the treated effluent will be diverted back to the factory for re use in “grey water” applications such as lairage cleaning, feather flume make-up water and crate and vehicle washing.

The rotary disc ultrafilter will be located on staging adjacent to the holding tank such that the outlet flows by gravity to the recycle holding tank. A sodium hypochlorite dosing unit will be installed in the outlet from the ultrafilter, controlled by a free chlorine probe. This will be used to sterilise any water that is to be returned to the factory.

If the demand for recycled water drops or is insufficient to handle the volumes available a high-level sensor in the recycle tank will activate an auto valve on the discharge pipe of the ultrafilter to divert the filtered effluent to river (unchlorinated).

There will also be a higher, high level overflow on the recycle tank which will discharge to river.

5.10.6 Tertiary Treatment

Further polishing techniques are required to reduce suspended solids further to meet tighter environmental quality standards. Ultra-fine membrane filtration is now used quite widely in the food and drink sector and affords water recycling for many applications. Additional UV sterilisation is needed for re-use in food processing areas however and this is not widely used in the food and drink sector so far.

The typical quality of treated effluent using membrane filtration is shown in the Table 17 below:

Table 17: Treated effluent quality with membrane filtration

Parameter	Maximum
BOD	10mg/l
pH range	6 - 9
Suspended solids	15mg/l
Ammonia	5mg/l
Temperature	25 - 30ºC

Other tertiary techniques include reverse osmosis, reed beds and sand filters.

Membrane filtration uses additional energy and transfers heat to the effluent. This can create problems in summer if the receiving waters are sensitive to elevated temperatures. We note that the River Dee is a salmonid river and is sensitive to temperature. It may be necessary to cool the treated effluent before discharge in these cases which consumes further energy.

In addition to these concerns, we can achieve a very high quality treated effluent without tertiary treatment and our modelling shows that this will not be detrimental to the River Dee water quality. We also have limitations on our applications for using more recycled water. We therefore do not propose to install tertiary treatment now but have designed the plant so that we have scope to add this in future if necessary.

5.10.7 Sludge Treatment

The on-site effluent treatment techniques will influence the amount of sludge produced and plants using secondary and tertiary stages will separate most solids. As described in section 5.8 above, dry cleaning techniques and two stage drain meshes will minimise sludge by keeping solids out of the effluent stream.

Where desired, sludge is usually dewatered in a centrifuge or filter press and this reduces the volumes requiring transfer offsite. Energy is required to remove water by centrifugation or pressing however.

We do not plan to dewater the sludge initially but if the slaughterhouse increases throughput to 2 million birds/week a drum thickener would be added to thicken the waste activated sludge due to the increase in sludge volumes.

Our ETP will include a sludge holding tank to store the combined DAF and waste activated sludge prior to transfer offsite for land spreading or injection. The tank will be covered and a mixer will keep the sludge mixed. The off gas from the tank headspace will be vented through a passive activated carbon filter. Displaced air from the road tanker during sludge transfers will be fed into a portable passive carbon filter to abate odours.

The tank will have high level alarms and our EMS will include procedures for offloading to road tanker.

Given the odour controls and procedures we will have in place, as well as the relatively isolated location, our odour impact assessment and odour management plan, (Appendices E2 and E2.1), conclude that there is a medium odour risk from the sludge storage and transfer operations.

5.10.8 Indicative BAT for Effluent Treatment

Table 18 below outlines the BAT measures:

Table 18: Effluent treatment BAT

	Indicative BAT	Maelor Foods	Aspect
Management & maintenance	Competent and trained personnel responsible for the day to day checks.	Yes – after commissioning the suppliers will issue operating procedures and train our key staff.	Eff, O, W, R
	Plant performance should be monitored and recorded and routine reviews made to ensure optimum performance.	Operating procedures to include monitoring, reporting and review of data.	Eff, O, W, E, R
	Plant included in the preventative maintenance system.	Yes.	Eff, O, W, E, R
	Alarms should be linked to the process PLC and be visible / audible in a manned location so they can be addressed promptly.	Yes – ETP screen will be viewable from process plant along with alarms.	Eff
	Procedures should include contingency measures in case of treatment plant operational or mechanical failures. Accident management procedures to address dealing with spillages to prevent the overloading or damage to the treatment plant.	The Emergency response plan will address responding to spillages and actions to take in response to alarms, abnormal process deviations, spillages and breakdowns, including contingencies.	Eff, O, W, R
Primary treatment	Primary screenings should be dewatered and stored in covered skips or in a covered area to keep out rainwater and minimise odour potential. Primary screenings should be disposed of in accordance with the ABP Regs.	Screenings will be collected in skips and transferred to the ABPs building for collection with ABPs.	Ws, O

	Indicative BAT	Maelor Foods	Aspect
Reception and balance tanks	Flow balancing tanks with a hydraulic retention time of 6 – 12 hours.	RT will be 12 hours at peak flow and 19.2 hours at average flow.	Eff
	A separate diversion tank should be available for storing potentially damaging wastewater, e.g. blood spillages, typically with a capacity of 2 – 3 hours at peak flow rate.	Diversion tank is same size as balance tank.	Eff
	Monitor wastewater upstream of the treatment plant to allow automatic diversion to this tank.	Consistent influent, pH unlikely to vary much.	Eff
		Procedures to alert of abnormal discharges to trade effluent drains.	Eff
	New balance or reception tanks should be covered or fitted with a lid to minimise odour.	No, existing unlidded tanks – odour impact assessment shows negligible offsite impact.	O
	Tank internals should be cleaned at regular intervals to prevent the build-up of solids and fat.	Yes – will be part of maintenance / housekeeping procedures	O
	Interlocked level controls should be fitted to prevent the tank being overfilled.	Yes	O, W
	Duty and standby pumps should be in place and interlocked with alarms to warn of failure.	Yes	Eff
	The tank should be agitated to prevent settlement of solids.	Yes	Eff, O
	Low level alarms should shut off pumps to avoid excessive solids being pumped into the treatment plant.	Yes	Eff
	Above ground tanks should be bunded.	Yes for chemical tanks. Costs to retrofit bunding around existing tanks is prohibitive. Tanks inspected and relined. ETP area will drain into sump for processing in the ETP with slopes and kerbing to prevent run off.	W
DAF plant	Locate DAF units inside to contain odours.	No – a removable cover will be fitted with ventilation to a passive carbon filter	O

	Indicative BAT	Maelor Foods	Aspect
Secondary treatment	Aerobic activated sludge treatment widely used for wastewater from the sector.	Yes – ASP to be used	Eff
	Procedures should include contingency measures in case of bacterial failures requiring re-seeding of plant.	Emergency response plan to include measures to tanker effluent away and reseed ETP.	Eff
	Treated effluent quality may be sufficient for low grade uses.	Yes – circa 40% will be recycled as grey water.	W
	Careful management of: • bulking sludge development • the carrying of excessive biomass inventories • biologically stable foam formation • the inhibition of microbial activity by biocidal substances from cleaning/sterilising agents	Anoxic zone sludge conditioning to prevent filamentous bacteria growth. Rotary disc filter after clarifier tank to achieve solids standard. Anti-foam to be dosed if required. Cleaning chemicals meet EU biodgrability legislation.	Eff Eff Eff
	Ensure the installation clean surface water drains are not routed to the treatment plant	Surface water segregated & drains to discharge points W2 and W3	
Tertiary treatment	Suspended solids and BOD can be reduced further to meet tight environmental standards using membrane filtration, sand filters or reed beds. High quality water achieved can be used for many cleaning practices. Water produced using membrane filtration / reverse osmosis is warm and can be used as boiler feed make up water to give energy savings. However, some cooling may be required if discharging direct to sensitive surface waters during warmer weather periods. Potential to sterilise and use in process areas.	Not proposed initially – treated effluent will meet standards to discharge to river and for re-use as grey water without tertiary step. Temperature of discharge and energy consumption unfavourable. Scope to add this with sterilisation if throughput is increased to 2 million birds/week.	E, Eff, W

	Indicative BAT	Maelor Foods	Aspect
Sludge treatment and storage	De-water sludge to reduce volumes for further treatment and save on disposal costs.	Not initially but may add as production increases.	R, Ws
	De-watered sludge should be stored in covered skips to minimise odour and keep rainwater out or else a covered storage area should be used.	Not de-watered.	O
	Non de-watered sludge storage tanks should have lids fitted.	Yes	O
	Tank vents and air displaced when offloading into road tanker should be abated.	Yes – into passive carbon filters	O
	The internal tank should be cleansed regularly, new tanks should have a CIP port fitted and CIP lances should be retro fitted to older tanks.	Mixer in tank to prevent solids build-up. Odours from ETP area unlikely to contribute to offsite odour.	O
	Tanks should have high level alarms and procedures should cover offloading into road tanker.	Yes	O

5.11 Raw Materials

Our primary raw materials are live birds and we will process up to 1 million per week (52million per year).

The other raw materials to be used are discussed below.

All raw materials will be stored in accordance with any specific legislative criteria and in a manner to prevent and minimise the potential for spillages of polluting materials escaping into the environment. Our EMS will address receipt and storage and handling of raw materials.

Our site inventories will be way below the relevant thresholds set in the COMAH Regulations for the materials we will hold on site.

5.11.1 Packaging

Packing will be undertaken in the portioning plant and packaging criteria tends to set by the customer. This is influenced by desired shelf life, quality and aesthetics. We will work with our customers and suppliers to minimise the amount of packaging we use and specify recyclable materials wherever possible.

We do not have data on the annual amounts of packaging we will use yet.

5.11.2 Boiler Fuel

Oil will be used as fuel for the existing boilers as there is currently no serviceable natural gas supply to site. There is a gas main passing through the site so could be used for the additional hot water heating systems we are considering.

Low sulphur fuel oil (<0.1% S) will be used to comply with the Sulphur Content of Liquid Fuels (England and Wales) Regulations. A typical specification is shown in Appendix D, Figure 11.

The existing fuel storage tank alongside the boiler house is to be retained and the external bund will be replaced to comply with the Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations SI 2016/359.

We have no data available on the annual fuel consumption but will keep track of this to monitor consumption performance as part of our EMS.

There will be no fuel / fuelling point on the installation for fuelling vehicles and our fork trucks will be electric.

5.11.3 Chemicals

The installation will use chemicals for cleaning applications, hygiene stations, effluent treatment and odour abatement. No boiler water treatment chemicals are to be used for the existing boilers.

There is limited data available on chemical usage in poultry slaughterhouses. The Environment Agency's 2010 Sector Best Practice Review found that an average of 4kg of chemicals are used per tonne of carcass with consumption being split 44% ETP: 56% cleaning. We will monitor our consumption and review it on an annual basis to identify trends and areas for improvement.

Cleaning Chemicals & Hygiene Stations

Advances are always being made in cleaning chemical technologies and the type of chemicals used will be kept under regular review under our EMS. Chemicals with improved performance, efficiency or lower application temperature and lower direct environmental impact will be considered.

We will use automated dosing of chemicals to minimise chemical additions to cleaning water and these will be monitored and consumption reviewed.

The two primary cleaning chemicals we plan to use are:

- Chlorfoam Plus

Contains Caustic Soda (NaOH), Sodium Hypochlorite, foaming agents and a blend of sequestering agents and surfactants to inhibit scale formation and aid wetting, emulsification and foam stability. It is a high foaming formulation, designed primarily for applications in Breweries, Beverage, Dairies and Food Processing plants. Chlorfoam Plus is also suitable for use in other high care industries.

The combination of high alkalinity and chlorination gives excellent removal and suspension of fats, protein, vegetable and fruit staining. It is also very useful for brightening stainless steel.

- Tribac

A quaternary ammonium compounds (QAC) free disinfectant, the components of which meet the requirements of current European Legislation and the biocidal element of the formulation is supported in the Biocidal Products Regulation (EU 528/2102).

Tribac is suitable for use as a disinfectant in Breweries, Dairies, Food Processing and Beverage Production plants. The broad spectrum of biocidal activity makes it suitable for use in high risk industries where good antimicrobial control is required, particularly in applications where QAC disinfectants are undesirable.

Effluent Treatment Chemicals

The chemicals we will use in effluent treatment are ferric chloride, sodium hydroxide, phosphoric acid, polymer and anti-foam. Sodium hypochlorite will be used to chlorinate grey water to be recycled.

Bulk storage tanks of ferric chloride and sodium hydroxide will be located at the ETP. These tanks will be double skinned and fitted with level controls and alarms.

We have no data available on the annual chemical consumption but will keep track of this to monitor consumption performance as part of our EMS. We have estimated the consumption in Table 19 below, based on data from similar plants in the sector.

Odour Abatement Plant Chemicals

Chemicals will be used in the scrubbing liquors of the odour abatement system. The scrubber will be automatically dosed by chemical dosing equipment adding sodium hydroxide and sodium hypochlorite. The scrubber re-circulates the liquor within the column and automatically drains down and doses chemicals to ensure the liquor is effective at scrubbing.

The chemical dosage rates will be set and optimised during commissioning and will be reviewed to ensure that consumption is minimised while retaining optimum odour abatement efficiency.

The scrubbing chemicals will either be stored in bunded bulk storage tanks or in IBCs, located inside or in a bunded area.

We have no data available on the annual chemical consumption but will keep track of this to monitor consumption performance as part of our EMS.

5.11.4 Potential pollution risk of raw materials

The potential pollution risk of the raw materials we will use, their applications and an estimate of their annual consumption, based on similar sites in the sector are summarised in Table 19 below.

Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 in Appendix D show the raw material information and MSDSs for the chemicals we intend to use.

Table 19: Raw material pollution risk by application

Application	Purpose	Materials used	Hazardous substance	Risk phrases (CHIP)	Environmental fate	Potential pollution risk	Storage arrangements	Delivery and use details	Estimated annual consumption
Poultry slaughter and processing	Production of poultry portions for sale	Live birds	No	NA	Biodegradable	Yes - odour	NA	Live birds delivered to lairage by HGVs.	52million birds/year
Packaging	To protect product during distribution	Plastic wrap and trays	No	NA	Essentially inert	No	Inside	By vehicle, used inside	
Fuel	Combustion in boilers to raise hot water for process	Gas oil (low S content)	Yes	See Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 in Appendix D - Chemical and fuel SDSs	Immiscible, floats on water. Moderate to high toxic effects and bioaccumulation potential	Yes	Bunded storage tank, compliant with Oil Storage Regs.	By tanker and offloaded to bulk tank	
Cleaning applications	Cleaning of vehicles, crates, process equipment & floor areas	Detergents	Yes		Biodegradable	Yes	Inside in plastic containers, drums or IBCs	By vehicle, used internally for various cleaning applications	25T
Effluent treatment	pH control, flocculants, sterilisation	Sodium hydroxide	Yes		May cause long-term adverse effects in the aquatic environment. Readily degradable in water. Iron compounds are mainly resistant to degradation.	Yes	Inside or in bunded areas in plastic containers, drums or IBCs. Bulk storage in bunded tanks	Delivered by vehicle or tanker offloaded to bulk storage tanks	120T
		Ferric chloride	Yes						125T
		Phosphoric acid	Yes						
		Sodium hypochlorite	Yes						12T
		Polymer	No		Readily degradable in water				
		Anti-foam	No						
Odour abatement	Chemical scrubber	Sodium hypochlorite Sodium hydroxide	Yes		May cause long-term adverse effects in the aquatic environment. Readily degradable in water	Yes	Bunded bulk storage tanks or IBCs in bunded areas or inside	Delivered by vehicle or tanker offloaded to bulk storage tanks	12T sodium hypochlorite 1 – 2T sodium hydroxide
Anti-coagulant	anti-coagulant of blood	Sodium citrate or similar - to be considered if needed	No		Readily degradable in water	No	Inside in plastic containers	By vehicle	

Table 20 below outlines the BAT measures for raw materials consumption:

Table 20: Raw material chemicals consumption BAT

	Indicative BAT	Maelor Foods	Aspect
Management	Record and monitor consumption rates routinely. Undertake planned reviews of raw materials consumption. Consider alternative chemicals, packaging and technologies that become available with lower environmental impact.	To be included in EMS. Consumption to be reviewed annually. Alternatives to be reviewed when identified.	R R R
Cleaning	Audit cleaning contractors. Use automated chemical dosing to minimise consumption.	Yes Yes – for cleaning systems	R R
Effluent treatment	Effluent balancing tanks hydraulic retention time of 6 – 12 hours to allow waste streams of different pH and organic strength to be mixed. This can reduce consumption of reagents in subsequent treatment stages	Yes – RT is 12 hours peak flow and 19.2 hours average flow. DAF plant sized for 2 million birds/week so chemical consumption will be minimal for 1 million birds/week.	R, Eff
Odour abatement - Chemical scrubbers	Controls required to monitor and re-circulate the liquor within the column and automatically drain down / top up to ensure the liquor is an effective scrubbing medium	Automated dosing, drain down with continuous monitoring of pH / redox	R, O
Boilers	Low S fuel where natural gas is not available	Fuel spec will not exceed 0.1% S	A

5.12 Waste Management

The waste arisings from the installation are itemised below. Note that Animal by-products are not classed as waste. The storage and handling of these materials is discussed Section 5.9 above.

We have no operational data yet on annual amounts of waste arisings so have estimated them based on information from similar processes.

Waste will be segregated, handled, stored and collected in accordance with a waste storage and handling procedure which will be included in our EMS. The segregated waste streams will be stored in skips or bins in designated waste storage areas awaiting collection.

Under our EMS we will:

- keep records of all waste arisings
- keep copies of all Waste Transfer Notes and Waste Consignment Notes
- keep copies of licences for waste carriers and waste disposal / recovery sites
- follow the Waste Duty of Care guidance and waste hierarchy
- submit routine reports on waste arisings to NRW

The EWC codes of the waste arisings we expect to generate are summarised along with the hazardous classification and R or D code in Table 21 below:

Table 21: Waste arisings

EWC Code	Description	Hazardous?	Recovery or Disposal Code
wastes from the preparation and processing of meat, fish and other foods of animal origin			
02 02 01	sludges from washing and cleaning	No	R10
02 02 04	sludges from on-site effluent treatment	No	R10
02 02 99	wastes not otherwise specified	No	R13 or D15
waste engine, gear and lubricating oils			
13 02 05*	mineral-based non-chlorinated engine, gear and lubricating oils	Yes	R9
13 02 06*	synthetic engine, gear and lubricating oils	Yes	
13 02 07*	readily biodegradable engine, gear and lubricating oils	Yes	
13 02 08*	other engine, gear and lubricating oils	Yes	
oil/water separator contents			
13 05 03*	sludges from oil/water separators	Yes	R13
13 05 07*	oily water from oil/water separators	Yes	R13
Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions			
20 01 01	paper and cardboard	No	R3
20 01 02	glass	No	R5
20 01 21*	fluorescent tubes and other mercury-containing waste	Yes	D15
20 01 30	detergents other than those mentioned in 20 01 29	No	D15
20 01 34	batteries and accumulators other than those mentioned in 20 01 33	No	D15
20 01 36	discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	No	R13
20 01 38	wood other than that mentioned in 20 01 37	No	R3
20 01 39	plastics	No	R3
20 01 40	metals	No	R4
other municipal wastes			
20 03 01	mixed municipal waste	No	R13 or D15

Waste disposal codes
D1 Deposit into or onto land (e.g. landfill, etc.)
D10 Incineration on land
D15 Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)

Waste recovery codes
R3 Recycling/reclamation of organic substances which are not used as solvents (including composting
and other biological transformation processes)
R4 Recycling/reclamation of metals and metal compounds
R5 Recycling/reclamation of other inorganic materials
R9 Oil re-refining or other reuses of oil
R10 Land treatment resulting in benefit to agriculture or ecological improvement
R13 Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)

5.12.1 Effluent treatment sludge & lairage waste

Sludge from the effluent treatment plant is the primary waste arising from the installation. Sludge will be stored in the sludge tank in the effluent treatment plant area and will be collected by road tanker for offsite application or injection to land for agricultural benefit. An approved waste collector will be used and we will ensure that the land application sites are appropriately authorised for this purpose. Initially we do not plan to dewater the sludge but may add this feature as production increases.

A similar effluent treatment plant at an animal by-products installation produces around 3,000TPA sludge. The plant is around 50% of the capacity of the Maelor Foods ETP so our sludge arisings may roughly be estimated at 6,000TPA, biodegradable non-hazardous waste for recovery.

See Section 5.10.7 above for more details of the sludge tank design and the operational techniques to control odour.

Lairage floor waste, i.e. manure from the bird cages, will be segregated by dry scraping and the manure will be collected by an approved contractor for land spreading.

5.12.2 Packaging waste

Packaging waste will be re-used or recycled where feasible.

- Clean plastic packaging will be recycled but packaging contaminated with blood or meat scraps cannot be recycled and will be sent for disposal.
- Pallets, dolavs and other containers will be re-used unless damaged in which case they will be sent for recovery or recycling.
- Cardboard, metal and paper will be segregated and recycled.
- Empty chemical and detergent IBCs and containers will be returned to the suppliers for re use or recycling.

Our estimated arisings are:
<100TPA - Biodegradable non-hazardous waste for recovery (wooden pallets, cardboard, paper)
<100TPA - Non-biodegradable non-hazardous waste for recovery (metal, glass, plastic)

5.12.3 Other wastes

Waste oils from engineering will be stored in a dedicated waste oil container and sent for recovery.

Small amounts of hazardous waste such as light bulbs and engineering waste will be sent for disposal.

Electrical equipment will be sent for recovery in accordance with The Waste Electrical and Electronic Equipment Regulations 2013.

Our estimated arisings are:
<10TPA - Hazardous waste for disposal (light bulbs)
<10TPA - Hazardous waste for recovery (WEEE, waste oils & oil contaminated cloths)

5.12.4 Indicative BAT for waste management

Table 22 below outlines the BAT measures for waste management:

Table 22: Waste management BAT

	Indicative BAT	Maelor Foods	Aspect
Management	Waste minimisation Policy to prevent and minimise waste, to recycle, re use or recovery options with landfill the last option.	Yes – will be part of our EMS and environmental policy.	R, Ws
	Apply and demonstrate the waste hierachy.	Waste hierarchy declaration and justification in our EMS waste matrix	R, Ws
	Effective systems to monitor and record product yield, waste production and use correct waste codes	EMS waste matrix	R, Ws
	Waste management KPI's and regular audits	Will be part of EMS waste matrix	R, Ws
	Training & awareness on waste minimisation for all staff and at induction for new starters	Yes – will be part of env training for key staff and induction	R, Ws
Maintenance & process equipment	Consider waste minimisation in any new projects at design stage.	Design / layout considered waste minimisation.	R, Ws
	Address waste minimisation aspects in preventative maintenance system, e.g. ensure lines / machinery causing product spoilage or spillage are reported & repaired quickly	Yes – will be in PM system and training to report faulty equipment causing spillage	R, Ws
Packing	Recycle clean cardboard, plastic and metal.	Yes, all packaging materials will be segregated, re-used or recycled.	
	Minimise packaging and consider thinner, lighter materials	Yes	R, Ws
Effluent treatment plant sludge	Dewater sludge to minimise amounts requiring subsequent land application	Our sludge will not be de-watered initially but we may add this feature in future.	R, Ws

	Indicative BAT	Maelor Foods	Aspect
Land spreading of waste	For any waste being land spread it must be demonstrated that it represents a genuine agricultural benefit or ecological improvement.	We will not be spreading on land within our installation.	
	All the pollutants likely to be present should be identified and validated by chemical analysis of the waste. Identify the ultimate fate of the substances in soil.	We will use authorised waste contractors and ensure that our sludge is only applied to appropriately licensed land.	Ws
	Note: un-processed meat scraps collected from screening equipment are not listed as a waste which can be exempted and therefore cannot be sent for application by land spreading	Meat scraps will be included in our ABPs trailer for offsite processing.	
	Screened waste water may be collected and pumped to neighbouring agricultural land for soil injection as a fertiliser (subject EPR permit for land spreading)	Screened wastewater will be treated in our effluent treatment plant.	Eff

5.13 Utilities

Hot water for process rinsing, cleaning applications and workplace heating will be provided by one of the existing Rehema P200 series boilers initially. As the slaughter line is brought up to capacity we expect that we will require additional hot water capacity and may need to add an additional hot water heating system as the other existing Rehema P200 series boiler needs refurbishing.

We are considering the most energy efficient options available for a new additional unit. This may include non-waste derived biomass fuels, natural biomass solid fuel such as woodchip and CHP systems for example. We are also exploring scope to heat water using heat recovery from the main chiller which will influence this decision.

Further details will be provided as soon as we have finalised matters, either as additional information to support this permit application, as a pre-operational condition or under an application to vary the permit if necessary.

The hot water demand is such that our boilers and any additional units will not be a prescribed combustion activity in their own right, with a net rated thermal input of <20MWth.

The existing P200 boilers have 12 sections and are served by Riello RL 28 type burners. See technical details in Appendix F4.

The P200 units are small scale and are compliant with the 2009 Ecodesign Directive. The net thermal input of these units is 278 kW each so if operating both units it will only be 556kW, well below the prescribed activity threshold of 20MW.

The boiler(s) will be fired on low sulphur gas oil (<0.1% S) to comply with the Sulphur Content of Liquid Fuels (England and Wales) Regulations. There are gas services under the installation that we may be able to utilise however for future boilers.

The amount of combustion gases emitted to air from these units are calculated in Section 3.1. The annual mass emissions are very low and there are no foreseeable local air quality issues. We do not propose to undertake emissions monitoring of these points and emission control will be ensured by the routine maintenance of these units in accordance with the manufacturer's guidance and statutory requirements.

Electricity for all processing plant, lighting and equipment will be supplied by the mains. Given the rural location we will make contingencies in our emergency procedures to bring in a mobile back-up generator within 24 hours if there is a prolonged power interruption.

Water will be supplied to the installation from a combination of mains and borehole supplies, subject to a water abstraction licence being obtained. A NRW consent to investigate a groundwater source has been obtained and we have successfully completed pumping trials in accordance with our consent and have now applied for a full abstraction licence.

5.14 Site Drainage

Substantial work has been undertaken to update the site drainage and segregate clean surface water from trade effluent drains. We do not expect to have any external hardstanding areas that may be contaminated by spillages of organic material as all processing and handling of ABPs will be done internally.

The site drainage discharges via emission points W2 and W3 to the surface water culvert running southeast. This joins the land drainage system flowing northeast, then east before joining the River Dee further downstream. These emission points are shown on the site drainage plan, Figure 4 in Appendix A.

At the moment, the site drainage plan only shows the existing buildings which include the meat processing plant. Once the design for the slaughtering plant buildings and effluent treatment plant are finalised the site drainage plan will be revised. There will not be any additional emission points and clean drainage from these areas will be linked into emission points W2 and W3.

As there will be HGVs on site we are installing oil interceptors at suitable locations on the surface water drainage that could become contaminated with oils.

There will be no direct or indirect fugitive emission points to land. The working areas will be completely surfaced with impermeable hard standing and contained with kerbing, walls or sleeping policeman to ensure no potentially polluting liquids enter the ground or surface waters.

Potentially polluting substances will be stored in tanks (blood, sludge, effluent, fuel oils, chemicals) or containers (chemicals, detergents, engineering oils) within bunds, bunded

stores or stored inside. Our operating and emergency procedures will cover safe handling of these materials and measures to take if a spillage occurs.

The site is outside of the River Dee flood plain but could potentially flood if drains become blocked and overwhelmed in flash storm events. We will undertake regular checks and maintenance of the drainage system to ensure they are in good condition and unrestricted.

Spill kits will be available at key locations around the site and should a major spillage occur we would deal with this in accordance with our emergency response procedures. We will also identify the most suitable locations on our drainage systems to block them off under emergency scenarios such as major spillage or fire. This may be a fixed shut off point on one or more interceptor outlets or it may need to be a manual deployable system such as drain bungs or sandbags.

A copy of the site drainage plan will be held with our Emergency Management Plan to ensure any spillages can be quickly isolated and prompt and effective remedial action taken.

6 Odour Control

Some of the activities to be undertaken at the installation are inherently odorous by varying amounts.

The installation is quite rural but there are several residential receptors nearby in Pickhill Lane and larger residential areas within 1km so there is potential for offsite odour complaints. The closest housing in Pickhill Lane is owned by Maelor Foods.

We recognise that there is potential for odour from our installation to cause offence to our neighbouring receptors and this could lead to complaints.

The most important odour prevention and minimisation measure is good housekeeping and waste management standards. Additional odour control measures are required to address the odours that will inevitably occur given the nature of the process. These measures include extraction of odorous air and discharge to air with suitable dispersion of emissions to prevent offensive concentrations of odour offsite. For the more odorous process areas the discharge to air will need to be preceded by treatment of extracted air in an odour abatement unit.

6.1 General measures & management

Odour Management Plans (OMP) are required for installations permitted under the Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EPR) if the activities undertaken at the installation have significant potential to cause odour nuisance.

Activities for slaughtering poultry have an inherent significant odour nuisance potential so we have prepared an Odour Management Plan – see Appendix E2.1. We have also undertaken an odour impact assessment to determine the potential offsite odour impact and to verify the designs of the plant that can contribute to odour emissions – see Appendix E2.

This OMP identifies all potentially significant sources of odour at our installation. It describes the management practices and the infrastructure we will have in place to prevent and minimise those sources of odour.

The OMP addresses the potential for odorous emissions over our full range of normal operating conditions. It also covers our contingency measures to minimise odorous emissions during foreseeable abnormal and emergency events that could occur.

Our planned management systems to monitor, record and review our odour control performance are incorporated into the OMP. The plan describes the measures we intend to take if excessive odour is reported or detected during our monitoring or if we receive an external odour complaint.

The odour management plan will be reviewed regularly and includes odour report investigation procedures.

A key factor for odour control is prompt removal of animal by-products / wastes before decomposition starts to occur with subsequent generation of malodorous substances. Time, temperature and exposure affect the rate of decomposition.

Our operating procedures will ensure that we maintain a high standard of housekeeping in areas where wastes are handled and stored. Frequent cleaning, disinfection and removal of spillages will significantly reduce the potential for odour generation from fugitive sources.

Table 23 below outlines the BAT measures for odour management:

Table 23: Odour management BAT

	Indicative BAT	Maelor Foods
Management	Implement an effective Odour Management Plan to identify all potential sources of odour and the measures needed to minimise them during normal and abnormal operation.	Yes – OMP prepared.
	Operating procedures should include odour control measures. Staff training and awareness of odour issues is essential.	Operating procedures will include the odour control measures. Staff will be trained on this.
	Housekeeping and maintenance standards need to be high in areas where odour can arise and be released.	Operating procedures will address housekeeping. Preventative maintenance system will include plant which can affect odour.
	Where there is a history of odour complaints positive community liaison will be beneficial.	Not operational yet so no complaint history – will consider this accordingly.

6.2 Odour Impact and Abatement BAT Assessment

Our odour impact assessment (Appendix E2) has shown that the low odour risk process areas do not need to be abated and building air from these areas can be emitted directly to air, either via a stack or through roof mounted fan vents.

Only the most odorous process areas will need to be extracted to an odour abatement system and these are:

- Scald and de-feather area
- ABPs / blood tank building

The air extraction systems for these areas will be designed to minimise air volumes handled i.e. low flow/high concentration and to ensure that local extraction rates are high enough for efficient capture at the place where the odour is generated. However, for hygiene and animal welfare control purposes the process plant providers have specified minimum air changes per hour for the different process stages which we have had to satisfy.

There are a range of odour abatement techniques that we have considered to treat the odours from these areas:

6.2.1 Thermal Oxidation

Thermal oxidation of low volumes of intense odour in a thermal oxidiser or boiler is very effective, achieving over 99% odour destruction efficiency. It is commonly used in the animal by-products sector to destroy high intensity cooking odours which are particularly offensive.

The boilers or hot water heaters at slaughterhouses are smaller scale and unsuitable for reliable destruction of the less intense odours from slaughterhouses. Dedicated thermal oxidisers are very energy intensive and are not normally used at slaughterhouses as more suitable alternatives are available. This technique is therefore discarded for our installation.

6.2.2 Bio-filters

Bio-filters are widely used in the animal by-products, anaerobic digestion and waste water treatment plant sectors. They are used for abating lower level odours such as extracted building air or from tanks. They can require a large surface area so may not be suitable where there are space constraints. There are however some examples of multi storey bio-filters in use in the municipal waste water treatment plant sector.

Traditional organic bio-filters use media such as wood chip, heather or bark to provide a surface for bacterial action to occur. Inorganic clay based media has emerged in more recent years and is longer lasting and provides a very high surface area for oxidation to occur. More recent adaption of high efficiency advanced biofilter technology has been used in waste water treatment plants in Spain. These use media with a highly porous inorganic internal phase which is coated in an outer organic layer of nutrients to provide optimal fixing of micro-organisms.

Bio-filters are most effective when treating a consistent feed stream but have difficulty dealing with spikes of intense odours, such as when a blood tank is being emptied. Spikes in odour intensity are also found during periods of very hot weather.

Water scrubbers are usually installed upstream of bio-filters to remove solids and add humidity to the inlet supply to the filter beds.

Biofilters require regular maintenance, control and monitoring to ensure they are always effective and procedures are required to address these aspects. They require regular maintenance to prevent them becoming compacted and overgrown with weeds. They need to be rotavated and irrigated on a regular and consistent basis to prevent the media drying out or pooling with water. Irrigation equipment needs to be checked and maintained regularly. To save water, irrigation water can be recycled from an effluent treatment plant if of a suitable quality or harvested rainwater can be used.

Bio-filters are mostly uncovered at UK sites. Some bio-filters are covered however to provide shelter from the weather and prevent the beds drying out. Nonetheless water is required to irrigate the media to prevent it drying out.

An environmental impact assessment can ascertain the benefit in terms of odour treatment performance compared to uncovered filters. Where covers are fitted to bio-filters this can facilitate a point source release point for discharge vertically through a tall stack and a monitoring point can be installed. This is not considered necessary where an environmental impact assessment with air dispersion modelling shows the uncovered bio-filter emissions to be insignificant.

Many UK bio-filters use organic filter media such as wood chips or bark and this tends to last for around 3 years before it needs to be replaced. Sintered clay media has proven very effective at other sites and has a longer lifespan than woodchip, typically 6 – 8 years.

Where filters experience bacterial die-off due to extreme conditions they take several days to recover and may need re-seeding. During the interim period the odour abatement efficiency will drop.
Examples of extreme conditions include sudden very hot or very cold weather or shock loading with high intensity inlet air. Similarly, bacteria require a continual feed of organic material to feed on and they will hibernate during periods where no foul air is being supplied. Bacterial die off may occur if such periods extend for several days and the return to optimal performance will take time.

The required bio-filter surface area is designed by calculation in order to give a sufficient minimum residence time. This is typically at least 30 seconds.

Operational data for bio-filters at UK rendering plants show bio-filters typically achieve around a 90 - 95% odour abatement efficiency, occasionally higher.

Energy consumption by bio-filters is quite high as the air needs to be extracted from the process areas and ducted to the filters. Pumps, fans and humidifiers are also required.

Bio-filters need to be monitored to check the temperature across the beds and pH of the irrigation liquor return water to retain optimum bacterial conditions as the odour input and ambient conditions vary. Pressure drop monitoring across the beds is also recommended to check for resistance to flow due to compaction and this informs maintenance decisions.

Odour emissions are difficult to quantify for fugitive sources such as bio-filters. Olfactometry testing can be undertaken using grab samples above the filters and efficiency measured by comparing to samples of the inlet air stream. Similarly, inlet and outlet samples can be analysed for ammonia and hydrogen sulphide to check on abatement efficiency.

Regular routine qualitative sniff monitoring downwind of the bio-filters is a useful technique to check day to day odour destruction performance and should be incorporated into odour management plans.

This technique is a potential candidate technology for the Maelor Foods installation.

6.2.3 Chemical Scrubbers

Chemical scrubbers are an alternative to bio-filters and are a good option where limited space is available.

A chemical scrubbing system comprises 1, 2 or 3-stage scrubbing sequences depending on the complexity of the odorous waste stream to be treated. Automated chemical dosing equipment adds chemicals such as sulphuric acid, sodium hydroxide/hydrogen peroxide and sodium hypochlorite, depending on the nature and composition of the odour to be treated. The scrubber re-circulates the liquor within the column and automatically drains down and doses chemicals to ensure the liquor is effective at scrubbing.

Residual chlorine odour can cause complaints where the optimal chemical dose rate is exceeded and avoiding this can be difficult with a variable feed stream.

Negative aspects associated with wet scrubbers are the visible stacks and wet plume. The use of hazardous chemicals requires additional procedural controls, poses both health and safety and environmental hazards and is an additional expenditure and use of resource.

Energy consumption of wet scrubbers is very similar to bio-filters as the extracted air from the process areas still needs to be ducted to the scrubber.

Water consumption is lower for chemical scrubbers than biofilters however.

Installation costs of chemical scrubbers are also slightly lower than for biofilters but the operational costs are similar. Other than energy costs, the primary costs are the chemical reagents for scrubbing as opposed to media replacement and routine maintenance costs for biofilters.

Scrubber efficiency should be checked by continuous process control monitoring of pH / REDOX with linked alarms to warn of problems. Instrument readings should be observed regularly (for example, on start-up and then twice per shift) and the readings should be recorded in the log.

Monitoring by extractive stack sampling and olfactometry is easy to undertake. It is important that the lab also give a qualitative description of the nature of the odour they notice to confirm if there is a residual smell attributable to the slaughterhouse. The predominant odour is often of “chlorine” or “bleach” from the scrubbing chemicals. This odour stream would be very unlikely to contribute to any off-site perception of “slaughterhouse” odours but may still cause offence.

Stack tests can also measure ammonia and hydrogen sulphide concentrations and compare against inlet concentrations to check abatement performance.

Operational data for chemical scrubbers at UK rendering plants show that they typically achieve an odour destruction efficiency of 85 - 95%. Data for a recently installed scrubber at a poultry slaughterhouse shows odour destruction rates of >95%.

This technique is a potential candidate technology for the Maelor Foods installation.

6.2.4 Carbon Filters

Carbon filters are not widely used in the UK slaughterhouses sector. They are mostly small units for localised abatement during blood or sludge transfers from tankers and some tankers are fitted with them.

Media typically requires replacement every 6 months and for a large unit these costs are high.

Carbon filters can be affected by excess water, dust and fat aerosols. The relative humidity must therefore not exceed 80 - 90 % and particles must be effectively removed upstream of the filter.

If the filter medium becomes exhausted this will lead to emissions of odour. Filters should be changed at set intervals but saturation periods can vary so monitoring for odour breakthrough is required. Without monitoring a spent filter may stay in place for several weeks. Un-maintained carbon filters have been known to overheat and catch fire.

Regular qualitative sniff testing or tubes for ammonia and hydrogen sulphide can identify odour breakthrough.

The operational costs for replacing the media are excessive for consideration as the main odour abatement unit. For poultry slaughterhouses, the primary odour source is the scald tank

emissions which have a high moisture content so an additional treatment upstream would be required.

For these reasons this technique is not a potential candidate technology for the Maelor Foods installation but it will be considered for isolated minor applications such as at the effluent treatment plant and sludge tank.

6.2.5 Other Odour Abatement Techniques

Ozone, high voltage and thermal plasma systems can also be used for the oxidation of odour molecules.

“AEROX” high voltage systems are used in food and drink sector applications such as feed mills and AD plants. “AEROX” systems can be problematic when the catalysts become exhausted and odour abatement performance tails off.

The installation and running costs are higher than the traditional alternatives discussed above and given the reliability issues mentioned, these techniques are discounted for the Maelor Foods installation.

A UK rendering site and a UK food waste AD plant has recently installed a “Terminodour” system. This technology utilises negatively charged ions of oxygen to oxidise odours. The oxygen ions are created in a section of the air handling unit (AHU) that also contains the fan, filtration section, and instrumentation. Air is drawn into the AHU through a vermin-proof louver and filtration section by way of a fan. The filtered ambient air is then passed into the plasma reaction chamber where a series of corona discharge tubes create a plasma field through which the air must pass. As the air moves through the field, the oxygen molecules receive an electrical charge, the corona discharge tubes are operated with an alternating current, and consequently both negative and positively charged oxygen ions are produced.

The oxygen ions are then fed into the building via a carefully designed ductwork system to ensure the ions are properly distributed to the right areas. Once in contact with the malodorous air, the oxygen ions oxidise the odour in situ, thus providing not only an odour control solution but a significant improvement in the working environment.

These systems are unlikely to achieve the same efficiencies as thermal oxidation but may be an alternative to chemical scrubbers and bio-filters for handling odorous building air. Installation and running costs of the Terminodour unit are reported to be up to 50% less than biofilters and chemical scrubbers and require less surface area to install. Reported energy consumption is also lower and the system requires no water or chemicals.

Injecting air into meat production areas is not something that we would want to consider due to the potential for contamination. Our focus is to contain odours as much as possible to minimise the volume of air to be treated so this technique is not appropriate for the Maelor Foods installation.

The injection of odour neutralising solutions into the building air extraction stack have been tried at slaughterhouses but are not effective.

Odour neutralising solution sprays are sometimes used as an additional level of control to reduce odours above trailers or skips of ABPs but are not to be relied upon as a primary control measure.

Similarly, odour masking agents should not be sprayed around waste storage areas and effluent treatment plants as they are ineffective and should not be necessary if other measures are used effectively.

We do not plan to use odour neutralisers or masking agents.

Table 24 below summarises the techniques we have considered.

Table 24: Odour abatement options

	Applicable for Maelor Foods?
Combustion methods	Discarded
Bio-filters	Candidate
Chemical scrubbers	Candidate
Carbon filters	Candidate for secondary localised applications e.g. sludge tank, effluent treatment plant
High voltage, plasma, ozone, UV	Discarded
Odour neutralisers	Discarded

6.2.6 Selection of Odour Abatement Technique

Biofilters and chemical scrubbers are proven to be effective at treating odours associated with the compounds found in waste gases typically associated with poultry slaughterhouses. The bacteria or scrubbing chemicals are selected based on the odorous compounds to be treated. These are well understood for poultry slaughterhouses where there is a good history of olfactometry being undertaken at existing sites.

We initially considered an odour abatement technology used in Holland that uses a chemical scrubber system with an additional bio-filter stage. This was dismissed due to concerns identified during odour modelling about predicted offsite odour concentrations from the low-level fugitive release point. Another concern was that the biofilter bacteria could be starved if the odour levels were too low after the initial scrubbing stage, causing them to die off.

Bio-filters are not widely used in the sector and, while there is plenty of space available on site, we dismissed them as an option due to the more frequent and onerous maintenance required to ensure optimum abatement efficiency and the costs associated with this.

The proven, reliable and effective chemical scrubbing technique is widely used across the sector. The main disadvantage is the use of hazardous chemicals but the amounts we would need to use per year are still low. The systems are designed to address the health and safety and environmental issues and deliveries of chemicals would be infrequent.

Table 25 summarises the pros and cons of chemical scrubbers and biofilters:

Table 25: Odour abatement options comparison

	Chemical scrubber	Biofilter
Typical achievable odour concentration (uo_E/m^3)	2,000	2,000
Percentage abatement	95%	95%
Retention time (sec)	2	>30
Water consumption	Low	Medium
Energy consumption $MJ(m^3/hr)^{-1}$ air treated [(a)]	18.4	16.5
Chemical consumption	Approx.14T/yr	Low - for pH control
Land (footprint) [(a)]	$1/25^{th}$ of biofilter	1
Capex	Low	Medium - low
Opex	Low	Low
Maintenance	Low	High
Dispersion - vertical stack	Yes	Not unless covered filter
Monitoring	Scada based dosing control, in stack sampling ports for extractive olfactometry or chemical species tests if required	Grab sampling for olfactometry if uncovered
Waste arisings	Spent liquors to ETP – low volumes and impact	Media replacement. Non-hazardous (approx. every 3 years for organic media)

[(a)] "A sustainability analysis of odour abatement technologies"
J. M. Estrada*, N.J.R (Bart) Kraakman** R. Lebrero *, R. Muñoz *
*Department of Chemical Engineering and Environmental Technology, Valladolid University, Paseo del Prado de la Magdalena, s/n, 47011, Valladolid, Spain. (E-mail: jmestr@iq.uva.es, raquel.lebrero@iq.uva.es, mutora@iq.uva.es) **Department of Biotechnology, Delft University of Technology, Julianalaan 67, 2628 BC Delft, The Netherlands (n.j.r.kraakman@tudelft.nl). **CH2M Hill, Level 7, 9 Help Street, Chatswood NSW 2067, Australia.

Based on this information we have decided to select chemical scrubbing as our technique for abating the most odorous waste gases / building air from our installation.

We will use passive carbon filters for treating low volumes of air from the sludge tank headspace and the DAF unit at the effluent treatment plant.

6.2.7 Chemical Scrubber Design & Overview

The odour abatement system will be based on one scrubber with a final discharge to air via stack to disperse residual odours. A second scrubber may be added as production increases in the future subject to regulatory approvals. The scrubber manufacturer has specified an odour abatement design target of 98 - 99%. However, operational data at similar sites shows that performance is more typically around 95% abatement efficiency.

Our chemical scrubbing unit will be designed to destroy the odours and capture any remaining solids from the gas stream and will operate in five stages, including a single chemical treatment stage.

Details of the proposed chemical scrubber design are shown in Appendix F2.

The actual scrubber size is still being finalised at the time of this application but it will essentially be as described below.

Stage 1 & 2

The first stage is the scrubber tower, where the incoming gas stream to be treated is met by an opposing stream of neutralising reagent, which falls from 2 banks of spray nozzles at the top and the middle section of the scrubber. The sections below the spray nozzles are packed with the "Pall Rings", which are designed to give a maximum surface area of contact between the reagent and the gas stream to ensure the maximum abatement is achieved. The reagent falls into the reagent tank at the foot of the scrubber from where it is re-circulated to the spray nozzles by the pumps. The spray nozzles are designed and arranged to give a uniform spray over the complete cross section of the scrubber.

The two re-circulation pumps are a single stage vertical shaft configuration, allowing the pumps to be completely submerged in the reagent while the motor is above the tank and away from the reagent. This configuration allows all suction pipe work to be internal within the reagent tank. The pump body and internals are all constructed from corrosion resistant materials. A pressure switch will sound an alarm if the water pressure fails (pump stops running) in normal operation.

Both the scrubber pumps will run at the same time, treating section 1 & 2. If a pump fails, the scrubber is still being treated and an alarm will be sent via text to maintenance department phones and the alarm will activate on the panel. This is our supplier's preference as they have found in the past that with duty / stand by, the standby pump seizes through lack of use and does not start when needed.

The scrubber will be constructed from polypropylene sheet, formed and fusion welded, then reinforced with GRP, all designed and constructed in accordance with BS EN 131 21. The reagent tank is of similar construction and will also have stiffeners around the body. The scrubber tower shell will extend through to the floor of the reagent tank for additional strength.

The three remaining scrubber stages remove moisture droplets formed in the scrubbing process from the gas stream.

Stage 3

The third stage is a 150mm thick woven polypropylene filament pad, situated above the spray nozzles, and is designed to remove the largest moisture droplets from the gas stream, turning them back to fall down the scrubber with the rest of the reagent.

Stage 4

The fourth stage comprises of 2 banks of specially designed droplet eliminator blades, in series. These will remove moisture droplets down to 12 microns. The eliminator blades have a scientifically designed aerodynamic profile which forces the moisture droplets sideways into an integral drainage channel. At the foot of the eliminator blades the droplets collect in a small sump, which in turn drains back to the reagent tank at the foot of the scrubber.

Stage 5

The fifth and final stage of the scrubber is a finely woven polypropylene filament pad, situated immediately after the eliminator blades at the foot of the filament pad the droplets collect in a small sump, in common with stage 4. this to remove the finer droplets down to 5 microns.

Reagent Dosing

An automatic reagent dosing system and instrumentation system will be used to dose sodium hypochlorite and sodium hydroxide solutions into the reagent tank.

The control system above will control one fan, via an inverter to allow easy start and complete speed control. The panel will also control two reagent pumps and two dosing pumps. The level relay will inhibit the reagent pumps and dosing pumps. The reagent pumps will start up first then the fan will run. Once the fan is running the dosing pumps will operate as needed by the pH and Redox levels.

The dosing pump 4-20 mA signal will feed straight to the indicators on the panel door, to indicate the stroke length.

Telemetry and Controls

A remote monitoring and GSM unit will send out SMS messages when an alarm is generated to the unit, such as pump/fan fault. The pH and Redox levels will also be fed to the unit and operators will be able to see in real time the actual pH and Redox levels.

A local audible/visual alarm will warn of power to the fan or pumps failure. The drawing of the panel front is shown in Appendix F2, Figure 3.

Scrubber Design

We have selected to install one scrubber initially to treat the air extracted from the most odorous process areas described above. If operational experience and or increases in production require increased scrubbing capacity a second scrubber will be installed subject to regulatory approval.

The scrubber exhaust stack height will be at least 3 metres above the scrubber (9m) and the apex of the building (9.5m). Based on our odour impact modelling, a stack height of 13m will provide good dispersion but we will specify 16m to get additional dispersion benefit.

The efflux velocity from the stack will be designed at 10 - 12m/second, with an accelerator cone added to achieve up to 15m/second to ensure good dispersion.

An example of the typical scrubber layout and a photograph of a recently installed unit at another site in the sector are shown in Appendix F2, Figures 1 and 2.

7 Noise & Vibration

The activities undertaken at Maelor Foods installation have a low to medium risk of causing noise nuisance. The offsite impact of noise will be minimised using effective design and layout of the installation, management systems and techniques. The risk of vibration causing offsite nuisance is low.

7.1 Noise Management

We undertook a noise impact assessment for our planning application which took background noise levels at the nearest receptors and used estimated levels from the proposed installation. See the noise impact assessment in Appendix E4. This includes a noise management plan in Section 10.

Our Planning Consent requires that the rating level of any noise generated due to this development shall not exceed the pre-existing background level by more than 5dB(A) at any time. To demonstrate that we comply with this we are prepared to undertake a further noise impact assessment once the installation commences operation if NRW specify this.

Noise Management Plans (NMP) are required for installations permitted under the Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EPR) if the activities undertaken at the installation have significant potential to cause noise or vibration nuisance. We do not propose to prepare a more detailed noise management plan at this stage as the nuisance risk is low / medium. We will review this during the operational phase.

The potential noise sources at the installation are discussed below:

7.1.1 Vehicle movements

The noise impact assessment found that noise from on-site vehicle movements will not need to be screened by barriers so long as some general good practice measures are followed.

Vehicles using the installation will include HGVs delivering live birds and collecting finished product, ABPs collection vehicles, road tankers and fork trucks. The layout of the site has been designed so that vehicles will drive in and out of the lairage. HGVs collecting ABPs and blood will have to reverse into the offal building, then drive out using a traffic light system. Reversing beepers are a potential noise nuisance so banksmen may be used for guiding reversing HGV's if necessary. The entrance to these bays is physically screened from the nearest housing in Pickhill Lane by the adjacent building. Collapsible dock shelters will be used by HGVs to contain noise from poultry and internal processes.

On site vehicles, such as fork trucks will mostly operate inside the lairage. We may have a small number of dedicated fork trucks for external use and these will be fitted with white noise reversing beepers. Night time movements of vehicles outside of the buildings will be minimal. Our fork trucks will be electric and are less noisy than diesel powered trucks.

Blood and sludge collections will not be made overnight and the tanker loading areas will be shielded from Pickhill Lane by the buildings.

The on-site roadways will be maintained in a good condition to minimise the potential for clangs and bangs from vehicle movements. Trained and qualified staff will drive the vehicles

and should drive responsibly, within the site speed limit to ensure site safety and to keep noise levels down.

7.1.2 Operational noise egress

The processing plant will be compliant with the Control of Noise at Work Regulations, so that workers are not exposed above the Lower Action Value (LAV). Based on this the noise egress targets will be met.

7.1.3 External plant noise

Noise from the external plant will be designed to meet an overall sound power level of 79dB LWA. Alternatively, the plant will have a sound power level of 84dB LWA and be in housing with a minimum sound reduction of 15dB.

7.1.4 Building air extraction system / air intake fans

The extraction systems and chemical scrubber will be well maintained to ensure performance is optimal and checks will be made of the extraction ducting and fans so abnormal noise or vibration will be noticed and addressed.

The chemical scrubber will be located on the eastern side of the installation alongside the lairage building. The scrubber will be screened from Pickhill Lane by the buildings so noise from fans and pumps should not be detected at the nearest houses. We will consider fitting acoustic enclosures around any noisy equipment if operational experience identifies any noise sources that are contributing to offsite noise nuisance.

Air intake and exhaust fans can potentially cause noise complaints and where possible we have tried to install these in locations where they are screened by buildings or pointing away from the nearest housing receptors.

The efflux air from the scrubber and building extraction system fans could potentially create a “rushing air” type noise. If this does occur and is found to be contributing to offsite noise nuisance we will consider attenuation options such as fitting a silencer cone on the stack, shielding or alternative fan blades.

7.1.5 Refrigeration and chiller plant

Noise from refrigeration plant can potentially create offsite noise complaints. The main chiller refrigeration plant will be positioned by the offices. It will be a new unit and will meet the latest standards for noise levels and will be housed in an acoustic building. It will be maintained on a regular basis by refrigeration engineers. See details of the chiller plant condenser specification recommendations in the Noise Impact Assessment report.

The other smaller chiller units will be located at the meat cutting plant and the air-cooled condensers will be shielded from Pickhill Lane by the main buildings.

Refrigerated trailers parked up will be connected to electric hook up points, not diesel engines.

7.1.6 Boilers & Utility Buildings

Boiler houses are usually quite noisy areas. Our existing boilers are located inside the boiler house which has acoustic type doors and is enclosed by large buildings which shield it from Pickhill Lane housing. It is likely that replacement or additional boilers or hot water heating systems will be in a utility building along the eastern side of the lairage building alongside the chemical scrubber. This will also house vacuum pumps, compressors and other equipment. It will be shielded from the residential receptors in Pickhill Lane by the main buildings but will also be insulated to minimise noise egress.

7.1.7 Effluent Treatment Plant

Sources of noise at the ETP will include pumps and blowers. The ETP is located well away from Pickhill Lane housing and shielded by the main factory buildings. Sludge will be collected by road tanker from the effluent treatment plant area but collections will not be made overnight.

Externally mounted blowers will be installed in acoustic cabinets rated at 78 dB at 1.0m and these will be located amongst the large tanks at the ETP for additional screening.

8 Energy Efficiency

At most slaughterhouses, the refrigeration plant is the biggest consumer of electricity. It can constitute 45 - 90 % of the total site load during the working day and almost 100 % during non-production periods. Having an effective refrigeration management plan is therefore key to ensuring efficient and reliable refrigeration. As described earlier, we are investigating the potential to recover heat from the chiller plant for heating water.

On the slaughter, dressing and packing lines, the hoists, pullers, blowers, conveyors and packagers are powered pneumatically, hydraulically or by electric motors.

The requirement for hot water is high and is split between basins and showers, carcass washing, scalding, wash down (60-65^{o}C), and sterilising baths (>82^{o}C). Note that our scalding unit will not use hot water immersion so our scalder energy consumption will be lower than traditional immersion scald tank systems.

The 2005 SA BREF BAT energy consumption benchmark range for poultry slaughter is very wide (152kWh/T chicken carcass up to 860kWh/T chicken carcass). This is unlikely to represent BAT for a new installation as techniques have improved over the last 10 years.

The UK poultry sector climate change agreement, target period 1 (1 Jan 2013 – 31 Dec 2014) was an 8.95% reduction on the base year. At the time of the EA's 2010 sector review the CCA average was 558.8kWh/T chicken.

So, it seems reasonable to use 500kWh/T chicken as an upper range and to aim for the lower range as a new installation.

We do not have any operational data yet as the installation is not yet constructed. We cannot therefore enter a climate change levy agreement at this time but will consider applying to join the CCA for the poultry sector when we have operational data to present.

We plan to install sub metering and will compile an energy balance to target reductions and optimise high use areas and will utilise a central database for recording and monitoring our sub meter readings so we can monitor performance and quickly flag up any issues requiring maintenance.

The specific energy efficiency measures for the process areas are described in Section 5.

Table 26 below outlines the non-process BAT measures for energy efficiency:

Table 26: Energy management BAT

	Indicative BAT	Maelor Foods
Management	Central computerised sub meter reading systems to monitor and record energy use on the PLC or sub metering and daily manual reading at least	Sub meters with automated reading, data management.
	Energy management plan with KPI's and regular audits	Our EMS will incorporate energy management, including procedures and staff awareness. We will set targets on energy consumption.
	Training & awareness on energy efficiency for all staff and at induction for new starters	
	Energy Policy for purchase of energy efficient new plant	We have and will purchase energy efficient equipment wherever possible.
Maintenance & process equipment	Consider energy efficient techniques in any new projects at design stage and power correction factors when ordering new equipment.	The process and equipment is designed with low energy consumption in mind.
	Address energy consumption aspects in preventative maintenance system, e.g. ensure steam & compressed air leaks are reported & repaired and steam lines lagged, ensure solenoids, sensors and other process controls are operational.	Our preventative maintenance system will include routine checks to ensure equipment remains in optimum energy efficient state, for e.g. identify any leaks from utilities and damaged insulation. We will source low energy equipment for new or replacement purposes.
	Inverters should be standard on new equipment.	Inverters on fans on air extraction system, pumps, ETP blowers
	Use of automatic switch off sensors on lines in fail safe mode, e.g. photocells to switch line off if no product passing	Yes
Building lighting, heating & ventilation	Use energy efficient lighting with motion sensors and timers to switch off.	LED lighting will be installed with motion sensors and timer controls.
	Include switch off of lighting, heating and ventilation in shutdown procedures	Will be part of energy awareness training of staff
	Solar panels can be used to heat water.	Not considered reliable for our hot water demands.
	Use natural light and ventilation to minimise lighting and heating requirements.	The roof panels will have clear sections for natural light.
	Use thermostat control on building heating.	Thermostats will control heating.
	Design plant layout to optimise natural light, heat and ventilation and position boilers near points of use to reduce heat losses from steam lines.	The plant design and layout has considered use of natural light, ventilation and retention of heat or cold as applicable.

9 Water Consumption

Slaughterhouses and meat processors typically use a lot of water. This is mostly due to the hygiene requirements set by UK and EU meat regulations, which require potable water to be used for most washing and rinsing operations and mandatory cleaning criteria are set which limits opportunities for recycling and re-use of water.

Water consumption depends on factors such as the bird size, slaughter and processing technique, carcass dressing method, degree of automation, plant layout and recycling. Note that our scalding unit will not use hot water immersion so our scalder water consumption will be lower than traditional immersion scald tank systems.

In general, the amount of floor area used is one of the main factors affecting water consumption as the hygiene regulations require all process floor areas to be washed down and sanitised at least once per day.

The 2005 SA BREF BAT water consumption benchmark range is very wide (5.07 – 67.4m^3/T chicken carcass). The benchmark in Environment Agency Guidance EPR 6.11 Treating & Processing Poultry is 8 – 15 litres / chicken.

These figures are unlikely to represent BAT for a new installation as techniques have improved over the last 10 years. At the time of the 2010 EA sector review there were several poultry slaughterhouses using less than 8 litres/bird where they had installed sub metering, recycling and other water efficiency measures.

Around 40% of our treated effluent will be re-used for low grade “grey water” applications such as cleaning of the lairage, crates, vehicles and for feather flume make up water. By using a non-immersion scalding technique we will use less water than traditional immersion scald tanks.

We do not have any operational data yet as the installation is not yet constructed or operational. The design flow and loads of our effluent treatment plant are based on an average of 7l/bird with a range of 6 up to a maximum of 9 l/bird. This is the volume ratio obtained at a similar sized poultry plant. We will set an initial target of 7 litres/bird but will aim to achieve less once the plant is optimised.

We plan to install sub metering and will compile a water balance to target reductions and optimise high use areas. We will have a central database for recording and monitoring our sub meter readings so we can monitor performance and quickly flag up any issues requiring maintenance.

The specific water efficiency measures for the process areas are described in Section 5.

Table 27 below outlines the non-process BAT measures for managing water consumption:

Table 27: Managing water consumption BAT

	Indicative BAT	Maelor Foods
Management	Central computerised sub meter reading systems to monitor and record water use on the PLC or sub metering and daily manual reading at least Water management plan with KPI's and regular audits Training & awareness on water efficiency for all staff and at induction for new starters	Sub meters with automated reading, data management Our EMS will incorporate water management, including procedures and staff awareness. We will set targets on water consumption.
Maintenance & process equipment	Consider water efficient techniques in any new projects at design stage. Address water consumption aspects in preventative maintenance system, e.g. ensure water leaks are reported & repaired quickly, solenoids and level controls are operational.	The process and equipment is designed with low water consumption in mind and recycling / re-use of water wherever feasible. Our preventative maintenance system will include routine checks to identify any leaks from utilities.

10 Accidents and Emergencies

We have undertaken a Qualitative Environmental Impact Assessment to support our permit application - see Appendix E1. This has assessed the risks associated with both normal and abnormal operating conditions and scenarios.

We will implement an emergency response plan under our EMS for dealing with any incidents or events that we identify as having the potential to harm the environment. Our Plan will consider the potential accident and abnormal events that we have identified and the measures we should take to prevent or deal with them. These events will include:

- equipment breakdowns, such as the effluent treatment plant or odour abatement unit
- enforced shutdowns / power interruptions
- transport delays
- fires
- vandalism
- flooding
- loss of containment / spillage
- any other incident which causes abnormal operations, such as bad weather

For each potential incident, we will identify the:

- likelihood of the accident happening
- consequences of the accident happening
- measures to take to avoid the accident happening
- measures to take to minimise the impact if the accident does happen

Our emergency response plan will also specify how we will record, investigate and respond to accidents or breaches of our permit. This will be prescribed in an accident, incidents and near miss investigation procedure.

Our emergency response plan will also include:

- the date it was reviewed and when the next review is due
- a list of emergency contacts and how to reach them
- a list of substances stored and the storage facilities
- forms to record accidents on

All environmental accidents, incidents and near misses will be reported to the Site Manager or other person delegated this responsibility. This person will record the details and initiate the response which will include notifying the relevant internal and external parties in a timely manner as appropriate.

Our accident, incidents and near miss investigation procedure will explain how to respond and who to notify and how to investigate matters. The root cause and actions to prevent reoccurrence will be identified and full details and investigations will be recorded on the template to be provided.

Records will be kept and, on an annual basis, they will be reviewed to check on our performance. This information will be summarised in our annual environmental report to be prepared by the Site Director for the Board.

Our staff will be trained on emergency response procedures according to their roles and we will review and test our procedures and response plan on a regular basis and after any significant incident.

11 Application Site Condition Report

We have prepared an Application Site Condition Report for the Maelor Foods installation – see Appendix E5.

We note that the revised effluent treatment plant layout in Appendix F1, Figure 1 is slightly different to that provided to our Geotechnical Consultants when they prepared our site condition report. The final ETP layout now has the aeration tank, anoxic tank and clarifier tank on the western side of the existing chamber which is just outside of the area covered by the ASCR. These tanks will only hold organic based effluent that has been treated already in the DAF treatment stage.

The trial pit location plan in Appendix E5, Figure 6 shows that this area is between trial pits TP112, around 20m away and TP101 and TP106. We are satisfied that data from these locations is representative for the purposes of the baseline site condition for the revised effluent treatment plant layout.

During the lifespan of our permit we will undertake routine inspections and maintenance of our site infrastructure, such as bunds, tanks and hardstanding to ensure that the pollution risk to the ground is as low as possible and make records. Our EMS will include procedures and systems for this.

A ground investigation will be undertaken when instructed to do so under our permit, after a significant spillage or event causing ground contamination and in preparation for a site surrender application if appropriate.

11.1 Closure and Permit Surrender

A site closure and decommissioning procedure will be included in our EMS and reviewed on a regular basis. It will cover the general clean-up of the site, removal of all materials, residues, waste and emptying of any drains or sumps, dismantling of equipment and safe removal of any chemicals or oils.

The history of the ground condition, any incidents and remediation work during the lifespan of the installation permit will be used to inform the site closure plan and permit surrender application.

12 Monitoring

We will undertake various monitoring for process control purposes but we do not propose to undertake any routine monitoring for demonstrating compliance with emission limits unless specified by NRW in our permit.

We have summarised our proposals for monitoring below.

12.1 Air

We do not propose to undertake routine extractive monitoring of any point source emissions to air. Emissions from these sources are screened out as insignificant in our qualitative impact assessment, Appendix E1 and our odour impact assessment in Appendix E2.

Odour abatement plant monitoring
Our odour management plan in Appendix E2.1 describes the qualitative, process control monitoring of our odour control systems.

Monitoring of our chemical scrubber stack (A2) by extractive stack sampling and olfactometry is simple to undertake. However, for such monitoring it is important that the odour lab give a qualitative description of the nature of the odour they notice to confirm if there is a residual smell attributable to the slaughtering process. The predominant odour from scrubbers is often of “chlorine” or “bleach” from the scrubbing chemicals. This odour stream would be very unlikely to contribute to any off-site perception of “slaughtering” odours but may still cause offence and will contribute to the odour units reported.

Given this and other inaccuracies and limitations of olfactometry we do not propose to undertake quantitative monitoring of odour emissions to compare against an odour unit emission limit unless required to do so by our environmental permit.

Stack tests can measure concentrations of odorous gaseous species such as ammonia and hydrogen sulphide and be compared against inlet concentrations to check abatement performance.

We will have sampling point facilities to enable us to undertake monitoring of odour and gaseous species in the chemical scrubber inlet and outlets to check the efficiency of the scrubber. We propose that this is undertaken at a representative time during commissioning of the slaughtering plant and beyond that at a frequency specified in our OMP.

To monitor these parameters, it is not essential to have uniform airflow in the stack so one 75mm (3”) sampling port is sufficient and it will be installed at a point 1m downstream of the fan.

We plan to install a permanent access platform, with safety rail and kick plate, accessed by a ladder with safety hoops. This will allow the safe access to the monitoring point installed in the stack.

Combustion plant monitoring
The aggregated net thermal input of the hot water heating plant will be well below 20MWth so they will not be a prescribed activity in their own right. The current units are compliant with the

2009 Ecodesign Directive and any new systems will meet the latest energy efficiency standards. The estimated annual mass emissions of combustion gases from these units are very low and we do not propose to undertake emissions monitoring of these points.

Emission control will be ensured however, by the routine maintenance of these units in accordance with the manufacturer's guidance and statutory requirements. We will also undertake daily site checks to include visual observations of the boiler exhausts. If dark smoke is observed other than during start up and shut down this will be investigated.

Bird hang on area dust arrestor

The dust arrestor will be operated, inspected and maintained in accordance with the manufacturer's instructions. The unit will be specified to have automatic filter bag shaking and pressure drop controls to warn of bag bursts.

We do not propose to undertake emission monitoring of this exhaust point. The emissions will be negligible and these types of units are proven to achieve particulate emissions of <10mg/m^3.

12.2 Water

Treated effluent will be discharged to river via point W1. The flow rate of the discharge is likely to be consistent, given the balance tank retention times for mixing and buffering the influent. However, during periods when significant amounts of water are being recycled to the process areas the flow may drop or stop altogether.

We understand that we will be required to monitor the treated effluent discharge flowrate to the river continuously using an MCERT's approved flowmeter. We will await instructions from NRW on the other compliance monitoring requirements of our point source emissions to water. Once the requirements are known we will arrange for samples to be analysed at a suitable laboratory, certified for those parameters and methods / Standards.

Our proposals for monitoring our water discharges are summarised in Table 28 below.

Table 28: – proposed compliance monitoring of water discharges

Emission Point	Determinand	Proposed Discharge Limit	Units	Reference Period	Monitoring Frequency	Method or Standard
W1	Discharge volume	1,500	m^3/day	24hours	Continuous	MCERTs flowmeter
	Biochemical oxygen demand (BOD)	20	mg/l	As required by NRW	As required by NRW	As required by NRW
	Total suspended solids	30	mg/l			
	Ammonia	5	mg/l			
	Phosphate	2.5	mg/l			
	pH range	6 to 9	N/A			
	Temperature	30	°C			
	Oil	None visible	None			
W2	Oil	None visible	None			
W3	Oil	None visible	None			

We also plan to undertake the following qualitative, process control monitoring of the effluent treatment plant.

A turbidity monitor will be installed to continuously monitor the discharge to river. Turbidity monitors are useful for process control of suspended solids and can warn of malfunction of the DAF process or settlement stages. They can be used to instigate recirculation into the primary tank to investigate any problems.

We will also install temperature and pH monitors in the final effluent stream for process control.

An auto sampler will be used to take a 24-hour composite sample of the final treated effluent for analysis in our on-site laboratory for qualitative monitoring to allow us to check that treatment is within the normal range and allow us to adjust accordingly. The parameters to be analysed will be:

- Suspended solids
- Ammonia
- Phosphate
- pH
- Temperature
- COD
- Visible oil

We will perform a COD test instead of BOD as our laboratory will not be equipped to undertake BOD. We will estimate the BOD equivalent by undertaking comparison with a BOD: COD correlation graph for our discharge so we can gauge compliance with the BOD permit limit.

Our laboratory will not be UKAS accredited for the monitoring methods for these parameters and we are unlikely to have scope to use the approved methods for compliance monitoring.

We would propose to send composite samples to an external laboratory for compliance monitoring against our permitted emission levels at the frequency to be specified by NRW.

Table 29 below outlines the BAT measures for monitoring:

Table 29: Water emissions monitoring BAT

	Indicative BAT	Maelor Foods
Effluent monitoring	Monitor emissions to water at frequency specified by Regulator and in accordance with EN standards. If appropriate EN standards are not available, use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	Samples of final effluent will be taken in accordance with our permit conditions and analysed accordingly at a laboratory certified for the relevant standards for the specified parameters.
	Use continuous monitors to monitor pH, flow (MCERTs), TOC, turbidity and temperature.	MCERTS flowmeter, turbidity, pH and temperature.
	Use turbidity & pH monitors for process control and to warn of malfunction of the DAF process and instigate recirculation into the primary tank / investigation.	A turbidity meter will be installed on final eff to warn of problems. pH meters across the DAF stages.
	Where treated effluent is re used for cleaning use turbidity probe to activate shut off valves if the quality falls.	
	Monitor the pH of the influent to warn of chemical spillages and control pH adjustment.	Not included - limited variability of influent pH and large balance / diversion tanks.
	If sufficient storage is available discharge treated effluent in batches using chemical analysis to ensure compliance with standards before authorising discharge.	Daily composite samples to be analysed in house lab and other monitoring as above.

12.3 Monitoring of process variables

Monitoring of some process variables that may affect the environment will be undertaken, as listed in Table 30 below.

Table 30: Proposed process variables monitoring

Process variable	Comment	Monitoring frequency
Refrigerant	Quantity of refrigerant and oil added to or removed from the system	Each maintenance visit, charge or drain
Cleaning chemicals	Monitor the consumption of detergent and disinfectant to check that correct dilutions and application procedures are being followed	Weekly – to be included in our EMS
Bleed time	Monitor bleed times to check that the maximum	Blood trough design and conveyor rate determines this. To be optimised at

	quantity of blood has been collected for separate disposal and will not overload the effluent treatment plant	commissioning and conveyor speed kept at desired setting thereafter.
Energy consumption	Energy consumption across the installation and at individual points of use in accordance with the energy plan	Energy sub metering to be read continuously by SCADA system
Water consumption	Water consumption across the installation and at individual points of use in accordance with the water efficiency plan	Water sub metering to be read continuously by SCADA system
Bulk storage tank levels	The risk of accidents can be reduced by installing high level alarms interlocked to transfer pumps. Fitted on bulk chemicals, fuel, blood, effluent and sludge tanks.	Continuous - Tank levels and alarms displayed on SCADA system for ETP. Fuel oil tank will be compliant with OS Regs.
Effluent quality	Treated effluent monitoring for process control as described in section 12.2. DAF plant includes in line monitoring of pH, out of specification alarms and automatic by-pass systems routed to the diversion tank to store effluent.	Continuous - alarms displayed on SCADA system.
Chemical scrubber	Redox monitoring / pH control Abatement efficiency – odour, ammonia and hydrogen sulphide	Continuous - alarms displayed on SCADA system. During commissioning and after 12 months, then as specified in our odour management plan.

Table 31 below outlines the BAT measures for process monitoring:

Table 31: Process variables monitoring BAT

	Indicative BAT	Maelor Foods
Process monitoring	Where appropriate: Identify process variables that may affect the environment and monitor as appropriate. Assess whether monitoring the parameters identified would enable minimisation of your environmental impact or reduce the risk of an accident.	See Table 29 above.

13 Environmental Impact Assessment

We considered using the H1 tool to calculate the impact of proposed substance releases to air and water. This screens out from detailed assessment those releases described as 'insignificant' emissions to air or for discharges to water, effluent streams containing substances which are not 'liable to cause pollution'.

However, we have qualitatively 'screened out' potential risks from emissions to air from the boilers and small dust arrestor as the mass emissions are estimated to be small. Furthermore, the boiler units would not otherwise be subject to environmental permitting based on their aggregated net thermal input. The installation location is very rural so the background air quality is good. It is highly unlikely that these emissions will lead to the approach or exceedance of the relevant air quality standards for the parameters released. We have not done any further assessment of these emissions because the risk to the environment is insignificant.

We could use H1 to assess the odour impact and water discharge but have already undertaken more rigorous Air Dispersion Modelling and River Quality Planning Modelling so this is pointless. The only parameters listed in H1 for discharge to water of relevance to our discharge are ammonia and iron so we would have had to assess the other parameters by a different method anyway.

We concluded that the H1 tool is unsuitable for our assessment and does not provide any more useful or accurate screening assessment than our own qualitative and quantitative modelling described in this section.

13.1 Qualitative impact assessment

A qualitative environmental impact assessment has been undertaken and is shown in Appendix E1. The risk assessment has been prepared with reference to "guidance on risk assessments for your environmental permit" and is based on qualitative risk assessment methodology, where a judgement of risk of an environmental impact is assigned based on the 'Source-Pathway-Receptor' Model.

Where we consider that the hazards do not pose a significant risk, we have not undertaken any further assessment.

Based on our qualitative assessment we have identified the most significant environmental hazards from the installation and undertaken further assessments to determine the potential impact and to inform the plant design and procedural controls required to minimise impacts to acceptable levels. These are described further below.

13.2 Odour nuisance potential

Poultry slaughterhouses have an inherent odour risk due to the nature of the activities undertaken. The installation is approximately 1 km to the south east is the village of Bangor-on-Dee and approximately 700m to the north west is the residential area of Cross Lanes. There are five residential properties close by, located off Pickhill Lane, to the west of the proposed main poultry processing building and site entrance.

We have undertaken a qualitative odour impact assessment, (see Section 5 of our Odour Management Plan in Appendix E2.1) and a quantitative impact assessment using olfactometry and air dispersion modelling (see Appendix E2). These assess the potential for offsite ground level odour concentrations causing nuisance to human receptors and leading to odour complaints. This has informed the plant layout and design and various scenarios have been assessed to identify the most suitable configuration.

The significance of the predicted odour impact is assessed to be 'negligible' at all receptor locations. Based on the assessment results, it is anticipated that odour impacts at receptor locations because of operation of the installation would be negligible. As such, the potential for adverse odour impacts in the vicinity is low and would not result in loss of local residential amenity.

13.3 Treated effluent discharge to controlled waters

Treated effluent from our effluent treatment plant will be discharged into the River Dee. The river at this point is a good / high quality, potable supply water course and is designated as a Special Area for Conservation, designated for its Atlantic salmon and water plantain populations.

We have undertaken an assessment of the proposed discharge to river from the effluent treatment plant W1. This used the Environment Agency's River Quality Planning (RQP) Monte Carlo tool to model the effect of the discharge on the downstream river quality, specifically for BOD, ammonia, total phosphate, total suspended solids and pH. A mass balance spreadsheet tool was used to model the resultant river temperature downstream of the discharge. See the assessment report in Appendix E3.

The river quality modelling using RQP showed that the predicted impact of the discharge on downstream river quality is small, with most quality determinands showing no change. Any predicted change in quality was small, especially in the context of uncertainty in the upstream data.

This was reflected in the monthly temperature modelling, which showed no increase in temperature except at the second decimal place under Q95 (low) flow conditions in the river, and at the third decimal place with average conditions in the river.

The results were based on proposed discharge flows of an average 1,200 m^3/day and a maximum 1,500 m^3/day, with quality based on the discharge concentrations previously permitted at the site when managed by First Milk Ltd. The results showed negligible impact on the river at this loading (flow and concentration) due to the discharge.

Based on this modelling the river quality needs will not be detrimentally affected by the discharge. Furthermore, the actual emission limit parameters for the ETP will be tighter than those modelled so this gives a further safety margin.

We understand that NRW will re-run the modelling using the same tools and data to verify that it is correct. We will be happy to forward our monitoring files if necessary to assist in this.

We note that the modelling report identifies a potential contravention of NRW's policy for no deterioration of the river quality downstream by more than 10%. Modelling for a 10mg/l ammonia discharge limit shows ammonia concentrations will be 33% higher downstream, even though this only represents a change from 0.03mg/l to 0.04mg/l. This is due to the very

high quality of the river. The model does not give more than 2 decimal places so it is difficult to assess the discharge standard required.

Further investigations have been made by extrapolating the data graph. This indicates that for the proposed effluent plant ammonia limit of 5mg/l the increase in downstream ammonia concentration would be around 15% (0.005mg/l). This is still marginally above the policy of no worse than 10% however and we estimate a discharge limit of 2.5 - 3mg/l ammonia would be required to meet this. Our ETP providers will not guarantee this standard as a maximum limit but performance is likely to be within this range based on information from similar operational plants.

We therefore ask NRW to take a pragmatic view on this as the discharge will not cause the river to fail or approach the lower water quality standard and the uses of the river and its Special Area for Conservation status are unlikely to be affected.

13.4 Protection of the underlying aquifer / surface waters

The site is located on a groundwater source protection zone aquifer (Zone III, total catchment). The installation is also located within the 'Middle Dee Groundwater Management Unit' of the Dee Catchment Abstraction Management Strategy (CAMS).

The site drainage from the installation will ultimately feed into the River Dee, a sensitive watercourse with downstream potable extraction and a Special Area of Conservation (SAC) for its Atlantic salmon and water plantain populations.

Therefore, the potential impact of spillages of fuels and chemicals could be high.

Details of our raw materials and waste handling and storage, site drainage, site report and emergency preparedness are discussed in earlier sections of this report.

Our Site Condition Report in Appendix E5 assess these risks in more detail and estimates that there is a Moderate Risk of harm to sensitive receptors, mainly controlled waters, from the existing contaminative issues on site. It is anticipated there is a Low to Medium Risk of harm to sensitive receptors from the proposed activities to be undertaken at the installation.

The technical and procedural controls we will use to operate and monitor the installation should ensure that these risks are well managed and acceptable. Our qualitative risk assessment in Appendix E1 also concludes that the overall risk is low / medium.

13.5 Noise nuisance potential

Our noise impact assessment (Appendix E4) concluded that the predicted noise levels will exceed the Local authority requirements at the closest residential receptor in Pickhill Lane. However, with the recommended mitigation measures implemented, target requirements will be met at all the residential receptors.

The noise management plan provided with the noise impact assessment will address the potential noise sources and provide methods to minimise noise disturbance at the nearest residential receptors.

Appendices

Appendix A – Installation Maps & Plans

Appendix B – Environmental Setting Searches

Appendix C – Process Information

Appendix D – Raw Materials Information

Appendix E – Environmental Impact Assessments

Appendix F – Ancillary Plant Technical Information