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Ball Beverage Packaging UK Limited

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BALL PACKAGING KETTERING SITE ENVIRONMENTAL PERMIT APPLICATION: OPERATIONS REPORT

RAMBOLL

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INTRODUCTION

This document supports the application submitted by Ball Beverage Packaging UK Limited ("Ball Packaging" or "the Client") to North Northamptonshire Council ("NNC") under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (the "Regulations") for a Part A(2) Environmental Permit associated with the operation of a beverage can manufacturing facility located at Plot 4b, Segro Park, Kettering Gateway (the "Site" or the "Facility"). An overview of the location of the site is provided in Figure 1 in Appendix 1.

The site comprises a single rectangular building comprising a warehouse and offices, set over three storeys. The building is currently under construction and upon completion will be used as beverage can manufacturing facility. Ramboll understands that Ball Packaging plans to construct a four-line beverage can plant, with Line 1 operational from January 2023, Line 2 from June 2023, Line 3 from September 2024 and Line 4 from December 2024. The plant will also have the potential to expand to six lines by latest 2027.

Ramboll prepared a Phase I Environmental Site Assessment for the site in February 2021 (report ref: 1620011490). This report included a regulatory permitting and environmental infrastructure overview, which identified the environmental infrastructure provisions in Kettering, including water supply sources and location and potential capabilities of off-site wastewater treatment plants to adequately treat process water and sanitary wastewater arising from the plant.

The report also identified the likely environmental permitting requirements for the plant, which concluded that, assuming low VOC coatings are used, the plant will likely require a Section 6.4 A(2)(a) Environmental Permit, relating to the coating and printing of metal cans, which would be regulated by the local authority (solvent consumption >200tpa or >150kg/hr). Solvent emission limits would also apply under Schedule 14 of the Environmental Permitting Regulations.

This Operations Report is intended to accompany Ball Packaging's application to North Northamptonshire Council for a permit for surface treatment of metal packaging using organic solvents and provides an overview of the proposed regulated activity and the Operators management arrangements.

GENERAL LIMITATIONS AND RELIANCE

This report has been prepared by Ramboll UK Limited ("Ramboll") exclusively for the intended use by Ball Beverage Packaging UK Limited (the "Client") in accordance with the agreement (proposal reference number 1620011745_01), dated 2nd March 2021 between Ramboll and the Client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended, or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the Client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

NON-TECHNICAL SUMMARY

This Part A(2) Environmental Permit application is submitted by Ball Beverage Packaging UK Limited for the operation of a beverage can manufacturing facility, including the coating and printing of metal cans (solvent consumption >200tpa or >150kg/hr), located at Plot 4b, Segro Park, Kettering Gateway.

The facility will comprise a single building housing a warehouse, offices, and a production hall comprising six production lines for the manufacture of aluminium beverage cans. Sheets of aluminium will be fed through machines for uncoiling, lubricating, cutting and extrusion, before the cans are fed through a washer and subjected to seven different processes to be cleaned. The cans will then be fed through a printing system and an overvarnish will be applied, followed by subsequent drying and a lacquer applied internally. Visual inspections will be undertaken internally using a light tester, and the cans will be sorted with a palletiser prior to inspection and distribution.

The site will also comprise a wastewater treatment plant, which will be located in the south of the facility. The treatment plant will be able to process a maximum of 30 m^3/hour and will be controlled automatically. Flocculant and bentonite will be dosed based on a proportional flow rate, and systems will have a manual override capability. The processing area will include a sealed drainage system (perimeter trench and sump).

Activities directly associated with the facility are limited to the handling (e.g. receipt), storage, and distribution of organic solvents and other associated chemicals, treatment of effluent and treatment of VOC emissions.

Raw materials

The primary raw materials used in the permitted activity are inks containing organic solvents, which are used to print decoration onto the aluminium cans. All materials are provided with suitable containment measures.

Waste

The permitted activity generates a mixture of hazardous and non-hazardous waste, with the majority of material removed from site at the point of generation.

Energy

Mains gas and electricity are used as the predominant primary energy source for the facility.

Emissions to air

Emissions to air from the installation will principally comprise VOCs from the use of organic solvents, which are to be extracted and treated through a Regenerative Thermal Oxidiser (RTO). Combustion gases arising from the operation of the gas-fired boiler and RTO will also be generated.

Flue gases from the operation of the RTO will be emitted to air via one stack immediately south of the facility. The stack will be approximately 14.5 m above ground level with a diameter of approximately 1,600mm. A 15m/s exit velocity is anticipated for the six line unit. Exhaust air volume is anticipated to be a maximum of 84,500 Nm^3/hr.

Dispersion modelling has been undertaken to assess the impact of both point source and fugitive emissions to air. The results of the dispersion modelling show that at all modelled human health receptors and locations where the relevant air quality objectives are applicable, no exceedances will be caused by the installation. The impacts are assessed as negligible. Furthermore, the dispersion modelling concluded that the proposed development does not give rise to any significant air quality impacts on human health receptors and is fully compliant with national, regional, and local planning guidance.

Emissions to Water and Sewer

The Wastewater Treatment Plant managing the washwaters from the process will generate wastewater flows up to 8 L/s (28.8 m^3/hr). The WWTP has been designed to meet the requirements for discharge to sewer, including the BAT-AELs for AOX and fluoride.

Noise

A third-party noise impact assessment has been undertaken and found no significant adverse impact was predicted as a result of the proposed development.

Environmental Management Systems

The Operator proposes to implement an environmental management system to manage the environmental aspects of the operation of the facility.

Site Condition

A Site Condition Report (SCR) has been prepared which considers the risks presented by the materials stored at the facility, the sensitivity of the receiving environment and the measures in place to mitigate the potential for ground contamination. The primary risk is derived from the storage and use of organic solvents.

1. PROCESS DESCRIPTION

1.1 Process Summary and Technical Standards

1.1.1 Process Summary

The primary activities proposed to be undertaken at the site are associated with the operation and maintenance of a beverage can manufacturing facility, which is currently under construction, with a scheduled completion date for the building structure of December 2022. This date may be subject to change.

The facility will comprise a single building housing a warehouse, offices, and a production hall comprising six production lines for the manufacture of aluminium beverage cans. Sheets of aluminium will be fed through machines for uncoiling, lubricating, cutting and extrusion, before the cans are fed through a washer and subjected to seven different processes to be cleaned. The cans will then be fed through a printing system and an overvarnish will be applied, followed by subsequent drying and a lacquer applied internally.

The cans are then fed through a necker and flanger to form and reform the neck and bottom of the cans, and visual inspections are undertaken internally using a light tester. The cans are sorted into a pallet prior to inspection and distribution.

The site also includes a wastewater treatment plant, which will be located in the south of the facility.

When the site has four lines installed, the facility will require a Section 6.4 A(2)(a) Environmental Permit relating to the coating and printing of metal cans with a solvent consumption of >200tpa or >150kg/hr, which will be regulated by the local authority. Solvent emission limits will also apply under Schedule 14 of the Environmental Permitting Regulations.

Where a permit is required under Section 6.4 A(2)(a), the operations must meet the 'Best Available Techniques' (BAT) requirements as set out in the BAT Reference Document for Surface Treatment using Organic Solvents[1]. The BAT Conclusions set specific expectations for water and energy use, emissions to air and wastewater treatment amongst other things. For newbuild operations, the Environmental Permit application will need to demonstrate that the site and process design will meet the requirements set out in the BAT Conclusions from the commencement of production.

The site location is shown on Figure 1 and a site layout plan and installation boundary is provided in Figure 2 provided within Appendix 1.

1.1.2 Technical Standards

In compiling the environmental permit application, consideration has been given to the technical guidance and standards considered to be appropriate for the regulated activity proposed. A list of these guidance documents and standards is provided in the table below.

Table 1.1: Schedule of Technical Guidance

Title	Author	Date / Version
Reference Document on Best Available Techniques on Industrial Emissions, for Surface Treatment using	European Commission	June 2020

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?url=CELEX:32020D2009&from=EN), published December 2020

Title	Author	Date / Version
Organic Solvents Including Preservation of Wood and Wood Products with Chemicals		
H5 Site Condition Report Guidance and Templates	Environment Agency	V.03 May 2013
Horizontal Guidance for Noise Part 2 – Noise Assessment and Control	Environment Agency	V.03 June 2004
Environmental Permitting Regulations (England and Wales) 2010, Regulatory Guidance Series, No RGN2: Understanding the Meaning of Regulated Facility.	Environment Agency	V.3.1 May 2015
Environmental Permitting General Guidance Manual on Policy and Procedures for A2 and B Installations	Department for Environment, Food and Rural Affairs	April 2012

In addition, the general permitting requirements set out on the Environment Agency's website have also been considered[2].

1.2 Process Description

1.2.1 General Overview

The facility will comprise a single building housing a warehouse, offices, and a production hall comprising six production lines for the manufacture of aluminium beverage cans. The front end of production comprises aluminium coil preparation, uncoiling, lubricating, cutting and extrusion. The uncoiled sheets of aluminium are fed through a cupper press (or cupper) which draws the aluminium into a cup. The cups are gravity fed into the bodymaker which turns the cups into cans, and a trimmer is used to clean and straighten the edges, as well as achieving the desired can height.

The cans are then fed through a washer to remove any oil and dirt as well as apply a corrosion inhibitor and sterilise the cans in preparation for use in food grade applications. The washer comprises multiple stations where the cans are rinsed (water), prewashed (sulphuric acid), washed (surfactant and hydrofluoric acid), rinsed again (water), corrosion treated (Alodine corrosion inhibitor), rinsed for a third time (water) followed by a final rinse with deionised water. The cans come out of the washer and under a hot air dryer, and then go through a bottom rim coating process (varnish) to enhance the mobility of the cans through the multiple conveyor belts used in the remainder of the process.

The decorator receives cured basecoated cans from the conveying system and applies the desired label graphics using a dry offset printing process with up to eight-colour capability. An overvarnish application improves the can abrasion resistance and enhances can graphic quality with a glossy appearance.

Cans are fed into a mandrel wheel which rotates against a blanket wheel. This blanket wheel accumulates layers of the different coloured inks from the ink station before applying the completed colour plate onto the can, which rotates round on the wheel to transfer the full image. An overcoat varnish is then immediately applied to seal and protect the printed image.

[2] https://www.gov.uk/topic/environmental-management/environmental-permits Environment Agency Website. Accessed on 25/04/2022

The cans are dried following decoration at approximately 207°C in a pin oven, and then an inside lacquer spray machine (LSM) is used to spray varnish onto the inside of the cans. The cans go into an inside bake oven (ISO) to dry the inside of the cans in three stages, at 115°C, 210°C and 190°C. During the internal spray lacquer application an overspray forms as small lacquer particles or dust. The dust is extracted from the spray machines and filter bags are used to extract the dust.

The cans are then fed through a necker, where a neck and flange are formed and the bottom of the cans are reformed. The cans go through visual inspection systems where a “Pressco” camera used alongside a light tester to perform an internal inspection of the cans. A palletiser is then used to create a finished pallet of cans, and a final pallet inspection (FPI) is undertaken for quality control.

The site will also comprise a wastewater treatment plant, which will be located in the south of the facility. The automated treatment plant will be able to process a maximum of 25 m^3/hour. Flocculant and bentonite will be dosed based on a proportional flow rate, and systems will have a manual override capability. The processing area has a sealed drainage system consisting of a perimeter trench and sump.

1.3 Directly Associated Activities

The following activities are considered to be directly associated with the principal regulated activity.

1.3.1 Storage and Handling of Chemicals

Solvent handling is principally associated with the delivery of solvents to the site. Solvents will be stored in an internal bulk storage area in the south of the site. A total of eight 30m^3 tanks will be provided for various solvent based raw materials as well as soluble and waste oils. The tanks are connected to pump skids which feed into the production lines. Bulk tanks are indoors and will be provided with appropriate secondary containment at 110% of the capacity of the largest tank. The bulk storage room will be constructed with a sloped floor and sump at the lowest point to allow for convenient cleaning.

An ink mixing and storage area is also present in the south of the facility. Ink will be stored indoors in a combination of 205L Drums and 1000L Intermediary Bulk Container (IBCs). Appropriate secondary containment will be provided in the Ink storage and mixing area.

Smaller non-bulk storage of solvents include IBCs and drums of overvarnish, inside spray, basecoat, UV rim varnish and cleaners. Hazardous chemicals will be stored in a locked, internal chemical store room with secondary containment. An indoor flammable goods store will be provided for these materials with appropriate secondary containment also provided.

A chemical store and adjacent dosing room will also be provided at the south side of the site for storage and dosing of the various acids used in the process. The chemical store will predominantly store Acids, Alkalis and water treatment chemicals for use in both the washing plant and the water treatment plant. Three independent chemical stores will be present, each with individual secondary containment to ensure that reactive chemicals are separated.

1.3.2 Treatment of Effluent

A wastewater treatment plant (WWTP) will be present in the south of the facility. The automated treatment plant will process all facility wastewater to remove tramp oils, metals/fluoride, solids (contributing to BOD, COD, TSS and TDS), and other contaminants prior to discharge. The WWTP

is designed for a maximum flow rate of 28.8 m^3/hr. Up to 20 m^3/hr wastewater will originate from six total can washers once fully operational. Additional periodic wastewater sources requiring treatment will include: cooling tower blowdown, reverse osmosis condensate (ROC), filter backwashes, and purges from the can bodymaker coolant systems. These additional wastewater sources will total no more than 8.8 m^3/hr.

The WWTP is organised into the following areas:

- Equalisation / wastewater storage (totalling 280 m^3 capacity)
- Used oil recovery and storage
- Chemical precipitation tanks and solids removal
- Sludge dewatering and storage
- Chemical distribution system
- Wastewater demineralisation and recycle

Numerous oils and lubricants are used throughout the can-making process. The remaining lubricants are removed from the cans by the washers. A series of oil/water coalescers separate oil from the wastewater and collect the used oils. An oil skimmer is also present on each washer sump in order to further remove any tramp oils present in the wastewater. All recovered waste oils are stored and trucked off-site for disposal.

A continuous chemical precipitation and separation process (using either lime or caustic soda) is used to remove metals and other various solids from wastewater. Bentonite and inorganic coagulants are added to aid in removal of BOD/COD and sulphate/sulphite. These solids are separated using several inclined plate separators (lamellas) and the resultant sludge is further dewatered using a filter press. All solids are trucked off-site for disposal. The wastewater is then filtered by quartz multimedia filters and subsequently by ultrafiltration membranes (UF) to further removed dissolved solids (TDS).

A multi-stage reverse osmosis (RO) system is also utilised to generate demineralised water for the can washers. To reduce plant-wide water demand, a portion of the treated wastewater will be recycled and further purified by the RO units.

When water recycle is not operational, the maximum wastewater flow rate will be 8 L/s (28.8 m^3/hr), and the WWTP has been designed to ensure that the following are met:

- pH 7.0 – 10.0
- Aluminium ≤ 5.0 mg/L
- COD ≤ 250mg/L
- Sulphate ≤ 1 mg/L
- Sulphide ≤ 1 mg/L

When water recycle is operational, the final discharge from four lines at full production is expected to be closer to 4 L/s, with significant fluctuations in discharge expected during the start-up of Lines 1 and 2.

1.3.3 Treatment of VOC Emissions

The facility will include a regenerative thermal oxidiser, which will use combustion at high temperatures to oxidise VOCs and air pollutants from the process exhaust streams, turning them into CO_2 and H_2O before they are released into the atmosphere.

Stacks will be approximately 14.5 m above ground level with a diameter of approximately 1,600mm. A 15m/s exit velocity is anticipated for the six line unit. Exhaust air volume is anticipated to be a maximum of 84,500 Nm^3/hr.

This meets the requirements of BAT 15.

2. RAW MATERIALS, WATER & WASTE

2.1 Raw Materials

2.1.1 Use

Raw materials use associated with the operation of the facility is detailed in the table below:

Table 2.1: Summary of Raw Material Use

Substance	Reason for use	State (Solid / Liquid / Gas)	Estimated Annual Use	Maximum Storage Capacity	Environmental Hazard Statements
Aluminium	Main raw material used for can manufacture	Solid	34,000 tonnes	N/A	Not classified
Spray Lacquer	Internal spraying of cans	Liquid	1,900,000 kg	16 IBCs	H315 – Skin Irritation H318 – Eye Damage H317 – Skin Sensitivity
Overvarnish Lacquer	Spraying cans following printing	Liquid	630,000 kg	24 IBCs	H315 – Skin Irritation
Ink	Printing	Liquid	80,500 kg	6 IBCs	H318 – Causes serious eye damage
UV Rim Varnish	Varnishing can rims	Liquid	16,000 kg	3 IBCs	H319 – Causes serious eye irritation H317 – May cause an allergic skin reaction H411 – Toxic to aquatic life with long lasting effects
Lubricant	For use in front-end	Liquid	56,700 kg	3 IBCs	Not classified
Coolant	Printing line machinery and washer chemicals	Liquid	99,750 L	6 IBCs	H318 – Causes serious eye damage
Hydraulic Oil	Printing line machinery	Liquid	105,000 L	6 IBCs/24 drums	Not classified
Cleaners	Washer chemical	Liquid	241,500 L	10 IBCs	H290 – May be corrosive to metals H302 – Harmful if swallowed H314 – Causes severe skin burns and eye damage

Substance	Reason for use	State (Solid / Liquid / Gas)	Estimated Annual Use	Maximum Storage Capacity	Environmental Hazard Statements
					H318 – Causes serious eye damage
Sulphuric Acid	Washer chemical	Liquid	141,750,000 kg	5 IBCs	H290 – May be corrosive to metals H314 – Causes severe skin burns and eye damage
Alodine	Chromate conversion coating	Liquid	To be confirmed	2 IBCs	Not classified
Hydrofluoric Acid	Washer chemical	Liquid	To be confirmed	2 IBCs	H300, H310, H330 – Fatal if swallowed, in contact with skin or if inhaled. H314 – Causes severe skin burns and eye damage.
Flocculant	WWTP chemical	Liquid	To be confirmed	2 IBCs	H318 – Causes serious eye damage
Bentonite	WWTP chemical	Solid	To be confirmed	2 IBCs	Not classified
Lime	WWTP chemical	Liquid	To be confirmed	2 IBCs	Not classified

2.1.2 Storage & Containment

Chemical storage is predominantly undertaken in the south of the facility. Chemical stores are present in the Chemical Dosing Room, chemicals associated with the waste water treatment plant are stored next to the treatment area, an ink mixing and storage room is present in the south and a bulk materials store with 30m^3 containers of oil and solvents is present in the full height bulk materials store. A flammable goods store is also present adjacent to the bulk materials store.

Principles of good housekeeping will be met in order to prevent or reduce fugitive VOC emissions during storage and handling of solvent-containing materials and/or hazardous materials. Hazardous materials will be kept in locked, internal storage areas with secondary containment that has a capacity of at least the stored materials plus 10%.

A containment area for two tank trucks will be present to the south of the facility, with dimensions of 7.00 x 6.00 m, and the area will follow a slope. An ACO type drain trench will be installed around the containment area, so in the event of spillage from the bulk tank inlet connections or tank truck this will be collected through the drains. The trench drain will be sloped to a retention sump equipped with a cover hatch, to allow the immersion of a portable pump to pump out spilled liquid. Between the retention sump and the connection to the main foul water drainage pipe will be an electro-valve, which will be opened to allow the storm water runoff through the system, and closed during loading operations. If accidental spillage occurs, liquid will be stored in the retention sump.

A drainage plan is provided within Appendix 1 (drawing ref. P21028-FRH-EW-XX-DR-C-2000 v C02).

Aluminium coils will be stored in the south-east of the building within a coil storage area.

2.1.3 Raw Material Efficiency Measures

As per the BAT Conclusions, an Environmental Management System (EMS) will be implanted which will include a raw material evaluation system to use raw materials with low environmental impact and a plan to optimise the use of solvents in the process (BAT 1, BAT 3, BAT 7).

A robust waste management process will be in place to ensure that waste is minimised whoever possible and where waste cannot be avoided, will be recovered. Examples of this are provision of a waste oil collection tank and a scrap aluminium bailer to ensure that these wastes can be fully recovered.

2.2 Water

2.2.1 Use

Water is used routinely in the washing process on site, as well as within the combustion chamber of the boiler.

2.2.2 Efficiency Measures

The boiler will operate a condensing system for the reuse of water. In addition to this, the wastewater treatment plant will include water recycling which shall target 5 – 8 µS/cm at 80% recovery.

2.3 Waste

2.3.1 Wastes Generated

Wastes generated at the facility will comprise the following:

Table 2.2: Summary of Wastes

Description of Waste	Source	State (Solid/ Liquid / Gas)	Estimated Annual Quantity	Classification
Dry Waste				
General Trade Waste	General	Solid	113 tonnes	Non-Hazardous
Dry Mixed Recycling	General	Solid	2 tonnes	Non-Hazardous
Chemical Waste	Process	Solid	470 tonnes	Non-Hazardous
Hazardous Skip	Process	Solid	7.5 tonnes	Hazardous
Wood	Delivery pallets	Solid	10 tonnes	Non-Hazardous
Oil Filters	Machinery	Solid	15 tonnes	Hazardous
Ink Contaminated Cardboard	Packaging	Solid	6 tonnes	Hazardous
Oil contaminated materials	Packaging	Solid	3 tonnes	Hazardous
Cardboard	Packaging	Solid	4 tonnes	Non-Hazardous
Miscellaneous Waste	WEEE, Sample Testing	Solid	73 tonnes	Non-Hazardous
Filter cake	Wastewater Treatment Plant	Solid	500 tonnes	Hazardous
Wet Waste				
Waste oil	Oil/Water Tank	Liquid	315 tonnes	Hazardous
Drummed Waste	Grinding sludge	Liquid (Sludge)	78 tonnes	Hazardous
Waste Solvent	Solvent varnish oil mix	Liquid	18 tonnes	Hazardous

2.3.2 Storage & Containment

In the South yard, there will be a fenced area dedicated for waste management, with 5 enclosed skips for separated items as cardboard, wood, metal, plastic and general waste, and 1 Cabinet Sump Container for empty IBCs with a capacity for 12 units. A further bunded storage area capable of holding 24 empty IBCs is located in the chemical storage room.

Filter cake from the wastewater treatment plant will be collected within a skip located within the wastewater treatment room and removed from site for treatment and disposal.

2.3.3 Waste Minimisation

In order to reduce the quantity of waste sent for disposal, BAT 22 will apply. This will include the production of a waste management plan as part of the EMA (BAT 1) including measures to minimise the generation of waste, optimise the reuse, regeneration and/or recycling of waste and ensure the proper disposal of waste. Waste quantities will be monitored annually for each type of waste.

3. ENERGY USE & EFFICIENCY

3.1 Energy Consumption

The site will be heated via a 400 to 620 kW gas condensing boiler, situated within a boiler room in the west of the facility. Mains electricity will be supplied via the National Grid.

Table 3.1: Summary of Energy Consumption

Energy Source	Approximate Annual Energy Consumption		
	As Delivered (MWh)	At Primary Source (MWh)	% of total (primary)
Electricity	80,000	192,000	71
Gas	80,000	N/A	29

* For electricity from the public supply a factor of 2.4 should be used to convert from delivered to primary energy.

3.2 Energy Efficiency Measures

3.2.1 Operating & Management Procedures

The site will implement an EMS as part of BAT which will include an energy efficiency plan (BAT 19). The energy efficiency plan will define and calculate the specific energy consumption for the facility, setting key performance indicators (KPIs) on annual basis (e.g. MWh/tonne of product) and planning the periodic improvement targets and related actions.

Each year an energy balance record will be drawn out as per BAT 19, providing a breakdown of the energy consumption by the type of source.

Both elements form part of Ball Packaging's corporate EMS requirements and are embedded into their method of operation.

4. EMISSIONS TO AIR, WATER, SEWER & LAND

4.1 Emissions to Air

Emissions to air from the installation will principally comprise VOCs from the use of organic solvents. Combustion gases arising from the operation of the gas-fired boiler and regenerative thermal oxidiser (RTO) will also be generated.

4.1.1 Point Source Emissions to Air

Combustion gases from the operation of the RTO will be emitted to air via a single stack immediately south of the facility. The stack will be approximately 14.5 m above ground level with a diameter of approximately 1,600mm. A 15m/s exit velocity is anticipated for the six line unit. Exhaust air volume is anticipated to be a maximum of 84,500 Nm^3/hr.

An assessment of the potential impacts from the operation of the RTO is included in the accompanying Air Quality Assessment report (VC-103500-AQ-RP-0001, June 2021).

4.1.2 Emission Limit Values

As per BAT 17, in order to reduce NO_X emissions in waste gases while limiting CO emissions from the thermal treatment of solvents in off-gases, the thermal treatment conditions will be optimised through good design and regular planned maintenance of the combustion system.

The following BAT-associated emission levels (BAT-AEL) will apply to the RTO stack emissions:

Table 4-1: Emission Limits for RTO

Parameter	BAT-AEL	Monitoring frequency	Monitoring Standard
NOx	130mg/Nm^3	Once every year	EN 12619
VOC	20mg C/Nm^3	Once every year	EN 14792

No emission limits are proposed for the boiler as the unit is <1MWth in size and therefore is outside the scope of the Medium Combustion Plant Directive requirements.

4.1.3 Fugitive Emissions to Air

The facility includes the use of Local Exhaust Ventilation (LEVs) to ensure a regular air change within the installation. These LEVs vent at a roof level and would be expected to contain a low level of VOCs – although this will be limited through control of VOC emissions through correct storage of solvent-containing materials and extraction of high-VOC content for thermal treatment. An assessment of the potential impacts from the potential fugitive emissions is included in the accompanying Air Quality Assessment report (VC-103500-AQ-RP-0001, June 2021).

During the internal spray lacquer application an overspray forms as small lacquer particles or dust. Dust is extracted from the spray machines under a negative pressure and is conveyed at high speeds to a reverse jet filter. The filter contains 104 filter bags that filter the dust from the extraction air and collect the dust in a drum which can be removed to enable safe disposal. An alarm is fitted to the system, which identifies when new filter bags are required. If for any reason a filter bag fails, an alarm will be raised, and a secondary filter backup will be present to capture any dust. The extracted air is then directed to the RTO for release to atmosphere.

4.2 Emissions to Surface Water

4.2.1 Point Source Emissions to Surface Water

There are no direct discharges of wastewater from the installation to surface water.

4.2.2 Fugitive Emissions to Surface Water

Fugitive emissions to surface water are most likely to occur from leaks and spills of liquid materials at the installation.

The following measures are applied to minimise the potential for fugitive emissions:

- A containment area for tanker delivery consisting of a drain trench, retention sump and electro-valve, which will be opened to allow the storm water runoff through the system, and closed during loading operations. If accidental spillage occurs, liquid will be stored in the retention sump to at least 110% of tanker capacity (approximately 38,500 litres).
- Bunding of bulk storage to 110% of tank capacity (or 25% of total capacity in bund, whichever is greater).
- Storage of non-bulk chemicals within designated internal chemical stores to 110% capacity, incorporating sealed drainage systems.
- Storage of liquid waste with secondary containment of 110% capacity (fixed or mobile bunding dependent upon size).
- Three hydrocarbon interceptors will be provided within the surface water drainage network to retain any spillages of oil & fuels which reach the drainage system.

A drainage plan is provided within Appendix 1 (drawing ref. P21028-FRH-EW-XX-DR-C-2000 v C02).

4.3 Emissions to Groundwater

4.3.1 Point Source Emissions to Groundwater

The operation of the facility does not result in any point source discharges to groundwater.

4.3.2 Fugitive Emissions to Groundwater

Operational areas of the facility are provided with concreting or other impermeable surfacing to prevent fugitive emissions to groundwater associated with the regulated activity.

4.4 Emissions to Sewer

Each production line will make use of demineralised water in the final stage of the washing plant, it is unclear at this stage how many reverse osmosis plants will be installed at the site, however the site has the potential to require up to seven reverse osmosis units producing approximately 25 m^3/hr of demineralised water. It is expected that the RO unit(s) will produce approximately 5 m^3/hr of waste brine for discharge to foul sewer (based on an average 80% efficiency of the RO process).

The Wastewater Treatment Plant managing the washwaters from the process will also generate wastewater flows up to 8 L/s (28.8 m^3/hr). The WWTP has been designed to ensure that the following are met:

- pH 7.0 – 10.0

- Aluminium ≤ 5.0 mg/L
- COD ≤ 250mg/L
- Sulphate ≤ 1 mg/L
- Sulphide ≤ 1 mg/L

Additionally, the discharge is expected to meet the following BAT-AELs:

- AOX: 0.4mg/l
- Fluoride: 25mg/l

A trade effluent consent will be arranged with the local water undertaker prior to commencement of operations at the facility.

4.5 Emissions to Land

There are no emissions to land associated with the regulated activity at the facility.

5. ODOUR & NOISE

5.1 Odour

Through the proposed management techniques to be applied at the installation (including treatment of emissions through the RTO and effective management of solvent-based materials), the potential for generation of odours is considered to be low. To ensure this position is maintained, as per BAT 23, the facility will implement and regularly review an odour management plan as part of the EMS. This will include a protocol containing actions and timelines, and a protocol for response to identified odour incidents (e.g. complaints). Where odour issues at site are identified, an odour prevention and reduction programme will be developed to identify the source(s) to characterise the contributions of the source(s), and to implement prevention and/or reduction measures.

5.2 Noise

The continuous operation of the facility presents a potential noise issue in relation to nearby sensitive receptors. A noise assessment of the proposed activities has been undertaken to determine the potential impact of the installation and identify control measures where appropriate.

5.2.1 Noise Assessment

An environmental noise survey was undertaken by Vanguardia in July 2021 (Ref: VC-103500-EN-RP-0001 (the “third-party noise assessment”) to establish the prevailing noise climate in the vicinity of the site and to assess the impact of noise emissions from the proposed operation of the facility. The noise assessment was a requirement of Condition 14 of planning permission KET/2018/0774 (Outline Application for the proposed development). A copy of the report has been provided in Appendix 3.

The cumulative predicted noise level at each receptor was corrected as appropriate for acoustic features to determine the BS4142 rating level, which was compared with the typical background noise level at that location. At all but one location the rating level was predicted to be no louder than the typical background noise level. In this one location, the exceedance was predicted to be 1dB, but given the context, was not considered to be significant.

No significant adverse impact was predicted as a result of the proposed development.

6. MONITORING

6.1 Monitoring Emissions to Air

BAT 11 requires the monitoring of emissions in wase gases with at least the frequency given below and in accordance with EN standards.

Emission Point	Substance/Parameter	Standard(s)	Minimum Monitoring Frequency	Monitoring Associated With
A1 (RTO)	*TVOC*	EN 12619	Annual	BAT 14, BAT 15
	NO_x	EN 14792	Annual	BAT 17
	CO	EN 15058	Annual	BAT 17

6.2 Monitoring Emissions to Surface Water

There are no emissions to Surface Water associated with the proposed regulated activity and therefore no monitoring is required.

6.3 Monitoring Emissions to Sewer

Emissions to sewer are anticipated, where these occur the following monitoring will be undertaken prior to discharge from the installation.

Emission Point	Substance/Parameter	Standard(s)	Minimum Monitoring Frequency	Monitoring Associated With
S1	*AOX*	EN ISO 9562	Monthly	BAT 12, BAT 21
	Fluoride	EN ISO 10304-1	Monthly	BAT 12, BAT 21

6.4 Monitoring Emissions to Land

There are no emissions to land associated with the proposed regulated activity and therefore no monitoring is required.

6.5 Monitoring and Reporting of Waste

As the regulated activity is not associated with a waste Installation or Activity, the monitoring and reporting of waste is not considered to be appropriate to the site, other than as required for resource efficiency requirements or other internal environmental management system requirements.

7. ENVIRONMENTAL MANAGEMENT SYSTEMS

7.1 Summary

Ball Packaging is developing the site as a new facility and therefore, the management system for the site has not yet been implemented; however, a management system will be developed and implemented in accordance with Ball Packaging's corporate system requirements incorporating the following elements:

- Operations and maintenance;
- Management of change;
- Training and competence;
- Incidents, accidents & complaints management;
- Maintaining records; and
- Site closure.

A summary of the anticipated approach is provided below, although the final system as implemented may vary from this.

The management system will seek to identify and minimise the risk of pollution and harm to human health which may arise from operation, maintenance, accidents, incidents and non-conformances specific to the proposed operation of the facility. A list of environmentally critical plant and instrumentation will be developed and maintained. Maintenance of environmentally critical plant will be routinely included in the maintenance schedule.

The management system and procedures will be available for inspection upon request and will be applicable to all staff, contractors and visitors to the facility. The management system will be developed to enable compliance with the environmental permit and other legislative requirements for the protection of the environment and human health.

The management system and procedures will be subject to a regular review process. Internal review of the management system (or relevant parts therein) will be undertaken at least on an annual basis or in the event of a change in operations / site processes. Internal audits will be undertaken to ensure compliance with the management system, relevant legal requirements, environmental and management performance and to identify preventative / corrective actions to minimise the risk of breach / non-compliance. The findings of any such review and audits will be communicated to all staff and relevant external contractors and where appropriate improvement works / corrective actions implemented. All internal reviews, audits, amendments to the management system and improvement measures implemented will be recorded for reference and inspection purposes.

The following sections discuss the scope of the proposed management system and how it covers the main requirements for a management system set out in the Environment Agency's guidance.

Site Plans

A full final set of site plans for the proposed facility will be developed and maintained to reflect the location, layout, boundary and as-built conditions of the site. All drawings will be to scale and will be amended as required to reflect any changes to the process and other construction / operation changes to the site.

A copy of site plans and drawings, including those presented in Appendix 1, will be available from the operator for inspection / reference purposes.

Operations and Maintenance

Ball Packaging are in the process of developing SOPs for the operation of the facility, including delivery of hazardous materials and management of the drainage systems associated with the facility. These will be reflective of existing operational procedures from other UK plant operated by Ball Packaging.

The facility will be operated and maintained in accordance with a maintenance management plan which adheres to the requirements of the manufacturer. A computerised maintenance management system (CMMS) will be used to support the planning and recording of maintenance activities at the facility.

The operations and maintenance strategy for the facility will be based on:

- plant and equipment condition monitoring – undertake performance and health checks to ensure safe and efficient systems;
- preventative programmed maintenance and cleaning – using the CMMS to optimise maintenance activities;
- undertaking defect reporting and rectification – providing rapid response to system faults;
- minimising downtime/breakdown maintenance – the use of skilled engineering maintenance staff and 'call off' contracts;
- analysing historical data – to identify failure mechanisms and allow for system modification to enhance reliability;
- planning outages – including routine inspections and planned refurbishment; and
- optimal spares holdings - optimising system availability by identification of critical and specialist equipment spares.

A list of environmentally critical plant and instrumentation will be developed and maintained on site. Maintenance of the environmentally critical plant and instrumentation will form a key part in developing the routine maintenance schedule to be implemented at the site.

Accidents and Incidents

In addition to SOPs covering the operation and maintenance of the facility, the management system will also include environmental SOPs and health and safety SOPs to minimise the risk of accidents that may result in significant pollution and harm to human health, including for example:

- the maintenance of raw materials and waste registers;
- the delivery of raw materials and diesel/chemical spill response procedures;
- COSHH and task-based risk assessments;
- safety induction;
- reportable incidents and incident response; and
- accident / incident review.

During operation of the facility, accidents and incidents (including near misses) will be recorded and investigated in line with relevant procedures. These procedures will also allow for the implementation of improvement measure to prevent or reduce the risk of re-occurrence of an incident or where this is not possible to reduce the potential impact of the incident.

COMAH Regulations

The facility will not keep or hold quantities of any dangerous substances identified in the Control of Major Hazards and Accidents (COMAH) Regulations above the designated thresholds.

Site Security

Security measures to prevent unauthorised access to the site have been considered as part of the design process. Given the 24-hour operation of the facility, security measures will include:

- 24-hour on-site staff presence;
- the provision of a 2.4-metre high anti-climb security fence around the site perimeter;
- Sliding security control gates at the site entrance;
- Relevant signage at the site entrance;
- provision of building envelope around a significant proportion of the operation / process; and
- Security measures will be included in the management systems and shown on relevant site plans and drawings.

Incidents / Non-Compliances / Non-Conformances

Various measures have been put in places as part of the design process to prevent, or where that is not practicable, to reduce emissions from the facility. Such design measures include for example the use of sealed and bunded containment measures, segregated drainage systems, installation of shut-off valves on higher risk drainage, etc.

Information in relation to incidents / non-compliances / non-conformances will be recorded and reported, including:

- the date, time and duration of the incident;
- notification of the incident to the Regulator;
- the receiving environmental media in the event of any emission as a result of the incident;
- an initial estimate of the quantity and composition of any emission;
- the measures taken to prevent or minimise any emission or further emission;
- the cause and circumstances of the incident;
- an assessment of any harm to the environment;
- the steps taken to bring the incident to an end; and
- if necessary, proposals for improvements / remediation / preventing a repetition of the incident.

Procedures for the notification, recording, investigation, remediation and reporting of non-compliance or non-conformances are covered in the existing management system and included as part of the “Incident Plan”, which will be developed during commissioning. The Incident Plan

will be reviewed at least every 4 years. The findings of the review and any revisions to the plan will be recorded. Any changes to the plan will be communicated to the Regulator and to staff to ensure they are aware of the changes made.

Site Condition Report and Closure

Technical guidance states that as an operator when you come to apply to surrender your permit you need to be able to demonstrate that "you have taken the necessary measures to avoid pollution risk resulting from your activities and that the site has been returned to a satisfactory state".

To demonstrate this Ball Packaging as Operator will:

- produce an application stage Site Condition Report when first applying for an environmental permit;
- update the Site Condition Report as appropriate during the lifetime of the permit; and
- complete the surrender parts and submit a fully completed Site Condition Report when applying to surrender the environmental permit.

The Site Condition Report describes and records the condition of the land and groundwater at the site at the point of permit issue. The report and supporting records will be maintained over the lifetime of the site to demonstrate that land and groundwater have been protected during the lifetime of the site and that the land is in a satisfactory state at the time of the permit surrender application.

An application stage Site Condition Report has been prepared in accordance with Horizontal Guidance Note H5[3] and is included with this application.

Complaints

Management of complaints will be addressed within the management system and will be applied to the entire facility.

Any complaint received will be taken seriously and all necessary actions will be taken to investigate and fully resolve the complaint.

A record will be maintained of all complaints received in relation to alleged releases or emissions to the environment and the measures undertaken to resolve the issue. The record will contain the following information:

- the time and date the complaint was received;
- the method by which the complaint was communicated (e.g. letter, telephone, etc.);
- the name and contact details of the complainant;
- the nature of the complaint;
- investigation of the cause of the problem, measures taken to resolve it and ensure it is not repeated;
- the conclusion of any investigation and an explanation of the conclusions regarding the justification (or otherwise) of the complaint; and

[3] Horizontal Guidance Note H5, Guidance for applicants, Environmental Permitting Regulations, Site condition report – guidance and templates, LIT 8001 Version 3.0 April 2013

- any actions following the investigation (e.g. feedback of findings to the complainant; amendment to process / management systems, etc.) and their time and dates of completion.

Records will be maintained by the operator and will be available for inspection on request.

Resources and Training

Ball Packaging is experienced in the operation of this type of facility and will provide a team of appropriately trained and skilled personnel to manage the operation and maintenance of the facility.

The facility is designed to operate 24 hours per day and 7 days per week. Operation of the facility will be undertaken on a shift basis. Specialist external contractors will also be used for certain maintenance activities, particularly during planned shutdowns for the facility.

All staff will work under Ball Packaging's human resources policies and procedures including training and discipline. Staff will be trained to ensure competency in their particular role and to ensure they undertake their role in a safe manner.

- all new personnel will receive induction training, which will cover health, safety and environmental requirements.
- environmental awareness training will be provided to all employees and contractors involved with the generator plant. This will include the requirements of the Environmental Permit, including relevant emission limits and reporting requirements.
- key elements of operational training will form part of the technology supply contract and will be provided by specialist equipment manufacturers.

The site will establish and maintain job role profiles for all levels of personnel on-site which will provide minimum qualification and experience levels for all roles. A training matrix will also be maintained to ensure that all staff will receive appropriate training and where appropriate that refresher training is provided, including requirements for environmental training.

Training needs will be reviewed annually at a site level. Training will include environmental awareness training to ensure that all staff is fully aware of the environmental impacts of the facility and the potential impacts which could arise in the event of failure to control operations as designed together with notification procedures.

A training file will be kept for all personnel containing evidence of completed training, safety and technical competency assessments and also details of any briefings attended.

Emissions and Monitoring

Procedures for the monitoring of emissions will be developed as necessary and relevant to the facility, to include information on:

- emission points and any permitted discharge levels;
- monitoring locations, standards and reference conditions;
- frequency of monitoring, recording and reporting requirements; and
- emission control mitigation measures and management plans.

Environmental awareness training will be provided to all employees and contractors involved with the facility. This will include the requirements of the Environmental Permit, including relevant emission limits and reporting requirements.

Records

Records will be maintained in accordance with the requirements of the management system.

Records for the facility will include but not be limited to the following:

- incoming deliveries of VOCs and other associated chemicals;
- water and energy use;
- monitoring results for emissions to air and sewer;
- waste arisings and disposal;
- incidents, accidents and emergencies and details of follow-up;
- maintenance works scheduled and status;
- site infrastructure and boundary inspections;
- site diary;
- any other records required to be kept by the Environment Permit.

Document control procedures will be implemented to ensure that all documents are stored and controlled for easy reference, revised when appropriate, and authorised by relevant staff where necessary.

Records will be maintained for a minimum period of 4 years.

Access to Environmental Permit

A copy of the Environmental Permit will be maintained on site and will be made readily available for inspection to all members of staff.

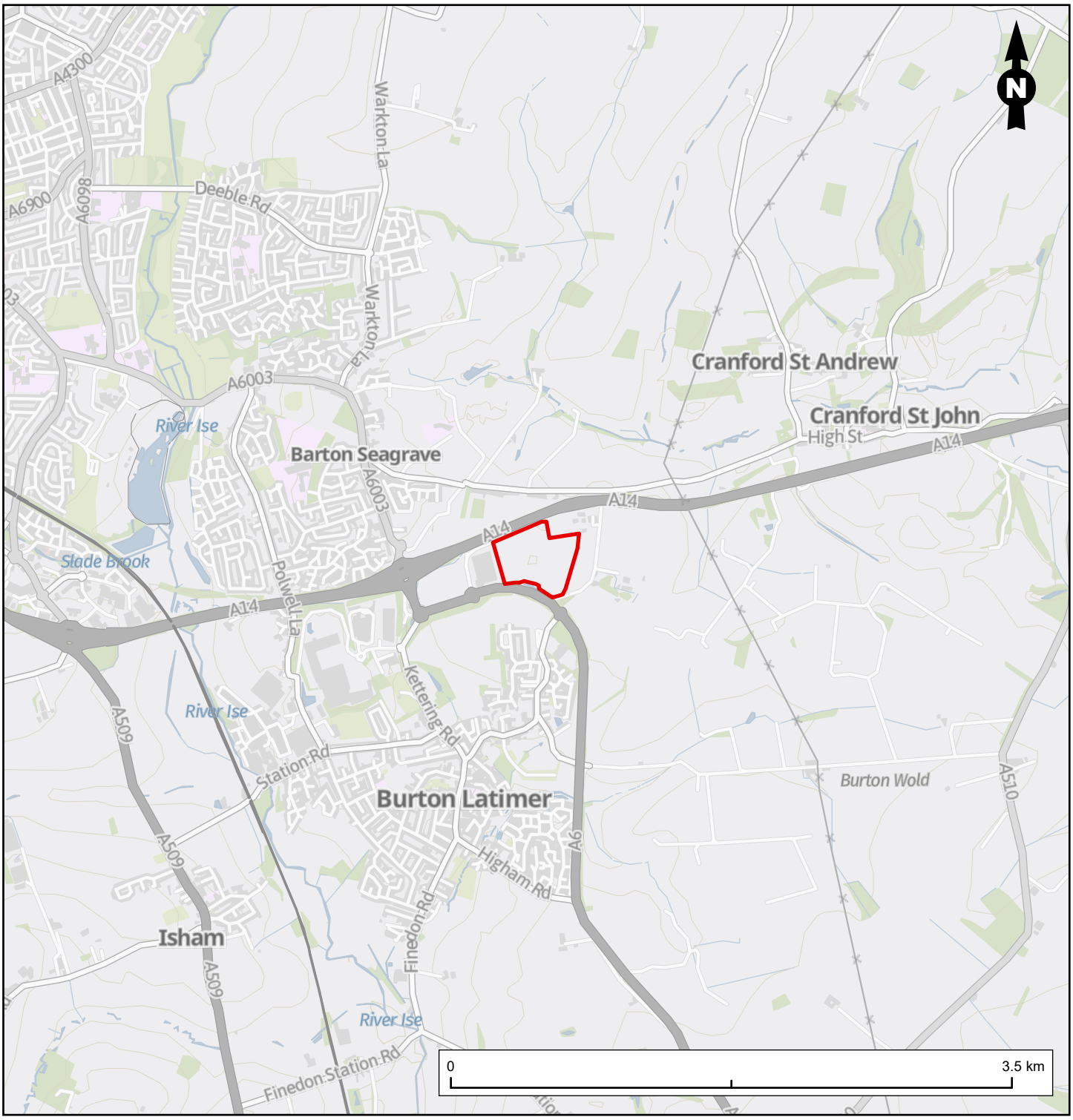
8. APPLICATION OF BAT

8.1 Determining Applicable BAT

The proposed regulated activity has a Best Available Technique (BAT) reference document under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions, for surface treatment using organic solvents including preservation of wood and food products with chemicals (dated 22 June 2020).

Ramboll has produced a separate BAT Assessment document (ref. 1620011745-001: Surface Treatment using Organic Solvents BAT Review, May 2022) which is included with the application.

APPENDIX 1
FIGURES



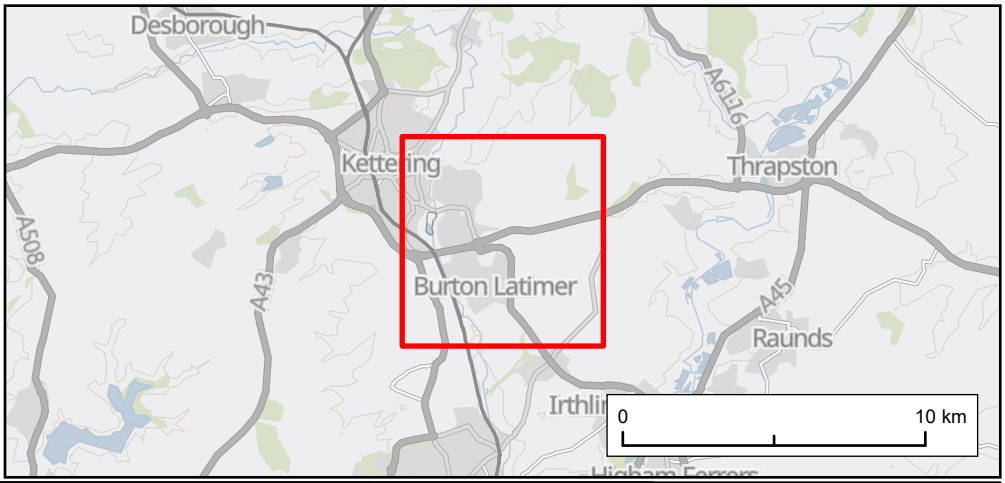
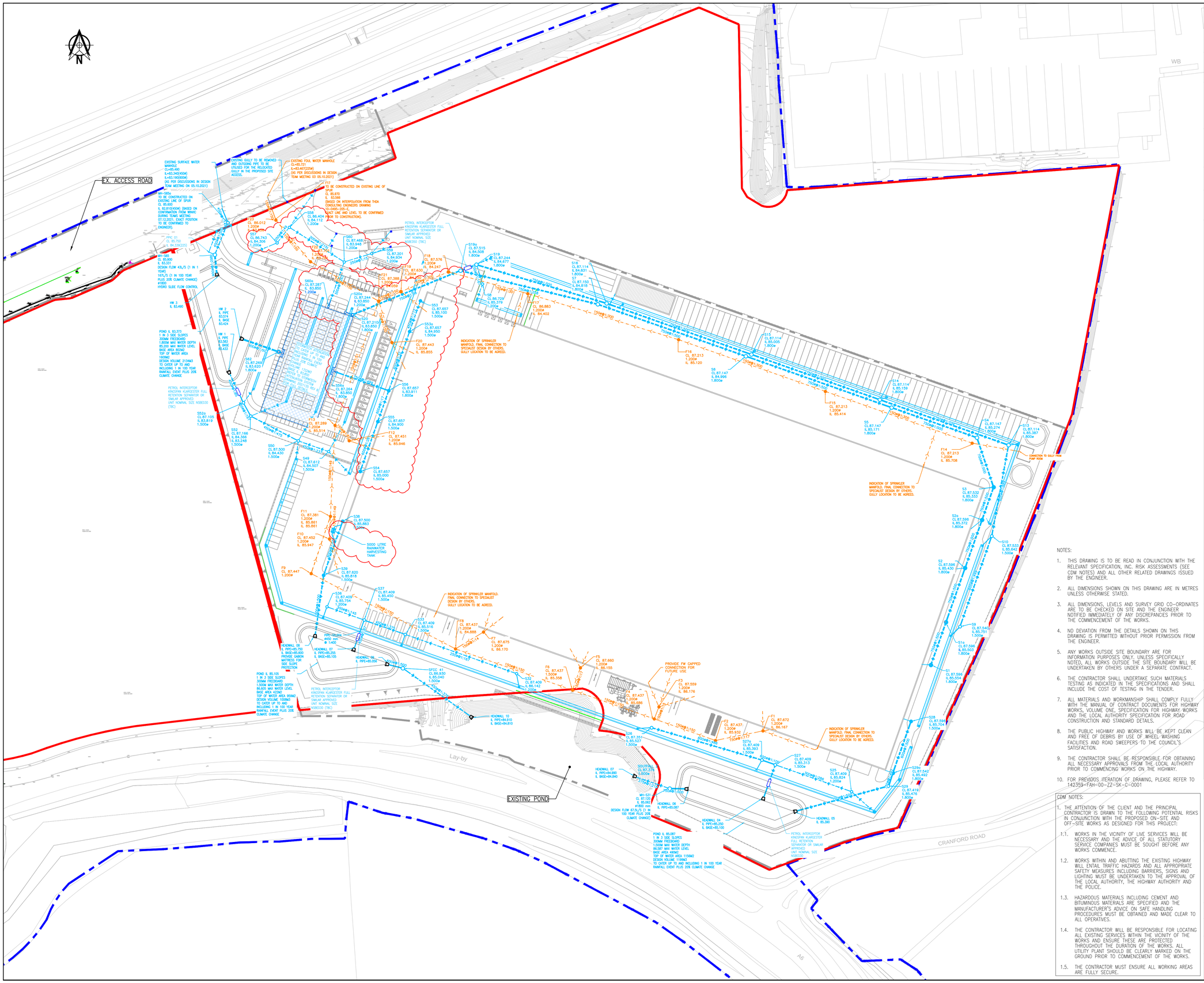


Figure Title: Figure 1: Site Location	Project Name: Plot 4b, Segro Park, Kettering	Date: April 2022	
		Scale on Main Map: 1:35,000	
Project Number: 1620011745-001	Client: Ball Beverage Packaging UK Limited	Issue: 1	Prepared By: lb

RAMBOLL



Do not scale from this drawing.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.

RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DESIGN ASSESSMENT FORM NO.

CONSTRUCTION

DEMOLITION

FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE SEE THE HEALTH AND SAFETY FILE

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

LEGEND

- SURFACE WATER PIPE
- FOUL WATER PIPE
- PCIC SURFACE WATER MANHOLE
- PCIC SURFACE WATER MANHOLE WITH VENTED COVER
- PETROL INTERCEPTOR
- LINEAR DRAINAGE CHANNEL
- RAINWATER HARVESTING TANK
- ROAD GULLY
- FOUL WATER MANHOLE – PCC
- FOUL PPIC
- APPLICATION BOUNDARY
- DEVELOPMENT BOUNDARY
- PROPOSED RETAINING WALL

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION, INC. RISK ASSESSMENTS (SEE CDM NOTES) AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.
3. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
4. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
5. ANY WORKS OUTSIDE SITE BOUNDARY ARE FOR INFORMATION PURPOSES ONLY, UNLESS SPECIFICALLY NOTED, ALL WORKS OUTSIDE THE SITE BOUNDARY WILL BE UNDERTAKEN BY OTHERS UNDER A SEPARATE CONTRACT.
6. THE CONTRACTOR SHALL UNDERTAKE SUCH MATERIALS TESTING AS INDICATED IN THE SPECIFICATIONS AND SHALL INCLUDE THE COST OF TESTING IN THE TENDER.
7. ALL MATERIALS AND WORKMANSHIP SHALL COMPLY FULLY WITH THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOLUME ONE, SPECIFICATION FOR HIGHWAY WORKS AND THE LOCAL AUTHORITY SPECIFICATION FOR ROAD CONSTRUCTION AND STANDARD DETAILS.
8. THE PUBLIC HIGHWAY AND WORKS WILL BE KEPT CLEAN AND FREE OF DEBRIS BY USE OF WHEEL WASHING FACILITIES AND ROAD SWEEPERS TO THE COUNCIL'S SATISFACTION.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY APPROVALS FROM THE LOCAL AUTHORITY PRIOR TO COMMENCING WORKS ON THE HIGHWAY.
10. FOR PREVIOUS ITERATION OF DRAWING, PLEASE REFER TO 142359-FAH-00-ZZ-SK-C-0001

CDM NOTES:

1. THE ATTENTION OF THE CLIENT AND THE PRINCIPAL CONTRACTOR IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:

1.1. WORKS IN THE VICINITY OF LIVE SERVICES WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.

1.2. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE.

1.3. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURER'S ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.

1.4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.

1.5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

Rev.	Date	Description	Drwn.	Chkd.	Appd.
C02	09.12.21	NOTE REGARDING TRADE EFFLUENT REMOVED. FOUL WATER MANHOLE SIZES REVISED ON PLAN. STORM WATER AMENDED AS CLOUDED. RAINWATER HARVESTING TANK ADDED	SA	DL	MJT
C01	06.12.21	DRAINAGE LAYOUT UPDATED, COVER LEVELS RAISED TO SUIT COLLINS RAISED LEVELS, DRAWING STATUS UPDATED.	DL	DL	MJT
P02	16.11.21	POND SIZE INCREASED, ATTENUATION TANK REDUCED, FW PUMP ADDED.	DL	DL	MJT
P01	27.09.21	FW CONNECTION POINTS ADDED	CDR	DL	MJT
T4	04.06.21	FW CONNECTION POINTS ADDED	JHJ	DM	DM
T3	24.05.21	F.W. PIPE DIA ADDED & INTERNAL F.W. AMENDED/REMOVED	CS	DM	DM
T2	14.05.21	PROPOSED ROAD AND DRAINAGE LEVELS AMENDED	JHJ	DM	DM
T1	26.04.21	TENDER ISSUE	JHJ	DM	DM

FAIRHURST
Oak House
Reeds Crescent
WATFORD
WD24 4PH
Tel: 01923 210 460
Fax: 0844 381 4412

Client: SEGRO WHERE BUSINESS WORKS

Project Title:
PLOT 4B
KETTERING

Drawing Title:
OVERALL DRAINAGE LAYOUT

Scale at A1:	Status:	
1:1000	CONSTRUCTION	
Drawn:	Checked:	Approved:
JHJ	DM	DM
Date:	Date:	Date:
26/04/2021	26/04/2021	26/04/2021

Drawing No.: P21028-FRH-EW-XX-DR-C-2000

Revision: C02

- Dimensions are in millimeters, unless stated otherwise.
- Scaling of this drawing is not recommended.
- It is the recipients responsibility to print this document to the correct scale.
- All relevant drawings and specifications should be read in conjunction with this drawing.

N

Key

Site Boundary	29.10 ac	11.78 ha
Development Boundary		
Permit Boundary		

W1 Surface Water Discharge

S1 Foul Sewer discharge

A1 RTO Air Emissions Point

A2 Boiler Air Emissions Point

A14 Dual Carriageway

Existing Estate Road

Incoming Services (2x Elec & 1x Gas)

Car Cycle- & Pedestrian Entrance

Dedicated HGV Entrance

W1

Security Barriers

Security Barriers

Cycle Shelters

Attenuation Pond

Car Parking 230no. Spaces Inc. 23no. accessible / 23no. EVCP

Main Deliveries & Emergencies Only

Drivers Entrance

Staff Entrance

6no. Dock Doors

1no. Level Access Door

3no. HGV Waiting Bays (with wheel stops)

Pallet Storage

45m Service Yard

50no. HGV Parking Spaces (With Wheel Stops)

Sprinkler Tanks & Pumphouse (Tenant Fit-Out)

Landscape Buffer

The Boundary Conditions Continues to climb for 1000's Protected Kites to Eastern Gates Elevation

WB

WB

Existing Bunzl facility

10no. Contractor Veh Spaces

35m Service Yard

Engineering Operations

A2

1no. Level Access Door

10no. Temporary Cabins

1no. Level Access Door

2no. Level Access Doors

25m Service Yard

Attenuation Pond

Oxidiser

S1

A1

1no. Level Access Doors

1no. Level Access Door

Dry Coolers

1no. Level Access Door

Canopy Over

1no. Level Access Door

Attenuation Pond

Retaining Structure to Existing Attenuation Pond to be remodelled to accommodate yard

Lay-by

A 6

GRANFORD ROAD

10m

SCALE 1:1000

APPENDIX 2
RTO SPECIFICATION

1. SYSTEM DESCRIPTION

The abatement system to be installed at Ball Beverage Packaging, Kettering consists of a Regenerative Thermal Oxidiser (RTO) that is operated in conjunction with a Zeolite Rotary Concentrator. The Zeolite Rotary Concentrator (ZRC) treats the exhaust from the cold processes (Ink Mist Over Varnish, Internal Spays and IBO conveyors). The air from the inside spray machines (ISS) is first filtered through a reverse jet bag filter to remove lacquer particles. The concentrated air from the ZRC is fed to the RTO for destruction, along with the exhausts from the hot processes (IBO and Pin ovens). A secondary heat recovery system (air to water heat exchanger) is fitted to the RTO exhaust to recover available heat from the hot exhaust air to heat water for a low temperature water circuit).

This section contains a summary of the design data for the installation, a general introduction to the oxidation and adsorption processes, and a description of the abatement plant EIS will provide.

1.1 Design Data

The system has been designed to meet the following design requirements that were provided in the Ball enquiry: (Note: EIS is contracted to provide abatement for Lines 1 – 4. The main plant items RTO/Concentrator/Stack/Heat Exchanger are designed and supplied to also process the future flows from Lines 5 & 6)

1.1.1 Cold Flows Lines 1 - 6

Cold Airflow	92753Nm^3/hr
Cold Flow Maximum Temperature	35°C
Maximum VOC Concentration	500mg/Nm^3

1.1.2 Hot Flows Lines 1 - 6

Oven Air Flow	79542Nm^3/hr
Oven Air Flow Maximum Temperature	165˚C
Maximum VOC Concentration	1000mg/Nm^3

1.1.3 Total RTO Flow with desorption air

Maximum Inlet Air Flow	91972Nm^3/hr
Maximum Inlet Air Flow Temperature	153°C

1.1.4 Regenerative Thermal Oxidiser (RTO) - DESIGN

Process type	Oven Exhaust & Filtered Cold Flows
Altitude	80m Above Sea Level
RTO Inlet Design	91972Nm^3/hr at 153°C and 124.02kg/hr VOC
Humidity	Ambient
Inlet Suction Pressure	-500 Pa
Particulates	<20mg/Nm^3
Silicone Compounds In Air Stream	Unspecified Assumed Zero

1.1.5 Zeolite Rotary Concentrator (ZRC) - DESIGN

Process type	Sprays, Ink Mist and IBO Conveyor Exhaust
Concentrator Inlet Design	92753Nm^3/hr at 35°C and 46.4kg/hr VOC
Concentration Ratio	10:1
Humidity	< 60%
Particulates	<20mg/Nm^3 (Zero Aerosol)

1.1.6 VOC List

Various mixtures containing some or all of the following main contaminants;

Ethylene Glycol Mono Butyl Ether

N-Butanol

Pentanol

Iso-Butanol

1.1.7 Design Emission Values (based on design inlet conditions)

Provided that the system is operated and maintained fully in accordance with our operating and maintenance manuals and that the duty is as given above, then we guarantee the system will achieve the following emissions over a time weighted average. All emissions will be measured under stack conditions with no corrections for oxygen or water content.

VOC	<=	20mgC/Nm^3
CO*	<=	50mg/Nm^3
NOx**	<=	50mg/Nm^3

* Based on zero CO on the inlet of the system

** Based on zero NOx on the inlet of the system and no nitrogen bearing VOCs in the process that when combusted will form NOx

1.2 Technical Data (Equipment)

1.2.1 Regenerative Thermal Oxidiser (RTO)

Oxidiser reference number	EC21395
Total RTO Inlet Design Volume	91972Nm^3/hr
Date installed	2022
Oxidiser Type	Regenerative Thermal
Main Fan Type	Induced Draft
Damper Actuation	Pneumatic
Compressed Air Consumption (Typical)	25Nm3/hr
Compressed Air Quality	Clean, dry and free of oil
Compressed Air Dryness Dew Point	- 40^{o}C
Compressed Air Supply Pressure	6 barg
Number of Main Fans Installed	1
Oxidiser Heat Recovery	96 %
Normal combustion chamber temperature	800-900deg C
Gas burner installed capacity (LHV)	2500 kW
Temperature Control Type	Standard
Supply power voltage	400 V
System control voltage	24 V
Burner control voltage	230 V
Gas Pressure (at inlet to gas train)	300mbar
Bakeout Design Temperature	400^{o}C max
Main Fan Motor	355kW
Flushing Fan Motor	7.5kW
Combustion Air Fan	11kW
Duct Purge Fan	2.2kW
Desorption Fan	15kW

Prior to the ignition of the RTO burners it is essential that the RTO and associated ductwork is purged. The details of the purge sequence is described in detail in document "*EIS Control Description and Functional Design Specification*"

System Purge Sequence and Times

	Time (mins)							
	1	2	3	4	5	6	7	8
Hot Duct Purge			→	→	→	→		
RTO Purge			→	→	→	→		
Desorption System Purge	→	→						
Concentrator Purge					→	→		

RTO Fan Speed (% full speed) for Purge 20%

1.2.2 Hot Water Heat Exchanger

Location	Installed in RTO Exhaust Duct
Type of Heat Exchanger	Air to Water
Air Outlet Temperature Limit (to minimise condensation)	110°C Min
Maximum System Water Pressure	5 Barg
Design Water Inlet Temperature	70°C
Design Water Outlet Temperature	90°C
Max Water Temperature (Shutdown)	110°C
Max Water Flowrate	174m^3/hr
Max Available Recovery	1900kw
Pressure Drop (Water Side)	0.5 Bar

1.2.3 Zeolite Rotary Concentrator (RZC)

Concentrator reference number	EC21395 VMU II-3750-V40-N
Total Process Volume	92753Nm^3/hr
Adsorption Medium	Zeolite
Cooling Flow Rate	8750Nm^3/hr
Concentrated Air Volume (To RTO)	9275Nm^3/hr
Inlet Temperature	35°C
Humidity	< 60%
Inlet Solvent Concentration	<500mg/Nm^3
Particulates	<20mg/Nm^3 (Zero Aerosol)
Rotor speed	Around 3.2 rph
Source of Desorption Heat	500kW In Duct Heater

Desorption Temperature (Setpoint)	210°C
Desorption Temperature (Max Alarm)	220°C
1st Stage Pre Filter	G4
2nd Stage Pre Filter	F9
Concentrator Fan	132kW

1.2.4 Reverse Jet Filter (RJF) (For L1 to L4 ISS and IBO Hoods)

RJF reference number	EC21395 66CJCD740 14x8
Volumetric Flow (Max As Installed)	37424Nm^3/hr (41544Am3/hr)
Inlet Temperature	30 ^{O}C
Process	Beverage Can Coating
Dust Classification	St3
Suction Pressure on Filter from Fan	-5900 Pa Max
Pressure Drop Allowed across Filter	1000 Pa (dirty condition)
Compressed Air Consumption (Typical)	30Nm3/hr
Compressed Air Quality	Clean, dry and free of oil
Compressed Air Dryness Dew Point	- 40°C
Compressed Air Supply Pressure	6 barg
Sprays Filter Fan	132kW

1.2.4 Ink Mist Over Varnish Filters IMOV (For L1 and L2 Decorators)

RJF reference number	EC21385
Volumetric Flow (Max As Installed)	6100Am3/hr
Inlet Temperature	20 ^{O}C
IMOV Fan 6100Am³/hr at 3500pa	7.5kW
1st Stage Filter	G3
2nd Stage Filter	F7

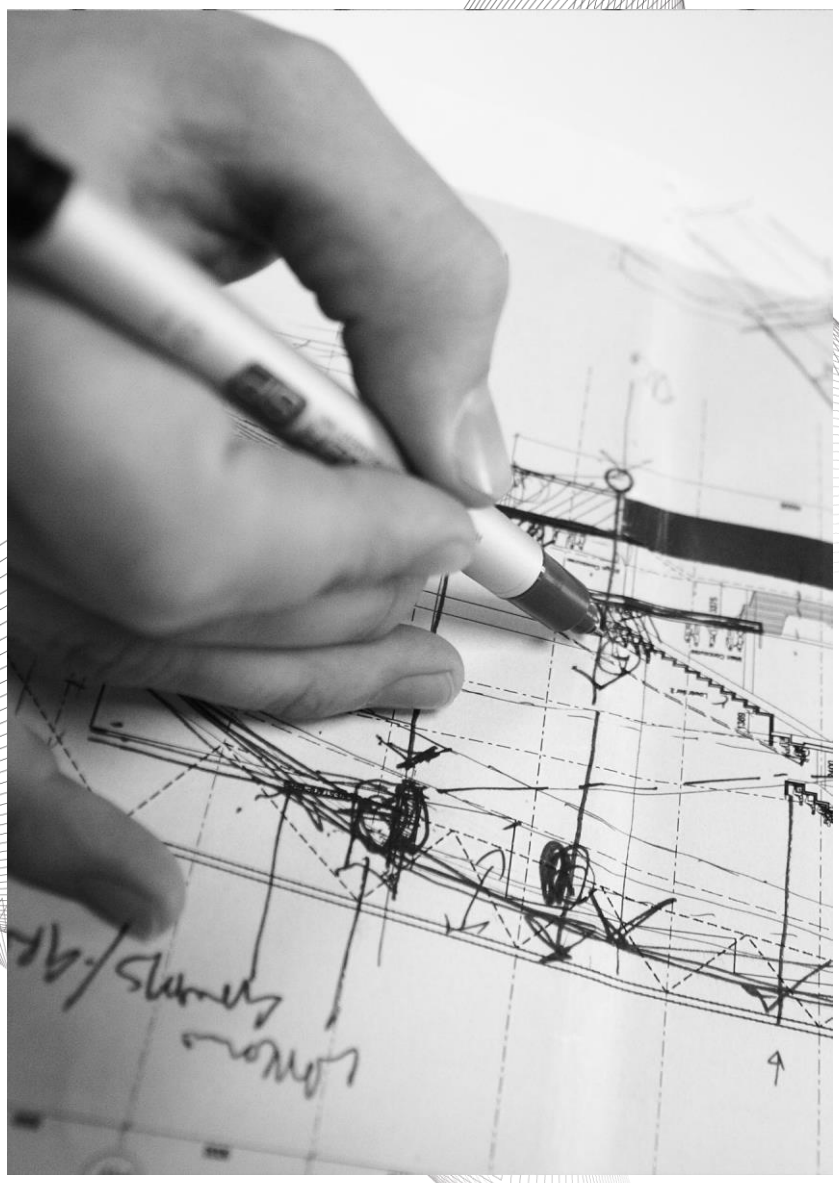
APPENDIX 3
NOISE ASSESSMENT

KETTERING GATEWAY PLOT 4B

NOISE IMPACT ASSESSMENT TO SUPPORT THE DISCHARGE OF CONDITION 14

VC-103500-EN-RP-0001
R02

1 JULY 2021



VANGUARDIA

DOCUMENT CONTROL			
DOCUMENT TITLE	NOISE IMPACT ASSESSMENT TO SUPPORT THE DISCHARGE OF CONDITION 14	**REVISION**	02
DOCUMENT NUMBER	VC-103500-EN-RP-0001	**ISSUE DATE**	1 JULY 2021
PROJECT NUMBER	103500	**AUTHOR**	AT
STATUS	DRAFT	**CHECKED**	RD
ISSUED TO	CLIENT	**PASSED**	JS

REVISION HISTORY		
REVISION	**NOTES**	**DATE ISSUED**
R01	DRY COOLERS ROTATED THROUGH 90 DEGREES	28/6/21
R02	SLIGHT REVISIONS IN RESPONSE TO COMMENTS FROM RAMBOLL	1/7/21

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CONTENTS

1. INTRODUCTION

1.1. Vanguardia has been appointed by SEGRO to undertake an assessment of the likely noise emission from the proposed development at Plot 4B of Kettering Gateway. The proposed development is for a large warehouse of approximately 5700 m^2 which will be used for the manufacture and distribution of aluminium drinks cans. To assist with the understanding of this report a glossary of acoustic terms is provided in Appendix A.

1.2. Kettering Gateway is located to the south-east of Kettering, immediately south of the A14 and east of the A6. The proposed site layout is shown in Appendix B. The proposals include warehousing (which will contain both production and distribution elements) and offices. The onward distribution of goods will occur from the northern side of the warehouse, while the south side will receive the raw materials to manufacture the cans. There are also service yards on the northern and southern warehouse façades.

1.3. Outline planning permission for the site was granted in December 2018 (KET/2018/0774). Condition 14 of the outline planning permission relates to noise and states that;

> *Prior to the first occupation of any of the buildings within the site for any purpose falling within use class B2 (general industry) or notwithstanding the provisions of the Town and Country Planning (Use Classes Order) 1987 (as amended) or any order amending, reinstating or replacing that order, any subsequent change within that use class, details of expected noise and/or emissions along with identified mitigation measures shall be submitted for the written approval of the Local Planning Authority and thereafter the measures shall be undertaken for the lifetime of that use.*
>
> *REASON: In the interests of pollution and noise control and the amenity of the other occupied units in accordance with policy 8 of the North Northamptonshire Joint Core Strategy.*

1.4. This report provides an assessment of the expected operational noise associated with the proposed development at Plot 4B to support the discharge of the noise related elements of Condition 14.

1.5. The assessment has been undertaken using information supplied by the proposed occupier about the nature of their operations and the plant and equipment that will be installed at the proposed development.

2. PLANNING POLICY CONTEXT & RELEVANT GUIDANCE

POLICY

NATIONAL PLANNING POLICY FRAMEWORK 2019

2.1. The National Planning Policy Framework (NPPF), last amended in June 2019, sets out the government planning policy for England. At its heart is an intention to promote more sustainable development.

2.2. The relevant paragraphs concerning noise in the NPPF are:

- Paragraph 170e: Specifies that new and existing development should be prevented from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution and, wherever possible, should help to improve local environmental conditions.
- Paragraph 180: "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
  a) *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*"

2.3. The NPPF makes direct reference to the Noise Policy Statement for England for advice on the achievement of these policy aims.

NOISE POLICY STATEMENT FOR ENGLAND 2010

2.4. The Noise Policy Statement for England (NPSE) sets out the government's overall policy on noise management. It aims to promote good health and a good quality of life through the effective management of noise in the context of government policy on sustainable development.

2.5. It uses the previously established concepts of No Observed Effect Level (NOEL) and Lowest Observed Adverse Effect Level (LOAEL), and extends these concepts by introducing Significant Observed Adverse Effect Level (SOAEL). This is the level above which significant

adverse effects on health and quality of life are likely to occur. However, the explanatory note to the NPSE states that it is not possible to identify a single objective value to define SOAEL that is applicable to all sources of noise in all situations. It is likely to be different for different noise sources, for different receptors and at different times.

2.6. The NPSE sets out the following long-term vision of noise policy and supporting aims in paragraphs 1.6 and 1.7:

> *"Noise Policy Vision*
>
> *Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*
>
> *Noise Policy Aims*
>
> *Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> *Avoid significant adverse impacts on health and quality of life;*
>
> *Mitigate and minimise adverse impacts on health and quality of life; and*
>
> *Where possible, contribute to the improvement of health and quality of life."*

2.7. The second aim of the NPSE refers to noise impacts that lie somewhere between LOAEL and SOAEL; while these may be considered as adverse effects, they are not considered as significant.

2.8. The NPSE asserts that, while all reasonable steps should be taken to mitigate and minimise adverse effects, this does not mean that such adverse effects cannot occur.

PLANNING PRACTICE GUIDANCE: NOISE (2019)

2.9. Further government guidance on the consideration of noise for planning has been published as the Planning Practice Guidance for Noise (PPG:N), last revised in July 2019. The PPG:N supports the NPPF by providing a range of advice and includes a noise exposure hierarchy table, and again makes reference to the NPSE.

2.10. The hierarchy table (replicated in Table 1 below), provides descriptive (i.e. non-numerical) guidance on the potential effects of noise exposure at levels corresponding to the NOEL, LOAEL and SOAEL as described in the NPSE, and confirms that adverse effects (between LOAEL and SOAEL) should be mitigated and reduced to a minimum, and significant adverse effects (above SOAEL) should be avoided, taking account of the economic and social benefit of the activity causing or affected by the noise.

Table 1 PPG:N Noise Exposure Hierarchy

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

CONSULTATION

2.11. Consultation regarding the approach to the assessment was undertaken in April 2021 with Environmental Protection Officers at North Northamptonshire Council.

2.12. During this consultation it was agreed;

- to undertake an assessment following the principles of BS 4142:2014+A1:2019;
- initially aim to achieve a rating level which does not exceed the background sound level at the noise sensitive receptors;
- however, in accordance with the guidance in BS 4142 the assessment will also consider the context in drawing a conclusion about the likely impact of the proposed development;
- the noise sensitive receptors and background sound levels would be those set out in the ES/noise & vibration report which accompanied the outline application ref. KET/2018/0774.

RELEVANT GUIDANCE

BS4142:2014+A1:2019 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND.

2.13. The assessment of the potential impacts arising from operational sound associated with the Proposed Development is based on the principles of BS 4142:2014+A1:2019. This methodology provides an initial estimate of impact based on the difference between the sound from the source being assessed (the specific level) and the existing background sound level at the measurement location.

2.14. Regarding the background sound level, the standard states that the value used should be representative of what occurs at the receptor locations during the assessment periods and that the objective is not simply to identify the lowest level. Typical background sound levels are usually identified using statistical analysis; see the Baseline Conditions section below for further information.

2.15. The standard also states that certain characteristics, if perceptible at the receptor location, can increase the extent of the impact over that expected from a simple difference in noise levels. These characteristics include tonality, impulsivity and intermittency as well as “other sound characteristics” which is used when the sound might be readily distinctive against the residual acoustic environment but is not considered to have any of the other three features.

The standard describes various options for taking any such features into account and for determining what is described in the standard as a 'rating level'.

2.16. The standard states that the extent of the impact can be determined by subtracting the typical background sound level from the rating level. The greater the difference the greater the magnitude of the initial impact estimate. The standard states that:

> *'Typically, the greater this difference, the greater the magnitude of the impact.*
>
> *A difference of around + 10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.'*

2.17. The standard states that while the difference between the rating level and the background sound level provides an initial estimate of impact, other factors should be considered in terms of context, such as the absolute noise levels and how the character and level of the source relates to the existing sound environment. Regarding the absolute noise levels, relevant guideline values are presented in Table 2.

Table 2 Summary of Guideline Values from BS 8233:2014

Location (activity)	Time period	Desirable Sound Level not to be exceeded
Inside bedrooms and living rooms (resting)	Day (07:00-23:00)	**35 - 40 dB $L_{Aeq,T}$**
Inside bedrooms (sleeping)	Night (23:00-07:00)	**30 - 35 dB $L_{Aeq,T}$**
Inside Dining Room/area (dining)	Day (07:00 – 23:00)	**40 - 45 dB $L_{Aeq,T}$**
External Amenity Space	Day (07:00-23:00)*	**50-55 dB $L_{Aeq,T}$**

*Time period not defined but assumed to be day.

2.18. The lower values presented in the table are generally regarded as the LOAEL for steady external sound, i.e. no adverse effect due to the impact of the sound would be expected. If the sound has certain characteristics at the receptor location, it could be appropriate to consider a lower value as the LOAEL.

3. BASELINE CONDITIONS & NOISE SENSITIVE RECEPTORS

NOISE SENSITIVE RECEPTORS

3.1. Consideration has been given to the area surrounding the A14 Business Park and the nearest noise sensitive receptors, which may potentially be adversely affected by the site once operations have commenced.

3.2. The locations of the nearest noise sensitive receptors (as identified in Figure 1 of Appendix 8.1 to the 2018 Environmental Statement[1]) are illustrated in Appendix C. To the north-east the nearest noise sensitive receptors are the residential dwellings at Blackbridge Farm and to the east are Windmill Cottages, both located on Cranford Road.

3.3. To the south of the A6, there is a cluster of dwellings on Elm Road, Woodland Drive and The Crescent. To the west, beyond Kettering Road there are a number of existing commercial premises which are part of an existing business park.

3.4. To the north, the nearest noise sensitive receivers are located on Cranford Road, north of the A14.

BASELINE CONDITIONS

3.5. A baseline noise survey was undertaken by Hoare Lea in February 2013 for the ES. Monitoring was conducted at six locations surrounding the site to establish the existing residual and background noise levels. The survey locations were selected to obtain a representative sample of the existing baseline noise climate at nearby noise-sensitive receptors that have the potential to be altered by the proposed development. Unattended long-term surveys were carried out over a weekday and weekend period by Hoare Lea.

3.6. The noise measurement locations comprised:

- Location 1 – Recycling plant and Residential Property at Blackbridge Farm
- Location 2 – Field adjacent to Windmill Cottages
- Location 3 – Boundary of properties to the south of Cranford Rd
- Location 4 – Field adjacent to industrial unit on Kettering Rd
- Location 5 – Field adjacent to A14 Junction 10 (within site boundary)

[1] P_1004806_PJ_20130924_1.TechnicalAppendixNoise.0774.2018.KET.041018

- Location 6 – Field boundary of properties to the north of Cranford Rd

3.7. The background noise climate is characterised by road traffic from the A14, A6 and industrial activities. Table 3 below provides daytime and night-time levels for the measurement locations.

3.8. The weather during the survey was dry with light showers on occasions, but mostly dry with breaks of sunny periods. Full details of the survey can be found in the Chapter 8 of the 2018 Environmental Statement[2].

3.9. The noise levels presented in Table 3 show the average ambient $L_{Aeq,16\ hour}$ from the survey period, the average ambient $L_{Aeq,8\ hour}$ from the survey period, and the typical background noise levels derived from a statistical analysis of the most commonly occurring levels. The analysis of these data can be found in Appendix D, with the selected typical levels indicated in blue.

3.10. It is noted that this data reflects the background noise environment at the time of measurement, and it is likely that the levels will have increased since that time, so this is considered a robust basis for the assessment.

3.11. Locations 4 and 5 do not have any associated noise sensitive properties for consideration and have therefore been excluded from the assessment. Location 7 was not included in the original baseline assessment but has been added due to its closer proximity to the proposed development site than Location 6. It has been assumed to have the same noise climate as Location 6, although in reality may be subject to marginally higher noise levels.

Table 3 Baseline levels for Assessment

Location	Averaged Ambient Noise Levels dB		Typical Background Noise levels dB	
	Daytime ($L_{Aeq,16\ hour}$)	Night-time ($L_{Aeq,8\ hr}$)	Daytime ($L_{A90,1\ hour}$)	Night-time ($L_{A90,5\ min}$)
Location 1	57	53	52	42
Location 2	59	53	54	42
Location 3	57	52	52	40
Location 6	58	52	49	42
Location 7	58	52	49	42

[2] 0661.2013.KET.ES Chapter 8.Noise and Vibration

4. OPERATIONAL SOUND LEVELS

4.1. The primary sources of operational noise associated with the proposed development are:

- Noise from HGV manoeuvres in the service yard areas;
- Noise from plant associated with the proposed development (locations provided in Appendix E) which includes:
  - typical mechanical services plant to provide heating and cooling to office spaces;
  - specialist plant associated with the production and coating of aluminium drinks cans (i.e., an oxidiser, two dry air coolers, and a substantial quantity of roof-top mechanical plant to provide ventilation to the production area);
- Noise break-out from the internal production area.

4.2. It is proposed that initially the plant will operate 4 production lines, but that in future it could expand the production area within the warehouse to operate 6 production lines. Therefore, the predictions have been undertaken for both 4-line and 6-line operation.

4.3. In accordance with the relevant British standard for predicting and assessing this type of noise (BS4142:2014+A1:2019), the likely noise levels arising from operational activities at Plot 4B have been considered during the 1-hour daytime assessment period and 15-minute night-time assessment period.

4.4. The noise sources included in the model and their associated noise emission are discussed in turn below.

HGV MANOEUVRES

4.5. The proposed occupier has provided information regarding the level of HGV activity associated with the proposed Plot 4B development.

4.6. The unloading of raw materials will occur on the southern side of the warehouse between the hours of 07:00 – 18:00 hours. This activity will be concentrated in the south-east corner of the service yard and is understood to take approximately 30 minutes per vehicle. There is not proposed to be any HGV manoeuvring at night on this side of the warehouse.

4.7. A summary of the number of lorries per day (07:00 - 18:00 hours) and the number in the peak hour are presented in Table 4 below. This indicates the number of lorries there would be

under the initial 4 production line scenario and how many under the 6 production line scenario.

Table 4 No. of HGVs manoeuvring – southern service yard

	Daytime (07:00 – 18:00)		Night-time (23:00 – 07:00)	
Lines	**4 lines**	**6 lines**	**4 lines**	**6 lines**
Number (whole period)	20	30	0	0
Peak number per hour	2	3	0	0

4.8. The distribution of manufactured cans will take place from the northern side of the warehouse. This will be a 24-hour operation and loading is anticipated to occur for approximately 20 minutes per HGV.

4.9. A summary of the number of lorries in the daytime (07:00 – 23:00 hours) and the number in the peak 15 minutes at night (23:00 – 07:00 hours) is presented in Table 5. This indicates the number of lorries there would be under the initial 4 production line scenario and how many under the 6 production line scenario.

Table 5 No. of HGVs manoeuvring – northern service yard

	Peak Hour Daytime (07:00 – 23:00)		Peak 15 mins of Peak Hour Night-time (23:00 – 07:00)	
Lines	**4 lines**	**6 lines**	**4 lines**	**6 lines**
Number	4	8	1	2

4.10. In accordance with BS 4142:2014 the daytime assessment period is 1 hour. It is assumed therefore that during the peak hour of the day each HGV associated with the development arrives, reverses up to the unit, loads/unloads for 30 minutes and then starts the engine and pulls away.

4.11. The night-time assessment period is 15 minutes. It is unlikely that an HGV will complete all of its loading/unloading and manoeuvring within 15 minutes, so it is assumed that during the assessment period, the HGV either reverses or pulls away and that loading/unloading occurs for the rest of the assessment period.

4.12. As the vehicles arriving and departing the site may be from different distribution companies, it is not possible to guarantee the use of broadband reversing alarms on these third-party

vehicles. It has therefore been assumed, in order to present a worst-case assessment, that all reversing alarms will be narrowband.

4.13. Based on measurements taken at other distribution parks, the source spectra used for each activity are presented in Table 6.

Table 6 Source Terms for Typical HGV Activities

Activity	Sound Power Level Lw (dB) in each Octave Band (Hz)								LwA (dB)
	63	125	250	500	1000	2000	4000	8000	
HGV Reverse	102	95	95	92	94	95	85	79	99
HGV Start-up & Pull Away	107	101	98	97	97	94	87	78	101
HGV Load / Unload	88	87	88	88	85	83	79	74	91

4.14. The calculations assume that there is no mitigation other than the screening provided by the proposed ground works, buildings and contouring which are inherent in the design of the Proposed Development.

PLANT NOISE

Office HVAC

4.15. The office heating and cooling plant is located in four main compounds on the roof of the warehouse as indicated in Appendix E (Figure 3) below. The compounds and number of units in each compound are set out below:

- Compound 1 (north-west roof): 3 No. VRV/VRF Condensers and 3 No. AHUs.
- Compound 2 (south-west roof): 3 No. VRV/VRF Condensers and 3 No. AHUs.
- Compound 3 (south roof): 3 No. VRV/VRF Condensers and 3 No. AHUs.
- Compound 4 (south-east roof): 1 No. VRV/VRF Condensers and 1 No. AHU.

4.16. The sound power levels of the VRV/VRF and AHU condensers are set out in Table 7. These were modelled at 1 m back from the edge of the roof with a source height of 1 m above the roof.

Table 7 Sound Power Level of Office HVAC

Equipment	Sound Power Level (dB) in each Octave Band (Hz)								LwA (dB)	LpA (dB at 1m)
	63	125	250	500	1000	2000	4000	8000		
VRV/VRF condenser	85.5	81.0	79.5	76.5	71.5	67.5	63.0	59.0	78	70
Comms Room AHU condensers	80.5	76.0	74.5	71.5	66.5	62.5	58.0	54.0	73	65

Oxidiser and Dry Air Cooler

4.17. The oxidiser and two dry air coolers are located externally close to the southern façade of the building as can be seen in the close-up of the location presented in Appendix E (Figure 4) below.

4.18. The oxidiser has been modelled as 5 No. point sources (1 to represent each fan on the oxidiser) each at a height of 2 meters. The oxidiser has been specified to achieve a sound pressure level of 75 dB(A) at 10 m from each fan. The sound power level for the oxidiser fans is presented in Table 8.

Table 8 Oxidiser Fans Sound Power Level

Sound Power Level (dB) in each One Third Octave Band (Hz)																
16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630
85.9	86.7	85	83.2	84	85.4	78.9	76.7	84.5	77.9	76.1	77	75.4	76	74.1	71.9	72.7

Sound Power Level (dB) in each One Third Octave Band (Hz)												
800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500
70.7	70.5	72	73.5	71.1	71	71	71.8	65.1	63	62.4	57.8	55.5

4.19. The 2 No. dry air coolers have each been modelled as 14 separate point sources. Each point source has been modelled at a height of 2m above ground level and with a sound power level of 80.5 dB. The sound power level spectrum, derived from manufacturer data (Model FVN91145B5BM D P2.1 EC QE RE OS HY) is set out in 0 below.

Table 9 Dry Air Cooler Fans Sound Power Level

Equipment	Sound Power Level (dB) in Octave Band (Hz)							L_{WA} (dB)
	125	250	500	1000	2000	4000	8000	
Dry Air Cooler (Per Fan)	81.7	80.1	76.8	75.3	72.5	69.4	62.8	80.5

Production Cooling Plant

4.20. There are multiple fans located on the roof of the production area which provide ventilation and cooling to the production area as indicated in Appendix E (Figure 5) below. Table 10 provides the sound power level of this equipment and the number of units of each type that would operate with 4 production lines and 6 production lines. All fans have been assumed to be located at 0.5 m above the roof except the spot cooling units, which are assumed to be at 1 m above the roof.

Table 10 Sound Power Level for Production Mechanical Services Plant

Equipment	Sound Power Level (dB) in Octave Band (Hz)								LwA (dB)	No of units	
	63	125	250	500	1000	2000	4000	8000		4 lines	6 lines
Extract/Exhaust Fan	85	92	88	87	85	82	79	76	90	25	37
Supply fans	91	92	100	93	91	88	85	82	97	27	40
Make-up air fan	91	92	100	93	91	88	85	82	97	6	9
Spot cooling	88	83	812	79	74	70	65	61	80	12	18

4.21. The exhaust, supply and make-up air fans will all be fitted with attenuators which will achieve as a minimum the insertion loss specified in Table 11.

Table 11 Exhaust, Supply and Make Up Fan Attenuator Insertion Loss

Equipment	Insertion Loss (dB) in Octave Band (Hz)							
	63	125	250	500	1k	2k	4k	8k
Attenuation	5	10	18	28	36	28	24	14

4.22. It has been assumed that there is no significant break out noise from penetrations through the roof structure associated with this plant. This will be addressed during detailed design by the occupier's acoustic consultant.

NOISE BREAKOUT FROM THE BUILDING ENVELOPE

4.23. Based on data provided by the occupier from measurements undertaken at a similar facility, the sound pressure level at the ground floor of the production area is expected not to exceed 95 dB(A). The assumed sound pressure level spectrum is set out in Table 12.

Table 12 Assumed Internal Sound Pressure Level Spectrum in Production Area

Octave Band (Hz)	63	125	250	500	1k	2k	4k	8k	dB(A)
Sound pressure level in each octave band	84	90	90	91	90	88	86	85	95

4.24. For 6 production lines, operations are assumed over a proportionally larger floor area than for 4 production lines, with a commensurate increase in the relative façade and roof areas.

4.25. The predictions consider the break-out from the roof over the production area, the eastern façade and the southern façade. It is noted that due to the presence of various technical rooms on the southern façade there would not be break out from the whole façade area. The northern and western façades of the building are not considered to have any significant noise break out due to the offices and internal fire wall separating the offices and distribution area from the production area.

4.26. The warehouse cladding system will be a combination of Euroclad Elite 51 panels (applied vertically) and Euroclad Elite 55 panels (applied horizontally) to the walls, and Euroclad Elite 1 Panels covering the roof. Vertical wall panels will cover approximately 2/3 of the height of the building, with horizontal panels covering most of the remainder up to the top of the parapet. An indicative detail is provided at Appendix F.

4.27. The sound reduction performance of these panels is presented in 0 to Table 15. As can be seen from the tables, the in-situ performance has been estimated by subtracting 5 dB from the laboratory performance.

Table 13 Sound Reduction Index – EuroClad Elite 1

Performance	Sound Reduction Index (dB) in Octave Band (Hz)							Rw
	63	125	250	500	1k	2k	4k	
Laboratory	13	21	31	39	45	51	56	40
In-situ	8	16	26	34	40	46	51	35

Table 14 Sound Reduction Index – EuroClad Elite 51

Performance	Sound Reduction Index (dB) in Octave Band (Hz)							Rw
	63	125	250	500	1k	2k	4k	
Laboratory	12	17	31	39	45	50	53	12
In-situ	7	12	26	34	40	45	48	7

Table 15 Sound Reduction Index – EuroClad Elite 55

Performance	Sound Reduction Index (dB) in Octave Band (Hz)							Rw
	63	125	250	500	1k	2k	4k	
Laboratory	10	20	31	38	45	53	60	40
In-situ	5	15	26	33	40	48	55	35

4.28. It has been assumed that the internal sound pressure level would be reduced by 3 dB at the points at which it breaks out from the roof and from the horizontally clad façades of the building.

PREDICTION METHODOLOGIES

4.29. Predictions have been undertaken using a 3D model of the proposed development and surrounding area, including topography, created using the software package IMMI.

4.30. Point-source (for HGV and plant sources) and area source (for façade breakout) propagation have been calculated using the methodologies described in ISO 9613-2:1996[3].

4.31. Ground-floor level is taken to be 1.5 m above local ground. First-floor level is taken to be 4.5 m above local ground.

[3] ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of calculation, ISO (1996)

5. ASSESSMENT

HGV MANOEUVRES

5.1. Predicted noise levels at the closest noise sensitive receivers are presented in Table 16.

Table 16 Predicted contributions from HGV Manoeuvres

Receptor	HGV Noise Levels dB(A)			
	4 Lines		6 Lines	
	Day	Night	Day	Night
R1 GF	28	28	32	31
R1 FF	29	29	33	32
R2 GF	28	14	30	17
R2 FF	30	13	32	17
R3 GF	33	7	34	10
R3 FF	31	7	32	10
R6 GF	31	30	35	35
R6 FF	31	30	35	35
R7 GF	24	23	27	26
R7 FF	24	23	27	26

PLANT NOISE

Constant Sources

5.2. Contributions from constant sources which are not affected by the number of production lines (Office HVAC, Oxidiser and Dry Air Coolers) have been grouped as shown in Table 17. Levels are expected to be steady and continuous.

Table 17 Predicted contributions from constant plant sources

Receptor	Constant Sources dB(A)			Combined Constant Plant Noise dB(A)
	Office HVAC	Dry Air Coolers	Oxidiser	
R1 GF	21	10	3	22
R1 FF	22	10	2	22
R2 GF	24	15	10	24
R2 FF	24	14	10	25
R3 GF	24	28	31	34
R3 FF	24	28	29	32
R6 GF	23	8	3	23
R6 FF	23	8	3	23
R7 GF	18	17	16	22
R7 FF	18	17	16	22

Production Cooling Plant

5.3. The number of fans active will depend on whether there are 4 or 6 production lines running. Levels are expected to be steady and continuous. The predicted contribution from each scenario is presented in Table 18.

Table 18 Predicted contributions from rooftop production plant

Receptor	Production Cooling Plant dB(A)	
	4 Lines	6 Lines
R1 GF	29	31
R1 FF	30	32
R2 GF	31	33
R2 FF	32	33
R3 GF	30	32
R3 FF	30	32
R6 GF	27	29
R6 FF	27	29
R7 GF	24	26
R7 FF	24	26

BUILDING ENVELOPE BREAKOUT

5.4. Predicted contributions from production noise breakout through the building envelope are presented in Table 19. Levels are expected to be steady and continuous.

Table 19 Predicted contributions from building envelope breakout

Receptor	Building Envelope Breakout dB(A)	
	4 Lines	6 Lines
R1 GF	30	31
R1 FF	29	31
R2 GF	35	37
R2 FF	37	38
R3 GF	34	34
R3 FF	33	34
R6 GF	25	26
R6 FF	25	26
R7 GF	25	26
R7 FF	25	26

CUMULATIVE LEVELS

5.5. The total predicted cumulative levels from all sources are presented in Table 20.

Table 20 Predicted cumulative contribution from all sources

Receptor	4 Lines		6 Lines	
	Day (dB $L_{Aeq,1\ hour}$)	Night (dB $L_{Aeq,15\ min}$)	Day (dB $L_{Aeq,1\ hour}$)	Night (dB $L_{Aeq,15\ min}$)
R1 GF	34	34	36	36
R1 FF	34	34	37	36
R2 GF	37	37	39	38
R2 FF	39	38	40	40
R3 GF	39	38	39	38
R3 FF	38	37	39	37
R6 GF	34	33	36	36
R6 FF	34	33	36	36
R7 GF	30	30	32	31
R7 FF	30	30	32	31

RATING LEVELS

5.6. None of the noise sources was considered likely to have any audible impulsivity, intermittency or tonality at the receptors. Where the specific noise level is relatively high compared to the background noise level, however, it is possible that it may be identifiable against the residual soundscape.

5.7. A cautionary +3 dB acoustic feature correction was applied to any specific noise level which was predicted to be within 5 dB of the typical background noise level from Table 3. The Rating levels thus derived are presented in Table 21, along with the background noise levels for comparison.

5.8. Where the predicted rating level exceeds the typical background noise level, this is indicated by red shading.

Table 21 Rating level compared with Background Noise Level

Receptor	Background Noise Level		4 Lines		6 Lines	
	Day (dB $L_{A90,1\ hour}$)	Night (dB $L_{A90,15\ min}$)	Day (dB $L_{Aeq,1\ hour}$)	Night (dB $L_{Aeq,15\ min}$)	Day (dB $L_{Aeq,1\ hour}$)	Night (dB $L_{Aeq,15\ min}$)
R1 GF	52	42	34	34	36	36
R1 FF	52	42	34	34	37	36
R2 GF	54	42	37	40	39	41
R2 FF	54	42	39	41	40	43
R3 GF	52	40	39	41	39	41

Receptor	Background Noise Level		4 Lines		6 Lines	
	Day (dB $L_{A90,1\ hour}$)	Night (dB $L_{A90,15\ min}$)	Day (dB $L_{Aeq,1\ hour}$)	Night (dB $L_{Aeq,15\ min}$)	Day (dB $L_{Aeq,1\ hour}$)	Night (dB $L_{Aeq,15\ min}$)
R3 FF	52	40	38	40	39	40
R6 GF	49	42	34	33	36	36
R6 FF	49	42	34	33	36	36
R7 GF	49	42	30	30	32	31
R7 FF	49	42	30	30	32	31

5.9. It is evident from Table 21 that rating level is predicted to exceed the typical background noise level at only one location, R2 (night-time, first-floor level).

5.10. When considering the context of this exceedance, the following must be taken into consideration:

- The predicted rating level exceeds the background by only 1 dB, which would not be considered a subjectively discernible difference, and includes a cautionary +3 dB acoustic feature correction.
- An exceedance of +5 dB would be considered significant under BS4142.
- The measured average night-time residual sound level at this location is 53 dB $L_{Aeq,8\ hour}$, and the noise climate is characterised by road traffic from the A14, the A6, and nearby existing industrial activities, so it is extremely unlikely that this exceedance will be noticeable.
- The predicted level is unlikely to exceed the BS8233 guideline desirable level inside a bedroom of 30 - 35 dB $L_{Aeq,T}$ with a window partially open for ventilation.

6. CONCLUSION

6.1. Noise level contributions from all identified sources have been predicted at the closest potentially noise sensitive residences.

6.2. The cumulative predicted noise level at each receptor has been corrected as appropriate for acoustic features to determine the BS4142 rating level, which has been compared with the typical background noise level at that location.

6.3. At all but one location the rating level was predicted to be no louder than the typical background noise level.

6.4. At R2 the exceedance was predicted to be 1 dB but given the context (in terms of the absolute level, the acoustic environment and the magnitude of the exceedance) was not considered significant.

6.5. No significant adverse impact is predicted as a result of the proposed development, and the requirements of Condition 14 are thereby considered to be discharged.

APPENDIX A – ACOUSTIC GLOSSARY

DECIBELS DB

Noise is commonly defined as unwanted sound. The range of audible sound is from 0 dB to 140 dB, which is taken to be the threshold of pain. The sound pressure detected by the human ear covers an extremely wide range. The decibel (dB) is used to condense this range into a manageable scale by taking the logarithm of the ratio of the sound pressure and a reference sound pressure.

'A' WEIGHTED DECIBELS DB(A)

6.7. The frequency response of the ear is usually taken to be about 18Hz (number of oscillations per second) to 18,000Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than at the lower and higher frequencies, and because of this, the low and high frequency component of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most used and which correlates best with the subjective response to noise, including that of music, is the dB(A) weighting. This electronic filter matches the variation in the frequency sensitivity of the meter to that of the human ear. This is an internationally accepted standard for noise measurements.

EQUIVALENT CONTINUOUS SOUND LEVEL LAEQ

The subjective response to a noise is dependent not only upon the sound pressure level and its frequency, but also its intermittency. Various indices have been developed to try and correlate annoyances with the noise level and its fluctuations. The parameter used for this measure is the Equivalent Continuous Sound Pressure Level (L_{Aeq}). The A-weighted sound pressure level of a steady sound that has, over a given period, the same energy as the fluctuating sound under investigation. In essence, the L_{Aeq} provides a single value to express the average sound energy over the measurement period and is the most widely used indicator for environmental noise.

The decibel scale is logarithmic and therefore when two noise sources are present together, they have to be combined logarithmically. Therefore, when two sound sources of the same sound pressure level are combined the resultant level is 3 dB(A) higher than the single source. However, in subjective terms the ear can distinguish a difference in 'loudness' between two simple noises sources when there is a 3 dB(A) difference between them.

Loudness, not a measure of annoyance. Again for simple sources, when two sounds differ by 10 dB(A) one is said to be twice as loud as the other.

OTHER NOISE UNITS:

$L_{A90,T}$: This is the 'A' weighted noise level exceeded for 90% of the measurement period,T. This is normally used to describe the background noise.

Façade Level: The sound level at a position 1 m in front of a reflecting façade of a building. The façade noise level is assumed to be 3 dB(A) higher than the level measured or predicted at an equivalent position away from the noise reflected from the building façade i.e. in the free-field.

Free-field Level: The sound level in an open area well away from any buildings or other sound reflecting surfaces other than the ground. Generally the minimum distance from building facades for free-field measurements is taken to be 3.5 m.

BS414:2014 TERMINOLOGY

Background Noise Level: The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval. Expressed as LA90,T and generally considered to be the average minimum noise level.

Ambient Noise Level: Totally encompassing sound in a given situation at any given time interval and usually composed of sound from many sources near and far. Usually expressed in terms of LAeq,T

Residual Noise Level: The ambient noise remaining at a given position in a given situation where the specific noise source is suppressed to such a degree that it does not contribute to the ambient noise. Expressed in terms of LAeq,T

Specific Noise Level: The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source (source being assessed) over a given reference time interval (LAeq,Tr)

Rating Noise Level: The specific noise level plus any adjustment for the characteristic features of the noise. Expressed in terms of LAr,Tr. The standard indicates that a correction should be added to the noise if it was tonal, impulsive or irregular enough to attract attention.

OBSERVED EFFECTS

The Noise Policy Statement for England (2010) defines several key terms in relation to the observed effects of noise. The three key terms are defined below;

No Observed Effect Level (NOEL): This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

Lowest Observed Adverse Effect Level (LOAEL): This is the level above which adverse effects on health and quality of life can be detected.

Significant Observed Adverse Effect Level (SOAEL): This is the level above which significant adverse effects on health and quality of life occur.

APPENDIX B – PROPOSED SITE LAYOUT

Figure 1 Site plan

APPENDIX C – NOISE SURVEY LOCATIONS

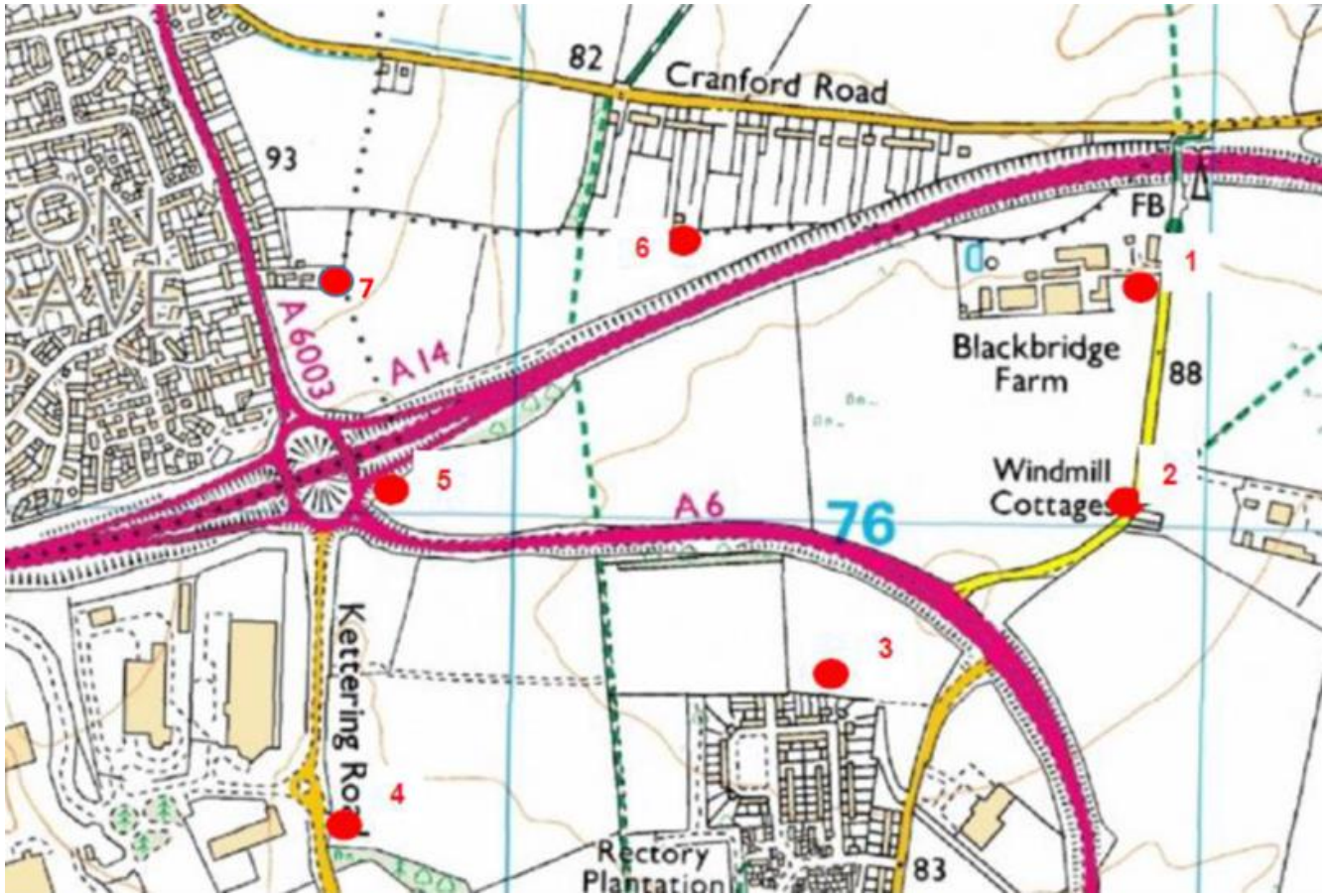
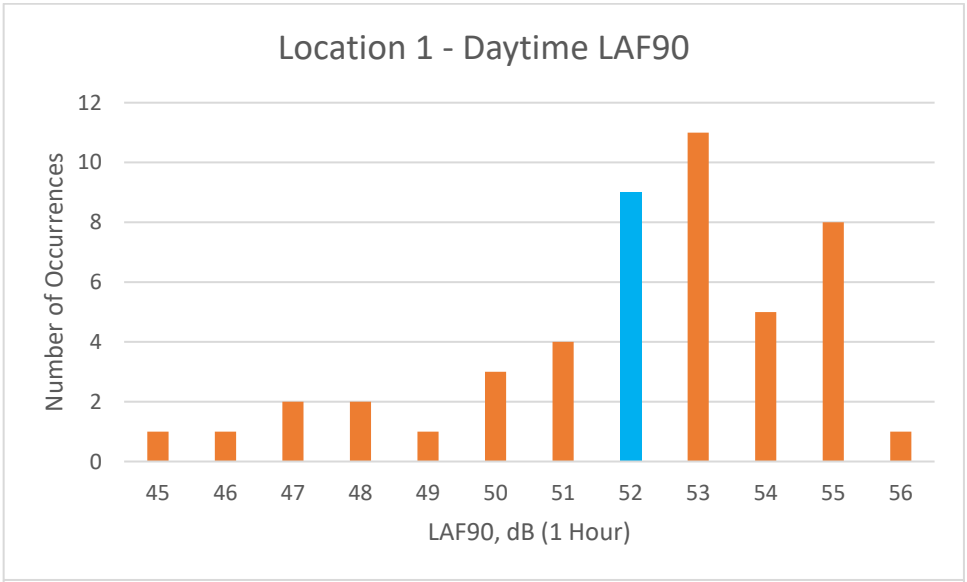


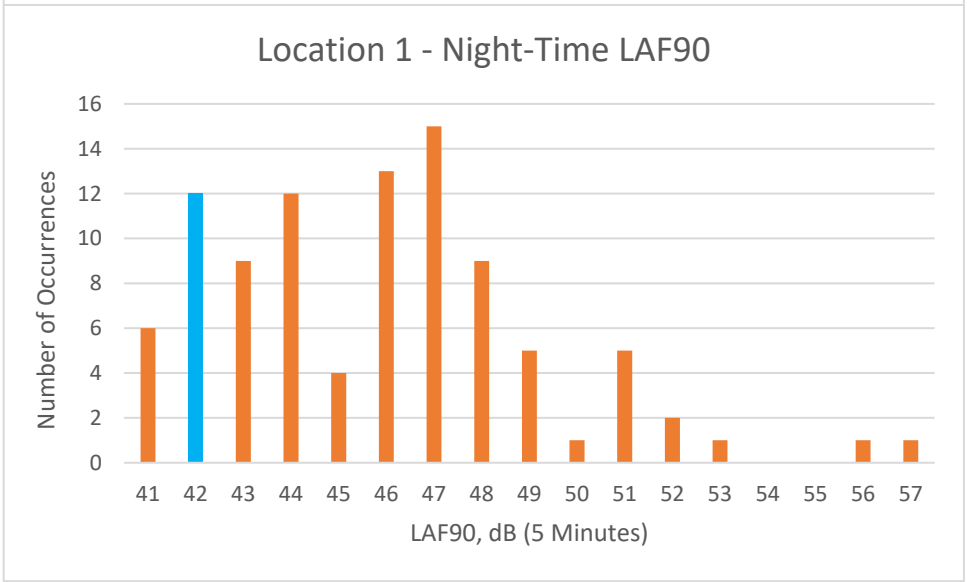
Figure 2 Noise survey locations

APPENDIX D – BACKGROUND NOISE LEVEL SELECTION

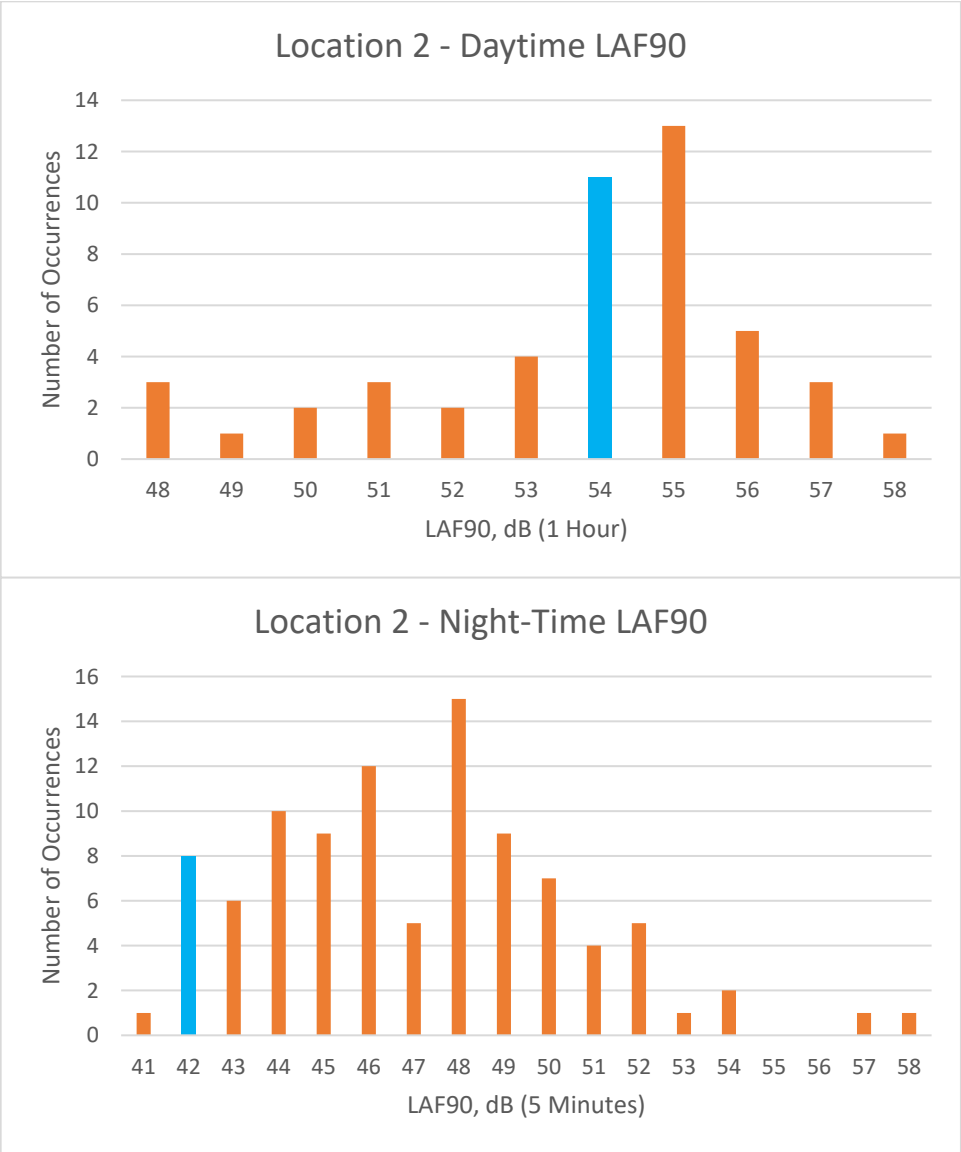
Data taken from the ES baseline assessment undertaken by Hoare Lea in 2013.

LOCATION 1

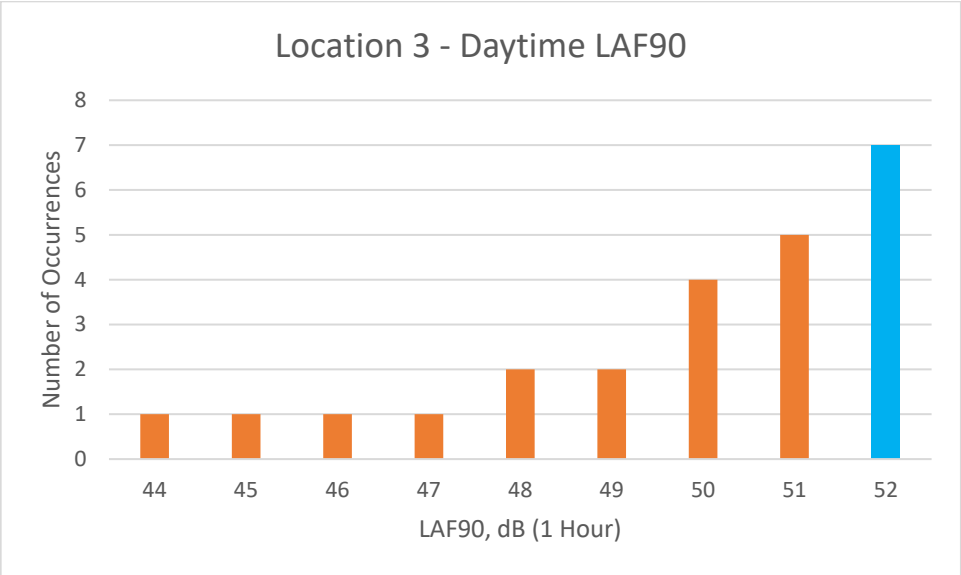


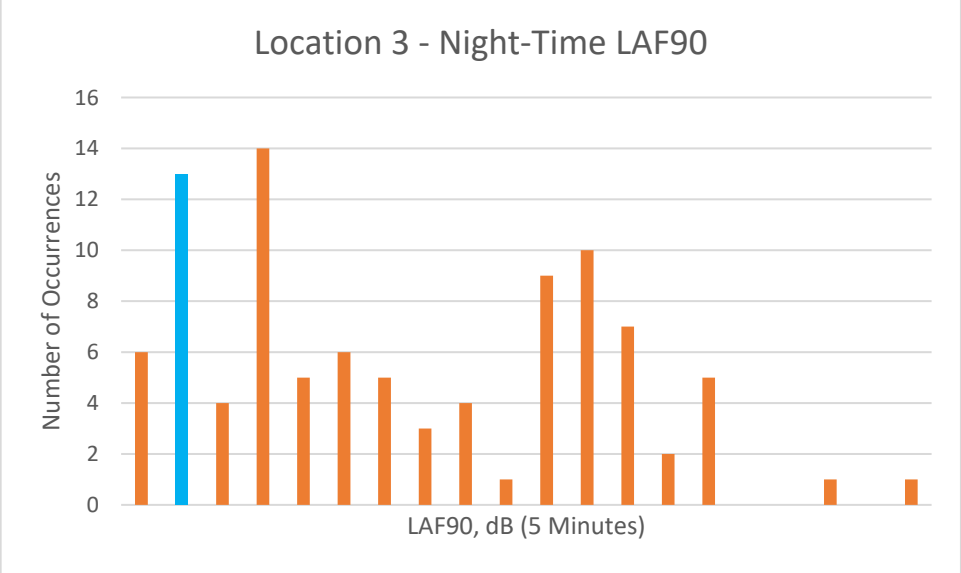


LOCATION 2

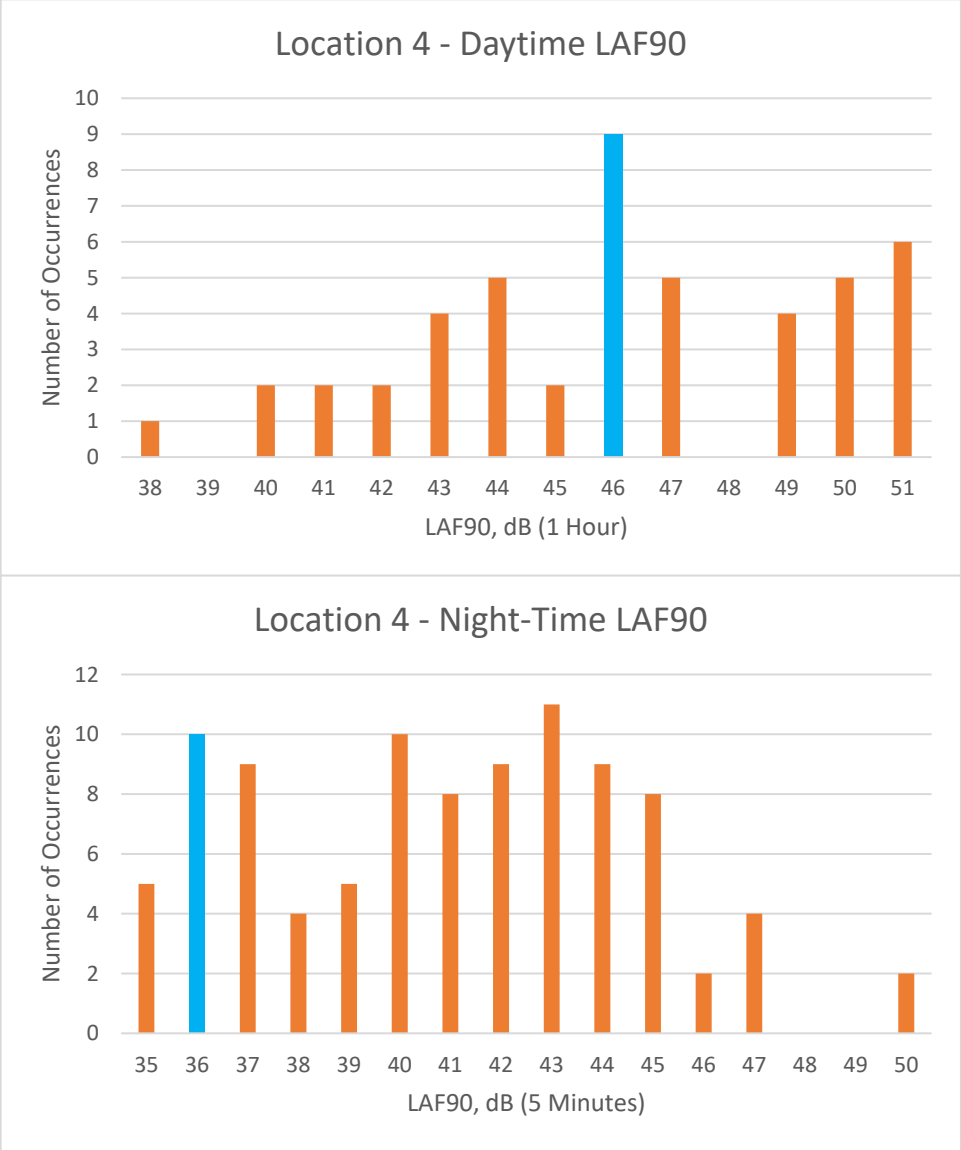

Location 2 - Daytime LAF90
Number of Occurrences
0
2
4
6
8
10
12
14
48
49
50
51
52
53
54
55
56
57
58
LAF90, dB (1 Hour)
Location 2 - Night-Time LAF90
Number of Occurrences
0
2
4
6
8
10
12
14
16
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
LAF90, dB (5 Minutes)

LOCATION 3

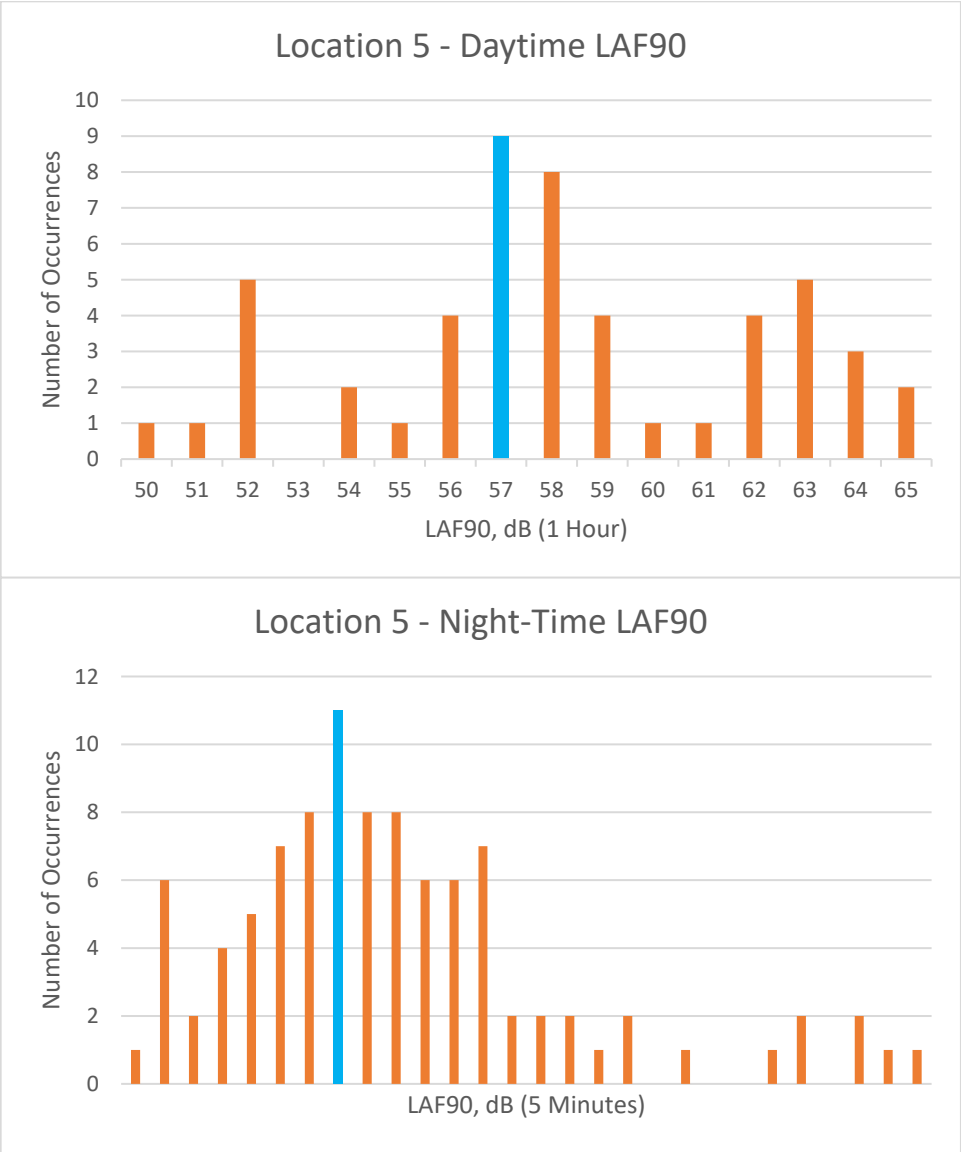

Location 3 - Daytime LAF90
Number of Occurrences
0
1
2
3
4
5
6
7
8
44
45
46
47
48
49
50
51
52
LAF90, dB (1 Hour)


Location 3 - Night-Time LAF90
Number of Occurrences
0
2
4
6
8
10
12
14
16
LAF90, dB (5 Minutes)

LOCATION 4


Location 4 - Daytime LAF90
Number of Occurrences
0
1
2
3
4
5
6
7
8
9
10
38
39
40
41
42
43
44
45
46
47
48
49
50
51
LAF90, dB (1 Hour)
Location 4 - Night-Time LAF90
Number of Occurrences
0
2
4
6
8
10
12
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
LAF90, dB (5 Minutes)

LOCATION 5


Location 5 - Daytime LAF90
Number of Occurrences
0
1
2
3
4
5
6
7
8
9
10
50
51
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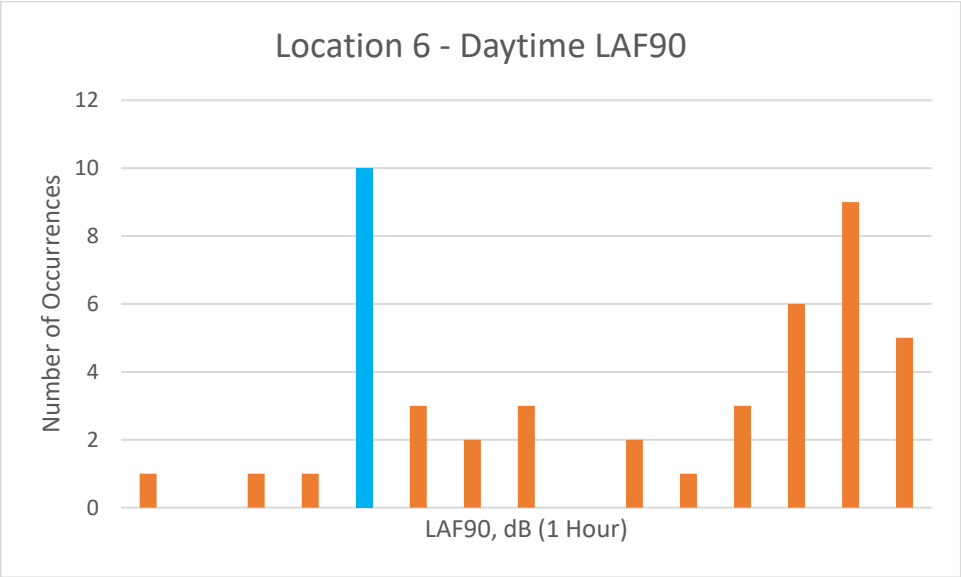
54
55
56
57
58
59
60
61
62
63
64
65
LAF90, dB (1 Hour)
Location 5 - Night-Time LAF90
Number of Occurrences
0
2
4
6
8
10
12
LAF90, dB (5 Minutes)

LOCATION 6


Location 6 - Daytime LAF90
Number of Occurrences
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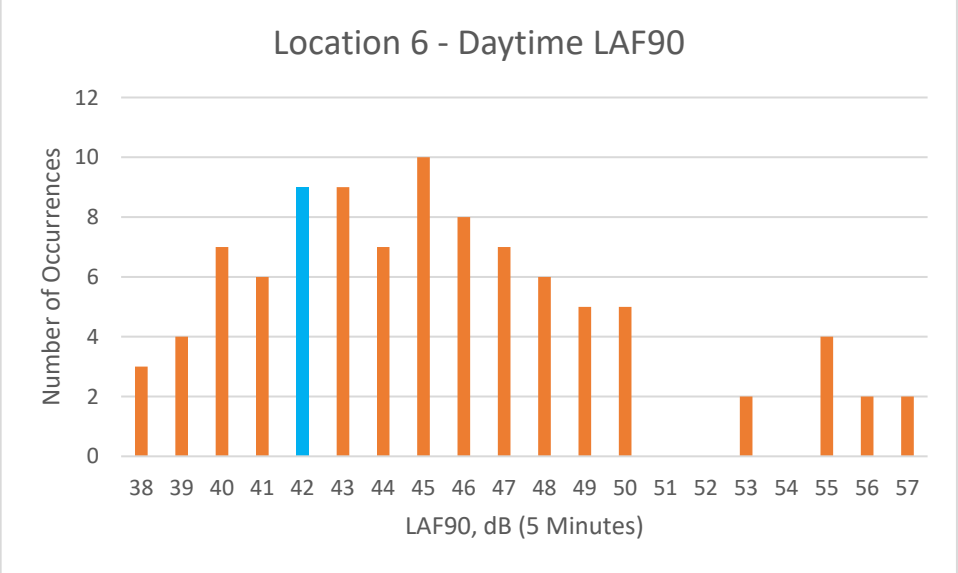
2
4
6
8
10
12
LAF90, dB (1 Hour)


Location 6 - Daytime LAF90
Number of Occurrences
0
2
4
6
8
10
12
38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
LAF90, dB (5 Minutes)

APPENDIX E – PLANT LOCATIONS

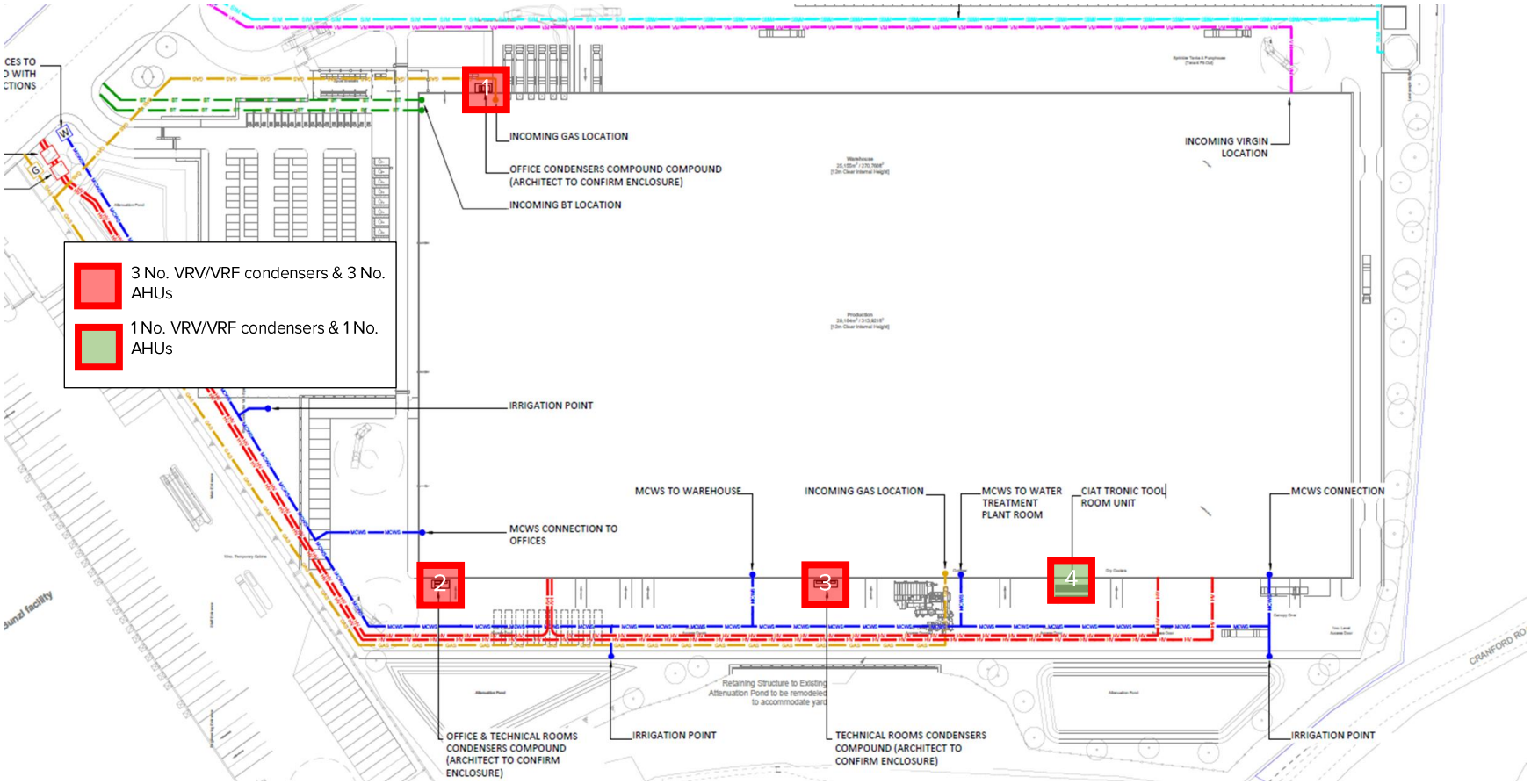


Figure 3 Office cooling plant locations

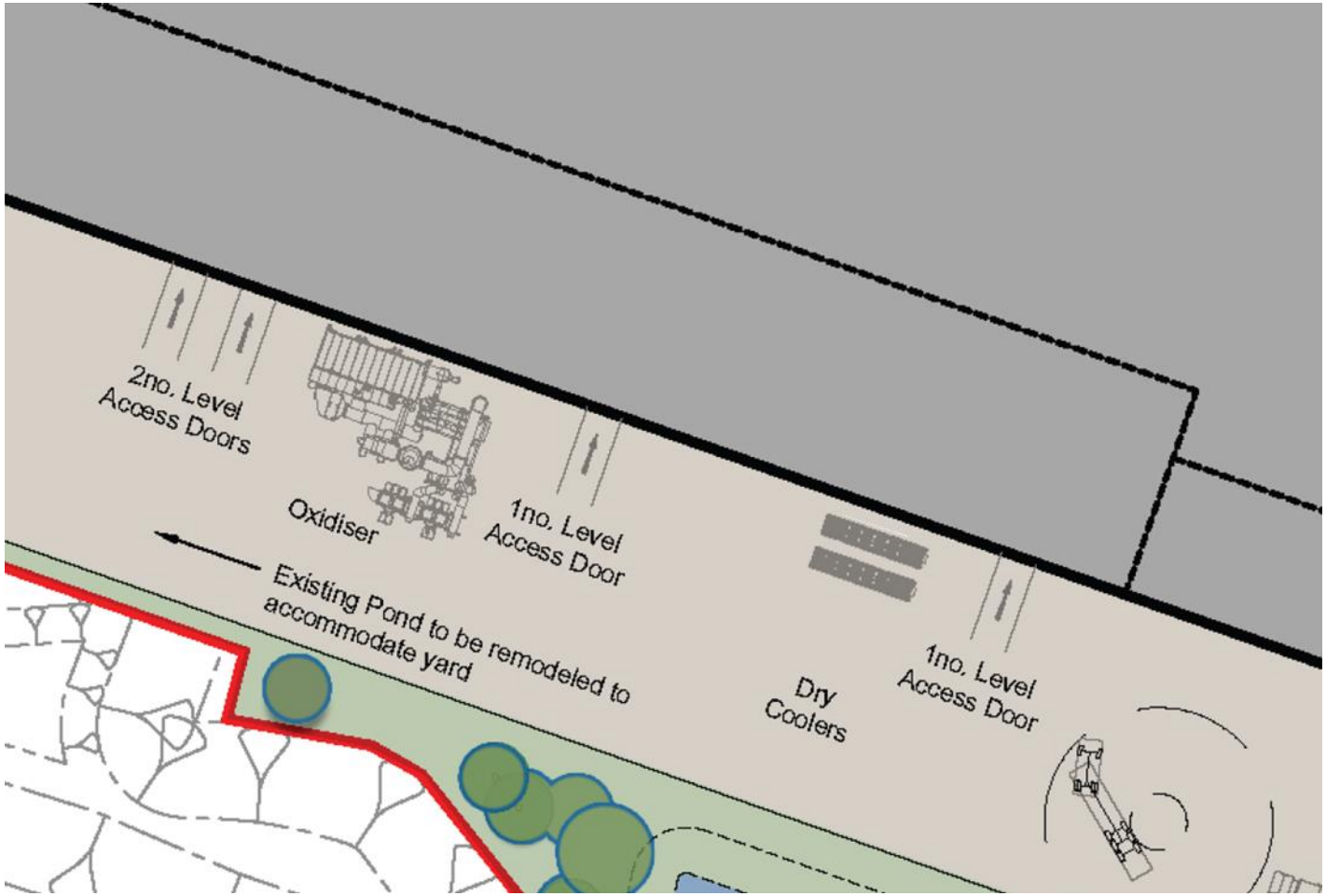


Figure 4 Oxidiser and Dry Cooler locations

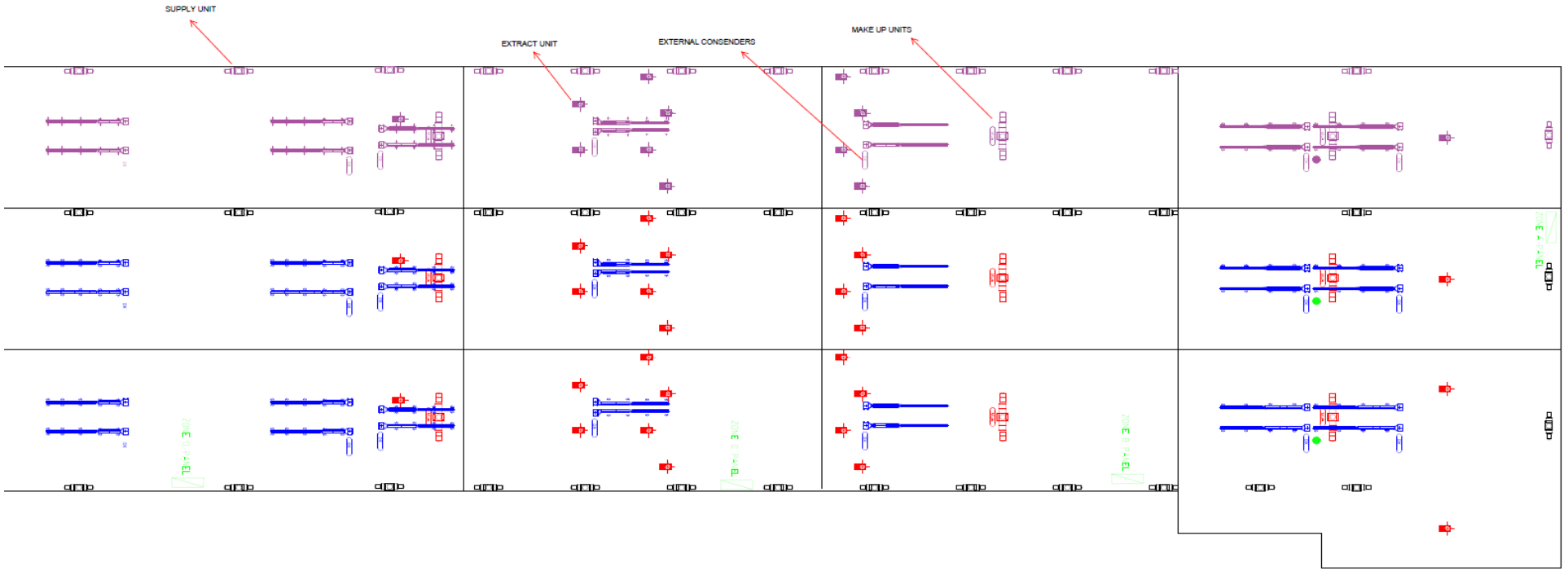


Figure 5 Cooling plant locations above the Production Area (Blue represents 4-line operation; purple represents additional plant for 6-line operation)

APPENDIX F – CLADDING DISTRIBUTION

Figure 6 Indicative Building Elevation Detail

Registered in England 05666276

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APPENDIX 4
AIR QUALITY ASSESSMENT

KETTERING 4B

AIR QUALITY ASSESSMENT

VC-103500-AQ-RP-0001
R01

JUNE 2021

VANGUARDIA

DOCUMENT CONTROL			
DOCUMENT TITLE	AIR QUALITY ASSESSMENT	**REVISION**	R01
DOCUMENT NUMBER	VC-103500-AQ-RP-0001	**ISSUE DATE**	22 JUNE 2021
PROJECT NUMBER	103500	**AUTHOR**	CW
STATUS	ISSUE	**CHECKED**	SG
ISSUED TO	CLIENT	**PASSED**	SG

REVISION HISTORY		
REVISION	**NOTES**	**DATE ISSUED**
01	INTERNAL COMMENTS	06/07/2021

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CONTENTS

1. INTRODUCTION

1.1. Vanguardia has been commissioned by Segro to undertake an air quality assessment to support a reserve matters planning application to discharge planning condition no.14, associated with planning approval (planning ref: KET/2018/0774) for Plot 4B at Segro Park, Kettering Gateway, A14 Junction.

1.2. The original approved planning permission is for the:

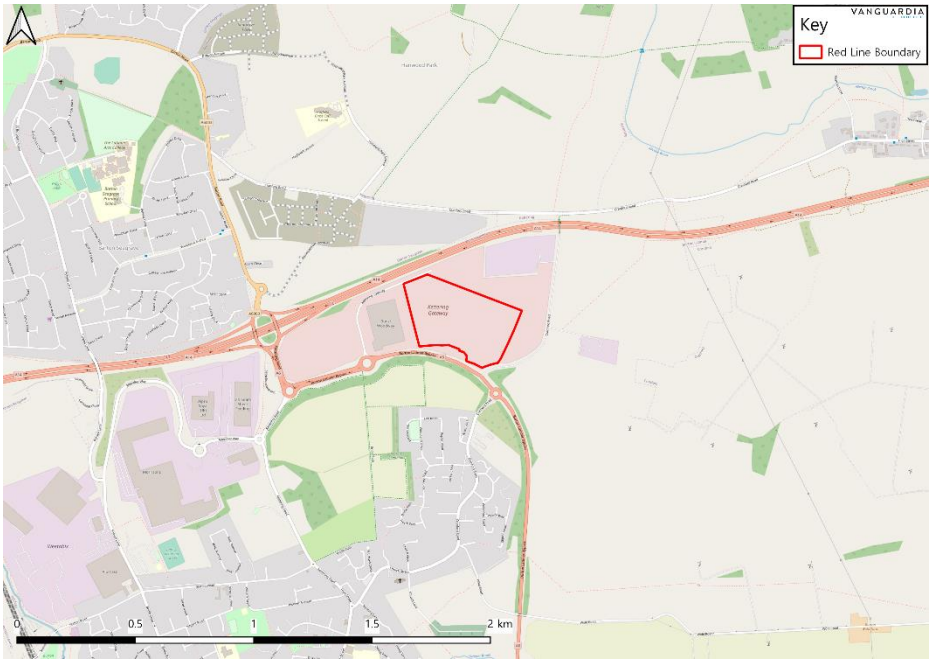
"Development of site for industrial/ distribution uses (use class B1 (c), B2 and B8) including ancillary offices together with roadside uses (petrol filling station and A3/A5 restaurant/cafe) and associated car parking, highway infrastructure and landscaping. All matters reserved for the development plots. Approval sought for matters related to access, the built highway infrastructure works and associated landscaping."

1.3. Planning condition no.14, which this air quality assessment is associated with, states:

"Prior to the first occupation of any of the buildings within the site for any purpose falling within use class B2 (general industry) or notwithstanding the provisions of the Town and Country Planning (Use Classes Order) 1987 (as amended) or any order amending, reinstating or replacing that order, any subsequent change within that use class, details of expected noise and/or emissions along with identified mitigation measures shall be submitted for the written approval of the Local Planning Authority and thereafter the measures shall be undertaken for the lifetime of that use."

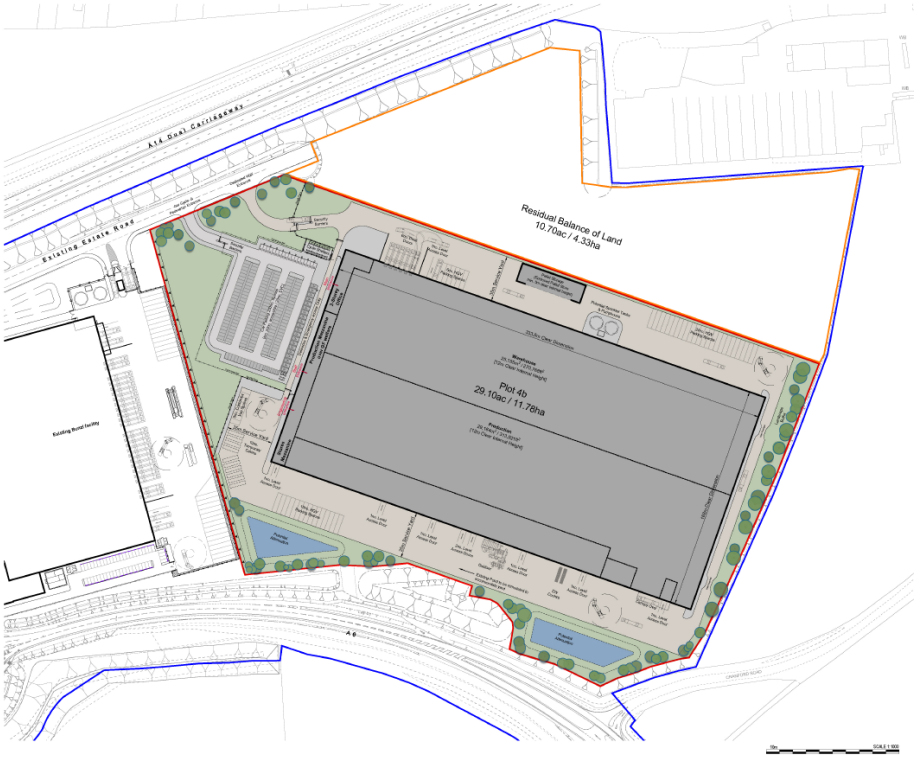
1.4. The Plot 4B site is located on an industrial park. The site is bounded to the north by the A14 with residential dwellings beyond, and to the east by Cranford Road, to the south by the A6 and to the west by a newly built industrial warehouse. The National Grid Reference for the centre of the site is SP 90566 76141 (British National Grid co-ordinates E: 490556, N: 276141. The location of the site is shown in Figure 1.

Figure 1 Site Location



1.5. Within Plot 4B a manufacturing process is proposed, which involves the surface coating of materials, which will release volatile organic carbon compounds (VOCs) to the air. It is planned that the VOC emissions will be minimised by treating them in a Regenerative Thermal Oxidiser (RTO). This will give rise to emissions of nitrogen oxides (NO_x). There will also be fugitive releases to air of VOCs from the manufacturing shopfloor. The proposed development will be subject to planning consent and an appropriate environmental permit. The proposed site layout is set out in Figure 2.

Figure 2 Proposed Site Layout



1.6. This assessment has been undertaken to assess the significance of the impacts from the operational phase of the development on human health receptors as a result of pollutant concentrations associated with stack and fugitive emissions.

KEY POLLUTANTS

NITROGEN DIOXIDE

1.7. NO_2 and nitric oxide (NO) are collectively referred to as oxides of nitrogen (NO_x). During fuel combustion, atmospheric nitrogen combines with oxygen to form NO, which is not considered harmful. Through a chemical reaction with ozone (O_3), NO further combines with oxygen to create NO_2 which can be harmful to human health and vegetation.

1.8. The foremost sources of NO_2 in the UK are combustion activities, mainly road transport and power generation. According to the National Atmospheric Emissions Inventory (NAEI), road transport is now the largest single UK source of NO_x, accounting for almost one third of UK emissions.

VOLATILE ORGANIC COMPOUNDS (VOCS)

1.9. Volatile organic compounds are a loose grouping of a large group of carbon-based compounds emitted to air from man-made and natural sources, due to their relatively low boiling points. Typically in use as liquids, significant man-made sources include petrol vapours from transport and solvents used in manufacturing and coating processes. Two VOCs in the UK are regulated air pollutants, 1,3-butadiene and benzene. VOCs contribute to local air pollution through their reactions with other air pollutants such as nitrogen oxides giving rise to ground-level ozone. Individual compounds are assessed for their impact on human health.

2. LEGISLATION AND POLICY CONTEXT

EUROPEAN LEGISLATION

2.1. The following text is taken from the leglislation.gov.uk[1] website and sets out how EU Legislation will be retained in the United Kingdom after the Brexit transition.

"The UK is no longer a member of the European Union. EU legislation as it applied to the UK on 31 December 2020 is now a part of UK domestic legislation, under the control of the UK's Parliaments and Assemblies, and is published on legislation.gov.uk.

[..]

EU legislation which applied directly or indirectly to the UK before 11.00 p.m. on 31 December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'. This is set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 (c. 16)."

2.2. Air pollutants at high concentrations can give rise to adverse effects upon the health of both humans and ecosystems. The European Union (EU) legislation on air quality forms the basis for the national UK legislation and policy.

2.3. The EU Framework Directive 2008/50/EC came into force in May 2008 and sets out legally binding limits for concentrations of the major air pollutants that can impact on public health. This Directive came into force in England in June 2010.

NATIONAL LEGISLATION

2.4. Part IV of the Environment Act 1995[2] requires local authorities to review and assess the air quality within their boundaries. As a result, the Air Quality Strategy was adopted in 1997, with national health-based standards and objectives set out for the, then, eight key air pollutants including benzene, 1-3 butadiene, carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulphur dioxide.

2.5. The purpose of the Air Quality Strategy was to identify areas where air quality was unlikely to meet the objectives prescribed in the regulations. The strategy was reviewed in 2000 and the

[1] EU legislation and UK law. Accessible at: https://www.legislation.gov.uk/eu-legislation-and-uk-law

[2] Department for Environment, Food and Rural Affairs (1995) The Environment Act. HMSO, London.

amended Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2000) was published. This was followed by an Addendum in February 2003 and in July 2007, when an updated Air Quality Strategy was published.

2.6. The pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence regarding how each pollutant affects human health. Pollutant objectives are the future dates by which each standard is to be achieved, taking into account economic considerations, practical and technical feasibility. The Air Quality Standards Regulations (2016)[3] impose duties on the Secretary of State relating to achieving of the limit values set out within the regulations.

RELEVANT AIR QUALITY STANDARDS AND ENVIRONMENTAL ASSESSMENT LEVELS

2.7. A summary of the relevant Air Quality Objectives (AQO) and Environment Assessment Levels (EAL) for human health and environmental receptors are presented in Table 1.

Table 1 Air Quality Standards

Pollutant	Average Period	Objective	Percentile Equivalent	Objectives Should Apply
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m^3		All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.
	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year	99.8th	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably have expected to spend one hour or longer.
Volatile Organic Compounds (VOCs) as Xylene	Annual Mean	4,410 µg/m^3		All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.

[3]The Air Quality Standards Regulations (Amendments), 2016.

	1-hour Mean	66,200 µg/m^3		All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably have expected to spend one hour or longer.

STATUTORY NUISANCE

2.8. It is recognised that the planning system presents a way of protecting amenity. However, in cases where planning conditions are not applicable to a development/installation, the requirements of the Environmental Protection Act 1990 still apply. Under Part III of the Environmental Protection Act 1990, local authorities have a statutory duty to investigate any complaints of:

- *"any premises in such a state as to be prejudicial to health or a nuisance*
- *smoke emitted from premises so as to be prejudicial to health or a nuisance*
- *fumes or gases emitted from premises so as to be prejudicial to health or a nuisance*
- *any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*
- *any accumulation or deposit which is prejudicial to health or a nuisance"*

2.9. Where the local authority establishes that any one of these issues constitutes a statutory nuisance and believes it to be unreasonably interfering with the use or enjoyment of someone's premises and/or is prejudicial to health, an abatement notice will be served on the person responsible for the offence or the owner / occupier. Failure to comply with the notice could lead to a prosecution. It is however considered as a defence if the best practicable means to prevent or to counteract the effects of the nuisance are employed.

PLANNING POLICY

NATIONAL POLICIES

2.10. A revised National Planning Policy Framework (NPPF) was published in July 2018 and updated in February 2019. The NPPF (2019)[4] sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

2.11. Paragraph 103 states:

"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making."

2.12. Paragraph 170 states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

[..]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

[..]"

2.13. Paragraph 180 states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."

2.14. Paragraph 181 states:

[4] Department of Communities and Local Government (2019). National Planning Policy Framework. HMSO, London.

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

2.15. Paragraph 183 states:

"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

2.16. The NPPF is supported by Planning Practice Guidance (PPG) (DCLG, 2019)[5], which includes guiding principles on how planning can take account of the impacts of new development on air quality.

2.17. Paragraph: 001 Reference ID: 32-001-20191101 states:

"The 2008 Ambient Air Quality Directive sets legally binding limits for concentrations in outdoor air of major air pollutants that affect public health such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2).

The UK also has national emission reduction commitments for overall UK emissions of 5 damaging air pollutants:

- *fine particulate matter ($PM_{2.5}$)*
- *ammonia (NH_3)*
- *nitrogen oxides (NO_x)*
- *sulphur dioxide (SO_2)*
- *non-methane volatile organic compounds (NMVOCs)*

[5] Department for Communities and Local Government (2019). National Planning Policy Guidance. HMSO, http://planningguidance.planningportal.gov.uk/

"As well as having direct effects on public health, habitats and biodiversity, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems. Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

2.18. Paragraph: 005 Reference ID: 32-005-20191101 states:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.

Where air quality is a relevant consideration the local planning authority may need to establish:

- *The 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality."*

3. ASSESSMENT APPROACH

INTRODUCTION

3.1. This section sets out the approach taken to assess the potential impact on air quality during the operation of the proposed development.

SCOPE OF ASSESSMENT

3.2. The assessment is based on the following scope of work:

- **Spatial -** The assessment considers the impact of emissions from the site (from the operation's stack and fugitive emissions) on local air quality; and
- **Temporal -** The operational phase impacts resulting from the proposed development have been considered for the earliest possible year of operation (2021).

OPERATIONAL PHASE

STACK EMISSIONS

3.3. The operation of the facility has the potential to generate NO_x and VOC emissions from the stack. VOCs will be abated by destruction in a RTO. This combustion process will emit NO_x. The VOC mixture is understood to contain xylene as a principal component and therefore emissions are assessed as xylene. The assessment is of the predicted impact of these emissions on local air quality in the vicinity of the facility.

FUGITIVE EMISSIONS

3.4. The operation of the facility has the potential to generate VOC emissions from the ventilation extraction from the building. The assessment is of the predicted impact of these emissions on local air quality in the vicinity of the facility.

DISPERSION MODEL

3.5. Dispersion modelling was undertaken using ADMS-5.2 (v5.2.2.0), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-5 is a PC based dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere from either single or multiple sources. The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected long-term and short-term averages. Building and source parameters have been taken from the architect's drawings and emissions parameters for the proposed development.

3.6. The model typically requires the following input data:

- Extend of the modelling area;
- Locations and dimensions of all sources and nearby structures;
- Output grid and receptor locations;
- Meteorological data;
- Terrain data (if modelling terrain effects);
- Emission rates, emission parameters (e.g. temperature) and emission profiles (e.g. one hour per day) for modelled pollutants; and
- Surface roughness and Monin-Obukhov length.

MODELLED SCENARIO

3.7. In order to provide a conservative estimate of the impact, this assessment assumes that the proposed development runs continuously i.e. 8,760 hours per year.

3.8. Two different configurations for the development are being considered: a 4-line facility and a 6-line facility. All operational scenarios have been considered for 2021, providing a conservative assessment of possible impacts. Therefore, two operational scenarios have been modelled:

- 4-line facility 2021; and
- 6-line facility 2021.

3.9. The model outputs have been set up for the:

- long-term (annual mean) NO_x concentration;

- short-term (1-hour mean) 99.79th percentile NO_x concentration;
- long-term (annual mean) VOC (as Xylene) concentration; and
- short-term (max 1-hour) VOC (as Xylene) concentration.

3.10. Further details on the NO_x to NO_2 relationship and conversion rates are in paragraph 3.24. Further details on modelling VOCs as Xylene can be found in paragraph 3.13 below.

SITE LAYOUT (BUILDING AND STRUCTURAL EFFECTS)

3.11. The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission point. Structures that are in excess of one third of the height of the stack can have a significant effect on dispersion by interrupting wind flows and causing significantly higher ground-level concentrations close to the source than would arise.

3.12. The grid references and the size dimensions of all buildings included in the dispersion model are set out below in Table 2.

Table 2 Modelled Building Dimensions

Name	Shape	X (m)	Y (m)	Height (m)	Length (m)	Width	Angle (°)
Building 4a	Rectangular	490218	276100	17.6	113.0	174.7	75.1
Building 4b	Rectangular	490567	276104	16.2	169.5	334.3	199.6

Figure 3 Modelled Buildings

SOURCE AND EMISSION PARAMETERS

3.13. The proposed development has two sources of emission: a proposed stack at the south of the development emitting NO_x and VOCs, and fugitive VOC emissions emitted from vents on the roof. The stack emissions for both model scenarios have been modelled as a point source, with fugitive emissions modelled as a volume source.

3.14. The source parameters and emissions data included in the model are summarised in Table 3, Table 4, Table 5 and Table 6.

Table 3 Stack Parameters

Parameter (unit)	Stack	
	4-Line	6-Line
Internal Stack Diameter (m)	1.41	
Stack Height (m)	14.5	
Stack area (m^2)	1.56	
Stack Position (m)	490549.01, 276006.02	
Temperature of release (^oC)	150	
Volume flow (Nm^3/s)	15.64	23.46
Emission Velocity at Stack Exit (m/s)	10	15

Table 4 Stack Emissions Data

Pollutant	Emission Rate (g/s)	
	4-Line	6-Line
NO_x	0.7819	1.1729
VOC (as xylene)	0.3454	0.5180

Table 5 Fugitive Source Parameters

Parameter (unit)	Volume Source	
	4-Line	6-Line
Volume source height (m)	16.2	
Volume source area (m^2)	17341.5	
Volume source L1 (m)	1	
Volume source volume (m^3)	17341.5	

Table 6 Fugitive Source Emissions Data

Pollutant	Emission Rate (g/s)	
	4-Line	6-Line
VOC (as xylene)	1.2575E-05	1.7924E-05

Figure 4 Modelled Sources

3.15. Further details of source parameter and emissions calculations are presented in Appendix A.

METEOROLOGICAL DATA

3.16. The key meteorological parameters for dispersion modelling are wind speed and wind direction. Meteorological parameters such as cloud cover, surface temperature, precipitation rate and relative humidity are also taken into account.

3.17. For dispersion modelling, hourly-resolved data are required and often it is difficult to find a local site that can provide reliable data for all the meteorological parameters at this resolution.

3.18. Based upon the above, a suitably representative meteorological monitoring station identified is Bedford meteorological station, which is located approximately 22 km southeast of the subject site.

3.19. To account for variation in meteorological conditions, the qualitative assessment and dispersion modelling have been carried out with the latest available meteorological data from the period 2016 to 2018.

TOPOGRAPHY

3.20. The presence of elevated terrain can significantly affect ground level concentrations of pollutants emitted from elevated sources, such as stacks, by reducing the distance between the plume centre line and ground level, increasing turbulence and, hence, plume mixing.

3.21. Guidance for the use of the ADMS-5 model suggests that terrain is normally incorporated within a modelling study when the gradient exceeds 1:10. Terrain is not included in the model.

SURFACE ROUGHNESS

3.22. The dispersion site surface roughness length (z0) was set to 0.3 m (agricultural areas max) for the dispersion site and 0.2 m (agricultural areas min) for the meteorological site.

MINIMUM MONIN-OBUKHOV LENGTH

3.23. The Minimum Monin-Obukhov Length (MMOL) provides a measure of the stability of the atmosphere. An MMOL value of 10 m (small towns < 50,000) was used in the dispersion model to describe both the modelling area; an MMOL value of 1 m was used in the dispersion model to describe both the meteorological site. These values are considered representative of the respective surrounding areas.

NO_X TO NO_2 RELATIONSHIP

3.24. As discussed in Section 1, emissions of NO_x will comprise contributions from both NO and NO_2. Typically, air quality assessments are made against the concentrations of NO_2 as it is more toxic than NO. However, combustion flue gases comprise 90-95% NO which, in time, will oxidise in the atmosphere into NO_2.

3.25. As NO_2 emissions from the operation are only one constituent of the total NO_x emissions, an allowance of the NO_2 proportion of NO_x needs to be made. The exact proportion of NO_2 in NO_x emissions from the development is unknown.

3.26. Empirical estimates have been made by Janssen *et al*[6], which are based on a comprehensive study of observations within power station plumes. This method, which is considered to be more realistic, suggests that the conversion would be in the order of 10 – 20% within 1 – 2 km of the release point.

3.27. In accordance with guidance provided by the Environment Agency Air Quality Modelling and Assessment[7] Unit1 it is assumed that 70% of the total NO_x emissions from the plant will be converted into NO_2 over the long-term period, with 35% of the of the total NO_x emissions from the plant will be converted into NO_2 over the short-term period. This is a 'worst case' approach when compared to other research and has been used in this assessment.

MODELLED GRID EXTENT

3.28. The assessment area was defined based upon the source location, anticipated pollutant dispersion patterns and the positioning of sensitive receptors. The modelled grid parameters are defined in Table 7 below with respect to the British National Grid.

Table 7 Modelled Grid Parameters

Parameter	Min	Max
X (m)	490304.01	490794.01
Y (m)	275806.02	276296.02
Z (m)	1.5	

SENSITIVE RECEPTORS

3.29. This assessment includes the nearest residential receptors identified using aerial photography mapping. Nearby workplace receptors are also included. Table 8 presents the receptors specified for assessment.

[6] L.H.J.M. Janssen, J.H.A. Van Wakeren, H. Van Duuren and A.J. Elshout, A Classification of NO Oxidation Rates in Power Plant Plumes Based on Atmospheric Conditions, Atmospheric Environment Vol. 22, No. 1, pp. 43 – 53. 1988.
[7] Environment Agency: Air Quality Modelling and Assessment Unit, Conversion rates for NO_x and NO_2. http://webarchive.nationalarchives.gov.uk/20140328232919/http:/www.environmentagency.gov.uk/static/documents/Conversion_ratios_for__NOx_and_NO2_.pdf

Table 8 Specified Receptors

Receptor ID	Description	X (m)	Y (m)	Z (m)
R1	Resi Woodland Dr	490364.75	275749.06	1.5
R2	Resi Woodland Dr	490394.91	275748.53	1.5
R3	Resi Cranford Rd	490584.34	275734.25	1.5
R4	Windmill Cottages	490907.66	276002.53	1.5
R5	Blackbridge Farm	490912.97	276383.53	1.5
R6	Hawkes Group	490644.88	276305.34	1.5
R7	Resi Cranford Rd	490668.69	276526.53	1.5
R8	Resi Cranford Rd	490433.75	276545.59	1.5
R9	Building 4a	490271.56	276119.12	1.5
R10	Building 4a	490296.03	276029.88	1.5

Figure 5 Specified Receptors

SCREENING CRITERIA

3.30. The EA risk assessment guidance[8] provides criteria for assessing the significance of emissions with respect to the background air quality and air quality standards.

Stage 1: Criteria for screening out insignificant Process Contributions (PCs)

3.31. PCs can be screened out from detailed dispersion modelling if both of the below criteria are met:

- PC long-term < 1% of the long-term air quality standard; and
- PC short-term < 10% of the short-term air quality standard.

3.32. If both of these criteria are met, no further assessment of the pollutant in question is required. If one or both of the criteria are not met then further screening criteria are applied, outlined below in stage 2.

Stage 2: Criteria for screening out insignificant Predicted Environmental Concentrations (PECs)

3.33. The PEC is the combination of the PC and the background concentration of the pollutant. Detailed dispersion modelling can be screened out if both of the below criteria are met:

- PEC long-term < 70% of the long-term air quality standard; and
- PC short-term < 20% of the short-term air quality standard minus twice the long-term background concentration.

3.34. Any emissions which don't meet the screening criteria for stage 2 require further detailed modelling.

3.35. Detailed modelling is also required if:

- Emissions affect an AQMA; or
- Restrictions apply for any substance emitted in this area.

3.36. The results of the detailed modelling are assessed for the resulting PECs against the relevant AQO. Significance criteria are used to inform the assessment, and are discussed in the next section.

IMPACT / SIGNIFICANCE CRITERIA

[8] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

3.37. Currently there is no formal guidance on the absolute magnitude and significance criteria for the assessment of air quality impacts. However, the IAQM & EPUK (2017) document have published recommendations for describing the impact at individual receptor locations as set out in Table 9 and utilised to determine the description of any impact.

Table 9 Air Quality Impact Descriptors for Individual Receptors

Long term average Concentration at receptor in assessment year.	% Change in concentration relative to Air Quality Action Level (AQAL*)			
	1	2-5	6-10	>10
75% of less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

*AQAL are considered to be the objective levels

3.38. The IAQM & EPUK (2017) document provides guidance on the severity of an impact as a descriptor. Although the impacts might be considered 'Slight', 'Moderate' or 'Substantial' at one or more receptor location, the overall effects of a proposed development may not always be judged as being significant.

3.39. The judgement of the overall significance should be made by a competent professional who is suitably qualified.

MODELLING ASSUMPTIONS, UNCERTAINTIES AND EXCLUSIONS

3.40. In addition to the parameters outlined above, some assumptions have been made for the modelling, including:

- The development will operate for 24 hours a day throughout the year; and
- Emission data and source parameters has been obtained from the client's stack monitoring data.

3.41. Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model limitations;

- Data uncertainty due to errors in input data, emission estimates, operational procedures, land use characteristics and meteorology; and
- Variability - randomness of measurements used.

3.42. Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- Choice of model - ADMS-5 is a widely used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Emission rates - Emission rates were calculated based upon data provided by the client. As such, they are considered to be representative of potential releases during normal operation;
- Receptor locations - A Cartesian Grid was included in the model in order to provide suitable data for contour plotting as well as specified receptors;
- Variability - Where site specific input parameters were not available, assumptions were made with consideration of the worst-case conditions as necessary in order to ensure a robust assessment of potential pollutant concentrations; and
- All results presented are the maximum concentrations from a 3-year modelling period, so represent the worst case.

4. BASELINE CONDITIONS

INTRODUCTION

4.1. The following section sets out the baseline conditions in relation to air quality at the subject site. For the purpose of this assessment, evidence has been obtained from the Defra air quality resource website[9]. Local air quality was managed by Kettering Borough Council until April 2021, when the council was merged into the new North Northamptonshire Council. The council has not published a recent Annual Status Report for local air quality management.

4.2. The air quality in this area in Northamptonshire is affected by emissions from the major trunk roads the A14 and A6.

BACKGROUND CONCENTRATIONS

4.3. Defra provides background pollution concentration estimates to assist local authorities with undertaking their 'Review and Assessment' work. This data is available to download from the Defra air quality resource website for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for every 1 km X 1 km grid square for all local authorities. The current dataset is based on 2018 background data and the future year projections are available for 2018 to 2030.

AIR QUALITY MANAGEMENT AREAS (AQMAS)

4.4. NNC does not currently have any AQMAs declared within its jurisdiction.

NO_2

4.5. The maximum Defra background NO_2 annual mean concentrations for the modelled grid extent is 11.67 µg/m^3, comfortably below the relevant AQO. This is considered a reasonable baseline given the information published.

VOC

4.6. A limited amount of monitoring for Non-Methane VOCs is carried out by Defra, which includes the compound xylene, as o, m and p isomers. The most representative site is at Chilbolton

[9] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

Observatory in England. The annual average measurement for the sum of the isomers in 2020 is 0.38 µg/m^3. The London Marylebone roadside site (one of the most polluted in the UK) reported an annual average of 1.90 µg/m^3.

BASELINE SUMMARY

4.7. A summary of the annual mean background concentrations used for the purpose of this assessment are presented below in Table 10.

Table 10 Summary of DEFRA Background NO_2 and VOCs as Xylene Concentrations

Source	Site Type	Averaging Period	2021
NO_2 (µg/m^3)			
Defra	Background	Annual Mean	11.67
		1-Hour Mean	23.35
VOCs (as Xylene) (µg/m^3)			
Defra	Background	Annual Mean	0.38
		1-Hour Mean	0.76

5. OPERATIONAL PHASE IMPACT ASSESSMENT

MODELLED 4-LINE SCENARIO

5.1. As discussed in Section 3, there are impacts on local air quality that will arise from the operation of the proposed development. The potential impact of air quality on human health is discussed below for the 4-line operation.

Nitrogen Dioxide (NO_2)

5.2. The impact on air quality from the proposed development with 4 lines operating for the pollutant NO_2 for both averaging periods are detailed below in Table 11 and Table 12.

5.3. Table 11 sets out the maximum PC and PECs for the modelled grid extent, as well as comparison against the relevant AQS. All results presented in Table 11 are the maximum concentrations from a temporal 3-year modelling period across a spatial grid, so represent the worst case. As such, these values are conservative and likely only to occur close to the emission source.

Table 11 Maximum PC and PEC Across the Modelled Grid Extent

	NO_2				
Averaging Period	**AQS (µg/m³)**	**Max PC (µg/m³)**	**Max PC (% AQS)**	**Max PEC (µg/m³)**	**Max PEC (% AQS)**
Annual Mean	40	19.7	49.3	31.4	78.5
1-Hour Mean	200	72.6	36.3	93.9	47.0

5.4. Table 11 shows that all relevant AQSs are met for the PECs for NO_2 for both averaging periods.

5.5. Table 12 assesses the max PCs and PECs for the modelled grid extent for NO_2 and averaging period against the EA screening criteria outlined in Section 3.

Table 12 Assessment of pollutants against EA screening criteria

	NO_2		
Averaging Period	**Scoped out at Stage 1?**	**Scoped out at Stage 2?**	**Detailed Assessment Required?**
Annual Mean	**No**	No	Yes

1-Hour Mean	No	No	Yes

5.6. Table 12 shows that the Predicted Environmental Concentrations of NO_2 cannot be scoped out using the EA screening criteria, requiring detailed assessment. Figure 6 and Figure 7 below present contour plots for both the NO_2 annual and 1-hour means showing the results of the detailed assessment carried out.

Figure 6 4 Line – Predicted Environmental Concentration of Annual Average (µg/m³)

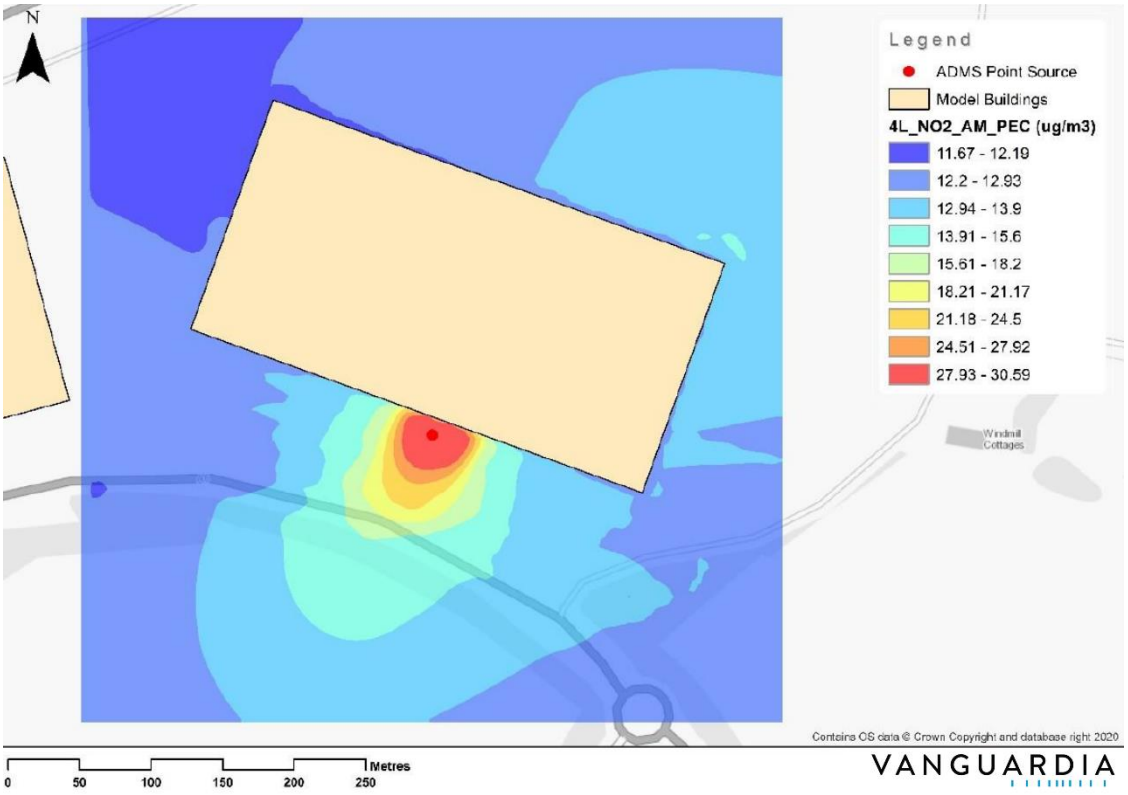
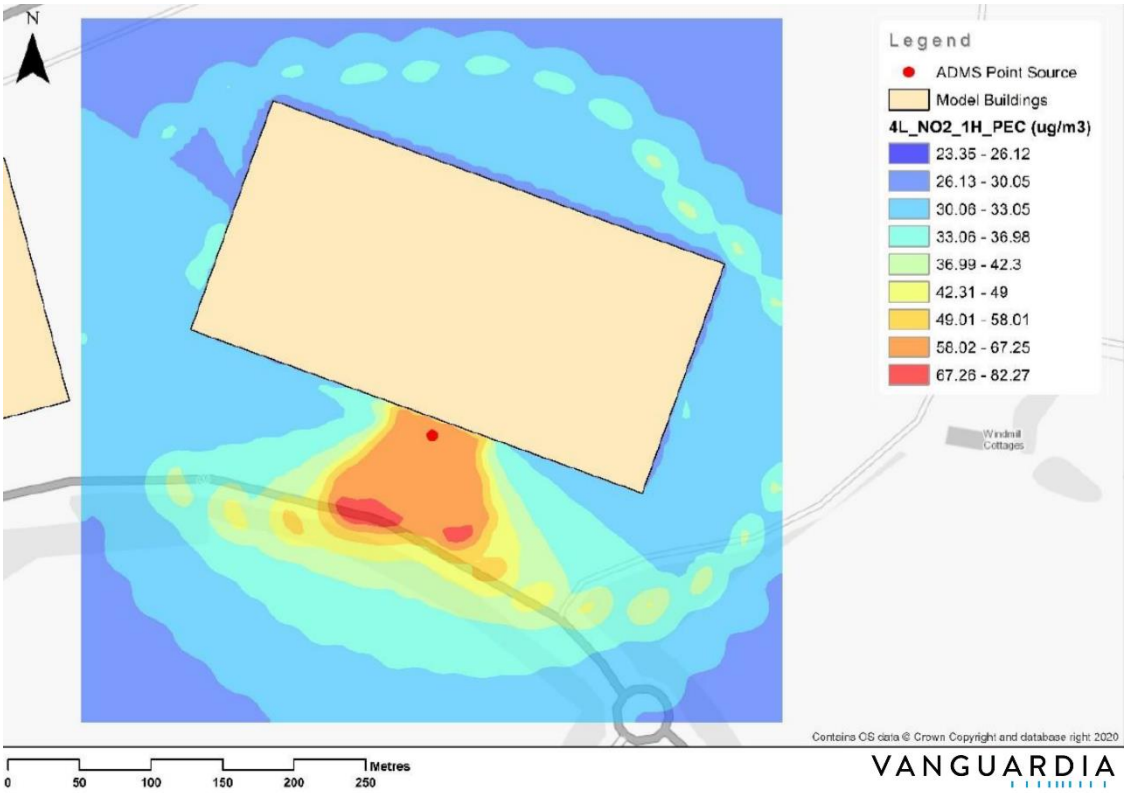


Figure 7 Predicted Environmental Concentration of 99.79th Percentile 1-Hour NO_2 (µg/m³)



5.7. Table 13 shows the maximum predicted annual mean NO_2 concentrations at the receptors. The impacts are assessed as negligible for all receptors.

Table 13 IAQM/EPUK Impact/Significance Criteria (Annual Mean NO_2 µg/m³)

Receptor	Predicted Annual Mean NO_2 Concentration 2021 (µg/m³)	Long Term Average Concentration at Receptor in Assessment Year 2021	Pollutant Concentration Change 2021 (µg/m³)	% Change Relative To AQAL in 2021	2021 Impact Descriptor
1	11.5	75% or less of AQAL	0.81	2-5%	Negligible
2	11.5	75% or less of AQAL	0.90	2-5%	Negligible
3	11.3	75% or less of AQAL	0.71	2-5%	Negligible
4	12.5	75% or less of AQAL	0.80	2-5%	Negligible
5	12.4	75% or less of AQAL	0.72	2-5%	Negligible
6	12.6	75% or less of AQAL	0.89	2-5%	Negligible
7	12.1	75% or less of AQAL	0.39	1%	Negligible

8	11.9	75% or less of AQAL	0.25	1%	Negligible
9	12.2	75% or less of AQAL	0.55	1%	Negligible
10	12.3	75% or less of AQAL	0.62	2-5%	Negligible

VOCs (as Xylene)

5.8. The impact on air quality from the proposed development for the pollutant VOCs for both averaging periods are detailed below in Table 14 and Table 15.

5.9. Table 14 sets out the maximum PC and PECs for the modelled grid extent, as well as comparison against the relevant EAL. All results presented in Table 14 are the maximum concentrations from a temporal 3-year modelling period across a spatial grid, so represent the worst case. As such, these values are conservative and likely only to occur close to the emission source.

Table 14 Maximum PC and PEC Across the Modelled Grid Extent

	Xylene				
Averaging Period	**EAL (µg/m³)**	**Max PC (µg/m³)**	**Max PC (% EAL)**	**Max PEC (µg/m³)**	**Max PEC (% EAL)**
Annual Mean	4410	13.6	0.3	14.0	0.3
1-Hour Mean	66200	337.3	0.5	338.0	0.5

5.10. Table 14 shows that all relevant EALs are met for the PECs for VOCs for both averaging periods.

5.11. Table 15 assesses the max PCs and PECs for the modelled grid extent for VOCs and averaging period against the EA screening criteria outlined in Section 3.

Table 15 Assessment of Pollutants Against EA Screening Criteria

	Xylene		
Averaging Period	**Scoped out at Stage 1?**	**Scoped out at Stage 2?**	**Detailed Assessment Required?**
Annual Mean	**Yes**	-	No
1-Hour Mean	Yes	-	No

5.12. Table 15 shows that VOC emissions can be scoped out of further assessment as Stage 1 of the EAs screening criteria. For completeness however, Figure 8 and Figure 9 below present contour plots for both the VOC annual and maximum 1-hour means.

Figure 8 4 Line – Predicted Environmental Concentration for VOCs as Xylene (Annual Mean µg/m³)

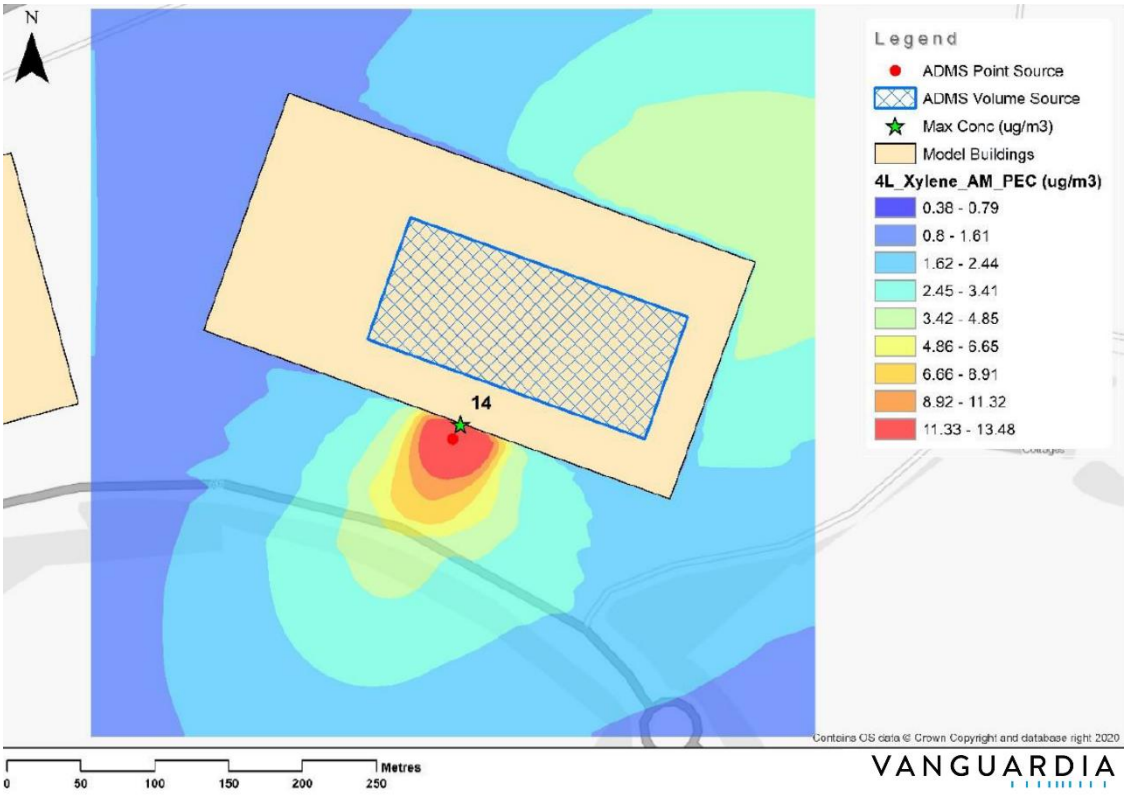
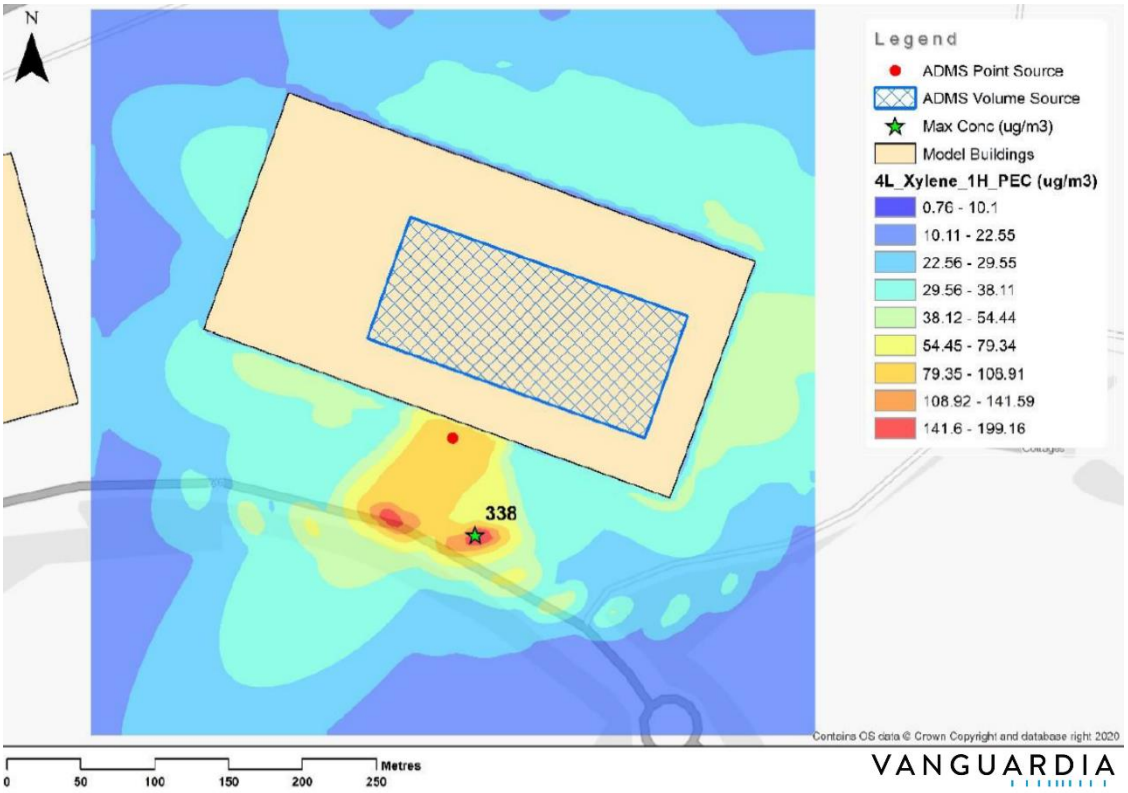


Figure 9 4 Line – Predicted Environmental Concentration for VOCs as Xylene (Maximum 1-Hour Mean µg/m³)



5.13. Table 16 shows the maximum predicted annual mean VOC concentrations at the receptors. The impacts are assessed as negligible for all receptors.

Table 16 IAQM/EPUK Impact/Significance Criteria (Xylene, µg/m³)

Receptor	Predicted Annual Mean Xylene Concentration 2021 (µg/m³)	Long Term Average Concentration at Receptor in Assessment Year 2021	Pollutant Concentration Change 2021 (µg/m³)	% Change Relative To AQAL in 2021	2021 Impact Descriptor
1	1.1	75% or less of AQAL	0.68	0%	Negligible
2	1.2	75% or less of AQAL	0.77	0%	Negligible
3	0.9	75% or less of AQAL	0.57	0%	Negligible
4	1.4	75% or less of AQAL	0.97	0%	Negligible
5	1.5	75% or less of AQAL	1.13	0%	Negligible
6	1.7	75% or less of AQAL	1.30	0%	Negligible
7	0.7	75% or less of AQAL	0.33	0%	Negligible
8	0.5	75% or less of AQAL	0.09	0%	Negligible
9	0.6	75% or less of AQAL	0.17	0%	Negligible
10	0.7	75% or less of AQAL	0.30	0%	Negligible

MODELLED 6-LINE SCENARIO

5.14. As discussed in Section 3, there are impacts on local air quality that will arise from the operation of the proposed development. The potential impact of air quality on human health is discussed below for the 6-line operation.

Nitrogen Dioxide (NO_2)

5.15. The impact on air quality from the proposed development with 6 lines operating for the pollutant NO_2 for both averaging periods are detailed below in Table 17 and Table 18.

5.16. Table 17 sets out the maximum PC and PECs for the modelled grid extent, as well as comparison against the relevant AQS. All results presented in Table 17 are the maximum concentrations from a temporal 3-year modelling period across a spatial grid, so represent the worst case. As such, these values are conservative and likely only to occur close to the emission source.

Table 17 Maximum PC and PEC Across the Modelled Grid Extent

	NO_2				
Averaging Period	**AQS (µg/m³)**	**Max PC (µg/m³)**	**Max PC (% AQS)**	**Max PEC (µg/m³)**	**Max PEC (% AQS)**
Annual Mean	40	20.6	51.5	32.3	80.7
1-Hour Mean	200	64.0	32.0	85.3	42.7

5.17. Table 17 shows that all relevant AQSs are met for the PECs for NO_2 for both averaging periods.

5.18. Table 18 assesses the max PCs and PECs for the modelled grid extent for NO_2 and averaging period against the EA screening criteria outlined in Section 3.

Table 18 Assessment of Pollutant Against EA Screening Criteria

	NO_2		
Averaging Period	**Scoped out at Stage 1?**	**Scoped out at Stage 2?**	**Detailed Assessment Required?**
Annual Mean	No	No	Yes
1-Hour Mean	No	No	Yes

5.19. Table 18 shows that the Predicted Environmental Concentrations of NO_2 cannot be scoped out using the EA screening criteria, requiring detailed assessment. Figure 10 and Figure 11 below present contour plots for both the NO_2 annual and 1-hour means showing the results of the detailed assessment carried out.

Figure 10 Predicted Environmental Concentrations of Annual Average NO_2 µg/m³

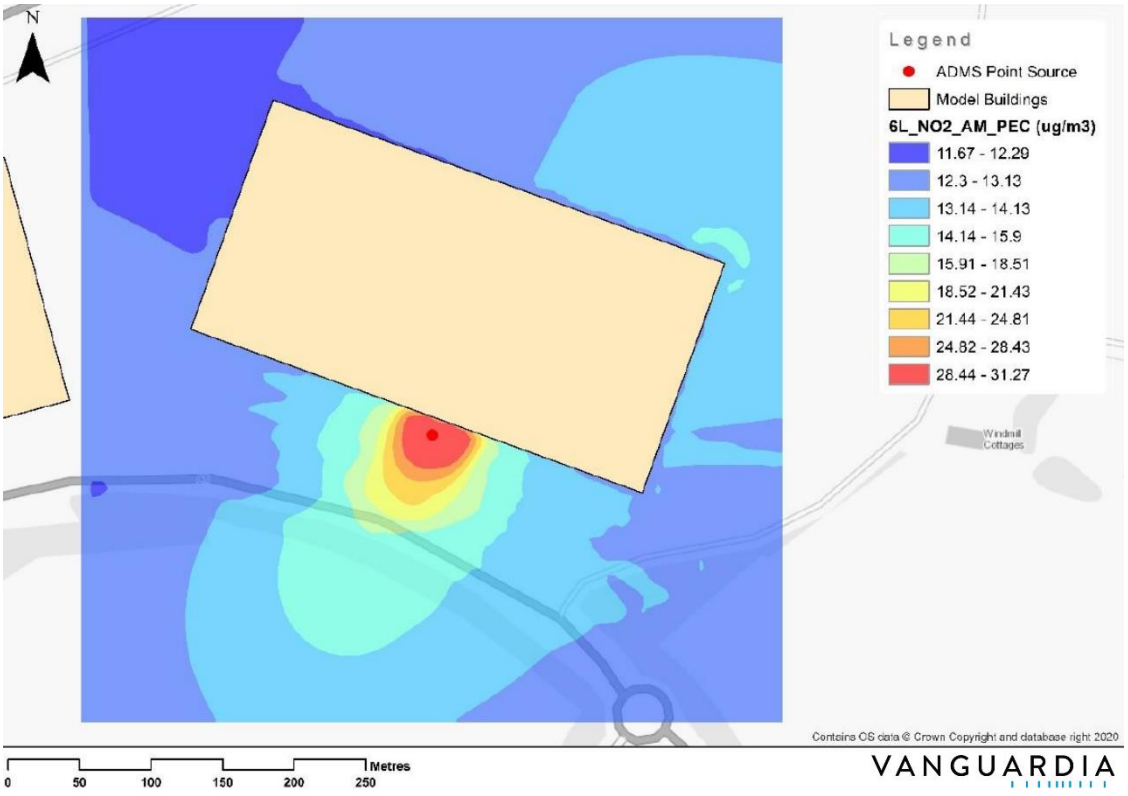
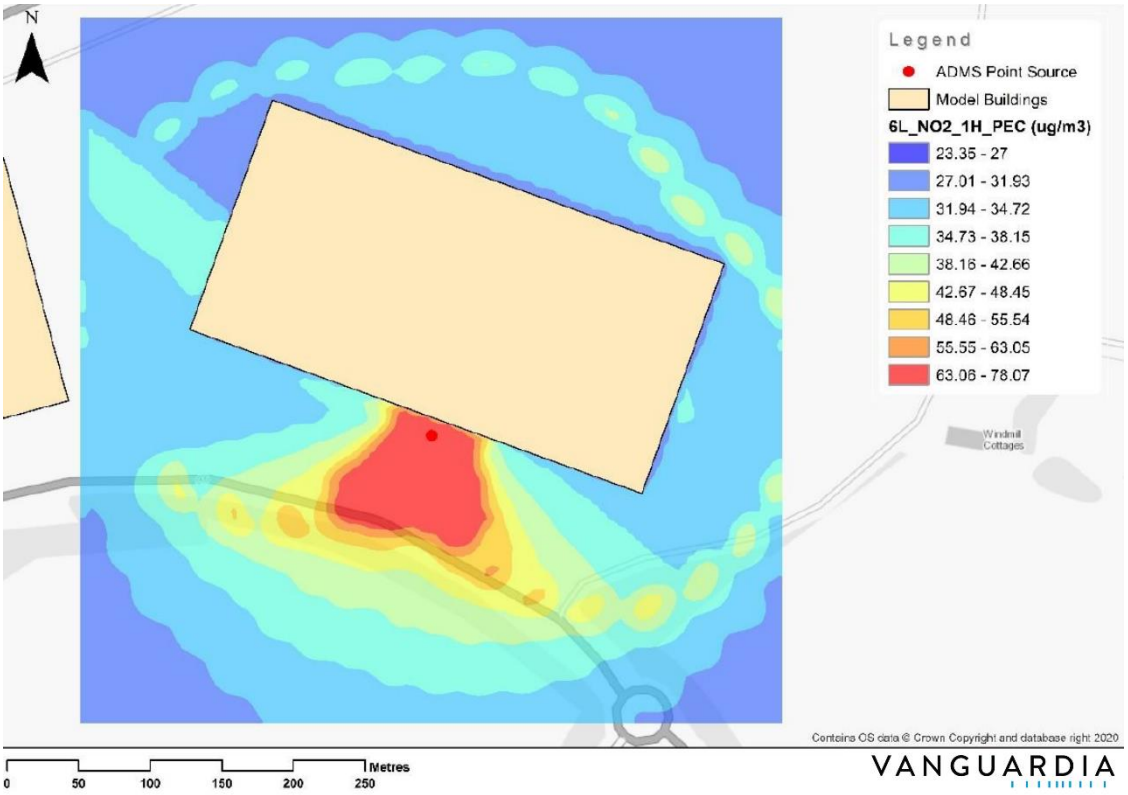


Figure 11 Predicted Environmental Concentration of 99.79th Percentile 1-Hour NO_2 µg/m³



5.20. Table 19 sets out annual mean NO_2 concentrations at the modelled receptors and the impact descriptor.

Table 19 IAQM/EPUK Impact/Significance Criteria (NO_2, µg/m³)

Receptor	Predicted Annual Mean NO_2 Concentration 2021 (µg/m³)	Long Term Average Concentration at Receptor in Assessment Year 2021	Pollutant Concentration Change 2021 (µg/m³)	% Change Relative To AQAL in 2021	2021 Impact Descriptor
1	11.7	75% or less of AQAL	1.04	2-5%	Negligible
2	11.8	75% or less of AQAL	1.15	2-5%	Negligible
3	11.5	75% or less of AQAL	0.89	2-5%	Negligible
4	12.6	75% or less of AQAL	0.97	2-5%	Negligible
5	12.6	75% or less of AQAL	0.88	2-5%	Negligible
6	12.8	75% or less of AQAL	1.09	2-5%	Negligible

7	12.2	75% or less of AQAL	0.50	1%	Negligible
8	11.0	75% or less of AQAL	0.30	1%	Negligible
9	12.3	75% or less of AQAL	0.64	2-5%	Negligible
10	12.4	75% or less of AQAL	0.73	2-5%	Negligible

5.21. Table 19 shows the maximum predicted annual mean NO_2 concentrations at the receptors. The impacts are assessed as negligible for all receptors.

VOCs (as Xylene)

5.22. The impact on air quality from the proposed development for the pollutant VOCs for both averaging periods are detailed below in Table 20 and Table 21.

5.23. Table 20 sets out the maximum PC and PECs for the modelled grid extent, as well as comparison against the relevant EAL. All results presented in Table 20 are the maximum concentrations from a temporal 3-year modelling period across a spatial grid, so represent the worst case. As such, these values are conservative and likely only to occur close to the emission source.

Table 20 Maximum PC and PEC Across the Modelled Grid Extent

	Xylene				
Averaging Period	**EAL (µg/m³)**	**Max PC (µg/m³)**	**Max PC (% EAL)**	**Max PEC (µg/m³)**	**Max PEC (% EAL)**
Annual Mean	4410	14.6	0.3	15.0	0.3
1-Hour Mean	66200	574.1	0.9	574.9	0.9

5.24. Table 20 shows that all relevant EALs are met for the PECs for VOCs for both averaging periods.

5.25. Table 21 assesses the max PCs and PECs for the modelled grid extent for VOCs and averaging period against the EA screening criteria outlined in Section 3.

Table 21 Assessment of Pollutants Against EA Screening Criteria

	Xylene		
Averaging Period	**Scoped out at Stage 1?**	**Scoped out at Stage 2?**	**Detailed Assessment Required?**
Annual Mean	Yes	-	No
1-Hour Mean	Yes	-	No

5.26. Table 21 shows that VOC emissions can be scoped out of further assessment as Stage 1 of the EAs screening criteria. For completeness however, Figure 12 and Figure 13 below present contour plots for both the VOC annual and maximum 1-hour means.

Figure 12 6 Line – Predicted Environmental Concentration for VOCs as Xylene (Annual Mean, µg/m³)

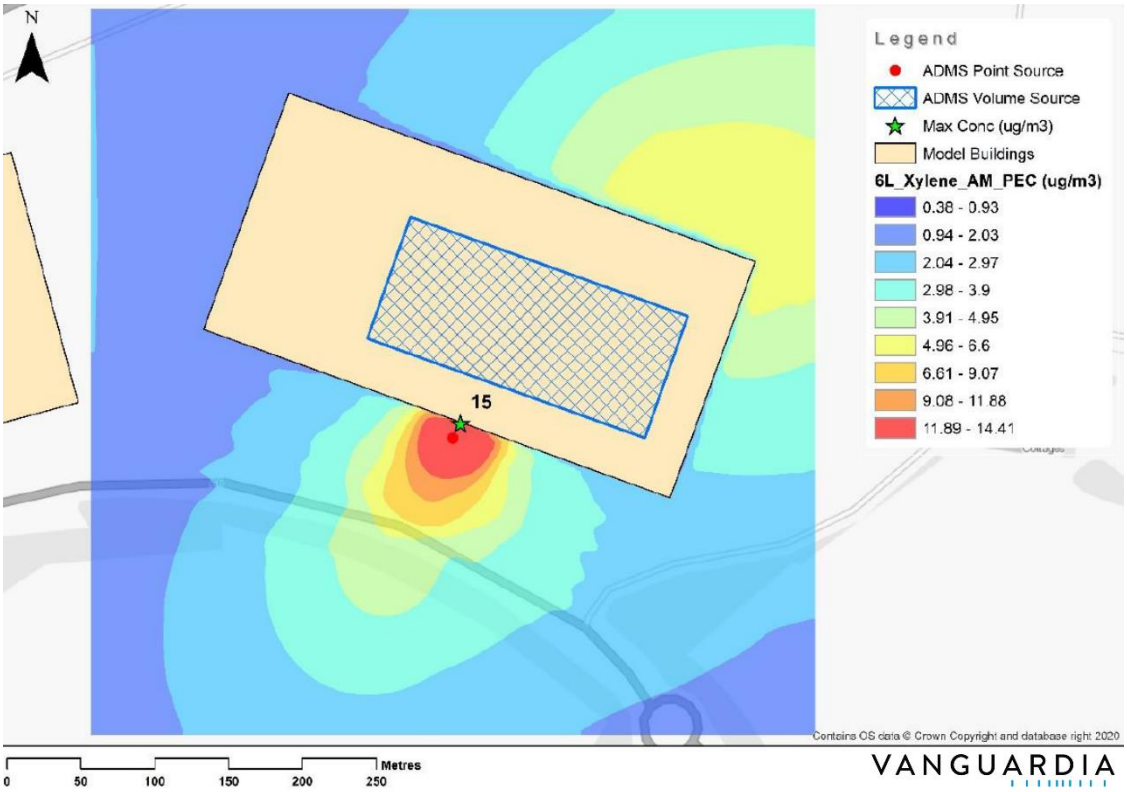
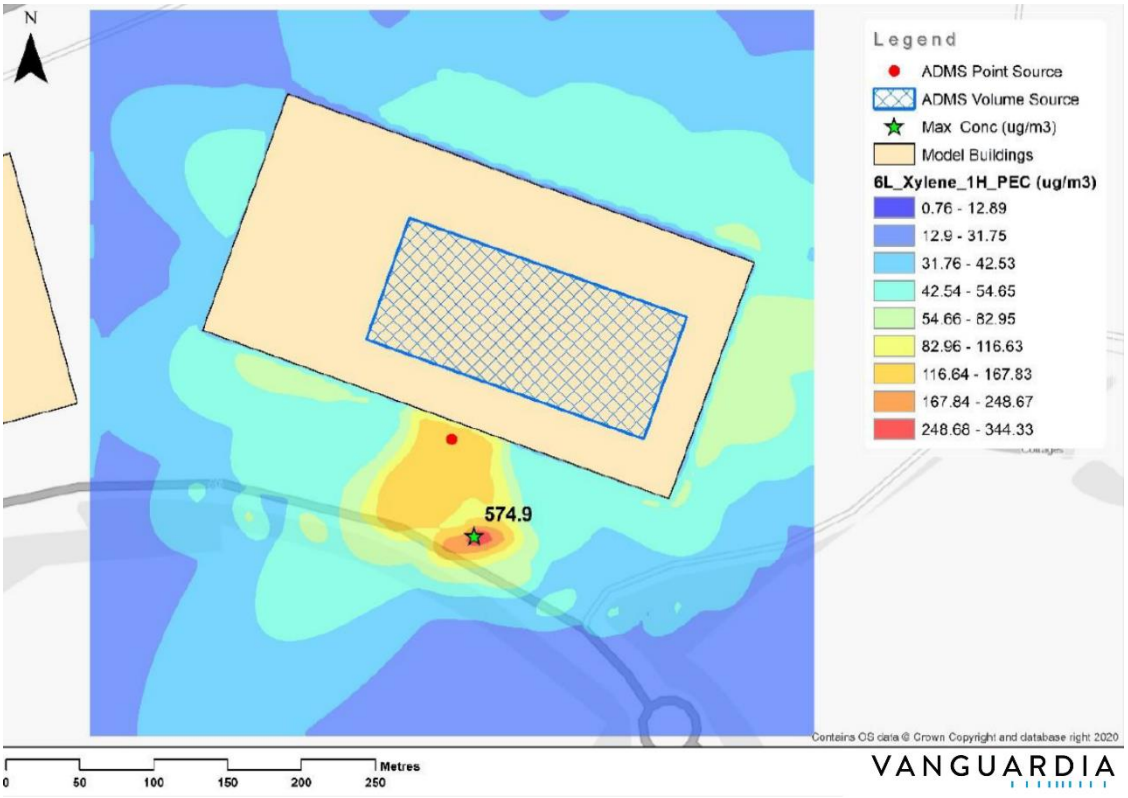


Figure 13 6 Line – Predicted Environmental Concentration for VOCs as Xylene (1 Hour Maximum, µg/m³)



5.27. Table 22 shows the maximum predicted annual mean VOC concentrations at the receptors. The impacts are assessed as negligible for all receptors.

Table 22 IAQM/EPUK Impact/Significance Criteria (Xylene, µg/m³)

Receptor	Predicted Annual Mean Xylene Concentration 2021 (µg/m³)	Long Term Average Concentration at Receptor in Assessment Year 2021	Pollutant Concentration Change 2021 (µg/m³)	% Change Relative To AQAL in 2021	2021 Impact Descriptor
1	1.4	75% or less of AQAL	1.05	0%	Negligible
2	1.6	75% or less of AQAL	1.18	0%	Negligible
3	1.3	75% or less of AQAL	0.90	0%	Negligible
4	1.8	75% or less of AQAL	1.44	0%	Negligible
5	2.1	75% or less of AQAL	1.67	0%	Negligible
6	2.3	75% or less of AQAL	1.90	0%	Negligible
7	1.0	75% or less of AQAL	0.60	0%	Negligible

8	0.6	75% or less of AQAL	0.26	0%	Negligible
9	0.7	75% or less of AQAL	0.34	0%	Negligible
10	0.9	75% or less of AQAL	0.51	0%	Negligible

6. CONCLUSIONS

6.1. This report provides an assessment of the impacts associated with the operation of the proposed development on local air quality.

6.2. This report has assessed the significance of the impacts from the operation of the proposed development on human health receptors as a result of pollutant concentrations arising from stack and fugitive emissions.

6.3. Modelling was undertaken using emissions information provided by the client, and a series of conservative assumptions:

- The proposed development was modelled to operate continuously; and
- All results presented are the maximum concentrations from a 3-year modelling period, so represent the worst case.

6.4. The results of the dispersion modelling show that at all modelled human health receptors and locations where the relevant air quality objectives are applicable, no exceedances will be caused by the proposed development. The impacts are assessed as negligible.

6.5. It can therefore be concluded that the proposed development does not give rise to any significant air quality impacts on human health receptors and is fully compliant with national, regional and local planning guidance.

APPENDIX A – SOURCE PARAMETER AND EMISSIONS CALCULATIONS

STACK PARAMETERS

Table A1 - 4-Line

Stack parameters	Value	Comment
Height (m)	14.5	Agreed by client and to be confirmed by modelling.
Volume flow (Nm^3/s)	15.64	Dürr Systems AG report section 3.5.4. Agreed by client.
Stack diameter (m)	1.41	Diameter calculated based upon a velocity of 10 m/s.
Velocity (m/s)	10	From client.
Temperature (°C)	150	Dürr Systems AG report section 3.5.4. Agreed by client.

Table A2 - 6-Line

Stack parameters	Value	Comment
Height (m)	14.5	As for 4-line model
Volume flow (Nm^3/s)	23.46	Increase of 50 % on 4-line model. Agreed with client.
Stack diameter (m)	1.41	As for 4-line model.
Velocity (m/s)	15	Calculated from volume flow and stack diameter.
Temperature (°C)	150	As for 4-line model.

STACK EMISSIONS

Table A3 - 4-Line

Emission Parameters	Value	Comment
NO_x concentration (mg/Nm^3)	50	Dürr Systems AG report section 2.2. Agreed by client.
NO_x concentration ($\mu g/Nm^3$)	0.05	Unit conversion
NO_x emission (g/s)	0.7819	Calculated from 4-line volume flow.
VOC (as Carbon) concentration (mgC/Nm^3)	20	Dürr Systems AG report section 2.2. Agreed by client.
VOC (as Carbon) emission (g/s)	0.3128	Calculated from 4-line volume flow.

Xylene/Carbon mass ratio	1.1042	Ratio of Xylene to Carbon atomic mass (106/96)
VOC (as Xylene) emission (g/s)	0.3454	Calculated from 4-line volume flow.

Table A4 - 6-Line

Emission Parameters	Value	Comment
NO_x concentration (mg/Nm³)	50	Dürr Systems AG report section 2.2. Agreed by client.
NO_x concentration (µg/Nm³)	0.05	Unit conversion
NO_x emission (g/s)	1.1729	Calculated from 6-line volume flow.
VOC (as Carbon) concentration (mgC/Nm³)	20	Dürr Systems AG report section 2.2. Agreed by client.
VOC (as Carbon) emission (g/s)	0.4692	Calculated from 6-line volume flow.
Xylene/Carbon mass ratio	1.1042	Ratio of Xylene to Carbon atomic mass (106/96)
VOC (as Xylene) emission (g/s)	0.5180	Calculated from 6-line volume flow.

FUGITIVE EMISSIONS : VOLUME SOURCE PARAMETERS

Table A5 - Volume Source Parameters

Volume Source Parameter	Value	Comment
Height (m)	16.2	Height of modelled building 4b
Area (m²)	17341.5	Calculated in GIS from designs supplied by client.
L1 (m)	1	Vanguardia assumption
Volume (m³)	17341.5	Calculated based on area and L1

FUGITIVE EMISSIONS : VOLUME EMISSION PARAMETERS

Table A6 – 4-Line

Emission Parameters	Value	Comment
Production Area area (m²)	22592.7	Calculated in GIS from drawing supplied by client
Production Area height (m)	14.85	From drawings supplied by client.
Production Area volume (m³)	335501.6	Calculated from Production Area area and height.
Ventilation rate (m³/s)	559.2	Calculated from Production Area volume and an air replacement rate of 6 x volume per hour.

VOC (as Xylene) concentration (mg/m³)	0.39	From RPS report OEM record form 3. Xylene not monitored for so took highest concentration of any VOC monitored. Assumed concentration for whole production Area volume so very conservative estimate.
VOC (as Xylene) emission (g/s)	0.2181	VOC emission calculated from concentration in µg/m³ multiplied by ventilation rate.
VOC (as Xylene) emission (g/m³/s)	1.2575E-05	VOC emissions divided by volume source volume.

Table A7 – 6-Line

Emission Parameters	Value	Comment
Production Area area (m²)	32202.2	Calculated in GIS from drawing supplied by client
Production Area height (m)	14.85	From drawings supplied by client.
Production Area volume (m³)	478202.7	Calculated from Production Area area and height.
Ventilation rate (m³/s)	797.0	Calculated from Production Area volume and an air replacement rate of 6 x volume per hour.
VOC (as Xylene) concentration (mg/m³)	0.39	From RPS report OEM record form 3. Xylene not monitored for so took highest concentration of any VOC monitored. Assumed concentration for whole production Area volume so very conservative estimate.
VOC (as Xylene) emission (g/s)	0.3108	VOC emission calculated from concentration in µg/m³ multiplied by ventilation rate.
VOC (as Xylene) emission (g/m³/s)	1.7924E-05	VOC emissions divided by volume source volume.