Environmental Permit Application
Manchester Airport

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Manchester Airport Plc
MAG42059

Combustion Permit - EPR/PP3023PR
27 June 2025

Environmental Permit Application Manchester Airport

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Acronyms and abbreviations

AQMA	Air Quality Management Area
ASD	Application Support Document
BAT	Best Available Techniques
BREF	Best Available Techniques Reference Document
BS	British Standard
DAA	Directly Associated Activity
EA	Environment Agency
EP	Environmental Permit
EPR	Environmental Permitting (England & Wales) Regulations 2016
EQS	Environmental Quality Standard
IED	Industrial Emissions Directive (2001/80/EC)
ISO	International Organisation for Standardisation
LCP	Large Combustion Plant
MAG	Manchester Airport Group PLC
MCP	Medium Combustion Plant
MCPD	Medium Combustion Plant Directive (2015/2193/EC)
MW	Megawatt
MWth	Megawatt thermal
NO_x	Oxides of nitrogen
NO_2	Nitrogen dioxide
P&ID	Piping & Instrumentation Diagram
PM	Particulate matter
PFD	Process Flow Diagram
SAC	Special Area of Conservation
SCR	Site Condition Report
SDS	Safety Data Sheet
SO_2	Sulphur dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

Non-Technical Summary

The application is for a new bespoke environmental permit for the combustion of fuel in appliances at Manchester Airport. This application is being made by Manchester Airports Group plc (hereafter 'MAG'), under the Environmental Permitting (England and Wales) Regulations 2016 (EPR 2016).

The total rated thermal input of the combustion plant at the site is more than 50MWth and therefore requires an Installation permit under Section1.1 Part A(1) (a) 'Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts' activity, as defined in the EPR regulations.

The on-site combustion plant includes existing natural gas fuelled[1] boilers and gas-oil (diesel) fuelled standby generators, which provide heat and/or power across the site including the airport terminals, fire stations and associated training areas, sprinkler and hydrant systems and railway station. There are 94 combustion units in total.

Site plans are included in Appendix A which show the location of the combustion plant emission points.

Manchester Airport is located approximately 14 km south-southwest from the centre of the city of Manchester in the metropolitan county of Greater Manchester. The M56 motorway is adjacent to the northern, eastern and western boundary of the site with open grassland and woodland adjacent to the southwestern and southern boundary. Beyond the M56 are the residential developments of Warburton Green and Woodhouse Park. The National Trust's Quarry Bank and Styal Country Park is to the east. The airport's second runway crosses the River Bollin, a tributary of the River Mersey, which runs in a tunnel beneath the airfield.

There are a number of protected conservation areas in the surrounding area, including sites with European designation within 15km and national and local designations within 2km. The boundary of some of these local nature sites encroach the site.

An air quality impact assessment has been carried out to predict the impacts associated with the operation of the combustion plant subject to this application. The assessment was carried out using a recognised atmospheric dispersion modelling technique. The model predicts the dispersion of operational emissions from a specific source (e.g. a stack), and the subsequent concentrations over an identified area (e.g. at ground level across a grid of receptor points) or at specified points (e.g. a residential property). The most relevant sensitive human and ecological receptors have been identified from local mapping and are summarised in figures within the air quality report.

The pollutants of potential concern from the burning of natural gas and gas oil (diesel) are:

- nitrogen dioxide (NO_2)
- carbon monoxide (CO)
- sulphur dioxide (SO_2)
- particulate matter (PM_{10}, particles with an aerodynamic diameter of 10 microns or less and $PM_{2.5}$, particles with an aerodynamic diameter of 2.5 microns or less).

Emissions of these pollutants from the assessed boilers and standby generators were calculated and concentrations predicated at nearby receptor locations assessed in accordance with Environment Agency guidance.

At off-site sensitive human receptor locations, the air quality impacts are considered 'not significant'. At some of the assessed protected conservation areas, process contributions from site operations are elevated with some exceedances of the relevant Environmental Quality Standard (EQS) being predicted. It should be

[1] Natural gas is the primary fuel for those duel-fueled boilers.

noted some of the assessed protected conservation areas encroach the site boundary (denoted by the site fenceline). However, the conservative approach adopted throughout the assessment means the results presented are likely to be considerably higher than would reasonably be expected and based on professional judgement, the impact is considered to be 'not significant'.

There is no wastewater routinely generated from the combustion plant. Relatively small quantities of wastes are generated through maintenance activities such as waste oil and oil filters. All wastes are removed off site and disposed of in accordance with the company's waste management policy.

There is potential for spills or leaks of fuel arising from the generators and associated fuel supply pipework and storage tanks. This risk is managed through the bunding of tanks, level monitoring and alarm systems. All fuel storage areas are regularly inspected by MAG staff.

At the Manchester Airport site surface water drainage is carefully managed in accordance with a Surface Water Drainage Management Plan, which forms part of the sites environmental management system. MAG has a long-established spillage procedure that describes actions to be taken in the event of any fuel spillages that have the potential to enter surface water drainage system or in the event of any contamination of drainage systems, public services or watercourses. There are around 40 oil interceptors on the surface water drainage system across the site. These are checked regularly and maintained.

Noise emissions from the combustion plant have been considered within the application. It has been demonstrated that as noise from generators and plant does not exceed existing baseline noise from aircraft and the surrounding road network and therefore, more detailed noise modelling and assessment is not required.

The combustion plant is serviced and maintained in line with the manufacturer's recommendations and MAGs operational experience with the units in order to maintain combustion efficiency. Air emissions monitoring is not currently routinely undertaken, however this will be implemented and undertaken in accordance with the new permit requirements.

All MAG airports have maintained carbon neutral status certified by the Airports Carbon Accreditation Scheme. Carbon emissions from boilers and generators are addressed by carbon off-setting. However, the MAG Corporate Social Responsibility Strategy commits to move beyond carbon neutrality to achieve net zero emissions for MAGs airport operations no later than 2038. MAGs approach to decarbonisation focusses on efficiency and renewable energy and this will drive future decisions on the operation of the combustion plant.

It is concluded that the combustion plant operations subject to this permit application will not result in significant impacts upon environmental receptors, and that environmental controls and operational practices employed at the airport comply with the requirements of Best Available Techniques (BAT).

1 Introduction - Part A Form

1.1 Introduction

The purpose of this Application Support Document (ASD) is to provide supplementary information to support a new bespoke environmental permit (EP) application for the combustion of fuel in appliances at Manchester Airport (hereafter 'the site'). This application is being made under the Environmental Permitting (England and Wales) Regulations 2016 (EPR 2016).

The total rated thermal input of the combustion plant at the site is more than 50MWth and therefore requires an Installation permit under Section1.1 Part A(1) (a) 'Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts' activity, as defined in the EPR regulations.

The address of the combustion installation is:

Chicago Avenue, Manchester Airport

Manchester

Greater Manchester

M90 1QX

The installation, which is owned by Manchester Airports Group plc (hereafter 'MAG'), is operated by Manchester Airport plc.

Although Manchester Airport does not currently hold an environmental permit for combustion units, as identified to the Environment Agency (EA) during the pre-application advice process, other permits are in place at the site. These include a Greenhouse Gas Emissions Permit, effective from March 2024 (UK-E-IN-11829), and discharges to watercourse, relating to site drainage and containment system, effective from February 2019 (NW/EPRCB3299EN/002).

The following application forms have been completed and should be reviewed in conjunction with this ASD:

- Environmental Permit Form Part A: apply for an environmental permit (about you)
- Environmental Permit Form Part B2: general - new bespoke permit
- Environmental Permit Form Part B2.5: medium combustion plant and/or specified generator bespoke permit
- Environmental Permit Form Part B3: new bespoke installation permit
- Environmental Permit Form Part F1: apply for an environmental permit (charges and declarations).

1.2 Form Part A About you

Application for a registered company	
Name of the company	Manchester Airport Plc
Company registration number	01960988
Main Registered Office Address	Level 5 Town Hall Extension, Albert Square, Manchester, England, M60 2LA
Contact Name	N/A
Email contact number	N/A

Application Contact	Main Contact	Secondary Contact
Title & Name	Oliver Dugan	Karen Wallis
Role	Energy Manager	Environmental Coordinator
Address	3rd Floor, Olympic House, Manchester Airport, Manchester, United Kingdom, M90 1QX	3rd Floor, Olympic House, Manchester Airport, Manchester, United Kingdom, M90 1QX
Phone	07958877643	07711574489
Email	oliver.dugan@magairports.com	Karen.Wallis@magairports.com

Billing or Invoicing Contact	
Contact Name	Oliver Dugan
Address & Contact details	As above

Details of Directors and Company Secretary
Name: Chris Woodroofe Correspondence address: Level 5, Town Hall Extension, Albert Square, Manchester, England, M60 2LA Role: Director Occupation: Director Date of birth: October 1977 Appointed on: 28 October 2022 Nationality: British Country of residence: England
Name: Janine Bramall Correspondence address: Level 5, Town Hall Extension, Albert Square, Manchester, England, M60 2LA Role: Director Occupation: Financial Director Date of birth: October 1972 Appointed on: 12 November 2020 Nationality: British Country of residence: United Kingdom
Name: Manchester Professional Services Ltd. Correspondence address: Level 5, Town Hall Extension, Albert Square, Manchester, England, M60 2LA Role: Secretary Appointed before: 9 August 1992

2 About the Permit Application - Form Part B2

2.1 About the permit

Discussions before your application

MAG requested pre-application advice from the EA in April 2023. Correspondence between the EA and MAGs representative continued until November 2023.

Jacobs submitted a pre-application advice request on behalf of MAG in August 2024. This was followed by an initial call with the EA, and a formal pre-application meeting at Manchester Airport in October 2024.

The EA advised that all of the combustion activities should be aggregated together in a single Installation to fall under Schedule 1.1 Part A(1) (a) 'Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts' activity as defined in the EPR Regulations.

Is the permit for a site or for mobile plant?

A site

Have we told you during pre-application discussions that we believe that a mobile permit is suitable for your activity?

No. Pre-application admission has confirmed that a mobile permit is not suitable.

Have there been any changes to your proposal since this discussion?

No

2.2 About the site (excludes mobile plant)

Site Details	
Site name	Manchester Airport
Address	Chicago Avenue, Manchester Airport, Manchester, Greater Manchester
Post code	M90 1QX
National Grid Reference	SJ 81812 85038
Regulated facility type	Installation (Pre-application advice reference: EPR/PP3023PR)

Low impact installations (installation only)

Are any of the regulated facilities low impact installations?

No – not applicable

Treating batteries

Are you planning to treat batteries?

No, this application is not for the treatment of batteries.

Ship recycling

Is your activity covered by the Ship Recycling Regulations 2015?

No, this application is not covered by the Ship Recycling Regulations 2015.

Multi-operator installation

If the site is a multi - operator site (that is there is more than one operator of the installation) then fill in the table below the application reference for each of the other permits.

Not applicable – MAG owns and operates all of the combustion plant subject to this permit application.

2.3 Your ability as an operator

Relevant offences

Have you, or any other relevant person, been convicted of any relevant offence?

No but prosecution pending. East Midland Airport (EMA) is due to attend a sentencing hearing on 25th July 2025 in relation to 3 breaches of ifs surface water permit at EMA. EMA and Manchester Airport Plc. are part of the same group of companies.

Technical ability

Relevant waste operations only. Please indicate which of the two schemes you are using to demonstrate you are technically competent to operate your facility and the evidence you have enclosed to demonstrate this.

Not applicable

Finances

Do you, or any relevant person, or a company in which you (or they) (or any relevant person) were a relevant person, have current or past bankruptcy or insolvency proceedings against you?

No

Management systems (all)

What management system will you provide for your regulated facility?

MAG operate an Environmental Management System certified under ISO14001: 2015. The certificate number is 24937 and it was issued 18 December 2023. The date of expiry is 17 February 2027. A copy of the ISO14001 certificate is provided in Appendix B.

MAG also operate an Energy Management System which is certified under ISO 50001: 2018. The certificate number is 24936 and it was issued 18 December 2023. The date of expiry is 12 September 2026. A copy of the ISO50001 certificate is provided in Appendix B.

Key management systems procedures are included in Appendix B and are cross referenced within this application document:

- EMOP06 – Spill response
- EMOP07 – Bulk Storage of oil, fuel and other materials
- EMOP10 – Waste Management
- Airside Standing Instruction 21 - Spillages
- Airside Standing Instruction 36 – Minimum Standards for Bowers Tankers Tanks & Chemical Stores
- Surface Water Drainage Management Plan
- Airside Standing Instruction 21 - Spillages

- Airside Standing Instruction 36 – Minimum Standards for Bowers Tankers Tanks & Chemical Stores
- Surface Water Drainage Management Plan

2.4 Consultation

Could the waste operation or installation involve releasing any substance into any of the following?

A sewer managed by a sewerage undertaker?

No.

A harbour managed by a harbour authority?

No.

Directly into relevant territorial waters or coastal water within the sea fisheries district of a local fisheries committee?

No.

Is the installation on a site for which:

A nuclear site licence is needed under section 1 of the Nuclear Installations Act 1965?

No.

A policy document for preventing major accidents is needed under regulation 5 of the Control of Major Accident Hazards Regulations 2015, or a safety report is needed under regulation 7 of those Regulations?

The site is an Upper Tier Establishment, under the COMAH Regulations 2015 due to the quantity of petroleum products and alternative fuels stored that could potentially result in a major accident. The airport COMAH site address is Manchester Airport, Pinfold Lane, Manchester Airport, Manchester, Greater Manchester, M90 5XA. The site operates a Major Accident Prevention Policy.

2.5 Supporting information

Provide a plan or plans for the site

The following plans and supporting information are provided in the appendices:

- Appendix A1: Figures
  - Figure 1: Site Boundary Plan
  - Figures 2-6: Emission Sources
  - Figure 7: Surface Water Drainage Catchments
  - Figure 8: Environmental Constraints
- Appendix A2: Process Flow Diagrams
- Appendix A3: Site photographs
- Appendix A4: Site drainage plans
- Appendix B. Management System
- Appendix C. Air Quality Assessment
- Appendix D. Plant Specification

- Appendix E. Habitats Assessment
- Appendix F. Material Safety Data Sheets
- Appendix G. Climate Change Plan
- Appendix H. Site Condition Report

Provide the relevant sections of a site condition/baseline report if this applies

Please refer to Appendix H of this Application Support Document. A baseline Site Condition Report is provided.

Provide a non-technical summary of your application

A Non-Technical Summary is included at the start of the Application Support document.

Are you applying for an activity that includes the storage of combustible wastes?

No, the site does not require a fire prevention plan in accordance with EA guidance.

2.6 Environmental Risk Assessment

Please refer to Section 6 of this Application Support Document.

3 Form B2.5 – Medium Combustion Plant and/or Specified Generator Permit

3.1 About the permit

What is your permit application for?

This application is for a bespoke EP permit under the EPR and covers 94 combustion units across the site comprising:

- 34 boilers
- 34 fixed standby generators
- 15 mobile generators
- 11 fire systems (comprising standby generators and standby diesel pumps).

Of these, the following plant exceeds 1MW thermal input capacity, as detailed in Table 4.1.1 of this document:

- 13 x boilers
- 22 x standby generators

3.2 About your MCP/SG

For stationary and mobile SG and MCP what is the site name, address, postcode and national grid reference where the plant is located?

Site name - Manchester Airport

Address - Chicago Avenue, Manchester Airport, Manchester, Greater Manchester

Postcode - M90 1QX

NGR: Grid references for the individual plant are provided in the plant specification table in Appendix D.

Is your permit application for new MCP(s) with a total aggregated thermal input of 20MW thermal or more?

Yes. The aggregated net rated thermal input of all combustion units at the site exceeds 20MWth and has been calculated as 123.7 MWth. Please refer to Appendix D (Plant Specification).

Is your permit application for a MCP and/or SG which is:

A unit greater than or equal to 20MW thermal?

There are no individual units equal to or exceeding 20MW thermal. The aggregated net thermal input of all combustion plant forming the Installation is 123.7 MWth (comprising 63.9 MWth for the boilers, 42.5 MWth for the standby generators, 15 MWth for the mobile generators and 2.4 MWth for the fire systems). The individual thermal input capacity of the combustion plant ranges from <1MWth to 7.7MWth.

One that burns waste biomass as described in Article 3(18) (b) of MCPD?

No.

Do any of the MCPs and/or SG on site meet the criteria of a EPR Chapter 1, Section 1.1 Part B activity?

No.

Do any of the MCPs and/or SG on site meet the criteria of a EPR Chapter 5, Section 5.1 Part B activity?

No.

Does your MCP(s) require an air emissions risk assessment to assess the risk to habitats?

Yes. An Air Quality Impact Assessment (see Appendix C) has been carried out to predict the impacts associated with the operation of the considered MCP at nearby protected conservation areas. It is concluded that the operation of the assessed combustion plant at Manchester Airport are acceptable from an air quality perspective.

Do you want to declare that your existing MCP(s) will meet new MCP emission limit values (ELVs) from the medium combustion plant directive (MCPD) in order to demonstrate a low risk impact to habitats under a stage 1 or 2 air emissions risk assessment?

Air dispersion modelling has been undertaken. The emission concentrations utilised are detailed in Section 5.2.1.

Does your SG require dispersion modelling to assess the risk to human health and habitats from proposed emissions to air?

Yes. An Air Quality Impact Assessment (see Appendix C) has been carried out to predict the impacts associated with the operation of the considered MCP. At off-site sensitive human and ecological receptor locations, the air quality impacts are considered 'not significant'. A summary of impacts is provided in Section 6.1.

3.3 Your ability as an operator

Relevant offences - have you, or any other relevant person, been convicted of any relevant offence?

As per Section 2.3.

No but prosecution pending. East Midland Airport (EMA) is due to attend a sentencing hearing on 25th July 2025 in relation to 3 breaches of ifs surface water permit at EMA. EMA and Manchester Airport Plc. are part of the same group of companies.

Finances - do you or any relevant person or a company in which you were a relevant person have current or past bankruptcy or insolvency proceedings against you?

No

Management Systems

Please refer to Section 2.3.

Provide a non - technical summary of your application

A non-technical summary is included at the start of this Application Support Document.

4 Technical Description and Operations

4.1 Plant Specification

This application is for a bespoke EP permit under the EPR and covers 94 combustion units across the site comprising; 34 boilers, 34 fixed standby generators, 15 mobile generators and 11 fire systems (comprising standby generators and standby diesel pumps).

The aggregated net thermal input of all combustion plant forming the Installation is 123.7 MWth (comprising 63.9 MWth for the boilers, 42.5 MWth for the standby generators, 15 MWth for the mobile generators and 2.4 MWth for the fire systems). The individual thermal input capacity of the combustion plant ranges from <1MWth to 7.7MWth.

The boilers are fuelled by natural gas to provide heat, typically operating between October and April each year.

The standby generators, mobile generators and fire systems operate intermittently (depending on energy demand or testing requirements). The generators are fuelled by Gas-oil (diesel). Low Sulphur Fuel Oil (sulphur content of 0.001% or 10mg/kg) is used for plant in accordance with the requirements of the Sulphur Content in Fuels (England & Wales) Regulations 2014.

Table 4.1.1 details the combustion units with a thermal input capacity greater than 1MWth and associated typical annual operational hours. The full list of emission sources is provided in Appendix D – Plant Specification.

Process flow diagrams are provided in Appendix A.3 and site photographs in Appendix A.4.

Table 4.1.1: Combustion plant with a thermal input capacity >1MWth

Emission point ref	Location / description	Thermal input capacity (MWth)	Typical annual operational hours
Natural gas fuelled boilers			
A20	Fire training rig	7.728	12
A07-1	T2 Boiler House	7.143	4,200
A07-2	T2 Boiler House	7.143	4,200
A01-A	T1 Boiler House	4.643	4,200
A01-B	T1 Boiler House	4.643	4,200
A03-1	T3 Boiler House	2.857	4,200
A03-2	T3 Boiler House	2.857	4,200
A03-3	T3 Boiler House	2.857	4,200
A08-A	Cargo Centre Main Boiler House	2.857	4,200
A08-B	Cargo Centre Main Boiler House	2.857	4,200
A24-1	MAN- TP Energy Centre	2.144	4,200
A24-2	MAN- TP Energy Centre	2.144	4,200
A24-3	MAN- TP Energy Centre	2.144	4,200
Diesel fuelled standby generators			
GEN02	ATC Tower	1.33	39
GEN04	BSUB ENG 1	1.33	193[1]

Emission point ref	Location / description	Thermal input capacity (MWth)	Typical annual operational hours
GEN05	BSUB ENG 2	1.33	164[1]
GEN06	CSUB ENG 1	1.33	159[1]
GEN07	CSUB ENG 2	1.33	180[1]
GEN08	CSUB R2/C	1.21	<250
GEN09	D SUB	1.33	<10
GEN11	G SUB	1.52	12
GEN14	PHASE 4 SUB	1.48	<10
GEN15	Pump Station B7	1.05	25
GEN17	RSUB ENG 1	1.64	12
GEN18	RSUB ENG 2	1.33	12
GEN19	Southern Front	1.21	12
GEN21	R2/1 SUB ENG 1	2.42	126[1]
GEN22	R2/1 SUB ENG 2	2.42	128[1]
GEN24	R2/3 SUB ENG 1	2.42	140[1]
GEN25	R2/3 SUB ENG 2	2.42	120[1]
GEN28	T2 B1 SUB	1.06	72
GEN29	T2 G2A SUB	4.00	12
GEN30	T3 H1 SUB	1.64	12
GEN31	Voyager 7th Floor	1.83	12
GEN32	West Apron Ph6A	1.33	14

Note 1: Anticipated to be 12 hours per year from May 2025 onwards.

Associated activities comprise:

- Fuel (diesel) storage and transportation
- Natural gas supply pipework
- Waste generation

4.2 Site Layout and Permit Boundary

Manchester Airport encompasses a large geographic area totalling approximately 5,666,000m^2. The airport terminals (T1, T2 and T3), offices, on-site hotels and car parks are predominately located in the northern section of the airport with the aircraft hangars, warehouses and air traffic control (ATC) tower located near the western and southwestern boundary of the site. Runway 05L / 23R and 5R / 23L are located in the southern section of the airport.

The majority of boilers considered in this application are housed in locations in and around T1, T2 and T3 to satisfy the required energy demand. There are also boilers located at the on-site railway station, Olympic House (the main office for all airport staff), fire stations and associated training areas situated across the site and an energy centre, which is located near the northern boundary of the site adjacent to the Multi Storey T2 west carpark. The standby generators and fire systems are housed sporadically across the airport with GEN21 & GEN 22 and GEN 24 & GEN 25 housed adjacent to the runways. The mobile generators, by definition, are not in a fixed location.

A site boundary plan is provided as Figure 1 in Appendix A. The location of the combustion plant installation areas are demarcated in green on Figure 1.

The individual boilers, generators and fire systems are identified in greater detail on Figures 2-6 in Appendix A.

An environmental permit is in place to control discharges to watercourse. The primary activity on site the environmental permit covers is aircraft de-icing and airfield anti-icing.

4.3 Surrounding Area and Receptors

There are numerous sensitive human and ecological receptors (also referred to as 'protected conservation areas') in the vicinity of the site in respect of potential air emissions from the process. With regard to protected conservation areas, Rixton Clay Pits Special Area of Conservation (SAC), Manchester Mosses SAC, Rostherne Mere Ramsar, Midland Mere & Mosses – Phase 1 Ramsar are all within 15km of the site. Cotterill Clough Site of Special Scientific Interest (SSSI) and 48 local nature sites are within 2km of the site, some of which encroach the site.

As part of the Local Air Quality Management (LAQM) process, Greater Manchester Combined Authority (GMCA)[2] has declared an air quality management area (AQMA) (termed 'Greater Manchester Combined Authority AQMA'). his AQMA encompasses an area covering the 10 districts of Greater Manchester including arterial routes, district centres and parts of Manchester Airport. The AQMA has been declared for elevated concentrations of annual mean nitrogen dioxide (NO_2) and 24-hour mean PM_{10} (particles with an aerodynamic diameter of 10 microns or less) concentrations.

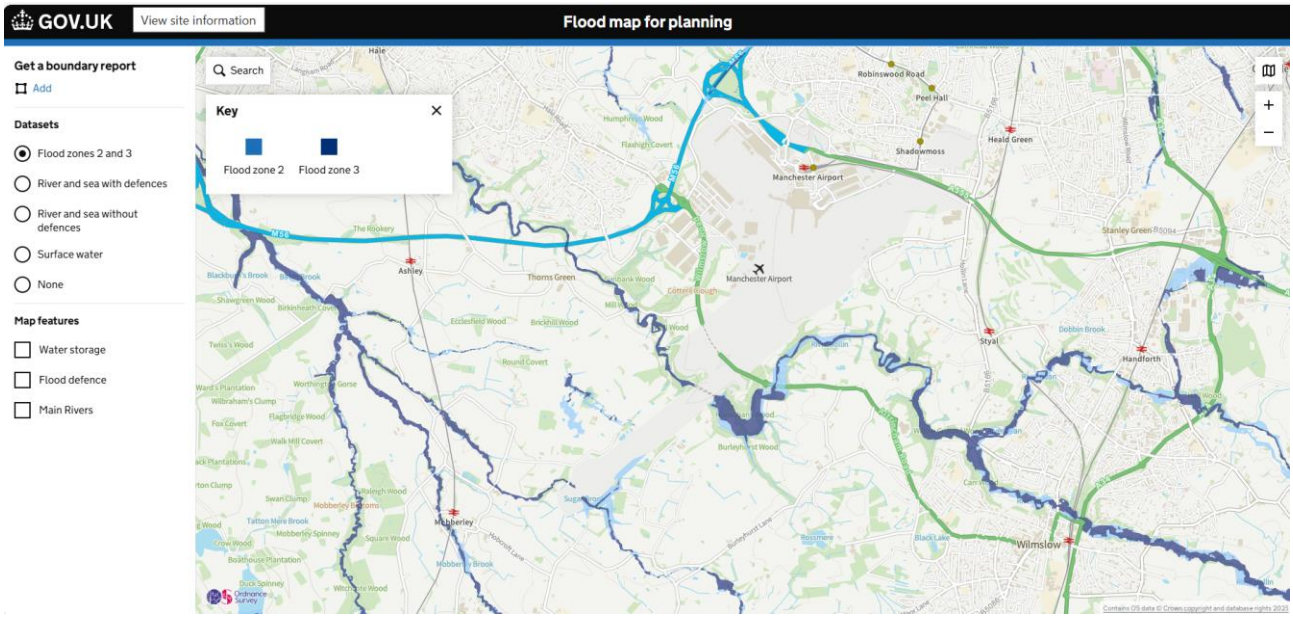
With regard to the potential for flooding, areas of the site primarily near the southern boundary (denoted by the site fence line), sit within Flood Zone 2 (i.e. annual probability of between 1:1,000 and 1:100 of river flooding) and Flood Zone 3 (i.e. annual probability if 1:100 of river flooding).

Surface water discharges to the River Bollin, a tributary of the River Mersey, which runs in a tunnel beneath the airfield at the airport's second runway (south side of the site). Smaller brooks (Timperley Brook, Sugar Brook, Bager Brook, Double Wood Brook) and Cotteril Clough have been identified in drainage plans as surface water receptors around the site.

Flood Zone 2 and 3 areas are located in parts of the southern western sections of the airport site, largely surrounding the River Bollin. Some flood Zone 2 areas are also present north-west of the site, with Zone 3 areas to the north.

2 Made up of the ten Greater Manchester councils and Mayor, who work with other local services, businesses, communities and other partners to improve the city-region.

Figure 4.3.1: Map of Flood Zones 2 and 3



4.4 Operations

4.4.1 Resources and Materials - Usage and Storage

Fuel Oil

Gas oil is used as fuel for electricity generators and the fire systems.

MAG complies with the Sulphur Content in Fuels (England & Wales) Regulations 2014 (and meet BAT) and for all fuel storage, will continue to be fully compliant with the requirements of the Control of Pollution (Oil Storage) (England) Regulations 2001. This is also supported by EMOP07 – Bulk Storage of oil, fuel and other materials and Airside Standing Instruction 36 – Minimum Standards for Bowers Tankers Tanks & Chemical Stores.

Fuel is stored in bulk tanks and transferred using fuel Bowsers that deliver locally then pump into smaller local smaller tanks and day tanks. An inventory of fuel tanks associated with the combustion plant subject to this permit application is provided in Table 4.4.1. The Bulk Storage Inventory (EP07-D01) record information on all MAG bulk storage tanks including their compliance with the OSR and/or the Aerodrome Manual and is updated as required following changes to tanks or internal auditing.

All external stores of fuel over 200 litres comply with the standards set out within the Control of Pollution (Oil Storage) (England) Regulations.

All MAG bulk storage tanks are regularly inspected. The inspection includes an assessment of the tank, its secondary containment and surrounding land and compliance with the OSR.

Stock checks and tank levels are regularly monitored:

- MAG standby generator tank levels are checked weekly and recorded on the Standby Engine Check Sheet.
- MAG vehicle refuelling tank levels and Fuel Works stock control system.

Individual departments are responsible for any calibration requirements on level sensors, fuel gauges etc.

Where underground pipework is part of the Installation, it is pressure tested in accordance with the OSR.

Mobile fuel bowsers that cannot be moved under their own power are double skinned /self-bunded with 110% of the tank capacity provided within the bund. Bowsers are maintained in good condition and hatch/fill points kept secured, and preferably locked to prevent unauthorised use.

Fuel bowsers that are moved under their own power are maintained in good condition with no leaks, including but not limited to, hoses, sight glasses, fill points, valves, pumps etc. Hoses are secured when the vehicle is in transit. A spill kit is carried on the vehicle to allow the clean-up of small spillages, including any plastic bags/shovels as required to facilitate the sweep up and disposal of any used spill kit by the operator.

Prompt remedial action will be undertaken in the event of a fuel spillage. This will be in accordance with EMOP06 – Spill response. Refer to Sections 4.4.5 and 7.2 for additional information on spill response.

Typical annual fuel consumption is around 59.5 tonnes a year based on historical consumption, typically broken down as follows:

- Pumps – 3,918 litres
- Boilers – 36,272 litres
- Generators – 19,310 litres

Consumption data for temporary equipment is based on gas oil fuel invoices or deliveries from the third party suppliers.

Activity data for ground power units is estimated based on the bowser meter, at the point of dispersal.

Natural Gas

Manchester Airport has its own extensive gas distribution network. There are two major independent systems in operation: Airport Gas System 1 which is fed from Manchester Airport Gas Meter House No.1, (Prime 1) and operates at a controlled outlet pressure of 70 mbar, and Airport Gas System 2 which is fed from Manchester Airport Gas Meter House No.2, (Prime 2) and operates at a controlled outlet pressure of 138 mbar.

There are three fiscal meters (OB-G-4, OUT-G-1 and 4M-G-3). The volume of gas consumed by Manchester Airport is determined from supplier invoices for the three fiscal meters less the gas consumed by activities at emission point customer's premises. The volume of gas consumed at customer's premises is taken from the Manchester Airport customer gas billing platform which measures customer gas usage by means of individual metering devices.

The total annual gas consumption for the boilers for FY25 (April 2023 - March 2024) was 3,169,800 m^3. Consumption for the current year is expected to be similar to this value.

Activity data from supplier invoices are adjusted pro rata to the start and finish of the reporting year. As part of the UK-ETS scheme, MAG carry out a yearly review of the gas consumption and associated emissions. The most recent review was completed in April 2025. This data is subject to external verification.

Manchester Airport has a monitoring methodology plan for the UK-ETS Permit (UK-E-IN-11829 version 24), which identifies the energy flows and activities including any accessing and controlling risks. It was last verified in March 2025.

The MAG Asset Standard for Fuel Gas sets out the design performance standard for gas fuel systems including connections to gas fired equipment, and testing, purging and commissioning.

At all gas meter locations, building gas intakes, boiler houses and plantrooms a line diagram of the installation fed from the sub-meter is provided by the gas installer and a diagrammatic layout of the gas

installation, positioned in a readily accessible position. MAG have access to real-time data, which is monitored and reviewed as part of the ISO 50001 Energy Management Systems (ENMS) certification process.

Maintenance Oils

Oil is required for maintenance of the boiler and generator units. All servicing and maintenance activities for the combustion plant is undertaken by contractors on behalf of MAG. Contractors are contractually required to remove and appropriately dispose of all wastes generated by their activities. Refer to Section 4.4.2.

Chemicals

For boiler treatment chemicals, a corrosion inhibitor and biocide are utilised in the closed boiler system as required, to attain the appropriate dosage to protect the associated pipework. The chemicals are brought on to site and stored temporarily in an appropriately sized bund in the relevant plant location room before being removed from site.

Table 4.4.1: Tank Inventory Associated with the Combustion Plant Installation

Tank name	Purpose	Location	Tank type	Position	Contents	Max tank capacity (litres)	Installation date	Oil storage/ groundwater regs apply?	Compliant with relevant standard?
A2 MSCP standby generator	Standby generator	T1 - a2 mscp	Bulk	External	Diesel	968	2020	Yes	Yes
ATC tower standby generator	Standby generator	West side	Bulk	Internal	Diesel	15,200	2013	N/a	Yes
B sub standby generator day tank (b1b)	Standby generator	Airfield- taxiway alpha	Day tank	Internal	Diesel	1,000		No	N/A
B sub standby generator main tank	Standby generator	Airfield- taxiway alpha	Bulk	External	Diesel	15,000	2011	Yes	Yes
B sub watchman day tank	Standby generator	Airfield- taxiway alpha	Day tank	Internal	Diesel	3,420		No	N/A
C sub standby generator day tank	Standby generator	Airfield- southside	Day tank	Internal	Diesel	6,299		No	N/A
C sub standby generator main tank	Standby generator	Airfield - southside	Bulk	External	Diesel	16,000	2011	Yes	Yes

Tank name	Purpose	Location	Tank type	Position	Contents	Max tank capacity (litres)	Installation date	Oil storage/ groundwater regs apply?	Compliant with relevant standard?
Cargo 2 & 3 day tank	Fire hydrant pumps	Cargo	Day tank	Internal	Diesel	550		No	N/A
Cargo 4 day tank	Fire hydrant pumps	Cargo	Day tank	Internal	Diesel	300		No	N/A
D sub (b1d)	Standby generator	Airfield - stand 61	Bulk	External	Diesel	17,000	2019	Yes	Yes
Fire station (north) standby generator main tank	Standby generator	Fire station	Day tank	Internal	Diesel	297		No	N/A
Fire training ground - kerosene tank	Fire training	Fire training ground	Bulk	External	Kerosene			Yes	Yes
G sub standby generator day tank	Standby generator	T3 - stand 55	Day tank	Internal	Diesel	1,000		No	N/A
G sub standby generator tank	Standby generator	T3 - stand 55	Bulk	Internal	Diesel	1,319		No	N/A
Gen 01	Lighting	B30	Integrated	Internal	Diesel	170 approx.		No	N/A
Gen 03	Lighting	B30	Integrated	Internal	Diesel	170 approx.		No	N/A
Gen 04	Lighting	B30	Integrated	Internal	Diesel	170 approx.		No	N/A
Gen 05	Lighting	B30	Integrated	Internal	Diesel	170 approx.		No	N/A
Gen 08	Lighting	B30	Integrated	Internal	Diesel	170 approx.		No	N/A

Tank name	Purpose	Location	Tank type	Position	Contents	Max tank capacity (litres)	Installation date	Oil storage/ groundwater regs apply?	Compliant with relevant standard?
Gen 12	Mobile generator	B30	Integrated	Internal	Diesel			No	N/A
Gti	Standby generator	Gti	Day tank	Internal	Diesel	800		No	N/A
H sub standby generator day tank	Standby generator	T1 - tower road	Day tank	Internal	Diesel	1,066		No	N/A
H sub standby generator main tank	Standby generator	T1 - tower road	Bulk	External	Diesel	9,590	2012	Yes	Yes
H4 mt waste oil tank	Mt operation	Hangar 4	Bulk	External	Waste oil	7,500	2009	Yes	Yes
Mobile 1 standby generator t2 service yard	Standby generator (trailer mounted)	T2 - east service yard	Integrated	External	Diesel	2,091	2020	Yes	Yes
Mobile 2 standby generator b sub	Standby generator (trailer mounted)	Airfield - b sub	Integrated	External	Diesel	2,091	2020	Yes	Yes
Mobile 3 standby generator b sub	Standby generator (trailer mounted)	Airfield - b sub	Integrated	External	Diesel	2,091	2020	Yes	Yes
Portable gen 02	Mobile generator	B30		Internal	Diesel			No	N/A

Tank name	Purpose	Location	Tank type	Position	Contents	Max tank capacity (litres)	Installation date	Oil storage/ groundwater regs apply?	Compliant with relevant standard?
Portable gen 03	Mobile generator	B30		Internal	Diesel				
Pump station b7	Standby generator	Thorley Lane	Bulk	Internal	Diesel	880	1991	No	N/A
Q sub standby generator main tank	Standby generator	T1 - outwood lane	Bulk	Internal	Diesel	580		No	N/A
R sub standby generator day tank 1	Standby generator	West side	Day tank	Internal	Diesel	1,200	2021/22	No	N/A
R sub standby generator day tank 2	Standby generator	West side	Day tank	Internal	Diesel	1,500	2021/22	No	N/A
R sub standby generator main tank	Standby generator	West side	Bulk	External	Diesel	24,822	2012	Yes	Yes
R1 hydrant pump	Standby pump (serving for fire hydrant system)	Airfield – r1	Day tank	Internal	Diesel	154		No	N/A
R2 hydrant pump	Standby pump (serving for fire hydrant system)	Airfield - r2	Day tank	Internal	Diesel	154		No	N/A
R2/1 sub standby generator day tank r2 west	Standby generator	Airfield - r2	Day tank	Internal	Diesel	5,630	1999	No	N/A
R2/1 sub standby generator main tank r2 west	Standby generator	Airfield - r2	Bulk	External	Diesel	15,100	1999	Yes	Yes

Tank name	Purpose	Location	Tank type	Position	Contents	Max tank capacity (litres)	Installation date	Oil storage/ groundwater regs apply?	Compliant with relevant standard?
R2/2 south fire station	Standby generator	Airfield - sfs	Bulk Tank	Internal	Diesel	860			
R2/2a sub standby generator day tank r2 west	Standby generator	Airfield - r2	Day tank	Internal	Diesel	745	1999	No	N/A
R2/2a sub standby generator main tank r2 west south road tunnel	Standby generator	Airfield - r2	Bulk	External	Diesel	5,237	1999	Yes	Yes
R2/3 sub standby generator day tankr2 east	Standby generator	Airfield - r2	Day tank	Internal	Diesel	2 x 5630	1999	No	N/A
R2/3 sub standby generator main tank r2 east	Standby generator	Airfield - r2	Bulk	External	Diesel	2 x 15,100	1999	Yes	Yes
Runway viewing park - heating system	Heating oil	Avp	Bulk	External	Diesel	2,000		Yes	Yes
South fire station fuel oil tank	Back-up generator	Airfield - r2	Bulk	Internal	Diesel	947		No	N/A
Southern front standby generator day	Standby generator	T1 - southern front	Day tank	Internal	Diesel	1,200		No	N/A

Tank name	Purpose	Location	Tank type	Position	Contents	Max tank capacity (litres)	Installation date	Oil storage/ groundwater regs apply?	Compliant with relevant standard?
Southern front standby generator main tank	Standby generator	T1 - southern front	Bulk	Internal	Diesel	3,181		No	N/A
T1 sprinkler system	Pump	T1 - plant room 83	Day tank	Internal	Diesel	<100		No	N/A
T1 water treatment	Oil & chem storage	T1	Ibc/drums	Internal (Boiler House)	Chemical (chemicals for water treatment)			No	N/A
T2 a1 sub chp	Standby generator	T2 - chp	Day tank	Internal	Diesel	1,200	2021/22	No	N/A
T2 a2 sub standby generator	Standby generator	T2 - stand 206	Bulk	Internal	Diesel	1,676			
T2 b1 sub standby generator	Standby generator	T2 east service yard	Day tank	External	Diesel	1,900		Yes	Yes
T2 g2a standby generator	Standby generator	T2 west service yard		Internal	Diesel	4,620		No	N/A
T3 h1 sub standby generator day tank	Standby generator	T3 - baggage hall	Day tank	Internal	Diesel	1,520		No	N/A
T3 h1 sub standby generator main tank	Standby generator	T3 - baggage hall	Bulk	Internal	Diesel	3,750		No	N/A

Tank name	Purpose	Location	Tank type	Position	Contents	Max tank capacity (litres)	Installation date	Oil storage/ groundwater regs apply?	Compliant with relevant standard?
Voyager	Standby generator	Voyager	Bulk	Internal	Diesel	360	1997	No	N/A
West apron ph6a	Standby generator	Airfield - t2 stand 112	Bulk	External	Diesel	20,000	2019	Yes	Yes

4.4.2 Waste Generation

There is no wastewater routinely generated from the combustion plant. The boilers are hot water boilers (not steam) so are fully flooded systems that do not require to be blow down.

Waste oils are routinely generated through maintenance activities. Other maintenance wastes include oily rags, oil absorbent materials and filters. All servicing and maintenance activities for the combustion plant is undertaken by contractors on behalf of MAG. Minimal quantities of waste are generated from maintenance activities.

Contractors are contractually required to remove and appropriately dispose of all wastes generated by their activities. MAG does not provide storage facilities for contractor wastes. The waste storage areas are secure with restricted access.

As part of the EMS, the Manchester Airport Environment Team carries out waste duty of care audits, as part of our internal audit programme. This includes reviewing waste carriers' registrations, environmental permits, and waste transfer note / hazardous waste consignment notes. We maintain a 'waste matrix' which details all waste streams, waste contractors and carrier's registrations. MAG's main waste contractor is also required to carry out Duty of Care checks.

Waste management techniques at the site are detailed within the site's *Environmental Management Operational Procedure EMOP10 – Waste Management* document included in Appendix B - Management Systems.

4.4.3 Maintenance and Inspection

The plant and associated equipment are under a planned maintenance system and undergo regular testing, undertaken by a third party and managed by MAG (MA Facilities). Maintenance is carried out as per the manufacturers' recommendations and MAGs operational experience with the units.

4.4.4 Monitoring

For the boilers, MAG are compliant with the UK Emissions Trading Scheme (UK-ETS). As part of this process, MAG carry out a yearly review of the gas consumption and associated emissions. The most recent review was completed in April 2025. Furthermore, MAG have access to real-time data, which is monitored and reviewed as part of ISO 50001 Energy Management Systems (ENMS) certification process.

For the generators, MAG monitor and record the volume of fuel deployed into the fuel tanks and report to EcoAct UK as part of their requirement each annual quarter.

MAG will monitor the emission points in accordance with EA guidance and in compliance with the permit.

4.4.5 Accident Management

The Manchester Airport site is an Upper Tier Establishment, under the COMAH Regulations 2015 due to the quantity of petroleum products and alternative fuels stored that could potentially result in a major accident. The site operates a Major Accident Prevention Policy.

MAG has produced a Safety Case (MAG-H&S-SC-02) to describe the arrangements for the safe operation of the gas supply networks at Manchester Airport. The Safety Case is written to meet the requirements of Regulation 3 of the Gas Safety (Management) Regulations 1996. The Safety Case has been formally accepted by the HSE.

MAG operates in accordance with an Accident and Incident Reporting & Investigation policy (document reference MAG-HSP-02). It details the arrangement for reporting, suitable recording and investigation of all accidents, incidents and near misses.

Airside Standing instruction 21 – Spillages details the details the necessary procedures should there be spillages of fuel, oil or any chemical. *EMOP06 – Spill response* describes actions to be taken in the event of any spillages that have the potential to enter surface water drainage system or in the event of any contamination of drainage systems, public services or watercourses.

MAG has a long-established spillage procedure whereby anyone finding or causing a spill must report it. Failure to report a spillage is an airfield infringement can attract a fine.

On the airfield, Manchester Airport staff clean up any spills using a road sweeper, granules, or pads as required, and will take actions to try to prevent a spillage from entering the drainage system. A spill response trailer is available to deal with larger spillages.

If a spill enters the drainage system, then actions will be taken to prevent it from entering the watercourse, including flushing the drains into a tanker, operating the containment system or other actions deemed necessary.

Where any contamination enters the watercourse or the public sewer, the Environment Agency and/or United Utilities would be alerted as appropriate, clean up initiated and a full investigation carried out.

There are around 40 oil interceptors across the site, including at each main outfall (refer to Section 7.2 Emissions to Water). These are checked regularly and an external contractor cleans them as required.

Manchester Airport emergency plans include actions to be taken in the event of an emergency to protect local watercourses from pollution and consult with environmental regulatory agencies as required. These plans are periodically tested.

All plantrooms within a building are contained within 60 minute fire compartmentation rooms (i.e. the floor, walls and ceiling will provide 60 minute fire protection. These rooms have an L1 fire detection system installed, which is monitored continuously by an alarm receiving centre (i.e. the Watchroom and EBDM). Any activation within a plantroom will be picked up by the fire alarm system with the Airport Fire Service responding accordingly. Regular inspections are undertaken by the fire safety team.

5 Form Part B3

5.1 Types of activities

Table 5.1.1 below details the activities listed in Schedule 1 of the Environmental Permitting Regulations and all directly associated activities at the installation. There are no waste treatment activities. Only wastes arising from the installation activities are handled at the Installation (refer to Section 4.4.2).

Table 5.1.1: Types of activities

Installation name & Activity Ref.	EPR Schedule 1 ref.	Description of the Activity	Activity Capacity	Annex I and II codes and descriptions	Non-hazardous waste treatment capacity
A1	Section 1.1, Part A(1)a	'Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts'	123.7 MWth	N/A	N/A
Directly Associated Activities					
	Storage and handling of raw materials				
	Handling of waste derived from the combustion activities				

5.2 Point source emissions to air, water and land

5.2.1 Point Source Emissions to Air

An air quality impact assessment (AQIA) (see Appendix C) has been carried out to predict the impacts associated with the operation of the MCP. The assessment only considers combustion plant that fall under either the MCPD or specified generator regulations (i.e. the assessment only considers combustion plant with a thermal input capacity greater than 1 MWth).

For the assessed boilers (excluding boilers A24), the NOx emission concentration was obtained from the MCPD (European Union, 2015) for existing MCP other than engines and gas turbines. For boilers with a thermal input capacity of between 1 and 5MWth the emission concentration utilised is 250mg/Nm^3. For the three boilers with a thermal input capacity greater than 5 MWth the emission concentration utilised is 200mg/Nm^3. As the A24 boilers were commissioned in 2019, a NOx emission concentration of 100mg/Nm^3 was utilised as per the MCPD (European Union, 2015) for new MCP other than engines and gas turbines.

The CO emission concentration (100mg/m^3) for the assessed boilers was obtained from the value for natural gas from Defra's *Process Guidance Note 1/3,'Statutory Guidance for Boilers and Furnaces 20-50MW thermal input*' (Defra, 2012).

Comprehensive emissions monitoring data is not available, however during servicing of the gas fired boilers flue gas emissions are typically checked for CO and in some instances for NOx. The levels of CO recorded have been below 100mg/Nm^3 and levels of NOx below 200mg/Nm^3.

As per the MCPD (European Union, 2015), there are no emission requirements for standby generators. Therefore (and in the absence of emissions data), a NOx emission concentration of 750 mg/Nm^3 has been applied. This is derived from the Environment Agency's '*Emergency backup diesel engines on installations: best available techniques (BAT)*' guidance level (Environment Agency, 2023), which is not an emission limit

value compliance requirement. In practice, based on the thermal input capacity of the standby generators, the NOx emission concentrations are likely to be considerably lower.

In the absence of emissions data, the CO, particulates and SO_2 emission concentrations used in the model for standby generators are based on professional judgement acquired from previous work involving diesel fuelled standby generators of a similar size, which is considered an appropriate approach to the assessment.

Table 5.2.1: Emissions to Air – modelled release concentrations

Emission point reference and location	Source	Parameter	Concentration	Unit
Boilers				
A20 Fire training rig	Natural gas fueled boiler	NOx	200	mg/Nm^3
		NOx Release	0.472	g/s
		CO	100	mg/Nm^3
		CO Release	0.236	g/s
A07-1 T2 Boiler House	Natural gas fueled boiler	NOx	200	mg/Nm^3
		NOx Release	0.437	g/s
		CO	100	mg/Nm^3
		CO Release	0.218	g/s
A07-2 T2 Boiler House	Natural gas fueled boiler	NOx	200	mg/Nm^3
		NOx Release	0.437	g/s
		CO	100	mg/Nm^3
		CO Release	0.218	g/s
A01-A T1 Boiler House	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.355	g/s
		CO	100	mg/Nm^3
		CO Release	0.142	g/s
A01-B T1 Boiler House	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.355	g/s
		CO	100	mg/Nm^3
		CO Release	0.142	g/s
A03-1 T3 Boiler House	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.218	g/s
		CO	100	mg/Nm^3
		CO Release	0.087	g/s

Emission point reference and location	Source	Parameter	Concentration	Unit
A03-2 T3 Boiler House	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.218	g/s
		CO	100	mg/Nm^3
		CO Release	0.087	g/s
A03-3 T3 Boiler House	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.218	g/s
		CO	100	mg/Nm^3
		CO Release	0.087	g/s
A08-A Cargo Centre Main Boiler House	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.218	g/s
		CO	100	mg/Nm^3
		CO Release	0.087	g/s
A08-B Cargo Centre Main Boiler House	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.218	g/s
		CO	100	mg/Nm^3
		CO Release	0.087	g/s
A24-1 MAN- TP Energy Centre	Natural gas fueled boiler	NOx	100	mg/Nm^3
		NOx Release	0.066	g/s
		CO	100	mg/Nm^3
		CO Release	0.066	g/s
A24-2 MAN- TP Energy Centre	Natural gas fueled boiler	NOx	100	mg/Nm^3
		NOx Release	0.066	g/s
		CO	100	mg/Nm^3
		CO Release	0.066	g/s
A24-3 MAN- TP Energy Centre	Natural gas fueled boiler	NOx	100	mg/Nm^3
		NOx Release	0.066	g/s
		CO	100	mg/Nm^3
		CO Release	0.066	g/s
A24-4 MAN- TP Energy Centre	Natural gas fueled boiler	NOx	100	mg/Nm^3
		NOx Release	0.017	g/s

Emission point reference and location	Source	Parameter	Concentration	Unit
		CO	100	mg/Nm^3
		CO Release	0.017	g/s
A14 Aviation Viewing Park	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.064	g/s
		CO	100	mg/Nm^3
		CO Release	0.066	g/s
A13-1 Voyager	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.055	g/s
		CO	100	mg/Nm^3
		CO Release	0.022	g/s
A13-2 Voyager	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.055	g/s
		CO	100	mg/Nm^3
		CO Release	0.022	g/s
A02-1 T1 Arrivals	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.051	g/s
		CO	100	mg/Nm^3
		CO Release	0.021	g/s
A02-2 T1 Arrivals	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.051	g/s
		CO	100	mg/Nm^3
		CO Release	0.021	g/s
A02-3 T1 Arrivals	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.051	g/s
		CO	100	mg/Nm^3
		CO Release	0.021	g/s
A05-01 Olympic House Plantroom	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.044	g/s
		CO	100	mg/Nm^3
		CO Release	0.018	g/s

Emission point reference and location	Source	Parameter	Concentration	Unit
A05-02 Olympic House Plantroom	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.044	g/s
		CO	100	mg/Nm^3
		CO Release	0.018	g/s
A11-A Rail Station	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.013	g/s
		CO	100	mg/Nm^3
		CO Release	0.005	g/s
A11-B Rail Station	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.013	g/s
		CO	100	mg/Nm^3
		CO Release	0.005	g/s
A11-C Rail Station	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.013	g/s
		CO	100	mg/Nm^3
		CO Release	0.005	g/s
A09-01 North Side Fire Station	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.015	g/s
		CO	100	mg/Nm^3
		CO Release	0.006	g/s
A09-02 North Side Fire Station	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.015	g/s
		CO	100	mg/Nm^3
		CO Release	0.006	g/s
A17-A T1 OBC	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.014	g/s
		CO	100	mg/Nm^3
		CO Release	0.006	g/s
A17-B T1 OBC	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.014	g/s

Emission point reference and location	Source	Parameter	Concentration	Unit
		CO	100	mg/Nm^3
		CO Release	0.006	g/s
A18-A Terminal 1 Stand 21 F&B	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.046	g/s
		CO	100	mg/Nm^3
		CO Release	0.018	g/s
A18-B Terminal 1 Stand 21 F&B	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.007	g/s
		CO	100	mg/Nm^3
		CO Release	0.003	g/s
A18-C Terminal 1 Stand 21 F&B	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.014	g/s
		CO	100	mg/Nm^3
		CO Release	0.005	g/s
A18-D Terminal 1 Stand 21 F&B	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.014	g/s
		CO	100	mg/Nm^3
		CO Release	0.005	g/s
A18-E Terminal 1 Stand 21 F&B	Natural gas fueled boiler	NOx	250	mg/Nm^3
		NOx Release	0.014	g/s
		CO	100	mg/Nm^3
		CO Release	0.005	g/s
Notes: Emission points that serve the same location but have separate stacks are denoted by the location reference with a numerical suffix e.g. A09-1, A09-2 Combustion units that share a common stack are denoted by the location reference with an alphabetical suffix e.g. A11-A, A11-B				
Generators				
GEN02 ATC Tower	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.947	g/s
		CO	39	mg/Nm^3

Emission point reference and location	Source	Parameter	Concentration	Unit
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN04 BSUB ENG 1	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.947	g/s
		CO	39	mg/Nm^3
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN05 BSUB ENG 2	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.947	g/s
		CO	39	mg/Nm^3
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN06 CSUB ENG 1	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.947	g/s
		CO	39	mg/Nm^3
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN07		NOx	750	mg/Nm^3

Emission point reference and location	Source	Parameter	Concentration	Unit
CSUB ENG 2	Diesel fueled standby generator	NOx Release	0.947	g/s
		CO	39	mg/Nm^3
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN08 C SUB R2/C	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.947	g/s
		CO	39	mg/Nm^3
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN09 D SUB	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.947	g/s
		CO	39	mg/Nm^3
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN11 GSUB	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	1.076	g/s
		CO	39	mg/Nm^3
		CO Release	0.056	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.019	g/s
		SO_2	0.6	mg/Nm^3

Emission point reference and location	Source	Parameter	Concentration	Unit
		SO_2 Release	0.001	g/s
GEN14 PHASE 4 SUN	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	1.055	g/s
		CO	39	mg/Nm^3
		CO Release	0.055	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.018	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN15 Pump Station B7	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.749	g/s
		CO	39	mg/Nm^3
		CO Release	0.039	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.013	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN17 RSUB ENG 1	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	1.162	g/s
		CO	39	mg/Nm^3
		CO Release	0.060	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.020	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN18 RSUB ENG 2	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.947	g/s
		CO	39	mg/Nm^3
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3

Emission point reference and location	Source	Parameter	Concentration	Unit
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN19 Southern Front	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.861	g/s
		CO	39	mg/Nm^3
		CO Release	0.045	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.015	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN21 R2/1 SUB ENG 1	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	1.722	g/s
		CO	39	mg/Nm^3
		CO Release	0.090	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.030	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN22 R2/1 SUB ENG 2	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	1.722	g/s
		CO	39	mg/Nm^3
		CO Release	0.090	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.030	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN24 R2/3 SUB ENG 1	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	1.722	g/s
		CO	39	mg/Nm^3

Emission point reference and location	Source	Parameter	Concentration	Unit
		CO Release	0.090	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.030	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN25 R2/3 SUB ENG 2	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	1.722	g/s
		CO	39	mg/Nm^3
		CO Release	0.090	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.030	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN28 T2 B1 SUB	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.753	g/s
		CO	39	mg/Nm^3
		CO Release	0.039	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.013	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN29 T2 G2A SUB	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	2.841	g/s
		CO	39	mg/Nm^3
		CO Release	0.148	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.049	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.002	g/s
GEN30		NOx	750	mg/Nm^3

Emission point reference and location	Source	Parameter	Concentration	Unit
T3 H1 SUB	Diesel fueled standby generator	NOx Release	1.162	g/s
		CO	39	mg/Nm^3
		CO Release	0.060	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.020	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN31 Voyager 7th Floor	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	1.298	g/s
		CO	39	mg/Nm^3
		CO Release	0.068	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.023	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s
GEN32 West Apron Ph6A	Diesel fueled standby generator	NOx	750	mg/Nm^3
		NOx Release	0.947	g/s
		CO	39	mg/Nm^3
		CO Release	0.049	g/s
		PM_{10}	13.0	mg/Nm^3
		PM_{10} Release	0.016	g/s
		SO_2	0.6	mg/Nm^3
		SO_2 Release	0.001	g/s

5.2.2 Point Source Emissions to Water

There are no point source emissions to water from the Installation activities.

5.2.3 Point Source Emissions to Land

There are no point source emissions to land from the Installation activities.

5.3 Operating Techniques

Operating techniques for activities at the Installation have been assessed in relation to the relevant BAT guidance detailed in Table 5.3.1. Please refer to Section 7.5 for the BAT assessment.

Table 5.3.1: Technical standards

Description of the schedule 1 activity or directly associated activity	Best available technique (BATC, BREF or TGN reference)	Document Reference (if applicable)
'Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts'	Best Available Techniques (BAT) Reference Document for Large Combustion Plants Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control). 2017 BAT conclusions (published in December 2021) BREF deals with combustion installations with a rated thermal input exceeding 50 MW	2010/75/EU
DAA - Storage & handling raw materials in designated areas and dedicated storage facilities.	Best Available Techniques (BAT) Reference Document for Large Combustion Plants- 2017	2010/75/EU
DAA - Handling of wastes in designated areas and dedicated storage facilities.	Best Available Techniques (BAT) Reference Document for Large Combustion Plants- 2017	2010/75/EU

General requirements are detailed in Table 5.3.2.

Table 5.3.2: General requirements

Name of the installation	Document reference or references
If the technical guidance or your risk assessment shows that emissions of substances not controlled by emission limits are an important issue, send us your plan for managing them	How to comply with your environmental permit, additional guidance for combustion activities (EPR1.01).
Where the technical guidance or your risk assessment shows that odours are an important issue, send us your Odour Management Plan.	Not applicable. Refer to Section 7.3 (Emissions to Air)
If the technical guidance or your risk assessment shows that noise or vibration are important issues, send us your noise or vibration management plan (or both)	Not applicable. Refer to Section 7.3 (Noise Emissions)

5.4 Types and amounts of raw materials

Raw material utilised for the Installation activities are detailed in Table 5.4.1.

Table 5.4.1: Types and amounts of raw materials

Description of raw material and composition	Maximum amount stored (tonnes)	Annual throughput (tonnes each year)	Description of the use of the raw material including any main hazards (include safety data sheets)
Natural Gas	N/A	Approx. 25,430	Boiler fuel
Fuel Oil	Approx. 280	16.23	Standby generator gas oil
Water	N/A	Not known	The gas fired boilers provide heating and hot water. Closed system. Top up water quantity is not recorded.
Sentinel X100	0.01	Not known	Corrosion and Scale Inhibitor for Heating and Cooling Systems Soluble in water. Does not contain any substances to be mentioned according to the criteria of section 3.2 of REACH Annex II The product is not considered harmful to aquatic organisms nor to cause long-term adverse effects in the environment.
HB160 (blend including sodium hydroxide)	0.01	Not known	Boiler treatment chemical - corrosion inhibitor Soluble in water. Not bio accumulative. Marine pollutant H400: Very toxic to aquatic life. R50: Very toxic to aquatic organisms.
Nalco Trac109 (sodium nitrite and sodium hydroxide)	0.01	Not known	Boiler treatment chemical - corrosion and scale inhibitor H400: Very toxic to aquatic life.

Material safety data sheets for the chemicals are provided in Appendix F.

5.5 Monitoring

Point source emissions to air

For the boilers, MAG are compliant with the UK Emissions Trading Scheme (UK-ETS). As part of this process, MAG carry out a yearly review of the gas consumption and associated greenhouse gas emissions. The most recent review was completed in April 2025. Furthermore, MAG have access to real-time data, which is monitored and reviewed as part of ISO 50001 Energy Management Systems (ENMS) certification process.

Stack emissions monitoring is not currently routinely undertaken. Emissions monitoring will be implemented and undertaken in accordance with the permit requirements.

Emissions monitoring requirements are anticipated to be for new and existing MCP, equal to or exceeding 1MWth only. This relates to the emission points detailed in Table 4.4.1.

Table 5.5.1 Emission points requiring emission monitoring

Emission point ref	Location / description	Individual / shared stack	Thermal input capacity (MWth)	Typical annual operational hours
Natural gas fuelled boilers				
A20	Fire training rig	Individual	7.728	12
A07-1	T2 Boiler House	Individual	7.143	4,200
A07-2	T2 Boiler House	Individual	7.143	4,200
A01-A	T1 Boiler House	Shared	4.643	4,200
A01-B	T1 Boiler House		4.643	4,200
A03-1	T3 Boiler House	Individual	2.857	4,200
A03-2	T3 Boiler House	Individual	2.857	4,200
A03-3	T3 Boiler House	Individual	2.857	4,200
A08-A	Cargo Centre Main Boiler House	Shared	2.857	4,200
A08-B	Cargo Centre Main Boiler House		2.857	4,200
A24-1	MAN- TP Energy Centre	Individual	2.144	4,200
A24-2	MAN- TP Energy Centre	Individual	2.144	4,200
A24-3	MAN- TP Energy Centre	Individual	2.144	4,200
Notes: Emission points that serve the same location but have separate stacks are denoted by the location reference with a numerical suffix e.g. A03-1, A03-2 Combustion units that share a common stack are denoted by the location reference with an alphabetical suffix e.g. A08-A, A08-B				
Diesel fuelled standby generators				
GEN02	ATC Tower	Individual	1.33	39
GEN04	BSUB ENG 1	Individual	1.33	193[1]
GEN05	BSUB ENG 2	Individual	1.33	164[1]
GEN06	CSUB ENG 1	Individual	1.33	159[1]
GEN07	CSUB ENG 2	Individual	1.33	180[1]
GEN08	CSUB R2/C	Individual	1.21	<250
GEN09	D SUB	Individual	1.33	<10
GEN11	G SUB	Individual	1.52	12
GEN14	PHASE 4 SUB	Individual	1.48	<10
GEN15	Pump Station B7	Individual	1.05	25
GEN17	RSUB ENG 1	Individual	1.64	12
GEN18	RSUB ENG 2	Individual	1.33	12
GEN19	Southern Front	Individual	1.21	12
GEN21	R2/1 SUB ENG 1	Individual	2.42	126[1]

Emission point ref	Location / description	Individual / shared stack	Thermal input capacity (MWth)	Typical annual operational hours
GEN22	R2/1 SUB ENG 2	Individual	2.42	128[1]
GEN24	R2/3 SUB ENG 1	Individual	2.42	140[1]
GEN25	R2/3 SUB ENG 2	Individual	2.42	120[1]
GEN28	T2 B1 SUB	Individual	1.06	72
GEN29	T2 G2A SUB	Individual	4.00	12
GEN30	T3 H1 SUB	Individual	1.64	12
GEN31	Voyager 7th Floor	Individual	1.83	12
GEN32	West Apron Ph6A	Individual	1.33	14

Monitoring is anticipated to be required for the gas fuelled boilers every 3 years for the following parameters:

- Oxides of Nitrogen (NO and NO_2 expressed as NO_2)
- Carbon monoxide

Monitoring is anticipated to be required for the diesel fuelled standby generators every 3 years for the following parameters:

- Oxides of Nitrogen (NO and NO_2 expressed as NO_2)

All emission points that require permanent monitoring access will be surveyed by MAG and/or an appointed MCERTS contractor to determine their suitability for monitoring in adherence to BS EN 15259. Remedial works will then be undertaken to modify ducting, install sample ports and provide access arrangements where feasible. Any deviations from BS EN 15259 will be identified in a Site Specific Protocol (SSP).

At this stage, it is unclear how many sampling point locations meet the requirements of BS EN 15259 clause 6.2 and 6.3.

5.6 Environmental Impact Assessment

Have your proposals been the subject of an environmental impact assessment under Council Directive 85/337/EEC of 27 June 1985 [Environmental Impact Assessment] (EIA)?

No – not required.

5.7 Resource efficiency and climate change

Describe the basic measures for improving how energy efficient your activities are

Given the increasing costs of utilities, and MAGs carbon reduction commitment, there is an increasing demand to more effectively manage gas consumption across the site. The most effective strategy for any efficiency scheme is that of avoidance, and as such a boiler switch off protocol has been developed so that the boiler plant is only operational during the peak heating season.

This will result in the shutdown of all boiler plant between specified dates. However, it should be noted that the dates are only targets and shutdown/start-up dates will be based on a forward weather forecast which will be initiated 4 weeks prior to the target dates. This will provide flexibility to cope with variations to the end and start of the Summer and Winter periods and is outlined below.

Temperature Analysis Monitoring Period		
Period Opens	Target Month	Operation
1st September	October	Boilers On
1st April	May	Boilers Off

During the periods where boiler plant is not in operation, hot water will be supplied to the Terminal facilities by means of electric immersion heaters and calorifiers.

The shut down procedure is to be reviewed twice yearly, one month after the shutdown process and one month after the start up process. The review shall consider any issues arising from the start up/shutdown process and amend any operational procedures that may have changed since the last review. It shall also consider input into future heating strategies and the effectiveness of the existing arrangements.

Have you entered into, or will you enter into, a climate change levy agreement?

MAG does not currently hold a Climate Change Agreement (CCA).

MAG hold a Greenhouse gas emissions permit (UK-E-IN-11829) under The Greenhouse Gas Emissions Trading Scheme Order 2020 (the Order). This includes a number of conditions including the monitoring and reporting of emissions.

The activities covered by the permit include various natural gas fired air heaters and hot water boilers for space heating and hot water in various boiler houses across the site. Certain boilers are dual-fuelled natural gas and gas oil. There are also various gas oil fired generators, ground power units and gas oil fired fire pumps.

Explain and justify the raw and other materials, other substances and water that you will use

Refer to Section 5.4.

Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste

Refer to Section 4.4.2.

5.7 Installations that include a combustion plant (excluding waste incinerators)

List all your combustion plant at the site and provide thermal input and operating hours for each

Please refer to Appendix D (Plant Specification).

Do any of your combustion plants have a net rated thermal input of 1 or more MW and is not an excluded MCP?

Please refer to Appendix D (Plant Specification).

Is the aggregated net thermal input of your combustion plant more than 20 MW?

Yes. The aggregated net thermal input of all combustion plant forming the Installation is 123.7 MWth (comprising 63.9 MWth for the boilers, 42.5 MWth for the standby generators, 15 MWth for the mobile generators and 2.4 MWth for the fire systems).

Identify the type of fuel burned in your combustion units (including when your units are started up, shut down and run as normal).

Fuel usage is detailed in Table 5.7.1.

Table 5.7.1: Type of fuel burned (normal, start up and shut down)

Type of Fuel	When run as normal	When started up	When shut down
Natural gas - boilers	☑	☑	☑
Gas oil - generators	☑	☑	☑

Give the composition range of any fuels you are currently allowed to burn in your combustion plant

The typical composition of the fuel usage for the Installation activities is provided in Table 5.7.2.

Table 5.7.2: Composition of the fuel

Parameter	Unit	Fuel 1 – Sulphur-free gas oil	Fuel 2 – High-Sulphur Gas Oil Specification	Fuel 3 – Ultra-Low sulphur diesel specification	Natural gas
Moisture	Mass%/m	0.02	0.02	200 (mg/kg)	-
Ash	(mass %)	0.01	0.01	0.010	-
Sulphur (total)	mg kg-1	20	0.1 (mass%)	10.0	-
	mg/m3				<50 (Source 1)
Hydrogen sulphide	mg/m3				<5 (Source 1)
Manganese	mg l-1	2	2	-	<0.000008
FAME content	Vol%	0.1	0.1	7.0	-
Particulate content	mg kg-1	24	24	24	-
Carbon residue	Mass%	0.3	0.3	0.3	-
Hydrogen	Molar				< 0.1% (Source 1)
Oxygen	Molar				<0.001% (Source 1)
Nitrogen	%				4.5 (Source 2)
Calorific value	MJ/m3				39.3 (Source 2)

Source 1: National Grid specification, encompasses the statutory requirements set out in the Gas Safety (Management) Regulations 1996 (as amended)

Source 2: Material comparators for end-of-waste decisions. Fuels: natural gas. Report: SC130040/R15 (ShARE 25). Environment Agency – August 2016

If NOx factors are necessary for reporting purposes (that is, if you do not need to monitor emissions), please provide the factors associated with burning the relevant fuels

It is expected that emissions monitoring will be required under the permit. Refer to Section 5.5.

Will your combustion plant be subject to Chapter III of the Industrial Emissions Directive 2010/75/EU?

No.

6 Environmental Assessment

6.1 Emissions to Air

Point source emissions to air are detailed in Section 5.2.1.

An air quality impact assessment (AQIA) (see Appendix C) has been carried out to predict the impacts associated with the operation of the MCP. The assessment only considers combustion plant that fall under either the MCPD or specified generator regulations (i.e. the assessment only considers combustion plant with a thermal input capacity greater than 1 MWth).

The AQIA considers the impacts set out below.

- The potential impact on human health due to emissions of pollutants. The pollutants considered include nitrogen dioxide (NO_2); carbon monoxide (CO); sulphur dioxide (SO_2) and particulate matter (PM_{10}, particles with an aerodynamic diameter of 10 microns or less and $PM_{2.5}$, particles with an aerodynamic diameter of 2.5 microns or less).
- The potential impact on vegetation and ecosystems due to emissions of oxides of nitrogen (NOx) and SO_2.

The predicted impacts were assessed against the relevant air quality standards and guidelines for the protection of human health and protected conservation areas (referred to as critical levels and critical loads).

The AQIA has concluded the following:-

Off-site sensitive human receptor locations

The results indicate that for annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations, the respective process contributions (PCs) are either less than 1% of the relevant long-term Environmental Quality Standard (EQS) or where the PCs are above 1% of the relevant EQS, the predicted environmental concentration (PEC) is less than 70% of the relevant EQS and the impacts are considered '*not significant*' as per Environment Agency guidance (Environment Agency, 2025).

For short-term NO_2, CO, SO_2 and particulate concentrations, the PCs are either less than 10% of the relevant EQS or where the PCs are above 10% of the relevant EQS, the respective PEC is less than 70% of the relevant EQS and the impacts are considered '*not significant*'.

On-site sensitive human receptor locations

For short-term CO and SO_2 concentrations, although there is no requirement to compare[3], the PCs are less than 10% of the relevant EQS and the impacts are considered '*insignificant*' as per Environment Agency guidance (Environment Agency, 2025).

For 1-hour mean NO_2 (99.79th percentile) concentrations, the PC is extremely elevated and the corresponding PEC exceeds the relevant standard. The highest PC is predicted to occur at a receptor which represents a parking space on the upper floor of the T2 West multi-storey car park, adjacent to the A24 boiler stacks. As this receptor represents an airport parking space, it is reasonable to assume that a member of the public would not be exposed for an hour or more at this location.

3 As the on-site human receptor locations do not meet the relevant public exposure definition as per Defra's 'Local Air Quality Management Technical Guidance (TG22)' (Defra, 2022),

Greater Manchester Combined Authority AQMA

The results indicate that for annual mean NO_2 and 24-hour mean (90.41st percentile) PM_{10} concentrations, the respective PCs are less than 16% of the relevant EQS. The highest PCs are predicted to occur in hedgerow between GEN15 and the M56 motorway in an area not accessible to members of the public.

Based on the findings of the assessment and when considering the conservative approach adopted throughout this assessment, the overall impact is considered '*not significant*' for sensitive human receptor locations.

Protected Conservation Areas

In line with the Environment Agency guidance 'Air emissions risk assessment for your environmental permit' (Environment Agency, 2025), it is necessary to identify protected conservation areas within the following distances from the site:

- European sites (i.e. Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar sites) within 15 km; and
- Site of Special Scientific Interest (SSSI) and local nature sites (i.e. ancient woodlands, local wildlife sites (LWS), national and local nature reserves (NNR and LNR) within 2 km.

A list of protected conservation areas is provided in Appendix E. Based on the above criteria; Rixton Clay Pits SAC, Manchester Mosses SAC, Rostherne Mere Ramsar, Midland Mere & Mosses – Phase 1 Ramsar, Cotterill Clough SSSI (& AW, LWS) and 48 local nature sites were included in the air quality assessment. It should be noted that the boundary of some of these local nature sites encroaches the site.

For critical levels and critical loads, the results indicate that at the assessed European designated sites and assessed local nature sites, the PCs are less than 1% and 100%, respectively, of the relevant critical level / load and the effect is considered '*insignificant*' as per Environment Agency guidance (Environment Agency, 2025).

At Cotteril Clough SSSI (& AW, LWS), the annual mean NOx PC is above 1% (i.e. 3.6%) of the relevant critical level value and the corresponding PEC exceeds this value. For critical loads, the PC for nutrient nitrogen deposition is just above 1% of the relevant critical load value. Further analysis of Cotteril Clough SSSI indicates that the main habitat type at Unit 001 and 002 has been declared 'Favourable', even with the historical operation of the assessed combustion plant at Manchester Airport.

The conservative approach adopted throughout this assessment means the results presented are likely to be higher than would reasonably be expected. Therefore, the impact at Cotteril Clough SSSI is considered 'not significant'.

For the maximum 24-hour mean critical level for NOx, the results indicate that at the assessed European designated sites Rixton Clay Pits SAC and Manchester Mosses SAC, the PCs are less than 10% of the relevant critical level and the effect is considered '*insignificant*' as per Environment Agency guidance (Environment Agency, 2025). At Rostherne Mere Ramsar and Midland Mere & Mosses - Phase 1 Ramsar, the PCs are above 10% of the relevant critical level (i.e. 15% and 10.2%. respectively). However, the corresponding PECs equates to less than 54% of the EQS and the impact is considered '*not significant*'.

At Cotteril Clough SSSI (& AW, LWS), the 24-hour mean NOx PC is elevated and equates to 68.3% of the EQS and the corresponding PEC is predicted to exceed the critical level value. The highest PC is predicted to occur approximately 0.27 km northwest from where aircraft taxi to and from runway 05L / 23R.

Further analysis indicates that GEN04, which is approximately 0.22 km south of this location, contributes approximately 99% of the predicted PC. GEN04 primarily operates during routine testing / essential maintenance works and typically operates for less than 200 hours per year (reducing to approximately 12

hours per year from May 2025 onwards). It is extremely unlikely that it would operate for a prolonged period up to 24 hours and would coincide with all of the worst meteorological conditions each year.

At Ponds near Manchester Airport Runway LWS, Wood End - Lady Lane LWS and Oversley Ford Brickworks And Road Embankment LWS, the respective daily mean NOx PCs exceed 900 µg/m^3. The PCs predicted at these protected conservation areas are dominated by emissions from GEN04, GEN21 and GEN24. These standby generators operate primarily during routine testing / essential maintenance works and typically operate for less than 200 hours per year (reducing to approximately 12 hours per year from May 2025 onwards). It is extremely unlikely that they would operate for a prolonged period up to 24 hours and would coincide with all of the worst meteorological conditions each year.

The conservative assumptions adopted throughout this assessment means the results presented are likely to be considerably higher than would reasonably be expected and based on professional judgement, the impact is considered to be '*not significant*'.

Summary

Based on the above assessment, it is concluded that the operation of the assessed combustion plant at Manchester Airport are acceptable from an air quality perspective.

There are no activities that will give rise to odorous emissions.

6.2 Emissions to Water

There are no point source discharges to water from the Installation activities.

Surface water run off from the installation areas has the potential to become contaminated from spills or leaks of fuel arising from the generators and associated fuel supply pipework and storage tanks. However, this risk is managed:

- Fuel oil stored externally is in bunded tanks fitted with high-level alarms.
- Tank bunds are impermeable and resistant to the stored materials with a capacity greater than 110% of fuel oil stored.

At the Manchester Airport site, surface water drainage is carefully managed in accordance with a Surface Water Drainage Management Plan, which forms part of the site EMS.

There are a number of surface water drainage catchments, which discharge via nine separate outfalls to watercourses around the site. These are depicted in Figure 6.2.1.

The watercourses include Timperley Brook to the north, which eventually meets the River Mersey, and Cotterill Clough which drains into the River Bollin near the western end of the northern most runway. From here the River Bollin flows west, eventually joining the River Mersey. Development of Runway 2 (opened in 2001) in the south-west involved diverting a section of the River Bollin through a specially constructed tunnel at the site.

The drainage layout of each catchment varies but will in general include an oil interceptor and automatic water quality monitoring of Total Organic Carbon (TOC).

The Engineering Shift Team Manager (ESTM) has responsibility for managing the drainage containment system to prevent pollution of watercourses. There is an ESTM on duty 24/7.

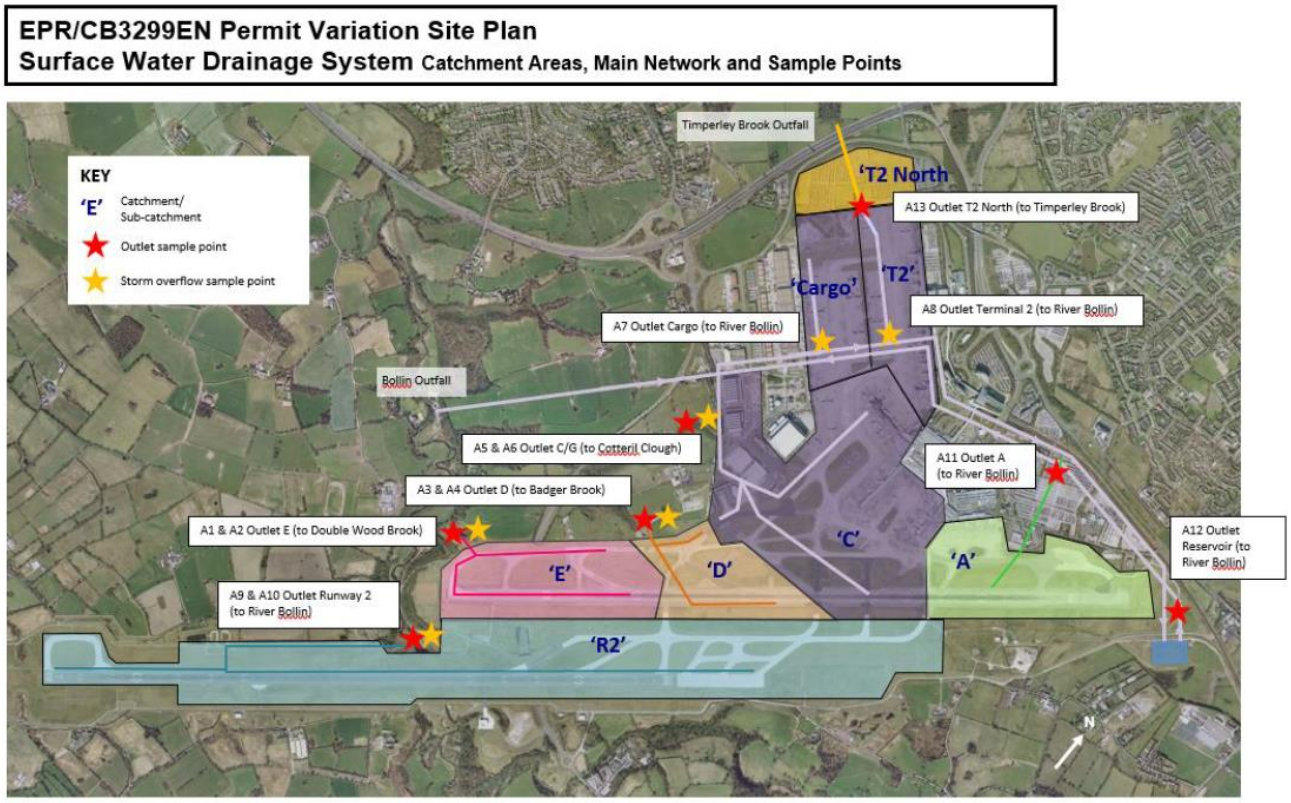
In the event of a fuel spillage, measures are taken to contain the spillage or contamination as locally as possible, prevent too much dilution and/or direct it to a location where it can be captured and recovered.

If there is a risk that the spillage could enter the drainage system, then the drainage system individual catchments can be put into containment mode by the ESTM. This diverts any flow into containment and

disables all pumps so that contaminated flows are retained within local storage where it can be accessed for recovery. A clean up would then be initiated, which can involve specialist third party contractors.

Live telemetry and data logging provides information on the status of penstocks, water levels, pumps and water quality and flow monitoring via the Building Management Systems (BMS).

Figure 6.2.1: Surface water catchment areas and outlets



Manchester Airport holds a discharge permit, effective from February 2019 (NW/EPRCB3299EN/002). Under the permit the following activities are permitted:

- A1: Discharge of trade effluent consisting of contaminated surface water via Outlet E (to Double Wood Brook)
- A2: Discharge of trade effluent consisting of site drainage in storm conditions via Outlet E (to Double Wood Brook)
- A3: Discharge of trade effluent consisting of contaminated surface water via Outlet D (to Badger Brook)
- A4: Discharge of trade effluent consisting of site drainage in storm conditions via Outlet D (to Badger Brook)
- A5: Discharge of trade effluent consisting of contaminated surface water via Outlet C/G (to Cotterill Clough)
- A6: Discharge of trade effluent consisting of site drainage in storm conditions via Outlet C/G (to Cotterill Clough)
- A7: Discharge of trade effluent consisting of site drainage in storm conditions via Outlet Cargo (to River Bollin)
- A8: Discharge of trade effluent consisting of site drainage in storm conditions via Outlet Terminal 2 (to River Bollin)

- A9: Discharge of trade effluent consisting of contaminated surface water via Outlet Runway 2 (to River Bollin)
- A10: Discharge of trade effluent consisting of site drainage in storm conditions via Outlet Runway 2 (to River Bollin)
- A11: Discharge of trade effluent consisting of contaminated surface water via Outlet A (to River Bollin)
- A12: Discharge of trade effluent consisting of contaminated surface water via Outlet Reservoir (to River Bollin)
- A13: Discharge of trade effluent consisting of contaminated surface water via Outlet Terminal 2 North (to Timperley Brook)

Manual water samples are taken at outfalls with EA permit conditions according to Schedule 3 of the Environmental Permit, and at other locations and frequencies as required. This includes in response to pollution investigations, surveys, auditing or other reasons.

Risks to fugitive releases of fuel to the groundwater are managed through:

- storage of fuel in above ground tanks in accordance with the Oil Storage Regulations
- good quality hardstanding in tank storage and refuelling areas
- pressure testing of below ground gas oil distribution pipework
- monitoring of stock inventories to highlight any unexplained loss of inventory.

6.3 Noise Emissions

The environmental permit application includes for 34 boilers, 34 fixed standby generators (ten of which are used for 'prime power' with the remainder used for backup power), 15 mobile generators and 11 fire systems (comprising standby generators and standby diesel pumps). It is considered that the generators are likely to be the noisiest plant items.

The generators for Manchester Airport are widely spread out across the entire vicinity and the nearest noise sensitive receptors (NSR) are isolated dwellings south and west of the airport near the airport boundary. There are conurbations containing multiple dwellings located to the northeast of the airport in Woodhouse Park and to the west of the airport in Hale Barnes. The NSR in Hale Barnes are separated from the airport by the M56 motorway network.

The location of the generators toward the edges of the airport vicinity in relation to the nearest NSR are listed in Table 6.3.1. The closest receptor to any prime power generators is 200m, and back-up generators 185m.

Table 6.3.1: Receptor locations in relation to airport generators

Plant	Distance to NSR (m)	NSR	Address	Coordinates
GEN15 Back-up generator for fire hydrant pumps	185m	NSR1	Rose cottage, Thorley Lane, Ringway, Wythenshawe, Altrincham WA15 8UN	53.371139522244796, -2.2795417577560246
GEN01 Back-up generator	588m	NSR2	64 Thornsgreen Road, Wythenshawe, Manchester M22 0AD	53.36715030347407, -2.260281160783343
GEN06, GEN07 & GEN08	253m	NSR3	86-80 Moss Lane, Wilmslow SK9 4LQ	53.356772, -2.258393

Plant	Distance to NSR (m)	NSR	Address	Coordinates
Prime Power generators				
GEN04 & GEN05 Prime Power generators	260m	NSR4	Mill Lane Altrincham WA15 0RE	53.350092, -2.294890
GEN21 & GEN22 Prime Power generators	200m	NSR5	Woodend Lane	53.33649, -2.29555
GEN24 & GEN25 Prime Power generators	600m	NSR6	Rylands Farmhouse, Altrincham Rd, Wilmslow SK9 4LT	53.34276516916842, -2.2715584495070438
A13 Boiler House	570m	NSR7	27 Gorston Walk Wythenshawe, Manchester M22 1PG	53.370004, -2.268520
A24 Energy Centre	300m	NSR8	Rose cottage, Thorley Lane, Ringway, Wythenshawe, Altrincham WA15 8UN	53.371139522244796, -2.2795417577560246

In order to establish existing noise levels for NSR in the vicinity of Manchester Airport a desktop review of available information has been carried out. This has included aircraft noise contours, and contours of road traffic noise.

Contours of aircraft noise are produced independently for Manchester Airport for day and night-time periods. The 2024 summer contours indicate that the average daytime noise levels for 2024 range between 51-72 dB $L_{Aeq,16h}$, and the night-time contours range between 45-66 dB $L_{Aeq,8h}$. The noise contours are reproduced in Figure 6.6.3.1 and Figure 6.3.2:6.3.2 below.

Figure 6.3.1: MAN 2024 Summer Day $L_{Aeq,16hr}$ Noise Contours

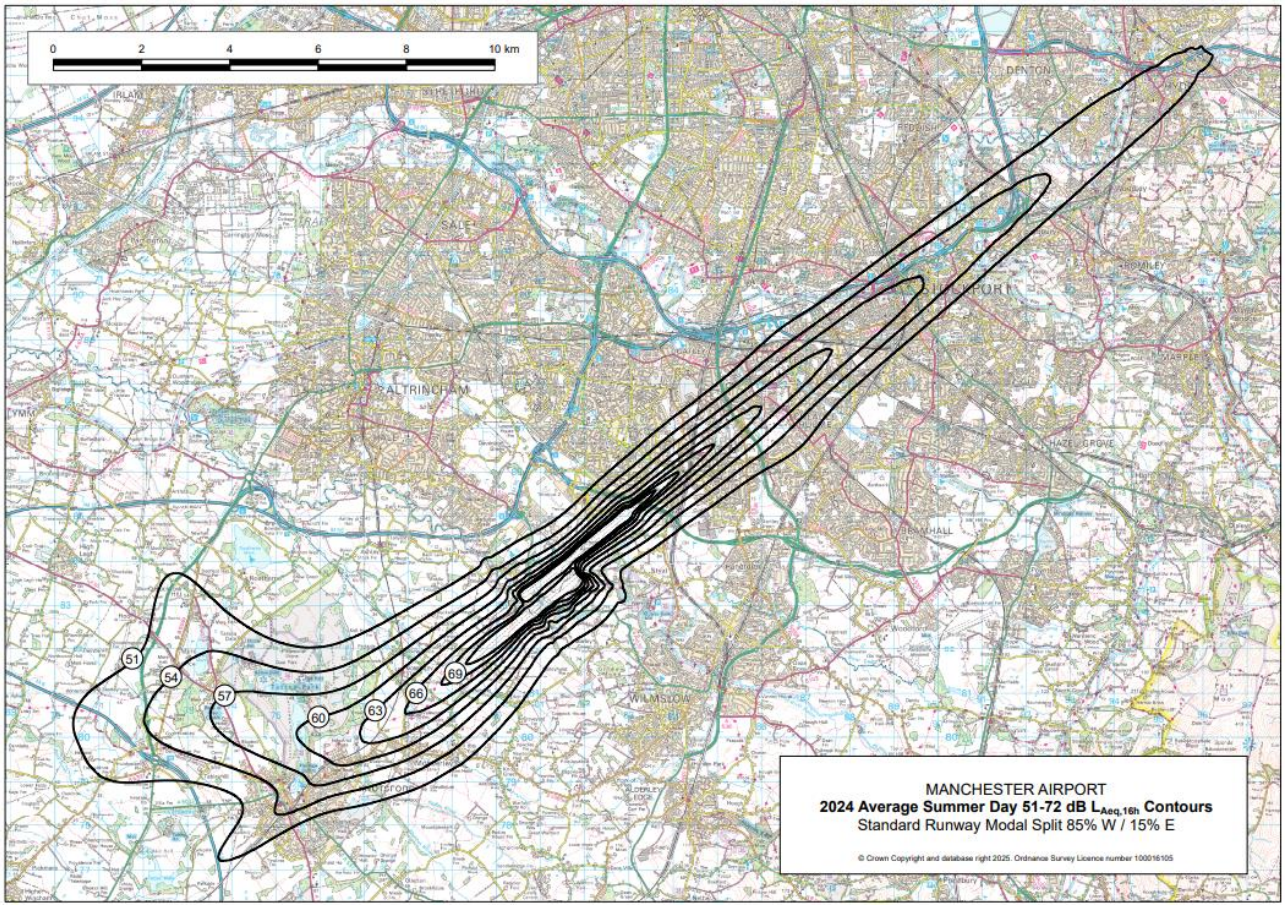
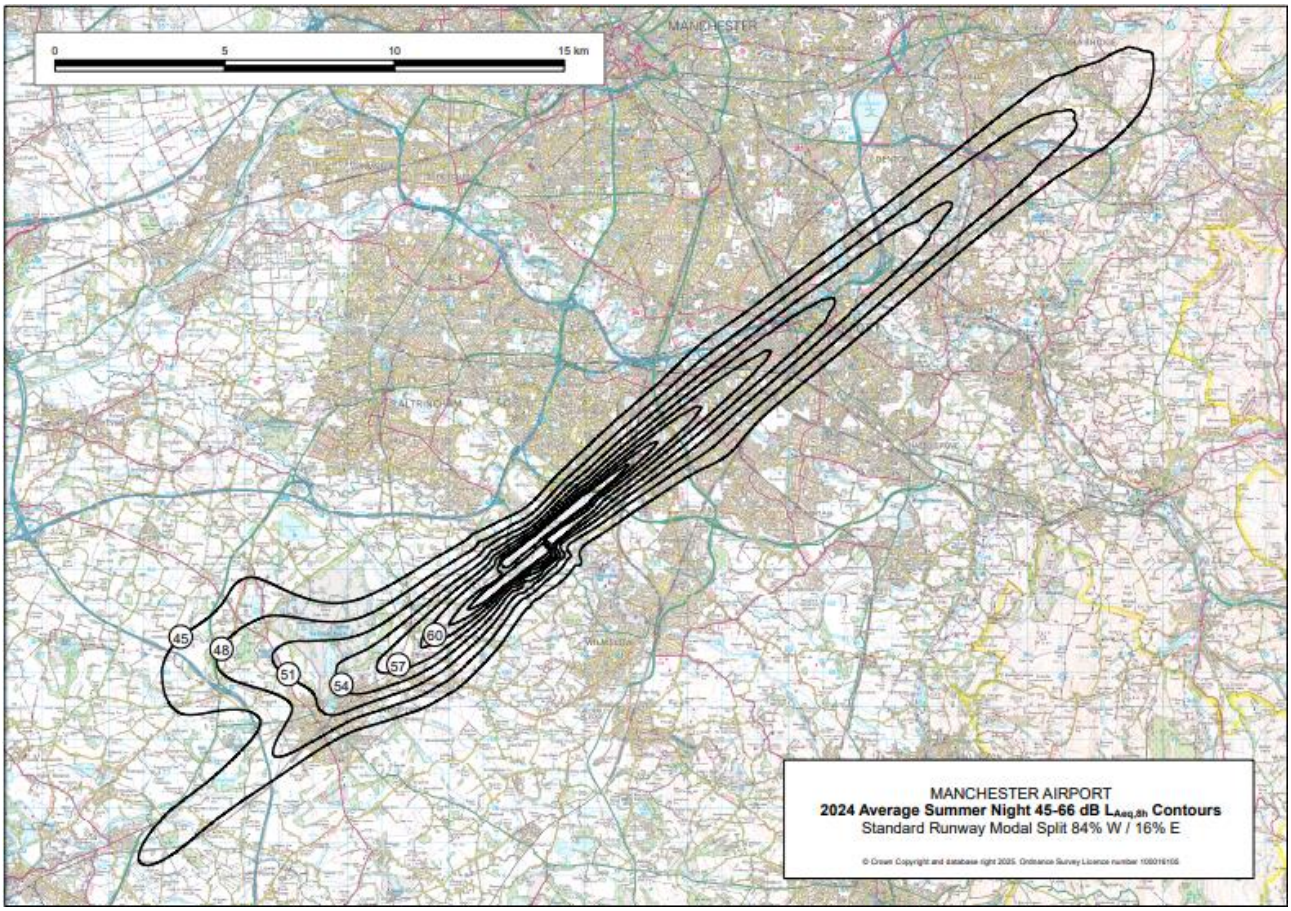


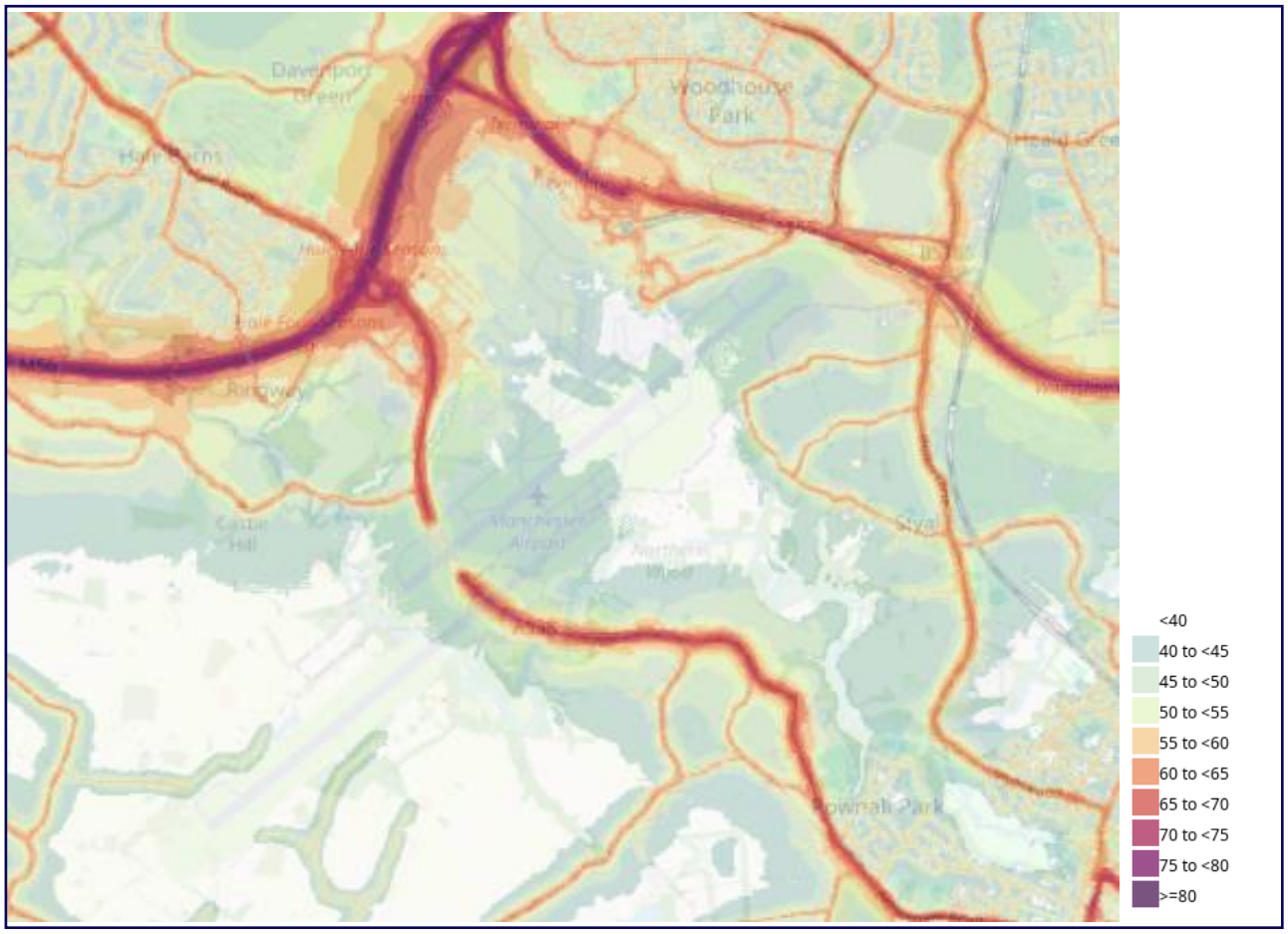
Figure 6.3.2: MAN 2024 Summer Night L_{Aeq}, Noise Contours



The closest receptor (NSR1) to any generator is outside of the day 51dB $L_{Aeq,16h}$ and night-time 45dB $L_{Aeq,8h}$ noise contours. The closest receptor to a main power generator is NSR5 which is inside of the day 69dB $L_{Aeq,16h}$ and night-time 62dB $L_{Aeq,8h}$ aircraft noise contour.

Defra's strategic noise mapping has also been reviewed to give an indication of the existing L_{night} baseline noise levels for the NSR. The round 4 strategic noise maps indicate that road traffic noise from the M56 adjacent to Manchester Airport noise levels is in excess of 70 dB $L_{Aeq,16h}$ on the immediate surrounding network and within 10 metres of the carriageway edge with levels then falling to between 65 to <70 $L_{Aeq,16h}$ on the secondary surrounding network. The location of the closest receptor NSR1 to any generator is within the daytime 60 to <65dB $L_{Aeq,16h}$ noise contour and night-time 55 to <60dB L_{night} noise contour. The closest receptor to a main power generator is NSR5 which is within the 40 to <45dB $L_{Aeq,16h}$ noise contour and night-time 35 to <40dB L_{night} noise contour. An extract from the strategic noise mapping in and around the M56 is reproduced in Figure .

Figure 6.3.3: Defra strategic noise mapping $L_{Aeq, 16hr}$ dB



Sound emission data for two of the back-up generators and one mobile unit were identified during a site survey and are listed in Table 6. Noise emission data has not been identified for the prime power generators, however a similar type of containerised generator is made by Jenbacher, with a published sound emission level of 65dB(A) at 10m.

Table 6.3.2: Site Generator Sound Emission Data

Generator Reference	Sound Power Level (LWA) in dB	Sound Pressure Level (LP) at 10m in dB(A)
GEN016 Back-up generator for water pumps	88	60
Mobile GEN	83	55
GEN09 Back-up generator	98	70
Jenbacher, example containerised generator system	-	65

A detailed assessment of noise emissions from all plant has not been possible given that the noise emission data for the generators is not available. However, it should be noted that all generators are housed within a building or, where located externally, are containerised which will provide a certain amount of attenuation to a receptor location.

A comparison of the sound emission data for the plant listed in Table 6. against the baseline noise level at receptors from aircraft noise contours and Defra noise mapping has been undertaken.

Receptors located closest to the Manchester Airport generators are listed in Table 6.3.1. NSR1 is located 185m from GEN15, a back-up generator, where the baseline noise from road traffic noise is 60 to <65dB $L_{Aeq,16h}$.daytime, reducing to 55 to <60dB L_{night} at night-time. Assuming the higher source noise level for a back-up generator from Table 6.3.2 of 98dB Lw; at a distance of 185m generator noise would be 57dB $L_{Aeq,T}$. This is below daytime road traffic noise at this location, and within the range of night-time road traffic noise. The use of this back-up generator is less than 50-hours per year.

The closest prime power generators are GEN21 and GEN22 which are located approximately 200m from the closest residential dwelling at NSR5. These are two co-located generators which are situated within a building. The building will provide additional noise attenuation, however, to be conservative, this has not been included in the discussion presented here. The baseline noise identified at this location from aircraft is 69 to <70dB $L_{Aeq,16h}$.daytime, reducing to 62 to <63dB $L_{Aeq,8h}$ at night-time. Assuming two generators operating simultaneously at 65dB Lp@10m, at a distance of 200m generator noise would be 52dB $L_{Aeq,T}$. This is below both day and night-time aircraft noise at this location.

The remaining generators and plant are located at greater distances from any noise sensitive receptors, in many cases several hundreds of metres, and noise from these at sensitive receptors would be lower than the levels predicted at NSR1 and NSR5. As it has been demonstrated that operational generator noise from the closest prime power generators is well below baseline aircraft or road traffic noise levels, then operational noise from the remaining prime power generators and plant at greater distances are also likely to be well below baseline noise levels. The operational noise levels from the closest back-up generator to any noise sensitive receptors has been demonstrated to be well below daytime baseline noise levels and in a similar range to night-time baseline noise levels from road traffic noise. Operational noise from the rest of the back-up generators and plant at greater distances to receptors are also likely to be below baseline noise levels.

It has been demonstrated that as noise from generators and plant does not exceed existing baseline noise from aircraft and the surrounding road network more detailed noise modelling and assessment is not required.

6.4 Energy Efficiency & Carbon Emissions

In order to conserve energy, MAG has introduced a seasonal switch off policy for the gas fired heating boilers. The boilers shut down in April or May depending upon the weather conditions and are started back up in September or October.

Gas boilers are serviced annually during which their combustion efficiency is checked.

Only the stationary gas fired boilers exceed 1,500 running hours per year. The main gas boilers are connected to the Building Management System (BMS) which controls operations and avoids burners being active when not needed. As per BAT 10 & 11 above, boilers are switched off seasonally to minimise usage.

All MAG airports have maintained carbon neutral status certified by the Airports Carbon Accreditation Scheme. Carbon emissions from boilers and generators are currently addressed by carbon off-setting. However, the MAG Corporate Social Responsibility Strategy commits to move beyond carbon neutrality to achieve net zero emissions for MAGs airport operations no later than 2038.

MAGs approach to decarbonisation focusses on efficiency and renewable energy and this will drive future decisions on the operation of the combustion plant. From 28 February 2026, any new qualifying combustion units (>1MWth input) or substantially refurbished units (where the cost of refurbishing the combustion plant exceeds 50% of the investment cost for comparable new combustion plant) will be required to demonstrate decarbonisation readiness. To meet the requirements of decarbonisation readiness operators must demonstrate either of the following requirements:

- the plant shall be ready to operate as a "qualifying complete CCS system" that can continuously operate at a minimum capture rate of 90% or,
- the plant shall be hydrogen ready and can be converted to operate on hydrogen as the primary source of fuel.

6.5 BAT Assessment

An assessment of best available techniques (BAT) has been made for the Installation against the BAT Reference Document for Large Combustion Plants Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control), 2017 and the associated BAT conclusions (published in December 2021).

It is noted that whilst the BAT conclusions relate to the combustion of fuels in installations with a total rated thermal input of 50 MW or more, they do not address the combustion of fuels in units with a rated thermal input of less than 15 MW. There are no individual combustion units at Manchester Airport that exceed 15MWth. The largest unit is 7.7MWth.

Therefore, an indicative BAT assessment has been undertaken in relation to the general BAT conclusions and those relating to the combustion of HFO and/or gas-oil-fired engines and the combustion of natural gas. The assessment against BAT is presented in Table 6.5.1 below.

BAT conclusions for the following activities are not relevant to this application:

- BAT 18 - 23 combustion of coal and/or lignite.
- BAT 24 -27 combustion of solid biomass and/or peat
- BAT 28 - 30 HFO and/or gas-oil-fired boilers
- BAT 46 - 51 combustion of iron and steel process gases
- BAT 52 - 54 combustion of gaseous and/or liquid fuels on offshore platforms
- BAT 55 - 59 combustion of process fuels from the chemical industry
- BAT 60 - 71 co-incineration of waste
- BAT 72 - 75 gasification

Table 6.5.1: Indicative Assessment against BAT Conclusions for Large Combustion Plants

BAT Requirements	
General	
BAT 1	*In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS).* MAG operate an Environmental Management System certified under ISO14001: 2015. The certificate number is 24937 and it was issued 18 December 2023. The date of expiry is 17 February 2027. A copy of the ISO14001 certificate is provided in Appendix B. MAG also operate an Energy Management System which is certified under ISO 50001. The certificate is 24936 and it was issued 18 December 2023. The date of expiry is 12 September 2026.
Monitoring	
BAT 2	*BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the combustion units by carrying out a performance test at full load, according to EN standards, after the commissioning of the unit and after each*

BAT Requirements	
	modification that could significantly affect the efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality. Gas boilers are serviced annually during which their combustion efficiency is checked. These checks are undertaken in accordance with the Gas Safety (Installation and Use) Regulations and are not necessarily to EN standards. The electrical generating efficiency of the fuel oil combustion plant is not routinely checked. Operational efficiency is maintained through a preventative maintenance programme.
BAT 3	*BAT is to monitor key process parameters relevant for emissions to air and water including those given below.* ▪ NOx – gas oil fired boilers and engines & natural gas fired boilers & engines ▪ CO - gas oil fired boilers and engines & natural gas fired boilers & engines ▪ SO_2 – gas oil fired boilers & engines Stack emissions monitoring is not currently routinely undertaken. Emissions monitoring will be implemented and undertaken in accordance with the permit requirements. Monitoring is anticipated to be required for the gas fuelled boilers every 3 years for the following parameters: ▪ Oxides of Nitrogen (NO and NO_2 expressed as NO_2) ▪ Carbon monoxide Monitoring is anticipated to be required for the diesel fuelled standby generators every 3 years for the following parameters: ▪ Oxides of Nitrogen (NO and NO_2 expressed as NO_2).
BAT 4	*BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.* BAT 4 specifies continuous emissions monitoring for NOx and CO. However, as detailed in the instruction to this section, the BAT conclusions do not address the combustion of fuels in units with a rated thermal input of <15 MW. There are no individual combustion units at Manchester Airport that exceed 15MWth. The largest unit is 7.7MWth. Emissions monitoring on a 3 yearly cycle is considered to be BAT, in accordance with the MCP requirements. All emission points that require permanent monitoring access will be surveyed by MAG and/or an appointed MCERTS contractor to determine their suitability for monitoring in adherence to BS EN 15259. Remedial works will then be undertaken to modify ducting, install sample ports and provide access arrangements where feasible. Any deviations from BS EN 15259 will be identified in a Site Specific Protocol (SSP).
BAT 5	*BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality*. Not applicable to this application – there is no flue gas treatment.
BAT 6	*In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion.* Environmental performance is maintained by: ▪ Use of low sulphur fuel as the primary measure for SO_2 control ▪ Natural gas use in the boilers which is the least polluting fossil fuel ▪ Optimisation of combustion conditions e.g. control of oxygen content in flue gas

<table>
<tr><th colspan="2">BAT Requirements</th></tr>
<tr><td></td><td>▪ Use of low NO_x burners
▪ During servicing of the gas fired boilers, flue gas emissions are typically checked for CO.</td></tr>
<tr><td>BAT 7</td><td>In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NOX emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR.
Not applicable to this application.</td></tr>
<tr><td>BAT 8</td><td>In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.
Not applicable to this application. There are no emission abatement systems serving the combustion plant.</td></tr>
<tr><td>BAT 9</td><td>In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system.
▪ Initial full characterisation of the fuel used including at least the parameters listed below
<table>
<tr><td>Gas oil</td><td>— Ash
— N, C, S</td></tr>
<tr><td>Natural gas</td><td>— LHV
— CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index</td></tr>
</table>
▪ Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications.
▪ Subsequent adjustment of the plant settings as and when needed and practicable.
Natural gas is supplied from the national grid and complies with the national quality specification.
Gas oil fuel quality is guaranteed by the supplier and provided with a specification.
The typical composition of the fuel usage for the Installation activities is provided in Table 5.7.2.</td></tr>
<tr><td>BAT 10 & 11</td><td>In order to reduce emissions to air during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system, commensurate with the relevance of potential pollutant releases and to monitor emissions to air during OTNOC.
In order to conserve energy, MAG has introduced a seasonal switch off policy for the gas fired heating boilers. The boilers shut down in April or May depending upon the weather conditions and are started back up in September or October.
By their nature, the standby and mobile generators have more frequent start up/ shut down periods.
The air quality modelling undertaken for emissions from the combustion plant is inherently conservative and it is considered that the assessment of impacts is relevant for start up situations.</td></tr>
<tr><td>BAT 12</td><td>In order to increase the energy efficiency of combustion units operated ≥ 1,500 h/yr, use appropriate BAT techniques.
Only the stationary gas fired boilers exceed 1,500 running hours per year. The main gas boilers are connected to the Building Management System (BMS) which controls operations and avoids burners being active when not needed. As per BAT 10 & 11 above, boilers are switched off seasonally to minimise usage.</td></tr>
</table>

BAT Requirements	
	Gas boilers are serviced annually during which their combustion efficiency is checked.
BAT 13-15	*Relate to water usage and emissions to water* Not applicable to this application. Combustion is only utilised to generate hot water. There is not flue gas treatment and no wastewater generated.
BAT 16	*In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:* Not applicable to this application. There is no waste routinely generated from the combustion process, only from maintenance of the combustion plant and equipment.
BAT 17	*In order to reduce noise emissions, BAT is to use one or a combination of the techniques; operational measures, Low-noise equipment, noise attenuation, noise-control equipment, appropriate location of equipment and buildings.* It is considered that the generators are likely to be the noisiest plant items. The generators for Manchester Airport are widely spread out across the entire vicinity and the nearest noise sensitive receptors (NSR) are isolated dwellings south and west of the airport near the airport boundary. The closest receptor to any prime power generators is 200m, and back-up generators 185m. All generators are located within buildings or, where located externally, are containerised, thus noise attenuation is provided. An assessment of noise impacts is provided in Section 7.3.
HFO and/or gas-oil-fired engines	
BAT 31	*In order to increase the energy efficiency of HFO and/or gas oil combustion in reciprocating engines, BAT is to use an appropriate combination of the techniques given in BAT 12*. Refer to BAT 12.
BAT 32	*In order to prevent or reduce NOX emissions to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.* ▪ *Low-NOX combustion concept in diesel engines* ▪ *Exhaust-gas recirculation - not applicable to four-stroke engines* ▪ *Water/steam addition* The status with respect to low NO_x burners for each of the diesel generators is uncertain. However, the majority of generators are pre 2018 in age and are considered unlikely to have low NOx burners.
BAT 33	*In order to prevent or reduce emissions of CO and volatile organic compounds to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use combustion optimisation for the installation activities.* Standby generators are only used for emergency power reasons. These are optimised to only provide emergency power for specific supplies at the relevant substation. Maintenance activities include optimisation checks and testing for black smoke which is indicative of incomplete combustion of the fuel.
BAT 34	*In order to prevent or reduce SOX, HCl and HF emissions to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to manage by fuel choice for the installation activities.* Gas oil fuel quality is guaranteed by the supplier and provided with a specification. Low sulphur gas oils are used. The typical composition of the fuel usage for the Installation activities is provided in Table 5.7.2.

<table>
<tr><th colspan="2">BAT Requirements</th></tr>
<tr><td>BAT 35</td><td>In order to prevent or reduce dust and particulate-bound metal emissions from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to manage by fuel choice for the installation activities.
Gas oil fuel quality is guaranteed by the supplier and provided with a specification.
The typical composition of the fuel usage for the Installation activities is provided in Table 5.7.2.</td></tr>
<tr><td colspan="2">Combustion of Natural Gas</td></tr>
<tr><td>BAT 40</td><td>In order to increase the energy efficiency of natural gas combustion, BAT is to use appropriate techniques as per BAT 12. BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas are below:
<table>
<tr><th rowspan="3">Type of combustion unit</th><th colspan="5">BAT-AEELs (1) (2)</th></tr>
<tr><th colspan="2">Net electrical efficiency (%)</th><th rowspan="2">Net total fuel utilisation (%) (3) (4)</th><th colspan="2">Net mechanical energy efficiency (%) (4) (5)</th></tr>
<tr><th>New unit</th><th>Existing unit</th><th>New unit</th><th>Existing unit</th></tr>
<tr><td>Gas engine</td><td>39,5–44 (6)</td><td>35–44 (6)</td><td>56–85 (6)</td><td colspan="2">No BAT-AEEL.</td></tr>
<tr><td>Gas-fired boiler</td><td>39–42,5</td><td>38–40</td><td>78–95</td><td colspan="2">No BAT-AEEL.</td></tr>
<tr><td>Open cycle gas turbine, ≥ 50 MWth</td><td>36–41,5</td><td>33–41,5</td><td>No BAT-AEEL</td><td>36,5–41</td><td>33,5–41</td></tr>
</table>
(1) These BAT-AEELs do not apply to units operated < 1,500 h/yr.
(2) In the case of CHP units, only one of the two BAT-AEELs 'Net electrical efficiency' or 'Net total fuel utilisation' applies, depending on the CHP unit design (i.e. either more oriented towards electricity generation or heat generation).
These BAT-AEELs are relevant to the gas fired boilers. There is currently no data available on net electrical efficiency and/or net total fuel utilisation.</td></tr>
<tr><td>BAT 41</td><td>In order to prevent or reduce NOX emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given below.
▪ Air and/or fuel staging
▪ Low-NOX burners
▪ Flue-gas recirculation
▪ Advanced control system
▪ Reduction of the combustion air temperature
▪ Selective catalytic or non–catalytic reduction
Low NO_x burners are utilised in the combustion of natural gas in the boilers.</td></tr>
<tr><td>BAT 42</td><td>Measures to prevent or reduce NOX emissions to air from the combustion of natural gas in gas turbines.
Not applicable to this installation.</td></tr>
<tr><td>BAT 43</td><td>Measures to prevent or reduce NOX emissions to air from the combustion of natural gas in engines.
Not applicable to this installation.</td></tr>
<tr><td>BAT 44</td><td>In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts.
Not applicable - BAT 44 relates to the combustion of natural gas in gas turbines</td></tr>
<tr><td>BAT 45</td><td>Measures to reduce non-methane volatile organic compounds (NMVOC) and methane (CH4) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines.</td></tr>
</table>

BAT Requirements	
	Not applicable to this installation.

7 Form Part F1 Charges

The following charges are considered to be applicable to this application:

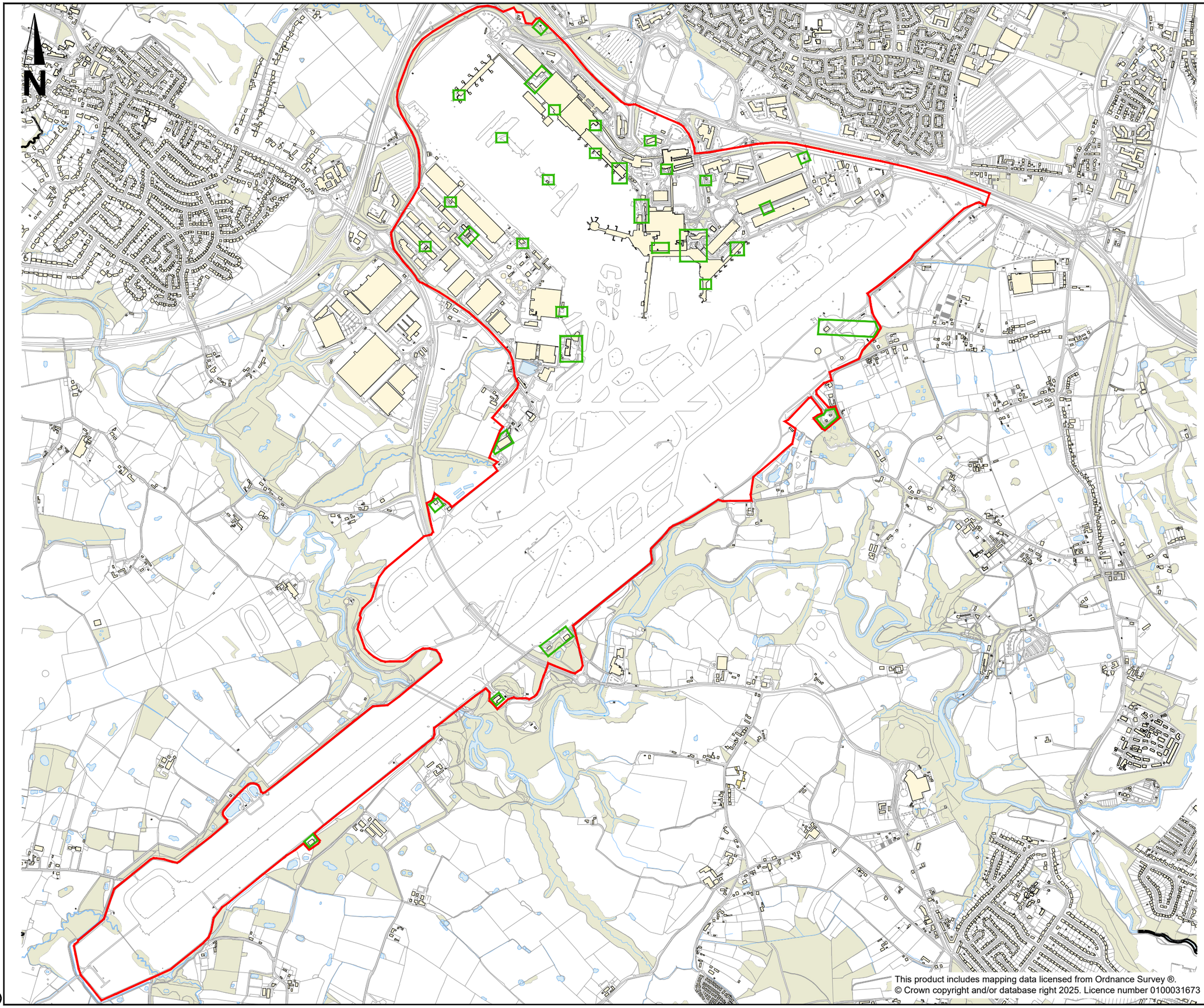
- New activity charge – (Charging scheme 1.10.1) – Section 1.1 Combustion Plant rated thermal input of 50 MWth or more - £19,103
- Component charge: Habitats assessment (Charging scheme 1.19.2): £779

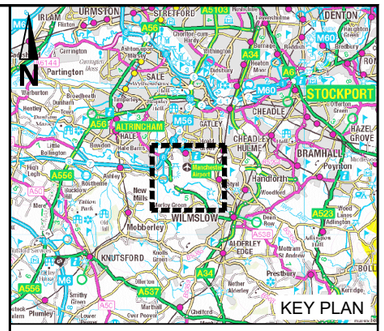
The total application fee has therefore been calculated as £19,882. This has been paid by BACS (refer to Form F1).

Manchester Airport do not wish to claim confidentiality for the application.

Appendix A. Site Plans & Diagrams

A.1 Figures





LEGEND

Site Boundary

Permit Boundary

0 200 400 600 800

METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	JUNE. 2025	PERMITTING	AR	DH	SP	XX

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ENVIRONMENTAL PERMIT APPLICATION
MANCHESTER AIRPORT

Drawing title

FIGURE 1
COMBUSTION PERMIT SITE BOUNDARY

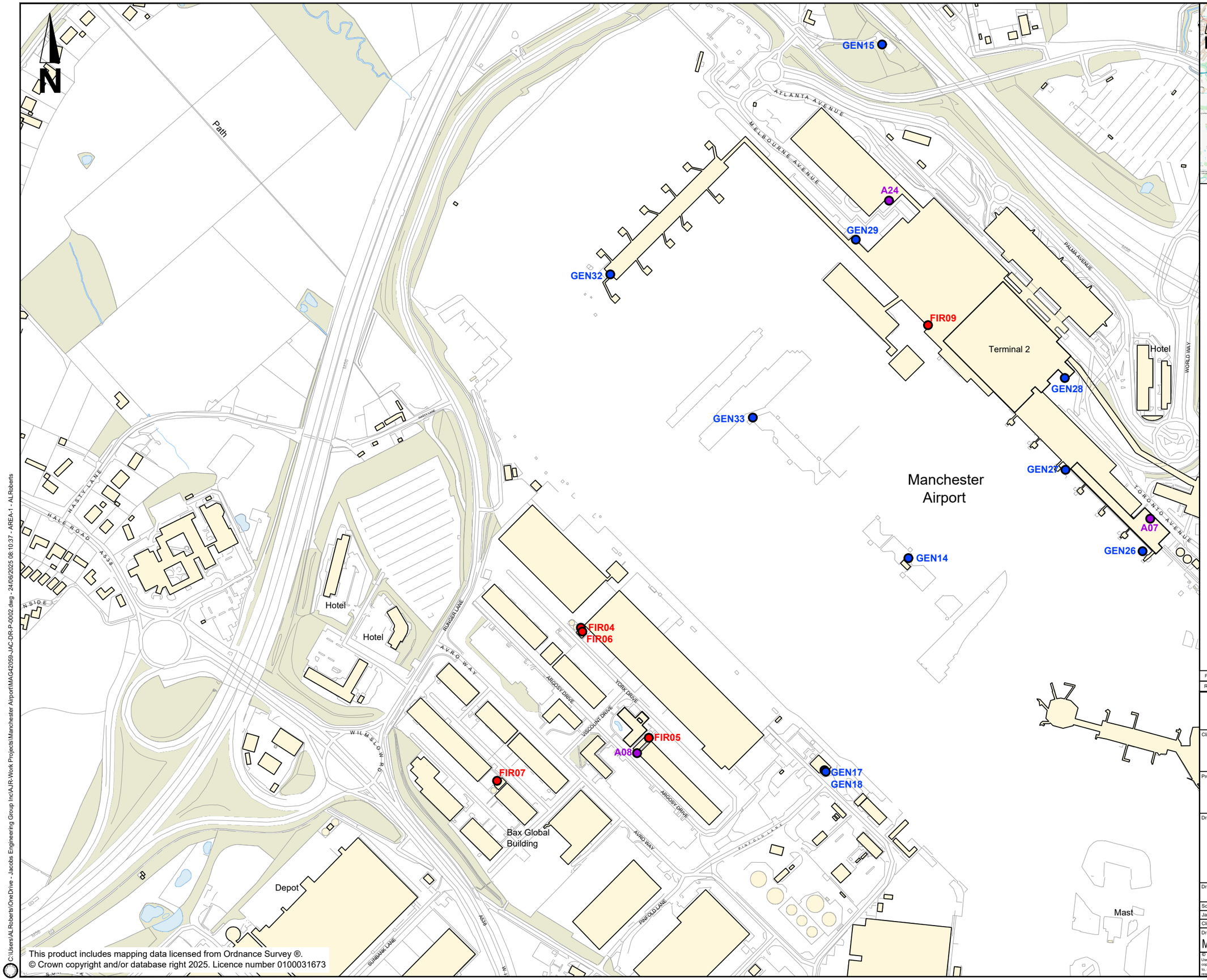
Drawing status

PERMITTING

Scale	AS SHOWN @ A3	DO NOT SCALE
Jacobs No.	MAG42059	Rev P01
Client no.		

Drawing number

MAG42059-JAC-DR-P-0001



LEGEND:

- Boiler
- Standby Generator
- Fire Systems

A07 - Terminal 2 Boilerhouse Exhausts
A08 - Cargo Centre Boilerhouse Exhausts
A24 - MAN-TP Energy Centre
GEN14 - Phase 4 SUB
GEN15 - Pump station B7
GEN17 - RSUB Eng 1
GEN18 - RSUB Eng 2
GEN26 - T2 A1 SUB
GEN27 - T2 A2 SUB
GEN28 - T2 B1 SUB
GEN29 - T2 G2A SUB
GEN32 - West Apron Ph6A
GEN33 -
FIR04 - Cargo Ph3 Hydrant
FIR05 - Y Sub Sprinklers
FIR06 - Cargo Ph3 Sprinklers
FIR07 - Cargo Ph4 Sprinklers
FIR09 - T2W Sprinklers

0 100 200
1:5000 @A3 METRES

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Drawing title: FIGURE 2 EMISSION SOURCES (SHEET 1 OF 5)

Drawing status: PERMITTING

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Jacobs No.	MAG42059	Rev P01
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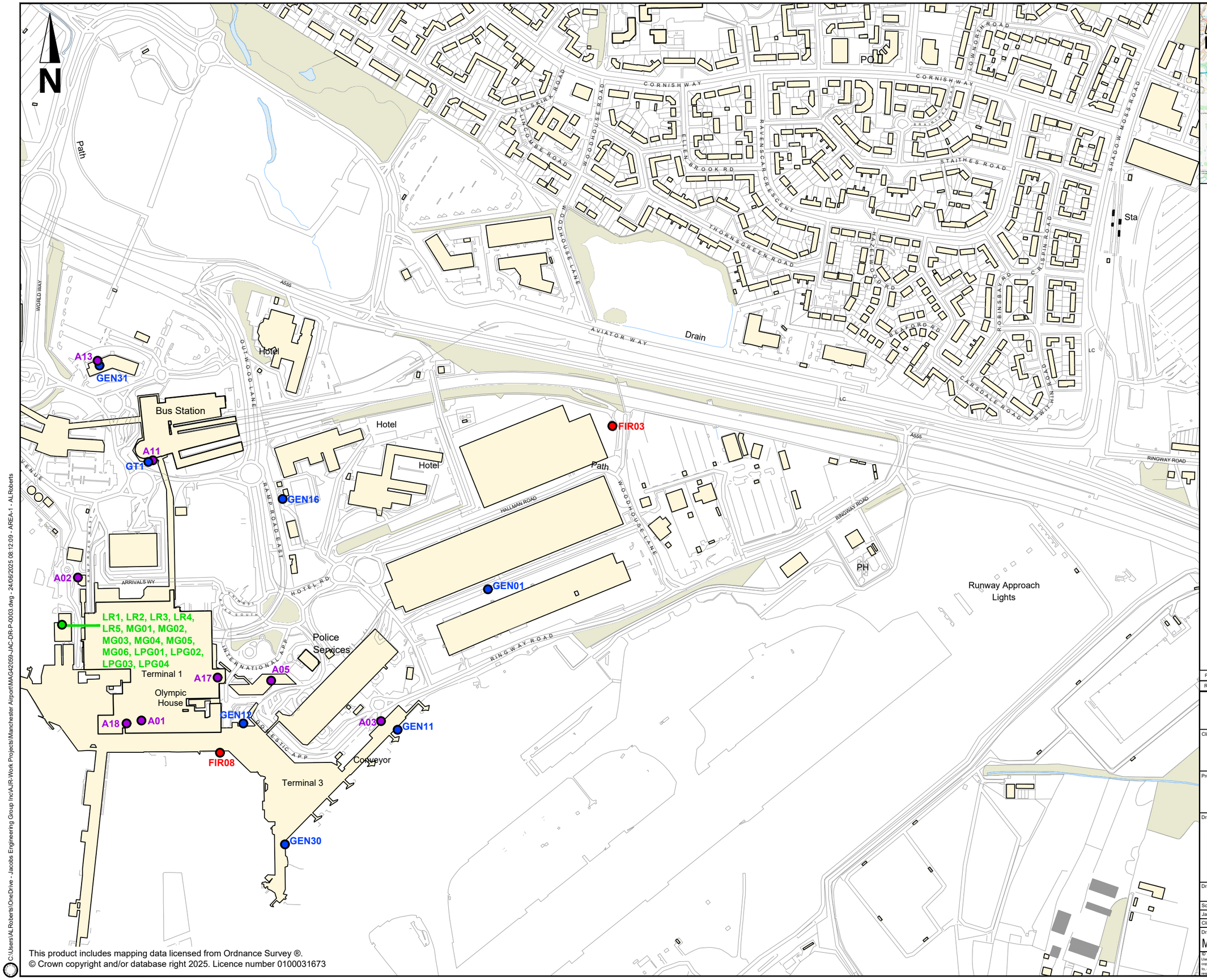
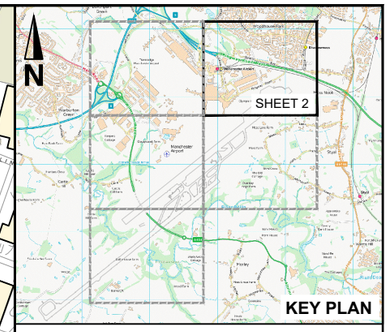
Drawing number: MAG42059-JAC-DR-P-0002





LEGEND:

- Boiler
- Standby Generator
- Mobile Generator
- Fire Systems

A01 - T1 Boiler House/CHP
A02 - T1 Arrivals
A03 - T3 Boiler House
A05 - Olympic House Plant Room
A11 - Rail Station
A13 - Voyager
A17 - T1 OBC
A18 - Terminal 1 Stand 21 F & B
GEN01 - A2 MSCP
GEN11 - G SUB
GEN12 - HSUB Eng 1
GEN16 - Q SUB
GEN30 - T3 H1 SUB
GEN31 - Voyager 7th Floor
GT1 - GT1
FIR03 - A1 Car Park Fire Hydrants
FIR08 - T1 & T3 Sprinlers

0 100 200
1:5000 @A3 METRES

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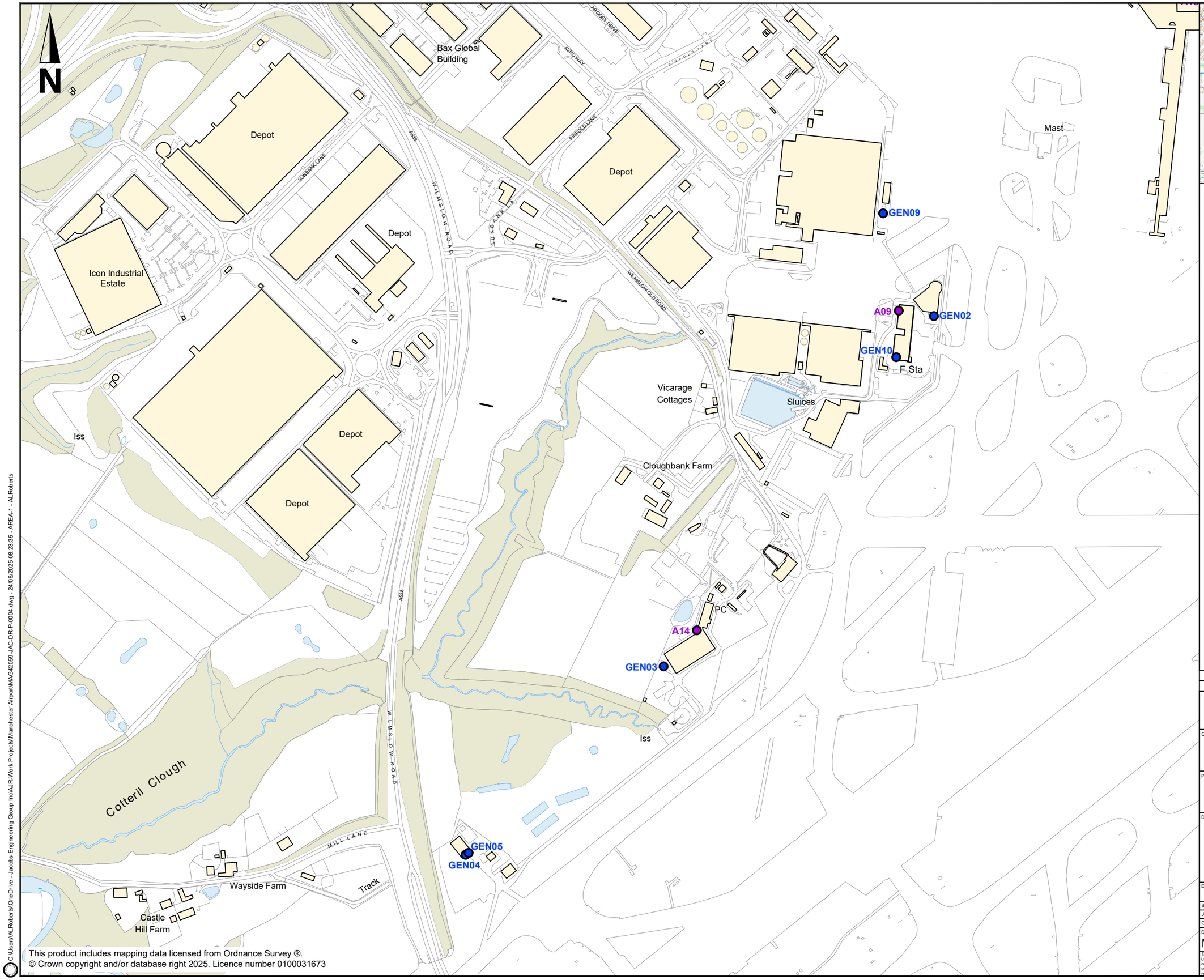
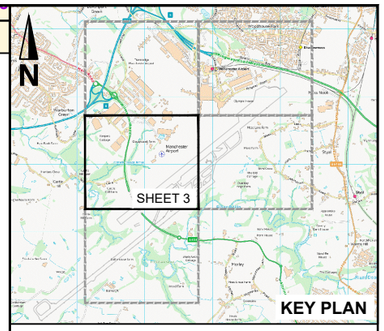
Drawing title: FIGURE 3
EMISSION SOURCES
(SHEET 2 OF 5)

Drawing status: PERMITTING

Scale	1:5000 @ A3	DO NOT SCALE
Jacobs No.	MAG42059	Rev P01
Client no.		

Drawing number: MAG42059-JAC-DR-P-0003





LEGEND:

- Boiler
- Standby Generator

A09 - West Side Fire Station
A14 - Aviation Viewing Park
GEN02 - ATC tower
GEN03 - AVP
GEN04 - BSUB Eng 1
GEN05 - BSUB Eng 2
GEN09 - D SUB
GEN10 - Fire Station

0 100 200
1:5000 @A3 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
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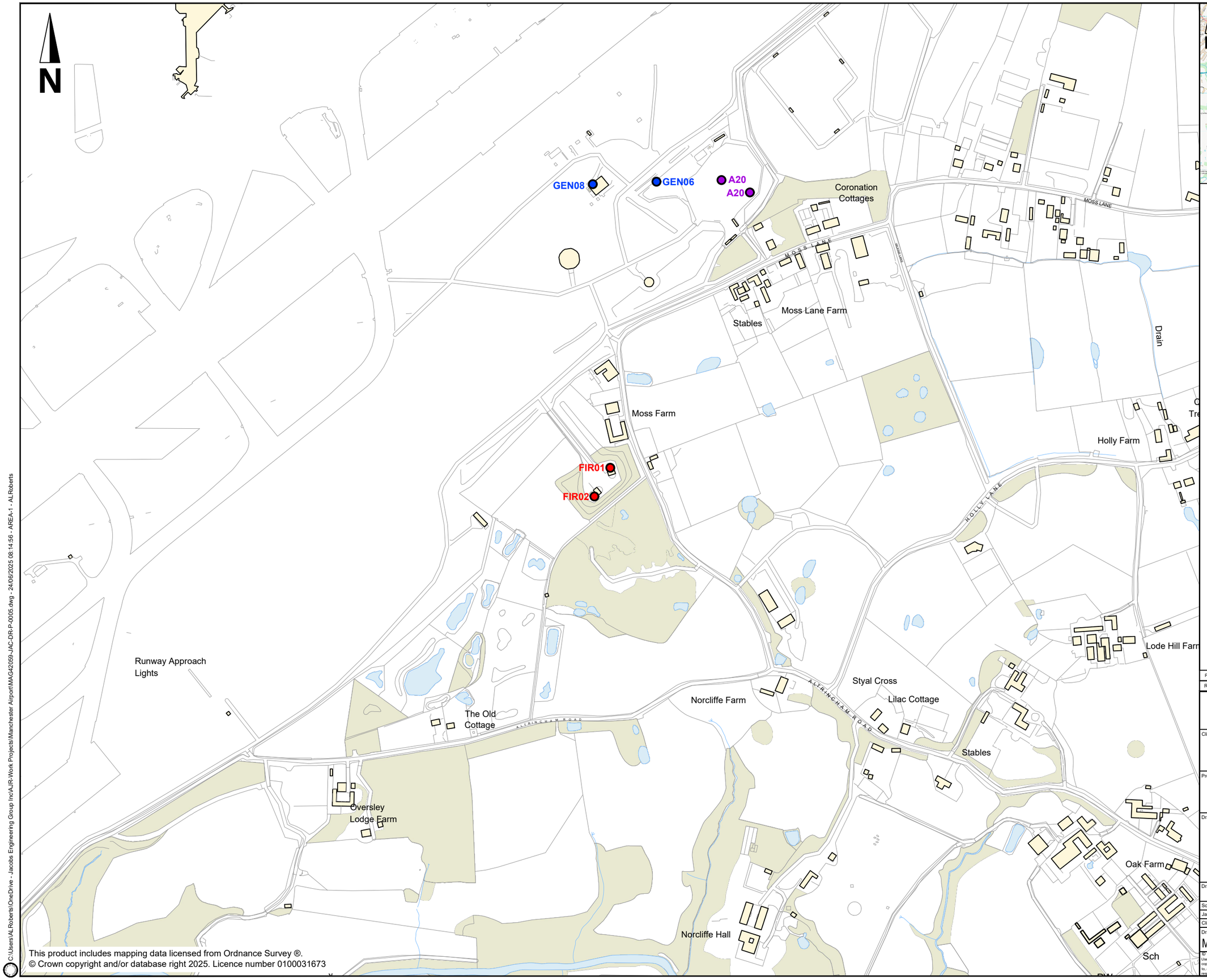
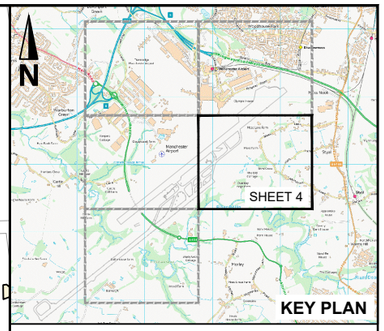
Drawing title: FIGURE 4 EMISSION SOURCES (SHEET 3 OF 5)

Drawing status: PERMITTING

Scale	1:5000 @ A3	DO NOT SCALE
Jacobs No.	MAG42059	Rev P01
Client no.		

Drawing number: MAG42059-JAC-DR-P-0004





LEGEND:

- Boiler
- Standby Generator
- Fire Systems

A20 - Fire Training Rig
GEN06 - C SUB ENG 2
GEN08 - C SUB R2/C
FIR01 - Runway 1 Hydrant
FIR02 - Runway 2 Hydrant

0 100 200
1:5000 @A3 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
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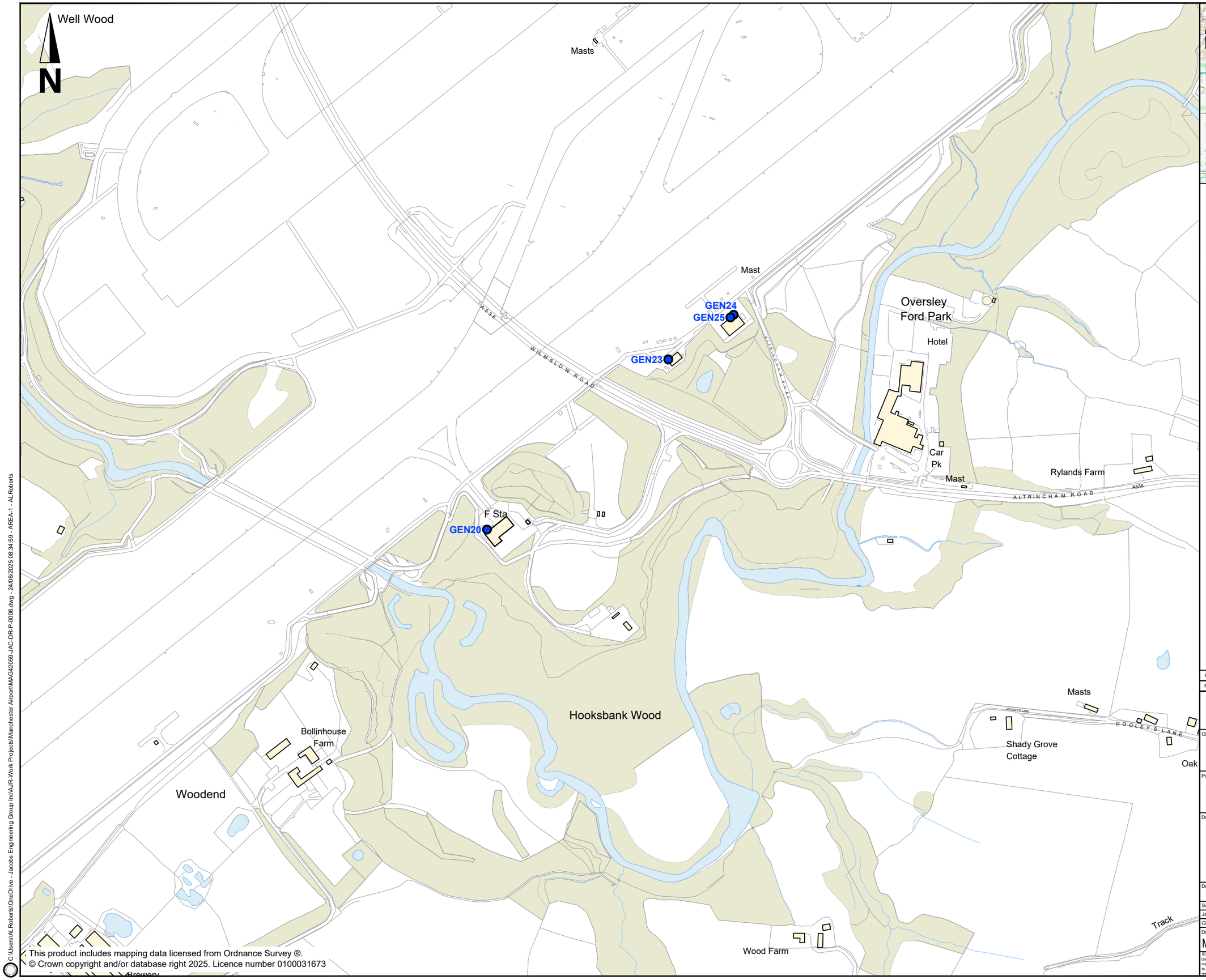
Project: ENVIRONMENTAL PERMIT APPLICATION MANCHESTER AIRPORT

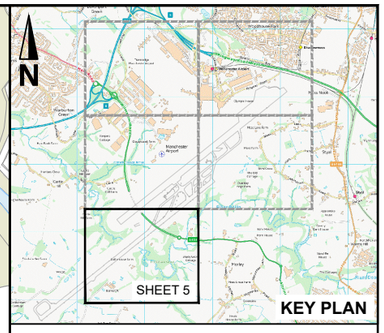
Drawing title: FIGURE 5 EMISSION SOURCES (SHEET 4 OF 5)

Drawing status: PERMITTING

Scale	1:5000 @ A3	DO NOT SCALE
Jacobs No.	MAG42059	Rev P01
Client no.		

Drawing number: MAG42059-JAC-DR-P-0004





LEGEND:

Standby Generator

GEN20 - R2/2 SUB (South Fire Station)
GEN23 - R2/2A SUB
GEN24 - R2/3 SUB ENG 1
GEN25 - R2/3 SUB ENG 2

0 100 200
1:5000 @A3 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	JUNE. 2025	PERMITTING	AR	DH	SP	XX

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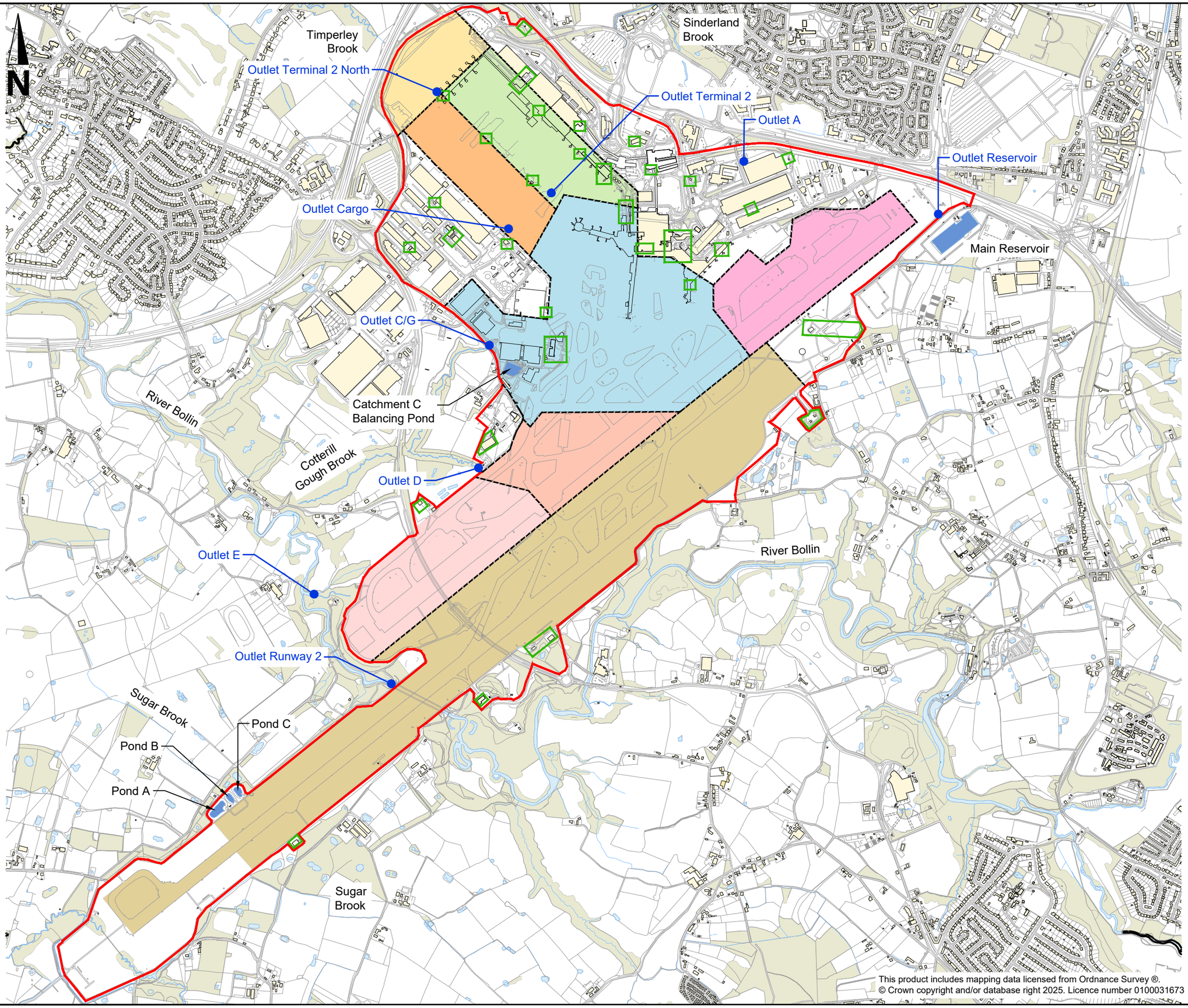
Project: ENVIRONMENTAL PERMIT APPLICATION MANCHESTER AIRPORT

Drawing title: FIGURE 6 EMISSION SOURCES (SHEET 5 OF 5)

Drawing status: PERMITTING

Scale	1:5000 @ A3	DO NOT SCALE
Jacobs No.	MAG42059	Rev P01
Client no.		

Drawing number: MAG42059-JAC-DR-P-0006



LEGEND

- Site Boundary
- Permit Boundary
- Water Courses
- Ponds
- Permitted Discharge Points

SURFACE WATER DRAINAGE CATCHMENTS

- Terminal 2 Catchment
- Cargo Catchment
- Catchment A
- Catchment C
- Catchment D
- Catchment E
- Terminal 2 North Catchment
- Runway 2 Catchment

0 200 400 600 800

METRES

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Project: ENVIRONMENTAL PERMIT APPLICATION MANCHESTER AIRPORT

Drawing title: FIGURE 7 SURFACE WATER DRAINAGE CATCHMENTS

Drawing status: PERMITTING

Scale	AS SHOWN @ A3	DO NOT SCALE
Jacobs No.	MAG42059	Rev P01
Client no.		

Drawing number: MAG42059-JAC-DR-P-0008

LEGEND

- Site Boundary
- Site of Special Scientific Interest (SSSI)
- National Nature Reserve
- Local Nature Reserve
- Ancient Woodland

NOTE:

There are no SPA, SAC, AONB or RAMSAR sites within 6.5km of the site boundary.

- Rixton Clay Pits SAC (14.13km West-Northwest)
- Manchester Mosses SAC (15.95km West-Northwest)
- Rostherne Mere Ramsar (6.5km West)
- Midland Mere & Mosses - Phase 1 Ramsar (7.43km Southwest)

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	JUNE. 2025	PERMITTING	AR	SP	XX	XX

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Client: MAG Manchester Airport

Project: ENVIRONMENTAL PERMIT APPLICATION MANCHESTER AIRPORT

Drawing title: FIGURE 8 ENVIRONMENTAL CONSTRAINTS

Drawing status: PERMITTING

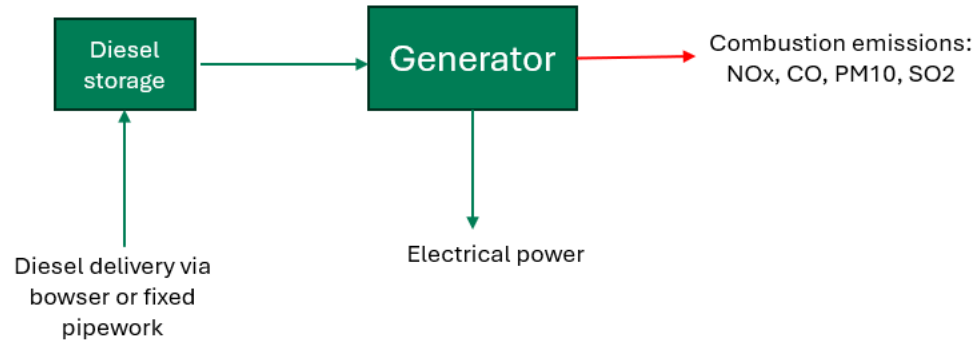
Scale	1:50,000 @ A3	DO NOT SCALE
Jacobs No.	MAG42059	Rev P01
Client no.		

Drawing number: MAG42059-JAC-DR-P-0008

A.2 Process Flow Diagrams

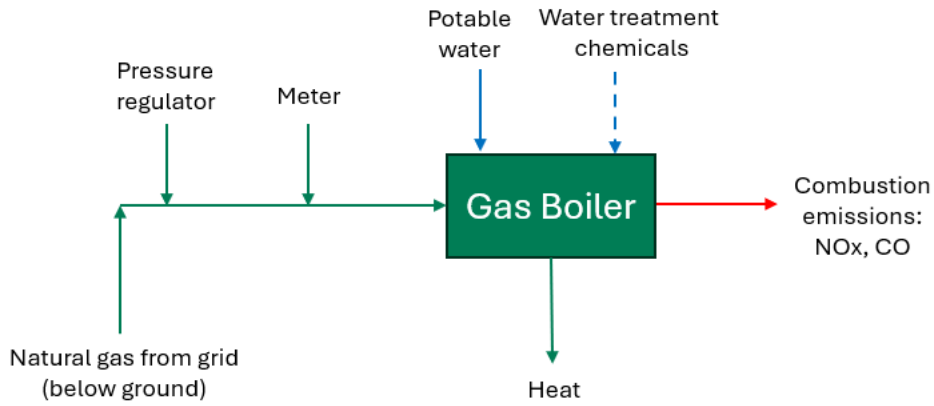
Diesel Generators

Assessed standby generators		
Emission Point	**Location**	**Thermal Input Capacity (MWth)**
GEN02	ATC Tower	1.33
GEN04	BSUB ENG 1	1.33
GEN05	BSUB ENG 2	1.33
GEN06	CSUB ENG 1	1.33
GEN07	CSUB ENG 2	1.33
GEN08	CSUB R2/C	1.21
GEN09	D SUB	1.33
GEN11	G SUB	1.52
GEN14	PHASE 4 SUB	1.48
GEN15	Pump Station B7	1.05
GEN17	RSUB ENG 1	1.64
GEN18	RSUB ENG 2	1.33
GEN19	Southern Front	1.21
GEN21	R2/1 SUB ENG 1	2.42
GEN22	R2/1 SUB ENG 2	2.42
GEN24	R2/3 SUB ENG 1	2.42
GEN25	R2/3 SUB ENG 2	2.42
GEN28	T2 B1 SUB	1.06
GEN29	T2 G2A SUB	4.00
GEN30	T3 H1 SUB	1.64
GEN31	Voyager 7th Floor	1.83
GEN32	West Apron Ph6A	1.33
38 x additional generators <1 MWth		



Gas Fired Boilers

Emission point	Location / description	Thermal input capacity (MWth)
A20	Fire training rig	7.728
A07-1	T2 Boiler House	7.143
A07-2	T2 Boiler House	7.143
A01-A	T1 Boiler House	4.643
A01-B	T1 Boiler House	4.643
A03-1	T3 Boiler House	2.857
A03-2	T3 Boiler House	2.857
A03-3	T3 Boiler House	2.857
A08-A	Cargo Centre Main Boiler House	2.857
A08-B	Cargo Centre Main Boiler House	2.857
A24-1	MAN- TP Energy Centre	2.144
A24-2	MAN- TP Energy Centre	2.144
A24-3	MAN- TP Energy Centre	2.144
A24-4	MAN- TP Energy Centre	0.558
A14	Aviation Viewing Park	0.824
A13-1	Voyager	0.714
A13-2	Voyager	0.714
A02-1	T1 Arrivals	0.673
A02-2	T1 Arrivals	0.673
A02-3	T1 Arrivals	0.673
A05-1	Olympic House Plantroom	0.577
A05-2	Olympic House Plantroom	0.577
A18-A	MAN- TP Energy Centre	0.603
A18-B	Terminal 1 Stand 21 F&B	0.089
A18-C	Terminal 1 Stand 21 F&B	0.177
A18-D	Terminal 1 Stand 21 F&B	0.177
A18-E	Terminal 1 Stand 21 F&B	0.177
A11-A	Rail Station	0.175
A11-B	Rail Station	0.175
A11-C	Rail Station	0.175
A09-1	North Side Fire Station	0.191
A09-2	North Side Fire Station	0.191
A17-A	T1 OBC	0.183
A17-B	T1 OBC	0.183



A.3 Site Photographs

Photo Log

1. Boilers

A01 - T1 Boiler House

Figure 1: 2 x 4.643 MWth boilers (Ref A01-A & A01-B)

Figure 2: Boiler exhausts exiting the boiler room

A02 - T1 Arrivals

Figure 3: 3 x 0.673 MWth boilers (Ref A02-1, A02-2 & A02-3)

Figure 4: Boiler exhausts exiting the boiler room

Figure 5: Vertical capped stacks

A03 - T3 Boiler House

Figure 6: 3 x 2.857 MWth boilers (Ref A03-1, A03-2 & A03-3)

Figure 7: Boiler exhaust stacks exiting the boiler room

A05 - Olympic House Plant Room

Figure 8: 1 x 0.577 MWth boiler (Ref A05-1)

Figure 9: 1 x 0.577 MWth boilers (Ref A05-2)

Figure 10: Boiler exhaust exiting the boiler room

A07 - T2 Boiler House/CHP

Figure 11: 2 x 7.143 MWth boilers (Ref A07-1 & A07-2)

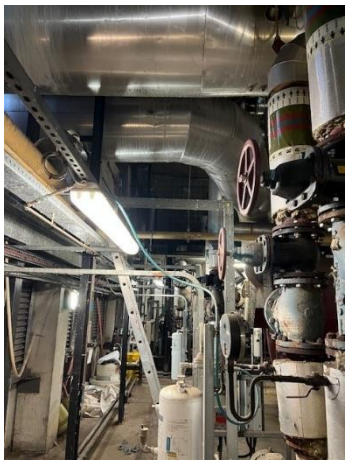


Figure 12: Boiler exhausts exiting the boiler room

Figure 13: Boiler exhaust stacks exiting the building

A11 - Rail Station

Figure 14: 3 x 0.1752 MWth boilers (Ref A11-A, A11-B & A11-C)

Figure 15: Shared exhaust exiting the boiler room

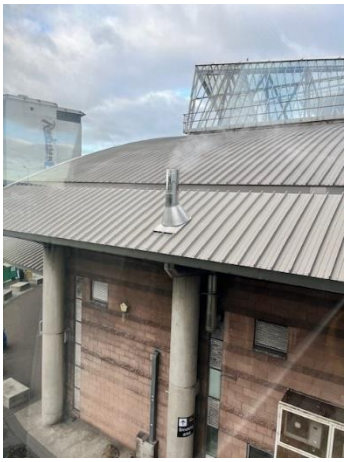


Figure 16: Shared exhaust stack exiting the building

A13 - Voyager

Figure 17: 2 x 0.714 MWth boilers (Ref A13-1 & A13-2)

Figure 18: Vertical capped stacks exiting the building

A17- T1 OBC

Figure 19: 2 x 0.183 MWth boilers (Ref A17-A & A17-B)

Figure 20: Vertical capped stacks exiting the building

A24 - MAN-TP Energy Centre

Figure 21: 3 x2.144 MWth boilers (Ref A24-1, A24-2 & A24-3) and 1 x 0.558 MWth boiler (Ref A24-4)

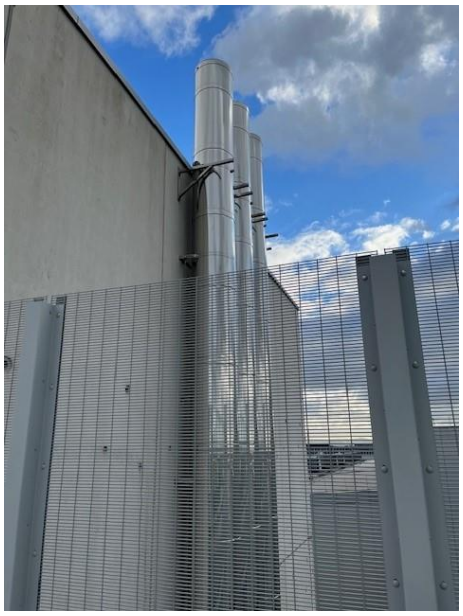


Figure 22: Vertical exhaust stacks exiting the MAN - TP Energy Centre

2. Generators

FIR08 - Southern Front

Figure 23: 1 x0.0.45 MWth standby generator (Ref FIR08)

Figure 24: FIR08 horizontal stack exiting the building

GEN01 - T1 A2 MSCP

Figure 25: 1 x0.848 MWth standby generator (Ref GEN01)

Figure 26: GEN 01 horizontal stack

GEN04 & GEN05 - BSUB ENG 1 & BSUB ENG 2

Figure 27: 1 x 1.333 MWth standby generator (Ref GEN04)

Figure 28: 1 x 1.333 MWth standby generator (Ref GEN05)

Figure 29: GEN04 & GEN05 horizontal exhaust stacks exiting the building

GEN06 & GEN07 - Airfield southside

Figure 30: 2 x 1.333 MWth standby generator (Ref GEN06 & GEN07

Figure 31: GEN06 & GEN07 vertical capped exhaust stacks exiting the building

GEN09 - Airfield Stand 61

Figure 32: 1 x .1.333 MWth standby generator (Ref GEN09)

Figure 33: GEN09 vertical capped exhaust stack

GEN11 - T3 Stand 55

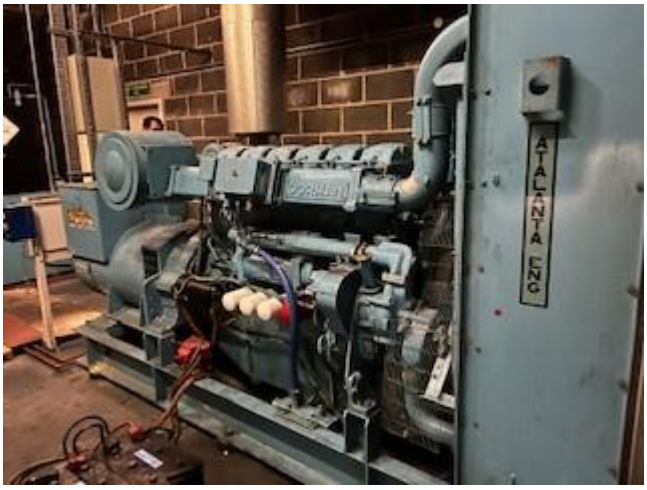


Figure 34: 1 x .1.212 MWth standby generator (Ref GEN11)

Figure 35: GEN11 horizontal exhaust stack exiting the building

GEN12 - H Sub Engine 1

Figure 36: 1 x .0.830 MWth standby generator (Ref GEN12)

GEN16 - T1 Outwood Lane

Figure 37: 1 x .0.367 MWth standby generator (Ref GEN16)

GEN19 T1 - Southern Front

Figure 38: 1 x .1.212 MWth standby generator (Ref GEN19

Figure 39: GEN19 horizontal exhaust stack exiting the building

GEN21 & GEN22 - R2/1 SUB ENG 1 & R2/1 SUB ENG 2

Figure 40: 1 x .2.424 MWth standby generator (Ref GEN21

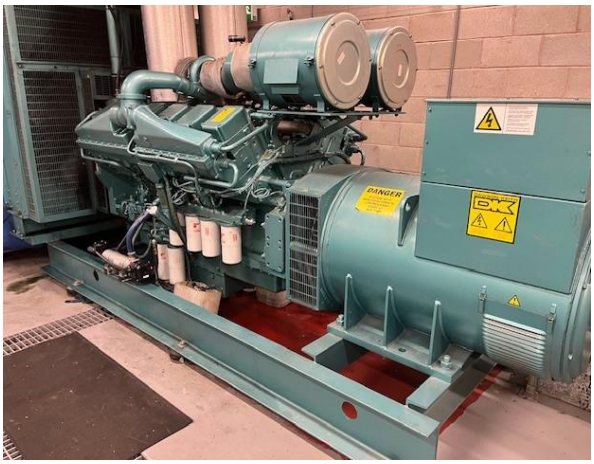


Figure 41: 1 x .2.424 MWth standby generator (Ref GEN22)

Figure 42: GEN21 & GEN22 horizontal twin exhaust stacks exiting the building

GEN23 - R2/2A SUB

Figure 43: 1 x .0.285 MWth standby generator (Ref GEN23)

Figure 44: GEN23 horizontal exhaust stack exiting the building

GEN24 & GEN25 - R2/3 SUB ENG 1 & R2/3 SUB ENG 2

Figure 45: Twin horizontal exhaust stacks for GEN24 & GEN25 (although not pictured, generator type are identical to GEN21 & GEN22)

GEN26 - T2 A1 SUB

Figure 46: 1 x .0.985 MWth standby generator (Ref GEN26)

Figure 47: Twin horizontal exhaust stacks for GEN26 exiting the building

GEN27 - T2 A2 SUB

Figure 48: 1 x .0.800 MWth standby generator (Ref GEN27)

Figure 49: Horizontal exhaust stack for GEN27 exiting the building

GEN29 - T2 G2A SUB

Figure 50: 1 x .4.000 MWth standby generator (Ref GEN29)

Figure 51: Horizontal exhaust stack for GEN29 exiting the building

GEN30 - T3 H1 SUB

Figure 52: 1 x .1.636 MWth standby generator (Ref GEN30)

Figure 53: Twin horizontal exhaust stacks for GEN30 exiting the building

GEN31 - Voyager 7th floor

Figure 54: 1 x .1.828 MWth standby generator (Ref GEN31)

GEN32 - West Apron Ph6A

Figure 55: 1 x .1.333 MWth standby generator (Ref GEN32)

Figure 56: Horizontal exhaust stack for GEN32

Mobile generators

Figure 57: Mobile generator (approx. 1MWth)

Figure 58: Vertical capped exhaust stack

Sprinklers

FIR08 - T1&3 Sprinklers

Figure 59: 1 x .0.045 MWth sprinkler (Ref FIR08)

FIR09 - T2W Sprinklers

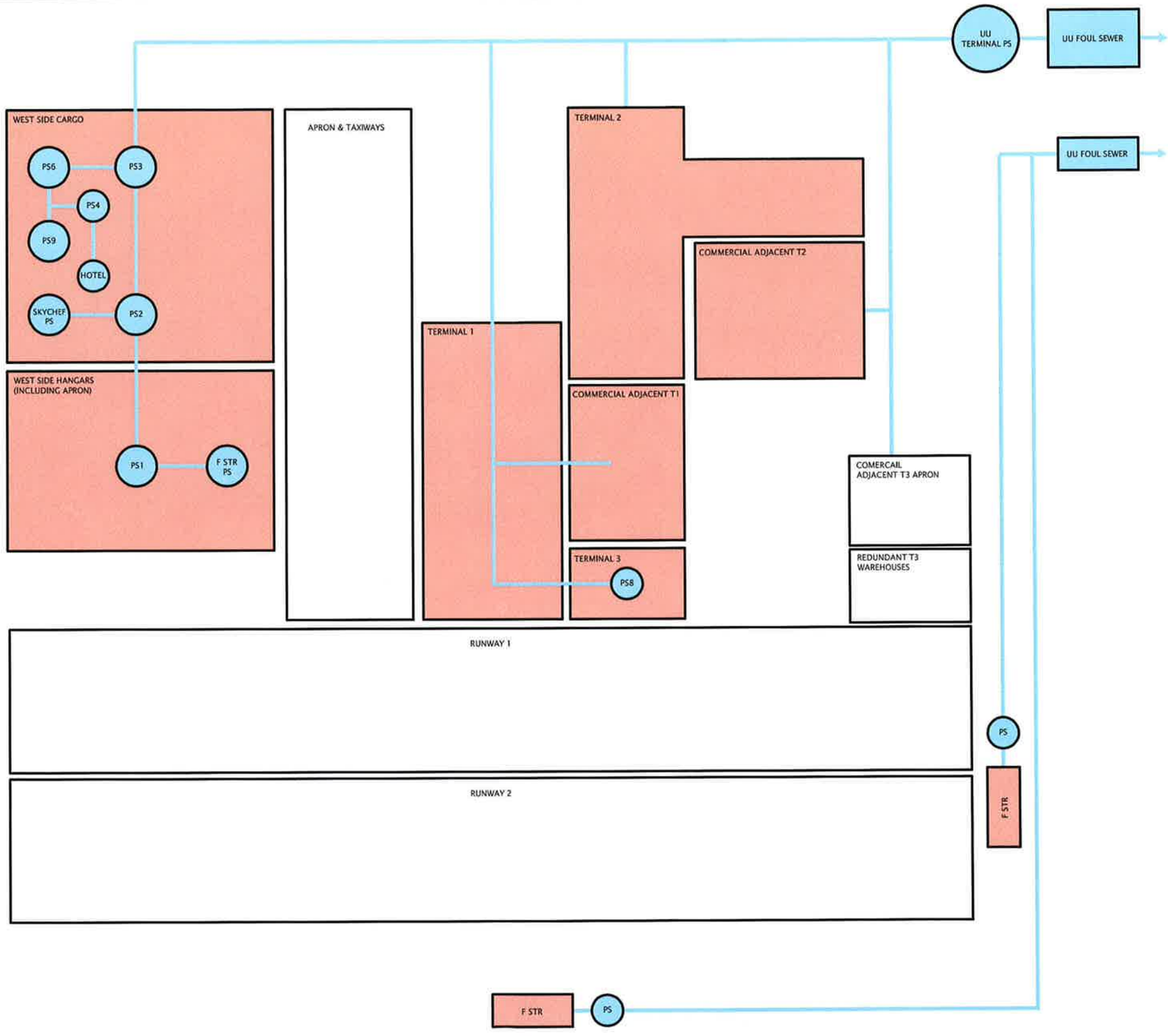
Figure 60: 1 x .0.188 MWth sprinkler (Ref FIR09)

Figure 61: FIR09 vertical stack exiting the building

A.4 Site Drainage Plans

Timperley Brook Outfall
Timperley Brook Catchment
West Apron
Landside SW - non-containment
Airside SW - containment
Airside SW - non-containment
SW - non-containment mode
SW - containment mode
Foul
PS1 SW pumping station
PS9 Foul pumping station
Cargo Landside
Cargo Area
PS9
PS6
PS
Skychef PS
PS2
PS3
PS1
FStn PS
Cargo Aprons
Terminal 2 Apron
T2
UU Terminal PS
UU Foul Sewer
Oversize Sewer
Oversize Sewer
Tunnel Sewer
PS F6
Bollin Outfall
Outfall Sewer
PS3
Catchment G
Catchment C
Terminal Landside
Cotteril Clough Outfall
PS2
PS8
T1
T3
Cotteril Clough Outfall
PS1
Catchment D
Catchment A
UU Foul Sewer
Meter
Double Wood Brook Outfall
Catchment E
PS
FTG PS
FTG
Sugar Brook Outfall
Sugar Brook Catchment
R2 Catchment
Reservoirs Nos. 1 & 2
FStn PS
FStn
R2 PS
MANCHESTER AIRPORT DRAINAGE - SCHEMATIC


M.S.C.P.



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Web www.mottmac.com

Client

-
-
-
-
-
-
-

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	23.05.07	RG	Preliminary Issue	GB	LE

Title: Manchester Airport Capacity Thermometer

Drainage Foul Water

Drawn	RG
Checked	GB
Approved	LE
Scale at A3	N.T.S.
Drawing No.	230350/003
Rev	P1
Status	PRE

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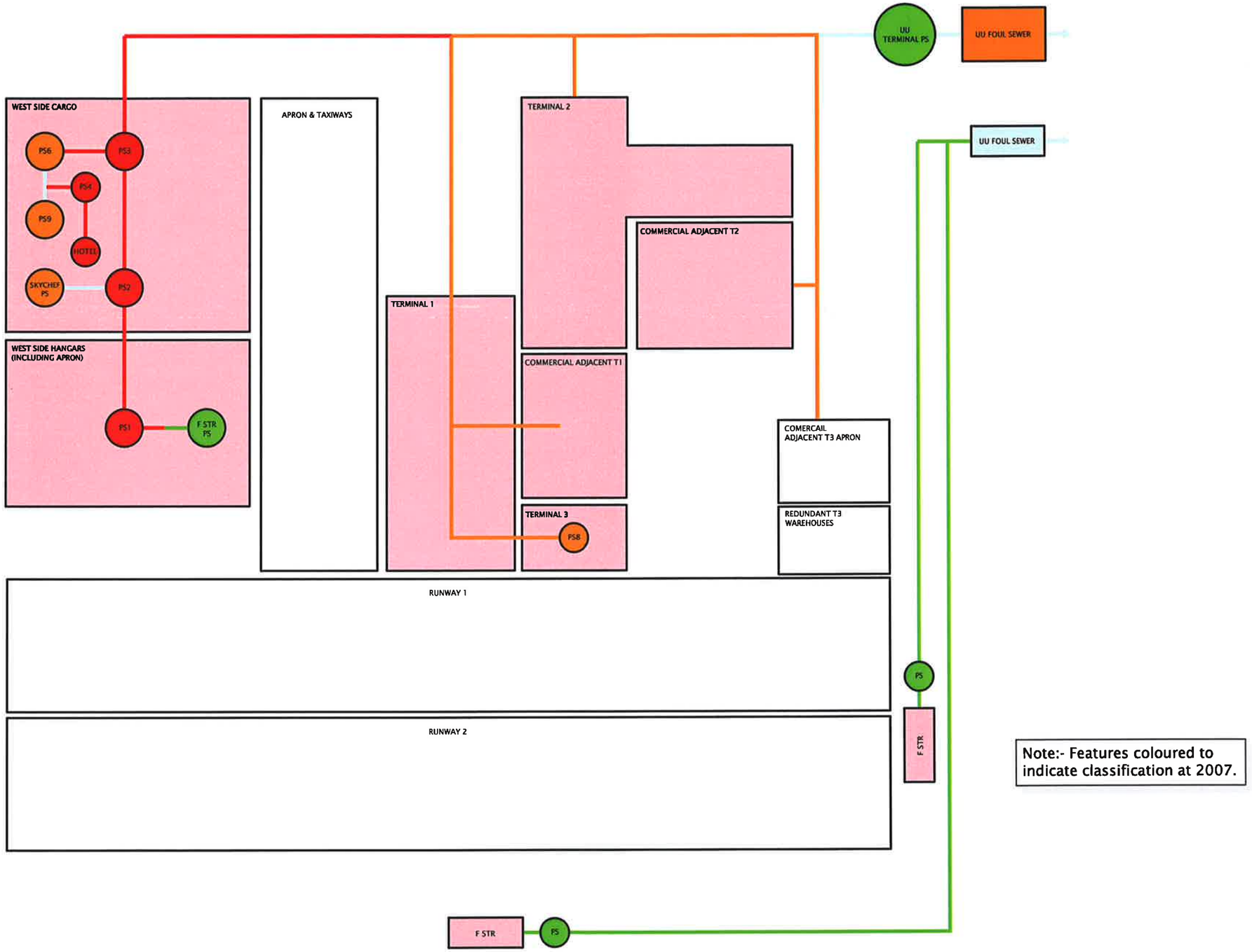

Note:- Features coloured to indicate classification at 2007.

Mott MacDonald

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Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	08.06.07	RG	Preliminary Issue	GB	LE

Title: Other Infrastructure Capacity Thermometer Existing Foul Drainage Capacity Thermometer Simplified Schematic Diagram

Drawn	RG
Checked	GB
Approved	LE
Scale at A3	N.T.S.
Drawing No.	5156-189-FW02
Rev	P1
Status	PRE

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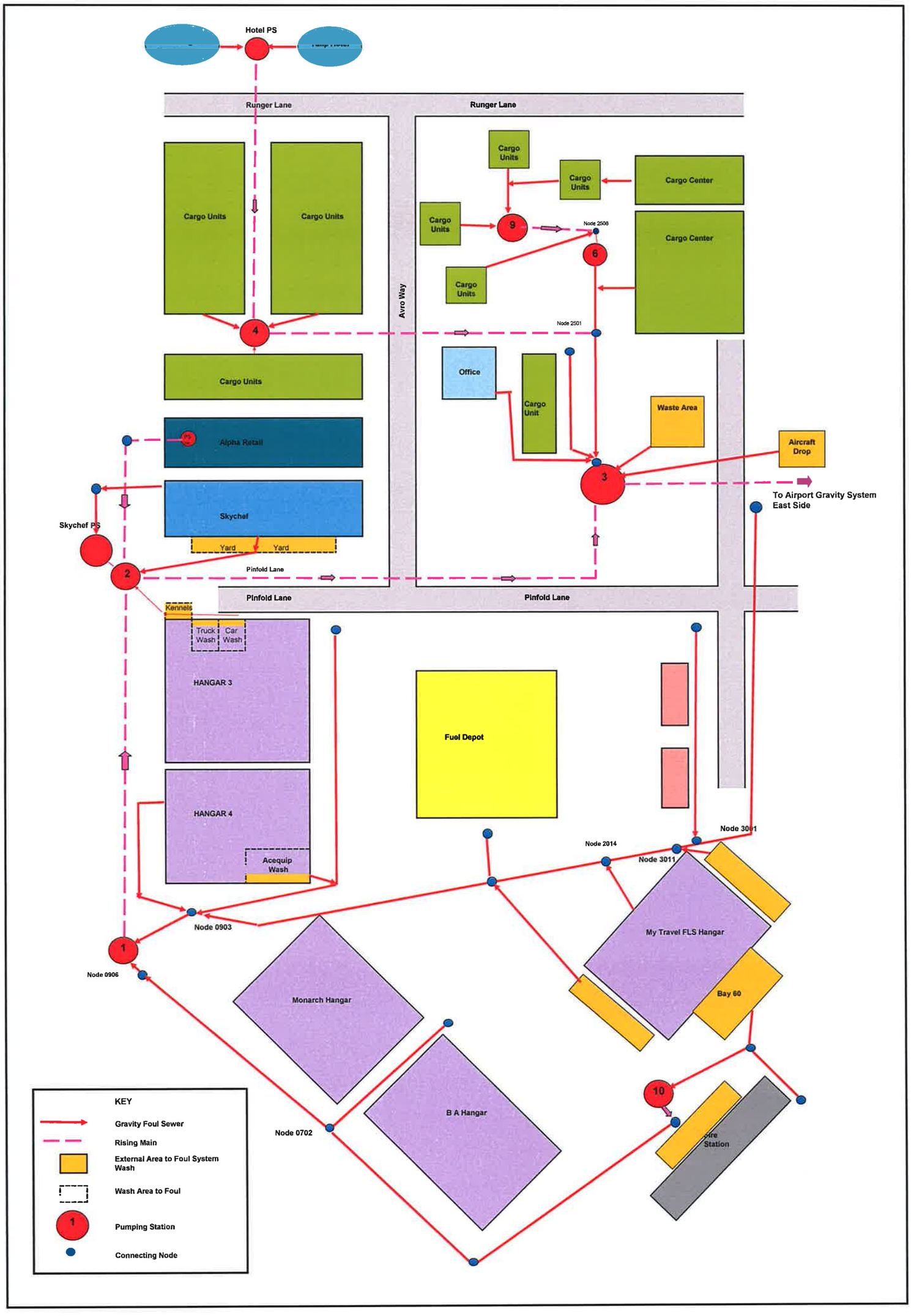
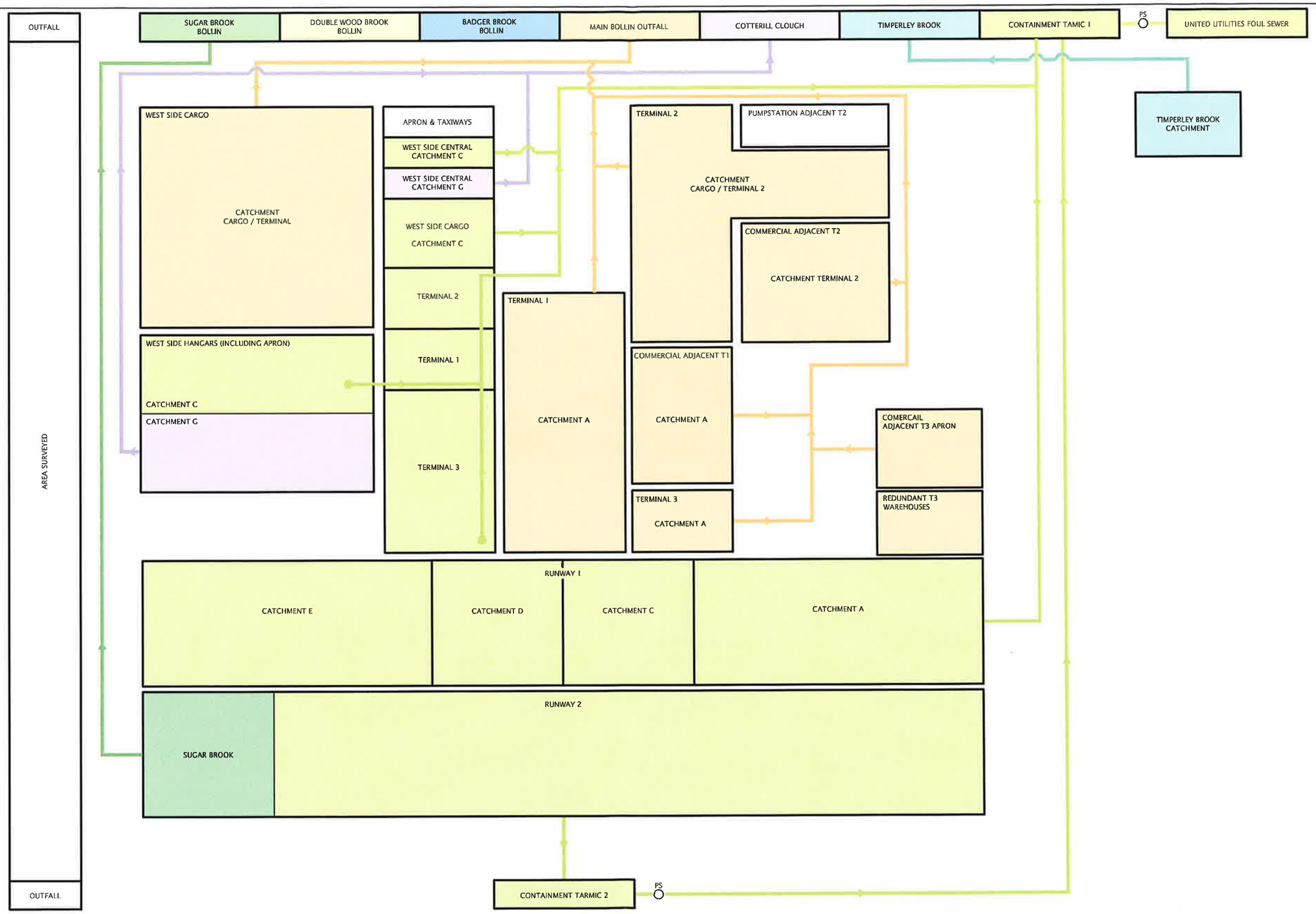
Manchester Airport West Side Foul Drainage Diagramatic Layout Existing





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Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	23.05.07	RG	Preliminary Issue	GB	LE

Title

Manchester Airport Capacity Thermometer

Drainage Surface Water Winter Mode Containment

Drawn	RG
Checked	GB
Approved	LE
Scale at A3	N.T.S.
Drawing No.	230350/002
Rev	P1
Status	PRE

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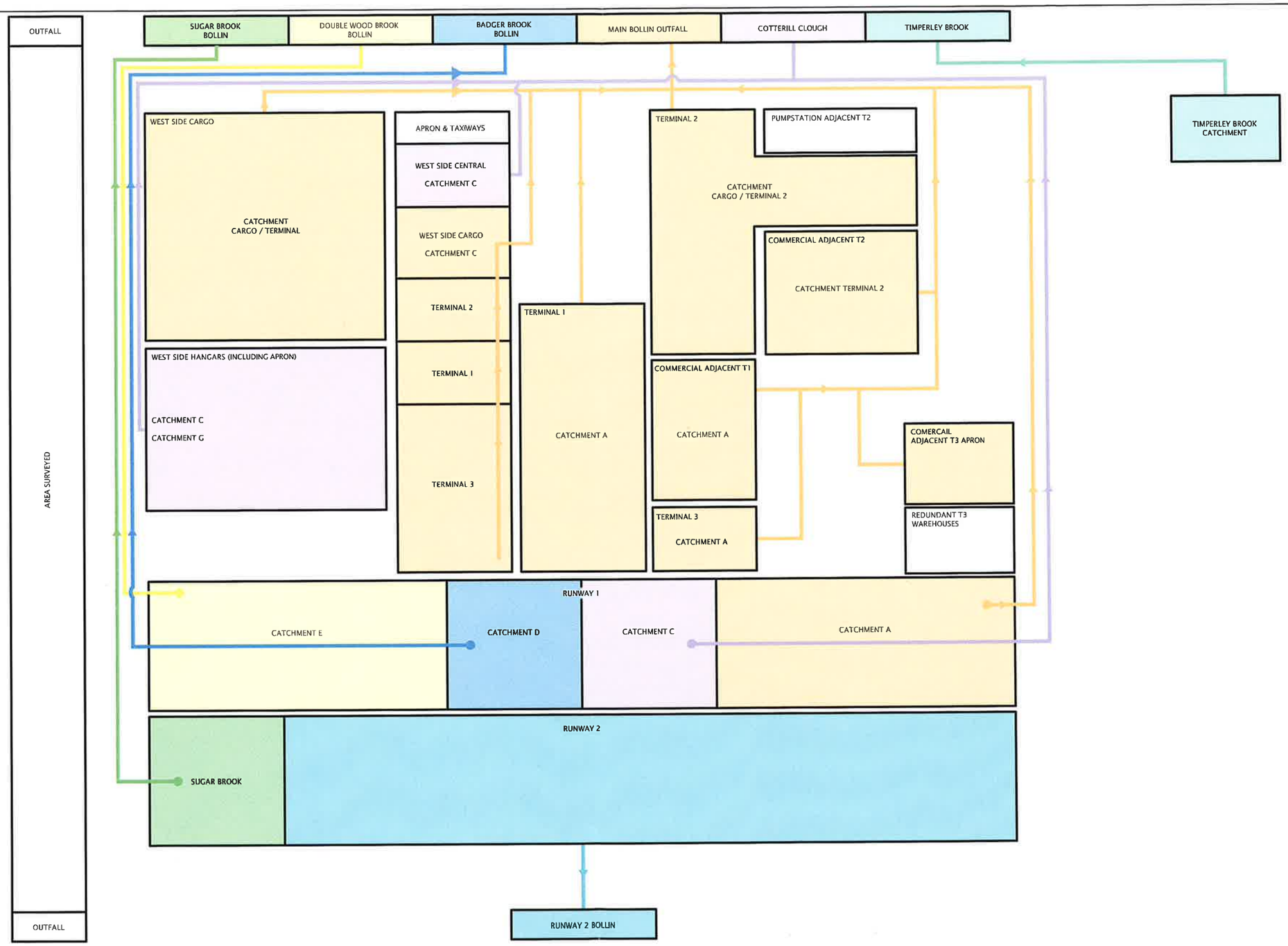

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P1	23.05.07	RG	Preliminary Issue	GB	LE

Title

Manchester Airport Capacity Thermometer

Drainage Surface Water Summer Mode

Drawn	RG
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Approved	LE
Scale at A3	N.T.S.
Drawing No.	230350/001
Rev	P1
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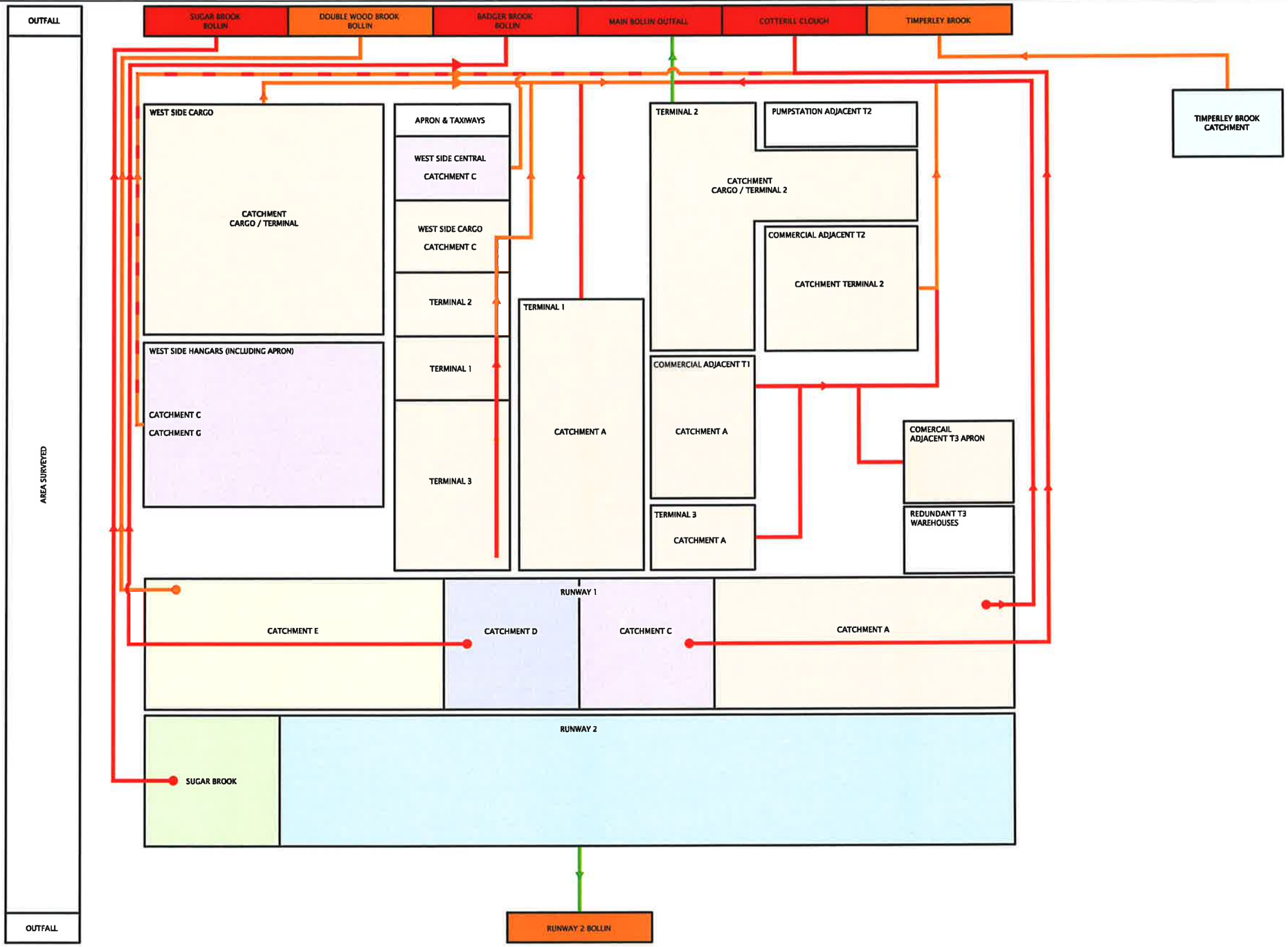

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Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	08.06.07	RG	Preliminary Issue	GB	LE

Title

Other Infrastructure Capacity Thermometer Existing Surface Water Drainage Summer Mode - Capacity Thermometer Simplified Schematic

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Checked	GB
Approved	LE
Scale at A3	N.T.S.
Drawing No.	5156-189-SW02
Rev	P1
Status	PRE

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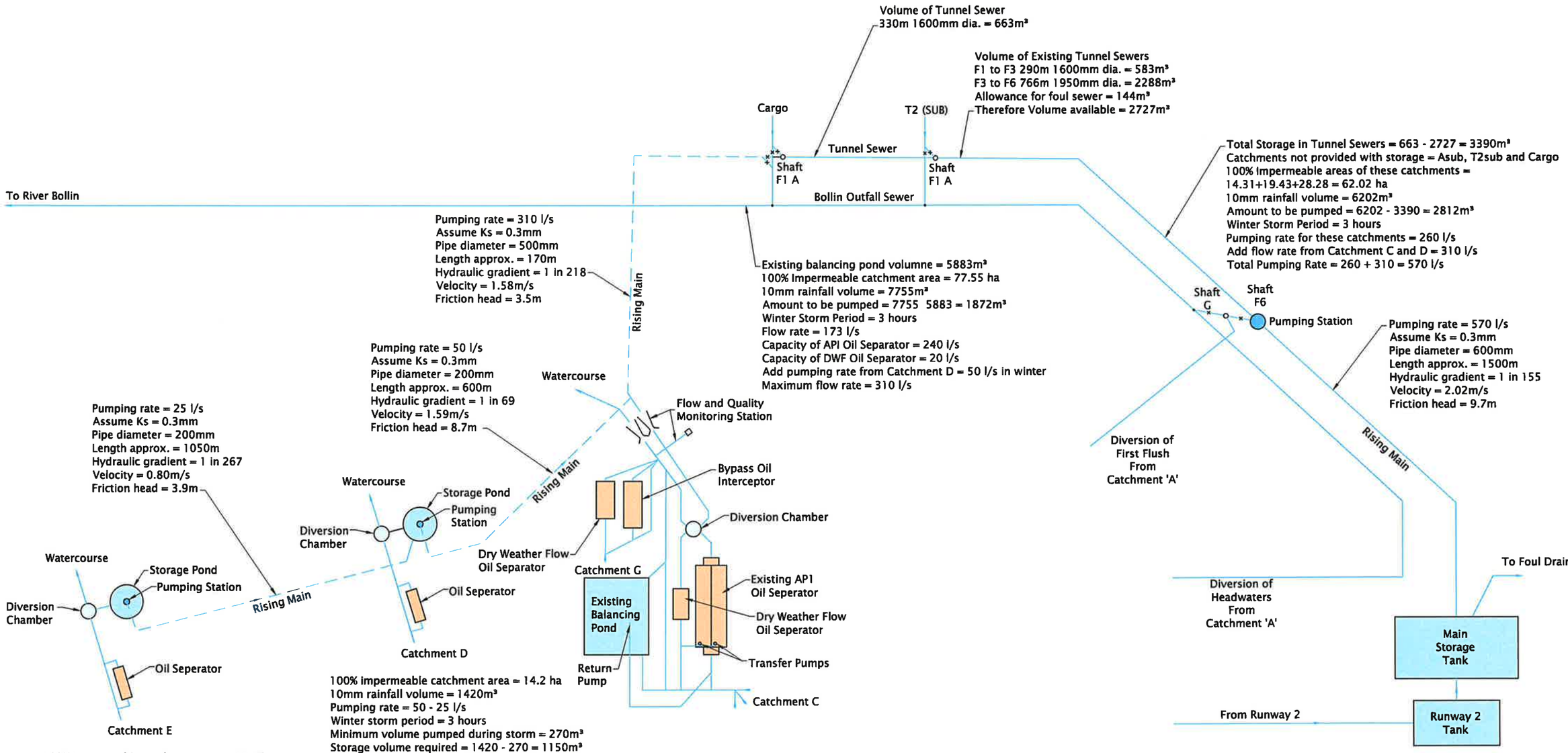

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Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	08.06.07	RG	Preliminary Issue	GB	LE

Title: Other Infrastructure Capacity Thermometer Containment System Schematic and Operation (From Airport Record Drawings)

Drawn	RG
Checked	GB
Approved	LE
Scale at A3	N.T.S.
Drawing No.	5156-189-CM02
Rev	P1
Status	PRE

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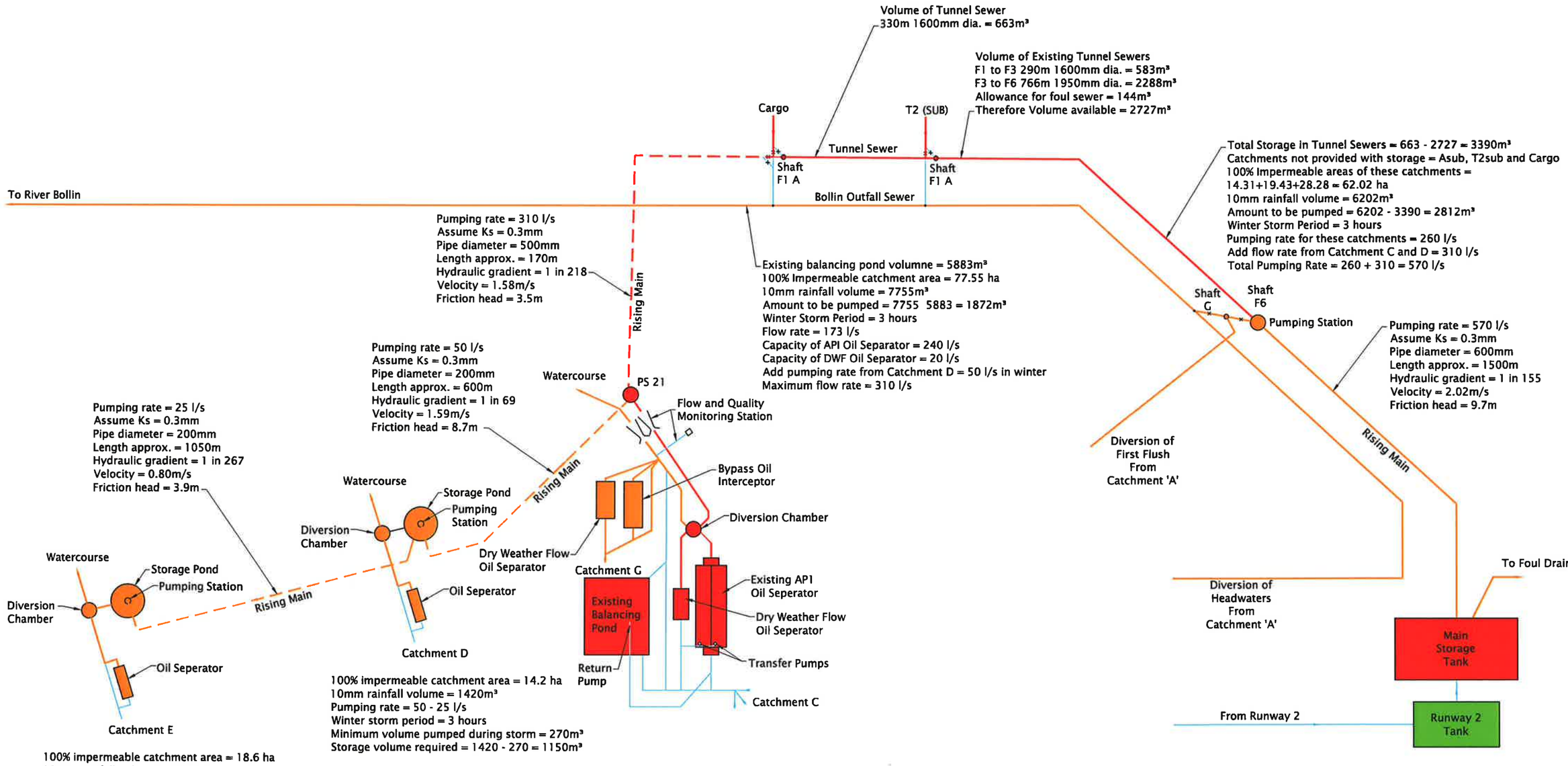

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P1	08.06.07	RG	Preliminary Issue	GB	LE

Title
Other Infrastructure
Capacity Thermometer
Containment System Capacity Thermometer
Schematic and Operation
(From Airport Record Drawings)

Drawn	RG
Checked	GB
Approved	LE
Scale at A3	N.T.S.
Drawing No.	5156-189-CM03
Rev	P1
Status	PRE

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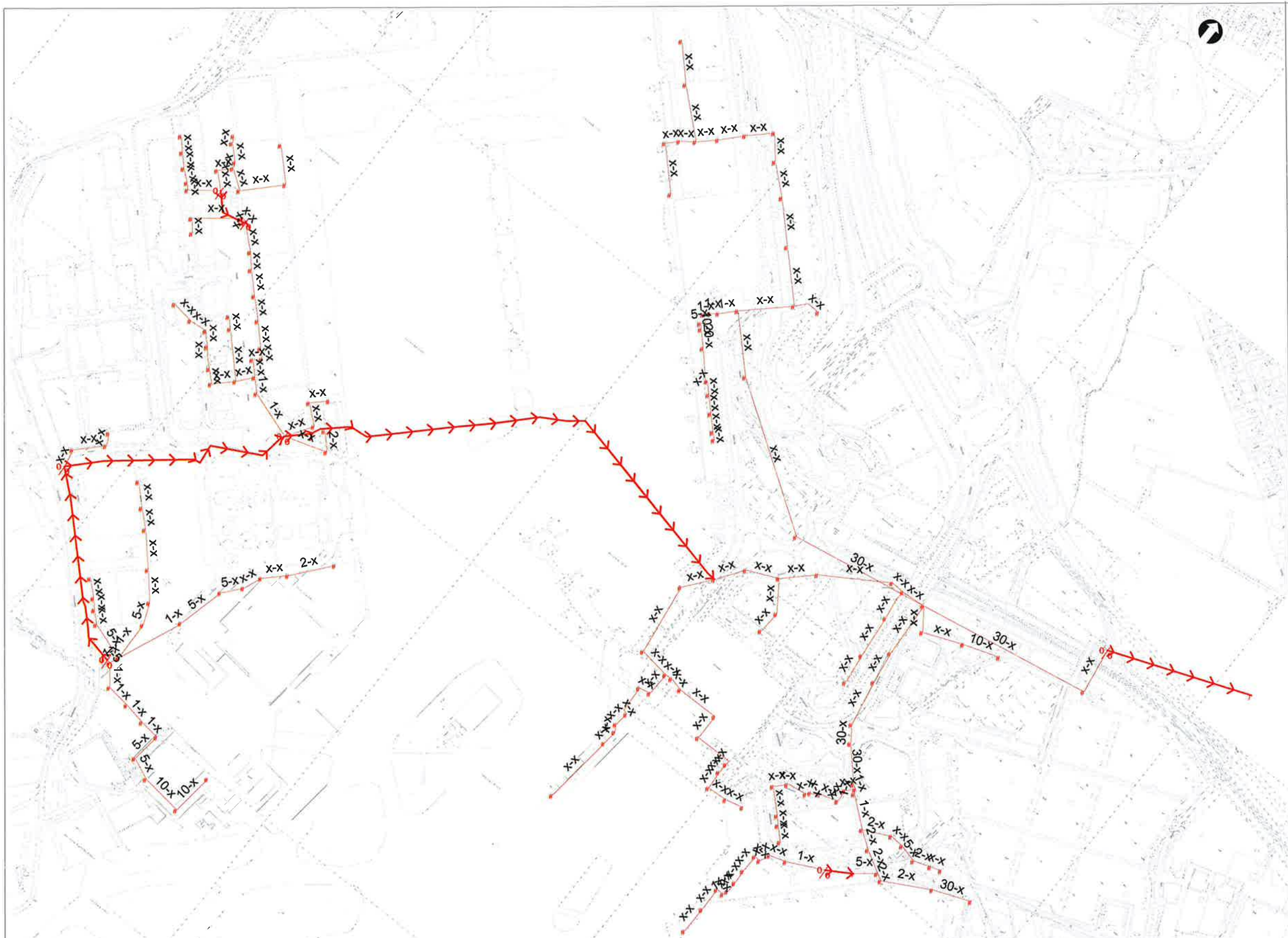

Rev	Drawing Revision	Date
Drawing Status		

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Project Title:
Manchester Airport
Site Wide Services Infrastructure Survey
Stage 1

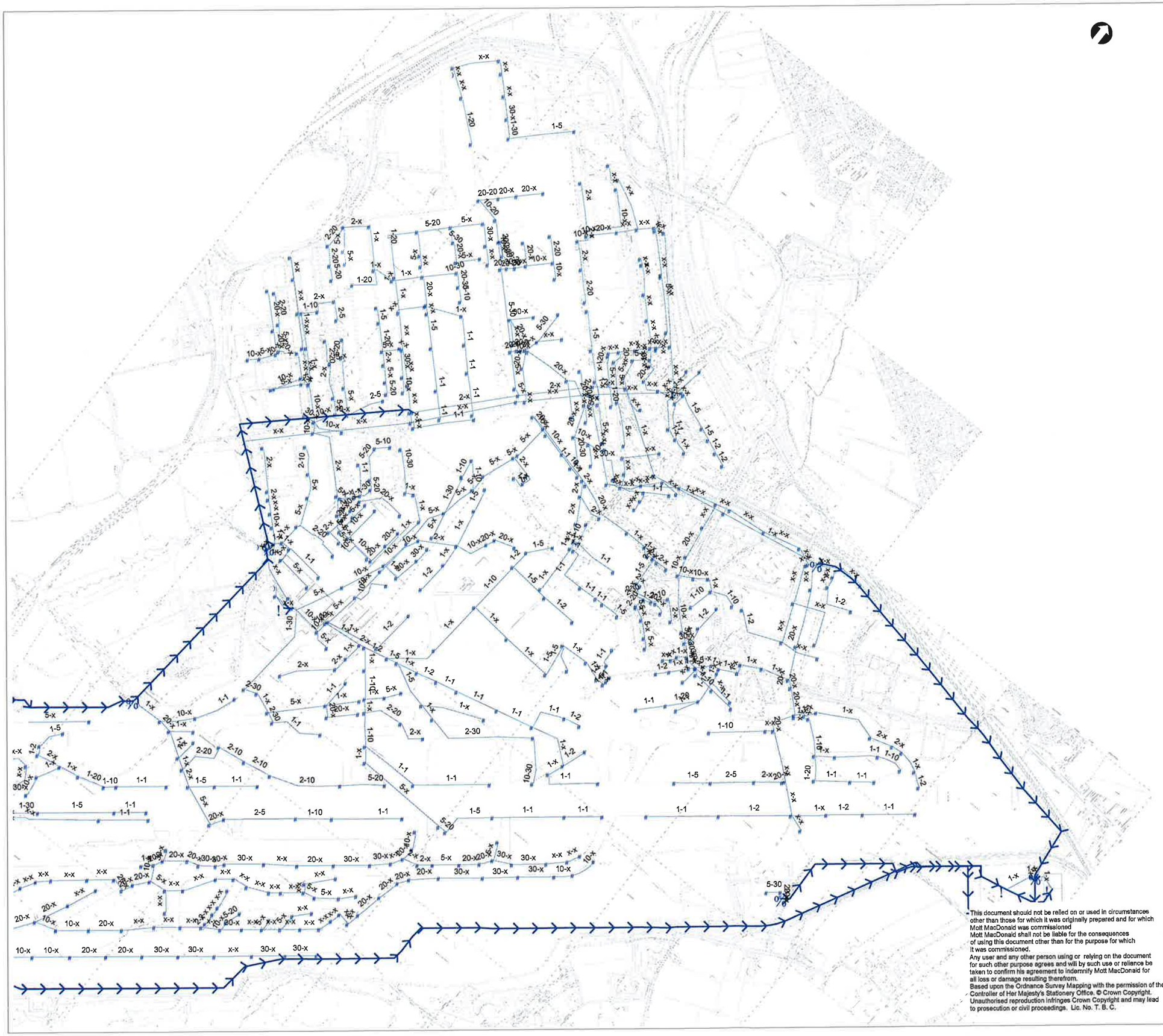
Drawing Title:
Foul Drainage
Modelled Network Performance
Return Period Analysis Sheet 1 of 1

Drawing Number:

Originators Internal Drawing Number:
208017/AW/102

Date Drawn: 20/05/05		Author: CDW	
Drawing Scale: 1 : 6,000	@A3	Checked by: RGT	Rev: 00

location:



Legend

- Modelled Pipe
- Rising main
- Modelled Manhole
- Modelled Pumping Station
- Modelled Reservoir
- x-x Return Period at first surcharge / Return Period at first flood (x indicates >1 in 30 year event)

Rev	Drawing Revision	Date
Drawing Status		

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Project Title:
Manchester Airport
Site Wide Services Infrastructure Survey
Stage 1

Drawing Title:
Surface Water Drainage
Modelled Network Performance
Return Period Analysis Sheet 1 of 2

Drawing Number:

Originators Internal Drawing Number:
208017/AW/100

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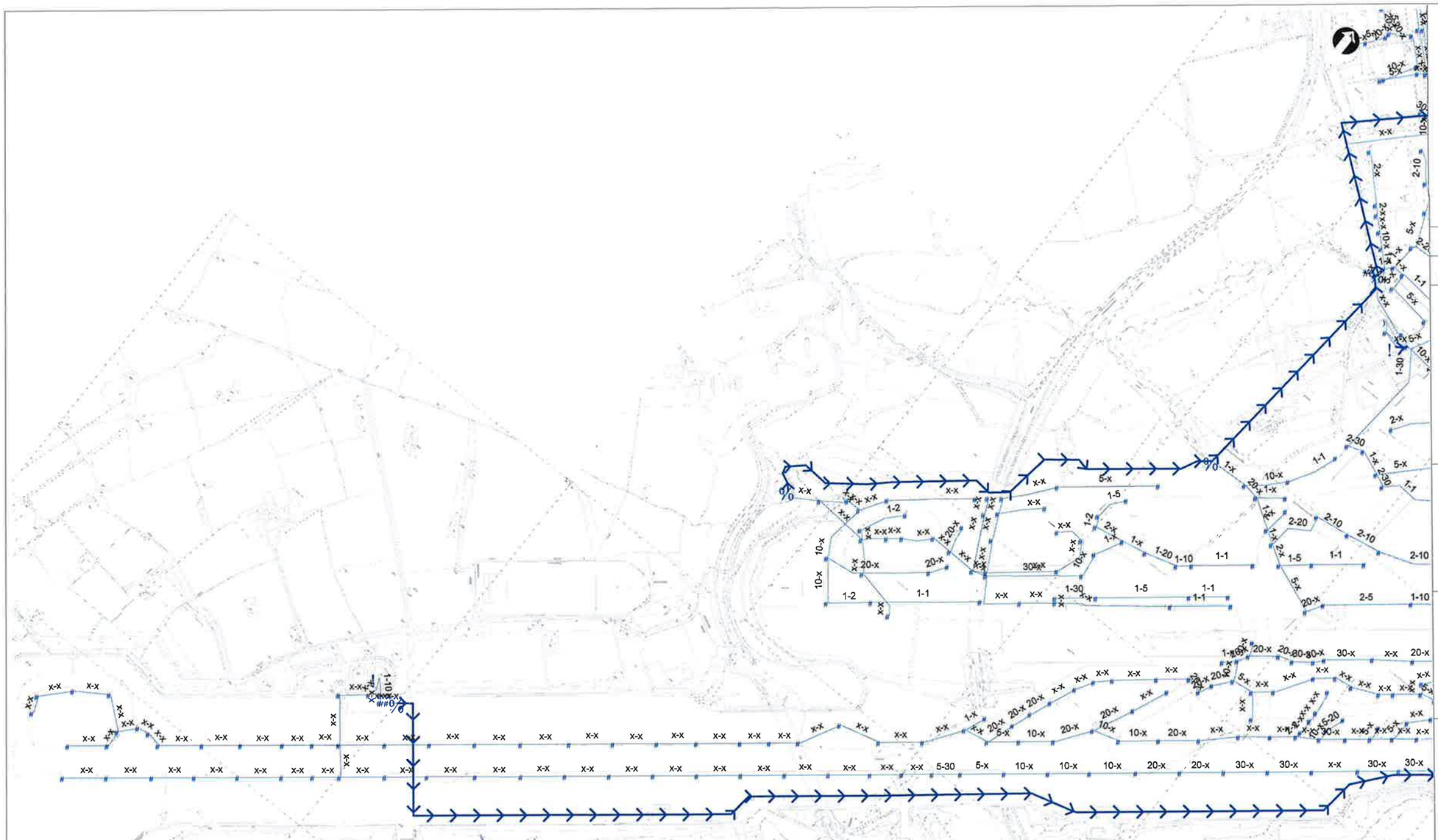
20/05/05		CDW	
Drawing Scale: 1 : 10,000	@A3	Checked by: RGT	Rev: 00
location:			



Legend

- Modelled Pipe
- Rising main
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- x-x Return Period at first surcharge / Return Period at first flood (x indicates >1 in 30 year event)

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Project Title:
Manchester Airport
Site Wide Services Infrastructure Survey
Stage 1

Drawing Title:
Surface Water Drainage
Modelled Network Performance
Return Period Analysis Sheet 2 of 2

Drawing Number:

Originators Internal Drawing Number:
208017/AW/101

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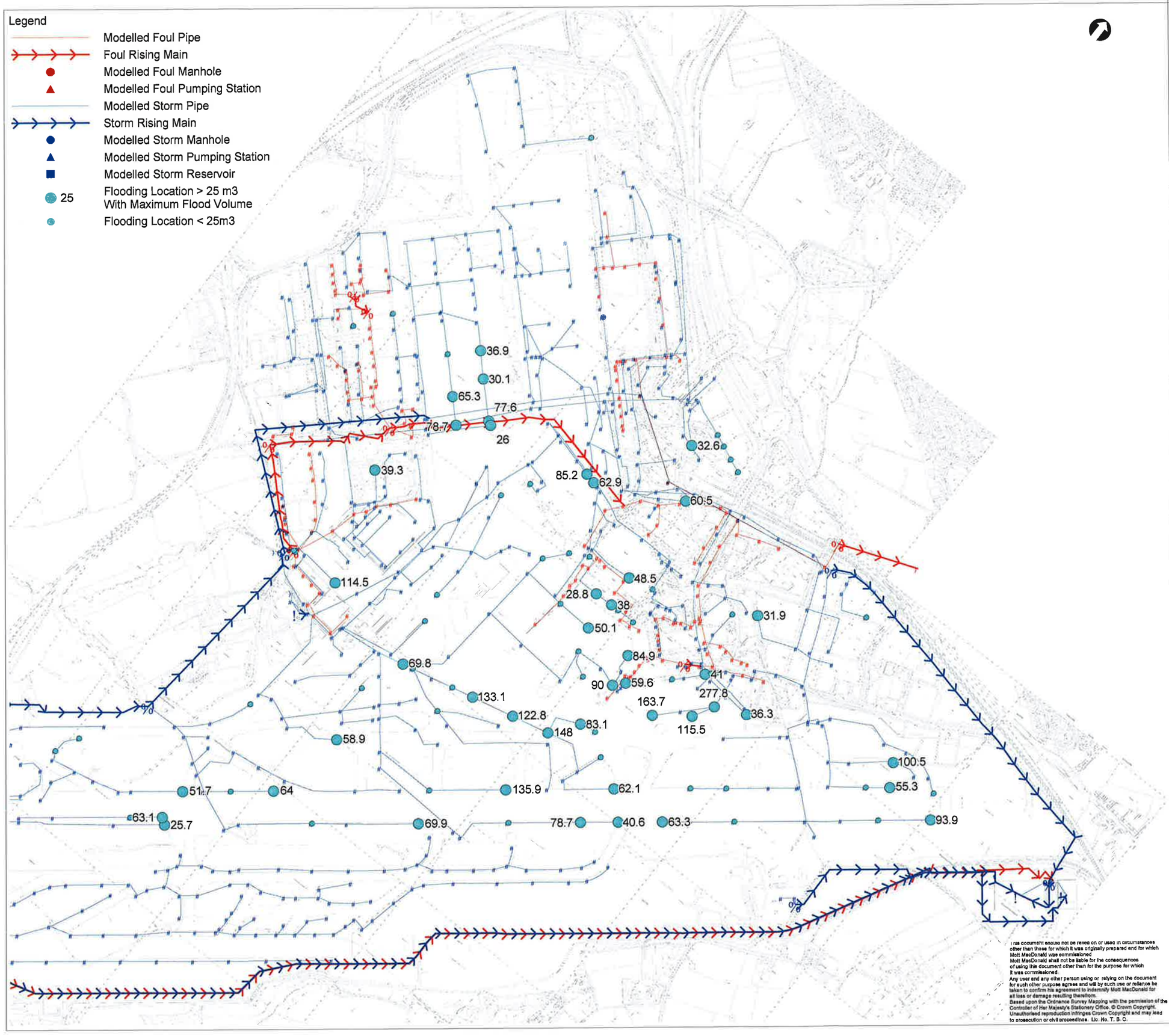

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Project Title:
Manchester Airport
Site Wide Services Infrastructure Survey
Stage 1

Drawing Title:
Existing Drainage Layout
Modelled Network Performance
5 Year Predicted Flooding Sheet 1 of 2

Drawing Number:

Originators Internal Drawing Number:
208017/AW/103

Date Drawn: 20/05/05		Author: CDW	
Drawing Scale: 1 : 10,000	@A3	Checked by: RGT	Rev: 00

location:

Appendix B. Management System

Surface Water Drainage Management Plan

1. Introduction

This document summarises the operating techniques used to control surface water discharge activity at Manchester Airport.

An environmental permit is in place to control discharges to watercourse. The primary activity on site that the environmental permit covers is aircraft deicing and airfield anti-icing. In this management plan, references to Activities A1 to A13 relate to the activities within the environmental permit for discharge of contaminated surface water and site drainage in storm conditions via the various outfalls to watercourse.

2. Water Pollution Prevention Measures

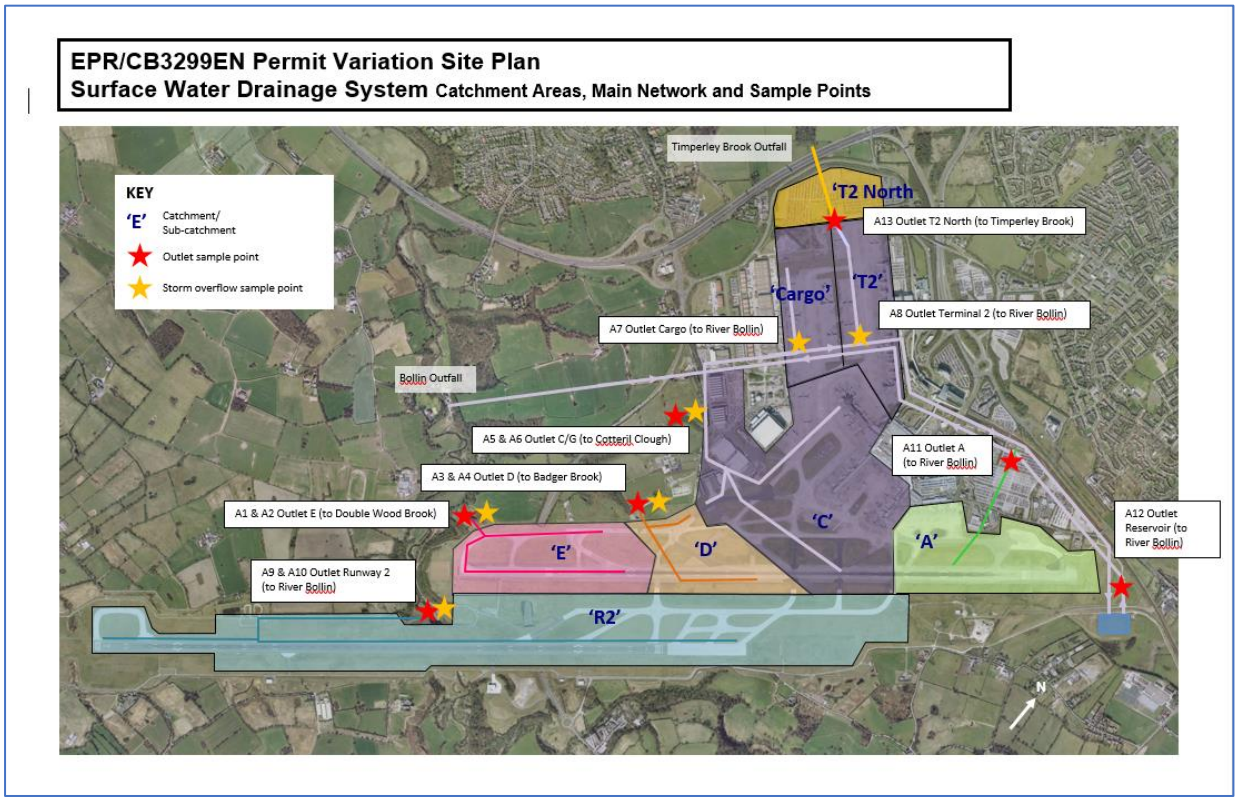
Manchester Airport (MA) operate an environmental management system which is certified to ISO14001:2015. Within this, there are extensive measures taken to control potential impacts to surface water and to manage drainage systems effectively. These include:

- Companies undertaking aircraft deicing must notify the Engineering Shift Team Manager (ESTM) each day before deicing takes place, informing them of the locations of deicing activity. Airfield Duty Managers also inform the ESTM of any airfield pavement anti-icing activity.
- Urea based deicing and anti-icing products will not be used.
- The current airfield anti-icing fleet have a computer controlled application system that monitors the amount applied, and uses GPS to optimise the areas covered.
- Landside anti-icing is only undertaken using grit/salt.
- Aircraft washing is undertaken by third parties and can only be undertaken on one of the aircraft washbays, which drain to foul sewer under a trade effluent agreement with UU.
- Vehicle washing on the site is only permitted in areas that drain to the foul sewer and that are controlled by a trade effluent consent. MA operates two vehicle wash areas. Other wash areas are operated by tenants.
- We have a long-established spillage procedure whereby anyone finding or causing a spill must report it to MA. Failure to report a spillage is an airfield infringement that can attract a fine.
- On the airfield, MA staff clean up the spill using a road sweeper, granules, or pads as required, and will take actions to try to prevent a spillage from entering the drainage system. A spill response trailer is available to deal with larger spillages.
- If a spill enters the drainage system, then actions will be taken to prevent it from entering the watercourse, including flushing the drains into a tanker, operating the containment system or other actions deemed necessary.

- Where any contamination enters the watercourse or the public sewer, the Environment Agency (EA) and/or United Utilities would be alerted as appropriate, appropriate clean up initiated and a full investigation carried out.
- There are around 40 oil interceptors across the site, including at each main outfall. These are checked regularly and an external contractor cleans them as required.
- Fire training and foam testing of fire appliances is only permitted to take place at the fire training ground which discharges to foul sewer under a trade effluent agreement with UU.
- Our Emergency plans include actions to be taken in the event of an emergency to protect local watercourses from pollution and consult with environmental regulatory agencies as required. These plans are periodically tested.

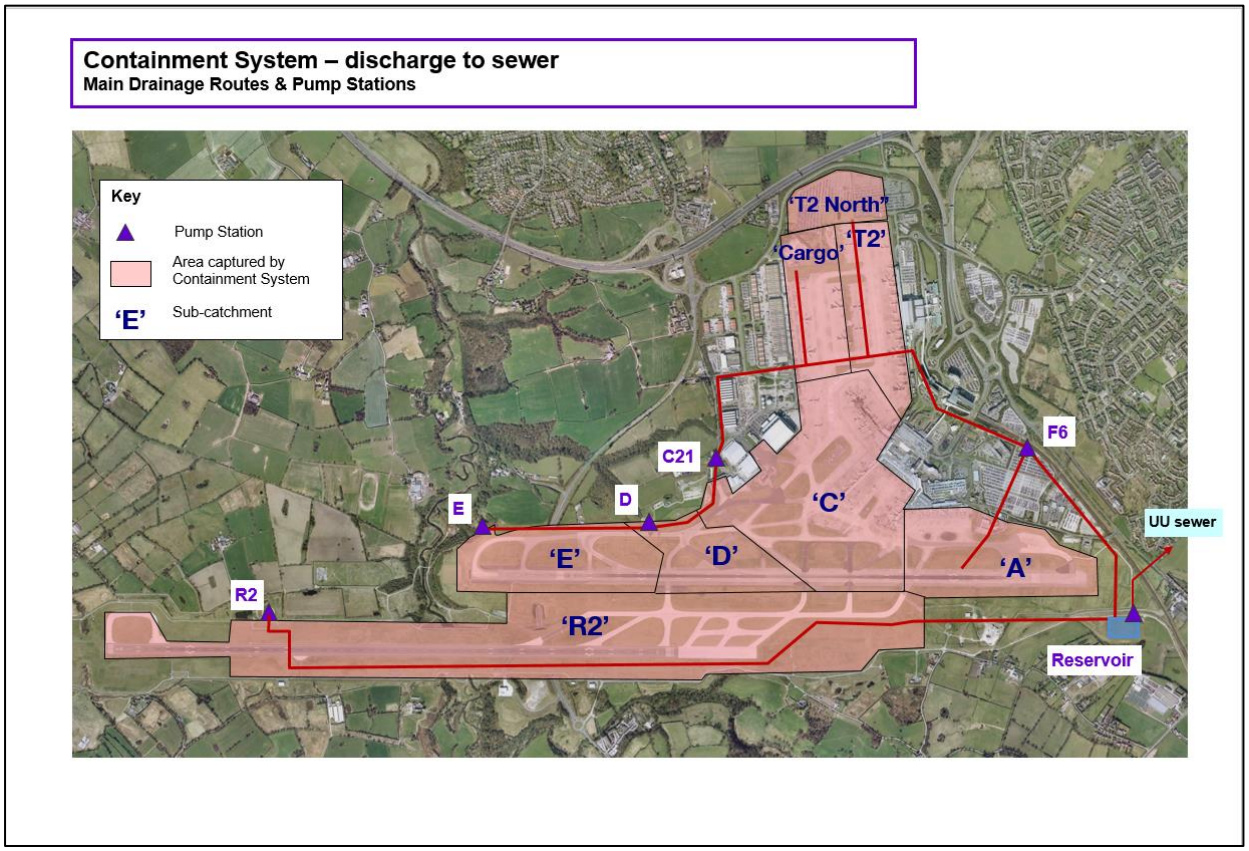
3. Description of Drainage System

There are a number of surface water drainage catchments, which discharge via 6 separate outfalls to watercourses around the site. The catchment areas are shown below.



A drainage containment system is in place to capture runoff from runways, taxiways and aircraft parking areas when it is contaminated with deicing and anti-icing products and divert it to the public sewer for treatment. As aircraft parking areas receive a higher loading of deicing products, runoff from individual catchments can be diverted independently of each other.

The areas that can be diverted to containment are shown below:

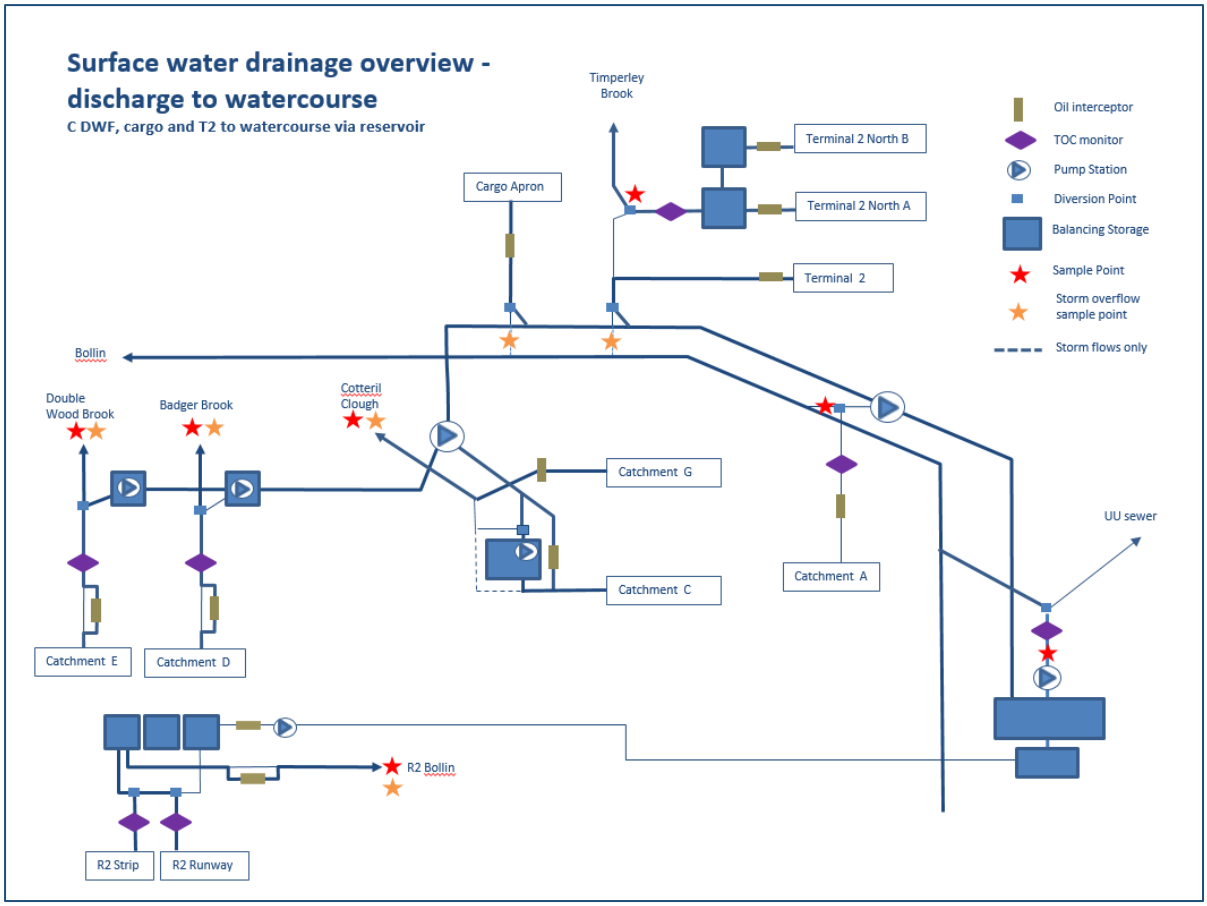


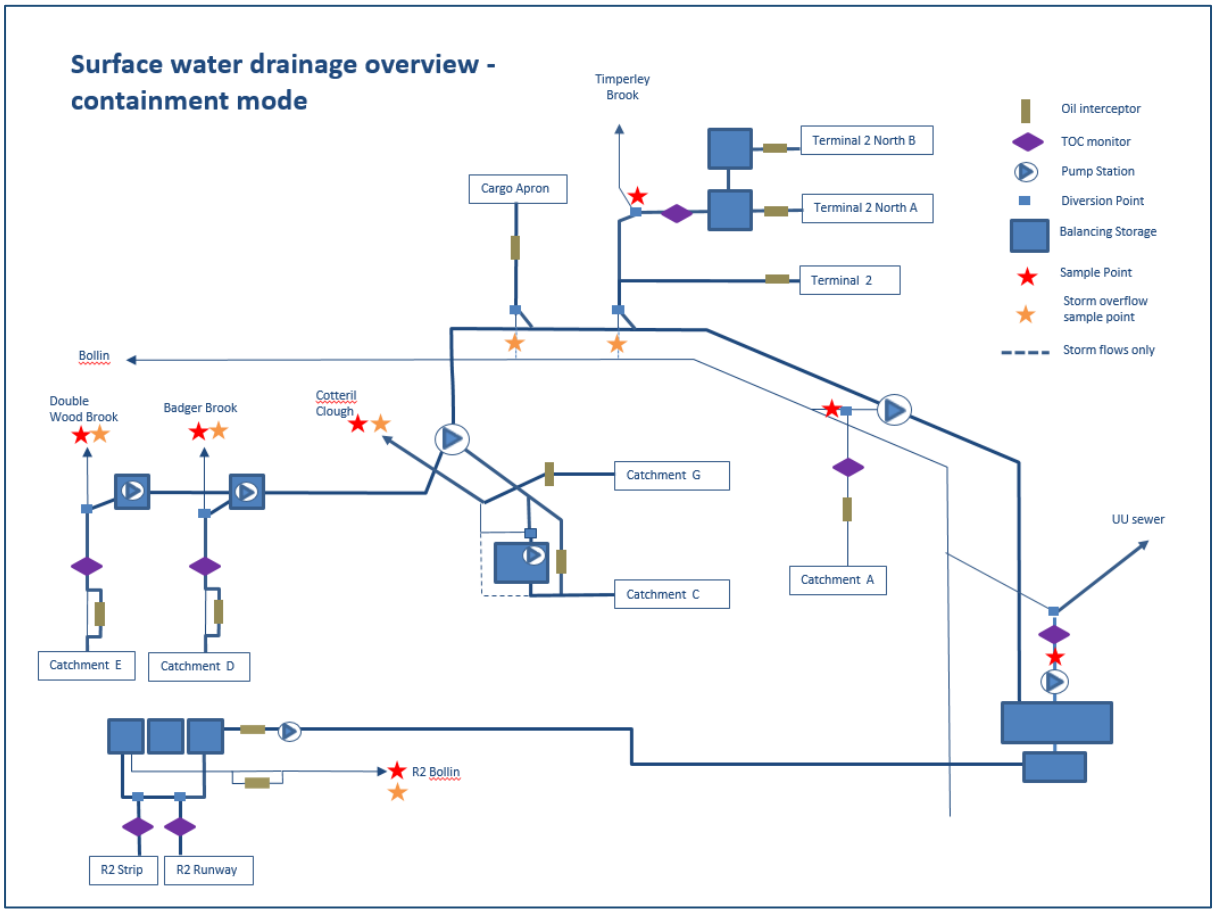
The drainage layout of each catchment varies but will in general include some or all of the following elements.

- oil interceptor;
- automatic water quality monitoring of Total Organic Carbon (TOC). TOC is utilised in preference to BOD due to quicker response times, allowing first flush to be more rapidly identified and captured by the drainage system. Drainage diversion trigger levels have been identified through correlation of TOC results with lab BOD;
- diversion chamber with actuated penstock that can be controlled remotely or locally;
- gravity outfall to watercourse for "clean" flows, with concrete apron and energy dissipation arrangements as appropriate;
- local balancing storage tanks or ponds to provide flow attenuation;
- pump station with pumps controlled automatically on level sensors, and operated on duty/standby to reduce pump wear and provide resilience in the event of pump failure or maintenance;
- The pump systems are interlinked such that flows will only be passed forward within the containment system if there is capacity downstream;

- storm overflow where instantaneous runoff rates exceed that which can be conveyed within the containment system or where attenuation storage is full;
- main contaminated surface water reservoirs – two separate but linked tanks with total 73,000 m^3 capacity;
- pumped discharge of contaminated runoff to foul sewer under the terms of a trade effluent consent with a current flow limit of 125 ls^{-1} and limits on COD levels and daily COD load;
- sample point at outfall or discharge point to surface water sewer;
- Live telemetry information and data logging on status of penstocks, water levels, pumps and water quality and flow monitoring via the Building Management Systems (BMS);
- Alarms set within the BMS to alert the ESTM of faults or high levels on the system.

A schematic of the overall system in watercourse and containment mode is given below. The layout within each individual catchment is presented in Appendix A.





4. Operation of Drainage System

4.1. Normal Operation

The Engineering Shift Team Manager (ESTM) has responsibility for managing the drainage containment system to prevent pollution of watercourses. There is an ESTM on duty 24/7.

Individual catchments are put into containment mode in the event of:

- receipt of notification of aircraft or airfield pavement deicing activity within that catchment. Aircraft deicing companies are required to notify the ESTM of deicing on each separate day. Failure to notify MA falls under our airfield infringement scheme for which a penalty is applied;
- TOC monitoring equipment indicates that runoff will exceed the relevant trigger level;
- a TOC monitor or comms failure – failsafe operation will default the drainage system to containment mode;
- a risk that a spillage has entered the drainage system;
- maintenance of the drainage system.

The drainage system is returned to watercourse mode in the event of:

- measured TOC reading falling below the relevant trigger level;
- on catchments without water quality monitoring equipment – based on water quality levels experienced on other areas of the site, knowledge of deicing activity and rainfall. Considerable caution is exercised in reverting these catchments to watercourse mode.

All changes in containment status are recorded within the BMS. Reasons for non-automatic changes in the containment status are additionally noted within the ESTM's daily log.

4.2. Emergency Mode

In the event of an aircraft or vehicle incident or fuel or chemical spillage, measures are taken to contain the spillage or contamination as locally as possible, prevent too much dilution and/or direct it to a location where it can be captured and recovered.

If there is a risk that the spillage could enter the drainage system, then the drainage system would be put into Emergency Mode by the ESTM. This diverts any flow into containment, and disables all pumps so that contaminated flows are retained within local storage where it can be accessed for recovery. A clean up would then be initiated.

4.3. Containment System Storm Overflow

The system is actively managed to maximise available capacity in the system by releasing clean flows to watercourse and by discharging contaminated surface water to sewer at the maximum flow and load rate permitted by the trade effluent consent with United Utilities.

However, in the event of prolonged or heavy rainfall, especially when combined with cold weather during which deicing activity occurs, there is a risk that runoff volume will exceed the storage capacity available with a risk of overspill to watercourse. This could occur when:

- balancing storage within the system is exceeded;
- instantaneous flows exceed that which can be passed forward by the system;
- major failure of pump station, infrastructure or electrical systems.

In the event that the main contaminated surface water reservoirs are full, then the system surcharges, using other available storage capacity within pump stations and the tunnel sewer, until a point is reached where it overflows at Outlet A8 Terminal 2 to the surface water sewer discharging to the River Bollin. Most catchments also have local storm overflow arrangements. Details are presented in the Appendix.

In the event that the drainage containment system could approach capacity, measures will be taken to minimise any impact on watercourses. The ESTM would:

- Review opportunities to return catchments to watercourse;

- Review opportunities to increase the discharge to foul sewer, including requesting United Utilities for a temporary increase in flow and/or load limit if appropriate;
- If there is a significant risk that the system will reach capacity and that areas will spill to watercourse with runoff that may be above permit conditions, the ESTM will preferentially manage the system to contain flows from more highly contaminated apron catchments (A, C, T2, T2 North, Cargo), and release runoff from less polluted areas (E, D and Runway 2). This can include:
    - disabling pumps from E, D and Runway 2 storage ponds to hold runoff locally and provide capacity within the main reservoir for apron runoff;
    - diverting E, D, and Runway 2 runoff to watercourse, even though quality may be above permit conditions where this is preferable to discharging more contaminated runoff from catchments on which aircraft deicing occurs.

Any discharge in these circumstances is permitted under Activities A2, A4, A6, A7, A8 and A10.

Where there is a possibility that runoff has been discharged that has exceeded consent conditions, MA would record the event. There is no requirement to formally notify the EA via the incident line or Schedule 5 form, but MA would normally inform the EA Pollution Control Officer as soon as reasonably practical.

5. Maintenance

A planned preventative maintenance programme is in place for all elements of the drainage system and recorded within the Idhammer & Maximo Asset Management Systems. Reactive maintenance is also undertaken.

The drainage system is monitored by the ESTM and Water Services team. Maintenance of the drainage system is undertaken by the on-site Water Services team supported with specialist subcontractors as appropriate. MA retains a BMS maintenance engineer.

- Oil interceptors – are inspected on a 6-monthly basis and skimmed/de-sludged as required;
- Pumps, level sensors, penstocks, actuators etc – inspected on a 6-monthly basis and servicing/repairs undertaken as required;
- WQ monitoring - The monitors are covered by a servicing and maintenance programme and are automatically calibrated against standard reagents on a daily basis.

6. Sampling & Reporting

Manual water samples are taken at outfalls with EA permit conditions according to Schedule 3 of the Environmental Permit, and at other locations and frequencies as required. This includes in response to pollution investigations, surveys, auditing or other reasons.

As part of the sampling, there is a visual check of the discharge and outfall and any concerns raised at the time to allow the Environment Department, Water Service department or ESTM to investigate the source and/or take actions to prevent pollution.

All samples collected are stored in an appropriate manner in readiness for collection and analysis by a third-party laboratory with all results recorded within a database.

Results are reported to the EA monthly as required within Schedule 4 of the permit.

In accordance with Section 4.3 of the Environmental Permit, MA will notify EA in the event of:

- Any issue that is causing or may cause significant pollution;
- Any breach of the environmental permit limits;

Written notification to the EA using the form within Schedule 5 of the Environment Permit would be made for any significant pollution event.

Appendix A – Catchment Layouts & Operation

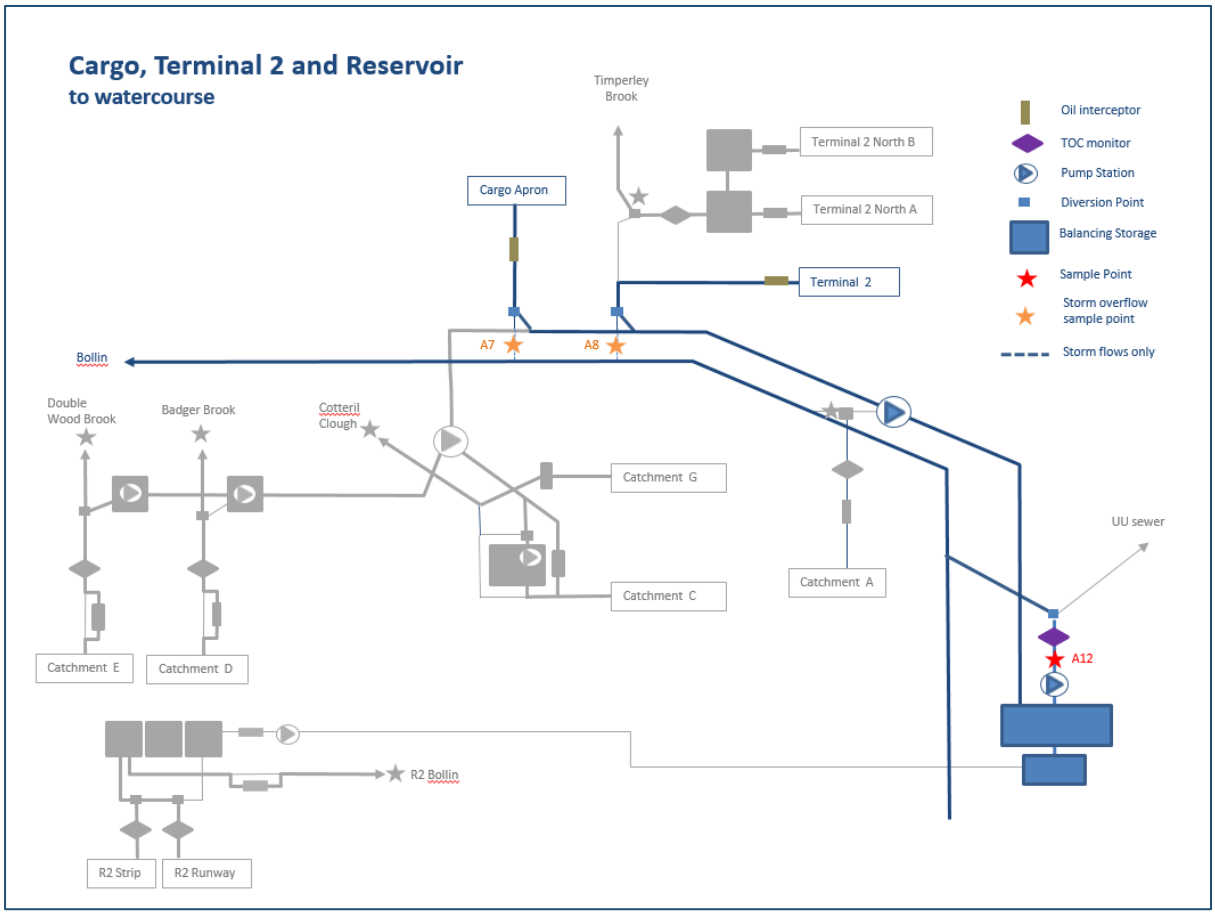
Cargo, Terminal 2 & Reservoir

Activities A7, A8 and A12

Overview

Runoff from Cargo and Terminal 2 sub-catchments are managed as a single system with runoff directed to the main contaminated surface water reservoir at all times. Each sub-catchment also has a storm overflow direct to watercourse (Activities A7 and A8).

Contaminated runoff from other catchments (E, D, C, A & R2) is also discharged into the contaminated surface water reservoir. There is a diversion point downstream of the reservoir from which clean runoff is discharged to watercourse (Activity A12 Outlet Reservoir to River Bollin) and contaminated runoff discharged to sewer.



Cargo sub-catchment

Activity A7

Runoff from the Cargo catchment is conveyed through a 1200 mm diameter pipe by gravity to the cargo catchment diversion chamber. The diversion penstock is configured permanently to containment mode, with runoff diverted into the 1950 mm diameter tunnel sewer and discharged into the F6 pump station and thence to the main contaminated surface water reservoir for flow balancing.

If the flow rate from Cargo sub-catchment exceeds 4300 ls^{-1}, this cannot be passed forward within the containment system, and will spill via a storm overflow within the diversion chamber to the surface water sewer and thence Outlet Cargo to the River Bollin (Activity A7).

The flow monitor within the storm overflow will record any event of storm water discharge, triggering alarms to alert MA staff that a storm water discharge has occurred. Levels and alarms will be recorded within the BMS.

The sample point for the storm overflow is located at manhole 4209 at NGR SJ 81211 85122.

Terminal 2 sub-catchment

Activity A8

Runoff from the Terminal 2 catchment is conveyed through a 1600 mm diameter pipe by gravity to the Terminal 2 catchment diversion chamber. The diversion penstock is configured permanently to containment mode, with runoff diverted into the 1950 mm diameter tunnel sewer and discharged into the F6 pump station and thence to the main contaminated surface water reservoir for flow balancing.

Where the flow rate from Terminal 2 sub-catchment exceeds 2600 ls^{-1}, this cannot be passed forward within the containment system, and will spill via a storm overflow within the diversion chamber to the surface water sewer and thence Outlet Terminal 2 to the River Bollin (Activity A8).

The flow monitor within the storm overflow will record any event of storm water discharge, triggering alarms to alert MA staff that a storm water discharge has occurred. Levels and alarms will be recorded within the BMS.

The sample point for the storm overflow is located at manhole 7305 at NGR SJ 81429 85315.

Reservoir

Activity A12

All runoff (except for storm flows) from Cargo and Terminal 2 sub-catchments, plus contaminated runoff from all other catchments is discharged into the main contaminated surface water reservoir for flow balancing. The main contaminated surface water reservoir provides 54,000 m^3 balancing storage and is linked to the 19,000 m^3 Runway 2 contaminated surface water reservoir giving a combined storage volume of 73,000 m^3.

The reservoir outlet pumps discharge to a diversion chamber with a TOC monitor:

- Where the TOC level is greater than the trigger level, then the runoff will be discharged into UU foul sewer under the terms of a trade effluent consent. The discharge rate is limited by a flow condition and a COD load condition, currently 125 ls^{-1} and 5000 kd COD day^{-1} respectively. In the event that the COD load limit is reached, the reservoir discharge pumps will switch off.
- Where the TOC level is lower than the trigger level, then the runoff will be discharged via Outlet Reservoir to surface water sewer at NGR SJ 83310 85194 (Activity A12) and then into UU's public surface water sewer, discharging into the River Bollin at NGR SJ 80107 83695. The frequency and volume of this discharge is rainfall dependent and comprises runoff that would otherwise have been discharged directly to watercourse (without attenuation) from Catchments Cargo and T2. The maximum rate that the attenuated runoff will be discharged to watercourse is 200 ls^{-1} (17,280 m^3d^{-1}).
- A failsafe has been included within the controls such that any failure of the comms or TOC metering will divert flow to sewer.

Flow meters record the flow and volume discharged to sewer and watercourse.

The sample point for the discharge to watercourse is within the reservoir compound at NGR SJ 83382 85117 accessed via MA's car park off Styal Road.

TOC levels, flow, volume, containment status and levels are recorded within the BMS.

Emergency Overflow to the River Bollin

Activity A8

The drainage system will be managed to avoid becoming over-capacity as described in section 4.3 above.

In the event that the contaminated surface water reservoirs approach capacity at 4m (74.47 m AOD), the pumps at F6 pump station are inhibited.

Subsequent runoff will utilise additional storage capacity within F6 pump station and surcharge the 1950 mm diameter tunnel sewer. When levels in F6 pump station reach 14.9 m (58.54 m AOD), surcharged runoff within the tunnel sewer will have reached a level where it will spill to MA's surface water sewer at the T2 catchment storm overflow, discharging to the River Bollin. (Activity A8).

The sample point for the emergency overflow is located at the T2 diversion chamber, manhole 7305 at NGR SJ 81429 85315.

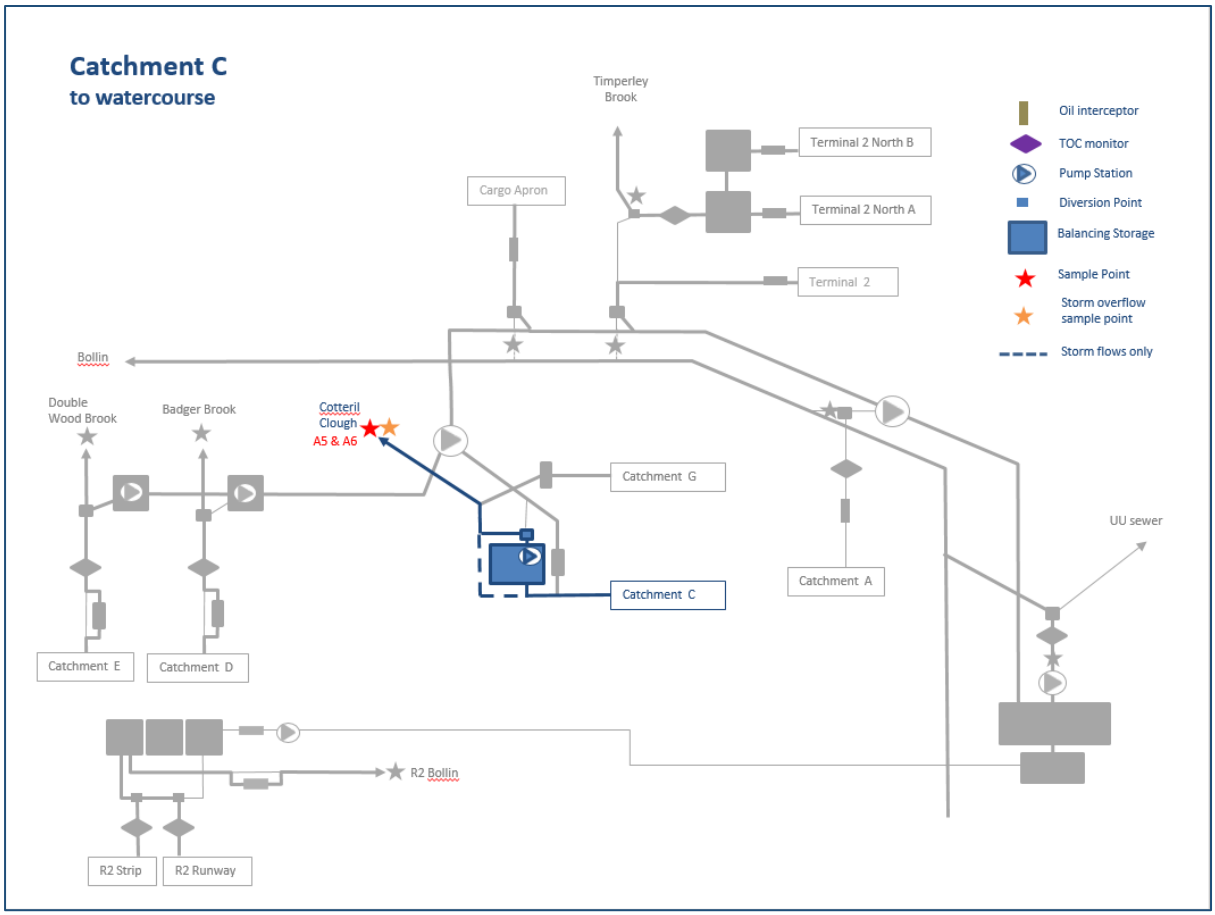
The emergency overflow would be recorded through logging of the level within the reservoir, F6 and the flow monitor within the surface water sewer downstream of the T2 diversion chamber.

Catchment C/G

Activity A5 & A6

Catchment C

Runoff arises from runway, taxiway and aircraft parking areas around Terminal 1. Runoff flows by gravity via positive drainage and French drains to the Catchment C inlet chamber.



From catchment C, all dry weather flows and flows up to 20 ls^{-1} are passed via a 32 m^3 oil interceptor and discharged into C21 pump station. This is then pumped at 310 ls^{-1} to F6 pump station and thence to the main contaminated surface water reservoir for flow balancing.

Flows greater than 20 ls^{-1} are discharged into Catchment C balancing pond which has 5800 m^3 capacity. From here runoff is pumped via Outlet C/G to Cotteril Clough (Activity A5) or to C21 pump station as above.

Where the balancing pond is full, the first flush will have been captured and the inlet to the balancing pond is shut and all subsequent flows are diverted to the bypass channel for direct discharge to Cotteril Clough. Catchment C balancing pond has a weir wall set at 65.383 m AOD. If this level is exceeded, flows will also be discharged directly to Cotteril Clough via Outlet C/G (Activity A6).

Alarms are set on the level sensors within Catchment C inlet channel to alert MA staff that a storm water discharge has occurred. Levels and alarms are recorded within the BMS.

The sample point for Cotteril Clough is at the headwall into the clough, immediately adjacent to Wilmslow Old Road at NGR SJ 81122 84506.

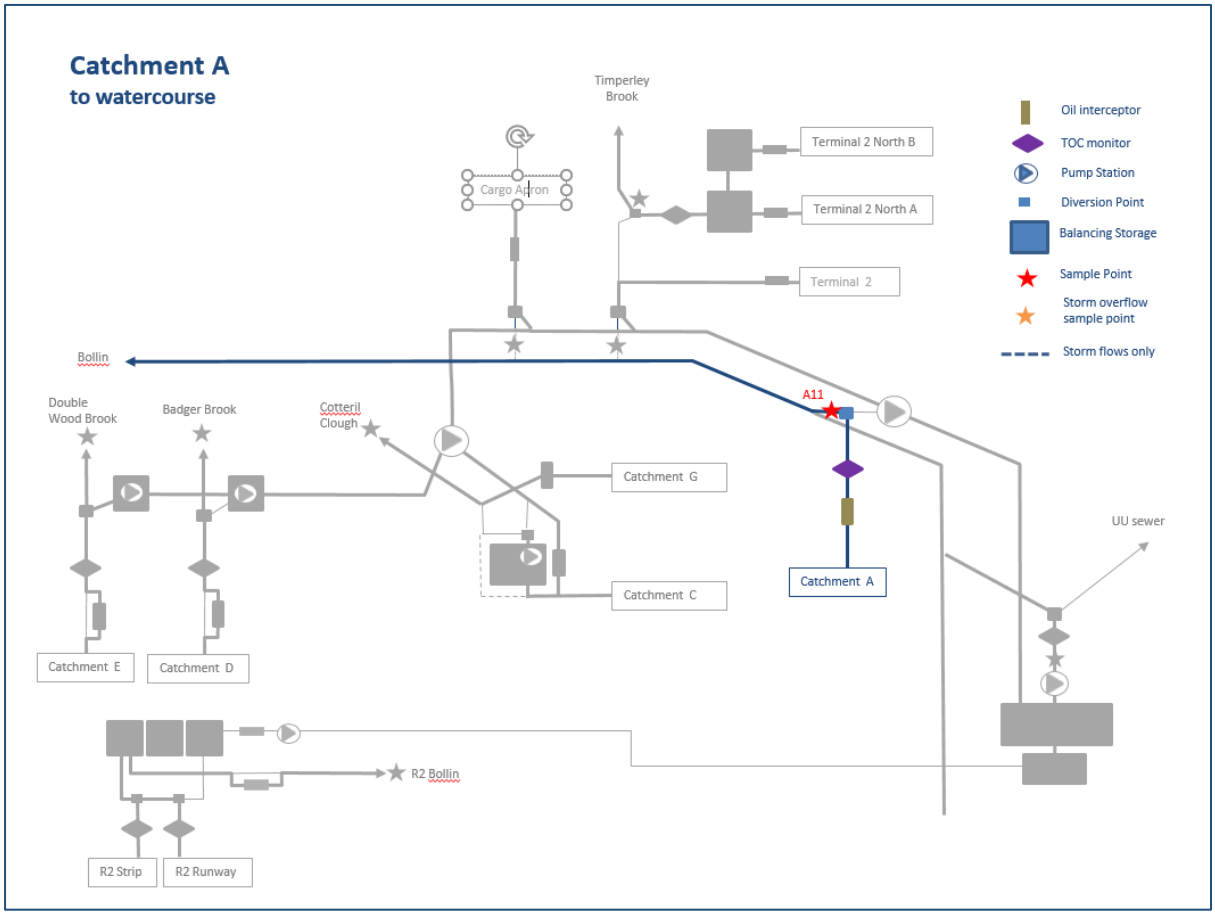
Catchment G

Catchment G is a landside catchment within which no deicing or anti-icing takes place, except from gritting of roads. Catchment G discharges via a Stormceptor bypass fuel separator to the Cotteril Clough outfall at NGR SJ 81122 84506, along with any storm overflow discharge from Catchment C.

Catchment A

Activity A11

Runoff arises from runway, taxiway and aircraft parking areas around Terminal 3. Runoff flows by gravity via positive drainage and French drains to the oil interceptor (with high level bypass) and then to the diversion chamber.



Where the measured TOC of the runoff is above the trigger level, runoff will be diverted into the containment system via F6 pump station. The pump station also receives contaminated flows from upstream catchments E, D, C, Cargo and T2. It acts as combined attenuation tank (490 m^3 capacity) and pump station with runoff pumped forward at 570 ls^{-1} to the main contaminated surface water reservoir for discharge to UU sewer.

Clean runoff from is allowed to discharge into the MA's surface water drainage system via Outlet A and ultimately discharged into the River Bollin at the Castle Mill Bollin Outfall.

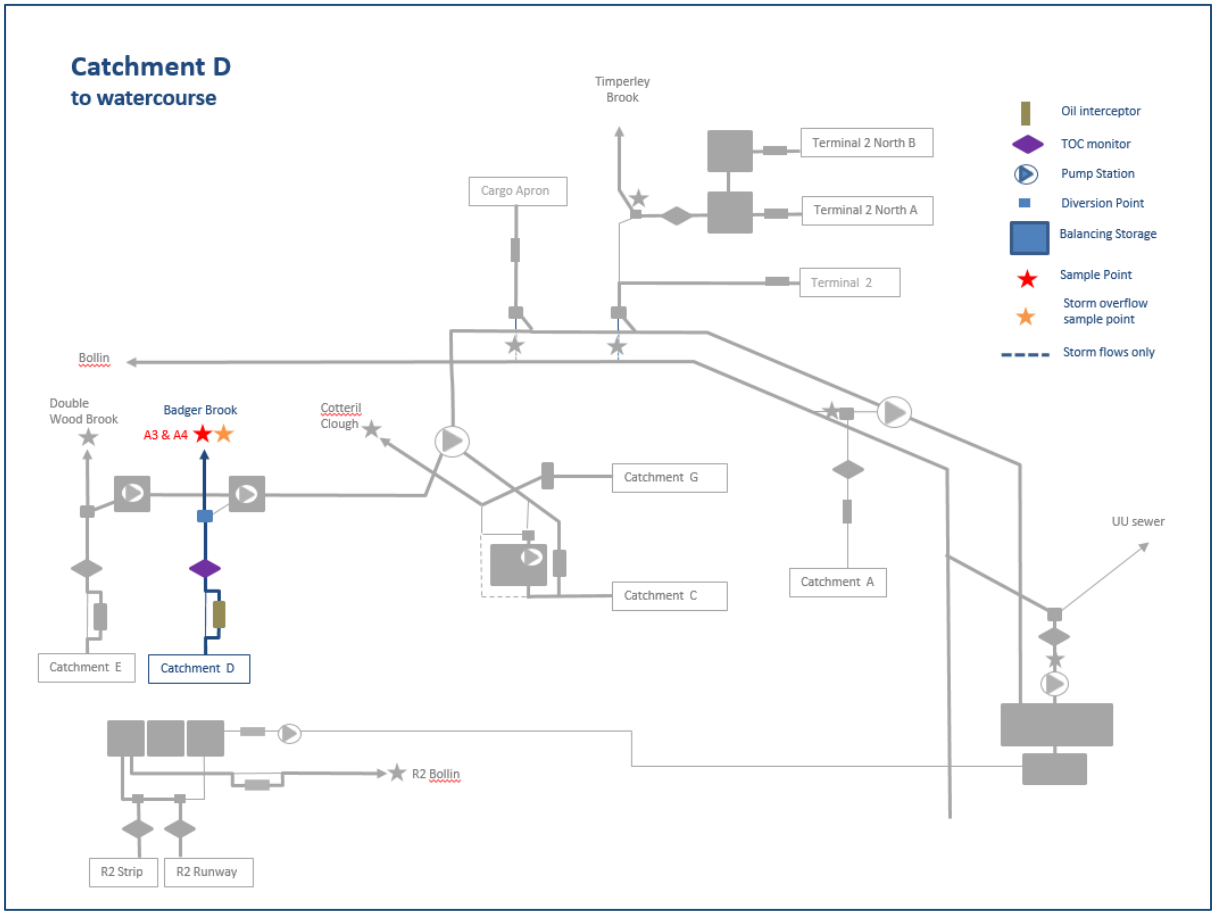
There is no storm overflow to watercourse at Catchment A. In the event that runoff exceeds pipe capacity, or that F6 pump station is full, runoff would surcharge catchment A drainage systems causing surface ponding.

The sample point is located at the manhole at the diversion point at NGR SJ 82356 85419. The actuator position should be used to interpret whether the flow is passing to watercourse or containment. The manhole is within a locked compound which is landside and accessed via T1/T3 long stay car park.

Catchment D

Activity A3 & A4

Runoff arises from runway, taxiway, perimeter road and airfield grasslands and flows by gravity via positive drainage and French drains to the 10m^3 oil interceptor (with high level bypass) and then to the diversion chamber.



Where the measured TOC of the runoff is above the trigger level, runoff will be diverted into the containment balancing tank which has a storage volume of c. 2100 m^3 capacity. Contaminated runoff from catchment E is also discharged into this tank.

From the balancing tank, the combined flows from Catchments E and D are pumped forward at a rate of 50 ls^{-1} to Catchment C21 pump station and via F6 pump station to the main contaminated surface water reservoir for discharge to UU sewer.

Where the measured TOC of the runoff is below the trigger level, the uncontaminated runoff will be discharged via Outlet D to Badger Brook, a tributary of Cotteril Cough. To dissipate energy and protect the river bed, revetment blocks have been installed beyond the outfall structure.

The sample point is at the outfall headwall at NGR SJ 81085 83940.

In the event that the balancing tank is full, flow will back up into the diversion chamber and at 61.5 m AOD, spill over to the outfall to Badger Brook (Activity A4). This level equates to 6.55m in the storage tank. Alarms are set to alert MA staff of any storm overflow.

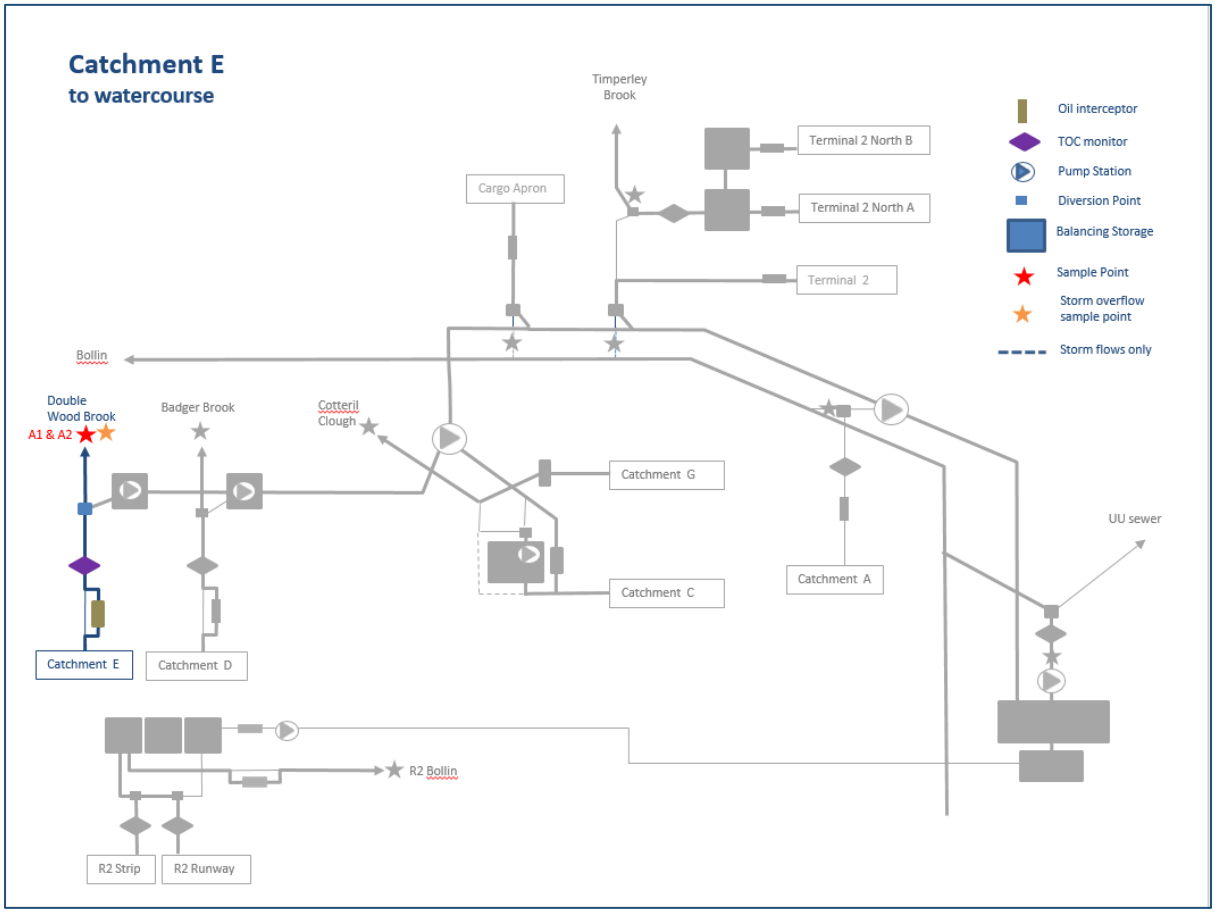
The system may also spill to watercourse where instantaneous flows reach 400 ls^{-1} and exceed the capacity of the pipe to the tank.

TOC and balancing tank levels are recorded within the BMS. Storm overflow events will also be recorded.

Catchment E

Activity A1 & A2

Runoff arises from runway, taxiway, perimeter road and airfield grasslands and flows by gravity via positive drainage and French drains to the 18m^3 oil interceptor (with high level bypass) and then to the diversion chamber.



Where the measured TOC of the runoff is above the trigger level, runoff will be diverted into the containment system balancing tank which has 1600 m^3 capacity.

From the balancing tank, the contaminated runoff is pumped forward at a rate of 24 ls^{-1} to Catchment D balancing pond and thence via a series of further pump stations to the main contaminated surface water reservoir for discharge to UU sewer.

Uncontaminated runoff is discharged via gravity to the outfall into Double Wood Brook and thence the River Bollin. To dissipate energy and protect the river bed, revetment has been installed beyond the outfall structure.

The sample point is at the outfall headwall at NGR SJ 80370 83316.

In the event that the balancing tank is full, flow will back up into the diversion chamber and spill over the outfall penstock (at 38.0 m AOD) to watercourse and be discharged via the outfall into Double Wood Brook (Activity A2). Alarms alert MA staff of any storm overflow.

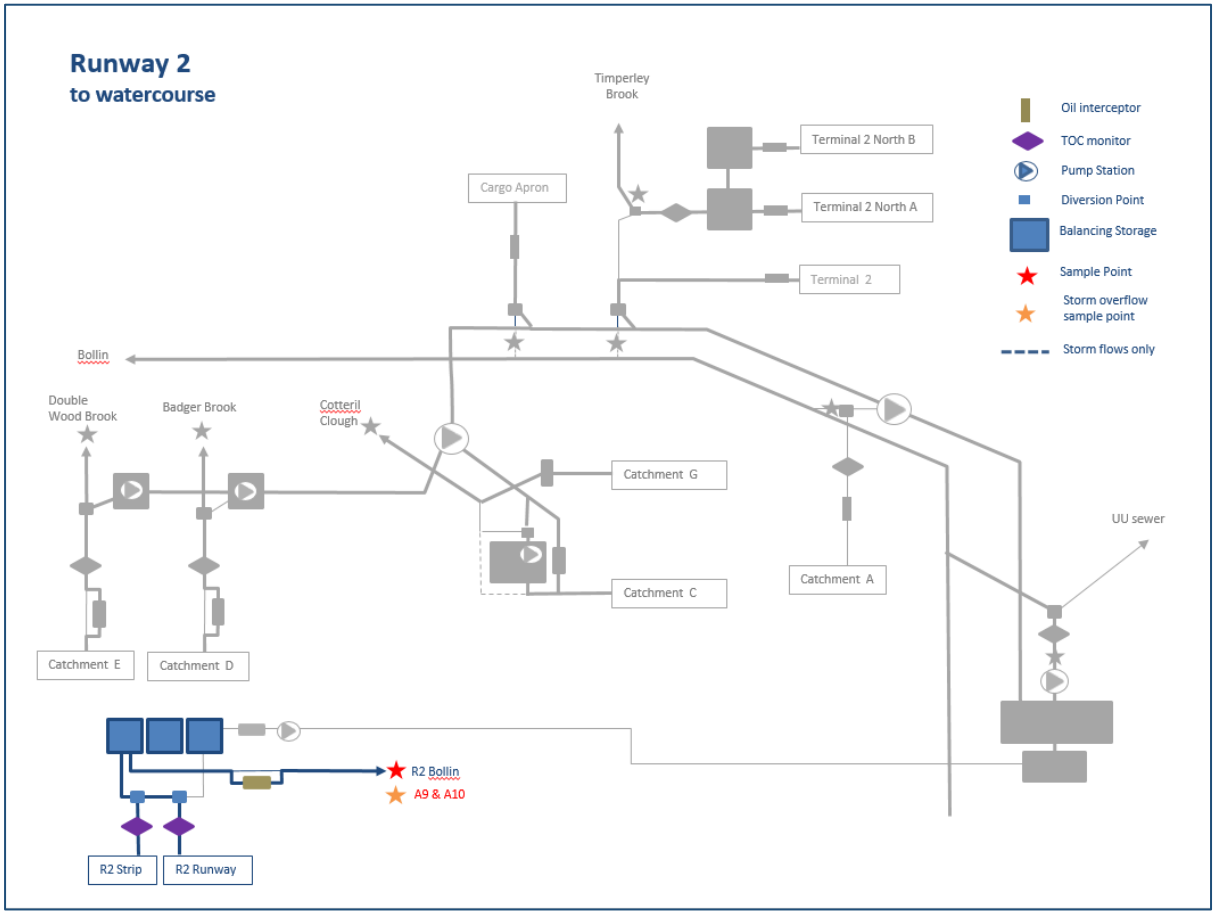
TOC and balancing tank level will be recorded within the BMS.

Runway 2 Catchment

Activity A9 & A10

There are 2 separate drainage systems within the Runway 2 catchment which both discharge into Runway 2 inlet chamber.

- The runway drain takes runoff from runway/taxiway surfaces via positive drainage.
- The strip drain takes runoff from surrounding airfield grasslands via French drains and positive drainage systems.



TOC monitors on both the runway and strip drainage systems continuously monitor the quality of runoff.

Where the TOC level is below the trigger level, uncontaminated flows are directed to Pond A for flow balancing (c. 11,500 m^3 capacity), and from there via 3 x 72,000 litre full retention oil interceptors (with high level bypass) via Outfall Runway 2 to the River Bollin (known as R2 Bollin Outfall) (Activity A9).

Pond B and Pond C are linked and are operated as a single attenuation facility. Where the measured TOC of the runoff is above the trigger level, contaminated flows are directed to Ponds B and C for flow balancing (combined capacity 7400 m^3). The ponds outfall via a 42,000 litre full retention oil interceptor (with high level bypass) to a pump station, and is pumped forward at 100 ls^{-1} to the Runway 2 contaminated surface water reservoir. This has a capacity of 19,000 m^3 and is linked to

the main contaminated surface water reservoir to give a combined capacity of 73,000 m^3. From here it is discharged to UU foul sewer. Runway runoff can be diverted to containment independently of Strip runoff.

At high levels in Ponds B and C, runoff will spill to Pond A and subsequently be discharged to the River Bollin (Activity A10). This occurs when the water level reaches 54.35m AOD.

TOC readings, levels in Pond C and the R2 pump station will also be recorded within the BMS.

The Environmental Permit sample point is in a manhole just upstream of the outfall at NGR SJ 80621 82908.

In the event of an aircraft incident or similar emergency, runoff can be diverted into Ponds B and C and the pumps switched off. Any contaminated runoff would be contained here until an appropriate action plan for recovery has been identified and implemented.

Terminal 2 North to Timperley Brook

Activity 13

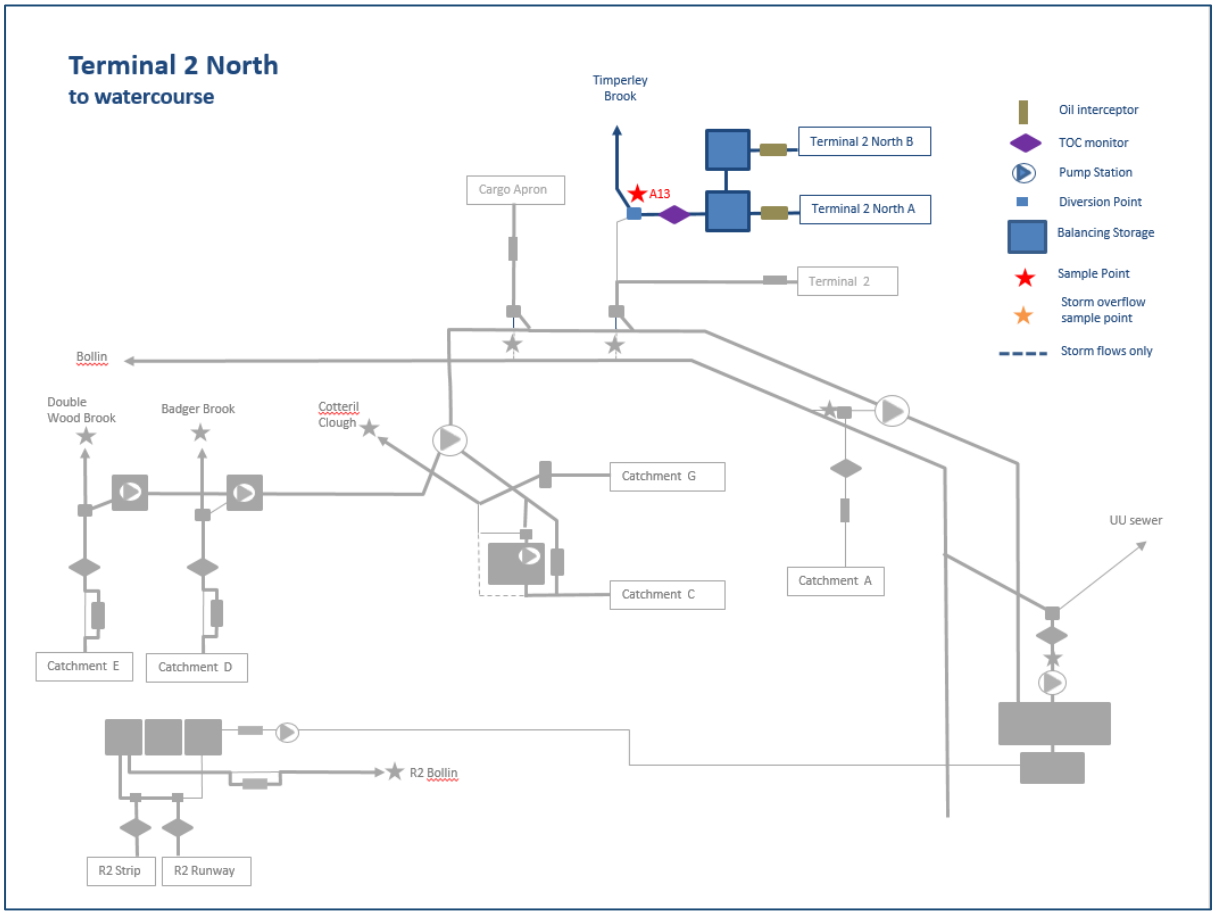
Runoff arises from taxiway and aircraft parking stands for the northern part of Terminal 2 and flows by gravity to oil interceptors (with high level bypass) to 2600m^3 of underground attenuation storage for T2 North A sub-catchment and 3400m^3 attenuation for T2 North B sub-catchment.

Water quality is measured at the outlet of the T2 North A attenuation tank and where the measured TOC of the runoff is above the trigger level, runoff will be diverted into the existing Terminal 2 containment system. (see Activity A8 above) and then to the main contaminated surface water reservoir for discharge to UU sewer.

Uncontaminated runoff is diverted into the existing 450 mm diameter outfall to Timperley Brook. The sample point is located at the diversion point on the airfield at the monitoring cabin at NGR SJ 80883 85727.

In the event that the attenuation storage is full, it will spill into the containment system and surcharge apron drainage systems. There is no storm overflow to Timperley Brook.

TOC, containment status and attenuation tank level will be recorded within the BMS.



Environmental Management Operational Procedure
EMOP06 – Spill response

Ref	Procedure	Responsibility

1 PURPOSE

1.1.1 This procedure describes actions to be taken in the event of any spillages that have the potential to enter the surface water drainage system or in the event of any contamination of drainage systems, public sewers or watercourses.

2 PRIMARY RESPONSIBILITY

2.1.1 The primary responsibility to oversee the clean-up and liaise with regulatory bodies lies with the Engineering & Baggage Duty Manager and Airfield Duty Manager.

3 SPILLAGE PREVENTION

3.1.1 Measures in place to prevent spillages from occurring are described in

- EMOP05 – Surface Water and Trade Effluent Management
- EMOP07 – Bulk Storage of oil fuel and other chemicals

4 REPORTING SPILLAGES

4.1.1 Where possible, any spill should be immediately cleaned up by the person causing it, ensuring that no material enters the drains and that the recovered material is disposed of in an appropriate manner in compliance with legislative requirements. — All staff

4.1.2 Any person causing or finding a spill on site that cannot be immediately recovered should report it immediately to the following, providing information on location of the spill, details of material spilt, an estimate of the amount, who or what caused the spill and whether it has entered any of the drains. — All staff

- Airside – Airfield Control (AC) on 0161 489 3331 (as Aerodrome Manual)
- Landside (Core) – Asset Support Team (AST) on 0161 489 3776
- MAG Property areas – ISS Helpdesk on 0844 406 8779

4.1.3 For any spill associated with the fuel hydrant system, the emergency cut-off button located at head of stand should be pressed, as Aerodrome Manual instructions. — All staff

5 CO-ORDINATION OF RESPONSE

5.1 Minor spillages (not aircraft fuel)

5.1.1	**Airside** – For small toilet or hydraulic oil spillages, that have not entered a drain, do not impact on airfield operations and there are no other concerns, Airfield Control (AC) will request the Airfield Safety and Compliance Officer (ASCO) and apron sweeper to attend the spillage.	AC/AST ASCO/ Engineering
5.1.2	**Landside Core** – Landside spillages in "core" areas (terminal forecourts, access roads, car parks, service yards etc) are reported to the Front of House cleaning contractor for clean-up.	AST/MITIE
5.1.3	**Landside MAG Property** – landside spillages within non-core areas managed by MAG Property will be reported to the Property cleaning contractor for clean-up.	ISS

5.2 Larger spillages and any aircraft fuel spill

5.2.1	Airside fuel or hazardous material spills will be dealt with in accordance with the Aerodrome Manual and Emergency Orders.	
5.2.2	For all airside aircraft fuel spills, AC to request MA Fire & Rescue Service (MAFRS), ASCO and apron sweeper to attend the spillage. MAFRS respond in accordance with MAFRS Standard Operating Procedures (SOPs). Measures will be taken to prevent spread of the spill and to facilitate clean up..	AC/ASCO/ Engineering/ MAFRS
5.2.3	For larger spills of any material or where it is beyond the capability of the sweeper, has entered the drainage system, there are impacts on aircraft operations, or where there are other concerns, the following may additionally be contacted for assistance. • Airfield Duty Manager (ADM) for implications to aircraft operations • Engineering and Baggage Duty Manager (EBDM) to facilitate the clean-up and manage drainage issues • MASHCO • Greater Manchester Fire & Rescue Service • Cleaning contractor • Water Services Department • Environmental Specialist	MAFRS/AC/ ASCO/ Engineering
5.2.4	Where the management and clean-up of a major spill is beyond the capabilities of the on-site team then the external Emergency Spill Response Team shall be called (Adler and Allan – 0800 592827).	EBDM

6 SPILLAGE/CONTAMINATION CLEAN UP

6.1.1 The following spill clean-up equipment will be maintained.

• Spill kits at MAG refuelling points and within Motor Transport	MTM
• Spill grab bags on MAFRS fire appliances	MAFRS
• Oil absorbent granules	Engineering
• Apron sweeper – primarily for airside spillages, but available to assist with landside spillages if required	Engineering
• Spill clean-up equipment held by Facilities Management and MAG Property cleaning contractors for dealing with landside spillages.	FM-AE/ SEWFM
• An emergency spillage response trailer	Engineering

6.1.2 There will be an approved incident response contractor (Emergency Spill Response team) for use in the event of a major spillage. — ES

6.1.3 Actions will be taken to prevent any spillage or other contamination from entering the drainage system, stop the source, to clean it up and appropriately dispose of any contaminated materials. — All

6.1.4 The containment system may be operated to divert a spillage away from the watercourse and to foul sewer where appropriate, or into Emergency mode to hold the spillage within the drainage system for recovery on site as per drainage management plan. — EBDM

6.1.5 For larger spillages, or where contamination of the drainage system or pollution of watercourse on any part of the airport has occurred, an additional response will be undertaken to prevent further spread of the contamination and protect the watercourse or sewer and to co-ordinate the containment and recovery of the spillage. — EBDM

6.1.6 Where a spillage enters the watercourse or the public sewer, the Environment Agency (EA) and/or United Utilities should be alerted as appropriate. — EBDM

7 DISPOSAL & RECOVERY OF COST

7.1.1 All materials used for the recovery of any spillage or other pollution event shall be properly stored and disposed of. Methods of disposal will be in accordance with procedure EMOP10 (Waste management) and include: — Engineering

- Sweeper via the sweeper tip;
- Used oil absorbent granules and other absorbent materials via the oily sweepings skip at West Gate;
- Overdrums and other containers via the hazardous waste compound.

7.1.2 Records shall be kept on the source, cause and details of airside spillage for future analysis, investigation where appropriate and for recharge. — All

8 EVALUATION OF COMPLIANCE

8.1 Non-compliance definition

8.1.1	Any instance of unauthorised discharge to the public sewer or watercourse will be logged as a non-conformance along with a summary of actions taken in accordance with procedure EMSP06 – Monitoring Environmental Compliance and Performance.	ES

9 COMPETENCY REQUIREMENTS

9.1.1	MAFRS have specific competency requirements for the management of fuel and hazmat spillages which are recorded on red kite.	MAFRS
9.1.2	Other staff will be competent to manage spill response based on training and/or experience.	All

10 EMERGENCY PREPAREDNESS

10.1.1	Notification and responsibilities for actions in the event of a major aircraft or airport incident would be as described within the Emergency Orders. This includes where there is a major spillage and hazardous material incidents. Testing of these emergency plans take place at intervals.	HoBR
10.1.2	Additional training exercises may be undertaken which include spill scenarios.	MAFRS, Fuel companies etc

11 RECORD KEEPING, REPORTING AND RETENTION

11.1.1	Actions relating to larger spillages shall be recorded in the ADM, EBDM, Fire Service Duty Manager Log and Red Kite, as appropriate. All records will be kept in line with MAG retention policies.	ADM/ EBDM/ MAFRS

12 SUPPORTING INFORMATION

12.1 Definitions & abbreviations

- **AC** – Airfield Control
- **ADM** - Airfield Duty Manager
- **All staff** - staff working for MAG, its contractors, third parties or any other company at Manchester Airport.
- **ASCO** - Airfield Safety and Compliance Officer
- **AST** – Asset Support Team
- **EBDM** - Engineering & Baggage Duty Manager

- **ES** -Environmental Specialist
- **FM-AE** - Facilities Manager - Airport Estates
- **HoBR** – Head of Business Resilience
- **MAFRS** - MA Fire and Rescue Service
- **MASHCO** - Manchester Airport Storage & Hydrant Company (fuel farm management company)
- **MTM** - Motor Transport Manager
- **SEWFM** – Senior Estates Warden and Facility Manager

12.2 Related documents and contacts

- Aerodrome Manual
- Emergency Orders
- Drainage management plan
- Duty Manager Logs
- MAFRS Standard Operating Procedure 23
- Red Kite MAFRS training record system
- EMOP05 – Surface water and trade effluent management
- EMSP06 – Monitoring environmental compliance and performance
- EMOP07 – Bulk Storage of oil fuel and other chemicals
- EMOP10 – Waste management

12.3 Contacts

Environment Agency
Emergency No. - 0800 807060

Spillage reporting:
Airside – Airfield Control (AC) on 0161 489 3331 (as Aerodrome Manual)
Landside (Core) – Asset Support Team (AST) on 0161 489 3776.
MAG Property areas – ISS Helpdesk on 0844 406 8779

United Utilities
Key Customer Unit/Emergency No. - 0345 6723 723

Emergency Spill Response
Adler and Allan - 0800 592827

12.4 Document control

Any questions concerning this procedure should be directed to environment@manairport.co.uk.

ASI Owner

Environment & Energy Manager

1 Information

Spillages of fuel, oil, de-icing chemicals, toilet effluent or any other chemical have the potential to cause pollution of local watercourses and can also cause health and safety impacts.

2 Penalties

If you don't act, and pollution occurs, you could be prosecuted by the Environment Agency. Failure to report a spillage will also lead to an Airside Infringement Notice from MA Airfield Ops.

3 General responsibilities

All Managers are responsible for ensuring that:

- tanks, bowsers and storage facilities for fuel, oil, de-icing chemicals, toilet effluent and any other chemical are fit for purpose and properly maintained (including all pipes and dispensing equipment). See ASI 36 for relevant standards.
- staff have been given appropriate training in the use of equipment to reduce the risk of spillages
- their staff know and understand what to do in the event that they cause or discover any kind of spillage

All Airside Personnel, regardless of employer are responsible for: reporting any spillage which they cause or discover without delay. Providing information and where possible assisting in preventing the spill from entering the water drains.

4 Procedures

If you cause or find a spillage of oil, fuel, toilet effluent or any other material you should therefore carry out the following actions:

- If possible, you should take all measures to clean it up and to stop it entering any drain.
- You should report it so that MA can arrange for it to be cleaned up to prevent it entering surface waters.
- Contact: Airfield Control on 0161 489 3331

You should provide as much of the following information as possible:

- Location of the spill
- Material spilt
- An estimate of the amount spilt
- Who or what caused the spill
- Whether it has entered any drains.

MA can assist in cleaning up the spillage and will recharge the company causing it for all costs.

5 Further information

This can be obtained from the MA Environment Department from environment@manairport.co.uk

Environmental Management Operational Procedure
EMOP07 – Bulk storage of oil, fuel and other materials

Ref	Procedure	Responsibility

1 PURPOSE

1.1.1 This procedure applies to the storage, in bulk, of oil, fuel or chemicals in order to prevent pollution of watercourses or the ground.

1.1.2 All external stores of oil and fuel over 200 litres must comply with the standards set out within the Control of Pollution (Oil Storage) (England) Regulations. This standard is also recommended for storage of all other chemicals in containers or tanks over 200 litres.

2 PRIMARY RESPONSIBILITY

2.1.1 The "tank owner" has the primary responsibility for the management and maintenance of bulk storage facilities. — Tank owner

3 STANDARDS FOR BULK STORAGE TANKS

3.1.1 All external stores of oil and fuel over 200 litres must comply with the Control of Pollution (Oil Storage) (England) Regulations (OSR) standards, and this standard is recommended for any other environmentally harmful material. In particular, containers and tanks stored outside should be located in an area protected from vehicle impact. — Tank owner

3.1.2 The Aerodrome Manual sets additional requirements for tanks and containers for deicing fluid, fuel and toilet bowsers and chemical stores on the airfield which do not fall under the OSR. — Tank owner

3.1.3 The tank owner is responsible for managing and maintaining their tanks, and for ensuring compliance with the Regulations and taking remedial action where the tank is not compliant. — Tank owner

3.1.4 Deliveries to all MAG tanks will be undertaken by or supervised by a member of MAG staff and delivery records retained. — Tank owner

4 EVALUATION OF COMPLIANCE

4.1 Monitoring and measurement

4.1.1	All MAG bulk storage tanks will be regularly inspected. The inspection will include an assessment of the tank, its secondary containment and surrounding land and compliance with the OSR.	Tank owner/ES
4.1.2	Where underground pipework is part of the installation, it will be pressure tested in accordance with the OSR.	Tank owner
4.1.3	Stock checks and tank levels will also be regularly monitored including:	
	• MAG standby generator tank levels are checked weekly and recorded on the Standby Engine Check Sheet.	HMT
	• MAG vehicle refuelling tank levels and Fuel Works stock control system;	HMT
	• MAG airfield anti-icing tank levels are monitored via the building management system and also recorded on a spreadsheet.	EBDM
4.1.4	Compliance of tenants' tanks will be assessed during Tenant or Walkaround audits in accordance with EMSP06 – Monitoring environmental compliance & performance, with compliance and any remedial action the responsibility of the tenant.	EAud
4.1.5	A template will be available for checking compliance with the OSR during tank inspections, walkaround, department or tenant audits.	ES

4.2 Calibration of equipment

4.2.1	Individual departments or tenants are responsible for any calibration requirements on level sensors, fuel gauges etc.	Tank owner

4.3 Non-compliance definition

4.3.1	Tanks that do not comply with the requirements of the OSR and/or Aerodrome Manual standards will be logged as non-conformant in accordance with procedure EMSP06 – Monitoring environmental compliance & performance.	As EMSP06

5 COMPETENCY REQUIREMENTS

5.1.1	Competency requirements are as stated within EMSP07 – Environmental training and awareness.	As EMSP07

6 EMERGENCY PREPAREDNESS

6.1.1 Prompt remedial action will be undertaken in the event of a spillage. This will be in accordance with EMOP06 – Spill response. — As EMOP06

7 RECORD KEEPING, REPORTING AND RETENTION

7.1.1 EP07-D01 Bulk Storage Inventory will record information on all MAG and tenant bulk storage tanks including their compliance with the OSR and/or the Aerodrome Manual and will be updated as required following changes to tanks or internal auditing. — ES / EAud

7.1.2 All records will be retained for a minimum of 3 years. — All

8 SUPPORTING INFORMATION

8.1 Definitions & abbreviations

- **EAud** – Environment Auditor
- **ES** – Environmental Specialist
- **EBDM** – Engineering & Baggage Duty Manager
- **HMT** – Head of Motor Transport
- **OSR** – Control of Pollution (Oil Storage) (England) Regulations
- **Tank owner** – MAG manager or tenant responsible for maintenance and management of a bulk storage tank, bowser or drum store.

8.2 Related documents and contacts

- Aerodrome Manual ASI 36
- Delivery records
- EMOP06 - Spill Response
- EMOP07-D01 Bulk Storage Inventory
- EMSP06 – Monitoring Environmental Compliance & Performance
- EMSP07 – Environmental Training and Awareness.
- Tank inspection sheets

8.3 Document control

Any questions concerning this procedure should be directed to environment@manairport.co.uk.

ASI Owner

Environment & Energy Manager

1 General Requirements

All storage facilities for bulk liquids should be adequate to prevent any leakage that could be a health and safety hazard and/or cause pollution. In general, the standards set out in the Control of Pollution (Oil Storage) (England) Regulations 2001 should be adopted.

Any vehicles and trailed equipment operating airside at Manchester Airport are also subject to Airside Standing Instruction 32 Airside Vehicle & Equipment Standards.

2 STANDARDS

2.1 Mobile Bowsers That Cannot Be Moved Under Their Own Power

Mobile Bowsers that cannot be moved under their own power, including those used for storage of:

- Oil or fuel;
- Waste oil or fuel

should be:

- Double skinned /self-bunded with 110% of the tank capacity provided within the bund.
- In good condition without leakage.
- Hatch/fill point kept secured, and preferably locked to prevent unauthorised use.
- Generally located in a position that is protected from impact.
- Labelled with:
  - the company name and a contact number.
  - the type of fuel;
  - the capacity of the tank/bowser.
  - hazard symbols as required.
- Labelled with relevant CLP hazard symbols on each side and the rear of the bowser. E.g.
  - Flammable.
  - Hazardous to the environment.
  - Others as required

COMPANY NAME
CONTENTS
XXXX LITRES CAPACITY
EMERGENCY CONTACT NUMBER(S)

Template for general bowser information

CLP Hazard symbols

Mobile bowsers that are solely used for water do not need to comply with this standard but must be clearly labelled with the company name and contents.

2.2 Bowsers And Tankers That Are Moved Under Their Own Power

Bowsers and tankers that are moved under their own power, including those used for:

- Vehicle or equipment refuelling.
- Toilet effluent.
- Aircraft de-icing

should be:

- In good condition with no leaks.
- With ancillary equipment in good condition and with no leaks, including but not limited to, hoses, sight glasses, fill points, valves, pumps etc.
- Hoses to be secured when the vehicle is in transit.
- Fill and dispensing points to have a secure cap that is connected to the body of the bowser so that it cannot be lost.
- Labelled with:
  - the company name and a contact number.
  - the type of fuel/material being held.
  - the capacity of the tank/bowser.
  - hazard symbols as required.

Additional requirements for fuel bowsers:

- A spill kit should be carried on the vehicle to allow the clean-up of small spillages, including any plastic bags/shovels as required to facilitate the sweep up and disposal of any used spill kit by the operator.
- Labelled with CLP hazard symbols on each side and the rear of the bowser such as:
  - Flammable;
  - Hazardous to the environment;
  - Or others as required.

COMPANY NAME
CONTENTS
XXXX LITRES CAPACITY
EMERGENCY CONTACT NUMBER(S)

Template for general bowser/tanker information

CLP Hazard symbols

2.3 Static Bulk Tanks

All static bulk storage tanks (greater than 200 litres) used for:

- Fuel or oil;
- Waste fuel or oil;
- De-icing chemicals

should be:

- Provided with secondary containment such as:
  - Integral bund/double skin;
  - Impermeable bund wall;
  - Stored within a chemsafe or similar bunded and covered container;
- With the secondary containment holding at least 110% of the tank/container capacity;
- Protected from impact by Armco barrier or similar;
- Labelled with:
  - the company name and a contact number;
  - the type of fuel/material being held;
  - the capacity of the tank/bowser;
  - hazard symbols as required.
- Labelled with CLP hazard symbols on each side and the rear of the bowser such as:
  - Flammable;
  - Hazardous to the environment;
  - Or others as required.

COMPANY NAME
CONTENTS
XXXX LITRES CAPACITY
EMERGENCY CONTACT NUMBER(S)

Template for general bowser/tanker information

CLP Hazard symbols

IBCs of de-icing fluid may be permitted on the airfield in the following circumstances:

- As a temporary measure only;
- In an area agreed with Airfield Ops and Environment.
- Where protected from impact.

2.4 Static Chemical/Oil Stores

Static stores of smaller containers (less than 200 litres) of materials including:

- Fuel/oil;
- Waste fuel/oil;
- Chemicals;
- Detergents

should be:

- Stored within a chemsafe or similar bunded and covered container.

The chemsafe/container should be:

- Generally located in a position that is protected from impact;
- Labelled with:
  - the company name and a contact number;
  - the type of fuel/material being held;
  - the capacity of the tank/bowser;
  - hazard symbols as required;
- Preferably kept locked;
- Regularly inspected and any spillage in the bund removed.

3 FURTHER INFORMATION

Further information on environmental standards for Oil Storage can be found at https://www.gov.uk/topic/environmental-management/oil-storage

Additional information may be obtained from MA environment department – environment@manairport.co.uk

Environmental Management Operational Procedure
EMOP10 – Waste management

Ref	Procedure	Responsibility

1 PURPOSE

1.1.1 This procedure defines the mechanisms for waste management, to ensure the necessary control during handling, storage and transportation off-site, and to ensure compliance with relevant regulatory and other requirements.

2 PRIMARY RESPONSIBILITY

2.1.1 The Head of Facilities Management has the primary responsibility for the management of waste through the main waste contract. Other responsibilities are as outlined in the body of the procedure.

3 ENVIRONMENTAL PERMITS AND EXEMPTIONS

3.1.1 All permits and exemptions held by MAG with regards to waste at Manchester Airport will be recorded in EP02-D03 Environmental Permits and Exemptions Inventory. This will be updated by the Environment & Energy department as required and not less than annually. — EEM

4 WASTE CONTRACTS

4.1.1 MAG co-ordinates the main waste contract for its own and most tenant and concessionaires' general waste and recyclables from the site, including Category 1 International Catering Waste (Cat 1 ICW) and some hazardous wastes. The contract is contracted as described within the MAG FM Contract Service Information - Soft Services. In summary, the waste contractor provides bulk containers and services for on-site storage, carriage and recycling, recovery or disposal of waste. On-site day-to-day management is also provided including checking compliance, bulking of materials and managing collection frequencies, plus contract management services including management information, Health and Safety (H&S) advice and central office services. — FM-SS

4.1.2 MAG does not provide waste facilities for:

- companies operating on a ground lease who must provide and use their own facilities (e.g. aircraft catering, hotels etc);
- other companies on-site whose lease conditions exclude waste disposal;
- construction contractors' waste;
- hazardous wastes generated by any company on site, other than those within the main contract or as otherwise agreed;
- clinical wastes generated by any company other than MAG;
- liquid wastes generated by any company other than MAG.

In these instances, then the tenant or local manager is responsible for putting in place appropriate facilities and contracts. — Tenants/ Local Managers

4.1.3 Cat 1 ICW will be managed in accordance with the Requirements for Cat 1 ICW at Manchester Airport protocol. — Tenants/ Waste Contractor/ FM-SS

4.1.4 Some specialised waste contracts are also held by individual departments (e.g. motor transport hazardous waste). — Contract managers

5 USE OF WASTE FACILITIES

5.1.1 Waste is deposited into MAG waste facilities by a number of companies across the site, including cleaning companies and retailers. Tenants and local managers should take actions to reduce waste generation and to recycle where possible. They are also responsible for identifying their waste and ensuring safe storage and appropriate disposal into the correct container, including for recycling. — Tenants/ Local Managers

5.1.2 Tenants and local managers are responsible for ensuring their staff have been adequately trained in the use of the waste management facilities and the safe use of the compactors. The Waste Contractor will provide training to tenants as required. — Tenants/Local Managers/ Waste Contractor

5.1.3 Hazardous waste from across the site will be stored in the hazardous waste compound pending collection. Suitable containers such as overdrums, Waste Electrical and Electronic Equipment (WEEE) containers, battery boxes and chem-safes will be used where possible. A log will be kept of all large WEEE and "ad-hoc" chemicals or other materials stored. — Waste Contractor

6 EVALUATION OF COMPLIANCE

6.1 Duty of care

6.1.1 All waste streams managed by MAG will be identified and recorded within EMOP10-D01 (Waste inventory), which will be updated on a periodic basis, not less than annually. The register will include information on the waste, contractor and destination and the contract holder within MAG and detail carriers' licences and — EEM

environmental permits. Copies of carriers' licence registrations and permits will also be retained.

6.1.2 Duty of care waste transfer notes and hazardous waste consignment notes will be correctly completed and provided for all waste transfers off-site. Those relating to the main waste contract will be held on MAG site by the waste contractor. Those relating to other contracts will be retained by the contract manager. — Waste Contractor/ Contract Manager

6.1.3 To cover MAG's duty of care obligations, tenants are annually required to complete and return an internal duty of care survey. This is also used to document that companies are aware of the requirements on recycling, responsible disposal and H&S. Where the survey is not returned, additional measures will be taken for any companies considered high risk with regard to waste management (e.g. cleaning companies, companies generating large quantities of waste and/or generate hazardous waste). Copies of internal duty of care responses will be retained and the information may be used to inform tenant audits. — EEM/Tenants

6.2 Monitoring and measurement

6.2.1 The waste contractor provides management information detailing all collections from site, tonnages and recycling and recovery rate. — Waste contractor

6.2.2 An annual audit is undertaken of the main waste contract in which drivers tickets and weighbridge tickets will be checked for sample collections from the site, and checked against the waste inventory and waste management information. — EEM

6.2.3 An annual audit is also undertaken of specialist waste contracts held by MAG departments to check waste transfer notes/consignment notes have been correctly completed and retained, including consignee returns/part E, and to obtain data on tonnages of waste. — EEM

6.2.4 Checks on tenant's own waste contracts will be carried out as part of tenant audits. — EEM

6.3 Calibration of equipment

6.3.1 N/A

6.4 Non-compliance definition

6.4.1 Non-compliances may be raised and logged within EMSP06-D03 Environmental non-conformance & observation tracker for the following reasons: — EEM

- waste contractor notification of critical contamination within recycling;
- facilities, processes or documentation not compliant with requirements of duty of care, hazardous waste regulations or animal by-products regulations;
- disposal of hazardous waste or Cat 1 ICW to general waste facilities.

6.4.2 Observations may be raised and logged within EMSP06-D03 Environmental non-conformance & observation tracker for the following reasons: EEM

- tenant's waste contract documentation not correctly completed or retained;
- repeated contamination of recyclables.

7 COMPETENCY REQUIREMENTS

7.1.1 MAG contract managers, Waste contractor and site teams will have adequate understanding of legislative requirements for the management of waste on behalf of MAG. FM-SS/Waste Contractor/ EEM

8 EMERGENCY PREPAREDNESS

8.1.1 Spill kits will be retained within the hazardous waste compound. Any spill that cannot be managed will be dealt with in accordance with EP06 Spill Response. Waste contractor

9 RECORD KEEPING, REPORTING AND RETENTION

9.1.1 All waste documentation including duty of care notes/ hazardous waste consignment notes, carriers' licences and permits will be retained for a minimum of 3 years. Waste contractor/ Contract managers

9.1.2 Management information provided by the waste contractor and obtained during waste audits will be used for internal and external reporting on waste generation and landfill diversion performance against targets. EEM

10 SUPPORTING INFORMATION

10.1 Definitions & abbreviations

- **Contract manager** – Any MAG manager holding a contract for disposal of wastes.
- **EEM** – Environment & Energy Manager
- **FM-SS** - FM Manager – Soft Services
- **HoFM** – Head of Facilities Management
- **H&S** – Health and Safety
- **ICW** – International catering waste
- **Local managers** – MAG managers
- **Tenants** – tenants, concessionaires and any other company operating at the airport that uses MAG waste facilities
- **Waste contractor** – Main FM waste management contractor for MAG
- **WEEE** – Waste electrical and electronic equipment

10.2 Related documents and contacts

- EMOP06 - Spill Response
- EMOP10-D01 - Waste Inventory
- EMSP03-D02 - Environmental Permits and Exemptions Inventory
- EMSP06-D03 - Environmental non-conformance & observation tracker
- Internal duty of care returns
- MAG FM Contract Service Information - Soft Services
- Requirements for Cat 1 ICW at Manchester Airport protocol
- Waste contract

- Waste Contractor's Waste Foreman – 07979 333106

10.3 Document control

Any questions concerning this procedure should be directed to environment@manairport.co.uk.

Appendix C. Air Quality Assessment

Appendix D. Plant Specification

Appendix E. Habitats Assessment

Appendix F. Material Safety Data Sheets

Sentinel X100

Safety Data Sheet

according to UK REACH Regulation

Issue date: 03/02/2022 Revision date: 02/11/2023 Supersedes: 11/08/2023 Version: 2.3

SDS No: 12301-0053

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Mixture

Product name : Sentinel X100

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Use of the substance/mixture : Corrosion and Scale Inhibitor for Heating and Cooling Systems

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Manufacturer

Sentinel Performance Solutions LTD

7650 Daresbury

Warrington, Cheshire, WA4 4BS - Great Britain

T +44 (0)1928 704 330 - F +44 (0)1928 562 070

info.uk@sentinelprotects.com

Distributor

Sentinel Performance Solutions Ltd

Cité Descartes - 16 rue Albert Einstein

77420 CHAMPS SUR MARNE - France

T +33 (01) 64 15 22 40 - F +33 (01) 64 15 22 57

info.france@sentinelprotects.com

E-mail address of competent person responsible for the SDS: sd@gbk-ingelheim.de

1.4. Emergency telephone number

Emergency number : +44 (0)1928 704 339 (24 hours, 7 days)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to GB CLP Regulation

Not classified

Adverse physicochemical, human health and environmental effects

To our knowledge, this product does not present any particular risk, provided it is handled in accordance with good occupational hygiene and safety practice.

2.2. Label elements

Labelling according to GB CLP Regulation

No labelling applicable

2.3. Other hazards

Contains no PBT/vPvB substances ≥ 0.1% assessed in accordance with REACH Annex XIII.

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

This mixture does not contain any substances to be mentioned according to the criteria of section 3.2 of REACH Annex II

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing.

First-aid measures after skin contact : Take off immediately all contaminated clothing. Gently wash with plenty of soap and water. Wash skin with plenty of water.

First-aid measures after eye contact : Rinse immediately with plenty of water, also under the eyelids. Remove contact lenses, if present and easy to do. Continue rinsing. Rinse eyes with water as a precaution.

First-aid measures after ingestion : Do NOT induce vomiting. Rinse mouth. Call a poison center or a doctor if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Water spray. Dry powder. Foam. Carbon dioxide.

Unsuitable extinguishing media : Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products in case of fire : Carbon monoxide. Carbon dioxide. Nitrogen oxides. Phosphorus oxides.

5.3. Advice for firefighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Do not allow run-off from fire fighting to enter drains or water courses.

Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures : Ventilate spillage area. Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Take up liquid spill into absorbent material.

Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Ensure good ventilation of the work station. Wear personal protective equipment.
Hygiene measures	:	Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	:	Store in original container. Keep container closed when not in use. Store in a well-ventilated place. Keep cool.

7.3. Specific end use(s)

See Section 1.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls:
Ensure good ventilation of the work station.

Hand protection:

Chemically resistant protective gloves. ISO 374-1. Choosing the proper glove is a decision that depends not only on the type of material, but also on other quality features, which differ for each manufacturer. Please follow the instructions related to the permeability and the penetration time provided by the manufacturer

Eye protection:

Protective goggles (EN 166)

Skin and body protection:

Wear suitable protective clothing

Respiratory protection:

In case of insufficient ventilation, wear suitable respiratory equipment

Environmental exposure controls:
Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Colour	:	Clear. colourless to yellow. straw.
Odour	:	Barely perceptible.
Odour threshold	:	No data available
pH	:	7.56 (25 °C)
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	-10 °C
Auto-ignition temperature	:	No data available

Decomposition temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	No data available
Relative vapour density at 20°C	:	No data available
Relative density	:	No data available
Density	:	1.0388 g/cm³ (25 °C)
Solubility	:	Miscible with water.
Log Pow	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosive properties	:	Product is not explosive.
Oxidising properties	:	Non oxidizing.
Explosive limits	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

The product is non-reactive under normal conditions of use, storage and transport.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

Extremely high or low temperatures.

10.5. Incompatible materials

No information available.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	:	Not classified (Based on available data, the classification criteria are not met)
Acute toxicity (dermal)	:	Not classified (Based on available data, the classification criteria are not met)
Acute toxicity (inhalation)	:	Not classified (Based on available data, the classification criteria are not met)
Skin corrosion/irritation	:	Not classified (Based on available data, the classification criteria are not met) pH: 7.56 (25 °C)
Serious eye damage/irritation	:	Not classified (Based on available data, the classification criteria are not met) pH: 7.56 (25 °C)
Respiratory or skin sensitisation	:	Not classified (Based on available data, the classification criteria are not met)
Germ cell mutagenicity	:	Not classified (Based on available data, the classification criteria are not met)
Carcinogenicity	:	Not classified (Based on available data, the classification criteria are not met)
Reproductive toxicity	:	Not classified (Based on available data, the classification criteria are not met)
STOT-single exposure	:	Not classified (Based on available data, the classification criteria are not met)
STOT-repeated exposure	:	Not classified (Based on available data, the classification criteria are not met)

Aspiration hazard : Not classified (Based on available data, the classification criteria are not met)

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : The product is not considered harmful to aquatic organisms nor to cause long-term adverse effects in the environment.

Hazardous to the aquatic environment, short–term (acute) : Not classified (Based on available data, the classification criteria are not met)

Hazardous to the aquatic environment, long–term (chronic) : Not classified (Based on available data, the classification criteria are not met)

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Results of PBT and vPvB assessment

No additional information available

12.6. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Product/Packaging disposal recommendations : Empty containers should be taken for recycling, recovery or waste in accordance with local regulation.

SECTION 14: Transport information

In accordance with ADR / IMDG / IATA / ADN / RID

ADR	IMDG	IATA	ADN	RID
14.1. UN number				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.2. UN proper shipping name				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.3. Transport hazard class(es)				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.4. Packing group				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
No supplementary information available				

14.6. Special precautions for user

Overland transport
Not applicable

Transport by sea
Not applicable

Air transport
Not applicable

Inland waterway transport
Not applicable

Rail transport
Not applicable

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

Contains no substance(s) listed on REACH Annex XVII (Restriction Conditions)
Contains no substance(s) listed on the REACH Candidate List
Contains no substance(s) listed on REACH Annex XIV (Authorisation List)
Contains no substance(s) listed on the PIC list (Regulation EU 649/2012 concerning the export and import of hazardous chemicals)
Contains no substance(s) listed on the POP list (Regulation EU 2019/1021 on persistent organic pollutants)

Directive 2012/18/EU (SEVESO III)

Seveso Additional information : Not subject to the Seveso III Directive

15.1.2. National regulations

No additional information available

15.2. Chemical safety assessment

No chemical safety assessment has been carried out

SECTION 16: Other information

Indication of changes:			
Section	**Changed item**	**Change**	**Comments**
9.1		Modified	pH value; Flash point; Colour

Abbreviations and acronyms:	
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	Acute Toxicity Estimate
CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
DNEL	Derived-No Effect Level
EC50	Median effective concentration
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
LC50	Median lethal concentration
LD50	Median lethal dose

PBT	Persistent Bioaccumulative Toxic
PNEC	Predicted No-Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
vPvB	Very Persistent and Very Bioaccumulative
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
DOT	Department of Transport
TDG	Transportation of Dangerous Goods
GHS	Globally Harmonized System of Classification, Labelling and Packaging of Chemicals
CAS	CAS (Chemical Abstracts Service) number
IBC-Code	International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
BCF	Bioconcentration factor
MARPOL 73/78	MARPOL 73/78: International Convention for the Prevention of Pollution From Ships
ADG	Transport of Australian Dangerous Goods
BLV	Biological limit value
BOD	Biochemical oxygen demand (BOD)
COD	Chemical oxygen demand (COD)
DMEL	Derived Minimal Effect level
EC-No.	European Community number
EN	European Standard
LOAEL	Lowest Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOEC	No-Observed Effect Concentration
OECD	Organisation for Economic Co-operation and Development
OEL	Occupational Exposure Limit
SDS	Safety Data Sheet
STP	Sewage treatment plant
ThOD	Theoretical oxygen demand (ThOD)
TLM	Median Tolerance Limit
VOC	Volatile Organic Compounds
CAS-No.	Chemical Abstract Service number
N.O.S.	Not Otherwise Specified
ED	Endocrine disrupting properties

Data sources : REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Other information	:	Data of sections 4 to 8, as well as 10 to 12, do partly not refer to the use and the regular employing of the product (in this sense consult information on use and on product), but to liberation of major amounts in case of accidents and irregularities. The information describes exclusively the safety requirements for the product(s) and is based on the present level of our knowledge. The delivery specifications are contained in the corresponding product sheet. This data does not constitute a guarantee for the characteristics of the product(s) as defined by the legal warranty regulations.

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should therefore not be construed as guaranteeing any specific property of the product.

SAFETY DATA SHEET

HB 160

Compilation date: 28/07/2016

Revision No: 4

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: HB 160

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of substance / mixture: Closed circuit corrosion inhibitor.

1.3. Details of the supplier of the safety data sheet

Company name: Hydraclean Ltd
Gladden Place
Gillibrands
Skelmersdale
Lancs
WN8 9SX

Tel: 01695 727391

Fax: 01695 728786

Email: info@hydraclean.co.uk

1.4. Emergency telephone number

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification under CLP: Ox. Sol. 3: H272; Acute Tox. 3: H301; Aquatic Acute 1: H400

Classification under CHIP: T: R25; Xi: R36/38; N: R50

Most important adverse effects: May intensify fire; oxidiser. Toxic if swallowed. Very toxic to aquatic life.

2.2. Label elements

Label elements under CLP:

Hazard statements: H272: May intensify fire; oxidiser.
H301: Toxic if swallowed.
H400: Very toxic to aquatic life.

Signal words: Danger

Hazard pictograms: GHS03: Flame over circle
GHS06: Skull and crossbones
GHS09: Environmental

Precautionary statements: P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

[cont...]

P221: Take any precaution to avoid mixing with combustibles.

P262: Do not get in eyes, on skin, or on clothing.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

P352: Wash with plenty of soap and water.

P301+310: IF SWALLOWED: Immediately call a POISON CENTER or doctor.

P273: Avoid release to the environment.

2.3. Other hazards

PBT: This product is not identified as a PBT substance.

Section 3: Composition/information on ingredients

3.2. Mixtures

Hazardous ingredients:

SODIUM NITRITE - REACH registered number(s): 01-2119471836-XXXX

EINECS	CAS	CHIP Classification	CLP Classification	Percent
231-555-9	7632-00-0	-	Ox. Sol. 3: H272; Acute Tox. 3: H301; Aquatic Acute 1: H400	10-30%

SODIUM HYDROXIDE - REACH registered number(s): 01-2119457892-27-XXXX

215-185-5	1310-73-2	-	Skin Corr. 1A: H314	1-10%

Contains: A blend of corrosion inhibitors.

Section 4: First aid measures

4.1. Description of first aid measures

Skin contact: Remove all contaminated clothes and footwear immediately unless stuck to skin. Drench the affected skin with running water for 10 minutes or longer if substance is still on skin. Transfer to hospital if there are burns or symptoms of poisoning.

Eye contact: Bathe the eye with running water for 15 minutes. Transfer to hospital for specialist examination.

Ingestion: Do not induce vomiting. If conscious, give half a litre of water to drink immediately. If unconscious, check for breathing and apply artificial respiration if necessary. If unconscious and breathing is OK, place in the recovery position. Transfer to hospital as soon as possible.

Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so. If unconscious, check for breathing and apply artificial respiration if necessary. If unconscious and breathing is OK, place in the recovery position. If conscious, ensure the casualty sits or lies down. If breathing becomes bubbly, have the casualty sit and provide oxygen if available. Transfer to hospital as soon as possible.

[cont...]

4.2. Most important symptoms and effects, both acute and delayed

Skin contact: Irritation or pain may occur at the site of contact. Absorption through the skin may occur causing symptoms similar to those of ingestion.

Eye contact: There may be irritation and redness. There may be severe pain. Corneal burns may occur.

Ingestion: There may be difficulty swallowing. Inhalation of fumes from the stomach may cause symptoms similar to direct inhalation. Nausea and stomach pain may occur. There may be vomiting. The breathing may become shallow and rapid. May cause dizziness. There may be loss of consciousness. Convulsions may occur.

Inhalation: There may be a feeling of tightness in the chest with shortness of breath. There may be loss of consciousness. Convulsions may occur.

Delayed / immediate effects: Immediate effects can be expected after short-term exposure.

4.3. Indication of any immediate medical attention and special treatment needed

Immediate / special treatment: Immediate medical attention is required. Show this safety data sheet to the doctor in attendance. Eye bathing equipment should be available on the premises.

Section 5: Fire-fighting measures

5.1. Extinguishing media

Extinguishing media: Carbon dioxide. Alcohol resistant foam.

5.2. Special hazards arising from the substance or mixture

Exposure hazards: Toxic. In combustion emits toxic fumes.

5.3. Advice for fire-fighters

Advice for fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions: Refer to section 8 of SDS for personal protection details. Mark out the contaminated area with signs and prevent access to unauthorised personnel.

6.2. Environmental precautions

Environmental precautions: Do not discharge into drains or rivers. Contain the spillage using bunding.

6.3. Methods and material for containment and cleaning up

Clean-up procedures: Absorb into dry earth or sand. Clean-up should be dealt with only by qualified personnel familiar with the specific substance.

6.4. Reference to other sections

Reference to other sections: Refer to section 8 of SDS.

[cont...]

Section 7: Handling and storage

7.1. Precautions for safe handling

Handling requirements: Ensure there is sufficient ventilation of the area. Avoid direct contact with the substance.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Store in cool, well ventilated area. Keep container tightly closed.

7.3. Specific end use(s)

Specific end use(s): No data available.

Section 8: Exposure controls/personal protection

8.1. Control parameters

Hazardous ingredients:

SODIUM HYDROXIDE

Workplace exposure limits: **Respirable dust**

State	8 hour TWA	15 min. STEL	8 hour TWA	15 min. STEL
UK	2 mg/m3	2 mg/m3	-	-

8.1. DNEL/PNEC Values

DNEL / PNEC No data available.

8.2. Exposure controls

Engineering measures: Ensure there is sufficient ventilation of the area.

Respiratory protection: No specific recommendations , but respiratory protection may be required under exceptional circumstances. Respiratory protection must be worn if there is a risk of breathing mists or vapours from heated or aspirated material.

Hand protection: Protective gloves.

Eye protection: Safety goggles. Ensure eye bath is to hand.

Skin protection: Protective clothing with elasticated cuffs and closed neck. Boots made of PVC. Ensure safety shower is to hand.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State: Liquid

Colour: Colourless

Odour: Odourless

Oxidising: Non-oxidising (by EC criteria)

Solubility in water: Soluble

Viscosity: Non-viscous

Relative density: 1.18-1.22 **pH:** 10-12

[cont...]

9.2. Other information

Other information: No data available.

Section 10: Stability and reactivity

10.1. Reactivity

Reactivity: Stable under recommended transport or storage conditions.

10.2. Chemical stability

Chemical stability: Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous reactions: Hazardous reactions will not occur under normal transport or storage conditions.

Decomposition may occur on exposure to conditions or materials listed below.

10.4. Conditions to avoid

Conditions to avoid: Hot surfaces.

10.5. Incompatible materials

Materials to avoid: Acids.

10.6. Hazardous decomposition products

Haz. decomp. products: In combustion emits toxic fumes. Contact with acids liberates toxic gas.

Section 11: Toxicological information

11.1. Information on toxicological effects

Toxicity values:

Route	Species	Test	Value	Units
ORL	MUS	LD50	175 Sodium Nitrite	mg/kg
ORL	RAT	LD50	180 Sodium Nitrite	mg/kg
SCU	RAT	LD50	96600 Sodium Nitrite	µg/kg

Hazardous ingredients:

SODIUM NITRITE

ORL	MUS	LD50	175	mg/kg
ORL	RAT	LD50	180	mg/kg
SCU	RAT	LD50	96600	µg/kg

[cont...]

SODIUM HYDROXIDE

IPR	MUS	LD50	40	mg/kg
ORL	RBT	LDLO	500	mg/kg

Relevant effects for mixture:

Effect	Route	Basis
Acute toxicity (toxic)	ING	Hazardous: calculated
Irritation	OPT DRM	Hazardous: calculated

Symptoms / routes of exposure

Skin contact: Irritation or pain may occur at the site of contact. Absorption through the skin may occur causing symptoms similar to those of ingestion.

Eye contact: There may be irritation and redness. There may be severe pain. Corneal burns may occur.

Ingestion: There may be difficulty swallowing. Inhalation of fumes from the stomach may cause symptoms similar to direct inhalation. Nausea and stomach pain may occur. There may be vomiting. The breathing may become shallow and rapid. May cause dizziness. There may be loss of consciousness. Convulsions may occur.

Inhalation: There may be a feeling of tightness in the chest with shortness of breath. There may be loss of consciousness. Convulsions may occur.

Delayed / immediate effects: Immediate effects can be expected after short-term exposure.

Section 12: Ecological information

12.1. Toxicity

Ecotoxicity values:

Species	Test	Value	Units
Daphnia magna	48H EC50	12.5-100 (Sodium Nit	mg/l
Fish	96H LC50	0.56-1.78 (Sodium Ni	mg/l

Hazardous ingredients:

SODIUM HYDROXIDE

Fish	96H LC50	4	mg/l

12.2. Persistence and degradability

Persistence and degradability: Biodegradable.

12.3. Bioaccumulative potential

Bioaccumulative potential: No bioaccumulation potential.

[cont...]

12.4. Mobility in soil

Mobility: Soluble in water.

12.5. Results of PBT and vPvB assessment

PBT identification: This product is not identified as a PBT substance.

12.6. Other adverse effects

Other adverse effects: Toxic to aquatic organisms. Do not allow concentrated product to enter rivers or water courses.

Section 13: Disposal considerations

13.1. Waste treatment methods

Disposal operations: Transfer to a suitable container and arrange for collection by specialised disposal company. Disposal should be carried out by licenced contractors. Do not allow entry to drains or waterways.

Disposal of packaging: Containers must be disposed of in a safe way.

NB: The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

Section 14: Transport information

14.1. UN number

UN number: UN3287

14.2. UN proper shipping name

Shipping name: TOXIC LIQUID, INORGANIC, N.O.S.
(SODIUM NITRITE)

14.3. Transport hazard class(es)

Transport class: 6.1

14.4. Packing group

Packing group: III

14.5. Environmental hazards

Environmentally hazardous: Yes **Marine pollutant:** Yes

14.6. Special precautions for user

Special precautions: No special precautions.

Tunnel code: E

Transport category: 2

Section 15: Regulatory information

[cont...]

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.2. Chemical Safety Assessment

Chemical safety assessment: A chemical safety assessment has not been carried out for the substance or the mixture by the supplier.

Section 16: Other information

Other information

Other information: This safety data sheet is prepared in accordance with Commission Regulation (EU) No 453/2010.

* indicates text in the SDS which has changed since the last revision.

Phrases used in s.2 and 3: H272: May intensify fire; oxidiser.

H301: Toxic if swallowed.

H314: Causes severe skin burns and eye damage.

H400: Very toxic to aquatic life.

R25: Toxic if swallowed.

R36/38: Irritating to eyes and skin.

R50: Very toxic to aquatic organisms.

Legal disclaimer: The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. This company shall not be held liable for any damage resulting from handling or from contact with the above product.

MINI SDS

Considered a hazardous mixture according to Reg. (EC) No 1272/2008 and their amendments. Classified as Dangerous Goods for transport purposes.

Nalco Trac109

INGREDIENTS	CAS NO	%	8HR OEL
sodium nitrite	7632-00-0	30-60	-
sodium hydroxide	1310-73-2	1-5	-

GHS

DG

UN No: **2922**
Hazchem Code: **2X**
DG Class: **8**
Subsidiary Risk: **6.1**
Packing Group: **III**

HEALTH HAZARD INFORMATION

Signal word:	Danger
Hazard statement(s):	**H290** May be corrosive to metals. **H301** Toxic if swallowed. **H314** Causes severe skin burns and eye damage. **H400** Very toxic to aquatic life.

PRECAUTIONS FOR USE

Appropriate engineering controls:	Local Exhaust Ventilation recommended.
Glasses:	Consider full face-shield.
Gloves:	1.NAT, NEOPR, NITRILE 2.NEOPRENE
Respirator:	Type AK-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)
Storage and Transportation:	Restrictions on Storage apply. Refer to Full Report. Dispose of this material and its container at hazardous or special waste collection point. Keep locked up. Keep out of reach of children. Keep away from living quarters. Keep away from food, drink and animal feeding stuffs.
Fire/Explosion Hazard:	Dispose of this material and its container at hazardous or special waste collection point. In case of fire and/or explosion, DO NOT BREATHE FUMES.
Environment:	Very toxic to aquatic organisms.Use appropriate container to avoid environmental contamination. Avoid release to the environment. Refer to special instructions/Safety data sheets.

PROPERTIES

liquid
Does not burn.

EMERGENCY

FIRST AID

Swallowed:	Give water (if conscious). URGENT MEDICAL ATTENTION.
Eye:	Wash with running water (15 mins). Medical attention.
Skin:	Flood body with water. Remove contaminated clothing. Wash with water
Inhaled:	Fresh air. Rest, keep warm. If breathing shallow, give oxygen. Medical attention.
Advice To Doctor:	Supportive care. Irrigate eyes with saline. Supportive care.
Fire Fighting:	Keep surrounding area cool. Water spray/fog.
Spills and Disposal:	Prevent from entering drains. Contain spillage by any means. Absorb with dry agent. Stop leak if safe to do so. Dispose of this material and its container at hazardous or special waste collection point. This material and its container must be disposed of in a safe way. To clean the floor and all objects contaminated by this material, use water.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

x	x	+	x	+	+	+

x — *Must not be stored together*
0 — *May be stored together with specific preventions*
+ — *May be stored together*

Appendix G. Climate Change Plan

Manchester Airports Group

Climate Change Adaptation Progress Report

For East Midlands, London Stansted and Manchester Airports

December 2021

Report submitted to the Department for Environment, Food and Rural Affairs (Defra) by Manchester Airports Group for East Midlands, Manchester and London Stansted Airports

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Contents

Introduction

Purpose and scope

Over the last decade MAG has published two Climate Change Adaptation Reports, identifying and evaluating risks to our airports from the physical impacts of climate change. The reports, which are required to be submitted to the Department for Environment, Food and Rural Affairs (DEFRA), include comprehensive coverage of how the projected changes in climate may impact our business. They also explore the actions we can take to minimise risk and unlock any opportunities which arise from climate change.

Since our first Climate Change Adaptation Report was published in 2011 MAG has acquired London Stansted Airport. We no longer own Bournemouth and Humberside airports, which were not included within the scope of the Adaptation Reporting Power of the Climate Change Act and so had not previously submitted Climate Change Adaptation Reports. In response to our refreshed operating model, our 2021 Climate Change Adaptation Report is the first holistic report covering all three airports. This report outlines the progress made at East Midlands, Stansted and Manchester Airports and should be read in conjunction with previous reports published in 2011, 2015 and 2016.

Timeline of our airports' adaptation reporting to date:

- 2011 – MAG published its first Climate Change Adaptation Report for East Midlands and Manchester Airport. Separately BAA published their Airport Climate Change Adaptation Plan for Stansted Airport.
- 2015 – MAG published its second Climate Change Adaptation Report for East Midlands and Manchester Airport[1].
- 2016 – MAG published its first Climate Change Adaptation Report for Stansted Airport[2].
- 2021 – MAG published this Climate Change Adaptation Report for East Midlands, Stansted and Manchester Airports.

As well as preparing for climate change, we are also engaged in climate change mitigation. MAG has been dedicated to reducing the carbon intensity of our airport operations for over 15 years. In 2006, MAG became the first UK airport operator to commit to make its own operations carbon neutral. We achieved that objective in 2012 when our airports at Bournemouth, East Midlands and Humberside became the first in the UK to become carbon neutral. Since then, Manchester, and later Stansted, have achieved this outcome, making MAG the only carbon neutral airport group in the UK. Our airports are each independently certified to Level 3+ (Neutrality) of the Airport Carbon Accreditation programme. This achievement not only recognises our carbon neutral status, but also demonstrates the progress we have made in reducing our direct carbon emissions and working with partners to minimise emissions indirectly associated with our business. Each of our airports take their approach to environmental management seriously and are ISO 14001 certified, with London Stansted Airport also certified to ISO 50001 for energy management. Our approach to decarbonisation has been multi-award winning and, earlier this year, MAG was recognised as the highest performing transport organisation in the Financial Times' 2021 assessment of European Climate Leaders.

[1] MAG (2015). Climate Change Adaptation Progress Report For East Midlands and Manchester Airports. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/488080/climate-adrep-manchester-airport-group.pdf

[2] London Stansted Airport (2016). Climate Change Adaptation Progress Report For London Stansted Airport. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/566149/climate-adrep-stansted.pdf

Last year we published our Corporate Social Responsibility Strategy for 2020 – 2025, 'Working together for a brighter future'[3]. Our Strategy features three strategic priorities, including 'Zero Carbon Airports' which focuses on making our airport operations net zero carbon no later than 2038. Our CSR Strategy is guiding our transition to net zero, and therefore we are maintaining a stronger focus on physical and operational risks to the business in this Adaptation Report, as opposed to transition risks.

Our decision making will be increasingly influenced by climate risks and exposures identified over the short, medium and long term. Such risks are identified in this report and previous Adaptation Reports. We recognise the importance of the Task Force on Climate-related Financial Disclosures (TCFD) and are committed to implementing the recommendations in full. This year we have enhanced our annual reporting[4] by aligning it with recommendations made by the TCFD.

The impact of the COVID-19 pandemic has been severe, with international travel restricted and passenger numbers down over 99% in the initial phase of the lockdown. The last 18 months have been a testing period for MAG, our colleagues, our communities and the wider aviation industry. Despite the unprecedented challenges of the pandemic on our business, we remain committed to eliminating our residual carbon emissions and reaching net zero by 2038. We are confident that, by demonstrating leadership, driving change and collaborating with the wider aviation industry and UK Government, we will succeed in a sustainable recovery while also achieving these goals.

Furthermore, we remain committed to ensuring that we build our resilience to the physical impacts of climate change. This is demonstrated by the prioritisation of our participation in this voluntary round of adaptation reporting and the additional consideration we have given to interdependency risks with our business partners at a time when our business activities have been significantly disrupted by the global pandemic.

Manchester Airports Group

We are a leading UK based airport company operating Manchester, London Stansted and East Midlands Airports. Prior to the COVID-19 pandemic more than 60 million flew through our airports each year, MAG directly employed 6,500 people and our airports provided on-site employment for 40,000 people and an additional 90,000 jobs in the wider supply chain. MAG supports airports in the US where we operate a network of executive lounges.

MAG is privately managed on behalf of its shareholders, who include IFM Investors (35.5% ownership), Manchester City Council (35.5% ownership) and the nine other Greater Manchester local authorities (29% ownership).

We strongly support the Government's commitment to the principles of sustainable development in the aviation industry, striking a balance between economic, social and environmental considerations.

East Midlands Airport

East Midlands Airport connects over 4 million passengers each year (pre-pandemic) with more than 90 leisure and business destinations, ranging from Guernsey to Geneva and Fuerteventura to Florence. The airport supports a range of charter and scheduled flights and is also an important part of the European low-cost network as a major base for operators including Ryanair and Jet2.com.

East Midlands Airport is a strategically important cargo hub for the UK, handling more than 420,000 tonnes each year and is the second busiest cargo airport in the UK after London Heathrow. The airport is an

[3] MAG (2020). Working Together For A Brighter Future: Our Corporate Social Responsibility Strategy for 2020 – 2025. Available online: https://www.magairports.com/media/1635/csr-strategy-2020.pdf

[4] MAG (2021). Manchester Airports Holdings Limited: Annual report and consolidated financial statements for the year ended 31 March 2021. Available online: https://www.magairports.com/media/1721/mahl-fy21-final-signed-12072021.pdf

important UK base for three of the major global integrated freight airlines (DHL, UPS and FedEx) and the largest air hub of Royal Mail.

East Midlands Airport is well positioned in the centre of the UK with direct access to the national motorway system, with 90% of England and Wales within a 4-hour lorry drive. The airport's location and catchment area provide an opportunity for future growth and the development of passenger and cargo operations, with the airport a key component of the recently announced East Midlands Freeport.

East Midlands Airport is in a semi-rural setting in north-western Leicestershire, with the nearest cities being Leicester (17 miles southeast), Derby (12.5 miles northwest) and Nottingham (14 miles northeast). With the exception of Donington Park Circuit, which is at the western end of the runway, and the town of Castle Donington to the north, land use in the vicinity of the airport is predominantly agricultural in nature. It is bounded to the east by the M1 motorway and to the south by the A453, which provides the main access route. The nearest railway station is East Midlands Parkway, 4 miles away. The River Trent runs approximately 1.5 miles to the northwest of the airport, and the River Soar is at an estimated 1 mile to the east beyond the M1.

London Stansted Airport

Stansted Airport is the UK's fourth largest airport (pre-pandemic), connecting over 28 million passengers each year to over 200 destinations. It is the only major London airport with significant runway capacity, offering a European route network which is unrivalled in the UK, providing London with more visitors from Europe than any other airport. Stansted Airport is in a strategic location at the heart of the UK Innovation Corridor between North London and Cambridge, with 25 million people located within a two-hour drive. In 2021 the airport was granted planning permission to increase its maximum number of passengers from 35 to 43 million passengers.

Stansted's World Cargo Centre is designed to offer 55,000 sqm of warehouse and office space. The airport offers continuous delivery of service; 24 hours a day, 365 days a year.

Stansted Airport is in a semi-rural setting directly adjacent to the M11 motorway in Essex, a short distance from the town of Bishops Stortford to the west. The general character of the surroundings is semi-rural to rural. The National Trust Hatfield Forest is an extensive wooded area around 1 mile to the south of the airport. The Pincey Brook rises at the south-eastern part of the airport and flows south towards the village of Hatfield Park Farm and onwards to join the River Stort south of Sawbridgeworth.

The M11 motorway provides the main access route to the airport from the north and south, and the A120 connects it to Essex to the east. The airport is served by an extensive network of bus and coach operations that connect to London in the south and cities to the northwest, north and east. The airport also benefits from a rail connection to London Liverpool St, and rail services that connect the airport to Birmingham, Cambridge and Norwich amongst others. For on-airport travel, the Stansted Airport Transit System links the terminal to satellite buildings via an elevated rail transit system.

Manchester Airport

Manchester Airport is the third busiest airport in the UK (pre-pandemic), and the largest outside London, serving just under 30 million passengers each year before the pandemic. Over 70 airlines serve more than 210 destinations from the airport, including many long-haul routes only served from Manchester, outside of London – such as Singapore, Hong Kong, Atlanta and Addis Ababa. Manchester is the only airport in the UK, alongside London Heathrow, to have two full-length runways.

More than 22 million people live within a two-hour travel-time of Manchester Airport. The airport's scale, location and the strength of its catchment area provide significant opportunities for future growth and development.

As the global gateway in the North of England, the airport is an integral part of the Northern economy. The benefits that the airport brings are in the form of passenger and cargo connectivity, economic activity, inward investment, tourism and direct and indirect employment.

Manchester Airport is located in the southern extremities of Greater Manchester, 8 miles from the City Centre, and extends into Cheshire East. It is bordered to the north, northeast and northwest by suburban housing, to the west and south by open farmland and rural housing. The National Trust's Quarry Bank and Styal Country Park is to the east. The airport's second runway crosses the River Bollin, a tributary of the River Mersey, which runs in a tunnel beneath the airfield.

Vehicle access to the airport is via the M56 motorway and A555, with Junction 5 of the M56 and the A555 providing access to passenger terminals and the airport complex and the A538 and Junction 6 of the M56 serving the World Freight Terminal to the west of the airport. These roads bound the airport to the north, west and south and provide for extensive local and national bus and coach connections to the airport. Manchester Airport station is served by trains operated by Northern, TransPennine Express, and Transport for Wales which connect the airport to Manchester Piccadilly and Crewe train stations and onwards. The station is also a terminus for the Manchester Metrolink light rail network.

Progress in adapting for climate change

Overview

We recognise that climate change should not be considered in isolation or responded to by us alone. To this end, our understanding of interdependencies in relation to climate change has significantly advanced through extensive collaboration with key business partners and agencies, including through active contributions to local Resilience Development Groups and Resilience Forums at Manchester, East Midlands, and London Stansted Airports. These forums are important to MAG and enjoy support from the Department for Communities and Local Government and the Environment Agency.

Our previous Adaptation Reports identified a number of actions intended to help us better understand the likely impact of climate change and to prepare our business for a changing climate. We have made significant progress against these actions, and this is discussed later in this report.

We have also re-evaluated and supplemented our assessment of climate change risk at each of our airports. Our updated climate change risk registers reflect changes to our business processes for risk and assurance, progress against previously identified actions, changes at our airports and development in our understanding of climate change. In addition, we have increased the focus placed on off-airport risks, which often involve interdependencies with other organisations. In re-assessing our risks, we have taken account of the latest projections by the Met Office of the impact of climate change on the UK weather, the UK Climate Projections 2018 (UKCP18)[5].

Reviewing our assessment of climate change risk

Approach to risk assessment

In July 2021, a series of Risk Workshops brought together colleagues in key roles at Manchester, East Midlands and London Stansted Airports and from MAG's group-wide business support functions to review and revise each airport's climate change risk register.

In previous years, climate change adaptation risks have been assessed through in-person risk workshops, with the exception of the first-round reporting for Stansted Airport which was managed by external consultants who gathered information through 1-2-1 interviews. Adapting to restrictions due to the COVID-19 pandemic, this year we ran smaller, virtual workshops for internal stakeholders.

[5] https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

A total of five workshops focussed on strategic asset management, engineering, and operations at each of our airports, reviewing climate adaptation risks associated with infrastructure and airport operations respectively. Discussion centred on evaluating the effectiveness of current risk controls in managing future risks, identifying knowledge gaps, and improving our understanding of interdependencies.

Our updated risk assessments, which are provided in Appendix 1 – 3, follow a consistent methodology to our previous risk registers. Consistent with MAG's last Climate Change Adaptation Reports, our assessment considers the impact and likelihood of potential risk consequences on a scale of 1 (minimal) to 5 (critical). The impact and likelihood scores for each risk are multiplied to calculate risk exposure, therefore the maximum exposure rating for any risk is 25. To best identify areas where further control is necessary, our climate change risk registers baseline future risk against current net risk.

UK Climate Projections (UKCP)

Our risk assessments were based upon the UKCP18 Probabilistic (25km) climate change projections for England which form part of the UKCP18 land projections. These Probabilistic projections were chosen as they offered the best fit for our risk assessment purposes in that they cover the full range of climate change scenarios, are comparable with UKCP09 (which was used for our previous assessments) and, for a given scenario, provide information on known uncertainties. In keeping with the approach used in previous reporting rounds, we have used projections for average temperature and rainfall under a medium emission scenario (RCP6.0) and at 50% probability.

While the UKCP18 Probabilistic projections were identified as the best fit for our purposes, we also considered whether supplementary information should be used to reflect variation due to the geographic spread of our airports. Our assessment of the UKCP18 Regional (12km) projections for North West, Central and Eastern regions concluded that variability between regions would not be material to our assessment outcomes. As such, we considered it appropriate to use the Probabilistic projections for England as the basis for our assessments.

Recognising the higher materiality of maximum summer temperatures to our assessments and the importance of other weather projections, participants were provided with details of:

- UKCP18 Regional (12km) projection for summer maximum temperature, which is not available through the Probabilistic projections, for the Central England region.
- Information about disruptive weather events drawn from Met Office resources and UKCP18 Regional projections, which were found to be similar between the sites.

Tables 1, 2 and 3 show projected changes in temperature, rainfall and to disruptive weather, which were used as inputs to risk workshops. The use of consistent projections for all airports increased accessibility of our risk workshops, which included attendees from all three airports, ensuring participants were able to make a full contribution.

Table 1: Projected change in temperature used in risk rating

Temperature (oC)	2030s (2020-2039)	2050s (2040-2059)	2080s (2070-2089)
Mean annual	+0.8	+1.2	+2.4
Winter average	+0.8	+1.1	+2.0
Summer average	+1.0	+1.6	+3.1
Summer maximum	+2.6	+4.0	+6.0

Table 2: Projected change in rainfall used in risk rating

Rainfall	2030s (2020-2039)	2050s (2040-2059)	2080s (2070-2089)
Winter average	+5%	+6%	+13%
Summer average	-7%	-14%	-22%

Table 3: Summary of projected changes in other key climate variables used in risk rating

Variable	Change
Storms	Frequency of periods of intense Summer and Autumn rainfall projected to increase. No quantitative data.
Windspeed	Very small changes to seasonal average wind speed. Summer: <0.2m/s reduction. Winter: no change.
Wind direction	Very small changes to seasonal average wind direction overall (<0.2m/s).
Snow	Annual snowfall: 60-80% less. Slight reduction in projected surface snow (0.3mm).
Lightning	Frequency assumed to increase during Summer in line with increased temperatures, more frequent dry spells and predicted increase in Summer intense rainfall. No quantitative data.

Climate change adaptation risks

East Midlands Airport climate change adaptation risks

Our East Midlands risk workshops reviewed and largely endorsed the risks identified in 2015. In taking the opportunity to be more outward-looking in our approach, participants identified new risks, some of which have been assessed as significant. A copy of the climate change adaptation risk register for East Midlands Airport is provided at Appendix 1a. The key risks identified are:

- Physical damage to infrastructure due to increased frequency and severity of storm events including high winds, rain, lightning and snow; and
- Release of contaminated surface water due to increased frequency and intensity of winter rainfall events leading to overspill of balancing ponds containing de-icing chemicals.

Other risks include:

- Downstream flooding due to increased high intensity rainfall events leading to high outflows as a result of balancing pond capacities being exceeded;
- Difficulties in snow contingency planning due to variability and unpredictability of snow events; and
- Disruption to flight schedules as a result of adverse weather and sea level rise/storm surge en-route and at destination airports.

Eight new risks were identified since 2015. These were:

- Increased variability and unpredictability of snow events challenging snow contingency plans;
- Restrictions to airport water supplies due to prolonged drought conditions and lowering of the water table;
- Operational and reputational disruption caused by disruption to off-airport surface transportation;

- Damage to on and off-airport infrastructure due to an increase in storm events including high winds, rain, lightning and snow;
- Disruption to delivery of essential supplies to the airport due to off-airport transport and other impacts;
- Off-airport flooding due to insufficient balancing pond capacity at times of extreme rainfall leading to high outflows and impacts downstream;
- Operational disruption due to climate impacts at destination airports and weather en-route; and,
- Increased cost of insurance cover as a result of increased climate-related insurance claims nationally and internationally.

When reviewing the 2015 risk registers, risk workshop participants took the opportunity to strengthen the wording of a number of risks and ensure the list of risk control measures was accurate and complete. They also sought to identify interdependencies with external stakeholders and identify appropriate action to better address such risks.

Following discussion, the risk relating to the pollution of local watercourses by accumulated drainage system debris was removed from the risk register on the basis that this was adequately covered by another risk.

London Stansted Airport climate change adaptation risks

This is the first of MAG's Climate Change Adaptation Reports to include London Stansted Airport. As such, the airport's risk register has been aligned with the approaches taken at our other airports. Despite this necessitating a degree of change to the way in which risks are presented, workshop participants identified little change to underlying risks to the business. A copy of the climate change adaptation risk register for Stansted Airport is provided at Appendix 1b. At Stansted, key risks include:

- Physical damage to infrastructure due to increased frequency and severity of storm events including high winds, rain, lightning and snow; and
- Release of contaminated surface water due to increased frequency and intensity of winter rainfall events leading to overspill of balancing ponds containing de-icing chemicals.

Other risks include:

- Difficulties in snow contingency planning due to variability and unpredictability of snow events;
- General disruption to the schedule as a result of adverse weather en-route and at destination airports;
- Restrictions to airport water supplies due to more frequent and prolonged periods of drought;
- Structural damage to surfaces caused by increased water ingress and temperature fluctuations;
- Downstream flooding due to increased high intensity rainfall events leading to high outflows as a result of balancing pond capacities being exceeded; and
- Damage or disruption to off airport surface access.

One new risk was identified since 2015. This relates to increased cost of climate-related insurance.

When reviewing the 2015 risk registers, risk workshop participants strengthened the wording of a number of risks and ensured the list of risk control measures was accurate and complete. They also sought to identify interdependencies with external stakeholders and identify appropriate action to better address such risks.

Following discussion, three risks were removed from the risk register. These were:

- Seasonal changes to fog-related disruption;
- Increased longevity of wing tip vortex effect; and,
- Changes to the prevailing wind direction.

Other risks contained in the 2015 register have been amalgamated into rephrased risks presented in the 2021 register.

Manchester Airport climate change adaptation risks

Risk workshops at Manchester Airport recorded similar risks to those identified in 2015. However, in taking the opportunity to be more outward-looking in our approach, this year we have identified new risks. A copy of the climate change adaptation risk register for Manchester Airport is provided at Appendix 1c. Key risks identified are:

- Physical damage to infrastructure due to increased frequency and severity of storm events including high winds, rain, lightning and snow;
- Release of contaminated surface water due to increased frequency and intensity of winter rainfall events leading to overspill of balancing ponds containing de-icing chemicals; and
- Increases in serious airfield safety incidents due to more frequent and/or severe weather events such as high winds, intense rainfall and icy conditions.

Other risks include:

- General disruption to the schedule as a result of adverse weather en-route and at destination airports;
- Difficulties in snow contingency planning due to variability and unpredictability of snow events;
- Damage to airport electrical systems due to lightning strikes arising from increased frequency of summer storm events;
- Structural damage to surfaces caused by increased water ingress and temperature fluctuations;
- Increased bird strike risk as a result of changing wildlife control needs; and
- Downstream flooding due to increased high intensity rainfall events leading to high outflows as a result of balancing pond capacities being exceeded.

Eight new risks were identified since 2015. These were:

- Restrictions to airport water supplies due to prolonged drought conditions and lowering of the water table;
- Operational disruption due to staffing impacts caused by congestion and disruption to off-airport surface transportation;
- Increased variability and unpredictability of snow events challenges snow contingency plans;
- Damage to on and off-airport infrastructure due to an increase in storm events (high winds, rain, lightning and snow);
- Disruption to delivery of essential supplies to the airport due to off-airport transport and other impacts;
- Off-airport flooding due to insufficient balancing pond capacity at times of extreme rainfall leading to high outflows and impacts downstream;
- Disruption to flight schedules as a result of adverse weather and sea level rise/storm surge en-route and at destination airports; and
- Increased cost of insurance cover as a result of increased climate-related insurance claims nationally and internationally.

When reviewing the 2015 risk registers, risk workshop participants strengthened the wording of a number of risks and ensure the list of risk control measures was accurate and complete. They also sought to identify interdependencies with external stakeholders and identify appropriate action to better address such risks.

Following extensive discussion in the virtual workshops, no risks were removed from the risk register.

Required actions

Following the approach taken in our first and second rounds of adaptation reporting, actions have been assigned one of three categories:

- Maintain a **watching brief** in the short-term using the latest information on climate projections and the situation at the airport.

- **Action** needed to mitigate or adapt to a climate change risk.
- **Investigate** a risk to more fully understand it, its associated impacts and the likelihood it leads to risk.

Details of our new actions are included in our risk registers which are provided in Appendix 1.

Progress against previously identified actions

The progress we have made towards fulfilling the actions detailed in our first and second round climate change adaptation report is discussed below. Actions identified at East Midlands, London Stansted and Manchester Airports are considered separately.

Some of the actions we previously identified have now been closed, and others remain open.

Climate change adaptation progress at East Midlands Airport

Table 4. Summary progress against actions identified for East Midlands Airport in previous climate change adaptation report, with reference to actions identified in 2021 risk assessment (see Appendix 1)

East Midlands Airport action	Progress	Current status and reference to actions (see Appendix 1)
Maintain a watching brief on the risk of thermal expansion of temporary building infrastructure, such as concrete and steel, leading to failures and reduced longevity.	Asset monitoring and data collection in place through asset management system which tracks failures and identifies trends in asset failure. Additionally, research has been undertaken into alternative construction methods and materials to combat the impact of heat.	**Closed** See related actions: CCA01.2021.G1 CCA01.2021.G2
Consider the impact of future climate variables on the condition of the runway and aprons as part of the proposed runway refurbishment project.	Runway resurfacing has been completed. The condition of the runway and aprons are assessed on an on-going basis through reactive audits and maintenance undertaken by the Asset Maintenance team. We are confident that our asset standards and renewal programmes are adequate to mitigate risks in this area.	**Closed**
Maintain a watching brief on the risk of landside surface and sub-surface structural damage to bituminous surfaces, such as car parks, landside roads caused by extreme heat.	This risk is monitored, and action informed by a number of ongoing actions. These include the collection and analysis of asset health data, audits and planned maintenance.	**Retain watching brief** Ref: CCA02.2021.G1
Escalate the issues regarding increased ground movement and the related risk of asset damage and instability that were identified during the annual 'CAP 232' [now CAP 1732] survey to the Head of Engineering. Revise and adapt maintenance regime as required.	Annual surveys undertaken in accordance with Civil Aviation Authority 'CAP1732'. Infrastructure issues are also considered as part of planned and reactive audits and maintenance.	**Closed** See related action: CCA02.2021.G2
Review the need for additional surface water drainage system capacity, including capacity for developments, and deliver capacity where a requirement identified. Deliver sustainable drainage solutions as part of future site developments.	The airport is currently reviewing its drainage systems with significant work planned. This is expected to include changes to the flow diversion at the eastern apron. Asset standards updated to require on-stie attenuation for new developments.	**Open** Ref: CCA05.2021.E1 See related action: CCA01.2021.G1
Model the impact of future developments on the drainage system capacity and implement controls where requirements are identified. Deliver sustainable drainage solutions as part of future site development.	A full review of the existing drainage network is planned for FY23 to improve data capture and inform decisions on future improvements to the system. Furthermore, surface water drainage asset standards have been updated and now require on site attenuation for any new developments.	**Closed** See related actions: CCA01.2021.G1 CCA05.2021.E1

East Midlands Airport action	Progress	Current status and reference to actions (see Appendix 1)
Maintain a watching brief on the increased risk of food damage to aircraft navigation systems/buildings and instrument landing systems.	Daily checks are performed on equipment, cabin and antenna structures. The design of cabins and the equipment used allows for elevation above ground level which mitigates against water ingress/flooding. Cabin structures are assessed on a regular basis. Engineers monitor and record asset condition of the functional system during planned maintenance visits. Asset health is also audited by internal compliance and CAA Engineering Inspector.	**Closed** See related actions: CCA01.2021.G1 CCA05.2021.G1 CCA05.2021.E1 CCA08.2021.G1 CCA08.2021.G2 CCA08.2021.G3
Develop Performance Based Navigation (PBN) arrival and departure routes as part of future Airspace Strategy to address the risk of extremities of wet and dry conditions affecting ground reflection or navigational aids.	Future Airspace Project has commenced and will deliver PBN procedures. On-airport infrastructure, such as instrument landing system (ILS), will still be required. Equipment choice allows for large deviations of the water table. French drains installed in the beam forming area, the airport has fire hydrants in locations near to Glidepath beam forming area which allows for rapid rehydration of arid areas.	**Open** Ref: CCA08.2021.G2
Maintain a watching brief on the increased risk of fire due to hotter, dryer summers and increased incidence of lightning in the summer months.	Airport Rescue and Firefighting Service has procedures in place to respond to any incidents relating to fire. Operational personal monitoring airfield 24/7.	**Retain watching brief** Ref: CCA09.2021.G1
Revise and adapt the runway inspection regime to mitigate the risk of increased build-up of rubber on the runway.	Regular runway inspections and friction testing allow asset health to be monitored, recorded and analysed. Rubber removal takes place as required to ensure adequate friction available to maintain safe operations. Airfield safety is regulated and inspected by the Civil Aviation Authority.	**Retain watching brief** Ref: CCA11.2021.G1
Research the risk regarding a potential increase in disease vectors at the airport as a result of climate change to fully understand the risk, existing controls and those that may be required.	Reviews are constantly undertaken with The UK Health Security Agency and the local resilience forums to identify emerging issues.	**Retain watching brief** Ref: CCA12.2021.G1
Maintain a watching brief on the additional measures that may be required to exercise an appropriate duty of care for the health and wellbeing of outside workers at times of extreme weather.	MAG Health & Safety polices in place for all employees, including risk assessments and safe systems of work.	**Retain watching brief** Ref: CCA13.2021.G1
Ensure that the thresholds for new plant and equipment as set out in the asset standards is aligned with predicted temperature increases during an asset's lifetime to ensure terminals have adequate cooling systems. Amend design standards where required to take account of climate change projections.	New cooling system and chillers installed in 2016, including new mechanisms to control temperature within terminal and immigration hall. New installations will be in accordance with our asset standards which were developed in 2018 and will be further reviewed to ensure alignment with the latest climate change projections.	**Retain watching brief** Ref: CCA14.2021.G1
Research the risk of increased noise complaints as a result of local residents opening windows at night due to hot weather causing in more detail to more fully understand the risk, existing controls and those that may be required.	The sound insulation grant scheme continues to meet planning obligations and will remain subject to periodic review, which will consider climate change impacts.	**Open** Ref: CCA15.2021.G1
Maintain a watching brief on the risk of pollution of local watercourses by debris accumulated in the drainage pipework following a prolonged dry spell.	Periodic inspections to identify debris conducted throughout the year with reactive maintenance work instructed to resolve. Further options to prevent accumulated debris will be identified as part of a project looking at the airport surface water drainage system in FY23.	**Closed** See related action: CCA02.2021.E1

East Midlands Airport action	Progress	Current status and reference to actions (see Appendix 1)
Revise and adapt the landscape management regime as required in response to changes to airfield habitats and wildlife control needs.	Wildlife hazard risk assessments are undertaken on an annual basis and will identify any future changes that require the management regime to be adapted accordingly.	**Retain watching brief** Ref: CCA16.2021.E1
Maintain a watching brief on the risk of increased rainfall and more frequent heavy rain events leading to increased airfield safety incidents.	This will be assessed as part of a wider project looking at the airport surface drainage system.	**Retain watching brief** Ref: CCA17.2021.E1
Maintain a watching brief on the risk of increased lightning events leading to asset damage, decreased ground handling performance, or a decrease in airfield/airspace availability.	Emergency and business continuity plans are in place for loss of services. Increased lightning events would impact on time performance due to mitigation measures implemented to ensure the safety of ramp workers.	**Retain watching brief** Ref: CCA18.2021.G1
Maintain a watching brief on the risk of increased local air quality pollutants, such as ozone, due to high temperatures/low dispersion condition	There are currently no ozone issues in the vicinity of the airport. Current compliance and anticipated (road traffic-related) nitrogen oxides (NOx) emission reductions suggest the likelihood of this risk is low.	**Closed** See related action: CCA20.2021.E1

Climate change adaptation progress at London Stansted Airport

Table 5. Summary progress against actions identified for London Stansted Airport in previous climate change adaptation report, with reference to actions identified in 2021 risk assessment (see Appendix 1)

London Stansted Airport action	Progress	Current status and reference to actions (see Appendix 1)
Maintain a watching brief on the changes in distribution of pests and wildlife species.	Our Wildlife Hazard Management Plan continues to be implemented. We engage the services of an external agronomist and Wildlife Hazard Audits are conducted on site to ensure risks are kept to a minimum and any actions are addressed.	**Retain watching brief** Ref: CCA16.2021.S1
To mitigate against the risk of increased/heavy rainfall leading to local flooding, airfield flooding or pollutant release, complete surface water modelling, implement Flood Risk Assessment measures, and update the attenuation policy.	Surface Water modelling has been completed. Practical validation of the model is planned for FY22.	**Open** Ref: CCA05.2021.S1
Maintain a watching brief on seasonal changes to fog related disruption that could disrupt operations.	Work complete with National Air Traffic Services London Terminal Control to ensure that their Low Visibility Matrix is applied to Stansted Airport. 'Category 3' instrument landing system operations maintained. In the event of any poor visibility conditions experienced, scheduled breaks throughout the day enable de-congestion of built-up traffic.	**Closed**
In response to the increased risk of schedule interruption due to loss of power during storms, develop and implement an electrical site resilience strategy, and put operational contingencies in place.	Our site resilience strategy was reviewed in 2018 following a desktop exercise with key stakeholders. Updated incident management system implemented.	**Closed**
Maintain a watching brief on the risk of increased longevity of the wing tip vortex effect and the related potential increase in property damage.	The introduction of newer aircraft, with more efficient designs, has reduced vortices.	**Closed**

London Stansted Airport action	Progress	Current status and reference to actions (see Appendix 1)
Maintain a watching brief on changes to the prevailing wind direction and the potential impact on the runway utilisation rate and schedules.	Long-term operational monitoring shows no change in runway utilisation. Airspace modernisation programmes will consider all options and be designed to the latest international aviation standards, including tailwind component negating the impact of the runway utilisation element of this risk. Further monitoring is required to understand the impact of changes to en route wind which could impact airline schedules.	**Closed**
Maintain a watching brief on the impact of increased lightning events on electricity supply systems and ground handling operational performance.	Back-up generators provide alternative power supplies. Fuel stock increased to mitigate risk of lightning strike. Bespoke weather forecasting contract provides us with early warning of thunderstorm activity.	**Retain watching brief** Ref: CCA18.2021.S1
Maintain a watching brief on the increased need for cooling to avoid overheating of aircraft on the stands.	Fixed electrical ground power is provided on each stand for every aircraft. In the event that this provision is unsuitable, local planning consents allow for use of an auxiliary power unit when the outside air temperature is above +20°C.	**Closed** See related action: CCA22.2021.G1
Maintain a watching brief on the increasing variability of snowfall and potential challenges to the airports winter contingency plans.	Winter Operations Plan reviewed at the end of each season, updated as required. Airfield de-icer supplier changed, increasing stock and improving product performance. Equipment regularly reviewed to respond to changes in demand.	**Retain watching brief** Ref: CCA23.2021.S1
Maintain a watching brief on the impact of extremities of wet and dry conditions affecting ground reflection navigation aids.	ILS grass areas maintained as part of the Wildlife Hazard Management Plan to ensure navigation aid compliance. Airfield drainage systems maintained to reduce impact of localised flooding.	**Retain watching brief** Ref: CCA08.2021.G1
Maintain a watching brief on the increased build-up of rubber on the runway.	Regular runway inspections and friction testing allow asset health to be monitored, recorded and analysed. Rubber removal takes place as required to ensure adequate friction available to maintain safe operations. Airfield safety is regulated and inspected by the Civil Aviation Authority.	**Closed** See related action: CCA11.2021.G1
Maintain a watching brief on the risk of remote impacts restricting the flow of essential supplies to the airport.	The airport has contingencies to ensure essential services are able to operate. We also have supply rationing polices in place in the event of disruption.	**Retain watching brief** Ref: CCA24.2021.S1
Maintain a watching brief on the impact of freezing/thawing on the integrity of surfaces and underground infrastructure.	This is a risk experienced at present, it will continue to be monitored. If the risk increases further, alternative treatments may be explored.	**Retain watching brief** Ref: CCA02.2021.G1
Maintain a watching brief on the impact of wind damage to operations and airport assets.	Airside assets designed to withstand strong winds (+100mph). Strong wind warning system in place to ensure aircraft and equipment safety.	**Retain watching brief** Ref: CCA19.2021.G1
Complete surface water modelling and a Flood Risk Assessment to identify if/where improvement works are required. Continue to monitor and stress test the Balancing Pond performance. Ensure site developments are assessed for additional impacts on the surface water drainage system.	Monitoring of balancing pond performance ongoing. Extreme weather conditions can overwhelm pond capacity in a short period of time. All site developments now required to include on-site attenuation to alleviate impacts on balancing ponds. Asset standards have been updated to reflect these additional requirements.	**Retain watching brief** Ref: CCA05.2021.G1
Sensitivity test the airport drainage infrastructure to ensure it is as robust as practicable to future climate extremes. Investigate and address risks of flooding to existing critical airport assets. Confirm the airport's attenuation policy.	Surface water modelling designed to address this risk is complete. The model needs external validation, scheduled for FY22.	**Closed** See related action: CCA05.2021.S1

London Stansted Airport action	Progress	Current status and reference to actions (see Appendix 1)
Monitor surface water drainage system performance and stress test predicted climate change performance. Liaise with the Environment Agency to identify any risk of flooding in a receiving watercourse and to determine their role in downstream flood management. Complete surface water modelling and take appropriate action.	Drainage capacity modelling and flood risk assessment has completed. Operational changes made to reduce impact of releasing contaminated surface water.	**Open** Ref: CCA05.2021.S2
To ensure continued security of water supply, develop a contingency and prioritisation plan with the water supply company, to include actions to ensure continued robustness of building design standards to future water resource constraints (BREEAM). Ensure adoption of demand management arrangements and water efficient technologies such as rainwater recycling as part of critical water use asset refurbishment and replacement projects.	Leak detection surveys undertaken to identify and address water wastage. Water efficiency measures have explored across the airport campus. Bathroom Asset Standards updated to include water efficiency measures as well as a requirement to assess waterless toilets/urinals.	**Closed**
Research aviation fuel spill clean-up options currently used at airports in warmer climates to commence to develop policies robust to air temperatures exceeding 38°C, and review fire water management procedures.	Comprehensive contingency plans in place and including COMAH controls for incidents and spillages of aviation fuels, Airport Fire and Rescue Service (ARFS) training and procedures for spill management audits by AFRS. Further research into impacts of air temperature increases required.	**Open** Ref: CCA10.2021.G1
Conduct research into the options currently used at airports in warmer climates for spill reporting and clean up.	Regular spill kit reviews conducted. Spill log and chemical storage log maintained, allowing trend analysis. Regular environmental audits, third party audits of operations and spill kits undertaken. Environmental management system certified to ISO14001, with regular independent audits of our system and operational controls/ legal compliance.	**Closed**
Ensure that the fire water demand assessment and related changes to the Fresh Water Pumping Station consider and address the potential for increased fire risk resulting from climate change, and review fire water management procedures.	Confirmed sufficient capacity available in fresh water pumping station and reservoirs. Fire management considered in development of new assets.	**Closed**
Maintain a watching brief on increased on-airport fire risk.	Possible increase in grass fires, lightning strikes and increased risk of flashpoint being reached for fuel spills identified. Airport Fire Service has procedures covering all fire incident types identified across the campus and are well resourced with vehicles and equipment.	**Closed**
Maintain a watching brief on increased wintery conditions that may pose a health and safety risk.	Winter Operations Plan required by the Civil Aviation Authority and updated after each season, includes safety requirements for third-party stakeholders.	**Retain watching brief** Ref: CCA13.2021.G1
Maintain a watching brief on impact of a changing climate on the health and wellbeing of outside workers.	MAG Health & Safety polices in place for all employees, including risk assessments and safe systems of work.	**Retain watching brief** Ref: CCA13.2021.G1
Maintain a watching brief on the risk of passenger overheating surface access transport.	Regular engagement with transport providers who are continually renewing their fleet with newer vehicle models. Stansted Express fleet replacement includes air conditioning.	**Retain watching brief** Ref: CCA26.2021.S1

London Stansted Airport action	Progress	Current status and reference to actions (see Appendix 1)
Maintain a watching brief on the risk of increased ground movement caused by prolonged drought conditions leading to airside and landside surface sub-surface structural damage.	Annual surveys undertaken in accordance with Civil Aviation Authority 'CAP1732'. Also considered as part of audits, inspections and maintenance.	**Retain watching brief** Ref: CCA02.2021.G2
Review building design standards to ensure robustness to future temperature change. Ensure design and development of London Stansted's long term master plan manages risks from future climate change.	Heating, ventilation and air conditioning (HVAC) climate control considered in the design phase of any planning for new or major changes to the buildings. Asset standard for Mechanical Building Services issued in 2018 covers building ventilation and air conditioning. Standard to be updated to take account of future changes to climate projections.	**Retain watching brief** Ref: CCA14.2021.G1
Maintain a watching brief on climate-related offsite impacts and the impact on the flow of people (passengers, crew and staff) to the airport	Regular meetings with stakeholders including local authorities, Transport for London and transport operators as part of Transport Forum, providing insight into any impacts on surface access flow.	**Retain watching brief** Ref: CCA26.2021.S2
Maintain a watching brief on Sea Level Rise and storm surge risks that will cause a loss of low-lying destination airports.	Further assessment required. We note research in this area by third parties including Eurocontrol, Airports Council International and United Nation's International Civil Aviation Organisation.	**Retain watching brief** Ref: CCA27.2021.G1
(30) Maintain a watching brief on the Sea Level Rise and storm surge risks to London, which would impact transport infrastructure and utility supply systems.	Separate climate risk assessments undertaken by transport and utility organisations. Awaiting submission of Third-Round reports by other organisations.	**Retain watching brief** Ref: CCA26.2021.S2
(31) Complete a comprehensive review of our noise insulation scheme in our sustainable development plan to ensure it considers increase in hot nights when residents are likely to keep windows open.	The sound insulation grant scheme continues to meet planning obligations and will remain subject to periodic review, which will consider climate change impacts.	**Open** Ref: CCA15.2021.G1
(32) Maintain a watching brief on the risk of an increase in disease vectors at the airport.	Reviews are constantly undertaken with The UK Health Security Agency and the local resilience forums to identify emerging issues.	**Retain watching brief** Ref: CCA12.2021.G1

Climate change adaptation progress at Manchester Airport

Table 6. Summary progress against actions identified for Manchester Airport in previous climate change adaptation report, with reference to actions identified in 2021 risk assessment (see Appendix 1)

Manchester Airport action	Progress	Current status and reference to actions (see Appendix 1)
Ensure building specifications consider future climate change predictions.	Group Asset Standards introduced in 2018. A review is required to ensure these have adequately considered climate change projections.	**Open** Ref: CCA01.2021.G1
Maintain a watching brief on airfield surface and sub-surface structural damage to the runway and aprons caused by extreme heat.	Infrastructure issues considered as part of planned and reactive audits and maintenance.	**Retain watching brief** Ref: CCA02.2021.G1
Maintain a watching brief on the risk of landside surface and sub-surface structural damage to bituminous surfaces, such as car parks, landside roads caused by extreme heat.	Routine asset monitoring and data collection within Maximo, the asset management system, tracks failures and identifies trends in asset failure. We have undertaken research into alternative construction methods and materials to combat the impact of heat.	**Closed** See related action: CCA02.2021.G1
Maintain a watching brief on the risk of increased ground movement, leading to instability of surrounding objects, buildings and structures.	Asset monitoring and data collection in place through asset management system which tracks failures and identifies trends in asset failure.	**Retain watching brief** Ref: CCA02.2021.G2

Manchester Airport action	Progress	Current status and reference to actions (see Appendix 1)
Maintain a watching brief on the risk of increased ground movement due to clay soil changes on which the airport is built.	Asset monitoring and data collection in place through asset management system which tracks failures and identifies trends in asset failure.	**Retain watching brief** Ref: CCA02.2021.G2
Prepare a business case to increase the capacity of surface water drainage system balancing ponds. Consider surface water capacity as part of the [Manchester Airport Transformation Programme, 'MAN-TP']. Consider standard design requirements as part of future development design criteria.	Project to improve capacity of the balancing ponds has been completed. Further projects under investigation or in planning. Ongoing monitoring of surface water attenuation performance. Asset standards updated to require on-stie attenuation for new developments.	**Retain watching brief** Ref: CCA05.2021.G1
Incorporate climate change as part of reviews undertaken with air navigation service provider (ANSP). Develop Performance Based Navigation (PBN) arrival and departure routes as part of future airspace strategy.	Safety case for navigational equipment considers operating temperatures. Airspace modernisation programme underway to remove dependence upon the on-airport 'DVOR' navigational aid and introduce PBN procedures. Further consideration given in NATS' climate risk assessments.	**Open** Ref: CCA08.2021.G2
Maintain a watching brief on an increased risk of fire due to hotter, dryer summers and increased incidence of lightning in summer	Airfield operations and air traffic control procedures in place to identify and alert Airport Fire Service to fires. Fire service procedures in place to respond to incidents relating to fire.	**Closed** See related action: CCA09.2021.G1
Maintain a watching brief on the risk of an increase of build-up of rubber on runway.	Regular runway inspections and friction testing allow asset health to be monitored, recorded and analysed. Rubber removal takes place as required to ensure adequate friction available to maintain safe operations. Airfield safety is regulated and inspected by the Civil Aviation Authority.	**Retain watching brief** Ref: CCA11.2021.G1
Research the risk of increased disease vectors at the airport due to a change in distribution in more detail to more fully understand the risk, existing controls and additional controls that may be required.	Reviews are constantly undertaken with The UK Health Security Agency and the local resilience forums to identify emerging issues.	**Retain watching brief** Ref: CCA12.2021.G1
Maintain a watching brief on the health and wellbeing of outside workers.	MAG Health & Safety polices in place for all employees, including risk assessments and safe systems of work.	**Retain watching brief** Ref: CCA13.2021.G1
Ensure that the thresholds for new plant and equipment as set out in the asset standards is aligned with predicted temperature increases during an asset's lifetime to ensure terminals have adequate cooling systems. Amend design standards where required to take account of climate change projections.	Heating, ventilation and air conditioning (HVAC) climate control considered in the design phase of any planning for new or major changes to the buildings. Asset standard for Mechanical Building Services issued in 2018 covers building ventilation and air conditioning. Standard to be updated to take account of future changes to climate projections.	**Retain watching brief** Ref: CCA14.2021.G1
Research the risk of increased noise complaints as a result of local residents opening windows at night due to hot weather causing in more detail to more fully understand the risk, existing controls and those that may be required.	The sound insulation grant scheme continues to meet planning obligations and will remain subject to periodic review, which will consider climate change impacts.	**Open** Ref: CCA15.2021.G1
Revise and adapt the habitat management regime as required to meet any changes to airfield habitats and related wildlife control needs.	Wildlife hazard risk assessments are undertaken on an annual basis and will identify any future changes that require the management regime to be adapted accordingly.	**Retain watching brief** Ref: CCA16.2021.M1

Manchester Airport action	Progress	Current status and reference to actions (see Appendix 1)
Maintain a watching brief on the impacts of increased rainfall and heavy rain events on airfield safety.	Winter Operations Plan expanded to include all types of weather-related events and threats. The airfield drains well, apart from one area on runway 05L/23R. Well established and tested low visibility procedures and in-depth understanding of pavement anti-icing fluid performance, particularly on saturated surfaces.	**Retain watching brief** Ref: CCA17.2021.M1
Maintain a watching brief on the risk of increased lightning events, leading to asset damage, decreased ground handling performance and decreased airfield/airspace availability.	Winter Operations Plan expanded to include all types of weather-related events and threats. Bespoke weather forecasting service includes lighting proximity warnings.	**Retain watching brief** Ref: CCA18.2021.M1
Maintain a watching brief on the risk of increased local air quality pollutants, such as ozone, due to high temperatures/low dispersion condition.	Air quality monitoring near to Manchester Airport recorded exceedances of the short-term air quality objective for ozone. However, the number of occurrences has reduced over recent years. Air quality improvements targeting oxides of nitrogen (NOx), including the phase out of petrol and diesel vehicles as well as the introduction of the Greater Manchester Clean Air Zone, are expected to lead to a reduction in the atmospheric formation of ozone. The results of air quality monitoring near to the airport are published annually on the airport website.	**Open** Ref: CCA20.2021.M1
Review historic data relating to aircraft performance in high temperatures and identify potential issues for escalation, such as longer aircraft take-off run and reduced aircraft engine efficiency.	Modern aircraft designed to operate within a wide-ranging envelope of operational conditions. Considering increased temperatures, meteorological conditions in Manchester are well within the capabilities of aircraft which have been proven to operate in warmer climates.	**Retain watching brief** Ref: CCA21.2021.M1
Maintain a watching brief over the need for additional cooling to maintain cabin comfort during turnround at times of high ambient temperatures	Operational procedures permit use of aircraft auxiliary power units in warmer temperatures, maintaining cabin comfort. The installation of pre-conditioned air was considered within MAN-TP business case, and it was decided not to install at this time.	**Open** Ref: CCA22.2021.G1

Interdependencies

Our first-round adaptation report identified a number of interdependencies. These were considered as part of our 2015 and 2021 climate change risk register review. Attendees of the risk workshops and virtual meetings did not identify any further interdependencies and felt those detailed in our first-round climate change adaptation report remain relevant.

Our membership of Sustainable Aviation and Airports Council International enables us to share our learning and reflect on actions taken by others. We also have strong links with both NATS and Eurocontrol who are responsible for the movement of aircraft within the UK and Europe respectively.

In addition to our aviation sector business partners, we work with our supply chain partners and other infrastructure providers on climate change adaptation. This includes our relationship with electricity distribution network operators, internet service providers, and ground transport operators such as National Highways, Network Rail, Transport for London, and Transport for Greater Manchester. We are also actively engaged with local authorities and planning authorities on resilience including climate change adaptation.

We strongly believe that a collaborative approach is required to enable our airports to fully prepare for climate change and to support our communities and wider industry peers. This is an opportunity for us to be part of the solution to climate change and help to mitigate its impact on the UK by maintaining the crucial

transport links that we provide. MAG has developed a better understanding of how our climate change adaptation actions will impact upon other stakeholders, and the roles other stakeholders have in enabling us to prepare for a changing climate. Through Local Resilience Forums and our established relationships with Local Authorities, the Environment Agency, water supply companies, transport providers and others we are working to better understand and address these interdependencies.

Monitoring and review

The climate change risk registers for our airports contribute to our corporate assessment of risk. An overall assessment of the risk climate change poses to MAG is included within our corporate risk register. This ensures that climate change risk is discussed at the highest level within the organisation.

Climate change is at the forefront of our approach to having a sustainable business and, as a result, our governance will be increasingly influenced by climate risks and exposures identified over the short, medium and long term that are identified in this report and previous Adaptation Reports. Alongside this, we will continue to refine and develop our approach to TCFD as we progress our understanding of the financial risks and opportunities of climate change to our business. We will meet the recommendations in full, ahead of forthcoming mandatory reporting.

In the interim period, progress against the actions identified in our climate change adaptation risk registers will be regularly reviewed. In addition to maintaining positive working relationships with our infrastructure partners, we will continue to monitor and identify any new or emerging interdependencies and conduct scenario analysis to ensure that we are considering every possible risk to the business going forward.

Appendix 1: Climate change adaptation risk registers

Appendix 1a: East Midlands Airport climate change adaptation risk register

East Midlands Airport climate change adaptation risk register (2021)																					
Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
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CCA01	Summer temperature	**Thermal expansion** of building infrastructure, such as concrete and steel, leading to failures and reduced lifespan.	There is a current lack of knowledge around the vulnerability of the airport buildings design to the projected future temperatures.	- Financial costs of repair/replacement - Operational disruption - Airport closure - Reputational damage	2	2	4	- Structural inspections - Asset maintenance schemes - Capex plans that align to assets - Conformance with asset standards and Building Regulations	CCA01.2021.G1 Action: Ensure specifications for future developments and asset renewals consider climate change predictions. CCA01.2021.G2 Action: Seek specialist advice to ensure risk assessment is valid.	2	2	4	2	3	6	3	3	9	
CCA02	Summer temperature, Summer rainfall, Winter rainfall	**Structural damage to airside** runway, aprons and airfield subsurface caused by extreme heat or water ingress.	It is known that a combination of water ingress and temperature fluctuations causes deterioration in these surfaces.	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Operational disruption - Airport closure - Reputational damage	2	3	6	- Conformance to asset standards and Building Regulations - Management and maintenance plans - Remedial capabilities and ability to respond to issues on the runway quickly	CCA02.2021.G1 Watching brief: Impact of water ingress freeze/thaw and heat. CCA02.2021.G2 Watching brief: Increased ground movement leading to structural damage. See CCA01.2021.G1	2	3	6	2	4	8	3	4	12	Life cycle for a runway surface is 12-15 years so it will have been replaced a number of times over these time horizons.

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CCA03	Summer temperature, Summer rainfall, Winter rainfall	**Structural damage to landside** bituminous surfaces/subsurface such as car parks and landside roads caused by extreme heat or water ingress.	It is known that a combination of water ingress and temperature fluctuations causes deterioration in these surfaces.	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Operational disruption - Reputational damage - Cost of claims for damage/injury - Disruption to surface access to the airport	1	2	2	- Conformance to asset standards and Building Regulations - Management and maintenance plans - Remedial capabilities and ability to respond to issues quickly	See CCA01.2021.G1 See CCA02.2021.G1	1	1	1	1	3	3	1	4	4	
CCA04	Summer temperature, Summer rainfall, Winter rainfall	**Damage to buildings and belowground structures** and utilities due to increased ground movement.	Risk expected due to warmer, dryer summers and increased variance between summer and winter soil moisture levels particularly for clay soils	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Increased inspection and maintenance needs - Operational disruption - Reputational damage - Potential health and safety risk related to energy systems	1	1	1	- Inspection and maintenance programme - Conformance to asset standards and Building Regulations	See CCA01.2021.G1 See CCA02.2021.G2	1	1	1	1	2	2	1	3	3	

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CCA05	Winter rainfall, Summer rainfall	**Release of contaminated surface water** in contravention of environmental permits as a result of storm event, including exceeding balancing pond capacity.	Airfield run-off is held in balancing ponds to allow for degradation of de-icing chemicals to acceptable concentrations prior to discharge. A significant rainfall event during winter de-icing season could flush de-icer out of the ponds.	- Regulatory notification/fines - Reputational damage - Off-airport environmental impacts - Restrictions on future on-airport development - Requirement for airport infrastructure development (e.g. de-icing pads)	3	3	9	- Pollution control system design capacity - Agreed contingency plans - Elimination of clean rainwater to reduce capacity requirement - Monitoring and management systems	CCA05.2021.G1 Watching brief: Drainage system capacity in light of updated climate projections and site developments. CCA05.2021.E1 Action: Complete review of drainage system, identifying and implementing improvements. See CCA01.2021.G1	2	3	6	4	4	16	4	4	16	
CCA06	Winter rainfall	**On-airport flooding** due to insufficient on-airport drainage capacity leading to schedule disruption and damage to below ground infrastructure.	Airport drainage is held in balancing ponds, more intense rainfall could lead to flooding on the airport campus if the drainage system is unable to cope.	- Financial costs of repair/replacement - Operational disruption - Reputational damage	1	3	3	- Inspection and maintenance programme - Flood detection - Conformance to asset standards and Building Regulations	See CCA01.2021.G1 See CCA05.2021.G1 See CCA05.2021.E1	1	3	3	1	3	3	2	3	6	Risk of flooding is anticipated to increase in line with the projected increase in rainfall, but be offset by investment in drainage systems.

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CCA07	Winter rainfall	**Off-airport flooding** due to insufficient balancing pond capacity at times of extreme rainfall leading to high outflows and impacts downstream.	Airport drainage is held in balancing ponds, more intense rainfall could lead to flooding off the airport campus if the drainage system is unable to cope.	- Flooding of downstream properties and infrastructure - Cost of putting in place emergency arrangements - Reputational damage - Cost and operational disruption of retrofitting systems - Environmental permit and planning obligation changes - Cost of claims for damage/injury	2	3	6	- Input to Environment Agency contingency planning - Relationship with local authorities - Surface water attenuation for new developments	CCA007.2021.E1 Action: Continue to liaise with Local Authority and Environment Agency over flood contingency planning. See CCA01.2021.G1 See CCA05.2021.G1 See CCA05.2021.E1	2	2	4	2	3	6	2	4	8	Higher risk of flooding over time. Potential for significant cost or planning conditions in future development. Airport could be held responsible by stakeholders for flooding.

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CCA08	Summer rainfall, Winter rainfall	**Misalignment of navigational aids**, communications and surveillance systems due to extreme changes in wet/ dry surface conditions.	Extreme raising and lowering of the water table may lead to incorrect instrument alignment.	- Financial costs of repair/replacement - Operational disruption - Reduced aircraft movements - Increase in aircraft safety incidents - Reputational damage	3	1	3	- Inspection and maintenance programme	CCA08.2021.G1 Watching brief: Changes to ground conditions affecting navigation aids. CCA08.2021.G2 Action: Develop Performance Based Navigation (PBN) arrival and departure routes as part of future airspace strategy. CCA08.2021.G3 Watching brief: Monitor for new technology to move away from ground-based approach. See CCA01.2021.G1	3	1	3	3	1	3	3	1	3	No change in scores anticipated over time as risk can be managed through current controls. New technology could reduce risk in the 2050s and 80s.

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CCA09	Summer temperature, Summer rainfall, Lightning	**Schedule disruption** due to low visibility or structural damage caused by off-airport vegetation fires.	Grass and vegetation fires could cause poor visibility due to smoke and possible fire damage to infrastructure servicing the airport.	- Minor operational disruption	2	2	4	- Local authority and airport fire services - Air traffic control procedures to redirect aircraft where required - Communications with local emergency services and responder networks - External communication channels to alert passengers of schedule disruption	CCA09.2021.G1 Watching brief: On frequency and type of on and off-airport fires.	2	2	4	2	2	4	2	2	4	Land surrounding EMA is expected to become more developed over this time period. This will reduce the amount of vegetation around the airport that could catch fire.

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CCA10	Summer temperature	**Operational disruption, asset damage and employee safety risks** due to increased risk of on-airport fires.	Increased chance of fire from dry vegetation, waste and litter.	- Financial costs of repair/replacement - Operational disruption - Increase in aircraft safety incidents - Reputational damage - Increase in accident/incident frequency	2	2	4	- Airport fire service - Airfield and landscape management plans - Asset standards that minimise fire risk and damage potential - Mitigation measures are reviewed annually and aligned with regulations	CCA10.2021.G1 Investigate: Impacts of increased temperature on fuel spill and associated fire risk. See CCA09.2021.G1	2	2	4	2	2	4	2	2	4	Moving from kerosene to sustainable aviation fuel, electric or hydrogen-fuelled aircraft could reduce the fire risk. Although there is a recognised increased chance of aircraft fuel venting, this is not anticipated to increase fire risk because projected temperatures are below the auto-ignition threshold and procedures are in place to prevent exposure to ignition sources.

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CCA11	Summer temperature	**Increased runway closure / maintenance** requirement due to build-up of rubber on runway surface.	Requirement to maintain appropriate friction level drives the need for regular runway maintenance.	- Operational disruption - Aircraft safety incident - Increased cost of rubber removal - Degradation/ decreased lifetime of the runway through increased cleaning activity	1	1	1	- Inspection and maintenance programme - Friction monitoring - Rubber removal contract in place	CCA11.2021.G1 Watching brief: Rubber cleaning frequency and technological advances in aircraft tyres and runway material. See CCA01.2021.G1	1	1	1	1	1	1	1	1	1	A number of technological advances are expected to take place over the time horizons that will reduce this risk. UK temperatures not expected to exceed those already experienced at other global airports.
CCA12	Summer temperature, Winter temperature, Summer rainfall, Winter rainfall	**Increase in disease vectors and hence incidence of "tropical" diseases** at and around the airport resulting from climate change providing a newly hospitable environment for imported species.	Potential increase in disease vectors such as mosquitos leading to increase in certain diseases such as West Nile Virus.	- Employee and public health impact - Reputational damage	1	1	1	- On-going liaison with Local Resilience Forum and The UK Health Security Agency - Occupational health department	CCA12.2021.G1 Watching brief: On the risk of an increase in disease vectors.	1	1	1	1	1	1	1	3	3	Expected to increase over time, warmer winter temperatures will reduce natural seasonal mitigation, with an increased likelihood in the 2080s. This would be a national challenge but it is acknowledged that it is something that airports have a role in managing.

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CCA13	Summer temperature, Winter temperature, Winter rainfall	**Impact to health and wellbeing** of outside workers during extreme weather events due to inadequate PPE and rostering processes.	Heat exhaustion, dehydration and sunburn during extended hot spells in summer and hypothermia, slips/trips in icy or wet conditions during winter.	- Increase in accident/incident frequency - Reputational damage - Reduced productivity due to exhaustion and the need for respite - Need to increase staffing levels to maintain productivity	2	2	4	- Occupational health department - Health and safety risk assessment process, including provision of PPE, increased breaks and sun protection where required - Communication of weather forecasts to on-airport community - Operational procedures, including Winter Operations Plan	CCA13.2021.G1 Watching brief: Health, safety and wellbeing measures required to manage impact of changes to temperature and rainfall on outside workers.	1	1	1	1	2	2	1	3	3	Increase in likelihood from the 2050s, but the impact is anticipated to be unchanged as risk can be managed by applying current controls.
CCA14	Summer temperature	**Decrease in passenger and staff comfort** within airport buildings caused by inadequate cooling systems.	Heat exhaustion, dehydration and unworkable conditions for colleagues and passengers within those areas.	- Decline in revenue and passenger numbers - Reputational damage - Increased staff absence - Increase in staff and passenger ill-health	1	1	1	- Heating, ventilation and air-conditioning systems - Ongoing HVAC maintenance programme - Capital plans for new and replacement assets - Conformance to asset standards and Building Regulations	CCA14.2021.G1 Watching brief: Asset standards for heating, ventilation and air conditioning to be reviewed when updated climate change projections released. See CCA01.2021.G1	1	1	1	1	1	1	1	1	1	Asset standards, maintenance and capital plans will ensure that HVAC systems continue to maintain comfortable environments.

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CCA15	Summer temperature	**Increased community complaints** due to greater disturbance from aircraft operations, particularly on warm nights when residents' windows are open or due to wing tip vortex damage.	Aircraft operations give rise to noise which can be disturbing to local communities. Warmer temperatures are known to result in higher complaint numbers.	- Requirement for, and cost of, additional noise mitigation - Imposition of operational restrictions - Reputational damage	2	1	2	- Noise Action Plan - Sound Insulation Grant Scheme - Community engagement - Input to local planning policy by providing noise contours and responding as a statutory consultee	CCA15.2021.G1 Action: Consider climate change impacts during future review of sound insulation grant scheme.	2	1	2	2	1	2	2	2	4	This risk could increase with further development closer to the airport.
CCA16	Summer temperature, Summer rainfall, Winter temperature, Winter rainfall	**Changes to wildlife control** required due to changing airfield habitats.	Wildlife strikes pose a threat to aviation safety. Climate change could lead to different habitat, wildlife species and behaviour.	- Increasing wildlife strike risk/operational safety incidents - Reputational damage - Operational disruption	1	1	1	- Wildlife and airfield grassland management plan in place - Habitat management regime in line with Civil Aviation Authority 'CAP 772' requirements - Wildlife management operators	CCA16.2021.E1 Watching brief: Changes in distribution of wildlife species.	1	1	1	1	1	1	1	1	1	

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CCA17	Winter rainfall, Summer rainfall, Winter temperature	**Increase in serious airfield safety incidents** due to severe weather events.	Severe weather presents a risk to aviation safety.	- Aircraft/vehicle collision - Operational disruption - Health & Safety incidents - Increased runway excursion - Need for increased runway grooving	2	5	10	- Winter operations plan and activities - Safety management system requirement for risk assessments	CCA17.2021.E1 Watching brief: On changes to airfield safety procedures due to climate change.	2	5	10	2	5	10	2	5	10	
CCA18	Lightning	**Damage to assets and operational disruption** due to an increase in lightning events.	Lightning presents a risk of building and infrastructure damage, including to electrical, communications and navigational systems. Lightning damage and safety procedures during storm events are known to lead to operational disruption.	- Financial costs of repair/replacement - Operational disruption - Reputational damage - Health & Safety incidents - Damage to the surface of the runway, navigational systems and other assets	2	4	8	- Inspection, maintenance and repair capabilities - Conformance to asset standards and Building Regulations - Equipment design incl. contingency features such as lightning protection - Operational procedures - UPS to critical systems	CCA18.2021.G1 Investigate: Lightning detection and prediction technology. CCA18.2021.E1 Watching brief: On impact of increased lightning events on electricity supply systems and ground handling operational performance.	2	4	8	2	4	8	2	4	8	

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CCA19	Storms	**Damage to on and off-airport infrastructure** due to an increase in storm events (high winds, rain, lightning and snow).	Storm events, including high winds and intense rainfall, have the potential to cause damage to infrastructure.	- Operational disruption - Financial costs of repair/replacement - Disruption to airport surface access, particularly public transport - H&S incident - Reputational damage	3	4	12	- Inspection, maintenance and repair capabilities - Conformance to asset standards and Building Regulations - Asset renewal strategy	CCA19.2021.G1 Watching brief: On impact of wind damage to airport assets. See CCA01.2021.G1	2	4	8	4	4	16	4	4	16	
CCA20	Summer temperature	**Poor local air quality** due to increased frequency of low dispersion conditions, particularly during prolonged hot spells.	Air quality is an important public health issue which is interdependent with climatic conditions.	- Reputational damage - Increased local, regional or national controls on air emissions - Increased absence of vulnerable staff - Increase in ill-health of vulnerable passengers or community members	1	1	1	- Airport air quality monitoring - Engagement with local authority environmental health teams - Airport Sustainable Development Plan	CCA20.2021.E1 Action: Continue to monitor and report air quality at the airport, engaging local authority environmental health teams to identify and resolve issues.	1	1	1	2	1	2	2	1	2	Increased impact in future years due to anticipated increase in stakeholder interest in this issue.

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CCA21	Summer temperature	Impact of climate change on **aircraft performance.**	Due to reduced air density, the take-off performance of aircraft degrades in warmer conditions. In extreme circumstances this can reduce aircraft payload or range.	- Reduction in aircraft payload with consequential financial impact - Inability to operate certain aircraft type/route combinations - Lower efficiency on approach and departure, increased emissions - Increased noise impacts - Potential capital investment required to extend the runway - Current safeguarding measures could be insufficient for future performance - Reputational damage - Potential to limit growth opportunities	2	1	2	- Weather reporting to enable adjustments to be made to operating capabilities - Communications with new operators - Community engagement programme	CCA21.2021.E1 Watching brief: On instances of range/payload limitation.	2	1	2	2	1	2	2	2	4	Current aircraft operate to countries that are experiencing projected temperatures today. Assumed that future and emerging aircraft technology will be designed to a changing climate.

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CCA22	Summer temperature	**Increased need for aircraft cabin cooling and energy** to cool aircraft interior on stand in order to maintain comfortable cabin conditions during turnaround.	Warmer temperatures will require increased use of aircraft auxiliary power units (APU) or installation of pre-conditioned air (PCA). Installation of PCA is a significant infrastructure project and investment. APU use currently discouraged for noise and emissions reasons.	- Cost of installation, operation and maintenance of PCA - Increased workplace exposure to combustion gases - Impact on noise local air quality	2	2	4	- Asset strategy - APU use permitted on warmer days - Noise action plan	CCA22.2021.G1 Investigate: The temperature conditions under which there will be a requirement for PCA and energy system implications.	2	1	2	2	3	6	2	4	8	Increasing number of days when cabin cooling required. Greater utility demand from cooling with (PCA). Technology developments could mean aircraft are better at cooling.
CCA23	Winter temperature	**Increased variability and unpredictability of snow events** challenges snow contingency plans.	As the frequency of snow events decrease it is more difficult to assess the cost-benefit of investing in snow clearance equipment and contingency planning.	- Potential large investment in equipment that is not used, or significant disruption when an infrequent snow event occurs due to inadequate equipment and processes - Reputational damage - Operational disruption	3	3	9	- Winter operations plan and activities - Communication of weather forecasts to on-airport community	CCA23.2021.E1 Watching brief: Increasing variability of snowfall and potential challenges to winter contingency plans.	4	2	8	4	2	8	4	2	8	Increase in passenger numbers could mean there will be less resilience built-in

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CCA24	Summer temperature, Winter rainfall, Storms	**Disruption to delivery of essential supplies** to the airport due to off-airport transport and other impacts.	Extreme weather events including prolonged hot spells, high winds, snow and flooding can disrupt road and rail networks.	- Operational disruption - Short-term shortages of supplies - Reputational damage - Lost revenue	2	2	4	- Multiple suppliers for key supplies of food/drink - Contractual levers available to secure supply - Ongoing engagement with Highways England and Network Rail to manage disruption to surface access	CCA24.2021.E1 Watching brief: Disruption to delivery of essential supplies to the airport. CCA24.2021.E2 Action: Continued engagement with transport partners to manage disruption to surface access.	2	2	4	2	3	6	2	3	6	Significant infrastructure improvement is required to mitigate the potential for disruption, which is outside of MAG's control. Future planning standards could improve and reduce the risk but it is not possible to determine at present.
CCA25	Summer rainfall, Winter rainfall, Summer temperature	**Restrictions to airport water supplies** due to prolonged drought conditions and lowering of water table.	Potential for water supplier drought orders to limit the availability or use of mains water.	- Prohibition of certain non-critical activities such as washing - Financial impact arising from need to obtain alternative sources of water - Reputational impact - Asset renewal to introduce water efficient equipment	2	2	4	- Leak detection and repair programme - Distribution system maintenance / upgrade - Conformance to asset standards and Building Regulations - Asset renewal strategy - Ongoing dialogue with water companies	CCA25.2021.E1 Watching brief: On water scarcity issues with a view to preparing drought management plan when required.	1	3	3	2	2	4	2	3	6	

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA26	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature	**Damage or disruption to off-airport surface access** leading to impacts on passenger and staff journeys to/from airport.	Extreme weather events including prolonged hot spells, high winds, snow and flooding can disrupt public transport and road networks. Although this would not be MAG's responsibility, the risk is that access to the airport is perceived as unreliable.	- Operational disruption created by impacts on rosters - Reputational impact	2	2	4	- Multiple surface access options are available - Weather forecasting and pre-emptive planning - Monitoring of transport networks through communications from transport organisations - Procedures in place at airport to respond - Communications process for customers and staff - Engagement with local resilience forums regarding transport and network issues	CCA26.2021.E1 Watching brief: Climate-related offsite impacts on the flow of people to the airport. See CCA24.2021.E2	2	1	2	2	3	6	2	3	6	Expectation that demand will continue to be proactively managed in response to this risk. Anticipated decrease in frost events will have beneficial impact - most significant is expected to be in relation to summer temperature and rainfall.
CCA27	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature	**Disruption or changes to schedule due to en-route weather and sea level rise/storm surge**, including origin and destination airports.	Disruptive weather and sea-level rise/storm surges have the potential to cause disruption at origin/destination airports and en-route requiring temporary or permanent changes flight schedules.	- Operational disruption - Redistribution of market share to alternative routes	2	4	8	- Existing arrangements for diversion airports in case of disruption in-flight - European network management - Operational disruption and resilience plans	CCA27.2021.G1 Watching brief: Impact of sea level rise and storm surge on origin and destination airports. CCA27.2021.E1 Watching brief: Impact of extreme weather on schedules.	2	4	8	3	4	12	4	4	16	Changes to route networks due to sea level rise/storm surge expected to manifest gradually in later time periods and allow market redistribution.

East Midlands Airport climate change adaptation risk register (2021)																			
Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA28	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature, Storms, Snow	**Increased climate-related insurance claims** nationally and internationally.	Increased severity and frequency of extreme weather events of all types are likely to lead to increased damage, disruption and therefore insurance claims. As part of a global risk pool, MAG insurance costs increase as a result of natural disaster / catastrophe globally.	- Increased cost of insurance cover for operational disruption and infrastructure damage - Increased limitations to the availability and/or scope of insurance cover - Increased costs across the whole MAG insurance portfolio as insurers look to recoup losses incurred globally	1	4	4	-MAG has two brokers who negotiate with insurers on our behalf - Insurance team and senior management engage insurers annually to inform them of the robust controls to prevent and manage claims -MAG Insurance engages the Board and Audit Committee on strategic decision making to influence premium spend i.e. sums insured and deductibles	CCA28.2021.G1 Action: Develop insurance strategies to manage climate change risk.	1	3	3	1	4	4	1	4	4	

Appendix 1b: London Stansted Airport climate change adaptation risk register

London Stansted Airport climate change adaptation risk register (2021)																				
Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA01	Summer temperature	**Thermal expansion** of building infrastructure, such as concrete and steel, leading to failures and reduced lifespan.	There is a current lack of knowledge around the vulnerability of the airport buildings design to the projected future temperatures.	- Financial costs of repair/replacement - Operational disruption - Airport closure - Reputational damage	2	2	4	- Structural inspections - Asset maintenance schemes - Capex plans that align to assets - Conformance with asset standards and Building Regulations	CCA01.2021.G1 Action: Ensure specifications for future developments and asset renewals consider climate change predictions. CCA01.2021.G2 Action: Seek specialist advice to ensure risk assessment is valid.	2	2	4	2	3	6	3	3	9	
CCA02	Summer temperature, Summer rainfall, Winter rainfall	**Structural damage to airside** runway, aprons and airfield subsurface caused by extreme heat or water ingress.	It is known that a combination of water ingress and temperature fluctuations causes deterioration in these surfaces.	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Operational disruption - Airport closure - Reputational damage	2	3	6	- Conformance to asset standards and Building Regulations - Management and maintenance plans - Remedial capabilities and ability to respond to issues on the runway quickly	CCA02.2021.G1 Watching brief: Impact of water ingress freeze/thaw and heat. CCA02.2021.G2 Watching brief: Increased ground movement leading to structural damage. See CCA01.2021.G1	2	3	6	2	4	8	3	4	12	Life cycle for a runway surface is 12-15 years so it will have been replaced a number of times over these time horizons.

London Stansted Airport climate change adaptation risk register (2021)																				
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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA03	Summer temperature, Summer rainfall, Winter rainfall	**Structural damage to landside** bituminous surfaces/subsurface such as car parks and landside roads caused by extreme heat or water ingress.	It is known that a combination of water ingress and temperature fluctuations causes deterioration in these surfaces.	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Operational disruption - Reputational damage - Cost of claims for damage/injury - Disruption to surface access to the airport	1	2	2	- Conformance to asset standards and Building Regulations - Management and maintenance plans - Remedial capabilities and ability to respond to issues quickly	See CCA01.2021.G1 See CCA02.2021.G1	1	1	1	1	3	3	1	4	4	
CCA04	Summer temperature, Summer rainfall, Winter rainfall	**Damage to buildings and belowground structures** and utilities due to increased ground movement.	Risk expected due to warmer, dryer summers and increased variance between summer and winter soil moisture levels particularly for clay soils	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Increased inspection and maintenance needs - Operational disruption - Reputational damage - Potential health and safety risk related to energy systems	1	1	1	- Inspection and maintenance programme - Conformance to asset standards and Building Regulations	See CCA01.2021.G1 See CCA02.2021.G2	1	1	1	1	2	2	1	3	3	

London Stansted Airport climate change adaptation risk register (2021)																			
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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA05	Winter rainfall, Summer rainfall	**Release of contaminated surface water** in contravention of environmental permits as a result of storm event, including exceeding balancing pond capacity.	Airfield run-off is held in balancing ponds to allow for degradation of de-icing chemicals to acceptable concentrations prior to discharge. A significant rainfall event during winter de-icing season could flush de-icer out of the ponds.	- Regulatory notification/fines - Reputational damage - Off-airport environmental impacts - Restrictions on future on-airport development - Requirement for airport infrastructure development (e.g. de-icing pads)	3	3	9	- Pollution control system design capacity - Input to water company strategic plan - Agreed contingency plans - Elimination of clean rainwater to reduce capacity requirement - Monitoring and management systems	CCA05.2021.G1 Watching brief: Drainage system capacity in light of updated climate projections and site developments. CCA05.2021.S1 Action: Complete validation of drainage model during FY22. CCA05.2021.S2 Action: Share results of drainage modelling with Environment Agency and Local Authorities, working to minimise risk of pollution and/or flooding downstream. See CCA01.2021.G1	2	3	6	3	4	12	3	4	12	

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA06	Winter rainfall	**On-airport flooding** due to insufficient on-airport drainage capacity leading to schedule disruption and damage to below ground infrastructure.	Airport drainage is held in balancing ponds, more intense rainfall could lead to flooding on the airport campus if the drainage system is unable to cope.	- Financial costs of repair/replacement - Operational disruption - Reputational damage	1	3	3	- Inspection and maintenance programme - Flood detection - Conformance to asset standards and Building Regulations	See CCA01.2021.G1 See CCA05.2021.G1 See CCA05.2021.S1	1	3	3	1	3	3	2	3	6	Risk of flooding is anticipated to increase in line with the projected increase in rainfall, but be offset by investment in drainage systems.
CCA07	Winter rainfall	**Off-airport flooding** due to insufficient balancing pond capacity at times of extreme rainfall leading to high outflows and impacts downstream.	Airport drainage is held in balancing ponds, more intense rainfall could lead to flooding off the airport campus if the drainage system is unable to cope.	- Flooding of downstream properties and infrastructure - Cost of putting in place emergency arrangements - Reputational damage - Cost and operational disruption of retrofitting systems - Environmental permit and planning obligation changes - Cost of claims for damage/injury	2	3	6	- Input to Environment Agency contingency planning - Relationship with local authorities - Surface water attenuation for new developments	CCA007.2021.S1 Action: Continue to liaise with Local Authority and Environment Agency over flood contingency planning. See CCA01.2021.G1 See CCA05.2021.G1 See CCA05.2021.S1	2	2	4	2	3	6	2	4	8	Higher risk of flooding over time. Potential for significant cost or planning conditions in future development. Airport could be held responsible by stakeholders for flooding.

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA08	Summer rainfall, Winter rainfall	**Misalignment of navigational aids**, communications and surveillance systems due to extreme changes in wet/ dry surface conditions.	Extreme raising and lowering of the water table may lead to incorrect instrument alignment.	- Financial costs of repair/replacement - Operational disruption - Reduced aircraft movements - Increase in aircraft safety incidents - Reputational damage	3	1	3	- Inspection and maintenance programme	CCA08.2021.G1 Watching brief: Changes to ground conditions affecting navigation aids. CCA08.2021.G2 Action: Develop Performance Based Navigation (PBN) arrival and departure routes as part of future airspace strategy. CCA08.2021.G3 Watching brief: Monitor for new technology to move away from ground-based approach. See CCA01.2021.G1	3	1	3	3	1	3	3	1	3	No change in scores anticipated over time as risk can be managed through current controls. New technology could reduce risk in the 2050s and 80s.

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA09	Summer temperature, Summer rainfall, Lightning	**Schedule disruption** due to low visibility or structural damage caused by off-airport vegetation fires.	Grass and vegetation fires could cause poor visibility due to smoke and possible fire damage to infrastructure servicing the airport.	- Minor operational disruption	2	2	4	- Local authority and airport fire services - Air traffic control procedures to redirect aircraft where required - Communications with local emergency services and responder networks - External communication channels to alert passengers of schedule disruption	CCA09.2021.G1 Watching brief: On frequency and type of on and off-airport fires.	2	2	4	2	2	4	2	2	4	

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA10	Summer temperature	**Operational disruption, asset damage and employee safety risks** due to increased risk of on-airport fires.	Increased chance of fire from dry vegetation, waste and litter.	- Financial costs of repair/replacement - Operational disruption - Increase in aircraft safety incidents - Reputational damage - Increase in accident/incident frequency	2	2	4	- Airport fire service - Airfield and landscape management plans - Asset standards that minimise fire risk and damage potential - Mitigation measures are reviewed annually and aligned with regulations	CCA10.2021.G1 Investigate: Impacts of increased temperature on fuel spill and associated fire risk. See CCA09.2021.G1	2	2	4	2	2	4	2	2	4	Moving from kerosene to sustainable aviation fuel, electric or hydrogen-fuelled aircraft could reduce the fire risk. Although there is a recognised increased chance of aircraft fuel venting, this is not anticipated to increase fire risk because projected temperatures are below the auto-ignition threshold and procedures are in place to prevent exposure to ignition sources.

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA11	Summer temperature	**Increased runway closure / maintenance** requirement due to build-up of rubber on runway surface.	Requirement to maintain appropriate friction level drives the need for regular runway maintenance.	- Operational disruption - Aircraft safety incident - Increased cost of rubber removal - Degradation/ decreased lifetime of the runway through increased cleaning activity	1	1	1	- Inspection and maintenance programme - Friction monitoring - Rubber removal contract in place	CCA11.2021.G1 Watching brief: Rubber cleaning frequency and technological advances in aircraft tyres and runway material. See CCA01.2021.G1	1	1	1	1	1	1	1	1	1	A number of technological advances are expected to take place over the time horizons that will reduce this risk. UK temperatures not expected to exceed those already experienced at other global airports.
CCA12	Summer temperature, Winter temperature, Summer rainfall, Winter rainfall	**Increase in disease vectors and hence incidence of "tropical" diseases** at and around the airport resulting from climate change providing a newly hospitable environment for imported species.	Potential increase in disease vectors such as mosquitos leading to increase in certain diseases such as West Nile Virus.	- Employee and public health impact - Reputational damage	1	1	1	- On-going liaison with Local Resilience Forum and The UK Health Security Agency - Occupational health department	CCA12.2021.G1 Watching brief: On the risk of an increase in disease vectors.	1	1	1	1	1	1	1	3	3	Expected to increase over time, warmer winter temperatures will reduce natural seasonal mitigation, with an increased likelihood in the 2080s. This would be a national challenge but it is acknowledged that it is something that airports have a role in managing.

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA13	Summer temperature, Winter temperature, Winter rainfall	**Impact to health and wellbeing** of outside workers during extreme weather events due to inadequate PPE and rostering processes.	Heat exhaustion, dehydration and sunburn during extended hot spells in summer and hypothermia, slips/trips in icy or wet conditions during winter.	- Increase in accident/incident frequency - Reputational damage - Reduced productivity due to exhaustion and the need for respite - Need to increase staffing levels to maintain productivity	2	2	4	- Occupational health department - Health and safety risk assessment process, including provision of PPE, increased breaks and sun protection where required - Communication of weather forecasts to on-airport community - Operational procedures, including Winter Operations Plan	CCA13.2021.G1 Watching brief: Health, safety and wellbeing measures required to manage impact of changes to temperature and rainfall on outside workers.	1	1	1	1	2	2	1	3	3	Increase in likelihood from the 2050s, but the impact is anticipated to be unchanged as risk can be managed by applying current controls.
CCA14	Summer temperature	**Decrease in passenger and staff comfort** within airport buildings caused by inadequate cooling systems.	Heat exhaustion, dehydration and unworkable conditions for colleagues and passengers within those areas.	- Decline in revenue and passenger numbers - Reputational damage - Increased staff absence - Increase in staff and passenger ill-health	1	1	1	- Heating, ventilation and air-conditioning systems - Ongoing HVAC maintenance programme - Capital plans for new and replacement assets - Conformance to asset standards and Building Regulations	CCA14.2021.G1 Watching brief: Asset standards for heating, ventilation and air conditioning to be reviewed when updated climate change projections released. See CCA01.2021.G1	1	1	1	1	1	1	1	1	1	Asset standards, maintenance and capital plans will ensure that HVAC systems continue to maintain comfortable environments.

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA15	Summer temperature	**Increased community complaints** due to greater disturbance from aircraft operations, particularly on warm nights when residents' windows are open or due to wing tip vortex damage.	Aircraft operations give rise to noise which can be disturbing to local communities. Warmer temperatures are known to result in higher complaint numbers.	- Requirement for, and cost of, additional noise mitigation - Imposition of operational restrictions - Reputational damage	2	1	2	- Noise Action Plan - Sound Insulation Grant Scheme - Community engagement - Input to local planning policy by providing noise contours and responding as a statutory consultee	CCA15.2021.G1 Action: Consider climate change impacts during future review of sound insulation grant scheme.	2	1	2	2	1	2	2	2	4	This risk could increase with further development closer to the airport.
CCA16	Summer temperature, Summer rainfall, Winter temperature, Winter rainfall	**Changes to wildlife control** required due to changing airfield habitats.	Wildlife strikes pose a threat to aviation safety. Climate change could lead to different habitat, wildlife species and behaviour.	- Increasing wildlife strike risk/operational safety incidents - Reputational damage - Operational disruption	1	1	1	- Wildlife and airfield grassland management plan in place - Habitat management regime in line with Civil Aviation Authority 'CAP 772' requirements - Wildlife management operators	CCA16.2021.S1 Watching brief: Changes in distribution of wildlife species.	1	1	1	1	1	1	1	1	1	

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					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA17	Winter rainfall, Summer rainfall, Winter temperature	**Increase in serious airfield safety incidents** due to severe weather events.	Severe weather presents a risk to aviation safety.	- Aircraft/vehicle collision - Operational disruption - Health & Safety incidents - Increased runway excursion - Need for increased runway grooving	2	5	10	- Winter operations plan and activities - Safety management system requirement for risk assessments	CCA17.2021.S1 Watching brief: On changes to airfield safety procedures due to climate change.	2	5	10	2	5	10	2	5	10	
CCA18	Lightning	**Damage to assets and operational disruption** due to an increase in lightning events.	Lightning presents a risk of building and infrastructure damage, including to electrical, communications and navigational systems. Lightning damage and safety procedures during storm events are known to lead to operational disruption.	- Financial costs of repair/replacement - Operational disruption - Reputational damage - Health & Safety incidents - Damage to the surface of the runway, navigational systems and other assets	2	4	8	- Inspection, maintenance and repair capabilities - Conformance to asset standards and Building Regulations - Equipment design incl. contingency features such as lightning protection - Operational procedures - UPS to critical systems	CCA18.2021.G1 Investigate: Lightning detection and prediction technology. CCA18.2021.S1 Watching brief: On impact of increased lightning events on electricity supply systems and ground handling operational performance.	2	4	8	2	4	8	2	4	8	

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CCA19	Storms	**Damage to on and off-airport infrastructure** due to an increase in storm events (high winds, rain, lightning and snow).	Storm events, including high winds and intense rainfall, have the potential to cause damage to infrastructure.	- Operational disruption - Financial costs of repair/replacement - Disruption to airport surface access, particularly public transport - H&S incident - Reputational damage	3	4	12	- Inspection, maintenance and repair capabilities - Conformance to asset standards and Building Regulations - Asset renewal strategy	CCA19.2021.G1 Watching brief: On impact of wind damage to airport assets. See CCA01.2021.G1	2	4	8	4	4	16	4	4	16	
CCA20	Summer temperature	**Poor local air quality** due to increased frequency of low dispersion conditions, particularly during prolonged hot spells.	Air quality is an important public health issue which is interdependent with climatic conditions.	- Reputational damage - Increased local, regional or national controls on air emissions - Increased absence of vulnerable staff - Increase in ill-health of vulnerable passengers or community members	1	1	1	- Airport air quality monitoring - Engagement with local authority environmental health teams - Airport Sustainable Development Plan	CCA20.2021.S1 Action: Continue to monitor and report air quality at the airport, engaging local authority environmental health teams to identify and resolve issues.	1	1	1	2	1	2	2	1	2	Increased impact in future years due to anticipated increase in stakeholder interest in this issue.

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CCA21	Summer temperature	Impact of climate change on **aircraft performance.**	Due to reduced air density, the take-off performance of aircraft degrades in warmer conditions. In extreme circumstances this can reduce aircraft payload or range.	- Reduction in aircraft payload with consequential financial impact - Inability to operate certain aircraft type/route combinations - Lower efficiency on approach and departure, increased emissions - Increased noise impacts - Potential capital investment required to extend the runway - Current safeguarding measures could be insufficient for future performance - Reputational damage - Potential to limit growth opportunities	1	1	1	- Weather reporting to enable adjustments to be made to operating capabilities - Communications with new operators - Community engagement programme	CCA21.2021.S1 Watching brief: On instances of range/payload limitation.	1	1	1	1	1	1	1	1	1	Current aircraft operate to countries that are experiencing projected temperatures today (may change if more long-haul routes operated. Assumed that future and emerging aircraft technology will be designed to a changing climate.

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CCA22	Summer temperature	**Increased need for aircraft cabin cooling and energy** to cool aircraft interior on stand in order to maintain comfortable cabin conditions during turnaround.	Warmer temperatures will require increased use of aircraft auxiliary power units (APU) or installation of pre-conditioned air (PCA). Installation of PCA is a significant infrastructure project and investment. APU use currently discouraged for noise and emissions reasons.	- Cost of installation, operation and maintenance of PCA - Increased workplace exposure to combustion gases - Impact on noise local air quality	2	2	4	- Asset strategy - APU use permitted on warmer days - Noise action plan	CCA22.2021.G1 Investigate: The temperature conditions under which there will be a requirement for PCA and energy system implications.	2	1	2	3	3	9	3	4	12	Increasing number of days when cabin cooling required. Greater utility demand from cooling with (PCA). Technology developments could mean aircraft are better at cooling.
CCA23	Winter temperature	**Increased variability and unpredictability of snow events** challenges snow contingency plans.	As the frequency of snow events decrease it is more difficult to assess the cost-benefit of investing in snow clearance equipment and contingency planning.	- Potential large investment in equipment that is not used, or significant disruption when an infrequent snow event occurs due to inadequate equipment and processes - Reputational damage - Operational disruption	3	3	9	- Winter operations plan and activities - Communication of weather forecasts to on-airport community	CCA23.2021.S1 Watching brief: Increasing variability of snowfall and potential challenges to winter contingency plans.	4	2	8	4	2	8	4	2	8	Increase in passenger numbers could mean there will be less resilience built-in

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CCA24	Summer temperature, Winter rainfall, Storms	**Disruption to delivery of essential supplies** to the airport due to off-airport transport and other impacts.	Extreme weather events including prolonged hot spells, high winds, snow and flooding can disrupt road and rail networks.	- Operational disruption - Short-term shortages of supplies - Reputational damage - Lost revenue	2	2	4	- Multiple suppliers for key supplies of food/drink - Contractual levers available to secure supply - Ongoing engagement with Highways England and Network Rail to manage disruption to surface access	CCA24.2021.S1 Watching brief: Disruption to delivery of essential supplies to the airport. CCA24.2021.S2 Action: Continued engagement with transport partners to manage disruption to surface access.	2	2	4	2	3	6	2	3	6	Significant infrastructure improvement is required to mitigate the potential for disruption, which is outside of MAG's control. Future planning standards could improve and reduce the risk but it is not possible to determine at present.
CCA25	Summer rainfall, Winter rainfall, Summer temperature	**Restrictions to airport water supplies** due to prolonged drought conditions and lowering of water table.	Potential for water supplier drought orders to limit the availability or use of mains water.	- Prohibition of certain non-critical activities such as washing - Financial impact arising from need to obtain alternative sources of water - Reputational impact - Asset renewal to introduce water efficient equipment	2	3	6	- Leak detection and repair programme - Distribution system maintenance / upgrade - Conformance to asset standards and Building Regulations - Asset renewal strategy - Ongoing dialogue with water companies	CCA25.2021.S1 Action: Develop an airport Water Drought Management Plan to respond to the four levels of drought trigger.	1	3	3	4	3	12	4	4	16	

London Stansted Airport climate change adaptation risk register (2021)																				
Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA26	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature	**Damage or disruption to off-airport surface access** leading to impacts on passenger and staff journeys to/from airport.	Extreme weather events including prolonged hot spells, high winds, snow and flooding can disrupt public transport and road networks. Although this would not be MAG's responsibility, the risk is that access to the airport is perceived as unreliable.	- Operational disruption created by impacts on rosters - Reputational impact	2	3	6	- Multiple surface access options are available - Weather forecasting and pre-emptive planning - Monitoring of transport networks through communications from transport organisations - Procedures in place at airport to respond - Communications process for customers and staff - Engagement with local resilience forums regarding transport and network issues	CCA26.2021.S1 Watching brief: Passenger comfort on public transport to and from the airport due to increasing temperatures. CCA26.2021.S2 Watching brief: Climate-related offsite impacts on the flow of people to the airport. See CCA24.2021.S2	2	2	4	2	3	6	2	3	6	Expectation that demand will continue to be proactively managed in response to this risk. Anticipated decrease in frost events will have beneficial impact - most significant is expected to be in relation to summer temperature and rainfall.

London Stansted Airport climate change adaptation risk register (2021)																				
Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA27	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature	**Disruption or changes to schedule due to en-route weather and sea level rise/storm surge**, including origin and destination airports.	Disruptive weather and sea-level rise/storm surges have the potential to cause disruption at origin/destination airports and en-route requiring temporary or permanent changes flight schedules.	- Operational disruption - Redistribution of market share to alternative routes	2	4	8	- Existing arrangements for diversion airports in case of disruption in-flight - European network management - Operational disruption and resilience plans	CCA27.2021.G1 Watching brief: Impact of sea level rise and storm surge on origin and destination airports. CCA27.2021.S1 Watching brief: Impact of extreme weather on schedules.	2	4	8	3	4	12	4	4	16	Changes to route networks due to sea level rise/storm surge expected to manifest gradually in later time periods and allow market redistribution.
CCA28	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature, Storms, Snow	**Increased climate-related insurance claims** nationally and internationally.	Increased severity and frequency of extreme weather events of all types are likely to lead to increased damage, disruption and therefore insurance claims. As part of a global risk pool, MAG insurance costs increase as a result of natural disaster / catastrophe globally.	- Increased cost of insurance cover for operational disruption and infrastructure damage - Increased limitations to the availability and/or scope of insurance cover - Increased costs across the whole MAG insurance portfolio as insurers look to recoup losses incurred globally	1	4	4	-MAG has two brokers who negotiate with insurers on our behalf - Insurance team and senior management engage insurers annually to inform them of the robust controls to prevent and manage claims -MAG Insurance engages the Board and Audit Committee on strategic decision making to influence premium spend i.e. sums insured and deductibles	CCA28.2021.G1 Action: Develop insurance strategies to manage climate change risk.	1	3	3	1	4	4	1	4	4	

Appendix 1c: Manchester Airport climate change adaptation risk register

Manchester Airport climate change adaptation risk register 2021																				
Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
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CCA01	Summer temperature	**Thermal expansion** of building infrastructure, such as concrete and steel, leading to failures and reduced lifespan.	There is a current lack of knowledge around the vulnerability of the airport buildings design to the projected future temperatures.	- Financial costs of repair/replacement - Operational disruption - Airport closure - Reputational damage	2	2	4	- Structural inspections - Asset maintenance schemes - Capex plans that align to assets - Conformance with Asset Standards and Building Regulations	CCA01.2021.G1 Action: Ensure specifications for future developments and asset renewals consider climate change predictions. CCA01.2021.G2 Action: Seek specialist advice to ensure risk assessment is valid.	2	2	4	2	3	6	3	3	9	
CCA02	Summer temperature, Summer rainfall, Winter rainfall	**Structural damage to airside** runway, aprons and airfield subsurface caused by extreme heat or water ingress.	It is known that a combination of water ingress and temperature fluctuations causes deterioration in these surfaces.	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Operational disruption - Airport closure - Reputational damage	2	3	6	- Conformance to Asset standards and Building Regulations - Management and maintenance plans - Remedial capabilities and ability to respond to issues on the runway quickly	CCA02.2021.G1 Watching brief: Impact of water ingress freeze/thaw and heat. CCA02.2021.G2 Watching brief: Increased ground movement leading to structural damage. See CCA01.2021.G1	2	3	6	2	4	8	3	4	12	Life cycle for a runway surface is 12-15 years so it will have been replaced a number of times over these time horizons.

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CCA03	Summer temperature, Summer rainfall, Winter rainfall	**Structural damage to landside** bituminous surfaces/subsurface such as car parks and landside roads caused by extreme heat or water ingress.	It is known that a combination of water ingress and temperature fluctuations causes deterioration in these surfaces.	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Operational disruption - Reputational damage - Cost of claims for damage/injury - Disruption to surface access to the airport	1	2	2	- Conformance to asset standards and Building Regulations - Management and maintenance plans - Remedial capabilities and ability to respond to issues quickly	See CCA01.2021.G1 See CCA02.2021.G1	1	1	1	1	3	3	1	4	4	
CCA04	Summer temperature, Summer rainfall, Winter rainfall	**Damage to buildings and belowground structures** and utilities due to increased ground movement.	Risk expected due to warmer, dryer summers and increased variance between summer and winter soil moisture levels particularly for clay soils	- Financial costs of repair/replacement - Accelerated asset deterioration/reduced lifespan - Increased inspection and maintenance needs - Operational disruption - Reputational damage - Potential health and safety risk related to energy systems	1	1	1	- Inspection and maintenance programme - Conformance to asset standards and Building Regulations	See CCA01.2021.G1 See CCA02.2021.G2	1	1	1	1	2	2	1	3	3	

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CCA05	Winter rainfall, Summer rainfall	**Release of contaminated surface water** in contravention of environmental permits as a result of storm event, including exceeding balancing pond capacity.	Airport drainage is held in balancing ponds, more intense rainfall could lead to flooding on the airport campus if the drainage system is unable to cope.	- Regulatory notification/fines - Reputational damage - Off-airport environmental impacts - Restrictions on future on-airport development - Requirement for airport infrastructure development (e.g. de-icing pads)	3	3	9	- Pollution control system design capacity - Input to water company strategic plan - Agreed contingency plans - Elimination of clean rainwater to reduce capacity requirement - Monitoring and management systems	CCA05.2021.G1 Watching brief: Drainage system capacity in light of updated climate projections and site developments. See CCA01.2021.G1	2	3	6	3	4	12	3	4	12	

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CCA06	Winter rainfall	**On-airport flooding** due to insufficient on-airport drainage capacity leading to schedule disruption and damage to below ground infrastructure.	Airport drainage is held in balancing ponds, more intense rainfall could lead to flooding on the airport campus if the drainage system is unable to cope.	- Financial costs of repair/replacement - Operational disruption - Reputational damage	1	3	3	- Inspection and maintenance programme - Flood detection - Conformance to asset standards and Building Regulations	See CCA01.2021.G1 See CCA05.2021.G1	1	3	3	1	3	3	2	3	6	Risk of flooding is anticipated to increase in line with the projected increase in rainfall, but be offset by investment in drainage systems.
CCA07	Winter rainfall	**Off-airport flooding** due to insufficient balancing pond capacity at times of extreme rainfall leading to high outflows and impacts downstream.	Airport drainage is held in balancing ponds, more intense rainfall could lead to flooding off the airport campus if the drainage system is unable to cope.	- Flooding of downstream properties and infrastructure - Cost of putting in place emergency arrangements - Reputational damage - Cost and operational disruption of retrofitting systems - Environmental permit and planning obligation changes - Cost of claims for damage/injury	2	3	6	- Input to Environment Agency contingency planning - Relationship with local authorities - Surface water attenuation for new developments	CCA007.2021.M1 Action: Continue to liaise with Local Authority and Environment Agency over flood contingency planning. See CCA01.2021.G1 See CCA05.2021.G1	2	2	4	2	3	6	2	4	8	Higher risk of flooding over time. Potential for significant cost or planning conditions in future development. Airport could be held responsible by stakeholders for flooding.

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CCA08	Summer rainfall, Winter rainfall	**Misalignment of navigational aids**, communications and surveillance systems due to extreme changes in wet/ dry surface conditions.	Extreme raising and lowering of the water table may lead to incorrect instrument alignment.	- Financial costs of repair/replacement - Operational disruption - Reduced aircraft movements - Increase in aircraft safety incidents - Reputational damage	3	1	3	- Inspection and maintenance programme	CCA08.2021.G1 Watching brief: Changes to ground conditions affecting navigation aids. CCA08.2021.G2 Action: Develop Performance Based Navigation (PBN) arrival and departure routes as part of future airspace strategy. CCA08.2021.G3 Watching brief: Monitor for new technology to move away from ground-based approach. See CCA01.2021.G1	3	1	3	3	1	3	3	1	3	No change in scores anticipated over time as risk can be managed through current controls. New technology could reduce risk in the 2050s and 80s.

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CCA09	Summer temperature, Summer rainfall, Lightning	**Schedule disruption** due to low visibility or structural damage caused by off-airport vegetation fires.	Grass and vegetation fires could cause poor visibility due to smoke and possible fire damage to infrastructure servicing the airport.	- Minor operational disruption	2	2	4	- Local authority and airport fire services - Air traffic control procedures to redirect aircraft where required - Communications with local emergency services and responder networks - External communication channels to alert passengers of schedule disruption	CCA09.2021.G1 Watching brief: On frequency and type of on and off-airport fires.	2	2	4	2	2	4	2	2	4	

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CCA10	Summer temperature	**Operational disruption, asset damage and employee safety risks** due to increased risk of on-airport fires.	Increased chance of fire from dry vegetation, waste and litter.	- Financial costs of repair/replacement - Operational disruption - Increase in aircraft safety incidents - Reputational damage - Increase in accident/incident frequency	2	2	4	- Airport fire service - Airfield and landscape management plans - Asset standards that minimise fire risk and damage potential - Mitigation measures are reviewed annually and aligned with regulations	CCA10.2021.G1 Investigate: Impacts of increased temperature on fuel spill and associated fire risk. See CCA09.2021.G1	2	2	4	2	2	4	2	2	4	Moving from kerosene to sustainable aviation fuel, electric or hydrogen-fuelled aircraft could reduce the fire risk. Although there is a recognised increased chance of aircraft fuel venting, this is not anticipated to increase fire risk because projected temperatures are below the auto-ignition threshold and procedures are in place to prevent exposure to ignition sources.

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CCA11	Summer temperature	**Increased runway closure/maintenance** requirement due to build-up of rubber on runway surface.	Requirement to maintain appropriate friction level drives the need for regular runway maintenance.	- Operational disruption - Aircraft safety incident - Increased cost of rubber removal - Degradation/ decreased lifetime of the runway through increased cleaning activity	1	1	1	- Inspection and maintenance programme - Friction monitoring - Rubber removal contract in place	CCA11.2021.G1 Watching brief: Rubber cleaning frequency and technological advances in aircraft tyres and runway material. See CCA01.2021.G1	1	1	1	1	1	1	1	1	1	A number of technological advances are expected to take place over the time horizons that will reduce this risk. UK temperatures not expected to exceed those already experienced at other global airports.
CCA12	Summer temperature, Winter temperature, Summer rainfall, Winter rainfall	**Increase in disease vectors and hence incidence of "tropical" diseases** at and around the airport resulting from climate change providing a newly hospitable environment for imported species.	Potential increase in disease vectors such as mosquitos leading to increase in certain diseases such as West Nile Virus.	- Employee and public health impact - Reputational damage	1	1	1	- On-going liaison with Local Resilience Forum and The UK Health Security Agency - Occupational health department	CCA12.2021.G1 Watching brief: On the risk of an increase in disease vectors.	1	1	1	1	1	1	1	3	3	Expected to increase over time, warmer winter temperatures will reduce natural seasonal mitigation, with an increased likelihood in the 2080s. This would be a national challenge but it is acknowledged that it is something that airports have a role in managing.

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CCA13	Summer temperature, Winter temperature, Winter rainfall	**Impact to health and wellbeing** of outside workers during extreme weather events due to inadequate PPE and rostering processes.	Heat exhaustion, dehydration and sunburn during extended hot spells in summer and hypothermia, slips/trips in icy or wet conditions during winter.	- Increase in accident/incident frequency - Reputational damage - Reduced productivity due to exhaustion and the need for respite - Need to increase staffing levels to maintain productivity	2	2	4	- Occupational health department - Health and safety risk assessment process, including provision of PPE, increased breaks and sun protection where required - Communication of weather forecasts to on-airport community - Operational procedures, including Winter Operations Plan	CCA13.2021.G1 Watching brief: Health, safety and wellbeing measures required to manage impact of changes to temperature and rainfall on outside workers.	1	1	1	1	2	2	1	3	3	Increase in likelihood from the 2050s, but the impact is anticipated to be unchanged as risk can be managed by applying current controls.

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CCA14	Summer temperature	**Decrease in passenger and staff comfort** within airport buildings caused by inadequate cooling systems.	Heat exhaustion, dehydration and unworkable conditions for colleagues and passengers within those areas.	- Decline in revenue and passenger numbers - Reputational damage - Increased staff absence - Increase in staff and passenger ill-health	1	1	1	- Heating, ventilation and air-conditioning systems - Ongoing HVAC maintenance programme - Capital plans for new and replacement assets - Conformance to asset standards and Building Regulations	CCA14.2021.G1 Watching brief: Asset standards for heating, ventilation and air conditioning to be reviewed when updated climate change projections released. See CCA01.2021.G1	1	1	1	1	1	1	1	1	1	Asset standards, maintenance and capital plans will ensure that HVAC systems continue to maintain comfortable environments.
CCA15	Summer temperature	**Increased community complaints** due to greater disturbance from aircraft operations, particularly on warm nights when residents' windows are open or due to wing tip vortex damage.	Aircraft operations give rise to noise which can be disturbing to local communities. Warmer temperatures are known to result in higher complaint numbers.	- Requirement for, and cost of, additional noise mitigation - Imposition of operational restrictions - Reputational damage	2	1	2	- Noise Action Plan - Sound Insulation Grant Scheme - Community engagement - Input to local planning policy by providing noise contours and responding as a statutory consultee	CCA15.2021.G1 Action: Consider climate change impacts during future review of sound insulation grant scheme.	2	1	2	2	1	2	2	2	4	This risk could increase with further development closer to the airport.

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CCA16	Summer temperature, Summer rainfall, Winter temperature, Winter rainfall	**Changes to wildlife control** required due to changing airfield habitats.	Wildlife strikes pose a threat to aviation safety. Climate change could lead to different habitat, wildlife species and behaviour.	- Increasing wildlife strike risk/operational safety incidents - Reputational damage - Operational disruption	3	2	6	- Wildlife and airfield grassland management plan in place - Habitat management regime in line with Civil Aviation Authority 'CAP 772' requirements - Wildlife management operators	CCA16.2021.M1 Watching brief: Changes in distribution of wildlife species.	3	2	6	3	2	6	3	2	6	
CCA17	Winter rainfall, Summer rainfall, Winter temperature	**Increase in serious airfield safety incidents** due to severe weather events.	Severe weather presents a risk to aviation safety.	- Aircraft/vehicle collision - Operational disruption - Health & Safety incidents - Increased runway excursion - Need for increased runway grooving	2	5	10	- Winter operations plan and activities - Safety management system requirement for risk assessments	CCA17.2021.M1 Watching brief: On changes to airfield safety procedures due to climate change.	2	5	10	2	5	10	2	5	10	

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CCA18	Lightning	**Damage to assets and operational disruption** due to an increase in lightning events.	Lightning presents a risk of building and infrastructure damage, including to electrical, communications and navigational systems. Lightning damage and safety procedures during storm events are known to lead to operational disruption.	- Financial costs of repair/replacement - Operational disruption - Reputational damage - Health & Safety incidents - Damage to the surface of the runway, navigational systems and other assets	2	4	8	- Inspection, maintenance and repair capabilities - Conformance to asset standards and Building Regulations - Equipment design incl. contingency features such as lightning protection - Operational procedures - UPS to critical systems	CCA18.2021.G1 Investigate: Lightning detection and prediction technology. CCA18.2021.M1 Watching brief: On impact of increased lightning events on electricity supply systems and ground handling operational performance.	2	4	8	2	4	8	2	4	8	
CCA19	Storms	**Damage to on and off-airport infrastructure** due to an increase in storm events (high winds, rain, lightning and snow).	Storm events, including high winds and intense rainfall, have the potential to cause damage to infrastructure.	- Operational disruption - Financial costs of repair/replacement - Disruption to airport surface access, particularly public transport - H&S incident - Reputational damage	3	4	12	- Inspection, maintenance and repair capabilities - Conformance to asset standards and Building Regulations - Asset renewal strategy	CCA19.2021.G1 Watching brief: On impact of wind damage to airport assets. See CCA01.2021.G1	2	4	8	4	4	16	4	4	16	

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CCA20	Summer temperature	**Poor local air quality** due to increased frequency of low dispersion conditions, particularly during prolonged hot spells.	Air quality is an important public health issue which is interdependent with climatic conditions.	- Reputational damage - Increased local, regional or national controls on air emissions - Increased absence of vulnerable staff - Increase in ill-health of vulnerable passengers or community members	1	3	3	- Airport air quality monitoring - Engagement with local authority environmental health teams - Airport Sustainable Development Plan - Greater Manchester air quality management plan	CCA20.2021.M1 Action: Continue to monitor and report air quality at the airport, engaging local authority environmental health teams to identify and resolve issues.	1	3	3	2	3	6	2	3	6	Increased impact in future years due to anticipated increase in stakeholder interest in this issue. Existing air quality management area adjacent to airport.

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CCA21	Summer temperature	Impact of climate change on **aircraft performance.**	Due to reduced air density, the take-off performance of aircraft degrades in warmer conditions. In extreme circumstances this can reduce aircraft payload or range.	- Reduction in aircraft payload with consequential financial impact - Inability to operate certain aircraft type/route combinations - Lower efficiency on approach and departure, increased emissions - Increased noise impacts - Potential capital investment required to extend the runway - Current safeguarding measures could be insufficient for future performance - Reputational damage - Potential to limit growth opportunities	2	1	2	- Weather reporting to enable adjustments to be made to operating capabilities - Communications with new operators - Community engagement programme	CCA21.2021.M1 Watching brief: On instances of range/payload limitation.	2	1	2	2	1	2	2	2	4	Current aircraft operate to countries that are experiencing projected temperatures today. Assumed that future and emerging aircraft technology will be designed to a changing climate.

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CCA22	Summer temperature	**Increased need for aircraft cabin cooling and energy** to cool aircraft interior on stand in order to maintain comfortable cabin conditions during turnaround.	Warmer temperatures will require increased use of aircraft auxiliary power units (APU) or installation of pre-conditioned air (PCA). Installation of PCA is a significant infrastructure project and investment. APU use currently discouraged for noise and emissions reasons.	- Cost of installation, operation and maintenance of PCA - Increased workplace exposure to combustion gases - Impact on noise local air quality	2	2	4	- Asset strategy - APU use permitted on warmer days - Noise action plan	CCA22.2021.G1 Investigate: The temperature conditions under which there will be a requirement for PCA and energy system implications.	2	1	2	2	3	6	2	4	8	Increasing number of days when cabin cooling required. Greater utility demand from cooling with (PCA). Technology developments could mean aircraft are better at cooling.
CCA23	Winter temperature	**Increased variability and unpredictability of snow events** challenges snow contingency plans.	As the frequency of snow events decrease it is more difficult to assess the cost-benefit of investing in snow clearance equipment and contingency planning.	- Potential large investment in equipment that is not used, or significant disruption when an infrequent snow event occurs due to inadequate equipment and processes - Reputational damage - Operational disruption	3	3	9	- Winter operations plan and activities - Communication of weather forecasts to on-airport community	CCA23.2021.M1 Watching brief: Increasing variability of snowfall and potential challenges to winter contingency plans.	4	2	8	4	2	8	4	2	8	Increase in passenger numbers could mean there will be less resilience built-in

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Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA24	Summer temperature, Winter rainfall, Storms	**Disruption to delivery of essential supplies** to the airport due to off-airport transport and other impacts.	Extreme weather events including prolonged hot spells, high winds, snow and flooding can disrupt road and rail networks.	- Operational disruption - Short-term shortages of supplies - Reputational damage - Lost revenue	2	2	4	- Multiple suppliers for key supplies of food/drink - Contractual levers available to secure supply - Ongoing engagement with Highways England and Network Rail to manage disruption to surface access	CCA24.2021.M1 Watching brief: Disruption to delivery of essential supplies to the airport. CCA24.2021.M2 Action: Continued engagement with transport partners to manage disruption to surface access.	2	2	4	2	3	6	2	3	6	Significant infrastructure improvement is required to mitigate the potential for disruption, which is outside of MAG's control. Future planning standards could improve and reduce the risk but it is not possible to determine at present.
CCA25	Summer rainfall, Winter rainfall, Summer temperature	**Restrictions to airport water supplies** due to prolonged drought conditions and lowering of water table.	Potential for water supplier drought orders to limit the availability or use of mains water.	- Prohibition of certain non-critical activities such as washing - Financial impact arising from need to obtain alternative sources of water - Reputational impact - Asset renewal to introduce water efficient equipment	2	2	4	- Leak detection and repair programme - Distribution system maintenance / upgrade - Conformance to asset standards and Building Regulations - Asset renewal strategy - Ongoing dialogue with water companies	CCA25.2021.M1 Watching brief: On water scarcity issues with a view to preparing drought management plan when required.	1	3	3	2	2	4	2	3	6	

Manchester Airport climate change adaptation risk register 2021																				
Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA26	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature	**Damage or disruption to off-airport surface access** leading to impacts on passenger and staff journeys to/from airport.	Extreme weather events including prolonged hot spells, high winds, snow and flooding can disrupt public transport and road networks. Although this would not be MAG's responsibility, the risk is that access to the airport is perceived as unreliable.	- Operational disruption created by impacts on rosters - Reputational impact	1	3	3	- Multiple surface access options are available - Weather forecasting and pre-emptive planning - Monitoring of transport networks through communications from transport organisations - Procedures in place at airport to respond - Communications process for customers and staff - Engagement with local resilience forums regarding transport and network issues	CCA26.2021.M1 Watching brief: Climate-related offsite impacts on the flow of people to the airport. See CCA24.2021.M2	1	2	2	2	3	6	2	3	6	Expectation that demand will continue to be proactively managed in response to this risk. Anticipated decrease in frost events will have beneficial impact - most significant is expected to be in relation to summer temperature and rainfall.
CCA27	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature	**Disruption or changes to schedule due to en-route weather and sea level rise/storm surge**, including origin and destination airports.	Disruptive weather and sea-level rise/storm surges have the potential to cause disruption at origin/destination airports and en-route requiring temporary or permanent changes flight schedules.	- Operational disruption - Redistribution of market share to alternative routes	2	4	8	- Existing arrangements for diversion airports in case of disruption in-flight - European network management - Operational disruption and resilience plans	CCA27.2021.G1 Watching brief: Impact of sea level rise and storm surge on origin and destination airports. CCA27.2021.M1 Watching brief: Impact of extreme weather on schedules.	2	4	8	3	4	12	4	4	16	Changes to route networks due to sea level rise/storm surge expected to manifest gradually in later time periods and allow market redistribution.

Manchester Airport climate change adaptation risk register 2021																				
Risk code	Climate variable	Risk (including indirect and interdependency risks)	Narrative	Potential consequences (functions, service, assets affected)	Current			Current control measures/strategy	Further planned actions (in next 5 years)	Current post control			2050 + post control			2080 + post control			Narrative on horizon scores
					Impact	Likelihood	ARP 3 risk score			Impact	Likelihood	ARP 3 risk score	Impact	Likelihood	ARP3 risk score	Impact	Likelihood	ARP3 risk score	
CCA28	Summer rainfall, Winter rainfall, Summer temperature, Winter temperature, Storms, Snow	**Increased climate-related insurance claims** nationally and internationally.	Increased severity and frequency of extreme weather events of all types are likely to lead to increased damage, disruption and therefore insurance claims. As part of a global risk pool, MAG insurance costs increase as a result of natural disaster / catastrophe globally.	- Increased cost of insurance cover for operational disruption and infrastructure damage - Increased limitations to the availability and/or scope of insurance cover - Increased costs across the whole MAG insurance portfolio as insurers look to recoup losses incurred globally	1	4	4	-MAG has two brokers who negotiate with the insurance market on our behalf - Insurance team and senior management engage insurers annually to inform them of the robust controls to prevent and manage claims -MAG Insurance engages the Board and Audit Committee on strategic decision making to influence premium spend i.e. sums insured and deductibles	CCA28.2021.G1 Action: Develop insurance strategies to manage climate change risk.	1	3	3	1	4	4	1	4	4	

Appendix H. Site Condition Report