

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

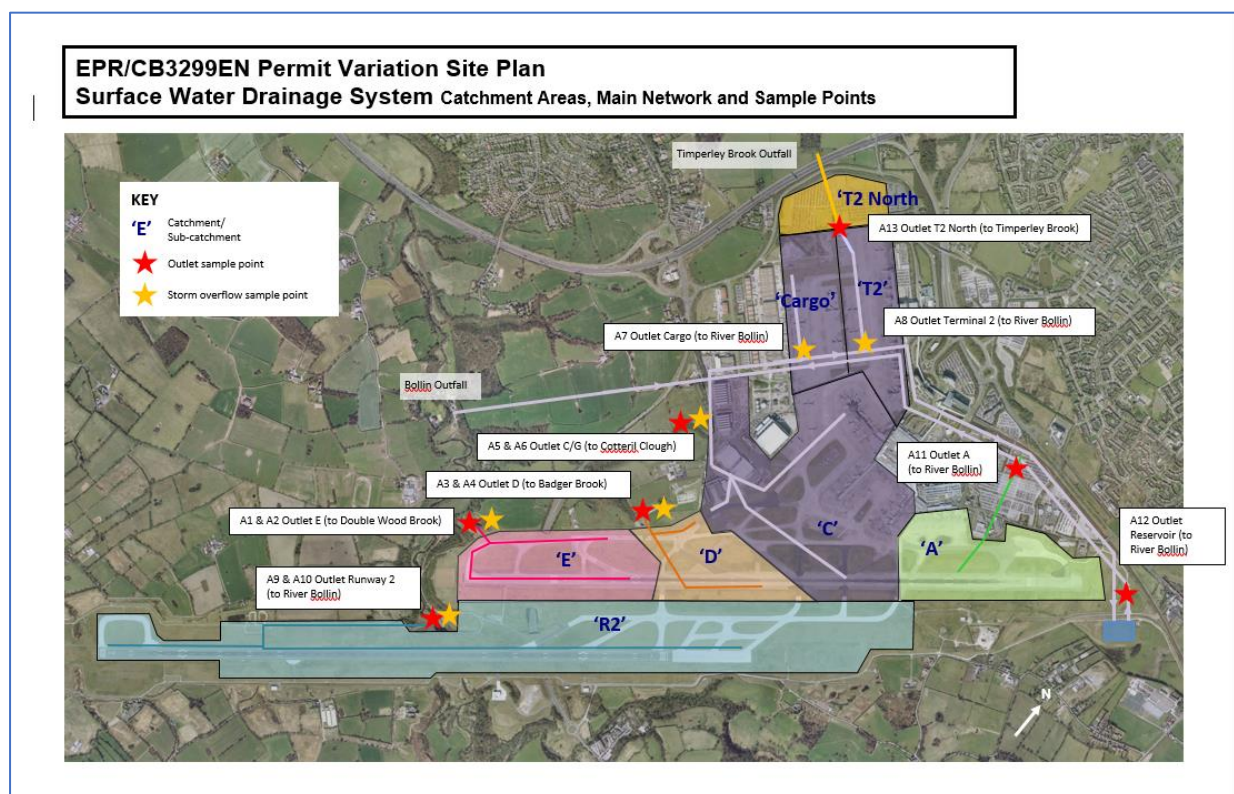
Manchester Airport (MA) operate an environmental management system which is certified to ISO14001:2015. Within this, there are extensive measures taken to control potential impacts to surface water and to manage drainage systems effectively. These include:

- 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.

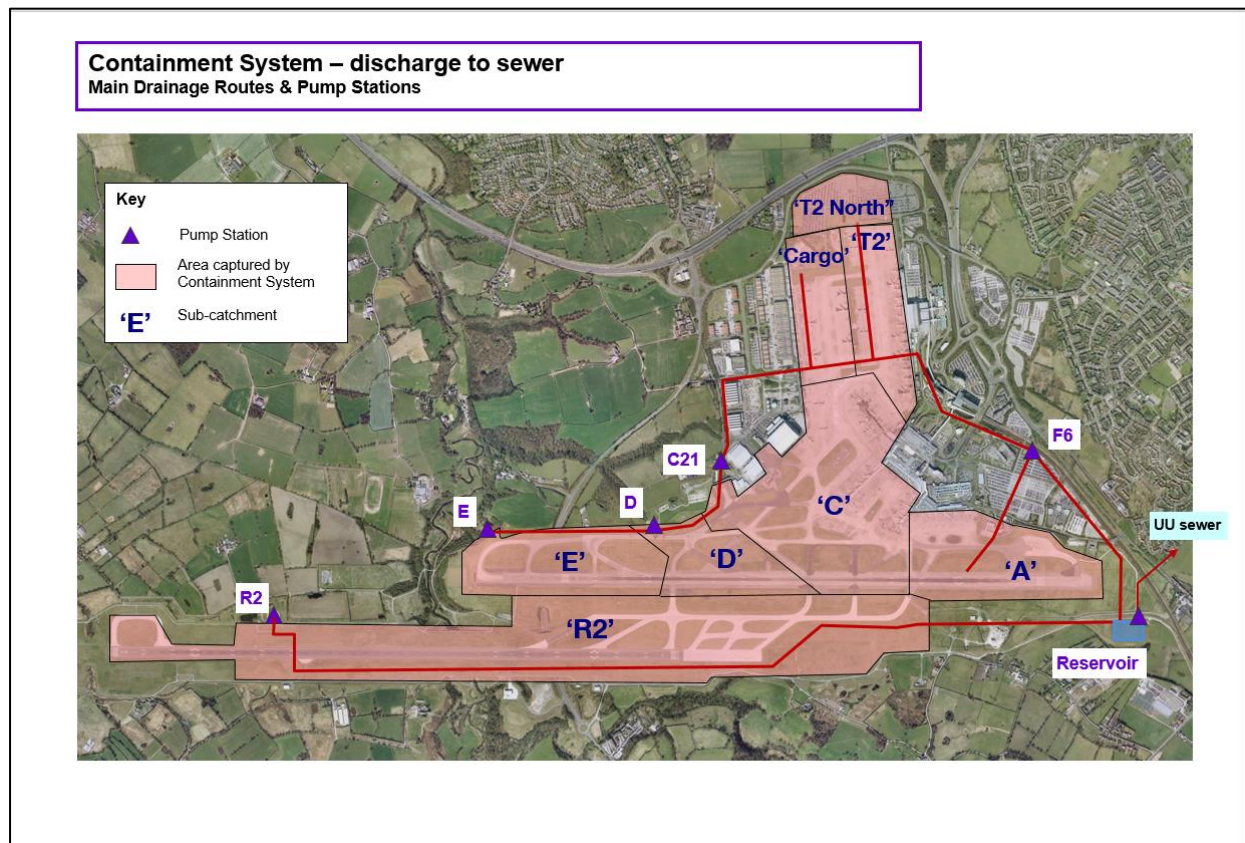
3. Description of Drainage System

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:

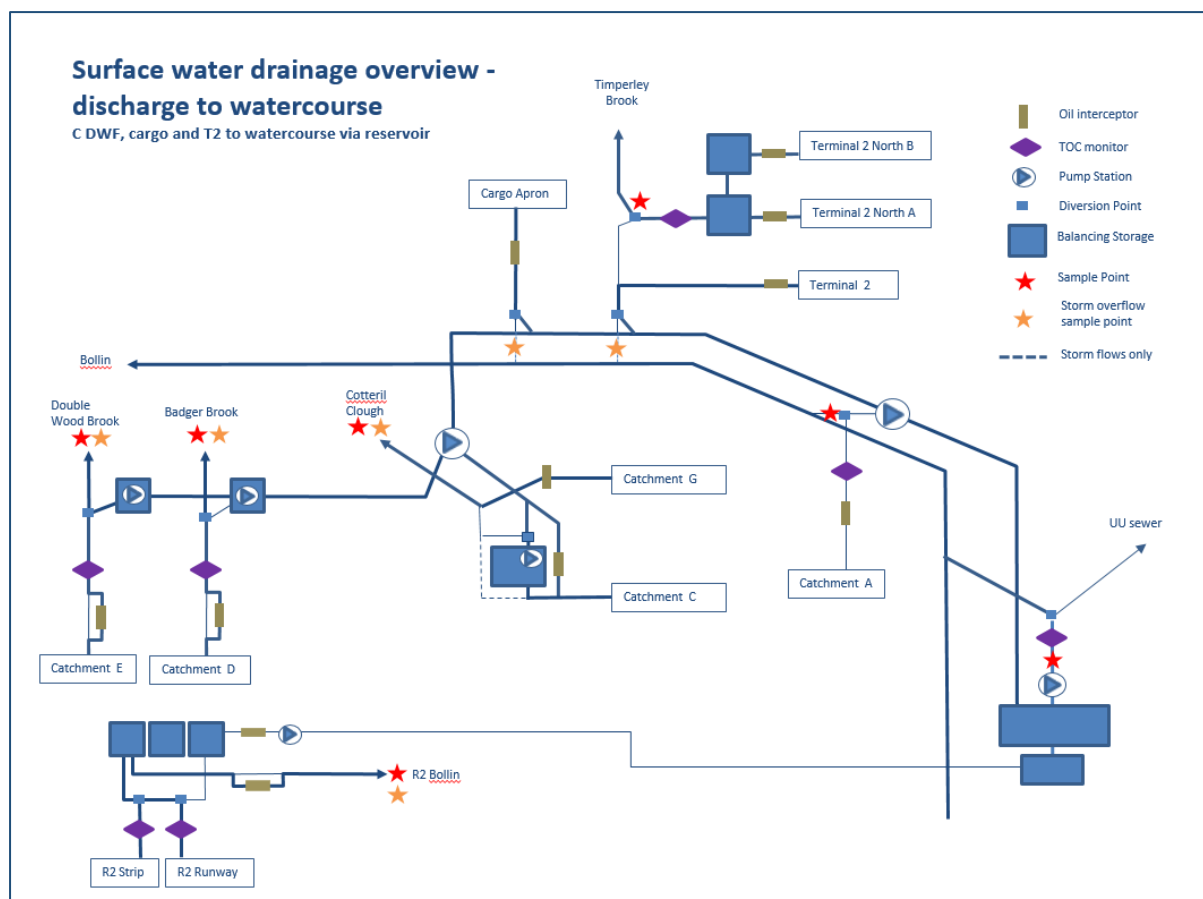


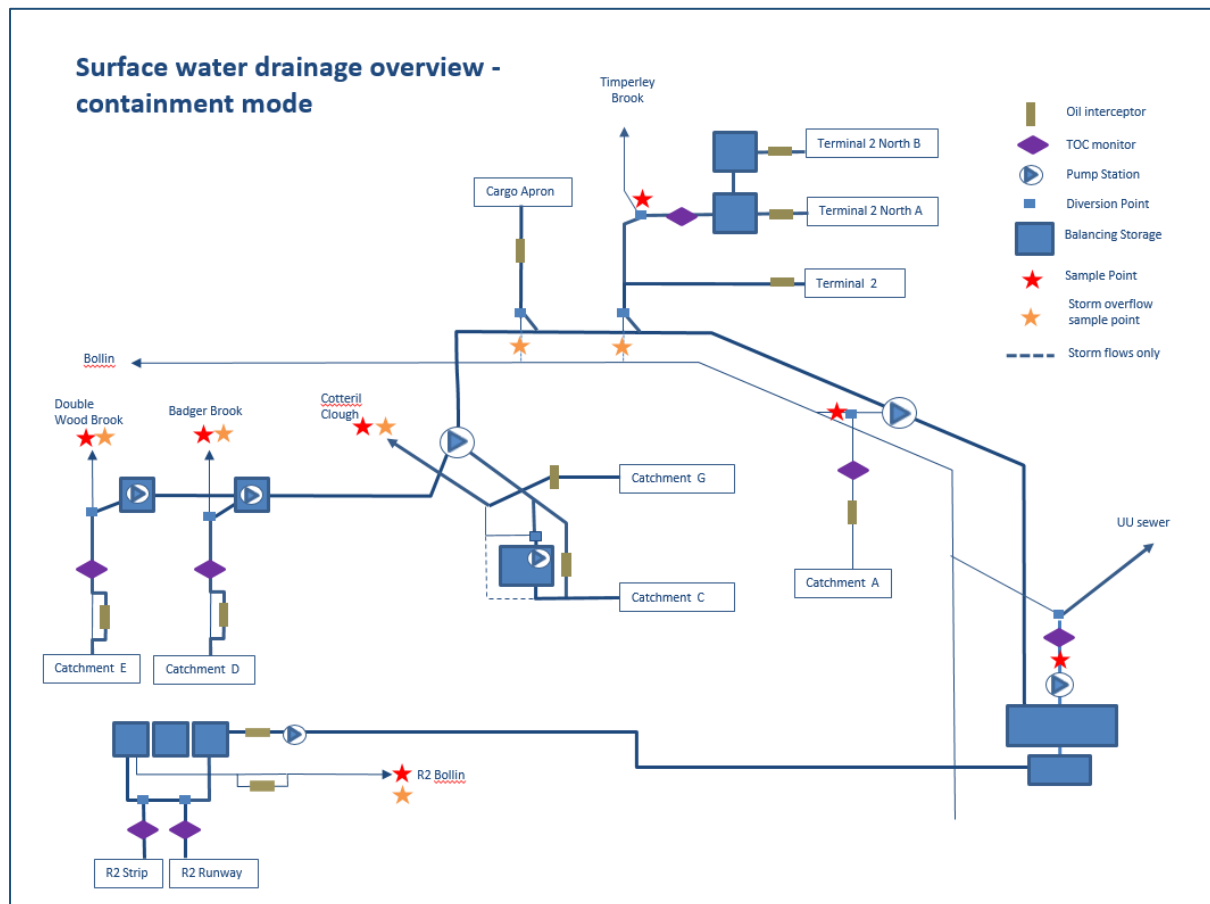
The drainage layout of each catchment varies but will in general include some or all of the following elements.

- 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 m³ 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

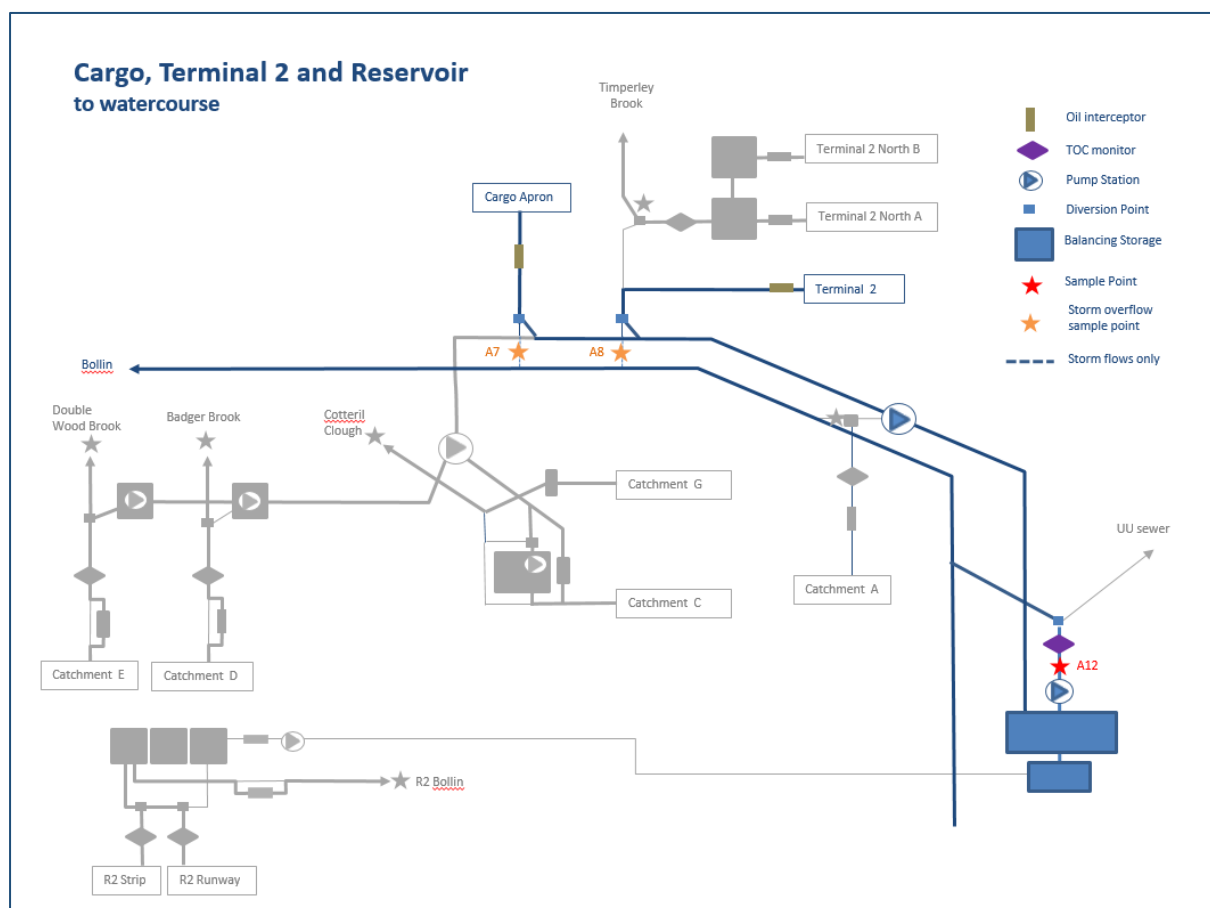
Cargo, Terminal 2 & Reservoir

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 l s^{-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 l s^{-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 $54,000 \text{ m}^3$ balancing storage and is linked to the $19,000 \text{ m}^3$ Runway 2 contaminated surface water reservoir giving a combined storage volume of $73,000 \text{ m}^3$.

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 l s^{-1} and $5000 \text{ kd COD day}^{-1}$ 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 l s^{-1} ($17,280 \text{ m}^3 \text{ d}^{-1}$).
- 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.

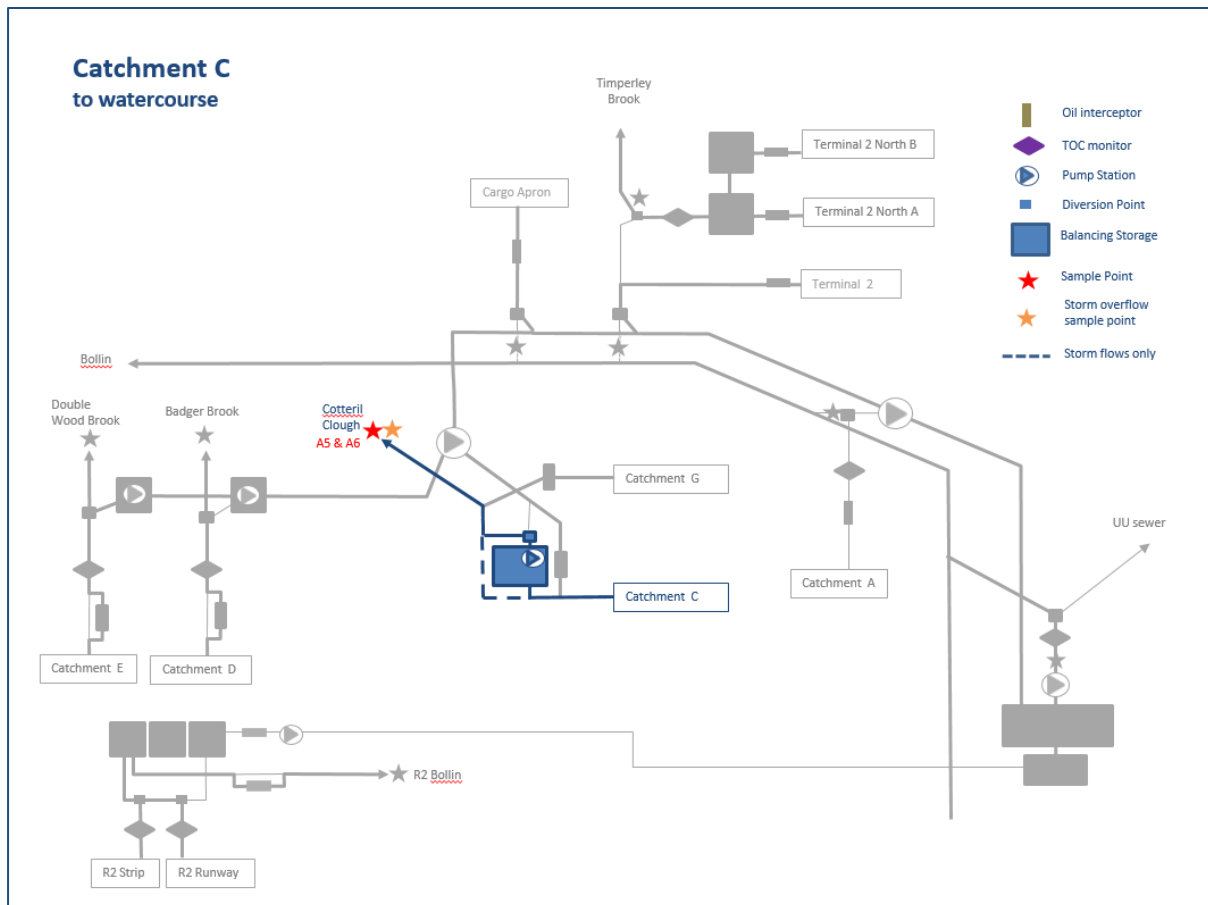
The emergency overflow would be recorded through logging of the level within the reservoir, F6 and the flow monitor within the surface water sewer downstream of the T2 diversion chamber.

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 l s^{-1} are passed via a 32 m^3 oil interceptor and discharged into C21 pump station. This is then pumped at 310 l s^{-1} to F6 pump station and thence to the main contaminated surface water reservoir for flow balancing.

Flows greater than 20 l s^{-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.

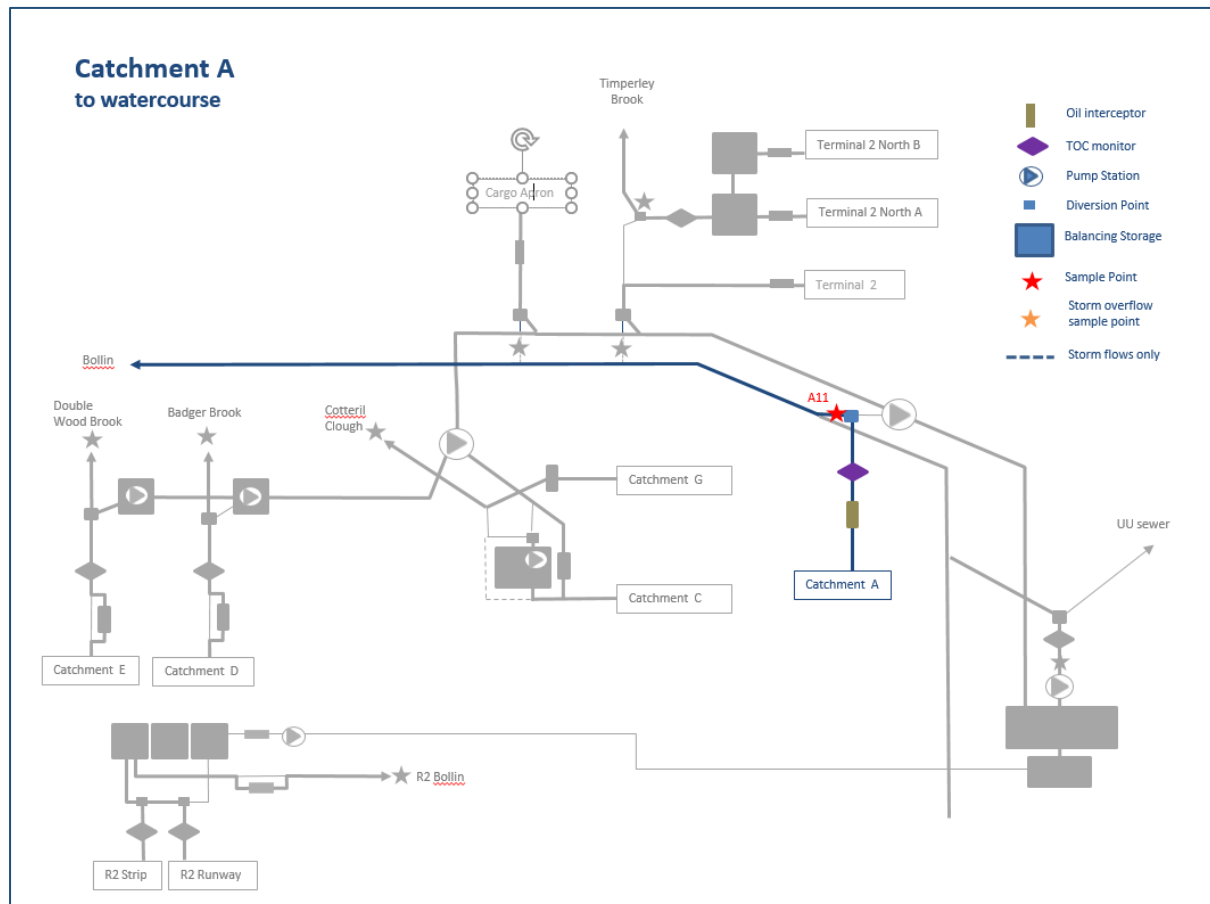
Catchment G

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 m³ 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.

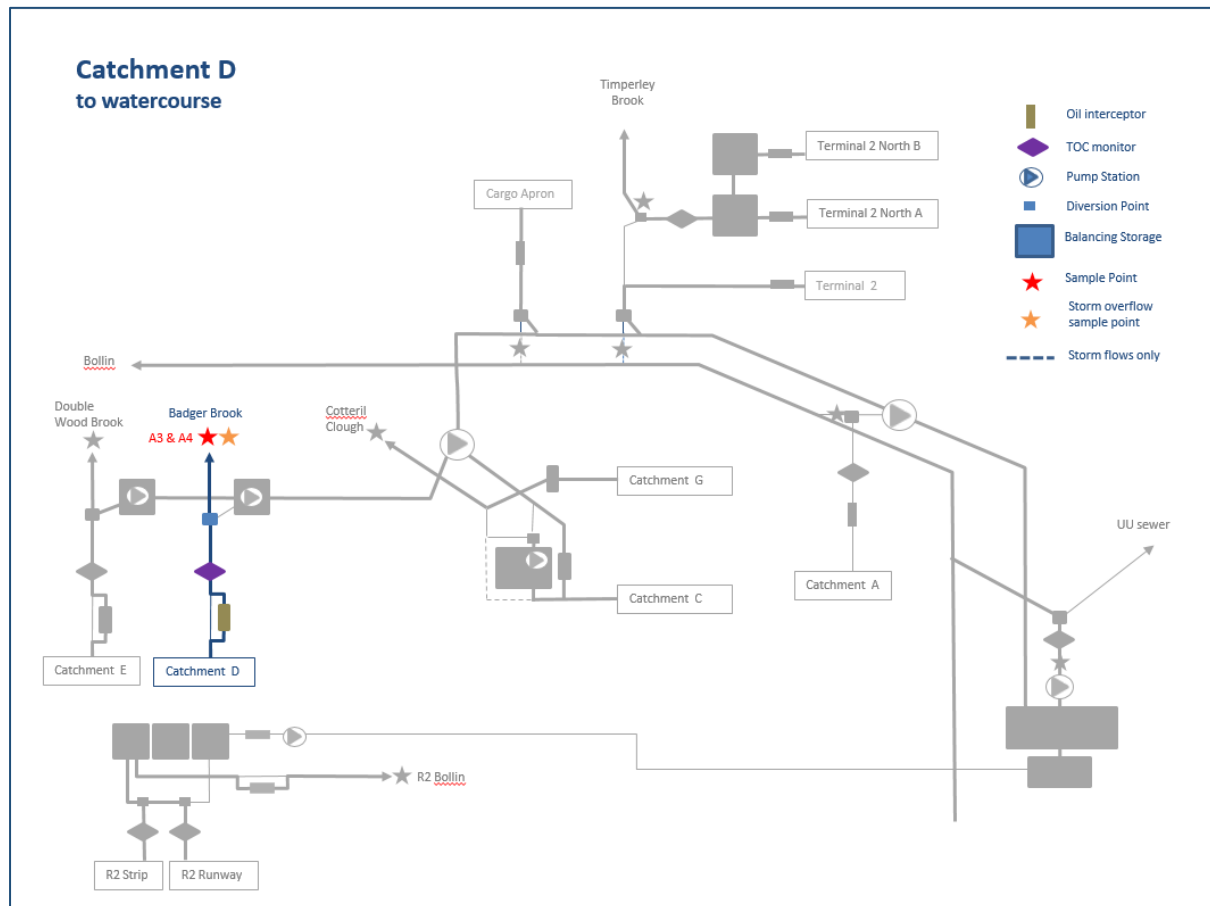
There is no storm overflow to watercourse at Catchment A. In the event that runoff exceeds pipe capacity, or that F6 pump station is full, runoff would surcharge catchment A drainage systems causing surface ponding.

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 10m³ 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 m³ 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.

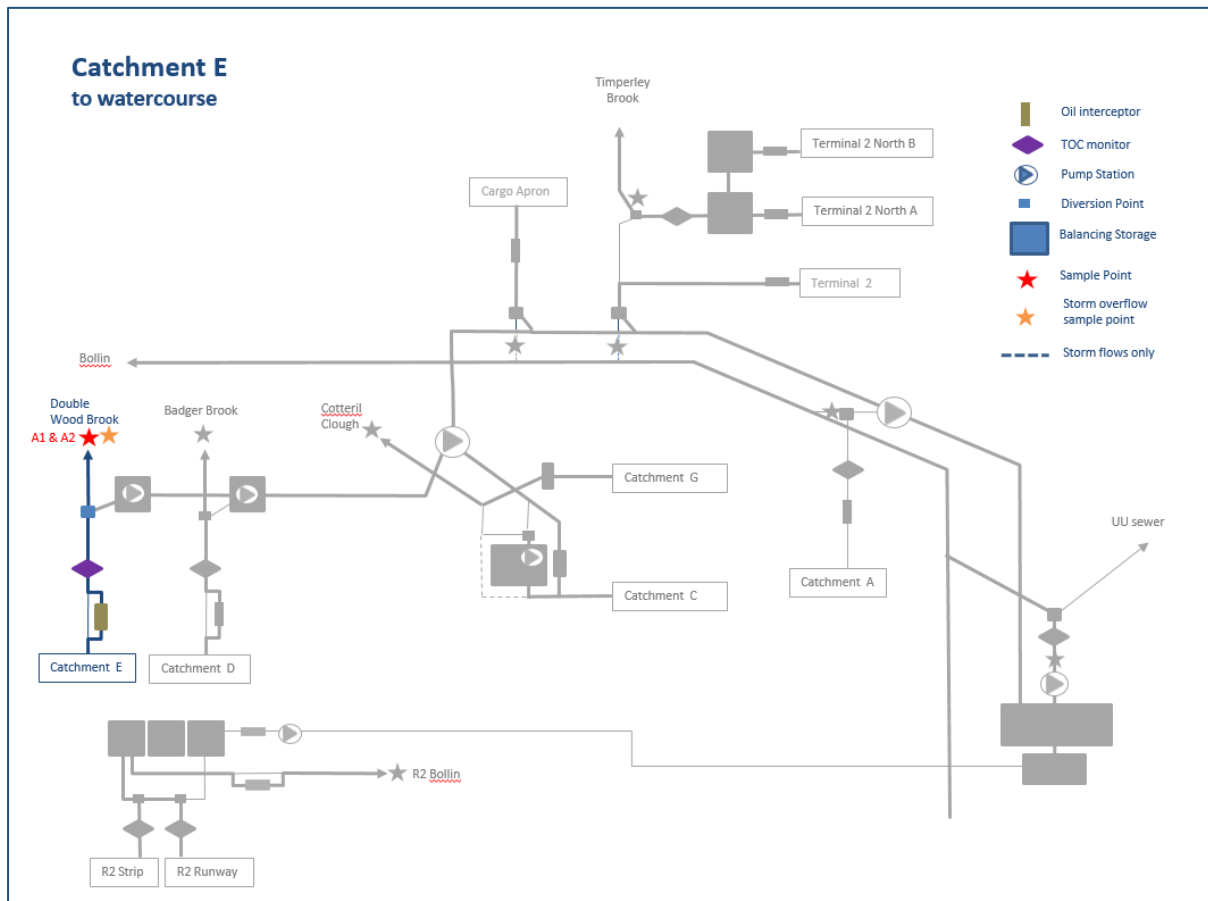
The system may also spill to watercourse where instantaneous flows reach 400 l s^{-1} and exceed the capacity of the pipe to the tank.

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 18m³ 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 m³ capacity.

From the balancing tank, the contaminated runoff is pumped forward at a rate of 24 l s⁻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.

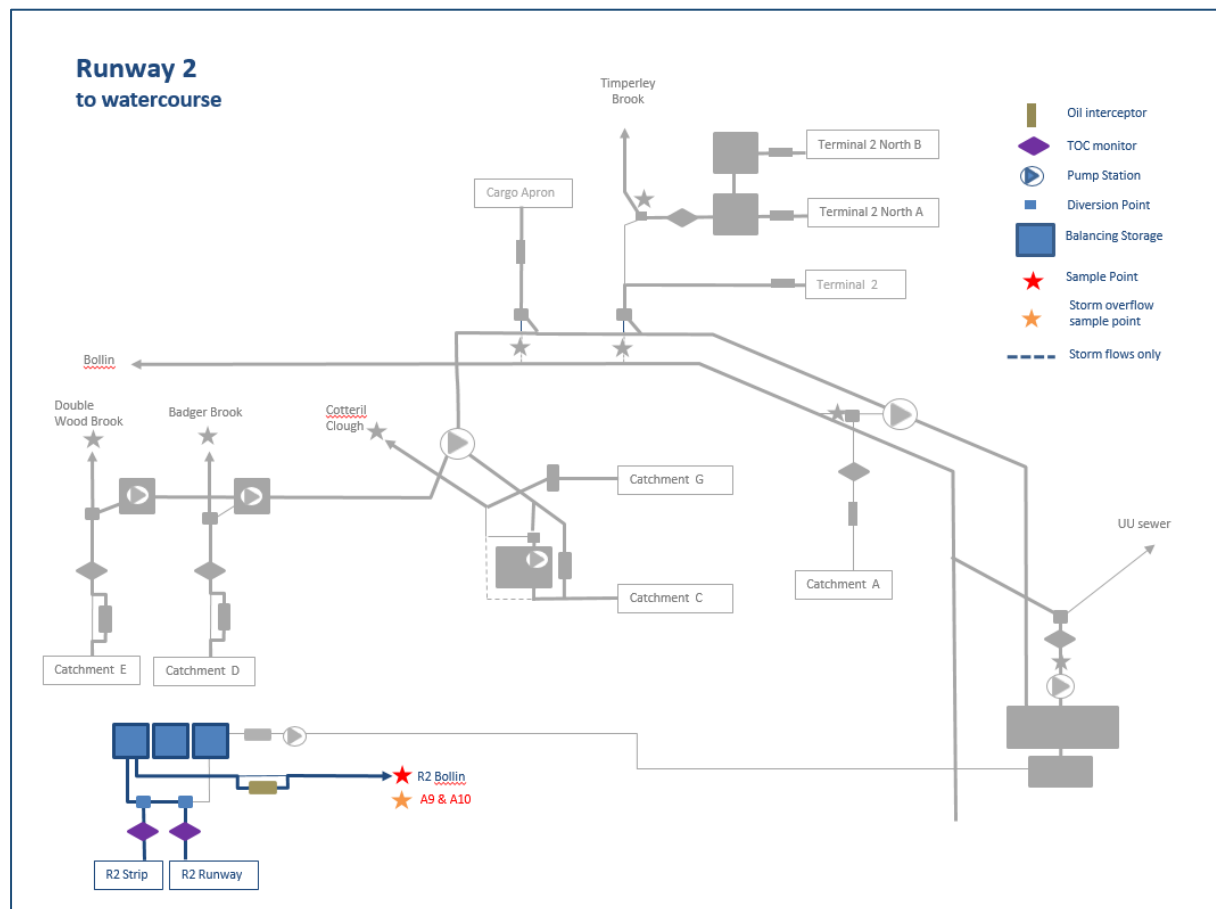
TOC and balancing tank level will be recorded within the BMS.

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 m³ 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 m³). 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 m³ and is linked to

the main contaminated surface water reservoir to give a combined capacity of 73,000 m³. 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 2600m³ of underground attenuation storage for T2 North A sub-catchment and 3400m³ 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.

