Luton Rising
Our airport.
Our community.
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November 2023

London Luton Airport Expansion

Planning Inspectorate Scheme Ref: TR020001

Volume 5 Environmental Statement and Related Documents

5.02 Appendix 20.4 Drainage Design Statement

Application Document Ref: TR020001/APP/5.02
APFP Regulation: 5(2)(a)

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

London Luton Airport Expansion Development Consent Order 202x

5.02 ENVIRONMENTAL STATEMENT APPENDIX 20.4 DRAINAGE DESIGN STATEMENT

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1 INTRODUCTION

1.1 Purpose of the Report

1.1.1 This Drainage Design Statement (DDS) forms part of the Development Consent Order (DCO) application for the proposed expansion of London Luton Airport (the airport) to 32 million passengers per annum (mppa), (hereafter referred to as 'the Proposed Development'). This application is made by London Luton Airport Limited (trading as Luton Rising and hereafter referred to as the Applicant), owners of London Luton Airport (the airport).

1.1.0 The airport is operated by London Luton Airport Operations Limited (LLAOL).

1.1.1 The DDS combines value driven and sustainable solutions to deliver the infrastructure required, having regard to stakeholder requirements.

1.1.2 The DDS informs 'design principles' included in the **Design Principles [TR020001/APP/7.09]** document that relate to the surface and foul water drainage infrastructure. These design principles capture key requirements identified through design, assessment and stakeholder engagement at preliminary design stage and will inform the detailed drainage design. The detailed drainage design will be developed following grant of the Development Consent Order (DCO), pursuant to the relevant Requirement in Schedule 2 of the **draft DCO [REP2-003]**.

1.1.3 This DDS has been updated for Deadline 4 of the DCO Examination to reflect a proposed change as a result of ongoing discussions with statutory stakeholders. The change relates to the previous iteration of the **DDS [APP-137]**, particularly the preferred option for the treatment and discharge of foul water and contaminated surface water from the Proposed Development to discharge to the Thames Water (TW) network.

1.2 Report Structure

1.2.1 Following this section, the report is structured in eight sections. The content of these is summarised as follows.

1.2.2 Section 2 provides an overview of the existing site conditions and the existing drainage layout.

1.2.3 Section 3 provides an overview of the key considerations taken into account in developing the drainage strategy for the Proposed Development.

1.2.4 Section 4 provides an overview of the proposed catchment areas, rainwater harvesting and water balance for the assessment phases.

1.2.5 Sections 5 and 6 then describe the approach to drainage for the purposes of assessment first providing an overview of the preliminary surface water and foul water drainage designs assumed for the purposes of assessment Phase 1 and then for assessment Phases 2a and 2b.

1.2.6 Section 7 describes the concept design for the proposed Water Treatment Plant.

1.2.7 Section 8 describes the concept design of surface water drainage for the highways proposals, including the Airport Access Road and the Off-site Highway Interventions.

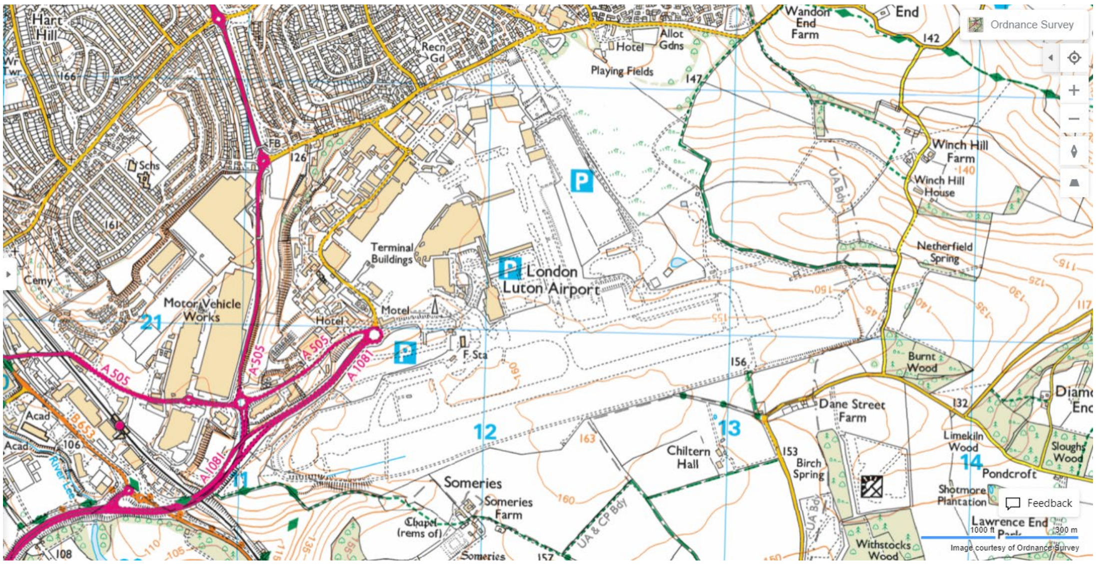
1.2.8 The design proposals incorporate requirements that have been set out by relevant stakeholders, following extensive engagement including two statutory public consultations. The conceptual model includes design assumptions and data collected from the stakeholders. Detailed design will also include continued engagement with stakeholders, in particular with respect to permits and approvals.

2 EXISTING SITE DETAILS

2.1 Location

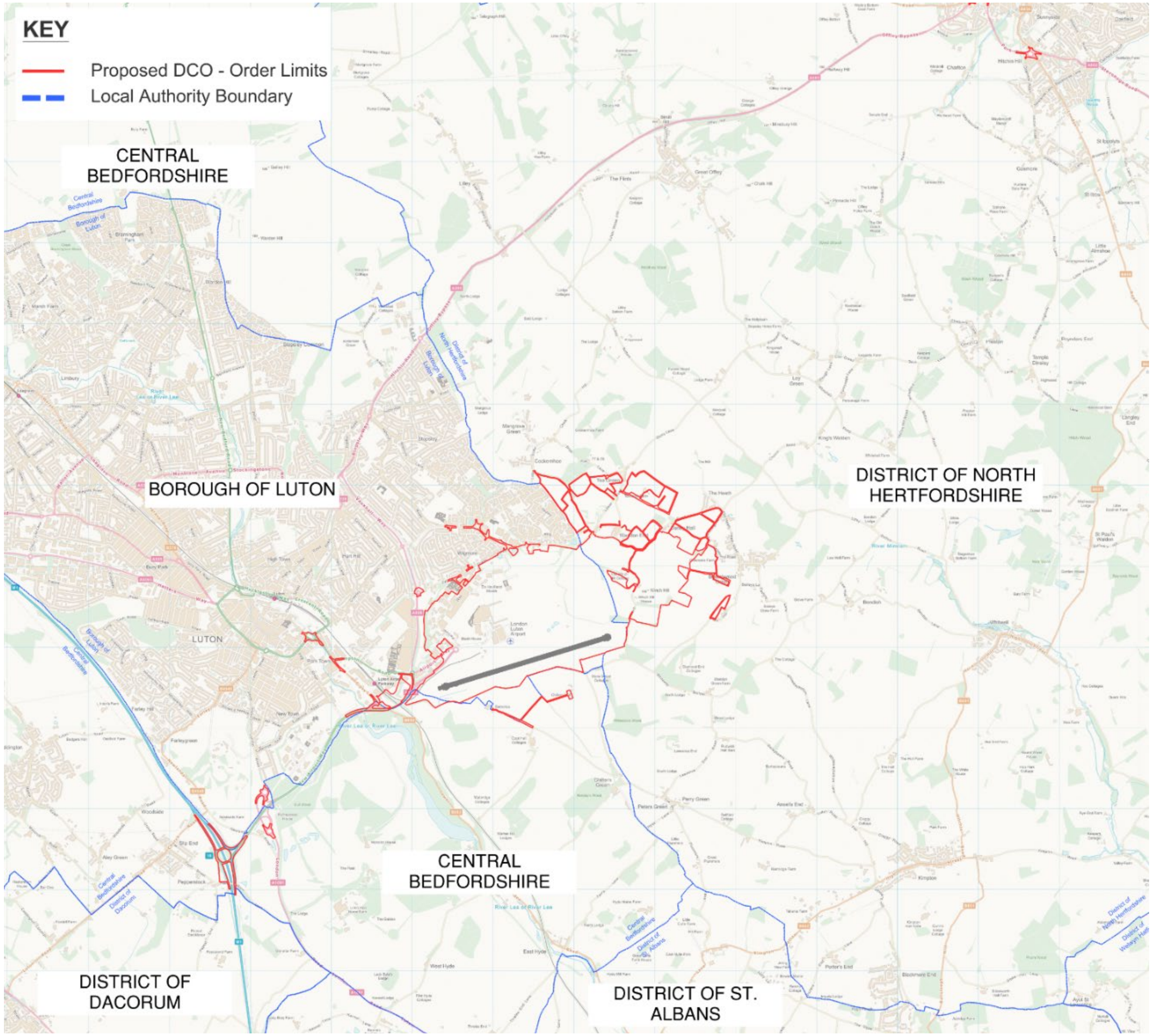
2.1.1 The Main Application Site is located on the south eastern outskirts of Luton, about 3km east of the town centre. It is bound to the north by Eaton Green Road and Darley Road with largely open land to the south and east. The topography is relatively undulating, with falls of 30m in elevation towards the east.

Inset 2.1: Ordnance Survey plan of the airport



2.1.2 The Application Site is located within the administrative areas of Luton Borough Council (LBC), North Hertfordshire District Council, Central Bedfordshire Council, Dacorum Borough Council and Hertfordshire County Council. The Lead Local Flood Authorities (LLFAs) are LBC, Central Bedfordshire Council and Hertfordshire County Council. A map of the local authority boundaries and Order Limits proposed for the DCO can be found in **Inset 2.2**.

Inset 2.2: Local Authorities Boundaries and Order Limits



2.2 Site Geology

2.2.1 The Main Application Site is generally underlain by superficial deposits of Clay-with-Flints (clay containing flint gravel) on the plateau areas, Head on the valley sides (clay), and Dry Valley Deposits (silty clay and gravel) at the base of the valley areas. These superficial deposits are in turn underlain by the solid geology which comprises the Lewes Nodular Chalk Formation.

2.2.2 The main water bearing strata in the region is Chalk, which is designated by the Environment Agency (EA) as a Principal aquifer. The majority of the Main Application Site is located within groundwater Source Protection Zone (SPZ) 3.

2.2.3 Superficial deposits comprising gravelly clay soil overlie the Chalk locally.

2.2.4 The former Eaton Green Landfill lies to the east of the existing airport. This feature fills part of the head of a dry valley extending across an area of approximately 40ha. The thickness of landfill waste varies from approximately 4m on the valley sides up to 20m at the centre and comprises mixed domestic, commercial and construction/demolition waste. Refer to **Chapter 17** of the **Environmental Statement (the ES) [TR020001/APP/5.01]** and **appendices [TR020001/APP/5.02].**

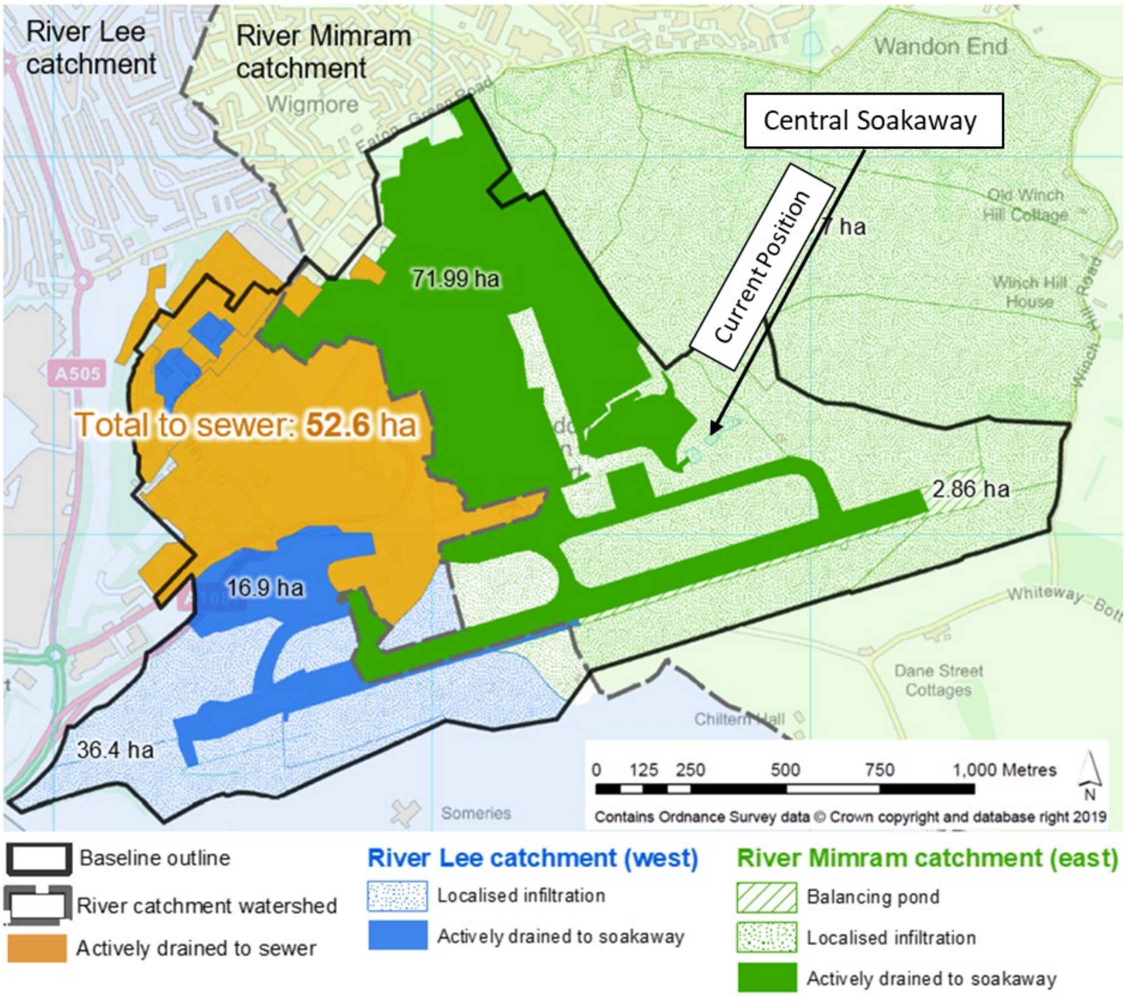
2.2.5 The Chalk aquifer is a designated Water Framework Directive (WFD) (Ref. 2.1) groundwater body: 'the Upper Lea Chalk'. For groundwater bodies there are two separate classifications (quantitative status and chemical status) that in combination provide an overall water body status. Both the quantitative and chemical status are classed as poor for the Upper Lea Chalk due to over-abstraction and contamination, respectively. The contamination is present across the wider catchment area with elevated levels of nitrate, pesticides, solvents due to industrial and agricultural land uses in the area.

2.3 Hydrology and Existing Catchments

2.3.1 Two main water body catchments split the Main Application Site - the Lea catchment to the west, and the Mimram catchment to the east. The exact positioning of the groundwater divide at the site is uncertain. Groundwater flow direction in the Lea catchment is influenced by local abstractions west of the airport and flows in a westerly direction. The groundwater flow in the Mimram catchment is affected by the potable abstraction near Kings Walden, 1.5km north east of the Main Application Site boundary (2.8km north east of the landfill) and a second potable water abstraction (Nine Wells) at Whitwell, 5.3km east of the former landfill. Both may create a more easterly flow direction than the expected south easterly regional flow - refer to **Hydrogeological Characterisation Report [TR02001/APP/5.02]** which has been updated for Deadline 4.

2.3.0 **Inset 2.3** illustrates the existing river catchment areas and indicative watershed line at the airport, dividing the airport into two distinct catchments.

Inset 2.3: London Luton Airport River Catchment Areas



2.3.0 The river Lea (referred to as River Lee in **Inset 2.3**) is located about 600m west of the airport and is divided over two WFD waterbodies: Lea (from Luton to Luton Hoo Lakes, WFD ID GB106038033391) and Lea (from Luton Hoo Lakes to Hertford, WFD ID GB106038033392). These two waterbodies are considered to be in “Bad” and “Moderate” condition respectively. The Lea from Luton to Luton Hoo Lakes is expected to meet “Good” status by 2027. There is no objective for the Lea from Luton Hoo Lakes to Hertford.

2.4 Stakeholders

2.4.1 Statutory Undertakers with assets and direct interest in the drainage within the Main Application Site have been a part of stakeholder engagements to date. Listed below are the named stakeholders:

a. LBC;

b. TW;

c. Affinity Water (AW);

d. Hertfordshire County Council;

e. Central Bedfordshire Council;

f. EA; and

g. LLAOL.

2.4.0 It is anticipated that permits will be required in respect of drainage from a number of stakeholders. These are described in the **Consents and Agreements Position Statement** [AS-070] included with the application for development consent.

2.5 Existing Airport Drainage Assets

2.5.1 Veolia manage the airport's potable and foul drainage systems on behalf of the operator, LLAOL (refer to section 3.3).

2.5.0 AW supply the airport with potable water. Their existing network has been outlined in a survey undertaken by Veolia which can be found in Appendix E.

2.5.1 TW existing surface and foul assets located across the Main Application Site have been outlined in a Veolia Survey, and can be found in Appendix F and Appendix G respectively.

2.5.2 Within the TW network north of the Application Site, there is a balancing pond south of Eaton Green Road.

2.5.3 Two existing soakaway units (known as the central soakaway) managed by the airport, are located north-east of the eastern taxiway. The rectangular soakaways were constructed using brickwork and filled with free draining material, each with unconfirmed depths. The combined capacity of the soakaways has been estimated. This is based on an assumed porosity range due to sedimentation, with an upper bound of 25% and lower bound of 5%. The estimated volume is between a minimum of 351m^3 and maximum 1755m^3 respectively. It should be noted the assumptions made in these calculations including the assumed depth and porosity are based on sedimentation observed prior to planned maintenance and are therefore conservative assumptions.

Inset 2.4: London Luton Airport Existing Asset Locations

3 DESIGN CONSIDERATIONS

3.1 Luton Local Plan 2011 – 2031

3.1.0 The Luton Local Plan 2011 – 2031, published in November 2017 (Ref 3.1), at Policy LLP6 London Luton Strategic Allocation states the following:

"The London Luton Airport Strategic Allocation (approximately 325 hectares) includes land within the airport boundary, Century Park and Wigmore Valley Park (as identified on the Policies Map). The allocation serves the strategic role of London Luton Airport and associated growth of business and industry, including aviation engineering, distribution and service sectors that are important for Luton, the sub-regional economy, and for regenerating the wider conurbation."

Part Fii further states:

"Development proposals for the London Luton Airport Strategic Allocation will ensure provision is made for sustainable drainage and the disposal of surface water in order to ensure protection of the underlying aquifer and prevent any harm occurring to neighbouring and lower land"

3.2 Airports National Policy Statement

3.2.1 The ANPS (Ref 3.2) sets out a number of principles for environmental impact assessment and compliance, and these will be an important and relevant consideration in the determination of the application for development consent. The relevant provisions of the ANPS include:

a. paragraphs 5.158-5.165 address the need for flood risk mitigation and management. They also provide advice on the use of sustainable drainage systems (SuDS) with the aim of ensuring that the volumes and peak flow rates of surface water leaving the site are no greater than the baseline rates, taking climate change into account;
b. paragraphs 5.172-5.177 outline assessment considerations for water quality and resources;
c. paragraphs 5.182-5.186 outlines requirements for the Proposed Development to consider interactions with Environment Agency requirements for water quality and resources.

3.3 Potable Water Scarcity

3.3.1 Potable water at the airport is supplied by AW. During early stakeholder engagement, AW identified the area suffers from groundwater scarcity.

3.3.1 LLAOL advised that the total potable water consumption for the entire airport during 2019 illustrated in Appendix E), was 236,756m3. An average AW supply was calculated accordingly at 7.5l/s (annual demand/time)

3.3.2 An objective of this Drainage Design Statement is to reduce reliance on potable water from the network and to not increase demand from the 2019 baseline.

3.4 Existing Management of Potable Water and Drainage Networks

3.4.1 Veolia are appointed by LLAOL to manage:

a. the potable water network (**Appendix E**); and
b. the foul water network (**Appendix G**).

3.4.2 The surface water network (Appendix F) however is directly managed by LLAOL.

3.5 Existing Sewerage Capacity/Limitations

3.5.1 The East Hyde Treatment Works (EHTW) is located to the south of the airport as shown on **Inset 2.4** and is owned by TW. The EHTW treats the existing foul discharge from the airport.

3.5.2 TW has indicated (Appendix H) that:

a. they have a statutory duty to receive all domestic foul flows from T2 (subject to any potential upgrades to the sewer network)
b. they have a statutory duty to use permitted development rights for the necessary sewer network upgrades to accommodate increased foul water runoff, and
c. the EHTW site is landlocked and expansion possibilities are correspondingly constrained. However, within EHTW TW can used permitted development rights for expansion.

3.5.3 The EHTW treats only foul water, therefore surface water runoff discharging from the airport is not treated at EHTW.

3.5.4 Veolia confirmed that 95% of the potable water supply was used as the basis to determine the foul water discharge to the TW network. In this Statement, it is assumed in forecasts that 100% of the potable water supply will be discharged as foul water i.e. a worst case assumption. Therefore, the annual foul water load is assumed to be 236,756m^3.

3.6 Water Flow Balance

3.6.1 This DDS includes a number of concepts which would make best use of existing water resources by reducing rate of discharge to sewers and soakaways whilst also minimising potable water demand. These consist of balancing flows using rainwater harvesting, attenuation below aprons, landside storage as well as water efficiency measures.

3.6.2 The balancing of flows will be critical to optimise the use of the existing infrastructure. Further details are outlined in Sections 4 and 5.

3.7 Rainfall Data

3.7.1 The rainfall data has been provided in a form of intensity (i.e., medium, or high) and not in a form of quantity in millimetres, therefore the relevant caveats have been included in the calculations and a conservative approach adopted. Detailed design will be based on updated data to include intensities in mm/hour.

3.8 Drainage Hierarchy

3.8.1 The SuDS Manual (Ref. 3.3) identifies that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:

a. into the ground (infiltration);
b. to a surface water body;
c. to a surface water sewer, highway drain, or another drainage system; and then
d. to a combined sewer.

3.8.2 The aim of this approach is to manage surface water runoff close to where it falls and to mimic natural drainage pathways as closely as possible.

3.9 Potential Infiltration

3.9.1 The Chalk bedrock is relatively permeable and ground investigation indicated a characteristic infiltration rate of about 0.085m/hr as detailed in the **Hydrogeological Characterisation Report [TR020001/APP/5.02]**, which has been updated for Deadline 4. This DDS is therefore based on the use of suitably sized infiltration basins – 'soakaway' – and attenuation tanks as the preferred SuDS technique for the management of runoff. The actual infiltration rates will be confirmed at detailed design stage as set out in the **Design Principles [TR020001/APP/7.09].**

3.10 Use of SuDS

3.10.1 The DDS solution is predicated on the fundamental core principles of SuDS, specifically large scale attenuation aligned with infiltration to manage water quality and quantity at source and thus prevent downstream flooding and/or contamination.

a. To control the quantity of runoff to support the management of flood risk, and maintain and protect the natural water cycle.
b. Manage the quality of the runoff to prevent pollution.

3.10.2 These objectives align with two of the four pillars of SuDS design and the Proposed Development incorporates a number of components as described in the SuDS manual (Ref 3.2) including pervious pavements, attenuation/retention, filter medium, treatment and infiltration. It is noted that in Part C – Applying the Approach in the SuDS manual the only references to solutions that are applicable to airports are in Chapter 20- Pervious Pavements and Chapter 21 – Attenuations storage tanks.

3.10.3 With respect to the other pillars of SuDS:

a. The drainage design objectives for the Proposed Development do not include improvements to biodiversity for the reasons stated in Section 36.3.5 of the SuDS manual (Ref 3.2) which relates to aircraft safety risk management and states: "*The [Civil Aviation Authority] CAA has identified SuDS components, in particular ponds, wetlands and green roofs, as a potential hazard to aircraft. Although the main concern is wildfowl including flocks of ducks, geese and swans, there is also concern about other flocking species such as rooks, starlings and gulls. Further advice is provided in Airport Operators Association (AOA) and General Aviation Awareness Council (GAAC) (2006).*"

3.10.4 Therefore the Proposed Development does not include SuDS that rely on vegetation features such as swales and reed beds as these are not compatible with the airfield location of the scheme, which relies instead on engineered solutions. It is noted that all changes to infrastructure on the airfield need to be approved by the CAA.

3.10.5 The proposed site of the drainage infrastructure is within the active airfield which is not a publicly accessible area due to reasons of safety and security. Therefore the strategy does not consider the requirement for amenity value.

3.11 Airside Pollution

3.11.1 Pollutants expected to be found on the airfield include, but are not limited to, those associated with aircraft and ground vehicle operations, de-icing agents both for aircraft and paved surfaces, fuel spillages from aircraft and vehicles, and mechanical oil, and wear and corrosion particles from both aircraft and vehicles.

3.11.2 It is noted that the airport operator has advised that technical aircraft washing is not undertaken in the operation of the airport. During the winter period (typically November to April), in line with Civil Aviation Authority (CAA) regulatory requirements, it is necessary to prevent the build-up of ice on aircraft and hard surfaces (anti-icing) or remove any ice already present (de-icing). The type of chemicals used for this are typically organic (e.g., propylene glycol, formate or acetate based). These substances require removal from surface water runoff to prevent contamination of the aquifers which are discussed in section 7.3. For this report, the term de-icing is used to cover both de-icing and anti-icing.

3.11.3 De-icing operations at the airport are increasing in effectiveness, and latest de-icing consumption figures show a sustained year on year reduction in product use. It is anticipated that the trend of reduced consumption, increased off-site re-cycling and decreased discharge, will continue.

3.11.4 Outside of the winter period, surface water runoff is not affected by de-icing chemicals.

3.11.5 Sediments and hydrocarbons spillages would be managed through good practice including silt traps and oil separators. Fuel spillage management includes booms to contain flow and rubber mats to cover gully gratings. In the event of larger fuel spills other mitigation would be deployed, for example temporary bunds and vacuum pumps to cylinders tanks that are then exported from site and re-cycled.

3.12 Limit of Design

3.12.1 This DDS is based on an outline concept design. Detailed design will progress following approval of the DCO and will include continued engagement with stakeholders. The detailed surface and foul water design will reflect the design principles set out in the separate **Design Principles [TR020001/APP/7.09]** document referenced in Section 1.1 in accordance with the relevant Requirement in Schedule 2 of the **draft DCO [REP2-003]**.

4 CATCHMENT AREAS AND WATER BALANCE

4.1 Assessment Phase 1 Water Balance & Rainwater Harvesting

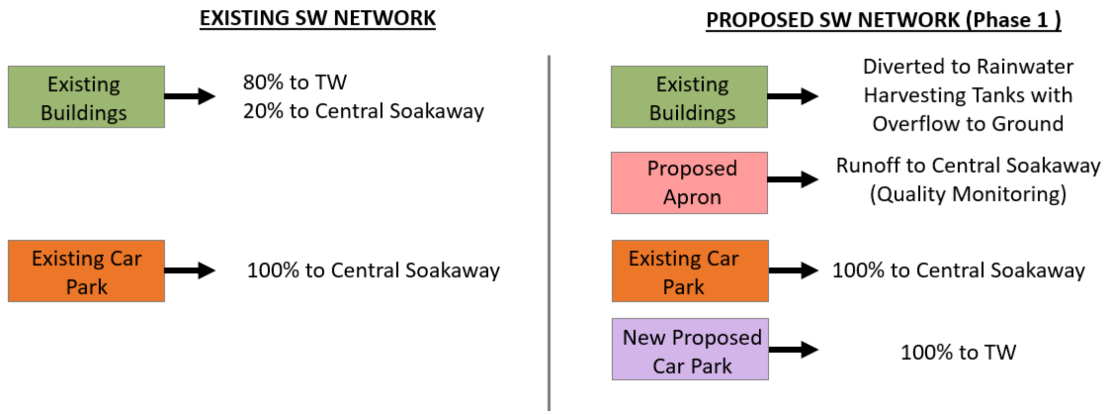
Rainwater Harvesting

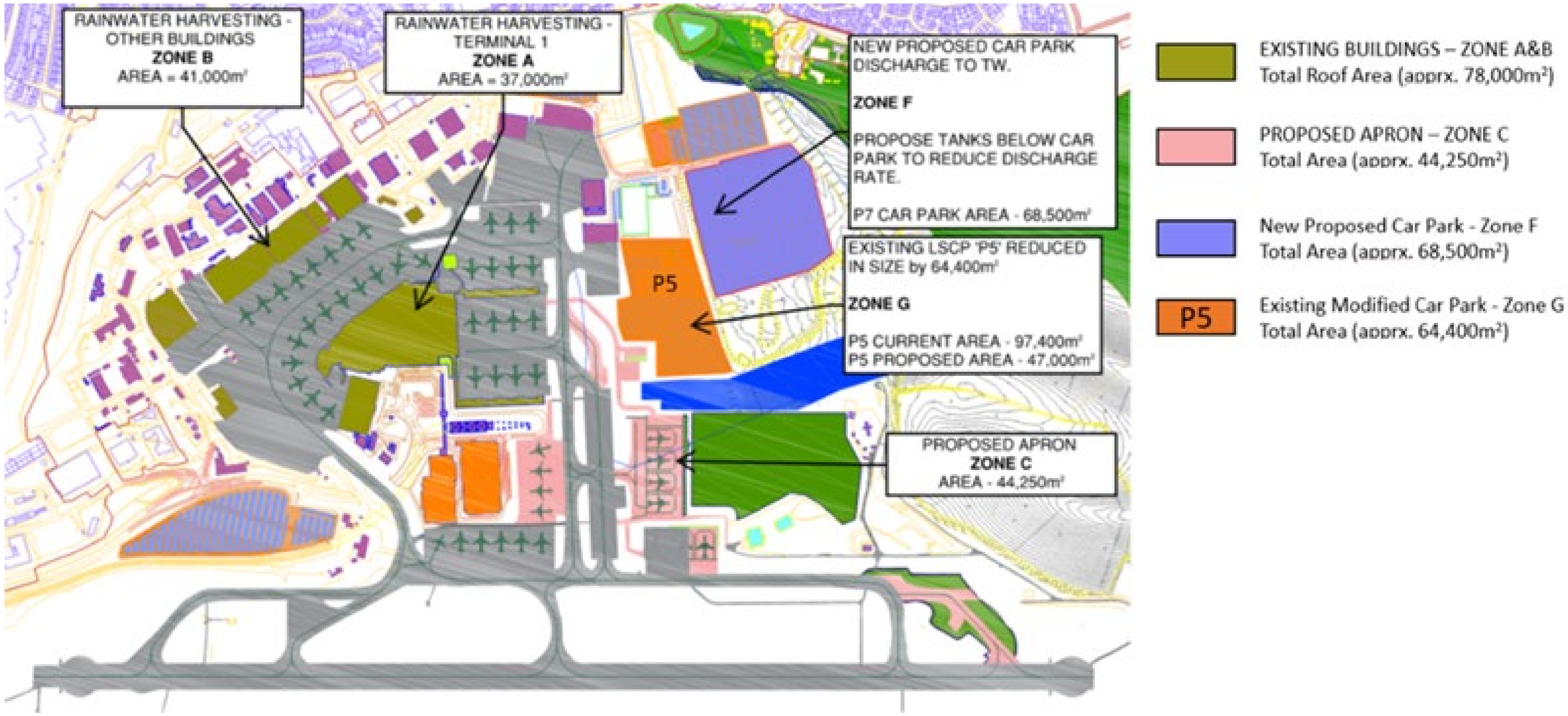
4.1.1 The rainwater harvesting strategy is outlined to reduce the demand for potable water supplied by AW as well as minimising the increase in discharge into the TW network and Central Soakaway. Zone A including T1 (37,000m^2), and Zone B other existing airport buildings (41,000m^2), as shown in **Inset 4.1**.

4.1.2 The rainwater harvesting strategy is outlined to reduce the demand for potable water supplied by AW as well as minimising the increase in discharge into the TW network and Central Soakaway. Zone A including T1 (37,000m^2), and Zone B other existing airport buildings (41,000m^2), as shown in **Inset 4.1**.

4.1.3 Based on a conservative approach to obtain the rainfall data in the Luton area, a total volume required for the storage tanks is approximately 3,000m^3 to maintain a constant monthly supply of approximately 3,400m^3 to the airport throughout the year. It is important to note that surface area calculations assume that all rainwater from existing buildings highlighted in **Inset 4.1** can be collected and stored. This will need to be confirmed at detailed design stage.

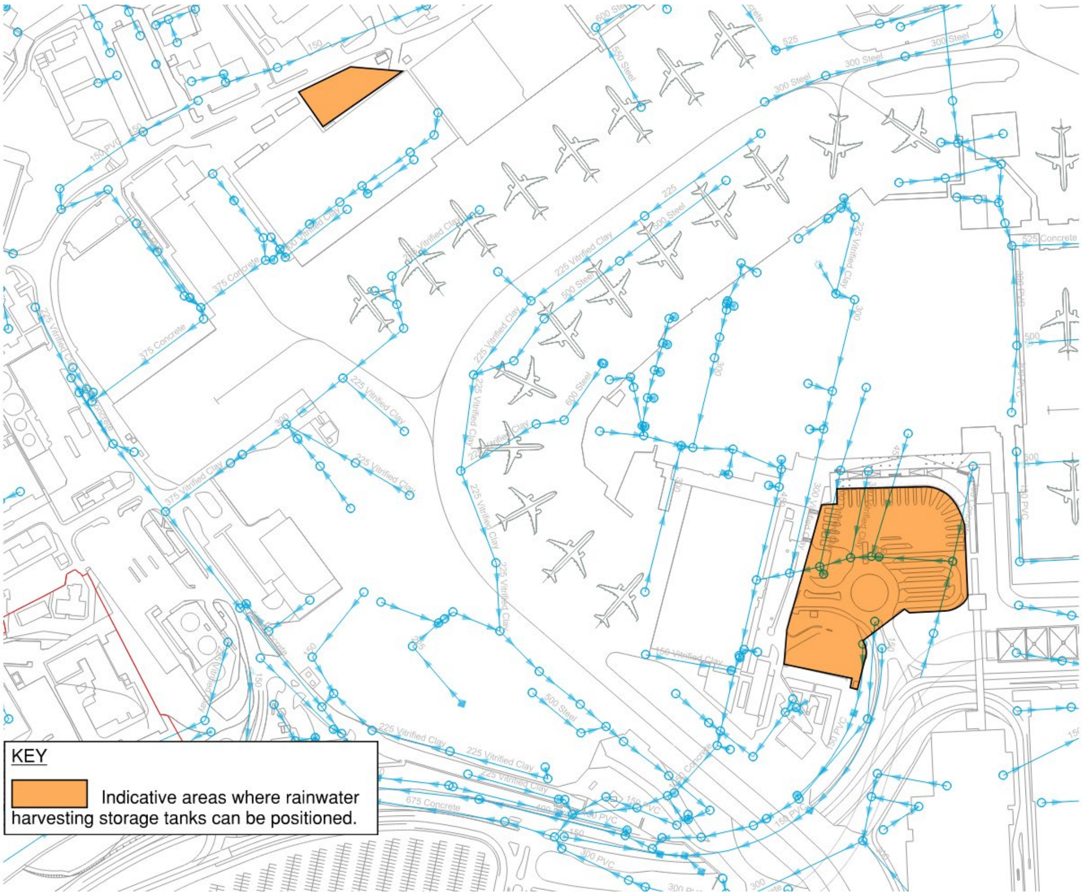
Inset 4.4: Balancing flows to maximise sustainability (Assessment Phase 1)





4.1.4 Potential locations of rainwater harvesting tanks are highlighted in **Inset 4.2**. Exact locations would be determined at detailed design stage.

Inset 4.5: Potential locations of rainwater harvesting tanks



4.1.5 Harvested rainwater would require treatment so that the quality is fit for the intended non-potable use. Preliminary treatment would include a series of filters and separators whereby the system shall be designed and located upstream of the storage tanks, noting that several systems may be needed to satisfy the number of tanks required. The treatment process will remove coarse solids and organic matter from the network such that the maximum particle size is equal or less than 1mm. The systems must also be accessible for maintenance and adhere to the requirements set by BS EN 16941-1:2018 (Ref. 4.3) (or equivalent at time of implementation).

Water Balance

4.1.6 Consideration has been given to reducing the volume of potable water used in the Proposed Development.

4.1.7 The existing LSCP (P5) east of T1, referred to as Zone G in **Inset 4.1**, will reduce in size by approximately 64,400m^2 to accommodate the proposed aprons to the south.

4.1.8 A review of the surface water network indicates that this car park is currently discharging into the Central Soakaway. Therefore, the reduction in impermeable catchment area will reduce the discharge into the Central Soakaway.

4.1.9 Capturing roof rainwater harvesting and the reduction in car park area will result in a reduction of surface water discharging to the Central Soakaway. The net decrease would be equivalent to a reduction in 34,750m^2 of paved area.

4.1.10 The reduction in the TW discharge from the airport due to rainwater harvesting and offset against the additional impermeable area from car park P7 (referred to as Zone F in **Inset 4.1**), provides a net contributing area increase to the TW network of 11,500m^2. The rainwater harvesting system will reduce discharge into TW through collecting and re-cycling roof rainwater from T1 (Zone A) and other buildings (Zone B).

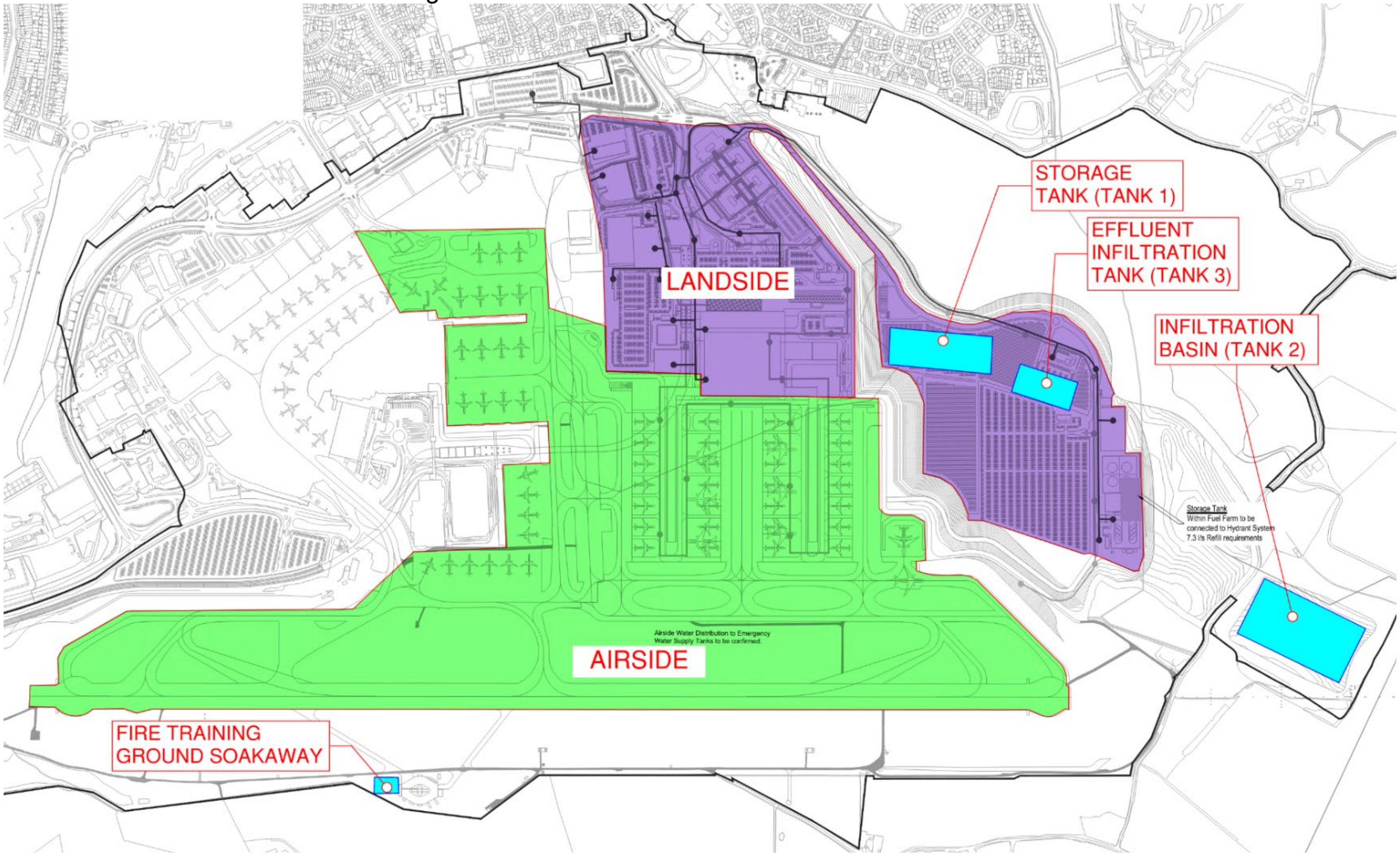
4.1.11 Therefore, the balancing of flows is expected to yield a net increase in discharge into the TW network while reducing the current levels of discharge into the Central Soakaway.

4.2 Assessment Phases 2a & 2b Water Balance & Rainwater Harvesting

Catchment Areas

4.2.1 The indicative catchment areas for the surface water volume calculations and discharge rates have been investigated and these are shown in Appendix A. The catchment has provisionally been split between landside and airside as detailed in **Inset 4.3**:

Inset 4.3: Airside and landside drainage catchments



Water Balance

4.2.2 The existing surface car park (P5) west of T2, will further reduce in size to approximately 19,250m^2 to accommodate an energy centre and substation.

4.2.3 The proposed surface car parks constructed in assessment Phase 1 labelled as P6 and P7 will be demolished to construct Green Horizons Park (formerly New Century Park), access roads and two multi storey car parks (P12) and (P19) indicated in **Inset 4.5**.

4.2.4 The proposed surface car park constructed in assessment Phase 1 labelled as P9, will reduce in its current footprint and extend to the south east of the Northern Soakaway. Overall, this will provide a net reduction in the impermeable surface to 21,600m^2.

4.2.5 The proposed surface car parks for assessment Phases 2a and 2b are located west of the water treatment plant, labelled as P10 and P11 in **Inset 4.5**. Approximately 22,950m^2 of P11 above Tank 1 will be permeable paving.

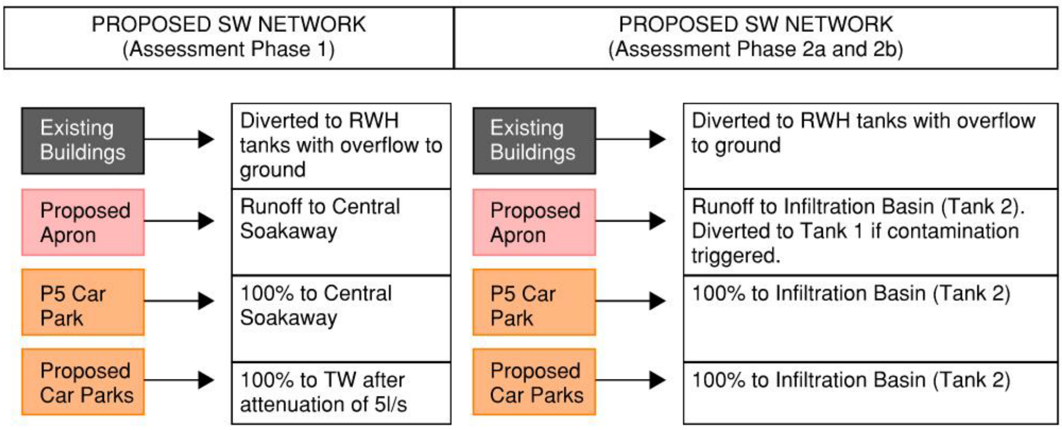
4.2.6 Following the relocation of the Central Soakaway to the far east of the Main Application Site, car park P5 will be diverted to discharge into the proposed infiltration basin (Tank 2).

4.2.7 The impermeable surface area for assessment Phases 2a and 2b will discharge to the proposed infiltration tank has a net increase catchment area of 509,450m^2.

4.2.8 The reduction in the TW discharge from the airport due to rainwater harvesting and offset against the additional impermeable area from car park P10 and P11, provides a net contributing area decrease to the TW network due to diverted runs to the proposed infiltration tank. The rainwater harvesting system will reduce discharge into the TW network through collecting and re-cycling roof rainwater from T2 and other buildings.

4.2.9 Therefore, the balancing of flows is expected to yield a net decrease in discharge into the TW network whilst diverting the current levels of discharge away from the Central Soakaway.

Inset 4.4: Summary of water balance for assessment Phases 1, 2a and 2b



Rainwater Harvesting

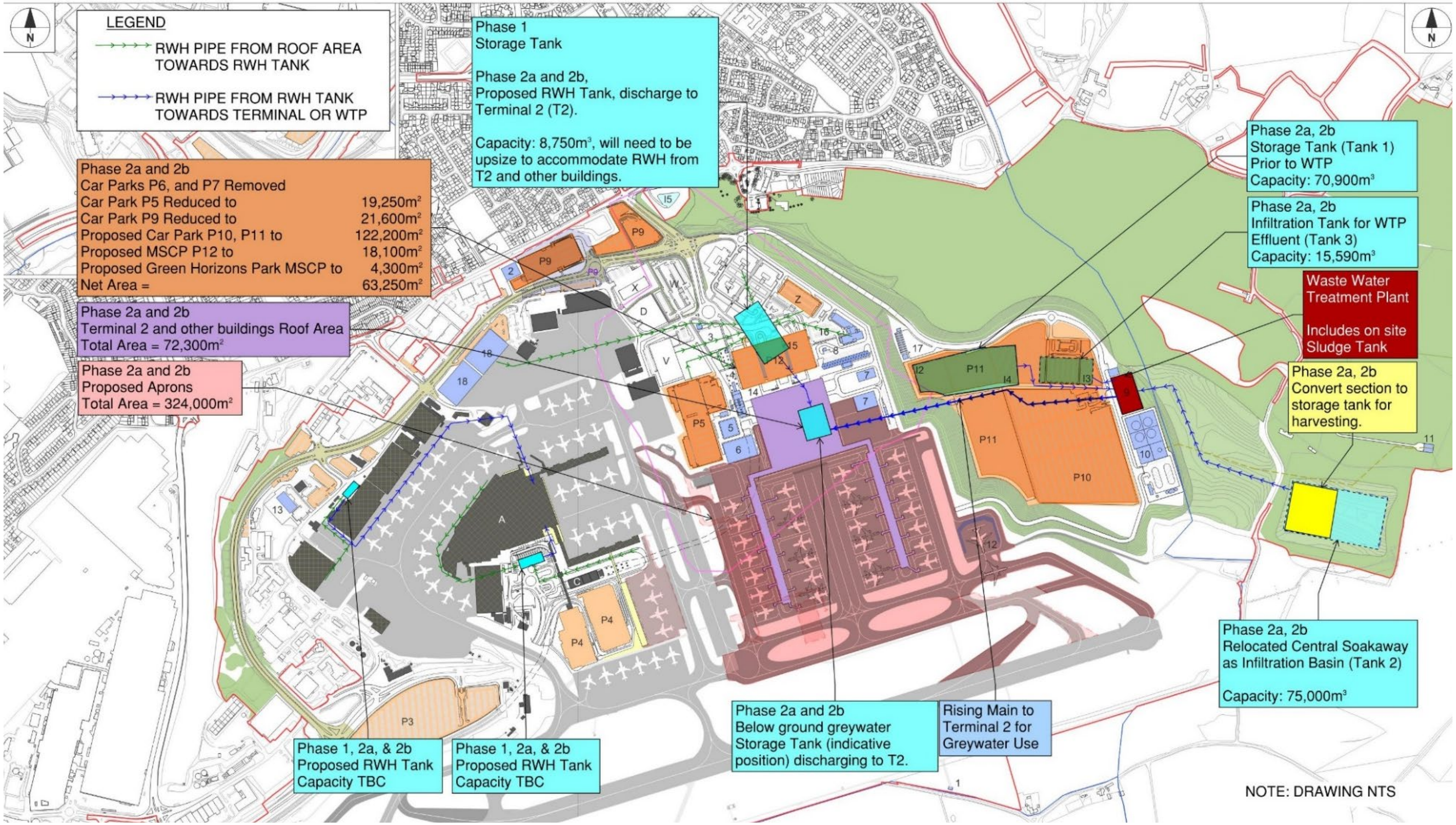
4.2.10 The rainwater harvesting strategy is outlined to reduce the demand for potable water supplied by AW, as well as minimising the increase in discharge via infiltration. **Inset 4.5** highlights proposed infiltration basin/tanks with corresponding uses as well as roof catchment areas.

4.2.11 Based on rainfall data in the Luton area, a total volume required for the storage tank attenuating rainfall from the T2 buildings is approximately 3,100m^3, to maintain a constant monthly supply of approximately 3,100m^3 to the airport throughout the year. It is important to note that surface area calculations assume that all rainwater from existing buildings highlighted in **Inset 4.5** can be collected and stored. This will need to be confirmed at detailed design stage.

4.2.12 Potential locations of rainwater harvesting tanks for assessment Phases 2a and 2b are highlighted in **Inset 4.5**. Exact locations would be determined at detailed design stage.

4.2.13 Harvested rainwater would require treatment so that the quality is fit for the intended non-potable use. Preliminary treatment would include a series of filters and separators whereby the system shall be designed and located upstream of the storage tanks, noting that several systems may be needed to satisfy the number of tanks required. The treatment process will remove coarse solids and organic matter from the network such that the maximum particle size is equal or less than 1mm. The systems must also be accessible for maintenance and adhere to the requirements set by BS EN 16941-1:2018 (or equivalent at time of implementation).

Inset 4.5: Rainwater harvesting for assessment Phases 2a and 2b



Water Efficiency Measures Across All Assessment Phases

4.2.14 The airport operator is committed to introducing water efficiency measures to reduce consumption, including:

a. Reduction in water consumption per passenger – reduced demand, and foul water discharge. This aligns with LLAOL's objectives to reduce total water consumption to less than 6.98 litres/pax by the end of 2023, representing a 10% reduction from the 2018 baseline.

b. Reduction in use of potable water in applications where non-potable water can be used.

c. Water efficient appliances and equipment to be used within the terminal.

5 ASSESSMENT PHASE 1 DRAINAGE DESIGN STRATEGY

5.1 Introduction

5.1.1 Assessment Phase 1 anticipates an increase in the number of passengers using the airport, from its current consented capacity of 19 mppa to 21.5 mppa.

5.1.2 Surveys will be required to determine the full details of the current drainage arrangements to support detailed design.

5.1.3 Assessment Phase 1 includes the following changes of relevance to drainage:

a. expansion of the existing Terminal 1 (T1);

b. introduction of the rainwater harvesting strategy for existing buildings;

c. the existing long stay car park (LSCP), Zone G on **Inset 4.1**, is to be reduced to approximately 64,400m^2, reducing the amount of discharge into the Central Soakaway;

d. new temporary car park proposed north east of existing LSCP, Zone F on **Inset 4.1**, comprising an area of 68,500m^2 to discharge into the TW network north east of the airport;

e. Landscape and ecological improvements, including the replacement of existing open space; and

f. new apron south east of the airport, Zone C on **Inset 4.1**, encompassing an area of 44,250m^2 to be attenuated and discharged into the Central Soakaway.

5.1.4 The drainage consideration for the Airport Access Road and Off-site Highway Interventions are considered in Section 8 of this report, rather than as a part of this section.

5.2 Existing Network

5.2.1 The airport currently drains via a combination of discharges to surface water and foul water public sewers and a number of infiltration-based systems.

5.2.2 An assessment has been made of the existing airport catchment likely to require replacement drainage infrastructure as a function of the Proposed Development.

5.2.3 The extent of proposed hard surfacing requiring engineered drainage has been determined from reference designs, and allowance has been made for a degree of runoff from new areas of managed soft landscaping. Drawings in **Appendix A** illustrate the total catchment assumed for the preliminary design.

5.3 Drainage Strategy

5.3.1 The proposed drainage strategy aims to expand the existing T1 infrastructure through the introduction of a rainwater harvesting system along with a series of diversions. The strategy includes the installation of storage tanks below proposed aprons to attenuate discharge rates and to monitor contaminants to safeguard the existing soakaways. Combined with the incorporation of landside storage, the strategy aims to enhance the water efficiency measures to reduce the total water consumption.

5.4 Preliminary Surface Water Drainage Design

5.4.1 The runway and T1 paved areas are referenced as 'Airside Drainage'. T1, hangars and other buildings, and corresponding parking zones are referenced as 'Landside Drainage'.

Airside Drainage

5.4.2 The proposed apron catchment area of 44,250m^2, Zone C on **Inset 4.1**, would discharge into the existing Central Soakaway.

5.4.3 Class 1 Oil Interceptors will be included as part of the surface water drainage system to safeguard for any spillages or pollutants entering the system and subsequently the Central Soakaway.

5.4.4 The discharge rate of the airfield surface water has been calculated to the green field run-off rate (GRR) and to achieve this, an attenuation tank of approximately 4,000m^3 would be constructed below the apron to manage the discharge rate to the soakaway. Real-time monitoring of surface water runoff would divert contaminated flow to a polluted water holding tank.

5.4.5 Whilst pollutants in runoff would typically be measured in terms of biological and chemical oxygen demand (BOD and COD), these present challenges to measurement on site including extended response times (typically 1 to 2 hours) and the requirement to be installed in an air-conditioned environment. They are thus typically measured in laboratories. Total organic carbon (TOC) is a substitute for these which can be measured in real time on site, and it is therefore used at a variety of sites to facilitate diversion of contaminated water. TOC monitors are known to be in use at a number of UK airports, including Manchester, Birmingham, Leeds Bradford and Wick, as well as internationally.

5.4.6 The proposed system would include TOC monitoring levels installed in an inspection chamber. A subsequent chamber, fitted with an automated valve would divert flows to the polluted water holding tank should pollutants be detected. The locations of the diversion valves and the TOC monitors would be selected in the detailed design stage based on the response time of any TOC monitor being used such that the travel time of contaminated runoff will be longer than the response time of the monitors.

5.4.7 Detection levels will be confirmed at detailed design stage. Correlation between TOC, BOD and COD is site specific. Any future TOC detection level will be set based on baseline quality monitoring of existing surface water runoff and calibration of TOC levels against BOD and COD in laboratory tests. Similar monitoring and testing will be undertaken at regular intervals during the operation of the expanded airport to validate the calibration and adjust the threshold, if needed.

5.4.8 The proposed layout for the polluted water holding tanks and their connections at Phase 1 is shown on the drawing in **Appendix B**. The monitored airside area will be limited to the stands where de-icing agents will be used. These are highlighted in **Inset 5.2**. De-icing of aircraft would only be allowed on five of the proposed stands, as the other two stands are restricted to engine testing. Contaminated water stored under the apron will be discharged back into the TW foul water main at a discharge rate of 2l/s as agreed with TW, via a rising main.

5.4.9 Both the attenuation and polluted water holding tanks would be located below the apron. These would be designed to latest industry standards, including but not limited to the requirements of the Building Regulations ‘Part H’ (Ref. 4.1) and Sewerage Sector Guidance ‘Design & Construction Guidance’ 2021 (Ref. 4.2), or equivalent at the time.

Landside Drainage

5.4.10 The proposed car park (P7) north-east of the airport, referred to as Zone F in **Inset 4.1**, will discharge to the TW network at President and Frank Lester Way to the north of the airport. To help eliminate the increased discharge rate into the TW network, an attenuation tank is proposed, below the car park, to reduce the risk of flooding and release water at a controlled rate. The estimated capacity of the tank is 8,750m^3. This tank would be constructed above the landfill and would need to be suitably designed to avoid risks of contamination. The sitewide strategy is to restrict the runoff from the car parks to GRR. A discharge rate of 5.0l/s/ha, from the attenuation tank, has been agreed with TW.

Class 1 Oil Interceptors will be included as part of the surface water drainage system to safeguard for any spillages or pollutants entering the system.

5.5 Preliminary Foul Water Strategy

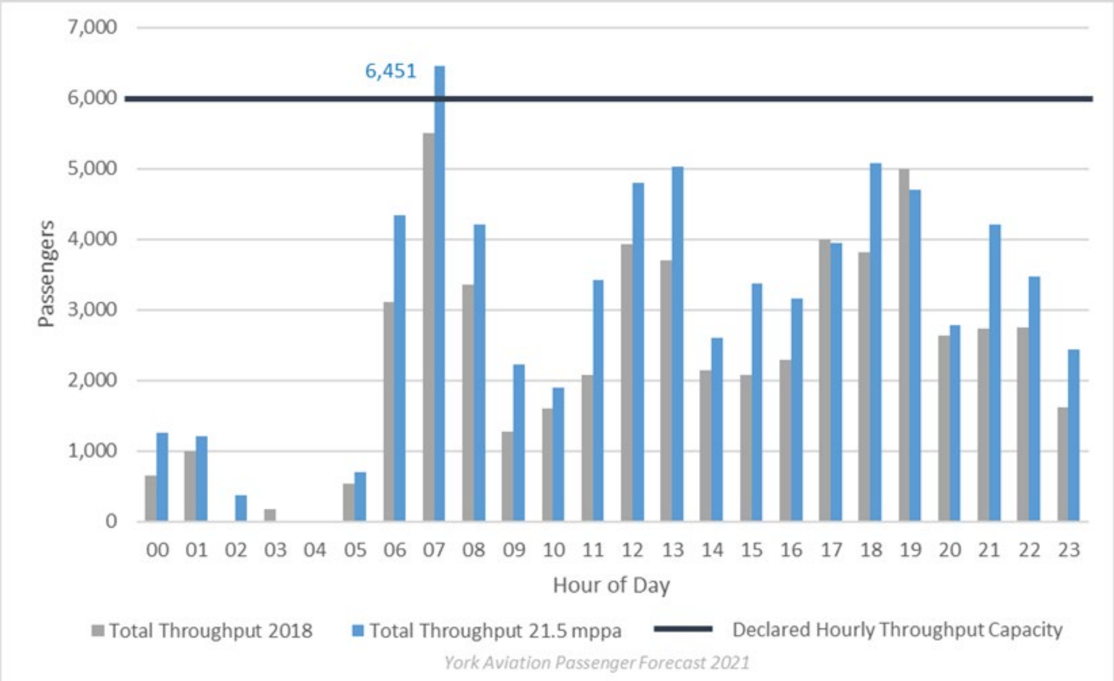
5.5.1 This strategy is based on the passenger forecasts set out in the **Need Case [AS-125].**

Terminal 1 Foul Water Drainage

5.5.2 The LLAOL 19 mppa Drainage and Water Supply Infrastructure Appraisal (Ref. 4.4) indicates that the existing foul network can accommodate a maximum capacity throughput of 6000 passengers per hour.

5.5.3 The uplift in passenger throughput in T1 will increase the foul water discharge to the TW network. The passenger forecast shown in **Inset 5.1**, indicates a net peak increase in passenger throughput at 07:00, which results in an increase of 451 passengers above the declared airport throughput capacity of 6,000 passengers per hour. The foul water drainage strategy includes a 6m^3 storage tank to attenuate this peak, allowing discharge at later hours of the day when the network is not at capacity. The requirement for this attenuation would be confirmed at detailed design stage.

Inset 5.1: Passenger daily forecast

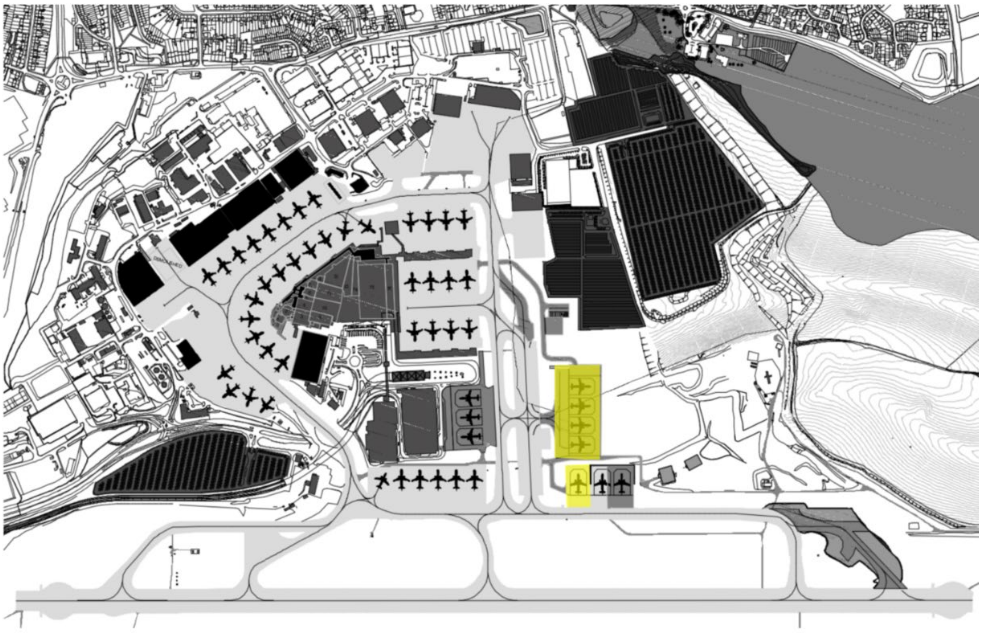


Contaminated Surface Water Runoff

5.5.4 In the event of surface runoff from the new aircraft stands shown in **Inset 5.2**, being contaminated (as indicated by the proposed monitoring system) (refer to section 5.4.4), it would be diverted from the surface water system and attenuated in a central polluted holding tank with an approximate capacity of 1,080m^3.

5.5.5 The polluted water from the tank will then be pumped by a rising main which will connect to the existing TW foul network infrastructure to the north of the aircraft stands.

Inset 5.2: Aircraft de-icing stands (indicated in yellow)



6 ASSESSMENT PHASES 2A AND 2B DRAINAGE DESIGN STRATEGY

6.1 Introduction

6.1.1 For the purpose of this section, works for assessment Phases 2a and 2b at the Terminal 2 (T2) campus are considered to include the following:

a. New passenger terminal building and boarding piers (T2);
b. Earthworks to create an extension to the current airfield platform; the vast majority of material for these earthworks would be generated on site;
c. Airside facilities including new taxiways and aprons, together with relocated engine run-up bay and fire training facility;
d. Landside facilities, including buildings which support the operational, energy and servicing needs of the airport;
e. Enhancement of the existing surface access network, including a new dual carriageway road accessed via a new junction on the existing New Airport Way (A1081) to the new passenger terminal along with the provision of forecourt and car parking facilities;
f. Extension of the Luton DART with a station serving the new passenger terminal;
g. Landscape and ecological improvements; and
h. Further infrastructure enhancements and initiatives to support the target of achieving zero emission ground operations by 2040[1] with interventions to support carbon neutrality being delivered sooner including facilities for greater public transport usage, improved thermal efficiency, electric vehicle charging, on-site energy generation and storage, new aircraft fuel pipeline connection and storage facilities and sustainable surface and foul water management installations.

6.1.2 Assessment Phases 2a and 2b include the following changes of relevance to drainage:

a. construction of T2;
b. installation of a new infiltration basin (Tank 2) at the east of the site, diverting existing discharge from existing Central Soakaway to proposed infiltration basin (Tank 2) as highlighted in **Inset 4.3**;
c. apron and taxiway expansion, comprising approximately 324,000m^2 of additional surface area discharging to the proposed infiltration basin (Tank 2);
d. rainwater harvesting strategy for proposed T2 buildings, and surface water attenuation from Tank 2. Storage tank installed during assessment Phase 1 to be converted to rainwater harvesting attenuation tank;
e. the existing long stay car park (LSCP), P5 on **Inset 4.5**, is to be reduced to approximately 19,250m^2, diverting the discharge from the existing Central Soakaway;
f. the temporary car parks proposed in assessment Phase 1 labelled as P6 and P7 on **Inset 4.3** will be built over in assessment Phases 2a and 2b, in

[1] This is a Government target, for which the precise definition will be subject to further consultation following the Jet Zero Strategy, and which will require further mitigations beyond those secured under the DCO.

part with T2 and associated development and also elements of Green Horizons Park (formerly New Century Park);

g. proposed car parks and block parking labelled P10 and P11 respectively on **Inset 4.5**, which would contribute to approximately 122,200m^2 of area, of which a proportion is permeable paving; and

h. construction of a Water Treatment Plant (WTP) to treat contaminated airside run-off to discharge to ground via infiltration tank 3 (refer to **Inset 4.4**), and tanker sludge off-site for treatment. The WTP will also treat harvested surface water run-off to greywater standards and discharge to T2.

6.1.3 Note that drainage considerations for the Airport Access Road and Off-site Highway Interventions are considered in Section 8 of this DDS, rather than as a part of this Section 8.

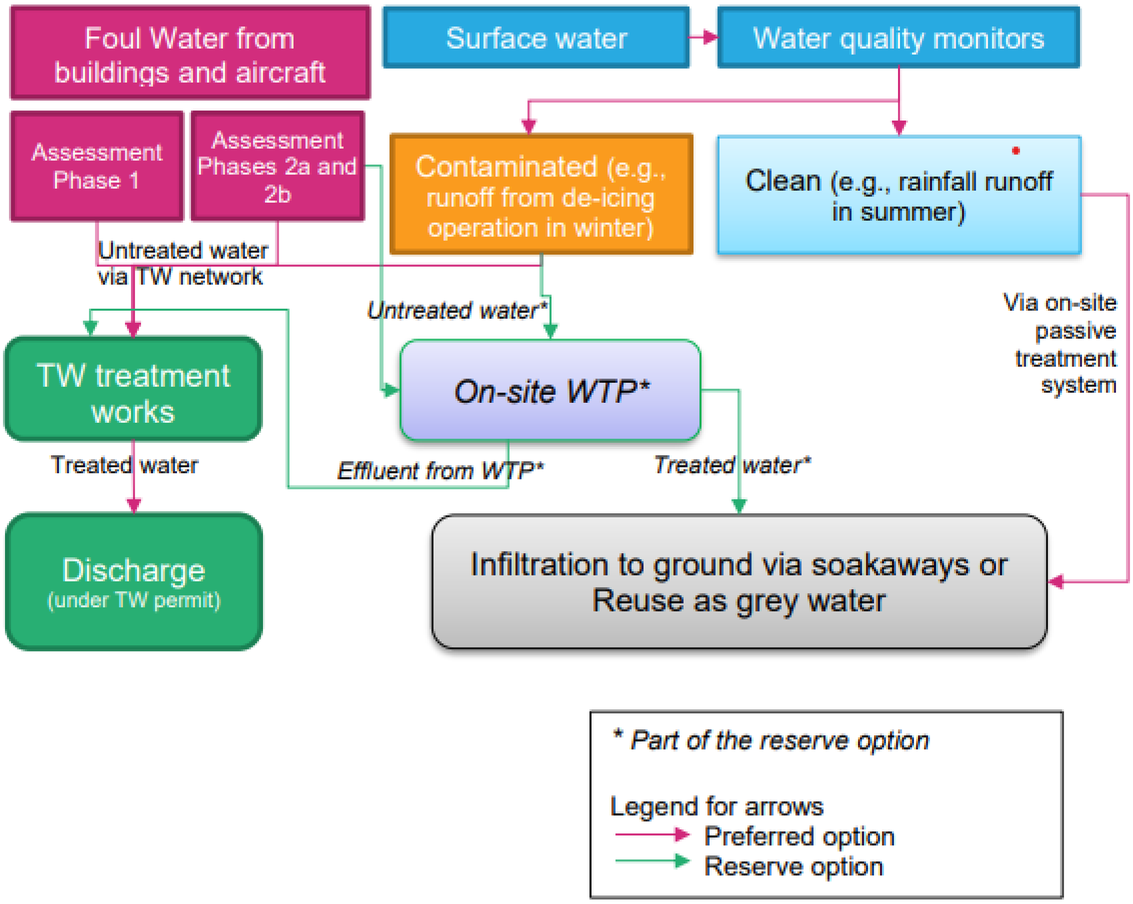
6.1.4 Given that TW's assessment of network and treatment capacity is ongoing, the DDS considers a preferred and a reserve option.

6.1.5 The preferred option is to direct all contaminated discharges from assessment Phases 2a and 2b of the Proposed Development (including foul water from buildings, aircraft blue water and contaminated surface water runoff) to the TW drainage, and TW treatment systems. As is the approach in the previous version of the **DDS [APP- 137]**, non-contaminated (clean) surface water runoff would continue to be directed to groundwater by infiltration or reused as grey water.

6.1.6 The reserve option retains the infiltration to ground for foul water and contaminated surface water. This ensures a viable option exists for the treatment of contaminated discharges from assessment Phases 2a and 2b of the Proposed Development, should the preferred option prove not to be deliverable.

6.1.7 The preferred and reserve options are detailed on **Inset 6.1:**

Inset 6.1 – Preferred and Reserved treatment options



6.2 Existing Network

6.2.1 The existing surface water network discharges into a combination of soakaways and the TW network.

6.2.2 The existing foul network discharges into the TW foul network.

6.3 Foul Water Strategy

T2 Campus Foul Water

6.3.1 The proposals with respect to the treatment of the T2 campus foul water (e.g. from toilets, kitchen), and aircraft blue water[1] are conceptually detailed below.

6.3.2 Two options were considered for treating the foul water – discharging to the TW network that connects to the EHTW or providing a WTP on-site with an independent drainage network.

6.3.3 Following the **EA's Principal Areas of Disagreement Summary Statement (PADSS) [AS-056]** , the Applicant has further consulted with TW to undertake an assessment of the existing and future TW network required to accommodate

[1] The vacuum toilet used on aircraft sucks the waste into a holding tank where it is stored until the aircraft lands. Blue liquid disinfects the bowl and helps kill odours hence the name aircraft blue water.

the foul water discharge that was identified to go to the on-site WTP, prior to discharge to groundwater via infiltration, within the previous version of this DDS.

6.3.4 A technical description of the WTP processes and monitoring systems is provided in the following section and will be further developed during the detailed design stage.

6.3.5 TW, via a letter dated 1 September 2023 (Appendix H) have confirmed the following:

"TWUL accepts that it has a statutory duty to receive all domestic foul flows from the proposed buildings in the Terminal 2 development subject to any potential upgrades to the sewer network."

6.3.6 Completion of the TW study into the above is due for completion after the DCO Examination. However, TW will be able to provide initial results during the Examination and further refinement by January 2024.

Terminal 2 Blue Water

6.3.7 A new discharge point for Terminal 2 blue water operations will be provided adjacent to Terminal 2 and discharge to the TW network. Underground storage and flow monitoring will be provided to ensure discharge when foul flow from the remained of the T2 campus is low to ensure that the overall discharge rate for the T2 campus is not exceeded.

6.4 Surface Water Drainage Strategy

Introduction

6.4.1 The main drainage infrastructure would include the installation of the new WTP, attenuation tanks and infiltration basins. The Proposed Development would replace the existing Central Soakaway with new infiltration tanks.

6.4.2 The proposed drainage system would divert the existing drainage runs away from the existing Central Soakaway to control the pathway of the contaminated runoff, continuously monitor the water quality and discharge via one of the following two methods:

a. Preferred Option - Discharge to the existing TW network at an agreed and controlled rate.
b. Reserve Option - If discharge to the existing TW network is not possible then on site treatment and discharge via infiltration will be applied.

6.4.3 The highlighted drainage runs in pink and yellow shown below on **Inset 6.2** currently discharge into soakaways.

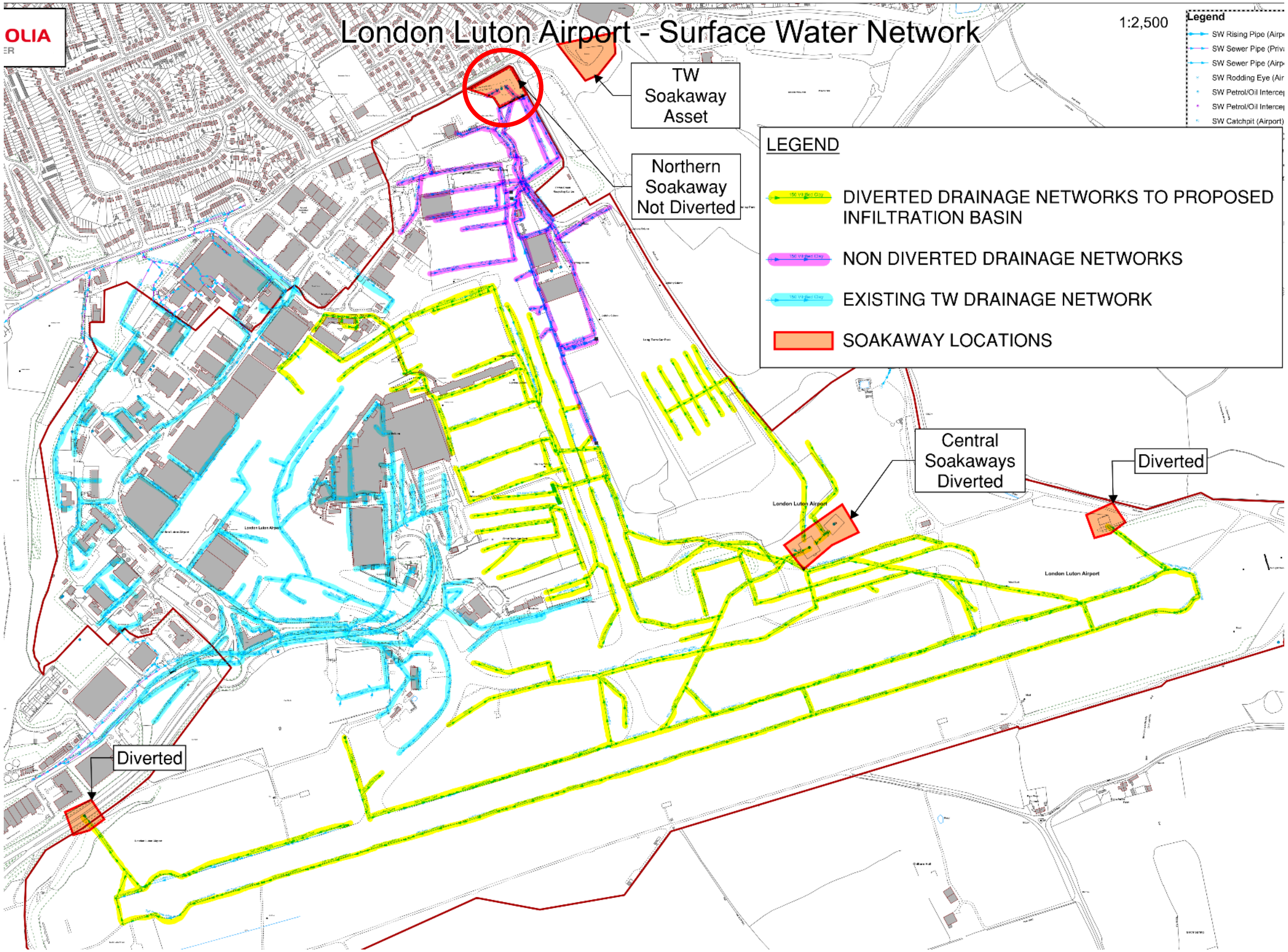
6.4.4 The extension of the apron for the T2 expansion will retain the attenuation tanks installed below the apron constructed in assessment Phase 1 and will continue to restrict the discharge to GRR. As such, there is an opportunity to further utilise this attenuation tank to control the discharge to the WTP.

6.4.5 The network discharging to the Northern Soakaway (circled in red on **Inset 6.2**) is not to be diverted in the Proposed Development. The existing connections to the TW network from the existing T1 and aprons would continue to discharge into the TW network.

Effect on Existing River Catchments

6.4.6 As a result of the proposed airside drainage infrastructure, under the contaminated water discharge scenario, approximately 9ha of land that currently discharges into the river Lea catchment will be diverted to the proposed drainage systems which would ultimately discharge into the river Mimram catchment.

Inset 6.2: Location of existing soakaways.



6.4.7 Pollution ControlIt is noted that operational preference is to pro-actively anti-ice to prevent the formation of ice as this is less disruptive to airport operations and requires less product than reactive de-icing which occurs after ice has formed.

6.4.8 The list and schematic below show the opportunities currently identified for pollutants to be identified and removed prior to discharge:

a. Basic protection by ensuring that all London Luton Airport vehicles carry the appropriate spill kits to limit vehicle fuel spill runoff.
b. Gullies with silt traps and/or filter drains adjacent to runway and parallel taxiway – these act as a first separation stage for the main areas where heavy metals may be present (i.e. the touch down and take off zones).
c. Class 1 oil separators are provided to all areas where there is a possibility of a fuel spillage.
d. A pollution monitoring chamber will be provided that contains a TOC monitor (for de-icer contaminated runoff detection) and a sensor to detect any floating pollutants (such as oil).
e. Dependant on whether pollutants are identified in the flow monitoring chamber, a flow control chamber is provided to direct and divert the flows as required. This is to be placed as far downstream of the pollution monitoring as possible to allow for adequate time for the mechanical flow control devices to operate.

6.4.9 Where there is a possibility of de-icing, the strategy below will be used:

a. De-icing will typically be required from November to April. The activity takes place at runway, taxiways, aprons, and at aircraft on stand. De-icing chemicals are applied to the ground and aircraft. The pollution prevention strategy will include:
   i. improved controls and management of the application of ground de-icers (e.g., bunds, vacuum pumps to tankers and off-site re-cycling); and
   ii. improved controls and management for dosing for application of de-icers to aircraft.
b. Any residual fluids resulting from the de-icing of aircraft and hard surfaces, would be collected by vacuum sweeper or collected by the drainage system, stored in the polluted storage tank, and discharged to the proposed water treatment plant. Monitoring inspection chambers within the drainage system are activated by pollutants and subsequently the flow is diverted to the polluted storage tanks or water treatment plant.
c. The aforementioned TOC monitor will be integral in diverting any remaining glycol that has been dissolved in rainwater runoff away from the clean water system.

Fire Training Ground

6.4.10 The drainage associated with the proposed Fire Training Ground, shown in **Appendix B** (drawing 5507), will be self-contained. When the Fire Training

Ground is not in use surface water run-off will discharge to an adjacent proposed soakaway, unless real time monitoring determines otherwise. During fire training operations, surface water run-off will be diverted to a holding tank and will not drain to ground under any circumstance. Effluent generated from fire training activities (containing foam and hydrocarbon breakdown constituents) may, subject to securing the necessary consents, be directed into existing public foul sewerage systems or will otherwise be tankered away for treatment off-site.

6.4.11 Work undertaken in future design stages will follow the principle of having no discharge from the Fire Training Ground via infiltration in order to protect the existing aquifer. This work will also set out the proposed detailed methodology for removing effluent from the site.

6.4.12 Outside of fire training operations, any surface water runoff will be screened by silt traps and oil interceptors prior to discharge.

6.4.13 During fire training operation, the fire training ground will be isolated from the rest of the airside sections of the airport by way of valves incorporated into the drainage pipe network. Water generated by the fire training activities including wash down after the event has ceased will then be collected and transported off site for appropriate treatment and disposal.

6.4.14 This water will not be treated within the on-site WTP and so will not be discharged to ground.

6.4.15 Environmental management procedures for the storage and use of bulk liquids will be developed in cognisance of the airport being located within a public water supply Source Protection Zone (SPZ).

6.4.16 Existing LandfillA former landfill site extends to the north of the airport and any potential surface water falling on the landfill area will need to be controlled by capping the landfill layer. The area occupied by the former landfill will therefore be impermeable with surface water being channelled towards infiltration basins/tanks outside the landfill area.

6.4.17 Site investigations to date indicate that the historic landfill is still producing gas and therefore gas protection measures are required. The extent of the landfill is shown on the drainage drawings in **Appendix B**.

6.4.18 All drainage systems (e.g., pipes and tanks) will need to be lined with a waterproof membrane.

6.4.19 In addition, the geotechnical site investigations indicate that the landfill will continue to settle with time and, therefore, any below ground installations will need to include flexible jointing to allow for differential settlement across the site. Settlement, along with any effects on the attenuation structure and pipework, will need to be monitored.

Emergency Water Supply

6.4.20 The airport's Rescue and Firefighting Service operates through CAA Category 7 with Category 9 on request (Ref. 5.1). These categories define the volume of firefighting media required at all times. The Proposed Development does not necessitate a change in the category; therefore, no additional water storage is required for firefighting purposes. Whilst the new apron design will include additional hydrants for firefighting purposes, the runway and taxiways do not have a hydrant system in place and rely on underground static tanks.

6.4.21 The total water storage inside the static water supply is 353m^3 with a further 49m^3 on wheels. The total water available (static emergency and on wheels) is therefore 402,000 litres (or 402m^3). Engagement with the airport operator indicates that the current static emergency water supply has sufficient capacity to cater for the Proposed Development.

6.5 Clean Surface Water Drainage Strategy

6.5.1 The preliminary drainage strategy assumed to be in place for this assessment phase is illustrated in **Appendix B**.

6.5.2 For this DDS, “clean” is airfield and landside runoff that has been screened by silt traps and oil interceptors but has no further contaminants.

Key Design Considerations

6.5.3 The key design considerations are intended to reflect a sustainable approach to water management, and include the following criteria:

a. The surface water drainage will be designed, where possible, as a gravity system. The drainage system is to be designed in accordance with Design and Construction Guidance v2-1 (Ref. 4.2) namely no surcharging during a critical storm event of 1 in 2 years return period and no exceedance flooding during a critical storm event of 1 in 30 years return period. All surface water drainage is to be assessed for a 1 in 100 year return period with 40% added for climate change, so that any flooding is contained on site and does not impact surrounding areas.
b. Suitable upstream management consisting of source control and continuous quality monitoring and end-of-pipe treatment to maximise the use of SuDS.

Proposed Design Details

6.5.4 If the water has been identified as clean, the following method is proposed as a baseline for dealing with the clean airfield surface water runoff:

a. Discharge to an infiltration basin (Tank 2) for discharge into the chalk layer.

6.5.5 This method would ensure that the aquifer continues to be recharged by surface water runoff from within the Main Application Site.

Tank 2

6.5.6 The proposed infiltration basin (Tank 2) provides 75,000m^3 of water storage and will be positioned at the lower levels of the Main Application Site. It has been sized such that it should remain mostly dry in all but the most severe storms.

6.5.7 Tank 2 drains into the chalk layer which is highly porous and therefore offers good infiltration properties.

6.5.8 Access to Tank 2 will be required for periodic maintenance.

6.5.9 Water stored in Tank 2 will be recycled for greywater use via a re-lift pumping station located along the pipe routing.

a. The re-lift pumping station will supply water to a grit removal plant which will include 75% duty/assist grit centrifugal separators. From the centrifugal separators the treated water will then gravitate to the final rainwater harvesting storage tank in the vicinity of the T2 building for use as grey water in the terminal.

b. The grit removed will be transferred to skip to be combined with the grit removed from the water treatment plant for removal.

6.6 Contaminated Surface Water Drainage Strategy

Key Design Considerations

6.6.1 The preliminary drainage strategy assumed to be in place for this assessment phase is illustrated in Appendix B.

6.6.2 The key design considerations are intended to reflect a sustainable approach to water management, and in addition to those already included under the Clean Surface Water Drainage Strategy in Section 6.5 of this DDS include the following criteria:

a. Improved methodologies for applying the de-icing agents such as bunds and vacuum systems will limit the volume entering the drainage system and increase the volume of de-icing agents to be re-cycled off-site.

6.6.3 It is noted that efforts are being made by the airport operator to reduce the areas where glycol is applied and recovery systems are being rolled out to collect glycol from pavement surfaces to prevent the contaminant entering the surface water network at source. The efficacy of these measures will be assessed at detailed design stage.

Proposed Design Details

6.6.4 If surface water has been identified as contaminated through water quality monitoring, the following method is proposed as a baseline for dealing with the contaminated airfield surface water runoff:

a. Preferred option – Storage of contaminated surface water and discharge to the TW network at a controlled and agreed rate. Depending on the outcome of the engagement with TW, there is a possibility that a WTP will be provided onsite (as referred to above and already included in the application) in order to pre-treat the effluent prior to discharge to the TW network.

b. Reserve option - Treatment to remove glycol and other identified contaminants followed by controlled discharge via infiltration to ground.

Tank 1

6.6.5 Proposed Tank 1 shown in **Inset 4.3** is to be located below car park P11. Further checks have been carried out to determine the sizing of Tank 1, which is calculated based on several factors, including meteorological data to determine the number of de-icing events but most importantly on the allowable discharge rate to the Water Treatment Plant.

6.6.6 Tank 1 will provide a degree of redundancy in the system to cater for a range of factors that will be considered further at detailed design, including:

a. flooding at the infiltration tanks due to extreme events – the preliminary analysis suggests that for an extreme storm event of 1:100 return period + 40% climate change design, the tank will fill by approximately 14,000m^3;
b. WTP part-closure due to maintenance;
c. allowable discharge rate from Tank 1 into the water treatment plant;
d. the chemical composition of the contaminated airside influent and hazardous substances;
e. infiltration basin/tank (Tank 2 and Tank 3) part-closure due to maintenance;
f. seasonal variations in the re-cycled water demand (e.g. due to irrigation); and
g. variations in the actual infiltration rates at the infiltration basin/tank (Tank 2 and 3), pending local geotechnical investigations.

6.6.7 Access to Tank 1 will be required for periodic maintenance.

Tank 3

6.6.8 Proposed Tank 3 shown in **Inset 4.3** is to be located below car park P11. Further checks have been carried out to determine the sizing of Tank 3 which is calculated based on several factors, including meteorological data to determine the number of de-icing events but most importantly on the allowable discharge rate to the water treatment plant.

6.6.9 The function of Tank 3 will vary depending on whether the preferred or reserve option is progressed:

a. Preferred option – Tank 3 will function as a storage tank (and may be combined with Tank 1) prior to discharge to the TW foul network.

b. Reserve option – Tank 3 will function as an infiltration tank to allow controlled discharge via infiltration to ground.

6.7 Discharge of Contaminated Surface Water to Thames Water Network

6.7.1 Further consultation is ongoing to identify if the adjacent TW foul water network has sufficient capacity to accommodate the contaminated airfield surface water runoff at a reduced rate. This would require a new trade effluent consent to be agreed.

6.7.2 The proposal for onsite storage and pumped discharge to the TW network is shown on the schematic in **Inset 6.1**: An assessment undertaken to identify the volume of polluted water storage which needs to be provided and the proposed outflow rate / quality to the existing TW network.

6.7.3 The methodology contained in the DDS is as follows:

a. A spreadsheet model of the pollution control system has been developed. Inputs include data from the Met Office Bedford Gauge for rainfall and daily weather data minimum temperature (1980 – 2023), received May 2023, and Biological Oxygen Demand (BOD) load of de-icing fluids. Assumptions, based on historical data provided by LLAOL, have been made in relation to the numbers of aircraft de-iced and BOD loads intercepted before reaching storage.

b. It is likely, based on the existing trade effluent consents (Refs EHY00012 & TEHY.0105A), that TW would impose limits on discharges to sewer both in terms of volume and BOD load. The calculations have been used iteratively, alongside liaison with TW to determine the allowable discharge volume and rate and therefore the size of storage tank required as part of the development.

c. The BOD load limit from the current discharge consent (Appendix D) effectively caps the discharge to sewer to 0.46 l/s and 20 kg/day BOD. With these limits the contaminated water tanks would not fully drain down over the summer so the required volume would increase each year such that the storage tank is unable to empty over the summer prior to the start of the next winter de-icing period. Therefore, the conclusion of the modelling is that under these existing discharge limitations, the storage volume required significantly exceeds the volume of the tanks included in the DCO proposals.

d. If the BOD load limit is increased to 1600kg/day and the allowable flow increased to 12 l/s as proposed in the ongoing discussions with TW, then the volume of polluted water storage required is estimated to be approximately 85,000m^3 which is within the volume included in the Proposed Development.

e. Active monitoring and discharge control will be implemented to ensure no discharge during high flow conditions, i.e. when identified existing Combined Sewer Overflows (CSO) on the drainage route are in operation.

6.7.4 Engagement and completion of this element with TW is ongoing and will include further consultation with the EA, LBC and AW.

7 PROPOSED WATER TREATMENT PLANT

7.1 Conceptual Design – Layout

7.1.1 A WTP will be designed to treat the flows as outlined below in the preferred and reserve options:

a. Preferred option – potential pre-treatment of contaminated surface water and treatment of surface water for re-use. (There maybe a requirement to pre-treat the contaminated surface water runoff being sent to TW if the ongoing study by TW highlights a capacity issue with regards to load capacity).

b. Reserve option - treatment of T2 foul water, contaminated surface water and surface water for re-use.

7.1.2 Depending on the option the water treatment plant could be separated into three streams:

a. The effluent treatment process (ETP) treating the potentially contaminated surface water.
b. The sewage treatment process (STP) treating the foul water, if this cannot be discharged to TW sewer.
c. The surface water treatment process (SWTP) for treating clean surface water for re-use on site.

7.1.3 There will be by-products produced from the various proposed processes which will include screenings, grit, recovered fluids and surplus sludges that will require some on-site management in terms of treatment, consolidation, storage, and then subsequent transport off-site for re-use, re-cycling or disposal.

7.2 Conceptual Design – Treatment

7.2.1 The detailed treatment arrangement will be determined at detailed design using the most appropriate technology at the time in accordance with the relevant **Design Principles [TR020001/APP/7.09]**. The following conceptual design of the water treatment plant is one potential option:

a. The ETP will consist of screening, ultrafiltration followed by two-stage reverse osmosis for the recovery and separation of de-icing fluids. The recovered de-icing fluids will be recycled.
b. The STP will consist of screening, settlement followed by a membrane bio-reactor (MBR). The effluent will then be sent through reverse-osmosis and advanced oxidation and ultraviolet disinfection. The sludge streams will be taken off-site for disposal. Tanks and processes may be covered and odour-controlled subject to a more detailed assessment.
c. The SWTP will consist of grit removal, followed by media filtration and ultraviolet disinfection.

7.3 Influent Characteristics

7.3.1 The main influent characteristics from the potentially contaminated runoff are indicated in **Table 7.1**. Traces of additional substances listed in the Joint

Agency Groundwater Directive Advisory Group (JAGDAG) (Ref 7.3) list such as metals, fuels and lubricants may also be present.

Table 7.1: Assumed potentially contaminated run-off characteristics

Influent characteristics	
Total Suspended Solids (TSS)	9 mg/l
Biological Oxygen Demand (BOD)	116 mg/l
Total Organic Compound (TOC)	200 mg/l

7.3.2 Anticipated foul sewage influent characteristics are shown in Table 7.2 below. These are the main influent strength parameters used for the design of the STP; other substances typical of domestic and commercial sewage will also be present in varying concentrations.

Table 7.2: Assumed sewage influent characteristics (Ref. 7.1)

Influent characteristics	
TSS	400 mg/l
BOD	350 mg/l
NH4-N	45 mg/l

7.3.3 The clean surface water characteristics are not expected to have any significant organic, inorganic or solids loads.

7.3.4 The combined peak inflow to the water treatment plant has been determined to be as follows.

Table 7.3: Water treatment plant maximum combined inflow

Inflow figures	
Max sewage Inflow	41.07 l/s
Max runoff inflow	205 l/s
Total combined inflow	246.07 l/s

7.4 Water Quality Monitoring

7.4.1 A key aspect of the strategy is the live monitoring of the water quality by the airport operator based on the following:

a. Monitoring of TOC will be automated and continuous and/or at regular intervals.

b. The monitoring is upstream of the water treatment plant and the inlet storage tanks, so that if levels of contaminants are below the trigger levels agreed with stakeholders, the influent will flow directly to the infiltration basin (Tank 2).

c. If, however, TOC is higher than the determined trigger level then the contaminated water will be automatically diverted to the inlet storage tank to be treated in the water treatment plant or discharged to the TW network.

7.4.2 It is anticipated that technology will evolve prior to construction of the Proposed Development and the following points are based on currently available technology.

7.4.3 It is intended that trigger levels with respect to TOC will be refined during detailed design. The TOC trigger level will be site dependent, and it is anticipated that it would follow a period of site background testing as recommended within the Environmental Protection Agency guidance documentation (Ref. 6.2), in the absence of UK equivalent guidance. This is to allow for seasonal variance in 'normal' background levels of contamination to be catered for. It is intended that samples would be taken frequently and in different environmental conditions to maintain a tight standard deviation.

7.4.4 Following this data gathering exercise, the warning and trigger percentiles will be developed and confirmed in discussion with relevant stakeholders. Commonly, the 90th percentile is used for warning and 95th percentile for action/trigger. In this case action/trigger would result in the actuated valve diverting water to the water treatment plant instead of Tank 2. An example of warning and action/trigger levels is detailed in **Table 7.4**, taken from the Environmental Protection Agency guidance document.

Table 7.4: Examples of Action/Warning Limits used at the Environmental Protection Agency sites

Parameter	Action (Upper) Limit (mg/l)	Warning (Lower) Limit (mg/l)
COD	80	50
TOC	40	30
SS	50	25
pH	6 to 9	6 to 8

7.4.5 The calibration of equipment is a maintenance schedule activity with the instrumentation to be checked against lab results.

7.4.6 The acceptability of discharge to ground from the proposed infiltration tanks in terms of the potential impact on groundwater quality is discussed in the **Hydrogeological Risk Assessment: Drainage [TR020001/APP/5.02].**

7.5 Final Effluent Quality

7.5.1 The below approach relates to all three potential effluent treatment streams and would be refined at detail design stage based on the drainage option adopted.

7.5.2 **Table 7.5** has been compiled using a number of typical final effluent discharge consents in England including watercourse and groundwater discharges. The characteristics have been further tightened based on experience and with the knowledge that there are public water supplies in the local area (site within SPZ3). Noting this is an outline design, the parameters stipulated below would be refined during detailed design with the development of the process solution.

Table 7.5: Proposed conceptual final effluent discharge consent levels

Parameter	Units	Prescribed Concentration or Value (PCV)	Sample Basis (assuming STP)
TSS	mg/l	<20	Composite daily sample – 95%ile
$CBOD_5$	mg/l	<10	5 day sample – 95%ile
NH4-H ammonium	mg/l	<5	Composite daily sample – 95%ile
COD	mg/l	<20	Composite daily sample – 95%ile
pH	pH units	5-9.5	Composite daily sample
TKN (Total Nitrogen)	mg/l	<20	Composite daily sample – 95%ile
Turbidity	NTU	<10	Composite daily sample
pH	pH units	5-9.5	Spot
Escherchia coli	number/100ml	250	Spot
Intestinal enterocci	number/100ml	100	Spot

Legionella pneumophilia	number/100ml	N/A	Spot
Total coliforms	number/100ml	1000	Spot
Cadmium	µgCd/l	4	Composite daily sample – 95%ile
Chromium	µgCr/l	20	Composite daily sample – 95%ile
Copper	µgCu/l	50	Composite daily sample – 95%ile
Iron	mgFe/l	10	Composite daily sample – 95%ile

7.5.3 The list of chemicals in **Table 7.5** are the assumed contaminants expected to be in the effluent from the water treatment plant, which will be monitored to maintain the prescribed concentration levels. Additional substances listed in the JAGDAG (Ref. 7.3) and drinking water standards may be present and these will need to be confirmed through additional sampling.

7.5.4 The list of hazardous chemicals, monitoring systems, and treatment processes will need to be confirmed during detailed design. Within the wastewater treatment process, glycols and hydrocarbons are captured or broken down, therefore, they are not listed in Table 7.5 but would be checked in sample monitoring. The monitoring regime for the final effluent is prescribed in **Table 7.5** which includes organics, hydrocarbons, and BODs. **Table 7.5** forms the basis of the water treatment plant design at this stage.

7.5.5 Tests for chemicals highlighted in green in **Table 7.5** are collected and monitored continuously to ensure prescribed levels at discharge are maintained, and are fully automated. Calibration would be checked against laboratory tests periodically.

7.5.6 For detecting heavy metals in the water treatment plant effluent shown in Table 7.5, to ensure prescribed levels at discharge are maintained, testing kiosks circa 2x2m per unit will be required. This would involve automated systems with submerged pumping to extract test samples to local kiosks. The samples will need to be onsite laboratory tested by an operative with immediate result.

7.5.7 Testing to ensure prescribed levels at discharge are maintained for chemicals highlighted in orange in **Table 7.5** would take several days before results can be checked, as the bacteria needs to be grown.

7.5.8 Testing for CBOD5 levels at the water treatment plant effluent, to ensure levels at discharge correspond with prescribed concentration levels, would take at least five days before results can be checked as the bacteria needs to be grown.

7.5.9 The final effluent quality would be in accordance with the design principle as set out in the **Design Principles [TR020001/APP/7.09]** document: “The drainage and water treatment systems will be designed so that all discharges to ground do not contain hazardous substances, as defined in WFD (Ref. 2.1), and are non-polluting, due to the underlying chalk being a Principal Aquifer and the infiltration tanks being proposed within a SPZ3.”

7.6 Protection of Chalk Aquifer

7.5.1 Given the sensitivity of the Chalk aquifer, a series of treatment steps has been incorporated into the concept preliminary design. Within the pollution prevention philosophy source and pathway controls capture the pollution event and limit spread, prior to end of pipe treatment. These include:

a. For the reserve option a water treatment plant will include the following processes: one process for the sewage load from the T2 campus - the STP - and a second process for the surface run-off - the ETP. As the de-icing agents will be seasonal (typically November - April), the ETP stream of the water treatment plant will not be required to operate during the summer. The STP will be designed to effectively treat the influent flows from T2 campus to the levels denoted in **Table 7.5** and will be in accordance with the relevant **Design Principles [TR020001/APP/7.09]**
b. The ETP portion of the water treatment plant is for the de-icing agents. The plant is primarily to separate glycol de-icers and very small amounts of aviation fuel, diesel, petrol, and other hydrocarbon based compounds as well as salt, which may escape the upstream separators. Any additional inflow from hydrocarbons (assumed to be petrol/diesel), standard road de-icers and/or potassium acetate or formates (assumed to be a de-icer) would need to be identified and the quantity of inflow determined during detailed design of the water treatment plant.

7.7 Disposal of Final Effluent

7.7.1 All excess treated final effluent from the water treatment plant will be channelled to a separate 15,600m^3 infiltration tank (Tank 3) located north of the water treatment plant, acting as an overflow.

7.7.2 The treated final effluent from the water treatment plant will be recycled for irrigation with the remainder suitable for discharge to the ground. The re-cycled water will be pumped by rising main to a tank with location to be confirmed during detailed design. Current projections for irrigation are estimated at 6l/s.

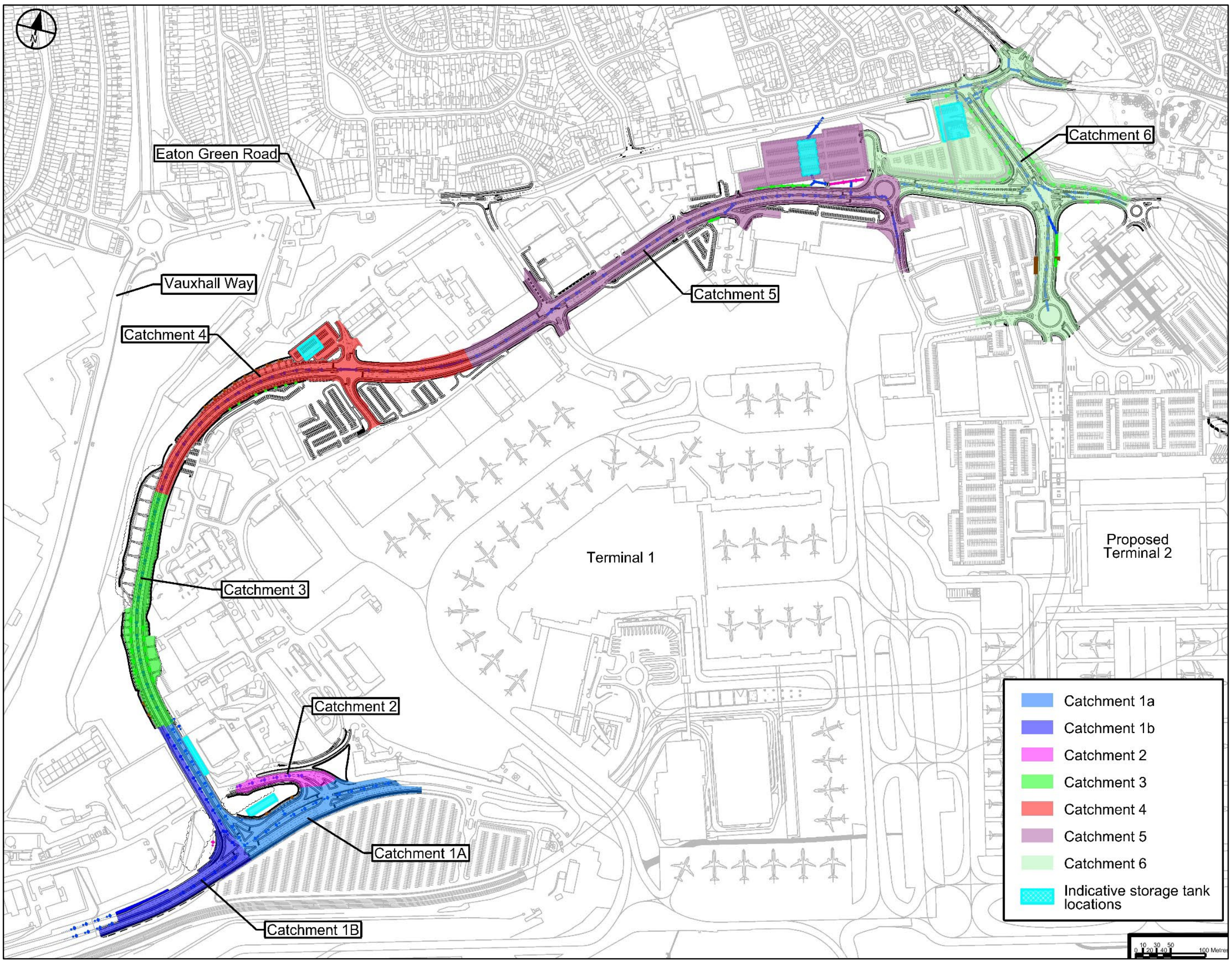
7.7.3 It is proposed to re-use some of the attenuated surface water from Tank 2 which is pumped to the SWTP for treatment. After this process, the greywater will be returned to the terminals via a holding tank.

8 AIRPORT ACCESS ROAD AND OFF-SITE HIGHWAY MITIGATION

8.1 Airport Access Road Drainage

8.1.1 Six overall catchment areas are proposed to cater for drainage requirements associated with the Airport Access Road (AAR), as shown below in **Inset 8.1**.

Inset 8.1: AAR catchment areas



8.1.2 **Table 8.1** is shown below, which summarises the impermeable and gross permeable areas of the proposed catchments with proposed outfalls. Proposed catchment 1 was split into two sub-catchments, to enable the proposed attenuation storages to be split and therefore provide additional flexibility in their placement and design.

Table 8.6: AAR Catchment Areas

Catchment Ref.	Catchments (ha)		Outfall to:
	Impermeable	Gross Permeable	
Catchment 1A	1.14	0.12	Highway drain – LBC
Catchment 1B	0.79	0.05	Highway drain - LBC
Catchment 2	0.20	0.04	Highway drain - LBC
Catchment 3	0.65	0.30	Highways drain - LBC
Catchment 4	1.56	0.34	Highway drain - Veolia
Catchment 5	3.20	0.30	Surface Water Sewer – TW
Catchment 6	3.76	0.67	Surface Water Sewer – TW

Proposed Attenuation Storage

8.1.3 Indicative storage proposals have been designed for 1 in 100-year storm event, plus climate change allowance.

8.1.4 The following climate change allowances were adopted based on Environment Agency Climate Change Allowance, 2022 (Ref. 8.1):

a. 35% for 1 in 30 storm events; and
b. 40% for 1 in 100 storm events.

8.1.5 A 10% additional storage has been added for urban creep (for expected changes over the lifetime of the Proposed Development). Surface water is to be managed within the site (no flooding beyond highway boundaries for 1 in 30 and 1 in 100-year rainfall events, plus climate change allowance). Micro Drainage – Source Control software, which is an industry standard modelling methodology, was used to model the storage requirements for each catchment.

8.1.6 **Table 8.2** summarises the proposed discharge rates and storage with levels, for each of the catchment areas.

Table 8.7: Proposed Discharge Rates and Storage

Catchment Ref.	Brownfield / Greenfield	Proposed Discharge Rates (l/s)	Indicative Proposed Storage
Catchment 1A	Brownfield	5.7	Proposed tank - 10m x 45m x 2m (900m^3 capacity) Cover Level – 148.0 mAOD Invert Level – 144.5mAOD
Catchment 1B	Brownfield	4.0	Proposed box culverts (x2) - 2m x 2m x 80m (640m^3 capacity) Cover Level – 139.6 mAOD Invert Level – 136.1 mAOD
Catchment 2	Brownfield	Existing	None
Catchment 3	Greenfield	2.0	Proposed tank - 5m x 60m x 2m (600m^3 capacity) Cover Level – 140.0 mAOD Invert Level – 136.5 mAOD
Catchment 4	Brownfield	7.8	Proposed tank - 20m x 30m x 2m (1200m^3 capacity) Cover Level – 154.5 mAOD Invert Level – 151.0 mAOD
Catchment 5	Brownfield	16.0	Proposed tank - 25m x 50m x 2m (2500m^3 capacity) Cover Level – 148.0 mAOD Invert Level – 144.5 mAOD
Catchment 6	Greenfield	7.5	Proposed tank - 38m x 50m x 2m (3800m^3 capacity) Cover Level – 142.4 mAOD Invert Level – 136.4 mAOD

Proposed Highway Drainage Criteria

8.1.7 Road drainage design will be carried out based on the Design Manual for Roads and Bridges (DMRB) (Ref. 8.2) standards (CG 501) unless agreed otherwise with LBC.

8.1.8 DMRB CG 501 states: “For road runoff within drainage systems the following overall design criteria shall apply:

a. *1 in 1 year – no surcharge of the drainage system; and*
b. *1 in 5 years – no flooding from the drainage system”*

8.1.9 DMRB CG 501 states: *“All drainage systems shall be designed so that highway surface water flooding does not extend beyond the highway boundary up to the 1-in-100 year rainfall event, including an allowance for climate change.”*

8.1.10 Surface runoff collection systems and pipe networks are to be designed at later design stages. Open surface drainage systems, such as ditches, shall be adopted where practical for ease of maintenance at future design stage.

8.1.11 SuDS have been proposed for water quantity (proposed attenuation storages) and water quality (vegetated ditches, filter drains and swales) to a certain extent at this design stage. Further SuDS (e.g. bioremediation system etc.) shall be considered to improve water quality, amenity and biodiversity where possible by coordinating with the landscape and environment disciplines at the next design stage.

8.1.12 Ditches are proposed at the toe of proposed embankments where spaces permit. Filter drains are proposed where the road is in deep cuttings and at the toe of embankments where there is not enough space to accommodate ditches.

8.1.13 Notably, calculations indicate that there is an opportunity to propose a 50% betterment in discharge rates for brownfield sites. This is based on the LBC requirement for a reduction in brownfield redevelopment discharge rates by 50%, for events up to and including the 1 in 100-year return period event plus climate change (LBC – Surface Water Management Plan, 2012 – cl. 4.7.2 Policy 2), as opposed to a discharge of 5 l/s/ha which was the figure previously agreed by LBC in relation to the Green Horizons Park (formerly New Century Park) planning permission (17/02300/EIA). This will reduce the storage required for attenuation and may create enough space to accommodate an attenuation basin/swale to replace the current proposal of attenuation underground structures.

8.1.14 The outfall levels of existing highway drains/TW sewers for each catchment have been taken from the information available at this design stage (existing drainage model). Where the information was not available, the connection level has been assumed based on the existing surface with a 1.2m cover to soffit (using topographical survey information). This is a standard level used in highway construction and final outfall levels will be confirmed during detailed design.

8.1.15 The following section provides details on potential drainage designs for the individual catchment areas. These are outline designs and subject to detailed design in the future.

Proposed Drainage Layout – Catchment 1A

8.1.16 A bridge kerb drain is proposed to drain the length along the proposed southbound retaining wall.

8.1.17 The proposed attenuation tank is located in what appears to be an abandoned car park (car park decommissioned in recent years as shown in Google Earth history). The proposed tank has been located with a clearance of 5m from existing land slopes. Structural and geotechnical disciplines will be consulted at a later design stage to validate that the proposed attenuation tank will have no impact on the existing slope.

8.1.18 Proposed catchment 1A is to outfall to the catchment 1B.

Proposed Drainage Layout - Catchment 1B

8.1.19 A bridge kerb drain shall be proposed to drain the length along proposed northbound retaining wall. Box culverts are proposed within the central reserve and verge of A1081 New Airport Way. There is flexibility to vary the position of the box culverts within the Order limits for the Proposed Development.

8.1.20 Box culverts will require interval chambers, as part of the design, with backdrops due to the steep surface gradients. A proposed swale is located near an existing land slope risking percolation. Further assessment is to be carried out during detailed design stage.

8.1.21 The Invert level (IL) of the proposed outfall to existing highway drain has been assumed based on a 1.2m cover to soffit and 300mm assumed pipe diameter, again based on standard levels used in highway construction.

Proposed Drainage Layout – Catchment 2

8.1.22 The proposed work involves only a re-alignment of existing carriageway which results in no increase in paved areas, therefore no attenuation is proposed.

Proposed Drainage Layout - Catchment 3

8.1.23 The proposed large earthwork along the northbound carriageway is to be drained naturally, as per the existing earthworks slope. A proposed attenuation tank is shown to the immediate east of the proposed AAR alignment, at the foot of the proposed AAR retaining wall.

8.1.24 The proposed attenuation tank is placed within an area of land which is subject to changes in level. Regrading of the land in this area would be required to accommodate the tank, in conjunction with potential amendments to the existing retaining structure, and a maintenance access will be proposed. The cover level of this area post-regrading has been assumed to be 140m AOD.

Proposed Drainage Layout - Catchment 4

8.1.25 Filter drains are proposed at certain locations along the toe of northbound embankment. This solution is proposed due to the narrow (1m) space being insufficient width to accommodate a ditch. The adjacent car park catchment has been included as impermeable to adopt a conservative approach. There is an opportunity to propose permeable pavement for the replacement areas of car parking located within this catchment.

Proposed Drainage Layout - Catchment 5

8.1.26 Filter drains are proposed at certain locations along the toe of northbound embankment. This proposal, which provides an appropriate solution, is proposed due to the narrow (1m) space being insufficient width to accommodate a ditch. The highway drain is to discharge at a proposed swale prior to connection to the proposed attenuation tank beneath the western (decked) section of car park P9.

8.1.27 The car park P9 catchment has been included as impermeable to adopt a conservative approach. There is an opportunity to propose permeable pavement for the external (non-decked) sections of the car park.

Proposed Drainage Layout - Catchment 6

8.1.28 Filter drains are also proposed within the verge areas due to the road being partially constructed in a deep cutting. The adjacent car park P9 catchment has been included as impermeable to adopt a conservative approach. There is an opportunity to propose permeable pavement for car park. An attenuation tank is proposed to be located within an area of the former landfill, beneath the eastern section of the proposed Car Park P9.

8.2 Off-site Highway Interventions Drainage

8.2.1 As part of the Proposed Development, a series of highway improvements are proposed at various locations in line with the incremental approach to the airport expansion. These are referred to as 'Off-site Highway Interventions' within the application documentation and include:

a. Vauxhall Way / Eaton Green Road
b. Windmill Road / Manor Road
c. A1081 New Airport Way / B653 / Gipsy Lane
d. A1081 New Airport Way / Percival Way
e. Windmill Road / Kimpton Road
f. Vauxhall Way / Kimpton Road
g. A1081 New Airport Way / London Road (North)
h. A1081 New Airport Way / London Road (South)
i. M1 Junction 10
j. Eaton Green Road / Lalleford Road
k. Wigmore Lane / Crawley Green Road
l. Wigmore Lane / Eaton Green Road
m. A602 Park Way / Stevenage Road / Hitchin Hill
n. A505 Upper Tilehouse Street / A602 Park Way
o. A505 Upper Tilehouse Street
p. Crawley Green Road / Lalleford Road
q. Windmill Road / Saint Mary's Road / Crawley Green Road
r. Eaton Green Road / Frank Lester Way.

8.2.2 The Off-site Highway Interventions generally consist of widening and converting existing at-grade roundabouts to signalised junctions, together with minor scale works including realignment of kerblines and local widening. The following sections summarise the proposed works at each of the locations, where a high level drainage assessment of the proposed highway has been conducted.

8.2.3 Table 8.3 provides a summary of the drainage mitigation required at each of the off-site locations, together with a high-level commentary on the scope of the works. The mitigation proposals noted in the table will need to be assessed against HEWRAT assessments at the detailed design stage, to ensure that no increases in pollutant loading occur.

Table 8.8: Off-site Highway Interventions Drainage Strategy

Off-site Junction Location	Extent of Proposed Works	Drainage / Mitigation Proposals
Vauxhall Way / Eaton Green Road	Provision of signals on roundabout- no change in impermeable area.	No mitigation or attenuation required.
A1081 New Airport Way / B653 / Gipsy Lane	Kerb realignment and carriageway widening.	Oversized pipework is assumed capable of attenuating the increased impermeable areas, due to limited changes in overall impermeable area.
A1081 New Airport Way / Percival Way	Roundabout replaced with signalised junction, kerb realignment and carriageway widening.	
Windmill Road / Kimpton Road	Roundabout replaced with signalised junction, minor kerb realignment.	
Vauxhall Way / Kimpton Road	Minor widening to junction, kerb realignment.	
A1081 New Airport Way / London Road (North)	Signalisation of roundabout, kerb realignment and minor widening.	
A1081 New Airport Way / London Road (South)	Signalisation of roundabout, no change to impermeable area.	No mitigation or attenuation required.
M1 Junction 10	Signalisation of roundabout, kerb realignment and carriageway widening.	Oversized pipework is assumed capable of attenuating the increased impermeable areas, due to limited changes in overall impermeable area.
Eaton Green Road / Lalleford Road	Mini roundabout replaced with signalised junction, minor kerb realignment.	No mitigation or attenuation required.
Wigmore Lane / Crawley Green Road	Roundabout replaced with signalised junction, kerb realignment. Reduction in impermeable area.	Oversized pipework is assumed capable of attenuating the increased impermeable areas, due to limited changes in overall impermeable area.
Wigmore Lane / Eaton Green Road	Roundabout replaced with signalised junction, kerb realignment and carriageway widening.	
A602 Park Way / Stevenage Road / Hitchin Hill	Kerb realignment and widening to various arms of roundabout.	

Off-site Junction Location	Extent of Proposed Works	Drainage / Mitigation Proposals
A505 Upper Tilehouse Street / A602 Park Way	Kerb realignment and widening to various arms of roundabout.	
A505 Upper Tilehouse Street / Pirton Road	Kerb realignment and minor widening.	No mitigation or attenuation required.
Crawley Green Road / Lalleford Road	Mini roundabout replaced with signalised junction, minor kerb realignment.	
Windmill Road / Saint Mary's Road / Crawley Green Road	Signalisation of roundabout, kerb realignment and carriageway widening.	Oversized pipework is assumed capable of attenuating the increased impermeable areas, due to limited changes in overall impermeable area.
Eaton Green Road / Frank Lester Way	Roundabout replaced with signalised junction, minor kerb realignment.	No mitigation or attenuation required.

GLOSSARY AND ABBREVIATIONS

Acronym	Description
AW	Affinity Water
BOD	Biological Oxygen Demand
DAF	Dissolved Air Floatation
Luton DART	Luton Direct Air-Rail Transit
DCO	Development Consent Order
EA	Environmental Agency
ETP	Effluent treatment process
EHTW	East Hyde Treatment Works
GRR	Greenfield Runoff Rate
LLAOL	London Luton Airport Operations Limited
LLFA	Lead Local Flood Authority
LSCP	Long Stay Car Park
MBBR	Moving Biological Bed Reactors
M&E	Mechanical and Electrical
mppa	Million passengers per annum
NH3-N	NH3 (ammonia) - N (nitrogen)
NH4-N	NH4 (ammonium) - N (nitrogen)
STP	Sewage treatment process
TOC	Total Organic Compound
TSS	Total Suspended Solids
TW	Thames Water
WFD	Water Framework Directive
WTP	Water Treatment Plant
UF	Ultrafiltration

REFERENCES

Ref. 2.1 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (SI 2017/407).
Ref. 3.1 Luton Borough Council. The Luton Local Plan 2011 – 2031, published in November 2017
Ref 3.2 Department for Transport. Airports National Policy Statement, 2018.
Ref. 3.3 Construction Industry Research and Information Association. The SuDS Manual (C753). London. CIRIA. 2015.
Ref. 4.1 HM Government. The Building Regulations. Approved Document H. Drainage and waste disposal: NBS. 2010.
Ref. 4.2 Water UK. Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code") 2021. Version 2.1. Water UK
Ref. 4.3 BS EN 16941-1:2018 On-site non-potable water systems. Systems for the use of rainwater
Ref. 4.4 London Luton Airport Operatons Ltd. 19mppa Application. Drainage and Water Supply Infrastructure Appraisal (41431JG22V2); Wood Group UK Ltd. 2021.
Ref. 5.1 Civil Aviation Authority. CAP 168: Licensing of Aerodromes. Edition 12. London. CAA. 2022.
Ref. 7.1 Metcalf and Eddy. Wastewater Engineering Treatment and Reuse. 4th Edition. New York: McGraw Hill, 2013.
Ref. 7.2 EPA Office of Environmental (2012). Guidance on the setting of trigger values for storm water discharges to off-site surface waters at epa ippc and waste licensed facilities. Issue No. 1. Ireland.
Ref. 7.3 Joint Agency Groundwater Directive Advisory Group (JAGDAG) List of hazardous substanaces, Jan 2017
Ref. 8.1 Environment Agency. Flood Risk Assessments: Climate Change Allowances, 2022.
Ref. 8.2 National Highways. Design Manual for Roads and Bridges. National Highways.
Ref. 8.1 Standards for Highways. Highway Construction Details.
Ref. 8.2 Department for Environment, Food and Rural Affairs. Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems. March 2015.
Ref. 8.3 International Civil Aviation Organisation, International Standards and Recommended Practices, Annex 14 to the Convention on International Civil Aviation, Volume 1 Aerodrome Design and Operation, Ninth Edition, July 2022.