LONDON STANSTED AIRPORT

Stansted Transformation Programme (STN-TP)

Terminal Extension

Flood Risk Assessment and Drainage Strategy (July 2023)

MAG London Stansted Airport

BUILDING FOR THE FUTURE

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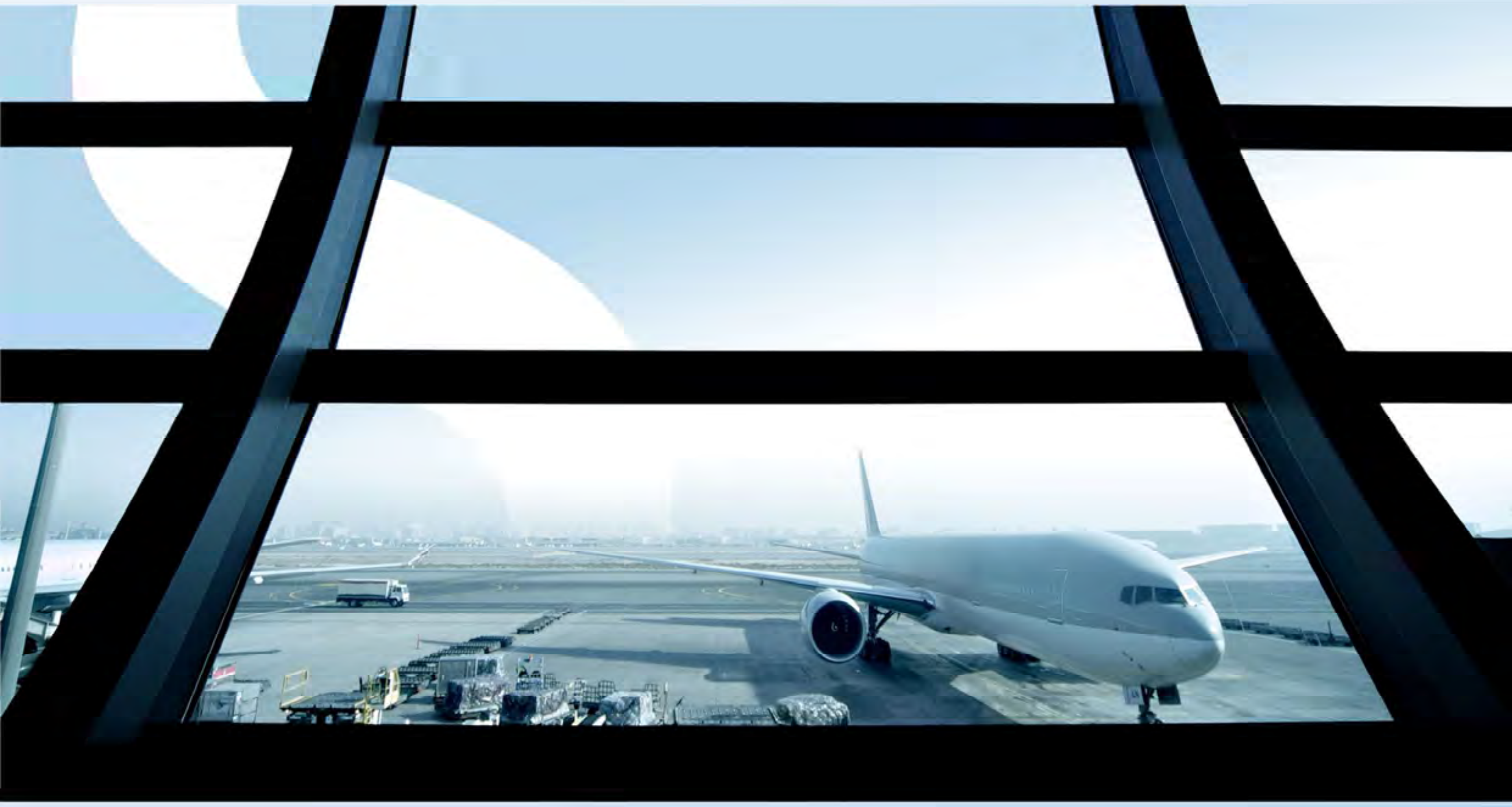
Stansted Airport Limited (STAL)

STANSTED TRANSFORMATION PROGRAMME (STN-TP)

Flood Risk Assessment and Drainage Strategy



STNTP-WSP-00-XX-RP-DR-0001
JULY 2023

PUBLIC

Stansted Airport Limited (STAL)

STANSTED TRANSFORMATION PROGRAMME (STN-TP)

Flood Risk Assessment and Drainage Strategy

FRA & DRAINAGE STRATEGY (P01) PUBLIC

PROJECT NO. 70110659

OUR REF. NO. STNTP-WSP-00-XX-RP-DR-0001

DATE: JULY 2023

Stansted Airport Limited (STAL)

STANSTED TRANSFORMATION PROGRAMME (STN-TP)

Flood Risk Assessment and Drainage Strategy

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QUALITY CONTROL

Issue/revision	P00	P01	P02	P03
Remarks	Draft issue	Issued for Planning		
Date	14/07/2023	27/07/2023		
Prepared by	Mattia Fagnano	Mattia Fagnano		
Signature		[redacted] Digitally signed by Fagnano, Mattia (UKMXF036) Reason: I am the author of this document Date: 2023.07.27 16:34:24 +01'00'		
Checked by	Joe Leslie	Joe Leslie		
Signature		[redacted] Digitally signed by Leslie, Joe (UKJJL005) DN: cn=Leslie, Joe (UKJJL005), ou=Active, email=Joe.Leslie@wsp.com Reason: I have reviewed this document Date: 2023.07.27 16:35:52 +01'00'		
Authorised by	Jason Giddings	Jason Giddings		
Signature		Groom, Anthony (UKADG002) Digitally signed by Groom, Anthony (UKADG002) DN: cn=Groom, Anthony (UKADG002), ou=Active, email=Anthony.Groom@wsp.com Date: 2023.07.27 16:41:17 +01'00'		
Project number	70110659			
Report number	STNTP-WSP-00-XX-RP-DR-0001			
File reference	[redacted]			

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1 INTRODUCTION

1.1 APPOINTMENT AND BRIEF

1.1.1. WSP have been appointed by Stansted Airport Limited (STAL) to undertake a Flood Risk Assessment and Drainage Strategy to support the Full Planning Application for the proposed extension of the passenger terminal building, 3 no. skylink walkways, a baggage handling building and a plant enclosure at Stansted Airport, Essex. The application is part of the Stansted Transformation Programme (STN-TP).

1.1.2. The proposed extension allows for approx. 11,000 m^2 of building plan (footprint) area, the overall application area is approx. 23,000 m^2. Refer to Appendix A for the proposed site layout.

1.2 PURPOSE OF DOCUMENT

1.2.1. The National Planning Policy Framework (NPPF) Section 10 'Meeting the Challenge of climate change, flooding and coastal change' requires a planning application to be accompanied by a site-specific FRA. This report sets out the proposed drainage strategy for the scheme including design considerations and constraints that have been applied in order for key consultees such as the Environment Agency (EA) and the Essex County Council (ECC), acting as Lead Local Flood Authority, to review the proposal prior to a decision on the planning application.

1.2.2. This report is a holistic risk-based assessment of potential flooding from possible sources, including fluvial, tidal, groundwater, existing sewers, and surface water run-off. It also identifies and examines the residual flood risk to the proposed development and third-party land. The report additionally includes a foul drainage strategy.

1.2.3. Whilst completing the assessment, consideration has been given to the National Planning Policy Framework (NPPF), National Planning Practice Guidance, British Standard 8533:2017, Assessing and Managing Flood Risk in Development, and British Standard 8582:2013 Code of Practice for Surface Water Management for Development Sites.

1.3 LIMITATIONS

1.3.1. This report is based on the interpretation and assessment of data provided by third parties. WSP cannot be held responsible for the accuracy of the third-party data and the conclusions and findings of this report may change if the data is amended or updated after the date of consultation.

1.4 CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS

1.4.1. The revised Construction (Design and Management) Regulations 2015 (CDM Regulations) came into force in April 2015 to update certain duties on all parties involved in a construction project, including those promoting the development. One of the designer's responsibilities under clause 9 (1) is to ensure that the client organisations, in this instance Stansted Airport Limited (STAL), are made aware of their duties under the CDM Regulations.

2 POLICY CONTEXT

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

2.1.1. The National Planning Policy Framework (NPPF) was published in February 2019 (updated in July 2021) with the aim of protecting the environment and to promote sustainable growth. There is an overarching presumption in favour of sustainable development that should be the basis of every plan and every decision.

2.1.2. The following paragraphs/policies within the NPPF are considered relevant to this assessment:

- Paragraph 159: Requires that “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.”.
- Paragraph 162: Explains that “The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source”;
- Paragraph 167: Explains that “When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere […];
- Paragraph 169: Recommends that “major development should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
  - take account of advice from the Lead Local Flood Authority;
  - have appropriate proposed minimum operational standards;
  - have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
  - where possible, provide multifunctional benefits.
- Annex 3: Provides information on flood risk vulnerability classification.

2.1.3. The guidance further states that “Where appropriate, applications should be supported by a site-specific flood-risk assessment.”

2.1.4. The planning of new development must therefore be considered against a risk-based search sequence as provided by the guidance.

2.1.5. This FRA serves as the site-specific flood-risk assessment and demonstrates that the Proposed Development is safe for its lifetime without increasing flood risk elsewhere.

2.2 TECHNICAL GUIDANCE TO THE NATIONAL PLANNING POLICY FRAMEWORK

The NPPF Technical Guidance provides additional guidance for the implementation of the NPPF planning policy set out above. Below is a summary of the main concepts that apply to the development subject of this assessment.

- Flood zone 1 comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
- For development proposals on sites comprising one hectare or above
    - the vulnerability to flooding from other sources as well as from river and sea flooding;
    - the potential to increase flood risk elsewhere through the addition of hard surfaces; and
    - the effect of the new development on surface water run-off

  should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.
- Stansted Airport is classified as “Essential infrastructure”, this type of development is considered appropriate for Flood Zone 1 and 2. An Exception Test is required for Zone 3a and 3b.

2.3 ESSEX COUNTY COUNCIL – PRELIMINARY FLOOD RISK ASSESSMENT (PFRA) 2011, AND 2017 ADDENDUM

2.3.1. Essex County Council (ECC) is required to produce and submit a Preliminary Flood Risk Assessment (PFRA) to the Environment Agency (EA) under the Flood Risk Regulations (2009). PFRAs are aimed at providing a high-level overview of flood risk from surface water, groundwater, and ordinary watercourses across the Lead Local Flood Authority (LLFA) study area. In this case, the administrative area of Essex includes twelve lower tier district and borough councils and is served by two different water companies.

2.3.2. The methodology for producing this PFRA has been based on the EA’s Final PFRA Guidance and Defra’s Guidance on selecting Flood Risk Areas, both published in December 2010. The EA has used a national methodology, specified by Defra to identify indicative Flood Risk Areas in England.

2.3.3. Flood risk data and records of historic flooding were collected from a number of local and national sources to develop a clear understanding of the flood risk across Essex. Information relating to 1342 flood events, caused by flooding from surface water, groundwater, ordinary watercourse, canals and small impounded reservoirs was collected and analysed, although comprehensive details on flood extents and consequences during these events was largely unavailable.

2.3.4. The PFRA is a high-level screening exercise to locate areas in which the risk of surface water and groundwater flooding is significant and warrants further examination through the production of maps and management plans.

2.3.5. The aim of the PFRA is to provide an assessment of potential flood risk across the study area, including information on past floods and the potential consequences of future floods.

2.3.6. The preliminary flood risk assessment (PFRA) and flood risk areas (FRAs) for Essex County Council were reviewed during 2017, using all relevant current flood risk data and information. The review has identified that there are no changes to the assessment of risk since the preliminary assessment report was published in 2011. The annexes to the preliminary assessment report have been reviewed and updated to show that there has been no new information since 2011.

2.4 UTTLESFORD STRATEGIC FLOOD RISK ASSESSMENT (SFRA) 2018

2.4.1. Uttlesford District is situated in the west of Essex, its main towns are Great Dunmow and Saffron Walden. It is at the watershed of three major river catchments: Great Ouse (River Cam, The Slade, River Bourn); Thames (River Roding, Pincey Brook, River Stort, Bourne Brook, Stansted Brook, Ugley Brook), and North Essex (River Pant, River Chelmer, Stebbing Brook, River Ter, River Can). Therefore, the SFRA considers the downstream impacts of development and land use change.

2.4.2. The National Planning Policy Framework (NPPF) emphasises the responsibilities for LPAs to ensure that flood risk is understood and managed effectively through all stages of the planning process. This Level 1 SFRA facilitates this by identifying the spatial variation in flood risk across the West Essex study area, providing guidance to the LPAs for each Authority on using the SFRA within the plan making process, and providing guidance to developers in the preparation of site-specific Flood Risk Assessments (FRAs).

2.4.3. Specifically, the SFRA:

- Refines information on flood risk taking into account all sources of flooding and the impacts of climate change;
- Informs the Sustainability Appraisal process, so that flood risk is fully taken into account;
- Informs the application of the Sequential and, if necessary, Exception Tests in the allocation of future development sites, as required by the NPPF, and planning application process;
- Identifies the requirements for site specific FRAs;
- Informs the preparation of flood risk policy and guidance;
- Determines the acceptability of flood risk in relation to emergency planning capability; and,
- Considers opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and storage for flood water.

2.4.4. In the preparation of the Level 1 SFRA, the most up-to-date flood risk information from all flooding sources (tidal, fluvial, surface water, groundwater, sewer and artificial sources) has been collated, reviewed and presented for use by the Essex Authorities to inform the preparation of Local Plans and prudent decision-making by Development Management officers on a day-to-day basis. This has included collation of existing hydraulic modelling outputs combined with updated hydraulic modelling (including flood defence breach analysis) to inform the SFRA mapping. For the purposes of this application, it concludes:

- There is no record in the EA Historic Flood Map of any flood event within the airport proximity.
- The risk of groundwater flooding within the airport area is 0-25%.
- There is a flood storage area (FSA) identified at the Balancing Ponds at London Stansted Airport.

2.5 UTTLESFORD ADOPTED LOCAL PLAN (2005)

2.5.1. The Uttlesford District Council adopted the current Local Plan in 2005. Policy GEN3 of this document refers to flood protection. This states that:

- Outside flood risk areas development must not increase the risk of flooding through surface water run-off. A flood risk assessment will be required to demonstrate this. Sustainable Drainage Systems should also be considered as an appropriate flood mitigation measure in the first instance.
- For all areas where development will be exposed to or may lead to an increase in the risk of flooding, applications will be accompanied by a full Flood Risk Assessment (FRA) which sets out the level of risk associated with the proposed development. The FRA will show that the proposed development can be provided with the appropriate minimum standard of protection throughout its lifetime and will demonstrate the effectiveness of flood mitigation measures proposed.

3 EXISTING SITE

3.1 EXISTING SITE LAYOUT

3.1.1. The site comprises the land immediately adjacent to the existing passenger terminal building, which is part of the wider Stansted Airport complex.

3.1.2. As shown in Figure 1, the area currently features the tracks for the internal Track Transit System (TTS) monorail, the Bus-Gate building, two skylink walkways to satellite piers, an internal road network and external hard-paved parking areas. Refer to Figure 2 for external views of the area showing the existing arrangement. As shown, the site is partly impermeable but includes existing soft landscaped areas.

3.1.3. A separate planning application for the growth of the airport was granted planning permission in June 2021 (appeal reference APP/C1570/W/20/3256619 / Uttlesford DC reference: UTT/18/040/FUL). This included changes to the airport layout to allow for:

"two new taxiway links to the existing runway (a Rapid Access Taxiway and a Rapid Exit Taxiway), six additional remote aircraft stands (adjacent Yankee taxiway); and three additional aircraft stands (extension of the Echo Apron) to enable combined airfield operations of 274,000 aircraft movements (of which not more than 16,000 movements would be Cargo Air Transport Movements) and a throughput of 43 million terminal passengers, in a 12-month calendar period."

3.1.4. The physical works (two new taxiway links and nine additional aircraft stands) approved as part of the application above are treated as existing (i.e. included in the baseline) for the purpose of this FRA and are referred to as "35+ MPPA works".

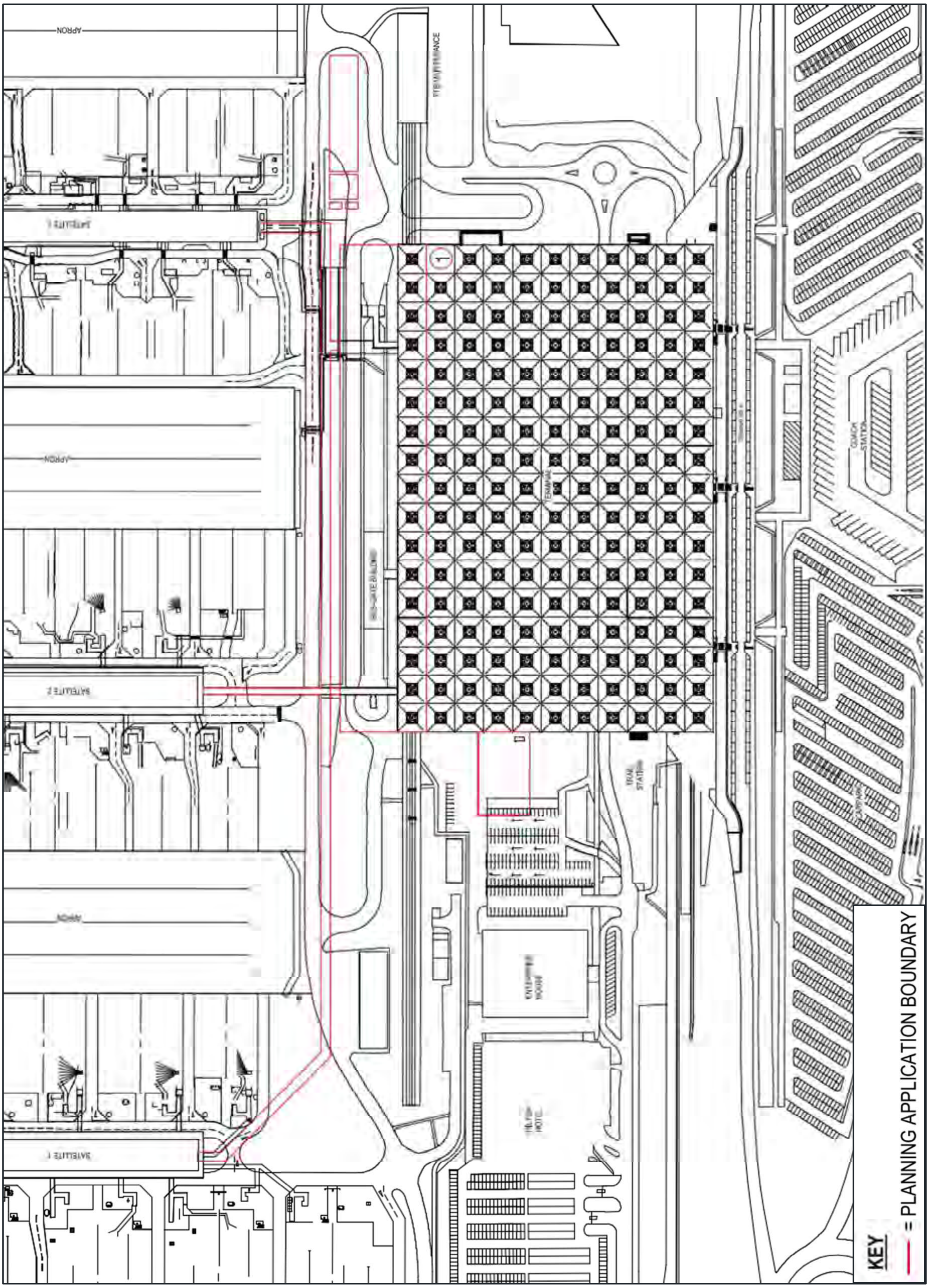


Figure 1 – Existing layout

Left – Passenger terminal, grassed area, and Satellite 3 connection
Right – Passenger terminal, grassed area, and Bus-Gate building

Left – Passenger terminal, grassed area, and Satellite 2 connection
Right – Passenger terminal, grassed area, and access road

Left – Apron, Bus-Gate building and Passenger terminal
Right – Passenger terminal, grassed area and Satellite 3 connection

Figure 2 – External views of the area north of the passenger terminal

3.2 GEOLOGY AND HYDROLOGY

3.2.1. The British Geological Survey (BGS) online mapping for this area shows a superficial layer of Lowestoft Formation underlaid by London Clay bedrock, refer to Figure 4 and Figure 5.

3.2.2. The Lowestoft Formation forms an extensive sheet of chalky till, together with outwash sands and gravels, silts, and clays. The till is characterised by its chalk and flint content. The carbonate content of the till matrix is about 30%, and tills within the underlying Happisburgh Formation have less than 20%.

3.2.3. The London Clay mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occur in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels.

3.2.4. The BGS has records of one borehole immediately adjacent to the site, reference number TL52SE185 on Figure 3.

3.2.5. The borehole log, dated March 1983, totals 21 m and shows ground to be formed primarily by clay getting stiffer with the increase of the depth. Seepage was observed at 9.80 m depth. Water was struck at 16.45 m depth and rose at 8.30 m depth (97.25 mAOD) after 20 minutes. The stratigraphy is summarised Table 3-1 below, while the complete log can be found in Appendix B.

3.2.6. The borehole record is consistent with the geology mapping in the BGS online database.

3.2.7. Based on the above and subject to site specific testing, it is unlikely that infiltration will be a feasible surface water disposal method in this area.

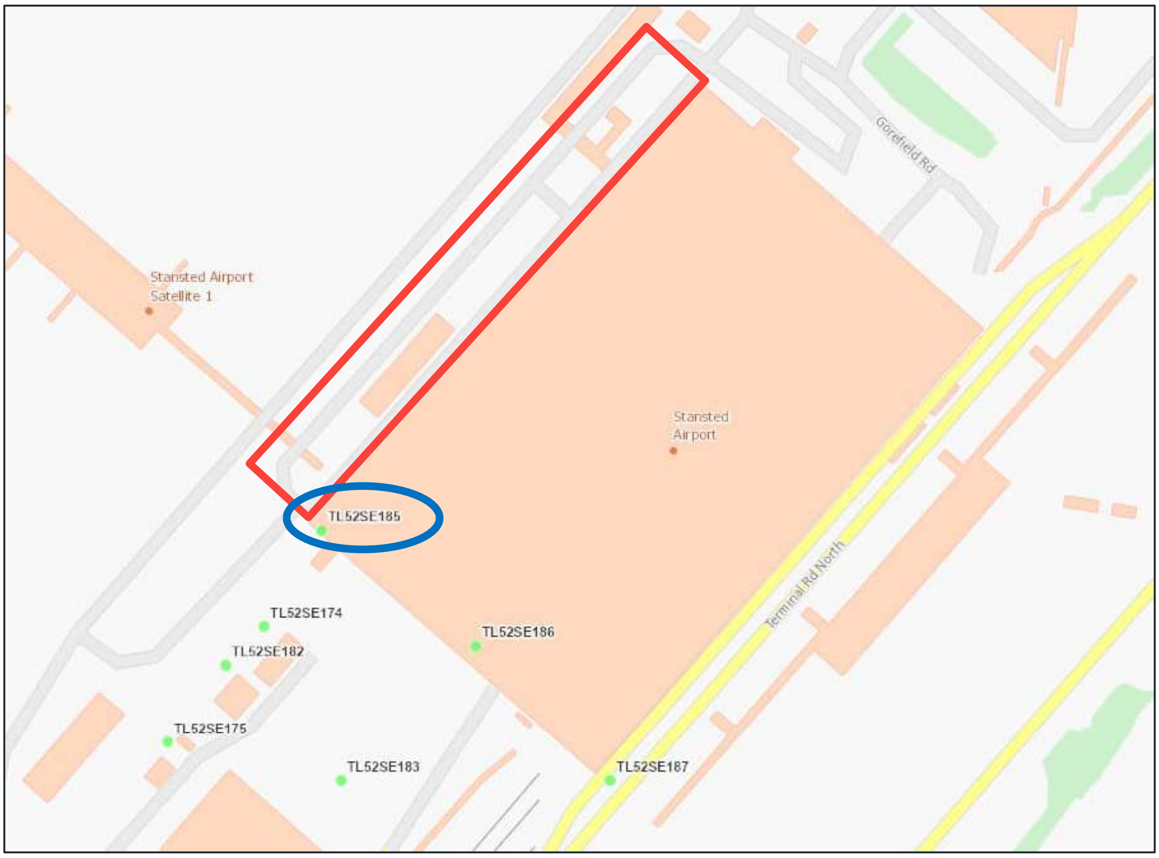


Figure 3 – BGS Borehole location plan

Table 3-1 – Borehole log summary

Depth From / to [m]		Prevalent material
0.00	0.35	TOPSOIL
0.35	4.80	firm to stiff sandy CLAY
4.80	16.45	stiff very silty CLAY groundwater rose at 8.30 depth (97.25 mAOD)
16.45	16.55	silty SAND
16.55	18.60	medium dense fine to coarse SAND
18.60	18.90	stiff sandy CLAY
18.90	19.60	dense fine to coarse GRAVEL
19.60	20.50	CLAY
20.50	21.00	very stiff silty CLAY

Figure 4 – Superficial geology

Figure 5 – Bedrock Geology

3.3 TOPOGRAPHY

3.3.1. A topographical survey for the site is being organised in preparation for the next design stage.

3.3.2. The airport area is generally flat, to facilitate the operation of aircrafts. The ground floor of the terminal building is located at a lower level compared to the airfield apron.

3.3.3. The railway line that serves the airport goes underground just west of Stansted Airport, crosses the airfield via a tunnel to then end at the railway station located on the southern side of the terminal building, at the lowest level.

3.3.4. Site observations summarised above suggest that the Terminal building acts as a low point for the adjacent area, while the airside of the airport is generally at a higher and constant level.

3.4 EXISTING DRAINAGE

The site is served by an existing foul and surface water gravity sewer networks, privately owned and maintained.

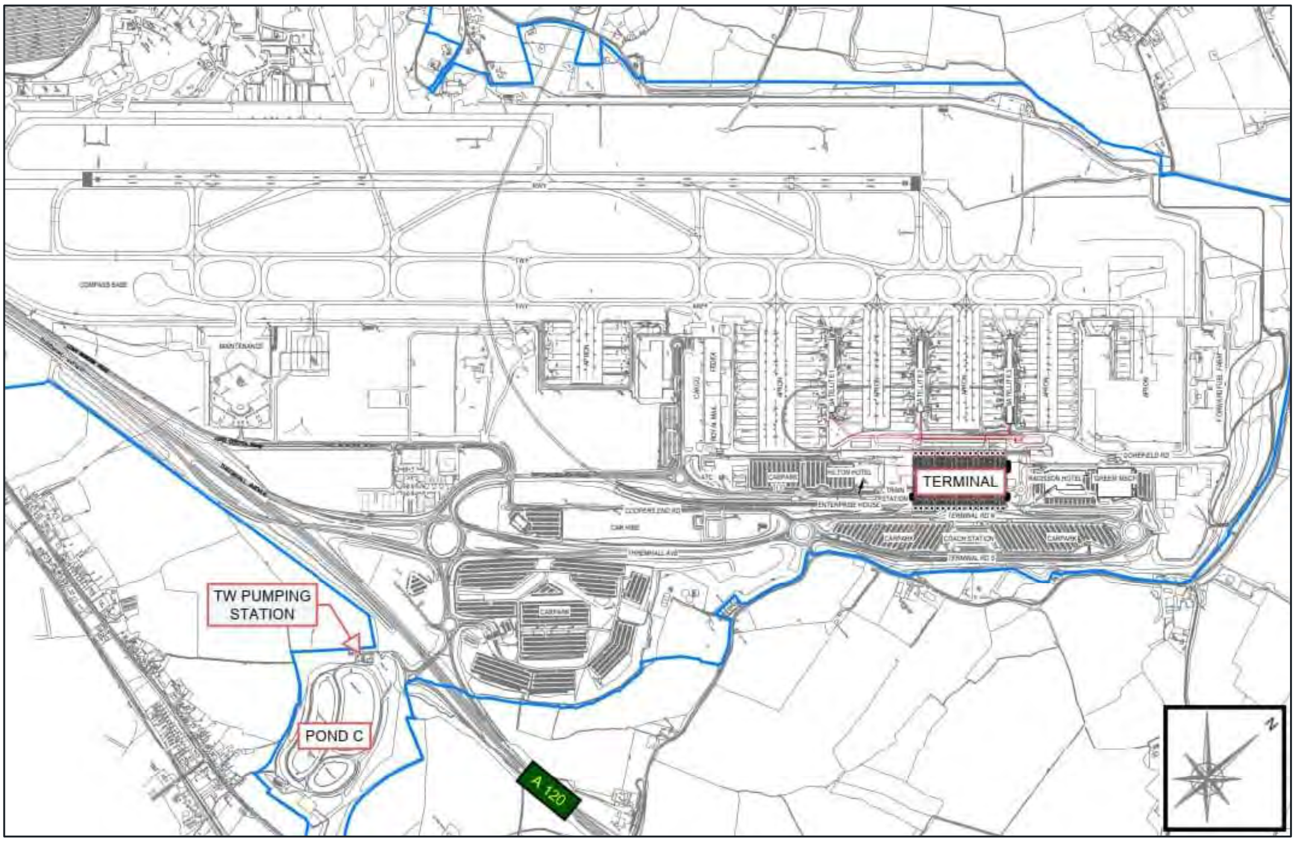


Figure 6 – Existing Foul Water pumping station and Balancing Pond location

SURFACE WATER

3.4.1. The airport is divided into 3 surface water catchments, each with its own outfall into the Pincey Brook and its own attenuation pond.

3.4.2. The Terminal building is located within the eastern catchment. The private surface water drainage network conveys the flows south of the airport towards the Balancing Pond C. From here, attenuated flows are discharged into the Pincey Brooke at a restricted discharge rate of approx. 535 L/s.

FOUL WATER

3.4.3. Flows from the airport are conveyed south to an adopted Thames Water pumping station (TW reference TAKES1ZZ) located north of Pond C. From there, an adopted 229 mm diameter rising main connects to the Bishop Stortford Wastewater Treatment Work on Jenkins Lane, south-east of Bishop Stortford between the A1060 and the M11.

4 SOURCES OF FLOOD RISK

4.1 SUMMARY

4.1.1. This chapter assesses the risk of flooding to the site from all current and future potential sources of flooding.

4.1.2. Table 4-1 summarises the findings of the assessment. A more detailed explanation of the sources of flooding impacting the site and determination of flood risk are presented in paragraph 4.2 to 4.6 below.

Table 4-1 – Summary of flood risk

Source	Risk
Rivers & the Sea	Negligible
Surface water	Low
Reservoirs	Not applicable
Groundwater	Low
Sewers	Possible

4.2 FLOODING FROM RIVERS AND THE SEA

4.2.1. Figure 7 below shows that the area of the proposed development is fully contained within Flood Zone 1, meaning that there is a less than 0.1% chance of flooding from rivers and seas in any given year.

4.2.2. Based on the above, the risk of flooding from rivers and the sea is considered negligible for this development.

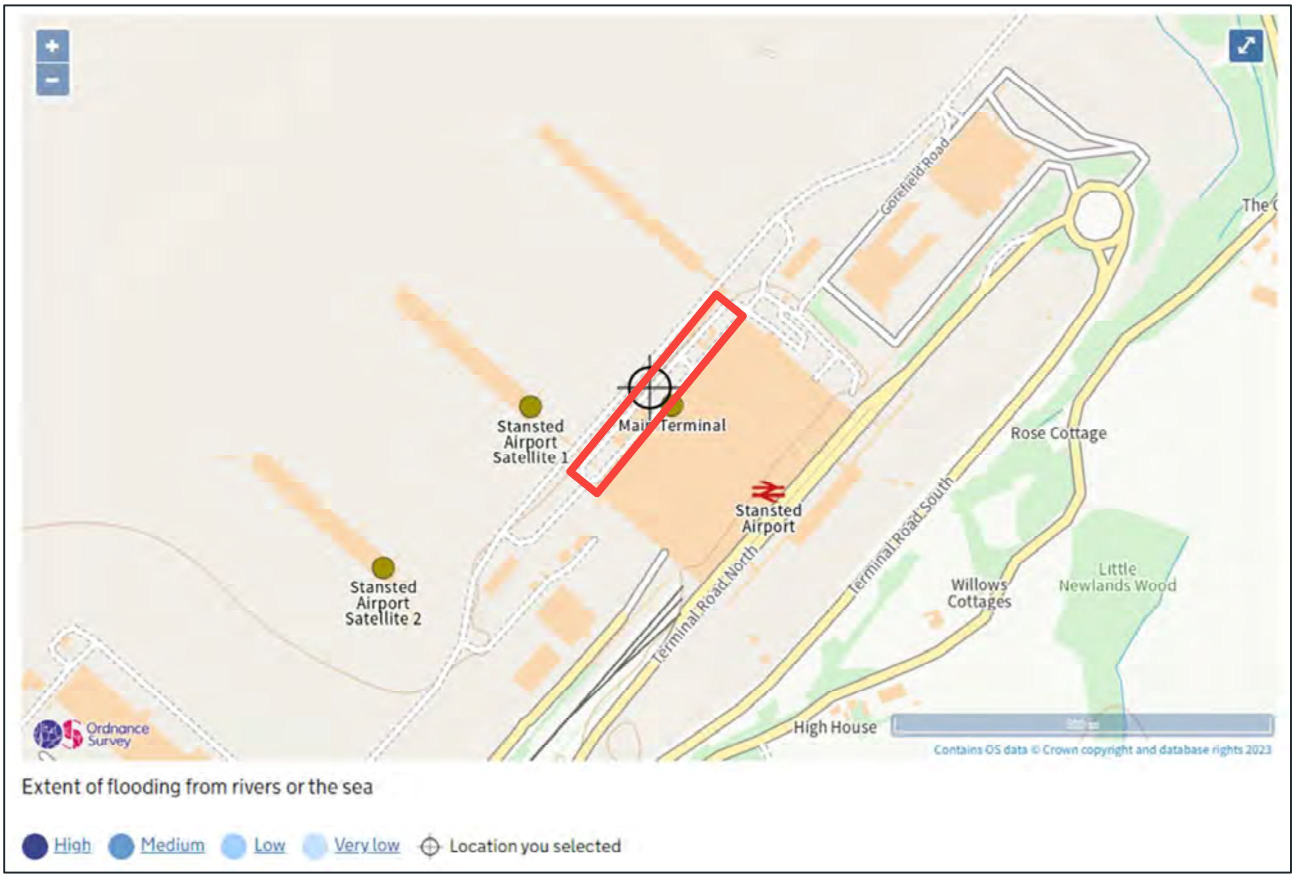


Figure 7 – EA Flood map – rivers & sea

4.3 SURFACE WATER FLOOD RISK

4.3.1. As per Figure 8 below, the area immediately adjacent to the existing terminal building is classified at "High Risk" of surface water flooding, meaning that there is a greater than 3.3 % annual probability of flooding.

4.3.2. It appears the origin of this flood is a low point within the site, as this coincides with the excavated depth of the site when the terminal was constructed in the later 1980s. There is no evidence of this being part of a wider flow path originating offsite.

4.3.3. It is noted that the EA assessment is based on a high-level topographic model and does not consider any existing drainage systems. The proposed surface water drainage strategy, as per paragraph 6.2 further below, captures and attenuates surface water arising from the application site and will mitigate this risk.

4.3.4. Based on the above, the risk of flooding from surface water is considered Low.

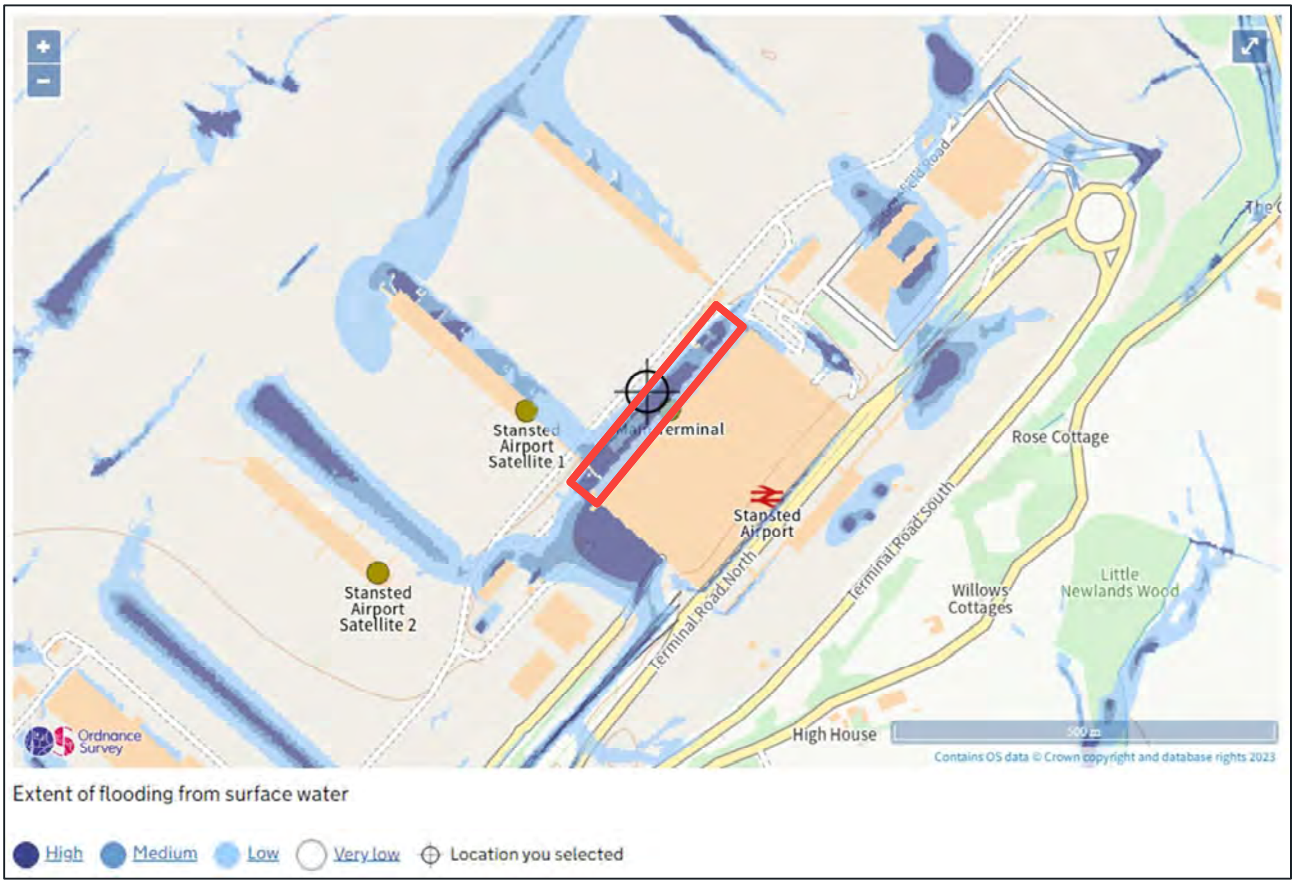


Figure 8 – EA Flood map – surface water

4.4 FLOODING FROM RESERVOIRS

4.4.1. No reservoirs are located in the immediate proximity of the development, the EA flood map in Figure 9 below confirms that the site is not at risk from reservoir flooding.

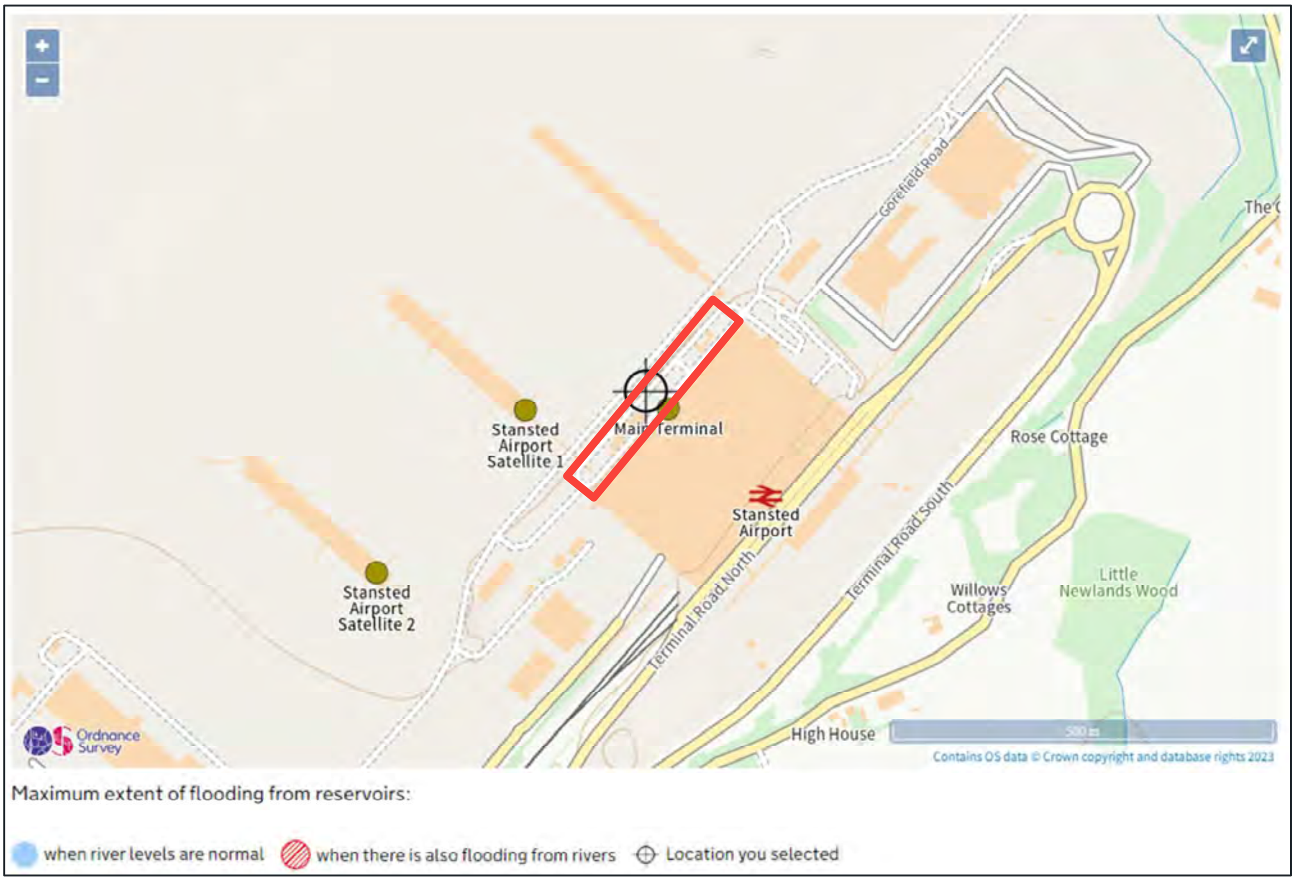


Figure 9 – EA Flood map – reservoirs

4.5 GROUNDWATER FLOODING

4.5.1. The BGS borehole log described in Section 3.2 recorded a ground water strike that settled at 8.30 m BGL (97.25 mAOD) at the time of recording. Based on this, groundwater flooding risk is considered negligible.

4.5.2. The above site result is coherent with the EA map appended to the Uttlesford SFRA. As shown in Figure 10 below, this quantifies the risk of groundwater flooding as lower than 25%.

4.5.3. Considering the above, the overall risk of groundwater flooding for this site is considered low.

4.5.4. Site specific groundwater monitoring is recommended to confirm these findings.

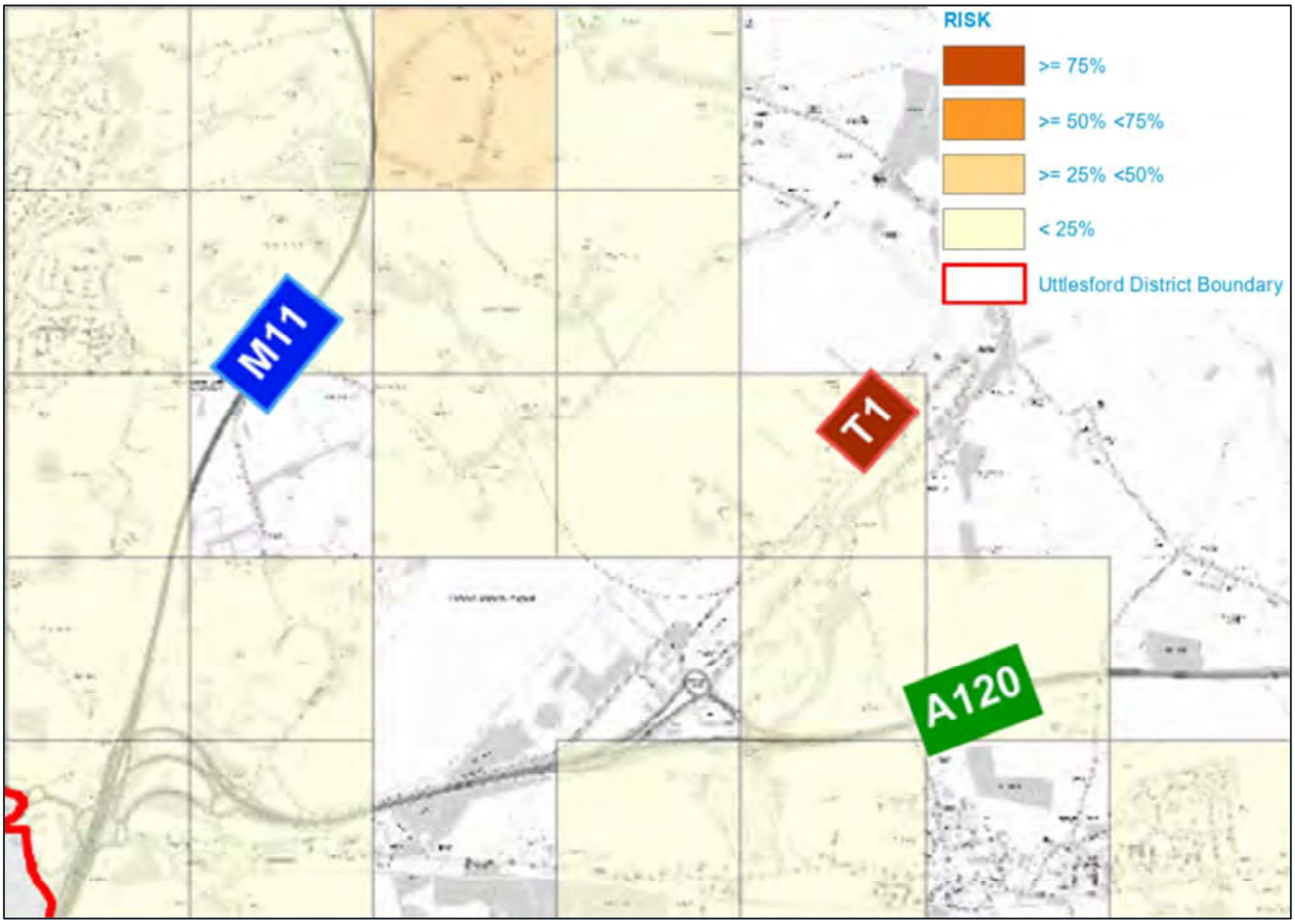


Figure 10 – Areas susceptible to Groundwater Flooding

4.6 SEWER FLOODING

4.6.1. There are no historical records of flooding events for the private foul and surface water sewer networks that serve the airport.

4.6.2. WSP have developed an ICM model of the airport-wide surface water drainage network. This model has not been validated, as telemetry equipment has not been installed within the existing surface water network. The results of the surface water drainage modelling can be found in Appendix F and are summarised below.

4.6.3. An assessment of the baseline scenario was made based on the existing site layout and the 35+ MPPA works as per paragraph 3.1.4. For the 1 in 30-year plus 35% climate change event, the model shows flooding of the existing surface water network along the northern and southern side of the terminal building. As shown in Figure 11, the flooded volume for the analysed manholes ranges between 8 – 170 m^3. The total flood volume adjacent to the building is in the region of 730 m^3.

4.6.4. This volume of flooding is attributed to the inadequate capacity of the existing SW network. As the topographical survey of this area is outstanding, at this stage it is not possible to confirm whether this volume will be conveyed towards the terminal building. However, considering the proximity to the terminal, the proposed drainage strategy will look to upgrade the network and address this issue.

4.6.5. As stated above, the model lacks validation from observed flows. For this reason, it is not possible to definitely quantify flood volumes occurring during rainfall events. It is advised to install flow monitoring devices at key manholes to enable the validation of the ICM model.

4.6.6. Based on the above, the risk of flooding from existing sewers is considered Possible.

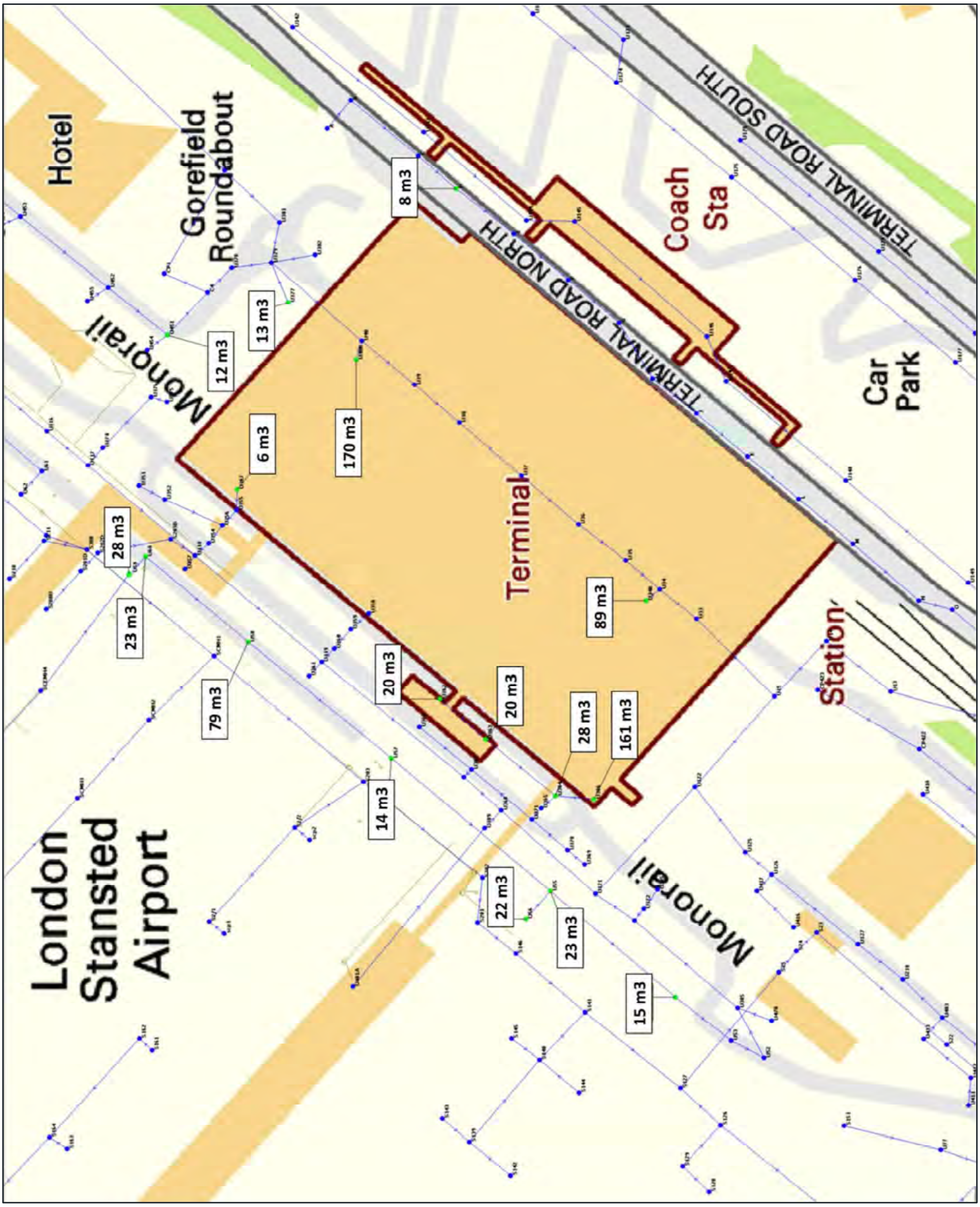


Figure 11 – Modelling results - baseline scenario 1 in 30-year + 35% CC, annotation indicates flooded volume at manhole

4.7 CLIMATE CHANGE ALLOWANCE

4.7.1. As mentioned previously, the risk of flooding from rivers is negligible and there are no watercourses in the vicinity at risk of flooding the site. Therefore, only peak rainfall climate change allowances will be considered.

4.7.2. The airport is located within the “Upper Lee” Management Catchment, the relevant peak rainfall intensity climate change allowances for this area are as per Table 4-2 and Table 4-3 below.

Table 4-2 – Climate change allowance (3.3% annual exceedance rainfall event)

Epoch	Central allowance	Upper end allowance
2050s	20%	35%
2070s	20%	35%

Table 4-3 – Climate change allowance (1% annual exceedance rainfall event)

Epoch	Central allowance	Upper end allowance
2050s	20%	40%
2070s	25%	40%

4.7.3. Based on the lifetime of the development going beyond 2100, the upper end allowance will be used when considering peak rainfall. This will be +35% for the 1 in 30-year rainfall return period and +40% for the 1 in 100-year rainfall return period.

5 NPPF SEQUENTIAL AND EXCEPTION TESTING

5.1 THE SEQUENTIAL TEST

5.1.1. As set out in the NPPF (2021), a sequential test is required if both of the following conditions apply:

- *The development is located within flood zone 2 or 3; and*
- *a sequential test hasn't already been done for a development of the type you plan to carry out on your proposed site.*

5.1.2. As neither of the conditions above apply to this development, a sequential test is not required.

5.2 THE EXCEPTION TEST

5.2.1. Annex 3 of the Flood Risk and Coastal Change Chapter of the National Planning Practice Guidance (2022) classes different types of development depending upon their vulnerability. Essential transport infrastructure such as airports are classified as 'Essential Infrastructure'.

5.2.2. Table 2 of the Flood Risk and Coastal Change Chapter of the Planning Practice Guidance (2022) shows that essential infrastructure is appropriate within Flood Zone 1 and no exception test is required.

6 FLOOD RISK MANAGEMENT AND DRAINAGE STRATEGY

6.1 PROPOSED SITE LAYOUT

6.1.1. The proposal involves:

- Partial demolition of the existing Track Transit System and full demolition of 2 no. skylink walkways and the bus-gate building.
- Construction of a 3-bay extension to the existing passenger terminal, Baggage Handling Building, Plant Enclosure, 3 no. Skylink walkways and associated hardstanding.

6.1.2. At roof level, the existing terminal building is characterised by a modular structure divided into squared bays. The proposal involves the retention of the last row of bays on the northern side (which has the TTS running below) and the construction of two additional rows as shown in Figure 12.

6.1.3. The overall area of the building reconfiguration is approx. 16,500 m^2, the extension beyond the original building (canopy roof) line totals approx. 11,000 m^2.

6.1.4. The building will also be extended at the mezzanine and under croft levels, but the existing access road located north of the terminal will be retained, as shown in Figure 13 and Figure 15.

6.1.5. The area object of the works (i.e. Terminal extension, sky links and 2 new buildings) totals approx. 23,000 m^2. This area is already partially developed, the resulting net increase in impermeable area is approx. 7,000 m^2.

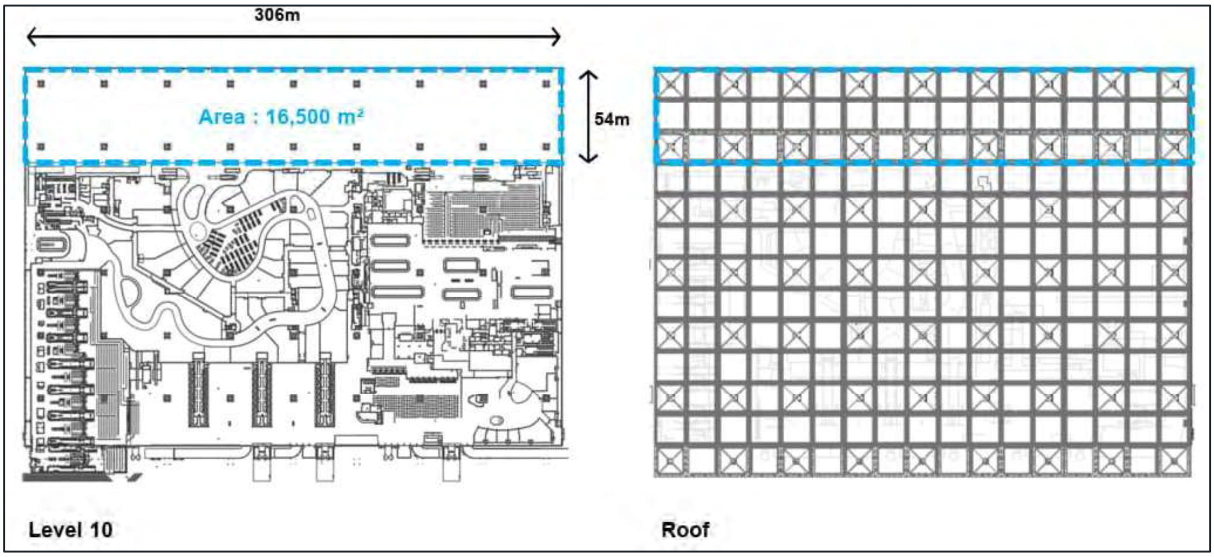


Figure 12 – Proposed extension, dimensions, and schematics

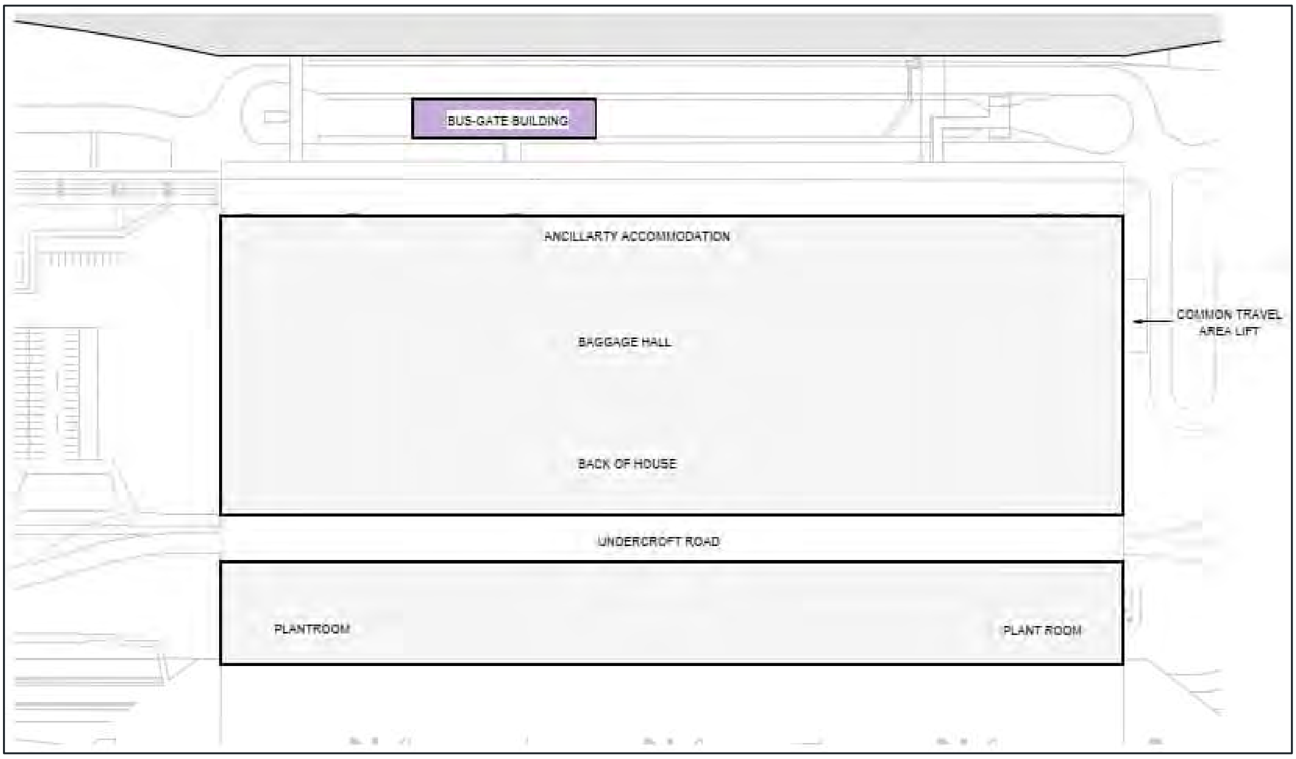


Figure 13 – Existing architectural plan – Level 0

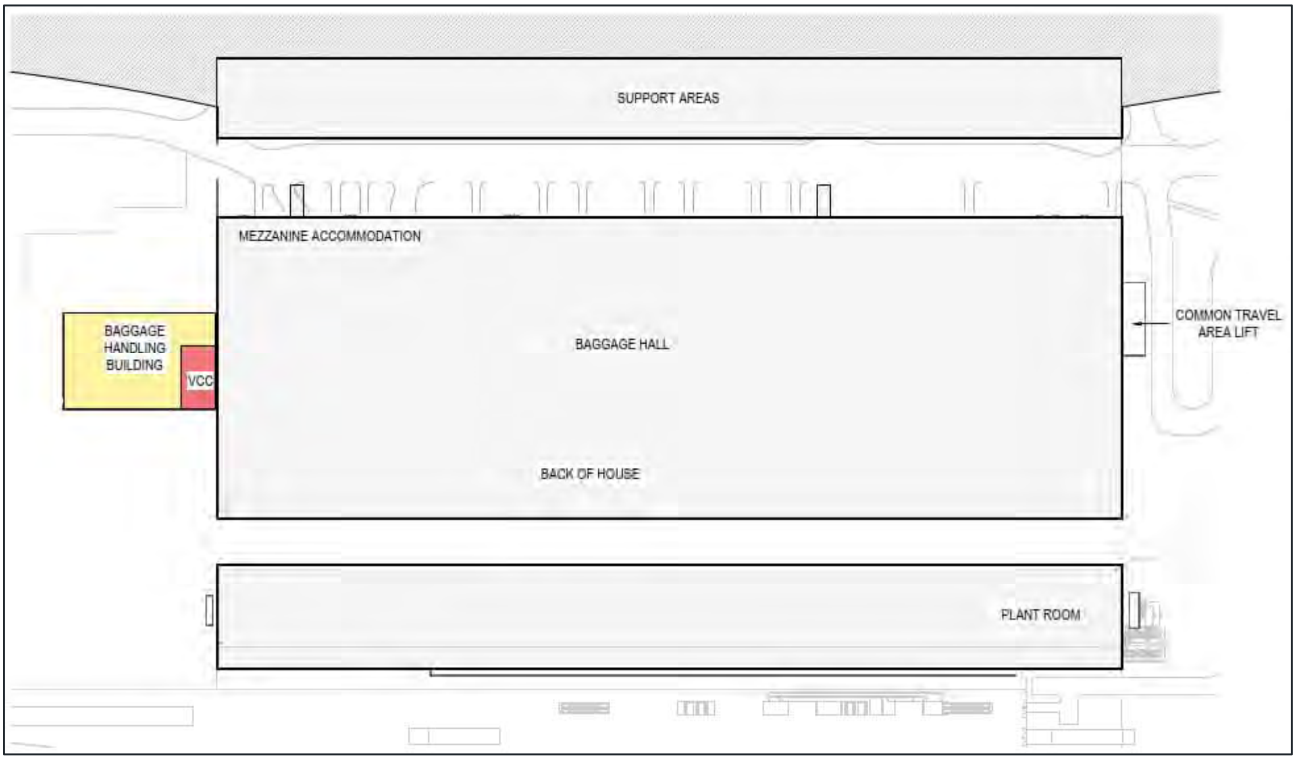


Figure 14 – Proposed architectural plan – Level 0

Figure 15 – Proposed extension, concept sections

6.2 PROPOSED SITE-WIDE SURFACE WATER DRAINAGE STRATEGY

6.2.1. The building's surface water drainage strategy has been developed by Mott MacDonald and is summarised in Appendix G.

6.2.2. Considering the geological and hydrological data presented in paragraph 3.2, it is considered unlikely that infiltration will be a viable means of discharge for this site. In-situ infiltration testing will be commissioned at the next design stage to confirm soakage rates in the area.

6.2.3. The surface water (SW) drainage strategy includes connecting the proposed drainage from the terminal building's extension to the existing airport's private SW network adjacent to the application site. Flows will then be conveyed to the balancing pond C via the existing gravity network (see Figure 6).

6.2.4. The surface water is to be designed to the criteria shown in Table 6-1 below.

Table 6-1 – Drainage strategy criteria

Return period	Climate change allowance	Principles
30 years	35%	- No flooding around the terminal building - No exacerbation of any existing flooding elsewhere
100 years	40%	- External levels around the terminal building will be engineered such that any flooding will be directed away from buildings

6.2.5. The above criteria will be achieved by;

- Upgrading the existing network north and south of the terminal building to allow for the additional flows;
- Upgrading the existing sewer mainline between the terminal and Pond C to allow for the additional flows; and
- Increasing the storage capacity within Pond C to attenuate the additional run-off volumes.

6.2.6. As part of the separate planning application for the 35+ MPPA works mentioned in paragraph 3.1.3, the Planning Inspector imposed the following condition.

"Prior to reaching 35mppa, a scheme for the provision and implementation of water resource efficiency measures during the operational phases of the development shall be submitted to and approved in writing by the local planning authority. The scheme shall include the identification of locations for sufficient additional water meters to inform and identify specific measures in the strategy. The locations shall reflect the passenger, commercial and operational patterns of water use across the airport. The scheme shall also include a clear timetable for the implementation of the measures in relation to the operation of the development. The approved scheme shall be implemented, and the measures provided and made available for use in accordance with the approved timetable."

6.2.7. Based on the above, consideration has been given to including rainwater harvesting (RWH) within the building extension. However, the RWH tank volume should not be included in any attenuation calculations, as it may be full during a storm event. Information regarding the proposal can be found in Appendix G.

6.2.8. A pre-application engagement meeting with the Essex County Council Lead Local Flood Authority (ECC LLFA) was held on the 20th of July 2023 to present the proposed surface water strategy. The LLFA confirmed the criteria shown in Table 6-1 are in line with their expectation for the development. In addition, they have highlighted the requirement to consider rainwater re-use within the proposal. Notes from the meeting can be found in Appendix D.

6.3 PROPOSED SITE-WIDE FOUL WATER DRAINAGE STRATEGY

6.3.1. The building's foul drainage strategy has been developed by Mott MacDonald and is summarised in Appendix G.

6.3.2. Flow monitor devices are installed within the existing private foul water (FW) network. Telemetry data is summarised in Table 6-2 below. The average and minimum daily load for the period 2020-2021 is not considered significative as it was during the COVID pandemic.

Table 6-2 – Existing daily foul loads

Period	Daily min. m^3/day	Daily max. m^3/day	Daily average m^3/day
2019	858	2,644	1,337
2020	307	2,322	841
2021	273	2,883	674
2022	440	2,104	1,069
Jan – Jul 2023	559	2,574	1,255

6.3.3. The additional foul peak flows discharged from the proposed terminal building extension have been estimated in the region of 34 L/s by Mott MacDonald. Additional daily volume generated by the development is yet to be confirmed.

6.3.4. The proposed foul water strategy will be based on connecting the terminal extension building's drainage to the nearest manhole within the existing private foul water (FW) network adjacent to the building. The additional flows as per paragraph 6.3.3 will route through the existing airport gravity network to the existing adopted pumping station shown in Figure 6. No changes to the existing permitted pumped rates are proposed.

6.3.5. A pre-planning engagement meeting with Thames Water was held on the 24th of July 2023 to present the proposed foul water strategy. In this instance, it was agreed that once building drainage design is finalised proposed FW additional volumes will be issued to Thames Water to check whether they can be accommodated at their treatment works.

6.3.6. The liaison with Thames Water regarding additional foul loads will be carried out between STAL and Thames Water, separately from the planning process. Any remedial actions will be agreed directly between the two companies and dealt with by rates.

6.4 RESIDUAL FLOOD RISK

6.4.1. As stated in Chapter 4, the site is exposed to risk of flooding from both surface water and sewers. The risk originated by both sources of flooding will be mitigated by the proposed surface water drainage strategy as per section 6.2 and the proposed foul water drainage strategy as per section 6.3.

6.4.2. Therefore, no significant residual risk of flooding is posed to the development.

7 CONCLUSIONS

7.1.1. This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared to accompany a full planning application for the extension of the passenger terminal building at Stansted Airport on behalf of Stansted Airport Limited (STAL). The site is located east of Bishop Stortford, Essex. An approximate address for the site is Bassingbourn Rd, Stansted CM24 1QW.

7.1.2. The proposal involves:

- Partial demolition of the existing Track Transit System and full demolition of 2 no. skylink walkways and the bus-gate building.
- Construction of a 3-bay extension to the existing passenger terminal, Baggage Handling Building, Plant Enclosure, 3 no. Skylink walkways and associated hardstanding.

7.1.3. Based on the information provided within this report, it is concluded that:

- As a separate planning application for the airport was granted planning permission in June 2021 (appeal reference APP/C1570/W/20/3256619 / Uttlesford DC reference: UTT/18/040/FUL). This included changes to the airport layout which are treated as existing for the purpose of this FRA and are referred to as “35+ MPPA works”.
- The development site is located in Flood Zone 1 and outside of any groundwater source protection zone or protected drinking water area.
- The British Geological Survey (BGS) records indicate that the site is underlain by Lowestoft Formation and London Clay. Subject to confirmation of soakage rates via site testing, infiltration is not expected to be a viable means of discharge for the development.
- EA data show that the site is at a low risk of flooding from all sources apart from surface water, this is based on topography causing surface runoff to pond around the building and is mitigated by the existing drainage network and the proposed drainage strategy.
- An ICM model for the existing SW drainage network is available and was used to assess the risk of flooding from existing sewers. The model shows flooding around the building for the 1 in 30-year + 35% climate change baseline scenario (i.e. existing airport operations plus 35+ MPPA works).
- The proposed foul water strategy will connect the building drainage to the existing foul water private network adjacent to the building. This will convey foul flows to the existing adopted Thames Water pumping station located south of the airport, adjacent to Pond C. No changes to the existing permitted pumped rates are proposed. Thames Water has been consulted and will provide relevant capacity checks on their network once the additional daily volumes of foul flows will be confirmed.
- The proposed development surface water drainage will be connected to the existing surface water private network, which will convey the flows towards the existing attenuation feature “Balancing Pond C”.
- All drainage calculation will take into account 35% climate change allowance for the 1 in 30-year design event, and 40% for the 1 in 100-year.
- The drainage strategy will be based on the following principles.
    - For the 1 in 30-year event: avoid flooding around the Terminal building without exacerbating flooding elsewhere within the site.

- For the 1 in 100-year event: engineer external levels around the building to route surface flooding away from the building.

- The above criteria have been presented to the LLFA which confirmed they are in line with their expectations for the development. These will be achieved via upgrades to the existing network and providing additional capacity to Pond C.
- The Terminal building extension will incorporate a rainwater harvesting (RWH) system.
- Safe access and egress from site will be via Terminal Road North and the A120.

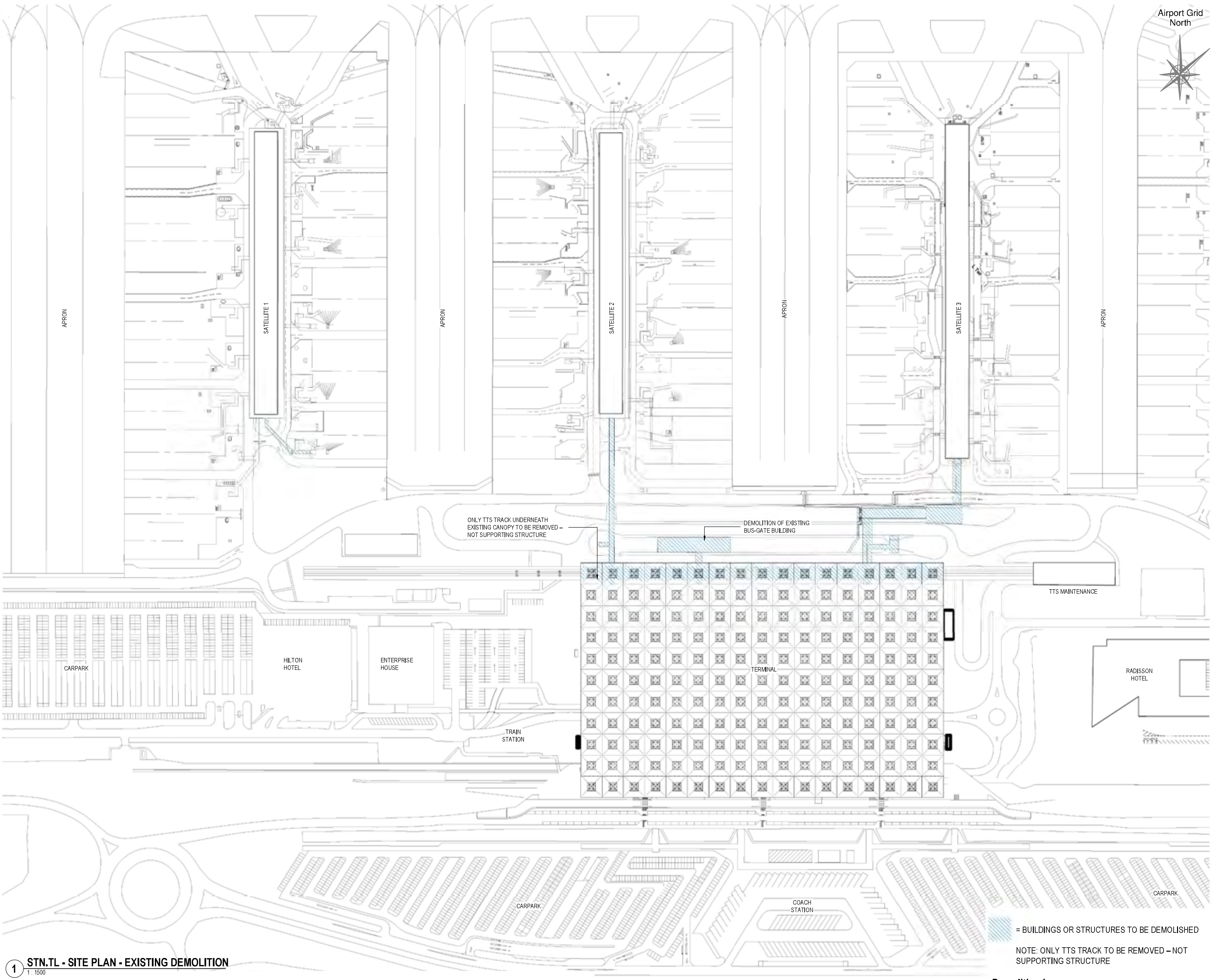
7.1.4. The following work is recommended to be undertaken at the next stage of design:

- Infiltration and groundwater testing;
- CCTV drainage survey; and
- Topographical survey.

7.1.5. Based upon information provided within this report, it is concluded that the site is presented as sustainable in terms of flood risk and compliant with the criteria set out in the NPPF.

Appendix A

SITE LAYOUT



Demolition key

= BUILDINGS OR STRUCTURES TO BE DEMOLISHED

NOTE: ONLY TTS TRACK TO BE REMOVED – NOT SUPPORTING STRUCTURE

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24/07/2023 13:11:44 \\Data1\caddrive\CAD\6953-Stansted_TP_MAG\XX-User\EWH\20230704 - Detached Revit Models\S1001241-STN.TL1.XX.XX-PAW-A-M3-XXX-0002_Terminal 01 Envelope_RIBA1 Studies_2023-07-24 Latest Planning Updates.rvt

GENERAL NOTES

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2. CONTRACTOR TO TAKE AND CHECK ALL DIMENSIONS ON SITE BEFORE WORK COMMENCES.
3. DISCREPANCIES TO BE REPORTED TO ENGINEER.
4. CONTRACTOR TO VERIFY ALL DIMENSIONS AND UTILITIES ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING MANUFACTURE.

Rev	Detail	Date	Ch'k'd	App'd

MAG London Stansted Airport

MOTT MACDONALD

PASCALL +WATSON

LEVEL C1 - PUBLIC

KEY PLAN

Airport
Stansted Airport

Project Name
Stansted Airport Terminal

Title
Stansted Airport Terminal
Architectural Site Plan - Demolition
Existing

Discipline	Project Phase
Architecture	Planning Application
Drawing Originator	Originator's Job No. 6953

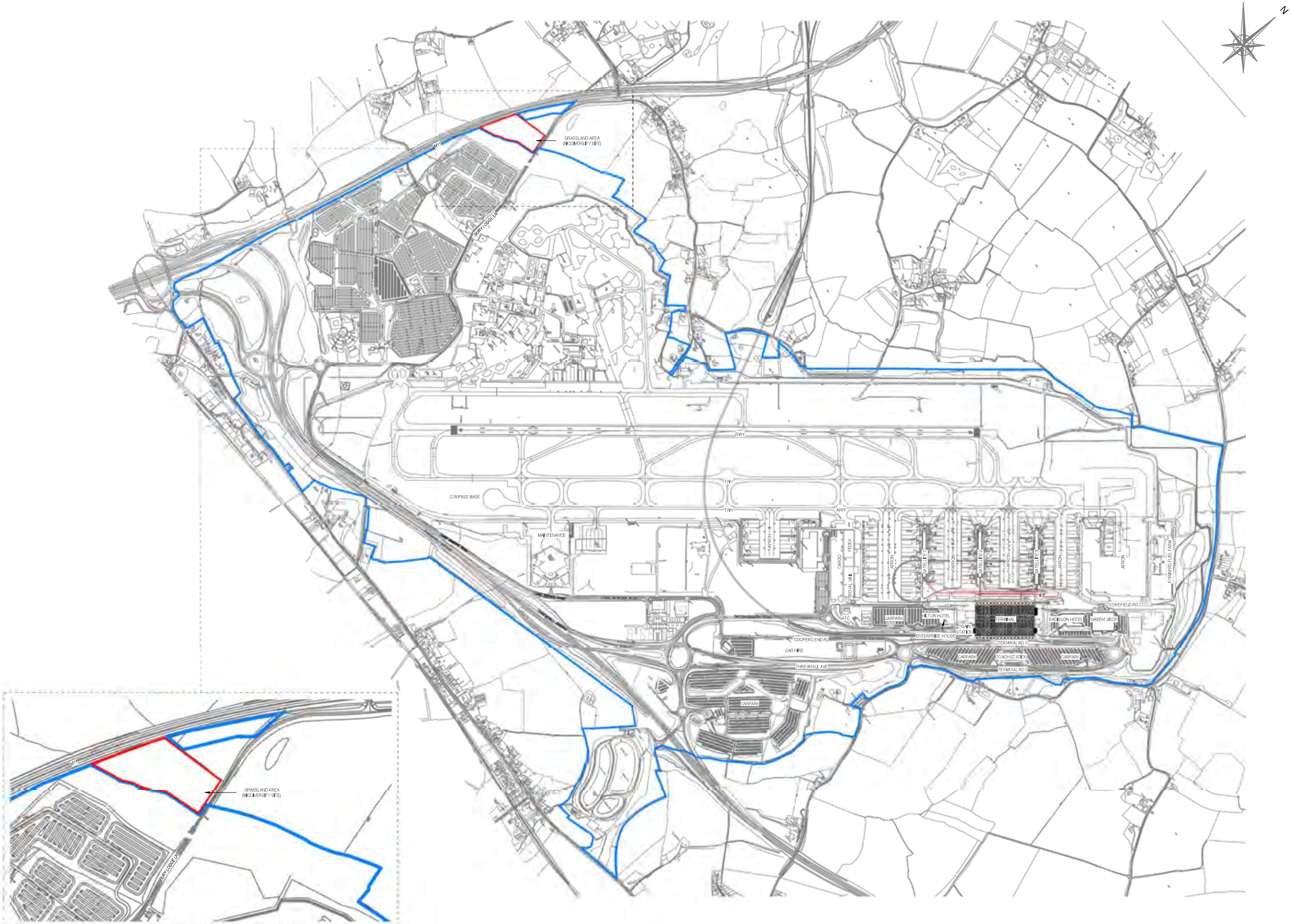
Drawn By	Drawn Date	Checked By	Plot Date
EWH	20.06.23	JW	
Approved By	Approved Date	Scale and sheet size @A1	
EB	07.07.23	As indicated	

Building British National Grid Reference

Project Number	Location Code		Origin
6953	STN . TL . XX . XX		PAW

Disc	Doc. Type	ACC	Unique ID Number	Status	Rev
A	DM	BLDSTR	2902	S2	

Airport Grid North



(1) STN.TL. - SITE CONTEXT PLAN
1 : 10000

(2) STN.TL. - ENLARGED EXTRACT OF GRASSLAND AREA (BIODIVERSITY SITE)
1 : 5000

KEY

- = PLANNING APPLICATION BOUNDARY
- = OTHER LAND IN THE OWNERSHIP OF THE APPLICANT

GENERAL NOTES

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Rev	Detail	Date	Chk'd	App'd

MAG London Stansted Airport

MOTT MACDONALD

PASCALL +WATSON

LEVEL C1 - PUBLIC

KEY PLAN

Airport	Stansted Airport
Project Name	Stansted Airport Terminal
Title	Stansted Airport Terminal Application Boundary Plan

Discipline: Architecture		Project Phase: Planning Application	
Drawing Originator		Originator's Job No.: 6953	
Drawn By: EWH	Drawn Date: 20.06.23	Checked By: JW	Plot Date
Approved By: EB	Approved Date: 07.07.23	Scale and sheet size: As indicated	@A1
Building British National Grid Reference			

Project Number	Location Code			Origin
6953	STN . TL . XX . XX			PAW
Disc	Doc. Type	ACC	Unique ID Number	Status	Rev
A	GA	BLDSTR	2010	S2	

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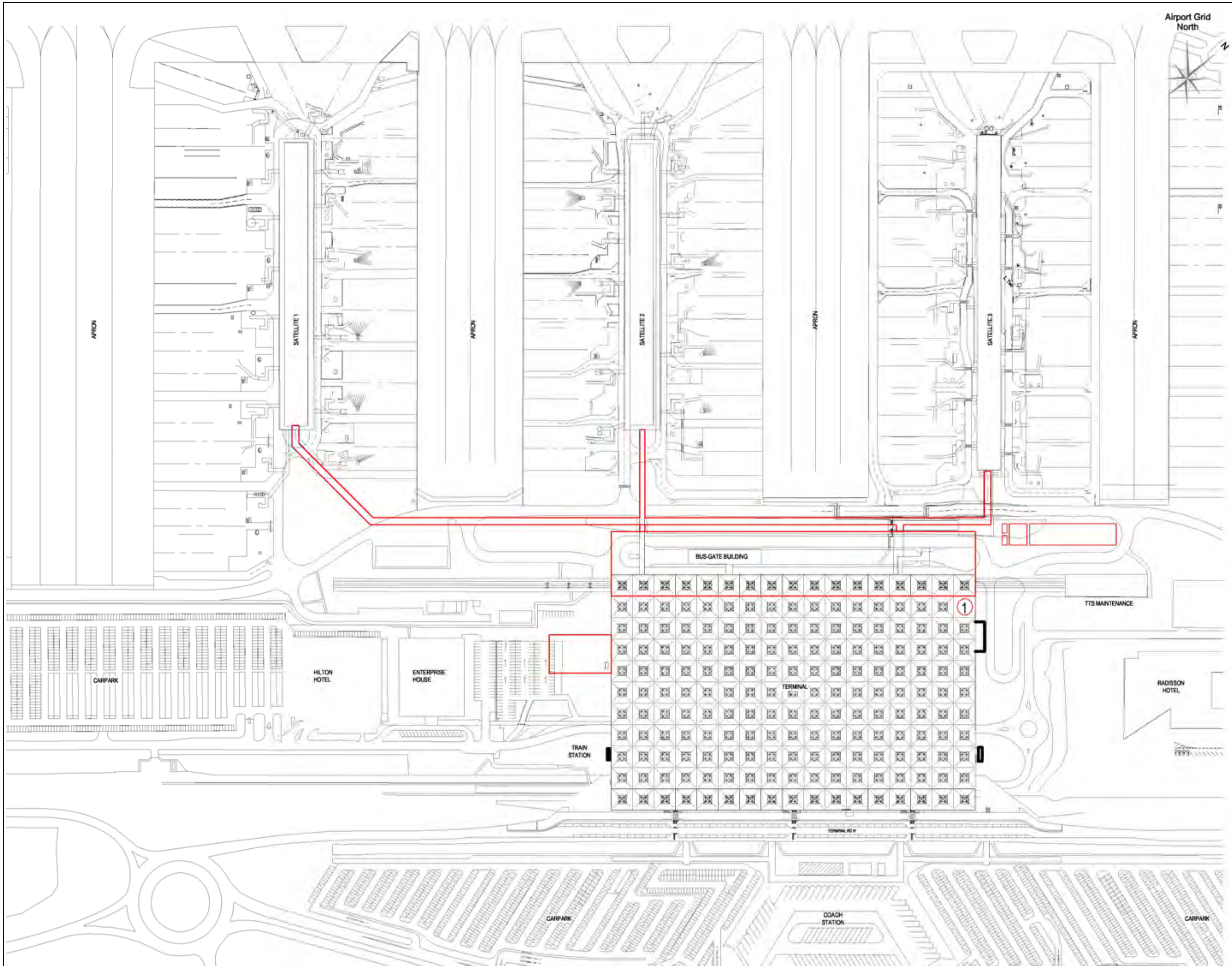

1 **STN.TL - SITE PLAN - EXISTING**
1 : 1500

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EXISTING ROOFING KEY

(1) = ALUMINUM AEROFOIL-SHAPED ROOF EAVES PROFILE

KEY

— = PLANNING APPLICATION BOUNDARY

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Rev	Detail	Date	Ch'k'd	App'd

MAG London Stansted Airport

MOTT MACDONALD

PASCALL +WATSON

LEVEL C1 - PUBLIC

KEY PLAN

Airport	Stansted Airport
Project Name	Stansted Airport Terminal
Title	Stansted Airport Terminal Architectural Site Plan Existing
Discipline	Architecture
Project Phase	Planning Application
Drawing Originator	
Originator's Job No.	6953
Drawn By	EWH
Drawn Date	20.06.23
Checked By	JW
Plot Date	
Approved By	EB
Approved Date	07.07.23
Scale and sheet size	@A1
Building British National Grid Reference	
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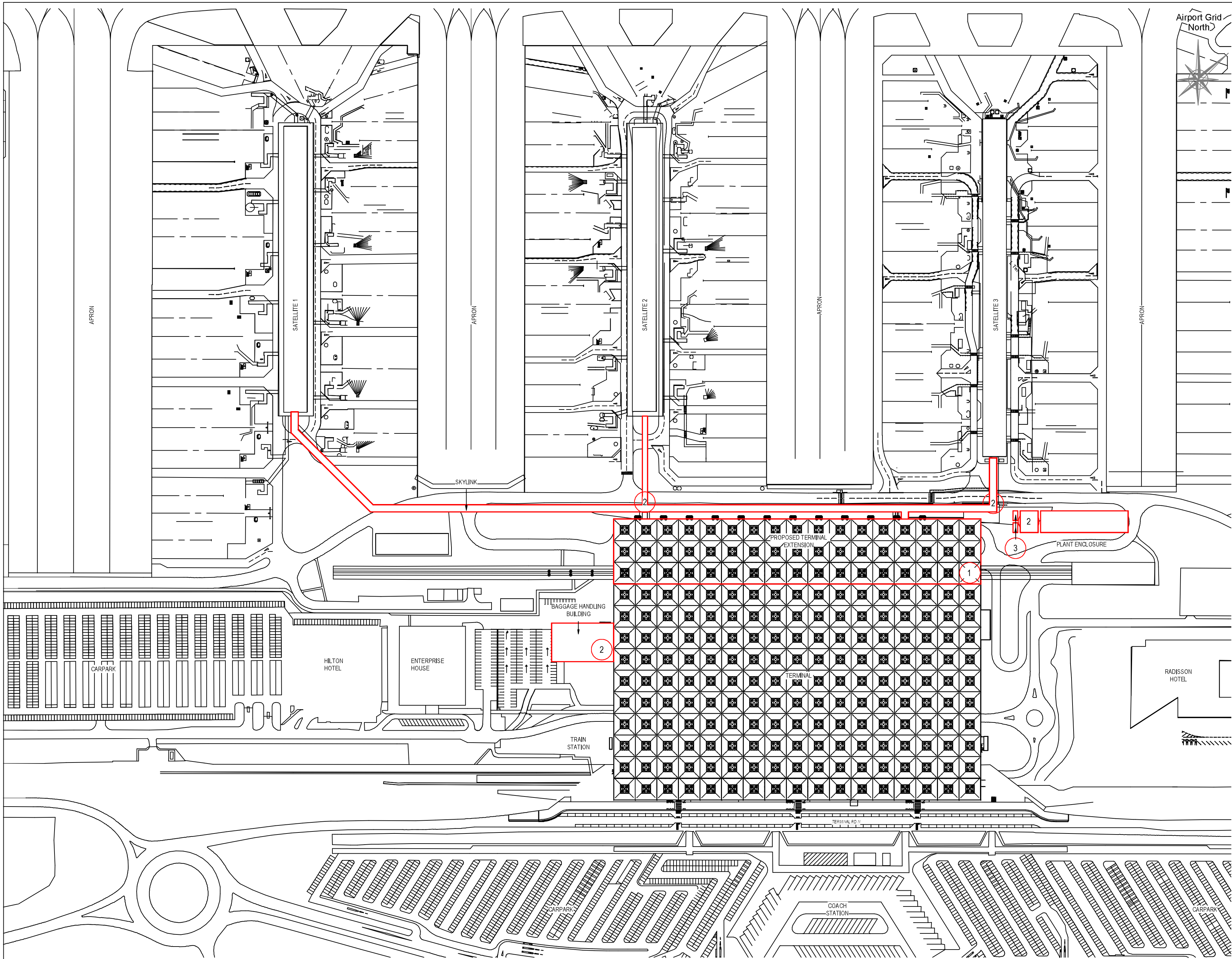
Disc	A
Doc. Type	GA
ACC	BLDSTR
Unique ID Number	2901
Status	S2
Rev	



1 STN.TL - SITE PLAN - PROPOSED

1 : 1500

PROPOSED ROOFING KEY:

1 = ALUMINUM AEROFOIL-SHAPED ROOF EAVES PROFILE
2 = INSULATED ROOF PANEL
3 = GRP MODULAR STRUCTURE

KEY

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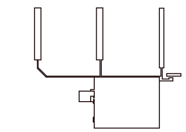
Rev	Detail	Date	Chk'd	App'd

MAG London Stansted Airport

MOTT MACDONALD

PASCALL +WATSON

LEVEL C1 - PUBLIC



KEY PLAN

Airport: Stansted Airport			
Project Name: Stansted Airport Terminal			
Title: Stansted Airport Terminal Architectural Site Plan Proposed			
Discipline: Architecture		Project Phase: Planning Application	
Drawing Originator		Originator's Job No.: 6953	
Drawn By: EWH	Drawn Date: 20.06.23	Checked By: JW	Plot Date
Approved By: EB	Approved Date: 07.07.23	Scale and sheet size: As indicated	@A1
Building British National Grid Reference			

Project Number	Location Code	Origin
6953	STN . TL . XX . XX	PAW

Disc	Doc. Type	ACC	Unique ID Number	Status	Rev
A	GA	BLDSTR	2910	S2	

Appendix B

BGS BOREHOLE LOG

PUBLIC

Record of Borehole No. 126

Location: STANSTED TERMINAL

Client: BRITISH AIRPORTS AUTHORITY

Type of boring: PERCUSSION

Job No. 11310221 Ground level 105.55m O.D.

Diameter / 200mm to 14.25m, 150mm to 21.00m

Casing / 200mm to 14.25m, 150mm to 19.80m

Daily Progress	Ground water levels	Depth of casing	Samples Depth	No.	Type	Strata Depth	Reduced level	Description of strata
1.3.83.								TOPSOIL
			0.45 - 0.45	1	D	0.35	105.20	Firm to stiff yellowish brown sandy CLAY with traces of rootlets to 0.70m With fine to coarse chalk and flint gravel below 0.60m.
			0.70 - 1.00	2	B			
		-	1.00 - 1.45	3	U102			
			1.45 - 1.60	4	D	1.45	104.10	..... becoming stiff and mottled grey below 1.45m.
		-	1.75 - 2.05	5	S(21)			(GLACIAL TILL)
			2.30 - 2.50	6	B			
		2.40	2.50 - 2.95	7	U102			
			2.95 - 3.10	8	D			
		2.40	3.25 - 3.55	9	S(27)			
		3.90	4.00 - 4.45	10	U102			
			4.45 - 4.60	11	D	4.45	101.10	..... becoming greyish brown
		3.90	4.75 - 5.05	12	S(23)	4.80	100.75	Stiff grey very silty CLAY with fine to coarse chalk and flint gravel.
			5.25 - 5.50	13	B			
		5.40	5.50 - 5.95	14	U102			
			5.95 - 6.10	15	D			
		5.40	6.25 - 6.55	16	S(25)			
(6.60m)	DRY	6.60						
2.3.83.	DRY	6.60						
		6.60	7.00 - 7.45	17	U102			
			7.45 - 7.60	18	D			
		6.60	7.75 - 8.05		S(19)			
			7.75 - 8.05	19	B			
	▽ 8.30		8.25 - 8.50	20	B			
			8.30	40	W			
		6.60	8.50 - 8.95	21	U102			
			8.95 - 9.10	22	D			
		6.60	9.25 - 9.55	23	S(26)			
	▼ 9.80 Seepage					10.00	95.55	

/continued.....

Key
- U.... undisturbed 102mm diameter sample
- D.... disturbed jar sample
- B.... disturbed bulk sample
- W.... water sample
- S( ). standard penetration test
- C( ). cone penetration test
- (33).. number of blows ('N' value)
- ▼.. groundwater encountered

Remarks
1. Seepage at 9.80m.
2. Water struck at 16.45m, rose to 8.30m in 20 minutes.

GROUND ENGINEERING

Record of Borehole No. 126

SHEET 2 of 3

Location: STANSTED TERMINAL

Client: BRITISH AIRPORTS AUTHORITY

Type of boring: PERCUSSION

Job No.: 11310221 Ground level: 105.55m O.D.

Diameter / 200mm to 14.25m, 150mm to 21.00m

Casing / 200mm to 14.25m, 150mm to 19.80m

Daily Progress	Ground water levels	Depth of casing	Samples Depth	Samples No.	Samples Type	Strata Depth	Reduced level	Description of strata
		6.60	10.00 - 10.45	24	U102	10.00	95.55	Stiff grey very silty CLAY with fine to coarse chalk and flint gravel.
			10.45 - 10.60	25	D			
		6.60	10.75 - 11.05	26	S(26)			
			11.25 - 11.50	27	B			
		6.60	11.50 - 11.95	28	U102			
			11.95 - 12.10	29	D			
		6.60	12.25 - 12.55	30	S(30)			
		6.60	13.00 - 13.45	31	U102			
			13.45 - 13.60	32	D			
		6.60	13.75 - 14.05	33	S(37)			
			14.25 - 14.50	34	B			
		14.40	14.50 - 14.95	35	U102			
			14.95 - 15.10	36	D			
		14.40	15.25 - 15.55	37	S(39)			
		14.40	16.00 - 16.45	38	U102			
	▼16.45		16.45 - 16.60	39	D	16.45	89.10	
						16.55	89.00	Grey silty SAND.
								Medium dense fine to coarse brown SAND with fine, medium and a little coarse flint gravel. (KESGRAVE BEDS?).
		16.75	16.90 - 17.20		S(16)			
			16.90 - 17.20	41	B			
17.25	8.45	17.25						
3.3.83.	8.10	17.25						
			17.65 - 17.95		C(19)			
			17.65 - 17.95	42	B			
			18.40 - 18.70		C(17)			
			18.40 - 18.70	43	B	18.60	86.95	Stiff brown mottled bluish grey sandy CLAY with fine to medium gravel.
			18.80 - 18.85	44	D	18.90	86.65	
			19.15 - 19.45		C(36)			Dense fine to coarse subangular to subrounded flint GRAVEL with medium to coarse brown sand. (KESGRAVE BEDS).
			19.15 - 19.45	45	B			
						19.60	85.95	Stiff reddish brown silty CLAY.
			19.75 - 19.80	46	D			
			19.95 - 20.40	47	U102			

Key
U.... undisturbed 102mm diameter sample
D.... disturbed jar sample
B.... disturbed bulk sample
W.... water sample
S( ). standard penetration test
C( ). cone penetration test
(33).. number of blows ('N' value)
▼.. groundwater encountered

Remarks

/contnued.....

GROUND ENGINEERING

Record of Borehole No. 126

SHEET 3 of 3

Location: STANSTED TERMINAL

Client: BRITISH AIRPORTS AUTHORITY

Type of boring: PERCUSSION

Job No.: 11310221 Ground level: 105.55m O.D.

Diameter / 200mm to 14.25m, 1500mm to 21.00m

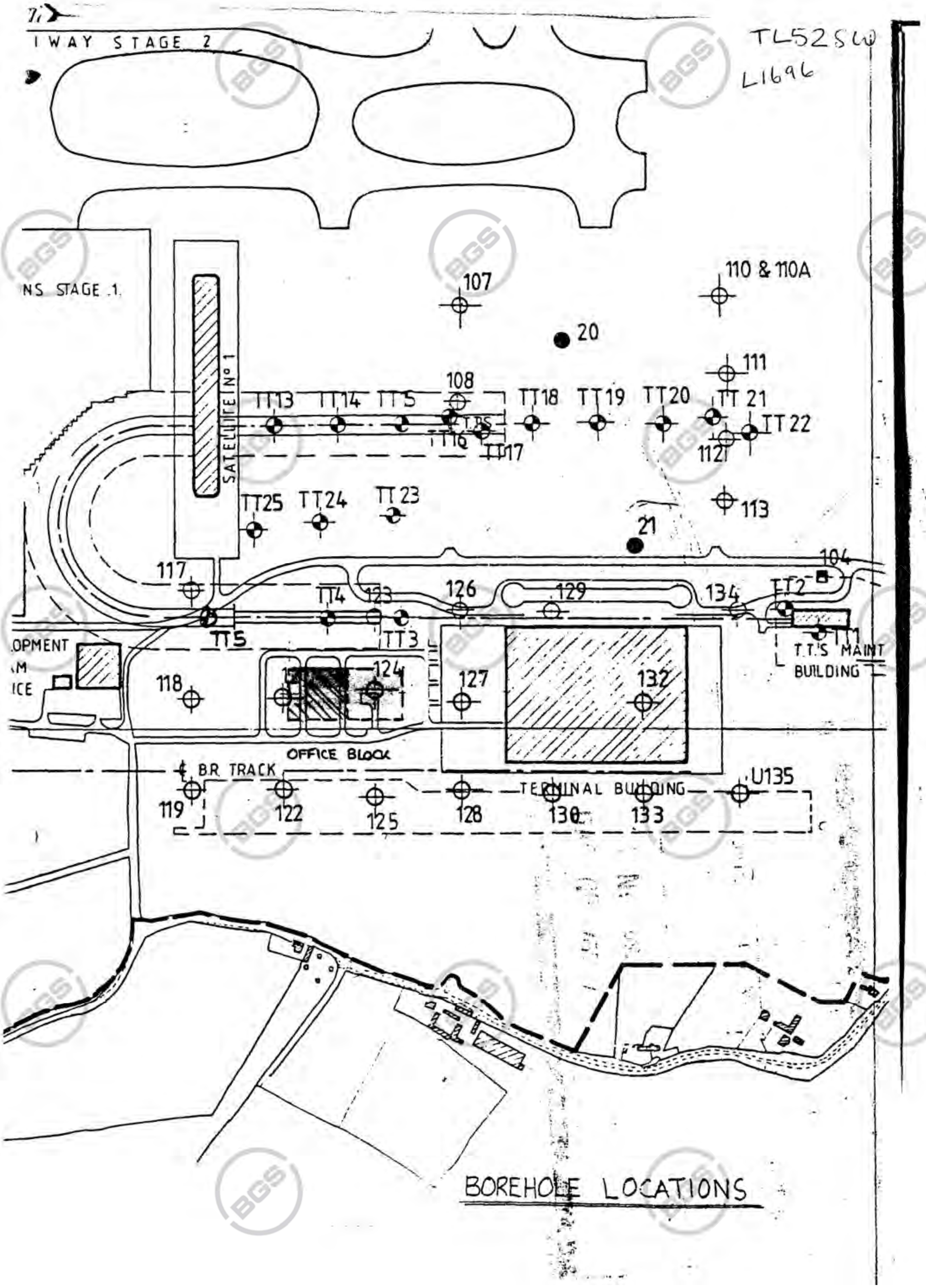
Casing / 200mm to 14.25m, 150mm to 19.80m

Daily Progress	Ground water levels	Depth of casing	Samples Depth	Samples No.	Samples Type	Strata Depth	Strata Reduced level	Description of strata
								Stiff reddish brown silty CLAY.
			20.40 - 20.55	48	D	20.50	85.05	(LONDON CLAY).
			20.70 - 21.00	49	S(42)			Very stiff brown fissured silty CLAY with brown and dark grey silt partings
(21.00m)	12.55	19.80				21.00	84.55	
								BOREHOLE COMPLETED.

Key
U.... undisturbed 102mm diameter sample
D.... disturbed jar sample
B.... disturbed bulk sample
W.... water sample
S( ). standard penetration test
C( ). cone penetration test
(33).. number of blows ('N' value)
▼.. groundwater encountered

Remarks

GROUND ENGINEERING

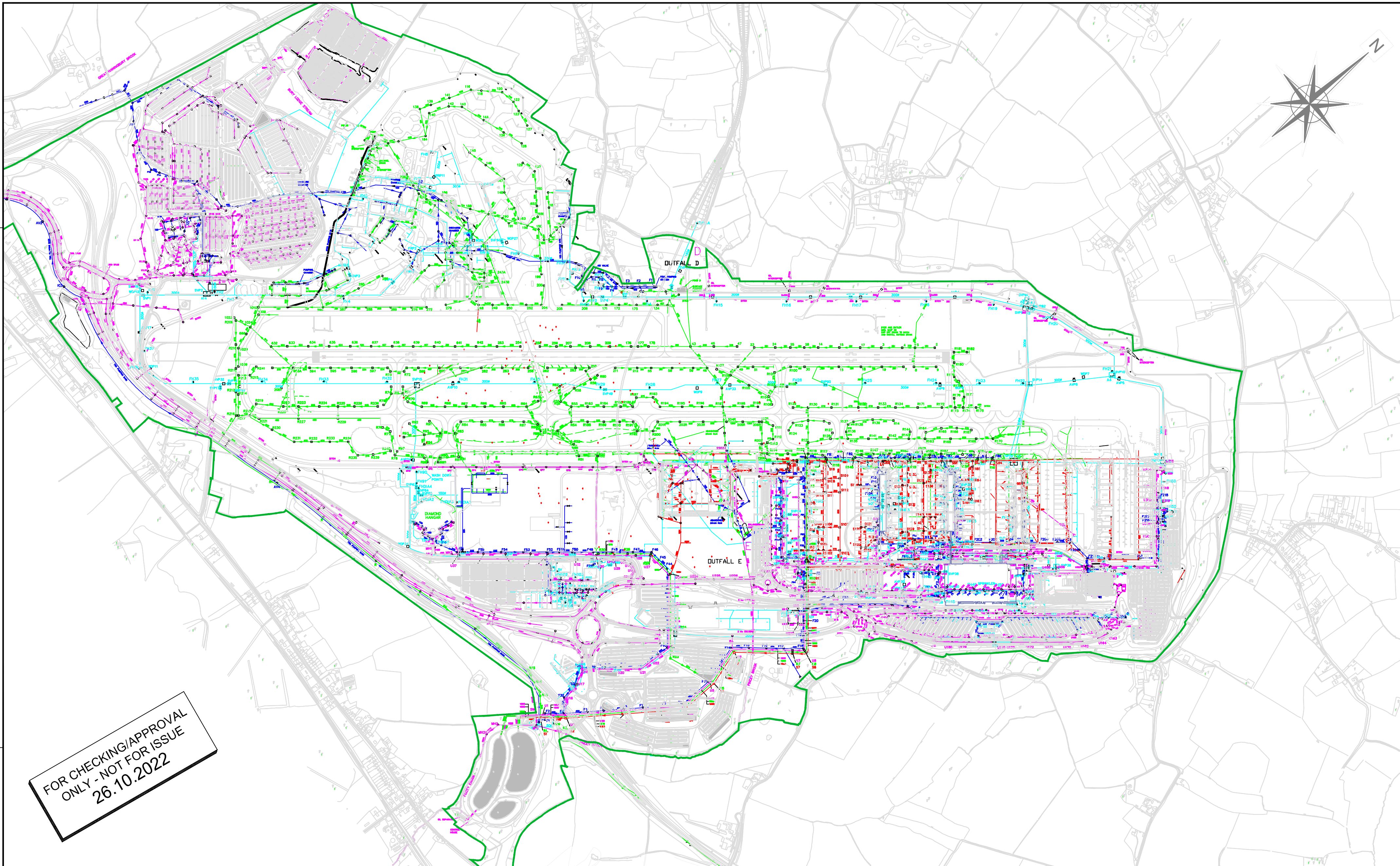


BOREHOLE LOCATIONS

Appendix C

SEWER RECORDS

PUBLIC



FOR CHECKING/APPROVAL ONLY - NOT FOR ISSUE
26.10.2022

LEVEL C3 - CONFIDENTIAL

Rev	Details	Date
0	ISSUED FOR INFORMATION	26/10/22

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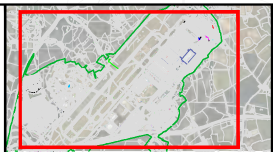
3. DISCREPANCIES TO BE REPORTED TO ENGINEER.
4. CONTRACTOR TO VERIFY ALL DIMENSIONS ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING MANUFACTURE.

Latest updates origin:



KEY PLAN 1:60000

MAG London Stansted Airport

Title: SURFACE WATER DRAINAGE & WATER UTILITY SYSTEMS	Discipline: Architecture	Project Phase: Scope	Drawn By: N.K.	Drawn Date: 26/10/2022
	Drawing Originator: MAG	Originator's Job No.: #####	Checked By: A.D.	Plot Date: 26/10/2022
	Building British National Grid: X = 554327384 Y = 223197178	Scale & sheet: 1:7500 @ A1 , 1:15000 @ A3	Approved By: A.D.	Approved Date: 26/10/2022

Airport	Project Name	Project Number	Location Code	Origin	Disc.	Doc. Type	ACC	Unique ID Number	Status	Rev.
Stansted Airport	Self Service Drawing Records	MAGCAD	STN	MAG	A	GA	XXXXXX	0001	S2	0

A1 scale 100% = A3 scale 50% = A5 scale 25%

Appendix D

LLFA CORRESPONDENCE

PUBLIC

Essex County Council
Development and Flood Risk
Waste & Environment
E3 County Hall
Chelmsford
Essex CM1 1QH

Mattia Fagnano

Date: 21 July 2023
Our Ref SUDS-006936

Dear Mr Fagnana,

Pre-application Response – SUDSPA529605359 - Stansted Airport - Terminal 1

Thank you for contacting us for pre-application advice which provides Essex County Council (ECC) with the opportunity to assess and advise on the proposed surface water drainage strategy for the aforementioned planning application.

As the Lead Local Flood Authority (LLFA) ECC provides advice on SuDS schemes for major developments. ECC have been statutory consultee on surface water since the 15th April 2015.

In providing advice this Council looks to ensure sustainable drainage proposals comply with the required standards as set out in the following documents:

- Non-statutory technical standards for sustainable drainage systems
- Essex County Council's (ECC's) adopted Sustainable Drainage Systems Design Guide
- The CIRIA SuDS Manual (C753)
- BS8582 Code of practice for surface water management for development sites.

Lead Local Flood Authority position

After reviewing the submitted documents please see a summary of our comments below:

ECC is statutory consultee to ensure the adoption of sustainable ways of surface water management where above ground storage is our preferred option when considering drainage strategies for new developments. Above ground storage options maximize the amenity and biodiversity benefits of SUDS. It is preferable that these are implemented throughout the development and integrated into the proposed landscaping as extensively as practicable.

Overall Drainage Strategy

The meeting with WSP consultants has been arranged to discuss the site at Stansted Airport Terminal 1.

The proposed development is brownfield and is extension of existing Airport terminal and is thought to be an increase in the footprint of approximately 11,00sqm. The written response is provided to ensure the development would meet the LLFA SuDS requirement. It is required all major developments should manage surface water runoff and mitigate adverse impact of surface water flooding.

We discussed Surface Water Run-off destinations and it was explained that the surface water will discharge in to the current drainage system and discharge in to a balancing to the south east of the airport.

The balancing pond discharges in to Pincey Brook at a rate of 535l/s. A separate application is being planned to increase the capacity of the balancing pond and the discharge rate will not increase as a result of this development, however, any opportunity to provide betterment should always be explored.

It was felt that the water quality requirements could be achieved through use of the current open SuDS features which provide treatments particular to airport run off. Please provide information regarding the treatment and pollution indices in the submission.

Sewer Network Design should demonstrate that there is No Surcharging for the 1 in 1yr RP, No Flooding for the 1 in 30yr RP and if not contained within the system, details of overland flood flow routes should be provided for the 1 in 100yr +CC RP, which should demonstrate no internal flooding to properties.

Flood Risk Assessment

A flood risk assessment should consider all forms of flood risk.

These include:

- Flooding from the sea or tidal flooding;
- Flooding from land;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from reservoirs, canals, and other artificial sources.

It should be considered how any existing flood risk will interact with the proposed development and associated drainage scheme.

Our records indicate that the proposed development is not within a Critical Drainage and does not fall within a Surface Water Management Plan (SWMP) Study Area. The Risk of Flooding from Surface Water (RoFfSW) map indicates the site to range from between Low to High Risk of Surface Water flooding.

Run off Destinations

Surface water run- off should be disposed of in line with the discharge hierarchy and should be investigated in the below order:

- Rainwater reuse
- Discharge via infiltration
- A hybrid Approach
- Discharge to a watercourse/surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

Rainwater re-use

In line with the updated 2020 Essex County Council SuDS Design Guide, rainwater re-use should be considered as part of any development. If this is not proposed as part of an application a clear explanation should be provided to demonstrate why this is not a viable option of source control on site. Essex is likely to experience increasing water scarcity in the near future so rainwater re-use needs to be strongly considered as part of any application for larger sites, however it should also be considered for smaller sites. If rainwater re-use is excluded without explanation, then the ECC SuDS team will ask for further information.

We strongly encourage the investigation into rainwater re-use in this development. The drought and dry weather over the last few years is an indication of the weather we can expect to happen more frequently in the future. Less groundwater recharge and larger seasonal variations in river flow, as well as changes to when and how extended dry periods occur, will affect how much water can be sustainably abstracted from groundwater and rivers. Climate change and population growth mean that if we do not act now, water demand from people, industry and agriculture will exceed water availability in many parts of the country. For more detailed advice please read the following section in our new design guide:
[redacted]

Infiltration

If infiltration is proposed, groundwater testing and infiltration testing in line with BRE 365 will need to be submitted to show that infiltration is feasible. Any infiltration storage devices should have 1m between the base of the storage device and seasonal high groundwater level.

If infiltration is unlikely to be possible at the site due to ground conditions, then we will still require high level ground investigations in order to prove that this is not a viable option.

Peak Flow

If following the discharge hierarchy infiltration is not found to be feasible on site, discharge from the site should be limited to the Greenfield 1 in 1 year rate for all storm events up to and including the 1 in 100 (plus climate change) storm event.

Alternatively, surface water can be discharged at equivalent Greenfield rates with the inclusion of long-term storage. Information would need to be provided about the values used to calculate this rate and these would be reviewed on submission.

Please also note that we do not accept a flat rate of 5l/s discharging from the site if the Greenfield 1 in1 year rate is below 5l/s. Historically 5l/s was applied to an outlet where Qbar was lower than 5l/s, as most devices would require an outlet orifice size smaller than 50mm, which would increase the susceptibility of blockage and failure.

There are now vortex flow control devices which can be designed to discharge at 1l/s, with 600mm shallow design head and still provide more than a 50mm diameter orifice. Furthermore, it is expected that appropriate measures should be put in place to remove materials that are likely to cause blockage before they reach the flow control device.

Storage requirements

It should be demonstrated how surface water up to the 1 in 100 year plus climate change event is managed within the development.

The Environment Agency updated their climate change allowance in May 2020 and we require the design to be to the upper end allowance (i.e. 40%, 45% which is applicable), unless this can be shown to make the development unviable, in which case the central allowance should be used with a sensitivity analysis carried out for the effects of the upper allowance. Please see the following link for more information on revised climate change allowances: [redacted]

As part of the planning application, detailed calculations considering a range of summer and winter storms should be submitted for storage requirements.

Please note if storage is placed in a path of a surface water flow that comes from off site, it should be demonstrated that any storage features will be sized appropriately for surface water created by the site and off site flows that may enter the storage features.

Water Quality

There should be treatment in line with Chapter 26 of the CIRIA SuDS Manual C753 for all areas of the site.

Considering impact of water pollution, in line with Paragraph 174 of the NPPF, priority should be given to SuDS and all SuDS options should be explored. If proprietary features are used however, it should be shown how these features will provide enough treatment in terms of total suspended solids, hydrocarbons and metals in line with Chapter 26.

It should be noted that trapped gullies and catch pits are generally not considered appropriate forms of pollution mitigation because of the high risk of remobilisation of pollutants using this method of treatment.

Residual Flood Risk

As part of any planning application it should be ensured that surface water is managed so that there is no flooding in a 1 in 30 year storm event and no internal flooding in a 1 in 100 year, inclusive of climate change storm event. Detail should also be given in regards to exceedance routes above the critical 1 in 100 year, inclusive of climate change storm event, which should be directed away from properties.

Maintenance and Adoption

The on-going maintenance of any features will be necessary to ensure that flooding does not occur due to failure of components. A maintenance plan should be provided as part of the planning application process detailing the maintenance activities and frequencies as well as who will be maintaining the system.

We understand that Anglian Water do adopt SuDS schemes within this region upon a scheme meeting their Adoption Criteria. If you intend to have them adopt your scheme, you will also need to provide proof that you have sent an Expression of Interest to them, or an Approval in Principle of your design.

Additional comments:

For a summary of what we require and when, please see the following link: [redacted]

Our ECC suds design guide 2020 can be found at the following link: [redacted].

Our ECC new suds proforma can be found at the following link: [redacted]

At some point during the planning stage, you would need to show how surface water will be managed during the construction phase.

You would also need to demonstrate how surface water impacts on the drainage system before and after development, and how the new development improves existing land drainage or surface water management.

Under Section 23 of the Land Drainage act (1991) any proposed structure that impacts on the cross-sectional area of a watercourse will require Ordinary Watercourse consent to be sought from Essex County Council. Such applications are separate from and are required in addition to the planning process.

Please note:

The advice provided by the Council's Officers is informal opinion only and is made without prejudice to any formal decision that may be given in the event of an application being submitted.

In particular, any advice given will not constitute a formal response or recommendation of the County Council. Any views of opinions expressed are in good faith and to the best of ability, without prejudice to the formal consideration of any application, which will ultimately be decided by the Local Planning Authority. The County Council cannot guarantee that new issues will not be raised following submission of a planning application and consultation upon it.

Officers cannot give guarantees about the final formal decision that will be made on planning or related applications. However, the advice contained within the written response will be considered by officers when considering any future planning application. This is subject to the proviso that circumstances and information may change or come to light that could alter the position. It should be noted that the weight given to pre-application advice will change if new material considerations arise.

Whilst we have no further comments at this stage, we strongly recommend you engage in pre-application consultation with any other organisations that maybe relevant to the proposed drainage strategy to avoid potential delays at the application stage. If you have any queries about any advice we have given please do not hesitate to contact us.

Yours sincerely,

Alison Vaughan
Senior Development and Flood Risk Officer
Team: Green Infrastructure and Sustainable Drainage
Service: Climate Action and Mitigation
Essex County Council

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Appendix E

THAMES WATER CORRESPONDENCE

Fagnano, Mattia

From: Fagnano, Mattia
Sent: 26 July 2023 11:01
To: [redacted]
Cc: Giddings, Jason; Connor Evans; Andrew Thompson; Andrew Doggart (STN); Alistair Andrew
Subject: Stansted Transformation Project - Pre-app notes
Attachments: TW CONSULTATION 230724.pptx

Filed: -1
Filed Location: \\uk.wspgroup.com\Central Data\Projects\70110xxx\70110659 - Stansted Transformation Project\03 WIP\CV Civil Engineering\05 Reports\FRA\APPENDICES\APPENDIX F - THAMES WATER CORRESPONDENCE.pdf.msg
Filed Location Folder: \\uk.wspgroup.com\Central Data\Projects\70110xxx\70110659 - Stansted Transformation Project\03 WIP\CV Civil Engineering\05 Reports\FRA\APPENDICES

Hi Nicholas,

Thank you for meeting with us on Monday, I believe it was a very useful conversation.

Please find attached presentation we shared on screen, below a few notes I took

- Site is provided with a private gravity FW sewer network which conveys flows south to an existing Thames Water pumping station (TW reference TAKES1ZZ).
  From there, a 229 mm diameter rising main conveys flows to the Bishop Stortford Wastewater Treatment Work centre.
- Proposed development involves an extension of the Stansted Airport Passenger Terminal building.
- FW drainage strategy will aim at connecting additional building drainage to existing private FW network adjacent to the Terminal building.
- Proposed development will generate additional daily foul volumes.
  An estimate of these volumes will be shared with you for capacity checks as the design progresses.
- No changes to existing pumped rates are proposed.

Please let me know if you would like to add anything to the above, or wish further clarification.

Thank you for your support.

Kind Regards

Mattia S. Fagnano
Senior Engineer – Development
MEng (Hons) IEng MICE
He/Him
ADVANCED NOTICE OF ANNUAL LEAVE
03-10 August

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WSP in the UK
Charter House

62-64 Hills Road
Cambridge CB2 1LA

[redacted]

Appendix F

SW DRAINAGE CALCULATIONS

Existing: 1 in 30yr + 35% CC (inc MPAA)

Notes: only showing >5m3 flood volume adjacent to the terminal building

Flooding Location near to the trminal :

BASE- 1in 30yr RP+35%CC

Node	GL	Flood Volume	RP	Duration	Sim
D	98.6	7.6	30	30	BASE_35+MPPA added M30-30
U34R	100	88.9	30	120	BASE_35+MPPA added M30-120
U362	97.9	19.6	30	30	BASE_35+MPPA added M30-30
U363	97.9	19.5	30	30	BASE_35+MPPA added M30-30
U364	97.85	27.7	30	30	BASE_35+MPPA added M30-30
U377	99.2	14.4	30	15	BASE_35+MPPA added M30-15_s
U386	98.15	161	30	60	BASE_35+MPPA added M30-60
U387	98.15	5.9	30	30	BASE_35+MPPA added M30-30
U40R	100	170.3	30	120	BASE_35+MPPA added M30-120
U451	99.5	12	30	15	BASE_35+MPPA added M30-15
U54	97.36	14.6	30	15	BASE_35+MPPA added M30-15
U55	97.36	22.5	30	30	BASE_35+MPPA added M30-30
U56	97.36	21.9	30	30	BASE_35+MPPA added M30-30
U57	97.58	14.1	30	60	BASE_35+MPPA added M30-60
U58	97.5	79.1	30	60	BASE_35+MPPA added M30-60
U59	98.2	27.5	30	15	BASE_35+MPPA added M30-15
U60	98	23.3	30	30	BASE_35+MPPA added M30-30
	Total(only>5m3)	730			

DEVELOPMENT- 1in 30yr RP+35%CC

Node	GL	Flood Volume	RP	Duration	Sim
D	98.6	7.6	30	30	Development M30-30
U34R	100	89.2	30	120	Development M30-120
U362	97.9	15.5	30	120	Development M30-120
U363	97.9	15.5	30	120	Development M30-120
U364	97.85	22.6	30	120	Development M30-120
U377	99.2	14.4	30	15	Development M30-15_s
U386	98.15	158	30	60	Development M30-60
U387	98.15	4.1	30	30	Development M30-30
U40R	100	170.3	30	120	Development M30-120
U451	99.5	12	30	15	Development M30-15
U54	97.36	14.4	30	15	Development M30-15
U55	97.36	22.5	30	30	Development M30-30
U56	97.36	22	30	30	Development M30-30
U57	97.58	14.2	30	60	Development M30-60
U58	97.5	79.3	30	60	Development M30-60
U59	98.2	27.5	30	15	Development M30-15
U60	98	23.3	30	30	Development M30-30
	Total(only>5m3)	708			

DEVELOPMENT- 1in 100yr RP+40%CC

Node	GL	Flood Volu	RP	Duration	Sim
CP423	100	8	100	15	Development M100-15_s
L	98.6	3.2	100	30	Development M100-30
M	98.6	3	100	30	Development M100-30
N	98.55	5.3	100	30	Development M100-30
O	98.5	8.9	100	30	Development M100-30
U352	98.2	0	100	30	Development M100-30
U355	97.9	32	100	30	Development M100-30
U356	98.07	1.7	100	30	Development M100-30
U358	97.9	99.1	100	30	Development M100-30
U359	98.03	3.6	100	30	Development M100-30
U363	97.9	43.6	100	120	Development M100-120_s
U364	97.85	58.9	100	120	Development M100-120_s
U365	98.03	0.2	100	120	Development M100-120_s
U377	99.2	47.7	100	15	Development M100-15
U382	99.1	23.2	100	15	Development M100-15_s
U386	98.15	356.1	100	60	Development M100-60
U387	98.15	98.3	100	30	Development M100-30
U455	102.5	0.3	100	15	Development M100-15_s
U54	97.36	49.8	100	15	Development M100-15
U55	97.36	54.3	100	30	Development M100-30
U56	97.36	49.4	100	30	Development M100-30
U57	97.58	35.9	100	60	Development M100-60
U58	97.5	134.7	100	60	Development M100-60
U59	98.2	64.2	100	15	Development M100-15
U60	98	49.5	100	30	Development M100-30
U61	100	10.6	100	15	Development M100-15
U63	100	6.6	100	15	Development M100-15_s
	Total(only>5m3)	2307			

Appendix G

BUILDING DRAINAGE STRATEGY

PUBLIC

LONDON STANSTED AIRPORT

Stansted Transformation Programme (STN-TP)

Terminal Extension

Drainage Strategy (July 2023)

MAG London Stansted Airport

BUILDING FOR THE FUTURE

MOTT MACDONALD

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	24.07.2023	CE / RB	OD	SC	Planning Issue
P02	26.07.2023	CE / RB	OD	SC	Planning Issue – Updated following MAG review

Document Reference:

N/A - Planning

Information Class: Standard

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Contents

1.0 Introduction

Mott MacDonald (MM) was commissioned to carry out the surface and foul water design in the form of a Drainage Strategy Report for Stansted Transformation Programme. This report is to support an Outline Planning Application for the proposed development boundary.

MM has followed accepted procedure in providing the services but given the residual risk associated with any prediction and the variability which can be experienced in flood conditions, we take no liability for and give no warranty against actual flooding of any property (client's or third party's) or the consequences of flooding in relation to the performance of the service.

Allowance for the effects of climate change (CC) will be made in accordance with government recommendations in place and statistical data available at the time of writing this report. These recommendations may become more onerous, and the statistical data may be revised in the future; we will not make any estimate of what changes may result from this. Please be aware that this, and other issues over which Mott MacDonald has no control, may affect future flood risk at the development and require further work to be undertaken for which we accept no liability.

A site wide Flood Risk Assessment (FRA) has been carried out in conjunction to this report by WSP, reference STNTP-WSP-00-XX-RP-DE-0001. For ease of reading this document will be referred to as WSP-FRA.

2.0 Existing Site

2.1 Site Location

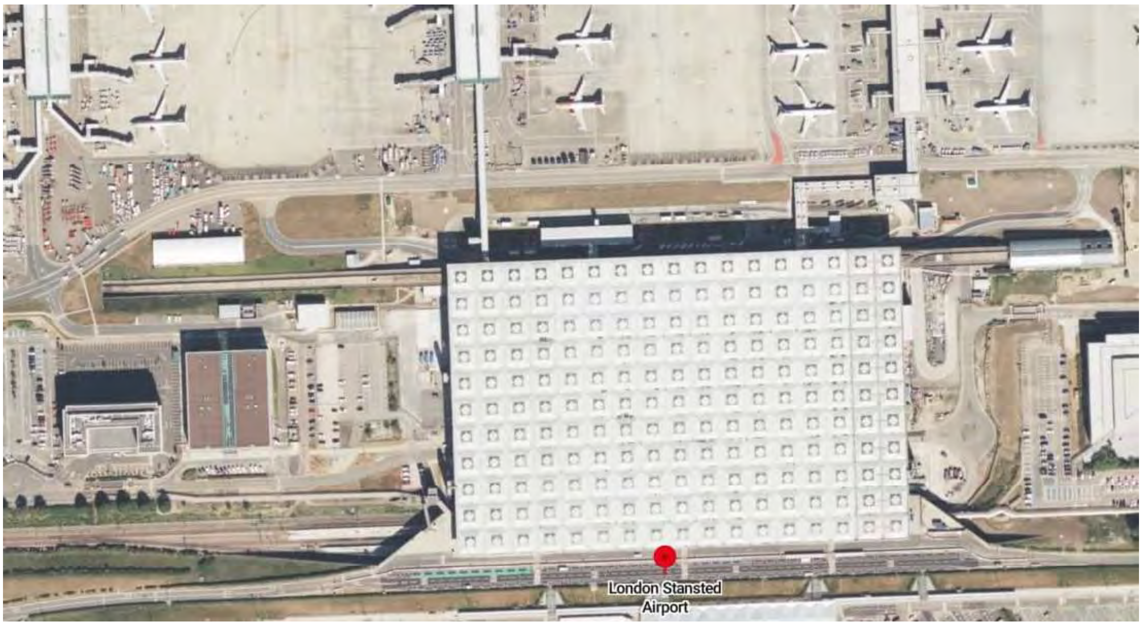
The proposed development is located at Stansted Airport, Stansted, Uttlesford, with an approximate postcode of CM24 1RW. Its National Grid Reference is 555742 (Eastings), 223682 (Northings). The site is approximately 7.5km from Bishop's Stortford.

2.2 Site Description

The site is situated at Stansted Airport which is owned by Stansted Airport Limited (STAL). The site lies within the airside portion of the Airport. There are two carriageways that run from north-east to south-west, one labelled as the Airside Road which is located nearest to the terminal on the north-west face whilst the latter carriageway is Princey Road (Airside Perimeter Road).

Existing site is shown in Figure 2.1.

Figure 2.1: Existing Site



Source: Bing Maps 2023

The site exhibits a significant variation in levels, with elevation at Princey Road approximately at 103+mAOD, followed by a noticeable drop in levels at the Airside Road to approximately 98+mAOD. These elevations have been determined based on available as-built data. However, the majority of the site lacks comprehensive topographic information, and further surveys are required to confirm the accuracy of these levels.

2.3 Existing Site Drainage

The proposed site lies within the wider Stansted Airport drainage network, owned and maintained by STAL. The existing surface water drainage network conveys water from the northeast to the southwest in the general direction of Balancing Pond C, located approx. 2km directly south west of the proposed scheme.

The wider Stansted Airport drainage network is split into three descriptors depending on the land use; Urban, Stands and Taxiway/Runway. Figure 2.2 shows the existing drainage systems, Urban as magenta, Stands as orange and Taxiway/Runway drainage as green.

The Urban drainage network refers to surface water runoff requiring little to no pollution mitigation measures, for example:

- Roof runoff,
- Carriageway runoff (general vehicle use as opposed to aircraft vehicle use),

- Pavements.

This generally runs from northeast to southwest, with a 1200mm diameter 'main' run to the west of the Terminal Building.

The Stands and Taxiway/Runway drainage networks refer to surface water runoff arising from the runoff from Stands and Taxiways/Runways. In colder periods or winter periods glycol is introduced to the taxiways, runways and stands to de-ice the areas, ensuring operations proceed without the risks that ice introduces. The Stands and Taxiway/Runways drainage networks are linked on the basis that they both drain to the same area of Balancing Pond C and therefore both require significant pollution mitigation measures for the use of de-icer.

The existing foul water drainage network is a gravity system comprising of two main branches originating at the northeast of the site, converging west of the existing terminal buildings, and continuing to a pump station southwest of the site, from where it is pumped northwest in the direction of Balancing Pond B, location shown in Figure 2.2.

The two branches cover the areas north and south of the satellite and terminal buildings. The northern branch captures flow from the northern parts of the satellite buildings, as well as the area west of the cargo sheds, before connecting with the southern branch southwest of Terminal 1. The southern branch originates at the forward fuel depot and captures flow from the ancillary buildings, the satellite buildings, the existing terminal building, and any foul flows connecting from the surrounding car park areas.

Figure 2.2: Existing Surface Water Systems with relation to Pond C

Source: STAL-BV-22742-C-20000_WIP_01-03-10 – SW Only

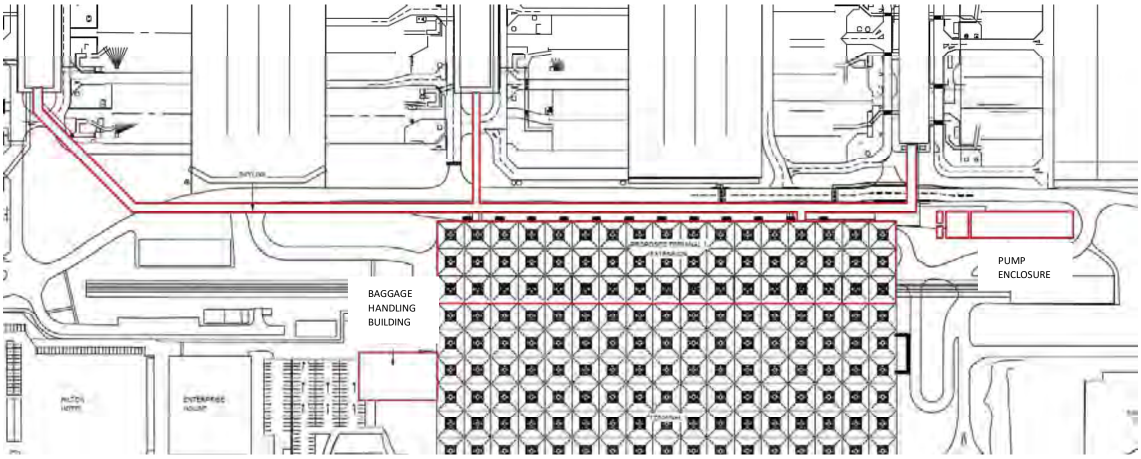
3.0 Proposed Development

The Proposed Development is a partial demolition of the existing Track Transit System and full demolition of 2 no. Skylink walkways and the bus-gate building. The main new elements of the works comprise:

- Construction of a 3-bay extension to the existing passenger terminal,
- A new Baggage Handling Building,
- A new Plant Enclosure and
- 3 no. Skylink walkways and associated hardstanding.

Approximate area of the proposed site is 2.3ha and areas are highlighted in red and shown in Figure 3.1 below.

Figure 3.1: Proposed Site



Source: STN.XX.00.XX-PAW-A-GA-BLDSTR-2910

4.0 Proposed Surface Water Strategy

4.1 Drainage Hierarchy

4.1.1 Infiltration based System

The British Geological Survey (BGS) Geology of Britain viewer indicates that the entire extent of the site is underlain by London Clay Formation – clay, silt and sand. Superficial deposits indicate Lowesoft Formation – Diamicton. Given these observations of the known geology there is a possibility that an infiltration-based system potentially may not be viable within the site boundaries. Furthermore, infiltration within airside is not considered suitable due to the risk of contamination to ground water with the use of de-icer (glycol) used on aircraft. Therefore, in light of this data and for the purpose of this assessment alternative methods of surface water discharge shall be considered. Methods of surface water discharge shall be reviewed upon receipt of GI information.

4.1.2 Watercourses

A desktop study using available topographical information, Ordnance Survey (OS) mapping and Google Maps revealed that there are no surface water bodies within the proposed scheme site. The River Roding is located approximately 1km to the northeast/east of the proposed site. The River Bourne is located approximately 1km southwest/west of the proposed site.

The Princey Brook is located approximately 1.3km to the southwest of the proposed site and is classified by the EA as a main river. The Princey Brook flows south to the River Stort. A tributary of Princey Brook, Takely Drain, is also classified by the EA as a main river and is located approximately 1.9km to the southwest of the proposed site. Therefore, discharge to a local watercourse is not deemed a viable solution and has been disregarded for the purpose of this assessment.

However it should be noted that the surface water arising from the proposed development will discharge to an existing sewer that conveys surface water to Pond C. Surface water is treated within Pond C prior to ultimately discharging to Princey Brook.

4.2 Surface Water

4.2.1 Surface Water Strategy

Surface water runoff from the proposed development shall discharge into the existing Urban drainage system due to its requirement for little to no pollution mitigation. The proposed surface water drainage will cover the proposed Skylink roof, Terminal Extension roof, Baggage Handling Building and Plant Enclosure roof.

The surface water runoff for the Terminal Extension roof, Skylink roof and Plant Enclosure roof is proposed to discharge to existing manhole U121 (see Figure 4.1), located to the northwest of the existing terminal building. The surface water runoff for the Baggage Handling Building roof is proposed to discharge into existing manhole U15 due to its location on the south-west face of the existing Terminal Building. The location of the rainwater downpipes serving these roofed areas are dependent on the structural and architectural proposals and are to be confirmed.

Figure 4.1: Proposed Surface Water Tie-In (U121 + U15)

Source: Bing Maps 2023

It is understood that all of the run-off produced by the development will be from the roof of the Terminal Extension, Skylinks, Baggage Handling Building and Plant Enclosure and will therefore require little treatment prior to discharging to the wider network. See section 4.2.8 for further details on runoff quality.

Existing carriageways on either face of the proposed Terminal expansion shall utilise existing drainage features such as road gullies, filter drains and channel/slot drains. As external level design is ongoing, the feasibility of utilising existing features is subject to change and will be reviewed upon receipt of further design information. However, for the purpose of this assessment it is assumed that the current Airside Road shall drain as existing.

The Skylink roof will cover an approximate area of 5,800m^2. The Skylink roof rainwater downpipe locations are dependent on the structural and architectural proposals and subject to change. Assuming a structural support every 18m, 11 no. DN150 downpipes would provide sufficient capacity to drain the Skylink roof. The sizing and number of downpipes shall be finalised when the structural arrangement of the Skylink is progressed further.

At the time of writing, the drainage of the existing terminal roof and its interaction with the proposed terminal extension roof is being investigated to rationalise proposals. It is understood the existing roof is drained via a siphonic drainage system, with rainwater downpipes at the terminal end. Siphonic roof drainage design is subject to design development and therefore detailed discharge rates are unknown at this stage. This will be assessed and confirmed at the next design stage but is not considered to impact the overall drainage strategy.

Since all of the proposed catchment areas solely consist of roof areas, there is no surface-level water runoff that requires specific drainage provisions/features. Any existing areas with surface-level drainage will remain unchanged, and it is assumed that they will continue to drain through the existing drainage features already in place. However, noting that the Airside Road that runs beneath the proposed Terminal Extension shall be provided with channel drains at thresholds to prevent the ingress of water (to be confirmed upon receipt of topographical survey).

The existing Airside Road that the proposed Terminal Extension shall be built over is assumed to drain as existing, utilising the existing drainage features such as road gullies and likely French or filter drains. Further coordination with the Structural and Architectural team will be required to confirm column and foundation layout to determine any localised drainage diversions that may be required to accommodate the foundations.

4.2.2 Climate Change

All drainage systems are sized to accommodate the runoff arising from a 1 in 100-year rainfall event and include an additional allowance to account for the further effects of CC.

Table 4.1 below shows the anticipated increases in rainfall intensities and river flows with time and has been reproduced in part from Table 4 of PPG-TG.

Table 4.1: Climate Change Allowances

Type	Applies across all of England	2015 to 2039	2040 to 2069	2070 to 2115
Rainfall	Upper End	10%	20%	40%
	Central	5%	10%	20%

Source: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-1

The development has a proposed design life in excess of 50 years, which, if the proposal is constructed, will be 2070 or later. Therefore, a CC value for rainfall flows of 40% will be used for the purpose of design/used for checking. CC values for river flows have been disregarded as there is no risk of fluvial flooding at this site.

4.2.3 Development Drainage and Site Discharge

The proposed surface water layout for the site is shown in Appendix A.

The total proposed development boundary is approximately 2.3ha and includes the below impermeable areas. All other areas are assumed to drain as existing and have therefore not been included in the below assessment. The existing and proposed impermeable and permeable areas are shown in Appendix C and D, where red areas indicate existing impermeable and green areas indicate existing permeable areas.

Existing:

- Carriageway, paving and stands (1.6ha)
- Soft landscaped areas (0.7ha)

Proposed:

- Roof area (Plant Enclosure, Terminal Building, Skylinks, Baggage Handling Building) (2.3ha)

Therefore, the total proposed impermeable area for within the drainage site boundary is 2.3ha. This is a 0.7ha increase over the existing impermeable area of 1.6ha, which is a 36% increase.

A development of this scale is likely to generate relatively large amounts of storm water runoff.

Estimation of the runoff for the proposed development site has been undertaken using Innovyze MicroDrainage Network analysis.

The runoff will not itself pose a risk to both the development site and the areas downstream of this point. The new impermeable area of the development will alter the existing runoff profile of the site with a commensurate increase in runoff potential. As such, the management of surface water will be important so as not to pose a significant flood risk. Further details with respect to the site wide ICM model is discussed in detail within the WSP-FRA.

4.2.4 Greenfield Development Rates

The existing greenfield runoff rates have been calculated for the existing impermeable area using the HR Wallingford Greenfield Runoff Rate Estimator. Refer to Section 4.2.3 for a breakdown of the existing impermeable areas.

Table 4.2: Greenfield Runoff Rates

Storm Return Period	Greenfield Runoff Rate (l/s)
QBAR	5
1 in 1 year	4.3
1 in 30 year	11.6
1 in 100 year	16.1

4.2.5 Proposed Development Rates

Following guidance from MAG, the allowable site discharge shall remain unrestricted. This determination is supported by the evidence presented in the WSP-FRA. The assessment demonstrates that the broader site network experiences minimal flooding, limited to the 1 in 100 year plus 40% CC storm event, and that the proposed schemes additional attenuation requirement can be effectively accommodated within the Stansted site.

Table 4.3: Proposed Unrestricted Runoff Rates

Storm Return Period	Unrestricted Runoff Rate (l/s)
1 in 1 year	292
1 in 30 year	789
1 in 100 year+40% CC	1,252

The proposed drainage system will make use of two existing manholes, namely U121 and U15. U121 will receive surface water runoff from roof areas: Terminal Extension, Plant Enclosure and Skylinks whilst U15 will receive surface runoff from the Baggage Handling Building. Based on the available information (STAL-BV-22742-C-20001_WIP_01-03-10-SW Only) these manholes are connected to the wider surface water network system comprising 1200mm diameter pipes.

A CCTV survey is recommended to be undertaken to validate the condition of the existing network at this location.

4.2.6 Site Attenuation

An assessment of the storage required to restrict flows from the proposed development to greenfield run off rates has been undertaken. Greenfield run off rates have been estimated within Table 4.2 and the estimated required attenuation for the 1 in 100 year + CC was approximately 2,450m^3 (using Innovyze MicroDrainage Quick Storage Estimate). Due to the limited availability of space in the areas immediately adjacent to the development, the required volume of attenuation and the corresponding area required to facilitate the volume at source it is therefore deemed not feasible to restrict rates to greenfield runoff rates.

Figure 4.2 illustrates a rough area of approximately 2,400m2 (highlighted in blue) that would be necessary if discharge rates were constrained to the Greenfield Runoff Rate, requiring on-site attenuation with an estimated depth of around 1m. However, due to limitations in available soft landscaping areas near the proposed site, the potential locations for at-source attenuation are restricted. It is worth noting that the majority of the soft landscaping areas in the vicinity of the site are allocated for use as utility corridors. This constraint also applies to the highlighted area depicted in Figure 4.2.

Figure 4.3 displays the existing utilities, particularly within the proposed attenuation area. However, it should be noted that the depicted area is presently utilised for utilities, as mentioned before. It is important to acknowledge that the existing utilities shown in the figure may not entirely reflect the current below ground conditions. Confirmation of the underground utilities will be sought through GPR results obtained during the subsequent stages of the project.

Figure 4.2: Example of Attenuation Requirement to Greenfield Rates

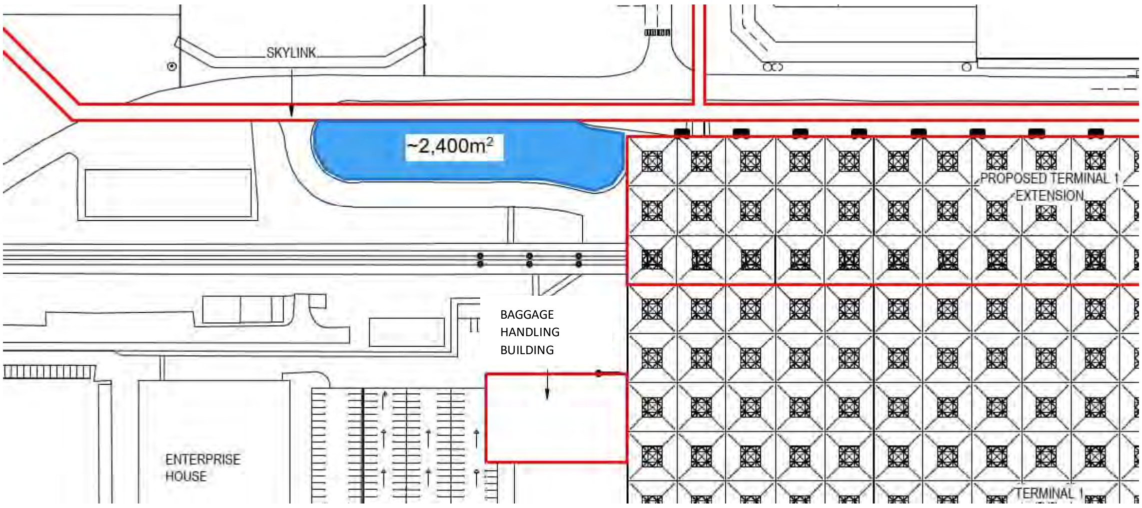
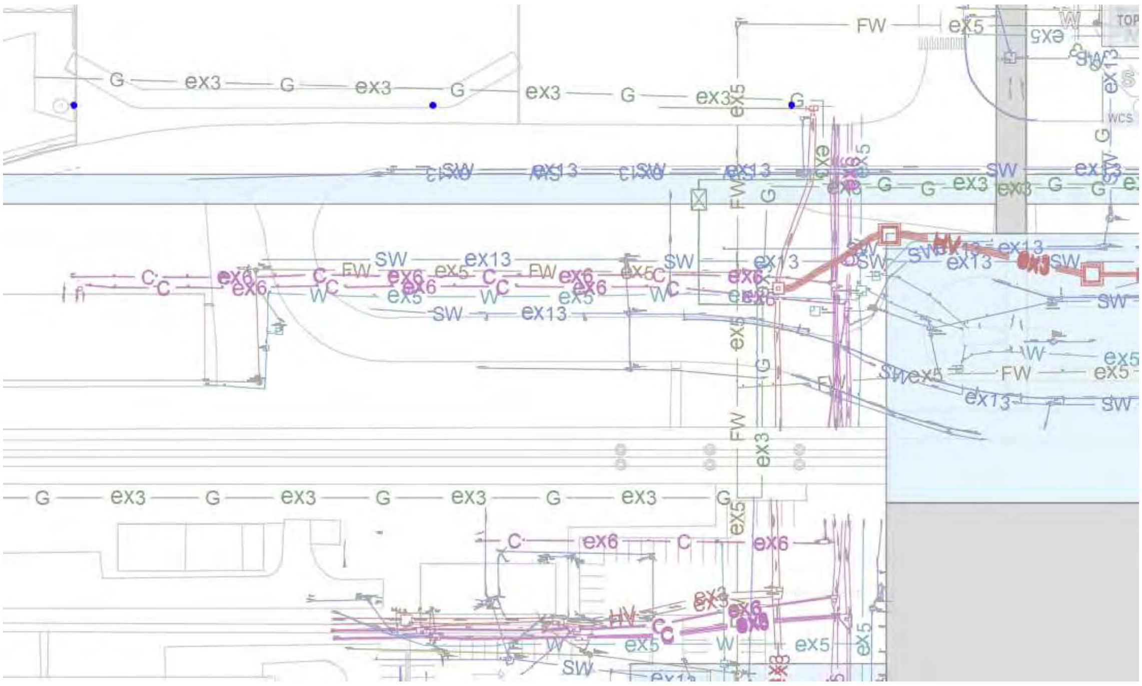


Figure 4.3: Existing Utilities south-west of Terminal Building



As aforementioned, attenuation for the proposed scheme shall be provided within the Stansted Site. See WSP-FRA for details and provision of attenuation.

4.2.7 Rainwater Harvesting

The rainwater harvesting (RWH) design shall consider rainwater runoff from roof areas and connect to a rainwater storage tank below ground. From the below ground tank, the water will be pumped through a treatment plant and stored in a day tank from where the treated water can be pumped to its end-use point. The end-use point has not been developed yet but shall be assessed in subsequent design stages.

Factors to be considered during subsequent design stages will be as follows:

1. The intended end-use of the rainwater as that will inform the size and complexity of the system.
2. Available below ground space in vicinity of the Terminal Expansion. Receipt of GPR will be required to confirm and to assess whether additional works are required to divert existing services.
3. Examples of intended end use to be considered include:
    a. External and washdown use,
    b. WC flushing for Terminal Extension,

c. WC flushing for Terminal Extension and retrofit of existing Terminal.

4.2.8 Sustainable Drainage Systems (SuDS) and Water Quality

The most appropriate attenuation system should satisfy three main characteristics:

- Provide the required volume of storage,
- Minimise the loss of developable land and,
- Where possible provide local amenity.

The application of the 'SuDS Manual' CIRIA report C753 for new developments requires that the runoff from sites is not only restricted to meet the pre-development runoff characteristics but also that SuDS systems are utilised to improve the quality of the runoff prior to outfall to watercourses.

The manual and EA guidance applies a sustainability hierarchy to the various types of SuDS systems, this is summarised in Table 4.4;

Table 4.4: SuDS Hierarchy

	SuDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
Most Sustainable	Living Roofs	√	√	√
↑	Basins and Ponds - Constructed Wetlands - Balancing Ponds - Detention Basins - Retention Ponds	√	√	√
	Filter strips and swales - Infiltration devices - Soakaways - Infiltration trenches and basins	√	√	√
↓	Permeable surfaces and filter drains - Gravelled areas - Solid paving blocks - Porous paviours	√	√	
Least Sustainable	Tanked Systems - Oversized pipes/ tanks - Cellular Storage			

Source: CIRIA SuDS Manual C753

Systems at the top of the hierarchy provide a combination of attenuation, treatment and ecology and are deemed the most sustainable options. There are always specific scenarios where some systems are more suitable than others and at this stage it is not possible to guide the development towards a particular strategy. However, included below are summaries of some of the main types of SuDS systems that may be applied to the development outlining the main benefits and constraints to their application.

In addition to the above hierarchy, the CIRIA SuDS Manual C753 identifies a number of treatment trains or SuDS devices through which flow should pass from various point sources of runoff. This is designed to ensure that the receiving watercourses are not put at risk of pollution by new development.

4.2.9 Runoff Quality

The proposed surface water drainage strategy will incorporate SuDS features that provide the benefit of water quality treatment prior to discharge of the surface water from the site. All runoff from vehicle trafficked areas will receive treatment via hydrodynamic separators as part of the SuDS treatment train to provide certainty of water quality treatment, enabling enhanced amenity and biodiversity downstream.

Notwithstanding this, reference to the SuDS manual and the simplified index approach (Chapter 26) classifies the hardstanding runoff thus:

Table 4.5: Summary of Pollution Index Table from SuDS Manual

Land use	Pollution Hazard level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

Source: SuDS Manual C753 Table 26.2

4.2.10SuDS Summary

Whilst the application of a SuDS based system needs to be considered as the primary measure for dealing with surface water for any proposal, it is assumed that the roof areas are the only areas that will be proposed within the scheme.

The natural topography and nature of the site is such that the use of ponds and basins, filter strips and swales may not be feasible at source. As there are superficial deposits present within the site infiltration is not recommended, however should be reviewed upon receipt of GI information.

Table 4.6: Summary of Treatment Index for SuDS used

Type of SuDS Component	Mitigation Indices		
	Total Suspended Solids (TSS)	**Metals**	**Hydro-carbons**
Pond (Pond C)	0.7	0.7	0.5

Source: SuDS Manual C753 Table 26.3

It is understood that all drainage ultimately conveys and discharges to Balancing Pond C where the surface water runoff is treated depending on the land use/drainage network it originates from. Mitigation indices from Balancing Pond C have been assumed above (based off of SuDS Manual C753 Table 26.3), and therefore shows that they would surpass the pollution indices associated with roof areas. There

This type of system will not only provide the required attenuation for the site but would also enable the features to be integrated with the existing natural habitat and provide water quality improvements to the flow prior to discharge.

5.0 Proposed Foul Water Strategy

5.1 Introduction

The foul water drainage strategy will be developed in accordance with UK Government Planning Practice Guidance, local planning policy requirements, SSG Design and Construction Guidance, Building Regulations, BS EN 752 and other relevant design standards and best practice guidance.

5.2 Existing Foul Water System

The existing foul water system flows parallel to the terminal building to its north, flowing south along the terminal's western side. Figure 5.1 shows the existing foul water arrangement in blue.

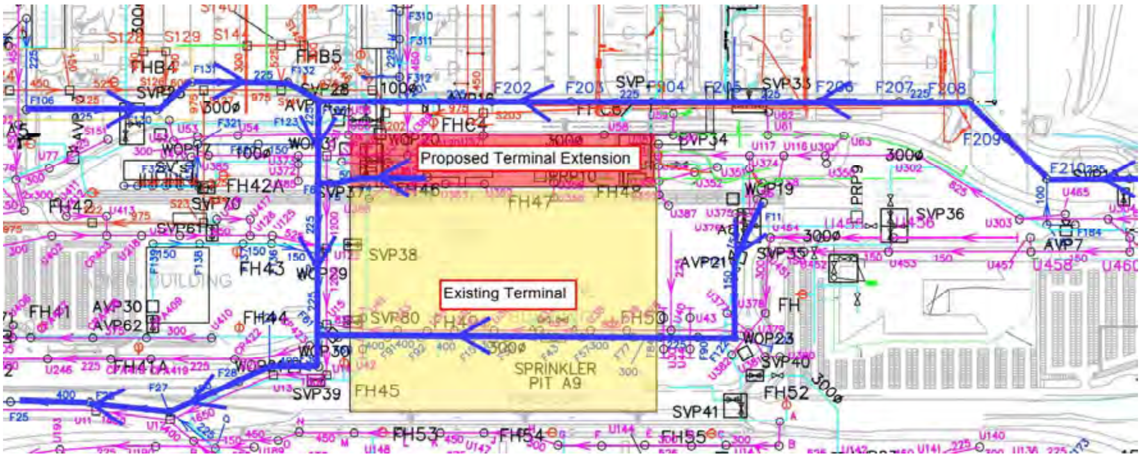


Figure 5.1: Existing foul water layout – Source: STAL-BV-22742-C-2000 P01

5.3 Proposed Foul Water System

Foul water flows originate from the proposed terminal extension, Baggage Handling building, Plant Enclosure, and Skylinks.

The proposed foul water drainage layout is shown in Appendix B. A proposed 150mm diameter foul water drain running parallel to the north of the terminal extension is to pick up foul water discharge from the terminal extension and discharge into the existing foul water main to the west of the extension via a new foul water manhole. The number of existing utilities in the area that require crossing should be noted – level information of the existing utilities is required to validate the proposed foul water drain design. Existing foul water manhole F201 to the north of the proposed terminal may be considered for connection to existing system should the crossing of existing utilities to the west of the extension be deemed unfavourable.

Five foul water discharge points are to service the proposed terminal extension, originating from the north side of the proposed extension. Four of these discharge points will solely serve flows produced from plant areas, at below apron level, whilst one discharge point will serve flows produced from both the sanitary and concession facilities in retail area at approximately apron level and a plant area below apron level.

Plant area sump discharges are to be pumped to ground level and drop to connect to the proposed external foul water carrier drain via gravity. It should be noted there is the potential for the two most west plant area discharge points to drain via gravity directly to the foul water carrier drain, rather than pumping. This is to be confirmed as the design is progressed. Flows produced from the sanitary and concession facilities are to drain to the external proposed carrier drain via gravity.

Three toilet facility locations are proposed in the proposed Skylinks. The foul water downpipe locations are to be determined based on structural proposals which are to be confirmed. A proposed 150mm diameter foul water drain is to pick up foul water discharges from the two west most Skylink discharge points and discharge to foul water manhole F321 (referenced in drawing STAL-BV-22742-C-2000 P01). Existing surface level information is not currently available for this area. The proposed foul water drain may have the potential to be raised depending on the surface levels, allowing for a shallower dig and a backdrop connection to the existing of foul water system. It should be noted existing utility information is not currently available in this area – the location of existing utilities in the area is required to finalise the route of the proposed foul water main. The third discharge point is to connect to the proposed foul water carrier drain serving the proposed terminal extension.

A proposed 150mm diameter foul water drain is to drain a single discharge point serving the toilet facilities within the proposed Baggage Handling building and connect to the existing foul water main running south to the west of the terminal building that is to be diverted around the proposed Baggage Handling building.

A proposed 150mm diameter foul water drain is to drain 3 discharge points from the Plant Enclosure. The proposed drain is to discharge to existing foul water manhole F11 (referenced in drawing STAL-BV-22742-C-2000 P01). The number of existing utilities in the vicinity of the proposed foul water main should be noted – level information for the existing utilities is required to be obtained for clash avoidance. Depending on the finalised finished floor level of the Plant Enclosure, it may be possible to connect to existing foul water manhole F206 which has less existing utilities in its vicinity, though is situated at a higher level.

The proposed foul water drains are to be further developed and coordinated with existing utilities at later design stages once further line and level information of existing utilities is known.

5.4 Proposed Foul Water Discharge Rates

The foul and wastewater drainage flow rates are determined using the discharge unit method, as detailed in BS EN 12056-2, based on the requirements for System III. The frequency factors used in the flow calculations will reflect the potential frequency of use for the various sanitary appliances, as agreed with MAG.

Where there are no details regarding the number or type of sanitary appliances in each toilet area, an assumed number based on existing provision is used. As the layout of the extension has yet to be confirmed, we have made the following assumptions:

- Toilet and concessions will produce a peak discharge of 4l/s
- The sumps in the plant areas will have a peak inflow of 1l/s and the pumped outflow will be 2 l/s

Table 7 shows the current assumed foul flows. Refer to the foul water drainage layout drawing in Appendix B drawing for the outfall manhole references.

Table 7: Assumed Foul Flows

Area		Discharge Units	Assumed Rate (l/s)	Outfall manhole
Terminal Extension	2 no. plant area*	0 - pumped discharges	4	FWMH 3
	2 no. plant area*	0 - pumped discharges	4	FWMH 3
	1 no. plant area* and toilets and concessions in APV gate area	32.6	4 from foul discharge 2 from pump discharge	FWMH 3
	2 no. plant area*	0 - pumped discharges	4	FWMH 3
	1 no. plant area*	0 - pumped discharges	2	FWMH 3
Skylink	1 no. toilet	4	1.4	Existing MH F321
	1 no. toilet	4	1.4	Existing MH F321
	1 no. toilet	4	1.4	FWMH 3
Baggage Handling - Passenger	2 no. toilet	10.6	2.3	FWMH 9
Baggage Handling - Staff	1 no. toilet	4	1.4	FWMH 9
Plant Enclosure	2 no. plant areas	0	6	Existing MH F11
Total Peak Flow		**59.2**	**Toilets/standard foul: 11.9**	

	Pumps: 22
	Total: 33.9

The total peak flow will need to be adjusted to account for the diversity in the flow rates from the sanitary appliances in the toilet areas, whereas the discharges from the plant areas will be either pumped, discharged or from draining down plant and will have no diversity. It should be noted that the pump discharges from the plant areas will be intermittent and not constant. Therefore, they will most likely not occur at the same time as the discharges from the toilet areas.

Whilst the additional toilets provide a modest increase in flows, the wider impact of increasing passenger numbers will increase the foul flows by approximately 34% above existing flows, at the peak passenger use. The requirements for any upgrades to foul water infrastructure on the site will be assessed further as the design develops. This will assist in understanding the trigger points in passenger flows for when any upgrades to foul water infrastructure as required to meet the increased passenger use. will be assessed in more detail in relation to existing foul infrastructure.

6.0 Conclusions and Recommendations

Infiltration is not considered viable for this site and as the site lies remote from the nearest watercourse a connection to the existing private drainage network has been progressed.

Pursuant to this, it has been assumed within the design and from advice from MAG that the allowable site discharge should remain unrestricted. This determination is supported by the evidence presented in the WSP-FRA. The WSP-FRA demonstrates that the broader site network experiences minimal flooding, limited to the 1 in 100 year plus 40% CC storm event, and that the proposed schemes additional attenuation requirement can be effectively accommodated within the Stansted site.

The requirements for any upgrades to foul water infrastructure on the site will be assessed further as the design develops. This will assist in understanding the trigger points in passenger flows for when any upgrades to foul water infrastructure as required to meet the increased passenger use.

The level of design detail used to inform this document is equivalent to RIBA Stage 1. Further surveys and design development are required to ensure the accuracy and completeness of the design to validate the current design assumptions and strategy set out in this report.

This report should be read in conjunction with WSP-FRA in respect of site wide drainage provisions.

7.0 Appendices

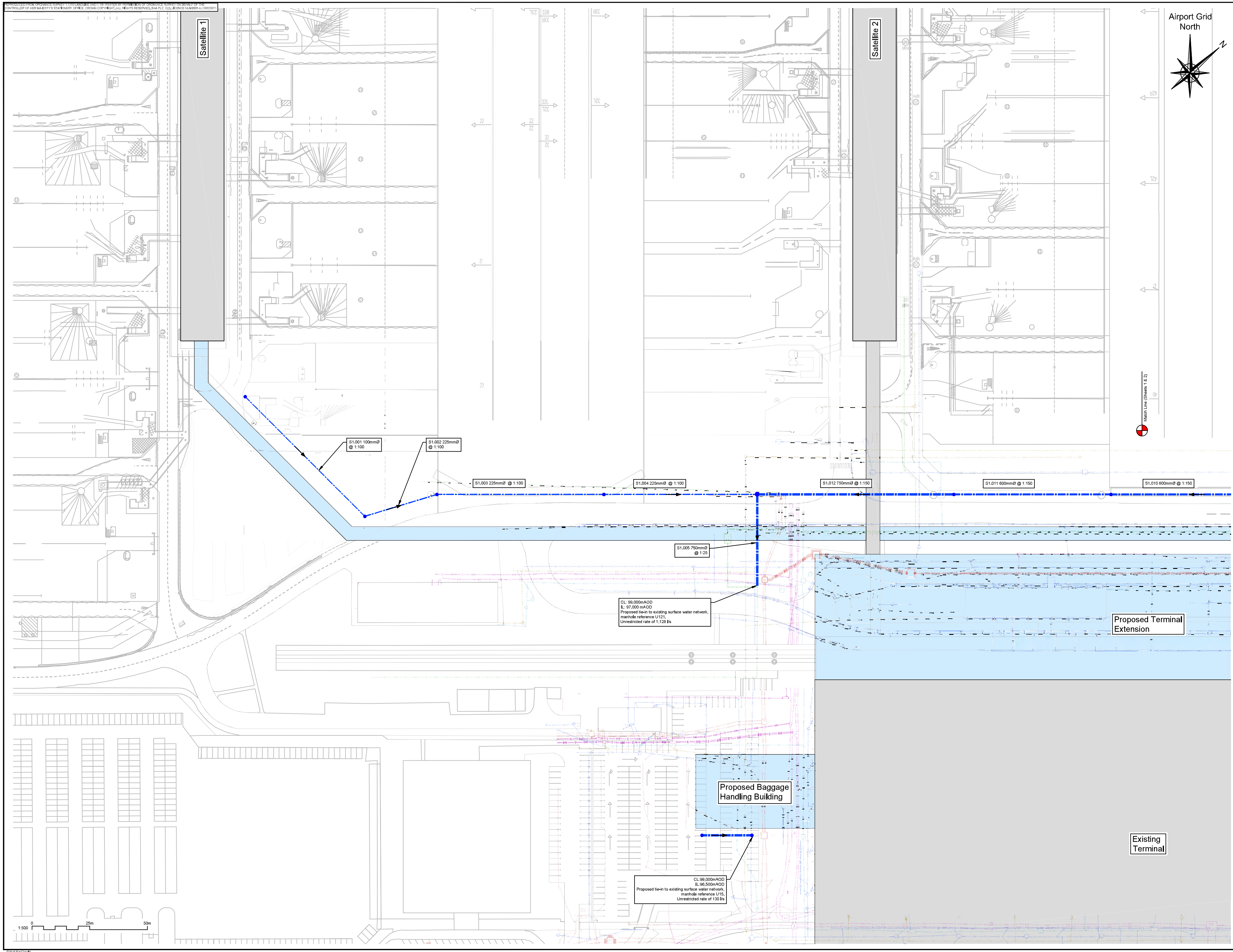
A. Proposed Surface Water Layout

B. Proposed Foul Water Layout

C. Existing Impermeable and Permeable Area Plan

D. Proposed Impermeable and Permeable Area Plan

A. Proposed Surface Water Layout



GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions are in metres (m) unless noted otherwise.
3. All levels are in metres (mAOD) unless shown otherwise.
4. This drawing is to be read in conjunction with all relevant drawings, specifications and documents, including from all other disciplines.
5. All drainage works to be in accordance with the National Building Specification (NBS) and the Civil Engineering Specification for the Water Industry (CESWI) as included in Sewer Sector Guidance – Design and Construction Guidance and the requirements of Building Regulations Approved Document Part H (2015 edition).
6. Design based on OS mapping, topographical survey information (Interlocks Surveys Drg No. 220222) and existing utility information (model C13233 – 9.11.4 – VFL – Combined Service Plan – Stansted Arrivals Terminal Enabling Works – REV_40 – 200428).
7. It should be noted that existing utility information, in particular that pertaining to the surface water drainage, is variable in coverage and typically of a low confidence grade.
8. Survey requests are being submitted as part of the RIBA Stage 2 project in order to confirm as-built sewers, connections, pipe sizes, invert levels and connections, along with other utilities.
9. Cover levels as shown are subject to change during RIBA stage 2.
10. All below ground surface water drainage pipes to be concrete pipes.
11. All manholes and inspection chambers to be precast concrete.
12. Rainwater pipe locations have been excluded however will be included once the design is progressed.
13. It should be noted diversions and abandonment of services may be required and will be progressed in subsequent design stages.
14. The current design is representative of a RIBA 1 design and is subject to change at subsequent design stages.
15. **Drawing must be read in colour.**

Key to Symbols

- Proposed SW Drainage
- Proposed SW Manhole
- Proposed buildings
- Existing buildings

Key to Symbols - Existing Utilities

- Electric HV
- Electric LV
- Electric Earth
- Gas
- Water
- BT
- Comms
- FW Drainage
- SW Drainage
- Unknown Trace
- Chiller
- Fuel Line
- Condenser

Rev	Details	Date	Chk'd	App'd
01	Planning Issue	24/07/23	OD	SC

MAG London Stansted Airport

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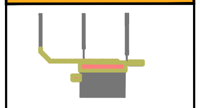


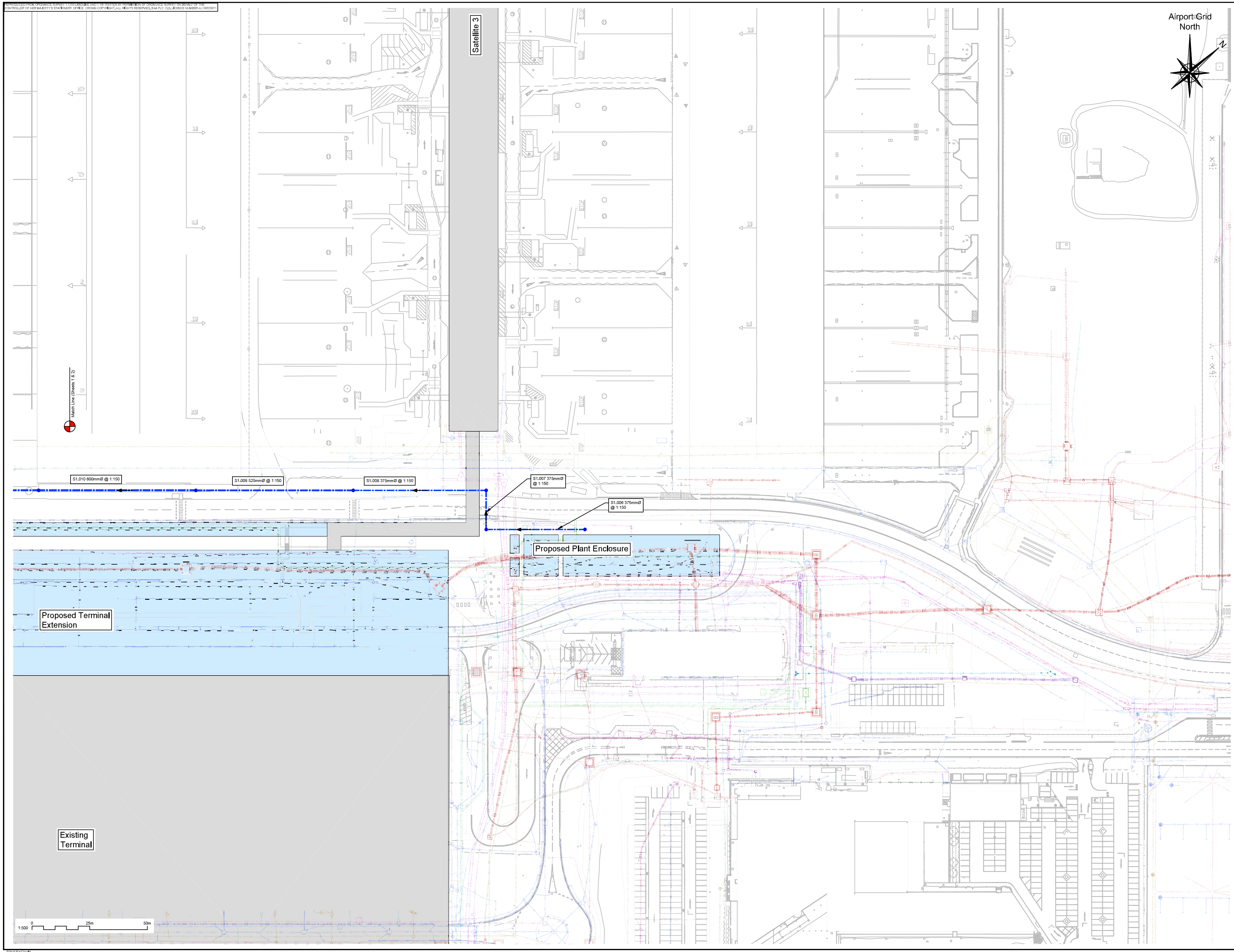
KEY PLAN

Airport	STANSTED AIRPORT
Project Name	STN TRANSFORMATION PROGRAMME (TP)
Title	MULTIPLE ZONE LEVEL 0 CIVIL SURFACE WATER DRAINAGE PLAN SHEET 1
Discipline	CIVILS
Project Phase	RIBA STAGE 1
Drawing Originator	MOTT MACDONALD
Originator's Job No.	100106627
Drawn By	C SUBIA
Drawn Date	24/07/2023
Checked By	O DAFFARN
Checked Date	24/07/2023
Approved By	S CAMPBELL
Approved Date	24/07/2023
Scale and sheet size	1:500 @A0
Building British National Grid Reference	E 555600M N 223900M - E 556200M N 224400M

Project Number	Location Code	Origin
20230714	.	MMD

Disc.	Doc. Type	ACC	Unique ID Number	Status	Rev.
.	.	.	.	T	01

XREF Files Attached: ZB02_AIRSTAND; ZH02_WATRFEAT; ZK02_CARPARKS; ZR02_SITEPLAN; ZZ02_AIRPORTBDY; ZZ02_AIRPORTGD; ZZ02_OSGRID



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KEY PLAN

Airport	STANSTED AIRPORT
Project Name	STN TRANSFORMATION PROGRAMME (TP)
Title	MULTIPLE ZONE LEVEL 0 CIVIL SURFACE WATER DRAINAGE PLAN SHEET 2
Discipline	CIVILS
Project Phase	RIBA STAGE 1
Drawing Originator	MOTT MACDONALD
Originator's Job No.	100106627
Drawn By	C SUBIA
Drawn Date	24/07/2023
Checked By	O DAFFARN
Checked Date	24/07/2023
Approved By	S CAMPBELL
Approved Date	24/07/2023
Scale and sheet size	1:500 @A0
Building British National Grid Reference	E 555600M N 223900M - E 556200M N 224400M

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20230714	.	MMD

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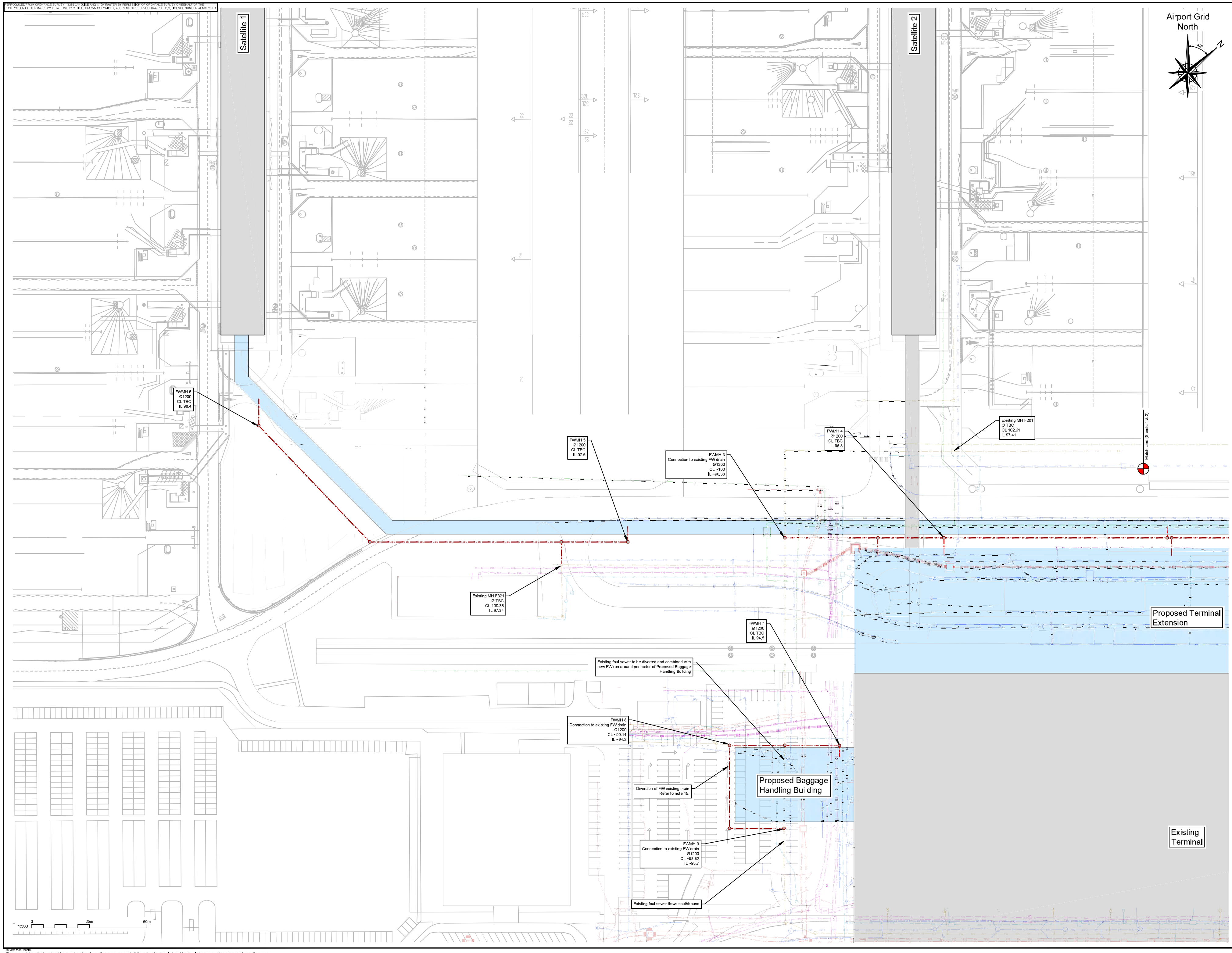
B. Proposed Foul Water Layout



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7. It should be noted that existing utility information, in particular that pertaining to the foul water drainage, is variable in coverage and typically of a low confidence grade.
8. Survey requests are being submitted as part of the RIBA Stage 2 project in order to confirm as built sewers, connections, pipe sizes, invert levels and connections, along with other utilities.
9. Cover levels as shown are subject to change during RIBA stage 2.
10. All below ground foul water drainage pipes to be vitrified clay.
11. All manholes and inspection chambers to be precast concrete.
12. All internal drainage points are based on the current internal layout and MM MEP preliminary foul drainage layouts. Therefore, the proposed foul water drains and connection points are subject to change.
13. It should be noted diversions and abandonment of services may be required and will be progressed in subsequent design stages.
14. The current design is representative of a RIBA 1 design and is subject to change at subsequent design stages.
15. At this stage of design, the new FW main runs are expected to be either 150mm or 225mm in diameter at 1:150 gradient. This depends on exact location of stub connections which will be developed during the next design stage. The size and design of the FW diversion is to be confirmed at next design stage following review of sitewide FW network capacity and flows.
16. **Drawing must be read in colour.**

Key to Symbols

- Proposed FW Drainage - Main run (see note 15.)
- Proposed FW Drainage - Connection
- Proposed FW Manhole
- Proposed buildings
- Existing buildings

Key to Symbols - Existing Utilities

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- Electric LV
- Electric Earth
- Gas
- Water
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- Comms
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KEY PLAN

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Disc.	Doc. Type	ACC	Unique ID Number	Status	Rev.
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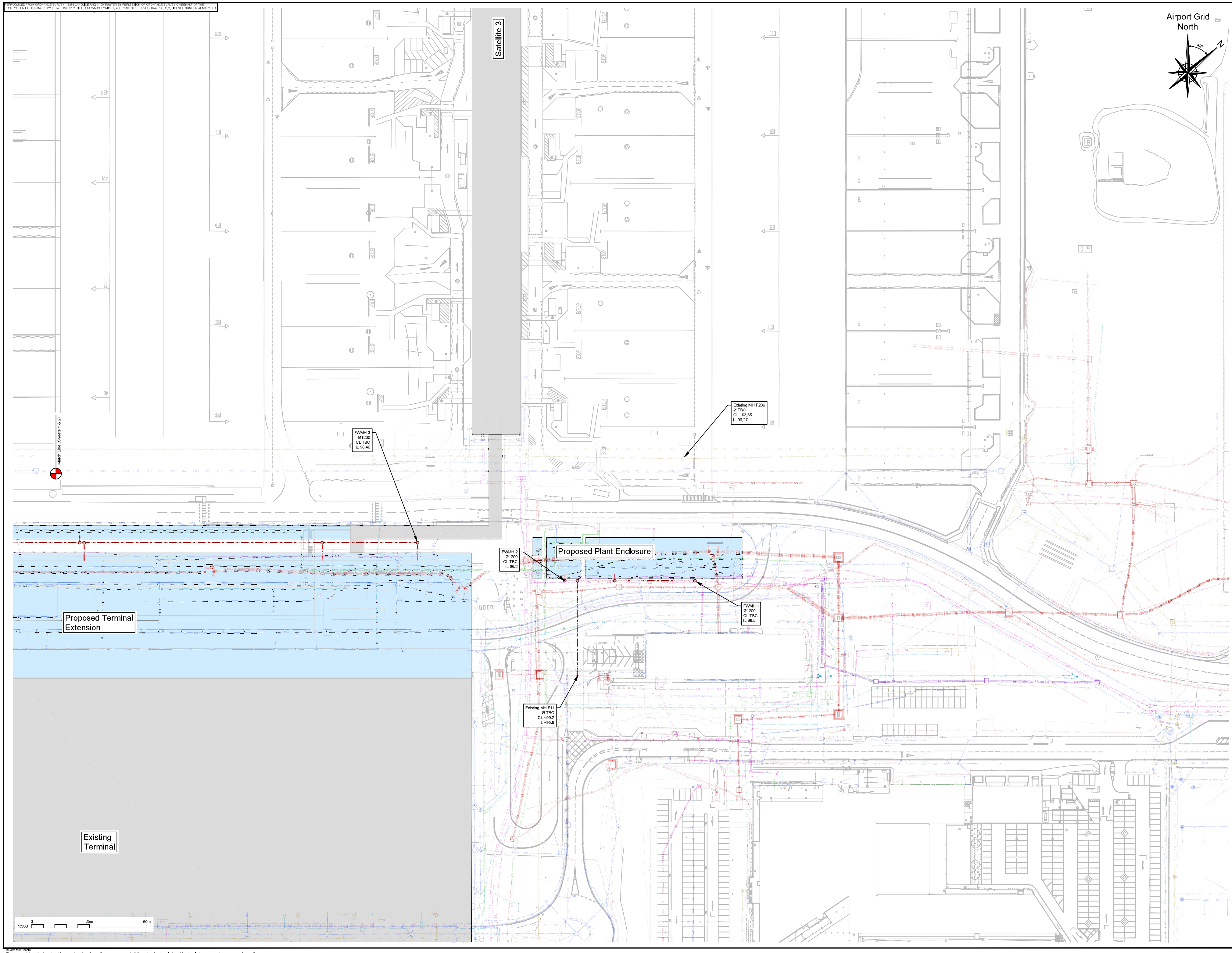

GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions are in metres (m) unless noted otherwise.
3. All levels are in metres (mAOD) unless shown otherwise.
4. This drawing is to be read in conjunction with all relevant drawings, specifications and documents, including from all other disciplines.
5. All drainage works to be in accordance with the National Building Specification (NBS) and the Civil Engineering Specification for the Water Industry (CESWI) as included in Sewer Sector Guidance - Design and Construction Guidance and the requirements of Building Regulations Approved Document Part H (2015 edition).
6. Design based on OS mapping, topographical survey information (Interlocks Surveys Drg No. 220222) and existing utility information (model C13233 - 9.11.4 - VFL - Combined Service Plan - Stansted Arrivals Terminal Enabling Works - REV_40 - 200428).
7. It should be noted that existing utility information, in particular that pertaining to the foul water drainage, is variable in coverage and typically of a low confidence grade.
8. Survey requests are being submitted as part of the RIBA Stage 2 project in order to confirm as built sewers, connections, pipe sizes, invert levels and connections, along with other utilities.
9. Cover levels as shown are subject to change during RIBA stage 2.
10. All below ground foul water drainage pipes to be vitrified clay.
11. All manholes and inspection chambers to be precast concrete.
12. All internal drainage points are based on the current internal layout and MM MEP preliminary foul drainage layouts. Therefore, the proposed foul water drains and connection points are subject to change.
13. It should be noted diversions and abandonment of services may be required and will be progressed in subsequent design stages.
14. The current design is representative of a RIBA 1 design and is subject to change at subsequent design stages.
15. At this stage of design, the new FW main runs are expected to be either 150mm or 225mm in diameter at 1:150 gradient. This depends on exact location of stub connections which will be developed during the next design stage. The size and design of the FW diversion is to be confirmed at next design stage following review of sitewide FW network capacity and flows.
16. **Drawing must be read in colour.**

Key to Symbols

- Proposed FW Drainage - Main run (see note 15.)
- Proposed FW Drainage - Connection
- Proposed FW Manhole
- Proposed buildings
- Existing buildings

Key to Symbols - Existing Utilities

- Electric HV
- Electric LV
- Electric Earth
- Gas
- Water
- BT
- Comms
- FW Drainage
- SW Drainage
- Unknown Trace
- Chiller
- Fuel Line
- Condenser

Rev	Details	Date	Chk'd	App'd
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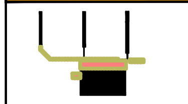

KEY PLAN

Airport	STANSTED AIRPORT
Project Name	STN TRANSFORMATION PROGRAMME (TP)
Title	MULTIPLE ZONE LEVEL 0 CIVIL FOUL WATER DRAINAGE PLAN SHEET 2
Discipline	CIVILS
Project Phase	RIBA STAGE 1
Drawing Originator	MOTT MACDONALD
Originator's Job No.	100106627
Drawn By	C SUBIA
Drawn Date	24/07/2023
Checked By	O DAFFARN
Checked Date	24/07/2023
Approved By	S CAMPBELL
Approved Date	24/07/2023
Scale and sheet size	1:500 @A0
Building British National Grid Reference	E 555600M N 223900M - E 556200M N 224400M

Project Number	Location Code	Origin
20230714		MMD

Disc.	Doc. Type	ACC	Unique ID Number	Status	Rev.
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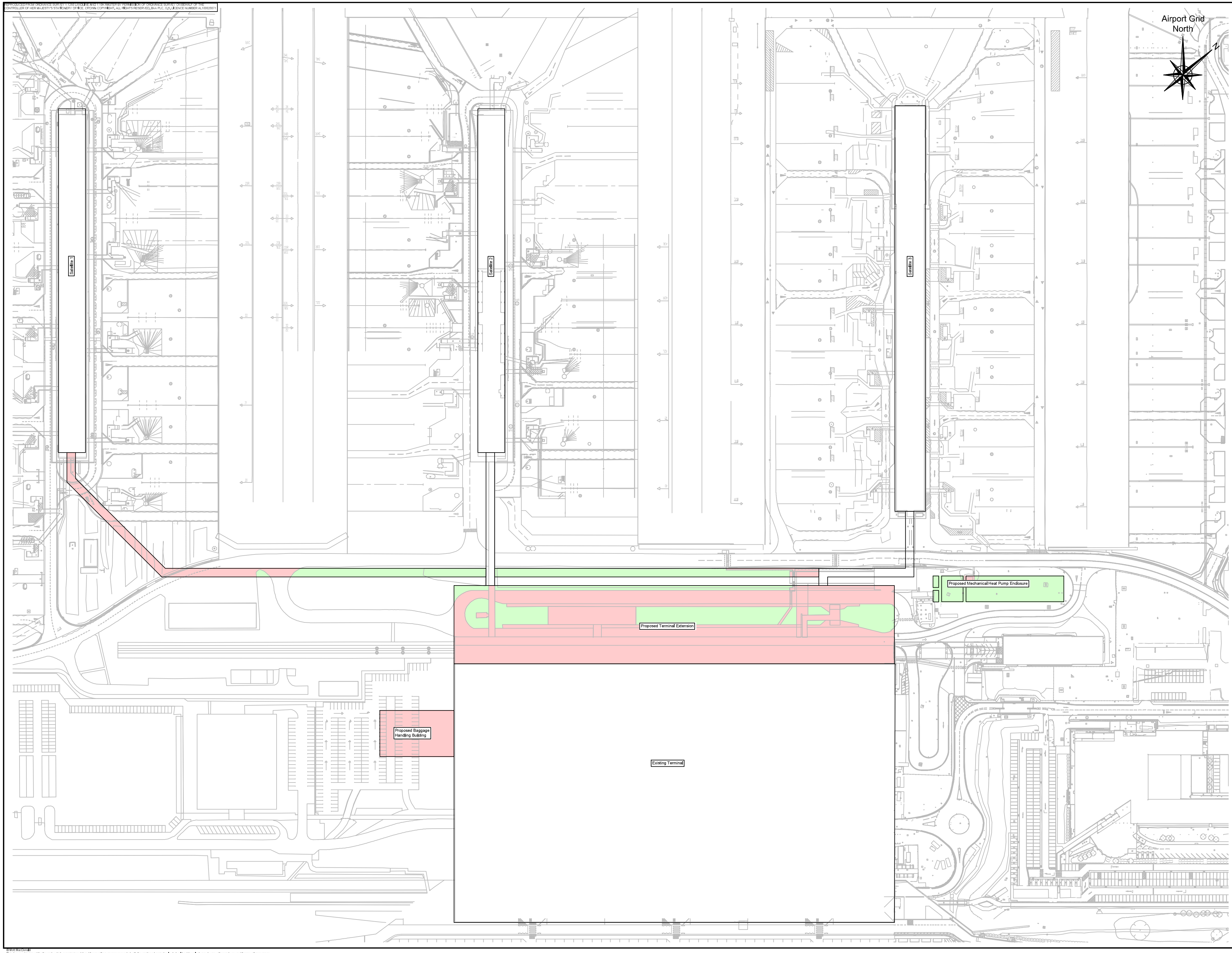
C. Existing Impermeable and Permeable Area Plan

XREF Files Attached: ZB02_AIRSTAND; ZH02_WATRFEAT; ZK02_CARPARKS; ZR02_SITEPLAN; ZZ02_AIRPORTBDY; ZZ02_AIRPORTGD; ZZ02_OSGRID



GENERAL NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. CONTRACTOR TO TAKE AND CHECK ALL DIMENSIONS ON SITE BEFORE WORK COMMENCES.
3. ANY DESIGN DISCREPANCIES TO BE REPORTED TO ENGINEER.
4. CONTRACTOR TO VERIFY ALL DIMENSIONS ON SITE BEFORE PROCUREMENT OF DRAWINGS OR COMMENCING MANUFACTURE.
5. ALL PLANT EQUIPMENT, SERVICES AND PIPEWORK NEW UNLESS OTHERWISE STATED.
6. BACKGROUND MAPPING TAKEN FROM THE EXISTING SITE TOPOGRAPHICAL SURVEY CARRIED OUT BY INTERLOCK SURVEYS ON 19/05/2022.

Key to Symbols

- Impermeable Area = 1.6ha
- Permeable: Soft Landscaping Area = 0.7ha

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01	Planning Issue	24/07/23	OD	SC

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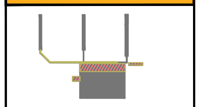


KEY PLAN

Airport: STANSTED AIRPORT	
Project Name: STN TRANSFORMATION PROGRAMME (TP)	
Title: MULTIPLE ZONE LEVEL 0 CIVIL PERMEABLE AREA EXISTING PERMEABLE AREA PLAN SHEET 1	
Discipline: CIVILS	Project Phase: RIBA STAGE 1
Drawing Originator: MOTT MACDONALD	Originator's Job No.: 100106627

Drawn By	Drawn Date	Checked By	Checked Date
C SUBIA	21/07/2023	O DAFFARN	21/07/2023
Approved By	**Approved Date**	**Scale and sheet size**	
S CAMPBELL	31/07/2023	NA	

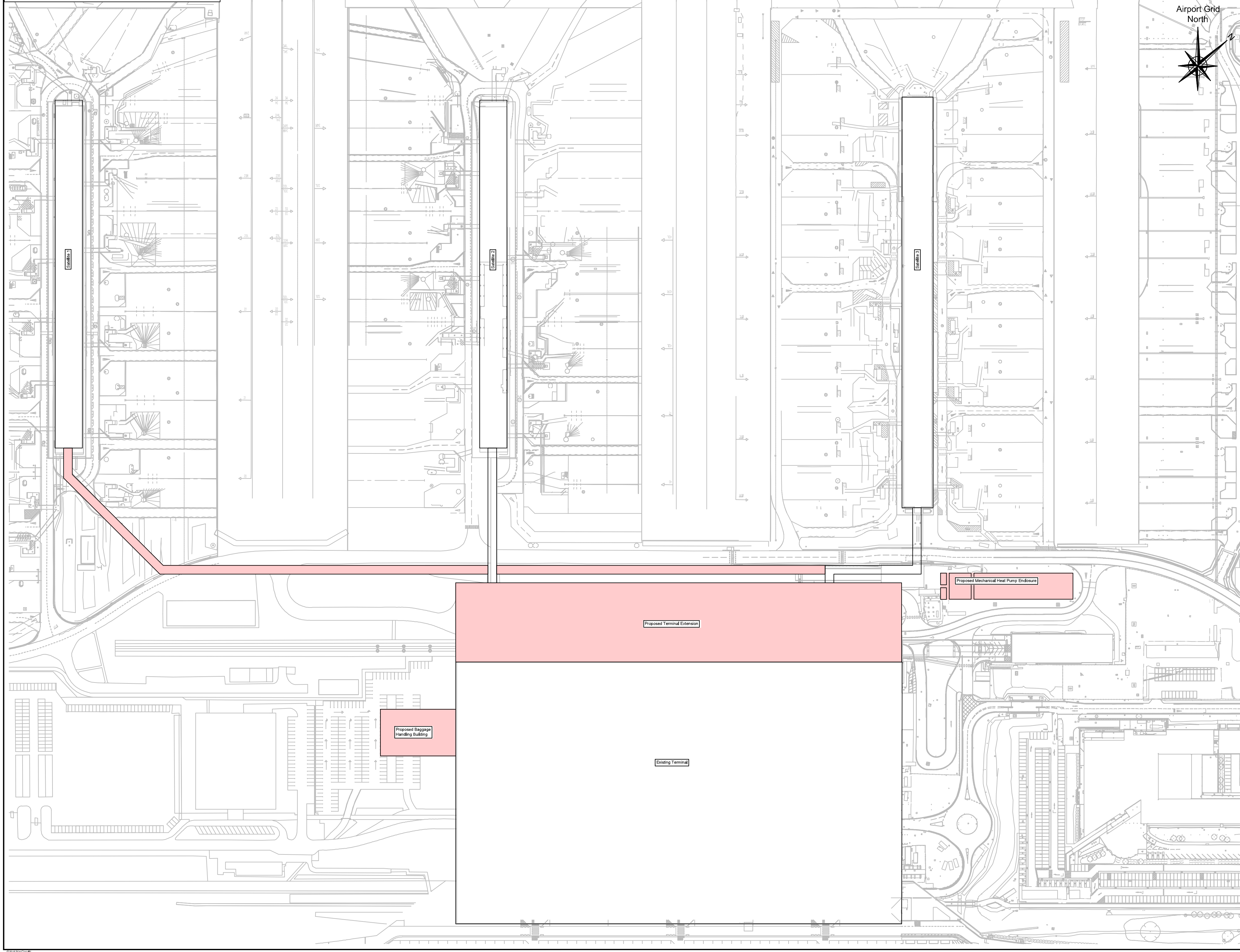
Building British National Grid Reference: E 555600M N 223900M - E 556200M N 224400M

Project Number	Location Code	Origin
20230714	-	MMD

Disc.	Doc. Type	ACC	Unique ID Number	Status	Rev.
-	-	-	-	T	01

D. Proposed Impermeable and Permeable Area Plan

XREF Files Attached: ZB02_AIRSTAND; ZH02_WATRFEAT; ZK02_CARPARKS; ZR02_SITEPLAN; ZZ02_AIRPORTBDY; ZZ02_AIRPORTGD; ZZ02_OSGRID



GENERAL NOTES:

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3. ANY DESIGN DISCREPANCIES TO BE REPORTED TO ENGINEER.
4. CONTRACTOR TO VERIFY ALL DIMENSIONS ON SITE BEFORE PROCUREMENT OF DRAWINGS OR COMMENCING MANUFACTURE.
5. ALL PLANT EQUIPMENT, SERVICES AND PIPEWORK NEW UNLESS OTHERWISE STATED.
6. BACKGROUND MAPPING TAKEN FROM THE EXISTING SITE TOPOGRAPHICAL SURVEY CARRIED OUT BY INTERLOCK SURVEYS ON 19/05/2022.

Key to Symbols

Impermeable Area = 2.3ha

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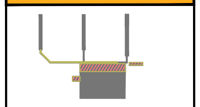

KEY PLAN

Airport	STANSTED AIRPORT
Project Name	STN TRANSFORMATION PROGRAMME (TP)
Title	MULTIPLE ZONE LEVEL 0 CIVIL PERMEABLE AREA PROPOSED IMPERMEABLE AREA PLAN SHEET 1
Discipline	CIVILS
Project Phase	RIBA STAGE 1
Drawing Originator	MOTT MACDONALD
Originator's Job No.	100106627
Drawn By	C SUBIA
Drawn Date	21/07/2023
Checked By	O DAFFARN
Checked Date	21/07/2023
Approved By	S CAMPBELL
Approved Date	31/07/2023
Scale and sheet size	NA
Building British National Grid Reference	E 555600M N 223900M - E 556200M N 224400M

Project Number	Location Code	Origin
20230714	-	MMD

Disc.	Doc. Type	ACC	Unique ID Number	Status	Rev.
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62-64 Hills Road
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