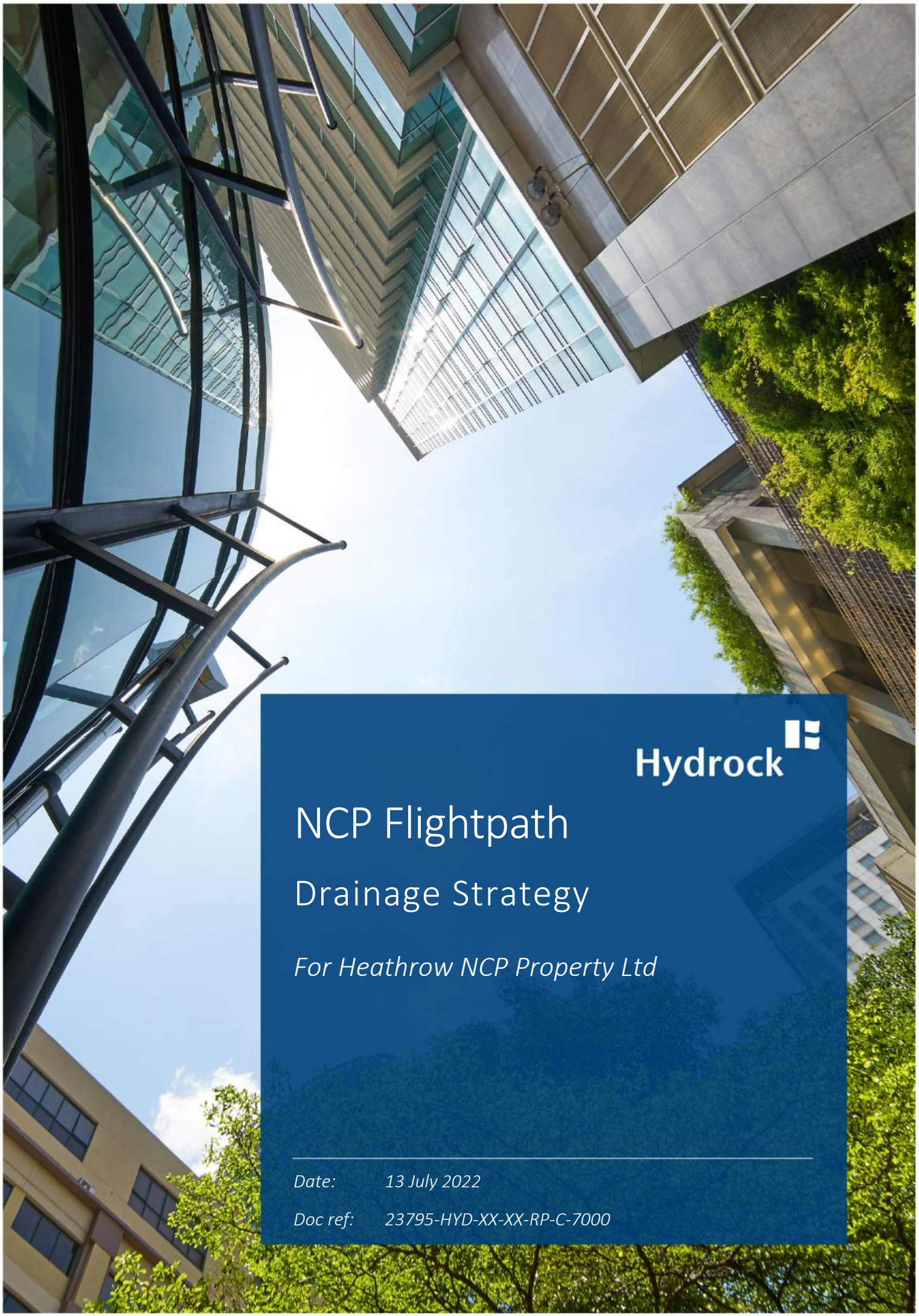

Hydrock

NCP Flightpath

Drainage Strategy

For Heathrow NCP Property Ltd

Date: *13 July 2022*

Doc ref: *23795-HYD-XX-XX-RP-C-7000*

DOCUMENT CONTROL SHEET

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P01	S2	08/07/2022	Planning Submission
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CONTENTS

Tables

Figures

1. INTRODUCTION

Hydrock have been appointed by Heathrow NCP Property Limited to provide a Drainage Strategy report for the approval of Hillingdon Council as Lead Local Flood Authority.

The proposed drainage strategy will be in accordance with both national guidelines and will incorporate a 'best practise' approach in reducing the impact of the flooding caused by the new development.

The report is based upon sewer asset information provided by the sewerage undertakers Thames Water in relation to assets within the vicinity of the development site.

The report highlights the key stakeholders in terms of ownership and maintenance to ensure the drainage system is kept well maintained and reduce the risk of failure. Should the network fail at any point, clearly defined ownership liabilities will ensure that problems can quickly be rectified thereby reducing the impact of potential damaged caused by flooding.

The information received is summarised within this report. In the event that the information is relied upon and is subsequently found to be incorrect, Hydrock Consultants Ltd accepts no responsibility for any direct and/or consequential loss that may occur as a result.

Appendices

Appendix A: Topographic Survey

Appendix B: Architects Layouts

Appendix C: Geotechnical Desk Study

Appendix D: Sewer Asset Map

Appendix E: CCTV Survey of Existing Drainage Layout

Appendix F: Calculations

Appendix G: Drainage Strategy Layout

References / Design Codes

- BS EN 752 - Drain and Sewer Systems Outside Buildings.
- Building Regulations Approved Document Part H - Drainage and waste disposals.
- Sewers for Adoption (where applicable).
- Local Authority Guidance.
- CIRIA C753 - SuDS Manual.
- National Planning Policy Framework (NPPF).
- DEFRA Non-Statutory Technical Standards for Sustainable Drainage.

2. SITE INFORMATION

2.1 Site Location

The site is located within Hillingdon borough of London. It is bounded by a new hotel development to the north, a dual carriageway section of the A4 to the south, an earthen embankment leading to the M4 incoming approach for London Heathrow to the east, and residential gardens to the west. Tree screening of varying coverage is present to all sides. Access is via a single lane road bridge on the eastern boundary.

Table 2.1: Site Referencing Information

Site Referencing Information	
Site Address	NCP Heathrow Flightpath, Bath Road Heathrow, London
Postcode	UB7 0DP
Grid Reference	TQ074770

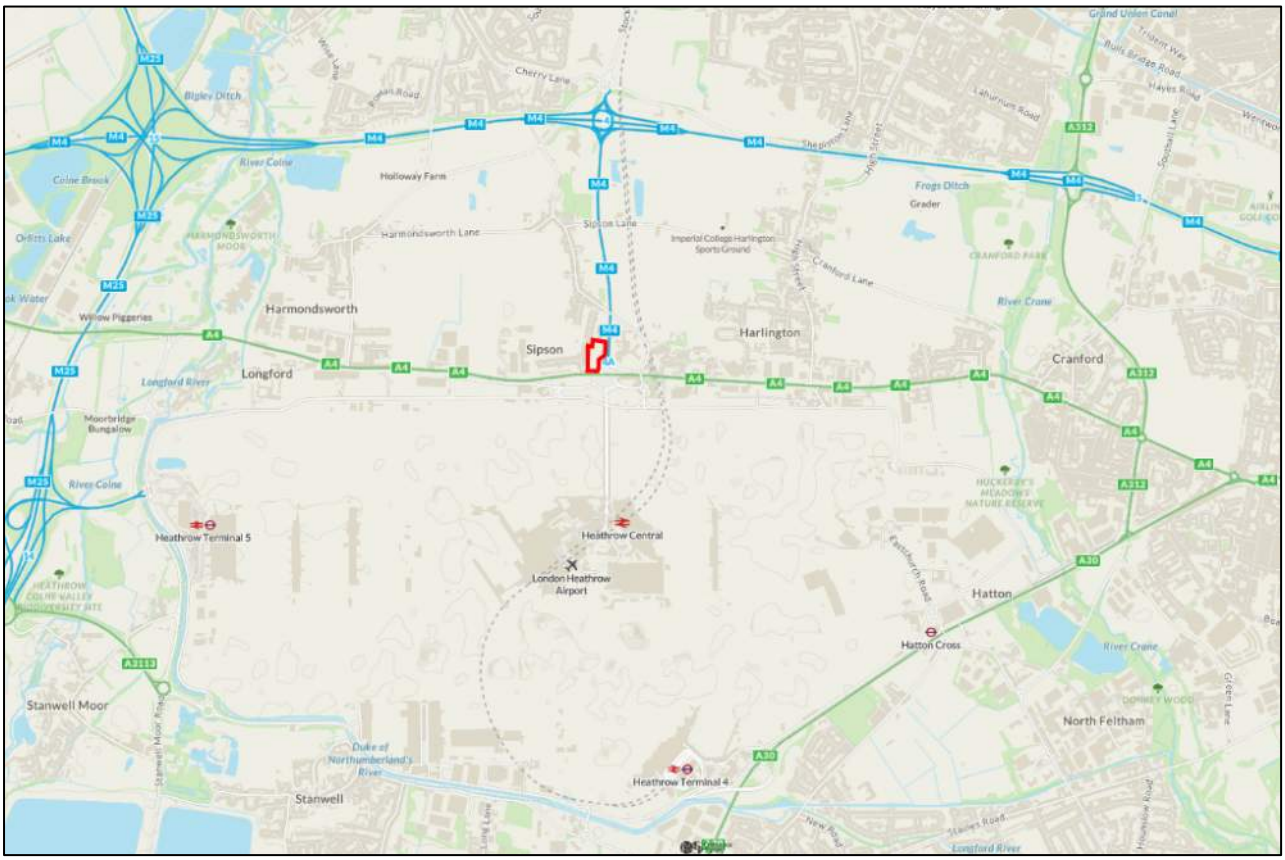


Figure 1: Site Location with Approximate Red Line Boundary

2.2 Topography

A topographical survey of the site was undertaken in December 2021. The site is generally flat with nominal falls towards the eastern boundary varying from around 1:10 to 1:250 with a maximum level difference of approximately 1m. The majority of the site is comprised of hard standing asphalt and is used as a car park for the airport.

The Highest level recorded was 26.58m on the south-western corner of the site.

The Lowest level recorded was 25.21m at the eastern boundary at the connecting bridge.

See Appendix A for Topographical Survey.

2.3 Development Proposals

Demolition of existing car park and redevelopment for industrial (Use Class B2); storage or distribution (Use Class B8); and/or light industrial (Use Class E(g)(iii)) purposes, with ancillary office space, landscaping, car parking, servicing and access arrangements.

See Appendix B for Architect's Layout.

2.4 Geology

British Geological Survey (BGS) mapping indicates that the site is underlain by superficial deposits comprising Langley Silt Member overlying Taplow Gravel Member deposits, a River Terrace Deposit associated with the River Thames. Bedrock is indicated to comprise London Clay Formation.

A thin layer of compacted subbase was encountered overlying a layer of Made Ground to depths of between 0.4 and 2.4mbgl (BH203 being an exception at 4.0mbgl).

Superficial deposits generally comprising very soft or soft becoming firm grey and lightly greyish brown variably silty variably gravelly clay, interpreted as Langley Silt Member was encountered to depths of between 1.5m and 3.20mbgl. The Langley Silt Member was underlain by dense or very dense very sandy, occasionally clayey gravel interpreted as Taplow Gravel Member. The Taplow Gravel extended to depth of between 4.1 and 6.1mbgl.

Bedrock geology comprising of the London Clay Formation was encountered beneath the London Clay and was found to extend to the base of the three deepest cable percussive boreholes at 10.45mbgl. The base of this unit was not encountered during the investigation.

Refer Appendix C for Geotechnical Desk Study

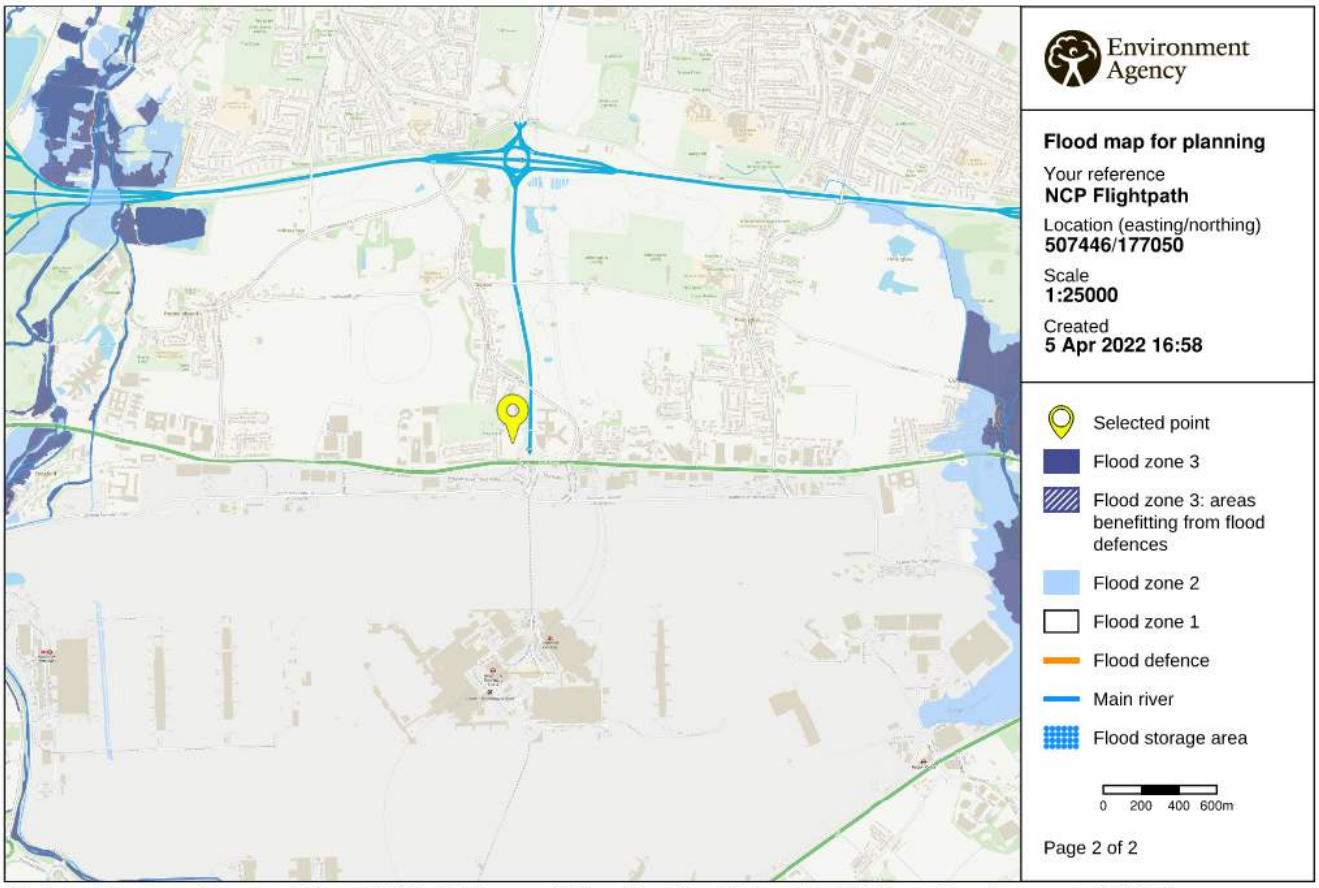
2.5 Hydrology & Hydrogeology

The EA Main River Map identifies the nearest main river as River Crane located 2.1km east of the site.

Ground investigation works recorded ground water resting levels between 3.84mbgl and 9.39mbgl. It is noted that the bedrock of London Clay is generally not considered to be conductive to the use of infiltration methods to discharge surface water run-off.

2.6 Flood Risk

The EA floodplain map indicates that the level of flood risk to the site corresponds to a Flood Zone 1 – Low Probability in Table 1 of NPPF Planning Practice Guidance. This zone has less than a 1 in 1000-year annual probability of flooding.



Flood Zones		
Flood Zone 1	Low Probability	Less than 1 in 1000 (< 0.1 %) chance of flooding occurring each year.
Flood Zone 2	Medium Probability	Between 1 in 100 and 1 in 1000 (1 % - 0.1 %) chance of flooding occurring each year
Flood Zone 3a	High Probability	Greater than 1 in 100 (> 1 %) chance of flooding occurring each year
Flood Zone 3b	Functional Floodplain	Land where water *has* to be stored in times of flood.

National Planning Policy Framework – Technical Guidance.

Figure 2: EA Flood Map and Probability Table

Refer to **Hydrock Flood Risk Assessment** for further information - 23795-HYD-XX-XX-RP-FR-0001

3. SURFACE WATER MANAGEMENT STRATEGY

3.1 Pre-Development Surface Water Drainage

Public

Thames Water sewer records does not identify any surface water sewers within the site boundary. They identify a series of 450mm diameter sewers to the west of the site which serve the residential areas on Sipson Way and flow south. This run connects into a 525mm diameter run flowing west to east along the A4 and runs parallel to the southern boundary of the site to an undefined end.

For the purpose of this report the drainage has been taken from the sewer asset map information only. It is recommended a full drainage CCTV survey is undertaken to determine accurate routes of the existing drainage so the proposed network can be suitably coordinated.

See **Appendix D** for Sewer Asset Map.

Private:

A CCTV survey of the site has not identified any surface water drains on site. It has been noted that all surface water on site runs to gravel areas.

See **Appendix E** for CCTV Survey of Existing Drainage.

3.2 Pre-Development Surface Water Catchments

The table below indicates each catchment type area, pre-development:

Table 3.1: Pre-Development Catchment Areas

Pre-Development Catchment	Area (m2)
Impermeable	
Building / Roof	57
Roads / Hardstanding	12,592
Permeable	
Soft Landscaping	3348
Total Area	16000

3.3 Pre-Development Surface Water Run-Off

In order to determine the post-development surface water flows, an assessment has been carried out on the pre-development to ensure that the run-off from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network:

3.3.1 Greenfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S2 (Peak Flow Control):

It is a requirement that on new developments that consideration be given to limit discharge as close as reasonably practical to the equivalent 'Greenfield' rate for the corresponding storm event. The following table considers what the maximum surface water discharge from the site would be if the site was 'Greenfield' i.e., not developed:

Table 3.2: Pre-Development Greenfield Run-Off Rates

Storm Event	Maximum discharge rate (l/s) Greenfield
1 in 1 Year	2.12
1 in 30 Year	5.73
1 in 100 Year	7.95
QBAR	2.49

3.3.2 Brownfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S3 (Peak Flow Control):

Should the site not be suitable to discharge as close as reasonably practical to the equivalent 'Greenfield' rate, Brownfield should be considered with a % betterment on the flow. The following formulae / table considers what the maximum surface water discharge from the site would be if the site was 'Brownfield' i.e., developed:

The following parameters were used to calculate the Brownfield Run-Off from the site.

$$Qp\ (l/s) = 2.78CiA$$

Where:

Qp = discharge rate

C = Run-off Coefficient (0.95)

i = mean rainfall intensity (mm/hr)

A = Area (ha) drained hard surfaces (1.26 ha)

The table below summaries the calculated Brownfield Run-Off Rates for the site for the 1 in 2year, 1 in 30year, 1 in 100year and 1 in 100year + 40% Climate Change events for the 15min TC:

Table 3.3: Pre-Development Brownfield Run-Off Rates

Storm Event	Mean rainfall intensity (mm/hr) 15min TC	Maximum discharge rate (l/s) Brownfield
Q2 Year (1 in 2 Year)	40.98	136.4
Q30 Year (1 in 30 Year)	79.07	263.1
Q100 Year (1 in 100 Year)	99.09	329.7
Q100 + 40% Climate Change	138.72	461.6

3.3.3 Capacity of Existing Drainage System

From the site survey it is understood that surface water run-off is currently directed towards the gravel parking bays and there is no system of formal drainage.

3.4 Pre-Development Flood Exceedance Flows

Topographical survey information indicates that prior to demolition exceedance flows will follow the site levels and fall towards the east and the M4 carriageway. A portion of these flows will be captured by the raised bullnose kerbing around the site perimeter and the grass verge.

3.5 Run-off Destinations

An appraisal should be undertaken to confirm the most suitable and sustainable method for managing surface water runoff from the development in accordance with the following hierarchy as highlighted in Part H of Building Regulations and the National Planning Policy Framework (NPPF):

1. Infiltration to the ground using a sustainable drainage system.
2. If this is not feasible, discharge to a watercourse or river; generally, at a controlled rate unless it does not affect flood risk e.g., if to the sea or an estuary.
3. Discharge at a controlled rate to a surface water sewer or drain.
4. Discharge at a controlled rate to a combined sewer system, with the approval from the Water Authority.
5. Only if the above have all been investigated and it has been proved that none of these options are suitable will discharge at a controlled rate to a foul sewer system, with the approval from the Water Authority.

The discharge of surface water run-off has been considered in accordance with the hierarchical approach:

Table 3.4: SuDS Hierarchy

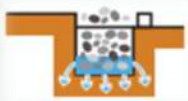
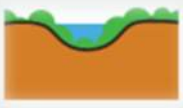
Method	Reasoning	
Interception / Re-use	To be considered at detailed design stage in co-ordination with the Mechanical Engineer.	✓
Infiltration	Currently discounted due to the absence of BRE 365 testing. Concerns regarding the potential for infiltrated runoff to re-emerge and flood the lower M4 highway adjacent to the site. Infiltration testing to be undertaken at detailed design.	X
Surface water body	No surface water bodies within the immediate area of or within the site.	X
To dedicated surface water sewer (public, highways or otherwise)	Existing Thames Water surface water sewer in Bath Road along the site's southern boundary	✓
To a combined sewer	N/A	X
To a foul sewer	N/A	X

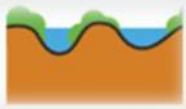
3.6 Suitability of SuDS Components

The drainage design should adopt the principles of SuDS where appropriate taking into consideration the site context and location. The principals of SuDS are that they should be designed to maximise the opportunities and benefits that can be secured surface water run-off management in terms of quality, quantity, flood risk, and amenity. The implementation and selection of SuDS techniques is largely dependent on the site layout and context. Some SuDS techniques may be more appropriate than others.

The suitability of SuDS components has been assessed as follows:

Table 3.5: Suitability of SuDS Components

Hierarchy	Description	Setting	Required area	Implemented
Green roofs 	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated.	X
Rainwater harvesting 	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (Underground or above ground).	X (Subject to co-ordination at detailed design with M+E Consultant)
Soakaway 	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open space	Dependent on runoff volumes, water table and soils.	X (Subject to BRE365 Testing)
Filter strip 	Filter strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	Open space	Minimum length 5m.	✓
Permeable paving 	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street / open space	Can typically drain double its area.	X
Bioretention area 	A vegetated area with gravel and sand layers below designated to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.	Street / open space	Typically, surface area is 5-10% of drained area with storage below.	X
Swale 	Swales are shallow depressions designed to convoy and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a	Street / open space	Account for width to allow safe maintenance typically 2–3 metres wide.	X

	gravel layer beneath. Can be lined or unlined to allow infiltration.			
Hardscape storage 	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	Street / open space	Could be above or below ground and sized to storage need.	X
Pond / Basin 	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Open space	Dependent on runoff volumes and soils.	X
Wetland 	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	Open space	Typically, 5–15% drainage area to provide good treatment.	X
Underground storage 	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Open space	Dependent on runoff volumes and soils.	✓

3.7 Post-Development Surface Water Drainage

The below ground surface water drainage system will connect all new rainwater pipes, channels, and gullies at ground floor level.

It is proposed that separate systems of drainage are provided for the roof areas and hardstanding. The latter will be directed through a Class I bypass separator to provide treatment to flows and reduce the risk of contaminating the public sewer network.

Discharge will be restricted to 8.1 l/s during all storm events up to and including the 1 in 100 year plus 40% allowance for climate change. This is equivalent to an allowance of triple 5l/s/ha.

Attenuation storage will be provided by geocellular storage located under the proposed shared car park in the south western corner of the site. It is proposed that this storage tank be of dimensions 27.1x21.0x1.60m providing 862 cubic meters of storage.

The site will discharge into the Thames Water surface water sewer in Bath Road via a new connection. This is subject to an S106 agreement with Thames Water as the local sewerage undertaker.

Where applicable, the surface water management strategy has incorporated the recommendations of the 'Non-Technical Standards for Sustainable Drainage' and general 'good practice' in terms of providing a Sustainable Drainage System (SuDS) which does not adversely impact on flood risk either within the site or beyond the development boundary.

3.8 Post-Development Surface Water Catchments

The table below indicates each catchment type area, post-development:

Table 3.6: Post-Development Catchment Areas

Post-Development Catchment	Area (m2)
Building / Roof	8767
Roads / Hardstanding - Impermeable	6400
Roads / Hardstanding – Permeable	0
Soft Landscaping	833
Total Area	16000

3.9 Post-Development Surface Water Run-Off

In order to determine the post-development surface water flows an assessment has been carried out to ensure that the flows from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network:

3.9.1 Greenfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S2 Cont. (Peak Flow Control):

Due to the nature of the existing development and its current arrangement, it is considered unfeasible for this site to reduce to Greenfield Run-off Rates as restricting to 2.5 l/s will be extremely detrimental to the cost of the project along with spatial limitations; therefore, brownfield analysis will need to be outlined to confirm what rate is considered close as reasonably practical to the current constraints.

3.9.2 Brownfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S3 Cont. (Peak Flow Control):

"Previously developed Brownfield sites should:

1. Aim to reduce the discharge to as close to the greenfield rate as possible.
2. Seek improvement on pre-development rate.
3. Peak rate of runoff reduced by 50% of value of pre-development rate.
4. Discharged volume minimised."

Therefore, using the pre-development Brownfield Run-off Rate, a 50% betterment has been calculated to reduce the current value:

Storm Event	Brownfield Run-off Rate (l/s)	Brownfield Run-off Rate plus 50% betterment
1 in 1 Year	136.4	68.2
1 in 30 Year	263.1	131.6
1 in 100 Year	329.7	164.9

However, in line with London Planning Policy, it is proposed that the discharge rate limited to 3 times the greenfield discharge rate. Therefore, the surface water discharge rate will be restricted to 8.1 l/s for all storm events up to and including the 1 in 100 year plus allowance for climate change.

3.9.3 Capacity of Existing Drainage System

As is has been taken that the current drainage regime is to allow runoff to permeate through the gravel car parking bays any discharge into the public sewer system will be additional flows. Therefore, a capacity check has been made with Thames Water, however at the time of writing no response has been received.

3.9.4 Summary of Post-Development Flows

It has been determined that the post-development surface water flow rates have been restricted to 8.1 l/s in line with London planning policy so as to not adversely impact downstream flooding of the site as a result of the new development.

3.10 Interception Storage

Interception can be defined as the capture and retention on site of the first 5mm of the majority of all rainfall events.

Systems	Reasoning	
Green roofs	All surfaces that have green / blue roofs	X
Rainwater harvesting	All surfaces drained to RWH systems designed whether for surface water management or just water supply, provided the RWH system design is based on regular daily demand for non-potable water	✓
Soakaways / infiltration	Areas of the site drained to systems that are designed to infiltrate run-off for events greater than a 1 month return period.	X
Permeable pavements	All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement.	X
Filter strips / swales	Roads drained by filters strips / swales, where the longitudinal gradient of the vegetated area is less than 1:100, are suitable for interception delivery for impermeable areas up to 5 times the base of the vegetated surface area receiving the runoff.	✓
Infiltration trenches	Roads drained by infiltration trenches can be considered to provide interception	X
Bioretention / rain gardens	Areas of the site drainage to unlined bioretention components can be assume to comply where the impermeable area is less than 5 times the vegetated surface area receiving run-off/ They can be designed to deliver interception for larger areas, where suitable infiltration capacity is available.	X
Ponds	Areas drained by ponds (with a permanent water pool that is effectively maintained by the outlet structure) are not assumed to deliver interception	X

3.11 Urban Creep

Urban Creep Factor (UCF) is defined as any increase in the impervious area that is drained to an existing drainage system without planning permission being required, such as the construction of patios, small extensions, etc.

As the footprint of the site will remain majority impervious, this factor is not applied.

3.12 Post-Development Surface Water Storage

In line with the Non-Statutory Technical Standard for Sustainable Drainage S7 & S8 (Flood Risk):

Attenuation flood storage will be provided in a geocellular storage tank located beneath the car park in the south western area of the site. It is proposed that the tank is 27.0 x 21.0 x 1.6m providing 862m^3 of storage. This will provide suitable storage for all storm events up to and including the 1 in 100 year plus allowance for climate change.

3.13 Post-Development Flood Exceedance Flows

In line with the Non-Statutory Technical Standard for Sustainable Drainage S9 (Flood Risk):

In the event that flows from rainfall exceed the 1 in 100-year rainfall event or system failure through lack of maintenance, surface water run-off will be directed via exceedance routes away buildings and/or critical infrastructure.

3.14 Water Quality Treatment

Pollution hazard indices for land use classifications (as identified in table 26.2 of Ciria C753 - The SuDS Manual) are as follows;

Table 3.7: Pollution hazard indices

Pollution hazard indices for different land use classifications in accordance with CIRIA C753 - The SuDS Manual. Table 26.2				
Land Usage	**Level**	**TSS**	**Metals**	**Hydrocarbons**
Other roofs (typically commercial / industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads / motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., 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

The indicative SuDS mitigation indices for discharges to surface waters (as identified in table 26.3 of The SuDS Manual), are as follows;

Table 3.8: SuDS pollution mitigation for discharge to surface waters

Indicative SuDS mitigation indices for discharge of surface water			
	Mitigation indices		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter drain	0.4	0.4	0.4
Permeable pavement	0.7	0.6	0.7
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately 1 in 1 year return period event, for inflow concentration relevant to the contributing drainage area		

Consideration will be given to both during construction and post-development water quality treatment to ensure that water quality is not impacted during the construction works:

3.14.1 Quality of Surface Water Run-off: Post-Development

In accordance with Environment Agency Document PPG3 (now withdrawn but considered best practice guidance) the proposed as the car park is less than 50 spaces or 800m2 it is considered to be 'low risk' in terms of pollution to the surface water network and as such an oil interceptor is deemed to be required.

Gullies and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network.

3.14.2 Quality of Surface Water Run-off: During Construction

It is anticipated that the during construction adequate provisions will be put in place to ensure the existing drainage is protected to prevent material which could have a negative impact on water quality entering the system.

3.15 Design Standards

All materials and products relating to the below ground drainage system shall be specified in accordance with their intended use and meet all relevant British Standards and BBA accreditations.

In accordance with best practice storm drainage will be designed to the following performance criteria:

Pipes running under full conditions with no surcharge	-	1 in 2-year storm return period
No flooding	-	1 in 30-year storm return period
Extreme flooding to be retained on site	-	1 in 100-year storm return period.

See **Appendix G** for Drainage Strategy.

4. FOUL WATER MANAGEMENT STRATEGY

4.1 Pre-Development Foul Water Drainage

Public:

Thames Water sewer records identify a foul sewer within the eastern portion of the site which flows north to south through the whole site. It enters the site as a 525mm diameter pipe, transitions to a 675mm diameter pipe approximately half way through the site and discharges into another foul water sewer within Bath Road. The site survey identified that the sewer within the site is generally at a depth of 5m below ground level.

It is recommended a full drainage CCTV survey is undertaken to determine the condition and accurate route of the existing drainage so the proposed network can be suitably coordinated.

It is noted that the current site layout will require either a diversion or build-over of this sewer. It is recommended that Thames Water are consulted to make suitable arrangements and put in place the necessary agreements.

Private:

The CCTV survey has identified that there are a series of 100mm diameter pipes which currently serve the gatehouse portacabin at the existing site entrance. This foul drain connects into the Thames Water foul network which runs through the site.

4.2 Post-Development Foul Water Drainage

The below-ground foul drainage system will connect all new soil, waste and ventilating pipes, sanitary appliances and gullies at ground level and discharge.

It is intended that only waste flows considered to be ‘Domestic’ shall be discharged into the foul drainage system. If the site wishes to discharge 'Trade Effluent' into the foul drainage system then it is required to make a formal application to the Sewerage Undertaker accordingly.

It will be a gravity system without the need for pumping.

The design of all foul sewers and lateral drains must conform to BS EN 752, BS EN 16933, Building Regulations 2010 Part H, planning policy and best practice guidelines (such as Sewers for Adoption 7th Edition) wherever applicable. Sanitary systems within building should be designed in accordance with BS EN 12056-2.

4.3 Post-Development Foul Water Flow Rates

Using Flows and Loads 4 Code of Practice it has been calculated that the peak foul flow from the development will be 4.76 l/s.

It is proposed that these flows are discharged into the Thames Water sewer flowing through the site

5. OWNERSHIP AND MAINTENANCE

The key elements of the foul and surface water drainage system will require periodic maintenance to prevent failure of the system and/or a reduction in capacity of the networks as a whole and the following matrix therefore sets out the various drainage items to be maintained, identifies who is responsible and the frequency of maintenance.

The proposed SuDS features will require maintenance including litter and debris removal, sediment removal, vegetation maintenance and remediation to any damaged structures.

The maintenance requirements will be the responsibility of a private maintenance company.

Table 5.1: Proposed Schedule of Maintenance for Below Ground Drainage

Permeable Paving - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most Sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.
Reference should be made to the manufacturer recommendations where applicable		

Underground Cellular Tanks - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually.
	Remove sediment from pre-treatment structures and / or internal forebays.	Annually, or as required.
Remedial actions	Repair / rehabilitate inlets, outlet, overflows and vents.	As required.
Monitoring	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.
Reference should be made to the manufacturer recommendations where applicable		

Filter Drain - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain height within specified design range	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g. oils).	Monthly (at start, then half yearly).
	Check flow spreader and filter strip surface for evens gradients.	Monthly (at start, then half yearly).
	Inspect gravel flow spreader upstream of filter strip for clogging.	Monthly (at start, then half yearly).
	Inspect silt accumulation rate and establish appropriate removal frequencies.	Monthly (at start, then half yearly).
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding.	As required.
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.

Other Drainage Items - Ownership & Maintenance Responsibility Matrix		
Feature	Maintenance	Frequency
Private Drains	Inspection	CCTV survey every 5-10 years.
	Regular Maintenance	Jet clean system fully every 5-10 years. (Recommend prior to CCTV drainage survey is)
	Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.
Discharge orifice manholes/flow control devices	Inspection	Quarterly
	Regular Maintenance	Remove silt and debris as necessary to prevent build up.
Gully / Drainage Channels	Inspection	Quarterly
	Regular Maintenance	Remove silt and debris as necessary to prevent build up.

The following information should be passed to the development operator to ensure that future maintenance is carried out in a safe and proper manner.

A formal review of the risks should be undertaken on an annual basis:

Table 5.2: Proposed Operational Schedule for Below Ground Drainage

Operation	Risks	Mitigating Measures
Access to manholes for Inspection and Maintenance.	1. Confined spaces	1. Entry to confined space to be minimised and, where unavoidable, to be carried out by appropriately trained personnel
Removal of silt from outfall	1. Risk to members of the public 2. Open Water	1. Access to hazardous areas by members of the public to be prohibited. 2. To be carried out by appropriately trained personnel
Removal of silt from drainage channel	1. Risk to members of the public	1. Access to hazardous areas by members of the public to be prohibited

All inspection and maintenance works should take into consideration the implications of 'lone working'. An assessment should be carried out and the risks mitigated accordingly.

6. CONSTENTS REQUIRED

Summary of expected consents required:

Consent will be required from Thames Water for Section 185 Diversion or a Build Over agreement with regards to the existing foul sewer run that flows through site. This is subject to additional discussions with Thames Water.

Section 106 agreements will be required to connect the site surface water and foul water discharges into the Thames Water system. It is expected that these applications will be made by the contractor at the relevant time.

Initial enquiries have been made to Thames Water, however at the time of writing no response has been received.

7. CONCLUSION

This report concludes that the foul and surface water drainage strategy for the development will be designed accordance with both national and local standards and best practice. The following key items have been summarised below:

- The foul and surface water drainage systems for the new development will be designed to accommodate the required flows for the lifetime of the development.
- Post-development surface water flow rates will be restricted to 8.1 l/s in accordance with London planning policy, so as to not adversely impact downstream flooding of the site as a result of the new development.
- All surface water run-off from storm events up to and including the 100-year plus 40% climate change will be retained within the overall site.
- Attenuation of surface water runoff will be provided by a geocellular tank located underneath the site carpark.
- Ownership and maintenance liabilities for the foul and surface water drainage system will be clearly defined so that in the event of failure the drainage system appropriate action can be taken to ensure that the drainage system continues to work efficiently.
- In the event that flows from rainfall exceed the 1 in 100-year rainfall event or system failure through lack of maintenance, surface water run-off will be directed via exceedance routes away buildings and/or critical infrastructure.

Appendix A

Topographic Survey

Symbol & Abbreviation Key.

- BARBED WIRE FENCE
- POST & RAIL FENCE
- CLOSE BOARD FENCE
- RAILINGS
- CHAIN LINK FENCE
- OTHER FENCE
- KERB
- DROPPED KERB
- GULLY CHANNEL
- TOP / BOTTOM OF BANK
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- GATE
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- TREE - CONIFEROUS
- BUSH
- BUILDING
- BOREHOLE
- SURVEY STATION
- ORDNANCE SURVEY BENCH MARK

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FP	FENCE POST	TOW	TOP OF WALL
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GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
IL	INVERT LEVEL	WO	WASH OUT

General.

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Notes.

Coordinates related to OS National Grid from ST03 by GPS (No scale factor added). Levels related to GPS.

INDICATIVE ONLY

Rev.	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
DB	DB	16/12/2021	GD	21/12/21	GD	21/12/21

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Client.

BRIDGE INDUSTRIAL
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W1S 4PP

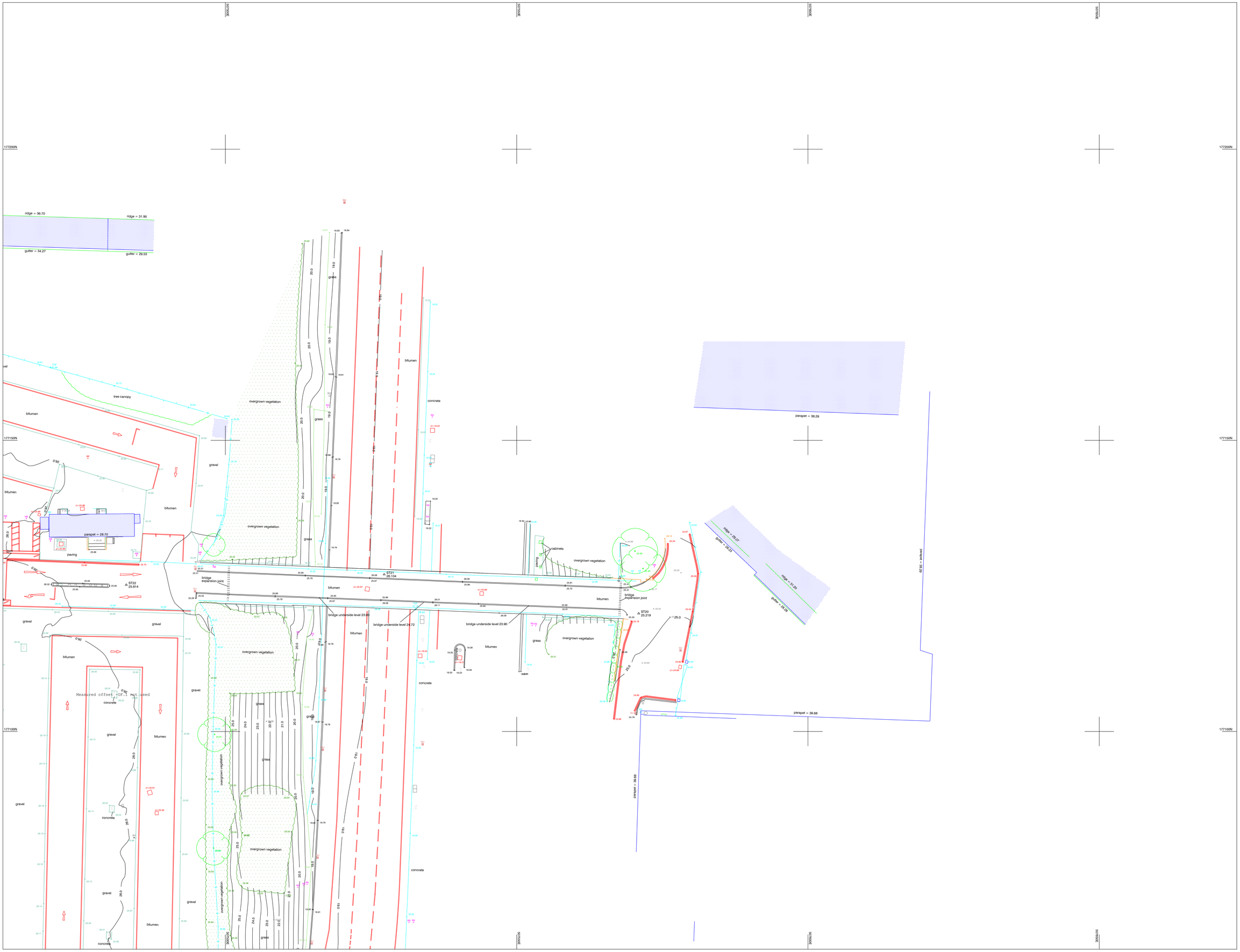
Title.

TOPOGRAPHICAL SURVEY

BRIDGE POINT HEATROW

Dwg No. **210833 2D** Sheet **1 OF 4**

Scale 1:200 A0 Sheet Rev. -



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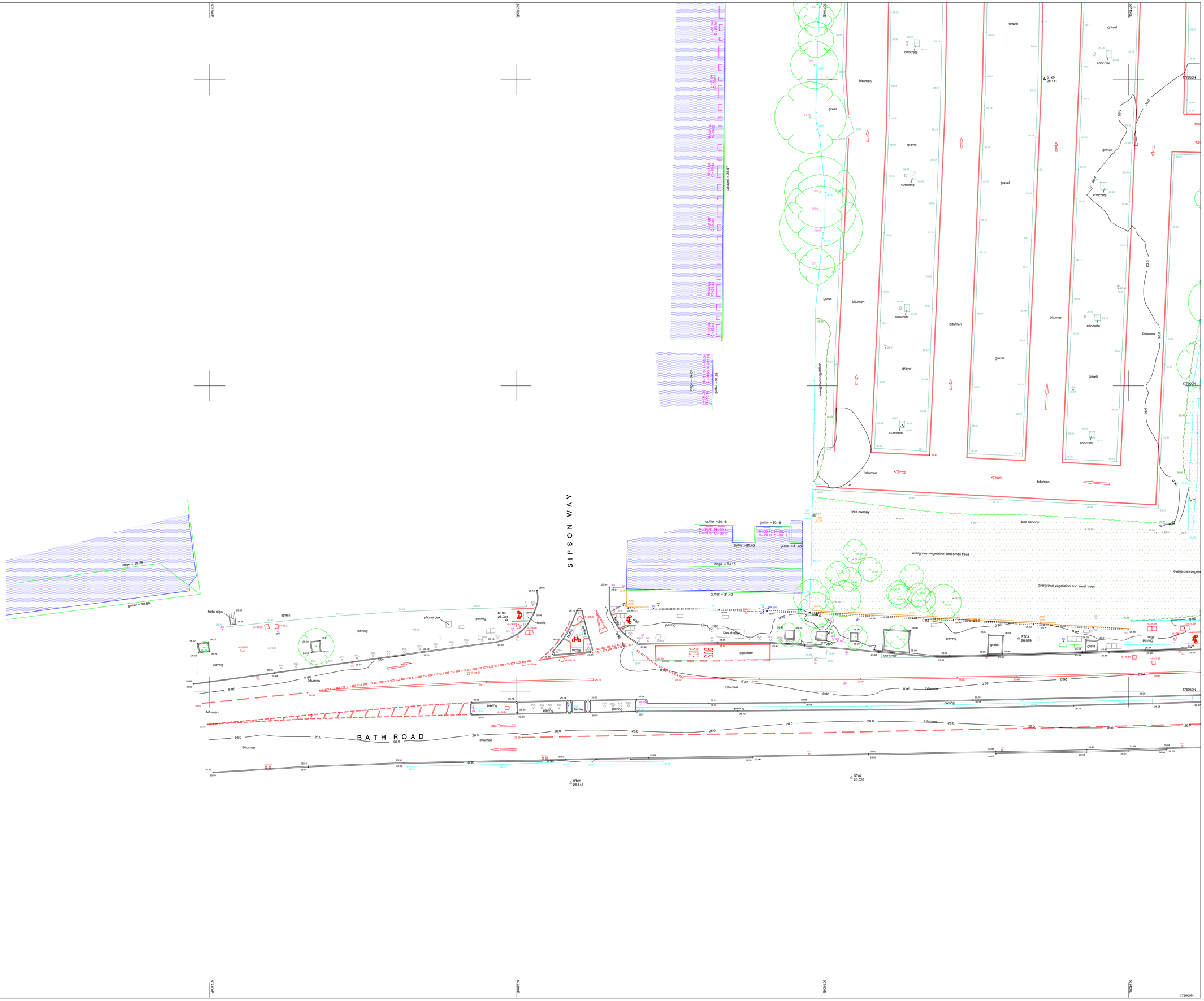
BRIDGE POINT HEATROW

Dwg No. **210833 2D** Sheet **2 OF 4**

Scale 1:200 A0 Sheet Rev. -



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Dwg No. **210833 2D** Sheet **3 OF 4**

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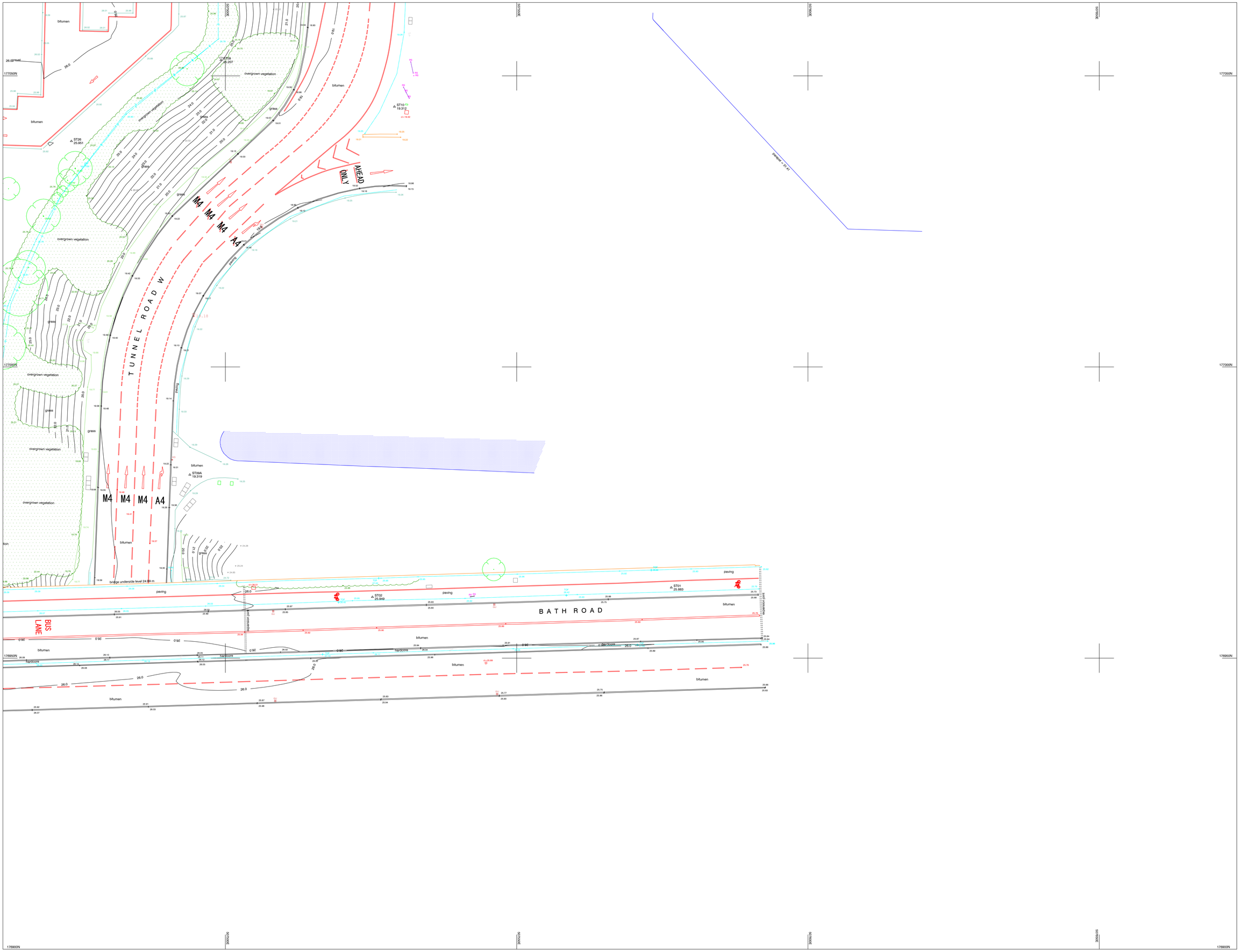

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TOPOGRAPHICAL SURVEY

BRIDGE POINT HEATROW

Dwg No. **210833 2D** Sheet **4 OF 4**

Scale 1:200 A0 Sheet Rev. -

Appendix B

Architects Layout

1 PROPOSED SITE PLAN
1 : 250

SCHEDULE OF ACCOMMODATION GIA

		sq m	sq ft
Unit 110			
Warehouse	:	1,297	13,961
Office (Incl. GF core)	:	209	2,250
Open Mezzanine	:	266	2,863
TOTAL (GIA)	:	**1,772**	**19,074**
TOTAL (GEA)	:	**1,883**	**20,269**
Haunch Height	:	10m	
Car Parking	:	21	
Level Access	:	4	
Unit 120			
Warehouse	:	1,892	20,365
Office (Incl. GF core)	:	245	2,637
Open Mezzanine	:	119	1,281
TOTAL (GIA)	:	**2,256**	**24,284**
TOTAL (GEA)	:	**2,345**	**25,242**
Haunch Height	:	10m	
Car Parking	:	6	
Level Access	:	3	
Unit 130			
Warehouse	:	2,300	24,757
Office (Incl. GF core)	:	282	3,035
Open Mezzanine	:	143	1,539
TOTAL (GIA)	:	**2,725**	**29,331**
TOTAL (GEA)	:	**2,831**	**30,473**
Haunch Height	:	10m	
Car Parking	:	20	
Level Access	:	3	
Unit 140			
Warehouse	:	1,237	13,315
Office (Incl. GF core)	:	185	1,991
Open Mezzanine	:	187	2,013
TOTAL (GIA)	:	**1,609**	**17,319**
TOTAL (GEA)	:	**1,708**	**18,384**
Haunch Height	:	10m	
Car Parking	:	17	
Level Access	:	2	
Shared Car Parking	:	27 (incl. substation)	
Shared Cycle Space	:	50 (incl. 40 Long Stay 10 Short Stay)	
Shared Motor Cycle	:	5	
TOTAL SITE (GIA)	:	**8,362**	**90,008**
TOTAL SITE (GEA)	:	8,767	**94,367**
TOTAL CAR PARKING	:	**91** (incl. 9 Disabled Parking & 10EV)	**1:95m²GEA**
SITE AREA	:	1.60 Ha / 3.95 acres	
TOTAL SITE DENSITY	:	52.26% (GIA)	

NOTES:

Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing is not to be scaled. Use figured dimensions only. ubject to statutory approvals and survey.
Building areas are liable to adjustment over the course of the design process due to the ongoing construction detailing developments.
Please note the information contained within this drawing is solely for the benefit of the employer and should not be relied upon by third parties.
The CDM hazard management procedures for the Chetwoods aspects of the design of this project are to be found on the "Chetwoods - Hazard Analysis and Design Risk Assessment" and/or drawings. The full project design teams comprehensive set of hazard management procedures are available from the Principle Designer appointed for the project.

THESE DRAWINGS ARE ILLUSTRATIONS ONLY TO SHOW DESIGN INTENT.
THEY WILL NEED TO BE ADAPTED TO SUIT SPECIFIC DEVELOPMENTS/ SITE CONDITIONS
THE ARCHITECT REMAINS RESPONSIBLE FOR THEIR DESIGNS AND OBLIGATIONS.

THIS DRAWING SHOULD BE PRINTED AT FULL SIZE. SEE TITLE BLOCK FOR DRAWING SIZE. TEXT TO BE LEGIBLE WHEN PRINTED AT A3 FOR EASE OF REFERENCE ONLY.

0 5m 10m
1:250

Tree and Root Protection Area with 1250mm easment zone for fundation and draindage.

Application Site Boundary 1.6 Ha /3.95 Acres

Other land owned by the applicant 0.02 Ha/0.049 Acres

Notes:

The blue line boundary is based upon information taken from rescaled PDF tile plans MX222300 and as such the accuracy of the title information cannot be relied upon.

Existing Fence Line based on Interlocks Survers, DWG No. 210833

Tree lcocation and Root Protection Area based on Tamla Trees, Tree Protection Plan, DRG no. 03528P-TPP-04 rev. B

Please note Title Plans have been scaled using Ordnance Survey features which may have altered over time. Complete accuracy cannot be guaranteed without further on-site survey.

Any dimensions given are to be confirmed with site measure.

Layout to be trackes.

Rev	Revision Description	Date	Author/ Reviewer
PL 1	Issue for Planning	09/07/22	RC/TC

PLANNING

32 Frederick Street,
Birmingham, B1 3HH
+44 (0)121 234 7500
www.chetwoods.com

Project
Aprirose NCP Flightpath Heathrow

Client
Heathrow NCP Property Limited

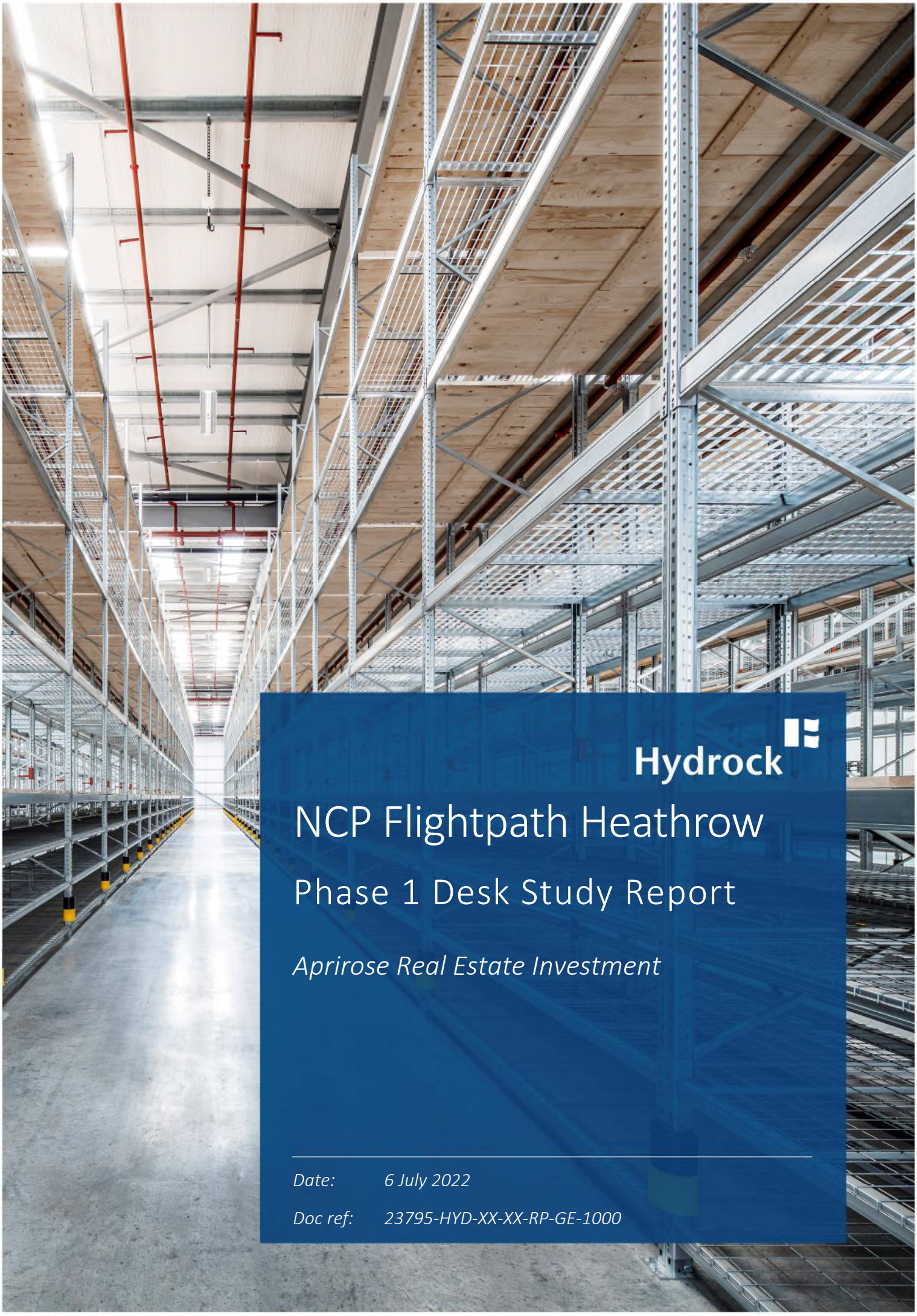
Drawing Title
PROPOSED SITE PLAN

Scale	Size	Drawn	Checked	Date
As indicated	A0	RC	TC	14/06/22

Project	Originator	Zone	Level	Type	Role	Number	Rev.
5110	CA	00	00	DR	A	00060	PL 1

Appendix C

Geotechnical Desk Study



Hydrock

NCP Flightpath Heathrow

Phase 1 Desk Study Report

Aprirose Real Estate Investment

Date: *6 July 2022*

Doc ref: *23795-HYD-XX-XX-RP-GE-1000*

DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited 5-7 Tanner Street London SE1 3LE	Tel: 0203 8468456 E-mail: london@hydrock.com www.hydrock.com
Client	Aprirose Real Estate Investment	
Project name	NCP Flightpath Heathrow	
Title	Phase 1 Desk Study Report	
BIM reference	23795-HYD-XX-XX-RP-GE-1000	
Project reference	23795	
Date	06/07/2022	

Document Production Record		
Status and Revision	S2 P01	Name
Prepared by		Ravelle Orchard BSc MSc FGS
Checked by		Julia Griffin MSci FGS
Approved by		Wayne Lewis BSc FGS

Document Revision Record			
Status	Revision	Date	Revision Details
S2	P01	04/07/2022	Final issue

CONTENTS

Appendices

Tables

Figures

EXECUTIVE SUMMARY

SITE INFORMATION AND SETTING	
Objectives	To support the planning application (application reference: 41632/APP/2021/1301) and to assist with the design of the development.
Client	Aprirose Real Estate Investment
Site name and location	NCP Flightpath Heathrow Terminals 2-3 Heathrow, Heathrow Flightpath, A408, West Drayton, UB7 0DU
Proposed development	The site development proposals are understood to comprise four industrial units with mezzanine levels and associated infrastructure and car parking facilities.
PHASE 1 (DESK STUDY AND SITE RECONNIASANCE)	
Ground Model	The site is currently a car park which was formally owned and operated by NCP, comprising largely hardstanding with two small structures to the north-east. Services associated with the former car park are present on site and are assumed to be live. The site is approximately 1.54ha in area and is generally flat 26m above Ordnance Datum (aOD). Immediately east of the site is an embankment which separates the site and the lower lying Tunnel Road East, which has been constructed within a road cutting (approximately 14m aOD). Review of historical Ordnance Survey (OS) mapping indicates: • The site was within an area of agricultural fields, with the majority of the site listed as an orchard on the earliest OS Map dated 1865. • Around 1894, a school (later labelled Heathrow County Primary School) was constructed towards the south of the site. The orchard remained to the north. • The orchard was fully removed by 1934, leaving open fields to the north of the site. • The school was demolished around 1973 and was replaced by a car park, which encompasses the entire site area. A small structure was shown on the car park to the north-east on aerial photograph from 1999. There has been little change to the site since then. • Several industries have been recorded operating in the surrounding region on the historical OS mapping, including: a hospital, fire station, multiple gravel pits, filter beds, a brick works and potential clay quarry, a sewage pumping station, Heathrow Airport and various works and depots. A non-specialist UXO assessment indicates a low bomb risk. The superficial geology at the site consists of the Langley Silt Member, anticipated to a maximum depth of 3.20m bgl, overlying the Taplow Gravel Member. Underlying the Taplow Gravel Member is the London Clay Formation, which has an upper horizon between 4.00m and 6.00m bgl and continues to a depth of <60m bgl. Made Ground associated with the sites historical uses is known to be present on site, and has been recorded to a maximum depth of 4.00m bgl in a previous ground investigation undertaken by TRC in 2021 on the site. Mineral extraction of sands, gravels and clay has been recorded in the surrounding area. However, mining/quarrying is not thought to have been undertaken within the site boundary. The Langley Silt Member and deeper London Clay Formation have been designated Unproductive Strata. These confine the intermediate Taplow Gravel Member, which is a Principal Aquifer capable of storing and transmitting significant quantities of groundwater. The site is not within a groundwater Source Protection Zone (SPZ). There are four active groundwater abstraction licences in operation within 1km of the site. The nearest surface water feature is a drainage ditch approximately 189m north-east of the site. Two other drainage ditches and three ponds are within 2km of the site. Duke of Northumberland's River (2.05km west), River Colne (2.35m west), River Crane (2.50m east), Wraysbury River (2.50m west) flow southwards within 3km of the site.

	The previous ground investigation, undertaken by TRC in 2021, indicates asbestos fibres are present in the Made Ground soils on site. In addition, polycyclic aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH) were identified in excess of the Generic Assessment Criteria threshold values in the Made Ground samples from BH103 and WS103 in the TRC investigation. TRC did not believe the hydrocarbons were into the underlying natural soils or groundwater, but further investigation was recommended in regards to the risk to controlled water. TRC gave the site a Characteristic Situation 2 designation for ground gas mitigation due to recording elevated concentrations of carbon dioxide during their monitoring visits. Further visits would be required to comply with CIRIA C665.
ASSESSMENT AND CONCLUSIONS	
Preliminary Geotechnical Hazards	The following plausible geotechnical risks are identified. • Variable Made Ground - settlement or differential settlement of foundations, floor slabs, roads and infrastructure elements. • Low strength, compressible ground – risk of shear failure and excessive settlement of foundations, roads and infrastructure elements. • Attack of buried concrete by aggressive ground conditions – the development site may contain Made Ground and potentially sulfate bearing soils. • Loose Made Ground and shallow perched groundwater, leading to difficulty with excavation due to trench instability. • Instability of neighbouring slope (embankment to Tunnel Road East) and impact on foundations, floor slabs, roads and infrastructure and construction plant. • Potential for obstructions and the risk of instability of excavations with the impact on construction staff, vehicles and plant operators. • Potential for unforeseen ground conditions and the risks associated with limited data.
Preliminary Geo-environmental Conclusions	Based on historical land uses and its current operational use, the overall risk from land contamination at the site is considered to be low for the current development, and moderate (with some specific high risks) identified for a redeveloped site, but would need to be confirmed by appropriate intrusive investigation, testing and assessment of the results of the investigation. It is considered that it is unlikely that the site would be classified as Contaminated Land under Part 2A of the EPA 1990. The possible pollutant linkages on an unremediated site determined by desk study and walk-over are summarised below for risk levels of moderate or greater.

Source(s)	◄ potential Impact on ►	Receptor(s)
On-site sources:		
Made Ground, associated with the sites former use as a school and car park, possibly including elevated concentrations of metals, metalloids, polycyclic aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH)		Site users Landscaping Building Groundwater
Hydrocarbon fuels, lubricants and solvents that have leaked from vehicles/plant associated with the former car park, school and agricultural activities		
Made Ground, potentially containing asbestos fibres and ACM from the demolition of the former school structures and/or the use of imported fill		Site users
Asbestos fibres from insulation or asbestos-containing materials in the existing buildings.		
Ground gases (carbon dioxide and methane) from organic materials in the Made Ground below the site.		Site users Neighbours

	Asbestos fibres from insulation or asbestos-containing materials in the existing buildings.	Site users
	Off-site sources:	
	Quarry backfill, associated with the former gravel pits and potential clay pit within the local area, possibly including metals, metalloids, PAH and petroleum hydrocarbons	Site users Buildings Landscaping
	Hydrocarbon fuels, lubricants and solvents from spillages/leakages at the petrol stations, depots, works and airport recorded within 500m of the site	Site users Buildings
	PFOS from firefighting foam used at the neighbouring fire station associated with Heathrow Airport, approximately 250m south of the site	Site users
	Contamination from sewage in the filter beds that were historically present approximately 250m east of the site, potentially containing elevated metals, detergents, inorganic and organic contaminants and possibly (although unlikely) pathogenic contaminants such as faecal coliforms	Site users Landscaping
	Ground gases (carbon dioxide and methane) from the gas valve compound and/or from organic materials in the backfill to the former quarries, now filled, located within the surrounding region.	Site users. Neighbours.

FUTURE CONSIDERATIONS	
Further work	In order to confirm the actual risks to receptors and confirm the ground conditions with respect to potential geotechnical and geo-environmental risks, an appropriate intrusive investigation will need to be undertaken. This investigation will need to: • further determine the depth and distribution of Made Ground and natural strata across the site; • determine the soil strength/density profile beneath the site; • determine the depth/level of groundwater beneath the site; • determine the ground gas concentrations beneath the site in line with CIRIA C665; • determine CBRs to assist with pavement design; • assess trench stability, over break potential and 'diggability'; • allow sampling for chemical and geotechnical laboratory testing; • allow soil classification to allow geotechnical characterisation and determine suitability for reuse of soils within earthworks; • obtain information in terms of Aggressive Chemical Environment for Concrete Class (ACEC Class). Following investigation, assessment will be required to: • update the Ground Model; • update the Geotechnical Risk Register; • provide Geotechnical Design recommendations; • update the Conceptual Site Model (CSM), including identification of plausible pollution linkages; • undertake generic quantitative risk assessment of potential chemical contaminants to establish 'suitability for use' under the current planning regime; • discuss potential environmental liabilities associated with land contamination (soil, water and gas); and • provide outline mitigation recommendations to ensure the site is 'suitable for use'.

This Executive Summary forms part of Hydrock Consultants Limited report number 23795-HYD-XX-XX-RP-GE-1000 and should not be used as a separate document.

1. INTRODUCTION

1.1 Terms of reference

In May 2022, Hydrock Consultants Limited (Hydrock) was commissioned by Aprirose Real Estate Investment (the Client) to undertake a Phase 1 desk study at NCP Flightpath Heathrow, Terminals 2-3 Heathrow, Heathrow Flightpath, A408, West Drayton UB7 0DU.

The site is currently a car park which was formally owned and operated by NCP.

Hydrock understands that the proposed development is to comprise four industrial units with associated infrastructure and car parking facilities. Each industrial unit will have a mezzanine level to the east of the structures. An additional entrance is to be created from Bath Road (A4) at the south of the site. A proposed development layout (UMC Architects Document Reference: 21323-UMC-ZZZZ-SI-DR-A, Drawing Number 0003), is presented in Appendix A.

The works have been undertaken in accordance with Hydrock's proposal referenced (Reference: C-23795-FP-GE-0001 and dated 6th April 2022) and the Client's instructions to proceed (via email).

1.2 Objectives

The works have been commissioned to support the planning application (application reference: 41632/APP/2021/1301) and to assist with the design of the development.

The objective of the Phase 1 Desk Study is to formulate an outline Conceptual Ground Model of the site to identify key geo-environmental and geotechnical risks to the proposed development.

1.3 Scope

The scope of the Phase 1 Desk Study comprises:

- a field reconnaissance (walkover) to determine the nature of the site and its surroundings including current and former land uses, topography and hydrology;
- acquisition and review of:
  - historical Ordnance Survey maps, to identify former potentially contaminative uses shown at the site and immediately surrounding it, and an assessment of the associated contamination risks;
  - a third-party environmental report to identify flooding warning areas, local landfills, pollution incidents, abstractions, environmental permits etc. which may have had the potential to have environmental impact on the site;
  - topographical, geological and hydrogeological maps;
  - British Geological Survey (BGS) archive records;
  - regional UXB risk maps;
- a review of previous investigations carried out at the site;
- development of a preliminary Ground Model representing ground conditions at the site;
- development of an outline Conceptual Model (oCM), including identification of potential pollution linkages;
- provide commentary on the UXO risk;

- a qualitative assessment of any geo-environmental risks identified; and
- identification of plausible geotechnical hazards.

1.4 Available information

The following have been provided to Hydrock by Client for use in the preparation of this report:

- Billfinger GVA. May 2015. 'Environmental Report. NCP Car Park, Heathrow Excelsior, Heathrow UB7 0DU', produced for CP Co. Borrower Limited.
- Mayer Brown Limited. March 2021. 'NCP Car Park, A4 Bath Road, Heathrow. Site Location Plan' Drawing Number: MBSL201222-08, Revision P2, prepared for Heathrow NCP Property Limited.
- The Council of the London Borough of Hillingdon. 7th June 2021. 'Report of the Head of Planning, Transportation and Regeneration', Application Reference: 41632/APP/2021/1301.
- The Council of the London Borough of Hillingdon. 28th June 2021. 'Grant of Planning Permission. NCP Heathrow Flightpath, Bath Road, Sipson', Application Reference: 41632/APP/2021/1301.
- UMC Architects. 27th August 2021. 'NCP Car Park, Bath Road, West Drayton. Site Layout – Option 2' Document Reference: 21323-UMC-ZZZZ-SI-DR-A, Drawing Number 0003, Revision C.
- UMC Architects. 21st September 2021. 'NCP Car Park, Bath Road, West Drayton. Site Location Plan', Drawing Reference 21323-UMC-XXXX-SI-DR-A, Drawing Number: 0006, Revision A.
- WSP. September 2021. 'Bridge Point Heathrow. Scoping Report', Reference: 70088897.01, produced for Bridge Industrial.
- TRC. November 2021. 'NCP Flightpath, Heathrow. Phase II Geo-Environmental Site Assessment with Supplementary Groundwater Investigation', Reference: 460366.0001.0000, produced for Bridge Industrial.
- Interlocks Surveys. December 2021. 'Topographical Survey. Bridge Point Heathrow', Drawing Number: 210833 2D sheet 1 to 4, Scale 1:200 at AO, produced for Bridge Industrial.

The Client has commissioned or obtained assignment of the above documents and Hydrock is entitled to full reliance upon their contents.

1.5 Regulatory context and guidance

The geo-environmental section of this report is written in broad agreement with BS 10175:2011+ A2:2017, 'Land Contamination: Risk Management' (LCRM, 2019) and the AGS (2006) 'Good Practice Guidelines for Site Investigations'. The methods used follow a risk-based approach, with the first stage being a Phase 1 desk study and field reconnaissance (this report), with the potential geo-environmental risk assessed qualitatively in future report(s) using the 'source-pathway-receptor contaminant linkage' concept to assess risk as introduced in the Environmental Protection Act 1990 (EPA, 1990).

The geotechnical section of this report is prepared in general accordance with BS EN 1997 (EC7) and BS 8004:2015. This report forms the Preliminary Sources Study Report (PSSR) as defined by DMRB CD622.

Where relevant the NHBC Standards (2022), have also been applied.

Remaining uncertainties and recommendations for further work are listed in Section 5 and Section 6.

Reference to the technical details of the approach and the methodologies adopted are provided in Appendix G.

2. PHASE 1 STUDY (DESK STUDY AND FIELD RECONNAISSANCE)

2.1 Data

A number of desk study sources have been used to assemble the following information. These are presented in Appendix D and include:

- Third-party environmental report (Groundsure report, reference HYD-8741409);
- Historical Ordnance Survey mapping;
- BGS Archive Records; and
- Zetica UXB Risk Maps (https://zeticauxo.com/downloads-and-resources/risk-maps/).

As part of the desk study data, a previous desk study and separate ground investigations prepared for the site have been reviewed (see Section 1.4 for full reference). Where suitable, the data from the previously referenced reports is included within this Phase 1 study in the relevant section. Historical works are presented in Appendix D and include:

- Billfinger GVA. May 2015:
  - Phase 1 Environmental Due Dillegance Report comprising desk-based research with no intrusive works.
- TRC. November 2021:
  - Phase 1 and Phase 2 geo-environmental and geotechnical site assessment including an initial intrusive investigation and supplementary intrusive investigation to further delineate contamination, comprising;
    - A total of seven cable percussive boreholes (BH101 to BH103 and BH201 to BH204) drilled to a maximum depth of 10.50m below ground level (bgl) with in situ CPTs/SPTs;
    - Seven window sample boreholes (WS101 to WS107) drilled to a maximum depth of 3.50m bgl with in situ CPTs/SPTs;
    - Screening using a photo-ionising detector (PID);
    - Installation of groundwater and gas monitoring installations at seven boreholes;
    - Infiltration testing;
    - Environmental and geotechnical testing and analysis of soil samples;
    - Post-fieldwork groundwater and gas monitoring undertaken over two phases of ground investigation; and
    - Collection of groundwater samples on two occasions.

2.2 Site referencing

The site is referenced in Table 2.1 and the location is indicated in Figure 2.1 and Figure 2.2.

Table 2.1: Site referencing information

Item	Brief Description
Site name	NCP Flightpath Heathrow
Site address	Terminals 2-3 Heathrow, Heathrow Flightpath, A408, West Drayton UB7 0DU.
Site location and grid reference	The site is located approximately 30m north of Heathrow Airport, which is separated from the site by Bath Road. West Drayton is approximately 2km north of the site. The National Grid Reference of the approximate centre of the site is 507451E, 177081N.

Figure 2.1: Site location

(Reproduced with permission from Groundsure)

Figure 2.2: Extract from the Ordnance Survey Map.

(OS licence 100023353).

A site location plan (Hydrock Drawing 23795-HYD-XX-ZZ-DR-GE-0001) is presented in Appendix A.

2.3 Site description and field reconnaissance survey

A field reconnaissance survey was undertaken on 16th May 2022 to visually assess potential geotechnical hazards, contaminant sources and receptors. The weather during the field reconnaissance survey was warm and sunny. All structures on site were locked/boarded up and were therefore inaccessible.

A basic site description is presented in Table 2.2 and selected photographs are presented in Figure 2.3 to Figure 2.8 Additional photographs are presented in Appendix B.

Table 2.2: Site description

Item	Brief Description
Site access	The site was accessed via an unnamed road just off Bath Road. This road passes the delivery area of the neighbouring Radisson Hotel and crosses an unnamed bridge over Tunnel Road East.
Site area	The Siteis almost rectangular in shape with a slight indent at the north-west and south-east corner. The land has an area of approximately 1.54 ha.

Item	Brief Description
Elevation, topography and any geomorphic features	The site occupies ground that is generally flat and is typically 26m above Ordnance Datum (OD). Less than 20m east of the site is Tunnel Road East. This has been constructed within a road cutting at approximately 14m aOD. An embankment separates the site and the lower lying road.
Present land use	The site was formally used as a car park operated by NCP until August 2021. Ticket barriers associated with the NCP operation are present at the entrance of the site. These were closed at the time of the walkover. However, the screen on the ticket machines were switched on, indicating electrical facilities are still operational on site. The majority of the site comprises car parking facilities. A one-way access road constructed from asphalt leads to the individual car parking bays which have aggregate at the surface in most areas. The exception are several bays along the eastern site boundary which have a concrete surface. Services were identified within the car park area, including street lights, CCTV cameras, underground water mains and surface water drainage systems. To the north-east of the site, next to the ticket barriers, is a structure which has been sign posted as 'Customer Services'. This was boarded up during the site visit and appeared to be in poor condition from the outside. The building is constructed of wood and is raised off the ground surface. The building is accessible via brick stairs to the door. Electrical plug sockets, CCTV cameras and aerials were noted on the outside of the building. Immediately west of the building is an electrical vehicle charging point. It is unknown whether these facilities are operational. A metal and plastic disused bus shelter is present at the south-west corner of the structure. A small metal shed is present at the north-east corner of the site. This was unlocked and appears to be disused. Along the western site boundary, a metal access gate was noted. This was locked at the time of the walkover. The gate led to the car park of a neighbouring restaurant. Next to the access gate, within the site boundary, was a small brick structure with wooden doors. This contained electrical equipment. Slightly north of this, again within the site boundary, is a wooden pole which appeared to carry overhead telecoms cables offsite to the neighbouring houses. The cables did not cross the site overhead. Inspection of the wooden pole indicate it is 9m tall and operated by BT. Three flush circular metal covers were identified within the central area of the car park. It is presumed that these are historical boreholes from previous ground investigations at the site.
Vegetation	Weeds, grass and wildflowers have grown through the aggregate within the car parking bays across the majority of the site. Trees and shrubs are present along the site boundary growing along the fence line.
General site sensitivity	The site is generally within an urban area. To the south of the site is Heathrow Airport. The agricultural land less than 200m to the north, west and east are designated Green Belt areas.
Site boundaries and surrounding land	The northern site boundary has been lined with Heras fencing with safety signage. Beyond this is a derelict structure to the north-east and occupied residential units to the north-west. The back gardens of the neighbouring houses bound the site. Beyond this is agricultural land and the residential area of West Drayton Metal mesh fencing is present along the western, southern and eastern site boundary. The land immediately west of the site comprises residential dwellings and a couple of commercial units. A children's play area and football playing fields are present within this estate. Further west is an industrial estate and agricultural land.

Item	Brief Description
	Heathrow Airport occupies a large area of land to the south of the site. Bath Road, which trends west to east, separates the site and the airport. Immediately east of the site is an embankment which slopes down towards Tunnel Road East. A bridge crosses this road from the site to the neighbouring land, which is occupied by the Radisson Hotel and Conference Centre. Additional commercial units are present around this area, along with agricultural land and the residential area of Harlington.

Figure 2.3: The entrance of the site as seen from the eastern site boundary. A bridge leading to the neighbouring hotel crosses the underlying Tunnel Road East. This is the main accessway to the site.

Figure 2.4: Customer Service cabin and bus stop towards the north of the site. Services including street lighting, an aerial, outdoor plug sockets and CCTV can be seen around the structure. It is unknown if services are live.

Figure 2.5: Disused metal shed at the north-east corner of the site.

Figure 2.6: Brick structure containing electrical equipment along the western site boundary.

Figure 2.7: Locked secondary access gate along the western site boundary.

Figure 2.8: Car parking area viewed from the south-west corner of the site. Parking bays with an aggregate surface are overgrown with weeds and grass. Asphalt roads provide an accessway to the parking bays. Street lighting and CCTV facilitate the car park.

2.4 Site history

A study of historical Ordnance Survey maps (Appendix C) has been undertaken to identify any former land uses at the site and surrounding areas which may have geotechnical or geo-environmental implications for the proposed development. The key findings are summarised in Table 2.3.

Table 2.3: Site history review

Reference	Key Features on Site	Key Features off Site
OS Map[1] 1865 – 1868 1:10,560 OS Map 1866 1:2,500	The majority of the site is within an orchard with the exception of the south-eastern corner which is undeveloped open space. A footpath runs through the centre of the site trending south-west to north-east.	The surrounding land is predominately agricultural and appears to be orchards and open fields. Immediately north of the site is an area of marshland. A large **pond is shown approximately 150m south-east** of the site. Two **smaller ponds are present approximately 110m north and 210m south-east** of the site.
OS Map 1881 1:10,560	No significant change.	No significant change.
OS Map 1894 – 1897 1:10,560 OS Map 1896 1:2,500	**A school has been constructed on the south of the site.** The original footpath has been removed and replaced by a new one trending west to east through the centre of the site.	Buildings, likely residential, have been constructed along the western site boundary. A **pond is shown within the marsh area to the north of the site approximately 40m** from the site boundary. Two wells are present approximately 600m and 650m east of the site. Three further wells are shown approximately 250m, 350m and 490m south. Cottage Hospital has been constructed 750m north. A small gravel pit is recorded approximately 1km west of the site.

[1] Ordnance Survey Historical Map Information provided by Groundsure.

Reference	Key Features on Site	Key Features off Site
OS Map 1898 – 1900 1:10,560	No significant change.	No significant change.
OS Map 1912 - 1913 1:10,560 OS Map 1914 1:2,500	No significant change.	The wells to the east and south of the site are no longer listed. **A building labelled 'Old Filter Beds' is shown approximately 250m east of the site.** The gravel pit to the west has been renamed 'Old Gravel Pit'. A new gravel pit is shown approximately 1.75km to the south-west. Gravel Pit Farm is located approximately 1km east of the site, which appears to include an open quarry.
OS Map 1934 - 1938 1:10,560 OS Map 1935 1:2,500	The orchard to the north of the site has been removed, leaving behind open fields.	Allotment gardens are listed immediately north of the site boundary. Several clusters of buildings, likely residential houses, have been constructed directly adjacent the northern boundary, approximately 20m to the west and approximately 400m to the east of the site boundary. A 'Piling and Construction Works' is shown approximately 490m west of the site. A brick works is listed approximately 760m south of the site. A water tower, tank and potential quarry are situated within the vicinity of this industry. A sewage pumping station has been constructed approximately 1km east of the site and sewage tanks are present approximately 1.1km to the south-east.
Google Earth© Imagery 1945[2]	No significant change.	Extensive groundworks are shown on a large area of land less than 50m south of the site associated with the construction of the future Heathrow Airport.
OS Map 1960 1:10,560	No significant change.	**Approximately 100m south of the site boundary, the London Airport has been constructed.** The old gravel pit (west), brick works (south) and sewage tanks (south-east) have been removed to allow this development. The sewage pumping station to the east is no longer listed. The 'Piling and Construction Works' is now labelled as 'works'. This has expanded northward and eastward, now approximately 400m from the site boundary.
OS Map 1962 1:2,500 OS Map 1964 1:10,560	The school on site has been labelled Heathrow County Primary School.	**Significant road works have been undertaken immediately east of the site and approximately 90m south of the site.** Both appear to have been built using a road cutting. A bridge crosses the eastern road and connects to the site. Airport Hotel has been constructed approximately 300m east of the site. A cooling tower and swimming pool are noted on the grounds. **A tank is listed outside the hotel boundary approximately 170m east of the site.**

[2] Google Earth imagery, dated 1/1/1945

Reference	Key Features on Site	Key Features off Site
OS Map 1970 1:10,560 OS Map 1962 - 1970 1:2,500 and 1:1,250	No significant change.	**An electricity substation is shown approximately 50m east of the south-eastern site boundary.** Additional buildings have been added to the works to the west of the site. Another **tank is listed approximately 180m east.** A recreational ground and play area are listed 250m west of the site. Drainage is noted in the surrounding area to the north. Two further works are listed approximately 450m north and 500m north. Approximately 750m from west of the site is a book warehouse and depot. Groundworks appear to have been undertaken approximately 1.2km to the northwest, comprising embankments and a newly constructed pond. More construction has been undertaken at London Airport including buildings and associated infrastructure 750m south and a depot with above ground tanks and drainage approximately 1km south-west.
OS Map 1974 1:10,000 OS Map 1973 – 1977 1:1,250	**The school and all associated structures have been demolished.** The site is now listed as a **car park.**	The allotments immediately north of the site and **Gravel Pit Farm to the east are no longer listed.** Airport Hotel has expanded northward. The depot 750m west has increased in size. Garages are listed approximately 900m west of the site and 1.5km north-west. **A fire station is listed 250m south-west of the site.** **The pond and embankments presumed to be earthworkings/quarries to the north has been removed.** A works and a depot have been constructed 500m south-east and 700m south-east of the site respectively. London Airport is now listed as Heathrow Airport. Two electricity substations and tanks are show within the airport approximately 1km of the site boundary. The depot 1km south-east has expanded and includes further tanks.
OS Map 1987 1:10,000 OS Map 1988 – 1995 1:1,250 1999 Aerial Photograph[3] Google Earth© Imagery 1999[4]	A **small structure** is visible to the north-east of the site on the aerial photograph.	A building has been constructed on the former allotment gardens immediately north of the site. A new gravel pit has been opened approximately 1km north-west of the site. Ponds are present within the gravel pit. Two ponds have been constructed approximately 800m north of the site.
OS Map 2001 1:10,000	No significant change.	Further ponds have been constructed in the land approximately 800m north. A quarry is listed approximately 800m north-east.

[3] Historical Aerial photograph, provided as part of the historical map Information provided by Groundsure
[4] Google Earth imagery, dated 9/9/1999

Reference	Key Features on Site	Key Features off Site
		The works and depot to the south-east near the airport are no longer listed. The depot and book workshop to the west are no longer listed. The buildings still remain. The gravel pit approximately 1km north-west is no longer shown.
OS Map 2003 1:1,250 Google Earth© Imagery 2003[5]	No significant change.	**An electricity substation is labelled approximately 50m west of the site boundary.**
OS Map 2010 1:10,000 2010 – 2017 Aerial Photograph	No significant change.	The former depot and book workshop have been demolished and new unlisted buildings have replaced them.
Google Earth© Imagery 2021[6] OS Map 2022 1:10,000	Electrical charging points are listed within the site boundary towards the north-west.	The ponds approximately 1km north-west and 800m north have been altered. The quarry 800m north-east is no longer listed. Tanks and substations are no longer shown within Heathrow Airport.

Prior to the construction of the existing car park, a school was situated on the southern area of the site. This was demolished in the early 1970's. Made Ground comprising of demolition rubble may be present below the hardstanding on site. Hazardous substances, such as asbestos, may be present within the demolition rubble, which should be given due consideration as part of the conceptual site model.

The land surrounding the site has an industrial history, with filter beds, Heathrow Airport, electricity substations, a fire station, gravel pits and several unspecified tanks recorded in close proximity to the site boundary. Contamination associated with industrial processes from these facilities will need to be considered further in this report.

Earthworks associated with the construction of the neighbouring roads and airport may have an impact on the geotechnical properties of the site, which may also require further investigation.

Several ponds are noted in close proximity to the site. These features should be contemplated when considering nearby receptors.

2.5 Geology

The general geology of the site area is shown on the 1:10,000 British Geological Survey (BGS) map extract reproduced as part of the Groundsure report and is summarised in Table 2.4. Extracts from the map are shown in Figure 2.9 and Figure 2.10.

[5] Google Earth imagery, dated 1/1/2003
[6] Google Earth imagery, dated 17/4/2021

Table 2.4: Geology

Ref. for Figures	Location	Stratigraphic Name	Description
Superficial Deposits (Figure 2.9)			
1	On site	Langley Silt Member	Yellowish brown variable silts and clays with massive bedding.
2	On site outcropping to the east	Taplow Gravel Member	Sand and gravel with localised lenses of silt, clay and peat.
Solid Geology (Figure 2.10)			
1	On site.	London Clay Formation	Blueish grey or greyish brown silty clays or clayey silts which may include shells, disseminated pyrite, sandy horizons/lenses and flint gravel fragments.

Figure 2.9: Superficial deposits.

(Reproduced with permission from Groundsure)

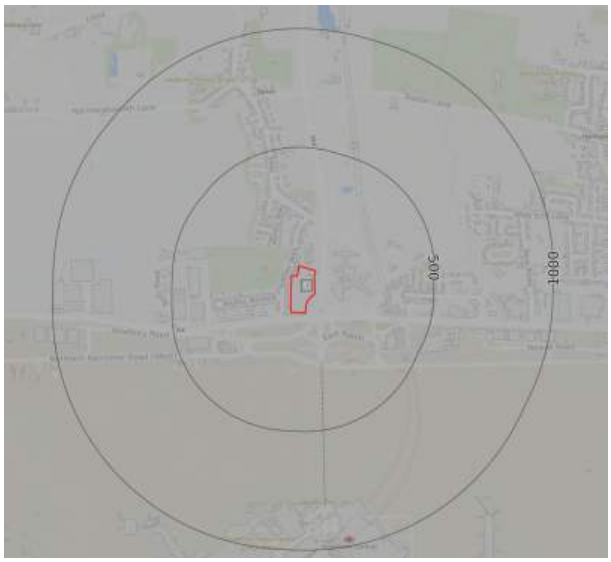


Figure 2.10: Solid geology.

(Reproduced with permission from Groundsure)

Areas where the Taplow Gravel Member outcrops at the surface, particularly towards the north, coincide with regions that have been recorded as 'worked ground' by the Groundsure Report. This suggests that the overlying Langley Silt Formation has been removed as part of historical industrial processes/construction creating outcrops of the Taplow Gravel Member at the surface.

Made Ground is known to be present at ground level across the site associated with the site's current use.

A number of borehole logs from the BGS archive have been reviewed. Selected records are summarised below:

- TQ07NE646, approximately 10m north-east of the site along Tunnel Road East (NGR 507519E, 177157N), drilled to a depth of 120m bgl and recorded:
  - Superficial ground from ground level to 6.00m bgl;

- London Clay Formation from 6.00m to 60.00m bgl;
- Redding Beds from 60.00m to 84.00m bgl;
- Chalk and flint from 84.00m to 98.00m bgl;
- Very flinty chalk with black cobbles from 98.00m bgl; and
- Black cobbles from 98.00m to 120.00m bgl.
- Two groundwater strikes were recorded at 60m and 92m bgl within the Redding Beds and Chalk respectively.

- The ground conditions proven by historical investigation (TRC, 2021), comprise:
  - Made Ground, comprising sandy gravel, from ground level to a maximum depth of 4.00m bgl;
  - Langley Silt Member, comprising silty clay, from between 0.40m and 2.40m to a maximum depth of 3.20m bgl;
  - Taplow Gravel Member, comprising clayey sandy gravel, from between 1.50m and 3.20m to a maximum depth of 6.10m bgl; and
  - London Clay Formation, comprising silty clay, from between 4.00m and 6.10m proven to a depth of 10.45m bgl.
  - Groundwater seepages were noted at two locations within the Made Ground which was described as perched groundwater bodies.
  - One groundwater strike was recorded at one location (BH103) at the contact between the Taplow Gravel Member and underlying London Clay Formation.

2.6 Hydrogeology

2.6.1 Aquifer designations

Based on the inferred geological sequence presented in Section 2.5 and the Environment Agency's interactive aquifer designation map, the aquifer system presented in Table 2.5 applies.

Table 2.5: Aquifer system

Stratum	Aquifer Designation	Comments
Made Ground (Imported Fill)	Unclassified/ unproductive	Artificial ground not included in the classification system. Likely to be moderate to high porosity because of unconsolidated nature, but permeability is likely to be constrained to low, or low to moderate because of poor sorting and clay content.
Superficial Deposits		
Langley Silt Member	Unproductive Strata	Due to the high fines content within this stratum, it is considered of low permeability. It is unlikely to be capable of storing or transmitting significant quantities of water.
Taplow Gravel Member	Principal Aquifer	Intergranular sands and gravels are likely to provide a high level of water storage due to its porous, permeable qualities. This material is considered highly transmissive, therefore could provide a source for water supply and/or river base flow. Horizons with a greater fines content may restrict water flow locally within this stratum.

Stratum	Aquifer Designation	Comments
Solid Geology		
London Clay Formation	Unproductive Strata	This stratum is dominated by low permeability low porosity clays and silts which will likely impede the flow of groundwater. Water storage and transmission is considered negligible within this material.

2.6.2 Groundwater abstraction

There are four active licensed groundwater abstractions within 1000m of the site. They are listed in Table 2.6.

Table 2.6: Groundwater abstractions

Location Relative to Site	Purpose of Abstraction
91m east at the Park Inn Hotel, Heathrow	General use
941m north at the Wet Pit on Sipson Lane	Mineral washing at Harleyford Aggregates Limited
949m west at Home Farm, Harmondsworth	Spray irrigation (direct)
	Farming and domestic use

It is possible that the groundwater being abstracted at the Park Inn Hotel is for human consumption. As such, this should be considered further in this report.

In addition, the use of groundwater in agricultural practices at Home Farm may also pose threat to consumers. However, due to its distance from the site, migration of potential contaminants from within the site boundary are unlikely to affect this abstraction.

2.6.3 Groundwater source protection zones and groundwater vulnerability

The site is not within a groundwater Source Protection Zone (SPZ).

2.6.4 Groundwater levels, recharge, and flow

The desk study information indicates that the main groundwater on site resides within the Taplow Gravel Member. This is designated as a Principal Aquifer, which is likely capable of providing base flow to local river systems.

The Taplow Gravel Member is overlain by the Langley Silt Member and underlain by the London Clay Formation, which are both deemed Unproductive Strata. As such, groundwater within this aquifer will be confined. The BGS Hydrogeological Maps indicate the Taplow Gravel Member is a locally important aquifer, likely due to its limited extent and the surrounding low permeability geology.

The previous ground investigation undertaken by TRC in 2021 notes the presence of perched groundwater within the Made Ground. This water is likely held within the more granular horizons within the variable manmade material. Cohesive layers/areas within the Made Ground and the underlying low permeability Langley Silt Member will prevent percolation of groundwater from the Made Ground into the main groundwater body within the Taplow Gravel Member. Groundwater within the Made Ground is anticipated to be laterally discontinuous.

Deeper groundwater is anticipated within the Chalk Group, which has been recorded at depths in excess of 80m bgl on logs acquired from the BGS archives. Activities on site are unlikely to affect this Principal Aquifer due to its depth and the significant amount of low permeability geology overlying the Chalk.

Based on the above assumptions, it is estimated that the Taplow Gravel Member is recharged off-site in regions that this stratum is exposed at the surface.

Groundwater flow direction was not determined as part of the previous ground investigation undertaken by TRC in 2021. However, based on the flow direction of the nearby surface water features, it is predicted that the groundwater likely flows south/south-eastwards to the Duke of Northumberland's River and Longford River.

2.6.5 Groundwater quality

The groundwater body beneath the site (Lower Thames Gravels) is currently (2019 Cycle 2) classified under the Water Framework Directive as 'poor'. From 2013 to 2016 the overall water body was given a 'good' rating. The water body is currently given a 'poor' status due to continuous sewage discharge.

This suggests that groundwater below the site may have been negatively impacted by the sewage treatment facility operating nearby. Off-site groundwater polluters should therefore be contemplated in regards to the conceptual site model.

2.6.6 Groundwater flooding

The environmental data report indicates a moderate risk of groundwater flooding. It can be inferred that groundwater flooding will originate from the Taplow Gravel Member, which is designated a Principal Aquifer. This stratum is anticipated at a shallow depth below the site, meaning subsurface structures could be affected by increases in groundwater level.

Less than 50m east and south-east of the site is an area at moderate to high risk of groundwater flooding. This appears to be associated with the lower ground within the road cuttings around Tunnel Road East, Tunnel Road East and the slip roads leading on to them. The increase in risk is likely connected to the presence of the Taplow Gravel Member at the surface in these areas.

2.7 Hydrology

2.7.1 Surface water system and drainage

The surface water features in the vicinity of the site are listed in Table 2.7.

Table 2.7: Surface water features

Feature	Location Relative to Site
Unnamed drainage ditch/inland river	189m north-east
	Approximately 760m north-west
	Approximately 950m west
Unnamed pond	Approximately 900m north
	Approximately 1.20km north-west
Saxon Lake	Approximately 1.90km north-west
Duke of Northumberland's River	Approximately 2.05km west

Feature	Location Relative to Site
Swan Lake	Approximately 2.10km west
Frogs Ditch	Approximately 2.30km east
River Colne	Approximately 2.35km west
River Crane	Approximately 2.50m east
Wraysbury River	Approximately 2.50m west
Balancing Reservoir	Approximately 2.60m south-west
Duke of Northumberland's River	Approximately 2.70km south
Longford River	Approximately 2.82km south
Bigley Ditch	Approximately 2.88m west
Balancing Reservoir	Approximately 3.10km south-east

The nearby drainage ditch is in close proximity to the site and therefore may be considered at risk from activities on site. Further assessment is required in regards to this feature in particular.

2.7.2 Surface water abstractions and discharges

There are no active licenced surface water abstractions or discharges recorded within 1km of the site.

2.7.3 Surface water quality

Reference to the Environment Agency web site shows the site is located within the catchment of the Crane Rivers and Lakes Operational Catchment, with the specific river water body being the River Crane Water Body. The current (2019 cycle 2) overall status under the Water Framework Directive is 'moderate'.

The water body is currently 'moderate' status due to moderate ecology, poor dissolved oxygen and phosphate levels and failures in benzo(g-h-i)perylene, perfluorooctane sulphonate (PFOS) and polybrominated diphenyl ethers (PBDE) levels. The objective is for ecology, dissolved oxygen and phosphate levels to be 'good' by 2027. Causes of benzo(g-h-i)perylene and perfluorooctane sulphonate (PFOS) levels are pending investigation and haven't been further considered in the objectives.

2.7.4 Surface water flooding

The desk study information indicates the proposed development is in Flood Zone 1 (with a low probability of flooding from rivers or the sea).

No further consideration of flood risk is undertaken in this report.

2.8 Mining and mineral extraction

The site is within an area known to have undergone mineral extraction.

There are six 'Brit Pits' (a database maintained by the British Geological Survey of surface and underground mineral workings) recorded within 500m of the site. Sand and gravel were extracted at these sites which are described in the Groundsure report as surface workings. The resource extracted likely originated from the Taplow Gravel Member which is thought to be underlying the area. The names of two separate quarries have been provided in relation to the 'Brit Pits' – Sipson Lane Quarry (267m north east) and Harmondsworth Lane Quarry (334m north west). Both are classified as inactive.

In addition, gravel pits have been identified on the historical Ordnance Survey (OS) maps in the surrounding region, further corroborating this statement. Cuttings and embankments likely associated with the quarrying activity are also shown on the historical maps (as summarised in Section 2.4 of this report).

In the vicinity of these gravel pits, manmade ponds appear to have been constructed to the north and north-east of the site based on the Ordnance Survey mapping. This could indicate the remnants of a former gravel pit which has been decommissioned and left to infill naturally with groundwater.

As described in Section 2.4, a brick works is also shown on the historical OS maps between 1934 and 1960. This appears to be located immediately north-west of what is presumed to be a quarry. It is likely that the London Clay Formation was extracted in this region for brick manufacture. However, there is no further evidence to confirm this.

2.9 Waste management

There is one waste management sites recorded within 250m of the site, as listed in Table 2.8.

Table 2.8: Waste management sites

Site Name and Location	Details
SUEZ Recycling and Recovery UK Ltd, Harmondsworth Landfill Site, Holloway Lane, Sipson, Middlesex UB7 OAE, 190 – 200m north-west	Status: Unknown Operational dates: Unknown Size: medium (>25,000/annum). Wastes accepted: unspecified Prohibited wastes: inert waste

Though this facility is in close proximity to the site, information provided by the local council indicates that this landfill has been operated in line with current legislation and has been suitably encased. Full details on the consultation are provided in Section 2.11.

2.10 Regulatory consultation

Information in the GroundSure Report (Appendix D), relating to various regulatory controls has been reviewed, with a summary presented below in Table 2.9.

Table 2.9: Regulatory information within 500m of the site

Regulatory Data	Distance from Site	Details	Potential Risk	Comment
Discharge Consents	N/A	No entries on licenced discharges to controlled water were recorded within 2km of the site.	No	-
Local Authority Pollution Prevention and Controls	201m south-west	Historical Part B Permit National Car Rental Compound, Northern Perimeter Road, Hillingdon TW6 2QB Unloading of petrol into storage at service station	Yes	As the hydrogeological gradient and direction is not known and due to the close proximity to the site.
	290m east	Current Part B Permit	Yes	

Regulatory Data	Distance from Site	Details	Potential Risk	Comment
		Co-operative Group Ltd, Harlington Filling Station, Sipsons Corner, Bath Road, UB3 5AY Unloading of petrol into storage at service station		
	317m east	Historical Part B Permit Star Sipson Corner, Harlington Road Petrol vapour recovery	Yes	
	376m south-east	Historical Part B Permit Customs House, Nettleton Road, TW6 2LA Combustion and incineration	No	Due to its distance from the site, these activities are unlikely to have negatively impacted ground within the site boundary.
	443m west	Current Part B Permit Aires (UK) Ltd, Northern Perimeter Road, Heathrow Airport, UB3 5AP	No	This site is likely down hydraulic gradient, therefore associated contamination is unlikely to migrate into the site boundary.
Pollution Incidents	194m north-west	October 2003, landfill odour, category 4 (no impact) water and land impact and category 3 (minor) air impact.	No	Due to the category 3/4 classification of the incident.
	480m east	March 2002, atmospheric pollutants – ammonia/amine odour, category 4 (no impact) water and land impact and category 3 (minor) air impact.	No	Due to the category 3/4 classification of the incident.
Trade Directory Entries	54m south	Active Gas valve compound (gas infrastructure)	Yes	Due to its proximity to the site.
Trade Directory Entries	60m west	Heathrow Airport Cycle Response Unit Ambulance and Medical Services	Yes	Due to its proximity to the site.
	66m west	Electricity substation	Yes	Due to its proximity to the site.
	68m west			
	174m east	Cooling tower	No	Unlikely to produce significant contamination.
	180m south-east	Air shaft	No	Unlikely to produce significant contamination.
	220m east	Electricity substation	No	Due to its proximity to the site.
	243m north	Electricity substation	No	Due to its proximity to the site.
Fuel Station Entries	278m east	Open Petrol Station operated by Esso Bath Road, Harlington, West Drayton UB3 5AY	Yes	As the hydrogeological gradient and direction is not known and due to the close proximity to the site.

Regulatory Data	Distance from Site	Details	Potential Risk	Comment
Control of major accident hazards sites (COMAH)	N/A	No entries COMAH sites within 2km of the site.	No	-
Registered radioactive substances	N/A	No entries on registered radioactive substances were recorded within 500m of the site.	No	-
Notification of installations handling hazardous substances	N/A	No entries on notification of installations handling hazardous substances were recorded within 500m of the site.	No	-

2.11 Consultations

As part of the Bilfinger GVA Environmental Report (2015), the Environmental Protection Officer at London Borough of Hillingdon was contacted. Comments from this exchange have been reproduced below:

- the council are not aware of any records of contamination status or pollution incidents;
- the site or sites nearby have not been designated as 'Contaminated Land' under Part 2a of the EPA 1990;
- remediation works at the former plating works (Norman Hay Site 343m east) and Technicolor site (746m east) have been undertaken;
- they have record of the following nearby landfills – Harmondsworth Lane (226m north-west), H Streeter Cranford Lane (588m north-west) and Heathrow Airport (464m south); and
- Harmondsworth Lane Landfill was formally a quarry until 1963 when it was engineered to accept inert and non-hazardous industrial waste. The Council understand that the landfill was capped and monitored regularly by the operator.

In addition, Bilfinger GVA enquired to the Petroleum Licencing Officer at the London Fire and Emergency Planning Authority, who stated:

- no petroleum tanks are recorded on the site;
- however, due to incomplete records, there is still a chance very old tanks may be present on site.

A record of the correspondence can be seen within the Billfinger GVA report presented in Appendix D.

2.12 Natural soil chemistry

Information contained within the environmental report (Appendix D) gives indicative (estimated) concentration values for the natural soils at the site for a selection of Contaminants of Potential Concern (CoPC). These have been reproduced in Table 2.10 and Table 2.11.

Table 2.10: Natural soil chemistry

Element	Arsenic	Cadmium	Chromium	Lead	Nickel
Concentration (mg/kg)	15	1.8 – 2.2	60 – 90	100 – 200	15 – 30

Table 2.11: Estimated urban soil chemistry

Element	Arsenic	Cadmium	Chromium	Lead	Nickel
Concentration (mg/kg)	14 – 15	0.6 – 2.2	80 – 96	190 – 210	23 – 25

2.13 Evidence of historical contamination

The previous ground investigation (TRC, 2021) identified:

- A slight hydrocarbon odour was observed at WS103 at 0.40m bgl and at BH204 at 0.30m bgl when soils were inspected for visual and olfactory evidence of hydrocarbon contamination.
- Asbestos fibres detected in two samples of Made Ground tested. The sample from WS105 was found to contain 0.935% hard chrysotile cement type material. At BH201, <0.001% amosite loose fibres were identified in the quantification.
- Minor concentrations of heavy metals were detected in the Made Ground and underlying natural soils at several locations. These concentrations did not exceed the General Acceptance Criteria threshold values (GACs), therefore were not considered a significant risk on site.
- PAH compounds benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene were identified above the GAC at the soil sample taken from WS103 at 0.35m bgl. Contamination was not considered to be migrating into the underlying natural soils and groundwater.
- Total petroleum hydrocarbon fraction aliphatic >EC21-EC35 was detected in excess of the GAC at the soil sample taken from BH103 at 0.30m. Again, this was not considered to be migrating into the underlying natural soils and groundwater.
- TRC state that they did not consider the contamination within the soil to present a significant risk to human health within the context of the proposal for industrial redevelopment. Remediation was not recommended as any residual risk would be mitigated by the construction of hardstanding across the site as proposed, which would break the source-pathway-receptor linkage.
- Dissolved phase hydrocarbons were identified within the controlled waters on site in the initial stage of the works. However, these were not detected during the second round of assessment. TRC concluded that the initial detection was resultant from a less reliable sampling technique. Further monitoring was recommended to confirm the conclusions of the assessment.
- Carbon dioxide was detected during the ground gas monitoring at concentrations above 5% at almost all locations, leading to a Characteristic Situation 2 designation for the site. TRC specified that mitigation will be required.

A Previous Ground Investigation Plan has been prepared by Hydrock (see 23795-HYD-XX-XX-DR-GE-0002 Appendix A) This drawing presents the TRC exploratory hole locations and areas of concern from their November 2021 Phase II investigation.

2.14 Radon

The radon risk is reported in the environmental report. The guidance indicates that the site is not in a Radon Affected Area and no radon protection measures are required.

2.15 Unexploded ordnance (UXO)

In general accordance with CIRIA Report C681 (Stone et al 2009) a non-specialist UXO screening exercise has been undertaken for the purposes of ground investigation and is presented in

Table 2.12 .

Table 2.12: Non-specialist UXO screening (for the purposes of ground investigation)

Data	Comment	Further Assessment Required
Site History	There is no indication of former military use from the desk study.	No
Post War Development	A review of the historical Ordnance Survey (OS) mapping does not indicate that the site or the surrounding area was bombed or redeveloped as a result of damage from wartime activities.	No
Geology Type	The anticipated ground conditions comprise the Langley Silt Member overlying the London Clay Formation. There is a potential that UXO, if present, would remain undetected.	Yes
Surface Cover during WWI	A school is listed on the site during WWII, which comprised structures to the south and associated grounds to the north. It is unlikely UXO would remain undetected.	No
Indicator of Aerial Delivered UXO	Screening against the regional bomb risk map Appendix D indicates the site to be in an area where the bomb risk is low. Review of wwwbombsight.org indicates that no bombs landed on site or in the immediate vicinity.	No

The non-specialist UXO screening exercise has indicated no further assessment is required with regard to UXO in relation to ground investigation. Further assessment may be considered prudent for construction activities.

2.16 Reliability of previous data

Data from the previous ground investigation reports listed in Section 1.4 have been considered during the preparation of this report were considered to be reliable. The section below provides comment as to the applicability of the various data available.

Geological data

The geological data from previous investigation undertaken by TRC in 2021 are consistent with the anticipated ground conditions from BGS sources and has been utilised in this report.

Chemical test data

Soil chemical test data provided as part of the TRC investigation was reported in 2021 and is MCERTS accredited. This chemical test data for soil from previous report is able to be used as part of the current ground investigation.

However, due to discrepancies with the groundwater sampling technique in the initial phase of investigation (see details in Section 2.13), Hydrock believe the controlled water chemical test data is unsuitable for use in any further assessments.

Groundwater data

The groundwater data within the historical investigation dates back to July and November 2021. It is Hydrock's opinion that the groundwater level data from historical report is able to be used as part of the current ground investigation.

Ground gas data

Ground gas data are available for the site, which appear to have been collected in accordance with current standards and guidance. Whilst the number of monitoring visits does not meet the requirements of CIRIA C665 and additional monitoring is required, the available data are suitable for use as part of an updated assessment.

Geotechnical data

Hydrock consider the geotechnical information to be relevant in regards to the physical ground conditions on site. As such, geotechnical test results are considered fit for use in any future assessments. However, should any significant changes be made to the proposed development design, additional works and reassessment may be required.

3. OUTLINE CONCEPTUAL SITE MODEL

3.1 Introduction

The outline Conceptual Model (oCM) incorporates evidence from the site walkover, the Desk Study and previous investigations carried out at the site. The formulation of an outline Conceptual Model is a key component of the LCRM methodology. The oCM incorporates a ground model of the site physical conditions and an exposure model of the possible contaminant linkages; it forms the basis for Generic Quantitative Risk Assessment (GQRA) in accordance with current guidelines.

3.2 Ground model

The preliminary ground model presented in Section 2 provides an understanding of the ground conditions and is the basis for preparing the preliminary geotechnical hazard assessment (Section 3.3) and the preliminary geo-environmental exposure model (Section 3.4).

3.3 Geotechnical hazard identification

3.3.1 Context

The preliminary geotechnical hazard identification has been undertaken in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622.

The following section sets out the identified geotechnical hazards and the development elements potentially affected (see Table E.1 in Appendix E for further information).

3.3.2 Plausible geotechnical hazards

Plausible geotechnical hazards identified at the site are:

- Uncontrolled Made Ground (variable strength and compressibility).
- Soft / loose compressible ground (low strength and high settlement potential).
- Variable lateral and vertical changes in ground conditions.
- Attack of buried concrete by aggressive ground conditions.
- Adverse chemical ground conditions, (e.g. expansive slag).
- Obstructions.
- Existing below ground structures to remain (particularly existing services and footings for the existing bridge over Tunnel Road East).
- Shallow groundwater (perched groundwater within the Made Ground has been recorded on site and it is expected within the superficial deposits of the Taplow Gravel Member).
- Changing groundwater conditions.
- Loose Made Ground, leading to difficulty with excavation and collapse of side walls.
- Slope stability issues – general slopes (the embankment to the east leading down to Tunnel Road East).
- Mining.
- Problematic soils.

3.3.3 Potential development elements affected

Development elements potentially affected by geotechnical hazards are:

- Buildings – foundations.
- Buildings – floor Slabs
- Roads and pavements.
- Services.
- General slopes.
- Landscaped areas.
- Construction staff, vehicles and plant operators.
- Concrete below ground.

Health and safety risks to site Contractors and maintenance workers have not been assessed during these works and will need to be considered separately during design.

The above plausible geotechnical hazards and development elements affected have been carried forward for investigation and assessment.

3.4 Geo-environmental exposure model

3.4.1 Context

The preliminary exposure model is used to identify geo-environmental hazards and to establish potential pollution linkages, based on the source-pathway-receptor (SPR) approach.

A viable pollution linkage requires all the components of an SPR to be present. If only one or two are present, there is no linkage and no further assessment is required.

3.4.2 Potential contaminants

For the purpose of this assessment the potential contaminants have been separated according to whether they are likely to have originated from an on-site or off-site source.

Potential on-site sources of contamination

- Made Ground, associated with the sites former use as a school and car park, possibly including elevated concentrations of metals, metalloids, polycyclic aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH) (S01).
- Made Ground, potentially containing asbestos fibres and ACM from the demolition of the former school structures and/or the use of imported fill (S02).
- Hydrocarbon fuels, lubricants and solvents that have leaked from vehicles/plant associated with the former car park, school and agricultural activities (S03).
- Coal tar, potentially present in the bituminous bound pavements present in the form of roads (S04)
- Ground gases (carbon dioxide and methane) from organic materials within the Made Ground (S05).
- Hydrocarbon vapours from potential VOCs and petroleum hydrocarbon spillages/leaks (S06).
- Asbestos within existing buildings (S07).

Potential off-site sources of contamination

- Quarry backfill, associated with the former gravel pits, infilled ponds and potential clay pit within the local area, possibly including metals, metalloids, PAH and petroleum hydrocarbons (S07).
- Leachate from landfilled waste (inert and non-hazardous waste) used to infill the former quarry at Harmondsworth Lane Landfill (S08)
- Hydrocarbon fuels, lubricants and solvents from spillages/leakages at the petrol stations, depots, works, landfill, airport and potential fuel tanks recorded within 500m of the site (S09).
- Hydrocarbon vapours from potential VOCs and petroleum hydrocarbon spillages/leaks from surrounding petrol stations, depots, landfill, airport and potential fuel tanks (S10).
- PFOS from firefighting foam used at the neighbouring fire station associated with Heathrow Airport, approximately 250m south of the site (S11).
- Contamination from sewage in the filter beds that were historically present approximately 250m east of the site, potentially containing elevated metals, detergents, inorganic and organic contaminants and possibly (although unlikely) pathogenic contaminants such as faecal coliforms (S12).
- Ground gases (carbon dioxide and methane) from organic materials in the backfill to the former quarries and ponds, now filled, located within the surrounding region (S13).
- Ground gases from the nearby gas valve compound which is recorded 54m south of the site (S14)
- PCBs and oils from transformers in the electricity sub-stations, historic and current (approximately 50m east and 50m west) off site. (S15)

3.4.3 Potential receptors

The following potential receptors in relation to the proposed land use have been identified.

- People (neighbours, site end users) (R01).
- Development end use (buildings, utilities and landscaping) (R02).
- Groundwater: Principal Aquifer of the Taplow Gravel Member (R03).
- Surface water: nearby drainage ditch (189m north-east), ponds (within 2km of the site) and local river network (within 3km of the site) (R04).
- Ecology: the drainage ditch likely drains into the local river network, which likely contains habitats for wildlife (R05).
- Groundwater abstractors: a groundwater abstraction licence is active at the Park Inn Hotel (91m east) which may be used for human consumption.

The following potential pathways have been identified.

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P01).
- Direct contact with substances deleterious to building materials (P02).
- Methane and carbon dioxide ingress via permeable soils and/or construction gaps (P03).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P04).
- Root uptake by plant (P05).

- Migration of contaminant via leachate migration through the unsaturated zone in the Taplow Gravel Member (P06).
- Migration of contaminant from the groundwater within the Taplow Gravel Member via base flow (P07).
- Abstraction and consumption by people (or other utilisation) of groundwater (P08).
- Surface water via overland flow (P09).
- Surface water, via drainage discharge (P10).
- Surface water via base flow from groundwater (P11).

Health and safety risks to site development contractors and maintenance workers have not been assessed as part of this study and will need to be considered separately.

The above sources, pathways and receptors have been considered as part of the Preliminary Risk Assessment in accordance with LCRM (2022), are considered to be plausible in the context of this site and have been carried forward for investigation and assessment. An assessment of the Source – Pathway – Receptor linkages is presented in Appendix F (Table F.1).

4. DESK STUDY CONCLUSIONS

4.1 Geotechnical conclusions

The following plausible geotechnical risks are identified.

- Variable Made Ground - settlement or differential settlement of foundations, floor slabs, roads and infrastructure elements.
- Low strength, compressible ground – risk of shear failure and excessive settlement of foundations, roads and infrastructure elements.
- Attack of buried concrete by aggressive ground conditions – the development site may contain Made Ground and potentially sulfate bearing soils.
- Loose Made Ground and shallow perched groundwater, leading to difficulty with excavation due to trench instability.
- Instability of neighbouring slope (embankment to Tunnel Road East) and impact on foundations, floor slabs, roads and infrastructure and construction plant.
- Potential for obstructions and the risk of instability of excavations with the impact on construction staff, vehicles and plant operators.
- Potential for unforeseen ground conditions and the risks associated with limited data.

These plausible risks require further investigation and assessment (see Section 6).

4.2 Geo-environmental conclusions

Based on historical and current land uses and in accordance with the processes set out in Appendix G:

- It is considered that it is unlikely that the site would be classified as Contaminated Land under Part 2A of the EPA 1990.
- The overall risk from land contamination at the site is considered to be low for the current development, as it is covered by hard standing or buildings limiting the possibility of contact with the soils, as well as the risk of significant rainwater infiltration leading to leaching.
- The overall risk for a redeveloped site is assessed to be moderate, with some specific potentially high risks, but this would need to be confirmed by appropriate intrusive investigation, testing and assessment of the results of the investigation.

The possible pollutant linkages (for risk levels of moderate or greater) on an un-remediated redeveloped site, as determined by the desk study and walk-over, are summarised in Table 4.1:

Table 4.1: Possible Pollutant Linkages (for Risk Levels of Moderate or Greater)

Source(s)	◄ potential Impact on ►	Receptor(s)
On-Site Sources		
Made Ground, associated with the sites former use as a school and car park, possibly including elevated concentrations of metals, metalloids, polycyclic aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH).		Site users Landscaping Building Groundwater
Hydrocarbon fuels, lubricants and solvents that have leaked from vehicles/plant associated with the former car park, school and agricultural activities.		
Made Ground, potentially containing asbestos fibres and ACM from the demolition of the former school structures and/or the use of imported fill.		Site users

Source(s)	◄ potential Impact on ►	Receptor(s)
Asbestos fibres from insulation or asbestos-containing materials in the existing buildings.		
Ground gases (carbon dioxide and methane) from organic materials in the Made Ground below the site.		Site users Neighbours
Asbestos fibres from insulation or asbestos-containing materials in the existing buildings.		Site users
Off-site Sources:		
Quarry backfill, associated with the former gravel pits and potential clay pit within the local area, possibly including metals, metalloids, PAH and petroleum hydrocarbons.		Site users Buildings Landscaping
Hydrocarbon fuels, lubricants and solvents from spillages/leakages at the petrol stations, depots, works, landfill, airport and potential fuel tanks recorded within 500m of the site.		Site users Buildings
PFOS from firefighting foam used at the neighbouring fire station associated with Heathrow Airport, approximately 250m south of the site.		Site users
Contamination from sewage in the filter beds that were historically present approximately 250m east of the site, potentially containing elevated metals, detergents, inorganic and organic contaminants and possibly (although unlikely) pathogenic contaminants such as faecal coliforms.		Site users Landscaping
Ground gases (carbon dioxide and methane) from the gas valve compound and/or from organic materials in the backfill to the former quarries and ponds, now filled, located within the surrounding region.		Site users. Neighbours.

These possible pollutant linkages require further investigation and assessment (see Section 6).

5. UNCERTAINTIES AND LIMITATIONS

5.1 Site-specific comments

Access to the Customer Services building was not possible during the walkover as the building was boarded up.

The gate to the west of the site was locked at the time of the walkover. As such, the adjacent land beyond the western site boundary was not accessible.

Due to the fencing to the south of the site, the area that is proposed to become a new access road from Bath Road was inaccessible. Dense vegetation in this region obstructed view into the area. It may be prudent to undertake another walkover in this area prior to any intrusive works to assess the ground conditions and accessibility constraints.

5.2 General comments

Hydrock Consultants Limited (Hydrock) has prepared this report in accordance with the instructions of Aprirose Real Estate Investment (the Client), by e-mail dated May 2022 under the terms of appointment for Hydrock, for the sole and specific use of the Client and parties commissioned by them to undertake work where reliance is placed on this report. Any third parties who use the information contained herein do so at their own risk. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared or for use of the report by any parties not defined in Hydrock's appointment.

This report details the findings of work carried out in May 2022. The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, not all potential environmental constraints or liabilities associated with the site may have been revealed.

Groundwater data are only representative of the dates on which they were obtained and both levels and quality may vary.

Information provided by third parties has been used in good faith and is taken at face value; however, Hydrock cannot guarantee its accuracy or completeness.

Where the existing report(s) prepared by others have been provided by the Client, it is assumed that these have been either commissioned by the Client, or can be assigned to the Client, and can be relied upon by Hydrock. Should this not be the case Hydrock should be informed immediately as additional work may be required. Hydrock is not responsible for any factual errors or omissions in the supplied data, or for the opinions and recommendations of others. It is possible that the conditions described may have since changed through natural processes or later activities.

The work has been carried out in general accordance with recognised best practice. The various methodologies used are referenced in Appendix G. Unless otherwise stated, no assessment has been made for the presence of radioactive substances or unexploded ordnance. Where the phrase 'suitable for use' is used in this report, it is in keeping with the terminology used in planning control and does not imply any specific warranty or guarantee offered by Hydrock.

The non-specialist UXO screening has been undertaken for the purposes of ground investigation only (i.e. low risk activity in accordance with CIRIA Report C681). Further assessment should be undertaken with regards to other higher risk activities e.g. construction.

Please note that notwithstanding any site observations concerning the presence or otherwise of archaeological sites, asbestos-containing materials or invasive weeds, this report does not constitute a formal survey of these potential constraints and specialist advice should be sought.

Any site boundary line depicted on plans does not imply legal ownership of land.

6. RECOMMENDATIONS FOR FURTHER WORK

6.1 Ground investigation objectives

In order to confirm the actual risks to receptors and confirm the ground conditions with respect to potential geotechnical and geo-environmental risks, an appropriate supplementary intrusive investigation will need to be undertaken. This investigation will need to:

- further determine the depth and distribution of Made Ground and natural strata across the site;
- determine the soil strength/density profile beneath the site;
- determine the depth/level of groundwater beneath the site;
- determine the ground gas concentrations beneath the site in line with CIRIA C665;
- determine CBRs to assist with pavement design;
- assess trench stability, over break potential and 'diggability';
- allow sampling for chemical and geotechnical laboratory testing;
- allow soil classification to allow geotechnical characterisation and determine suitability for reuse of soils within earthworks;
- obtain information in terms of Aggressive Chemical Environment for Concrete Class (ACEC Class);
- assessment of any potential impacts on the neighbouring bridge to the east and embankments associated with Bath Road and Tunnel Road East.

Following investigation, assessment will be required to:

- update the Ground Model;
- update the Geotechnical Risk Register;
- provide Geotechnical Design recommendations;
- update the Conceptual Site Model (CSM), including identification of plausible pollution linkages;
- undertake generic quantitative risk assessment of potential chemical contaminants to establish 'suitability for use' under the current planning regime;
- discuss potential environmental liabilities associated with land contamination (soil, water and gas); and
- provide outline mitigation recommendations to ensure the site is 'suitable for use'.

6.2 Proposed scope and rationale for investigation works

Based on the current data, site investigation is proposed to comprise:

- the excavation of trial pits to allow collection of samples for geotechnical and chemical analysis, to assess trench stability, over break potential and 'diggability' and allow soil infiltration rate testing to be undertaken;
- 3 cable percussive boreholes to allow collection of samples for geotechnical and chemical analysis of deeper soils, and allow *In situ* testing (SPTs) to be undertaken to determine the strength of the clay and assess density of the sands and gravel, and allow the installation of gas and groundwater monitoring wells;
- 1 days TRL Dynamic Cone Penetration tests to determine CBRs for pavement design;

- gas and groundwater monitoring installations to allow gas concentrations and groundwater levels to be monitored;
- minimum of 6 rounds of gas concentration and groundwater level monitoring;
- geotechnical testing of soils and rock;
- contamination analyses of soil and groundwater;
- geotechnical and geo-environmental assessment based on the results received;
- consideration into the potential loading of the neighbouring embankments and bridge may be required in the later stages of investigation.

Trial pitting and TRL Dynamic Cone Penetration testing would require breaking out the existing hardstanding. This may be restricted by the current site occupier. Alternatively, window sampling boreholes could be used to replace trial pitting to limit the disturbance of the surface covering whilst still allowing the collection of shallow samples for laboratory CBR testing and geotechnical and geo-environmental sampling.

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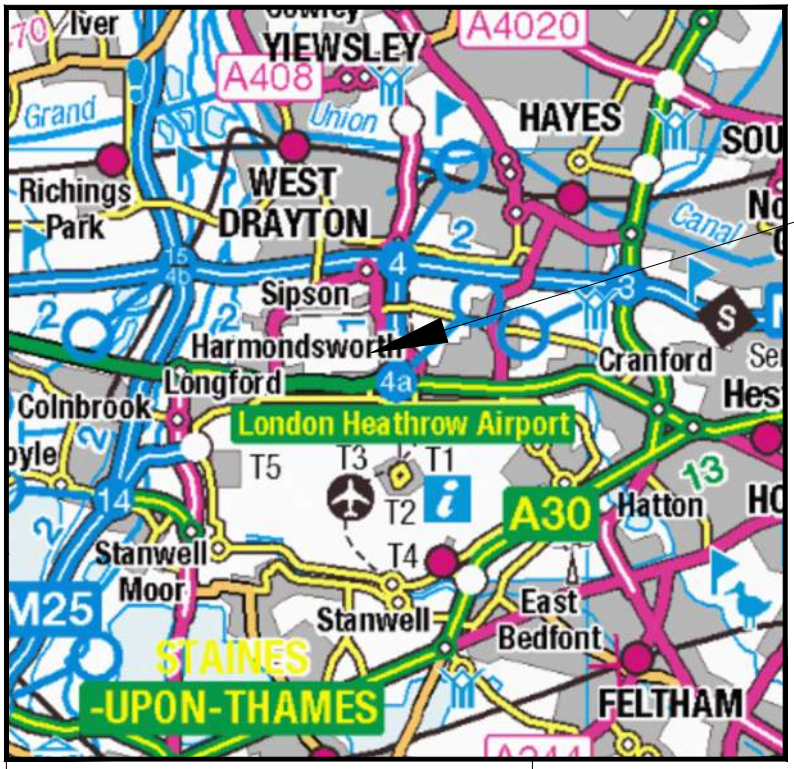
Appendix A

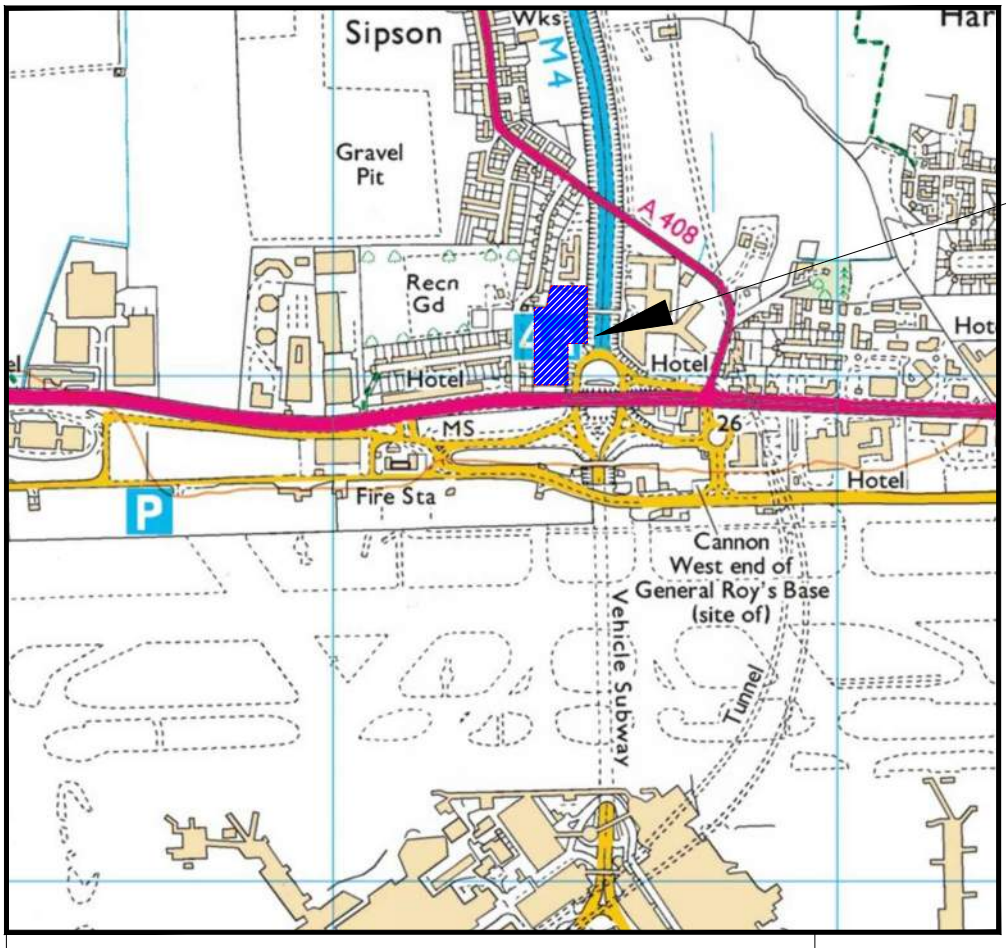
Drawings

Notes:

1. Contains Ordnance Survey data © Crown copyright and database right 2015



THE SITE



THE SITE

Rev	Date	Description	By	Ckd

Architect :

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Spratton, Northampton
NN6 8LD
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northampton@hydrock.com
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Client :

Aprirose Real Estate Investments

Project Title:

NCP Flightpath Heathrow

Drawing Title:

Site Location Plan

Reference:

23795-HYD-XX-ZZ-DR-GE-0001

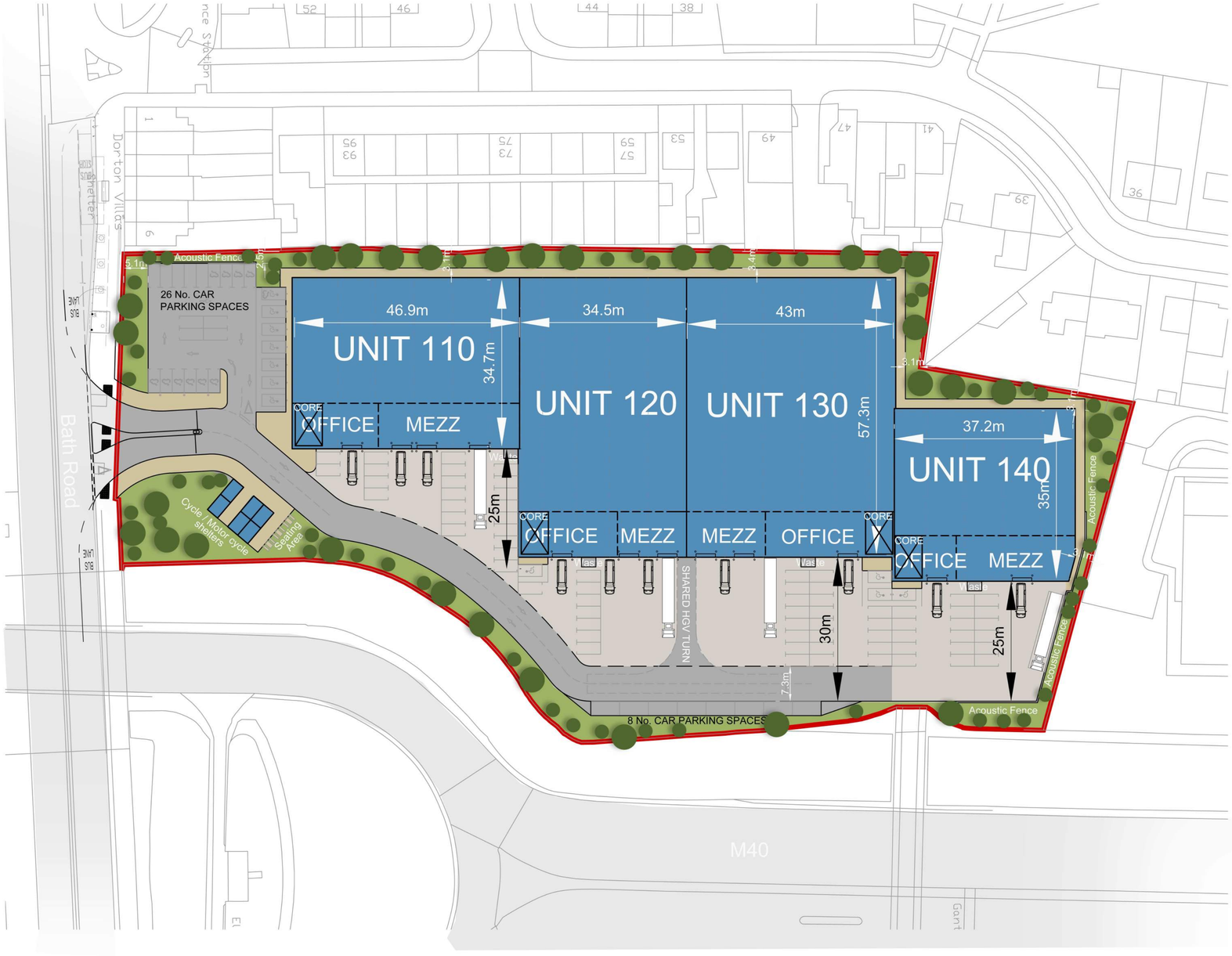
Hydrock Job No:

23795

Drawn	Checked	Scale @ A4	Date	Issue Date
RO	AL	See Drawing	25/05/22	25/05/22

Revision: P01.1

Status: S2



Schedule of Accommodation GIA

Unit 110		sq m	sq ft
Warehouse	:	**1,575**	**16,953**
Office (Incl. GF core)	:	203	2,185
Open Mezzanine	:	259	2,788
TOTAL (GIA)	**:**	**2,037**	**21,926**
TOTAL (GEA)	**:**	**2,152**	**23,164**
Haunch Height	:	10m	
Car Parking	:	22	
Level Access	:	4	

Unit 120		sq m	sq ft
Warehouse	:	**1,924**	**20,710**
Office (Incl. GF core)	:	227	2,443
Open Mezzanine	:	125	1,345
TOTAL (GIA)	**:**	**2,276**	**24,499**
TOTAL (GEA)	**:**	**2,375**	**25,564**
Haunch Height	:	10m	
Car Parking	:	9	
Level Access	:	3	

Unit 130		sq m	sq ft
Warehouse	:	**2,411**	**25,952**
Office (Incl. GF core)	:	284	3,057
Open Mezzanine	:	143	1,539
TOTAL (GIA)	**:**	**2,838**	**30,548**
TOTAL (GEA)	**:**	**2,944**	**31,689**
Haunch Height	:	10m	
Car Parking	:	23	
Level Access	:	3	

Unit 140		sq m	sq ft
Warehouse	:	**1,247**	**13,423**
Office (Incl. GF core)	:	162	1,744
Open Mezzanine	:	211	2,271
TOTAL (GIA)	**:**	**1,620**	**17,438**
TOTAL (GEA)	**:**	**1,727**	**18,589**
Haunch Height	:	10m	
Car Parking	:	18	
Level Access	:	2	

Shared Car Parking	:	34
Shared Cycle Space	:	50
Shared Motor Cycle	:	5

TOTAL SITE (GIA)	**:**	**8,771**	**94,410**
TOTAL SITE (GEA)	**:**	**9,198**	**99,006**
TOTAL CARPARKING	**:**	**106**	**1:87m2 GEA**
(Incl. 11 Disabled Parking & 11EV)			

		Ha	Acres
Total Site Area	:	1.66	4.10
Total Site Density	:	52.91%	(GIA)

Notes:
Please note Title Plans have been scaled using Ordnance Survey features which may have altered over time. Complete accuracy cannot be guaranteed without further on-site survey.

Any dimensions given are to be confirmed with site measure.

NB.
- **SUBJECT TO SURVEYS, CONSTRAINTS & PLANNING.**
- **LAYOUT TO BE TRACKED.**
- **RED LINE INDICATIVE ONLY.**

North

0m 5m 10m 15m 20m 25m

Rev	Revision Description	Date	Author/ Reviewer
P3	Siting area & EV point added Car park updated	23/05/22	RC/TC
P2	Site entry updated, Unit 140 extend, Car park updated	13/05/22	RC/TC
P1	First Issue	13/05/22	RC/TC

PRELIMINARY

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www.chetwoods.com

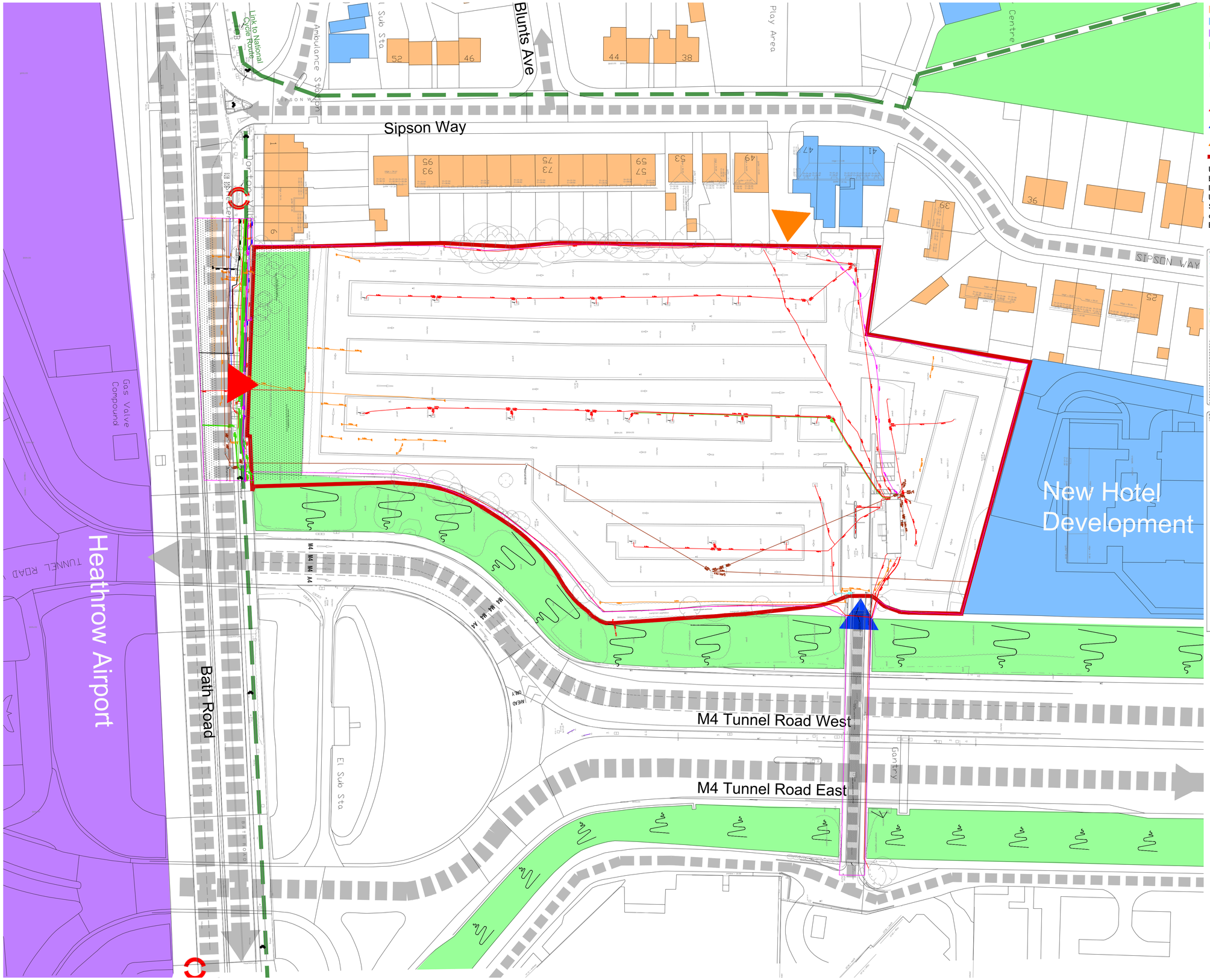
Project
Aprirose NCP Flightpath Heathrow

Client
aprirose | real estate investment

Drawing Title
Site Plan

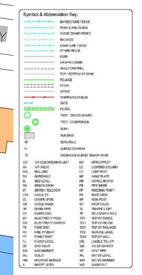
Scale	Size	Drawn	Checked	Date
1:500	A1	RC	TC	10/05/22

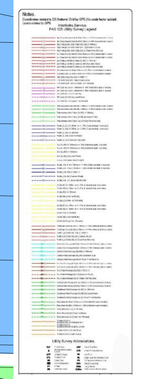
Project	Originator	Zone	Level	Type	Role	Number	Rev.
5110	CA	00	00	DR	A	00056	P3



- Residential
- Commercial / Others
- Airport
- Landscape / Green Area
- Road Link
- Cycle Route
- Bus Stop
- Proposed Site Entry
- Existing Site Entry
- Existing Emergency Access
- Indicative Site Boundary

Underground Utility Information below based on Interlocks Surveys Limited, Underground Utility Survey, Dwg No. 210833 ugs, dated 21/12/21
Easements Zone TBC





NOTES:

Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing is not to be scaled. Use figured dimensions only.

Subject to statutory approvals and survey.

Building areas are liable to adjustment over the course of the design process due to the ongoing construction detailing developments.

Please note the information contained within this drawing is solely for the benefit of the employer and should not be relied upon by third parties.

The CDM hazard management procedures for the Chetwoods aspects of the design of this project are to be found on the "Chetwoods - Hazard Analysis and Design Risk Assessment" and/or drawings. The full project design teams comprehensive set of hazard management procedures are available from the Principle Designer appointed for the project.

Notes:
Please note Title Plans have been scaled using Ordnance Survey features which may have altered over time. Complete accuracy cannot be guaranteed without further on-site survey.

Any dimensions given are to be confirmed with site measure.

NB.
- **SUBJECT TO SURVEYS, CONSTRAINTS & PLANNING.**
- **LAYOUT TO BE TRACKED.**
- **RED LINE INDICATIVE ONLY.**

North

0m 5m 10m 15m 20m 25m

Rev	Revision Description	Date	Author/ Reviewer
P2	Emergency access added	23/05/22	RC/TC
P1	First Issue	16/05/22	RC/TC

PRELIMINARY

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Project
Aprirose NCP Flightpath Heathrow

Client
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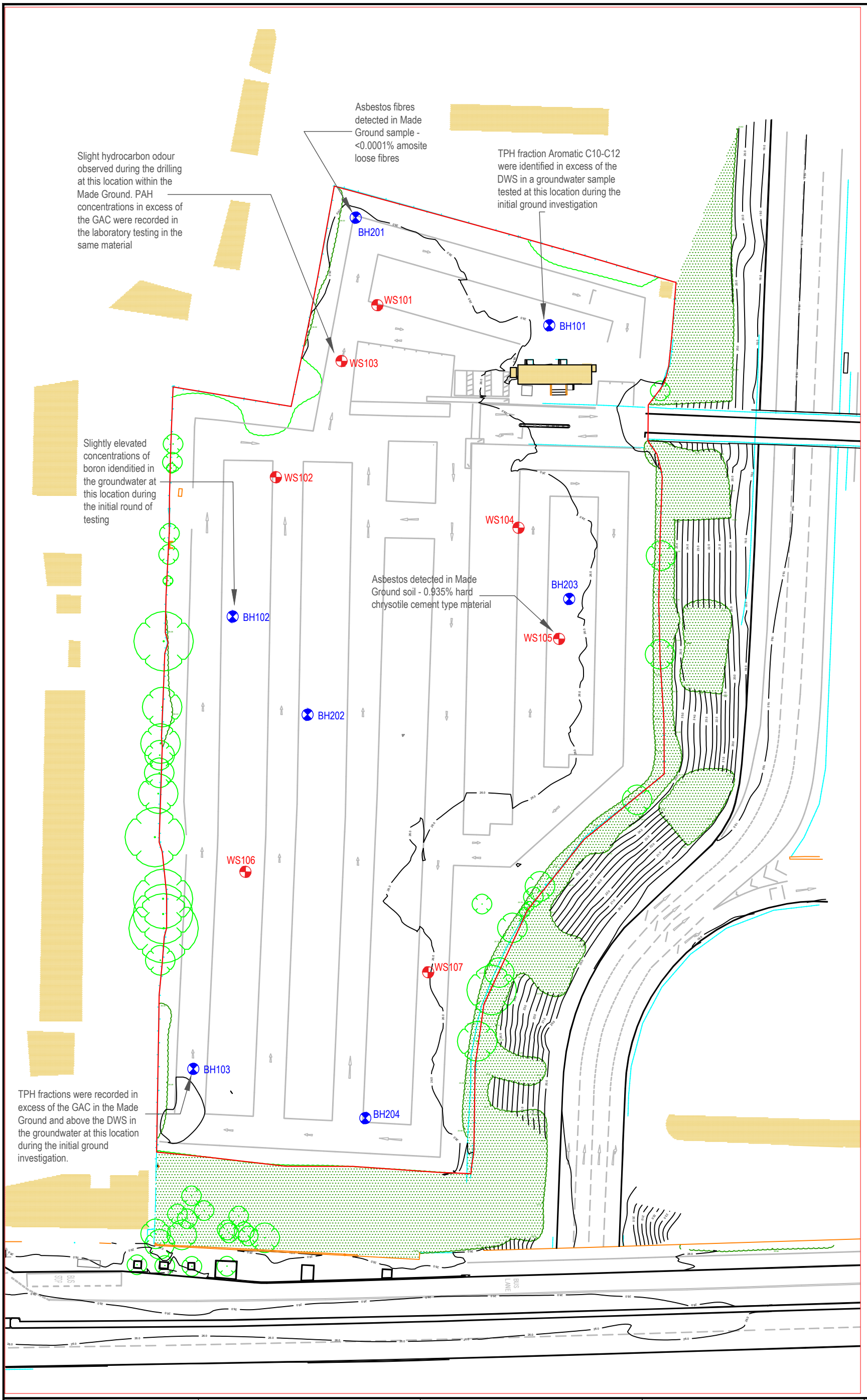
Drawing Title
Site Constraints Plan

Scale	Size	Drawn	Checked	Date
1:500	A1	RC	TC	16/05/22

Project	Originator	Zone	Level	Type	Role	Number	Rev.
5110	CA	00	00	DR	A	00058	P2



Abbreviations:

- GAC - Generic Acceptance Criteria
- DWS - Drinking Water Standards
- PAH - polycyclic aromatic hydrocarbon
- TPH - total petroleum hydrocarbon

Notes:

Groundwater contamination was discounted and attributed to unsuitable groundwater sampling techniques by TRC. A second round of sampling was undertaken which encountered no hydrocarbon concentrations in exceedance of the DWS. Further monitoring and sampling was recommended.

KEY

- Historical TRC (2021) Window Sample Borehole
- Historical TRC (2021) Cable Percussion Borehole
- Red line boundary

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing has been based on the following drawings and information:
Interlocks Surveys. December 2021. 'Topographical Survey. Bridge Point Heathrow', Drawing Number: 210833 2D sheet 1 to 4, Scale 1:200 at AO, produced for Bridge Industrial.

TRC. November 2021. 'NCP Flightpath, Heathrow. Phase II Geo-Environmental Site Assessment with Supplementary Groundwater Investigation', Reference: 460366.0001.0000, produced for Bridge Industrial.

REV.	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P1	FIRST ISSUE	RO	25/05/22	AL	25/05/22	AL	25/05/22

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CLIENT: Aprirose Real Estate Investment

PROJECT: NCP Flightpath Heathrow

TITLE: PREVIOUS GROUND INVESTIGATION PLAN

HYDROCK PROJECT NO.: 23795

SCALE @ A3: 1:750

PURPOSE OF ISSUE: SUITABLE FOR INFORMATION

STATUS: S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER): 23795-HYD-XX-XX-DR-GE-0002

REVISION: P1

Appendix B

Field Reconnaissance Photographs

Desk Study Photograph 1	
Date: 16/05/2022	
Description: A bridge crossing Tunnel Road West provides access to the site from the neighbouring Radisson Hotel & Conference Centre London Heathrow. This photo is taken from the site entrance facing north-eastward.	

Desk Study Photograph 2	
Date: 16/05/2022	
Description: The neighbouring Tunnel Road West as seen facing northwards from the bridge to the east of the site. The road has been built within a cutting, creating a slope downward from the site to the road. This is vegetated as seen.	

Desk Study Photograph 3	
Date: 16/05/2022	
Description: Former Customer Services building associated with the NCP Car Parking facility. This was boarded up and inaccessible. A disused bus stop can be seen next to this structure. Services facilitate this structure. It is unknown if they are live.	

Desk Study Photograph 4	
Date: 16/05/2022	
Description: Outdoor plug sockets to the north-east of the Customer Service building. It is unknown if these facilities are live.	

Desk Study Photograph 5	
Date: 16/05/2022	
Description: Disused metal shed at the north-east corner of the site. This was unlocked and empty at the time of the walkover.	

Desk Study Photograph 6	
Date: 16/05/2022	
Description: The building immediately north of the site boundary as seen from a gap in the fencing. This appears to be disused and derelict.	

Desk Study Photograph 7	
Date: 16/05/2022	
Description: Electrical vehicle charging points are present to the west of the Customer Service building. It is unknown whether this is live.	

Desk Study Photograph 8	
Date: 16/05/2022	
Description: Mechanical barriers at the entrance of the site towards the north-east. The screen on the barriers was working at the time of the walkover, indicating live power on site. Photograph taken from the barrier facing eastwards to the bridge.	