



Jockey Club Racecourses Ltd

Phase 1 Geoenvironmental Desk Study Report

**Sandown Park
Portsmouth Road
Esher
KT10 9AJ**

**Report No: 18.10.006
October 2018**

MAIN OFFICE & LABORATORIES

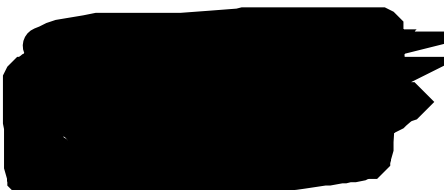

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Client Name Jockey Club Racecourses Ltd

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For and on behalf of ListersGeo, trading name of Listers Geotechnical Consultants Ltd

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EXECUTIVE SUMMARY

Project Reference	18.10.006
Site Location	Sandown Park, Portsmouth Road, Esher, KT10 9AJ
OS Grid Reference	514120, 165400
Development Proposals	<p>Outline planning application (with all matters reserved except for access to the development) for:</p> <ul style="list-style-type: none"> • Enhancement and rationalisation of existing racecourse facilities/infrastructure and car parking; • Re-location of an upgraded children's nursery (Use Class D1); • Development of a 150-room hotel (Use Class C1), and • Demolition of existing buildings/structures and residential development of approximately 318 dwellings (Use Class C3). <p>Full planning application for:</p> <ul style="list-style-type: none"> • Racetrack widening to the southwest and east sections of the existing racecourse track, including associated ground levelling/earthworks to the southwest section, and re-positioning of fencing, and improvements to a section of the existing internal access road from More Lane, and • New bellmouth accesses serving the development.
Current Site Usage	Horse racecourse.
Existing Buildings	Various buildings including the Grandstand, stables, workshop and hotel.
Topography	Slopes down gently to the north with a hill in the west called The Warren.
Vegetation	Mature and semi-mature trees, hedges and bushes.
Published Geology	The north and east of Sandown Park is underlain by Superficial geology, Kempton Park Gravel with River Terrace Deposits (undifferentiated) recorded towards the southeast and northwest of Sandown Park. Both of these Superficial Deposits are of Quaternary age above Bedrock geology, the Claygate Member of Paleogene age and the London Clay Formation in the northeast. No Superficial Deposits are recorded above the Claygate Member across the middle of Sandown Park. However, the Claygate Member is recorded to be overlain by the Bagshot Formation of Paleogene age in the southwest.
Site History	A horse racecourse was shown on the site since 1896 with various buildings constructed at the site since.
Unexploded Ordnance	Low risk.
Hydrology	Inland rivers are recorded towards the northwest and the east of Sandown Park and within a few metres to the north and east of Sandown Park.
Hydrogeology	<p>Sandown Park is located on a Principal Aquifer associated with the Kempton Park Gravel in the north and east and a Secondary A Aquifer associated with the River Terrace Deposits in the far northwest and east.</p> <p>The Bagshot Member and Claygate Formation appear to be recorded as Secondary A Aquifers whilst the London Clay Formation is recorded as Unproductive Strata.</p>
Geotechnical Hazards	<p>Significant risk of mines at The Warren in the west of Sandown Park which may also adversely affect sites 1, 2 and A.</p> <p>Up to a Moderate risk of shrinking or swelling clay and compressible deposits.</p>

Expected Ground Conditions	Site	Superficial Geology	Initial Bedrock Geology
	Site 1	-	Bagshot Formation
	Site 2	-	Bagshot Formation
	Site 3	Predominantly Kempton Park Gravel with River Terrace Deposits (undifferentiated) in the west and possible Alluvium in the far west.	Claygate Member (possibly from near surface)
	Site 4	Kempton Park Gravel	London Clay Formation
	Site 5	-	Claygate Member
	Site A	-	Bagshot Formation
	Site B - Hotel	-	Bagshot Formation in west and Claygate Member in the east
	Site C - Family enclosure	-	Claygate Member
	Site D	-	Predominantly Claygate Beds with Bagshot Formation in the southwest
	Site E1	-	Bagshot Formation
	Site E2	Kempton Park Gravel	London Clay Formation
	Site F	-	Bagshot Formation (West) Claygate Member (East)
Potential Risks to Human Health	Localised Petroleum hydrocarbon contamination associated with fuel storage containers, waste oil containers, leaks and spillages from vehicles and possible migration from the offsite former fuel filling station. Possible asbestos containing materials associated with the stables in the south and southwest of the site.		
Potential Risks to Controlled Waters	Predominantly petroleum hydrocarbon contamination as for human health.		
Risk of Soil Gases	Risk of ground gas from the historical landfill site to the north of Sandown Park especially for Site 3.		
Potential Remediation Required	Possible localised remediation associated with fuel spillages or leaks.		
Further Work	An intrusive ground investigation is recommended to assess the risk to human health and groundwater and to provide geotechnical information for foundation design. In addition, a full mining risk assessment is recommended.		

This executive summary should be read in conjunction with the main report.

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- Site Location Plan
- Plans Showing Existing Site Layout and Proposed Development Sites
- Site Photographs

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- Envirocheck Datasheets
- Index, Groundwater Vulnerability, Bedrock Aquifer, Superficial Aquifer, Source Protection Zones and Sensitive Land Use Maps
- Site Sensitivity, Borehole and Estimated Soil Chemistry Maps
- Historical Ordnance Survey and National Grid Maps



PHASE 1 GEOENVIRONMENTAL DESK STUDY REPORT

INTRODUCTION

A Phase 1 Geoenvironmental desk study has been undertaken for a number of parcels of land at Sandown Park, Portsmouth Road, Esher, KT10 9AJ. A Site Location Plan is provided in Appendix A. The Ordnance Survey National Grid reference for the centre of the site is approximately 514120, 165400.

Instructions to undertake the investigation were received from Rapleys acting on behalf of the client, Jockey Club Racecourses Ltd, in their email dated 3rd October 2018.

This report describes the desk study and walkover survey carried out by ListersGeo in order to provide an evaluation of the potential ground conditions and potential for any soil contamination at the site. The report presents a preliminary human health and groundwater risk assessment based on the findings of the desk study information, and information on the potential geotechnical conditions that may be encountered.

This report has been prepared for the sole use of the client and their professional advisors. This report shall not be relied upon by third parties without the express written authority of ListersGeo. If an unauthorised third party comes into possession of this report they must not rely on it and the authors owe them no duty of care and skill.

PROPOSALS

Outline planning application (with all matters reserved except for access to the development) for:

- Enhancement and rationalisation of existing racecourse facilities/infrastructure and car parking;
- Re-location of an upgraded children's nursery (Use Class D1);
- Development of a 150-room hotel (Use Class C1), and
- Demolition of existing buildings/structures and residential development of approximately 318 dwellings (Use Class C3).

Full planning application for:

- Racetrack widening to the southwest and east sections of the existing racecourse track, including associated ground levelling/earthworks to the southwest section, and re-positioning of fencing, and improvements to a section of the existing internal access road from More Lane, and
- New bellmouth accesses serving the development.

SITE INFORMATION AND WALKOVER SURVEY

A walkover survey of the site and its immediate surrounds was undertaken on the 10th October 2018. A selection of site photographs is provided in Appendix A along with a plan showing the existing site layout annotated with the salient features identified.

Sandown Park is situated to the north of Esher town centre and consists of a roughly triangular parcel of land measuring approximately 65ha in area.

The site generally comprised a horse racecourse across most of the northern part of the site surrounding a golf course and Kart racing track. The Grandstand is located to the south of the horse racing course with predominantly car parking to the south and east and stables to the southwest. An area known as the Warren is located on a hill to the southwest of the Grandstand and this generally comprised ancient woodland with a ski slope, gym and tree top adventure park.

The general topography of the area slopes gently down to the north with The Warren in the southwest at a higher ground level on a hill.

Sandown Park is bordered by:

Direction	Feature
North	Housing with railway track beyond
East	Station Road with golf course beyond.
South	Portsmouth Road, housing and some commercial business.
West	More Lane with housing beyond

Each individual proposed development site is discussed below.

Site 1

Site 1 is located in the southwestern corner of Sandown Park and is currently occupied by two rows of brick-built stables across a site area of approximately 0.6 acres. The stables were predominantly roofed with slate, however, a number of the stables along the south were roofed with suspected cement bound asbestos sheets.

A small adjoining storage unit was noted at the western end of the northern row of stables. There was a change in ground level of up to approximately 2m between the rows of stables in the south up to the row of stables in the north. The slope was grass covered with asphalt covered access roads to the front of each row of stables.

Further stables were noted to the east of Site 1 with housing and a pub to the south and west.

A storage yard and workshop were noted to within approximately 30m to the northwest of Site 1 on a higher ground level. Several items of plant machinery, a bunded oil storage tank, flammable liquid containers and oil drums were noted around the storage yard and workshop.

Site 2

Site 2 is located in the far south of Sandown Park. This site comprised an asphalt and gravel covered car park adjacent to a two storey hotel building toward the north of this area.

A row of brick-built stables with possible cement bound asbestos roofing were noted along this site's southwestern boundary.

This site sloped gently down towards the east.

This site is bordered by housing and some shops to the west, a paddock to the north, further car parking to the east and Portsmouth Road to the south.

Site 3

Site 3 is located to the northwest of the racecourse with a site area of 2.96 acres.

This site comprised some housing toward the centre along with an access road leading to Lower Green Road to the north and another access road roughly along its southern boundary.

Two storage yards were noted in the west of this site. Both of these storage yards contained some plant machinery including ride on lawnmowers and both had bunded oil storage tanks located with them.

In the far southwest corner of this site stockpiles of sand and wood chipping were noted.

Towards the east of this site a number of piles of vegetation for composting were noted adjacent to an allotment area.

A third storage yard is located in the eastern end of the site which contained several trailers and machinery along with some waste oil drums, part used cans of paint and a flammable liquid container.

The north of this site was occupied by mature and semi matures trees, bushes and grass.

This site was bordered by Lower Green Road to the north with housing beyond, the racecourse to the south and east and More Lane with housing beyond to the west.

Site 4

Site 4 is located in the east of Sandown Park with a site area of approximately 1.4 acres. This site is currently in use for the storage of empty bins, fencing and pallets.

The site surface is covered by a mixture of gravel and grass with semi-mature trees and bushes around its perimeter.

This site is bordered by commercial premises to the south and southwest, Station Road to the east and the racecourse to the north and northwest

Site 5

Site 5 is located toward the south of Sandown Park and measures approximately 2.3 acres.

The majority of this site is currently in use for car parking. A large puddle within a shallow depression was noted towards the eastern end of this carpark.

The car parking surface appeared to be a mixture of asphalt and compacted asphalt chippings.

Semi-mature and mature trees were noted along the carparks southern, eastern and western boundary.



A children's nursery building, asphalt covered carpark and gardens were noted in the east of this site.

This site is bordered by housing to the east, Portsmouth Road to the south with housing beyond, access road and a grassed covered area to the west and the racecourse to the north.

Site A

Site A is located to the immediate north and west of Site 2 and this comprises most of the two-storey hotel, a paddock and several stables leading toward Site 1 to the west.

Possible cement bound asbestos roofing was noted to some of the stables.

Site B - New Hotel Building

The location of the proposed new hotel site is located to the immediate northeast of the Grandstand building.

This site is part of a larger asphalt covered car park which slopes down gently to the east.

No obvious point sources of contamination were noted in this area.

This site is bordered by further car parking to the south and east, the racecourse to the north and the Grandstand building and viewing area to the west.

Site C - New Family Enclosure

The proposed family enclosure is currently occupied by temporary buildings located to the immediate Kart race track.

The track itself was asphalt with tyres along the track edge and bunding noted around the outside of the track comprising and mixture of soil and hardcore.

A possible petrol or diesel generator was noted to the northwest of track adjacent to the temporary buildings located in the northeast of Site C.

A carpark associated with the Kart racing track occupies the majority of Site C along with a Kart maintenance workshop approximately in the west of Site C.

The horse racecourse is located to the immediate north and south of this site with a golf course beyond the racecourse to the north.

A man-made reservoir was noted approximately 230m east of this site.

Site D

Site D predominantly comprised grass covered soft landscaping with an access road leading to the existing Kart Track and golf club. An asphalt covered car park associated with the golf course is located in the east of Site D.

Site E1

Site E1 is located to along the southern and western edges of Site D and comprises grass covered soft landscaping with and access road and footpaths crossing this site.



Site E2

Site E2 is located towards the northeast corner of Sandown Park and is located along the edge of the golf course. This existing surface comprised grass covered soft landscaping.

Site F

Site F is located between the Grandstand buildings and Portsmouth Road. The southern part of Site F is occupied by gravel and asphalt covered car parking with some areas of grass covered soft landscaping and several semi-mature trees. The northern part of the Site F is covered with grass.

DESK STUDY AND BACKGROUND INFORMATION

A desk study review of the site and its history has been undertaken to determine the former land usage and the potential for any historically derived sources of chemical contamination, as well as provide information to aid our geotechnical assessment.

The information provided in the desk study is obtained from independent third-party sources. We have relied on this information, but no guarantee can be given for the accuracy or completeness of the third-party data used. It should be appreciated that such data is not exhaustive and is constantly being updated and reviewed in light of new information and procedures. Therefore, improved practices, technology and new information may affect our conclusions and hence this report should be referred back to us for reassessment if new data comes to light, or changes in legislation/best practise is identified prior to development. Similarly, should the development commence after expiry of one year from publication of this report, then we recommend this report is referred back to us for reassessment.

A copy of the desk study information obtained from Landmark is presented in Appendix C of this report.

The desk study comprises a review of the following consultations and information sources:

- Environment Agency (EA)
- Natural England
- National Geoscience Information Service
- Public Health England
- Centre for Ecology & Hydrology
- British Geological Survey (BGS)
- Contemporary Trade Directories
- Historical Ordnance Survey maps
- Aerial Imagery
- Unexploded Ordnance (UXO) maps

Information from the above referenced sources has been utilised to develop a conceptual model of the site for use in the geotechnical appraisal and source-pathway-receptor risk assessment.

GEOLOGY

Published Geology

Reference to the British Geological Survey 1:50,000 scale map, sheet 270 for South London dated 1998, and other published geological information on the area indicates that the north and east of Sandown Park is underlain by Superficial geology, Kempton Park Gravel with River Terrace Deposits (undifferentiated) recorded towards the southeast and northwest of Sandown Park. Both of these Superficial Deposits are of

Quaternary age above Bedrock geology, the Claygate Member of Paleogene age and the London Clay Formation in the northeast. No Superficial Deposits were recorded above the Claygate Member across the middle of Sandown Park. However, the Claygate Member is recorded to be overlain by the Bagshot Formation of Paleogene age in the southwest.

Made Ground is recorded to within approximately 30m to the north of Sandown Park associated with the railway track and to within approximately 20m to the south of Site 4 in the east associated with the A307 road.

In addition, Alluvium is recorded to within a few metres to the northwest of Sandown Park which may also encroach on to Site 3 in the northwest of Sandown Park.

Superficial Deposits

The Kempton Park Gravel and the River Terrace Deposits (undifferentiated) are both generally represented by sand and gravel, locally with lenses of silt, clay or peat occurring up to 3m or 4m in this area.

The nearby Alluvium is generally represented by normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may also be present.

Bedrock

The Bagshot Formation is generally composed of pale yellow-brown to pale grey or white, locally orange or crimson, fine to coarse grained sand that is frequently micaceous and locally clayey, with seams of gravel, occurring up to 35m in thickness in this area, although considered likely to much thinner at its feathering edge at Sandown Park.

The Claygate Member comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt occurring up to 28m in thickness in this area. Ferruginous concretions and septarian nodules may occur in places.

The London Clay mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay occurring up to 140m in this area.

The following table provides a summary of the expected geological strata at each individual development site.

Site	Superficial Geology	Initial Bedrock Geology
Site 1	-	Bagshot Formation
Site 2	-	Bagshot Formation
Site 3	Predominantly Kempton Park Gravel with River Terrace Deposits (undifferentiated) in the west and possible Alluvium in the far west.	Claygate Member (possibly from near surface)
Site 4	Kempton Park Gravel	London Clay Formation
Site 5	-	Claygate Member
Site A	-	Bagshot Formation

Site B - Hotel	-	Bagshot Formation in west and Claygate Member in the east
Site C - Family enclosure	-	Claygate Member
Site D	-	Predominantly Claygate Beds with Bagshot Formation in the southwest
Site E1	-	Bagshot Formation
Site E2	Kempton Park Gravel	London Clay Formation
Site F	-	Bagshot Formation (West) Claygate Member (East)

Historical Boreholes

The British Geological Survey holds records of exploratory holes historically put down during previous investigations. The records of one historical borehole put-down towards the centre of Sandown Park and two put-down a few metres to the north and northwest have been reviewed to aid the preliminary assessment of the ground conditions.

The borehole put-down towards the centre of Sandown Park was a water well drilled in 2008 to a depth of 180m. This revealed the underlying soils to comprise a 0.4m layer of Topsoil overlying River Terrace Deposits (sand) to 1.0m above the Claygate Beds to 4.5m which in turn overlay the London Clay Formation to a depth of 89m. The Lambeth Group were then recorded to 115.5m overlying the Thanet Sands to 124m which in turn overlies the Upper Chalk to the base of the borehole. Monitoring undertaken as part of this borehole recorded groundwater at depths of between 9.8m and 18.5m.

The two boreholes put-down a few metres to the north and northwest of Sandown Park were drilled in 1963 using a cable percussive drilling rig to a maximum depth of 7.0m. These boreholes recorded Topsoil down to depths of 0.20m and 0.50m overlying medium dense and dense sandy gravel to the base of one borehole at 4m and a depth of 5.2m in the other borehole overlying very stiff fissured blue-grey silty clay.

HISTORY OF THE SITE

The history of the site has been assessed by reviewing the historical Ordnance Survey maps, on-line information sources and aerial imagery of the area, collected as part of the desk study information. This has revealed the following:

Time Period	Historical Usage of the Site	Historical Usage of the Surrounding Area
1871 - 1885	<p>The Sandown Park area predominantly comprised agricultural fields.</p> <p>Farm buildings were shown in in the approximate area of Site 5 with a possible pond immediately north of this area.</p> <p>Two houses were noted in the northwest (Site 3). Woodland was shown at to the north of Site 1 and this area was labelled The Warren.</p>	<p>An east to west running railway track is located approximately 20m north of Sandown Park with the train station noted only a few metres to the northeast. An Old Paper Mill is labelled approximately 300m northwest of the site.</p> <p>Housing is shown to the southwest, northwest and southeast of the site.</p> <p>An engine house was shown immediately southwest of the site and a blacksmith is located approximately 40m south of Site 1.</p>
1896-1913	<p>The Sandown Park area has been developed as a horse racing track with the Grandstand building and associated smaller buildings located towards the south of the site, large stable in the west, paddock in the far south with a row of small stables along the southwestern site boundary and racecourse around the majority of the remaining site area.</p> <p>The previously noted farm buildings in the east of the site are no longer shown.</p>	<p>Additional housing is shown within a few metres to the southeast of Sandown Park.</p> <p>A sewage works is located 500m northwest of the Site 3.</p>
1932-1948	<p>Serval rectangular buildings are shown towards the centre of Sandown Park.</p>	<p>Further housing has been constructed to the south and west of the Sandown Park.</p>
1956-1962	<p>Some additional small building (probable stables) are shown toward the south of the site.</p>	<p>A garage (possible fuel filling station) and electricity substation are shown to within approximately 10m to 30m south of the eastern end of Sandown Park (Site 4).</p> <p>A Bookbinding Works is shown approximately 230m north of the northwestern part of the site (Site 3).</p>

Time Period	Historical Usage of the Site	Historical Usage of the Surrounding Area
1974 -1987	<p>The Grandstand appears to have been redeveloped and now comprises a single large building with parade ring to the south and car parking further south.</p> <p>A golf course and golf range including building are shown within the race track toward the north of Sandown Park.</p> <p>A ski slope and building have been constructed at The Warren in the west of the Sandown Park.</p> <p>By 1975 reservoir has been constructed towards the east of the site.</p>	<p>On the 1975 map a depot is shown to within a few metres to the south of the eastern part of Sandown Park (between Site 4 and Site 5) and a garage is shown immediately east of the most eastern point of the Sandown Park (Site 4).</p>
1992-1999	<p>Additional buildings have been constructed at The Warren to the north of Site 1.</p>	<p>No obvious significant changes.</p>
2006	<p>A race track associated with the Karting has been developed in the centre of Sandown Park.</p>	<p>No obvious significant changes.</p>

UNEXPLODED ORDNANCE AND BOMB SITES

The Zetica bomb risk map shows that the site is located in an area where there is a low risk of unexploded ordnance. Low-risk regions are those with a bombing density of up to 10 bombs per 1000 acres. In general, further action to mitigate the risk is considered prudent, although not essential. Care is required when assessing the risk for specific sites where the risk may be higher because of local wartime activity, which may also include the storage or burial of 'friendly' UXO.

HYDROLOGY

Inland rivers are recorded towards the northwest and the east of Sandown Park between the golf course and Site 3 and within a few metres to the north and east of Sandown Park.

In addition, a man-made reservoir is present towards the centre of the site within a few metres to the east of the existing Karting track.

The Environment Agency's Catchment Data Explorer show the majority of the site falls within the Mole Catchment, indicates Moderate water body classification whilst the south of the site falls within the Rythe Catchment which indicates a Poor water body classification. Both of these results were recorded in 2016.

The Envirocheck data indicates that the north and part of the east of Sandown Park is shown to lie within a Zone 2 floodplain. These floodplains only appear to effect Site 3 and Site 4. However, it is understood that a separate site-specific Flood Risk Assessment (FRA) is being undertaken to support the planning application at the site.

There are no current surface water abstraction licenses located within 500m of the site.

HYDROGEOLOGY

Information obtained from the Environment Agency indicates that Sandown Park is located on a Principal Aquifer associated with the Kempton Park Gravel in the north and east and a Secondary A Aquifer associated with the River Terrace Deposits in the far northwest and east.

The Bagshot Member and Claygate Formation appear to be recorded as a Secondary A Aquifer whilst the London Clay Formation is recorded as Unproductive Strata.

The aquifer designation data is based on geological mapping provided by the British Geological Survey. The maps are divided into two different types of aquifer designation:

- **Superficial (Drift)** - permeable unconsolidated (loose) deposits. For example, sands and gravels.
- **Bedrock** - solid permeable formations e.g. sandstone, chalk and limestone.

For each type there are Principal, Secondary A, Secondary B and Unproductive Strata, each with a decreasing rank of importance.

There is one current groundwater abstraction license located within 500m of the site. This licence is owned by Arcadis Gergahty and Miler International Ltd 32m east of Site 4 for pollution remediation purposes.

According to information provided by the Environment Agency each of the proposed development sites at Sandown Park are outside of any Source Protection Zones (SPZ). An SPZ is a protection zone placed around a well or borehole that supplies groundwater of potable quality.

WASTE TREATMENT AND LANDFILL SITES

Reference to records indicates that there are two historical landfill disposal sites within 500m of the site. These are both recorded between 185m and 193m north of Site 3. It is likely that both maybe related to the same landfill site. The deposited waste included inert, commercial, industrial and household waste and the last input date was 1994.

Given the distance, topography and local geology in the area, which comprises relatively permeable Kempton Park Gravel and River Terrace Deposits in this area, it is considered possible that these landfill sites may pose a significant risk to the Site 3, however, in our opinion the proposed development can move forward subject to an intrusive investigation and appropriate remediation strategy being secured by an appropriately worded planning strategy. The remaining proposed development sites at Sandown Park are located in excess of 500m from the historical landfill sites and are therefore not considered to be at significant risk.

Reference to records from the BGS, the Environment Agency and the Local Authority indicates that there is one waste transfer site, one waste management facility and no waste treatment sites within 500m of the site area. It is considered unlikely that any of these facilities would significantly affect the site area, as these are located 437m and 435m northwest of development Site 3 and therefore also nearly 1km from the other sites.

ENVIRONMENTAL PERMITS, INCIDENTS AND REGISTERS

There have been no substantiated or recorded pollution incidents to controlled waters, land or air within 250m of the site.

There are no Integrated Pollution Control Licenses or Integrated Pollution Prevention and Control (IPPC) licenses within 1000m of the Sandown Park.

INDUSTRIAL USAGE SITES

There are twenty-five past or present trade directory entries that have been identified within 250m from Sandown Park. These include an inactive agricultural engineer recorded in the south of Sandown Park at the Grandstand building.

The remaining past and present trade directory entries included a pumps sales, service and repairer (9m west of Site 4), cycle manufacturer (10m south of Site 2), inactive dry cleaners (26m south of Site 2) and garden machinery sale and servicer (14m south of Site 4).

The nearest active fuel filling station is in excess of 500m from the Sandown Park. However, an obsolete fuel filling station is recorded 36m east of the site close to Site 4.

Historical Site Usage

According to the historical site maps Sandown Park has predominantly been in use as a horse race track since 1897. However, it is understood that Sandown park actually opened in 1875.

RADON GAS

Desk study information indicates that the site lies within an area where less than 1% of homes exceed the action level of 200Bq/m³ for radon gas. Therefore, in accordance with BR 211, 'Radon: guidance on protective measures for new dwellings', no radon protection measures are necessary in the construction of new dwellings or extensions without underground rooms at Sandown Park.

POTENTIAL GEOTECHNICAL HAZARDS

Geological

The risk of naturally occurring geotechnical hazards at the site is recorded in the Envirocheck report to be as follows:

Ground Stability Hazard	Hazard Potential Rating	Comments
Collapsible deposits	No hazard and Very Low	Very Low associated with the Bagshot Formation
Compressible deposits	No Hazard, Very Low and Moderate	Moderate associated with possible Alluvium encroaching in to Site 3 in the far northwest.
Ground dissolution from soluble rocks	No Hazard	-
Shrinking and swelling clays	No Hazard, Low and Moderate	Moderate associated with London Clay Formation in northeast of Sandown Park
Landslides	Very Low	Associated with Bagshot Formation
Running sand	No Hazard, Very Low and	Low hazard associated with Bagshot



Ground Stability Hazard	Hazard Potential Rating	Comments
	Low	Formation in south of Sandown Park

Mining

The desk study information identified that Sandown Park lies 158m north of an area classified as a Highly Likely Non-Coal Mining Area of Great Britain.

Two Man-Made Mining Cavities are recorded within 500m of the Sandown Park.

One Man-Made Mining Cavity is recorded in The Warren to the north of Site 1 and the commodity mined was sandstone from the Bagshot Formation.

The second Man-Made Mining Cavity is recorded 145m south of the Sandown Park, which is recorded as an Adit Entry Pillar and Stall Sand Mine for sandstone from the Bagshot member.

Further information regarding possible Man-Mining Cavities in Esher was found within the Chelsea Speleological Records Volume 3. This established that an underground cavity was revealed during trial boring at the location of the proposed Post Office in Esher High Street in 1955. This is understood to be located approximately 200m south of Sandown Park. In addition, alleged tunnels are also understood to have been found beneath a chemist's shop in Church Street and a garage. Church Street is located approximately 100m south of Sandown Park's southwestern boundary.

These records also indicate that part of Portsmouth Road is said to have collapsed and that tunnelling was also found nearby at Sandown Park, but no further information regarding the location of these were provided. The records also stated that a tunnel 'half a mile long has been found which connected to Hampton Court Palace'.

Additional information is understood to be available within Volume 5 of the Chelsea Speleological Records and therefore it is recommended that a copy of this is obtained for review prior to finalising an intrusive investigation.

In our opinion the above could if necessary be addressed by an appropriately worded planning strategy.

BACKGROUND SOIL CHEMISTRY

Information from the BGS is provided in the table below listing the background soil chemistry of some inorganic elements in the natural soils in the site area:

Contaminant	Level in Rural Soil (mg/kg)
Arsenic	<15
Cadmium	<1.8
Chromium	60-90
Lead	Up to 300
Nickel	15-30



With the exception of lead these concentrations are below the generic assessment criteria (GACs) for a residential site.

POTENTIALLY SENSITIVE LAND USES

Sandown Park is located within an Area of Adopted Greenbelt and is located within a broader nitrate vulnerable zone.

In addition, the area known as The Warren to the north of Site 1 is located within an area of ancient woodland.

CONCEPTUAL SITE MODEL

A preliminary qualitative risk assessment has been carried out using the source-pathway-receptor principle to create a Conceptual Site Model (CSM). It is understood that the development proposals are for residential developments with gardens, a hotel and a race day family enclosure.

Potential sources of contamination and potential receptors have been assessed using the Contaminated Land Exposure Assessment (CLEA) Guidelines. This takes into account the fact that a complete pathway must exist between a potential source of contamination and a potential receptor for there to be considered a risk.

POTENTIAL SOURCES OF SOIL OR GROUNDWATER CONTAMINATION

The results of the desk study and walkover indicate that the following potential sources of soil or groundwater contamination are present at or in close proximity to the site:

- Made Ground associated with existing and previously existing buildings across Sandown Park.
- Petroleum hydrocarbon contamination and possible other chemicals associated with spillages or leaks from the bunded oil storage tanks, oil drums, generator and other storage containers identified to the north of Site 1, in the east and west of Site 3 and to the northwest of the Karting Track.
- Petroleum hydrocarbon contamination associated with leaks from vehicles parked or maintained at the site in particular the areas currently being used as car parking including parts of Site 2, Site 3, Site 5, the karting track and the proposed new hotel.
- Possible asbestos containing materials associated with the stable roofs identified in sites 1 and 6.
- Potential migration of petroleum hydrocarbon contamination from the former petrol filling station recorded 36m south of Site 4 in the east of Sandown Park. Although this is recorded to have been remediated.

POTENTIAL SOURCES OF GROUND GAS CONTAMINATION

In consideration of the source-pathway-receptor methodology for ground gas risk assessment set out in CIRIA C665, the sensitivity of the development is considered to be moderate.

We have provisionally assessed the risk of ground gas impacting the site, by reference to the CL:AIRE research bulletin RB17, "A pragmatic approach to ground gas risk assessment" 2012.

The following potential sources have been assessed:

- A credible source and pathway for landfill gas migration from an off-site landfill has been identified for Site 3 in the northwest of Sandown Park.
- The site has not been a registered landfill.
- Any Made Ground present is not expected to be 5m deep or an average of 3m in thickness.

- Radon protection measures are not required at Sandown Park.
- The site may lie on a potential naturally organic soil associated with possible Alluvium encroaching in to the northwest of Site 3.

Therefore the following potential sources of ground gases have been identified for Site 3:

- Migrating soil gases
- Explosive gases

RECEPTORS

The following most sensitive receptors have been identified at the site:

Human Health

- End users of the site - the future residents/workers
- Surrounding residents
- Construction workers

Environmental

- Controlled Waters – Sandown Park is located on a Principal Aquifer associated with the Kempton Park Gravel in the north and east and a Secondary A Aquifer associated with the River Terrace Deposits in the far northwest and east.
- Controlled Waters - Inland rivers in the northwest and the east of Sandown Park and also within a few metres to the north and east of the Sandown Park.
- The Adopted Green Belt in which Sandown Park is located within and the Ancient Woodland at The Warren in the west of Sandown Park.

Infrastructure

- Substructures
- Water supply pipes

PATHWAYS

It is considered that a number of potential pathways exist between these potential sources and the above identified receptors.

For the human receptors these include:

- Direct soil ingestion in areas of exposed soil
- Ingestion of soil attached to home-grown fruit and vegetables
- Ingestion of fruit and vegetables with contamination uptake

- Inhalation of indoor and outdoor vapours and dust
- Dermal contact with contaminated soil
- Inhalation of soil gases or vapours migrating through permeable strata into the building

For controlled waters and the environmental receptors the pathways include:

- Migration of contaminants through the unsaturated zone
- Migration of contaminants through the groundwater
- Movement of contaminants through drains or services runs
- Run-off to the onsite and nearby watercourses

For the infrastructure the pathways include:

- Leachable or corrosive contaminants within the soil
- Leachable or corrosive contaminants within the groundwater

SUMMARY OF ENVIRONMENTAL RISK

Desk Study research has identified several potential contamination sources on the site including bunded oil storage tanks, oil drums, generator and other storage containers identified to the north of Site 1, in the east and west of Site 3 and to the Kart Track and Kart workshop at Site C. In addition, possible cement bound asbestos roofing was noted at sites 1, 2 and A. Based upon the findings of the Conceptual Site Model (CSM), it is considered possible that soils and groundwater below some localised parts of Sandown Park may be contaminated.

In addition to the above there is a significant risk from ground gases associated with the nearby historical landfill site to the north which may affect Site 3 in the northwest of Sandown Park. Given the distance of the remaining proposed development sites, around Sandown Park, from the historical landfill sites, these are not considered to be a significant risk from ground gases.

Although the site lies within an area where less than 1% of homes exceed the action level of 200Bq/m³ for radon gas and therefore radon protection measures are not necessary in the construction of new dwellings any proposed basements may require radon protection measures.

For proposed housing there is a high risk to human health from the above sources of contamination via direct contact of contaminated soil, ingestion or inhalation of vapours and gases. For proposed apartments there is considered to be a moderate risk to human health and for the hotel and family enclosure there is considered to be a low risk to human health.

Parts of Sandown Park, including Site 3, are located above Principal and Secondary A Aquifers. Therefore possible petroleum contamination from oil storage tanks may pose a significant risk to controlled waters in these areas.

Japanese Knotweed was identified in The Warren. However, this is located out of the development and it is evident by the fencing and warning sign around this that it is currently being controlled by an invasive species specialist.

GEOTECHNICAL CONCEPTUAL SITE MODEL

Given the variation in geology across the Sandown Park, each site has been discussed below separately.

Site 1

Site 1 is recorded to be underlain by the Bagshot Formation and as such may be suitable for conventional foundations or relatively shallow piled foundations required for buildings up to three storeys in height.

Given the Bagshot Formation is normally represented by sand then a soakaway drainage solution may be possible.

However, should shallow groundwater be present within the Bagshot Formation then there is a potential for running sands.

It should be noted that a man-made mining cavity is recorded towards the centre of The Warren to the north of Site 1. It should also be noted that as the site is named The Warren, this may be related to a network of underground mines. Therefore, it is recommended that further information regarding the recorded mine at this site should be investigated and a mining risk assessment should be undertaken.

Site 2 & Site A

Site 2 and Site A are recorded to be underlain by the Bagshot Formation and as such may be suitable for conventional foundations or relatively shallow piled foundations required for buildings up to three storeys in height. However, a four storey building would likely require a deeper piled foundation solution.

Given the Bagshot Formation is normally represented by sand then a soakaway drainage solution may be possible.

However, should shallow groundwater be present within the Bagshot Formation then there is a potential for running sands to be encountered.

Site 3

Site 3 is recorded to be predominantly underlain by the Kempton Park Gavel and Claygate Member which may be suitable for conventional foundations or relatively shallow piled foundations required for buildings up to three storeys in height. However, Alluvium appears to be recorded beneath the far west of this site and would not be sufficiently competent for shallow foundations if present to a significant depth.

The Claygate Member is normally a shrinkable soil and therefore there is a risk of desiccated soils where vegetation is present.

The Kempton Park Gravel and potentially the Alluvium may be amenable to a soakaway drainage solution but if groundwater was encountered at shallow depth then running sands may be a problem. The Claygate Member is unlikely to be amenable to a soakaway drainage solution.

Site 4

Site 4 is recorded to be underlain by the Kempton Park Gravel over the London Clay Formation. However, as it is currently proposed to construct an apartment block up to six storeys with basement carpark, a deep piled foundation solution will be required.

The Kempton Park Gravel is likely to be amenable to a soakaway drainage solution, however, should shallow groundwater be encountered then there is a potential for running sands at this site.

Site 5

Site 5 is recorded to be underlain by the Claygate Member, which may be suitable for conventional foundations or relatively shallow piled foundations required for buildings up to three storeys in height. However, a deeper piled foundation solution is likely to be required for the taller buildings.

Given the fine grained nature of the Claygate Member which is normally relatively impermeable an alternative to soakaways is likely to be required for drainage.



The Claygate Member is normally a shrinkable soil and therefore there is a risk of desiccated soils where vegetation is present.

Site B - New Hotel

The location of the proposed hotel appears to be above the boundary between the Claygate Member and Bagshot Formation. As the proposed hotel is to be up to six-storeys in height a deep piled foundation solution will be required.

The Bagshot Formation may be amenable to a soakaway drainage solution however the Claygate Member is unlikely to be sufficiently permeable for soakaways.

Depending on groundwater levels running sands may be a risk with the Bagshot Formation whilst desiccated clay may be an issue where vegetation is present.

Site C - Family Enclosure

The family enclosure is located above the Claygate Member which should be suitable for conventional foundations for low level buildings if proposed in this area.

However, the Claygate soils are unlikely to be amenable for a soakaway drainage solution.

Site D

Site D is shown to be predominantly located above Claygate Beds with Bagshot Formation shown in the southwest. As it is proposed to use this as carparking CBR testing will be required to design areas of hardstanding.

Site E1

Site E1 is shown to be located above the Bagshot Formation which should be amenable to the earthworks required for the track widening.

Site E2

Site E2 is located above the Kempton Park Gravel over the London Clay Formation which should be amenable to the earthworks required for the track widening.

Site F

Site F is located across the boundary between the Claygate Member (east) and the Bagshot Formation (west) both of which should be amenable to resurfacing for the proposed new car parking.

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER WORK

Based on the desk study research, several of the sources, pathways and receptors listed in the CSM are considered to have the potential to be present as complete pollutant linkages.

Due to the potential source of contamination and the proposed developments at each site we would recommend an intrusive investigation be undertaken at each site.

Based on the current proposals and existing site uses we would recommend the following are undertaken to assess the risk from contamination, ground gases, the design of building foundations and inform drainage solution recommendations.

Site Number	Cable percussive boreholes	Continuous Tube Sample Boreholes	Machine Excavated Trial Pits	Number of BRE Soakaway Tests
One	1x 15m	3x 6m	3x 3.5m	1 x pit
Two	2x 15m	9x 6m	3x 3.5m	1 x pit
Three	3x 15m	6x 6m	8x 3.5m	2 x pits
Four	2x 25m	3x 6m	8x 3.5m	2 x pits
Five	2x 20m	6x 6m	8x 3.5m	2 x pits
A	-	6x3m	6 hand excavated CBR pits	
B- New Hotel	2x25m	6x6m	Machine excavated trial pits & BRE soakaways replaced by continuous tube sample boreholes & infiltration testing in standpipes	
C – Family enclosure	-	6x3m		
D	-	-	6x3.5m including CBR testing	
E1 & E2		6x6m	-	
F	-	-	8x3.5m including soakaways and CBR testing	

In addition to the above a range of soil contamination testing should be undertaken at each site to assess the potential risk to human health and groundwater from the contamination sources

We would also recommend CBR testing to assist with road and car park design at each site along with groundwater and gas monitoring on at least three occasions.

Although it is not proposed to redevelop The Warren, it is recommended that the underground mines recorded in this area are further investigated to establish if these are likely to extend beneath the proposed development sites.

In our opinion the proposed development can move forward subject to an intrusive investigation and appropriate remediation strategy being secured by an appropriately worded planning strategy to address the potential risks to human health, controlled waters and the potential for shallow mine workings at this site.

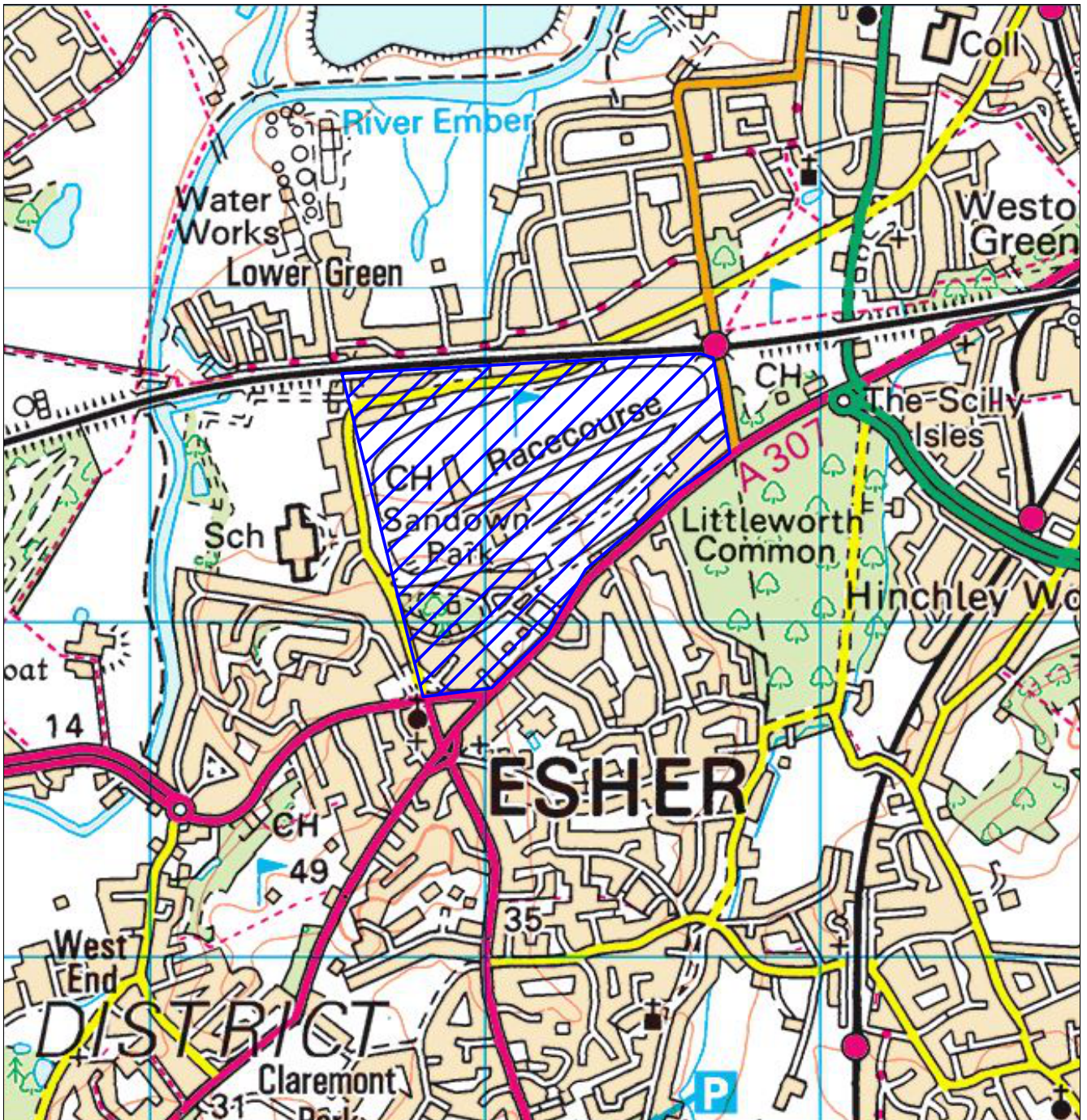
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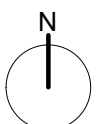




APPENDIX A PLANS AND PHOTOGRAPHS

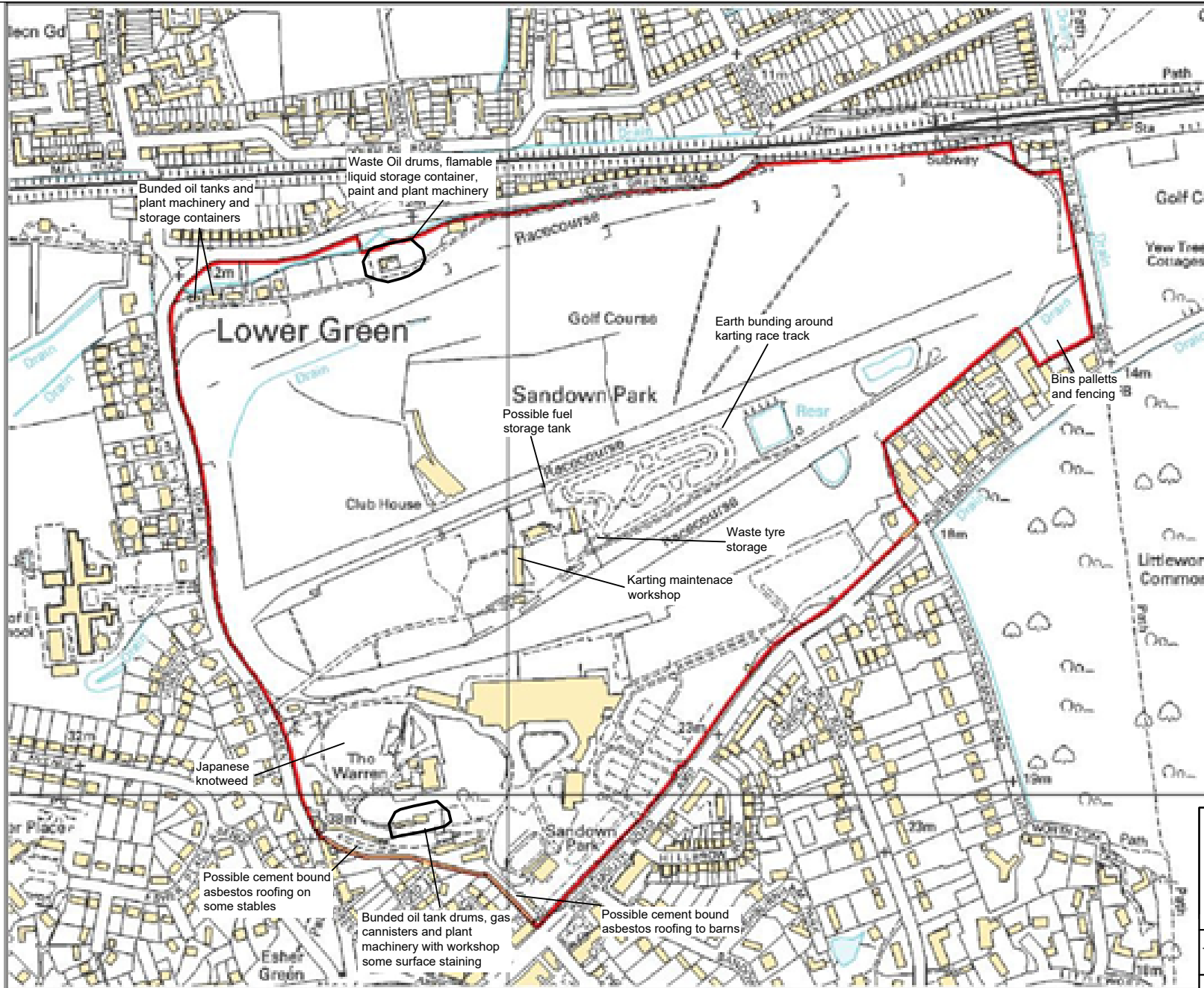
Extract of 1:50,000 Ordnance Survey Explorer Map



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Key:		Approximate Site Location
 LISTERS GEO Geotechnical and Geoenvironmental Consultants		
<small>Listers Geotechnical Consultants Ltd www.listersgeotechnics.co.uk Tel: 01327 860060</small>		
Title:	Site Location Plan	
Site:	Sandown Park, Portsmouth Road, Esher, KT10 9AJ	
Scale: NTS	Job No: 18.10.006	Drawn By: HC



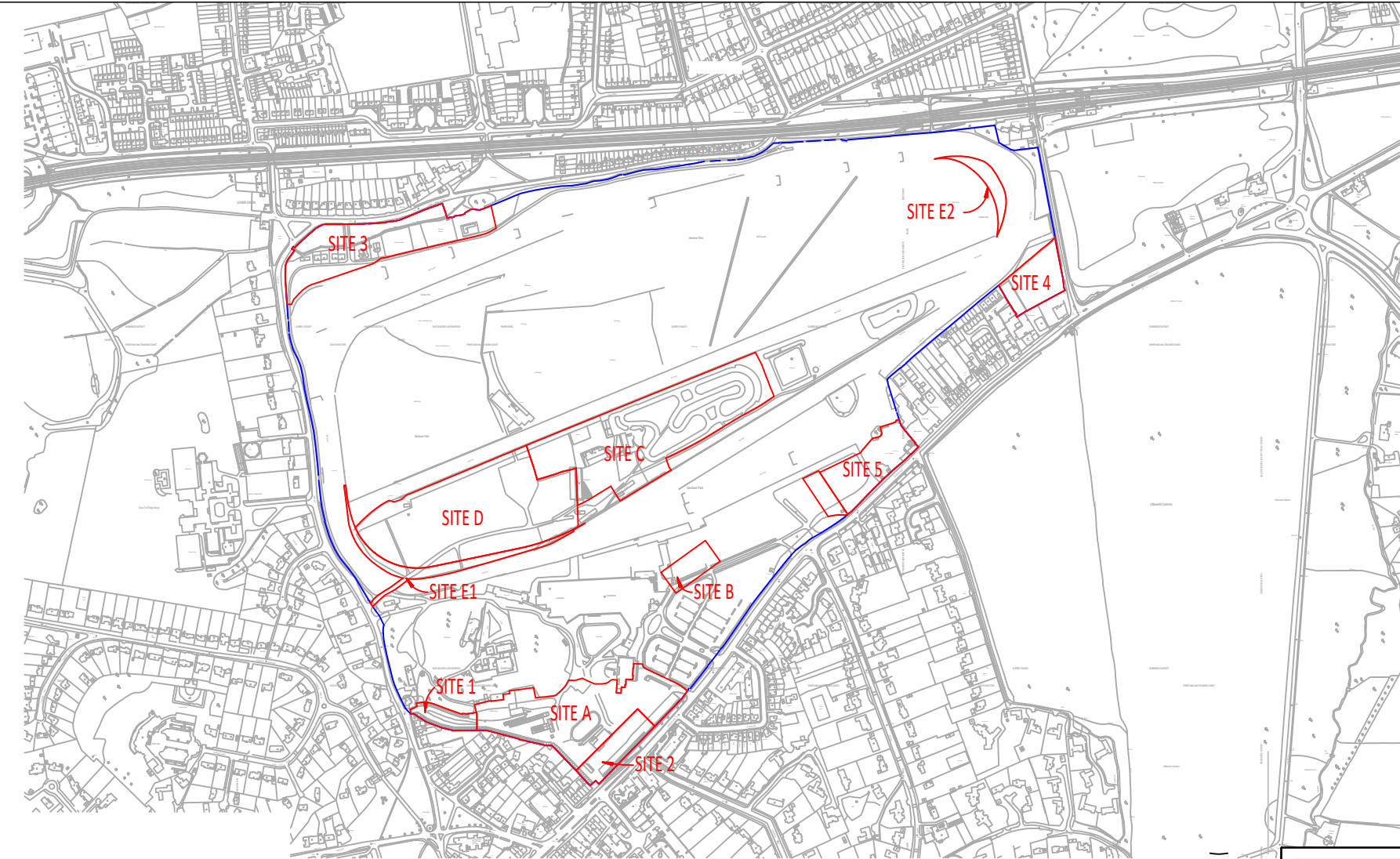
LISTERS GEO
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Title: Existing Site Layout

Site: Sandown Park, Portsmouth Road, Esher, KT10 9AJ

Scale: NTS Job No: 18.10.006 Drawn By: HC



Existing Site Location Plan Showing Development Areas

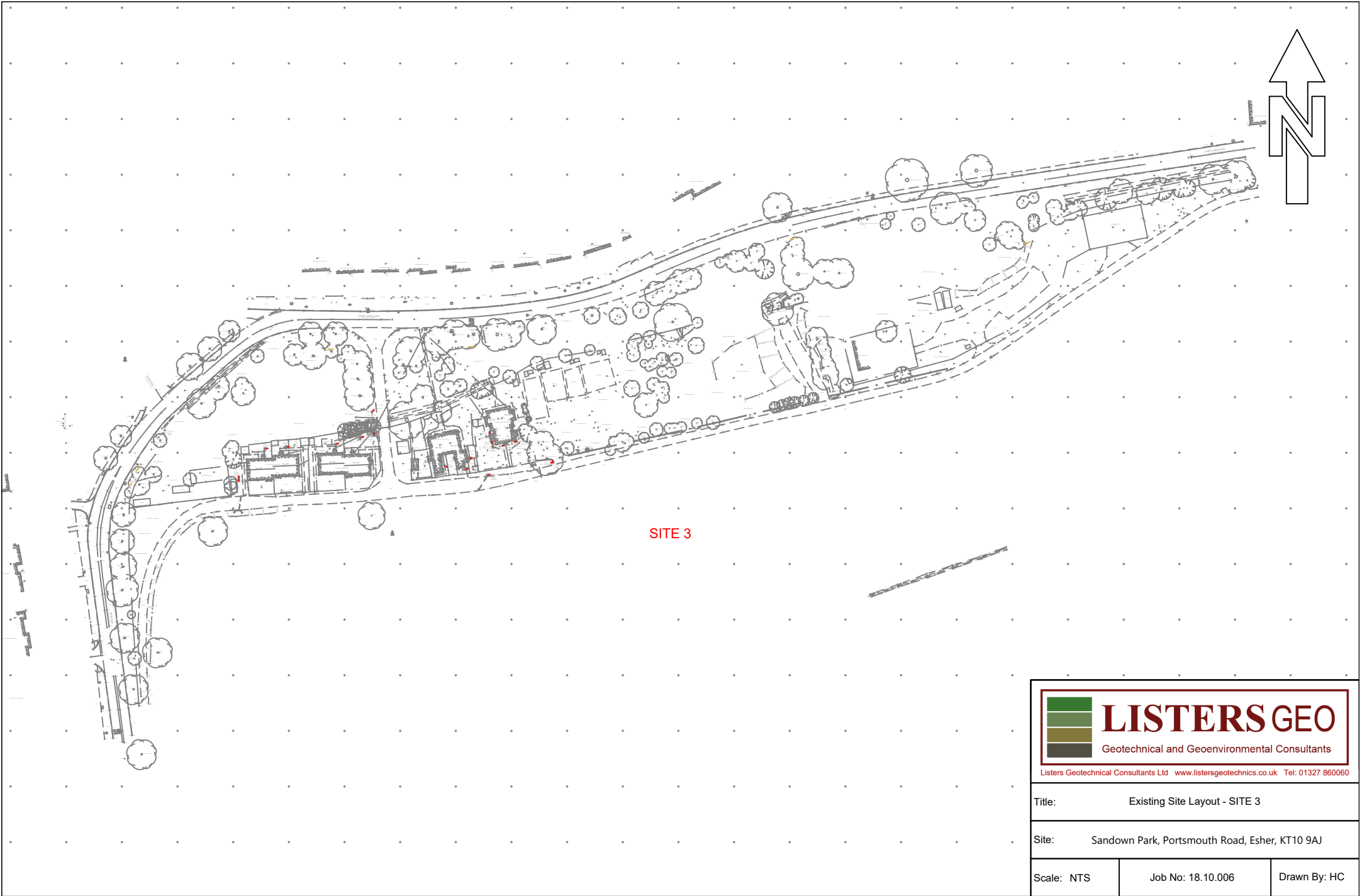

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Title: Existing Site Location Plan Showing Development Areas

Site: Sandown Park, Portsmouth Road, Esher, KT10 9AJ

Scale: NTS	Job No: 18.10.006	Drawn By: HC
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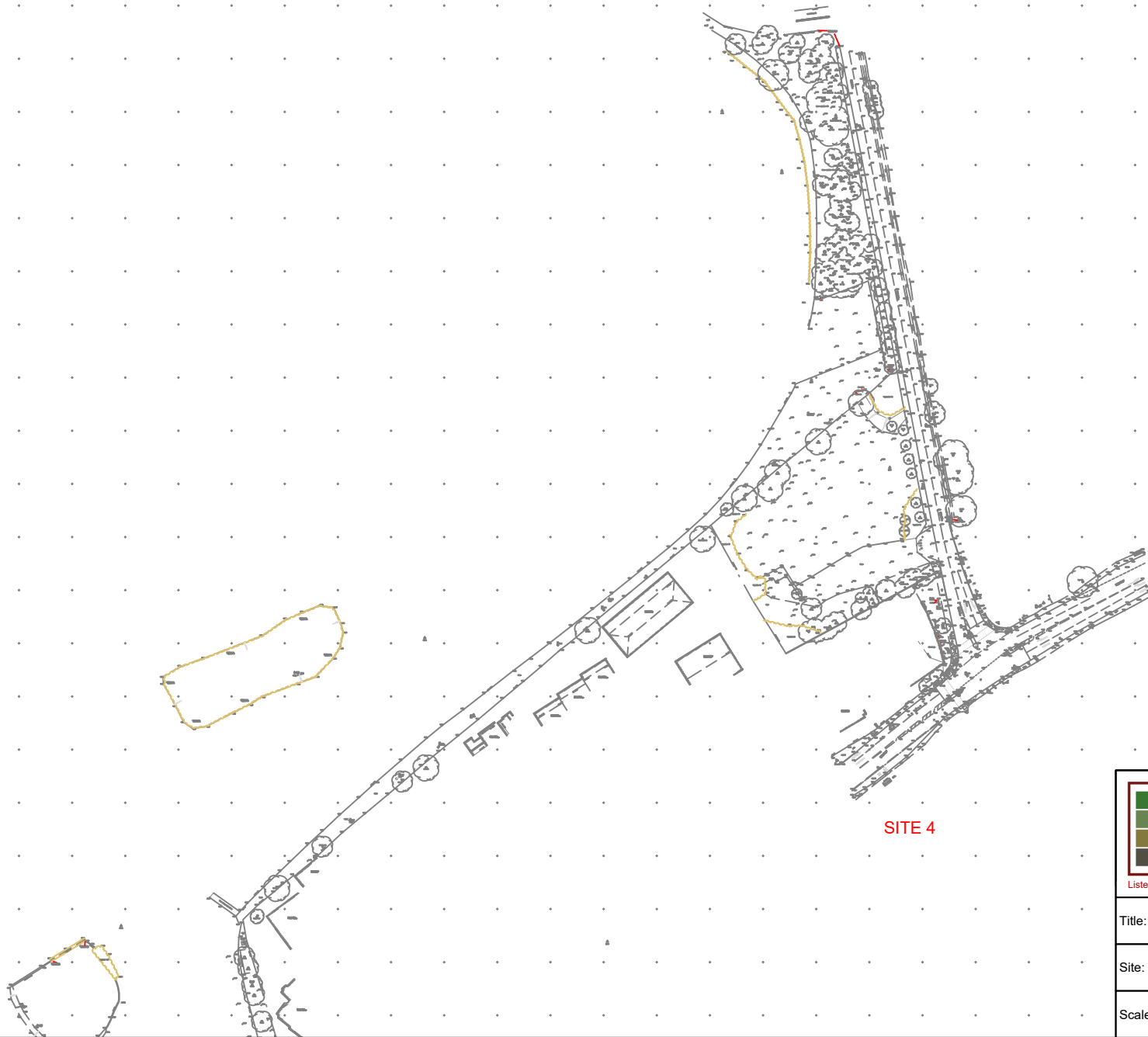
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Title: Existing Site Layout - SITE 3

Site: Sandown Park, Portsmouth Road, Esher, KT10 9AJ

Scale: NTS	Job No: 18.10.006	Drawn By: HC
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SITE 4

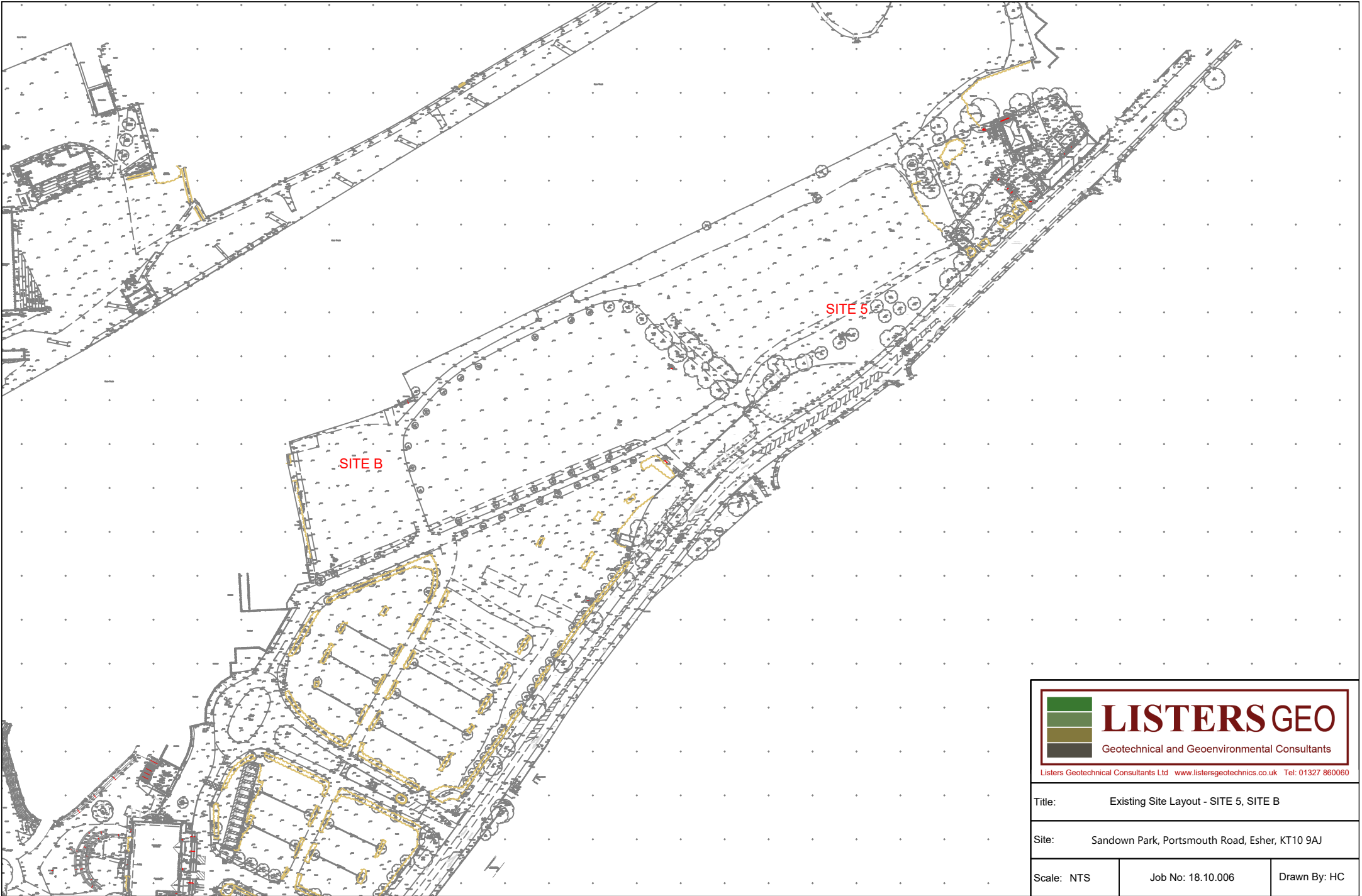
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Title: Existing Site Layout - SITE 4

Site: Sandown Park, Portsmouth Road, Esher, KT10 9AJ

Scale: NTS	Job No: 18.10.006	Drawn By: HC
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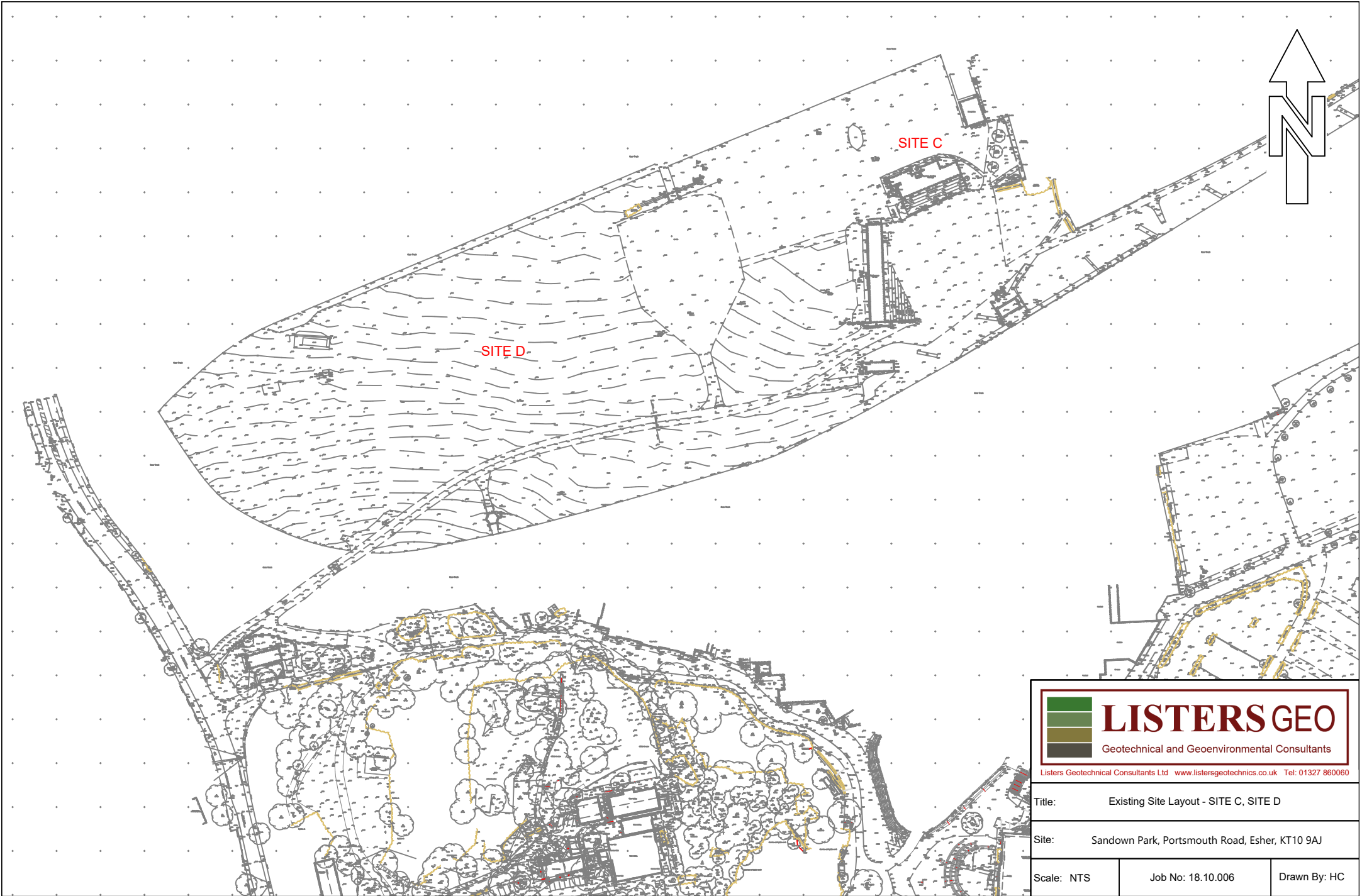
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Title: Existing Site Layout - SITE 5, SITE B

Site: Sandown Park, Portsmouth Road, Esher, KT10 9AJ

Scale: NTS	Job No: 18.10.006	Drawn By: HC
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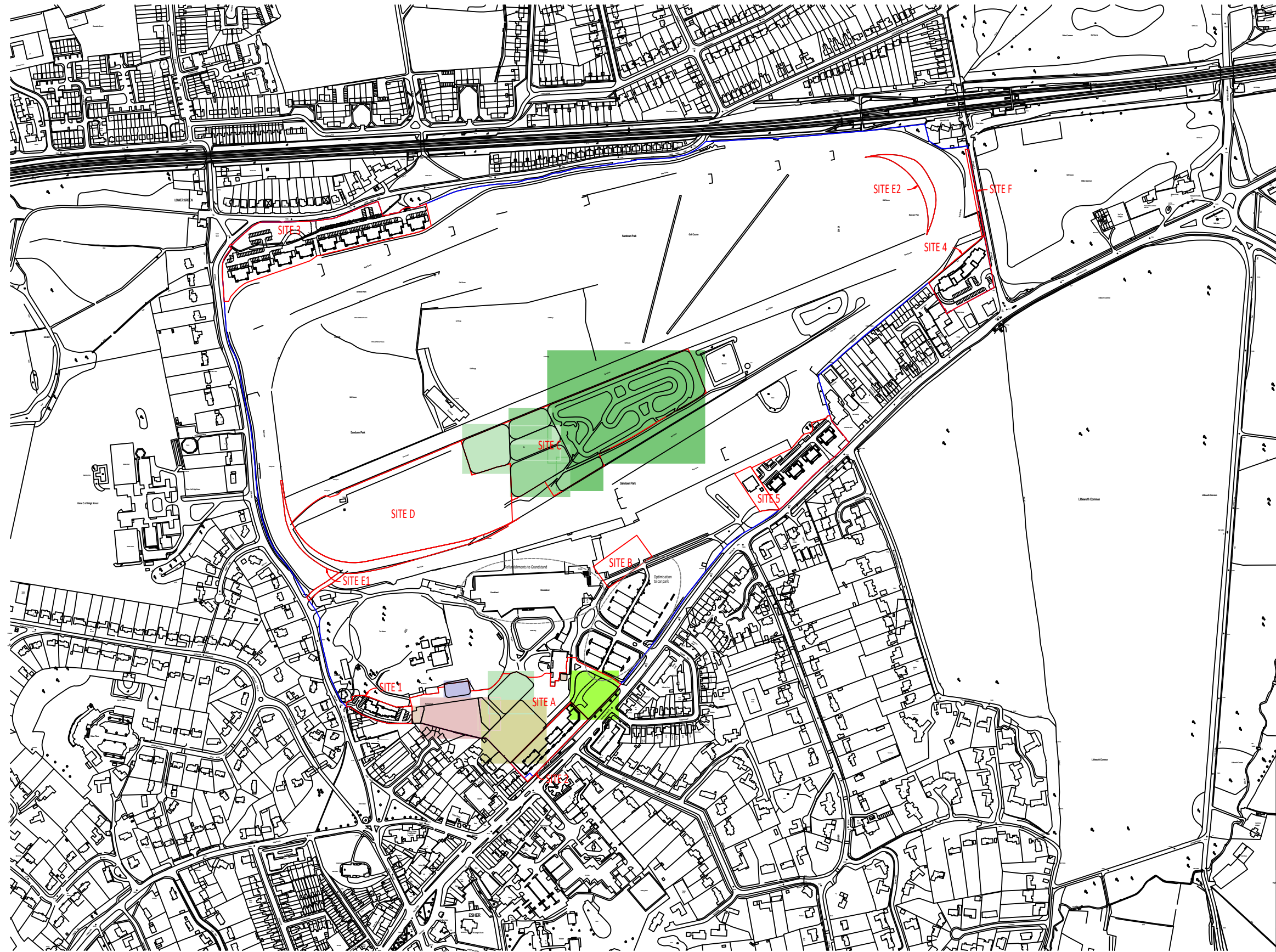
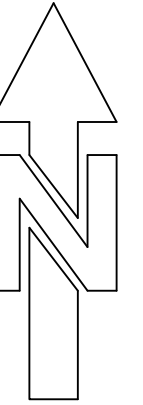
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Title: Existing Site Layout - SITE C, SITE D

Site: Sandown Park, Portsmouth Road, Esher, KT10 9AJ

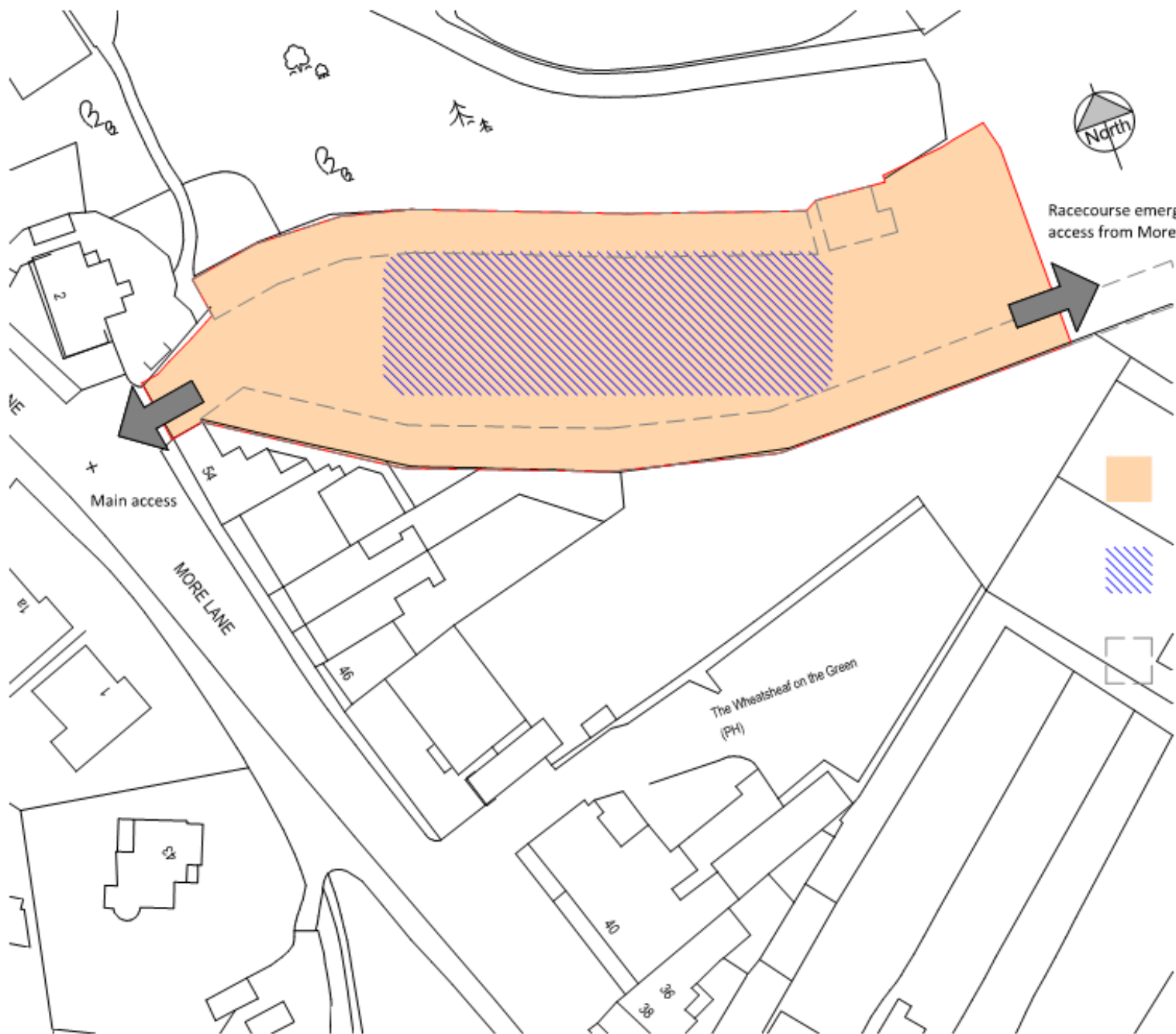
Scale: NTS	Job No: 18.10.006	Drawn By: HC
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Site Master Plan



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Title:	Proposed Master Plan Site Layout	
Site:	Sandown Park, Portsmouth Road, Esher, KT10 9AJ	
Scale: NTS	Job No: 18.10.006	Drawn By: HC



Racecourse emergency access from More Lane

Main access

MORE LANE

The Wheatsheaf on the Green (PH)



Residential development area, including buildings up to 4.65m (44.45m AOD) equivalent to 1 storey above ground level (assuming ground level at 39.8m AOD), associated landscaping and car parking.



Maximum building height of 10.95m (50.75m AOD) equivalent to 3 storeys above ground level.



Existing buildings demolished.

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Title: Site 1 Parameter plan

Site: Sandown Park, Portsmouth Road, Esher, KT10 9AJ

Scale: NTS Job No: 18.10.006 Drawn By: HC