

Our Ref:14094/JL
28th July 2014

Planning Department,
London Borough of Hillingdon,
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High Street,
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ST. HELEN'S SCHOOL, NORTHWOOD, HILLINGDON, HA6 3AS
FLOOD RISK ASSESSMENT AND SURFACE WATER DRAINAGE STRATEGY

To whom it may concern,

With reference to the proposed Junior School at St. Helen's School in Northwood, please find herein an assessment of the risk of flooding to the site. This letter has been prepared with due consideration of the National Planning Policy Framework¹ (NPPF) and associated Planning Practice Guidance².

DESCRIPTION OF DEVELOPMENT

The proposed development relates to the construction of a new Junior School within the grounds of St. Helen's School, which is located within the centre of Northwood in the London Borough of Hillingdon. The location and school boundary can be seen in Figure 1. The site boundary of the proposed Junior School is shown in more detail in drawing appended to this letter. The proposals include the construction of a new school building, which will be formed of three main sections. The central section will have classrooms over two floors, with the western and eastern sections having classrooms over only one floor. Landscaping will also be carried out surrounding the proposed school, with the provision of outdoor classroom areas and play spaces. Green roofs are proposed over the majority of the proposed school building, and additional sustainable drainage features will also be included. As it is a non-residential educational establishment, the development is considered 'more vulnerable' in flood risk terms.

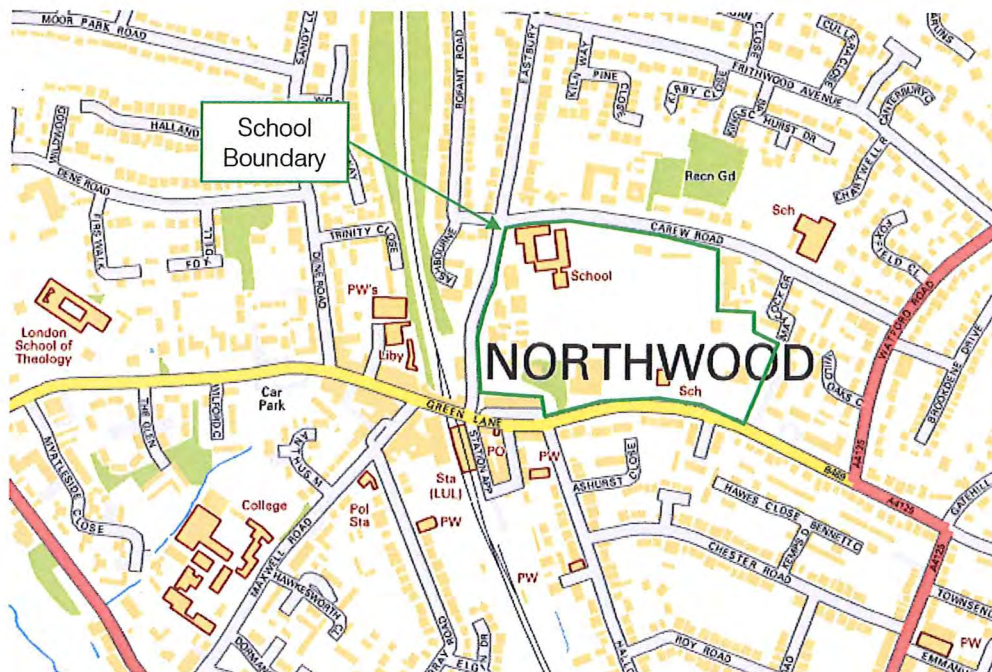


Figure 1 – Site Location³

¹ Communities and Local Government, National Planning Policy Framework, 2012

² Communities and Local Government, Planning Practice Guidance: Flood Risk and Coastal Change, 2014

³ Contains Ordnance Survey information © Crown copyright and database rights 2014

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INVESTOR IN PEOPLE

A representation of the ground model for the site can be seen in Figure 2. This shows the school to be on the watershed of two catchments, one to the north and one to the south. Finished floor levels within the proposed building are to be set at 85.05m AOD.



Figure 2 – Ground Model Produced from Topographical Survey

ASSESSMENT OF FLOOD RISK

Fluvial and Tidal Flooding

In October 2004, the Environment Agency released updated floodplain maps for the UK based on the 'JFLOW' project, a two-dimensional hydraulic modelling project. Figure 3 shows the latest online Environment Agency flood zone map and the site is shown to be located in Flood Zone 1. This zone comprises land assessed as having a less than 1 in 1,000 annual probability of fluvial or tidal flooding (<0.1%).

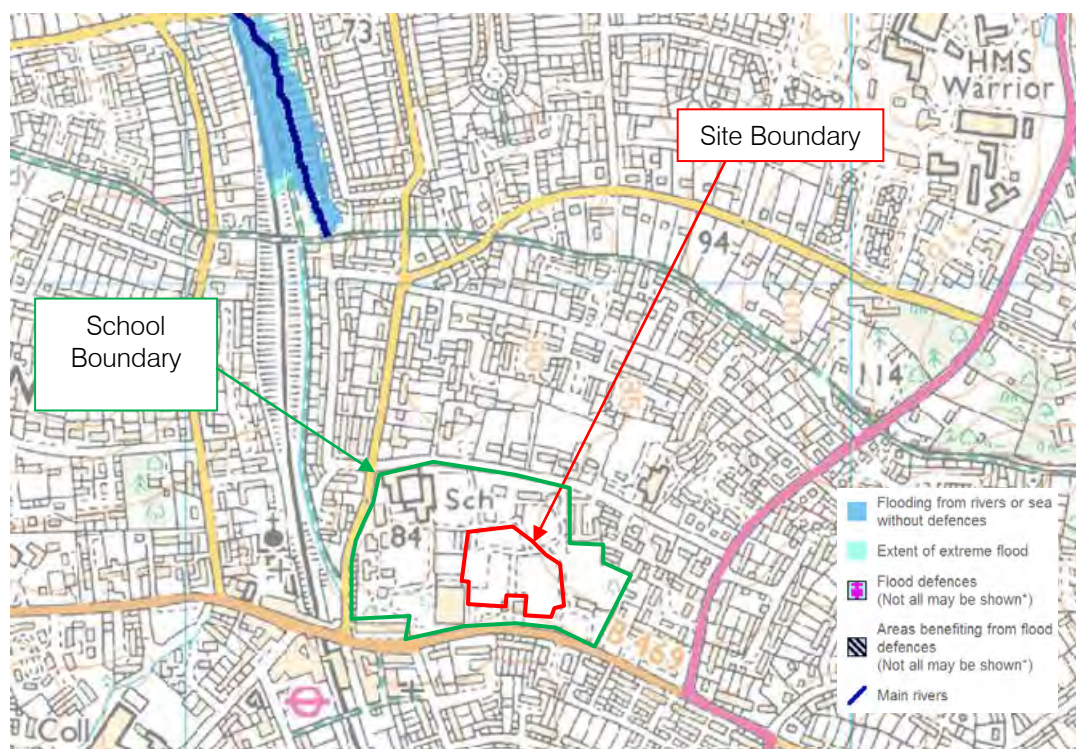


Figure 3 – Environment Agency Online Flood Zone Map

The closest Main River is approximately 500m to the north of the proposed site. This ditch follows the London Underground Metropolitan Line through Moor Park before joining the River Colne close to Hampermill Lake. Since the site lies entirely within Flood Zone 1 the risk of flooding from fluvial and tidal sources to the proposed school is less than 0.1% in any year and therefore presents no significant risk to future users of the building.

Flooding from Land

Flooding from surface water arises during intense rainfall events when flood waters are unable to infiltrate into the ground or discharge into local ditches or artificial drainage infrastructure. In an urban environment, the risk of flooding from surface water and from overloaded sewers is closely related, and both are included in the relevant surface water flooding datasets. Flooding events are typically of short duration (unless there is a drainage system blockage), but can be severe.

The Environment Agency online surface water flooding map, presented in Figure 4, shows that there is a very low risk of surface water flooding at the site. The site is located on the watershed of two drainage catchments. There is a flowpath that is shown to commence at the centre of the southern site boundary and continue to the south, and another along the northern school boundary that continues to the north, becoming the catchment that eventually drains into the River Colne.

The London Borough of Hillingdon Surface Water Management Plan (SWMP) shows the site lies close to a Critical Drainage Area (identified as Group1_016 on Figure 1.1). This area is associated with flooding within the tracks at Northwood Station on the London Underground Metropolitan Line. The site is considered to be sufficiently remote from this Critical Drainage Area to not have any influence. The risk of surface water flooding from overland flow is therefore considered to be low.

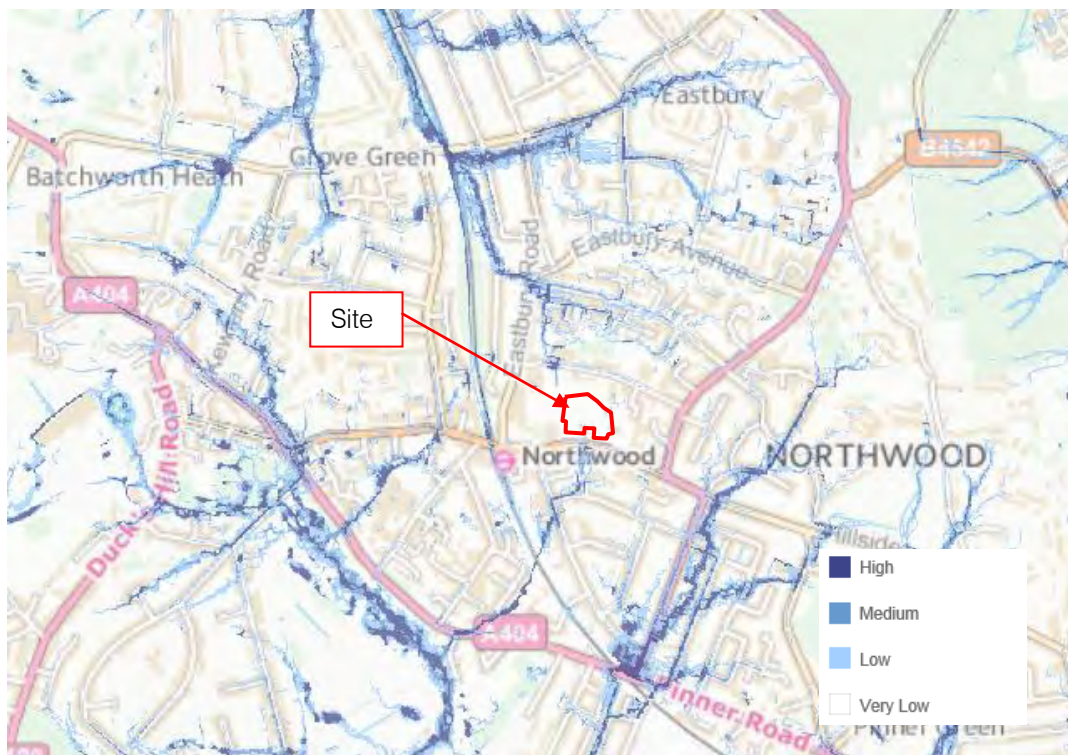


Figure 4 - Environment Agency Online Surface Water Flood Map

Flooding from Groundwater

The Environment Agency groundwater vulnerability map shows the site is located within Source Protection Zone 2 (Outer Zone) defined as an area around a source within which groundwater is expected to reach the abstraction point within 400 days.

The online 1:50,000 British Geological Survey (BGS) map shows bedrock geology as the London Clay Formation beneath the site with no superficial deposits. A ground investigation was undertaken within the

grounds of the school for a previous development, which encountered topsoil to approximately 0.8m over London Clay. This is consistent with the expected geology as reported by the BGS.

Figure 10.1 of the London Borough of Hillingdon SWMP shows that the site does not lie in an area that has the potential for elevated groundwater, therefore the risk of flooding from groundwater is considered to be low.

Flooding from Sewers

Figure 9.1 of the London Borough of Hillingdon SWMP shows the number of historical incidents of sewer flooding within Hillingdon postcodes. The site lies on the boundary between two postcode areas. It appears that the postcode for the northern half of the school has been affected by between one and five historical incidents of sewer flooding and the southern half has been affected by between 21 and 50. The area to the south is significantly more urbanised than to the north and therefore it is expected that there are likely to be more incidents of sewer flooding.

The sewers in the area are operated by Thames Water. Thames Water asset location plans have been obtained and are provided as an attachment to this assessment. There are both foul water and surface water sewers in the public highways that surround the school. As expected from the surface water flood maps, there is a divide along the centre of the school whereby the sewers in the road surrounding the northern half of the site boundary drain in a northerly direction and those in the south drain to the south. The majority of the surface water sewers are of relatively small diameter (225mm) as they are at the top of their respective catchments.

In urban areas the risk of sewer flooding closely corresponds to the risk of surface water flooding. Given the topography of the school at the watershed of two catchments, should water surcharge from any of the manholes surrounding the school, flood water will flow away from the school. Therefore the risk of flooding from sewers is considered low.

The management of surface water on the site is discussed further in a later section.

Flooding from Reservoirs, Canals and Other Artificial Sources

There are no ponds, reservoirs or canals on or adjacent to the site. The Environment Agency online maps show that there is an area at risk of flooding due to the unlikely failure of the Oxhey Woods Service Reservoir. The closest area of the predicted maximum extent of inundation lies approximately 500m to the south-east of the site. There are no other artificial water bodies in close proximity to the site that would constitute a source of flooding.

SURFACE WATER SUSTAINABLE DRAINAGE STRATEGY

Since the site area is greater than one hectare the impact that the site may have on flooding elsewhere has also been assessed, particularly the management of surface water runoff from the site.

A site visit was undertaken on 22nd July 2014 to review the existing drainage provision. There are currently no formal drainage features in the location of the proposed Junior School. The majority of the site is formed of landscaped areas that are covered by a number of mature trees. There are some areas of paving associated with the existing car park for the sports centre, the existing playground for the Infant School and paved pathways.

The site is less than 50ha. and, in line with the guidance provided in the Environment Agency report on rainfall runoff management for developments⁴, the Institute of Hydrology (IH) 124 methodology has been used to calculate existing runoff rates. The SOIL type on the site is considered to be Type 4, and a Seasonal Annual Average Rainfall of 669mm has been used. The peak 1 in 30 year greenfield surface water discharge rate from the site has been calculated as 15.25l/s. The peak 1 in 100 year greenfield runoff rate from the site has been calculated as 21.15l/s.

Surface water will be managed on the site through the provision of Sustainable Drainage Systems (SuDS). The aim of SuDS is to emulate natural processes with the result that watercourses and storage

⁴ Environment Agency (2013), Rainfall runoff management for developments. Report SC030219.

areas receive the hydrological profiles under which they evolved, and that water quality in local ecosystems is protected or improved. The best practice guide states that a sustainable drainage system will⁵:

- reduce the impact of additional urbanisation on the frequency and size of floods;
- protect or enhance river and groundwater quality;
- be sympathetic to the needs of the local environment and community; and
- encourage natural groundwater recharge

The design of the proposed system has been undertaken with the SuDS hierarchy in mind (as shown in Figure 5).

Information gathered to date suggests that the site is underlain by London Clay and is therefore not considered to be suitable for infiltration devices such as soakaways, filter strips or infiltration trenches. Permeable paving systems that discharge into the underlying soil are also not considered to be appropriate in this area.

Most Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storms cells	✓		
Least Sustainable				

Figure 5 - SuDS Hierarchy

The proposed drainage strategy for the site is illustrated in Elliott Wood drawing 213434-SK001-P1 appended to this letter. Green 'living' roofs will be provided on the two single storey wings of the proposed school building. These will provide a reduction in the runoff coefficient from the roof areas in line with Table 10.1 of CIRIA C644⁶.

There is an area of proposed hardstanding to the north of the Junior School that will form the playground for the school. A permeable surface, such as resin bound gravel, will be used for this area underlain by a granular drainage blanket. Surface water will be allowed to permeate through the top surface and will be attenuated in the underlying sub-base. The ground conditions are not conducive to infiltration to the underlying strata however the drainage blanket will be lined with a suitable geofabric to prevent infiltration of fines and allow any infiltration that *can* discharge to do so, thereby emulating existing greenfield performance in so far as possible. An outfall will be provided from this area, which will discharge into an attenuation pond to the south-east of the school. There will also be a connection from the eastern green roof and half of the central roof area into the attenuation pond.

Surface water from the western green roof and half of the central roof will be conveyed along the western boundary of the school. There will be a below-ground surface water attenuation tank beneath the

⁵ CIRIA C523 (2001), Sustainable Urban Drainage Systems – Best Practice Manual.

⁶ CIRIA C644 (2007), Guidance on the use of green roofs, green walls and complementary features on buildings.

proposed car park extension. Surface water on the proposed car park extension will be collected via slot drains and will discharge, via a petrol interceptor, into the below-ground attenuation.

The proposed surface-water drainage system will have a restricted outfall that will discharge into the nearby Thames Water surface water sewer in Green Lane. The discharge from the proposed system will be restricted through the provision of a flow control device to greenfield rates, namely a maximum of 21.15l/s. This discharge rate is subject to approval with Thames Water, and may be lower depending on the ability of the downstream sewer network to accept additional flows. Attenuation will be provided and will be sized during detailed design to ensure that the capacity of the system is adequate to accommodate the 1 in 100 plus climate change rainfall event.

SUMMARY

The proposal relates to the construction of a new Junior School within the grounds of St. Helen's School in Northwood. The site lies within Flood Zone 1 and has been assessed as having a low risk of flooding from all sources. The site is greater than one hectare in area and there is consequently the potential for an increase in surface water runoff as a result of the development. Sustainable Drainage Systems are proposed, including green roofs, permeable paving, cellular storage, and an attenuation pond, to ensure that there is no increase in the rate of runoff following development. The surface water drainage system will ultimately discharge into the Thames Water surface water sewer in Green Lane through the existing connection from the school.

Yours Sincerely

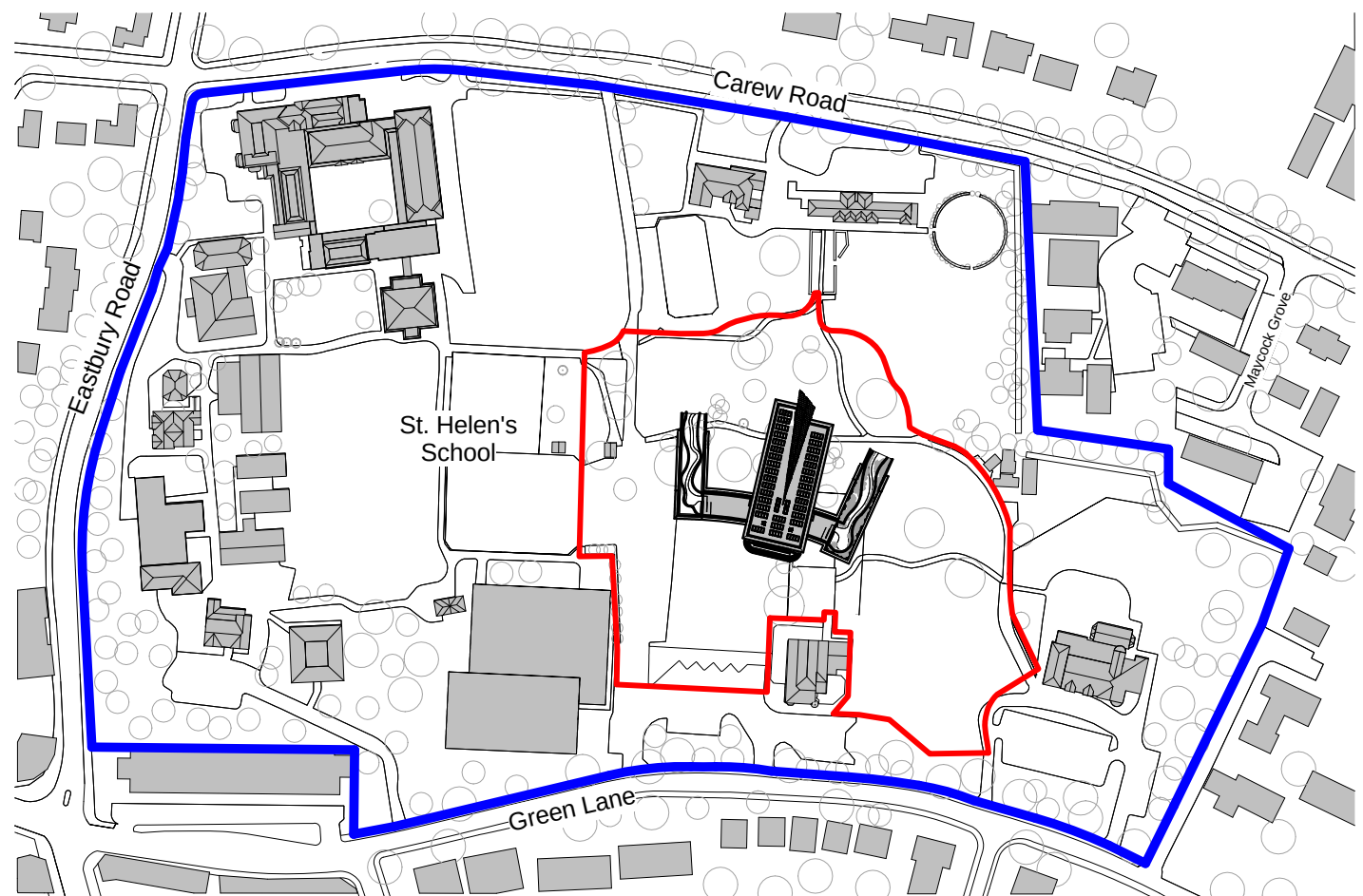


James Latham

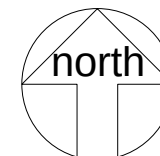
MSc DIC, MEng (Hons) MCIWEM
Environmental Engineer

Enclosures:

- Site Location Plan – *IID Architects Drawing Number 1284-301-01*
- Topographical Survey (in four parts) – *Glanville Group Drawing Numbers GS8140261/101-104*
- Ground Floor Proposed Plan - *IID Architects Drawing Number 1284-301-04*
- First Floor Proposed Plan - *IID Architects Drawing Number 1284-301-05*
- Site Wide Landscape Plan – *Place Design and Planning Drawing Number 532_GA_001 (P01)*
- Thames Water Sewer Asset Location Plans
- Proposed Drainage Strategy – *Elliott Wood Drawing Number 213434-SK001-P1*



- Land owned by applicant
(overall site area = 8.4 hectares)
- Application site
- Proposed building footprint



Ref

Revision

Date

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PROJECT

**ST HELEN'S NEW JUNIOR
SCHOOL**

DRAWING TITLE

Site Location Plan

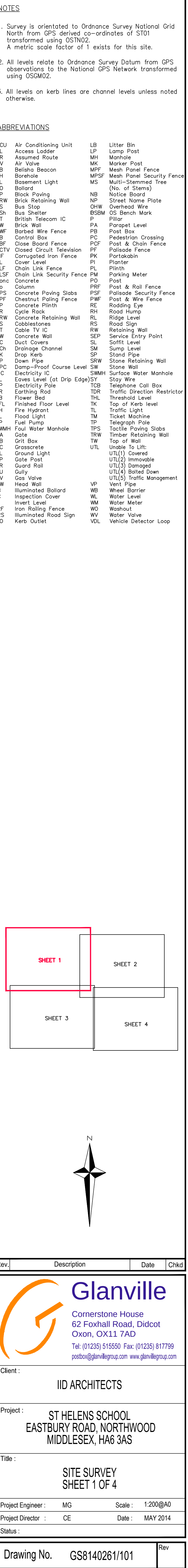
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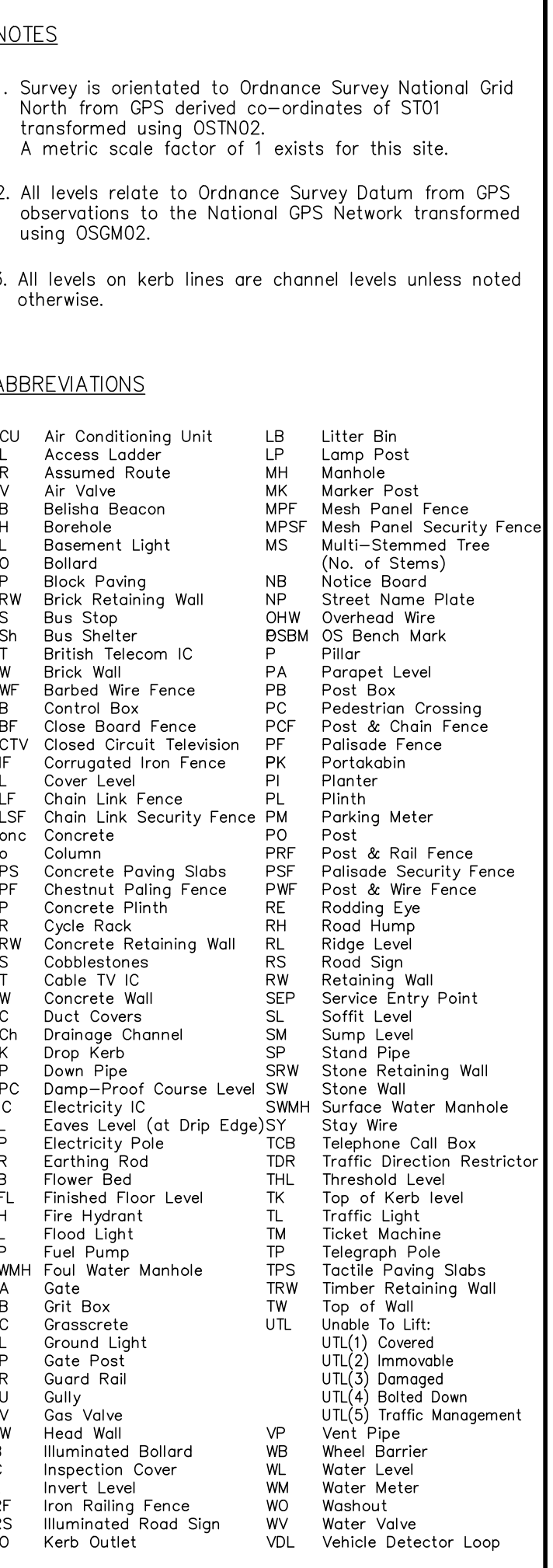
DATE 31/07/14

DRAWING No

REV

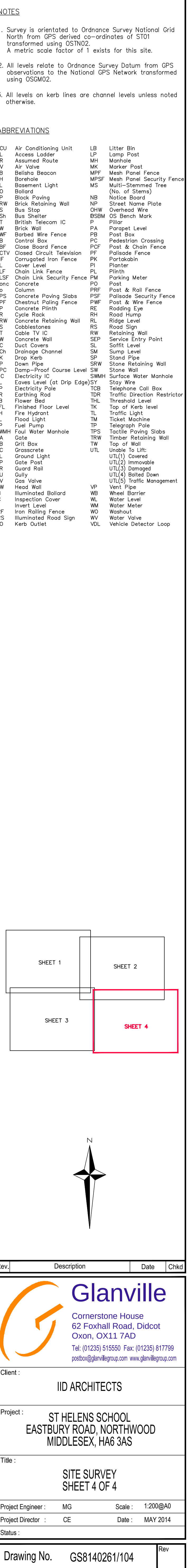
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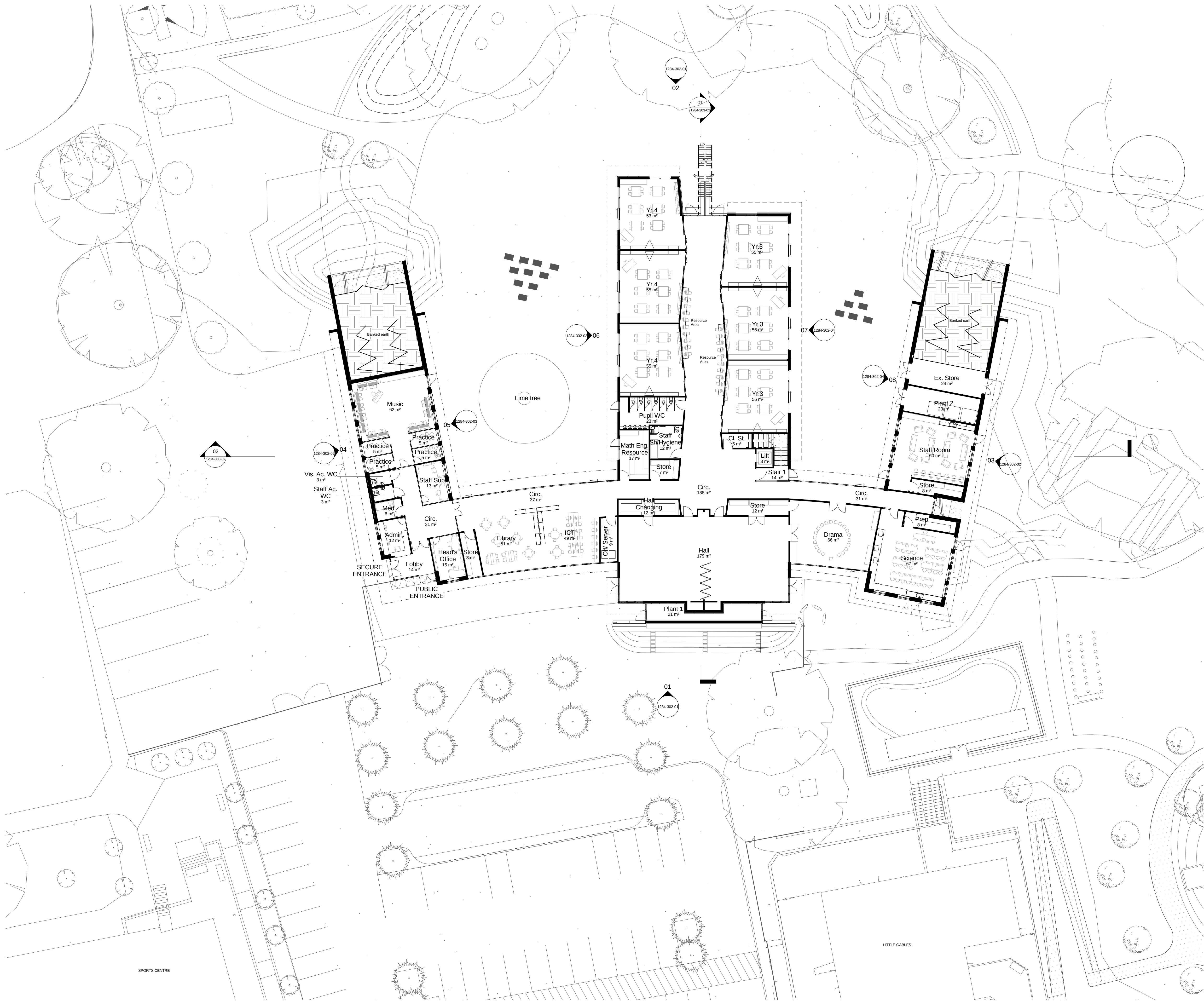




The diagram illustrates the layout of four sheets, labeled SHEET 1, SHEET 2, SHEET 3, and SHEET 4. SHEET 1 and SHEET 2 are positioned at the top, with SHEET 1 on the left and SHEET 2 on the right. SHEET 3 is located below SHEET 1, and SHEET 4 is located below SHEET 2. A compass rose is shown at the bottom, indicating North (N) is towards the top of the page.

Inv#	Description	Date	Check
 Glanville Cornerstone House 62 Foxhall Road, Didcot Oxon, OX11 7AD Tel: (01235) 515550 Fax: (01235) 817799 info@glanvillegroup.com www.glanvillegroup.com			
Client: _____			
IID ARCHITECTS			
Project: _____			
ST HELENS SCHOOL EASTBURY ROAD, NORTHWOOD MIDDLESEX, HA6 3AS			
Title: _____			
SITE SURVEY SHEET 3 OF 4			
Project Engineer: _____ MG _____ Scale: 1:200@A0			
Project Director: _____ CE _____ Date: MAY 2014			
Status: _____			
Drawing No. G58140261/103			Rev _____





Metres
0 2 4 6 8 10 12



Ref Revision Date

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INITIATIVES IN DESIGN

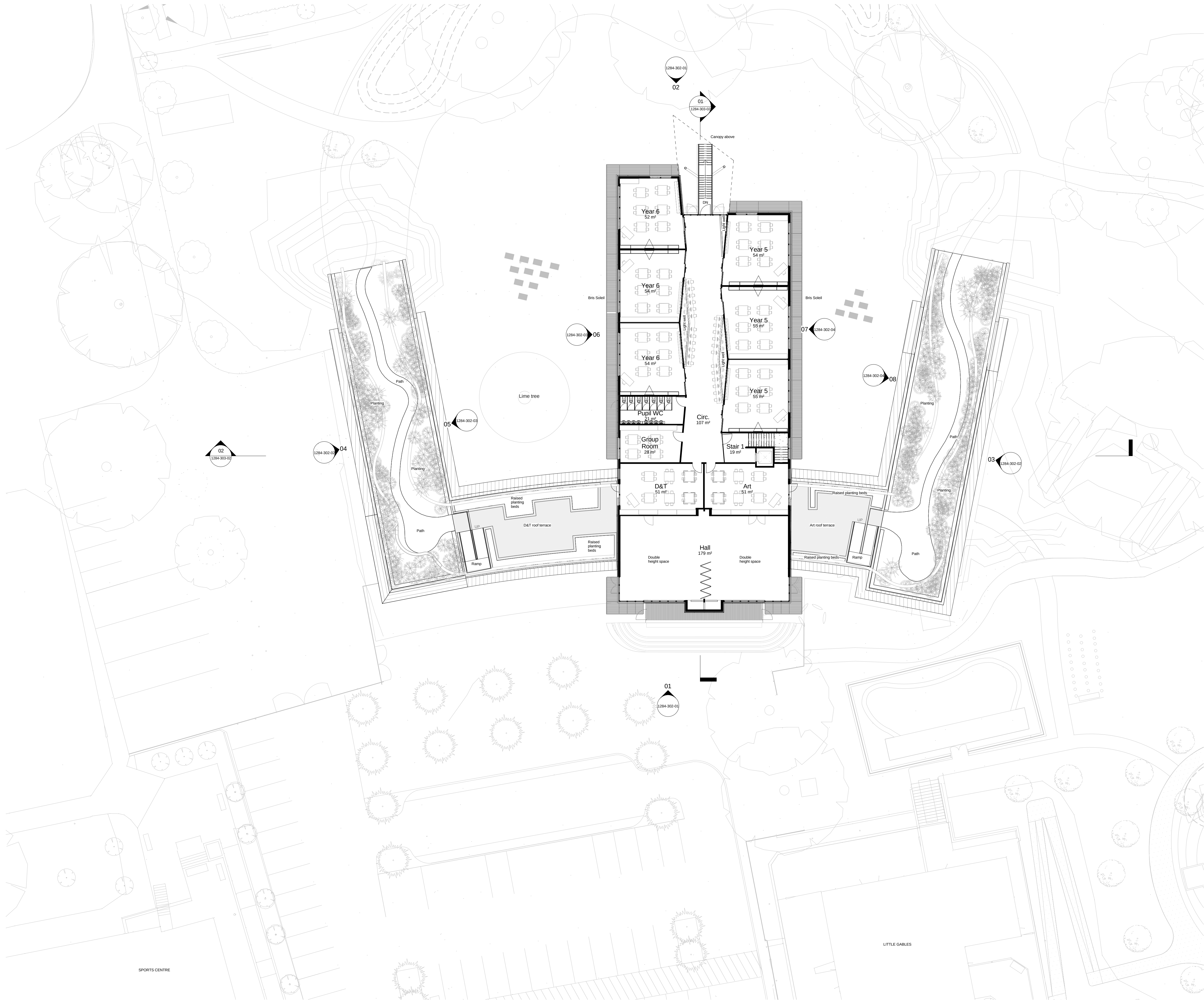
CLIENT
ST HELEN'S SCHOOL NORTHWOOD
PROJECT
ST HELEN'S NEW JUNIOR SCHOOL

DRAWING TITLE
Ground Floor - Proposed

SCALE 1:200 @A1 DATE 31/07/14

DRAWING No REV

1284-301-04



Metres

024681012

north

Ref	Revision	Date

IID

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CLIENT

ST HELEN'S SCHOOL NORTHWOOD

PROJECT

ST HELEN'S NEW JUNIOR SCHOOL

DRAWING TITLE

First Floor - Proposed

SCALE

1 : 200

@A1

DATE

31/07/14

DRAWING No

1284-301-05

REV