

Friern Sewage Works Site, Barnet

Development Constraints Report

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1 Introduction

1.1 Brief

In December 2007 Jacobs Engineering (UK) Ltd was commissioned by Drivers Jonas on behalf of London Borough of Barnet to assess development constraints for the Friern Barnet Sewage Works Site, Pinkham Way, Muswell Hill. The location of this 17 acre (circa 7 hectare) site is shown within Figure 1.

This report seeks to determine the constraints on the development of the site; at this stage, a commercial or light industrial end-use is assumed, although no specific plans for site layout or construction have yet been proposed.

1.2 Approach

In approaching this project, we conducted studies investigating the key factors governing the potential development of the site. These studies included a geotechnical and ecological assessment which are reported within:

- Land Quality Assessment Phase 1, Jacobs, March 2008
- Land Quality Assessment Phase 2, Jacobs, April 2008
- Extended Phase I Habitat Survey & Desk Study, Jacobs, March 2008

This report summarises the main findings of the above studies, whilst also reporting the spatial and public utilities constraints identified through a topographical and utility study undertaken during investigation works.

2 Geotechnical/Land Quality

2.1 Approach

Geotechnical investigations resulted in the preparation of Phase 1 and Phase 2 Land Quality Assessments. This section summarises the identified development constraints highlighted within these documents.

2.2 Ground Contamination

Results

The site investigation demonstrated the presence of lead in the Made Ground at the site at concentrations above the CLEA commercial soil guideline values. Asbestos was also identified as potentially present in the ground.

Commentary

The occurrence of lead and small amounts of asbestos in soil is typical of many brownfield sites and can be managed by standard brownfield development practices, including safe working methods, dust suppression, laying of services within clean fill and capping of landscaped areas with clean fill. Prior to development, some further investigation is likely to be required to confirm ground conditions in areas not currently accessible to investigation plant.

The presence of lead and asbestos is not anticipated to be a major constraint on development.

2.3 Microbiological Risk

Results

Due to the site having a former use as a Sewage Works, some residual microbiological activity has been identified both in the soils and the ground waters. Only limited testing has been carried out in relation to these contaminants and soil and water should be classed as potentially hazardous to human health across the site. Microbes thrive in anaerobic environments and therefore may exist beneath any area of the site which was formerly occupied by sewage works structures or the related waste materials, which have since been buried.

Commentary

Further investigation and risk assessment will be required where soils from the former sewage works are to be used within 1m of the surface in the final development. Safe systems of work to protect from microbiological exposure should be used during earthworks at affected locations. Areas likely to exhibit a microbiological risk are those within the northern section of the site, where buried structures have been identified.

By considering this issue within the design it may be possible to mitigate potential effects; the likely location of affected soil is at the lowest level on the site, therefore any earth works increasing the level would tend to reduce the impact of this issue.

2.4 Groundwater Contamination

Results

Perched water is believed to be present within the Made Ground on the site.

Commentary

If construction works require de-watering of excavations, this water may require treatment prior to disposal. A discharge consent may also be required by the local sewage treatment company if water is to be discharged to foul sewer. Perched water may also be mobilised by major regrading works.

The presence of slightly elevated chemical concentrations in groundwater is not anticipated to be a major development constraint at the site.

2.5 Gas Protection Measures

Results

Using the information from the preliminary gas data, the site appears to be classified as 'CIRIA Characteristic Situation 1', implying no gas protection measures are needed.

Commentary

Further rounds of gas monitoring, necessary in support of site development, may ultimately reveal the site to be 'CIRIA Characteristic Situation 2', requiring basic gas protection measures. In addition, local authority planners may require the developer to provide gas protection measures, despite low CIRIA classification. This assessment should therefore be treated as indicative at this stage.

If gas protection is needed, a range of options could be carried out. Such measures would be incorporated into building designs and could include the use of under-slab voids or synthetic void formers, collector pipes connected to appropriate ventilation and the provision of a gas impermeable membrane, appropriate to the structural slab design. Additional gas vent strips may also be required to alleviate gas build up beneath hard standing. These would be provided at pre-determined spacing, connected to gas ventilation devices.

2.6 Waste Soil Arisings and Disposal

Results

If soil is to be disposed of off-site, based on current data the majority is likely to be classified as 'non-hazardous' in accordance with Environment Agency Technical Guidance WM2. There is the potential for some hazardous waste, mainly due to the presence of lead and zinc, but WAC testing may show that the soil meets the classification of 'stable non-reactive hazardous waste'.

Commentary

Waste soil disposal should be minimised by re-use on site where possible, aiming for a cut and fill balance within the development, accompanied by risk assessment to demonstrate the suitability for use of soil arisings within the site. As the development proposal is not yet clear offsite disposal of soil may be required.

We cannot, at this stage, estimate the volume of arisings which may require disposal. This issue could be significant as the current indicative cost for haulage and licensed disposal of hazardous waste is approximately £130 per tonne. This underlines the desire to design the final development and its construction phasing to minimise arisings.

2.7 Buried Foundations and Concrete Waste

Results

Due to the history of tipping at the site and the burial of some sewage works structures, obstructions beneath the surface are to be expected during site investigation works. Abandoned cars and abundant concrete lampposts are a further obstruction and are likely to need to be removed.

Commentary

The volume of buried concrete waste at the site is difficult to quantify given the current condition of the site, however it is possible extensive waste has been deposited throughout the site.

The abundance of large waste objects on and immediately below the surface of the site means this should be considered within site clearance methodology.

2.8 Settlement & Foundation Design

Results

The loose and variable nature of the Made Ground poses a risk of excessive settlement for foundations located within it. This risk is compounded by potential infiltration of water, which can lead to localised ground collapse in poorly consolidated areas. A thin covering of Made Ground provides a pathway to the weathered London Clay, the surface properties of which are sensitive to variations in moisture content.

Commentary

Following a review of the geotechnical investigations undertaken, possible foundation and related options include:

- Piles founded in the London Clay should be considered for relatively heavy structures in order to avoid the problems associated with the Made Ground and the weathered London Clay;
- Stabilisation of the Made Ground and weathered London Clay for site roads where excavation to the stable natural materials is not practicable;
- Possible slabs on stabilised platforms for relatively lightly loaded buildings;
- Low angle and low height slopes should be formed in the natural materials to minimise the risk of slope failures; and,
- Avoid ground infiltration systems for site drainage in order to preserve the performance of foundations and slopes.

2.9 Culverted Watercourse

Results

Historic maps indicate the possible presence of a culverted water course running through the centre of the site, draining the golf course and connecting to the Bounds Green Brook, itself culverted beneath Pinkham Way. The culvert was also identified within utilities searches undertaken as part of investigations (see 4.3.2).

Commentary

Further information is required regarding the condition of the culvert and its vulnerability to contamination from the site, the importance of the culvert to local drainage systems and the risks associated with flooding should the culvert be damaged during development.

The design of the development and associated construction plan should consider the protection of the culvert; this should follow a condition survey to assess its vulnerability to construction works and final development loading.

2.10 Japanese Knotweed

Results

Japanese Knotweed has been identified on the site in various locations, but it was not possible to estimate the full extent impacted by Knotweed due to the dense vegetative cover and winter dieback. Giant Hogweed was also noted on site.

Commentary

A full specialist survey during the growing season (April-October) is required to assess the area of the site affected by Knotweed. Knotweed is a highly invasive plant that grows rapidly and can penetrate through hardstanding and is known to damage property. Remedial action to break the pollutant linkage is likely to be required, potentially including:

- *Excavation of the affected soil and off-site disposal*
- *Burial on-site*
- *Chemical treatment with herbicides; or*
- *Installation of a root barrier*

The method of treating the Japanese Knotweed will depend on time constraints, quantity requiring removal and the proposed final design of the development. Combined treatment is often the most suitable option, involving the removal of 200mm of soil and its off-site disposal, herbicide treatment of deeper roots and the installation of root barriers. This method takes a minimum of approximately 6-8 months to complete, provided it is undertaken in the growing season.

Giant Hogweed must be disposed of with care as contact with skin can cause injury, presenting health and safety issues which should be addressed during site investigation and construction. Removal should be undertaken by specialist contractors and the process usually involves mechanical removal of the plant or treatment with herbicides (or a combination of these techniques). Giant Hogweed is not a highly invasive plant species and its removal is not a significant constraint on development.

3.1 Approach

A desk study and an extended Phase I Habitat Survey were carried out to identify ecological constraints affecting the site. The full text is included within the 'Extended Phase I Habitat Survey & Desk Study' report; mapping of the main features of ecological interest are presented on Figure 2.

3.2 Badgers

Results

Evidence of possible badger setts was discovered on site, although they appear to be dormant at this time and may be outlying or subsidiary setts, rather than main setts used for breeding and rearing young.

Commentary

Due to the presence of potential badger setts on the site, it is recommended that the site be checked for badger activity prior to site clearance. Any sett closure must be carried out under license by a suitably qualified ecologist between late summer and early winter. If setts are confirmed as outliers, closure would be simpler than closing a main sett. The process involves the blocking of access to the sett, to stop badgers using them, along with a monitoring programme to ensure alternative outlying setts are available away from the development site but within the badger's range.

3.3 Breeding Birds

Results

The site is likely to support a wide range of breeding and foraging birds, however in the absence of habitats such as water bodies and associated wetland etc, these are likely to be common species.

Commentary

Any vegetation clearance or maintenance carried out in relation to the development of the site should occur outside the bird breeding season, generally considered to be March to August inclusive.

3.4 Amphibians

Results

No amphibians were noted on site during walk-over investigations, although the site offers good potential foraging habitat. A permanent water body offers suitable habitat for amphibians just off-site to the west which could be linked with water sources on the golf course to the south via a ditch running to the west of the site. Desk studies recorded the presence of common toad and common frog within 2km of the site boundary.

Commentary

There are no records of protected amphibian species on site or in the standing pond to the west. There is a record of Great Crested Newt activity within the borough in 1990, although they were observed over 2km from the site. The presence of protected amphibian species appears to be unlikely, however a detailed assessment in line with 'Habitat Suitability Index' methodology would be needed to confirm this. If protected species of amphibian were found on site, the creation of a mitigation strategy would be required.

3.5 Reptiles

Results

No reptiles were noted during site surveys, however several native reptile species have been recorded within 2km of the site boundary. The site offers good potential habitat for reptiles.

Commentary

The likelihood of reptiles being present on the site is considered to be medium-high. This can only be verified by further survey work and it is recommended that reptile surveys be carried out on this site.

If reptiles were found, a suitable mitigation strategy should be put into place. This could range from simply cutting back vegetation to make habitat unsuitable, to erection of reptile fencing together with daily trapping and relocation of any individuals found over a period of several months. Mitigation work would need to be carried out by a suitably experienced ecologist but for the common species that are most likely to be found on the site (e.g. common lizards and slow worms) this would not require a license.

3.6 Bats

Results

The site survey revealed that the area offers good foraging and roosting habitat for bats, however no activity was noted. A number of bat species have been recorded within 2km of the site.

Commentary

It is likely that bats are foraging on site and the potential for roosts on site cannot be ruled out. Bat activity surveys would therefore be necessary, involving at least two evening visits between April and September during suitable weather conditions.

If the survey showed only foraging activity no further mitigation would be required. If a bat roost were to be found, a suitable mitigation strategy should be put into place, from simply avoiding works to trees that contain roosts through to 'soft-felling' of branches/trunks under license.

4 Public Utilities

4.1 Approach

The approach for this assessment was to establish the size and location of the utility plant within and around the Friern Barnet Sewage Works Site including, inter alia, electrical power, water, sewerage, gas and telecoms services. Locations of utility plant on and around the site are mapped on Figure 3 of this report.

4.2 Utility Companies

The following companies have been contacted and issued C2 Notices in accordance with the New Roads and Street Works Act 1991: Thames Water, ES Pipelines, Envoy Asset Management Ltd, SSE Pipelines, Cross Rail, Easynet, Colt, VSNL, KPN, Thus, Fijitsu, EDF Energy, National Grid Gas and Electricity, Transco, NLGA (North London Gas Alliance, Virgin Media, BT, Cable and Wireless, Interoute, London Underground, Gamma Telecom, Fibrenet UK Ltd and AboveNet,

4.3 Utility Company Responses

4.3.1 Electrical Power

Existing Plant on Site

The local electricity provider EDF has issued plans of their plant on or around the site. The plans detail two buried cables running through the site from the north-west to a northern-central location. One cable has been noted as live while the other is thought to be redundant.

New Supply

Cable locations have been confirmed along both the northern and southern sides of the North Circular Road. In addition, further cables have been located serving the residential area to the west of the site. The location of a distribution box has also been confirmed adjacent to the Freehold Community Centre. More information on servicing requirements of the intended development is required before applications can be made to EDF for conclusive electrical supply details.

Should an electrical supply to the potential development on the Friern Barnet Sewage Works site be delivered from the distribution box noted above the supply procedure is not expected to involve extensive works. The condition of the existing cables running through the site that historically served the sewage works is unknown and further investigative works are required to establish their condition.

4.3.2 Water Supply and Foul Sewers

Existing Plant on Site

Thames Water has confirmed that they have no mains pipes present within the area of the site which would require protecting or diverting as a part of any development.

The utility search, along with historical studies undertaken within the Land Quality Assessment Phase 2, revealed a culverted watercourse running through the site. The culverted watercourse runs broadly from the centre of the site in a northerly direction, connecting with another culverted watercourse on Pinkham Way. These culverted watercourses are believed to contain sections of Bounds Green Brook, which historically ran at surface level. These culverts allowed the construction of the sewage works and the North Circular Road at Pinkham Way. The culvert is not maintained by Thames Water and information regarding depth, size and ownership of the culvert were not supplied.

New Supply

Water mains have been confirmed to the west of the site within the residential area and to the north west of the site on the north side of the North Circular Road. Thames Water were unable to confirm the nearest connection point able to serve the site within the timeframe of this study. Due to the close developments adjacent to the site connection distances are not anticipated to be significant.

Further information is required regarding the condition of the culvert, which should be undertaken in advance of site design. This would involve a condition survey of the culvert including a CCTV visual investigation and investigations to establish ownership and responsibility.

4.3.3 Gas

Existing Plant on Site

National Grid Gas, Gas Transportation Co., ES Pipelines, Envoy Asset Management Ltd and SSE Pipelines Ltd have all confirmed they do not have any plant located within the site area.

New Supply

National Grid Gas has confirmed low pressure gas pipelines supplying the residential area to the west of the site. A Medium pressure gas main has been established to be running along the North side of the North Circular Road.

In terms of providing a new supply to the site, it appears feasible to take a spur from the medium pressure pipeline running along the north side of the North Circular Road. This would require 30-50 metres of new pipeline to supply an area to the north of the site.

4.3.4 Telecoms Services

Existing Plant on Site

The various telecommunications service companies have all confirmed that they do not have any plant within the area of the site.

New Supply

BT has confirmed they have cables around the residential area to the west of the site along with the residential area to the east on the far side of the railway track. The nearest distribution box is currently unknown and will need to be located to allow accurate costs to be developed.

4.4 Constraints

The two potential constraints identified within the utilities search were an EDF Electricity buried cable and a buried water culvert; the location of these features are included within Figure 3. In addition to these known constraints, usual safety precautions should be taken within construction phases to ensure no unmapped utilities are damaged on site.

5 Spatial Assessment

5.1 Topographical Survey

A topographical survey was undertaken to assess site conditions. This survey established ground control using GPS to produce an Autocad drawing with spot levels and contours with a height accuracy of +/- 0.03m; it is presented within Figure 4.

5.2 Site Sections

The topographical survey was used to establish sections through the site along four axes. This was undertaken in order to provide a more detailed understanding of site topography; this is presented within Figure 5.

5.3 Site Topography

The topographical survey demonstrates that there are five areas (A to E) where ground levels are reasonably flat and could, subject to necessary geotechnical and remedial treatments, provide a platform for development without excessive earth moving operations. These areas and their levels are presented in Table 5.1 and shown in Figure 6, however the appropriateness of these developable areas is dependent on the development form, the building floorplates and the proposed access and circulation strategy for the site.

Location	Approximate Area (m ²)	Indicative Level (metres AOD)
A	10,300	35.0 – 37.0
B	12,200	44.0 – 46.0
C	10,500	47.0 - 49.5
D	9,700	46.0 – 47.0
E	2,700	43.5 – 44.0
Other	23,600	

Table 5.1 – Current Areas of Relatively Level Ground (also see Figure 6)

6 Initial Cost Estimates

6.1 Costs Summary

The table below presents an initial assessment of development costs for the items listed, subject to the limitations identified overleaf. All costs exclude VAT, additional investigation and professional fees.

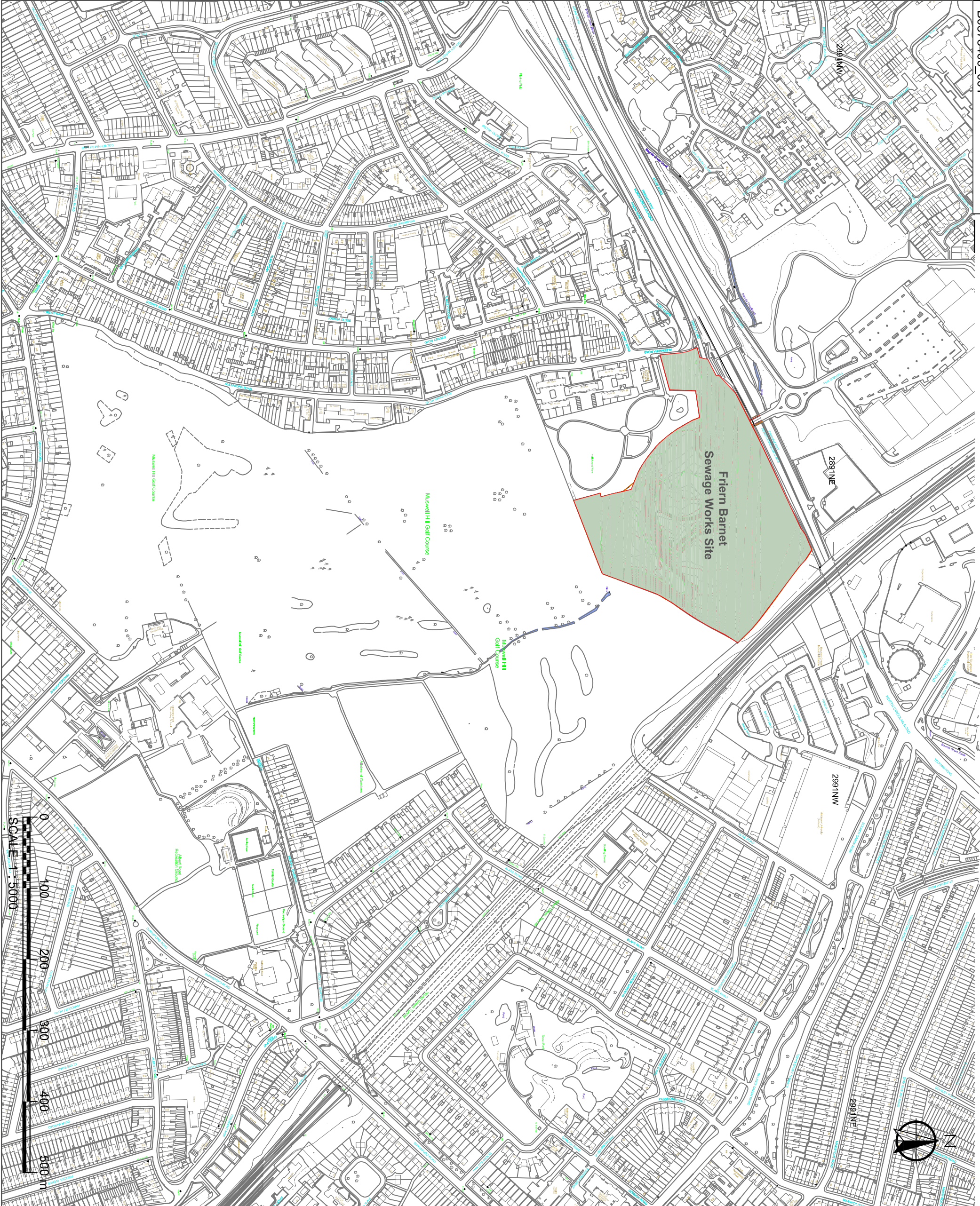
Item	Comments	Approximate Unit Rate
Site Clearance	To include vegetation and small trees (does not include Japanese Knotweed).	£1000 per hectare
	Clearance and disposal of Japanese Knotweed (18 months).	£95/m ²
External Hard Standing	To include allowance for ground preparation, tarmac surfacing for car park areas, concrete surfacing to yard area and paving to front of store (based on typical supermarket model).	£120 per m ²
Imported Engineered Fill (to underside of Pavement Construction)	Placed to create a stable base to receive paving / structures (as necessitated by development plan).	£40 per m ³
Barrier Capping Material	Use subject to contamination classification of site materials and disposal options.	£10 per m ²
Bulk Earthworks	To regulate the site – as required.	£5 per m ³
Offsite Disposal of Material	Hazardous (as classified by chemical testing).	£130 per tonne
	Non-Hazardous (as classified by chemical testing).	£48 per tonne
Gas Protection	Current report data suggests no gas protection measures are required (ie, CIRIA Characteristic Situation 1), however local authority planners may require the developer to provide such measures despite low CIRIA classification.	
	Passive protection and venting to buildings.	£12/m ²
	Venting below hard standing (sub-base material included in 'external hard standing' item above deemed to be suitable at this stage for Characteristic Situation 1 – CIRIA R665).	-
	Perimeter gas vent.	£75/m
Building Foundations	Based on piled foundations of nominal 15m length, 600mm diameter and 100 No. constructed onsite.	£950 per pile
	Mobilisation and demobilisation of piling rig onsite.	£10,000 per rig
Ground Improvement	The nature of and need for ground treatment will vary across the site as particular ground conditions change.	
	Extra over Cement Stabilisation to Engineered Fill.	£20 per m ³
	Square Impact Roller.	£15,000 per week (1 week per hectare)
	Soil Mixing (to 1m – 5m deep).	£60 per m ³

6.2 Limitations



At the early stage of the development of this site, without a confirmed scheme design or building footprint, the costs identified are only indicative of the quantum which could be expected should the site be developed.

Figures

- Figure 1 Site Location**
- Figure 2 Ecological Assessment**
- Figure 3 Public Utilities**
- Figure 4 Topographical Survey**
- Figure 5 Topographical Survey Cross Sections**
- Figure 6 Current Areas of Relatively Level Ground**



Key

-  Site Boundary
-  Site Location

Rev	Rev. Date	Purpose of revision	Drawn	Checked/Approved
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14-14407, 14-14408, 14-14409, 14-14410, 14-14411, 14-14412, 14-14413, 14-14414, 14-14415, 14-14416, 14-14417, 14-14418, 14-14419, 14-14420, 14-14421, 14-14422, 14-14423, 14-14424, 14-14425, 14-14426, 14-14427, 14-14428, 14-14429, 14-14430, 14-14431, 14-14432, 14-14433, 14-14434, 14-14435, 14-14436, 14-14437, 14-14438, 14-14439, 14-14440, 14-14441, 14-14442, 14-14443, 14-14444, 14-14445, 14-14446, 14-14447, 14-14448, 14-14449, 14-14450, 14-14451, 14-14452, 14-14453, 14-14454, 14-14455, 14-14456, 14-14457, 14-14458, 14-14459, 14-14460, 14-14461, 14-14462, 14-14463, 14-14464, 14-14465, 14-14466, 14-14467, 14-14468, 14-14469, 14-14470, 14-14471, 14-14472, 14-14473, 14-14474, 14-14475, 14-14476, 14-14477, 14-14478, 14-14479, 14-14480, 14-14481, 14-14482, 14-14483, 14-14484, 14-14485, 14-14486, 14-14487, 14-14488, 14-14489, 14-14490, 14-14491, 14-14492, 14-14493, 14-14494, 14-14495, 14-14496, 14-14497, 14-14498, 14-14499, 14-14500, 14-14501, 14-14502, 14-14503, 14-14504, 14-14505, 14-14506, 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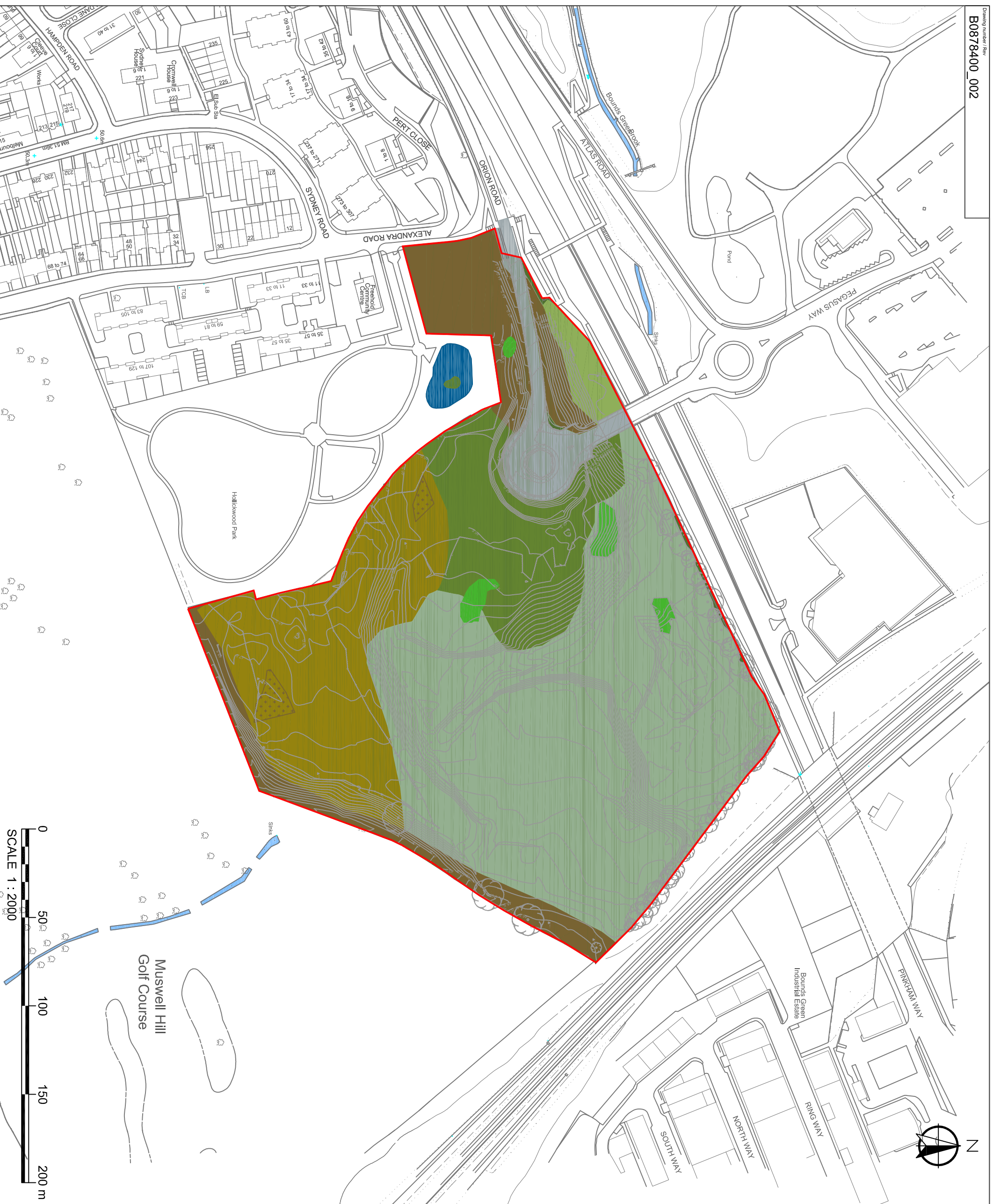
Client: LONDON BOROUGH OF BARNET

Project: FRIERN SITE ASSESSMENT

FIGURE 1
SITE LOCATION

Drawing status	
Scale	1:5000 @ A3
Jacobs No.	DO NOT SCALE
Client no.	
Drawing number	E0878400_001
Rev	0

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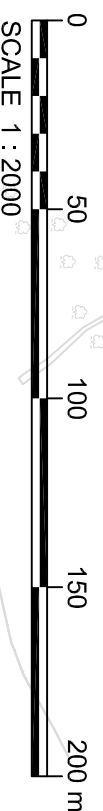
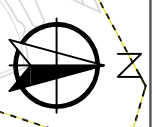
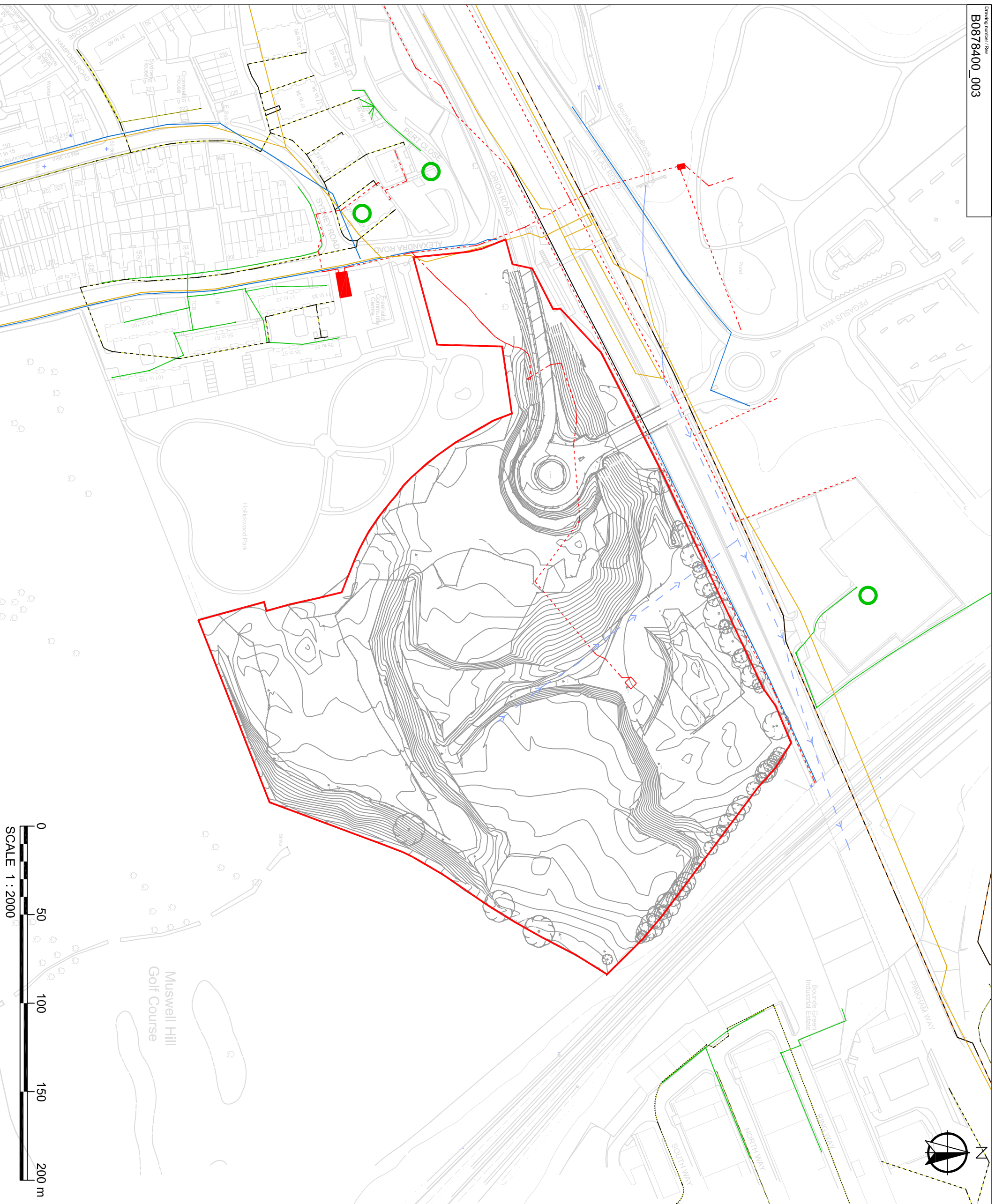
Key

- Site boundary
- Japanese Knotweed
- Dense/Continuous Scrub
- Tall Ruderal
- Semi-improved Natural Grassland
- Semi Natural Broadleaved Woodland
- Ephemeral/short perennial
- + + + + Scattered Scrub
- Standing Water
- Sinks

Client		LONDON BOROUGH OF BARNET	
Project		FRIERN SITE ASSESSMENT	
Drawing title			
FIGURE 2			
ECOLOGICAL ASSESSMENT OF CURRENT SITE			
Drawing status			
Scale	1:2000 @ A3	DO NOT SCALE	
Jacobs No.	B0878400		
Client no.			
Drawing number	B0878400_002	Rev	0
<small>This drawing is not to be used in whole or part other than for the intended purpose and project as defined on this drawing, refer to the contract for full terms and conditions.</small>			



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KEY

EDF
BT	————
GAS:	-----
LP MAINS:	-----
MP MAINS	- . - . - .
MAINS WATER	————
CULVERTED WATERCOURSE	- - - - -
FOUL SEWER	————
SITE BOUNDARY	————

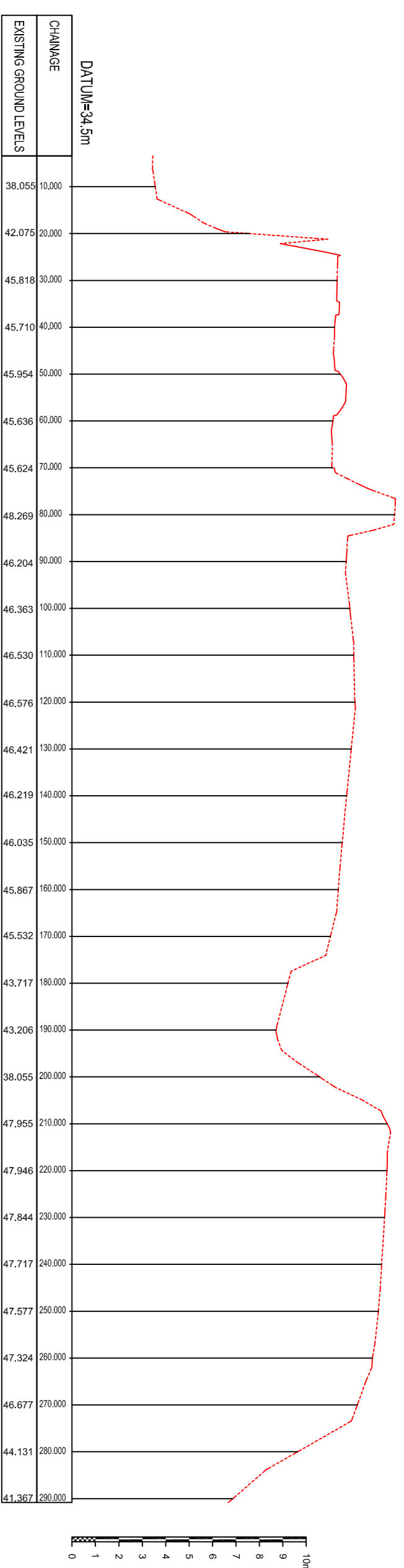
0	Rev. Date	Purpose of revision	Drawn	Checked	Approved

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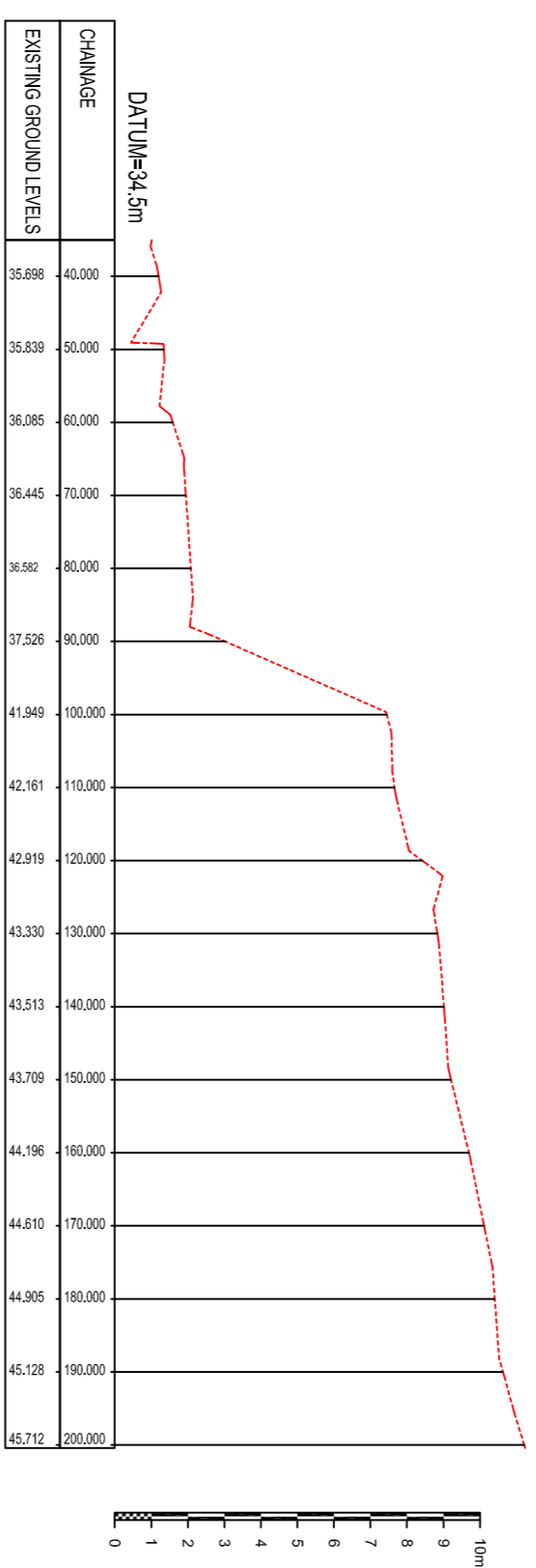
Client: **LONDON BOROUGH OF BARNET**
 Project: **FRIERN SITE ASSESSMENT**
 Drawing title: **FIGURE 3 PUBLIC UTILITIES**

Drawing status: **DO NOT SCALE**
 Scale: 1:2000 @ A3
 Jacobs No: E0878400
 Client no:
 Drawing number: **E0878400_003**
 Rev: **0**

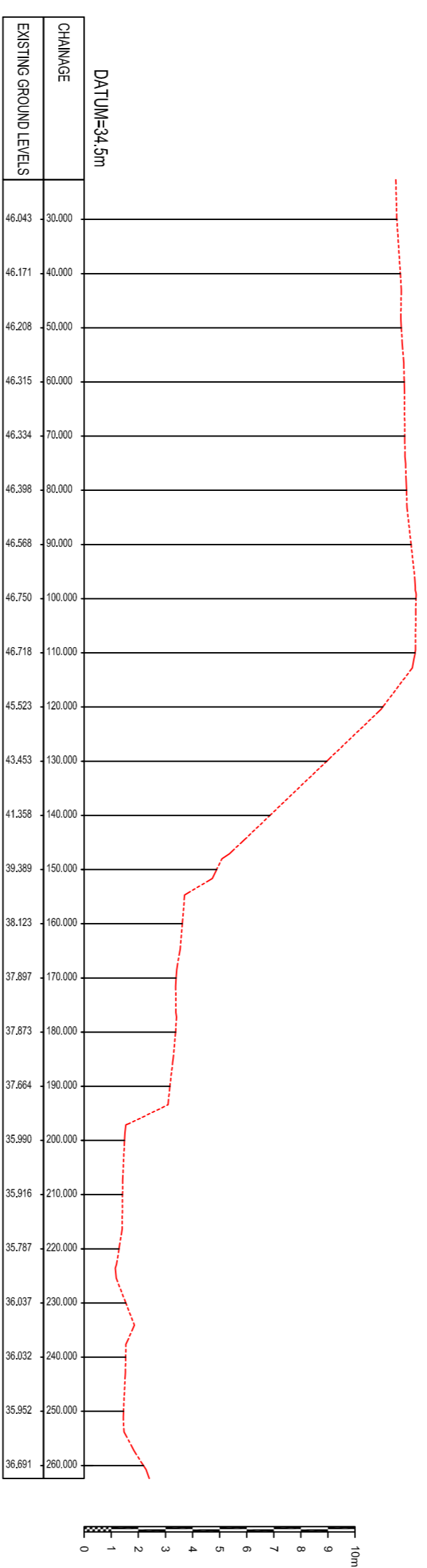
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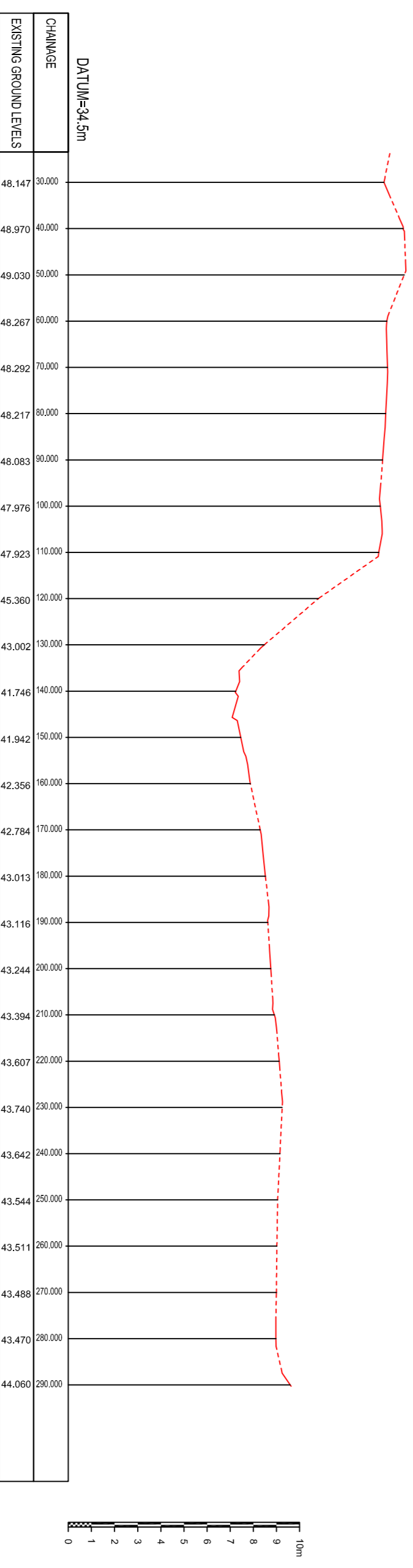
SECTION A-A



SECTION B-B

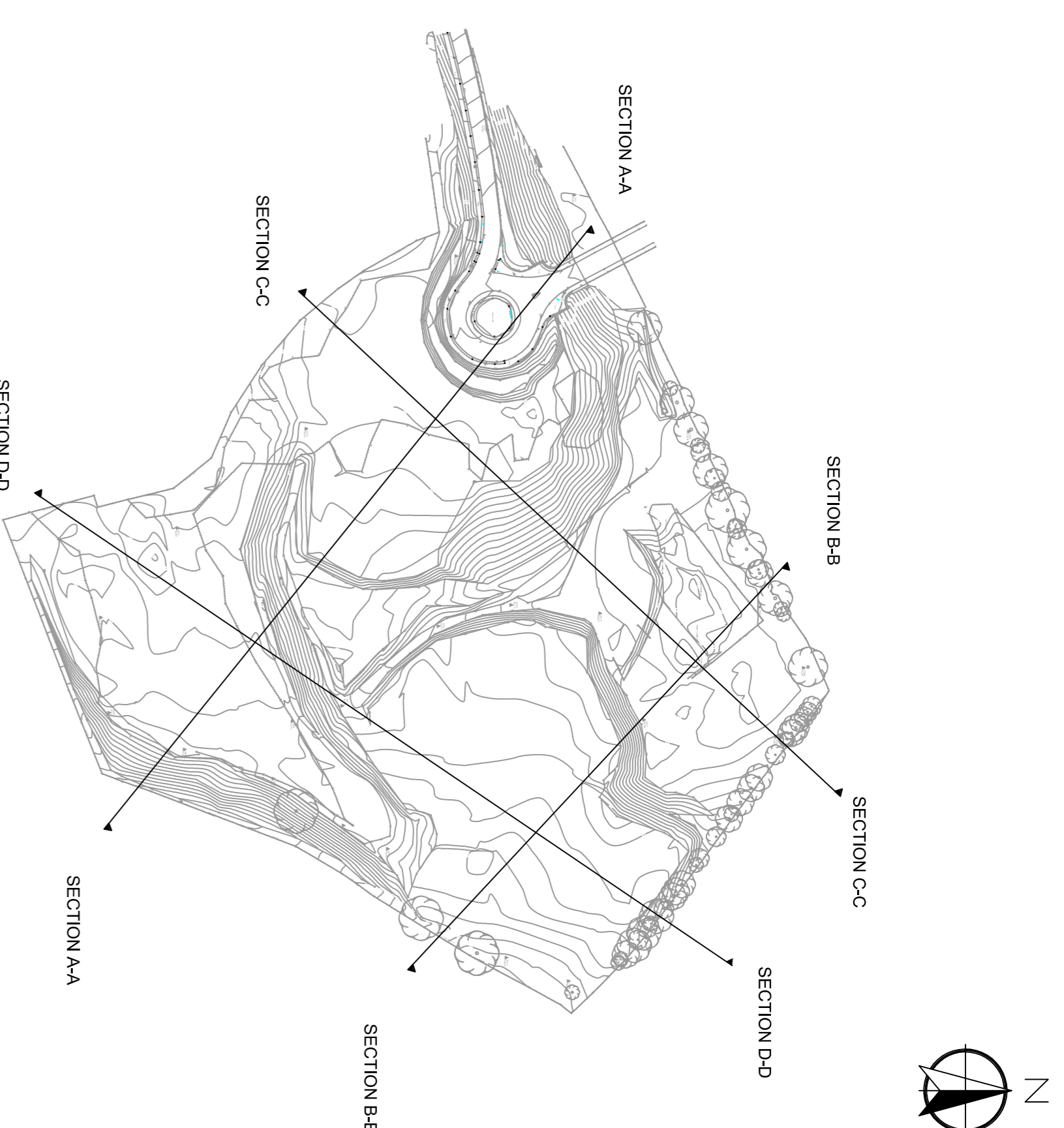


SECTION C-C



SECTION D-D

HORIZONTAL SCALE 1:1000 @ A1
VERTICAL SCALE 1:20 @ A1

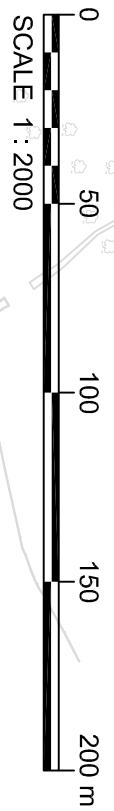
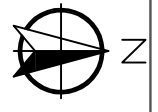
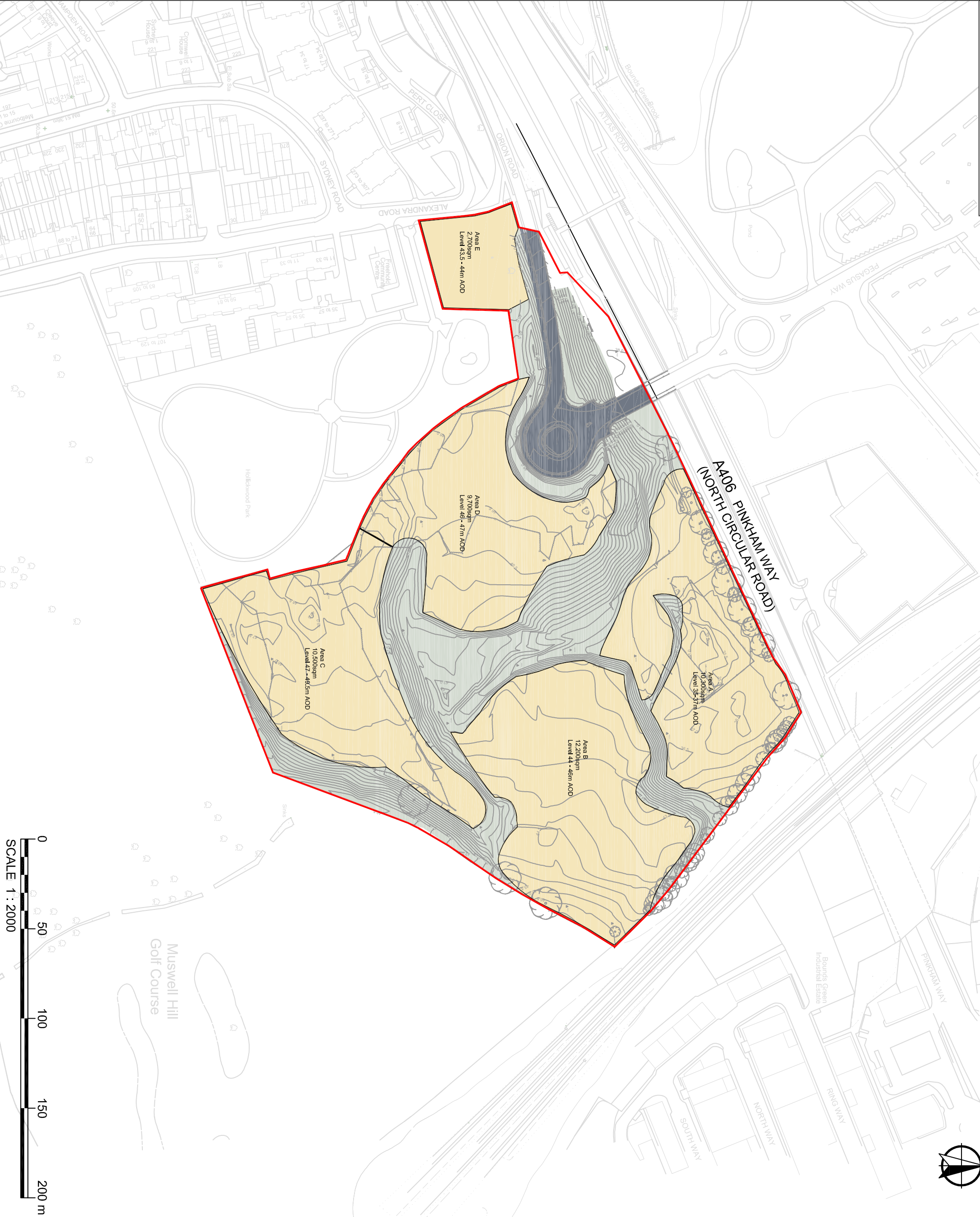


Cross-Section Location Plan

SCALE 1:2000 @ A1

0	Rev	Rev. Date	Purpose of revision	Drawn	Checked/Approved
<p>JACOBS 15 Foreland St, Glasgow, G2 7JH Tel: +44(0)141 201 5000 www.jacobs.com</p>					
<p>Client London Borough of Barnet</p>					
<p>Project FRIERN SITE ASSESSMENT</p>					
<p>Drawing title FIGURE 5 TOPOGRAPHICAL CROSS SECTIONS</p>					
<p>Drawing status</p>					
Scale	@ A1	DO NOT SCALE			
Jacobs No.	B0878400				
Client no.					
Drawing number	B0878400_005	Rev	0		

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- Key**
- Site Boundary
 - Plateau Definition
 - Existing Highway Access
 - Level Developable Area
 - Significant Gradient

Client	LONDON BOROUGH OF BARNET		
Project	FRIERN SITE ASSESSMENT		
Drawing title	FIGURE 6 CURRENT AREAS OF RELATIVELY LEVEL GROUND		
Drawing status	DO NOT SCALE		
Scale	1:2000 @ A3		
Jacobs No.	B0878400		
Client no.			
Drawing number	B0878400_006		
Rev	Rev	Date	Purpose of revision
0			
14-15 Greenway, Colindale, London, NW9 1QH Tel: +44(0)20 8729 2000 Fax: +44(0)20 8729 3100 www.jacobs.com			

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