TERRAGEN
Environmental Consultants

Practical, sustainable solutions to complex environmental problems

Risk Management Strategy

at

277a-Gray's Inn Road
London
WC1X 8QF

(Ref. TJ2824AR2v1.0)

E: **info@tgen.co.uk**

www.tgen.co.uk

TERRAGEN
Environmental Consultants

The Ridings
4 Village Close
Sherington
Bucks. MK16 9PZ
T: 020 8133 4418
W: www.tgen.co.uk

DOCUMENT CONTROL DETAILS		
Report Title:	**Risk Management Strategy** for 277a Gray's Inn Road London WC1X 8QF	
Report Reference:	TJ2824AR2	
Issue:	Version 1.0	
Date:	February 2015	
Client:	Regal Homes Limited 4-5 Coleridge Gardens London NW6 3QH	
Contact:	Graeme Whyte	
Author:	Terragen Environmental Consultants Limited The Ridings 4 Village Close Sherington Buckinghamshire MK16 9PZ	
Contact:	Paul Brewer (Project Manager)	
Prepared by:	Paul Brewer *BSc (Hons), MSc, MI Soil Sci* Senior Environmental Consultant	
Date:	16/02/2015	
Reviewed by:	Dr. Barry Powell *BSc (Hons), PhD, MCIWM* Principal Consultant	
Date:	17/02/2015	

CONTENTS

FIGURES

APPENDICES

LIST OF ABBREVIATIONS

ACM	Asbestos Containing Material
Agency	Environment Agency
Al	Aluminium
AONB	Area of Outstanding Natural Beauty
AoPC	Area(s) of Potential Concern
AST	Above Ground Storage Tank
BaA	Benzo(a)anthracene
BaP	Benzo(a)pyrene
BbF	Benzo(b)fluoranthene
BGS	British Geological Survey
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene & Xylene
CAT	Cable Avoidance Tool
C4SL	Category 4 Screening Levels
Chy	Chrysene
CLEA	Contaminated Lane Exposure Assessment
CSM	Conceptual Site Model
CWG	California Working Group
DEFRA	Dept for Environment, Food & Rural Affairs
DQRA	Detailed Quantitative Risk Assessment
E	East
FRA	Flood Risk Assessment
Ha	Hectare(s)
IcdP	Indeno(123-cd)pyrene
GAC	Generic Assessment Criteria
GQA	General Quality Assessment
GQRA	Generic Quantitative Risk Assessment
LLTC	Low level of toxicological concern'
LNR	Local Nature Reserve
m	Metre(s)
mAOD	Metres Above Ordnance Datum
mbgl	Metres Below Ground Level
MTBE	Methyl Tert-Butyl Ether
MCERTS	The Agency's Monitoring Certification Scheme
N	North
NGR	National Grid Reference
NNR	National Nature Reserve
NP	National Park
NVZ	Nitrate Vulnerable Zone
PAH	Polyaromatic Hydrocarbon(s)
PCB	Polychlorinated Biphenyl(s)
PCoC	Potential Contaminants of Concern
PE	Polyethylene
PID	Photo Ionisation Detector
POS	Parks and Open Spaces
PPE	Personal Protective Equipment
PRA	Preliminary Risk Assessment
PVC	Polyvinyl Chloride
QTSE	QTS Environmental Limited
RBMP	River Basin Management Plan
RMS	Risk Management Strategy
RWL	Resting Water Level
S	South
S4UL	Suitable 4 Use Levels
SAC	Special Area of Conservation
SGV	Soil Guideline Value
SNRHW	Stable Non Reactive Hazardous Waste
SPA	Special Protection Area
SPL	Significant Pollutant Linkage
SPR	Source-Pathway-Receptor
SPZ	Source Protection Zone
SSAC	Site Specific Assessment Criteria
SSSI	Site of Special Scientific Interest
SVOC	Semi Volatile Organic Compounds
TGEN	Terragen Environmental Consultants Ltd
TP	Trial Pit
TPH	Total Petroleum Hydrocarbon(s)
UCL_{95}	95% Upper Confidence Limit
UK	United Kingdom
UKAS	UK Accreditation Service
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
W	West
WAC	Waste Assessment Criteria
WFD	Water Framework Directive
WS	Window Sampler

1.0 INTRODUCTION

TGEN was commissioned by Soil Consultants Limited (SCL) on behalf of Regal Homes Limited (the client), via a written instruction to proceed (email dated 27/11/2014), to compile a RMS for the development at 277a Gray's Inn Road, London, WC1X 8QF (the site). A site location plan is presented in Figure 1.

2.0 BACKGROUND, REMIT AND APPROACH

2.1 Existing Site

The site comprises a roughly rectangular plot covering circa 0.285ha located in a mixed residential and commercial area of NW London, circa 150m to the SE of Kings Cross station. A steel framed warehouse building occupies the entire footprint of the site, which has been most recently in use as a car park. The site has been raised relative to an average level of 19.1mAOD compared to a level of 17.5mAOD at the St.Chad's Street exit and 18.1mAOD at the Gray's Inn Road exit.

The existing building comprises a steel column and roof truss structure, which runs down onto concrete pad footings. The boundary walls between the steel columns are formed in typical London brickwork and rise to a level of 6.0m along the full perimeter of the trussed roof.

Below part of the N section of the site there is a basement approximately 10m wide. The basement floor is circa 4.25m below the ground level across the site at 14.90mAOD. The basement is constructed from a series of brickwork walls supporting brickwork arches and appeared to have been used for storage, toilets, changing rooms and showers.

The site is bounded by St Chad's Street to the N, Gray's Inn Road to the E, Birkenhead Street to the W and Argyle Street to the S.

The E boundary of the site is directly adjacent to residential and commercial properties facing out onto Gray's Inn Road. These generally consist of four storey terraced brickwork buildings, a large proportion of which have a rear annex, which extends back to the E boundary of the proposed site. Further S along the E boundary, the proposed site is adjacent to number 275 Gray's Inn Road.

Along the S boundary, an existing building exists identified as No. 55 Argyle Street. This property, which runs along the length of the S boundary of the site contains an existing lower ground floor level and rises up two stories to the original roof level. A relatively recent extension to the building was undertaken, which comprised an additional high level storey on top of the original building. As part of the works undertaken the boundary wall was raised to suit the proportion of the new building. The boundary wall now extends to a level approximately 10.5m above existing ground level. To the W boundary, the site is bounded by the Birkenhead Street Estate, which contains four individual multi residential buildings each of which contain a single storey basement. The buildings are located approximately 5.0m from the existing site boundary wall. Surrounding the Birkenhead Street Estate is a communal green area, which has an average level of 18.75mAOD along the boundary with the site. To the N boundary, the site is accessed directly from St. Chad's street with properties each side of the site access. These have been identified as No.11 St. Chad's Street and No.13 St. Chad's Street. At present, No.11 St. Chad's Street is under development with construction of a new lower ground floor level through a series of underpins to the shared boundary walls.

2.2 Proposed Development

Planning permission (ref 2014/4267/P dated 10/10/2014) was granted by the London Borough of Camden (the local authority) for the demolition of the existing building and a comprehensive mixed use redevelopment of the site to provide sixty residential units (including fourteen affordable flats) comprising fifty six units arranged around the new open space (seven two-storey houses plus lower ground floor, forty nine flats in three, seven and eight storey blocks plus lower ground floor) and four flats in a four storey plus lower ground floor building on St Chads street with ancillary basement gym, offices at ground and lower ground floor, a café/gallery (Class A1/Class A3) at ground floor together with cycle parking, access, landscaping, boundary treatments and associated works. A copy of the

planning permission is presented in Appendix A, which is subject to a number of conditions, one of which (condition 9) relates to the investigation and remediation of potential contamination.

The proposed development will involve the demolition of the existing building and removal of all the existing hardstanding areas and underground services found within the confines of the site. The redeveloped site will provide three readily identifiable structural blocks, which rise up from an upper ground floor level of 18.95m AOD. The three blocks will include the low level residential "Eastern Block", the high level residential "Western Block" and the high level multi-purpose "Southern Block". A central courtyard is proposed between the three proposed blocks, which when considered together will form a continuous structural floor plate across upper ground floor level. The central communal areas between the eastern and western blocks will be dropped by 1.35m to a level of 17.60mAOD to form a split level upper ground floor.

Below the upper ground floor level, the site will maintain the split level characteristic of the proposed development with a split level lower ground floor to be identified separately as lower ground floor (to the raised levels below each of the residential blocks along the east and west boundaries) and basement level (to the central courtyard area and the full footprint of the southern block). The lower ground floor will be formed at a level of 16.1mAOD (i.e. circa 3m below the existing ground floor level) with the lower basement levels adopting a level of 14.3mAOD (i.e. circa 4.8m existing ground floor level).

As such, the redeveloped site will contain a single storey basement (typically 3.50m deep) across 60% of the site with a storey-and-a-half basement (typically 5.50m deep) over the remaining 40% of the site. When complete the site will be fully lined with RC facing walls in front of a combination of concrete underpins and contiguous piled walls.

The plans presented in Figure 2 show the extent of the upper ground floor, lower ground floor and the basement. A reduced level excavation of circa 3m across the entire site will be required with a deeper section, predominantly in the middle, circa 4.8m deep.

As the proposed development will result in the entire site being under permanent hardstanding, the landscape scheme is primarily hard materials. The soft landscaping will comprise a series of raised planters with grasses and herbaceous perennials and multistem trees helping 'green' the volume between the buildings. The raised planters will also provide seating opportunities as well as areas for visitor cycle parking, etc.

2.3 Previous Investigations

A Phase 2a preliminary site investigation and GQRA report (ref. TJ2824AR1v1.0 dated February 2015) was compiled by TGEN, which should be read in full in conjunction with this RMS.

The refined CSM based on the findings of the Phase 2a site investigation and Tier 2 GQRA allocated a very low risk rating to the majority of SPL. A high risk rating was however allocated to the following:-

- ACM in the rubble dominated made ground across the site considered to be a risk to groundwork operatives and offsite humans during the groundwork phase of the development.

All of the impacted made ground will be removed as part of the excavation to accommodate the basement structure. The RMS should include for good practice techniques to be employed during the development of the site in terms of mitigating any risks from the release of ACM fibres.

Elevated concentrations of lead were ubiquitous in the made ground across the site and whilst the UCL_{95} concentration was above the overly conservative residential GAC it was below the more realistic C4SL commercial threshold. Elevated concentrations of zinc were also ubiquitous in the made ground across the site, which exceeded the landscape planting GAC. However, on the basis that all of the made ground is to be removed as part of the development and that the entire site is to be under permanent hardstanding, both the human health and landscape planting SPL were considered to be inactive.

No evidence of hydrocarbon contamination was recorded during the Phase 2a site investigation, which was corroborated by in-situ headspace monitoring (PID) and laboratory testing (TPH, PAH, VOC and semi VOC) returning concentrations below their respective GAC and in the vast majority of cases below the laboratory limits of detection. As such, chemically, the use of standard PE pipe material for water supply pipes would not appear to be precluded. However, this should be confirmed by the local water supply company, who may require barrier pipes to be installed as a precaution considering the previous industrial uses of the site and the surrounds.

As such, we would recommend that a risk management strategy be implemented during the development to mitigate the active SPL and verify that the sources of potential contamination are removed and the respective SPL broken.

2.4 Remit and Approach

Our remit was to compile a RMS based on the findings of the Phase 2a site investigation and Tier 2 GQRA. Environmental assessors use a SPR conceptual site model when determining the risk posed by a potentially contaminated site. For potential risk to arise each stage of the SPR linkage must be present, plausible and significant. Our approach to site investigation, environmental risk assessment and the generation of GAC and SSAC used to assess land contamination and the success of remediation works, if required, is detailed in Appendix B.

3.0 RISK MANAGEMENT STRATEGY

In order to break the SPL identified at the site a remediation scheme should be implemented as part of the development.

Based on the refined CSM constructed on the basis of the Phase 2a site investigation and the Tier 2 GQRA the only remaining SPL requiring mitigation is as follows:-

- ACM in the rubble dominated made ground to be removed as part of the basement excavation.

In addition to the above, should there be any ACM in the fabric of the buildings then it will need to be removed in a controlled manner as part of the development.

Elevated concentrations of lead and zinc in the made ground were also identified across the site, which will also be removed as part of the basement excavation.

3.1 Options Appraisal

In preparing an options appraisal, we understand that the redeveloped site will contain a single storey basement (typically 3.50m deep) across 60% of the site with a storey-and-a-half basement (typically 5.50m deep) over the remaining 40%. When complete the site will be fully lined with RC facing walls in front of a combination of concrete underpins and contiguous piled walls. As such, the entire site will be subject to a bulk excavation in order to accommodate a single storey and storey and a half basement. The final development will be entirely under permanent hardstanding.

An options appraisal would in most circumstances involve a comparison between various methods of breaking exposure pathways versus removal of the source of contamination. In this case, the proposed development will involve the removal of the source of the contamination and therefore the SPL between ACM and end users of the completed development will be broken. However, the SPL between ACM and groundwork operatives and offsite humans as a result of fibre release and subsequent inhalation will be active during the earthwork phase until the site is capped by permanent hardstanding. As such, the remediation strategy will require the excavation to be carefully managed in order to ensure risks of fibre release are minimised and the short term SPL is broken.

As noted in the previous report, the Phase 2a site investigation and previous exploratory investigations at the site have been restricted due to the thickness of the reinforced concrete at the surface across the site and also the presence of obstructions in the shallow made ground. As a result, the overall coverage of investigation has been limited and the RMS should also include for a discovery strategy, a watching brief and a programme of investigation and sampling, which should be implemented after the building has been demolished and the surface hardstanding broken out and obstructions removed.

3.2 Remediation Strategy

The remediation strategy detailed below comprises a combination of source removal and breaking of pathways to mitigate the identified risks.

3.2.1 Removal of ACM from the Building Fabric

If any parts of the fabric of the existing buildings are suspected to contain ACM (e.g. roof tiles) we would recommend that these be removed by an appropriately licensed contractor and disposed to an appropriately permitted waste management facility.

3.2.2 De-Watering

Prior to and during the groundwork excavations it may be necessary to carry out a programme of dewatering in order to allow the excavation of the soils to be carried out. Based upon the results of the testing carried out on the samples of groundwater to date the groundwater at the site would appear to be largely uncontaminated. However, we would recommend that provision be made for settlement and potentially treatment through an oil water separator in order to be suitable for discharge to sewer as trade effluent. This will require an appropriate consent from the local water authority.

3.2.3 ACM in the Made Ground

ACM has been confirmed in the rubble dominated made ground at seven exploratory locations, comprising chrysotile, amosite and crocidolite free fibres as well as fragments of tile, insulation and lagging. On this basis, we would assume that it is ubiquitous in the made ground.

The proposed works will involve the removal of the made ground and therefore will result in the removal of the potential source of contamination. However, the remediation strategy will also need to ensure that SPL from fibre release to operatives and offsite humans (e.g. general public and neighbours) during the works is also broken.

The contractor should prepare and implement a method statement for the works to be undertaken in accordance with the Control of Asbestos Regulations (2012) and Asbestos in soil and made ground: a guide to understanding and managing risks CIRIA (2014). On this basis, the method statement should take into account the following:-

- An asbestos specialist should be consulted/employed to provide advice and guidance in relation to works involving ACM and should prepare the final method statement.
- The Health and Safety Executive (HSE) may need to be notified prior to work commencing.
- Work specifically involving ACM and air monitoring should be undertaken under the supervision of appropriately experienced personnel.
- As asbestos insulation materials and asbestos board etc. have been identified then it may be necessary to engage the services of a licensed contractor and pre-notify the regulator.
- An accredited analyst should be available onsite when working in asbestos contaminated areas, who will be capable of identifying any suspected ACM and determining whether it is notifiable to the HSE or can be removed as an unlicensed material.
- A regime of background air and personnel asbestos monitoring should be in place adjacent to work areas. Provided this exercise indicates there is no airborne asbestos fibres being generated by the works, the visit/test frequency may then be reviewed.

Records should be retained for inclusion in the closure report demonstrating that the fibre release SPL was broken during the works. This should include records of dampening down, air monitoring etc. If at any point during the works, the results of the air monitoring indicate that unacceptable fibre release has occurred, then the asbestos specialist should ensure that work is halted immediately, working practices reviewed and if necessary altered to ensure that fibre release is prevented.

During the groundwork, the method statement should take in to account the following:-

- Task specific risk assessments and method statements should be put in place, and risks and required mitigation measures communicated to all relevant personnel prior to the works commencing. Appropriate PPE and if required RPE should be provided and utilised.
- The excavation should be carried out by operatives who have undertaken an asbestos awareness course.
- Excavated material found to contain asbestos should be removed in sealed skips. A sealed skip should be available onsite while excavation works are being carried out.
- If ACM is found to be localised and can be picked then asbestos trained operatives should be employed to remove any material exposed by the excavator. They should then double bag any that is visible. The bagged ACM should be placed into a dedicated sealed skip pending offsite disposal to a suitably permitted facility.
- A specialist contractor should be available to mobilise onsite within short notice to respond to any discovery of suspected ACM in the excavation works.
- A decontamination unit should be available onsite during excavation works where it is thought likely that inadvertent exposure to asbestos fibres may occur.
- Any area where asbestos has been identified should be damped down while the ACM is being removed. A power washer (or similar) should be used to create a mist over the excavated ground to supress airborne particles. In dry conditions, all areas should be damped down as a matter of course to keep dust suppressed.
- Operatives should wear face fitted masks, disposable overalls, overshoes and gloves whilst hand picking ACM fragments and/or during excavations in areas known to be affected by ACM.
- The excavation and any temporary stockpiling of soils containing ACM should be dampened down to prevent the release of asbestos fibres.

- Suspected ACM containing soils should be placed in a dedicated temporary stockpile or directly into covered wagons pending offsite disposal to an appropriately permitted facility.

3.2.4 Water Supply Pipes

We assume that in accordance with good practice, any water supply pipes will be of an approved material and that the trench to accommodate them will be excavated to a depth of between 0.75m and 1.35m. The pipes will then be protected from stones etc. by backfill and bedding with fine sand.

Where possible we would recommend that any made ground be completely removed from the trench along the route of any water supply pipes prior to the trench being backfilled with a suitable material. On the basis that made ground is completely removed from the pipe run, then standard PE pipe materials would be suitable for use. This proposal should be confirmed by the local water supply company. Should this not be feasible and made ground remain in-situ along the pipe run, then in-lieu of removing all of the made ground, suitable barrier pipes should be used. Upon completion of the installation, the groundwork and building contractor should provide details (e.g. a product specification) and photographic evidence of the construction of the trench and the pipe materials used.

3.2.5 Interceptors, AST and UST

There has to date been no evidence (e.g. fill points, vent pipes, manhole covers etc.) of interceptors, AST or UST at the site. However, should any be found during the development, then they should be decommissioned in accordance with relevant agency guidelines (e.g. PPG27), which can be summarised as follows:-

1	Task specific risk assessments and method statements should be in place, and risks and required mitigation measures communicated to all relevant personnel prior to the works commencing. Appropriate PPE and, if required, RPE should be provided and utilised.
2	Once the location of the identified structure(s) is confirmed it should be made safe and removed from the site in accordance with the recommendations in Chapter 5 of the Defra Groundwater Protection Code *'Petrol stations and other fuel dispensing facilities involving underground storage tanks'*. The structure(s) and any associated pipework should be removed for offsite disposal. All works should be undertaken under specialist supervision.
3	If the structure(s) has not been previously decommissioned it should be assessed, opened to vent any gases contained within and any contents removed by vacuum tanker prior to removing it and any associated pipework for offsite disposal.
4	During the removal of the structure(s) and the excavation of the associated soils, a qualified geo-environmental engineer should maintain a watching brief and undertake a visual inspection of the ground material. Clean overburden should be stockpiled separately for reuse and damped down or covered to prevent dust generation as appropriate.
5	On the assumption that any significant hydrocarbon contamination is likely to be in localised hotspots, it is considered that the site has a low potential to generate levels of odour that are likely to cause a nuisance issue at or beyond the site boundary. However, should a potentially significant odour issue be identified, the groundwork in that area should be suspended until a suitable odour suppression or mitigation system is put in place.

- If an interceptor and/or AST or UST were found to contain liquids, then these should be emptied and cleaned/degassed by an appropriately licensed contractor. All certification for this process should be retained. The local petroleum officer should also be informed of this activity and in the case of petroleum filled tanks may wish to be in attendance to verify the process. Allowance should be made for over excavation to remove any hydrocarbon contaminated soils from around the base and sides of the interceptor and any AST or UST.
- Any areas where interceptors, tanks (AST or UST) or fuel feed infrastructure etc. were encountered should be treated as hotspots of contamination and should be subject to the validation procedure described in Section 3.3 (below) and should be backfilled with suitable imported material validated in accordance with the procedures described in Section 3.4.
- Once any interceptor or tank has been emptied and removed/broken out, then the surrounding made ground should be inspected. Should any hydrocarbon impacted soil be encountered in the surrounding made ground or upper layers of clay returning elevated concentrations of VOC (via headspace PID monitoring) these should be excavated out. Visual and olfactory evidence backed by PID monitoring should be used to determine the vertical and lateral extent of the remedial excavation.
- The materials from the remedial excavations should be temporarily stockpiled on suitable impermeable plastic sheeting and covered to prevent runoff or leaching of contamination and to minimise the potential

for dust generation. Additional testing, including WAC, should be undertaken on the stockpile to allow a proper classification of the materials for disposal offsite as waste.

3.3 Imported Soils

Any soils imported onto site should be tested in accordance with a general contamination suite and/or a relevant industry standard. Laboratory certificates of analysis should be provided for all soil based materials imported to the site (e.g. topsoil, aggregates, specified fill etc.) and the results assessed for compliance with an appropriate specification for the works, industry best practice and the relevant GAC. The contractor should provide documentation (e.g. delivery notes) indicating the volume and/or number of loads delivered and the location and depth of placement achieved.

3.4 Site Works

During any excavation and construction activities at the site, the standard risks to workers should be mitigated through suitable measures. The main contractor (and any subcontractors) should prepare their own risk assessments in accordance with Health and Safety legislation in order to protect operatives at the site. Consideration should be given to the advice listed in Appendix B.

Whilst a formal disposal classification is beyond the scope of this report, based upon the testing (including WAC) undertaken as part of the investigation, we would classify the materials as follows:-

Stratum	Typical Description	Likely Disposal Classification
Hardstanding	Reinforced concrete.	Inert (LoW Code 17 01 01)
Made Ground (MG1)	Dry, compact, crushed concrete sub-base.	Inert (LoW Code 17 01 01)
Made Ground (MG2)	Brown to reddish brown, compact brick rubble with a silty, sandy matrix and containing frequent fragments of concrete and occasional fragments of slate, ceramic and metal.	SNRHW (LoW Code 17 05 03)
Made Ground (MG3)	Very dark greyish brown, dry, compact, sandy, gravelly silt with frequent fragments of brick and concrete and occasional fragments of wood and ceramic, and occasional partially decomposed organic remains.	Inert/Non-Hazardous (LoW Code 17 05 04)*
London Clay	Yellow brown to orange brown, soft to firm silty clay.	Inert (LoW Code 17 05 04)

* Except material represented by the sample from TP6 @ 1.5-2.1mbgl.

The rubble dominated made ground (MG2) encountered across the site would be classified as SNRHW soil and stones (LoW Code 17 05 03) due to the quantity of asbestos fibres present exceeding 0.1%. Although several of the samples returned concentrations below 0.001% there is no practical way of visually differentiating between the materials and it is therefore likely that all of the rubble dominated made ground should be classified as SNRHW.

The sandy, gravelly silt made ground (MG3) should be properly classified as inert/non-hazardous soil and stones waste (LoW Code 17 05 04). Additional chemical testing including WAC should be undertaken on this material, which may allow reclassification as inert waste.

The only exception was material represented by the sample from TP6 @ 1.5-2.1mbgl, which should be classified as hazardous soil and stones as the concentration of ACM is greater than the threshold of 0.1%. Such material should be subject to additional WAC testing to determine whether it can be reclassified as SNRHW waste, which can then be disposed to a non-hazardous landfill site permitted to accept such material.

The underlying natural ground was free from visual and olfactory evidence of contamination, which was corroborated by laboratory analysis. Such material should be properly classified as inert soil and stones (LoW Code 17 05 04) for disposal offsite as waste.

On the basis that hazardous waste will be generated during the works, then the site will need to be registered with the agency as a producer of hazardous waste prior to works commencing.

3.5 Discovery Strategy

The investigations undertaken to date have been restricted in terms of coverage as a result of the thickness of hardstanding across the site and also the presence of concrete/rubble obstructions in the shallow made ground. As such, there is a residual risk of further contamination being present in small discrete areas (hotspots) and there can be no certainty that all such areas have been located and/or sampled. As such, a discovery strategy should be implemented by all those involved with development at the site, including the main contractor and sub-contractors, and particularly those involved in ground works (e.g. groundwork contractor etc.). Once the building has been demolished and the surface hardstanding has been broken out, we would recommend in advance of the basement excavation an additional investigation be undertaken to further assess the presence and significance of contamination across the site.

3.5.1 Previously Identified Contaminants

If during development work, contaminants previously identified at the site be found in areas previously expected to be uncontaminated, then the contractor should cease work at that location and a geo-environmental engineer or asbestos specialist required to attend site and inspect the materials encountered. Where the materials are confirmed to be impacted with contaminants identified previously on the site then remediation should be carried out in line with the strategy outlined in Sections 3.2.

3.5.2 Previously Unidentified Contaminants

If during development works, contamination is encountered which was not previously identified and is derived from a different source and/or different type to those previously encountered (e.g. those of an unusual appearance and/or odour etc.) then work should cease at that location, the local authority informed and a geo-environmental engineer required to attend site and inspect the suspect materials.

After a suitable assessment of the materials (e.g. in-situ monitoring and/or laboratory testing) a geo-environmental engineer should prepare an addendum to the remediation strategy to accommodate the materials encountered for submission to and approval by the local authority. Upon approval by the local authority, the contractor should implement the remediation strategy accordingly.

3.6 Closure Report

A closure report should be completed demonstrating that the works have been carried out satisfactorily. We would recommend that any works undertaken are documented and where necessary validated to include the following:-

- Documentation of any materials removed from the site (e.g. waste transfer notes etc.) including photographic evidence.
- Validation records (e.g. air monitoring etc.) demonstrating that the works have been undertaken in accordance with relevant asbestos regulations.
- Visual assessment of formation level, backed where necessary by compliance results of validation testing and/or monitoring.
- Verification testing of any soils proposed for importation onto the site.
- Verification that the appropriate construction materials have been used (including product specifications, certification and photographic record).
- Details of any unexpected contamination encountered and the measures implemented.

3.7 Regulatory Approval

Formal approval should be sought from the local authority with regards to the recommendations contained within this report prior to commencing significant development of the site.

4.0 LIMITATIONS AND USE OF THIS REPORT

IMPORTANT: This section should be read before reliance is placed on any of the opinions, advice, recommendations or conclusions set out in this report.

a) This report has been prepared for the purpose of providing advice to the client pursuant to its appointment of Terragen Environmental Consultants Limited (TGEN) to act as a consultant.
b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.
c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.
d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, TGEN has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.
e) TGEN acknowledges that it is being retained, in part, because of its knowledge and experience with respect to environmental matters. TGEN will consider and analyse all information provided to it in the context of our knowledge and experience and all other relevant information known to us. To the extent that the information provided to us is not inconsistent or incompatible therewith, TGEN shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of such information.
f) The content of this report represents the professional opinion of experienced environmental consultants. TGEN does not provide specialist legal advice and the advice of lawyers may be required.
g) In the summary and recommendations sections of this report, TGEN has set out our key findings and provided a summary and overview of our advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by TGEN and therefore any advice, opinions or recommendations set out in the executive summary, summary and recommendations sections ought not to be relied upon unless they are considered in the context of the whole report.
h) The assessments made in this report are based on the ground conditions as revealed by walkover survey and/or intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination (hot spots) and there can be no certainty that any or all such areas have been located and/or sampled.
i) There may be special conditions appertaining to the site which have not been taken into account in the report. The assessment may be subject to amendment in light of additional information becoming available.
j) Where any data supplied by the client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by TGEN for inaccuracies within the data supplied by other parties.
k) Whilst the report may express an opinion on possible ground conditions between or beyond trial pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.
l) Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.
m) This report is prepared and written in the context of the agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a reinterpretation of the report in whole or part after its original submission.
n) The copyright in the written materials shall remain the property of the TGEN but with a royalty-free perpetual license to the client deemed to be granted on payment in full to TGEN by the client of the outstanding amounts.
o) These terms apply in addition to the TGEN standard terms of engagement (or in addition to another written contract which may be in place instead thereof) unless specifically agreed in writing (In the event of a conflict between these terms and the said standard terms of engagement the said standard terms of engagement shall prevail). In the absence of such a written contract the standard terms of engagement will apply.
p) TGEN maintains adequate insurance cover for public liability and professional indemnity. However, we are unable to accept liability for asbestos related matters. Our work must not be taken as sufficient to identify the presence or absence of asbestos in or on the ground. In placing a contract with us the client accepts the restriction on asbestos. If we find or strongly suspect asbestos is or may be present in or on the ground we will inform the client and advise specialist investigation. The client agrees that they shall not bring any claim personally against any director / employee or consultant to us in respect of loss or damage suffered by the client arising out of this contract.

Figure 1 Site Location Plan.

277A GRAYS INNS ROAD

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing
Site / Block Plan
Scale:
1:500@A2
Drawing Number:
126 - 0101
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

EXISTING SITE BLOCK PLAN

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

Aerial View

Interior of the existing building

Gray's Inn Road entrance

Argyle Square Gardens

St Chad's Street entrance

View from Birkenhead Estate

West Elevation - from Birkenhead Estate

West Elevation - from Birkenhead Estate

West Elevation - from Birkenhead Estate

EXISTING SITE PHOTOS

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing
Site Photos
Scale:
NS@A2
Drawing Number:
126 - 0102
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

EXISTING BASEMENT FLOOR PLAN

MATERIAL
Architects 126

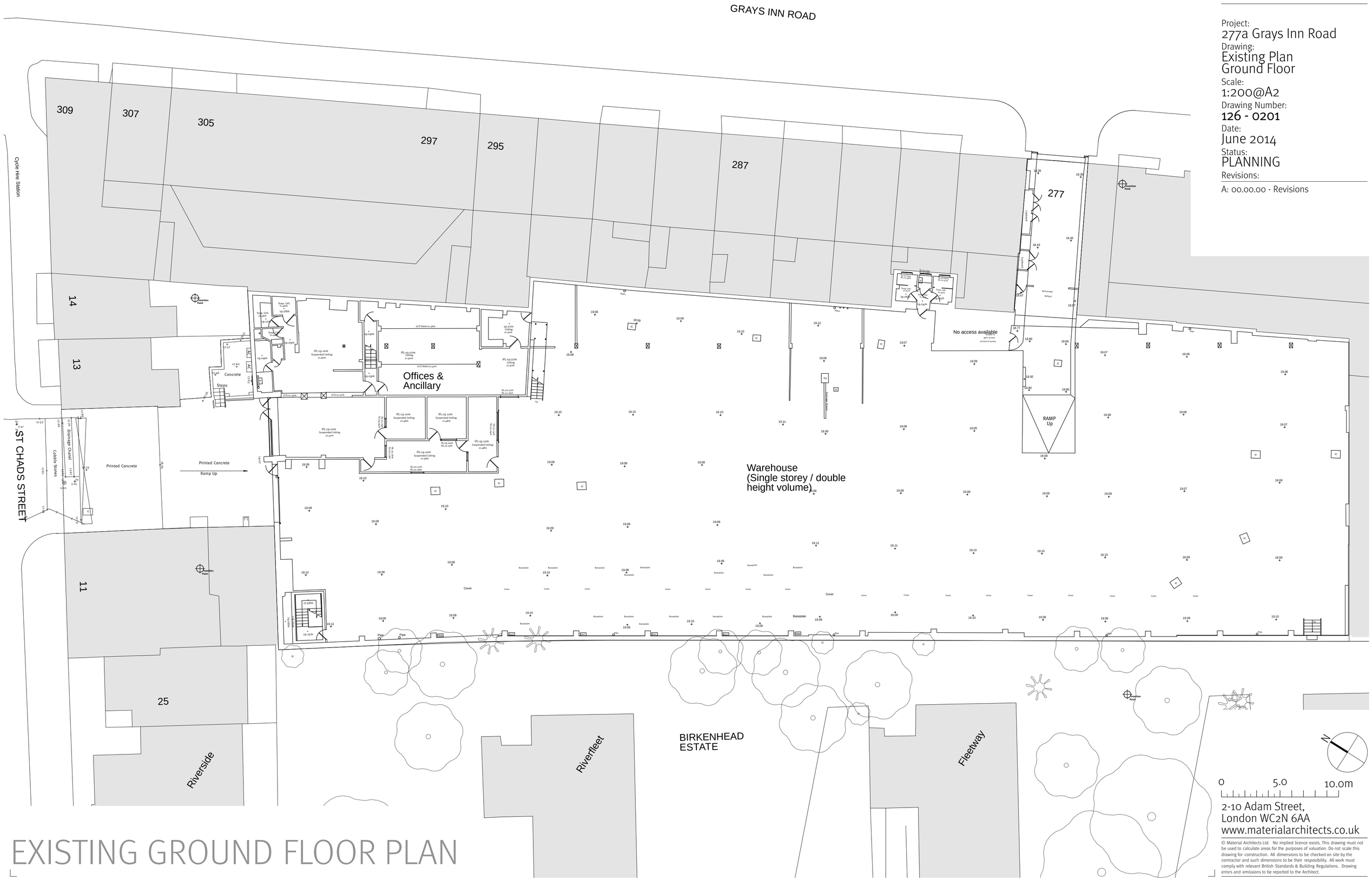
Project:
277a Grays Inn Road
Drawing:
Existing Plan
Basement Floor
Scale:
1:200@A2
Drawing Number:
126 - 0200
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD



EXISTING GROUND FLOOR PLAN

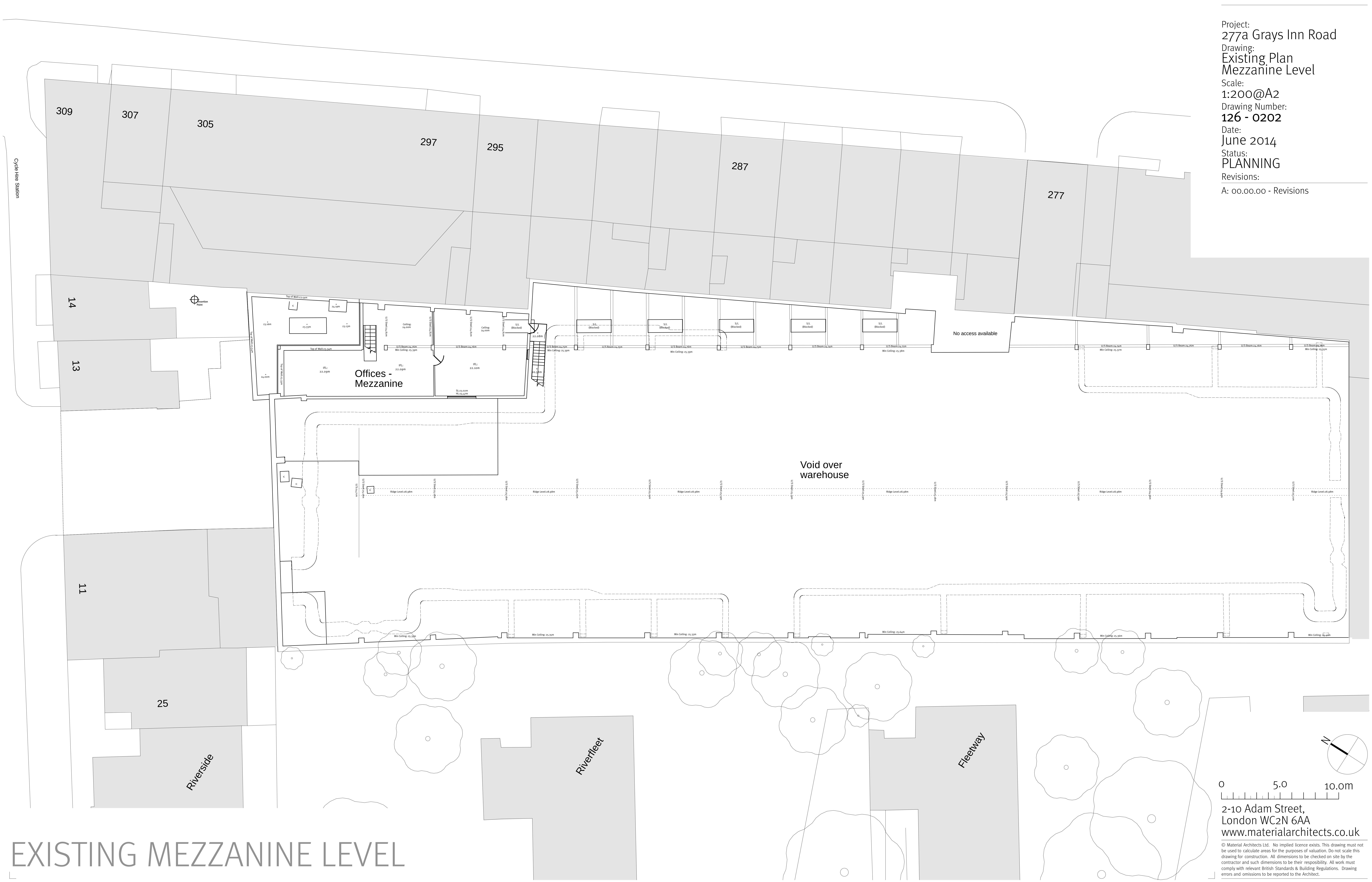
MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing Plan
Ground Floor
Scale:
1:200@A2
Drawing Number:
126 - 0201
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD



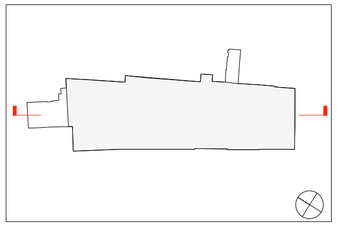
MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing Plan
Mezzanine Level
Scale:
1:200@A2
Drawing Number:
126 - 0202
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions

EXISTING MEZZANINE LEVEL

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

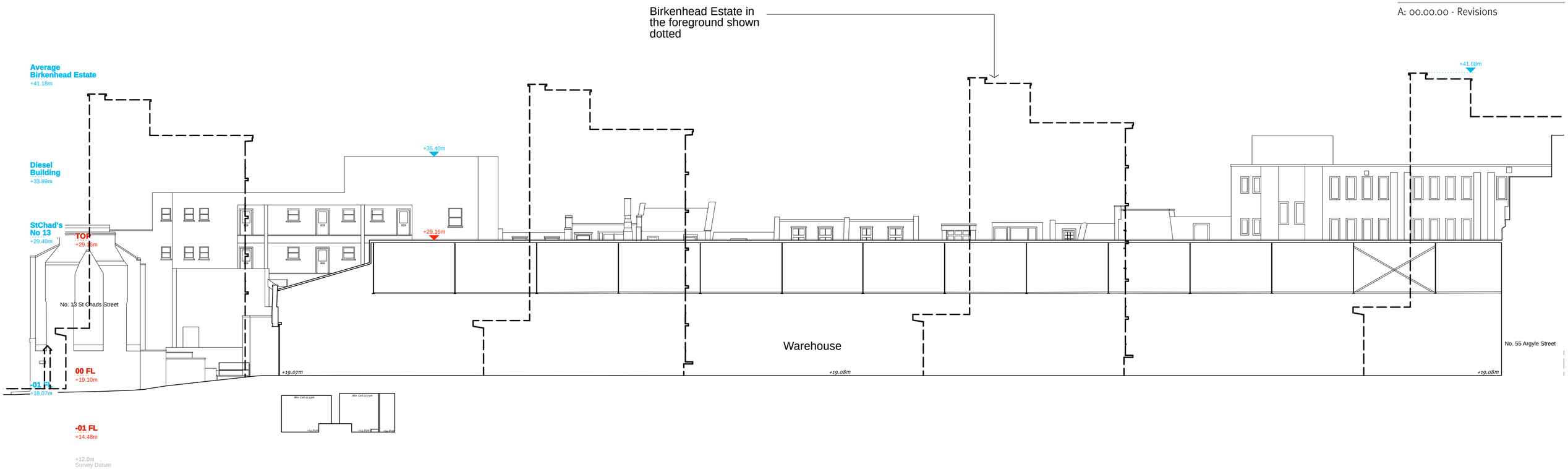
277A GRAYS INN ROAD



MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing
Longitudinal Section
Looking East
Scale:
1:200@A2
Drawing Number:
126 - 0301
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

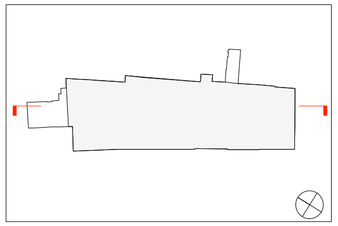


0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

EXISTING LONGITUDINAL SECTION (Looking East)

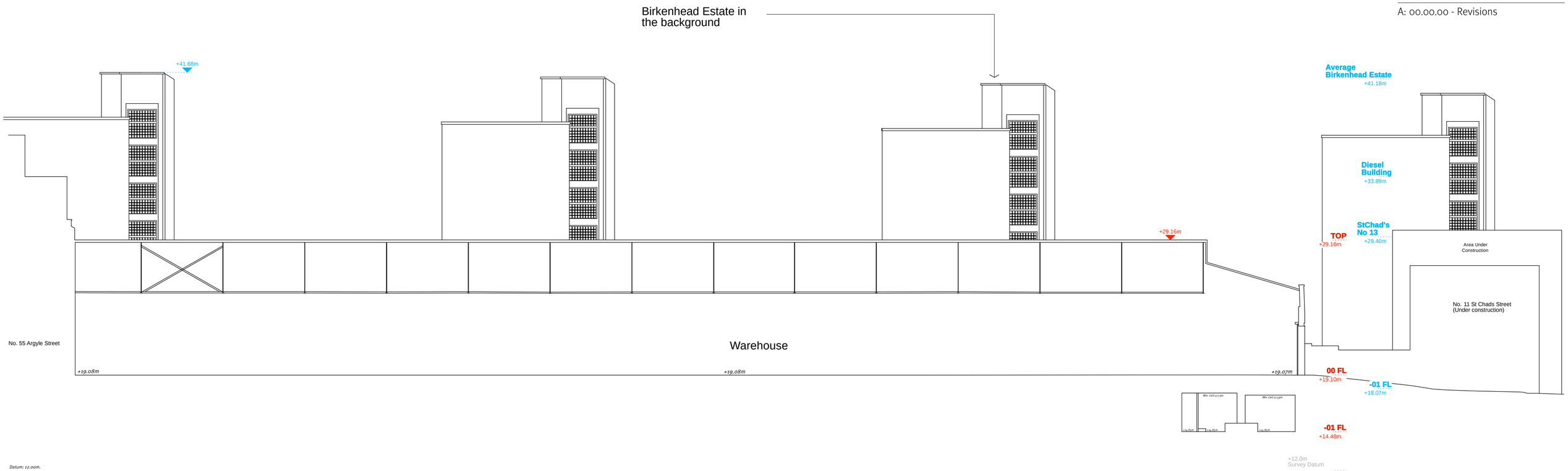
277A GRAYS INN ROAD



MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing
Longitudinal Section
Looking West
Scale:
1:200@A2
Drawing Number:
126 - 0302
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions



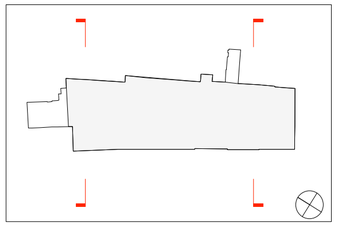
Datum: 12.00m.
Section 2

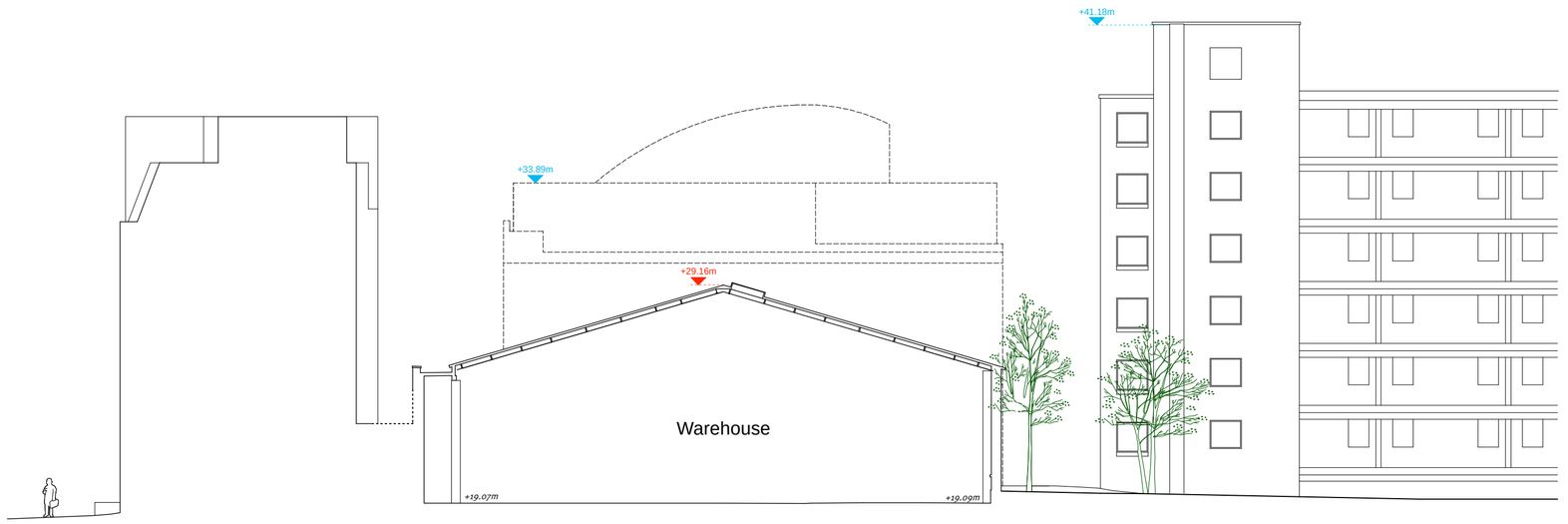
0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

EXISTING LONGITUDINAL SECTION (Looking West)

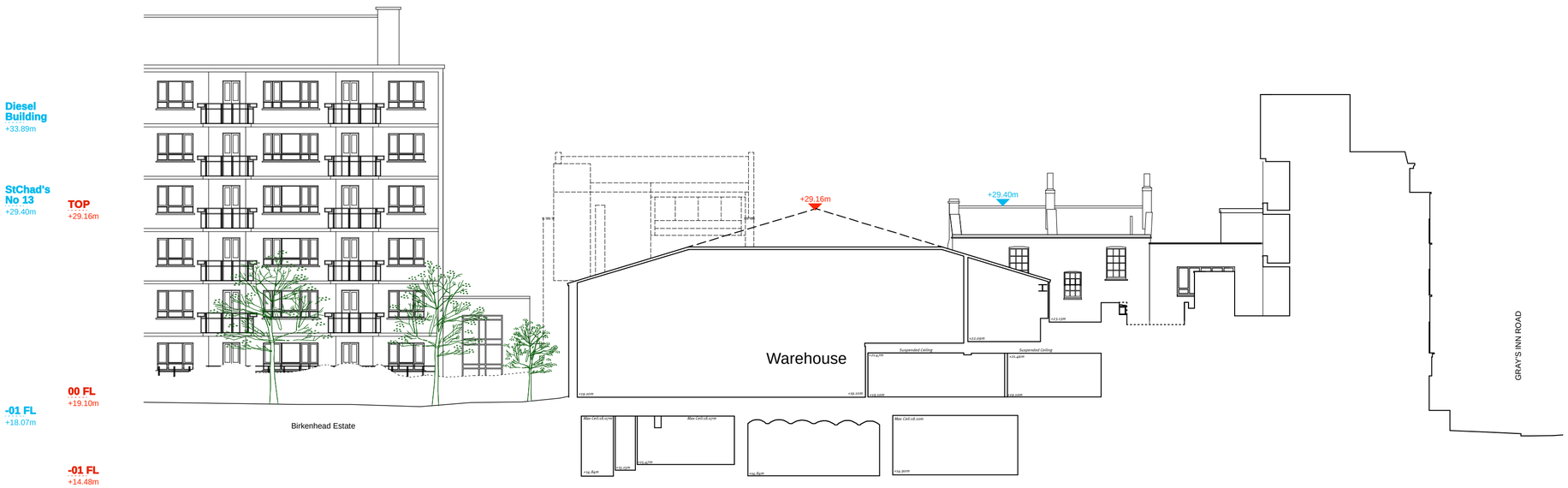
277A GRAYS INN ROAD





Section 5

Birkenhead Estate



Birkenhead Estate

Section 7

EXISTING CROSS SECTIONS

MATERIAL
Architects 126

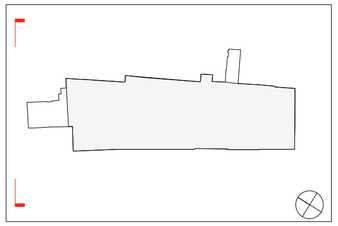
Project:
277a Grays Inn Road
Drawing:
Existing
Cross Sections
Scale:
1:200@A2
Drawing Number:
126 - 0303
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

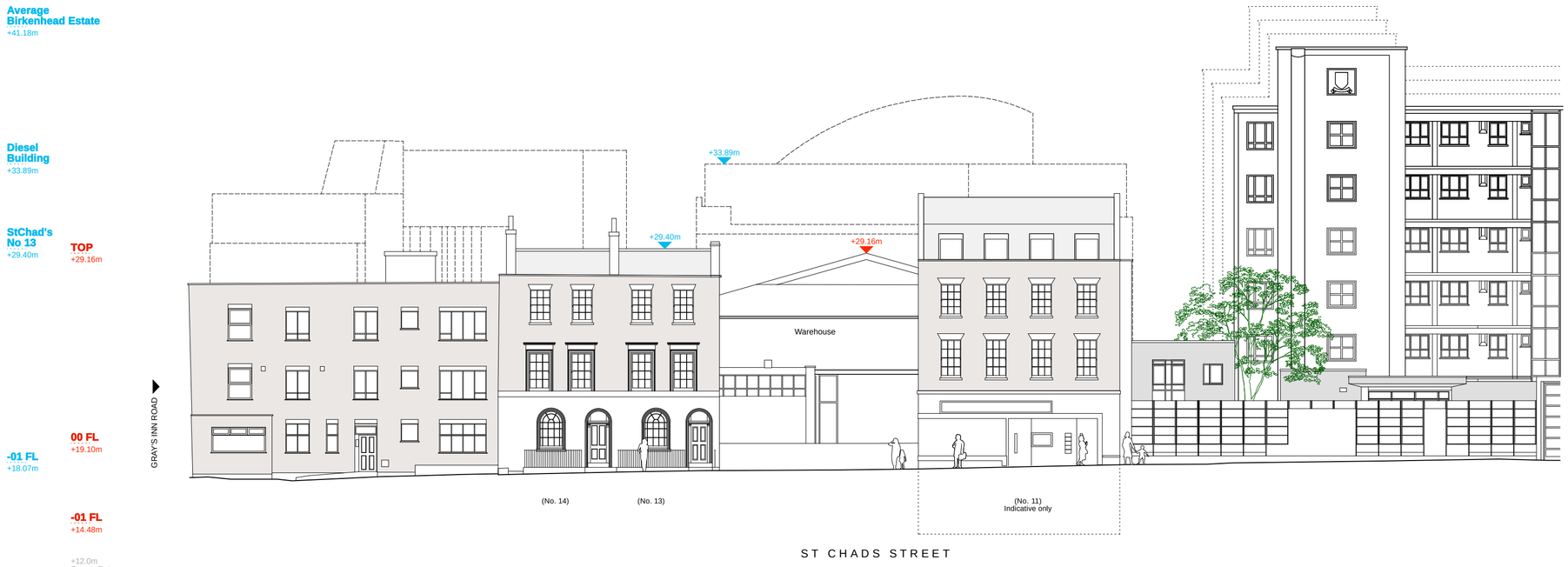
277A GRAYS INN ROAD



MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing
North Elevation
Scale:
1:200@A2
Drawing Number:
126 - 0401
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

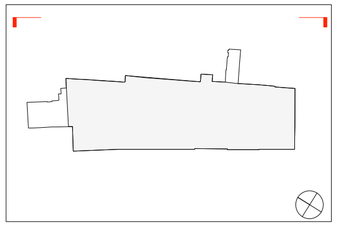


0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

EXISTING NORTH ELEVATION - (St Chad's Street)

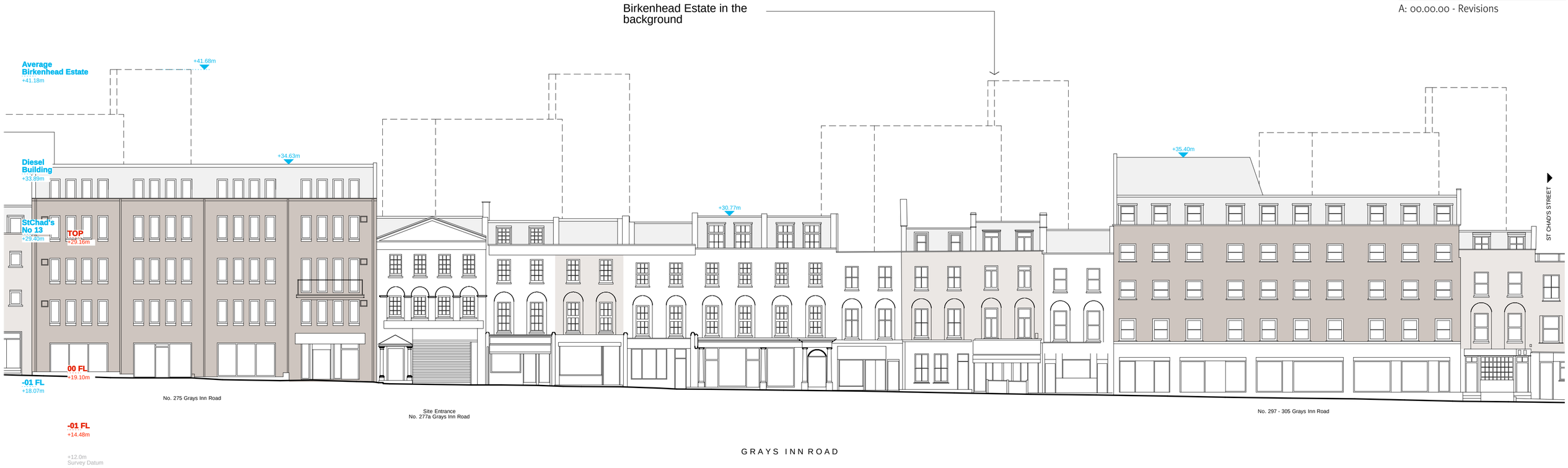
277A GRAYS INN ROAD



MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing
East Elevation
Scale:
1:200@A2
Drawing Number:
126 - 0402
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

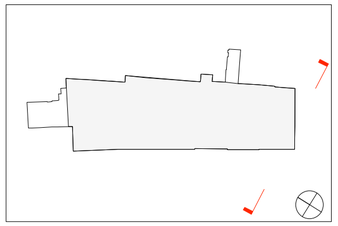


EXISTING EAST ELEVATION - (Gray's Inn Road)

0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

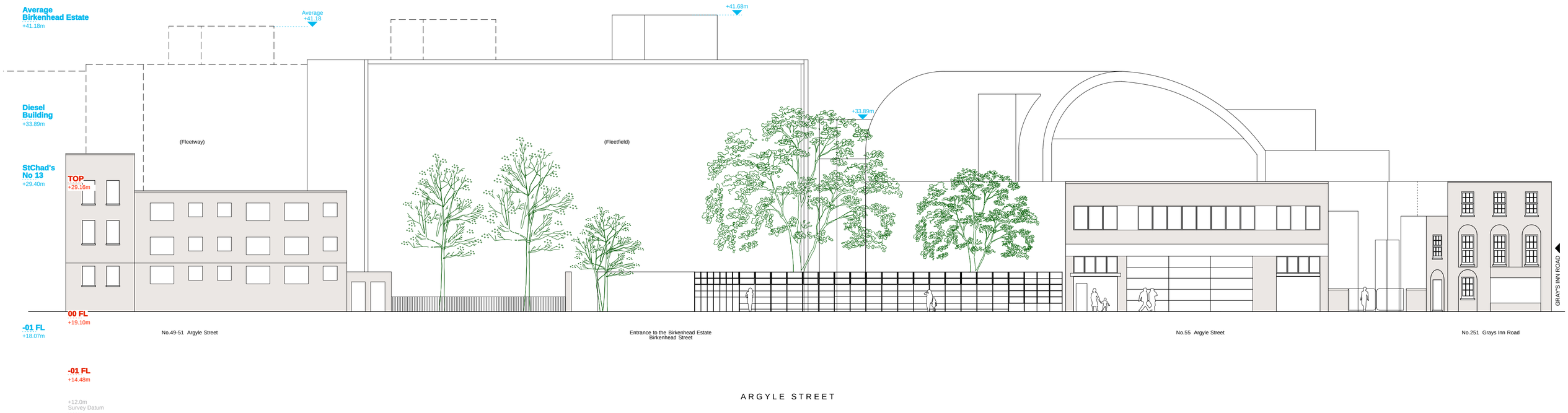
277A GRAYS INN ROAD



MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing
South Elevation
Scale:
1:200@A2
Drawing Number:
126 - 0403
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

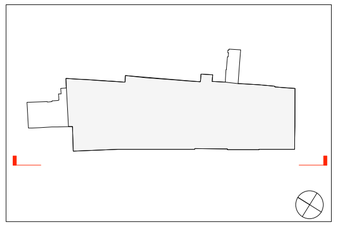


0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

EXISTING SOUTH ELEVATION - (Argyle Street)

277A GRAYS INN ROAD

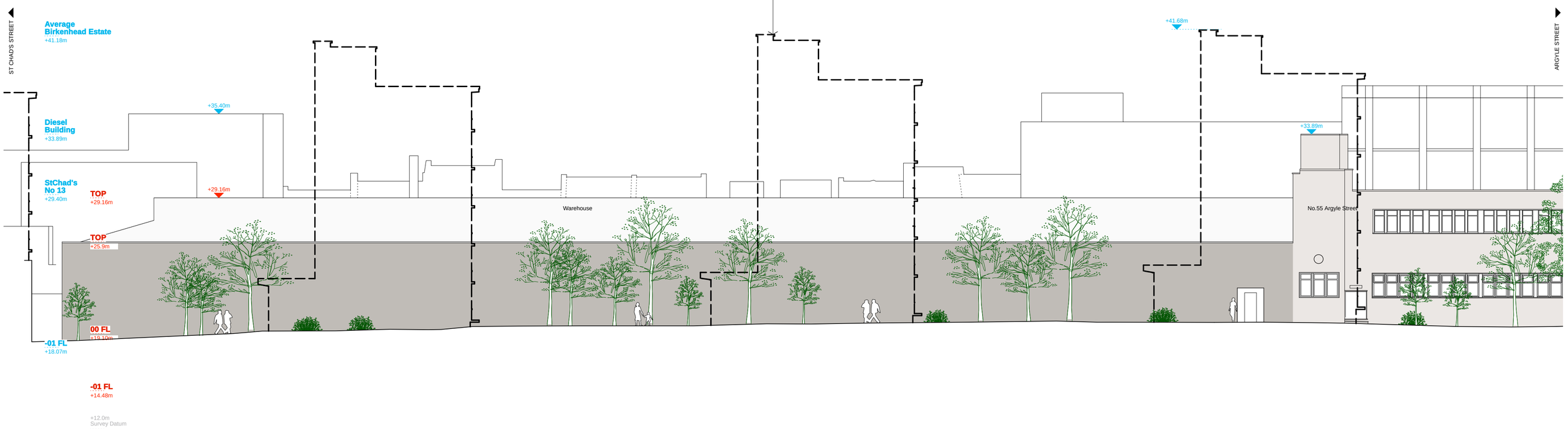


MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Existing
West Elevation
Scale:
1:200@A2
Drawing Number:
126 - 0404
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

Birkenhead Estate in the foreground shown dotted



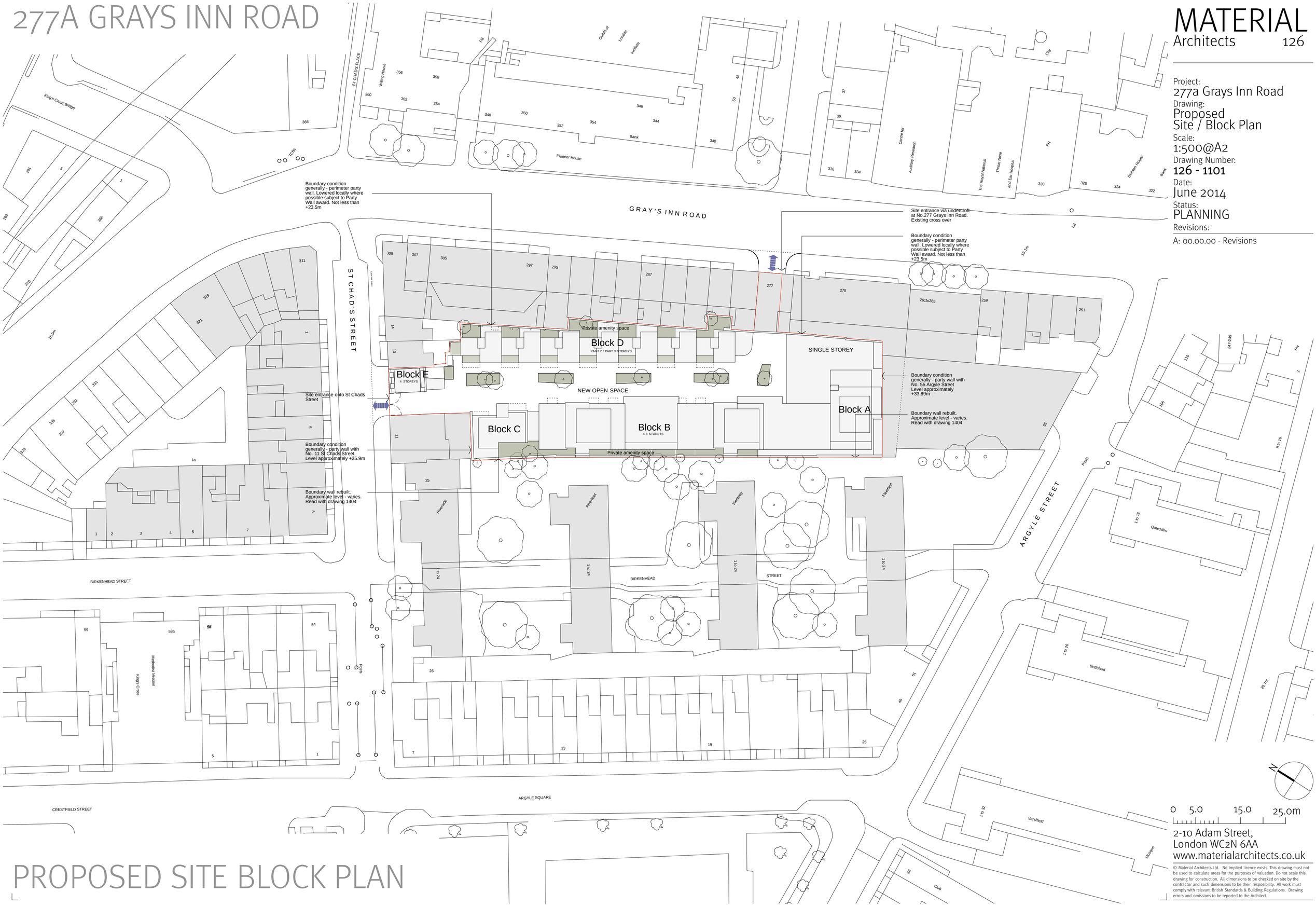
0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

EXISTING WEST ELEVATION - (to Birkenhead Estate)

Figure 2 Proposed Development Plans.

277A GRAYS INN ROAD



PROPOSED SITE BLOCK PLAN

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed
Site / Block Plan
Scale:
1:500@A2
Drawing Number:
126 - 1101
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

0 5.0 15.0 25.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

LOWER GROUND FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Lower Ground Floor
Scale:
1:200@A2
Drawing Number:
126 - 1200
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

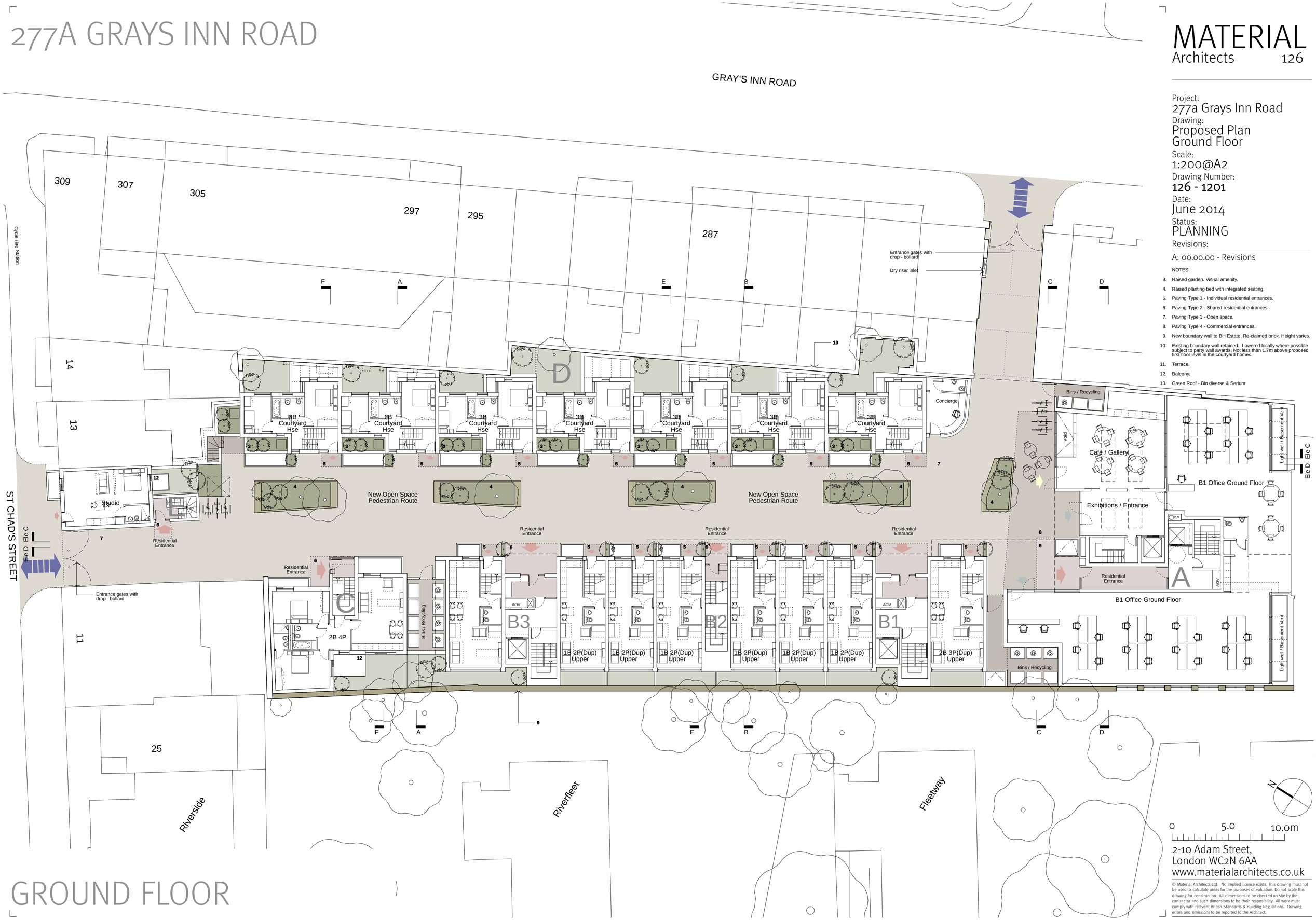
NOTES:

1. Lower ground floor private amenity space.
2. Front light well. Private amenity space.
3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.

0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD



GROUND FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Ground Floor
Scale:
1:200@A2
Drawing Number:
126 - 1201
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

NOTES:

3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
11. Terrace.
12. Balcony.
13. Green Roof - Bio diverse & Sedum

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

GRAY'S INN ROAD

309
307
305
297
295
287
14
13
11
25
Cycle Hire Station
ST CHAD'S STREET
Riverside
Riverfleet
Fleetway
Studio
3B Courtyard Hse
2B 3P
2B 4P
3B Dup (Lower)
1B 2P
3B 5P
AOV
Roof light over cafe
Roof light over commercial
Plant
Roof light over commercial entrance
Ele C
Ele D
A
B
B1
B2
B3
C
D
E
F
9
10
11
12
13

FIRST FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
First Floor
Scale:
1:200@A2
Drawing Number:
126 - 1202
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

NOTES:

3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
11. Terrace.
12. Balcony.
13. Green Roof - Bio diverse & Sedum

N

0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

GRAY'S INN ROAD

309
307
305
297
295
287
Cycle Hire Station
14
13
11
25
ST CHAD'S STREET
Riverside
Riverfleet
Fleetway
F
A
E
B
C
D
Ele C
Ele D
2B 3P(Dup)
Lower
1B 2P
2B 3P
2B 4P
3B Dup
(Upper)
3B 5P
AOV
B3
B2
B1
A
12
13
11

SECOND FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Second Floor
Scale:
1:200@A2
Drawing Number:
126 - 1203
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

NOTES:

3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
11. Terrace.
12. Balcony.
13. Green Roof - Bio diverse & Sedum

N

0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

GRAY'S INN ROAD

309
307
305
297
295
287
14
13
11
25
F
A
E
B
C
D
Cycle Hire Station
ST CHAD'S STREET
Ele C
Ele D
Ele C
Ele D
2B 3P(Dup)
Upper
12
2B 3P
AOV
B3
2B 4P
11
13
B1
1B 2P
3B 5P
A
Riverside
Riverfleet
Fleetway
N
0
5.0
10.0m

THIRD FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Third Floor
Scale:
1:200@A2
Drawing Number:
126 - 1204
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

NOTES:

3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
11. Terrace.
12. Balcony.
13. Green Roof - Bio diverse & Sedum

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

GRAY'S INN ROAD

309
307
305
297
295
287
14
13
11
25
Cycle Hire Station
ST CHAD'S STREET
Ele D
Ele C
Riverside
Riverfleet
Fleetway
F
A
E
B
C
D
B3
2B 3P
2B 4P
AOV
B1
A
1B 2P
12
13
11

FOURTH FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Fourth Floor
Scale:
1:200@A2
Drawing Number:
126 - 1205
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

NOTES:

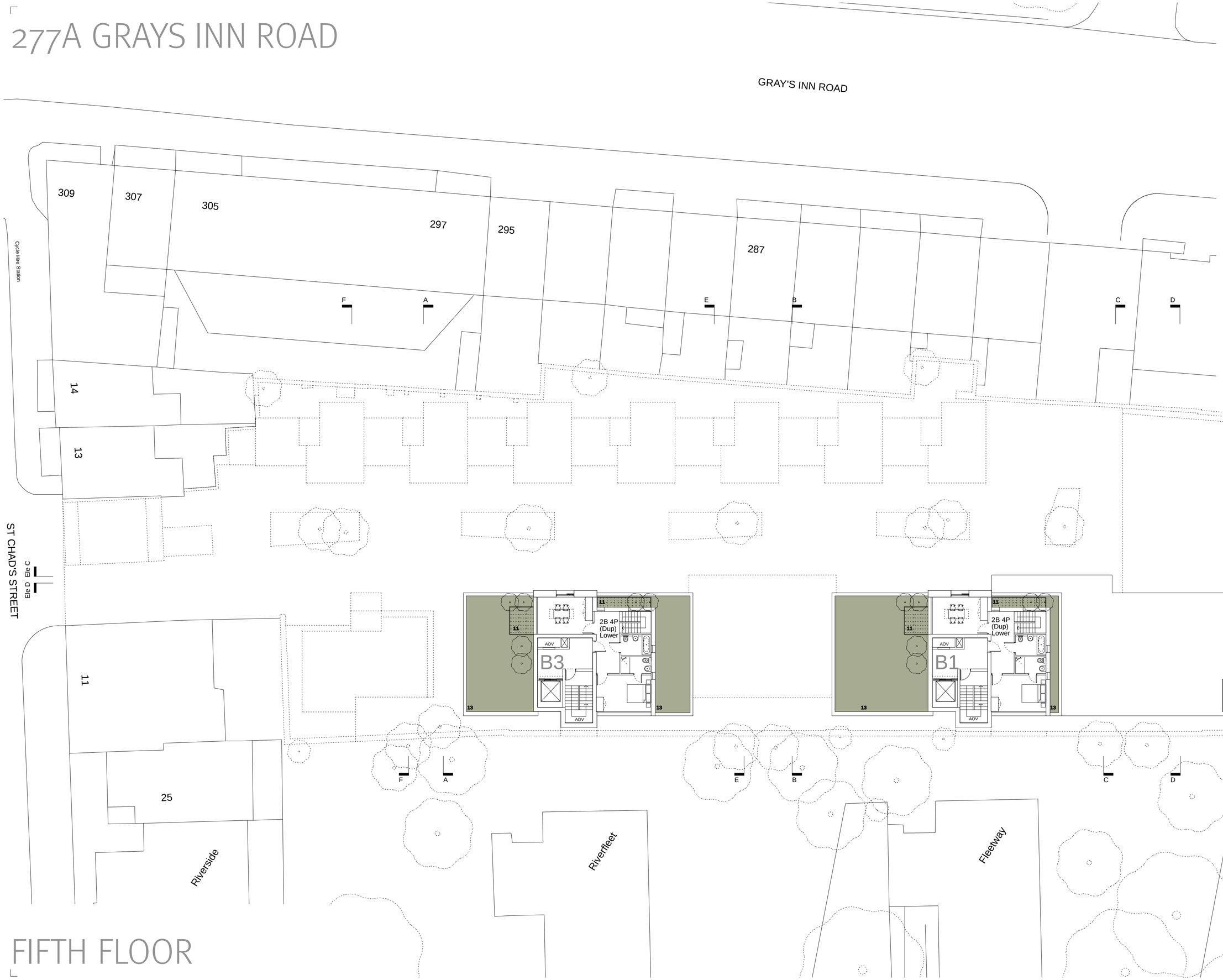
3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
11. Terrace.
12. Balcony.
13. Green Roof - Bio diverse & Sedum

N

0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD



FIFTH FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Fifth Floor
Scale:
1:200@A2
Drawing Number:
126 - 1206
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

NOTES:

3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
11. Terrace.
12. Balcony.
13. Green Roof - Bio diverse & Sedum

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

GRAY'S INN ROAD

309
307
305
297
295
287
14
13
11
25
Cycle Hire Station
ST CHAD'S STREET
Riverside
Riverfleet
Fleetway
Ele C
Ele D
Ele D
Ele C
A
B
C
D
E
F
13
11
AOV
2B 4P
(Dup)
Lower
2B 4P
(Dup)
Upper
3B 5P
(Dup)
Lower

SIXTH FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Sixth Floor
Scale:
1:200@A2
Drawing Number:
126 - 1207
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

NOTES:

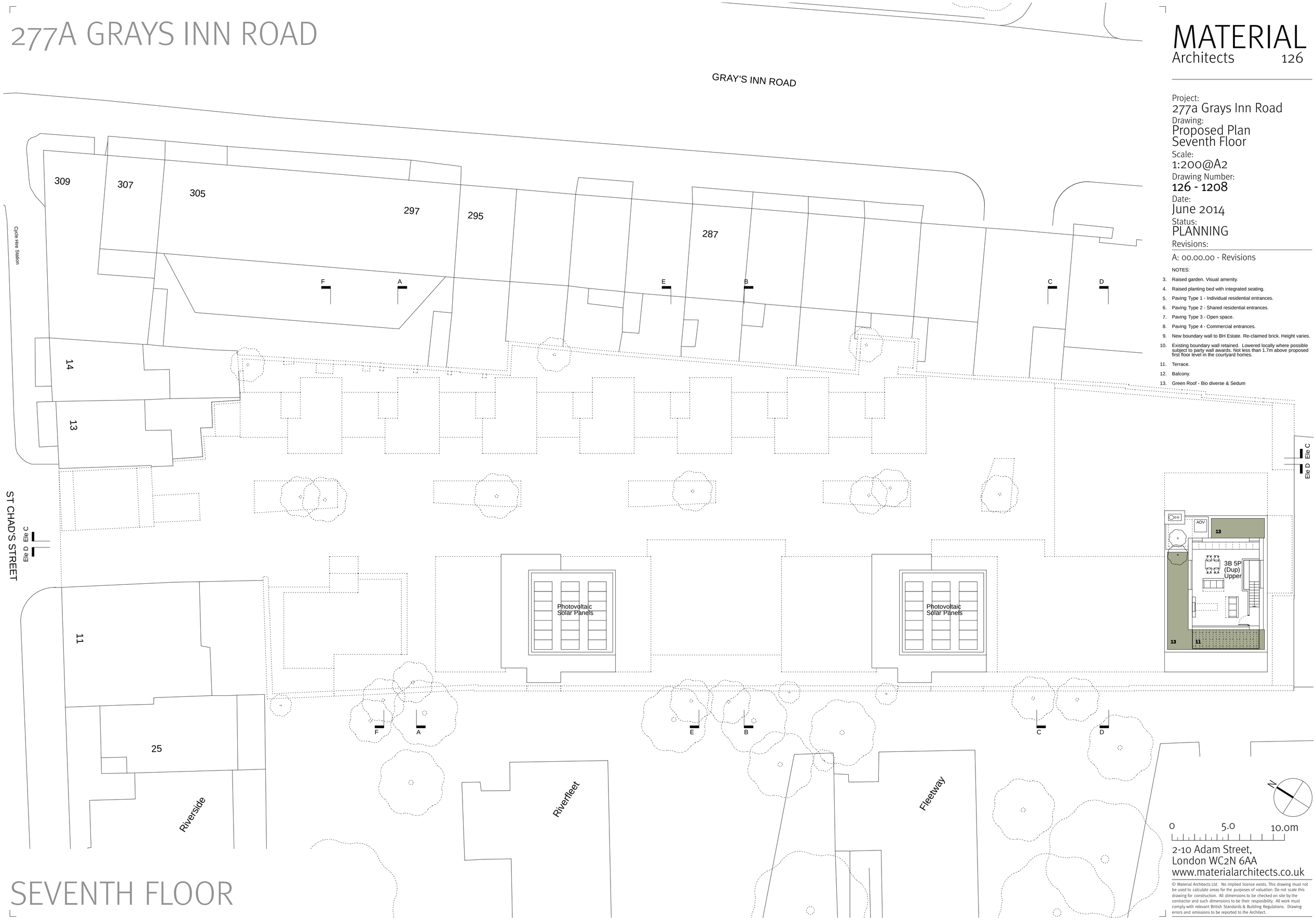
3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
11. Terrace.
12. Balcony.
13. Green Roof - Bio diverse & Sedum

N

0 5.0 10.0m

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD



SEVENTH FLOOR

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Seventh Floor
Scale:
1:200@A2
Drawing Number:
126 - 1208
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

NOTES:

3. Raised garden. Visual amenity.
4. Raised planting bed with integrated seating.
5. Paving Type 1 - Individual residential entrances.
6. Paving Type 2 - Shared residential entrances.
7. Paving Type 3 - Open space.
8. Paving Type 4 - Commercial entrances.
9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
11. Terrace.
12. Balcony.
13. Green Roof - Bio diverse & Sedum

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

277A GRAYS INN ROAD

GRAY'S INN ROAD

309
307
305
297
295
287
14
13
11
25
F
A
E
B
C
D
Ele C
Ele D
Cycle Hire Station
ST CHAD'S STREET
CHP Flue termination
Photovoltaic Solar Panels
Riverside
Riverfleet
Fleetway
N
0
5.0
10.0m

ROOF LEVEL

MATERIAL
Architects 126

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Roof Level
Scale:
1:200@A2
Drawing Number:
126 - 1209
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

2-10 Adam Street,
London WC2N 6AA
www.materialarchitects.co.uk

Figure 3 Exploratory Hole Plan.

Exploratory Hole Location Plan