Received Time 19.Jun. 13:13

ADUR DISTRICT COUNCIL

TOWN AND COUNTRY PLANNING ACT, 1990

APPLICATION FOR PLANNING PERMISSION

4 copies of this form required, together with plans and appropriate fee.
All measurements are to be given in metric.
If site relates to Lancing or Sompting, please submit 5 copies.

FOR OFFICIAL USE ONLY
Appl. No. Ad0307/07
Date Received 20 JUN 2007
Fee
Rem. List

IT IS IMPORTANT THAT YOU READ THE GUIDANCE NOTES AS INCORRECT COMPLETION INVOLVES DELAY

1. Applicant (In BLOCK CAPITALS)	Agent (if any) to whom correspondence should be sent (In BLOCK CAPITALS)
Name ABBEY CARE INVESTMENTS LTD.	Name DWA ARCHITECTS LIMITED
Address FIRST FLOOR, PO BOX 36, 37 BROAD STREET, ST HELIER, JERSEY JE4 9NU	Address 39 BLOSSOM STREET, YORK YO24 1AQ
Tel No.	Tel. No. (01904) 544400

2. Type of Application (see Note 2)

		State Yes or No
(a)	Full planning permission (including changes of use)	YES
(b)	Outline planning permission	
(c)	Renewal of a temporary permission	
(d)	Permission for retention of building or continuance of use without complying with a condition imposed on a planning permission	
(e)	Permission to develop land without complying with a condition imposed on a planning permission.	

If yes, state those matters to which this application relates (tick where appropriate)

(i)	Siting	☐
(ii)	Design	☐
(iii)	External appearance	☐
(iv)	The means of access	☐
(v)	Landscaping of the site	☐

If yes, state the date and number of the permission and outline the particular condition

Date

Application No.

Condition No.

3. (a) Full address or location of the land to which this application relates

12-18 OLD SHOREHAM ROAD, SHOREHAM

(b) State whether applicant owns or controls any adjoining land — State Yes or No: YES — If yes, this land must be edged blue on the location plan

(c) Area of site 1975 m^2 ~~hectares/sq. metres~~

Dimensions of the application site and distances from the new buildings to boundaries must be clearly indicated on plans

(d) Description of proposed development (If residential development, state no. of units proposed and type if known e.g. houses, bungalows, flats)	PROPOSED RESIDENTIAL DEVELOPMENT TO PROVIDE 24 APARTMENTS AND ASSOCIATED PARKING.

(e) State whether the proposal involves:-

		State Yes or No
(i)	New building(s) or structure(s)	YES
(ii)	Alteration or extension of building(s)	NO
(iii)	Construction of a new) vehicular access to a highway) pedestrian	YES / YES
(iv)	Alteration of an existing) vehicular access to a highway) pedestrian	NO / NO
(v)	Closure of existing access	YES
(vi)	Change of use only	NO

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adur planning
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PAGE : 2
19-JUN-07 12:13

Received Time 19.Jun. 13:13

4. Particulars of Use of Buildings or Land: state (a) Present use
(b) If vacant, the last use

6. Additional Information

		State Yes or No		State Yes or No
(a)	Is the application for industrial, office warehousing, storage, shopping, commercial purposes or places of public assembly? (See note 5)	NO	If yes, complete part 2 of form C.P. 1	
(b)	Is the application for the winning or working of minerals?	NO	If yes, complete part 4 of form C.P. 1	
(c)	Is the application for an agricutural dwelling or building?	NO	If yes, complete part 6 of form C.P. 1	
(d)	Does the proposed development involve the demolition of any residential units?	NO	If yes, how many units? Please indicate their position on plans	
(e)	Does the proposed development involve the felling of any trees?	YES	If yes, indicate their position on plans	
(f)	Does the proposed development involve any public right of way within the site?	NO	If yes, indicate the position on plan	
(g)	Does the proposed development involve demolition or alteration of a building or Special Architectural or Historic interest or demolition within a Conservation Area?	NO	If YES a separate application for Listed Building Consent or Conservation Area Consent may be necessary.	

(h) (i) How will surface water be disposed of? (i) MAINS
(ii) How will foul sewage be disposed of? (ii) MAINS
(e.g. mains, cesspit, etc.)

6. Plans (See Note 6). List of drawings and plans submitted as part of the application - indicate drawing numbers and scales.
4 sets of all drawings are required. Additional copies in respect of major applications will assist in determination of such applications. All measurements are to be given in metric (89/617 EEC Directive) L3049/AL(9)900, AL(9)901B, AL(0)01B, AL(0)02B, AL(0)03A, AL(0)04A, AL(0)40C, AL(0)41B, SITE LOCATION PLAN

7. Fees (See Note 7)
If a fee is submitted please give the amount £ NIL (FREE GO WITHIN 12 MONTHS)

8. I/WE APPLY FOR PLANNING PERMISSION AS DETAILED ABOVE.

DATE 18 JUNE 2007 SIGNED .....

on behalf of ABBEY CARE INVESTMENTS LTD.
(insert applicant's name if signed by an agent)

9. Certificate under Section 65 of the Town and Country Planning Act. 1990 (Article 7 of the T & CP (General Development Procedure) Order 1995
N.B. A signed certificate MUST accompany this application (See Note 9).
If the applicant is the sole owner (a) the following certificate should be completed and signed.

CERTIFICATE A

1. Certificate A(a)
I certify that

(a) Owner means a person having a freehold interest or tenancy the unexpired term of which was not less than 7 years

on the day 21 days before the date of the accompanying application nobody, except the applicant, was the owner (a) of any part of the land to which the application relates.

*2. None of the land to which the application relates is or is part of an agricultural holding.

OR

*3. *I have / The applicant has ~~given~~ requisite notice to every person other than *myself / himself/herself ~~who~~, on the day 21 days before the date of the application was a tenant of an agricultural holding on all or part of the land to which the application relates, as follows

Name of Tenant	Address at which Notice was served	Date on which Notice was served

*Delete where inappropriate

Signed .....

On behalf of ABBEY CARE INVESTMENTS

Date 18 JUNE 2007

BP 47.0 June 95

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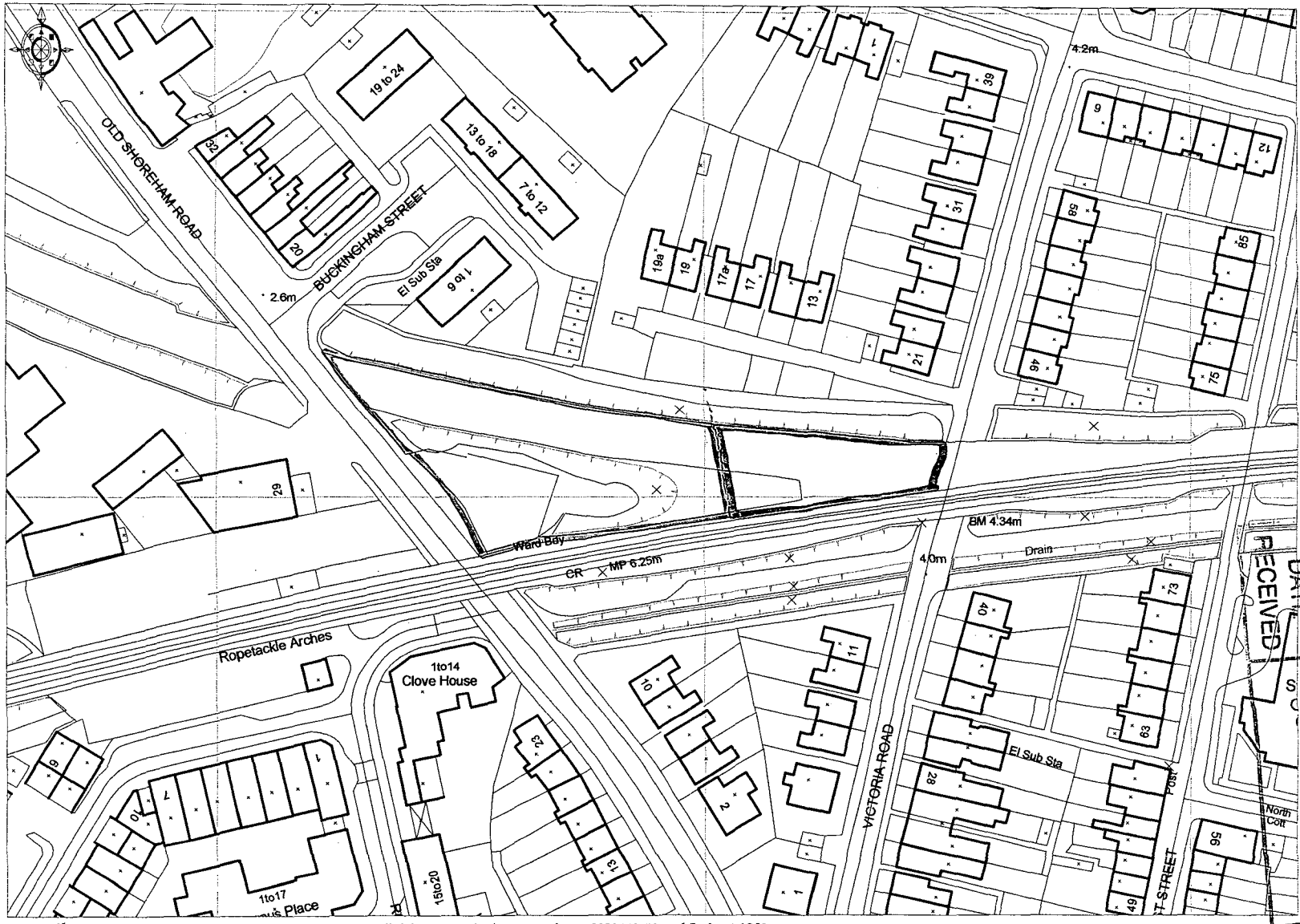
adur planning
01273263203
19-JUN-07 12:14
PAGE : 3

12-18 Old Shoreham Road, Shoreham-By-Sea



DATE RECEIVED
20 JUN 2007
PLAN No. A0603767
COUNCIL

Ordnance Survey
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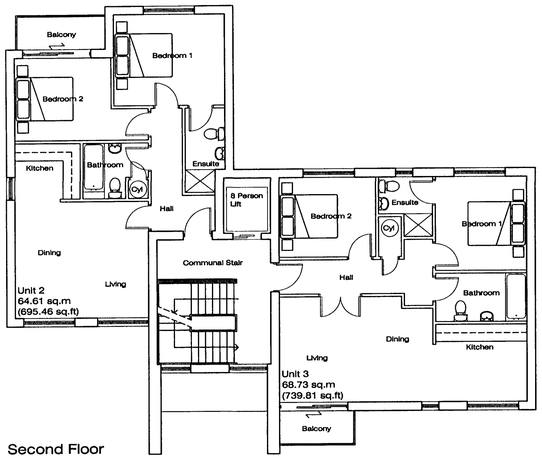
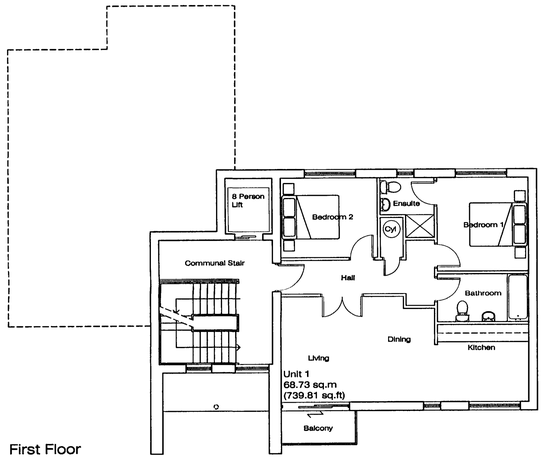
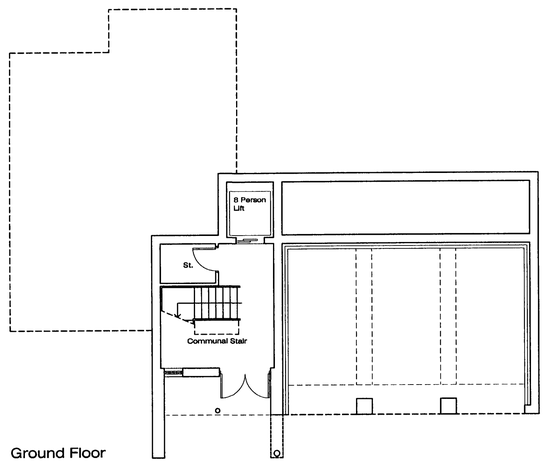
Produced By DWA Architects Ltd



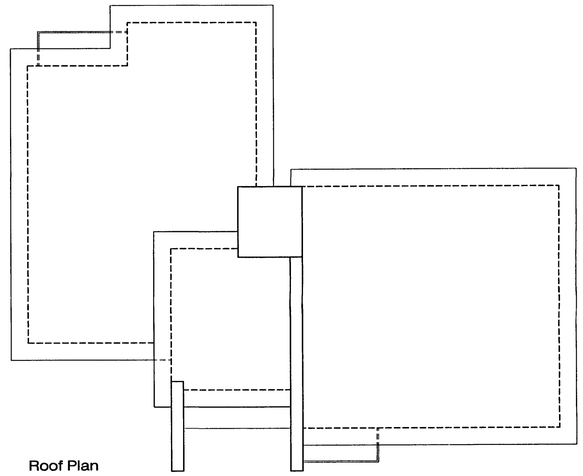
Second Floor



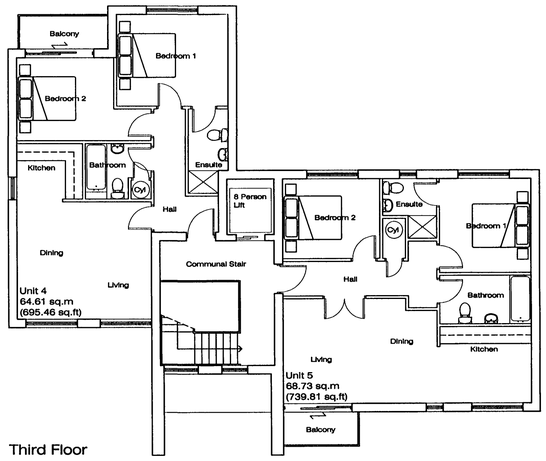
First Floor



Ground Floor



Roof Plan



Third Floor

Notes

Do not scale, use figured dimensions only.

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This drawing is to be read in conjunction with all related Architect's and Engineer's drawings and any other relevant information.

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Drawing Issues

Date	day / month / year	
Revision		
Issued To:		

	date	revision	
A	19/04/2007	Floor plans revised in accordance with the increase in the flood level	BC

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ADUR DISTRICT COUNCIL
PLANNING DIVISION
PLAN No. Ad0228/67
DATE RECEIVED 20 JUN 2007

Client

Abbeycare Investments Ltd

Project

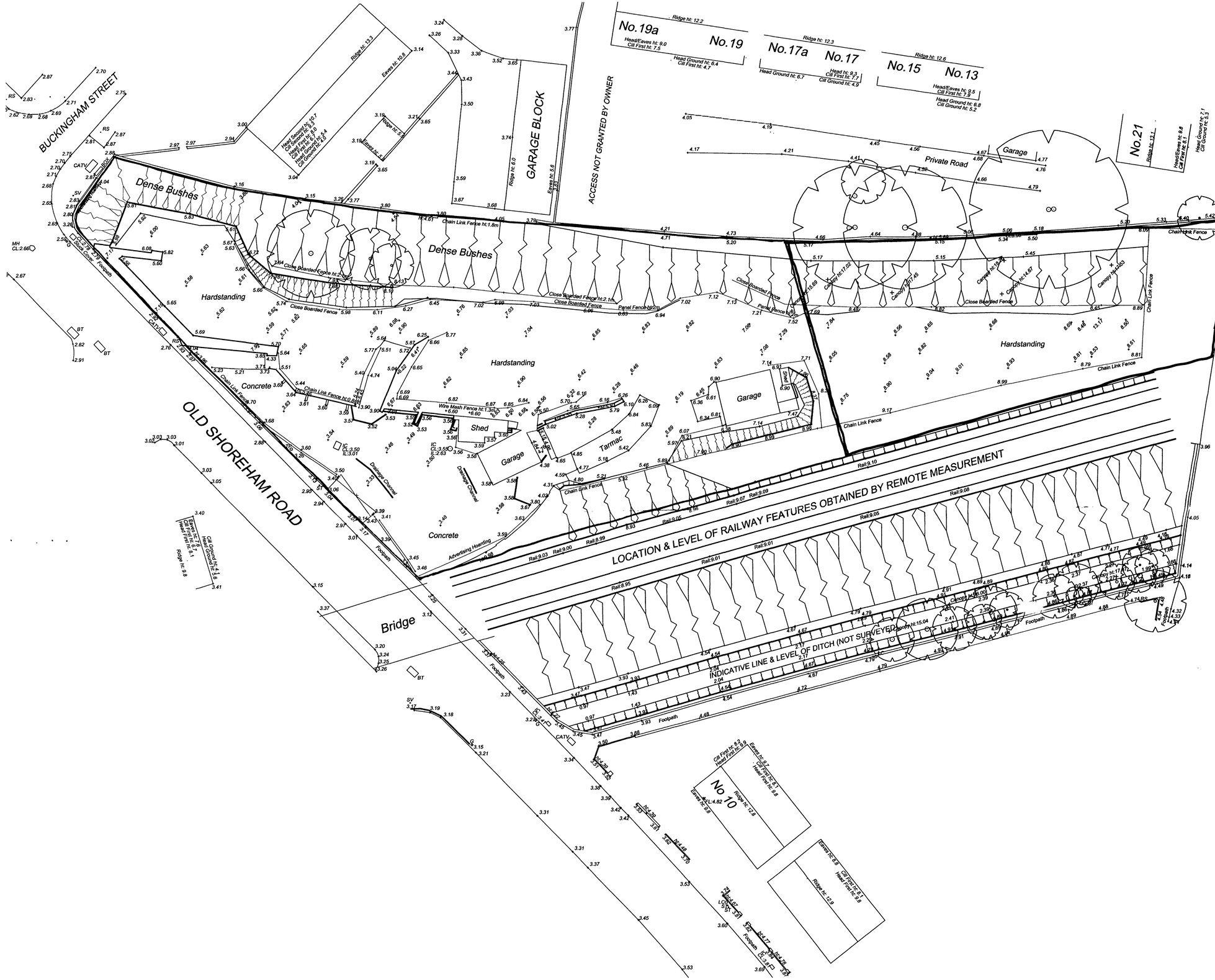
Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea

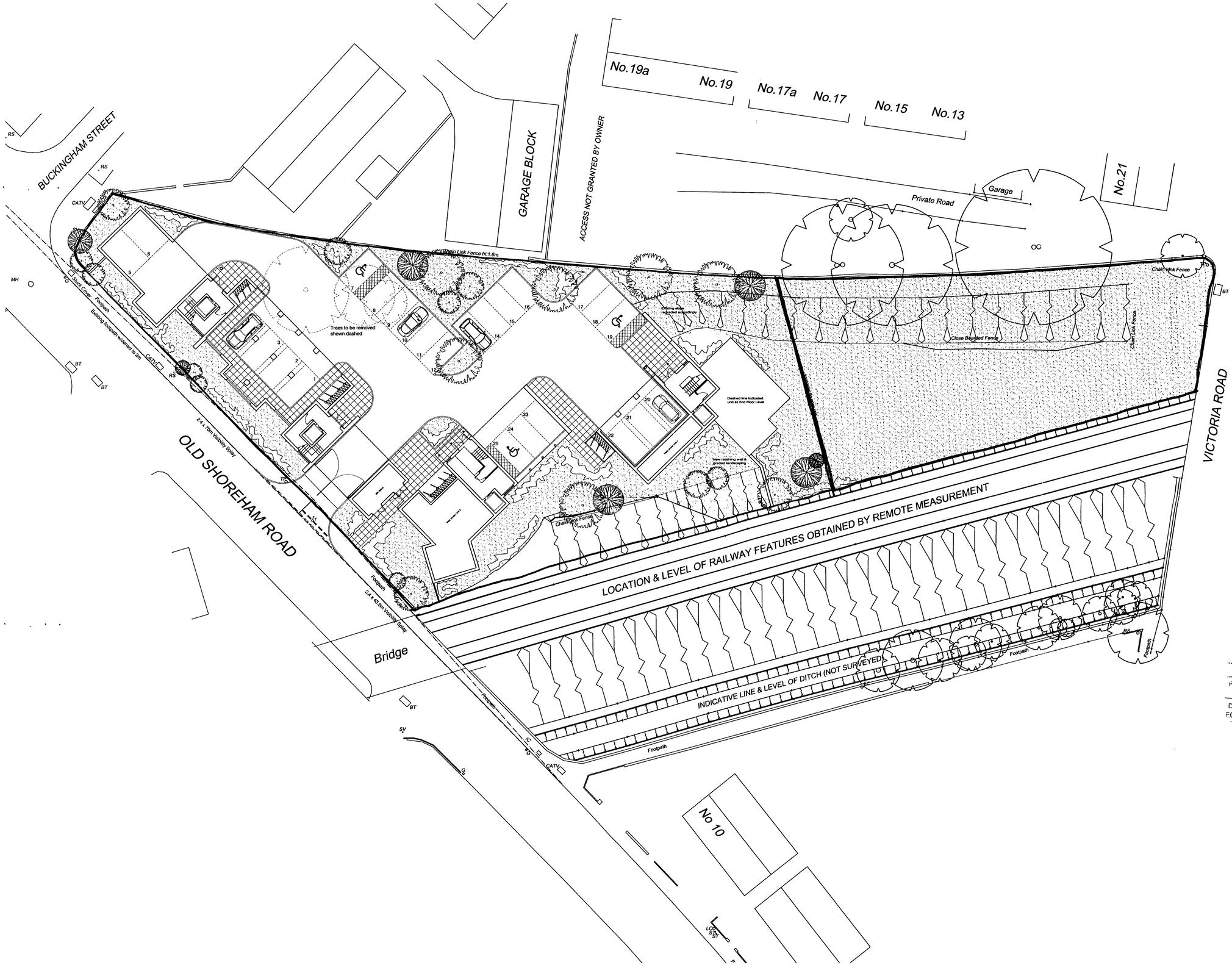
Drawing Title

Proposed Floor Plans & Roof Plan
Block C

Scale	Date
1:100 @ A1	06/02/2007
Drawn by: BDC	Checked by:

Job No.	Drawing No.	Rev.
L3049	AL(0)04	A


BUCKINGHAM STREET
OLD SHOREHAM ROAD
VICTORIA ROAD
ACCESS NOT GRANTED BY OWNER
GARAGE BLOCK
Private Road
Garage
No.19a
No.19
No.17a
No.17
No.15
No.13
No.21
No 10
Dense Bushes
Hardstanding
Concrete
Tarmac
Shed
Bridge
Footpath
Chain Link Fence
Close Boarded Fence
Panel Fence ht:2m
Wire Mesh Fence ht:1.3m
Advertising Hoarding
Drainage Channel
Ridge ht: 13.3
Eaves ht: 10.8
Ridge ht: 12.2
Head/Eaves ht: 9.0
Cill First ht: 7.5
Head Ground ht: 6.4
Cill First ht: 4.7
Ridge ht: 12.3
Head Ground ht: 6.7
Head ht: 9.3
Cill First ht: 7.7
Cill Ground ht: 4.9
Ridge ht: 12.6
Head/Eaves ht: 9.5
Cill First ht: 7.9
Head Ground ht: 6.8
Cill Ground ht: 5.2
Ridge ht: 6.0
Eaves ht: 5.8
Ridge ht: 5.4
Eaves ht: 5.3
Head/Eaves ht: 9.8
Cill First ht: 8.1
Ridge ht: 13.1
Head Ground ht: 5.3
Cill Ground ht: 4.3
Cill First ht: 9.2
Head First ht: 9.9
Eaves ht: 9.7
Cill First ht: 8.1
Head First ht: 9.8
Ridge ht: 12.8
Eaves ht: 9.8
Eaves ht: 8.8
Cill First ht: 8.1
Head First ht: 9.8
Ridge ht: 12.9
Cill First ht: 7.6
Head First ht: 9.7
Head First ht: 9.1
Ridge ht: 9.8
Old Ground ht: 5.6
Head Ground ht: 5.6
LOCATION & LEVEL OF RAILWAY FEATURES OBTAINED BY REMOTE MEASUREMENT
INDICATIVE LINE & LEVEL OF DITCH (NOT SURVEYED)
Rail:9.10
Rail:9.09
Rail:9.08
Rail:9.07
Rail:9.06
Rail:9.05
Rail:9.03
Rail:9.00
Rail:8.99
Rail:9.01
Rail:8.95
Canopy ht:17.02
Canopy ht:17.45
Canopy ht:15.69
Canopy ht:14.67
Canopy ht:15.04
Canopy ht:17.47
Canopy ht:17.63
Canopy ht:17.47
Close Boarded Fence ht:2.1m
Close Boarded Fence ht:2.2m
Close Boarded Fence ht:2.4m
Chain Link Fence ht:1.8m
Chain Link Fence ht:0.8m
Chain Link Fence ht:1.2m
Chain Link Fence ht:1.3m
Stone Cover
Footpath
Footpath
Footpath



Notes

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Drawing Issues

Date	day	
	month	
	year	
Revision		
Issued To:		

	date	revision	
A	23/04/2007	Parking layout revised in accordance with changes made to the building layouts	BC
B	04/05/2007	Parking under northern end of Block A adjusted to increase turning space	BC

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BOROUGH COUNCIL
PLANNING DIVISION
PLAN No. Ac/07/0367
DATE RECEIVED 20 JUN 2007

Client

Abbeycare Investments Ltd

Project

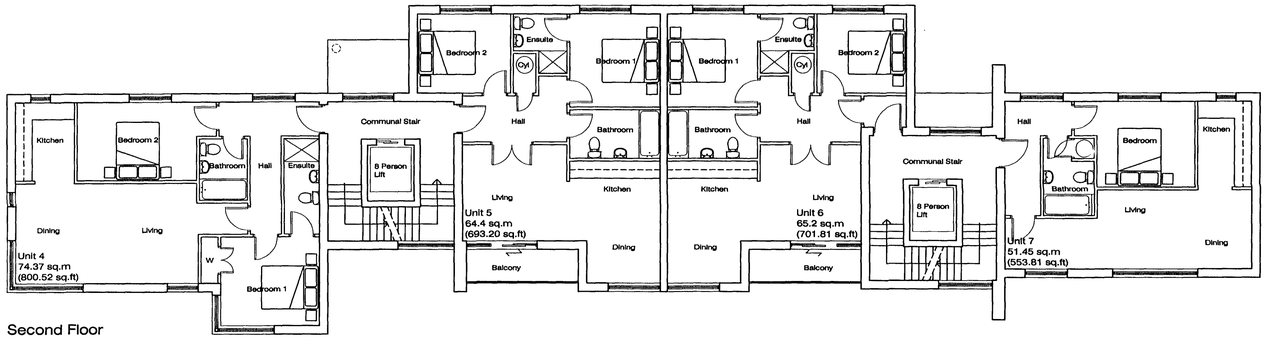
Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea

Drawing Title

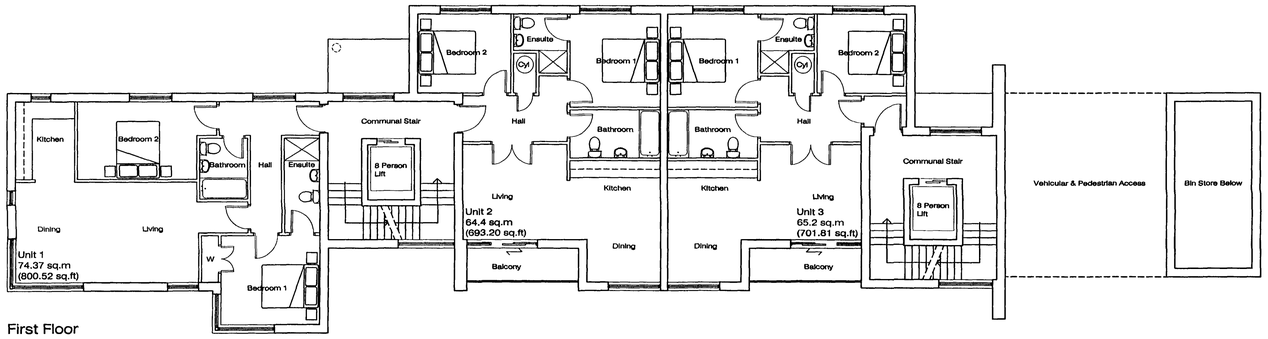
Site Plan
As Proposed

Scale	Date
1:200 @ A1	06/02/2007
Drawn by	Checked by
BDC	

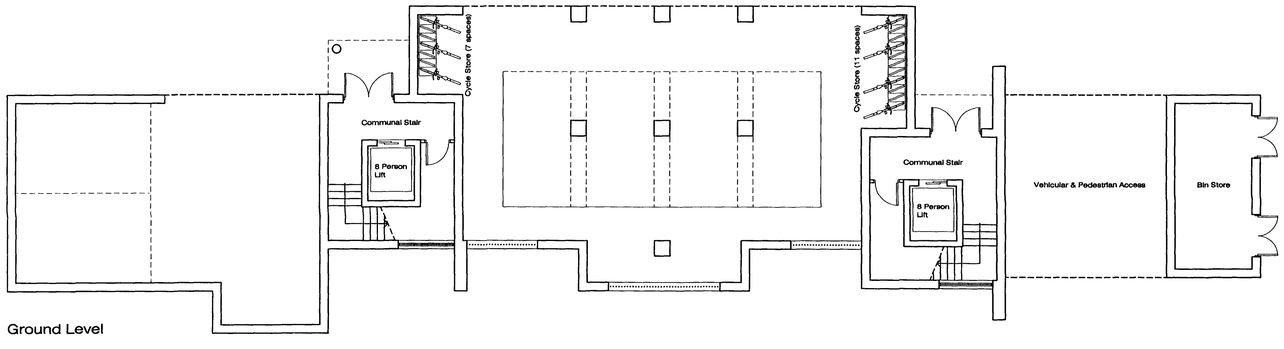
Job No.	Drawing No.	Rev.
L3049	AL(9)901	B



Second Floor



First Floor



Ground Level

Notes

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Drawing Issues

Date	day / month / year	
Revision		
Issued To:		

	date	revision	
A	19/04/2007	Floor plans revised in accordance with the increase in the flood level	BC
B	04/05/2007	Undercroft parking adjusted to increase turning space and Units 1 & 4 enlarged accordingly	BC

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PLANNING
PLAN No. A/06/37067
DATE RECEIVED 20 JUN 2007

Client

Abbeycare Investments Ltd

Project

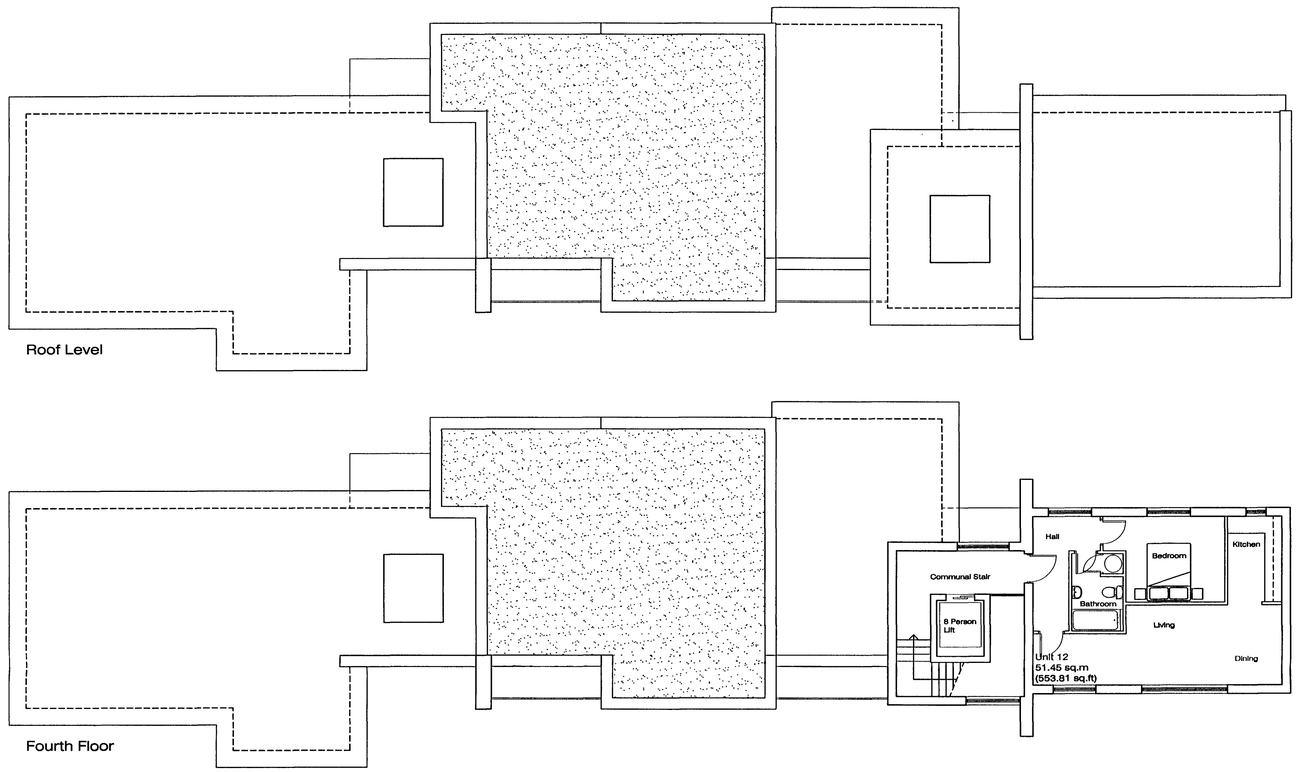
Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea

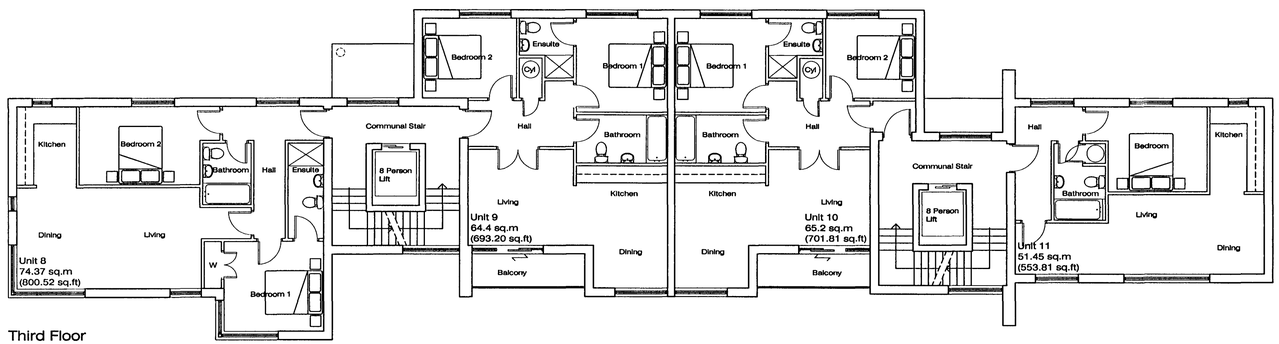
Drawing Title

Proposed Ground, First & Second Floor Plans
Block A

Scale	Date
1:100 @ A1	26/01/2007
Drawn by	**Checked by**
BDC	

Job No.	Drawing No.	Rev.
L3049	AL(0)01	B





Notes

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Drawing Issues

Date	day / month / year	
Revision		
Issued To:		

	date	revision	
A	19/04/2007	Floor plans revised in accordance with the increase in the flood level	BC
B	04/05/2007	Unit 8 & roof plans enlarged in accordance with changes to the undercroft parking	BC

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PLANNING COUNCIL
PLAN No 06/0368/F
DATE RECEIVED 20 JUN 2007

Client

Abbeycare Investments Ltd

Project

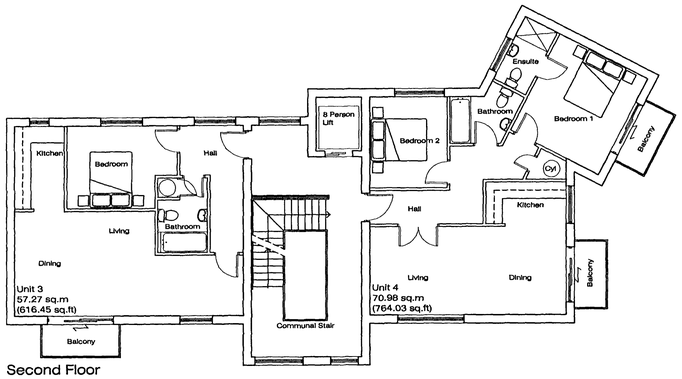
Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea

Drawing Title

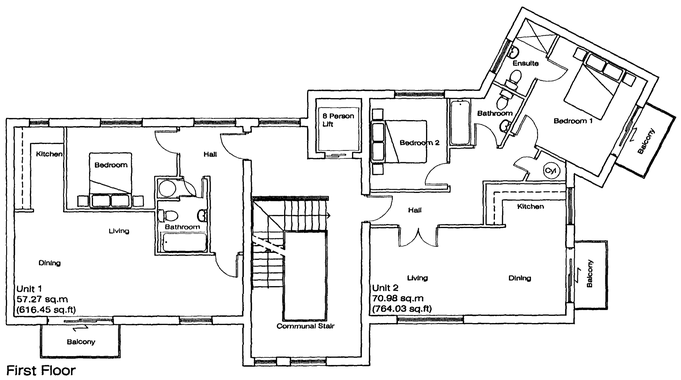
Proposed Third & Fourth Floor and Roof Plan
Block A

Scale	Date
1:100 @ A1	26/01/2007
Drawn by	**Checked by**
BDC	

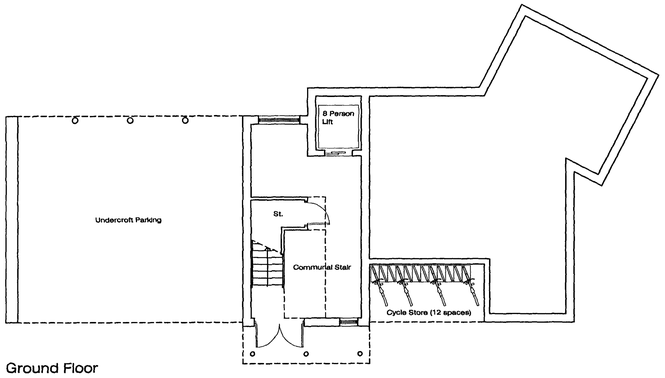
Job No.	Drawing No.	Rev.
L3049	AL(0)02	B



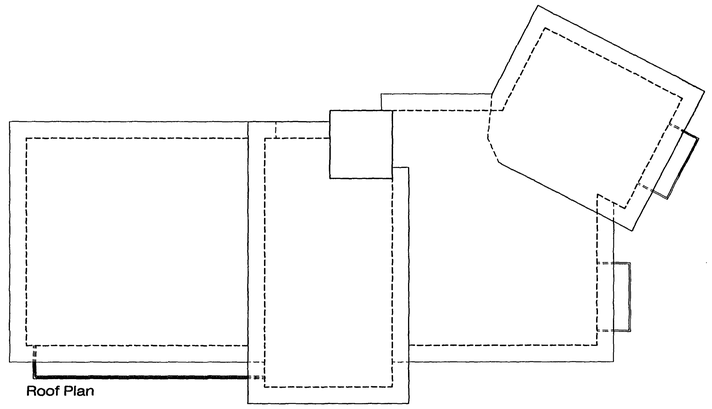
Second Floor



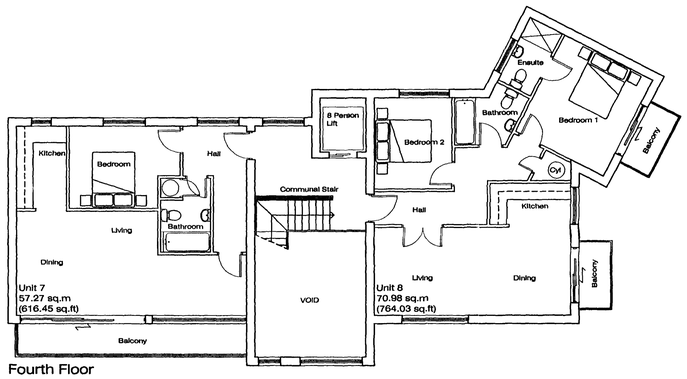
First Floor



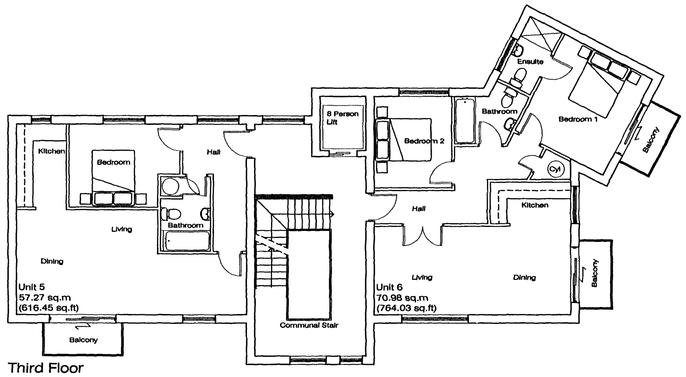
Ground Floor



Roof Plan



Fourth Floor



Third Floor

Notes

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Drawing Issues

Date	day month year
Revision	
Issued To:	

	date	revision	
A	19/04/2007	Floor plans revised in accordance with the increase in the flood level	BC

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PLANNING DIVISION COUNCIL
PLAN No A06/0367
DATE RECEIVED 20 JUN 2007

Client

Abbeycare Investments Ltd

Project

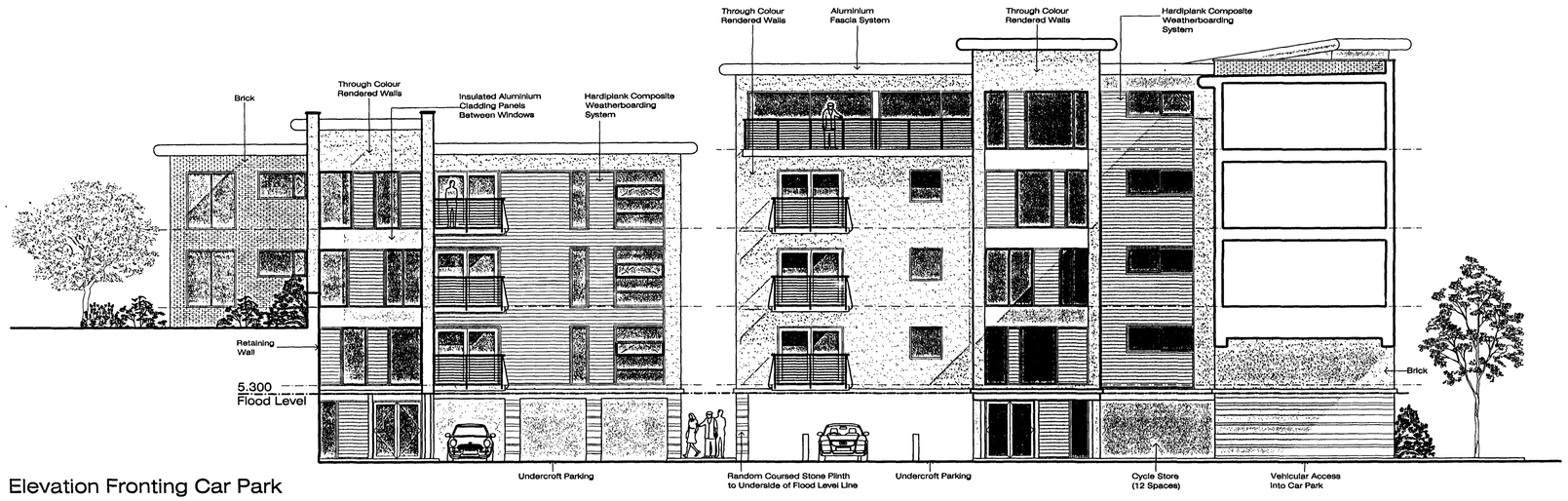
Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea

Drawing Title

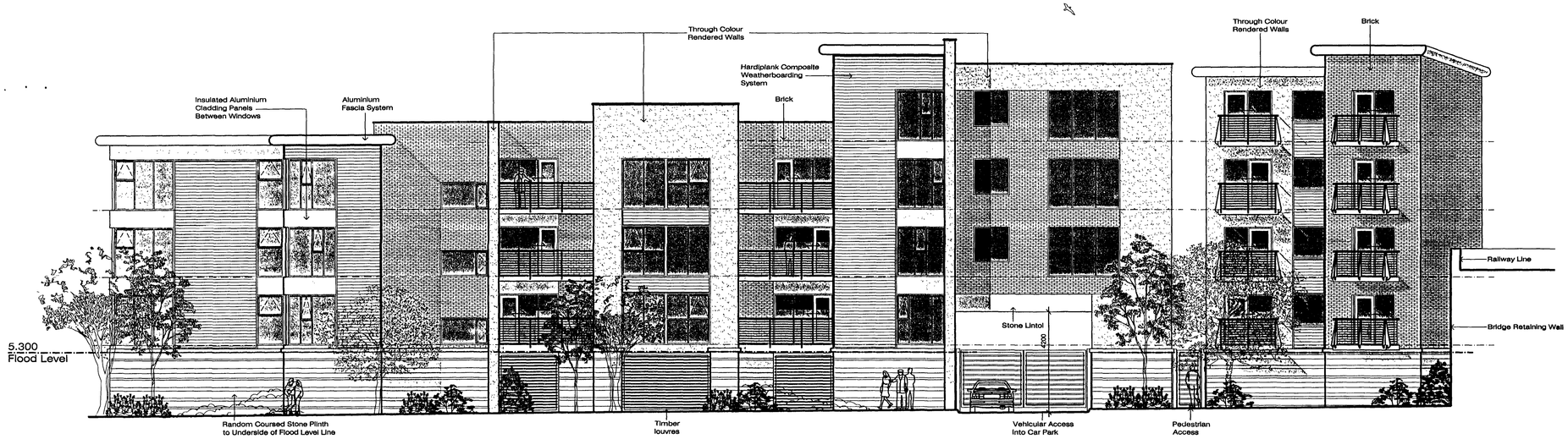
Proposed Floor Plans & Roof Plan
Block B

Scale	Date
1:100 @ A1	02/02/2007
Drawn by	Checked by
BDC	

Job No.	Drawing No.	Rev.
L3049	AL(0)03	A



Elevation Fronting Car Park



Elevation Fronting
Old Shoreham Road

Notes

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Drawing Issues

Date	day	
	month	
	year	
Revision		
Issued To:		

	date	revision	
A	23/03/2007	Dimension added to show archway height of access to site	BC
B	27/04/2007	Floor levels raised to reflect revised flood levels. Building access revised accordingly	BC
C	04/05/2007	Elevation fronting Old Shoreham Rd adjusted to accommodate increase in undercroft parking area and enlargement of Units 1, 4 & 8	BC

DWA ARCHITECTS

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www.dwa-architects.co.uk

PLANNING DIVISION
PLAN No. AL(0)40 Rev C
DATE RECEIVED 20 JUN 2007

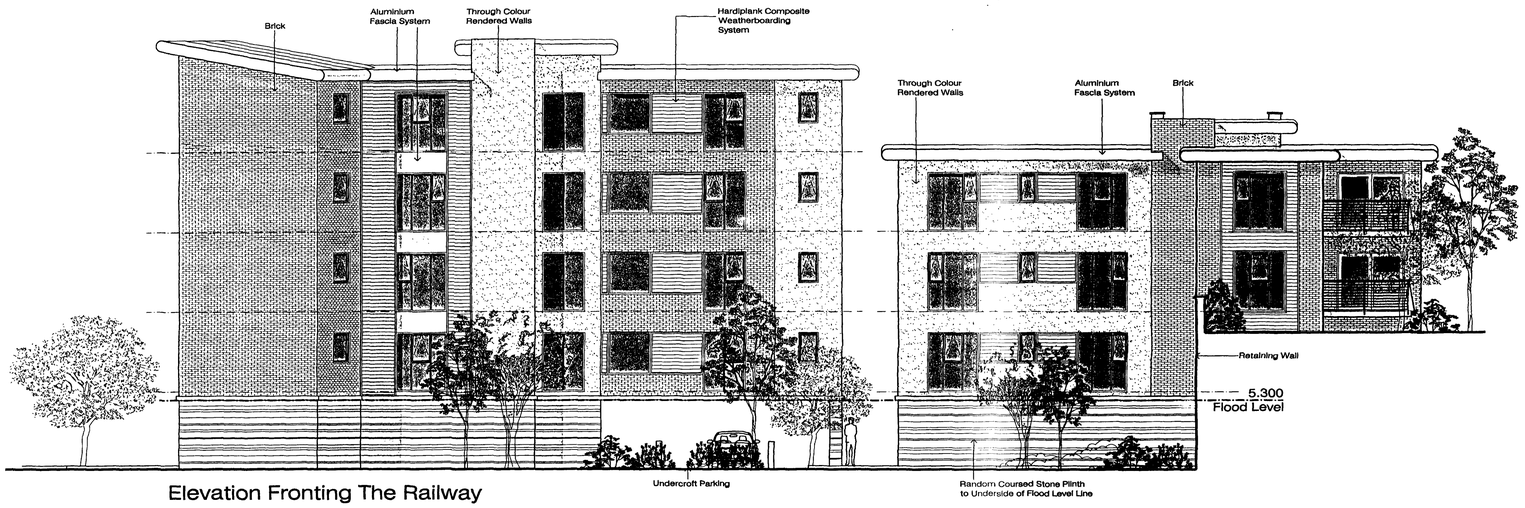
Client
Abbeycare Investments Ltd

Project
Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea

Drawing Title
Proposed Elevations

Scale	Date
1:100 @ A1	24/01/2007
Drawn by: BDC	Checked by:

Job No.	Drawing No.	Rev.
L3049	AL(0)40	C



Elevation Fronting The Railway



Elevation onto the Car Park & rear of the site

Do not scale, use figured dimensions only.

All dimensions to be verified on site prior to the commencement of any work or the production of any shop drawing. All discrepancies to be reported to the Architect.

This drawing is to be read in conjunction with all related Architect's and Engineer's drawings and any other relevant information.

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Drawing Issues

| Date | day | | |

Proposed Residential Scheme at Old Shoreham Road, Shoreham by Sea

Design & Access Statement

To Accompany Planning Application

PLANNING COUNCIL
PLAN No. A0d037d1d
DATE RECEIVED 20 JUN 2007

Prepared by DWA Architects Limited
39 Blossom Street, York YO24 1AQ
February 2007
Ref L3049

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1.0 INTRODUCTION

This design statement is being submitted as part of a planning application to Adur District Council. The report goes through the site, surrounding area, and any relevant influencing factors. It then explains how these factors have influenced the resulting design, and how the final design philosophy has been adopted, including an explanation of the planned workings of the development.

DWA Architects Limited was formed in 1988 and is a multi disciplinary design practice specialising in Care Home design. DWA Architects has gained a well deserved reputation for original and creative design and have gained extensive knowledge and expertise in all aspects of the design and construction of Residential Homes.

DWA Architects always develop each project design from first principles, with this development being no exception to this. It is our objective to exceed all the latest standards of good practice, whilst providing the most viable and efficient design necessary in the development of modern Residential Homes.

2.0 SITE ANALYSIS

2.1 Site

2.1.1 Landscape

The site includes a number of trees which are essentially self seeded on the existing embankment area to the northern section of the site set between the site and properties in Victoria Road. As part of the development a few of these will be removed but others will be retained where they are not affected in order to keep a good proportion of the established green wedge of land which attracts wildlife (mainly birds). Otherwise there is no other significant landscaping on the site.

2.1.2 Ecological Features

There are no known noteworthy ecological features present on the site.

2.1.3 Buildings

No buildings exist on the site other than some small garages, sheds and a small office which was used for car sales none of which are of any architectural interest or significance.

2.1.4 Physical Features

The site has direct access off Old Shoreham Road and is effectively a wedge of land which was the sidings and an old Branch line of the Railway network. The site is effectively broken into 3 separate distinctive parts being:

- A lower ground level with direct access off Old Shoreham Road bounded by the railway bridge support structure which crosses Old Shoreham Road and the old redundant railway line.
- A raised level which was the redundant railway line which is approximately 3m above the lower level. The existing railway is set at this same raised level.
- A steeply sloping embankment to the north towards Victoria Road with self seeded trees.

2.1.5 Infrastructure

There are various known infrastructure constraints on the site that will affect the design including:

2.1.5 continued....

- The need to set the level of all habitable rooms above 4.96 OD as a consequence of future predicted (2052) flood levels (from the sea) established with the Environment Agency. A full flood risk assessment has been carried out with details prepared and forwarded to the Environment Agency 14 November 2005. (Refer appendix 6)
- The position of the site access onto the site is dictated by the achievement of sight lines as prescribed by the Highways Authority which are fully achieved.
- The need to make new drainage connections to the existing sewage without overburdening the existing systems.
- The need to carefully deal with the ground so that areas of contamination if found can be properly dealt with to ensure that there is no compromising of the local environment and ground water.
- The need to design the development so that it is set adequate distances from the existing railway line and address satisfactorily issues related to sound.

2.1.6 Viewpoints in/out of Site

The upper part of the site is visible from the existing railway, but views out of the site from this level are restricted by a number of factors including trees to the north, the railway and new buildings to the south on the opposite side of Old Shoreham Road. From the lower level the existing railway bridge structure crossing Old Shoreham Road restricts views out of the site in this direction.

2.2 Surrounding Area

2.2.1 Street Pattern

Buildings around the site are generally semi detached residential buildings in medium sized plots in and around Victoria Road and both semi detached and terraced properties along Old Shoreham Road. In addition there are some new homes mainly in 3 and 4 storey flats on the old Ropetackle site which have only recently been completed and some older 3 storey flats set in large blocks with separate garage blocks in Buckingham Street (immediately adjacent to the site) all of which tend to maximise the available developable land, which is the norm for recent developments and in line with Government Planning Guidance.

2.2.2 Character of Surroundings

The buildings surrounding the site are generally of a traditional nature with some two storey semi detached residential properties but also with some long blocks of terraces. The redevelopment of the Ropetackle site diagonally opposite the site mainly comprises buildings of 3 and 4 storeys in blocks but there are some even higher. The character of the area is of a typically mixed developed suburban nature using a variety of styles and materials reflecting the style and age when they were built and typified by the Ropetackle development, which reflects the traditional nature of the area.

2.2.2 Continued...

The more recent developments have tended to utilise a variety of styles and materials but with a traditional background by utilising details which are common to the area and effectively being of a local vernacular. This is also seen as being an appropriate basis upon which to base the redevelopment of this site.

2.2.3 Design of Neighbouring Properties

The houses closest to the site in Victoria Road and Old Shoreham Road are typical of the era in which they were built being constructed of brick, render and with tiled roofs and of quite simple straightforward design.
An exception is the apartment buildings directly across from the site in Buckingham Street which is a rather non-descript three storey set of flats with separate garages. There is a new substantial housing development diagonally opposite the site (former Ropetackle site) which is of three and four storeys in blocks and terraces with brick and tiled roofs which as indicated above has been modelled on typical details from the area resulting in a fragmentation of styles giving some individuality to these properties. Directly opposite the site in Old Shoreham Road there are Car showrooms and a semi derelict dwelling which is ripe for redevelopment.

2.2.4 Proximity of Neighbouring Properties

To the north of the site the residential properties are at least 22m away from the site boundary with gardens, driveway and land between Old Shoreham Road lines the west boundary. The property to the west is very close to the boundary with some windows facing the site but at an angle to it.

2.3 General Planning Guidance and Consultations with the Planning Authority

2.3.1 Consultations with the Planning Authority

Comments were made previously in relation to Application SU/20/06/TP and are summarised as follows:-

- A flood risk survey would be required
- A full site contamination survey would be required.
- Full consideration of noise and appropriate sound mitigation measures to be undertaken.
- Achievement of Highways prescribed sight lines.
- Full substantiation of car parking numbers and manoeuvring.
- General design issues relating to the size, height, bulk and appearance of the proposal.
- Need to retain as many trees as possible.
- Clear demonstration of relationships with adjoining properties to ensure that overlooking was not a problem.

2.3.2 Relevant National and Local Planning Policies

Relevant policies set out in the National Planning Guidance Structure Plans and Local Plan applicable to the proposed development include:-

Reuse of previously developed land by infill:

LOC1 and ERA1 Policies in the adopted Structure Plan (2001 – 2016) encourage the reuse of previously developed land by infill redevelopment and conversion at higher densities on the proviso that the impact on the area and environment is acceptable.

Quality of Development

Policy DEV1 of the adopted Structure Plan requires new development of a high quality taking into account:-

- The need to integrate with and where possible enhance adjoining land uses, and minimise potential conflicts between land uses and activities.
- To create a sense of place
- To create a high quality socially inclusive and adaptable environment which meets the long term needs of users.
- To create a safe, well cared for environment where opportunities for crime and anti social behaviour are minimised.
- To ensure energy efficiency
- To give a priority to pedestrians, people with impaired mobility, cyclists, users of passenger transport.
- To reduce the dominance of cars and roads PPS1 and PPG3 echo these requirements.

New Dwellings

Policy AH2 relates to new dwellings. In these policies reference is made to new buildings being designed so that their appearance, character and scale create a pleasant place in which to live as well as being in keeping with and enhancing the local existing environment with attention paid to architectural form, height, materials, density and layout and not having an unneighbourly effect due to loss of privacy, daylight/sunlight, outlook or open space.

Amenity Space

In policies AH10 and AH2 of the District Local Plan reference is made to the provision of adequate standards of amenity for residents in terms of garden space daylight outlook and privacy.

Site Designation in the Local Plan

The site is not identified for any particular use or development in the Local Plan. The site lies within the 'built-up' area of Old Shoreham.

2.3.2 Continued...

Infill

The proposal represents an infill development which is as allowed for in the Structure and Local Plan policies which would support in principle residential development (including a Care Home) in this location.

Flood Risk

PPG25 sets out Government advice that a Flood Risk Assessment should be carried out by the applicant (which has been carried out – refer Appendix 6).

3 Evaluation of Constraints and Opportunities

The main recognised constraints on development are:

3.1 Guarding against possible future flooding

The revised development proposes that the floor level of habitable rooms be set at 5.600 OD above sea level (with only ancillary accommodation on the ground floor set below the 200 year flood level of 5.300 OD) all of which is fully in line with the recommendations of the Environment Agency and is therefore considered to be compliant.

3.2 Guarding against noise pollution from external sources

A sound survey was undertaken between 14 and 17 May 2005 and following dialogue with the Environmental Health Officer a further sound survey has been undertaken on the site (refer appendix 3) and its findings are that the site is in category B and therefore there are no acoustic requirements to deal with. The survey however recommends that various sound insulation measures and recommendations are followed in respect of the construction (mainly in respect of the glazing specification of windows). The recommendations of the report will be rigidly followed as part of the construction of the project and therefore it is concluded and considered that possible sound issues are not a concern.

3.3 Dealing with contamination issues

A desk top Phase I Risk Assessment has been undertaken of the site which recommended further specific on site investigation (refer appendix 4) and this has been supplemented by the carrying out of a full geotechnical and contamination survey of the site (refer appendix 4) by recognised specialists. The detailed report identifies only one sample exceeded the stated thresholds by a very minimal amount. As stated this ground will be removed during construction to an approved and licensed tip. There is no risk due to contamination and therefore nil migration from the site during construction activities.

3.4 Traffic Impact Study and Highways Requirements

A traffic impact study has been undertaken relating to the proposed development of the site (refer appendix 5). The conclusions of the study are that adequate car parking levels are proposed for the development and that there will not be any increased burden upon the highway infrastructure as there is unlikely to be any increase in traffic generation as a consequence of the development in comparison with the previous use of the site (second hand car sales). The proposed development will also incorporate increasing the width of the public footpath on Old Shoreham Road to the full length of the site and also a much improved site access arrangement for vehicles as well as sightline improvements at the junction of Buckingham Street with Old Shoreham Road. A speed test survey has been undertaken of traffic using Old Shoreham Road in order to

3.4 Continued...

establish, justify and agree sight lines with the Highways Authority It is therefore considered and concluded that traffic and highways matters are not issues of concern to this application as a consequence of them having been resolved during the pre application negotiations.

3.5 **Proximity of adjacent properties**

Proximity of the adjacent properties in Victoria Road to the west will mean that any new development will have to be certain minimum distances away or not have any windows facing onto the adjacent properties. This has been considered carefully in the design and layouts and as such complies with standards advised.

4 The Proposal

4.1 Overview

The proposal is for the redevelopment of the front part of the site and will consist of a 3 / 4 storey development (above the 200 year flood levels) of flats giving a total of 24 units. The majority of the flats are on the Old Shoreham Road frontage with an element to the rear of the main block backing onto the railway line but facing into the site essentially forming an 'L' shape.

4.2 Design Principles

The design of the flats is essentially contemporary in its form with its strongly defined fenestration flat roofs and parapets and the use of balconies but also utilising materials that reflect the character of the area and surrounding buildings. We consider that the proposed range of materials would sit easily with the existing buildings and new developments along Old Shoreham Road. The use of balconies, different coloured renders, and replica cedar boarding captures, we believe, the spirit of a well established resort on the English Channel. The layout has been carefully planned to avoid any overlooking of the existing flats off Buckingham Street with the nearest now being 33m away with facing habitable room windows and 12m away where a habitable room window faces a blank gable end.

The main front elevation runs parallel with Old Shoreham Road and creates interest by avoiding a flat elevational treatment and creating, on plan a stepped footprint which, together with the variations in height across the frontage, creates the appearance of several smaller interconnected buildings, something which is an existing feature of the area. The minimum distance between the development and buildings on the opposite side of Old Shoreham Road is 22m. Access into the development is via remote control gates for vehicles which will be set back from the road edge allowing vehicles to pull in off the street and not obstruct the public footpath. Pedestrian access is produced to both sides of the vehicular access and is through keypad operated gates.

Parking for 25 vehicles is provided, an element of which is under the buildings making use of the raised ground level which is set above the anticipated 200 year flood line. Three disabled parking bays are provided as part of the 25 spaces and these are spread across the car park. Although the car parking area is reasonably substantial (to allow for manoeuvring of refuse and emergency vehicles) there is an excellent provision of green space. Both to the road frontage and throughout the site. The existing mature trees to the northern boundary are retained as part of this development and supplemented with additional trees creating a screen between the adjoining existing flats and the development. New shrub and tree planting is in place around the site and all other areas of soft landscaping are predominantly laid to grass.

4.3 Transportation

Parking for 25 vehicles on site has been included in the proposal (this incorporates the necessary turning areas for delivery, emergency and refuse vehicles and also incorporates three disabled parking spaces which we feel is more than adequate in this location as it equates to 1 space for every 1.04 units. 38 cycle spaces are provided in covered sheds in various locations divided across the development.

4.4 Access

The existing site rises quite steeply front to rear and as a consequence the front area of the site will have a large area of banking removed in order to make the site flat across the front two thirds. In addition, because the site is susceptible to flooding the ground floor level accommodation is raised to a level of 5.600m above OSD which is 300mm above the assumed 200 year tide level thereby putting the ground floor approximately 2.700m above natural ground level at the rear of the footpath on Old Shoreham Road.

Access into the flats is via stair/lift enclosures designed to accord with the requirement of approved document M. Access into each flat is over a level threshold. Access from a disable parking space within the car park will be via a 1200m wide footpath with disabled crossing points at places where necessary.

5 Conclusion

In line with Planning Guidance it is appropriate for the site to be redeveloped at a higher density than the area around as its impact upon the area is minimal. The precedent for higher development of 3 and 4 storeys has recently been established by virtue of the Ropetackle site.

The most crucial aspect of redevelopment of the site is to provide a development which is one of high quality, which this one will be by virtue of its careful detailed design which respect the area around it utilising features and character which are fully in keeping with its immediate neighbourhood.

The design of the apartments has been carefully undertaken so that it is internally planned to create an appropriate living environment for its residents and those who will work in the building with particular attention given to provision of a safe area for parking with cycle and motorcycle parking integrated to separate areas and with a separate pedestrian and vehicular entrance.

The apartments will follow all prescribed requirements in respect of its building fabric so that it is an energy efficient building and where possible these will be exceeded so that it makes a positive contribution.

Care has been taken in developing the plan form of the building to ensure that it is a neighbourly redevelopment of the site by ensuring that minimum prescribed distances to adjoining properties are respected, achieved and exceeded where possible and thereby not affecting privacy, daylight/sunlight outlook or open space of existing dwellings.

Adequate amenity space will be provided for the residents of the apartments.

In conclusion we believe that the design of the building is entirely appropriate to this site and will make a positive contribution to the general townscape and street scene of the area. The proposed building and site redevelopment will enhance the experience of residents, and will benefit the local community in many ways.

Appendix 1 Application Drawings

Drawings:	L3049/AL (9)	900	Site Survey
	AL (9)	901B	Site Plans As Proposed
	AL (O)	01B	Ground, First and Second Floor Plans as proposed (Block A).
	AL (O)	02B	Third Floor and Roof Plans As Proposed (Block A).
	AL (O)	03A	Proposed Floor Plans and Roof Plan (Block B).
	AL (O)	04A	Proposed Floor Plans and Roof Plan (Block C).
	AL (O)	40C	Elevations as Proposed
	AL (O)	41B	Elevations as Proposed

Appendix 2 Site Photographs



1. View from the Site to the West



2. Houses located North from the Site



3. View to the West from Eastern part of the Site



4. View to the South from Eastern part of the Site



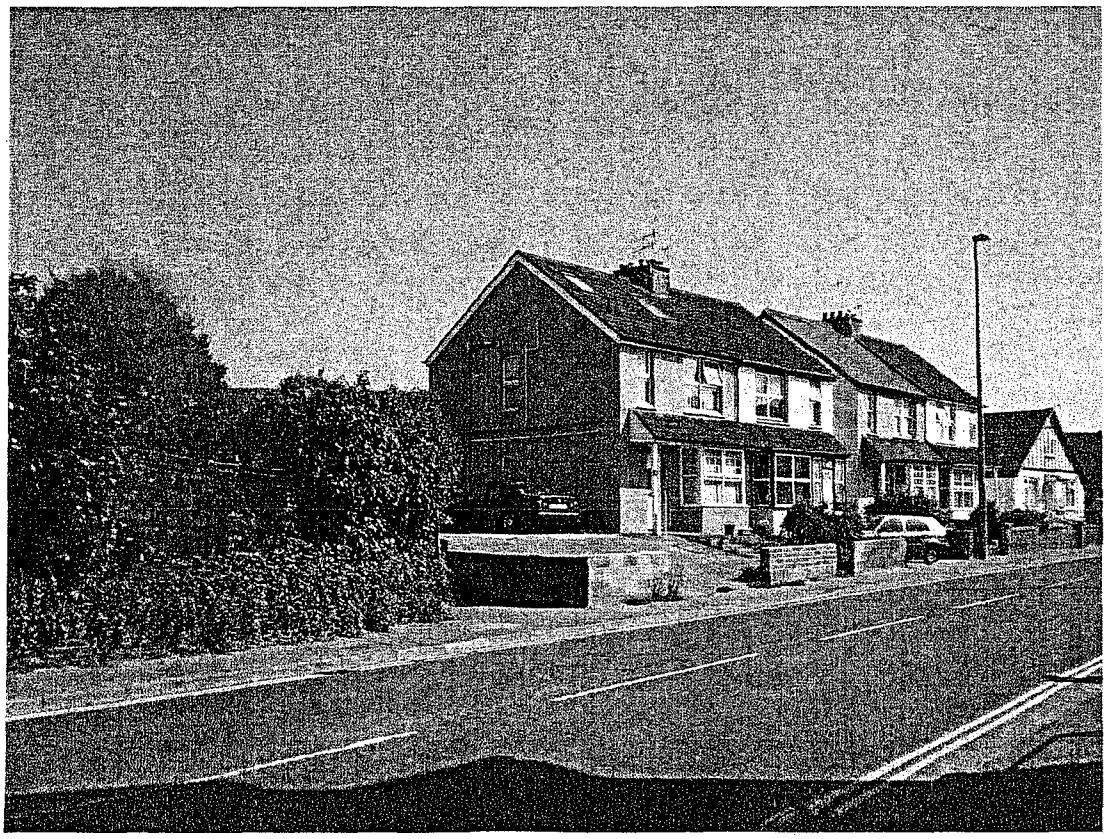
5. Three storey building located North of the Site



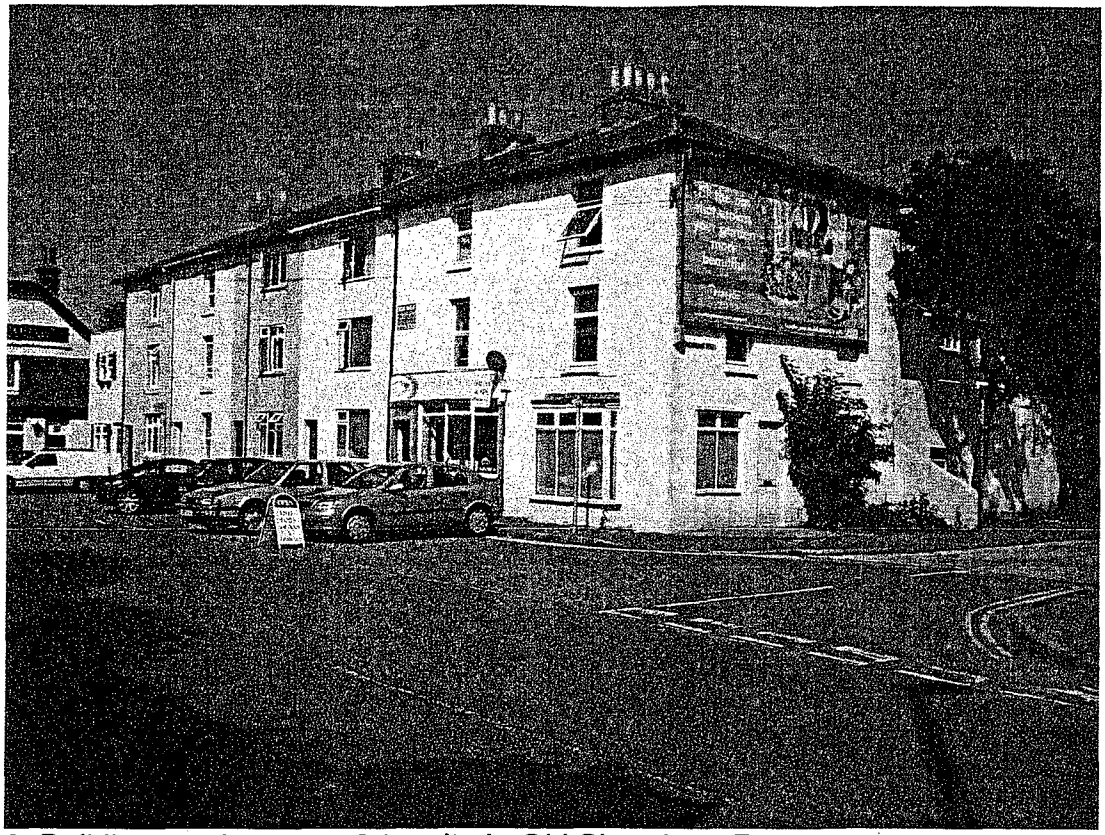
6. Entrance to the Site



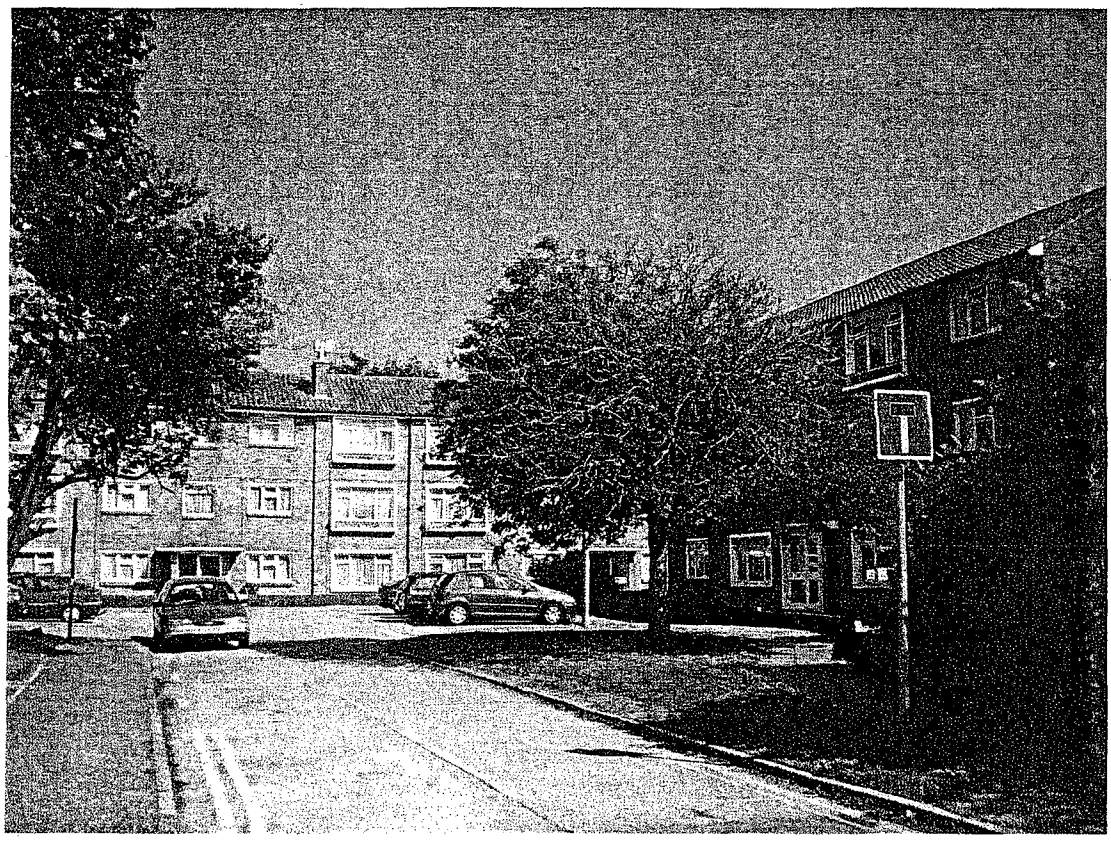
7. View along Old Shoreham Road towards to Railway Bridge.



8. Houses in Old Shoreham Road (to the east).



9. Buildings to the west of the site in Old Shoreham Road



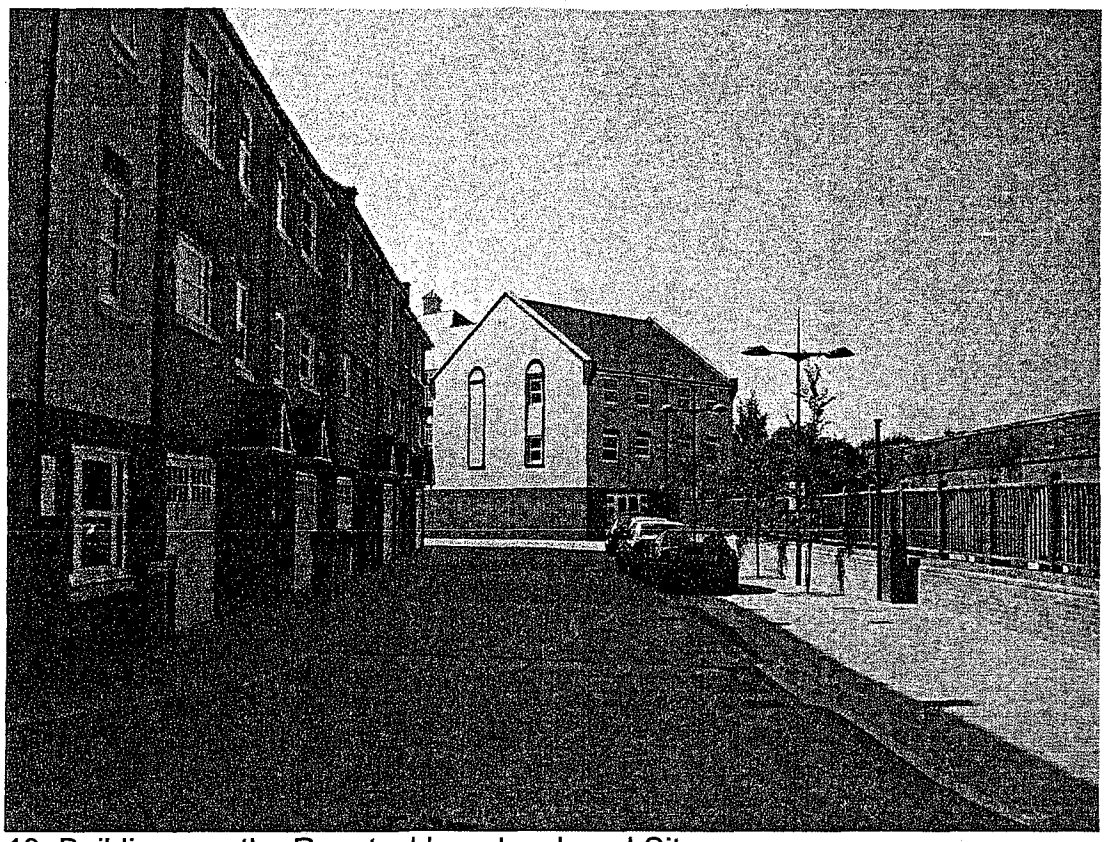
10. Flats in Buckingham Street.



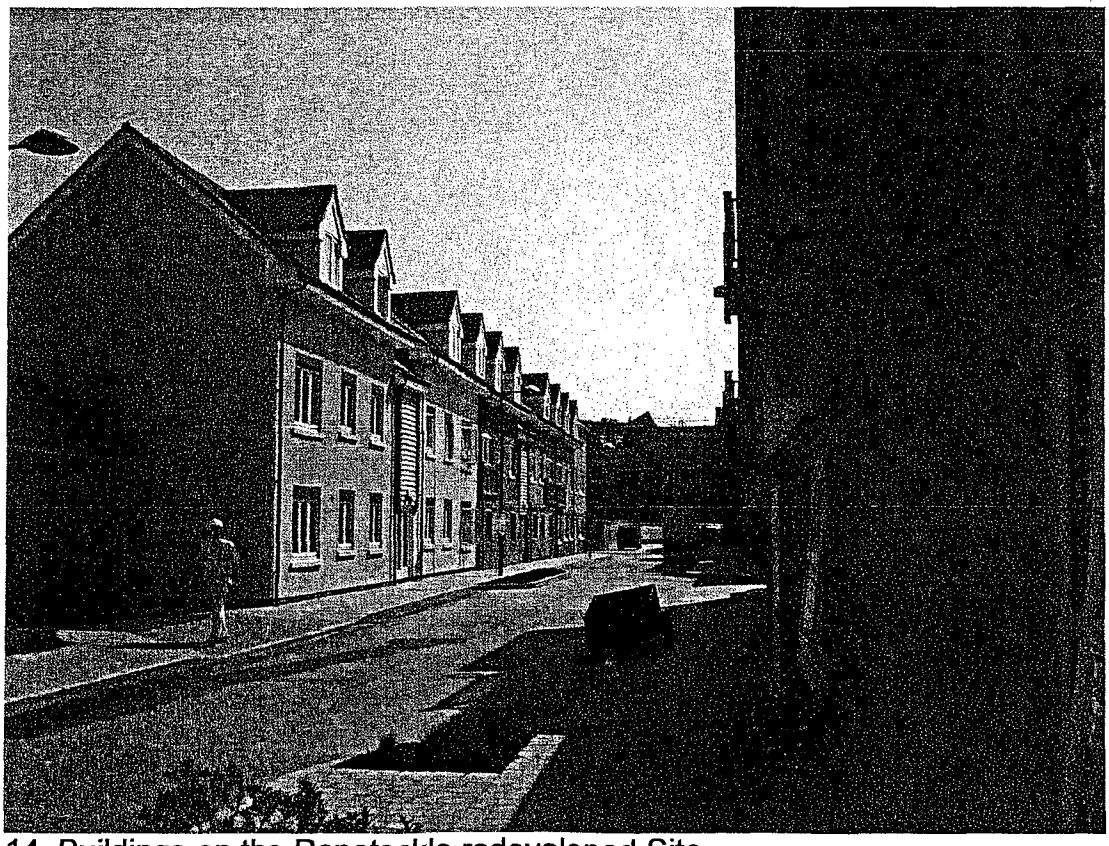
11. Corner of Ropetackle redeveloped site on Old Shoreham Road.



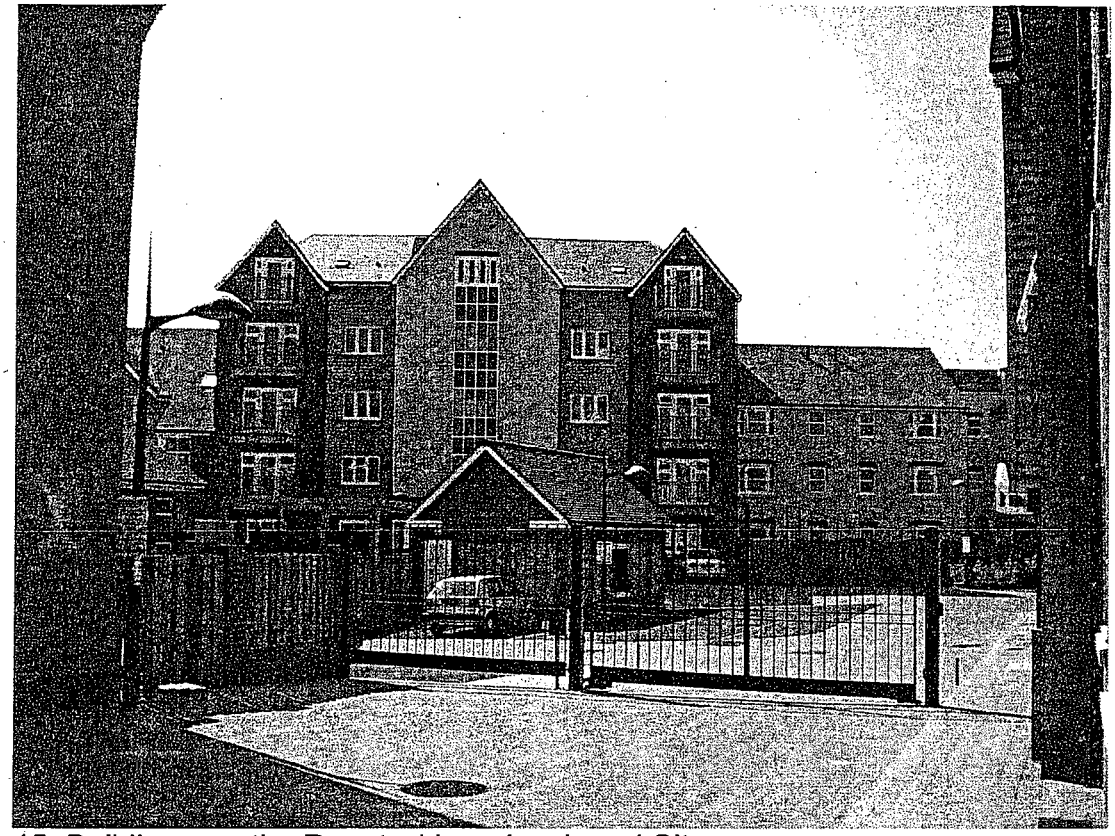
12. Buildings on the Ropetackle redeveloped Site.



13. Buildings on the Ropetackle redeveloped Site.



14. Buildings on the Ropetackle redeveloped Site.



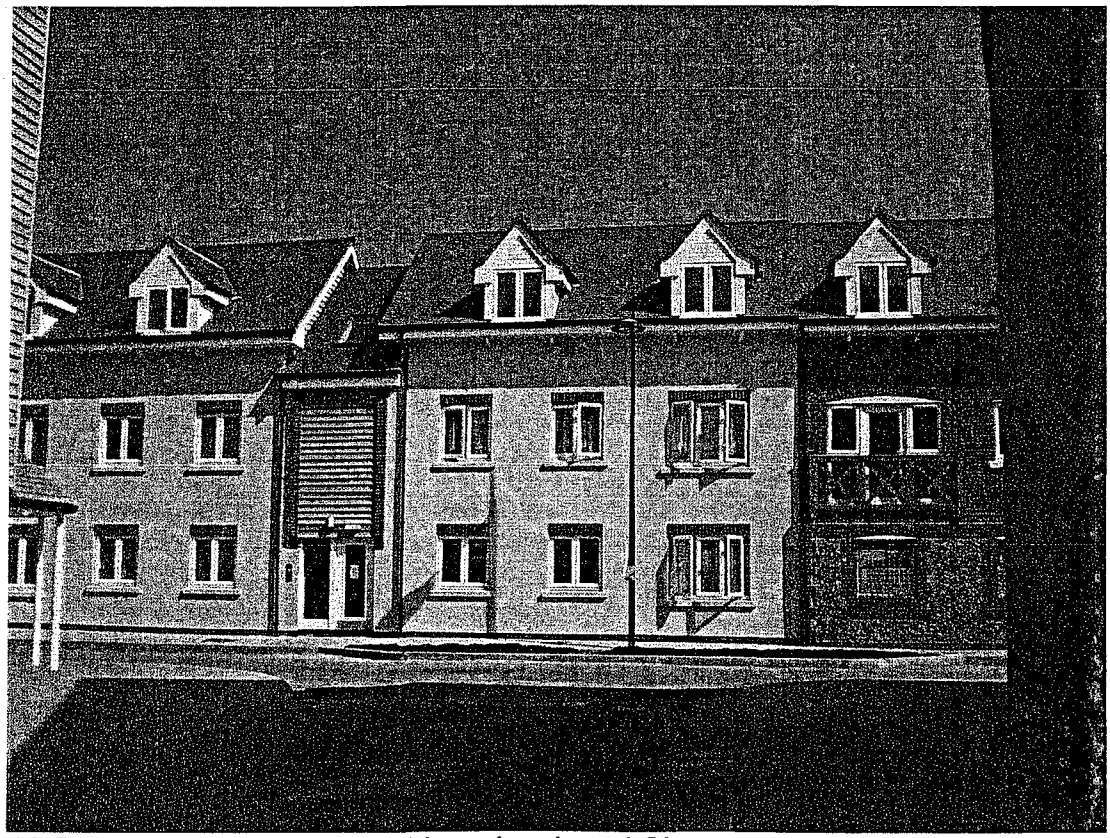
15. Buildings on the Ropetackle redeveloped Site.



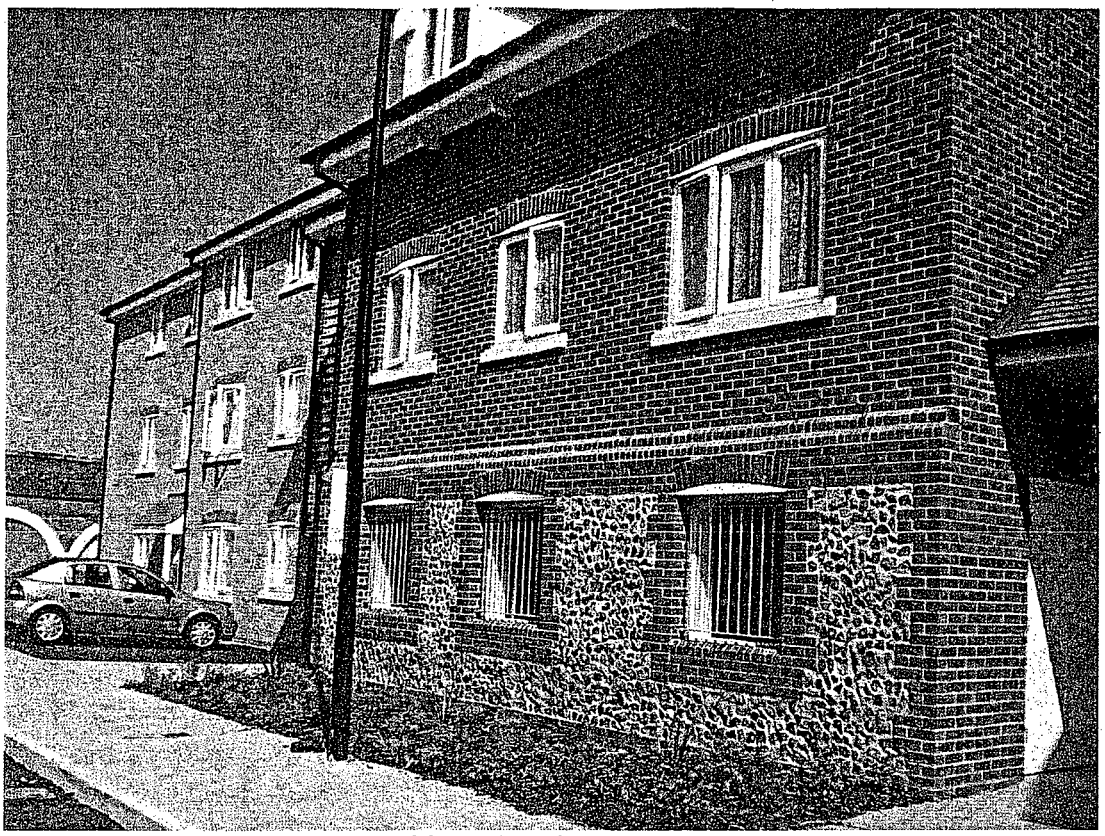
16. Buildings on the Ropetackle redeveloped Site.



17. Buildings on the Ropetackle redeveloped Site.



18. Buildings on the Ropetackle redeveloped Site.



19. Buildings on the Ropetackle redeveloped Site.

Flood Risk Assessment

12 - 18 Old Shoreham Road, Shoreham

April 2007

COUNCIL
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PLAN No. A/AD/03/07
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Figure 11 East to West across Southern Part of Development Site

1 INTRODUCTION

1.1 Site Location

This Flood Risk Assessment is concerned with a site on Old Shoreham Road in Shoreham and the general location of this site is provided on Figure 1. The sites lies close to the River Adur and according to the Environment Agency's flood maps lies within the Flood Zone 3 the 200 year tidal flood plain, where the probability of flooding is greater than 0.5% per year (Figure 2).

However these flood zones are indicative as they are often based on a coarse scale modelling assessment. The purpose of this Flood Risk Assessment (FRA) is to more accurately define flood levels and to address the potential risk of fluvial flooding from the River Adur.

1.2 Requirements for a Flood Risk Assessment

The requirements for a Flood Risk Assessment (FRA) are, from December 2006, provided in "Planning Policy Statement 25" (PPS25) which details the criteria for the content of a FRA report. The requirements for this document, and of the Environment Agency, are detailed below.

1.2.1 PPS25

PPS25 requires that flood risk should be considered in the planning and development process in order to reduce any future flood damage to property and loss of life. This emphasises the importance of managing and reducing flood risk in the land use development and planning process by taking account of flood risk and the impacts of climate change.

PPS25 and the previous PPG25 divided flood risk areas into three flood risk zones. Zone 1 areas have little or no risk with an annual probability of flooding of less than 0.1% per year. Zone 2 areas have a fluvial risk of flooding of between 0.1 and 1% a year and Zone 3 areas are considered to be at high risk with a fluvial risk of flooding of greater than 1% a year.

PPS25 requires all development proposals in Zones 2 and 3 to be accompanied by a FRA, which should include:

a) the vulnerability to flooding from other sources as well as from river and sea flooding;

b) the vulnerability to flooding over the lifetime of the development;

c) the potential to increase flood risk elsewhere through the addition of hard surfaces, the effect of the new development on surface water run-off, and the effect of the new development on depth and speed of flooding to adjacent and surrounding property; and

d) a demonstration that residual risks of flooding after existing and proposed flood management and mitigation measures are taken into account, including flood defences, flood resilient and resistant design, escape/evacuation, effective flood warning and emergency planning, are acceptable.

PPS25 requires that a FRA should be submitted with a planning application to determine the risks of flooding at a development site or the likely impact on neighbouring sites. As such a FRA is an essential element in the overall assessment of the economic viability of the development as well as its acceptability in planning terms. Guidance on the content of FRAs is provided in Appendix E of PPS25. The detail and complexity of a FRA will depend on the scale of the development and potential significance of flood risk but should address the requirements provided in Appendix E.

In ascertain the acceptability of certain types of development PPS25 divides land use into five categories: essential infrastructure, highly vulnerable, more vulnerable, less vulnerable and water compatible development and examples of these land uses are given in Table 1.1.

Table 1.1 PPS25 Classification Of Land Use

Classification	Land Use
Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk and strategic utility infrastructure.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres required to be operational during flooding. • Electricity-generating power stations and sub-stations. • Hospitals. • Emergency dispersal points. • Residential institutions such as residential care homes, childrens' homes, social services homes, student halls of residence and hostels. • Gypsy and traveller sites using caravans or mobile homes. • Mobile or park homes for permanent residential use. • Dwelling houses designed, constructed or adapted for the elderly or other people with impaired mobility.
More Vulnerable	• Buildings used for: dwelling houses (except for those in the highly vulnerable classification); drinking establishments; nightclubs; and hotels. • Non-residential institutions such as health services, nurseries and educational establishments, but excluding hospitals. • Landfill and hazardous waste facilities
Less Vulnerable	• Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions; and assembly and leisure. • Land and buildings used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste). • Minerals working and processing. • Transport infrastructure.
Water- compatible Development	• Flood control infrastructure. • Water treatment plants and pumping stations. • Sewage treatment plants and pumping stations. • Docks, marinas and wharves. • Navigation facilities. • Ship building, repairing and dismantling, dockside fish processing and

	refrigeration and compatible activities requiring a waterside location. • Water-based recreation and tourism (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

In terms of planning and development control, different constraints apply to each type of development in each of these three zones. Table D1 of PPS25 suggests which land use categories are appropriate by Flood Zone, where Zone 3a is the 100 year and Zone 3b functional flood plain defined by the 20 year flood limit, and these appropriate land uses are summarised in Table 1.2.

Table 1.2 PPS25 Appropriate Land Use by Flood Zone

Classification	Zone			
	1	2	3a	3b
Essential Infrastructure	Appropriate	Appropriate	Exception test	Exception test
Highly Vulnerable	Appropriate	Exception test	Not permitted	Not permitted
More Vulnerable	Appropriate	Appropriate	Exception test	Not permitted
Less Vulnerable	Appropriate	Appropriate	Appropriate	Not permitted
Water Compatible	Appropriate	Appropriate	Appropriate	If it has to be there

Some land uses are only permitted if they pass the exception test which requires a development proposal to pass each of four criteria given in paragraph D10 of PPS25.

1.2.2 Environment Agency Guidance

In addition the Environment Agency have produced Standing Advice and Guidance Notes on development and Flood Risk Assessments which aim to simplify the requirements for a FRA according to the nature of the development and the site location in relation to the flood plain zones. The approach is summarised in the Agency's flood matrix. Table 1.3 sets out the FRA requirements for development based on the size of site and the location within the floodplain.

Table 1.3 Environment Agency Requirements for a FRA by Flood Zone

Classification	Zone		
	1	2	3
Domestic + non domestic extensions < 250m²	No Comment	Check EA advisory comments	Check EA advisory comments
Site area < 1ha	Check EA advisory comments	Guidance Note 3	Guidance Note 3
Site area > than 1ha	Guidance Note 1	Guidance Note 3	Guidance Note 3

The requirements for this site will therefore depend on the site area and the defined flood zones. However given that the site is in Zones 2 and 3 the requirements will be to consider Guidance Note 3 which is included in this FRA as Appendix A. PPS25 and the Agency's Guidance Note 3 have therefore been used as guidelines for the content of this FRA but the precise requirements and any

constraints will depend on the calculation of flood levels and confirmation of the appropriate Flood Zone and this is undertaken as part of this FRA.

1.3 Consultation

In preparing this FRA the Environment Agency have been consulted in terms of their requirements for a Flood Risk Assessment report and the extent of available information on flood risk affecting the proposed development site and the height of the existing flood defences. Their views were also sought on the likely mechanisms of flooding, the run-off implications of the proposed development and any control measures they consider would be acceptable.

The Agency's letter of 2 April 2007 indicates the proposed development site may be at risk from flooding and hence they requested that the applicant provide a Flood Risk Assessment with the planning application in accordance with PPS25 to enable the flood risk to be determined. This should include revised estimates of sea level rise as affected by climate change. This report fulfils this requirement.

2 SITE DETAILS

2.1 Location Plan

The proposed development site is located on the west of Shoreham (Figure 1) immediately north of the Brighton to Worthing railway line on Old Shoreham Road. The site is currently occupied by a garage and car showroom parking area (Photo 1) and is bounded by commercial and residential properties on Old Shoreham Road to the west, Victoria Road to the east and Swiss Gardens the north (Figure 3). The site and surrounding areas are residential and commercial developed areas and the site is part of the disused branch railway line to Steyning (Photo 2).

A topographical survey of the site and surrounding area (Figure 4) provides the elevation of the site. This varies from a low point at 3.0m OD on the western boundary adjacent to Old Shoreham Road rising to 5.65m OD in the middle of the site on the old railway line and to a high point of 8.61m OD at the eastern edge of the site boundary. Old Shoreham Road is around 2.65m OD to 3.15m OD in front of the site. The variation in topography is evident in Photos 3 and 4.

2.2 The Proposed Development

The proposed development involves the construction of 24 residential units with associated car parking facilities (Figure 5).

The ground floor will be 300mm above existing ground levels at 3.3m OD (Figure 5) and will be devoted to car parking areas. All residential accommodation will be above 5.0m OD. To the east of the building there will be a garden area on the raised ground of the disused railway line with access from the residential units.

Parts of the disused railway embankment will be removed from the higher points indicated on the topographical survey i.e. the building footprint including the car parking will all be reduced to a level of around 3.1m OD.

3 HYDROLOGY AND FLOODING

3.1 Local Hydraulics and Flood Risk

A site visit has allowed identification of the main potential sources of flooding, and any structures that could influence local hydrology and hydraulics in times of flood, as required by PPS25. The main potential source of flooding of the site is from the River Adur estuary 200m to the west of the site (Figure 1). Extreme tides in the Adur estuary could potentially overtop the local flood defences and inundate the site from west. There are no other watercourses or water bodies nearby that are likely to affect the development site.

The Environment Agency's Flood Plain Map for Shoreham (Figure 2) suggests the east and west banks of the Adur, including the margins of the development site, could be affected by extreme flooding. However these maps assume no flood defences are present and for this location this may be unrealistic. With tidal defences this predicted extent of flooding may be unlikely to occur although this needs to be confirmed.

A precise definition extreme flood levels is therefore required and compared to the height of the existing and any planned defences to confirm whether the proposed development is acceptable in terms of flood risk. It will then be possible to determine whether the site is above or below the likely flood level and whether alleviation options or restrictions on development should be considered. This FRA therefore considers the likely maximum flood levels from the tidal River Adur and this is described in Section 4.

3.2 Existing Flood Alleviation Measures

As detailed above the main potential source of flood water is extreme tidal events on the River Adur 200m to the west of the proposed development site. In terms of overtopping there are three stretches of flood defence that need to be considered:

- The area to the north of Riverbank Business Centre is protected by the embankment of the disused railway line.

- Between the disused railway embankment and the existing Worthing to Brighton railway bridge is the Riverbank Business Centre flood defence. This is a wide grassed 266m long embankment (Photos 5, 6 and 7) which appears to have been subject to ad hoc repairs (Photos 8 and 9). Any flood water which overtops this defence would enter the Riverside Business Centre and could flow eastwards towards Old Shoreham Road and the proposed development site.

- The new development at Lawsons Quay by Berkeley Homes has a new flood defence wall which is higher than the Riverside defence (Photo 10).

In terms of the height of these tidal flood defences a survey undertaken by the Environment Agency in 1996 suggests the top of the disused railway embankment is 5.19 to 6.03m OD, the Riverside flood defence is 3.84 to 4.09m OD and Lawsons Quay 4.23m OD (Figure 6). The low points are below the railway bridge at 2.52 to 3.03m but these probably do not form part of the flood defence.

As the Lawson Quay is a new development (post 1996) with a new flood defence wall the Agency's 1996 survey was supplemented by a dedicated topographical survey undertaken in October 2005 for this flood risk assessment. This reveals the Lawsons Quay flood defence has a minimum height of 4.97 to 4.99m OD, the Riverside defences are between 3.87 and 4.27m OD and the railway embankment 5.29 to 6.0m OD. The Riverside Business Park embankment therefore forms the low point in the flood defences along this stretch of the Adur.

The Brighton Marina to River Adur Strategy Plan (April 2003) recognises that flood defences on the Adur are below standard at certain locations and improvements will be required. A cost benefit analyses indicates the preferred option is to improve the existing defences by raising them to the 1 in 200 year level. This will be achieved either through improvements to the current defence structures or by their complete replacement. Although precise designs and plans are not yet finalised it can be assumed that the Riverside Defences will be raised to a higher standard by 2060.

The calculation of tide levels and the effectiveness of these defences is described in Section 4.

3.3 Historical Flooding

Details of historical flooding have been sought from relevant Authorities and sources. As detailed above the Flood Plain Maps provided by the Environment Agency (Figure 2) are often based on the maximum historic flood and do not account for new or modified flood defences. These maps cannot be used as an accurate guide of historic flooding at the site and are intended to be an indicative measure of flood risk only.

In terms of measured water levels, both the Environment Agency and Shoreham Port Authority measure fluvial flows and tide levels on the Adur and these are considered below.

3.3.1 Fluvial Flows and Levels

In terms of measured water levels and fluvial flows the Environment Agency operate a number water level and flow measurement stations in the Sussex area including main rivers such as the River Arun and Adur. The nearest gauging station to the site is on the Chess Stream at Chess Bridge (Table 3.1). Although this gauge is in an upstream catchment it does form a useful indication of the date and magnitude of major fluvial flood events in the area.

Table 3.1 Environment Agency Gauging Stations Near Shoreham

CEH Ref No	Watercourse	Location	NGR	Start Date	End Date	No Years
41012	Adur	Sakeham	TQ219190	04-Nov-67	13-Nov-02	36
41014	Arun	Pallingham	TQ047229	11-Feb-74	02-Jan-03	30

41028	Chess Stream	Chess Bridge	TQ217173	20-Jan-65	02-Jan-03	39

The largest five floods in the period of record at these three stations are provided in Table 3.2. This suggests the largest flood in the period of record was in November 1974, and other major floods include October/November 2000, December 1999 and December 1979. The October/November 2000 flood caused some disruption to the Sussex area, including closure of the A27 and the access road to Shoreham airport although there are no records of flooding at the development site at this time.

Table 3.2 Largest Floods at Environment Agency Gauging Stations

	41012 Adur at Sakeham		41014 Arun at Pallingham		41028 Chess Stream at Chess Bridge	
Rank	**Date**	**Flow (m^3/s)**	**Date**	**Flow (m^3/s)**	**Date**	**Flow (m^3/s)**
1	12-Oct-00	57.923	28 Dec 79	149.052	21-Nov-74	14.258
2	22 Nov 74	48.450	02 Oct 93	114.861	06-Nov-00	13.538
3	25 Dec 99	48.242	08 Apr 79	105.726	14-Apr-81	12.381
4	28 Dec 79	47.760	06 Nov 00	97.463	24-Dec-99	11.557
5	11 Feb 74	44.709	09 Dec 82	94.920	10-Jan-93	10.956

3.3.2 Tide Gauge Levels

The Shoreham Port Authority and the Environment Agency both operate tide gauges in Shoreham Harbour (TQ235047). Records at the Port Authority began in 1950 and data are available until December 1998 although there are only 18 years of record are available in this 48 year period. The Environment Agency RECS/RTS gauge started on 5 March 1997 and records are available until September 2002. Comparison of the Agency's RTS data with the nearby Newhaven RTS gauge suggests drift occurred throughout most of 1997 and 1998 and these data are probably of dubious accuracy. The annual maximum data series from both gauges is provided in Appendix B and the largest 5 annual maximum tides in the period of record are provided in Table 3.3.

Table 3.3 Largest 5 Annual Maximum Tides at Shoreham Tide Gauge

Year	Date	Annual Maximum
1985	08 April 1985	3.98
1990	27 Feb 1990	3.98
1983	02 Feb 1983	3.93
2000	12 Dec 2000	3.92
1991	03 Jan 1991	3.87

This suggests the largest tidal events in recent years were on 8 April 1985 and 27 February 1990 when levels reached 3.98m OD. Although this is higher than the ground level of the site there are no records of flooding of the site at this time. This is discussed further in Section 4.3.3.

3.3.3 Other Sources of Information

Another useful source of historical flood information is the British Hydrological Society's "Chronology of British Hydrological Events" which has also been checked to provide further anecdotal evidence of flood events in the Worthing, Lancing and Shoreham area. Only one entry for Worthing exists and none for Lancing or Shoreham and this is summarised in Table 3.4.

Table 3.4 Summary of Historical Floods in Worthing and Shoreham from BHS Database

Year	Month	Day	Quotation
1867	June	3	Worthing, West Sussex: "... Rain began to fall about 10 p.m. on the night of the 2nd, and continued without cessation for five and a half hours ... The greatest downpour, however, took place between 12 midnight and 1.15 a.m. ... with very little hail ... On measuring the contents of my rain gauge next morning, I found the large amount of 2.08 inches ..."

There is therefore no measured information, direct, historical, photographic or other evidence on the extent or depth of flood events or flood water levels on the development site.

4 FLOOD RISK AT THE PROPOSED DEVELOPMENT SITE

4.1 Objectives

The development plan (Figure 5) are for the construction of 24 residential units with associated car parking facilities. Excavation of some earth materials is anticipated from the disused railway embankment but there will be no major change to flood plain topography.

As detailed in Sections 3.2 and 3.3, although the site lies on the edge of the Agency's Flood Plain Map (Figure 2) it is considered that a more precise definition of extreme flood levels is required. These can then be compared to the level of the flood defences, to confirm whether the proposed development site is susceptible to flooding and whether alleviation options or restrictions on development should be considered.

The site is 200m from the Adur and in tidal estuaries it is usual that tidal extreme events give higher water levels than fluvial extremes and these are therefore considered. If the site lies above the 200 year tidal flood level the site is above the required flooding threshold, there will be no impact on flood plain hydraulics and flood storage and no major changes to the hydraulic behaviour of the site during flood events. However, if the site lies below the 200 year tidal flood level the site may be affected by flooding, could influence flood plain hydraulics, reduce flood storage and may require compensatory storage or flood prevention measures. An objective of this FRA is therefore to define the 200 year tidal flood level on the Adur, compare this to the height of the flood defences, and determine which parts of the site and the development will be affected by extreme tidal events. An assessment of extreme tidal levels and associated probabilities is therefore required followed by the calculation overtopping flow rates and volumetric analyses.

4.2 Tide Level Probability

4.2.1 Extreme Tide Levels

As detailed above the main potential source of flood water for the site and this area of Shoreham is from extreme tidal events on the River Adur estuary 200m to the west. The Environment Agency has provided a 200 year estimate of 4.40m OD for the year 2000 year tide and 4.7m OD for 2060 (Environment Agency letter of 22 July 2005) which is based on historical flood defence levels used in Shoreline Management Plans and based on a constant estimate of sea level rise for climate change of 6 mm/yr. Revised allowances for climate change are detailed below.

The Proudman Oceanographic Labs (POL) Spatial Revised Joint Probability method (SRJPM) has also been used (Table 4.1) to calculate extreme sea levels and this suggests a 200 year sea level of 3.97m OD. A more recent Agency report by JBA suggested a 200 year extreme sea level of 4.15m OD (Table 4.1) although this is based on limited data.

Table 4.1 Extreme Sea Levels (m AOD) for Year 2000 at Shoreham

Method	Return Period (years)							
	1	2.33	5	10	25	50	100	200
EA Estimates								4.40
SRJPM	3.00			3.32	3.50	3.62	3.82	3.97
JBA Report	3.83	3.86	3.94	3.99	4.05	4.09	4.12	4.15

The difference between SRJPM and the JBA estimates are due to the 1 year level and the slope of the curves. The POL method provides a 1 year level of 3.00m OD compared to JBA's 3.83m but the Shoreham data is limited and erroneous due to drift and spikes. As per the Agency's letter of 22 July 2005 the 200 year estimate of 4.40m OD in Table 4.1 is used and the slope of the growth curve taken from POLs SRJPM method. The adopted estimated extreme levels are given in Table 4.2 for 2000 and 2010 based on the SRJPM required trend adjustment.

Table 4.2 Adopted Extreme Sea Levels (m AOD) for Year 2000 at Shoreham

Year	Return Period (years)					
	1	10	25	50	100	200
2000	3.43	3.75	3.93	4.05	4.15	4.40
2010	3.44	3.76	3.94	4.06	4.27	4.41

For these 2000 and 2010 extreme tides Table 4.2 suggests:

- The area to the north of Riverbank Business Centre is protected by the embankment of the disused railway line at 5.33 to 5.66m OD, which is above the 200 year tide level.

- The Riverbank Business Centre flood defences at 3.87 and 4.27m OD forms the low point along this stretch of coastline. The 200 year tide is above the minimum height of these defences and this defence is susceptible to overtopping at about the 10 to 25 year flood and above.

- The new Berkeley Homes development at Lawsons Quay has a new flood defence wall with a minimum height of 4.97 to 4.99m OD, which is above the present day 200 year extreme sea level.

4.2.2 Climate Change Impacts

The definition of defence standards for tidal areas should include an allowance for climate change for the lifetime of the development as required by PPG25, which is usually taken as 50 years or to 2060. The climate change sea-level rise estimates from MAFF's project appraisal guidance for climate change defence levels of 6mm/yr were previously adopted but these estimates have recently been updated. These latest predictions[1] have been accepted as providing the best basis for the appraisal of coastal defences and the accepted rates, also allowing for isostatic rebound and crustal movements, are given in Table 4.3.

[1] Flood and Coastal Defence Appraisal Guidance, FCDPAG3 Economic Appraisal. Supplementary Note to Operating Authorities – Climate Change Impacts. October 2006

Table 4.3 Regional Rates of Relative Sea Level Rise

Administrative or Devolved Region	Assumed Vertical Land Movement (mm/yr)	Net Sea-Level Rise (mm/yr)				Previous allowance
		1990-2025	2025-2055	2055-2085	2085-2115	
East of England, East Midlands, London, SE England (south of Flamborough Head)	-0.8	4.0	8.5	12.0	15.0	6mm/yr
South West and Wales	-0.5	3.5	8.0	11.5	14.5	5 mm/yr
NW England, NE England, Scotland (north of Flamborough Head)	-0.8	2.5	7.0	10.0	13.0	4 mm/yr

The EA extreme tide levels in Table 4.2 are therefore adjusted to account for sea level rise to a design year of 2060 by including the predicted sea level rise in Southern Region (Table 4.3) and the results given in Table 4.4. This suggests a 200 year level of 4.79m OD at Shoreham by 2060.

Table 4.4 Adopted Extreme Sea Levels (m AOD) at Shoreham

Return Period (years)	Rate (mm/yr)	Return Period (years)					
		1	10	25	50	100	200
2010		3.44	3.76	3.94	4.06	4.27	4.41
2025	4	3.50	3.82	4.00	4.12	4.33	4.47
2055	8.5	3.76	4.08	4.26	4.38	4.59	4.73
2060	12	3.82	4.14	4.32	4.44	4.65	4.79
2085	12	4.12	4.44	4.62	4.74	4.95	5.09
2110	15	4.49	4.81	4.99	5.11	5.32	5.46

In terms of overtopping of the three defences, by 2060;

- The area to the north of Riverbank Business Centre is protected by the embankment of the disused railway line which provides protection to 5.33 to 5.66m OD which is above the 2060 200 year tide level.

- The Riverbank Business Centre flood defence between 3.87 and 4.27m OD is susceptible to the 10 year extreme tidal event and above by 2060. This embankment forms the low point along this stretch of coastline.

- The Berkeley Homes development at Lawsons Quay by has a new flood defence wall of 4.97 to 4.99m OD which is at above the 2060 200 year extreme sea level.

Due to the relatively low elevation of the Riverside Business Centre embankment, extreme tidal events in the Adur estuary are likely to overtop this defence, inundate the Riverside Business Park and water could then flow across Old Shoreham Road towards the development site. Whether this occurs is dependent on flooding mechanisms as described below.

4.3 Flooding Mechanisms

4.3.1 Steady State Modelling

Due to the relatively low elevation of the flood defence adjacent to the Riverside Business Centre the most likely flood route for an extreme tidal event in Adur estuary is by overtopping this flood defences, inundation of the Riverside Business Park and water would then flow across Old Shoreham Road towards the development site. The degree of overtopping, volume of inundation and maximum flood levels in this area is dependent on two relationships;

- the height verses flow relationship of the defence, and the relative level of the defence and extreme tide level, and

- the height -storage relationship of the area behind the sea wall which dictates how the overflow volume fills up the storage area behind the defence and hence to what level the overtopped volume would rise.

Both of these are based on limited survey data but on the basis of the assumptions given below these relationships can be approximated and used to determine the likely water levels behind this flood defence when it is overtopped.

(i) Height verses flow relationship of the flood defence

The grass embankment alongside the Riverside Business Centre is variable in height between 3.866 and 4.268m OD and a relationship between level and flow has been derived based on the broad crested weir equation and incremental heights and lengths provided by the topographical survey. The best fit equation to these data points is approximated as:

Flow (m^3/s) =50.086*(Head) $^{1.7629}$

The relationship is provided in Table 4.5 and suggests the 200 year 2010 extreme tide of 4.4m OD would result in a flow over the flood defence of 16.57 m^3/s or 994m^3/min. The 2060 200 year tide of 4.79m would allow 43.57 m^3/s or 2614m^3/min to flow over this defence and this large flow rates occurs principally as this tide is 0.924m above the minimum elevation of the flood defence and the defence is 260m wide at this tide level.

Table 4.5 Height verse Flow Relationship for Riverside Flood Defence

Level (m OD)	Head (m)	Flow (m^3/s)	Flow (m^3/min)
3.866	0.0	0.00	0.0
3.9	0.034	0.13	7.7
4.0	0.134	1.45	86.9
4.1	0.234	3.87	232.2
4.2	0.334	7.25	434.8
4.3	0.434	11.50	689.9
4.4	0.534	16.57	994.4
4.5	0.634	22.43	1345.8
4.6	0.734	29.04	1742.2
4.7	0.834	36.37	2182.2
4.79	0.924	43.57	2614.3

(ii) Height -Storage Relationship of the Flood Cell

The height-storage relationship of the area behind the sea wall is based on limited topographical survey data. The Riverside Business Centre is assumed to be a triangular area of 160m by 175m with a minimum ground level at 1.80m OD. Once water levels exceed the entrance to the business park on Old Shoreham Road, which is at 3.0m OD, any flood water would flow northwards along this road and north east towards Buckingham Street. This area is assumed to 30m by 400m at 3.1m but increasing with height to cover a large part of Shoreham at 5.0m OD. The volume of each of these two areas, and the combined volume, is given in Table 4.6.

Table 4.6 Height verse Storage Relationship behind Riverside Flood Defence

	Riverside			Old Shoreham Road			Total
H	W	L	Vol (m^3)	W	L	Vol (m^3)	Vol (m^3)
1.8	80	120	1000			0	1000
2.0	100	140	2400			0	2400
2.2	120	160	4320			0	4320
2.4	140	175	6770			0	6770
2.6	160	175	9570			0	9570
2.7	160	175	10970			0	10970
2.8	160	175	12370			0	12370
2.9	160	175	13770			0	13770
3.0	160	175	15170	20	400	2400	17570
3.1	160	175	16570	30	400	3000	19570
3.2	160	175	17970	40	400	3800	21770
3.3	160	175	19370	50	400	4800	24170
3.4	160	175	20770	60	400	6000	26770
3.5	160	175	22170	80	420	7680	29850
3.6	160	175	23570	100	440	9880	33450
3.7	160	175	24970	125	460	12755	37725
3.8	160	175	26370	150	480	16355	42725
4.0	160	175	29170	200	500	26355	55525
4.2	160	175	31970	250	600	41355	73325
4.4	160	175	34770	300	700	62355	97125
4.6	160	175	37570	350	800	90355	127925
4.8	160	175	40370	400	900	126355	166725
5.0	160	175	43170	450	1000	171355	214525

A comparison of Tables 4.6 and 4.7 suggests the 200 year 2010 tide of 4.4m would allow 16.57 m^3/s, 994m^3/min or over a 30 minute period 29,820m^3 which would cause water levels to rise to 3.5m OD. The 2060 200 year tide of 4.79m would allow 43.57 m^3/s, 2,614 m^3/min or 78,420m^3 in a 30 minute period which, if it occurred would cause water levels in the flood cell to rise to approximately 4.3m OD.

These are obvious simplifications as tidal water levels rise and fall slowly and hence the volume of overtopping would also change as tidal height varies - it would not remain constant at the maximum rate for 30 minutes. The use of a dynamic approach to model these changing water levels, overtopping rates and resultant flood levels is detailed below.

4.3.2 Dynamic Modelling

The rise and fall of an extreme tidal event and the impact on flood levels at Old Shoreham Road has been considered by dynamic modelling of the Adur water levels, overtopping of the Riverside flood defences and how water levels in Riverside Business Centre and Old Shoreham Road would vary. The calculations are based on the generation of three consecutive tidal cycles using harmonic constants provided in the Admiralty Tide Tables. The head of water above the flood defence is used to calculate flow over the Riverside flood wall using the rating equation detailed in Table 4.6. The model then calculates water levels behind the sea wall based on the height verses storage relationship detailed in Table 4.7. It is assumed the only flow from the flooded area back to the estuary occurs over the sea wall rather than through any low level drainage pipes or flapped valves and these calculations therefore represent a worst case.

Figure 7 shows that the 200 year tide of 4.40m results in a large influx of water over the flood defence during the first tide so that water levels in the flood cell are the same as in the estuary. This suggests water levels would be continuous across the estuary, the Riverside Business Park and Old Shoreham Road, reaching the same water level of 4.4m OD. As stated above this is occurs because the existing flood defence is low (3.866m OD) and wide (260m) allowing a full interchange of water to the Shoreham area. The calculations are given in Appendix D.

Figure 8 shows that with the 200 year 2060 tide of 4.79m flood water also becomes continuous across the estuary, Riverside Business Park flood cell and Old Shoreham Road, reaching the same water level of 4.79m OD. The calculations are given in Appendix E.

Due to the low level of the existing flood defence (3.866m OD) and its long width (260m) a full interchange of water will occur during extreme tidal events with the Riverside Business Park, the proposed development site. During extreme events much of this part of Shoreham will be flooded to the same level as the estuary.

4.3.3 Recent Events

As detailed in Table 3.3, the largest events in recent years occurred on 6 April 1985 and 27 February 1990 when tide levels in Shoreham Harbour reached 3.96m OD. This would have resulted in overtopping of the Riverside flood defences (at 3.866m OD) but there were no reports of flooding of the proposed development site at these times. Figure 9 shows the assumed tidal curve for this event and confirms that water levels in the flood cell would have reached 1.87, 2.04 and 2.22m OD if the same water level occurred on three consecutive tides. Any flood water would therefore have been contained within the Riverside Business Park and would not have reached Old Shoreham Road at 3.0m OD.

The limited extent of flooding that would have occurred during these events is due to the small head of water over the flood defence (less than 10 cm) and for a limited time (1 hour or less) and hence flow volumes would have been small. The model suggests the volume of water that would have flowed over the wall on each tide would have been between 2000 and 4000 m^3, which as Table 4.7 indicates would have caused only a small rise in water levels.

4.4 Flood Defence Options

The Agency has a preliminary scheme to improve the flood defences along the western frontage of the River Adur to a level of 4.7m OD, probably by 2007/2008. The Brighton Marina to River Adur Strategy Plan (April 2003) recognises that flood defences on the Adur are below standard at certain locations and improvements will be required. A cost benefit analyses indicates the preferred option is to improve the existing defences by raising them to the 1 in 200 year level (i.e. 4.7m OD). This will be achieved either through improvements to the current defence structures or by their complete replacement. Although precise designs and plans are not yet finalised it can be assumed that the Riverside Defences will be raised to a higher standard by 2060.

The predicted water levels in the Riverside Business Park flood cell for raised flood defences has been calculated using the dynamic model detailed above and the results are summarised in Table 4.7. Raising the flood defence to 4.4m or below would have little impact if three tides occurred consecutively and would not protect the site from flooding by overtopping. Raising this defence to 4.5 or 4.6m would offer some protection and reduced water levels and a new defence at 4.7m would fully protect the site.

Table 4.7 Flood Cell Water Levels (m OD) for 2060 200 year tide at Shoreham

	Flood Defence Level					
Tide	**3.866**	**4.0**	**4.2**	**4.4**	**4.6**	**4.8**
Tide 1	4.79	4.79	4.79	4.70	2.518	1.800
Tide 2	4.79	4.79	4.79	4.79	3.334	1.800
Tide 3	4.79	4.79	4.79	4.79	4.144	1.800

These are indicative calculations, based on an uncalibrated model, but serve to show the inadequacy of the existing flood defence. The calculations do not include a breach of any of the Shoreham flood defences and hence it may be prudent to ensure all floor levels for the proposed development are above the 2060 200 year tide level of 4.79m OD with an additional 300mm freeboard, or at 5.09m OD.

5 FLOOD CHARACTERISTICS

5.1 Site Cross Sections

PPS25 requires that cross-sections of the site are provided showing finished floor, road and any other relevant levels relative to the source of flooding and to anticipated water levels and associated probabilities. The flood levels in relation to the existing site are shown on Figures 10 and 11 which represent east-west sections across the middle and southern part of the site. This confirms the 200 year flood will inundate the lower western part of the development site adjacent to Old Shoreham Road but that the higher parts of the site will not flood. However the proposed ground car parking level at 3.1m OD will be susceptible to flooding.

5.2 Speed and Duration of Flooding

PPS25 requires an assessment of the likely rate or speed with which flooding might occur, the order in which various parts of the location or site might flood and the likely duration of flood events. Appendix E suggest the 2060 flood will overtop the existing defences and reach the level of Old Shoreham Road within 45 minutes, which is fairly rapid. This is a worst case estimate base on one dimensional modelling and the actual rate will depend on obstacles in the flood cell, flood plain roughness etc. However, it is likely that the lower parts of the site will flood within 1 to 2 hours but the higher parts of the site is not expected to flood during the 200 year event. There will be safe access onto dry higher ground from the site.

The Brighton Marina to River Adur Strategy Plan (April 2003) recognises that flood defences on the Adur are below standard at certain locations and improvements will be required. The preferred option is to improve the existing defences by raising them to the 1 in 200 year level and this will be achieved either through improvements to the current defence structures or by their complete replacement. Although these designs and/or plans are not yet finalised it can be assumed that the Riverside Defences will be raised to a higher standard by 2060. Once these defences are in place it is expected that the site will not be affected by the 2060 200 year flood.

5.3 Volume of Displacement

The volume of water which would be displaced from the site for various flood levels, before and after development, is usually compared to determine the need for compensatory storage. However, as the area proposed for development is a replacement of existing buildings and built ground there is no requirement for compensatory storage.

PPS25 requires an assessment of the likely impact of any displaced water on neighbouring or other locations that might be affected subsequent to development. This should include the potential for a change of the flooding regime both upstream and downstream of the site due to ground raising or flood embankments. As detailed above, it is likely that there will be no additional displaced water and hence no changes in flooding potential for upstream and downstream sites.

5.4 Runoff Generation

The run-off likely to be generated from the development can be calculated using FEH rainfall data. However, as the development will occur on similar impermeable hard standing, the runoff will be similar to the existing situation. The 100 year storm will generate the same volume of runoff as the land use of the site will not be changed. The use of Sustainable Urban Drainage Systems (SUDS) as part of the development plans could further reduce the volume of runoffbut as the volumes are small, due to the small foot print of the development, this is not considered further.

5.5 Fluvial Morphology

There is considered to be no potential impact of the development on fluvial morphology nor on the likely longer-term stability and sustainability of any watercourses.

5.6 Residual Risks

The residual risks are assessed after the construction of any necessary defences. As new or modified flood defence arrangements are not provided, the consideration of their behaviour under extreme events is not required.

5.7 PPS25

PSG25 provides a sequential test which developers and the Planning Authority should consult in considering sites for development. The predicted flood levels are based on a tidal inundation model of the area and suggest the lower parts of the site lie within Flood Zone 3, the upper parts in Zone 2.

PPS25 divides land use into five categories (Table 1.1) and the proposed development falls into the "more vulnerable" classification which applies to residential buildings. Table D1 of PPS25 (Table 1.2)

indicates these types of development are appropriate in Zone 3a areas but the proposals have to pass each of the four criteria in the Exception Test as given in paragraph D10 of PPS25. This requires that:

a) the development makes a positive contribution to sustainable communities, and to sustainable development objectives of the relevant LDD;

b) the development is on developable brownfield land or where there are no reasonable alternative options on developable brownfield land;

c) a flood risk assessment demonstrates that the residual risks of flooding to people and property (including the likely effects of climate change) are acceptable and can be satisfactorily managed; and

d) the development makes a positive contribution to reducing or managing flood risk.

The proposals meet each of these four criteria. The development will makes a positive contribution to sustainable communities, and is on developable brownfield land. This FRA demonstrates that the residual risks of flooding to people and property (including the likely effects of climate change) are acceptable and can be satisfactorily managed; and the development makes a positive contribution to reducing or managing flood risk.

All accommodation will be above 5.0m OD and therefore above the 200 year flood level by 2060 including an allowance for climate change. There will be safe escape and access to higher ground at the rear of the building and within the site boundary. As the development passes the Sequential Test and the Exception Test the proposals meet the requirements of PPS25.

6 CONCLUSIONS

- The requirements for a flood risk assessment are provided in Planning Policy Statement 25: Development and Flood Risk (PPS25) together with the Environment Agency's Guidance Notes.

- The proposed development will involve the construction of a four-storey residential units with associated car parking facilities.

- The site lies within 200m of the tidally affected River Adur which forms the main potential source of fluvial flooding of the site and inundation from extreme sea levels overtopping the Adur defences is also considered the most likely route of flood water.

- The Environment Agency suggests a 200 year tide level at Shoreham of 4.40m OD which, allowing for a climatic change increase suggests a 200 year level of 4.79m OD by 2060.

- Existing flood defence crest levels along the Adur estuary are 4.99m at Lawsons Quay, 5.50m to the north at the disused railway embankment and these are well above the predicted 200 year tide level. The minimum level of the Riverside Business Park defence is at 3.87m OD and these defences are insufficient for the 2000 and 2060 predicted 200 year tide. Overtopping of this existing defence may therefore be expected under extreme tidal conditions.

- The Brighton Marina to River Adur Strategy Plan recognises that flood defences on the Adur at certain locations are below standard and improvements will be required. The preferred option is to raise the existing defences to the 1 in 200 year level either by improving the current defence structures or by their complete replacement. Although the designs and plans are not yet finalised it is likely that the Riverside Defences will be raised to a higher standard by 2060.

- A dynamic model has been used to calculate the rate of overtopping of these defence under extreme tidal condition based on the width and height of the defence at different levels and the height verses storage relationship of the Riverside Business Park and Old Shoreham Road flood cell. This suggests for the existing defences the 2010 and 2060 flood would be continuous across the estuary and the flood cell due to the low level and large length of the flood defences at this location.

- Calculations suggest a scheme to improve the defences along the Riverside Business Park river frontage to a level of 4.8m OD would prevent flooding of the site.

- The flood model calculations suggest that water levels at the development site will rise fairly rapidly and reach the same level as the in the tidal estuary. There is safe access onto dry higher ground within the site.

- The development will include buildings or structures below the 200 year flood level and these are at risk from flooding. The ground floor at 3.0 to 3.3m OD will be used for car parking whilst all residential accommodation above 5.0m OD which is above the 200 year 2010 and 2060 flood level with safe escape and access to higher ground at the rear of the building and within the site boundary.

- There will be no displaced water, no change in the flooding potential for sites upstream and downstream and hence no requirement for compensatory storage.

- The site will generate the same volume of runoff as the existing situation as the land use of the site will not be changed. The use of Sustainable Urban Drainage Systems (SUDS) as part of the development plans could reduce the volume of runoff but the beneficial effects would be small due to the small footprint of the development compared to the existing situation.

- In terms of PPS25 the predicted flood levels and a tidal inundation model of the area suggests that the lower parts of the site lies within Flood Zone 3 and the upper parts of the site in Zone 2. PPS25 suggests this residential development is a "more vulnerable" use and has to pass the exception test in Zone 3 but is appropriate in Zone 2.

- The proposals meet the requirements of the "Exception Test". The development will make a positive contribution to sustainable communities and is on developable brownfield land. All accommodation will be above 5.0m OD and therefore above the 200 year flood level by 2060 including an allowance for climate change. There will be safe escape and access to higher ground at the rear of the building and within the site boundary. This FRA demonstrates that the residual risks of flooding to people and property (including the likely effects of climate change) are acceptable and can be satisfactorily managed; and the development makes a positive contribution to reducing or managing flood risk. As the development passes the Sequential Test and the Exception Test the proposals meet the requirements of PPS25.

Figures

Photographs

Photo: 1 Proposed Development Site, looking east from disused railway west of Old Shoreham Road



Photo: 2: Proposed Development Site, looking west

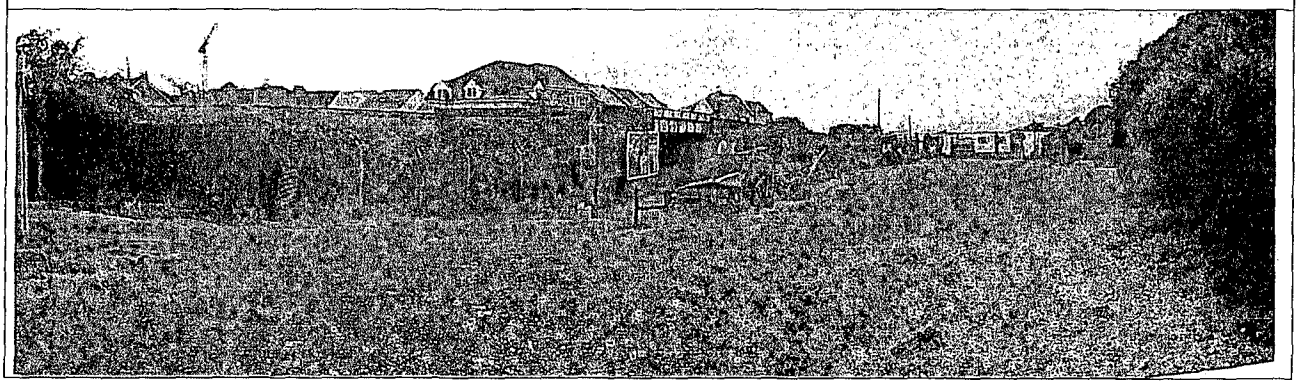


Photo: 3: Proposed Development Site, looking north east

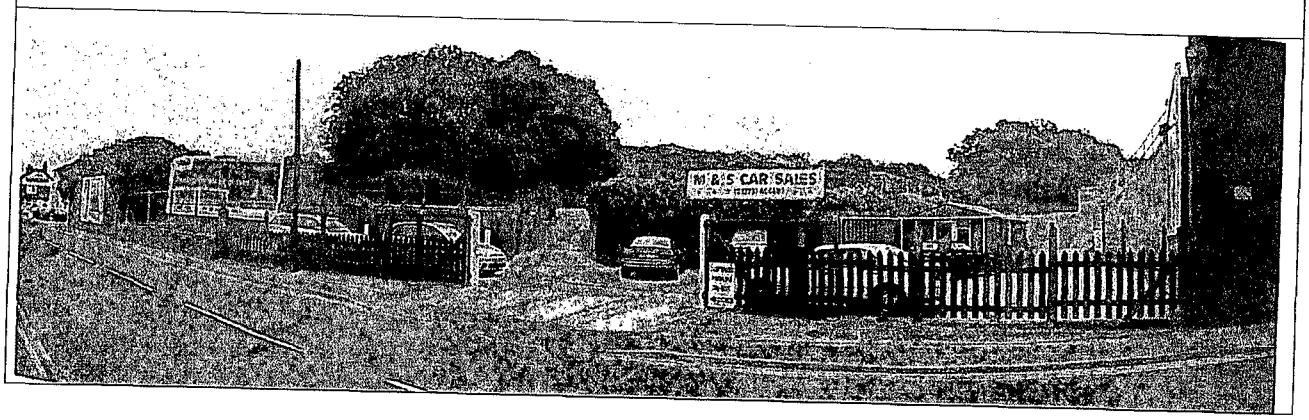


Photo: 4: Proposed Development Site, looking south

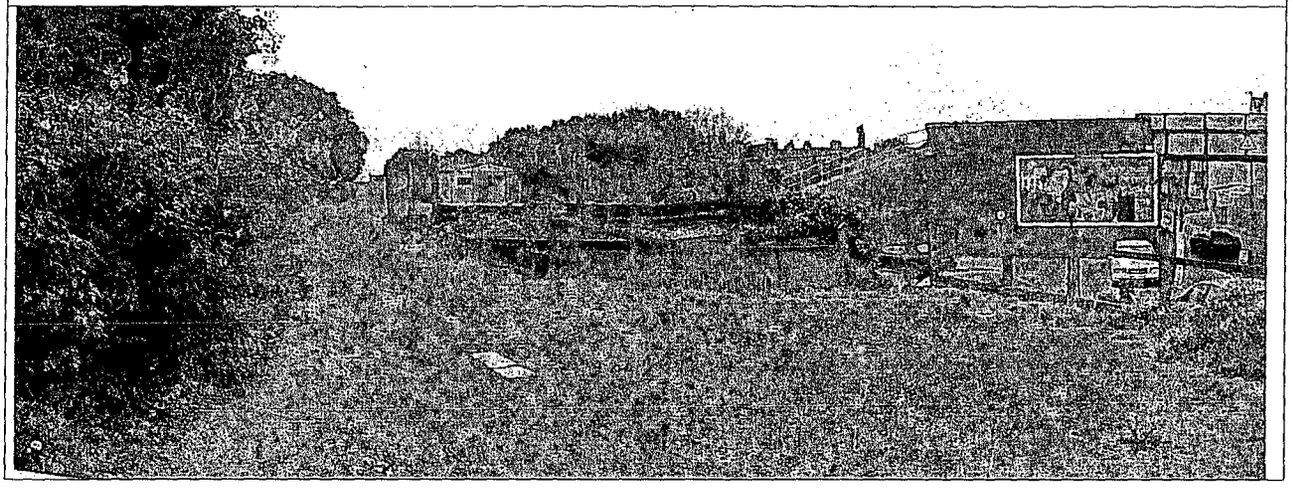


Photo: 5: Riverside Business Centre Flood Defence, looking south toward Railway Bridge

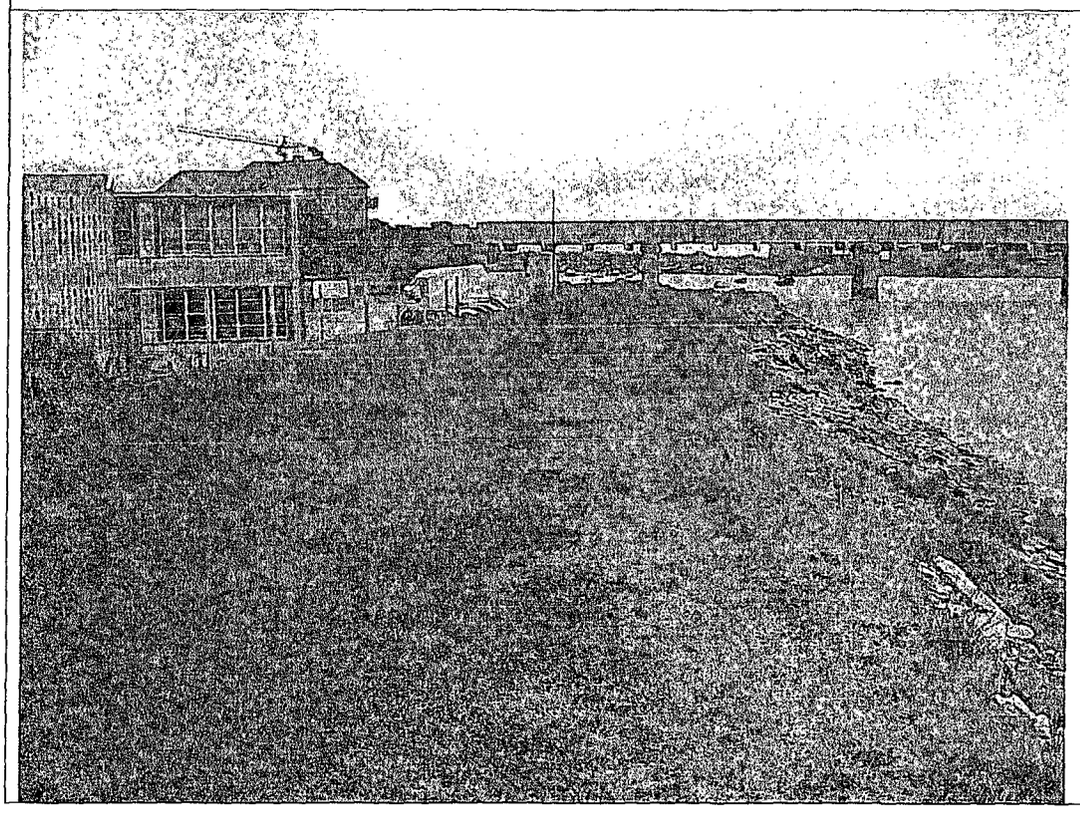


Photo: 6: Riverside Business Centre Flood Defence, looking north

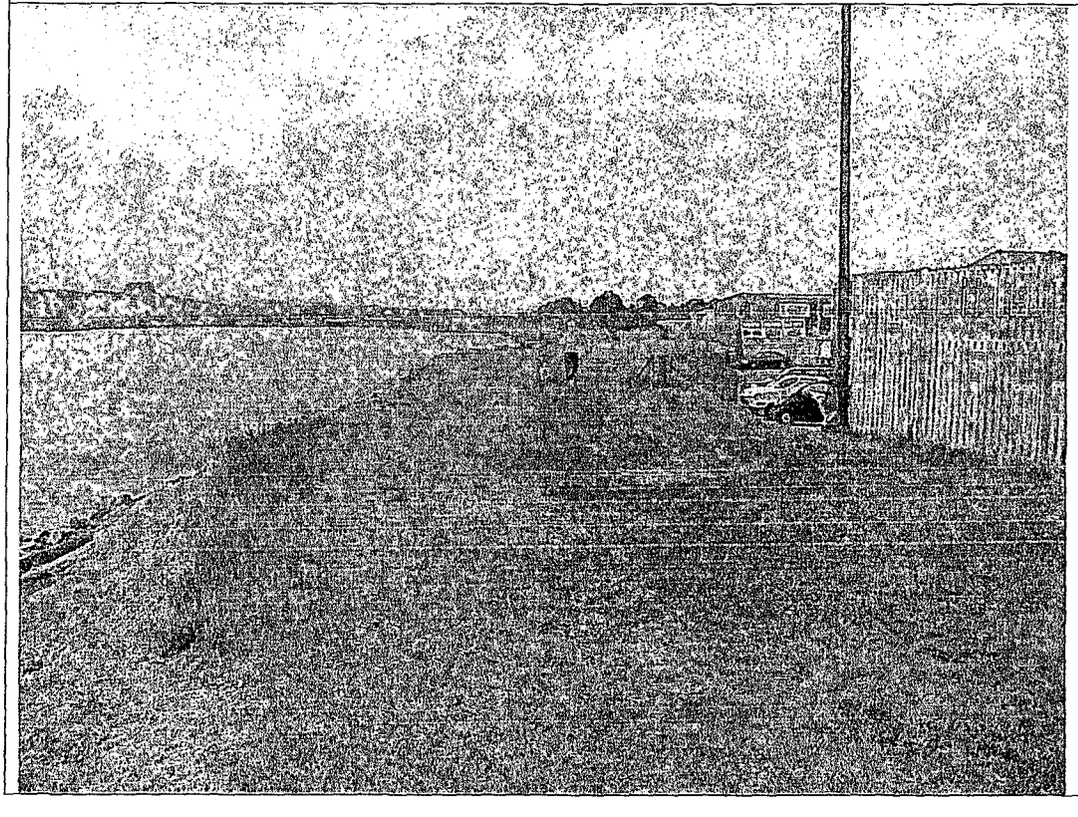


Photo: 7: Riverside Business Centre Flood Defence, looking south

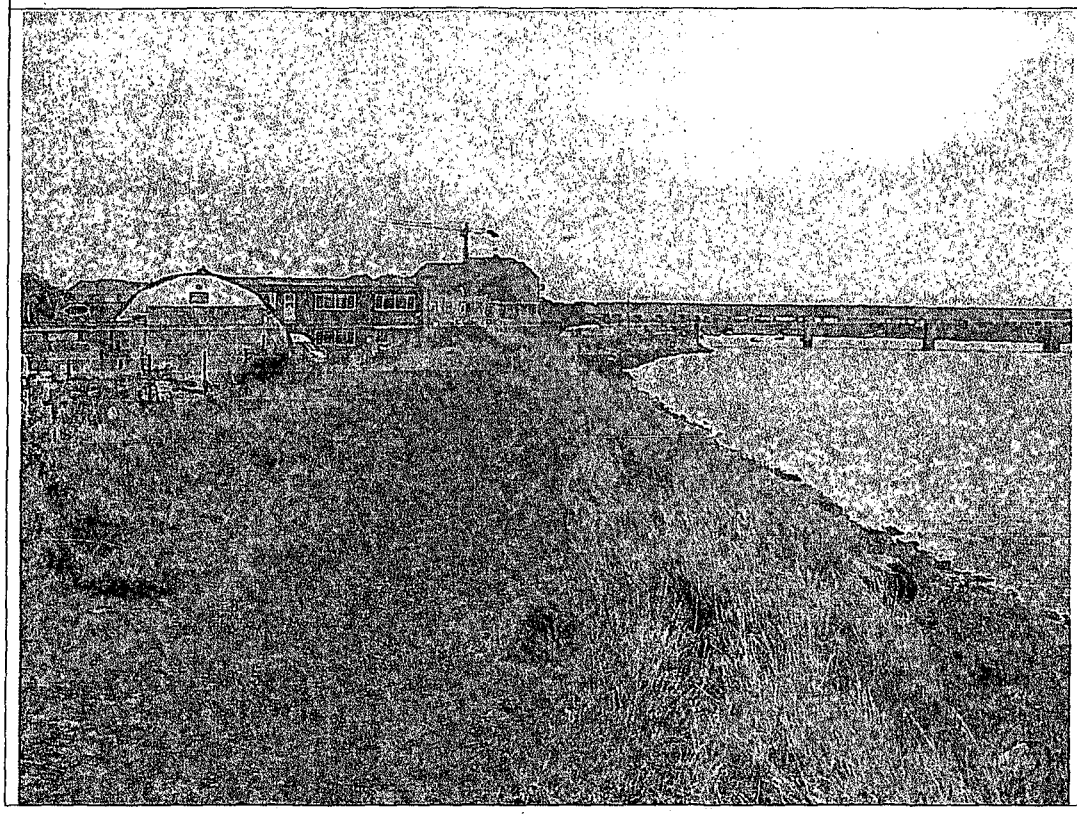


Photo: 8: Riverside Business Centre Flood Defence at Railway Bridge

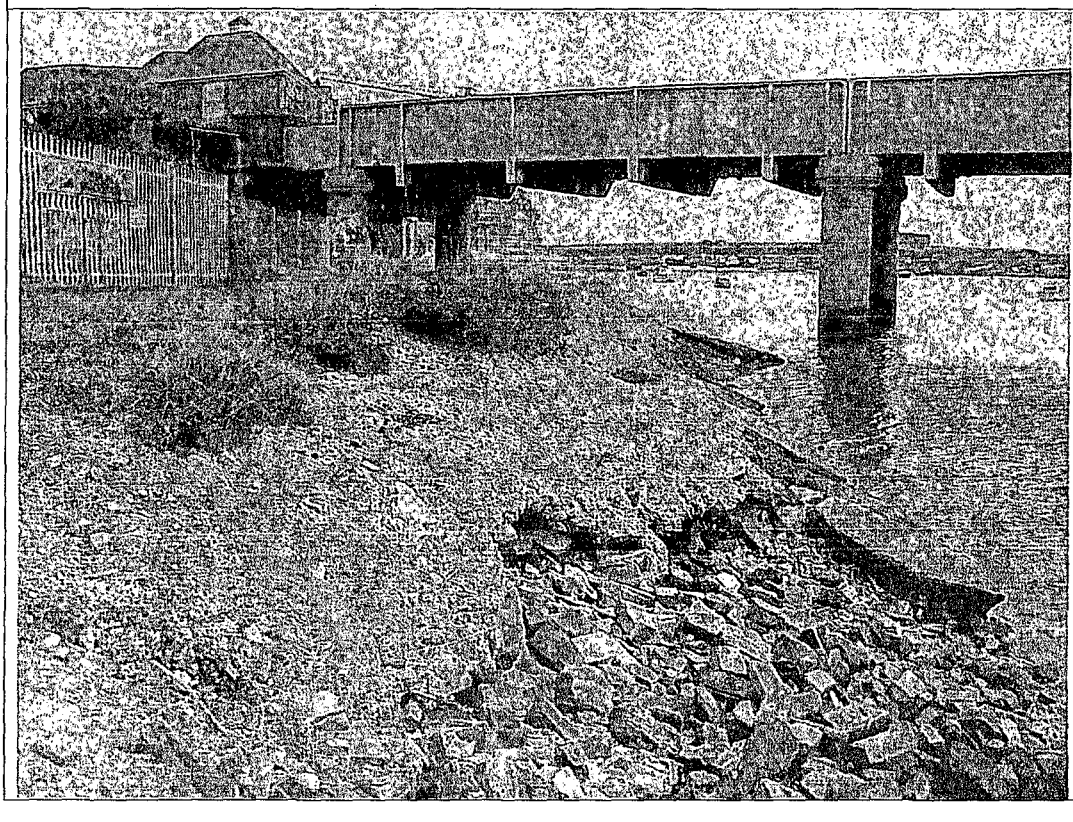


Photo: 9: Riverside Business Centre Flood Defence

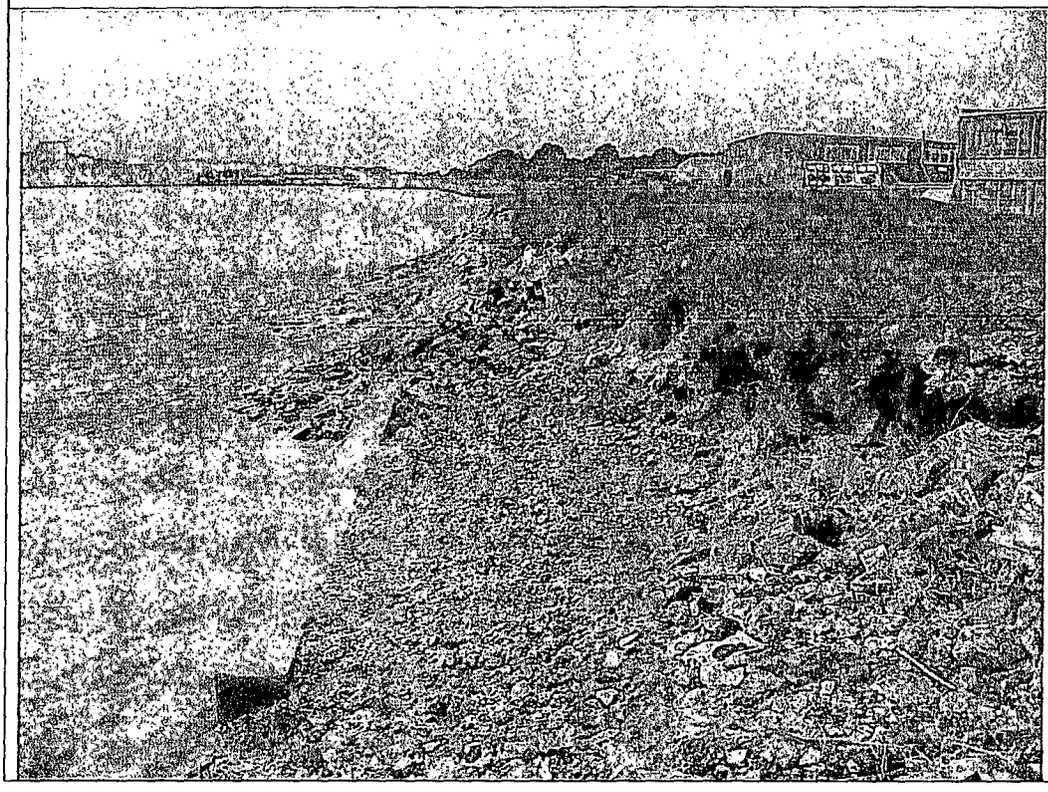
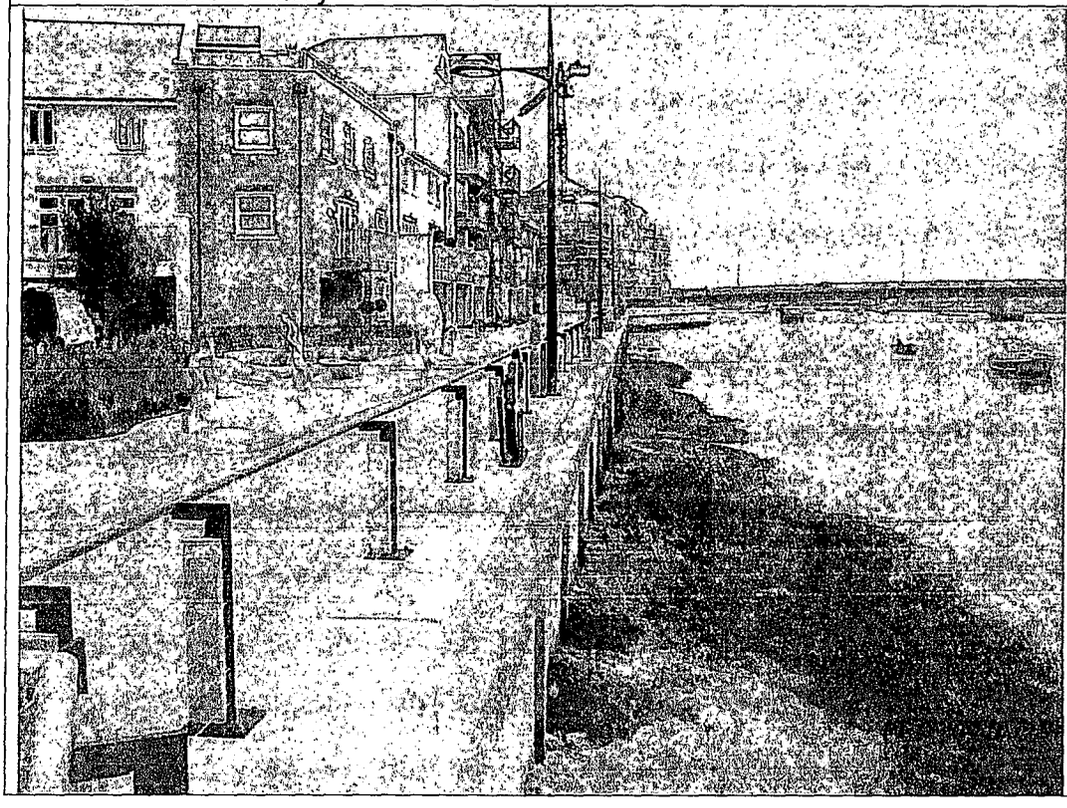


Photo: 10: Lawsons Quay Flood Defence



Appendices

Appendix A Environment Agency Guidance Note 3 - Development in Flood Zones 3 and 2

This guidance note relates specifically to the commissioning and undertaking of flood risk assessment studies for development in Flood Zones 2 and 3 other than 'minor' extensions i.e. excluding householder extensions and non-domestic extensions with a footprint of less than 250m², which are covered separately in FRA guidance note 2.

Prior to investing resources in completing a FRA, applicants are advised to contact the Local Planning Authority (LPA) and discuss how the flood risk Sequential Test as set out in Planning Policy Statement 25 (PPS25) will affect the proposed development. It is possible that the development will be inappropriate and be refused planning permission irrespective of any FRA. Advice on the evidence required to show that the Sequential and Exception Test has been properly applied is set out in the Sequential Test table within the Environment Agency's Standing Advice on development and flood risk and in the draft Practice Guide to PPS25. The Environment Agency may require evidence that the Sequential Test has been properly applied before commenting in detail on FRAs for development in this category.

Why is a FRA required?

In Flood Zone 3, the flood risk from rivers and the sea is classified as 'high', while in Flood Zone 2 it is said to be 'low to medium'. This classification is simply based on the probability of flood events occurring and does not address the possible consequences including the effects of any flood defences in the area. A FRA is required to ensure that all aspects of flood risk are considered both to the proposed development itself and also the potential impact on people and property elsewhere within the catchment. The scale, nature and location of the proposed development will inform the scope of the FRA required.

What should be in the FRA?

The detail and technical complexity of a FRA will reflect the scale and potential significance of the development. FRAs can be of a relatively minor nature, evaluating a small development on a site at the margins of the flood plain, or conversely can comprise major basin-wide studies for significant infrastructure developments. On occasions, preliminary or scoping studies may be undertaken prior to a fuller assessment. The following list sets out the kind of information that should be submitted as a FRA for development in Flood Zones 2 and 3:

Plans

- A location plan that includes geographical features, street names and identifies the catchment, watercourses or other bodies of water in the vicinity.
- A plan of the site showing
    - existing site;
    - development proposals;
    - identification of any structures, which may influence local hydraulics. This will include bridges, pipes/ducts crossing the watercourse, culverts, screens, embankments, walls, outfalls and condition of channel.

Surveys

- Site levels related to Ordnance Datum, both existing and proposed
- Appropriate cross-section(s) of the site showing finished floor levels or road levels, or other relevant levels relative to the source of flooding, and anticipated water levels and associated probabilities.

Assessments

- Consideration of whether the site falls within the functional flood plain as defined by the draft Practice Guide to Planning Policy Statement 25 (PPS25), and if so, demonstration that development meets the vulnerability criteria set out in table D1 PPS25.
- Flood alleviation measures already in place, their state of maintenance and their performance.
- Information about all potential sources of flooding that may affect the site – from rivers and the sea, streams, surface water run-off, sewers, groundwater, reservoirs, canals and other artificial sources or any combination of these.
- The impact of flooding on a site including:
    i. the likely rate or speed of surface water run-off with which flooding might occur;
    ii. the order in which various parts of the location or site might flood;
    iii. the likely duration of flood events
    iv. the economic, social and environmental consequences of flooding on occupancy of the site
    v. information on extent and depth of previous flood events or on flood predictions.

- An assessment of how safe access and exit can be provided for routine and emergency access under both frequent and extreme flood conditions.
- An assessment of how the layout and form of development can be used to reduce or minimise flood risk.
- An assessment of the capacity of any drains or sewers, existing or proposed, on the site during various flood events.
- An assessment of the volume of surface water run-off likely to be generated from the proposed development.
- Proposals for surface water management according to sustainable drainage principles, with the aim of not increasing, and where practicable, reducing the rate of runoff from the site as a result of the development
- The likely impact of any displaced water on third parties caused by alterations to ground levels or raising flood embankments.
- The potential impact on fluvial or coastal morphology and the likely longer-term stability and sustainability of existing defences.
- Estimates should be made of how climate change could affect the probability and intensity of flood events. The assessment should ensure that the development meets an acceptable standard of flood protection for the design life of the development. The hydrological analysis of flood flows and definition of defence standards needs to include the allowances for increased flows and sea level rise contained in DEFRA's project appraisal guidance for flood defence and in accordance with Appendix B of PPS 25 or the latest information from UKCIP.
- The residual risks to the site after the construction of any necessary defences and the means of managing those.
- Consideration of the proposal relative to any existing Strategic Flood Risk Assessment carried out by the local authority.

Appendix B Shoreham Tide Gauge Annual Maximum (AMAX) data

	Shoreham PA		Environment Agency Data	
	Date	AMAX	Date	AMAX
1967	05/10/67 12:06	3.84		
1968				
1969				
1970				
1971				
1972				
1973				
1974				
1975				
1976				
1977				
1978	11/01/78 00:12	3.61		
1979				
1980				
1981				
1982				
1983	02/02/83 02:22	3.93		
1984				
1985	08/04/85 00:37	3.98		
1986				
1987	07/10/87 10:48	3.77		
1988	16/09/89 23:59	3.65		
1989	13/12/89 11:32	3.74		
1990	27/02/90 00:28	3.98		
1991	03/01/91 00:36	3.87		
1992				
1993	11/01/93 13:02	3.80		
1994	26/02/94 23:55	3.68		
1995	23/12/95 11:42	3.84		
1996				
1997	14/01/97 23:48	3.55	*25/07/97 14:45*	*5.508*
1998			*14/01/98 00:15*	*4.029*
1999	24/10/99 10:32	3.83	*06/11/99 22:30*	*3.940*
2000			12/12/00 23:30	3.92
2001			12/03/01 00:30	3.857
2002			01/03/02 00:15	3.669

RTS data discounted for period 1997 to 1999 due to drift and spikes in data set.

Appendix C Tide Calculations for 2010 200 year flood of 4.4m OD

t (hrs)	Tide Level		Head (m)	Q (m3/s)	Vol (m3)	Culm Vol	Flood Cell Level
18/11/00 07:00:00	-2.822		0	0.000	0	0	1.80
18/11/00 07:05:00	-2.796		0	0.000	0	0	1.80
18/11/00 07:10:00	-2.765		0	0.000	0	0	1.80
18/11/00 07:15:00	-2.727		0	0.000	0	0	1.80
18/11/00 07:20:00	-2.683		0	0.000	0	0	1.80
18/11/00 07:25:00	-2.633		0	0.000	0	0	1.80
18/11/00 07:30:00	-2.576		0	0.000	0	0	1.80
18/11/00 07:35:00	-2.514		0	0.000	0	0	1.80
18/11/00 07:40:00	-2.446		0	0.000	0	0	1.80
18/11/00 07:45:00	-2.373		0	0.000	0	0	1.80
18/11/00 07:50:00	-2.293		0	0.000	0	0	1.80
18/11/00 07:55:00	-2.209		0	0.000	0	0	1.80
18/11/00 08:00:00	-2.119		0	0.000	0	0	1.80
18/11/00 08:05:00	-2.024		0	0.000	0	0	1.80
18/11/00 08:10:00	-1.923		0	0.000	0	0	1.80
18/11/00 08:15:00	-1.819		0	0.000	0	0	1.80
18/11/00 08:20:00	-1.709		0	0.000	0	0	1.80
18/11/00 08:25:00	-1.595		0	0.000	0	0	1.80
18/11/00 08:30:00	-1.477		0	0.000	0	0	1.80
18/11/00 08:35:00	-1.355		0	0.000	0	0	1.80
18/11/00 08:40:00	-1.229		0	0.000	0	0	1.80
18/11/00 08:45:00	-1.100		0	0.000	0	0	1.80
18/11/00 08:50:00	-0.967		0	0.000	0	0	1.80
18/11/00 08:55:00	-0.831		0	0.000	0	0	1.80
18/11/00 09:00:00	-0.692		0	0.000	0	0	1.80
18/11/00 09:05:00	-0.551		0	0.000	0	0	1.80
18/11/00 09:10:00	-0.407		0	0.000	0	0	1.80
18/11/00 09:15:00	-0.261		0	0.000	0	0	1.80
18/11/00 09:20:00	-0.113		0	0.000	0	0	1.80
18/11/00 09:25:00	0.036		0	0.000	0	0	1.80
18/11/00 09:30:00	0.187		0	0.000	0	0	1.80
18/11/00 09:35:00	0.338		0	0.000	0	0	1.80
18/11/00 09:40:00	0.491		0	0.000	0	0	1.80
18/11/00 09:45:00	0.644		0	0.000	0	0	1.80
18/11/00 09:50:00	0.797		0	0.000	0	0	1.80
18/11/00 09:55:00	0.950		0	0.000	0	0	1.80
18/11/00 10:00:00	1.103		0	0.000	0	0	1.80
18/11/00 10:05:00	1.255		0	0.000	0	0	1.80
18/11/00 10:10:00	1.407		0	0.000	0	0	1.80
18/11/00 10:15:00	1.557		0	0.000	0	0	1.80
18/11/00 10:20:00	1.706		0	0.000	0	0	1.80
18/11/00 10:25:00	1.853		0	0.000	0	0	1.80
18/11/00 10:30:00	1.999		0	0.000	0	0	1.80
18/11/00 10:35:00	2.142		0	0.000	0	0	1.80
18/11/00 10:40:00	2.283		0	0.000	0	0	1.80
18/11/00 10:45:00	2.421		0	0.000	0	0	1.80
18/11/00 10:50:00	2.556		0	0.000	0	0	1.80
18/11/00 10:55:00	2.688		0	0.000	0	0	1.80
18/11/00 11:00:00	2.816		0	0.000	0	0	1.80
18/11/00 11:05:00	2.941		0	0.000	0	0	1.80
18/11/00 11:10:00	3.062		0	0.000	0	0	1.80
18/11/00 11:15:00	3.179		0	0.000	0	0	1.80
18/11/00 11:20:00	3.292		0	0.000	0	0	1.80
18/11/00 11:25:00	3.400		0	0.000	0	0	1.80
18/11/00 11:30:00	3.503		0	0.000	0	0	1.80
18/11/00 11:35:00	3.602		0	0.000	0	0	1.80
18/11/00 11:40:00	3.695		0	0.000	0	0	1.80
18/11/00 11:45:00	3.783		0	0.000	0	0	1.80
18/11/00 11:50:00	3.866		0.00038	0.000	0	0	1.80
18/11/00 11:55:00	3.944		0.07775	0.555	166	166	1.80
18/11/00 12:00:00	4.015		0.14944	1.755	527	693	1.80
18/11/00 12:05:00	4.081		0.21533	3.342	1003	1696	1.80
18/11/00 12:10:00	4.141		0.2753	5.154	1546	3242	1.80
18/11/00 12:15:00	4.195		0.32924	7.066	2120	5362	1.80
18/11/00 12:20:00	4.243		0.37706	8.974	2692	8054	2.65
18/11/00 12:25:00	4.285		0.41867	10.792	3238	11291	3.04
18/11/00 12:30:00	4.320		0.45398	12.448	3734	15026	3.49
18/11/00 12:35:00	4.349		0.48295	13.882	4165	19191	3.99

18/11/00 12:40:00	4.372		0.38573	9.341	2802	21993	4.32
18/11/00 12:45:00	4.388		0.06698	0.427	128	22121	4.34
18/11/00 12:50:00	4.397		0.06132	0.365	110	22230	4.35
18/11/00 12:55:00	4.400		0.05137	0.267	80	22310	4.36
18/11/00 13:00:00	4.397		0.03843	0.160	48	22358	4.36
18/11/00 13:05:00	4.387		0.02283	0.064	19	22378	4.37
18/11/00 13:10:00	4.371		0.00419	0.003	1	22379	4.37
18/11/00 13:15:00	4.348		-0.01872	-0.045	-14	22365	4.37
18/11/00 13:20:00	4.319		-0.04631	-0.223	-67	22298	4.36
18/11/00 13:25:00	4.283		-0.0739	-0.507	-152	22146	4.34
18/11/00 13:30:00	4.241		-0.09759	-0.828	-248	21898	4.31
18/11/00 13:35:00	4.193		-0.11599	-1.123	-337	21561	4.27
18/11/00 13:40:00	4.139		-0.12997	-1.372	-412	21149	4.22
18/11/00 13:45:00	4.079		-0.14105	-1.585	-476	20673	4.16
18/11/00 13:50:00	4.013		-0.15043	-1.776	-533	20141	4.10
18/11/00 13:55:00	3.940		-0.1588	-1.954	-586	19554	4.03
18/11/00 14:00:00	3.863		-0.16325	-2.051	-615	18939	3.96
18/11/00 14:05:00	3.779		-0.08971	-0.714	-214	18725	3.93
18/11/00 14:10:00	3.691		-0.06411	-0.395	-118	18606	3.92
18/11/00 14:15:00	3.597		-0.04996	-0.254	-76	18530	3.91
18/11/00 14:20:00	3.498		-0.04084	-0.178	-53	18477	3.90
18/11/00 14:25:00	3.394		-0.03445	-0.132	-40	18437	3.90
18/11/00 14:30:00	3.285		-0.02971	-0.102	-31	18406	3.89
18/11/00 14:35:00	3.172		-0.02606	-0.081	-24	18382	3.89
18/11/00 14:40:00	3.055		-0.02317	-0.066	-20	18362	3.89
18/11/00 14:45:00	2.933		-0.02081	-0.054	-16	18346	3.88
18/11/00 14:50:00	2.807		-0.01887	-0.046	-14	18332	3.88
18/11/00 14:55:00	2.678		-0.01723	-0.039	-12	18321	3.88
18/11/00 15:00:00	2.546		-0.01583	-0.034	-10	18311	3.88
18/11/00 15:05:00	2.410		-0.01463	-0.029	-9	18302	3.88
18/11/00 15:10:00	2.271		-0.01358	-0.026	-8	18294	3.88
18/11/00 15:15:00	2.130		-0.01266	-0.023	-7	18287	3.88
18/11/00 15:20:00	1.986		-0.01185	-0.020	-6	18281	3.88
18/11/00 15:25:00	1.839		-0.01113	-0.018	-5	18276	3.88
18/11/00 15:30:00	1.691		-0.01048	-0.016	-5	18271	3.88
18/11/00 15:35:00	1.542		-0.0099	-0.015	-4	18267	3.88
18/11/00 15:40:00	1.390		-0.00938	-0.013	-4	18263	3.87
18/11/00 15:45:00	1.238		-0.0089	-0.012	-4	18259	3.87
18/11/00 15:50:00	1.085		-0.00846	-0.011	-3	18256	3.87
18/11/00 15:55:00	0.931		-0.00806	-0.010	-3	18253	3.87
18/11/00 16:00:00	0.777		-0.0077	-0.009	-3	18250	3.87
18/11/00 16:05:00	0.623		-0.00736	-0.009	-3	18247	3.87
18/11/00 16:10:00	0.469		-0.00705	-0.008	-2	18245	3.87
18/11/00 16:15:00	0.315		-0.00676	-0.007	-2	18243	3.87
18/11/00 16:20:00	0.163		-0.00649	-0.007	-2	18241	3.87
18/11/00 16:25:00	0.011		-0.00624	-0.007	-2	18239	3.87
18/11/00 16:30:00	-0.139		-0.00601	-0.006	-2	18237	3.87
18/11/00 16:35:00	-0.288		-0.00579	-0.006	-2	18235	3.87
18/11/00 16:40:00	-0.434		-0.00559	-0.005	-2	18233	3.87
18/11/00 16:45:00	-0.579		-0.0054	-0.005	-2	18232	3.87
18/11/00 16:50:00	-0.721		-0.00521	-0.005	-1	18231	3.87
18/11/00 16:55:00	-0.861		-0.00505	-0.004	-1	18229	3.87
18/11/00 17:00:00	-0.998		-0.00488	-0.004	-1	18228	3.87
18/11/00 17:05:00	-1.131		-0.00473	-0.004	-1	18227	3.87
18/11/00 17:10:00	-1.261		-0.00459	-0.004	-1	18226	3.87
18/11/00 17:15:00	-1.388		-0.00445	-0.004	-1	18224	3.87
18/11/00 17:20:00	-1.511		-0.00433	-0.003	-1	18223	3.87
18/11/00 17:25:00	-1.630		-0.0042	-0.003	-1	18222	3.87
18/11/00 17:30:00	-1.744		-0.00409	-0.003	-1	18222	3.87
18/11/00 17:35:00	-1.854		-0.00398	-0.003	-1	18221	3.87
18/11/00 17:40:00	-1.959		-0.00387	-0.003	-1	18220	3.87
18/11/00 17:45:00	-2.060		-0.00377	-0.003	-1	18219	3.87
18/11/00 17:50:00	-2.155		-0.00368	-0.003	-1	18218	3.87
18/11/00 17:55:00	-2.245		-0.00358	-0.002	-1	18218	3.87
18/11/00 18:00:00	-2.330		-0.0035	-0.002	-1	18217	3.87
18/11/00 18:05:00	-2.410		-0.00341	-0.002	-1	18216	3.87
18/11/00 18:10:00	-2.483		-0.00333	-0.002	-1	18216	3.87
18/11/00 18:15:00	-2.551		-0.00325	-0.002	-1	18215	3.87
18/11/00 18:20:00	-2.613		-0.00318	-0.002	-1	18214	3.87
18/11/00 18:25:00	-2.669		-0.00311	-0.002	-1	18214	3.87
18/11/00 18:30:00	-2.719		-0.00304	-0.002	-1	18213	3.87
18/11/00 18:35:00	-2.762		-0.00298	-0.002	-1	18213	3.87
18/11/00 18:40:00	-2.800		-0.00291	-0.002	-1	18212	3.87

18/11/00 18:45:00	-2.831		-0.00285	-0.002	0	18212	3.87
18/11/00 18:50:00	-2.744	Curve2	-0.00279	-0.002	0	18211	3.87
18/11/00 18:55:00	-2.762		-0.00274	-0.002	0	18211	3.87
18/11/00 19:00:00	-2.774		-0.00268	-0.001	0	18210	3.87
18/11/00 19:05:00	-2.779		-0.00263	-0.001	0	18210	3.87
18/11/00 19:10:00	-2.777		-0.00258	-0.001	0	18209	3.87
18/11/00 19:15:00	-2.769		-0.00253	-0.001	0	18209	3.87
18/11/00 19:20:00	-2.755		-0.00248	-0.001	0	18209	3.87
18/11/00 19:25:00	-2.734		-0.00244	-0.001	0	18208	3.87
18/11/00 19:30:00	-2.707		-0.00239	-0.001	0	18208	3.87
18/11/00 19:35:00	-2.673		-0.00235	-0.001	0	18208	3.87
18/11/00 19:40:00	-2.633		-0.00231	-0.001	0	18207	3.87
18/11/00 19:45:00	-2.587		-0.00227	-0.001	0	18207	3.87
18/11/00 19:50:00	-2.534		-0.00223	-0.001	0	18207	3.87
18/11/00 19:55:00	-2.476		-0.00219	-0.001	0	18206	3.87
18/11/00 20:00:00	-2.411		-0.00215	-0.001	0	18206	3.87
18/11/00 20:05:00	-2.341		-0.00212	-0.001	0	18206	3.87
18/11/00 20:10:00	-2.265		-0.00208	-0.001	0	18205	3.87
18/11/00 20:15:00	-2.183		-0.00205	-0.001	0	18205	3.87
18/11/00 20:20:00	-2.096		-0.00202	-0.001	0	18205	3.87
18/11/00 20:25:00	-2.004		-0.00198	-0.001	0	18205	3.87
18/11/00 20:30:00	-1.906		-0.00195	-0.001	0	18204	3.87
18/11/00 20:35:00	-1.804		-0.00192	-0.001	0	18204	3.87
18/11/00 20:40:00	-1.697		-0.00189	-0.001	0	18204	3.87
18/11/00 20:45:00	-1.585		-0.00187	-0.001	0	18204	3.87
18/11/00 20:50:00	-1.469		-0.00184	-0.001	0	18203	3.87
18/11/00 20:55:00	-1.349		-0.00181	-0.001	0	18203	3.87
18/11/00 21:00:00	-1.225		-0.00179	-0.001	0	18203	3.87
18/11/00 21:05:00	-1.098		-0.00176	-0.001	0	18203	3.87
18/11/00 21:10:00	-0.966		-0.00173	-0.001	0	18203	3.87
18/11/00 21:15:00	-0.832		-0.00171	-0.001	0	18202	3.87
18/11/00 21:20:00	-0.695		-0.00169	-0.001	0	18202	3.87
18/11/00 21:25:00	-0.555		-0.00166	-0.001	0	18202	3.87
18/11/00 21:30:00	-0.412		-0.00164	-0.001	0	18202	3.87
18/11/00 21:35:00	-0.267		-0.00162	-0.001	0	18202	3.87
18/11/00 21:40:00	-0.121		-0.0016	-0.001	0	18201	3.87
18/11/00 21:45:00	0.028		-0.00158	-0.001	0	18201	3.87
18/11/00 21:50:00	0.178		-0.00156	-0.001	0	18201	3.87
18/11/00 21:55:00	0.329		-0.00153	-0.001	0	18201	3.87
18/11/00 22:00:00	0.481		-0.00152	-0.001	0	18201	3.87
18/11/00 22:05:00	0.633		-0.0015	-0.001	0	18201	3.87
18/11/00 22:10:00	0.786		-0.00148	-0.001	0	18200	3.87
18/11/00 22:15:00	0.939		-0.00146	-0.001	0	18200	3.87
18/11/00 22:20:00	1.091		-0.00144	0.000	0	18200	3.87
18/11/00 22:25:00	1.243		-0.00142	0.000	0	18200	3.87
18/11/00 22:30:00	1.395		-0.00141	0.000	0	18200	3.87
18/11/00 22:35:00	1.545		-0.00139	0.000	0	18200	3.87
18/11/00 22:40:00	1.694		-0.00137	0.000	0	18200	3.87
18/11/00 22:45:00	1.841		-0.00136	0.000	0	18200	3.87
18/11/00 22:50:00	1.987		-0.00134	0.000	0	18199	3.87
18/11/00 22:55:00	2.130		-0.00133	0.000	0	18199	3.87
18/11/00 23:00:00	2.271		-0.00131	0.000	0	18199	3.87
18/11/00 23:05:00	2.409		-0.0013	0.000	0	18199	3.87
18/11/00 23:10:00	2.545		-0.00128	0.000	0	18199	3.87
18/11/00 23:15:00	2.677		-0.00127	0.000	0	18199	3.87
18/11/00 23:20:00	2.806		-0.00125	0.000	0	18199	3.87
18/11/00 23:25:00	2.931		-0.00124	0.000	0	18199	3.87
18/11/00 23:30:00	3.053		-0.00123	0.000	0	18198	3.87
18/11/00 23:35:00	3.170		-0.00121	0.000	0	18198	3.87
18/11/00 23:40:00	3.283		-0.0012	0.000	0	18198	3.87
18/11/00 23:45:00	3.392		-0.00119	0.000	0	18198	3.87
18/11/00 23:50:00	3.496		-0.00117	0.000	0	18198	3.87
18/11/00 23:55:00	3.595		-0.00116	0.000	0	18198	3.87
19/11/00 00:00:00	3.689		-0.00115	0.000	0	18198	3.87
19/11/00 00:05:00	3.777		-0.00114	0.000	0	18198	3.87
19/11/00 00:10:00	3.861		-0.00113	0.000	0	18198	3.87
19/11/00 00:15:00	3.939		0.07144	0.478	143	18341	3.88
19/11/00 00:20:00	4.011		0.12647	1.308	392	18733	3.93
19/11/00 00:25:00	4.077		0.14592	1.683	505	19238	3.99
19/11/00 00:30:00	4.137		0.14599	1.685	505	19744	4.05
19/11/00 00:35:00	4.192		0.13997	1.564	469	20213	4.11
19/11/00 00:40:00	4.240		0.13213	1.413	424	20637	4.16
19/11/00 00:45:00	4.282		0.12347	1.254	376	21013	4.20

19/11/00 00:50:00	4.318		0.11421	1.093	328	21341	4.24
19/11/00 00:55:00	4.347		0.10435	0.932	280	21620	4.28
19/11/00 01:00:00	4.370		0.09382	0.773	232	21852	4.30
19/11/00 01:05:00	4.386		0.08253	0.616	185	22037	4.33
19/11/00 01:10:00	4.396		0.07035	0.465	140	22177	4.34
19/11/00 01:15:00	4.400		0.05706	0.322	96	22273	4.35
19/11/00 01:20:00	4.397		0.04239	0.190	57	22330	4.36
19/11/00 01:25:00	4.387		0.0259	0.080	24	22354	4.36
19/11/00 01:30:00	4.371		0.00685	0.008	2	22357	4.36
19/11/00 01:35:00	4.348		-0.01608	-0.034	-10	22346	4.36
19/11/00 01:40:00	4.319		-0.04395	-0.203	-61	22285	4.36
19/11/00 01:45:00	4.283		-0.07217	-0.487	-146	22139	4.34
19/11/00 01:50:00	4.242		-0.09655	-0.813	-244	21896	4.31
19/11/00 01:55:00	4.194		-0.11549	-1.115	-334	21561	4.27
19/11/00 02:00:00	4.139		-0.12978	-1.369	-411	21150	4.22
19/11/00 02:05:00	4.079		-0.14102	-1.585	-475	20675	4.16
19/11/00 02:10:00	4.013		-0.15049	-1.777	-533	20142	4.10
19/11/00 02:15:00	3.941		-0.15891	-1.956	-587	19555	4.03
19/11/00 02:20:00	3.863		-0.16332	-2.053	-616	18939	3.96
19/11/00 02:25:00	3.779		-0.08972	-0.714	-214	18725	3.93
19/11/00 02:30:00	3.690		-0.06412	-0.395	-118	18606	3.92
19/11/00 02:35:00	3.596		-0.04996	-0.254	-76	18530	3.91
19/11/00 02:40:00	3.497		-0.04084	-0.178	-53	18477	3.90
19/11/00 02:45:00	3.393		-0.03445	-0.132	-40	18437	3.90
19/11/00 02:50:00	3.284		-0.02971	-0.102	-31	18406	3.89
19/11/00 02:55:00	3.171		-0.02606	-0.081	-24	18382	3.89
19/11/00 03:00:00	3.053		-0.02317	-0.066	-20	18362	3.89
19/11/00 03:05:00	2.931		-0.02081	-0.054	-16	18346	3.88
19/11/00 03:10:00	2.805		-0.01887	-0.046	-14	18332	3.88
19/11/00 03:15:00	2.676		-0.01723	-0.039	-12	18321	3.88
19/11/00 03:20:00	2.543		-0.01583	-0.034	-10	18311	3.88
19/11/00 03:25:00	2.407		-0.01463	-0.029	-9	18302	3.88
19/11/00 03:30:00	2.268		-0.01358	-0.026	-8	18294	3.88
19/11/00 03:35:00	2.126		-0.01266	-0.023	-7	18287	3.88
19/11/00 03:40:00	1.982		-0.01185	-0.020	-6	18281	3.88
19/11/00 03:45:00	1.835		-0.01113	-0.018	-5	18276	3.88
19/11/00 03:50:00	1.687		-0.01048	-0.016	-5	18271	3.88
19/11/00 03:55:00	1.537		-0.0099	-0.015	-4	18267	3.88
19/11/00 04:00:00	1.386		-0.00938	-0.013	-4	18263	3.87
19/11/00 04:05:00	1.233		-0.0089	-0.012	-4	18259	3.87
19/11/00 04:10:00	1.080		-0.00846	-0.011	-3	18256	3.87
19/11/00 04:15:00	0.926		-0.00807	-0.010	-3	18253	3.87
19/11/00 04:20:00	0.772		-0.0077	-0.009	-3	18250	3.87
19/11/00 04:25:00	0.618		-0.00736	-0.009	-3	18247	3.87
19/11/00 04:30:00	0.464		-0.00705	-0.008	-2	18245	3.87
19/11/00 04:35:00	0.310		-0.00676	-0.007	-2	18243	3.87
19/11/00 04:40:00	0.158		-0.00649	-0.007	-2	18241	3.87
19/11/00 04:45:00	0.007		-0.00624	-0.007	-2	18239	3.87
19/11/00 04:50:00	-0.144		-0.00601	-0.006	-2	18237	3.87
19/11/00 04:55:00	-0.292		-0.00579	-0.006	-2	18235	3.87
19/11/00 05:00:00	-0.438		-0.00559	-0.005	-2	18233	3.87
19/11/00 05:05:00	-0.583		-0.0054	-0.005	-2	18232	3.87
19/11/00 05:10:00	-0.724		-0.00522	-0.005	-1	18231	3.87
19/11/00 05:15:00	-0.863		-0.00505	-0.004	-1	18229	3.87
19/11/00 05:20:00	-1.000		-0.00489	-0.004	-1	18228	3.87
19/11/00 05:25:00	-1.133		-0.00473	-0.004	-1	18227	3.87
19/11/00 05:30:00	-1.262		-0.00459	-0.004	-1	18226	3.87
19/11/00 05:35:00	-1.388		-0.00445	-0.004	-1	18224	3.87
19/11/00 05:40:00	-1.510		-0.00433	-0.003	-1	18223	3.87
19/11/00 05:45:00	-1.627		-0.0042	-0.003	-1	18222	3.87
19/11/00 05:50:00	-1.741		-0.00409	-0.003	-1	18222	3.87
19/11/00 05:55:00	-1.850		-0.00398	-0.003	-1	18221	3.87
19/11/00 06:00:00	-1.954		-0.00387	-0.003	-1	18220	3.87
19/11/00 06:05:00	-2.053		-0.00377	-0.003	-1	18219	3.87
19/11/00 06:10:00	-2.147		-0.00368	-0.003	-1	18218	3.87
19/11/00 06:15:00	-2.236		-0.00358	-0.002	-1	18218	3.87
19/11/00 06:20:00	-2.319		-0.0035	-0.002	-1	18217	3.87
19/11/00 06:25:00	-2.397		-0.00341	-0.002	-1	18216	3.87
19/11/00 06:30:00	-2.468		-0.00333	-0.002	-1	18216	3.87
19/11/00 06:35:00	-2.534		-0.00326	-0.002	-1	18215	3.87
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19/11/00 12:45:00	4.061		0.14433	1.651	495	19106	3.98
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Figure 1 **Location Plan**

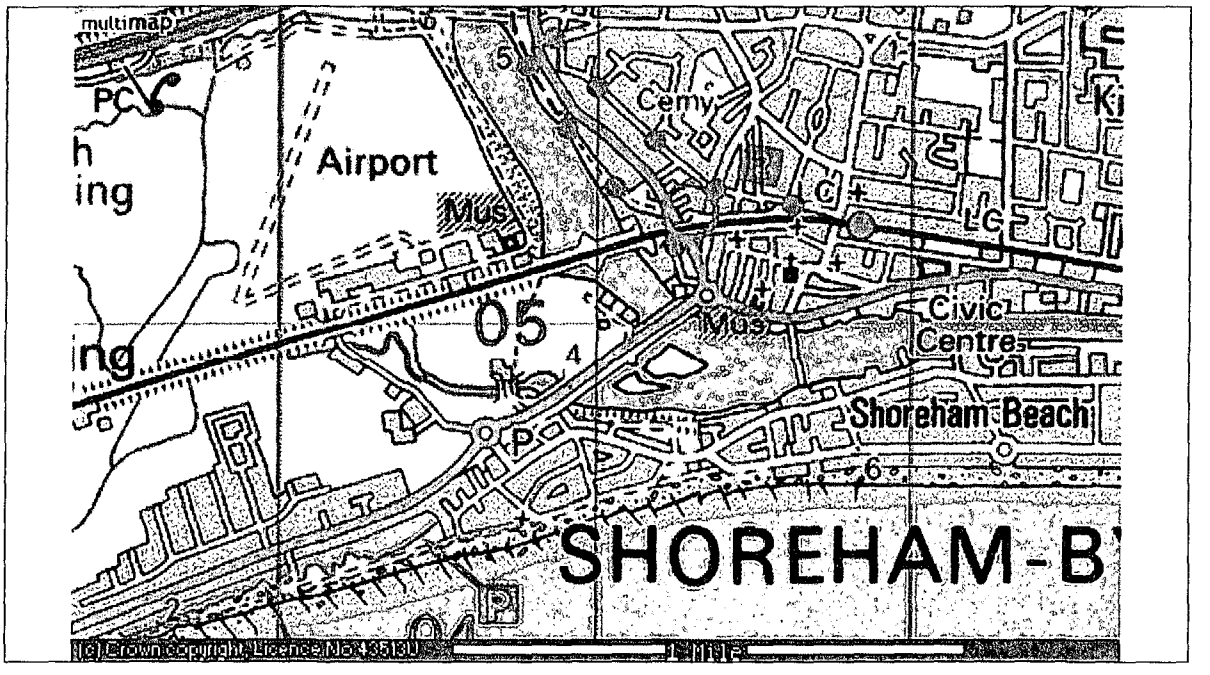


Figure 2 **Environment Agency's Flood Map of Shoreham**



Figure 3 **Site Plan**

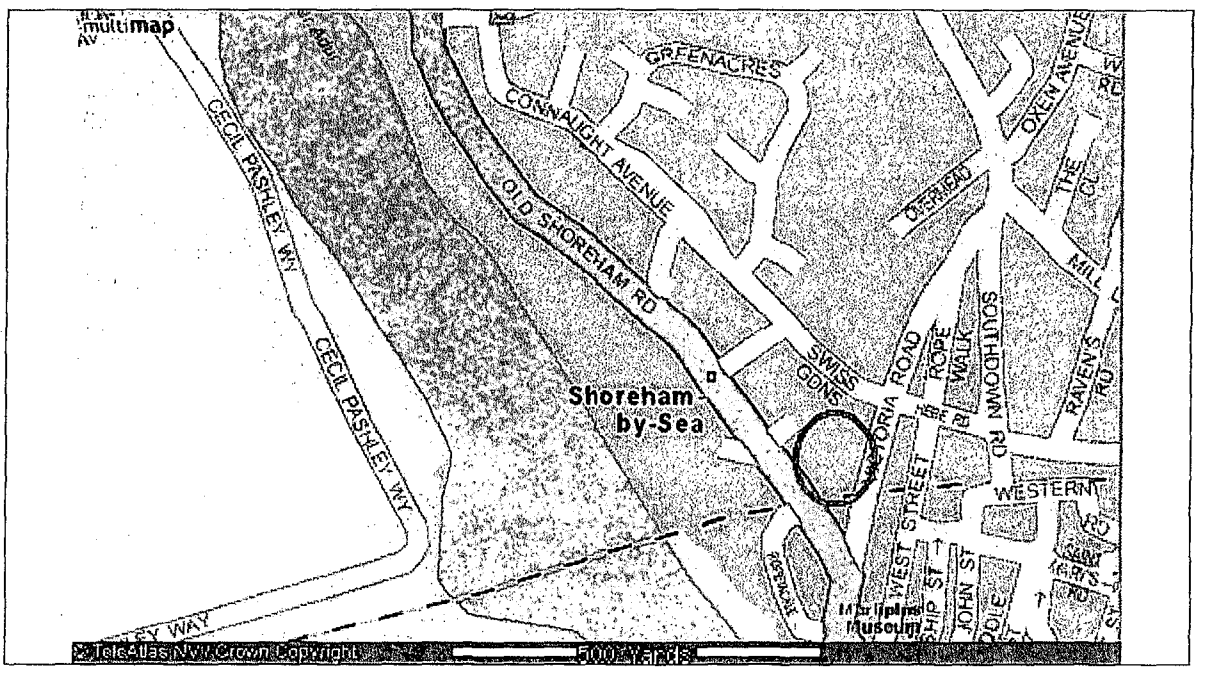
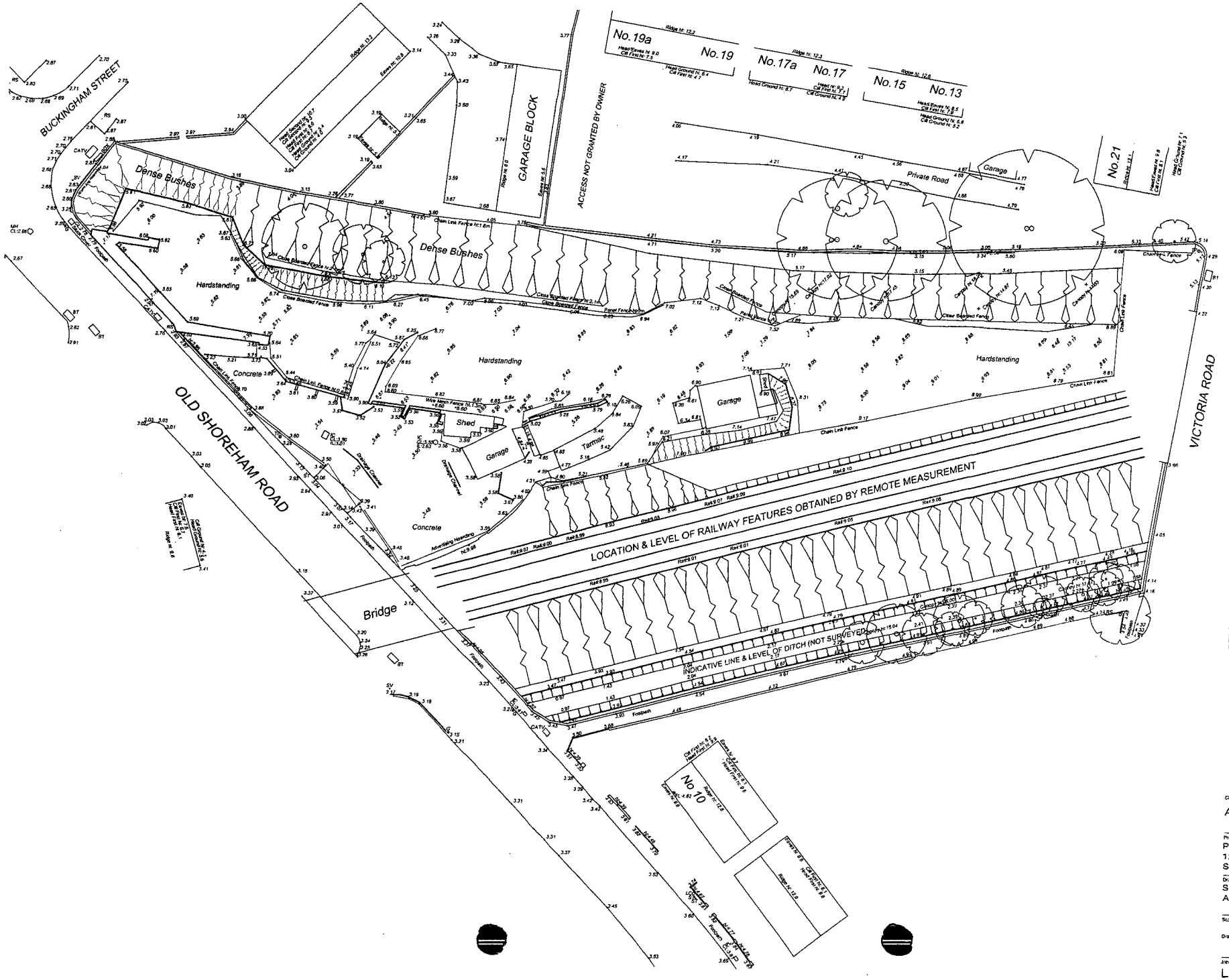


Figure 4 **Topographical Plan of the Development Site**



Notes

Do not scale, use figured dimensions only.

All dimensions to be verified on site prior to the commencement of any work or the production of any shop drawing. All discrepancies to be reported to the Architect.

This drawing is to be read in conjunction with all related Architects and Engineer's drawings and any other relevant information.

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Drawing Issues

Date	day
	month
	year
Revision	
Issued for:	

date	revision

DWA ARCHITECTS

DWA

Client

Abbeycare Investments Ltd

Project

Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea

Drawing Title

Site Plan
As Existing

Scale: 1:200 @ A1

Date: 26/01/2007

Drawn by: BDC

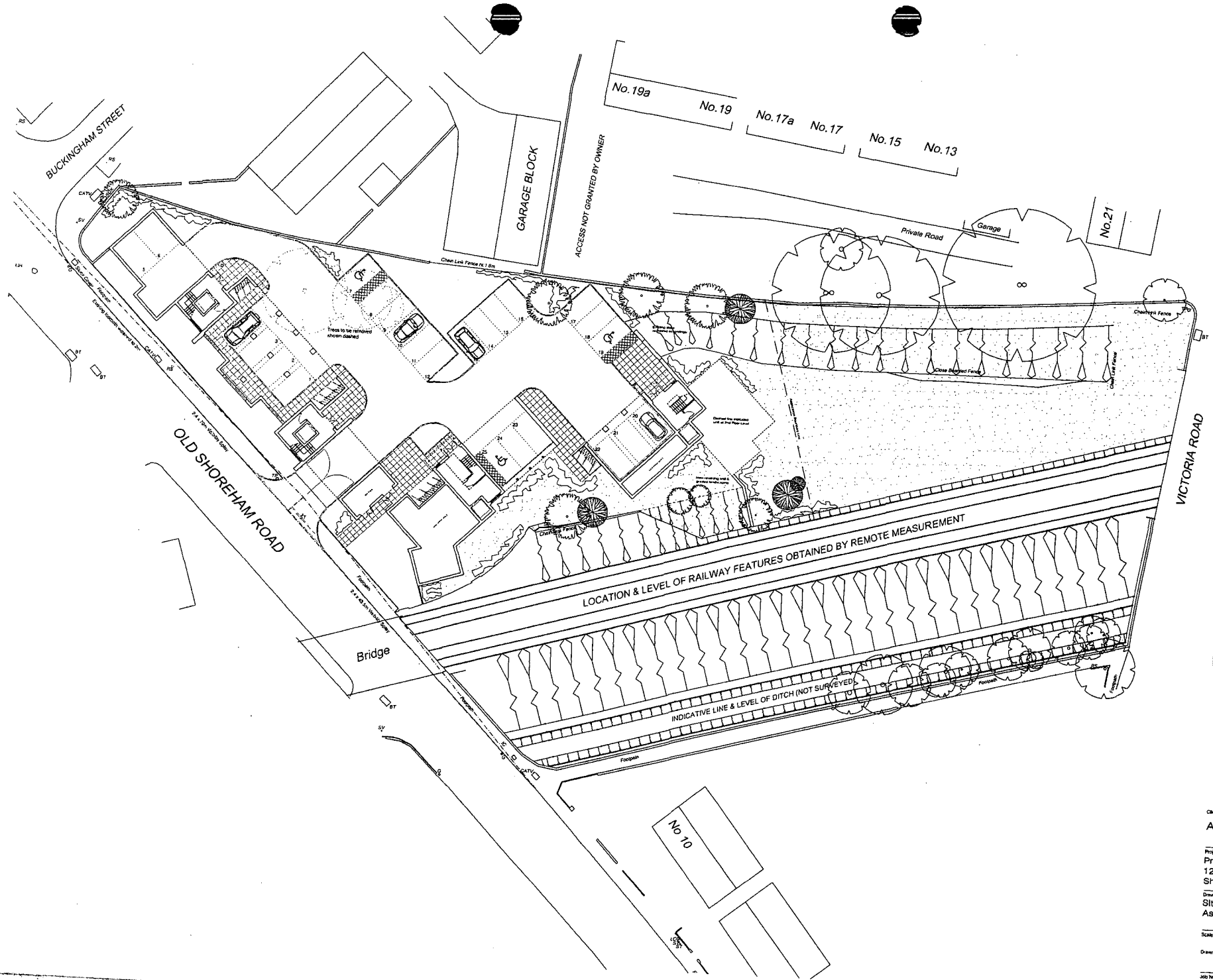
Check'd by:

Job No.: L3049

Drawing No.: AL(9)900

Rev.: -

Figure 5 **Plan of Proposed Development**


BUCKINGHAM STREET
GARAGE BLOCK
ACCESS NOT GRANTED BY OWNER
No.19a
No.19
No.17a
No.17
No.15
No.13
No.21
Private Road
Garage
Chain Link Fence no.1.8m
Trees to be removed shown dashed
Close Boarded Fence
Chestnut Fence
OLD SHOREHAM ROAD
VICTORIA ROAD
LOCATION & LEVEL OF RAILWAY FEATURES OBTAINED BY REMOTE MEASUREMENT
INDICATIVE LINE & LEVEL OF DITCH (NOT SURVEYED)
Bridge
Footpath
Footpath
Footpath
No.10
Notes
Do not scale, use figured dimensions only.
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Drawing Issues
Date
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month
year
Revision
Issued To:
date
revision
A
23/04/2007
Parking layout revised in accordance with changes made to the building layouts
BC
DWA ARCHITECTS
DWA
Client
Abbeycare Investments Ltd
Project
Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea
Drawing Title
Site Plan
As Proposed
Scale
1:200 @ A1
Date
06/02/2007
Drawn by
BDC
Checked by
Job No.
L3049
Drawing No.
AL(9)901
Rev.
A

Figure 6 **Environment Agency's 1996 Survey of Adur Flood Defences**

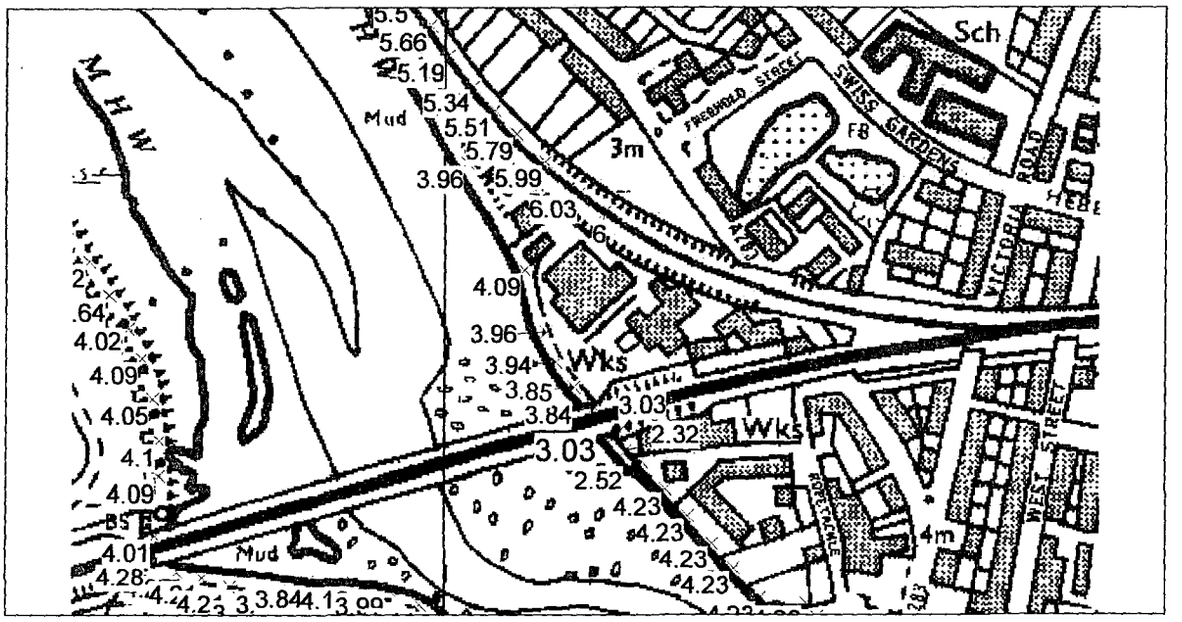


Figure 7 **Tide and Flood Cell Water Levels for 2010 200 year tide of 4.4m OD**

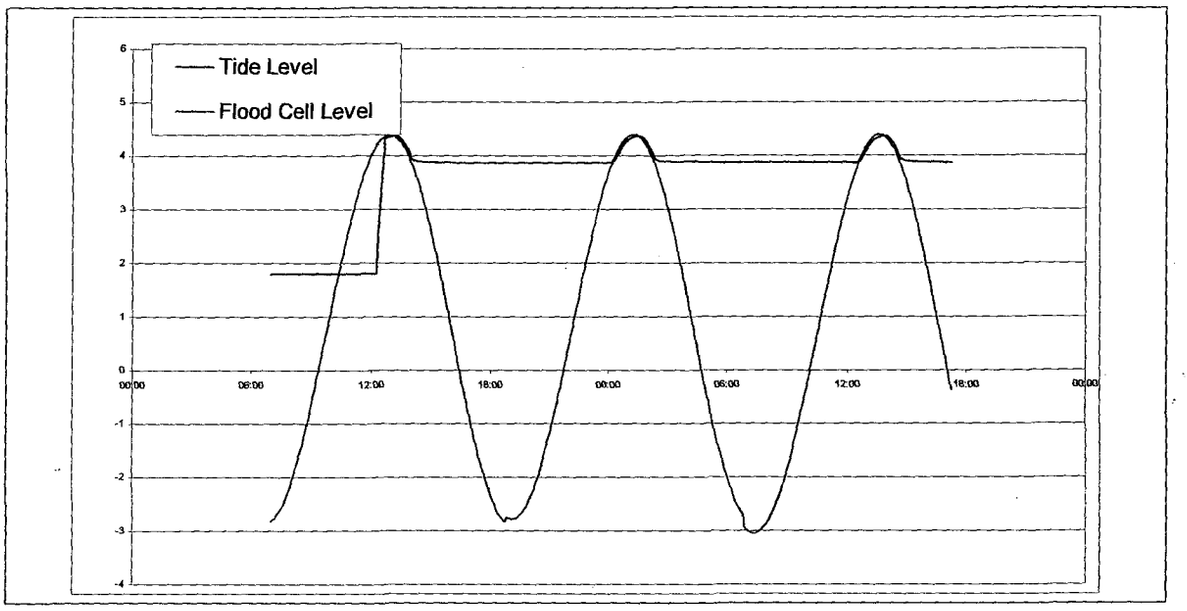


Figure 8 **Tide and Flood Cell Water Levels for 2060 200 year tide of 4.79m OD**

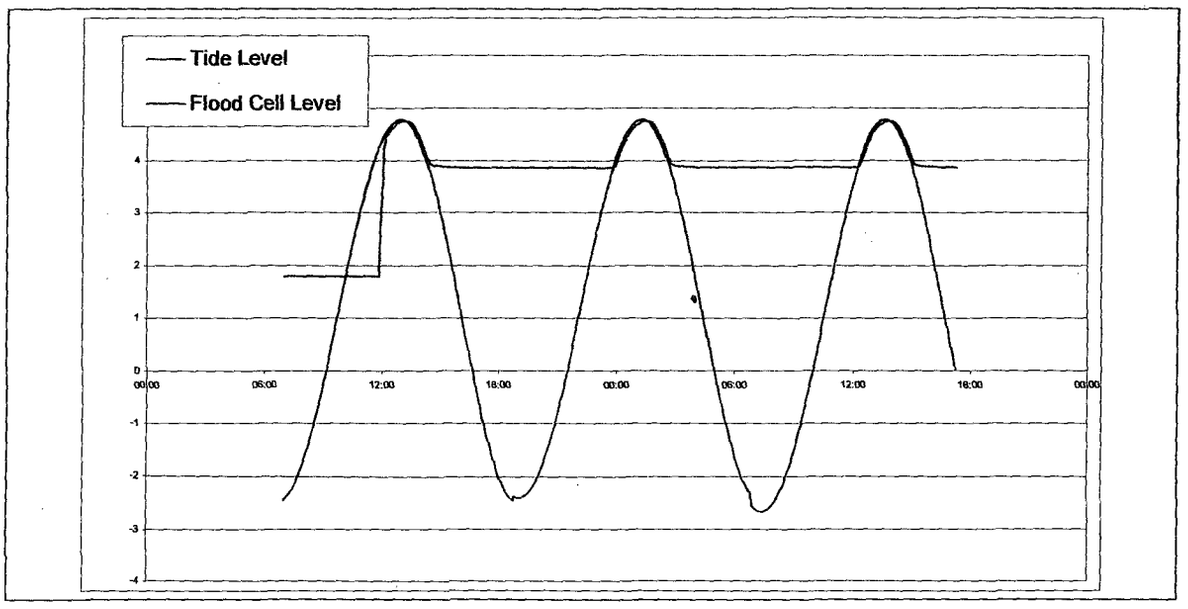


Figure 9 **Assumed Water Levels for Event of 27th February 1990**

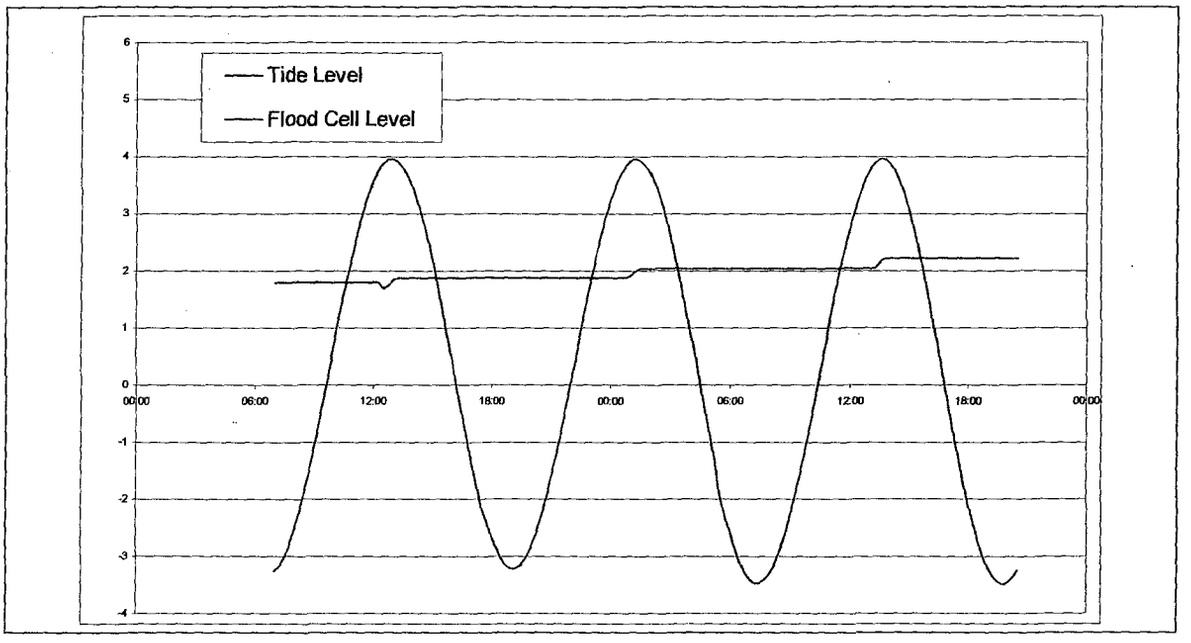


Figure 10 **East to West across Middle Part of Development Site**

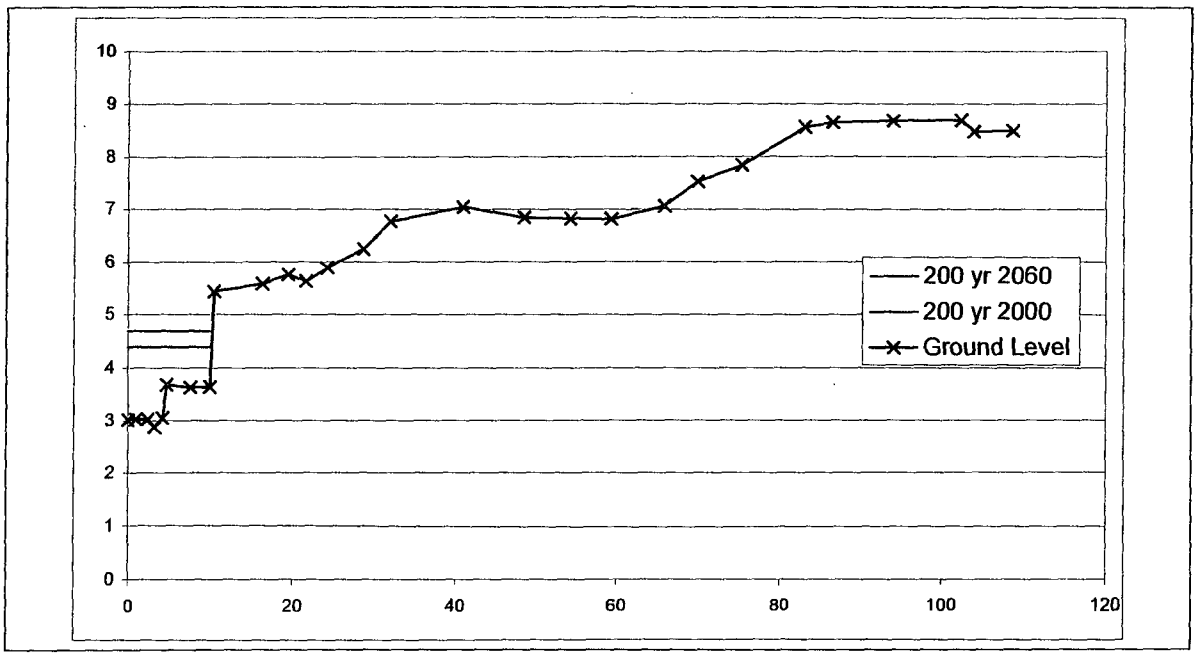
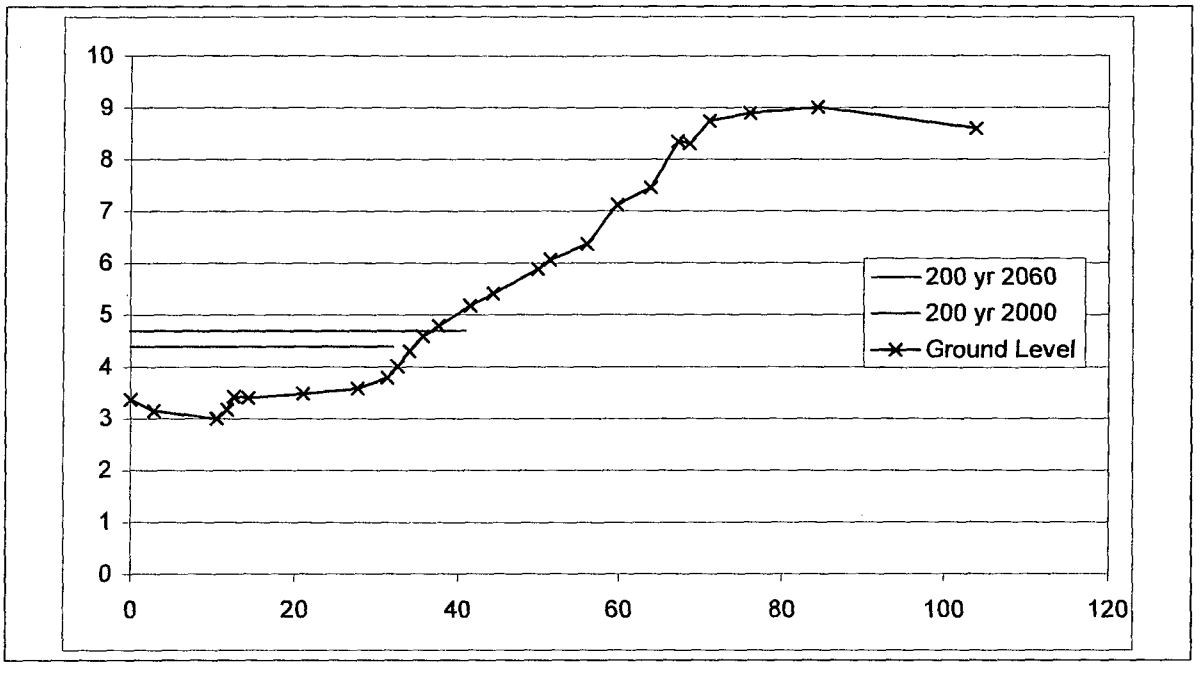


Figure 11 **East to West across Southern Part of Development Site**



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ACTION | JOB NO. L3040

Report No. R2419-1
Issued on 24th May 2005

An Assessment of the Impact of Noise on the Proposed New Care Home Development at Shoreham-by-the-Sea

***

For a Planning Application

ADUR DISTRICT COUNCIL
PLANNING DIVISION
PLAN No. Proc 0370107
DATE RECEIVED 20 JUN 2007

For:
Abbey Care Investments Limited
1st Floor
P O Box 36
37 Broad Street
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London SW20 8JU

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1. Introduction

DWA Architects are making a planning application for a New Care Home Development at 12-18 Old Shoreham Road, Shoreham-by-the-Sea, West Sussex.

Noise and Vibration Engineering Limited (NVE) has been commissioned by DWA Architects to perform an assessment of the impact of noise on the proposed development and prepare a report in accordance with PPG 24 "Planning and Noise".

2. The site

The development site under consideration is approximately triangular-shaped. On the south-west side it is adjacent to A283 Old Shoreham Road, on the south-east side to the railway line, and on the north side to the blocks of flats in Buckingham Street, see Figure 1. There is Victory Road (local cul-de-sac) to the east of the site.

The site is currently occupied by M & S Car Sales, which consists of two garages and a shed, see Figure 2.

It is proposed to erect a nursing home for elderly people on the site. There are no details, at present, about the exact size and position of the building or the layout of the rooms. However, we were informed that there will be bedroom windows facing the railway line. The nearest façade of the building is expected to be situated approximately 10m away from the railway line, see Figure 2.

3. PPG24 Recommended Noise Exposure Categories

When determining planning applications for development which will be exposed to an existing noise source, local planning authorities should consider both the likely level of exposure at the time of the application and any increase that may reasonably be expected in the foreseeable future.

Planning Policy Guidance Note 24 – Planning and Noise gives guidance on noise levels and noise exposure categories and these are used as basis for the most local authorities' standards. Local authorities are concerned to ensure that development proposals do not give rise to unacceptable noise conditions. Local authorities will therefore make careful assessment of likely noise levels before determining planning applications where noise is likely to be present.

When assessing a proposal for residential development near a source of noise, local planning authorities should determine into which of the four noise exposure categories (NECs) the proposed site falls, taking account of both day and night-time noise levels. Local authorities should then have regard to the advice in the appropriate NEC, as below:

NEC	Description
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

RECOMMENDED NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS NEAR EXISTING NOISE SOURCES

NOISE LEVELS(0) CORRESPONDING TO THE NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS $L_{Aeq,T}$ dB				
	NOISE EXPOSURE CATEGORY			
Noise Source	A	B	C	D
Road traffic 07.00-23.00 23.00-0700 (1)	<55 <45	55-63 45-57	63-72 57-66	>72 >66
Rail traffic 07.00-23.00 23.00-0700 (1)	<55 <45	55-66 45-59	66-74 57-66	>74 >66
Mixed sources (2) 07.00-23.00 23.00-0700 (1)	<55 <45	55-63 45-57	63-72 57-66	>72 >66

Notes:

0) Noise levels: the noise level(s) ($L_{Aeq,T}$) used when deciding the NEC of a site should be representative of typical conditions.

1) Night-time noise levels (23.00-07.00): site where individual noise events regulary exceed 82 dB L_{Amax} (slow time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8\text{-}h}$ (except where the $L_{Aeq,T}$ already puts the site in NEC D).

2) Mixed sources: this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table, The "mixed source" NECs should only be used where no individual noise source is dominant. If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "mixed sources".

4. Design Criteria

Limits for good conditions and reasonable conditions are given in Table 5 "Indoor ambient noise in spaces when they are unoccupied" of BS 8233: 1999 "Sound insulation and noise reduction for buildings".

The main criteria on this project are reasonable sleeping conditions in bedrooms and reasonable listening conditions in other rooms, i.e. 35 and 40 $L_{Aeq,T}$ respectively.

In addition to the above, for reasonable standard in bedrooms at night, individual noise events (measured in F time-weighting) should not normally exceed 45 dB L_{Amax}.

5. The Noise Survey

The noise survey was carried out between 1pm on Saturday, 14th and 7pm on Tuesday, 17th of May 2005.

Since the current occupiers of the site did not allow the noise survey to be carried out from their premises, the measurement was made from one location just beyond the site. A microphone was positioned one metre in front of the rear window of a second-floor flat in Buckingham Street, see Figure 2 and Photograph 1.

The noise monitoring location was situated approximately 50m from the railway line. The nearest façade of the proposed building is expected to be situated approximately only 10m from the railway line.

In order to be able to compare the results with the recommended Noise Exposures Categories (NECs), it is required that the measurements be corrected for a distance attenuation. For a line source such as a train the equivalent continuous noise level Leq

varies at 3 dB per doubling of distance, irrespective of the distance of a train from the monitoring location.

For the purpose of this survey the following noise monitoring instrumentation was used:

A 01dB type SIP95 sound level meter (Serial No. 010468), a half-inch microphone type MK250 (Serial No. 2943), a preamplifier type PRE 12 N (Serial No. 002213), and a type B&K 4231 calibrator (Serial No. 2084931) to check calibration levels. Both the meter and calibrator were laboratory calibrated by AVI Ltd in October 2003.

The meter was also checked for calibration, just before and after the measurements. There was a drift of -0.3 dB, however, this is within an acceptable range of +/- 0.5 dB.

It was mostly dry, cool and there were moderate breezes throughout the survey.

6. The Results

The results of the survey are presented in Tables 1 and 2, and consist of the NECs for a typical day during a weekend and a typical weekday respectively.

Since the noise boundaries of the recommended NECs are in terms of free-field levels, the measured façade levels of noise were reduced by 3 dB, (i.e. façade levels should be assumed to be 3 dB higher than levels measured away from any buildings).

Since the nearest façade of the proposed building is to be situated approx. 10m away from the railway line, the free-field levels of noise from rail traffic will be 7 dB higher than the respective levels of noise measured at the monitoring location, which was situated 50m away from the railway line.

The results are summarised below:

	Weekend		Weekday	
Time Period T (h)	16h Day	8h Night	16h Day	8h Night
Noise Level LAeq, T (dB)	**61**	**55**	**60**	**56**

Note: The recorded readings are rounded up.

All the above noise levels fall within the NEC B for road, rail and mixed sources of noise, see paragraph 3.

During the night of Sunday/Monday and Monday/Tuesday (23:00-07:00) there were only 2 and 4 trains respectively that would exceed 82 dB L_{Amax}. These trains occurred in different hour during each night. See footnote [1] in paragraph 3.

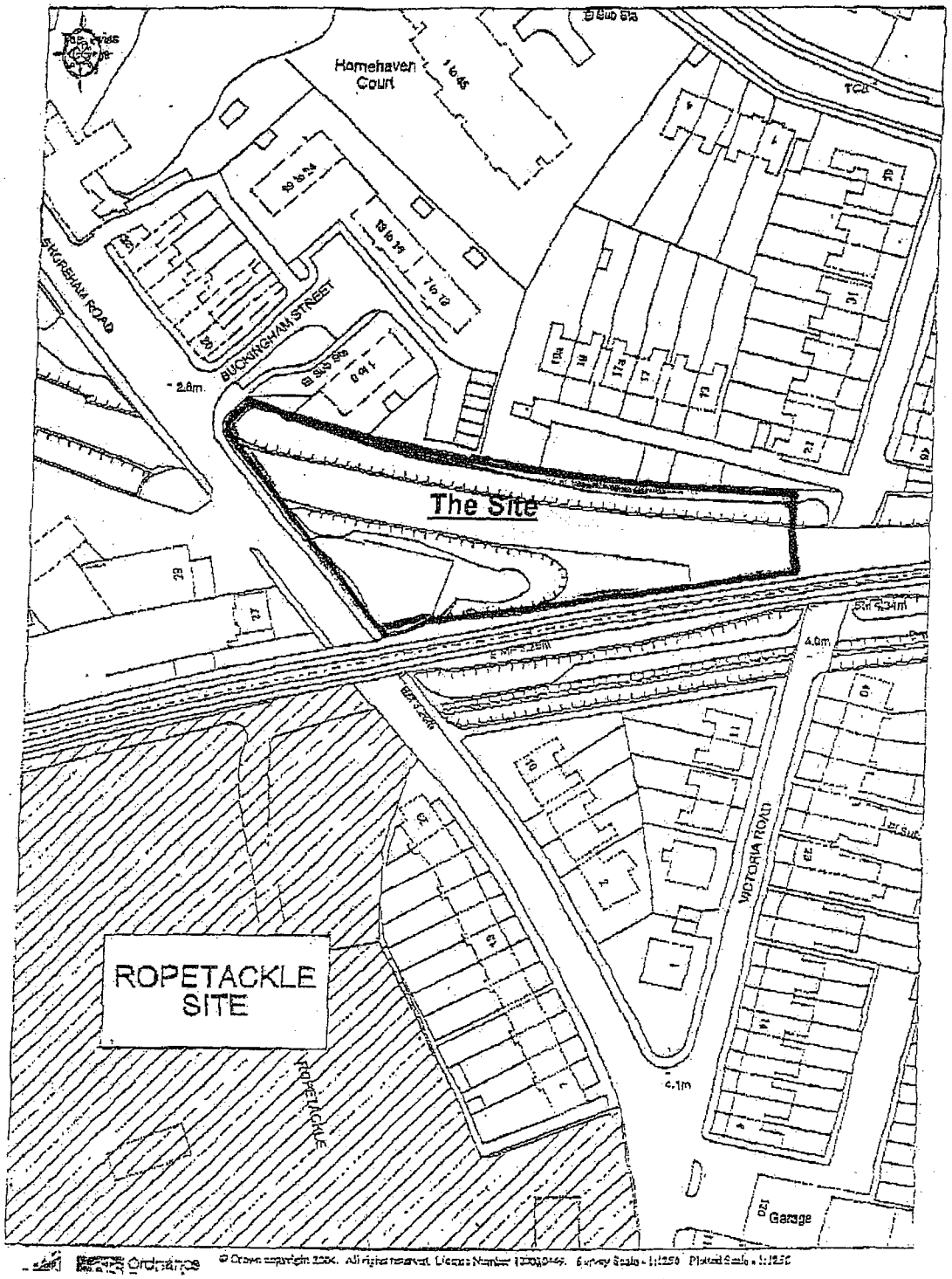
We can, therefore, conclude that the proposed site falls into the Noise Exposure Category B, which means that noise should be taken into account when determining planning applications, and where appropriate, conditions imposed to ensure an adequate level of protection against noise.

7. Recommendations

In order to meet the design criteria, we recommend the following:

- All windows of habitable rooms should be fitted with minimum 6mm glass/12mm air cavity/6mm glass thermal insulating double glazing units. All open-able windows should have pressure seals fitted all round the frames. The sides and top of the window reveal should be lined with sound absorbent material.

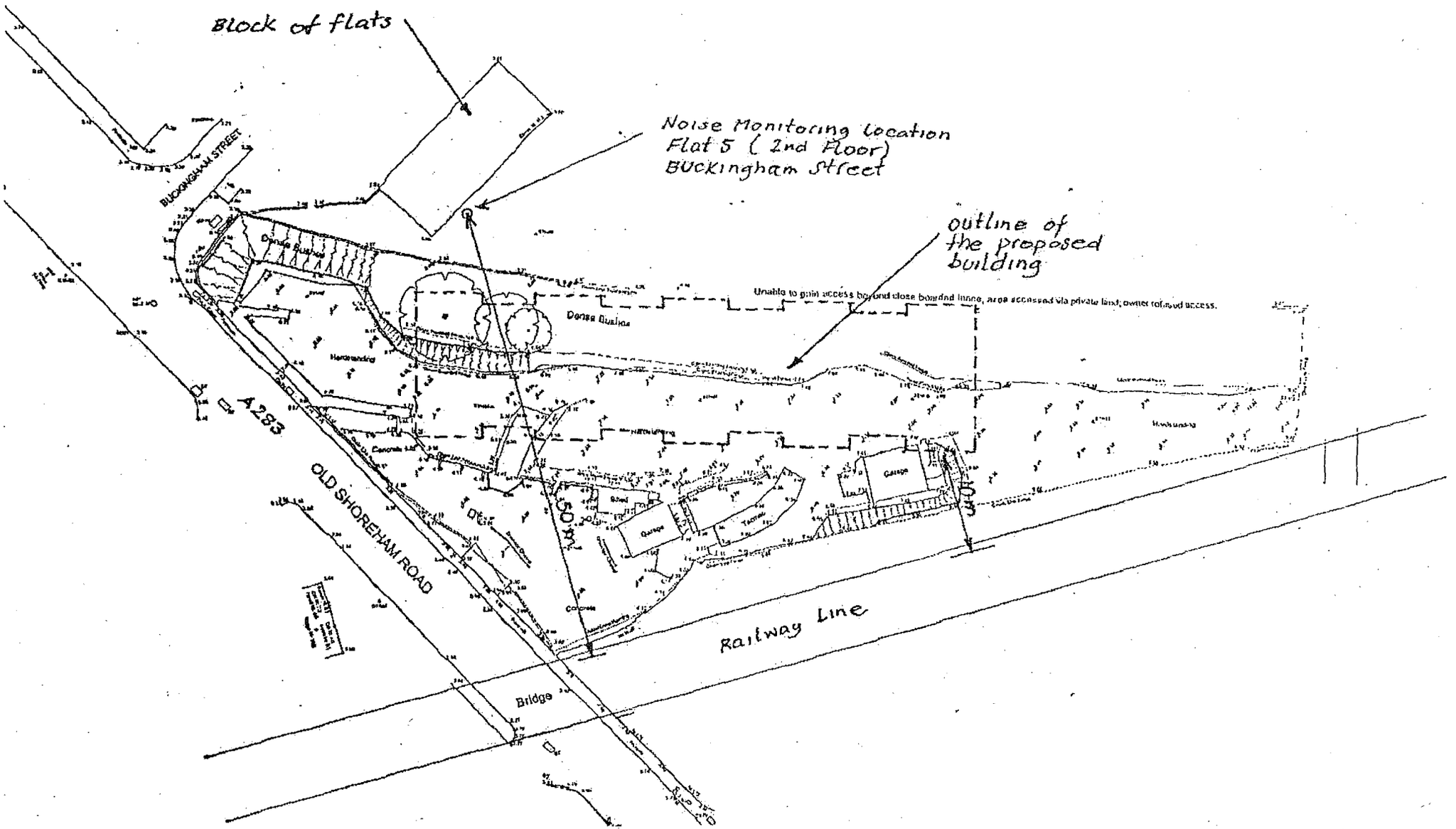
- Ventilation requirements may conflict with both the thermal and the sound-insulation requirements of windows. However, we recommend that sound attenuating type natural ventilators such as Greenwood MA3051 Acoustic Wall Ventilator or similar be fitted in all habitable rooms. For details see attached Technical Sheet in Appendix A.



Ordnance © Crown copyright 2004. All rights reserved. Licence Number 100030649. Survey Scale = 1:1250 Plotted Scale = 1:1250

Location Plan of the Site
(Scale: 1: 1250)

FIGURE 1



Plan Showing the Proposed Building and Noise Monitoring Location
(N.T.S)

FIGURE 2

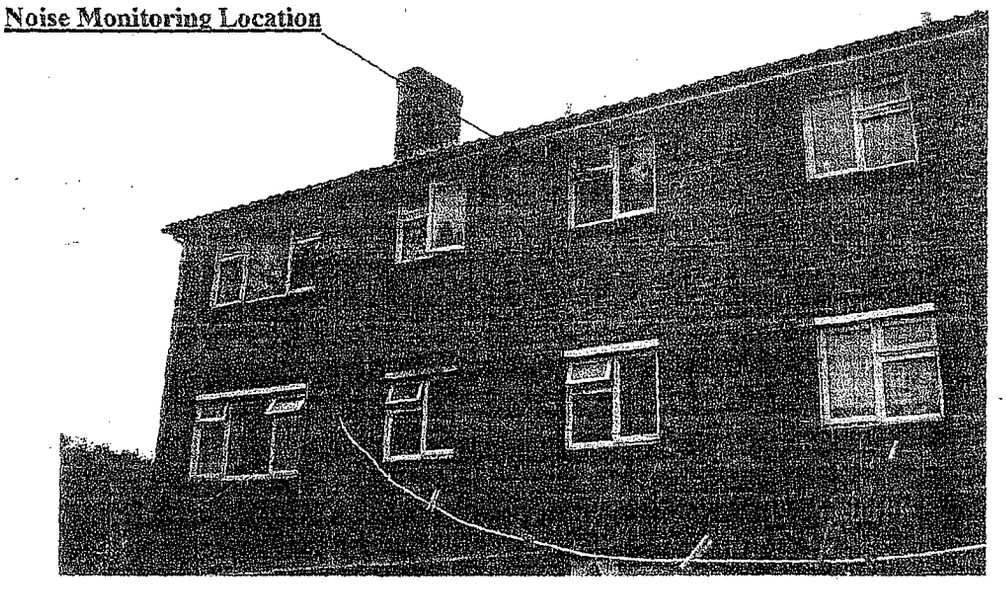


Photo Showing the Noise Monitoring Location at Block of Flats in Buckingham Street

PHOTO 1

RESULTS

Sunday/Monday, 15/16 May 2005 (weekend) measurement according to PPG24

Noise monitoring location: one metre in front of the rear window of the second-floor flat in Buckingham Street

Time Period	**Daytime**	
Start	15/05/2005 07:00	
End	15/05/2005 23:00	
Periods	1h	
Weighting	A	
Data type	Leq	Max
Unit	dB	dB
Period start	**Leq**	**Lmax**
15/05/2005 07:00	52.3	69.3
15/05/2005 08:00	53.9	69.4
15/05/2005 09:00	56.4	76.5
15/05/2005 10:00	57.3	78.5
15/05/2005 11:00	58.6	78.6
15/05/2005 12:00	58.3	74.6
15/05/2005 13:00	60.4	91.1
15/05/2005 14:00	58.2	78.8
15/05/2005 15:00	57.7	81.1
15/05/2005 16:00	58.3	74.6
15/05/2005 17:00	57.1	76.2
15/05/2005 18:00	56.9	74.5
15/05/2005 19:00	55.6	76.5
15/05/2005 20:00	54.2	74.7
15/05/2005 21:00	53.5	77.1
15/05/2005 22:00	52	73.9
LAeq, 16h façade	**56.9**	
LAeq, 16h free-field	**53.9**	

Time Period	**Night-time**	
Start	15/05/2005 23:00	
End	16/05/2005 07:00	
Periods	1h	
Weighting	A	
Data type	Leq	Max
Unit	dB	dB
Period start	**Leq**	**Lmax**
15/05/2005 23:00	51.6	72.7
16/05/2005 00:00	44.3	65.5
16/05/2005 01:00	38.1	60.5
16/05/2005 02:00	38.4	61.5
16/05/2005 03:00	39	63.9
16/05/2005 04:00	52.5	68.6
16/05/2005 05:00	54.7	77.5
16/05/2005 06:00	56	77.9
LAeq, 8h façade	**51.2**	
LAeq, 8h free-field	**48.2**	

At a distance of 10m away from the railway line, the levels of noise can be expected to be 7 dB higher, i.e.

LAeq, 16h free-field **60.9** **LAeq, 8h free-field** **55.2**

Table 1

RESULTS
Monday/Tuesday, 16/17 May 2005 (weekday) measurement according to PPG24

Noise monitoring location: one metre in front of the rear window of the second-floor flat in Buckingham Street

Time Period	**Daytime**	
Start	16/05/2005 07:00	
End	16/05/2005 23:00	
Periods	1h	
Weighting	A	
Data type	Leq	Max
Unit	dB	dB
Period start	**Leq**	**Lmax**
16/05/2005 07:00	59.8	80.4
16/05/2005 08:00	56.6	70.6
16/05/2005 09:00	56.3	72.5
16/05/2005 10:00	56.7	72
16/05/2005 11:00	56.7	75.7
16/05/2005 12:00	56.1	69.2
16/05/2005 13:00	56.4	81.7
16/05/2005 14:00	55.1	69.5
16/05/2005 15:00	55.4	69.4
16/05/2005 16:00	55.3	69.5
16/05/2005 17:00	55.6	72.5
16/05/2005 18:00	55.8	74
16/05/2005 19:00	56.5	74.6
16/05/2005 20:00	53.5	72.4
16/05/2005 21:00	52.8	73.4
16/05/2005 22:00	50.8	72.5
LAeq, 16h façade	**56**	
LAeq, 16h free-field	**53.9**	

Time Period	***Night-time***	
Start	16/05/2005 23:00	
End	17/05/2005 07:00	
Periods	1h	
Weighting	A	
Data type	Leq	Max
Unit	dB	dB
Period start	**Leq**	**Lmax**
16/05/2005 23:00	52.9	78.8
17/05/2005 00:00	50.1	78.7
17/05/2005 01:00	44.9	72.2
17/05/2005 02:00	40.9	63.6
17/05/2005 03:00	38.6	59.3
17/05/2005 04:00	52.5	69.8
17/05/2005 05:00	54.2	78
17/05/2005 06:00	55.8	77.3
LAeq, 8h façade	**51.6**	
LAeq, 8h free-field	**48.2**	

At a distance of 10m away from the railway line, the levels of noise can be expected to be 7 dB higher, i.e.

LAeq, 16h free-field **60.9** **LAeq, 8h free-field** **55.5**

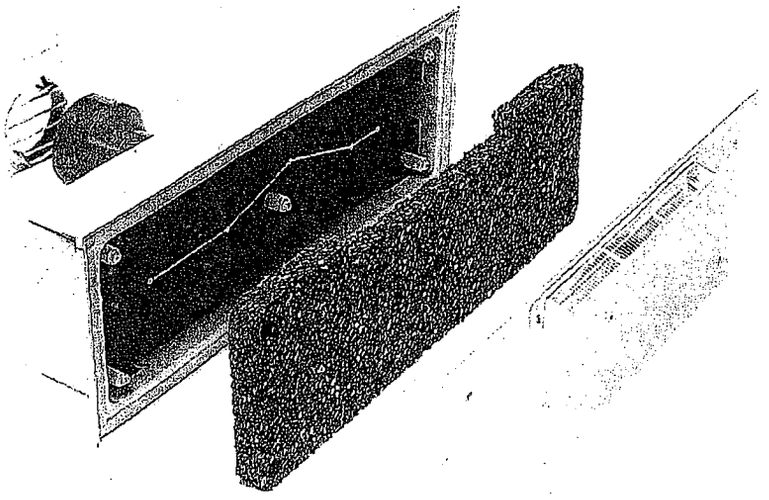
Table 2

APPENDIX A

APPENDIX A
APPENDIX A
APPENDIX A

GREENWOOD AIRVAC
Environmental

MA3051 Acoustic Wall Ventilator



Acoustic self-regulating background ventilator

Tested and conforms to Noise Insulation Regulations 1975

Suitable for external walls of thickness 140mm and above

Internal wall constructions of between 100mm and 150mm

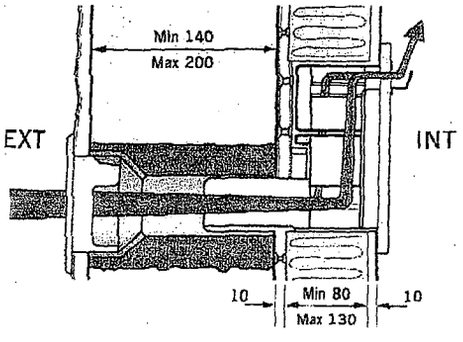
Meets the requirements of Building Regulation England & Wales Part F & E

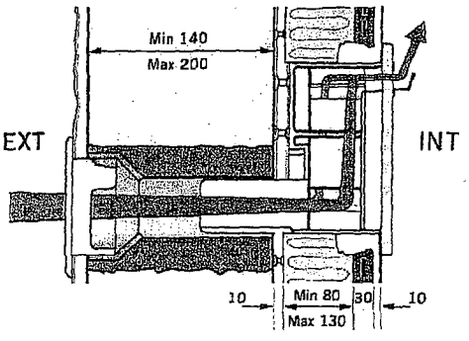
Greenwood's MA3051 acoustic wall ventilator provides 30m³/hr air flow and offers excellent acoustic attenuation, for areas where noise is a problem, providing fresh air into buildings situated near to industrial sites, busy road and airports.

The ventilator is fixed into the wall internally and vented through the external leaf of the building via a plastic sleeve. A clip-fit grille provides external weather protection and noise transfer is reduced via a convoluted air path through sound absorbing material in the acoustic box. Air entering the dwelling is controlled via a self-regulating mechanism supplied with the unit.

Easy to install and aesthetically pleasing, the MA3051 is supplied as a complete unit and available with a white or brown external grille, other colours available on request.

Typical Installation





MA3051 Acoustic Wall Ventilator | technical data sheet

an Etex GROUP company

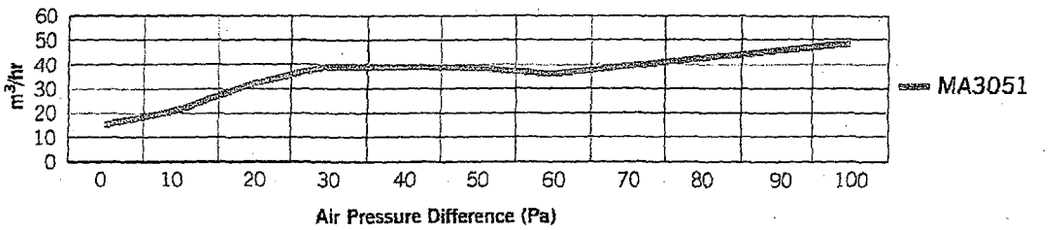
Greenwood Air Management Ltd Brookside Industrial Estate, Rustington, West Sussex BN16 3LH.

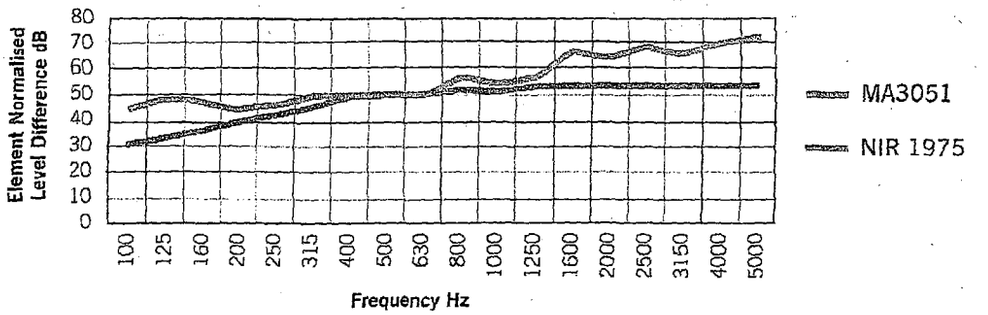
Tel: (01903) 771021 Fax: (01903) 782398 Web: www.greenwood.co.uk Email: info@greenwood.co.uk

MA3051 Acoustic Wall Ventilator

GREENWOOD AIRVAC
Environmental

Test Information





Model and Physical Specification

A: External weather grille, available in white and brown

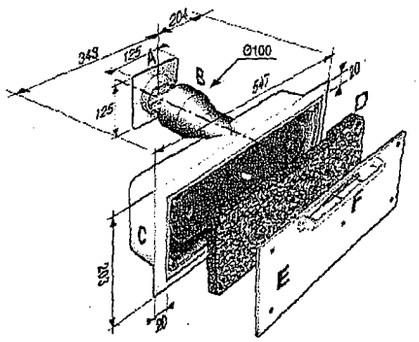
B: External connection sleeve

C: Acoustic box

D: Sound absorbing material

E: Internal facade

F: Self-regulating ventilator



Model	Airflow	Dimensions	Colour
MA3051	30m³/hr	See above	White, Brown

For further information, please contact Greenwood Customer Services on:

01903 777130

an Etex GROUP company

Greenwood Air Management Ltd Brookside Industrial Estate, Rustington, West Sussex BN16 3LH.

Tel: (01903) 771021 Fax: (01903) 782398 Web: www.greenwood.co.uk Email: info@greenwood.co.uk

L3040

Addendum to Report No. R2419-1

Issued on 18th January 2006

Addendum

An Assessment of the Impact of Noise on the Proposed New Care Home Development at Shoreham-by-the-Sea

***

For a Planning Application

For:
Abbey Care Investments Limited
1st Floor
P O Box 36
37 Broad Street
St Helier
Jersey
JE4 9NU

Prepared by:
Tom Brodowski MIOA
Noise & Vibration Engineering Limited
1 Rothesay Avenue
London SW20 8JU

Tel: +48 (0)20 8542 9226
Email: info@noise-vibration.co.uk

1. Introduction

Noise & Vibration Engineering Ltd (NVE) has prepared Report No. R2419-1, issued on 24th May 2005, entitled "An Assessment of the Impact of Noise on the Proposed New Care Home Development at Shoreham-by-the-Sea" for a planning application.

Adur District Council's Environmental Health Officer stated that "there is sufficient uncertainty in the measurements and calculations to require the applicants to carry out a further assessment on the site itself in order to remove any arguments".

At the request of DWA Architects NVE has, therefore, carried out an additional sound survey on the site.

This addendum briefly describes the survey, presents the results and evaluates them against the original noise measurements.

2. The Additional Noise Survey

The additional noise survey was carried out on Thursday, 12th of January 2006 between the hours of 1100 and 1400.

The new assessment location was chosen to reflect the nearest bedroom window and the direct line of site with the railway line. The actual monitoring position was approx. 5m to the east from the proposed window because there is a garage building in its place and the land is sloping down towards Old Shoreham Road, see Figure 1a and Photo 1a. A microphone was positioned approx. 1.6m above ground level, (i.e. approx. 1.2m above the railway tracks), and approx. 12m away from the centre line of the tracks, see Figure 2a.

For the purpose of this additional survey the same noise monitoring instrumentation was used as before, i.e. A 01dB type SIP95 sound level meter (Serial No. 010468), a half-inch microphone type MK250 (Serial No. 2943), a preamplifier type PRE 12 N (Serial No. 002213), and a type B&K 4231 calibrator (Serial No. 2084931) to check calibration levels.

The meter was also checked for calibration, just before and after the additional measurements. There was a drift of -0.3 dB, however, this is within an acceptable range of +/- 0.5 dB.

Throughout the measurements it was overcast, dry, cool and there were light westerly breezes.

3. The Results

The results of the survey are presented in tables 1a and 2a. Table 1a gives noise level measurements of all individual train pass-by's in terms of $L_{Aeq,T}$ and the L_{Amax} in dB. There were on average 15 trains an hour, i.e. a train every four minutes.

Table 2a gives hourly noise level measurements in terms of $L_{Aeq,1\text{-}h}$ and the L_{Amax} and also an overall three-hourly noise level measurement. All the above measurements are free-field.

The overall three-hourly reading was found to be at 59.7 dB, $L_{Aeq,3\text{-}h}$. From the original measurements, it can be expected that the actual $L_{Aeq,16\text{-}h}$ would be in the order of 58 dB. This implies that the predicted $L_{Aeq,16\text{-}h}$ measurement of 60.9 dB was, in fact, just overestimated.

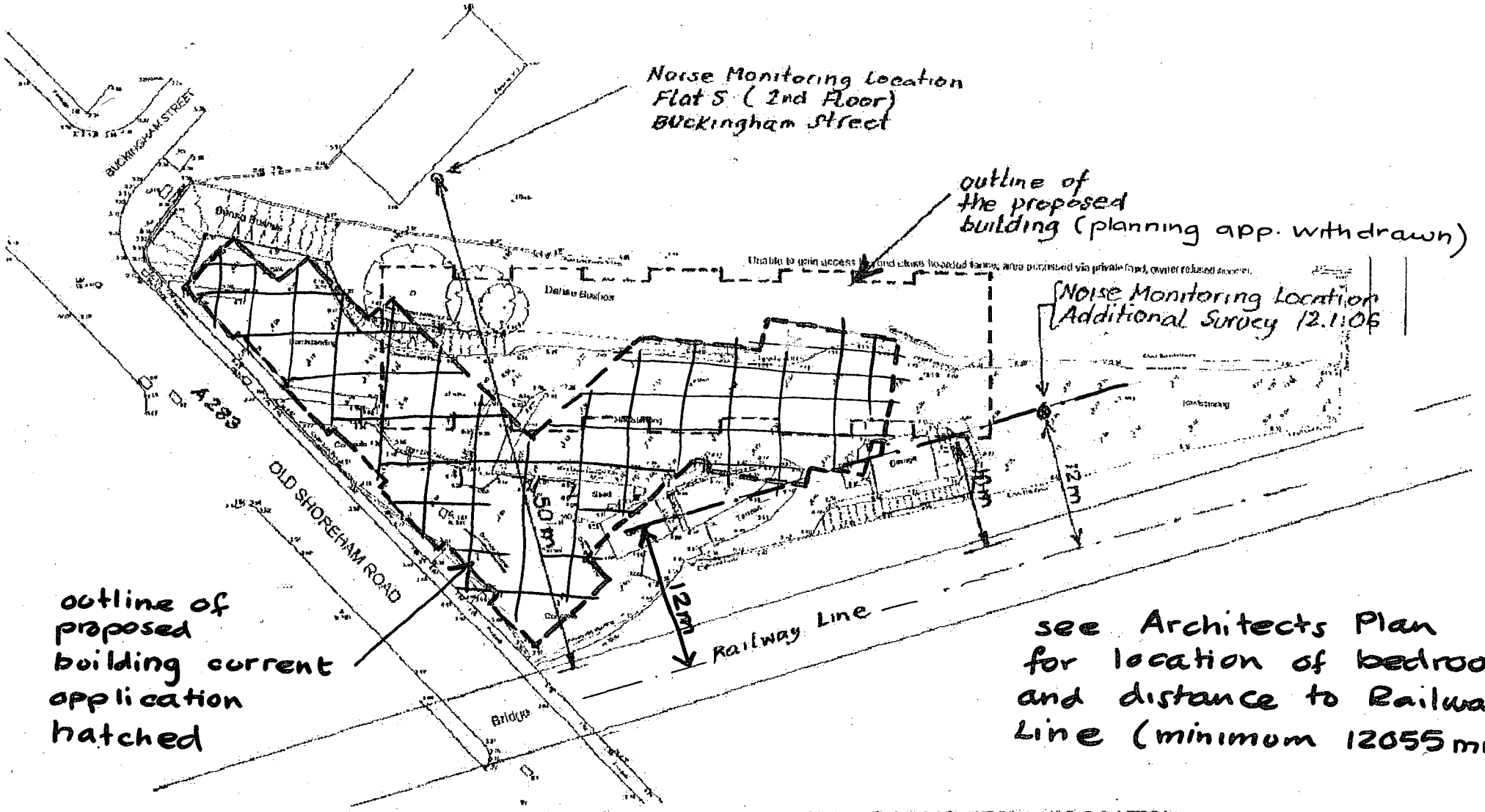
In spite of the fact that the actual predicted noise level is approx. 3 dB lower that initially estimated, the site still falls into Noise Exposure Category B.

4. Recommendations

In order to meet the design criteria, as before, we recommend the following:

- All windows of habitable rooms should be fitted with minimum 6mm glass/12mm air cavity/6mm glass thermal insulating double glazing units. All open-able windows should have pressure seals fitted all round the frames.

- Ventilation requirements may conflict with both the thermal and the sound-insulation requirements of windows. However, we recommend that sound attenuating type natural ventilators such as Greenwood MA3051 Acoustic Wall Ventilator or similar be fitted in all habitable rooms. For details see attached Technical Sheet in Appendix A.



PLAN SHOWING THE PROPOSED BUILDING AND NOISE MONITORING LOCATION
(N.T.S.)

FIGURE 2a

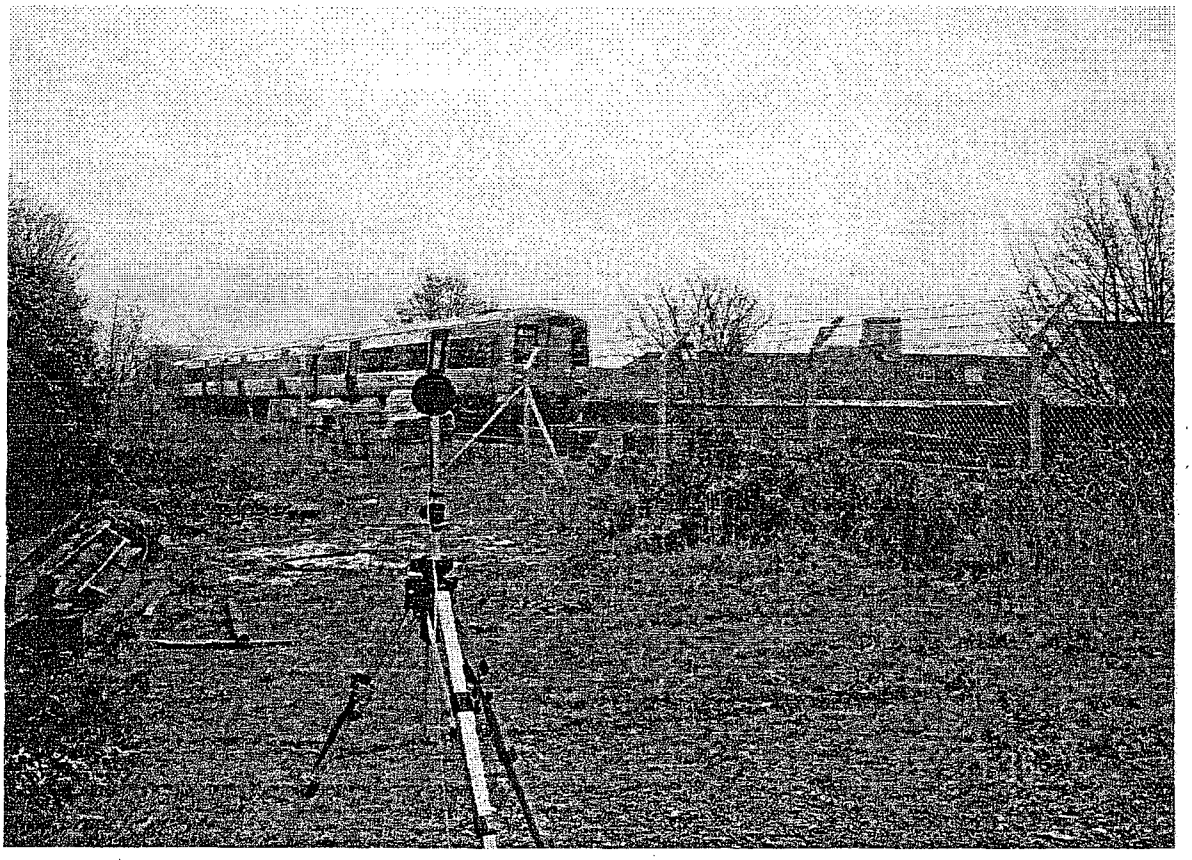
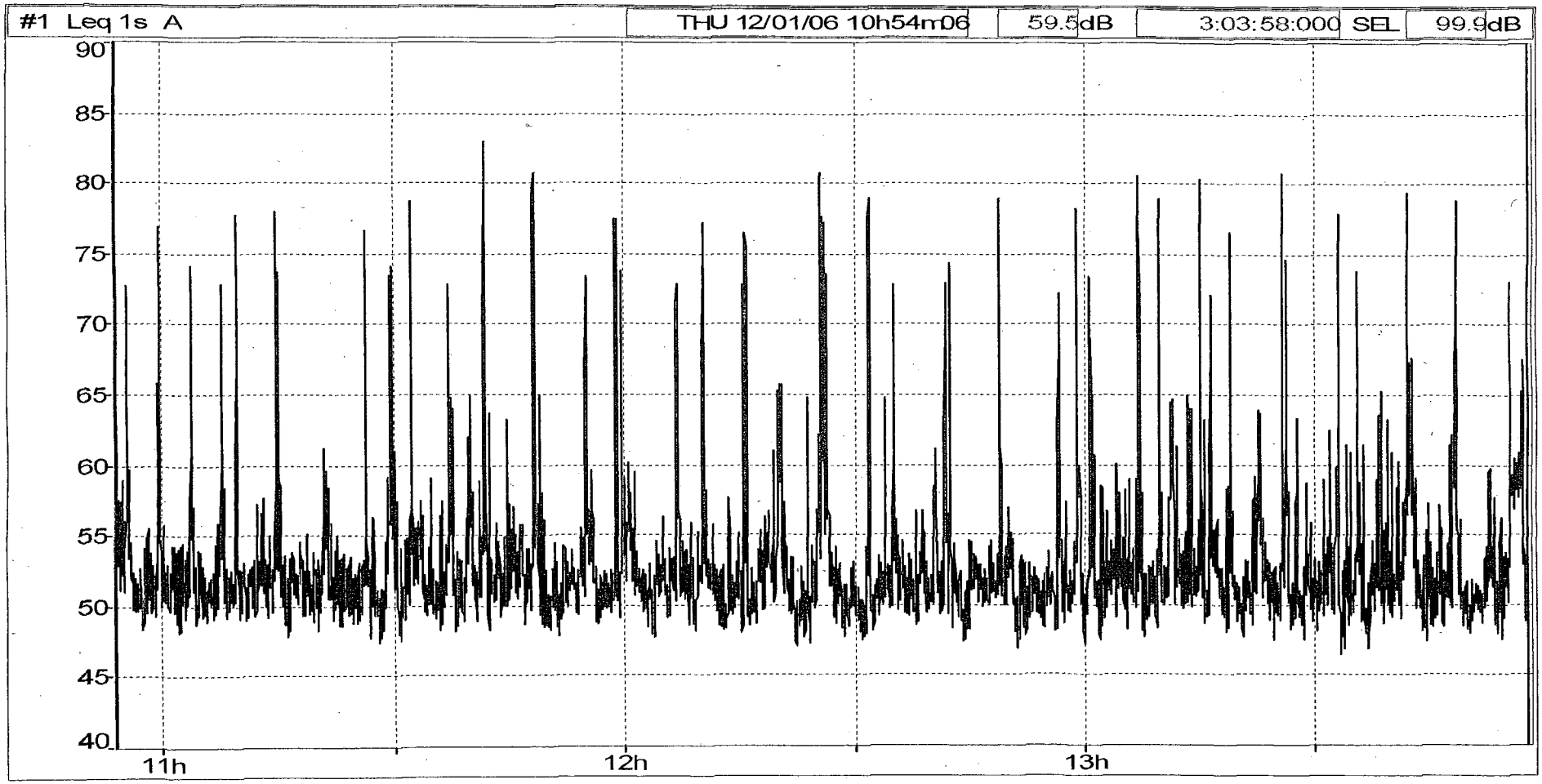


Photo 1a – Noise Monitoring Location, Survey of 12th January 2006

RESULTS



Noise Time History

Chart 1a

No.	Time (hh:mm)	Train Operator	No. of Cars	Direction	Pass-by Time (s)	$LAeq_{,T}$ (dB)	LAmax (dB)	Comments
1	10:55	S	3	W	7	69.1	73.4	
2	11:00	S/W	4	E	7	74.3	77.5	
3	11:04	S	4	W	8	70.9	75.2	
4	11:08	S/W	4	W	8	70.7	74.1	
5	11:10	S	4	E	10	73.8	79.3	
6	11:15	S	3	E	7	74.2	78.7	
7	11:16	S	3	W	6	70.6	74.4	
8	11:27	S	3	E	8	72.8	77.5	
9	11:30	S	4	W	7	72.3	74.6	
10	11:33	S	3	E	7	75	79.6	
11	11:38	S	3	W	6	69.5	73.4	
12	*11:43*	*S*	*4*	*E*	*12*	*77.1*	*83.5*	Passed simultaneously
13	*11:43*	*S*	*3*	*W*	*12*	*77.1*	*83.5*	
14	11:48	S	4	E	8	76.3	81.3	
15	11:55	S	3	W	7	70.3	73.8	
16	11:59	S/W	4	E	9	71.9	77.9	
17	12:00	S	4	W	12	69.1	74.5	
18	12:07	S/W	4	W	8	70.1	74.5	
19	12:10	S	4	E	8	74.1	77.6	
20	12:16	S	4	W	8	69	73.9	
21	12:16	S	3	E	8	72.6	76.9	
22	12:26	S	3	E	7	76.3	82.1	
23	12:26	S	4	W	8	70.5	74.4	
24	12:32	S	3	E	7	74.8	80.2	
25	12:35	S	3	W	8	68.8	73.5	
26	12:42	S	4	W	11	68.8	73.5	
27	12:43	S	4	E	10	71.6	74.9	
28	12:49	S	3	E	8	74.5	79.6	
29	12:57	S	3	W	6	69.3	73.1	
30	12:59	S/W	4	E	7	75.5	78.8	
31	13:01	S	8	W	11	71.3	74.1	

No.	Time (hh:mm)	Train Operator	No. of Cars	Direction	Pass-by Time (s)	$LAeq_{,T}$ (dB)	LAmax (dB)	Comments
32	13:07	S/W	2	W	7	75.3	81.5	
33	13:10	S	4	E	7	76.1	79.4	
34	13:15	S	3	E	8	75.5	80.9	
35	13:16	S	3	W	7	69.4	73	
36	13:17	M	2	W	6	72.7	77.2	
37	13:26	S	3	E	7	75.6	82.4	
38	13:26	S	4	W	8	71.3	75.1	
39	13:34	S	3	E	7	74.1	78.8	
40	13:36	S	4	W	6	70.6	74.3	
41	*13:42*	*S*	*4*	*W*	*11*	*74.9*	*79.8*	Passed
42	*13:42*	*S*	*4*	*E*	*11*	*74.9*	*79.8*	simultaneously
43	13:48	S	3	E	7	75.6	79.3	
44	13:56	S	3	E	6	70.2	73.7	

Legend:

S	Southern Trains
S/W	South West Trains
M	Maintenance Train

Table 1a

RESULTS
Additional measurments in terms of hourly readings

File	Care Home 12.01.06.CMG
Periods	1h
Start	12/01/06 11:00:00:000
End	12/01/06 14:00:00:000
Location	12m away from the nearest track (Free-field)
Weighting	A
Data type	Leq
Unit	dB

Period start	Leq	Lmax
12/01/06 11:00:00:00	59.6	83.5
12/01/06 12:00:00:00	59.1	82.1
12/01/06 13:00:00:00	60.4	82.4
Overall	59.7	83.5

Table 2a

AP GEOTECHNICS
a ground investigation and consultancy service

Brunel Science Park
Coopers Hill Lane
Englefield Green
Surrey TW20 0JZ

T 01784 438038
F 01784 472870
E mail@apgeotechnics.co.uk

OLD SHOREHAM ROAD
SHOREHAM BY SEA
SUSSEX

Geoenvironmental investigation

Client

Abbeycare Investments Limited

ADUR DISTRICT COUNCIL
PLANNING DIVISION
PLAN No. Ad0328dot
DATE RECEIVED 20 JUN 2007

Architect

DWA Architects Limited

Report No. 2681

20 January 2006

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APPENDICES

A	Borehole and Trial Pit Records
B	Standpipe Records
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OLD SHOREHAM ROAD
SHOREHAM BY SEA
SUSSEX

Geoenvironmental investigation

Synopsis

A ground investigation has been carried out at a site fronting Old Shoreham Road on the instructions of DWA Architects Limited, professional advisors to Abbeycare Investments Limited.

A Phase I Risk Assessment[1] has previously been conducted which concluded there is a medium to high risk of potential contamination beneath the site as a results of commercial use of the site and its surroundings.

The purpose of this investigation was therefore twofold: firstly to determine the ground conditions and to provide recommendations in respect of foundation design and other geotechnical matters for the proposed residential care home, and secondly to confirm the significance of any contamination found in the soil or groundwater.

This report describes the work carried out for the intrusive phase of investigation and presents our recommendations. Four boreholes and five trial pits were carried out, supported by a programme of in situ and laboratory testing. The results indicate that piled foundations will be acceptable and appropriate design data is provided. Laboratory testing did not reveal the presence of significant contamination in either soil or groundwater.

1

Site description

Reference should be made to the Phase 1 Risk Assessment which contains a detailed description of the site and its surroundings. In essence, the site comprises a triangular plot of land, the bulk of which is the embankment which once carried the railway line over the Old Shoreham Road. The southern boundary of the site is formed by the embankment carrying the present live rail lines and there is a small area at road level sandwiched between the two.

The general layout of the site is shown at Figure 1 of Appendix D herein.

2

Development proposals

Figure 2 of Appendix D illustrates the proposals for the new care home.

No details of the proposed loadings were available during preparation of this report. However, it is understood that car parking will be provided at ground level (3.1 m OD) with two floors of accommodation above. Structural loads are thus expected to be moderate.

The proposed layout and ground level for the car park implies that the old rail embankment will be removed to provide a sensibly flat and level site.

3

Geology

Published records of the British Geological Survey indicate the site to lie on Superficial deposits of Head which is underlain by the solid geology of undivided Upper and Middle Chalk. Marine and Estuarine Alluvium is mapped immediately west of the site.

The rail embankments consist of fill material of unknown origin.

4

Field work

The extent of the field work was agreed with the Architect and comprised four boreholes drilled by light percussive rig, two each to 18 and 21 m depth, supplemented by five trial pits excavated by conventional wheeled backhoe machine to 3.1 - 4.0 m depth. The locations of these exploratory positions are shown on Figure 1 of Appendix D.

Representative samples were recovered for subsequent laboratory examination and testing; whilst Standard Penetration Tests (SPT) were carried out as appropriate. Details of the strata encountered are provided on the Borehole and Trial Pit Records at Appendix A; together with particulars of the samples recovered, groundwater observations and SPT results. The SPT data is also shown graphically at Figure 3 of Appendix D.

Standpipes were installed in BHs 1, 3 & 4 to permit monitoring of the groundwater and ground gas régimes. These have been read on three occasions and the results are presented at Appendix B.

The Risk Assessment highlighted the potential for contamination and NRA clean drilling techniques were therefore adopted. In essence, the boreholes were drilled at 200 mm diameter through the fill and a bentonite seal placed just above the interface with the natural ground. Drilling then continued at 150 mm diameter. The drill string was cleaned with high pressure washer between boreholes. Except where standpipes were installed, all boreholes were backfilled with bentonite.

Ground levels quoted in this report have been interpolated from spot levels given on the topographical survey drawing[2]. However, relative levels for the top of the three standpipes have been established by specific survey. It is assumed these use Ordnance Datum.

5

Laboratory testing

The following laboratory tests were conducted on samples recovered during the field work:-

Geotechnical

- Particle size distribution: by sieve analysis to classify granular soils and extended by sedimentation techniques for fine particles.
- California Bearing Ratio: for the structural design of paved areas.
- Dry density and saturation moisture content: to classify chalk into behavioural groups.
- Soluble sulphate concentration and pH value: for the specification of buried concrete.

Environmental

Potential contaminants indicated by the Phase 1 Risk Assessment:-

- Metals and semi - metals: arsenic, cadmium, chromium, lead, mercury, copper, nickel, zinc, barium, beryllium and vanadium.

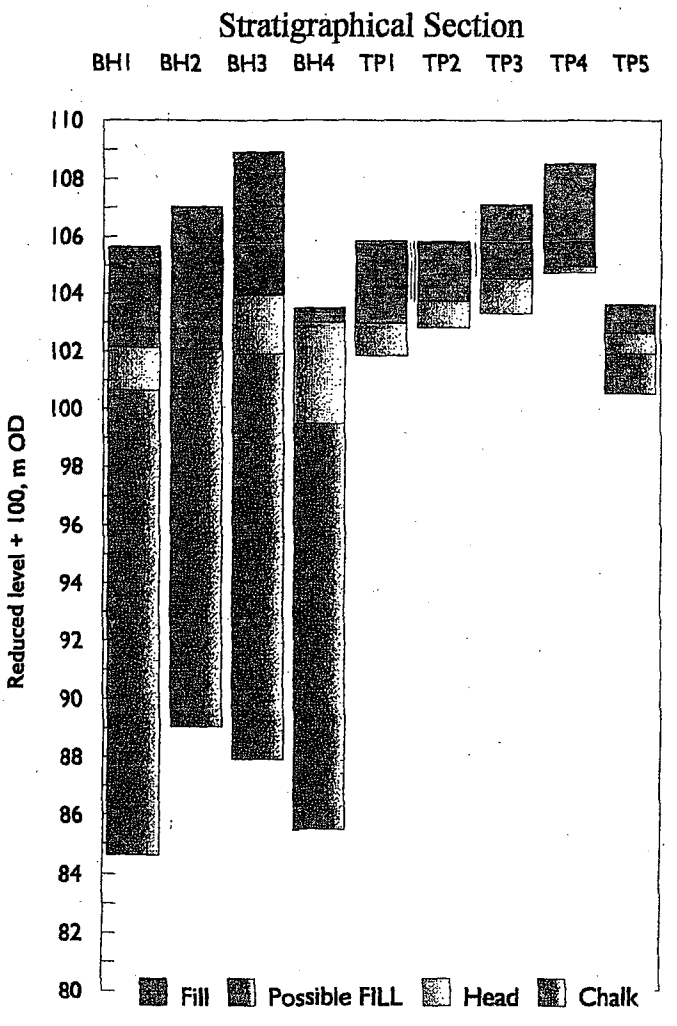
- Free cyanide.
- Total petroleum hydrocarbons.
- pH
- Total sulphate
- Asbestos
- Polyaromatic hydrocarbons

Results of these tests are presented at Appendix C.

6
Ground conditions

6.1
Stratigraphy

The stratigraphy revealed by the investigation is given in detail at Appendix A. It is illustrated in general terms in the section at right and described hereafter.



6.1.1
Fill material

Boreholes 1 - 3 and trial pits 1 - 4 were all located on the old rail embankment and encountered between 2 and 4½ m of chalk fill.

The samples produced by light percussive drilling only permit basic descriptions since the fabric is destroyed by the action of drilling. However, the trial pit excavations provided good exposures and showed the fill to be a structureless mélange of gravel and cobble, occasionally boulder, size fragments of intact chalk in a sand and silt matrix.

The base of the chalk fill rose from about 3.6 m OD in BH 1 and TP 1 at the western end of the site to almost 5 m OD in TP 4 at the eastern end.

Other horizons of fill were observed beneath the chalk in BHs 1 - 3 and TP 1. The brick and chalk mixture in BH 1 and the ash, clay, chalk and gravel in BH 2 were obviously fill. However, BHs 2 & 3 and TP 1 encountered material similar to the Head deposits described below but containing rare small brick fragments. This is therefore thought to be reworked material of local origin.

Borehole 4 and TP 5 were excavated in the paved yard at road level. Borehole 4 proved 300 mm of concrete on a 200 mm thick brick and clay sub - base. In contrast, TP 5 only encountered 100 mm of concrete, followed by 900 mm of clay with sand lenses, brick and chalk fragments.

6.1.2
Head

Typically for superficial deposits such as Head, the investigation found considerable differences in both thickness and composition of this stratum across the site. Gravelly and cobbley clays were found in BHs 1 & 3 and TPs 3 & 4 and cobbles in TP 1. Elsewhere, the Head was predominantly clay/silt mixtures or fine sands although subordinate gravels were also present at times.

6.1.3
Chalk

Chalk was found in all boreholes and in TP 5 at between 2.03 and -0.53 m OD and continued to the base of investigation at -15.4 m OD.

As previously stated, little direct indication of the character of chalk can be obtained from the borehole samples. Nevertheless, the SPT results give a good indication of its condition. Figure 3 shows a wide variation in the penetration resistance to about -11 m OD to indicate differences in the degree of weathering. Fairly constant resistance was measured below -11 m OD with N values in the range 40 - 50.

The natural chalk was revealed in the base of TP 5 and excavated to a depth of 1.4 m. This showed the upper horizons of this stratum to consist of comminuted chalk in sand and silt size particles with cobble size fragments of intact chalk, indicating a high degree of weathering. As noted on the Trial Pit Record, the chalk surface varied by 1 m depth between the two ends of the pit.

6.2
Groundwater

Slow to moderate inflows of groundwater were encountered during drilling between about zero and -2 m OD, rising 300 to 600 mm during the subsequent observational pause. Deeper and much faster inflows were observed between about -3.5 and -6.9 m OD, rising to between zero and about -1.5 m OD.

Full details of all groundwater observations are given on the Borehole Records at Appendix A.

All trial pits remained dry during excavation.

Standpipe readings are given at Appendix B and show groundwater at about 1 m OD. Comparison of the depth to groundwater with accurate levelling of the top of the standpipes suggests groundwater flow during the monitoring period has been to the south or south south east.

7
Discussion

7.1
General

It is understood that car parking for the new care home will be provided at 3.1 m OD, approximating to the level of the public footway to Old Shoreham Road. The bulk of the old railway embankment will thus be removed but some fill and the underlying Head will remain. The Phase 1 investigation has shown the site to have previously carried development and other deposits of fill material should therefore be expected; perhaps deeper, of different character or associated with underground construction; which have not been revealed by the investigation.

Fill material does not represent a reliable bearing stratum since it is inherently variable in both composition and compaction and is therefore prone to large and unpredictable settlement. Similarly, the Head is variable in thickness and composition and will also be

unreliable as a bearing stratum. Structural loads for the development should therefore be carried into the natural chalk. This was found between about 2 and -0.5 m OD whilst groundwater lies at about 1 m OD. Piled foundations are therefore recommended as discussed in the following section.

7.2
Foundations

Either driven or bored piles could be used but consideration of the various advantages and disadvantages of the different pile types suggests CFA piles to be preferred. They avoid many of the installation difficulties that would be otherwise be experienced; particularly the need for casing to support the bore and to control vigorous groundwater inflows. Driven piling should be avoided as it generates greater ground - borne vibrations which could jeopardise the stability of the existing live rail embankment and bridge, or any other nearby structures.

Parameters for the preliminary design of CFA piles are provided in Tables 1 & 2.

Table 1: Preliminary design parameters for CFA piles - Shaft friction

Stratum	Level, m OD	Ultimate unit shaft friction
All material	g.l. to -0.5	Ignore
Chalk	-0.5 to -3.5	Increases linearly from 25 to 40 kPa
	-3.5 to -10.0	Increases linearly from 40 to 120 kPa
	-10.0 to -15.0	Constant at 120 kPa

Table 2: Preliminary design parameters for CFA piles - End bearing capacity

Stratum	Level, m OD	Ultimate unit end bearing capacity
Chalk	-9.0 to -12.0 -12.0 to -15.0	Increases linearly from 2000 to 4500 kPa Constant at 4500 kPa

Table 1 has been derived in accordance with guidance provided by the Federation of Piling Specialists[3]. In the absence of successful load tests, this recommends shaft friction be derived by the method proposed in CIRIA Report PG6[4] for SPT N values less than 10. Above this value, the recommendations of CIRIA PR11[5] and PR86[6] should be followed which suggest an adhesion factor of 0.8. However, this yields a marked step in the design line at -3.5 m OD which has been smoothed by adopting a gradual increase in adhesion factor between -3.5 and -10.0 m OD.

It is assumed that no significant shaft friction will be developed in the fill material or the Head.

Factors of safety must be applied to derive the allowable working load from the ultimate values calculated from the table. A value of 2.5 is commonly adopted for both shaft friction and end bearing resistance.

Tables 1 & 2 predict that a 450 mm diameter CFA pile installed to -9.0 m OD will have an allowable load capacity of approximately 415 kN, rising to some 770 kN at -12.0 m OD.

Evidently it would be possible to utilise other pile types and different geometries. Further advice could be given on the load capacity for any other configuration which may be under consideration.

The actual load capacity achieved in practice depends upon the precise installation procedures. Advice should therefore be sought from specialist contractors to verify the load capacity and settlement characteristics of their particular piles in the ground conditions revealed by this investigation. In any event, and especially in respect of the current state of knowledge surrounding the shaft friction in chalk, it is recommended that the chosen pile configuration be confirmed by load tests conducted at an early stage in the development, preferably before installation of the contract piles.

7.3
Excavations

All fill should be regarded as inherently unstable whilst the Head rarely contained sufficient cohesive material to provide a reliable measure of stability. All excavations in these materials should therefore be supported at all times. Any apparent stability that may be present immediately on excavation should not be relied upon. In any event, excavations over 1.2 m depth should be supported at all times for the safety of personnel working within or nearby. Alternatively, excavations could be battered to a safe angle of repose.

The natural chalk may be able to maintain vertical excavated of moderate height although some spalling may be expected from the face. Stability will be reduced where weathered to a structureless mélange. However, the investigation showed that it would not be encountered at less than 1.2 m below the finished ground level over much of the site and would thus require support regardless.

It should be ensured that excavations do not jeopardise the stability of the live rail embankment, the overbridge or any other nearby structure. Temporary and permanent works

should therefore be designed to resist the lateral earth pressures generated by superimposed loadings in addition to those from the soil itself without significant deformation.

Observations during the investigation suggest that groundwater lies at about 1 m OD. However, it is likely to be affected by both river and sea levels in addition to normal climatic variations and high groundwater levels may be experienced during construction. In addition, a perched water table may be established in the fill or Head where underlain by less permeable soils which may give rise to high level inflows.

Excavations that are required to penetrate the water table will require appropriate control measures. Trench sheets would serve the dual purpose of supporting the excavation and hindering groundwater flow by extending the seepage path, although no acquiclude is present. The reduced flow into excavations could perhaps be controlled by conventional pumping from a shallow sump. In granular soils, care should be taken to ensure the rate of pumping was not so great that fines are removed or that boiling occurs in the base of the excavation, leading to major settlement of the surrounding ground. No attempt should be made to lower the general groundwater of the area. This is unlikely to be successful and the increase the effective stress in the soil could cause settlement and distress to surrounding structures.

7.4
Pavement construction

The proposed car park level of 3.1 m OD implies a construction level of about 2½ m OD. The investigation has revealed a wide variety of soils at this level such as fill, reworked clay Head, cobbles, silt or gravelly clay. A highly variable sub - grade should therefore be expected. Many of these materials would be regarded as unsuitable and should therefore be replaced

with suitable imported fill. However, this may prove impractical and the sub - grade should then be carefully inspected on exposure. Locally unsuitable material should be replaced. Proof rolling would give a more uniform surface for construction but will not improve the properties at depth.

California Bearing Ratios were determined on two samples of silt Head, recompacted at the "as received" moisture content. CBR values of 1.0 to 2.4 % were obtained at 15 % moisture content. Silts are extremely susceptible to loss of strength on increase in moisture content. It is known that drainage conditions often deteriorate beneath the finished pavement as the years go by, resulting in an increase in the sub - grade moisture content. The CBR of silt and fine sand may therefore fall dramatically in service, perhaps to a value of about ½ % in service.

Consideration should therefore be given to the use of a capping layer or geotextile reinforcement unless some post - construction deformation can be accepted. It is recommended that flexible pavement construction be adopted, such a wholly bituminous material or block paviors as these are more accommodating to small deformations and can be more readily realigned should movement become unacceptable.

7.5
Contaminant analysis

7.5.1
Solid Phase

Testing was undertaken on nine soil samples for a comprehensive suite of potential contaminants suggested by the Risk Assessment. The results are presented at Appendix C and

have been compared with Soil Guideline Values published by CLEA[7]. Where not yet available, reference has been made to other established guidelines and to generally accepted precedence. Soil Guideline Values for residential use with plant uptake (the most stringent) are appended to the data sheets and it is seen that only one sample, for lead, exceeded the thresholds, and then by only 10 mg/kg (460 mg/kg *cf.* 450 mg/kg). However, this material lies within or immediately below the old rail embankment between 2.9 and 3.5 m OD and is likely to be removed during construction.

All other tests on soil samples confirmed concentrations to be either below the limit of detection for the test or well within allowable levels.

No asbestos has been identified.

Notwithstanding the results, some determinands were present at detectable concentrations and appropriate health and safety precautions, such as detailed in HS(G)66[8] and elsewhere, must be followed by the construction workforce and others who may come into contact with the soil. These should be agreed with the Health and Safety Executive and are likely to include, but not be restricted to, the following:-

- maintain good standards of personal hygiene.
- wear personal protective clothing that is changed and cleaned frequently to eliminate skin contact.
- prevent ingestion by using washing and changing facilities at all break times.
- not eating, drinking or smoking between break times.
- control the spread of dust and airborne mists to prevent inhalation.

All material removed from site should be transported to a suitable licenced tip. A series of Waste Acceptance Criteria tests should be conducted to classify the spoil accordingly.

7.5.2
Liquid phase

Purged groundwater samples were obtained from the standpipe in BH 4 and subjected to a comparable suite of tests to the soil samples.

No UK standard exists for groundwater quality and the results have been compared with accepted precedent. None of the results are considered to prejudice the development proposals, most again being below the limit of detection.

7.5.3
Gas phase

The three standpipes installed at the site have been monitored for flow rate and concentrations of oxygen, methane and carbon dioxide on three occasions. The results are presented at Appendix B.

They show no detectable methane and only small concentrations of carbon dioxide, reaching a maximum of 0.8 % in BH 1 in association with slightly depressed oxygen. Otherwise, oxygen levels were close to the free air condition. Slightly elevated carbon dioxide concentrations are not unusual at chalk sites.

For comparison, an upper limit of 1½ % is given for carbon dioxide in Waste Management Paper 27[9]. In conjunction with the very low initial flow rates which quickly decayed to zero, the results do not indicate the need for gas protection to the new development.

7.6

Buried concrete

Laboratory tests yielded a maximum soluble sulphate concentration of 0.28 g/l which results in a Design Sulphate Class[10] of DS-1 for the site. The highest total sulphate concentration of 650 mg/kg recorded during contaminant testing does not warrant a higher classification.

Groundwater tests produced a highest concentration of 110 mg/l which also falls within class DS-1. Groundwater conditions must be considered mobile and both soil and water were slightly alkaline. These results indicate the aggressive chemical environment for concrete, ACEC, is class AC-1. However, underground concrete supplied to the site should also be capable of resisting brackish groundwater since the water table is assumed to be in hydraulic equilibrium with the tidal River Adur.



A W Parr
AP GEOTECHNICS LTD.
20 January 2006

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PROCEDURAL NOTES for GROUND INVESTIGATIONS

General

This report is based upon data obtained from field descriptions of the strata and examination of the samples by an engineer, together with the results of in situ and laboratory tests as appropriate. Responsibility cannot be accepted for variations in ground conditions between and around any of the exploratory points that is not revealed by the data. Whilst the report may offer an opinion on the ground conditions between exploratory points and below the depth of investigation, this is for guidance only and no liability is accepted for its accuracy.

Drilling procedure

Boring by light cable percussion drilling allows the ground conditions to be reasonably well established. However, a certain amount of disturbance is inevitable and some mixing of soils can occur.

Sampling procedure

"Undisturbed" samples of predominantly cohesive soils are taken with a 100mm diameter open tube sampler, generally in accordance with BS 5930: 1999.

Where appropriate, or where an undisturbed sample is unsuccessful, disturbed samples are recovered and sealed into polythene bags.

Groundwater samples are taken when water is encountered in sufficient quantity.

Standard penetration tests

The test is conducted generally in accordance with BS 1377: Part 9: 1990. The sampler tube is subject to a seating drive of 150mm into the soil at the base of the borehole. Results are given on the Borehole Records as the number of blows required to drive the sampler tube a further 300mm and this is known as the "N" value. Where the driving resistance is such that full penetration is not achieved, the test is generally terminated after 50 blows and the actual distance penetrated is recorded.

Groundwater

Groundwater observations necessarily reflect the conditions encountered at the time of the exploratory work. Long term monitoring of standpipes is usually required to establish an equilibrium water level since the normal rate of boring is too fast to permit steady state conditions to be achieved.

Groundwater levels are subject to variations caused by changes in drainage conditions and seasonal climatic changes.

Water may necessarily be added to advance the bore whilst casing may be required to maintain an open hole. These can both mask subsequent groundwater observations and are therefore noted on the individual Borehole Record.

APPENDICES

A Borehole and Trial Pit Records

Symbols and Abbreviations
Borehole Records
Trial Pit Records

B Standpipe Records

Gas Emissions and Water Levels

C Laboratory Test Results

Summary of Geotechnical Tests
Particle Size Distribution
California Bearing Ratio

D Figures

Figure 1	Borehole and Trial Pit Location Plan
Figure 2	Outline of Development Proposals
Figure 3	SPT Profile

APPENDIX A

BOREHOLE AND TRIAL PIT RECORDS

SYMBOLS and ABBREVIATIONS

Samples

Undisturbed

U	Standard open drive "undisturbed" 102mm dia. in boreholes 38mm dia. in trial pits, window sampler and hand auger
T	Thin wall open drive
P	Piston
C	CBR mould

Disturbed

D	Small
B	Bulk
C	Contaminants: plastic tub
J	brown glass jar
W	Water

In situ tests

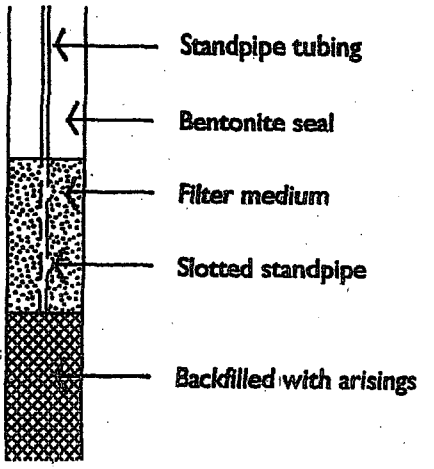
SPT	Standard Penetration Test, open shoe
CPT	solid cone
	N value is number of blows for 300mm penetration. Blow count also given as seating drive followed by four increments of 75mm.
V ( )	Vane test (c_u kPa)
P ( )	Hand penetrometer (c_u kg/cm^2)
M ( )	Mexe probe (CBR %)

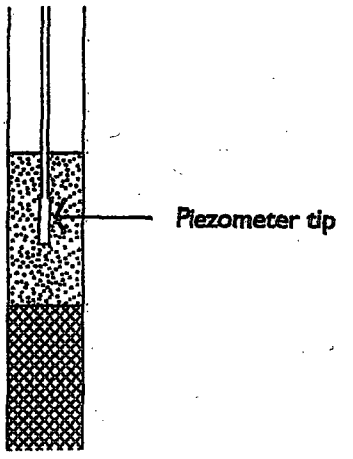
Water records

∇_1	Standing level
$\underline{\nabla}_1$	Depth encountered

suffix identifies separate strikes

Standpipes





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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 4.00m 150mm cased to 19.00m	5.62	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	13/10/2005	DWA Architects	1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							FILL: Chalk			
0.50	D1									
0.50	C1									
1.00-1.45	SPT N=10		DRY	2,2/3,2,3,2		(2.00)				
1.00	C2									
1.00	D2									
1.00-1.50	B1									
1.50	D3									
2.00	C3				3.62	2.00	FILL: Brick and chalk			
	D4									
2.50	D5					(1.00)				
2.50-3.00	B2									
2.80-3.25	SPT N=19		DRY	1,2/5,5,6,3						
3.00	D6				2.62	3.00	Possible FILL: Brown gravelly clay			
3.00	C4					(0.50)				
3.50	D7				2.12	3.50	Firm orange brown sandy gravelly cobbly CLAY. Gravel and cobbles are irregular flints			
4.00-4.45	SPT N=13	4.00	DRY	2,1/2,3,5,3						
4.00	C5					(1.50)				
4.00	D8									
4.00-4.50	B3									
4.50	D9									
5.00	C6				0.62	5.00	Off white CHALK with silt size particles and clay			
5.00	D10									
5.50-5.95	SPT N=9	5.50	DRY	2,1/2,2,3,2						
5.50	D11									
6.00	D12								▽1	
				slow(1) at 7.00m, rose to 6.50m in 20 mins, not sealed.					▽1	
7.00-7.45	SPT N=7	7.00	6.50	2,1/2,2,1,2					▽2	
8.80-9.25	SPT N=7	8.50	7.00	2,1/1,2,2,2						
10.00-10.45	SPT N=8	10.00	8.50	1,2/3,2,1,2						

Remarks
Pressure wash drill string: ½ hour.
Swelling time for bentonite seal: 2 hour
Reducing diameter: ½ hour
Clearing spoil: ½ hour
Excavating from 0.00m to 1.20m for 1 hour.

Scale (approx)	Logged By
1:50	

Figure No. 2681.BH1

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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
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	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	13/10/2005	DWA Architects	2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(7.00)	Off white CHALK with silt size particles and clay			
11.80-12.25	SPT N=9	11.80	10.30	2,1/2,2,3,2						
					-6.38	12.00	White CHALK			
				fast(2) at 12.50m, rose to 7.50m in 20 mins, not sealed.					▽2	
13.00-13.45	SPT N=13	13.00	7.30	2,3/2,3,4,4						
14.50-14.95	SPT N=15	14.50	8.00	2,2/3,4,4,4						
00-16.45	SPT N=27	16.00	8.30	4,4/5,6,8,8						
17.80-18.25	SPT N=50	17.50	7.50	10,12/12,12,13,13						
19.00-19.45	SPT N=48	19.00	8.00	7,9/10,12,14,12						

Remarks

Scale (approx)	Logged By
1:50	

Figure No. 2681.BH1

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	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	13/10/2005	DWA Architects	3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(9.00)	White CHALK			
20.50-20.95	SPT N=46	19.00	8.10	5,8/10,10,12,14						
					-15.38	21.00	Complete at 21.00m			

Remarks

Scale (approx)	Logged By
1:50	

Figure No. 2681.BH1

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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 5.00m 150mm cased to 17.00m	7.03	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/11/2005	DWA Architects	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							FILL: Chalk			
0.50	D1									
1.00-1.45	SPT N=7		DRY	1,2/2,1,2,2						
1.00	C1									
1.00	D2					(2.60)				
1.00-1.50	B1									
1.50	C2									
2.00	C3									
2	D3									
2.50-2.95	SPT N=2		DRY	1/1,,,1						
2.50	C4				4.43	2.60	FILL: Ash, clay, chalk, flint gravel and cobbles			
2.50-3.00	B2									
3.00	D4									
3.00	C5									
						(1.40)				
3.50	C6									
4.00-4.45	SPT N=4		DRY	1,2/1,,1,2	3.03	4.00	FILL: Soft to firm brown gravelly cobbly silty clay with rare brick fragments. Gravel and cobbles are angular flint			
4.00	C7									
4.00	D5									
4.00-4.50	B3									
4.50	C8					(1.00)				
5.00	C9				2.03	5.00	Off white becoming white CHALK			
5.00	D6									
5.50-5.95	SPT N=24	5.50	DRY	4,6/6,6,6,6						
5.50	D7									
5.50	C10									
7.00-7.45	SPT N=24	7.00	DRY	3,5/6,7,6,5						
8.50-8.95	SPT N=27	7.50	DRY	2,4/5,6,7,9					▽1	
				slow(1) at 9.00m, rose to 8.70m in 20 mins, not sealed.					▽1	
10.00-10.45	SPT N=26	10.00	9.50	3,4/4,6,8,8						

Remarks
Backfilled with bentonite and surface reinstated with mass concrete
Pressure wash drill string: ½ hour.
Swelling time for bentonite seal: 2 hour
Reducing diameter: ½ hour
Clearing spoil: ½ hour
Backfilled with bentonite and surface reinstated with mass concrete

Scale (approx)	Logged By
1:50	

Figure No. 2681.BH2

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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 5.00m 150mm cased to 17.00m	7.03	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/11/2005	DWA Architects	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							Off white becoming white CHALK			
11.50-11.95	SPT N=28	11.50	9.70	4,4/6,6,7,9		(13.00)				
13.00-13.45	SPT N=37	13.00	8.70	5,7/8,9,10,10						
14.50-14.95	SPT N=45	14.50	9.00	5,8/9,9,13,14						
16.00-16.45	SPT N=42	16.00	9.50	4,7/9,10,11,12						
17.50-17.95	SPT N=46	17.00	10.00	4,6/10,11,13,12						
					-10.97	18.00	Complete at 18.00m			

Remarks	Scale (approx)	Logged By
	1:50	
	Figure No. 2681.BH2	

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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 6.00m 150mm cased to 19.50m	8.91	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/12/2005	DWA Architects	1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.50)	FILL: Old roadstone and gravel			
0.50	C1				8.41	0.50	FILL: Chalk			
1.00-1.45	SPT N=10		DRY	1,2/3,3,2,2						
1.00	C2									
1.00	D1									
1.00-1.50	B1									
1.50	C3									
2.00	C4									
	D2									
2.50-2.95	SPT N=3		DRY	1/1,1,,1		(4.00)				
2.50	C5									
2.50-3.00	B2									
3.00	C6									
3.00	D3									
3.50	C7									
4.00-4.45	SPT N=5	4.00	DRY	1,1/,1,2,2						
4.00	C8									
4.00	D4									
4.00-4.50	B3									
4.50	C9				4.41	4.50	FILL: Dark greyish brown silty clay with silt and gravel size chalk fragments and rare brick fragments			
						(0.50)				
5.00	C10				3.91	5.00	Firm orange brown slightly gravelly CLAY. Gravel is intact chalk fragments			
5.00	D5									
5.50-5.95	SPT N=10	5.50	DRY	1,2/2,3,2,3						
5.50	C11									
5.50	D6									
5.50-6.00	B4									
6.00	D7					(2.00)				
7.00-7.45	SPT N=20	7.00	DRY	2,3/4,6,5,5	1.91	7.00	Off white CHALK with silt			
7.00	D8									
7.00-7.50	B5									
8.00	D9								▽1	
8.50-8.95	SPT N=20	7.50	DRY	2,4/5,5,5,5						
10.00-10.45	SPT N=19	7.50	DRY	2,3/4,4,5,6						

Remarks
Pressure wash drill string: ½ hour.
Swelling time for bentonite seal: 2 hour
Reducing diameter: ½ hour
Clearing spoil: ½ hour

Scale (approx)	Logged By
1:50	

Figure No. 2681.BH3

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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 6.00m 150mm cased to 19.50m	8.91	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/12/2005	DWA Architects	2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(5.00)	Off white CHALK with silt			
11.50-11.95	SPT N=16	7.50	DRY	2,1/2,4,5,5						
					-3.09	12.00	White CHALK			
				fast(1) at 12.50m, rose to 9.00m in 20 mins, not sealed.					▽1	
13.00-13.45	SPT N=10	13.00	9.50	2,1/2,3,2,3						
14.50-14.95	SPT N=9	14.50	9.00	1,2/2,2,3,2						
00-16.45	SPT N=13	16.00	9.80	2,3/3,4,3,3						
17.50-17.95	SPT N=27	17.50	11.70	2,4/8,8,5,6						
19.00-19.45	SPT N=41	19.00	10.00	5,7/9,10,10,12						

Remarks

Scale (approx)	Logged By
1:50	

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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 6.00m 150mm cased to 19.50m	8.91	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/12/2005	DWA Architects	3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(9.00)	White CHALK			
20.50-20.95	SPT N=44	19.50	9.00	5,9/8,9,11,16						
					-12.09	21.00	Complete at 21.00m			

Remarks

Scale (approx)	Logged By
1:50	

Figure No. 2681.BH3

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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH4

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 1.80m 150mm cased to 17.50m	3.47	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	14/10/2005	DWA Architects	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30)	CONCRETE			
					3.17	0.30				
						(0.20)	FILL: Brick and clay			
0.50	C1				2.97	0.50	Firm orange brown slightly gravelly clayey fine SAND. Gravel is fine to medium flint			
1.00-1.45	SPT N=10		DRY	1,2/2,3,2,3						
1.00	D1									
1.00	C2									
1.00-1.50	B1									
1.50	C3									
						(2.50)				
2.00	D2									
2.00	C4									
2.50-2.95	SPT N=8	2.50	DRY	2,1/2,2,2,2						
2.50	C5									
2.50-3.00	B2									
3.00	D3				0.47	3.00	Soft to firm very pale orange brown clayey SILT. Silt is comminuted chalk			
3.00	C6								▽1	
3.50	C7					(1.00)				
4.00	D4			moderate(1) at 4.00m, rose to 3.40m in 20 mins, sealed at 5.00m.	-0.53	4.00	Off white CHALK with silt		▽1	
4.00	C8									
4.00-4.45	SPT N=13	4.00	3.40	1,2/3,3,4,3					▽2	
5.50-5.95	SPT N=10	5.50	DRY	1,2/3,2,3,2						
				fast(2) at 7.00m, rose to 5.00m in 20 mins, not sealed.					▽2	
7.00-7.45	SPT N=7	7.00	5.00	2,2/1,2,2,2						
8.50-8.95	SPT N=15	8.50	5.50	2,2/4,3,4,4						
10.00-10.45	SPT N=19	10.00	6.70	2,3/4,4,5,6						

Remarks
Pressure wash drill string: ½ hour.
Swelling time for bentonite seal: 2 hour
Reducing diameter: ½ hour
Clearing spoil: ½ hour
Clean yard area: 1½ hour

Scale (approx)	Logged By
1:50	

Figure No. 2681.BH4

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Site	Borehole Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	BH4

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	200mm cased to 1.80m 150mm cased to 17.50m	3.47	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	14/10/2005	DWA Architects	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(14.00)	Off white CHALK with silt			
11.50-11.95	SPT N=28	11.50	7.00	4,6/4,6,8,10						
13.00-13.45	SPT N=30	13.00	6.80	3,5/5,6,9,10						
14.50-14.95	SPT N=47	14.50	7.20	7,13/12,12,11,12						
16.00-16.40	SPT 50/245	16.00	7.50	9,10/13,14,17,6						
17.50-17.95	SPT N=50	17.50	8.00	5,10/10,12,13,15						
					-14.53	18.00	Complete at 18.00m			

Remarks

Scale (approx)	Logged By
1:50	

Figure No. 2681.BH4

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Site	Trial Pit Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	TP 1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit		5.83	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/11/2005	DWA Architects	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	FILL: *Pea shingle over grey black old roadstone fragments*		
				5.68	0.15	FILL: Structureless CHALK composed of sandy silty subangular COBBLES. Cobbles are weak, low density, off white. Matrix is grey white.		
0.50	J1							
0.50	C1							
					(2.15)			
1.50	J2							
1.50	C2							
				3.53	2.30	FILL: Very dark brown clayey silt with rare brick fragments		
2.50	J3							
2.50	C3				(0.60)			
2.80	J4							
2.80	C4			2.93	2.90	Orange brown slightly clayey COBBLES of subrounded rinded flint		
3.00	J5							
					(1.10)			
				1.83	4.00			

Plan

Remarks

Pit dry
Chalk very unstable below 1.5m
Backfilled with spoil arising.

Scale (approx)	Logged By	Figure No.
1:25		2681.TP 1

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Site	Trial Pit Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	TP 2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit		6.00	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/11/2005	DWA Architects	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	FILL: Dark grey and black fragments of old roadstone, very dark brown clay, rounded flint gravel and roots		
				5.85	0.15	FILL: Structureless CHALK composed of white BOULDERS with gravel size voids. Boulders are moderately strong, medium to high density.		
					(1.35)			
				4.50	1.50	FILL: Structureless CHALK composed of sandy silty GRAVEL and COBBLES. Gravel and cobbles are subangular, moderately weak, low to medium density off white. Matrix is off white.		
1.60	J1							
1.60	C1				(0.60)			
				3.90	2.10	Firm dark brown clayey SILT		
2.20	J2				(0.20)			
2.20	C2			3.70	2.30	Firm orange brown with vertical grey veins slightly clayey gravelly fine SAND. Gravel is subrounded flint.		
2.40	C3				(0.90)			
				2.80	3.20	Complete at 3.20m		

Plan

Remarks

Pit terminated on collapse of chalk
Pit dry
Backfilled with arisings

Scale (approx)	Logged By	Figure No.
1:25		2681.TP 2

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Site	Trial Pit Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	TP 3

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit		7.10	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/11/2005	DWA Architects	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	FILL: Roadstone fragments and very dark brown clay with roots		
				6.90	0.20	FILL: Structureless CHALK composed of off white cobbly sandy SILT. Cobbles are weak, low density off white and subangular. Occasional irregular rinded flint cobbles		
0.50	J1							
0.50	C1							
1.00	J2					roots to c. 1m		
1.00	C2							
					(2.40)			
1.50	B1					brown staining 1.5 - 1.7m		
						subangular chalk boulders below 1.7m		
2.00	J3							
2.00	C3							
				4.50	2.60	Firm brown slightly gravelly CLAY. Gravel is subangular medium flint		
2.70	J4							
2.70	D1							
2.70	C4							
					(0.60)			
				3.90	3.20	Firm orange brown SILT		
3.30	J5							
3.30	C5							
3.50	B2				(0.60)			
				3.30	3.80	Complete at 3.80m		

Plan

Remarks

Pit dry
Chalk unstable below 1.7m
Backfilled with spoil arising

Scale (approx)	Logged By	Figure No.
1:25		2681.TP 3

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Site	Trial Pit Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	TP 4

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit		8.52	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/11/2005	DWA Architects	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	J1					FILL: Structureless CHALK composed of off white cobbly sandy SILT. Cobbles are weak, low density off white and subrounded.		
0.50	C1				(1.50)			
				7.02	1.50	FILL: Structureless CHALK composed of sandy silty subrounded and subangular COBBLES and BOULDERS. Cobbles and boulders are moderately weak, medium density off white. Matrix is off white.		
1.70	B1				(2.10)			
				4.92	3.60	Firm brown very cobbly CLAY. Cobbles are rounded, subrounded and subangular flint		
3.70	J2				(0.20)			
3.70	C2			4.72	3.80	Complete at 3.80m		

Plan

Remarks

Pit dry
Chalk fragments spalling badly from face
Backfilled with spoil arising

Scale (approx)	Logged By	Figure No.
1:25		2681.TP 4

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Site	Trial Pit Number
OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX	TP 5

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit		3.60	Abbeycare Investments Limited	2681
	Location	**Dates**	**Engineer**	**Sheet**
	see site plan	10/11/2005	DWA Architects	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				3.50	0.10	Mass CONCRETE		
0.30	J1					FILL: Firm brown and dark brown clay with orange brown sand lenses, brick and chalk fragments		
0.30	C1							
					(0.90)			
0.60	J2							
0.60	C2							
1.00	J3			2.60	1.00	Yellow with dark brown spots very sandy SILT		
1.00	C3							
1.00	B1							
					(0.70)			
						slightly gravelly below c. 1.5m. Gravel is irregular rinded flint cobbles and boulders		
				1.90	1.70	Structureless CHALK composed of sandy silty subrounded and subangular COBBLES. Cobbles are moderately weak, low to medium density, off white with frequent black specks. Matrix is very light brown and off white. (Grade Dc)		
2.00	C4							
					(1.40)			
						chalk boundary at 1.7 m in south end of pit, 2.7m in north		
3.00	J4							
3.00	C5			0.50	3.10			
						Complete at 3.10m		

Plan

Remarks

Sides stable during excavation
Pit dry
Backfilled with arisings

Scale (approx)	Logged By	Figure No.
1:25		2681.TP 5

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APPENDIX B

STANDPIPE RECORDS

STANDPIPE RECORDS

GAS EMISSIONS AND WATER LEVELS

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA
Client: Abbeycare Investments Ltd
Agent: DWA Architects

Project No: 2681
Sheet No: 1/1

Date	Atmos Press. mb	Measurement	Units	Location							
				BH1		BH3		BH4			
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
30/11/05	1010	Flow rate	l/hr	0.4	0.0	-0.3	0.0	-0.2	0.0		
		Methane	%	0.0	0.0	0.0	0.0	0.0	0.0		
		Carbon dioxide	%	0.7	0.2	0.1	0.1	0.3	0.3		
		Oxygen	%	19.5	19.1	19.6	19.6	19.4	19.3		
		Water level	m bgl	4.55		7.98		2.43			

Date	Atmos Press. mb	Measurement	Units	Location							
				BH1		BH3		BH4			
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
16/12/05	1010	Flow rate	l/hr	0.5	0.0	0.5	0.0	0.4	0.0		
		Methane	%	0.0	0.0	0.0	0.0	0.0	0.0		
		Carbon dioxide	%	0.8	0.8	0.0	0.0	0.1	0.1		
		Oxygen	%	17.6	17.2	20.8	20.8	20.6	20.5		
		Water level	m bgl	4.53		7.89		2.45			

Date	Atmos Press. mb	Measurement	Units	Location							
				BH1		BH3		BH4			
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
16/01/06	1008	Flow rate	l/hr	0.3	0.0	2.4	0.0	0.2	0.0		
		Methane	%	0.0	0.0	0.0	0.0	0.0	0.0		
		Carbon dioxide	%	0.8	0.8	0.0	0.0	0.1	0.2		
		Oxygen	%	17.4	17.3	20.7	20.7	20.4	20.2		
		Water level	m bgl	4.58		7.90		2.47			

Date	Atmos Press. mb	Measurement	Units	Location							
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
		Flow rate	l/hr								
		Methane	%								
		Carbon dioxide	%								
		Oxygen	%								
		Water level	m bgl								

Date	Atmos Press. mb	Measurement	Units	Location							
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
		Flow rate	l/hr								
		Methane	%								
		Carbon dioxide	%								
		Oxygen	%								
		Water level	m bgl								

Readings taken with GA 2000 manufactured by Geotechnical Instruments Ltd.

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APPENDIX C

LABORATORY TEST RESULTS

SUMMARY OF GEOTECHNICAL TESTS

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Abbeycare Investments Ltd
Agent: DWA Architects

Project No: 2681
Sheet No: 1/1

Loc'n	Sample No	Depth m	Description	CLASSIFICATION								TRIAXIAL COMPRESSION - TOTAL STRESS							CHEMICAL		
				Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plast. Index %	Passing 425µm %	Class	Saturation Moisture Content %	Dry Density Mg/m³	Type	Moisture Content %	Bulk Density Mg/m³	Radial Stress kPa	Deviator Stress kPa	Cohesion cu, kPa assuming Øu = 0	Cohesion cu, kPa Øu, deg	Sulphate (SO4) Water g/l	Sulphate (SO4) Soil (Sol) g/l	pH
BH1	D6	3.00	Brown gravelly CLAY																	0.17	7.4
	D8	4.00	Firm orange brown sandy gravelly CLAY																	0.24	7.3
BH2	D5	4.00	FILL: Brown gravelly cobbly silty clay with rare brick fragments																	0.13	7.4
BH3	D6	5.50	Orange brown slightly gravelly CLAY																	0.28	7.5
BH4	D2	2.00	Orange brown slightly gravelly clayey fine SAND																	0.17	7.5
TP3	B1	1.50	FILL: Chalk							27	1.57										
										27	1.55										
										27	1.56										
	B2	3.50	Orange brown SILT																	0.21	7.4
TP4	B1	1.70	FILL: Chalk							26	1.57										
										26	1.59										
										26	1.57										
TP5	B1	1.00	Yellow sandy SILT																	0.15	7.3

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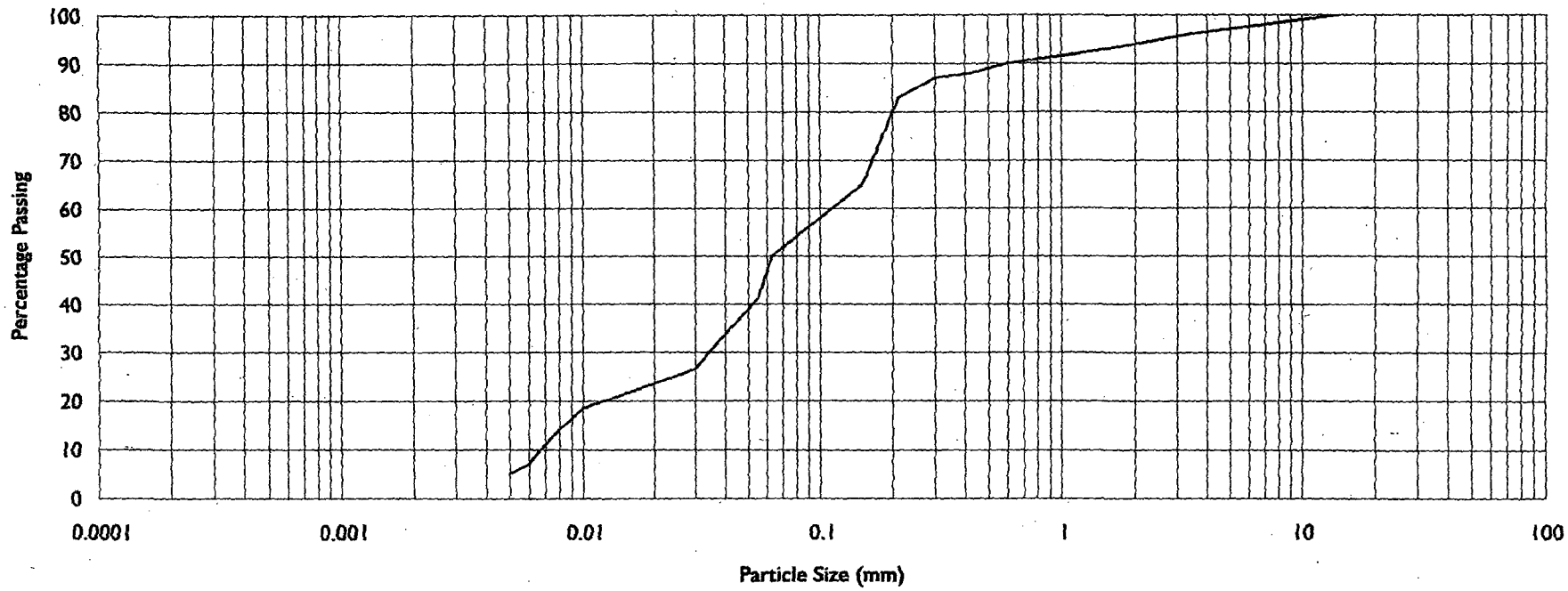
PARTICLE SIZE DISTRIBUTION

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Abbeycare Investments Ltd
Agent: DWA Architects

Project No: 2681
Sheet No: 1/1



Clay	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	Cobbles
	Silt			Sand			Gravel			
Hydrometer				Sieve						

Location: TP5
Sample: B1
Depth, m: 1.00

Description:-
Yellow with dark brown spots very sandy SILT

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CALIFORNIA BEARING RATIO

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Abbeycare Investments Ltd
Agent: DWA Architects

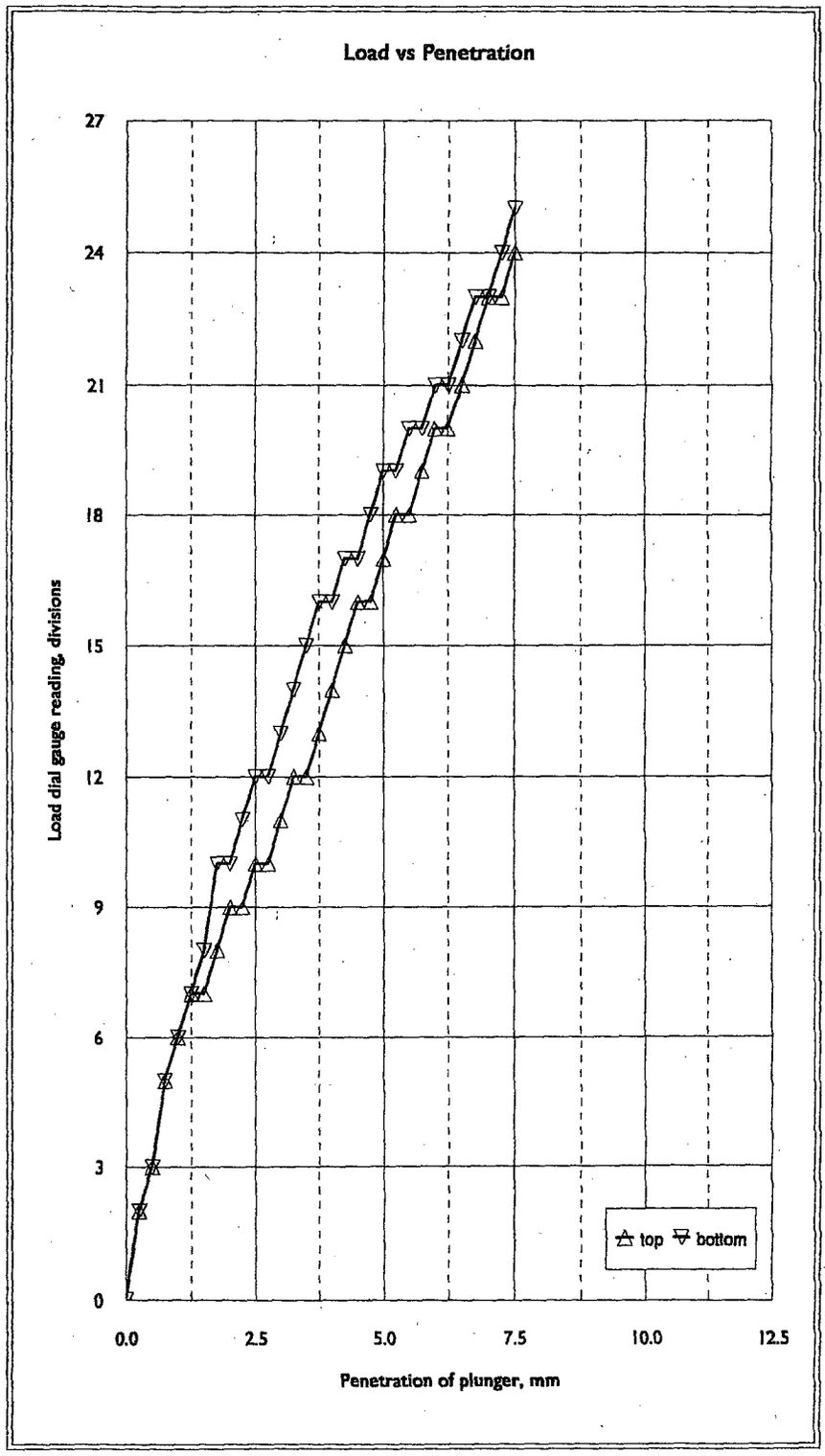
Project No: 2681
Sheet No: 1/2

Loc'n	Sample	Depth (m)
TP3	B2	3.5

Description
Firm orange brown SILT

Sample Preparation
In situ
Undisturbed
Remoulded
Recompacted 2.5kg
4.5kg

Penetration	Load Dial Gauge, div	
mm	top	bottom
0.00	0	0
0.25	2	2
0.50	3	3
0.75	5	5
1.00	6	6
1.25	7	7
1.50	7	8
1.75	8	10
2.00	9	10
2.25	9	11
2.50	10	12
2.75	10	12
3.00	11	13
3.25	12	14
3.50	12	15
3.75	13	16
4.00	14	16
4.25	15	17
4.50	16	17
4.75	16	18
5.00	17	19
5.25	18	19
5.50	18	20
5.75	19	20
6.00	20	21
6.25	20	21
6.50	21	22
6.75	22	23
7.00	23	23
7.25	23	24
7.50	24	25
Surcharge, kg		4.0
Seating Load, N		
Proving Ring Factor, N/div		25.61



CBR at 2.5mm = (Dial reading x ring factor)/132.4
CBR at 5.0mm = (Dial reading x ring factor)/199.6

Moisture	Density, Mg/m³		% retained
Cont. %	Bulk	Dry	at 20mm
15	2.07	1.80	0

CBR %	Penet'n	Top	Bottom
	2.5mm	1.9	2.3
	5.0mm	2.2	2.4

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CALIFORNIA BEARING RATIO

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Pavillion Developments
Agent: DWA Architects

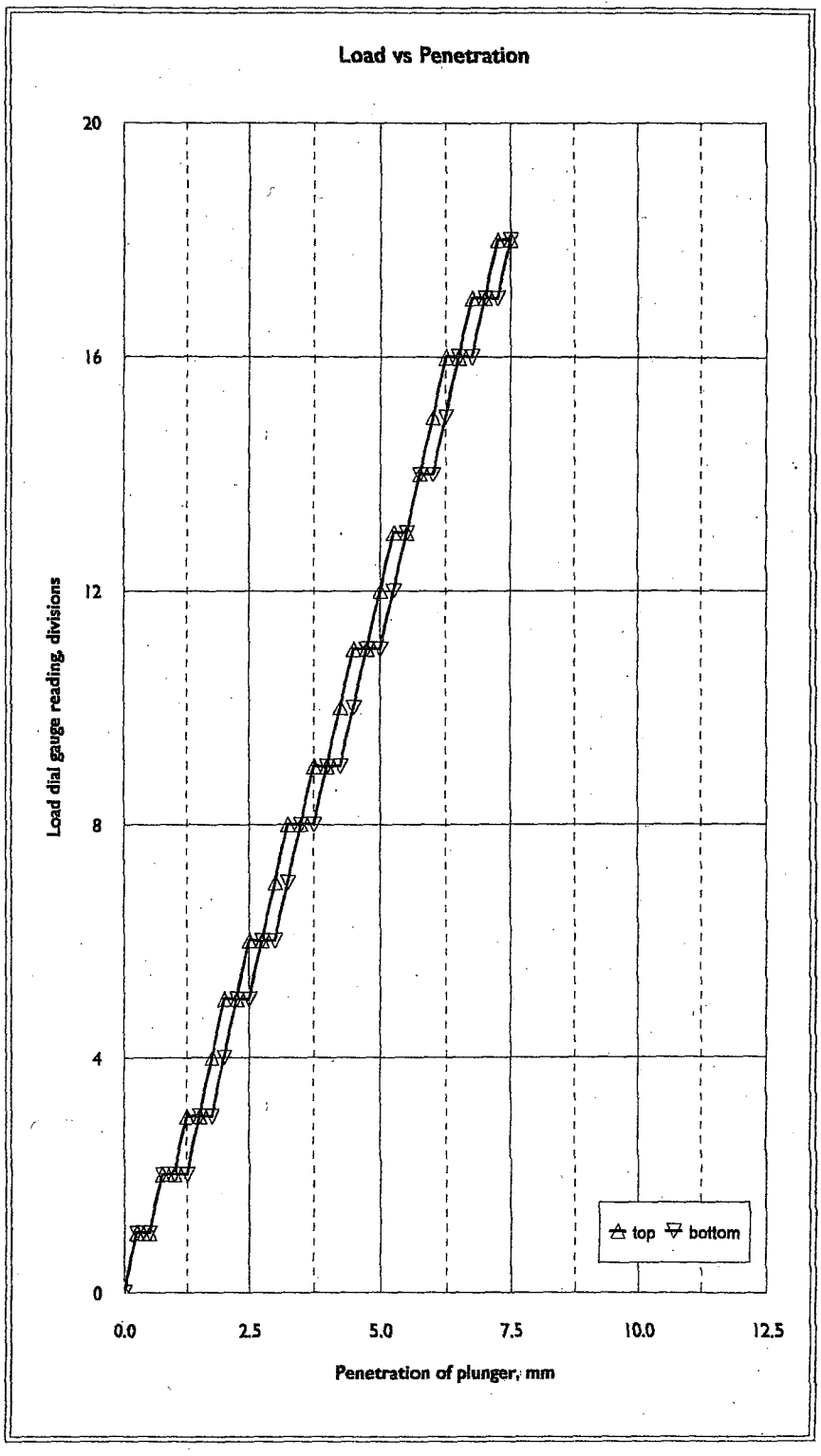
Project No: 2681
Sheet No: 2/2

Loc'n	Sample	Depth (m)
TP5	B1	1.0

Description
Yellow very sandy SILT

Sample Preparation	
In situ	
Undisturbed	
Remoulded	
Recompacted	2.5kg
	4.5kg

Penetration	Load Dial Gauge, div	
mm	top	bottom
0.00	0	0
0.25	1	1
0.50	1	1
0.75	2	2
1.00	2	2
1.25	3	2
1.50	3	3
1.75	4	3
2.00	5	4
2.25	5	5
2.50	6	5
2.75	6	6
3.00	7	6
3.25	8	7
3.50	8	8
3.75	9	8
4.00	9	9
4.25	10	9
4.50	11	10
4.75	11	11
5.00	12	11
5.25	13	12
5.50	13	13
5.75	14	14
6.00	15	14
6.25	16	15
6.50	16	16
6.75	17	16
7.00	17	17
7.25	18	17
7.50	18	18
Surcharge, kg		4.0
Seating Load, N		
Proving Ring Factor, N/div		25.61



CBR at 2.5mm = (Dial reading x ring factor)/132.4
CBR at 5.0mm = (Dial reading x ring factor)/199.6

Moisture	Density, Mg/m³		% retained
Cont. %	Bulk	Dry	at 20mm
15	2.05	1.79	0

C B R %	Penet'n	Top	Bottom
	2.5mm	1.2	1.0
	5.0mm	1.5	1.4

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CONTAMINANTS IN SOIL

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Abbeycare Investments Ltd
Agent: DWA Architects

Project No: 2681
Sheet No: 1/1

Location	Sample	Depth m	Arsenic	Cadmium	Chromium	Lead	Mercury	Selenium	Copper	Nickel	Zinc	Barium	Beryllium	Vanadium	TPH by GCMS unspeciated	Cyanide free	pH	Sulphate (SO4) total	Sulphate (SO4) sol. g/l	PAH by GCMS unspeciated	
BH2		2.50	<10	<0.5	<2	<5	<0.3	<0.5	<2	<5	13	<10	<0.5	<5	<10	<5	8.9	650		<0.05	
BH4		0.50	<10	<0.5	27	19	<0.3	<0.5	14	16	55	44	0.71	42	<10	<5	8.5	250			
TP1		0.50	<10	<0.5	5	19	<0.3	<0.5	10	7	21	21	<0.5	6	<10	<5				3.3	
		2.50	13	<0.5	20	460	1.2	<0.5	42	16	80	90	1	38	45	<5	8.2	600			
TP2		1.60	<10	<0.5	3	7	<0.3	<0.5	4	<5	13	12	<0.5	<5	<10	<5				1.5	
		2.40	<10	<0.5	24	22	<0.3	<0.5	11	11	39	49	0.73	40	<10	<5	8.4	<200			
TP3		0.50	<10	<0.5	4	16	<0.3	<0.5	35	6	24	20	<0.5	<5	94	<5				10	
TP5		0.30	12	<0.5	26	47	<0.3	<0.5	14	17	59	63	0.97	42	24	<5	8.2	<200		0.91	
		1.00	<10	<0.5	19	22	<0.3	<0.5	8	10	48	34	0.62	32	<10	<5	7.9	<200		<0.05	
CLEA trigger			20	1 - 8*	130	450	8	35		50											

CLEA trigger applicable to residential land use with plant uptake

* cadmium trigger is pH dependent (1, 2 or 8 mg/kg at pH = 6, 7 or 8 respectively)

All units are mg/kg dry weight of soil unless otherwise stated, except for pH which is dimensionless

Exceptions denoted thus: XX

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CONTAMINANTS IN SOIL

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Abbeycare Investments Ltd
Agent: DWA Architects

Project No: 2681
Sheet No: 1/1

Speciated Polyaromatic Hydrocarbons																		
Location	BH4	TP1	TP2	TP3	TP4													
Sample																		
Depth, m	0.50	2.50	2.40	0.30	1.00													
Determinand	Concentration, mg/kg																	
PAH																		
napthalene	<0.05	0.1	<0.05	<0.05	<0.05													
acenapthylene	<0.05	<0.05	<0.05	<0.05	<0.05													
acenapthene	<0.05	0.35	<0.05	<0.05	<0.05													
fluorene	<0.05	0.38	<0.05	<0.05	<0.05													
phenanthrene	<0.05	5.1	<0.05	0.09	<0.05													
anthracene	<0.05	0.75	<0.05	<0.05	<0.05													
fluoranthene	<0.05	6.1	0.06	0.14	<0.05													
pyrene	<0.05	4.5	<0.05	0.14	<0.05													
benzo(a)anthracene	<0.05	2.3	<0.05	0.10	<0.05													
chrysene	<0.05	2.0	<0.05	0.05	<0.05													
benzo(b)fluoranthene	<0.05	2.0	<0.05	0.10	<0.05													
benzo(k)fluoranthene	<0.05	0.67	<0.05	<0.05	<0.05													
benzo(a)pyrene	<0.05	1.3	<0.05	0.09	<0.05													
indeno(123-cd)pyrene	<0.05	0.82	<0.05	<0.05	<0.05													
dibenzo(ah)anthracene	<0.05	0.32	<0.05	<0.05	<0.05													
benzo(ghi)perylene	<0.05	1.1	<0.05	0.07	<0.05													
Total PAH	<0.05	28	0.06	0.78	<0.05													

Notes
1. Total PAH = Sum of 16 identified components
2. The results are expressed as mg/kg dry weight soil after correction for moisture content

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CONTAMINANTS IN SOIL

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Abbeycare Investments Ltd
Agent: DWA Architects

Project No : 2681
Sheet No : 1/1

Location	Sample	Depth	Asbestos identification		
		m	Description of matrix	Overall percentage of asbestos identified (approx.)	Type of asbestos identified
BH2		2.50	Soil	<0.001	
TP1		0.50	Soil	<0.001	
TP3		0.50	Soil	<0.001	
TP5		0.30	Soil	<0.001	

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CONTAMINANTS IN WATER

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Abbeycare Investments Ltd
Agent: DWA Architects

Project No: 2681
Sheet No: 1/1
Sampled on: 29/11/05

Location	Sample	Depth m	Arsenic	Cadmium	Chromium	Lead	Mercury	Copper	Nickel	Zinc	Barium	Beryllium	Vanadium	Cyanide free	Cyanide complex	Nitrate	pH	Sulphate (SO_4)	TPH total	Sulphur elemental	Acetone
BH4	s/pipe		<10	<5	<10	<5	<0.1	<10	<10	<10	21	<5	65	<30			7.4	110000	<10		

All units are µg/l unless otherwise stated, except for pH which is dimensionless.

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CONTAMINANTS IN WATER

Project: OLD SHOREHAM ROAD, SHOREHAM BY SEA, SUSSEX
Client: Abbeycare Investments Ltd
Agent: DWA Architects

Project No: 2681
Sheet No: 1/1
Sampled on: 29/11/05

Speciated Polyaromatic Hydrocarbons by GC/MS														
Location	BH4													
Sample	s/pipe													
Depth, m														
Determinand	Concentration µg/l													
PAH														
Napthalene	<0.05													
Acenapthylene	<0.05													
Acenapthene	<0.05													
Fluorene	<0.05													
Phenanthrene	<0.05													
Anthracene	<0.05													
Fluoranthene	<0.05													
Pyrene	<0.05													
Benzo(a)anthracene	<0.05													
Chrysene	<0.05													
Benzo(b)fluoranthene	<0.05													
Benzo(k)fluoranthene	<0.05													
Benzo(a)pyrene	<0.05													
Indeno(123-cd)pyrene	<0.05													
Dibenzo(ah)anthracene	<0.05													
Benzo(ghi)perylene	<0.05													
Total PAH	<0.05													

Notes
1. Total PAH = Sum of 16 identified components

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APPENDIX D

FIGURES

Old Shoreham Road,
Shoreham by Sea, Sussex

Borehole and trial pit location plan

Scale approx. 1/500

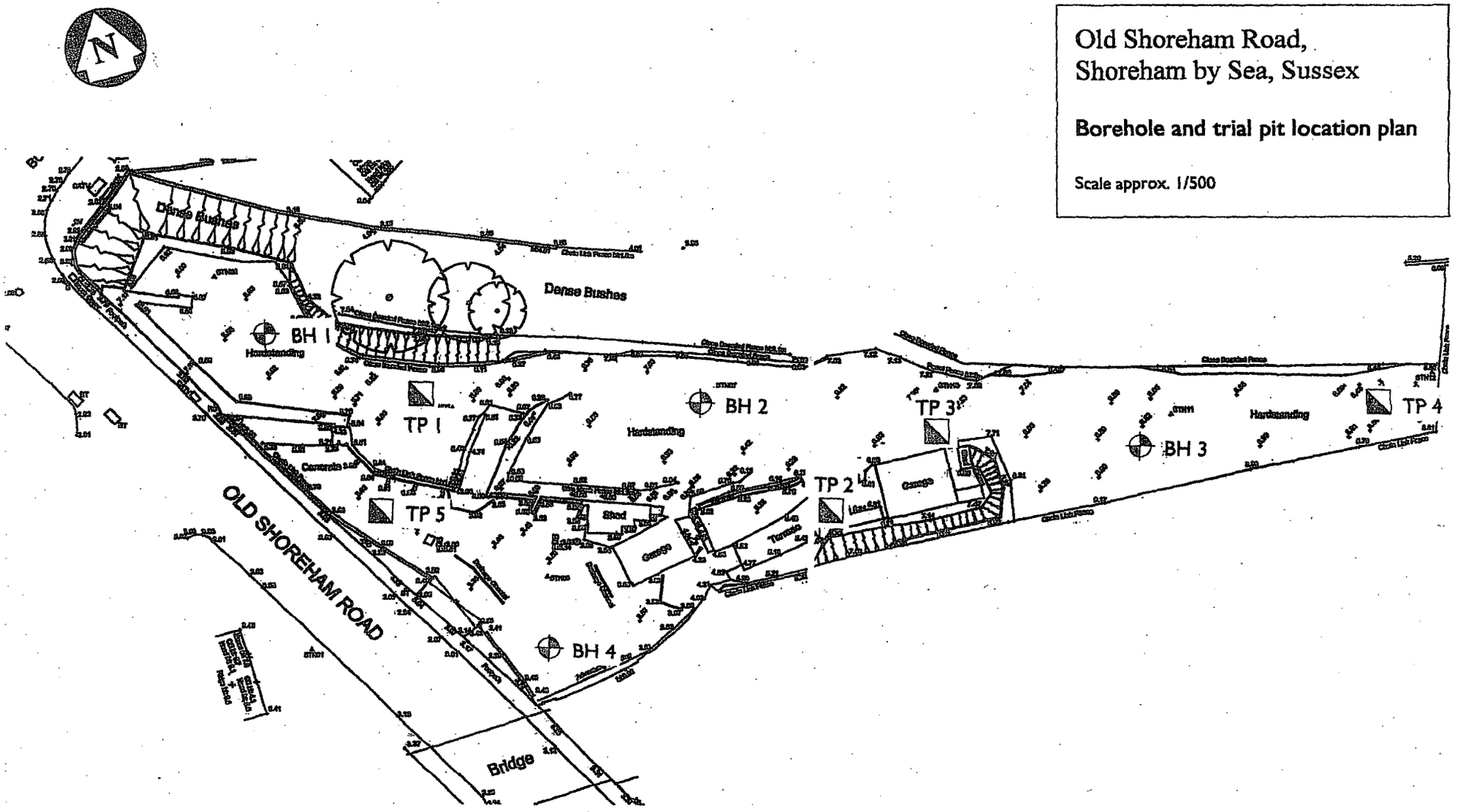

Figure 1

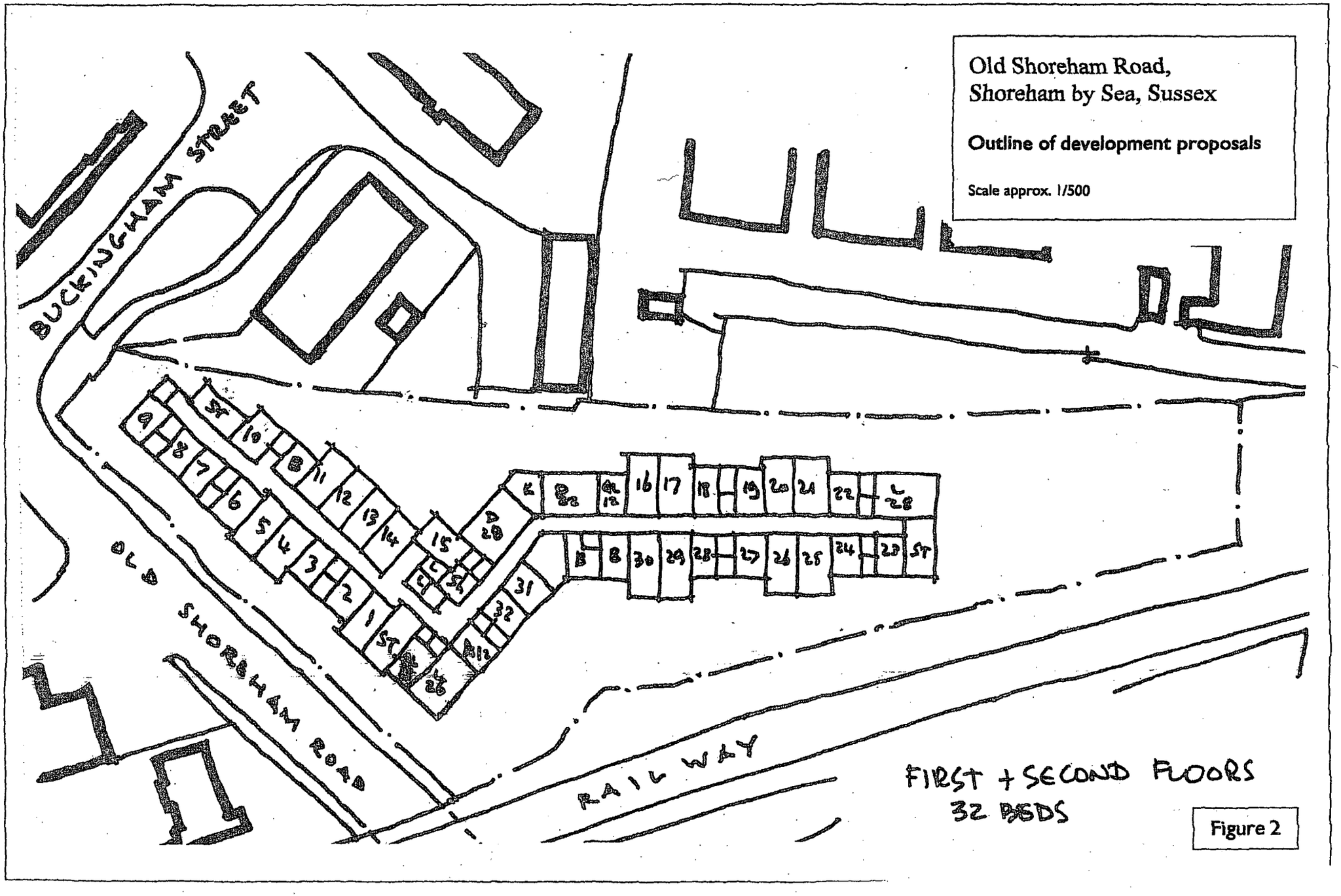
Old Shoreham Road,
Shoreham by Sea, Sussex
Outline of development proposals
Scale approx. 1/500
BUCKINGHAM STREET
OLD SHOREHAM ROAD
RAILWAY
FIRST + SECOND FLOORS
32 BEDS

Figure 2

SPT PROFILE

Old Shoreham Road, Shoreham by Sea

Natural Chalk

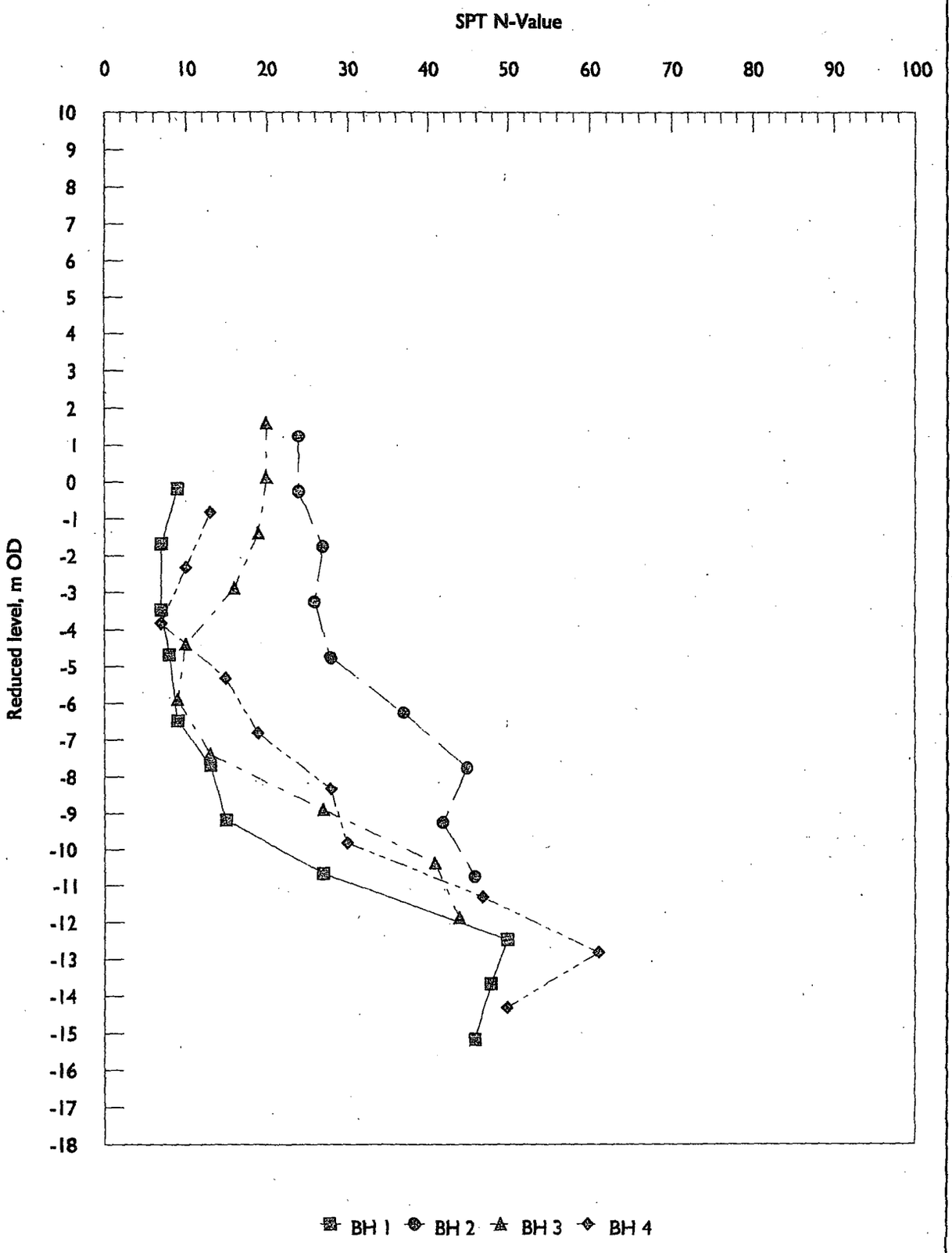

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Figure 3

PROPOSED REDEVELOPMENT
12 – 18 OLD SHOREHAM ROAD
SHOREHAM – BY - SEA
ACCESS ARRANGEMENTS

STAGE 1 SAFETY AUDIT

APRIL 2007

...DISTRICT COUNCIL
PLANNING DIVISION
PLAN No. A06032d07
DATE RECEIVED 20 JUN 2007

PROPOSED REDEVELOPMENT
12 – 18 OLD SHOREHAM ROAD
SHOREHAM – BY - SEA
ACCESS ARRANGEMENTS

STAGE 1 SAFETY AUDIT

APRIL 2007

Project Code:	DWASHOREHAM
Prepared by:	JOHN REID
Position:	Technical Director
Approved by:	JFR/BSL/AP
Issue Date:	27th April 2007
Status:	FINAL

Mayer Brown Limited Lion House Oriental Road Woking Surrey GU22 8AP
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12- 18 OLD SHOREHAM ROAD
SHOREHAM – BY - SEA

Contents

1.0	Introduction
2.0	Qualifications And Experience Of The Report Writers
3.0	Matters Arising From This Audit
4.0	Audit Team Statement

12- 18 OLD SHOREHAM ROAD
SHOREHAM – BY - SEA

List of Figures

Figure 1.0 Site Location Plan

Figure 2.0 Reference Plan

List of Appendices

Appendix A CV for J F Reid

1.0 INTRODUCTION

1.1 This report results from a stage 1 Road Safety Audit carried out on Friday 20th April 2007.

1.2 A site location plan is appended to this report as Figure 1.

1.3 The inspection was carried out on Thursday 19th April 2007 from - 14.00hrs. onwards.

1.4 The weather was fine and dry.

1.5 Traffic conditions were light to moderate.

1.6 The audit was carried out on the instructions of DWA Architects.

1.7 The terms of reference of the audit are as set out in the Department for Transport document HD 19/03. Where appropriate cognisance has also been taken of guidelines for reducing mobility handicaps and the Manual for Streets. The writers have examined and reported only on road safety implications of the scheme as presented and have not examined or identified the compliance of the design to any other criteria.

1.8 The audit is concerned only with the highways that are adopted by the Highway Authority.

1.9 The proposals are to redevelop an existing car sales yard to provide some twenty four residential units.

1.10 The proposals which are the subject of this audit are shown on the following drawings.

- DWA Job No. L3094 Drawing AL(9)900 — Existing use.
- DWA Job No. L3094 Drawing AL(9)901 Revision B — Proposed layout

1.11 For ease of reference, a reduced scale extract of the above mentioned drawing AL(9)901 is appended to this report.

1.12 Whilst recommendations have been made within this report, there may be equally satisfactory alternatives.

1.13 The auditors will be pleased to consider alternatives if required.

2.0 QUALIFICATIONS AND EXPERIENCE OF THE REPORT WRITERS

2.1 This Audit has been carried out by the following:

J F REID MSc., Dip.H.T.E, MIHT,MITAI – Team Leader
Technical Director (Safety)
Mayer Brown Limited.

B SMITH-LAING M Eng MIHT
Principal Consultant
Mayer Brown Limited

A PLANT
Senior Consultant
Mayer Brown Limited

A summary of the Team Leader's qualifications is appended to this report

3.0 MATTERS ARISING FROM THIS AUDIT

Limit of Adoption.

3.1 The limit of adoption is not indicated, however for the purposes of this audit it is assumed to be the point at which the access is gated.

Departures from Standards

3.2 The Writers are not notified of any departures from standards.

Service Provision.

3.3 Problem. New service provision will be required for the proposed development.

3.4 Recommendation. Ensure that any inspection chambers or manholes are located;

i) Where attendant vehicles and personnel will not create a hazard for themselves or other road users.
ii) Where they will not be traversed by two-wheeled vehicles during turning manoeuvres.
iii) Ensure lighting provision is to current design standards

New / Existing Road Interface

3.5 Problem. The access as proposed is in the form of a priority controlled road junction. Given the scale of development to be served such a facility will cause an unnecessary disruption to pedestrian movements along Old Shoreham Road and will not be conducive to low entry speeds for vehicles entering the development.

3.6 Recommendation.

i) If the proposed access is to be implemented, dropped kerbs and tactile paving should be provided on each side of it.
ii) Alternatively and preferably, provide the access as a footway crossing.

3.7 Problem. The access is to be gated. It will be important that a car is able to wait at the gates without the rear of the vehicle obstructing the Old Shoreham Road footway and causing pedestrians to step into the carriageway.

3.8 Recommendation. Ensure that there is sufficient room for a car to wait without encroaching on the Old Shoreham Road footway or carriageway.

3.9 Problem. Landscape planting is shown to be provided which encroaches within the area of the visibility splays.

3.10 Recommendation. Ensure that any landscaping which could obstruct the visibility of pedestrians or drivers will not exceed a height of 0.6m when mature and / or is clear stemmed with a leaf canopy which will not obstruct visibility.

3.11 Problem. No drainage arrangements are shown on the plans submitted at this stage.

3.12 Recommendation. Ensure that the roadway and footways are adequately drained and that surface water will not drain from the development onto the public highway.

3.13 Problem. It is apparent that the new building is to span over the vehicular access.

3.14 Recommendation. Ensure that sufficient clearance is provided for vehicles which may require access including emergency services.

Non – Motorised Provision

3.15 Problem. A telegraph pole is shown to be retained within the footway on the northern side of the access road.

3.16 Recommendation. Ensure that there is adequate footway width to allow a wheelchair to pass any such obstruction within the footway.

3.17 Problem. A gate is to be provided on the footway access.

3.18 Recommendation. Ensure that there is sufficient width and appropriate gradient to permit wheelchair access, and ensure continuity of wheelchair access to all new properties within the development.

4.0 Audit Team Statement

We certify that we have examined the drawings and documents listed in this report. The examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified in order to improve the safety of the scheme. The problems identified have been notified in this report together with associated safety improvement suggestions, which we recommend should be considered for implementation. The writers have not been involved with the scheme design.

Signed ..... J F Reid (Audit Team Leader)

Date 27th April 2007

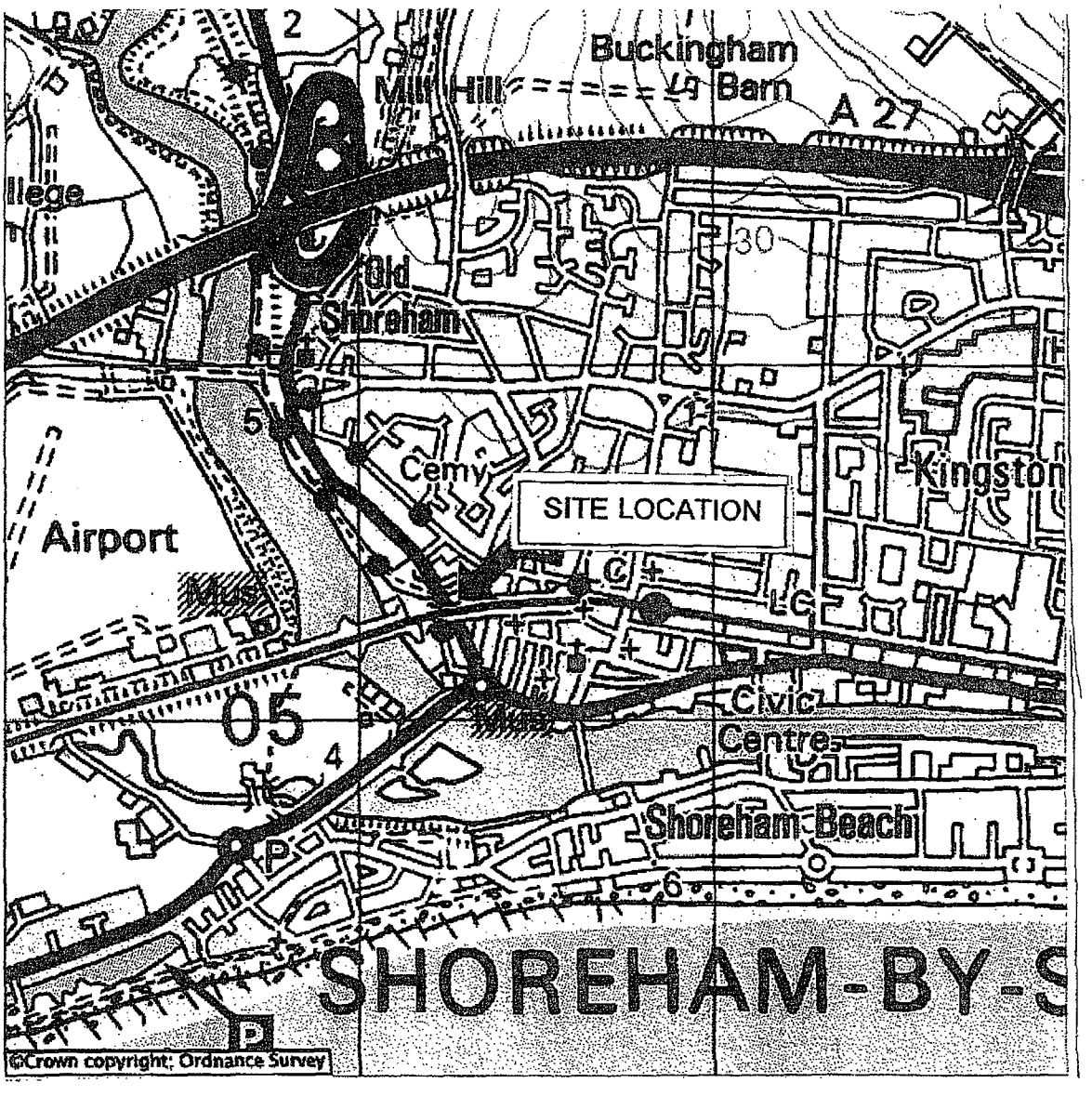
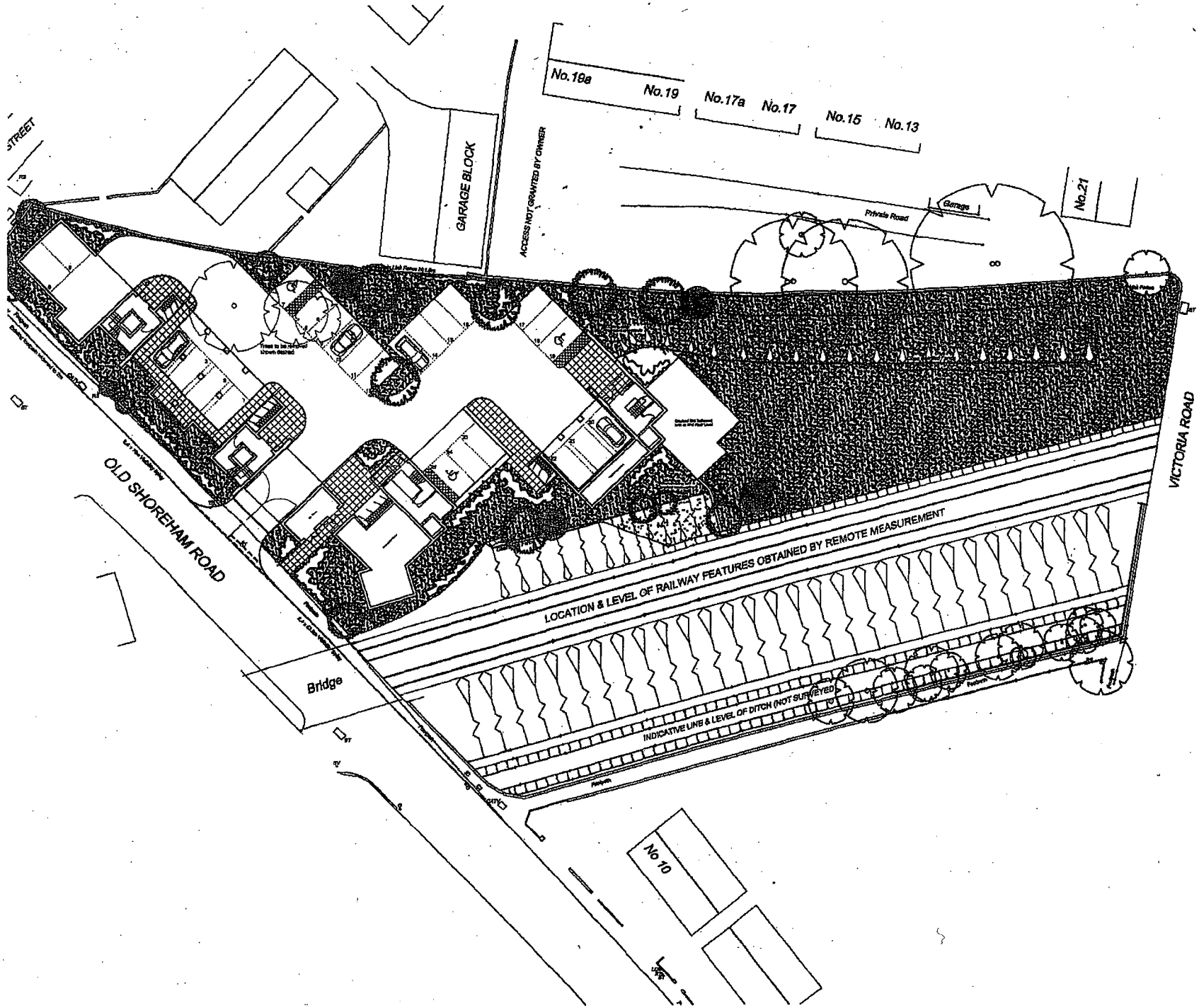

Buckingham
Mill Hill
Barn
A 27
Old
Shoreham
Cemy
SITE LOCATION
Kingston
Airport
Civic
Centre
Shoreham Beach
SHOREHAM-BY-S
©Crown copyright; Ordnance Survey

FIGURE 1



Notes

Do not scale, use figured dimensions only.

All dimensions to be verified on site prior to the commencement of any work, or the production of any shop drawing. All discrepancies to be reported to this Architect.

This drawing is to be read in conjunction with all related Architects and Engineers drawings and any other relevant information.

This drawing is copyright © of DWA Architects Ltd.

Drawing Issues

	Date	Description	Drn
A	03/01/2007	Parking layout updated to accommodate comments made to the Building Inspector	BG
B	05/02/2007	Parking space southern end of block A relocated to accommodate turning space	BG

DWA ARCHITECTS

DWA

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[illegible]

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01903 [illegible]

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01903 [illegible]

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Website
[illegible]

Client
Abbeycare Investments Ltd

Project
Proposed Residential Dev.
12-18 Old Shoreham Road
Shoreham-By-Sea

Drawing Title
Site Plan
As Proposed

Scale	Date
1:200 @ A1	05/02/2007
Drawn by: BGC	Checked by:

Job No.	Drawing No.	Rev.
L3049	AL(9)901	B

APPENDIX A

CV for J F Reid

JOHN REID **TECHNICAL DIRECTOR**

EDUCATION AND QUALIFICATIONS

MSc	Master of Science in Road Safety Engineering
Dip.HTE	Post Graduate Diploma in Highways and Traffic Engineering
HNC	Higher National Certificate in Civil Engineering
MIHT	Member of the Institution of Highways and Transportation
MITAI	Member of the Institute of Traffic Accident Investigators
MAPS	Member of the Association of Planning Supervisors

Registered with The Law Society as an approved Expert Witness

EXPERIENCE

General. John has some thirty years experience in the fields of road accident investigation and remedial engineering.
The research dissertation for his Masters Degree involved the analysis of road accident data in relation to Highway Design characteristics.
He has acted as Team Leader for the preparation of some 1200 Safety Audit reports.
As an Expert Witness he has prepared some 500 accident investigation reports submitted as evidence in criminal trials and civil litigation.

He has attended numerous events providing CPD in the fields of safety audit and accident investigation. Including:-

- ROSPA Accident Remedial Engineering Course
- Advanced Safety Auditing – 3 day course/seminar
- International Conference on Safety Auditing
- International Conference on Vehicular Speed Management

November 2004 to present

MAYER BROWN LTD - Technical Director.
Head of Road Safety Team.
Responsible for the preparation of independent
Safety Audit reports for this practice and numerous other consultancies.
Responsible for the preparation of accident investigation reports and the presentation of oral evidence as Expert Witness.

Expert Defence witness on behalf of Local Highway Authorities.

August 1994 – November 2004

DENIS WILSON PARTNERSHIP - Associate Director
Responsible for the preparation of independent Safety Audit Reports and Accident Reconstruction reports.

The Audit Reports were prepared in accordance with Highways Agency guidelines (HD19/03).

Audit reports for Stage 1, Stage 2 and Stage 3 audits which have been submitted to more than 40 Highway Authorities throughout the UK and Ireland.

Liaised as required with the respective Local Authority officers and carried out numerous Stage 3 Audits in the company of Local Authority officers to maintain an awareness of current practices in relation to accident prevention and remedial measures.

Retained as Defence Expert on behalf of a number of Highway Authorities defending claims in relation to their procedures and practices concerning accident analysis, the implementation of remedial measures and the conduct of safety audits.

Prepared Audit Reports on the instructions of:

- Various Design Offices within the Denis Wilson Partnership
- Numerous other Design Consultancies in the UK and the Republic of Ireland
- Local Highway Authorities

Analysis of accident data to identify patterns of causative factors to be addressed during the preparation of schemes to modify existing highway layouts.

Instructed on numerous occasions by the legal profession to prepare accident reconstruction reports to be used in evidence at both civil and criminal trials.

As an expert Witness, presented oral evidence, at all levels of civil and criminal Courts.

1991- 1994

KENNEDY AND DONKIN TRANSPORTATION - Principal Engineer.

Responsible for the conduct of all the company's accident reconstruction reports. Also responsible for the Safety Audits of major trunk road schemes designed by other Consultancies. Preparation of reports on road/railway crossing accidents in the UK and the Irish Republic.

Accident analysis and the design of numerous accident remedial schemes for Local Authorities.

Responsible for the safety aspects of the design of the on-street running facilities for a proposed new tramway in Manchester.

Co-ordination of Emergency Services requirements for a proposed 800m long tunnel on London's North Circular Road.

1974 -1991

NORFOLK COUNTY COUNCIL - Accident Studies Officer.

Responsible for the analysis of police accident records to identify accident cluster sites. Responsible for the identification of dominant accident factors. Design and implementation of cost effective accident remedial measures. Presentation of evidence at Coroners Court in relation to highway design and maintenance aspects of fatal accidents.

Presentation of Evidence on behalf of Highways Department in High Court action against the Local Authority.

Day to day liaison with the Norfolk Constabulary Traffic Department.

Regular contributor to Norfolk Constabulary Accident Investigation courses, presenting the role of highway engineering in accident investigation and prevention.

Investigation and treatment of safety hazards identified by Police Traffic Patrol Officers.

Responsible for establishing a system of safety auditing. Conduct of over 200 Safety Audits.

Co-founder of the Eastern Regional Group for the exchange of information on best practice and innovative accident remedial engineering measures.

Norfolk Highways Department's representative, together with Senior Police Officers on the Eastern region working party co-ordinating policy and resources towards national accident reduction target.

1961 -1974

A variety of posts of increasing responsibility within local Authorities concerned with the planning, design and construction of a wide variety of road traffic related projects.

ADUR DISTRICT COUNCIL
PLANNING DIVISION
PLAN No. A/0637/07
DATE RECEIVED 20 JUN 2007

PROPOSED RESIDENTIAL DEVELOPMENT 12 - 18 OLD SHOREHAM ROAD, SHOREHAM-BY-SEA

TRANSPORT STATEMENT

MAY 2007

PROPOSED RESIDENTIAL DEVELOPMENT
12 - 18 OLD SHOREHAM ROAD, SHOREHAM-BY-SEA

TRANSPORT STATEMENT

MAY 2007

Project Code:	**DWAShoreham2.1**
Prepared by:	**SS**
Approved by:	**MU**
Issue Date:	**May 2007**
Status:	**DRAFT**

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Proposed Residential Development
12 - 18 Old Shoreham Road,
Shoreham-by-Sea
Transport Statement

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12 - 18 Old Shoreham Road,
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1. INTRODUCTION

1.1 Mayer Brown has been instructed by DWA Architects Limited to prepare a Transport Statement in respect of a planning application for the proposed redevelopment of a car sales site at Old Shoreham Road, Shoreham-by-Sea. The purpose of this report is to consider the highways and transport aspects of the proposal.

1.2 The remainder of this section sets out the site location and development proposals, while Section 2 considers the relevant planning policy guidance. Section 3 contains details of the accessibility of the site by modes of transport other than the private car while Section 4 assesses the impact of the proposals on the operation of the adjacent highway network. Finally, a summary and our conclusions are contained in Section 5.

Site Location

1.3 The site is located approximately 500m to the north west of the A259 High Street, immediately adjacent the railway, as illustrated in Figure 1.1 below.

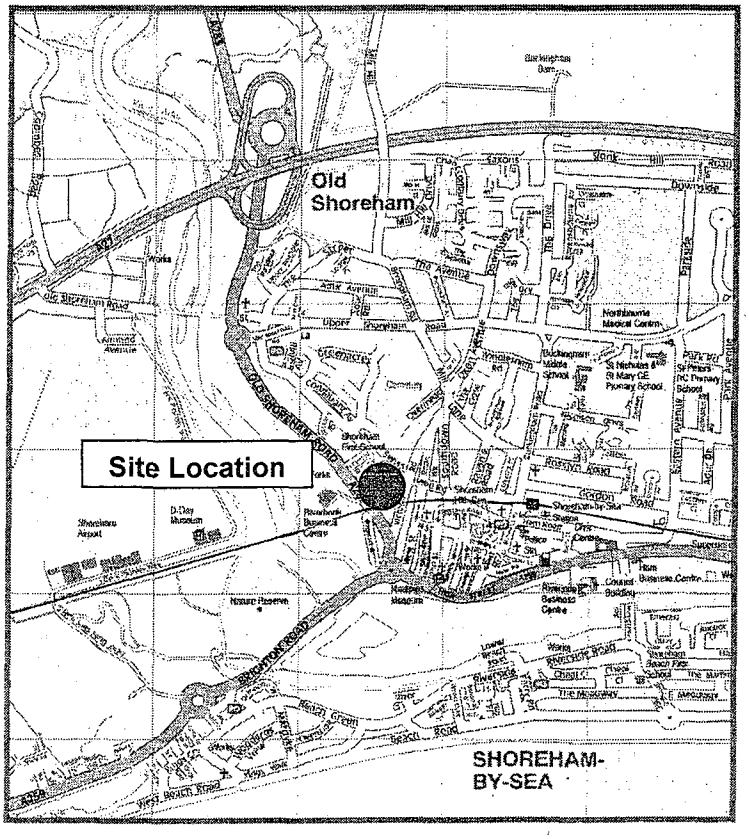

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Figure 1.1: Site in Relation to Local Highway Network

1.4 The A283 Old Shoreham Road heads south to join the A259, which in turn heads west to Worthing and east to Hove. The A283 runs north to join the A27 Chichester to Eastbourne road. Thus, the site has good connections to the local, primary and trunk road networks as illustrated in Figure 2.2 below.

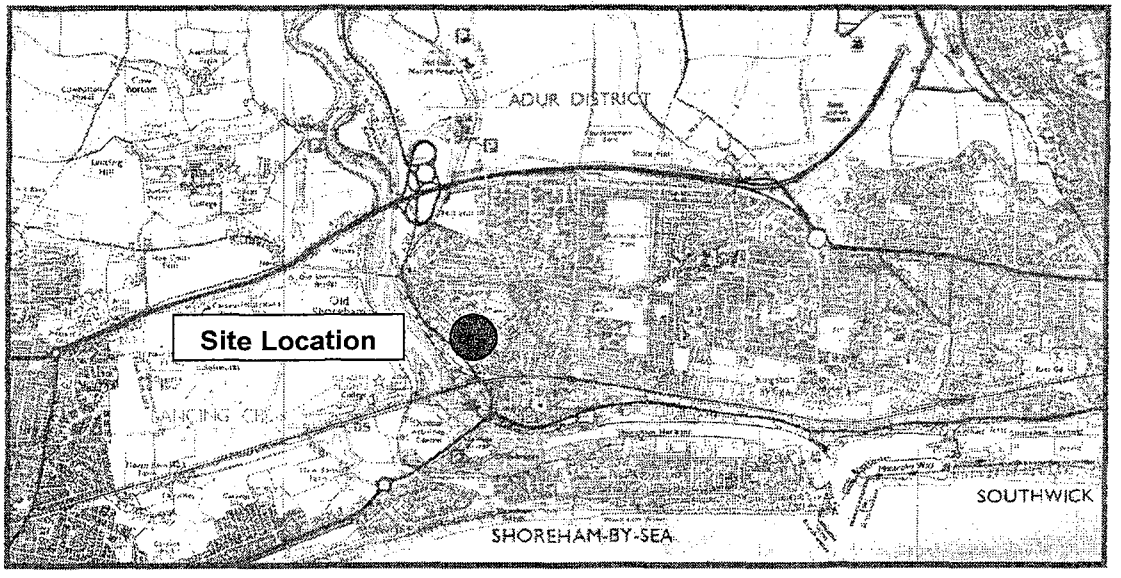

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Figure 2.2: Site in Relation to the Regional Highway Network

1.5 The site lies at the foot of a railway embankment, which is currently occupied by a car storage and car cleaning service area, as part of the car showroom opposite. The south eastern section of the site is occupied by garages. Access to the site is gained from Old Shoreham Road via an entrance along the south west site boundary.

Development Proposals

1.6 The proposed redevelopment involves the demolition of all existing buildings on the site and the construction of 25 residential apartments and associated parking. The development will comprise 7 one-bed apartments and 18 two-bed apartments. The architects' proposed site layout drawing is contained at Appendix A to this report.

1.7 In conjunction with the redevelopment the footway along Old Shoreham Road will be widened to 2.0m across the whole site frontage, involving the demolition of the existing brick wall.

1.8 Following the redevelopment access to the residential units will continue to be from the Old Shoreham Road.

1.9 It is proposed that 25 parking spaces will be provided on the site, which will include three spaces dedicated for people with disabilities. Provision for the parking of 30 bicycles will be provided on site.

2. PLANNING POLICY

National Policy

2.1 Central Government has provided specific guidelines on both the policies and operation of the planning system, with respect to transportation policy for new development.

2.2 Planning Policy Guidance (PPG) Note 13, entitled 'Transport' provides objectives to local authorities when considering planning applications. It sets out policies that seek to promote developments that minimise CO_2 and other polluting emissions.

2.3 The three objectives of PPG13, as set out in paragraph 4, are to:

- *"promote more sustainable transport choices for both people and for moving freight;*
- *promote accessibility to jobs, shopping, leisure and services by public transport, walking and cycling; and*
- *reduce the need to travel, especially by car."*

2.4 In order to deliver the objectives above PPG13 also states that housing should be accommodated principally within existing urban areas and *"at locations which are highly accessible by public transport, walking and cycling"* (paragraph 6.3).

2.5 PPG13 also states that in considering sites for housing development local planning authorities should *"consider their location and accessibility to jobs, shops and services by modes other than the car, and the potential for improving such accessibility"* (paragraph 14).

2.6 In terms of parking provision at new developments, PPG13 states that local authorities should *"use parking policies, alongside other planning and transport measures, to promote sustainable transport choices"* (paragraph 6.7).

2.7 Planning Policy Statement (PPS) 3, entitled 'Housing,' which replaces PPG3, sets out the national planning policy framework for delivering the Government's housing objectives. With reference to parking provision at paragraph 16 the document states a design-led approach should be taken and provision should be well-integrated with streets that are pedestrian, cycle and vehicle friendly.

2.8 Paragraph 36 states that suitable locations for housing development should be identified, including through making effective use of land and prioritising previously developed land for new development. In identifying suitable locations for housing,

PPS3 also promotes accessibility and refers to the need to locate development where there are good public transport facilities and/or travel means other than the private car (paragraph 36).

2.9 On the basis of the above it is therefore considered that the proposed development accords with the objectives and policies set out in the regional planning guidance.

Regional Policy

2.10 West Sussex County Council adopted their Structure Plan in October 2004. It provides a framework for decisions on the planning of land use and transport in the county and covers the period 2001 to 2016.

2.11 With reference to transport, policy NE13 states that proposals for development should be permitted provided that, where possible, they *"widen travel choice and promote walking, cycling and passenger transport"* and *"promote access to facilities and services for all."* In addition, the policy emphasises the importance of road and personal safety for the travelling public, the integration of different transport modes and the reduction in traffic growth, pollution and congestion. The widening of the footway to 2.0m in width along the site frontage will encourage walking to and from the site through increasing safety for pedestrians.

Local Policy

2.12 Adur District Council has prepared a Development Plan which replaces their 1996 Local Plan. The Submission Core Strategy document was approved by the Council in January 2007 and sets out policies and proposals for the development and use of land in the district.

2.13 The three strategic objectives of the Core Strategy are:

- *"To secure the economic and social regeneration of Adur;*
- *"To meet the social and economic needs of the community and ensuring that new facilities are in accessible and sustainable locations;*
- *"To ensure that Adur's unique environmental features are protected and enhanced."*

2.14 Policy T1 of the plan encourages the provision of sustainable transport and walking and cycling facilities in order to promote travel by these means. Paragraph 13.7 states *"it is important to reduce the reliance on the car to access town centres and to encourage alternatives such as walking or cycling."*

2.15 In relation to new developments, paragraph 13.15 states that *"a range of sustainable transport measures will be required from developers to reduce car dependence."* In addition, paragraph 13.17 states that *"in order to minimise the effects that new developments can have they should be in central locations or areas well served by public transport."* This approach is established in policy T3 which states that new development will be expected to make efficient use of land and to locate close to public transport.

2.16 Policy T4 sets out the Council's strategy on parking, and with reference to private parking states:

"The provision of private car parking for new development will be assessed taking into account the need to discourage unnecessary car use and to promote the provision and use of sustainable transport. Account will also be taken of the type of development and its location to ensure the economic viability of the development and minimise the environmental impact."

2.17 The Adur District Local Plan was adopted in 1996 and covers the period until 2006, hence it is now in the process of being replaced. However, policies in the Local Plan should still be referred to and as stated in The Adur Development Plan Local Development Scheme 2007 – 2010 certain policies are to be saved beyond September 2007.

2.18 Part 8 of the Local Plan refers to policies and guidance on transport issues for the district with the aim being:

"To meet the transport needs of all of the district's residents, to promote modes of transport for local movements as alternatives to use of the private car, to recognise the needs of those travelling through the district, and to promote improvement to traffic flow and safety where this is consistent with improvements to the district's environment."

2.19 The Local Development Scheme states that policy AT12 is proposed to be saved beyond September 2007. The policy relates to the development and use of land and requires that it should be located, designed and carried out to ensure it:

- has *"safe, adequate access to the main road network;"*
- caters *"safely and adequately for any vehicular traffic it would generate;"*
- does not *"reduce safety or worsen traffic conditions"* or incorporates remedial measures;
- is *"accessible by public transport;"*

- has *"safe and adequate access for pedestrians, cyclists and people with disabilities;"* and
- includes provision for parking in accordance with the Council's adopted standards.

2.20 On the basis of the above it is therefore considered that the proposed development accords with the objectives and policies set out in the local planning guidance.

2.21 **Parking**

2.22 West Sussex County Council adopted their Supplementary Planning Guidance (SPG) 'Revised County Parking Standards and Transport Contributions Methodology' in November 2003. Adur District Council now refer to the County Council's SPG as their own parking standards document has been superseded.

2.23 For residential dwellings the maximum parking standards are as follows:

- one bed dwellings – one space per dwelling
- two and three bed dwellings – two spaces per dwelling
- four bed dwellings – three spaces per dwelling

2.24 Applying these standards to the proposed development of 25 apartments gives a maximum of 43 parking spaces that could be provided on site. It is proposed that 25 parking spaces will be provided on site, which therefore accords with the Council's standards.

2.25 West Sussex County Council's SPG on parking also sets out standards for cycle parking. For one-bed dwellings a minimum of one cycle space plus one space per eight dwellings for visitors should be provided, while for two or more bed dwellings a minimum of two cycle spaces plus one space per eight dwellings for visitors should be provided. In addition the document states that all cycle parking must be sheltered. The proposed development will provide cycle parking.

2.26 The proposed residential development accords with the County Council's standard that at least one space or 5% of the total car parking provision should be allocated as disabled parking.

3. ACCESSIBILITY

3.1 It is important to demonstrate that the proposed development complies with governmental guidance in terms of facilitating a choice of travel modes and hence reducing reliance on the private car.

3.2 The proposed redevelopment site is located close to the town centre and potential therefore exists for trips to and from the site by sustainable modes of transport. This section considers the accessibility of the site on foot, by bicycle and by public transport.

Accessibility on Foot

3.3 All roads within the vicinity of the site have footways of at least 1.0m in width and street lighting is provided on both sides. A signalised pedestrian crossing is provided approximately 200m to the south of the site, allowing pedestrians to walk to and from the town centre and adjacent residential areas.

3.4 In addition it is proposed that the footway along the site frontage on Old Shoreham Road be widened to 2.0m in order to increase pedestrian safety and encourage walking trips to and from the site.

Accessibility by Bicycle

3.5 The site is located approximately 100m north of a traffic-free cycle path which links Old Shoreham Road with Victoria Road to the east. Priority to cyclists is also given at the pedestrian crossing located approximately 200m to the south of the site.

3.6 There are also cycle routes leading from Shoreham-by-Sea station to the north, east and west of the town. These are all accessible from the site, including that along Connaught Avenue, which is located to the east of the site and runs parallel to Old Shoreham Road.

Accessibility by Bus

3.7 There are currently five bus services that pass the site along Old Shoreham Road and bus stops are located on both the northbound and southbound sides of the road. The southbound bus stop is located approximately 100m to the north of the site while the northbound bus stop is located approximately 200m to the north of the site.

3.8 Details of the bus services passing the site are provided in Table 3.1 below. Services 2/2A, 20 and 59 are provided by the Brighton and Hove Bus and Coach Company while services 108 and 109 are provided by Compass Bus.

Service No.	Route	Bus Frequency		
		Mon - Fri	Sat	Sun
2/2A	Rottingdean – Hove – Portslade Station – Shoreham – Old Shoreham – Beeding - Stenying	1 per hour in each direction	1 per hour in each direction	1 per hour in each direction
20	Old Steine – Hove – Southwick – Shoreham – Old Shoreham – Beeding - Stenying	3 per day in each direction	1 per day in each direction	No service
59	Shoreham Beach – Shoreham – Old Shoreham – Southern Cross – Seven Dials – Brighton – Old Steine	2 per day in each direction	No service	No service
108	Shoreham – Beeding – Stenying – Ashurst – West Grinstead – Dial Post – Maplehurst – Horsham	Weds only - 1 in each direction		
109	Lancing – Shoreham – Beeding – Stenying – Wiston – Ashington - Horsham	Sat only - 1 in each direction		

Table 3.1: Bus Services on Old Shoreham Road

3.9 As shown in Table 3.1 the services are provided in the opposite direction and most of the services serve Shoreham-by-Sea town centre. Accessibility by bus between the town centre and the site is therefore good, and in addition, buses can be caught to destinations along the south coast, including Lancing and Hove, and to towns in West Sussex such as Horsham and Beeding.

Accessibility by Rail

3.10 Shoreham-by-Sea rail station is located approximately 250m to the north of the A259 High Street in the town centre and is approximately 750m to the east of the site. There is potential for multi modal trips to be made between the station and the site by bus or bicycle.

3.11 Services to and from Shoreham-by-Sea railway are provided by South West Trains and Southeastern and Table 3.2 below provides a summary of the rail services that serve the station.

Route	Train Frequency		
	Mon - Fri	Sat	Sun
London Waterloo – Woking – Basingstoke – Winchester - Brighton	I per hour	1 per hour [1]	1 every three hours [2]
London Victoria – Gatwick Airport – Horsham – Brighton – Worthing – Portsmouth Harbour – Southampton Central	1 per hour [3]	1 per hour [3]	No direct trains
Brighton – Worthing - Littlehampton	2 per hour	2 per hour	1 per hour
Brighton – Worthing – Chichester – Portsmouth Harbour	1 per hour	1 per hour	1 per hour
Brighton – Worthing – West Worthing	2 per hour	2 per hour	No service [4]
Brighton – Worthing – Chichester – Havant - Fareham	1 per hour	1 per hour	1 every three hours

Table 3.2: Summary of Rail Services via Shoreham-by-Sea

[1] service commences from Basingstoke (does not serve London Waterloo)

[2] service commences from Reading (does not serve London Waterloo)

[3] additional indirect services are provided

[4] No service between these stations but other services provide trains between these stations

3.12 The services shown in Table 3.2 are all provided in the opposite direction and at the same frequencies. In addition to the main destinations shown above, direct trains can also be caught to Clapham Junction, East Croydon, Bognor Regis and Haywards Heath as well as a number of smaller towns.

3.13 The site is therefore located so that it benefits from good public transport links to towns along the south coast as well as to London.

Summary

3.14 On the basis of the above information, it is concluded that the proposed redevelopment is accessible by modes of transport other than the car and therefore accords with government policy, which seeks to encourage a reduction in the length and number of private car trips.

4. TRAVEL DEMAND ASSESSMENT

4.1 It is important to assess the impact of the development in terms of the increase in traffic flows on the local highway network and this section sets out the analysis.

Existing Highway Situation

4.2 The A283 Old Shoreham Road is the main road south and north, to and from, Shoreham-by-Sea town centre and links the A27 trunk road, which is located to the north of the site, with the A259 Brighton Road, which is located to the south of the site. The A27 is part of the Strategic road Network, and links a number of conurbations along the south coast from Portsmouth to Lewes.

4.3 Generally, when considering the impact of a development, traffic flows on the adjacent highway combined with development traffic flows are their greatest in the morning and evening peak hours. Old Shoreham Road is subject to congestion in this period. However, this section will go on to demonstrate that the traffic flows generated by the proposed residential redevelopment are unlikely to be significant during the peak hours.

Development Traffic Flows

4.4 Based on information provided by current occupiers and our own observations it is estimated that the site currently generates approximately 40 vehicular movements per day, consisting principally of the movement of vehicles for sale.

4.5 In order to determine the traffic implications of the proposed redevelopment, vehicular trip rates for the appropriate land use have been obtained from the TRICS database. Trip rates for weekdays and Saturdays for privately owned flats have been obtained and the full TRICS output is contained in Appendix B.

4.6 Table 4.1 below sets out the trip attraction rates per dwelling for the Friday morning and evening peak hours of 08:00 to 09:00 and 17:00 to 18:00 respectively. These peak periods have been chosen based on the TRICS output and in order to assess the proposed redevelopment against the peak commuter periods. Table 4.1 also sets out the trip attraction rates per dwelling for the Saturday peak hour of 13:00 to 14:00 which has been chosen based on the TRICS output and the likely peak period for shopping or recreational trips to Shoreham-by-Sea town centre and harbour.

Time Period	Arrivals	Departures	Total
Friday AM Peak	0.051	0.151	0.202
Friday PM Peak	0.127	0.067	0.194
Saturday Peak	0.135	0.140	0.275

Table 4.1: TRICS Trip Rates for Privately Owned Flats

4.7 The trip generation rates identified in the table above have been applied to the number of residential units proposed (24) in order to determine the likely number of vehicular movements during each hourly period. The resulting flows are presented in Table 5.2 below.

Time Period	Arrivals	Departures	Total
Friday AM Peak	1	4	5
Friday PM Peak	3	2	5
Saturday Peak	3	3	7 *

Table 4.2: Vehicular Movements for Proposed Development

* Note: these figures do not add up due to rounding

4.8 As shown above, the proposed residential development would generate in the order of 5 vehicular movements during the Friday peak periods, whilst 7 movements would be generated during the Saturday peak period. This equates to one vehicular movement every 9 to 12 minutes, depending on the day of the week.

4.9 The trip generation of the existing site is considered to be approximately 40 vehicular movements per day. Bearing in mind that an average working day could last for eight hours (09:00 to 17:00) this equates to 5 vehicular movements every hour or one vehicular movement every 12 minutes. The number of trips generated by the proposed redevelopment of the site is therefore marginally greater than for the existing site, depending on the day of the week. This increase in trips is unlikely to have any material effect on the surrounding highway network and the increase in trips on the adjoining A283 Old Shoreham Road is likely to be substantially within daily traffic fluctuations.

Multi-Modal Trips

4.10 The assessment above is based on the number of vehicular trips likely to be generated by the proposed redevelopment. However, the proposed residential development is also likely to generate a number of multi-modal trips due to its proximity to Shoreham-by-Sea town centre and the availability of facilities for non-car modes of trips. As detailed in Section 3 accessibility to and from the site for pedestrians and cyclists is good and will be enhanced by the widening of the footway to 2.0m along the site

frontage. The nearest bus stop to the site is located approximately 100m to the north indicating that there is good potential for trips to be made to and from the site by bus linked with a short walk to or from the bus stop. In addition trips can be made to and from Shoreham-by-Sea by train which may be linked with a walk, cycle and/or bus journey in order to access the site itself.

5. ACCESS ARRANGEMENTS

Internal Layout

5.1 An analysis of the operation of the site access and internal parking layout has been carried out in order to ensure that the site and parking spaces are accessible for the relevant vehicles.

5.2 Track plots have been produced to illustrate a large car manoeuvring into various parking spaces within the site. These are contained in drawings DWASHOREHAM2.1/TK07, TK08, TK09, TK10, TK13, TK14, TK15 and TK16 at Appendix C.

5.3 Track plots have also been produced to show a medium refuse vehicle entering and exiting the site. Drawing numbers DWASHOREHAM2.1/TK11 and TK12 in Appendix C show that the manoeuvres can be carried out successfully.

Visibility

5.4 New guidance on visibility splays is contained in the Department for Transport's Manual for Streets document. Old Shoreham Road is subject to a speed restriction of 30 mph and therefore, according to the guidance, visibility splays of 2.4m by 43.0m should be provided from the site access.

5.5 Visibility at the site access junction is illustrated in drawing DWASHOREHAM2.1/01 contained in Appendix D, and shows that the required 2.4m by 43.0m visibility splays can be achieved.

6. SUMMARY AND CONCLUSIONS

6.1 Mayer Brown Limited has been instructed by DWA Architects Limited to prepare a Transport Statement in respect of the proposed redevelopment of a car sales site at Old Shoreham Road, Shoreham-by-Sea.

6.2 The site currently comprises a car sales area and is used for the storage of cars in connection with the car showroom on the opposite side of the A283 Old Shoreham Road. The proposal involves the demolition of all existing buildings on the site and the construction of 25 residential apartments and associated parking.

6.3 This report demonstrates that the proposed redevelopment is compliant with relevant national and local governmental policies on transport related matters, including those relating to parking.

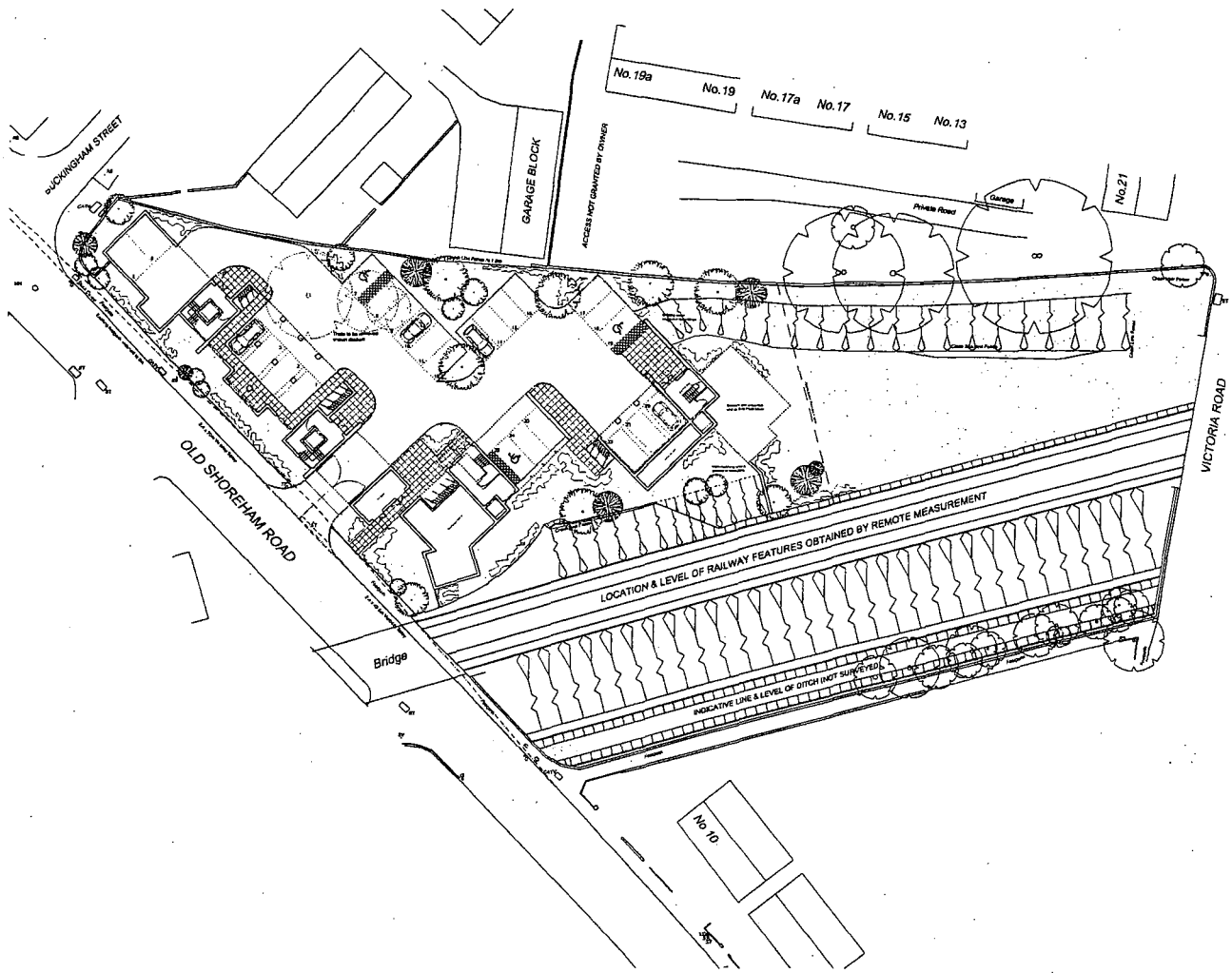
6.4 The site is accessible by modes of transport other than the private car and the development itself will provide improved facilities for journeys by non-car modes of transport, including the provision of cycle parking facilities and an improved footway along the site frontage. This is likely to result in multi-modal trips being made to and from the site.

6.5 Taking into account the existing site use, the number of vehicular trips generated by the proposed development is unlikely to have a significant effect on the local highway network and the increase in trips on the adjoining A283 Old Shoreham Road is likely to be substantially within daily traffic fluctuations.

6.6 The internal layout of the development allows for the necessary vehicular movements into, out of and within the site and visibility from the site access accords with current Government guidance.

6.7 On the basis of the above it is concluded that the site accords with the necessary guidance and should be permitted on the grounds of highway and transportation matters.

APPENDIX A: Architects' Site Layout



DWA ARCHITECTS

Client
Abbeycare Investments Ltd

Project
Proposed Residential Dev.
12-15 Old Shoreham Road
Shoreham-By-Sea

Drawing title
Site Plan
As Proposed

Scale 1:200 @ A1 Date 05/02/2007
Drawn by BDC Checked by

Job No. L3049 Drawing No. AL(9)901 Rev. B

APPENDIX B: TRICS Outputs

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : C - FLATS PRIVATELY OWNED
VEHICLES

Selected regions and areas:

01	**GREATER LONDON**		
	CD	CROYDON	1 days
	EG	EALING	1 days
	GR	GREENWICH	1 days
	KI	KINGSTON	1 days
	RD	RICHMOND	1 days
06	**WEST MIDLANDS**		
	WM	WEST MIDLANDS	2 days
07	**YORKSHIRE & NORTH LINCOLNSHIRE**		
	NY	NORTH YORKSHIRE	1 days
	WY	WEST YORKSHIRE	1 days
08	**NORTH WEST**		
	GM	GREATER MANCHESTER	1 days
	MS	MERSEYSIDE	1 days

Main parameter selection:

Parameter: Number of households
Range: 24 to 215 (units:)

Date Range: 01/01/98 to 20/04/04

Selected survey days:

Monday	3 days
Tuesday	5 days
Thursday	2 days
Friday	1 days

Selected survey types:

Manual count	11 days
Directional ATC Count	0 days

LIST OF SITES relevant to selection parameters

1 **CD-03-C-01** **PRIVATE FLATS, NORBURY** **CROYDON**
LONDON ROAD

NORBURY
Total Number of households: 103 ******
Survey date: MONDAY *09/06/03* *Survey Type: MANUAL*

2 **EG-03-C-02** **PRIVATE FLATS, EALING** **EALING**
HANGER LANE

EALING
Total Number of households: 132 ******
Survey date: TUESDAY *20/04/04* *Survey Type: MANUAL*

3 **GM-03-C-01** **FLATS, SALFORD** **GREATER MANCHESTER**
ASGARD DRIVE
ORDSALL
SALFORD
Total Number of households: 215 ******
Survey date: TUESDAY *20/10/98* *Survey Type: MANUAL*

4 **GR-03-C-01** **PRIVATE FLATS, BLACKHEATH** **GREENWICH**
BENNETT PARK

BLACKHEATH
Total Number of households: 134 ******
Survey date: MONDAY *29/03/04* *Survey Type: MANUAL*

5 **KI-03-C-01** **PRIVATE FLATS, KINGSTON** **KINGSTON**
SOPWITH WAY

KINGSTON-U-THAMES
Total Number of households: 132 ******
Survey date: TUESDAY *26/06/01* *Survey Type: MANUAL*

6 **MS-03-C-01** **PRIVATE FLATS, LIVERPOOL** **MERSEYSIDE**
WAPPING ROAD
WAPPING DOCK
LIVERPOOL
Total Number of households: 114 ******
Survey date: THURSDAY *16/10/03* *Survey Type: MANUAL*

7 **NY-03-C-01** **PRIVATE FLATS,NORTHALLERTON** **NORTH YORKSHIRE**
BOROUGHBRIDGE ROAD
ROMANBY
NORTHALLERTON
Total Number of households: 30 ******
Survey date: MONDAY *22/09/03* *Survey Type: MANUAL*

8 **RD-03-C-01** **PRIVATE FLATS, KEW** **RICHMOND**
KEW ROAD

KEW
Total Number of households: 144 ******
Survey date: TUESDAY *11/06/02* *Survey Type: MANUAL*

9 **WM-03-C-01** **FLATS, BIRMINGHAM** **WEST MIDLANDS**
WAKE GREEN ROAD
MOSELEY
BIRMINGHAM
Total Number of households: 26 ******
Survey date: FRIDAY *16/06/00* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

10 **WM-03-C-02** **BIRMINGHAM FLATS** **WEST MIDLANDS**
WAKE GREEN ROAD
MOSELEY
BIRMINGHAM
Total Number of households: 24 ******
Survey date: TUESDAY *14/11/00* *Survey Type: MANUAL*

11 **WY-03-C-01** **FLATS, LEEDS** **WEST YORKSHIRE**
EAST STREET
CROWN POINT
LEEDS
Total Number of households: 127 ******
Survey date: THURSDAY *13/11/03* *Survey Type: MANUAL*

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED

VEHICLES

Calculation factor: 1 HHOLDS

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. HHOLDS	Trip Rate	No. Days	Ave. HHOLDS	Trip Rate	No. Days	Ave. HHOLDS	Trip Rate
00:00 - 01:00	0	0	0.000	0	0	0.000	0	0	0.000
01:00 - 02:00	0	0	0.000	0	0	0.000	0	0	0.000
02:00 - 03:00	0	0	0.000	0	0	0.000	0	0	0.000
03:00 - 04:00	0	0	0.000	0	0	0.000	0	0	0.000
04:00 - 05:00	0	0	0.000	0	0	0.000	0	0	0.000
05:00 - 06:00	0	0	0.000	0	0	0.000	0	0	0.000
06:00 - 07:00	1	215	0.005	1	215	0.014	1	215	0.019
07:00 - 08:00	11	107	0.027	11	107	0.110	11	107	0.137
08:00 - 09:00	11	107	0.051	**11**	**107**	**0.151**	11	107	0.202
09:00 - 10:00	11	107	0.065	11	107	0.092	11	107	0.157
10:00 - 11:00	11	107	0.058	11	107	0.084	11	107	0.142
11:00 - 12:00	11	107	0.057	11	107	0.083	11	107	0.140
12:00 - 13:00	11	107	0.063	11	107	0.064	11	107	0.127
13:00 - 14:00	11	107	0.066	11	107	0.080	11	107	0.146
14:00 - 15:00	11	107	0.069	11	107	0.060	11	107	0.129
15:00 - 16:00	11	107	0.071	11	107	0.073	11	107	0.144
16:00 - 17:00	11	107	0.080	11	107	0.049	11	107	0.129
17:00 - 18:00	11	107	0.127	11	107	0.067	11	107	0.194
18:00 - 19:00	**11**	**107**	**0.141**	11	107	0.083	11	107	0.224
19:00 - 20:00	3	88	0.136	3	88	0.109	**3**	**88**	**0.245**
20:00 - 21:00	3	88	0.109	3	88	0.091	3	88	0.200
21:00 - 22:00	1	215	0.093	1	215	0.065	1	215	0.158
22:00 - 23:00	0	0	0.000	0	0	0.000	0	0	0.000
23:00 - 24:00	0	0	0.000	0	0	0.000	0	0	0.000
Daily Trip Rates:			1.218			1.275			2.493

Parameter summary

Trip rate parameter range selected:	24 - 215 (units:)
Survey date date range:	01/01/98 - 20/04/04
Number of weekdays (Monday-Friday):	11
Number of Saturdays:	0
Number of Sundays:	0
Optional parameters used in selection:	NO
Surveys manually removed from selection:	0

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : C - FLATS PRIVATELY OWNED
VEHICLES

Selected regions and areas:
08 NORTH WEST
GM GREATER MANCHESTER 1 days

Main parameter selection:

Parameter: Number of households
Range: 24 to 215 (units:)

Date Range: 01/01/98 to 20/04/04

Selected survey days:
Saturday 1 days

Selected survey types:
Manual count 1 days
Directional ATC Count 0 days

LIST OF SITES relevant to selection parameters

1 **GM-03-C-01** **FLATS, SALFORD** **GREATER MANCHESTER**
ASGARD DRIVE
ORDSALL
SALFORD
Total Number of households: 215 ******
Survey date: SATURDAY *05/12/98* *Survey Type: MANUAL*

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED

VEHICLES

Calculation factor: 1 HHOLDS

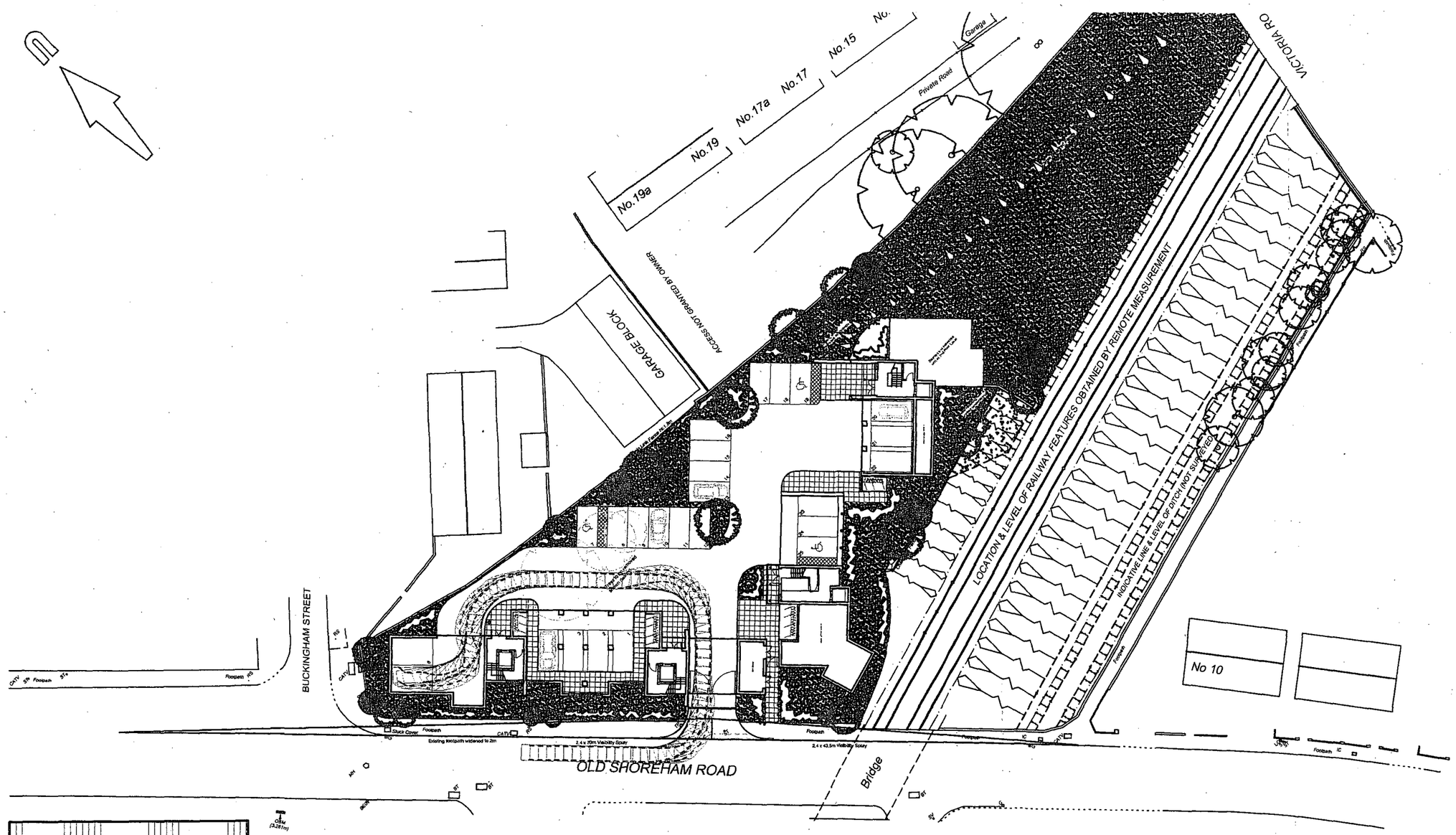
BOLD print indicates peak (busiest) period

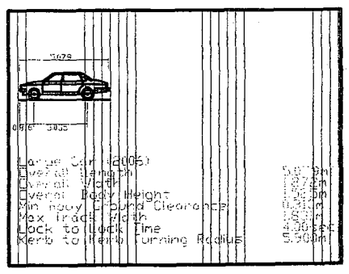
	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. HHOLDS	Trip Rate	No. Days	Ave. HHOLDS	Trip Rate	No. Days	Ave. HHOLDS	Trip Rate
00:00 - 01:00	0	0	0.000	0	0	0.000	0	0	0.000
01:00 - 02:00	0	0	0.000	0	0	0.000	0	0	0.000
02:00 - 03:00	0	0	0.000	0	0	0.000	0	0	0.000
03:00 - 04:00	0	0	0.000	0	0	0.000	0	0	0.000
04:00 - 05:00	0	0	0.000	0	0	0.000	0	0	0.000
05:00 - 06:00	0	0	0.000	0	0	0.000	0	0	0.000
06:00 - 07:00	1	215	0.000	1	215	0.009	1	215	0.009
07:00 - 08:00	1	215	0.028	1	215	0.070	1	215	0.098
08:00 - 09:00	1	215	0.079	1	215	0.112	1	215	0.191
09:00 - 10:00	1	215	0.051	1	215	0.084	1	215	0.135
10:00 - 11:00	1	215	0.070	1	215	0.074	1	215	0.144
11:00 - 12:00	1	215	0.098	1	215	0.158	1	215	0.256
12:00 - 13:00	1	215	0.126	1	215	0.107	1	215	0.233
13:00 - 14:00	1	215	0.135	1	215	0.140	1	215	0.275
14:00 - 15:00	1	215	0.135	1	215	0.088	1	215	0.223
15:00 - 16:00	1	215	0.126	1	215	0.126	1	215	0.252
16:00 - 17:00	1	215	0.112	1	215	0.126	1	215	0.238
17:00 - 18:00	1	215	0.135	1	215	0.135	1	215	0.270
18:00 - 19:00	**1**	**215**	**0.205**	**1**	**215**	**0.172**	**1**	**215**	**0.377**
19:00 - 20:00	1	215	0.177	1	215	0.107	1	215	0.284
20:00 - 21:00	1	215	0.102	1	215	0.144	1	215	0.246
21:00 - 22:00	1	215	0.186	1	215	0.135	1	215	0.321
22:00 - 23:00	0	0	0.000	0	0	0.000	0	0	0.000
23:00 - 24:00	0	0	0.000	0	0	0.000	0	0	0.000
Daily Trip Rates:			1.765			1.787			3.552

Parameter summary

Trip rate parameter range selected:	24 - 215 (units:)
Survey date date range:	01/01/98 - 20/04/04
Number of weekdays (Monday-Friday):	0
Number of Saturdays:	1
Number of Sundays:	0
Optional parameters used in selection:	NO
Surveys manually removed from selection:	0

APPENDIX C: Swept Path Plots





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wokingoffice@mayerbrown.co.uk www.mayerbrown.co.uk

client
DWA ARCHITECTS LTD

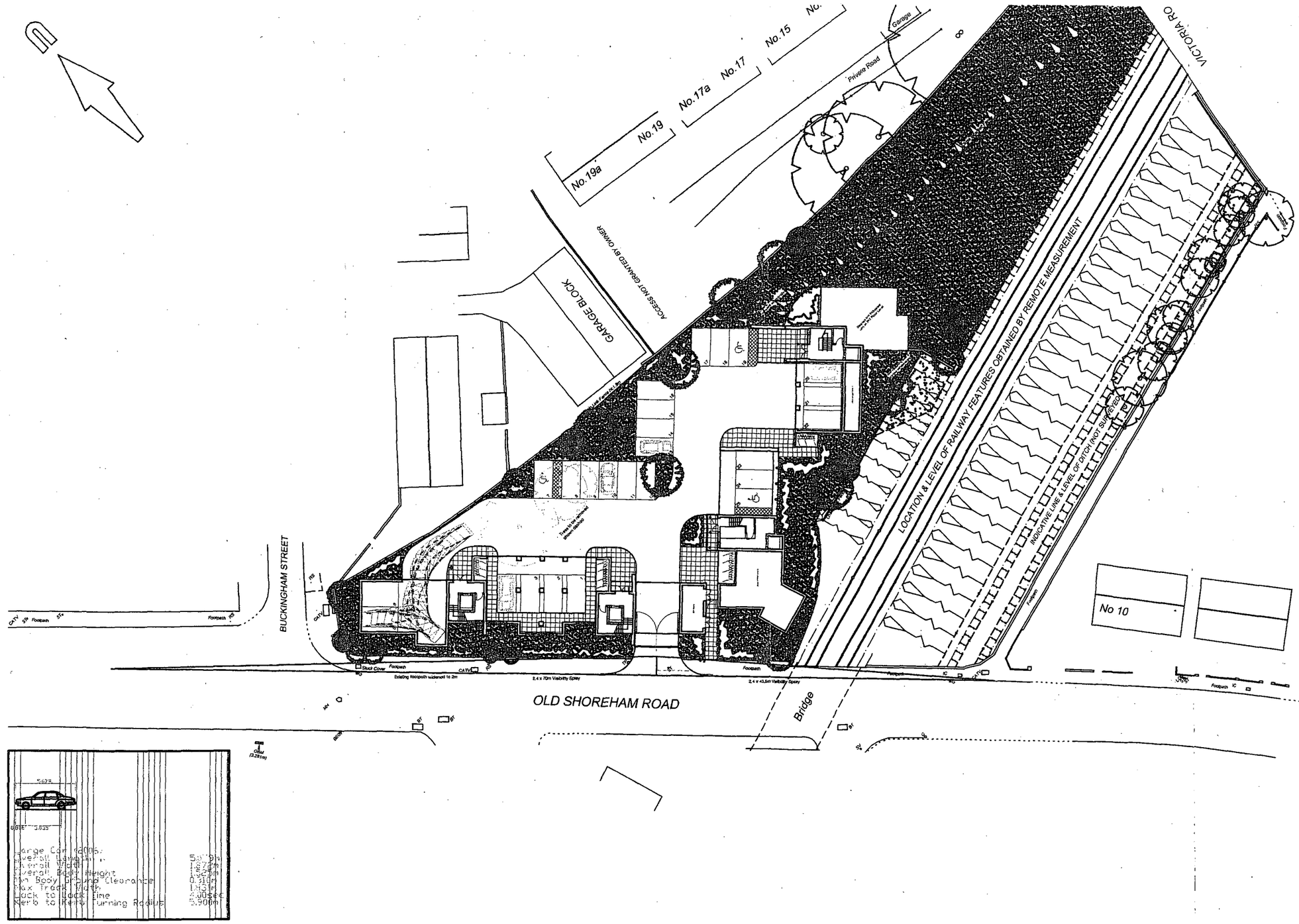
project
SHOREHAM BY SEA

title
LARGE CAR MANOEUVRING
INTO PARKING BAY 5

scale	1:500 @ A3	drawn by	OAN	checked by	SS
date	MAY 2007	cad file	TK13.DWG		

drawing number
DWASHOREHAM2.1/TK13

rev.



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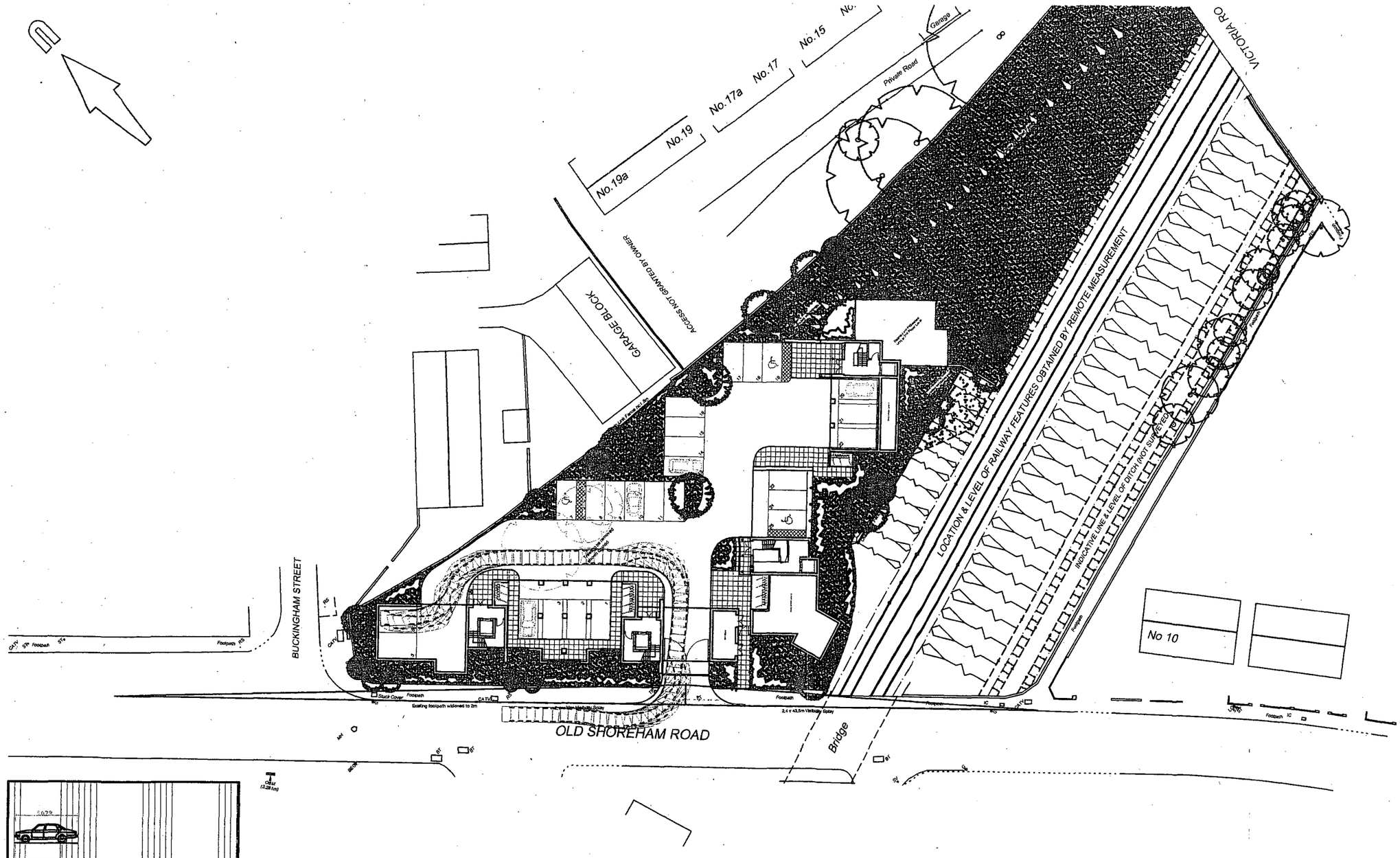
SHOREHAM BY SEA

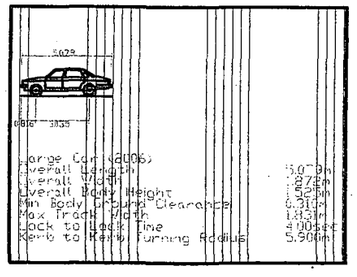
title
LARGE CAR MANOEUVRING
OUT OF PARKING BAY 5

scale	1:500 @ A3	drawn by	OAN	checked by	SS
date	MAY 2007	cad file	TK14.DWG		

drawing number
DWASHOREHAM2.1/TK14

rev.





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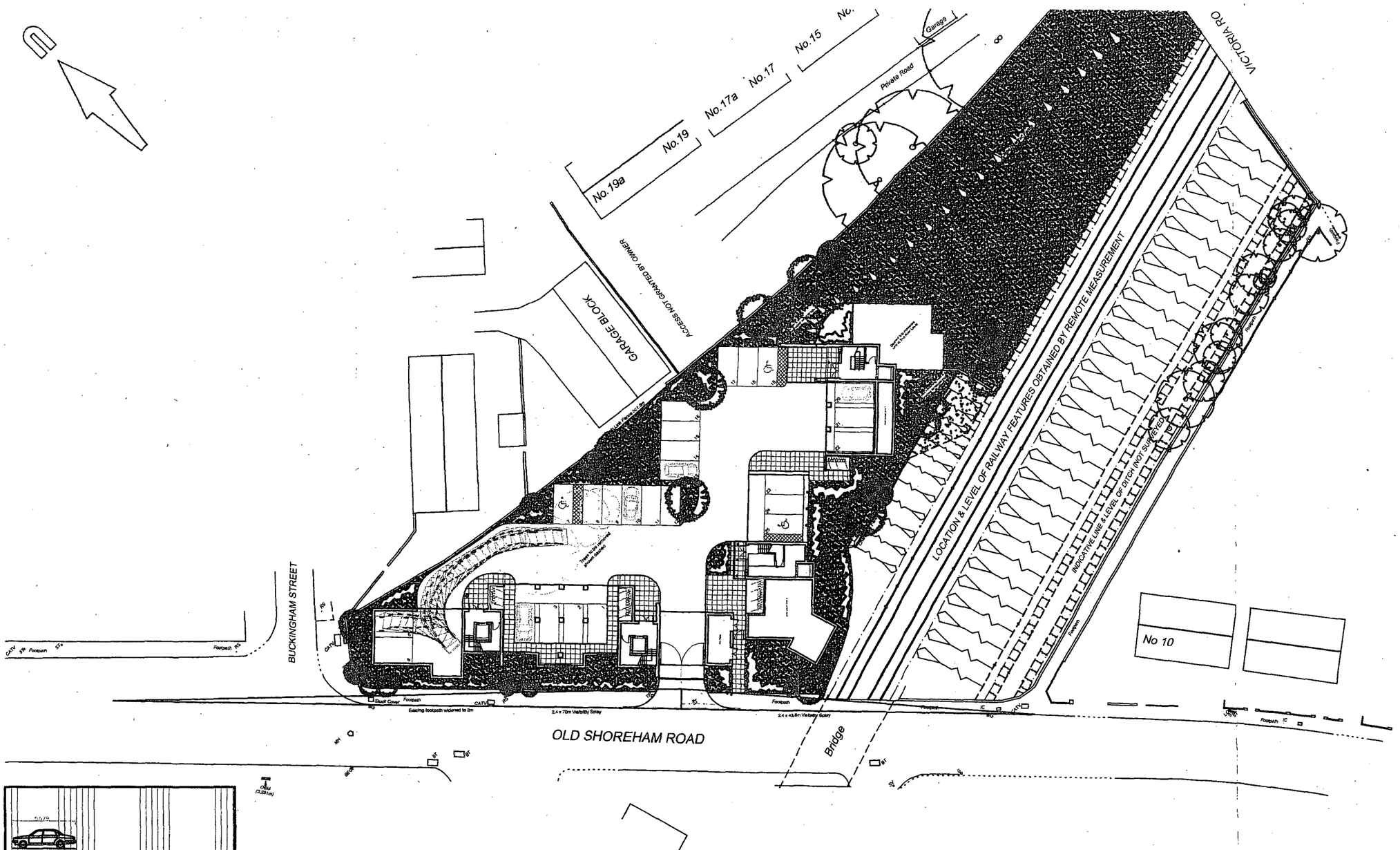
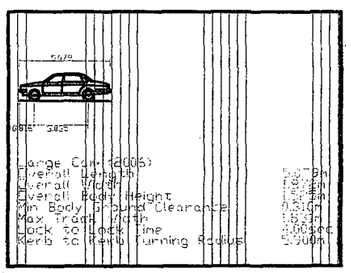
title
LARGE CAR MANOEUVRING
INTO PARKING BAY 6

scale	1:500 @ A3	drawn by	OAN	checked by	SS
date	MAY 2007	cad file	TK15.DWG		

drawing number
DWASHOREHAM2.1/TK15

rev.





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project
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title
LARGE CAR MANOEUVRING
OUT OF PARKING BAY 5

scale	1:500 @ A3	drawn by	OAN	checked by	SS
date	MAY 2007	cad file	TK16.DWG		

drawing number
DWASHOREHAM2.1/TK16

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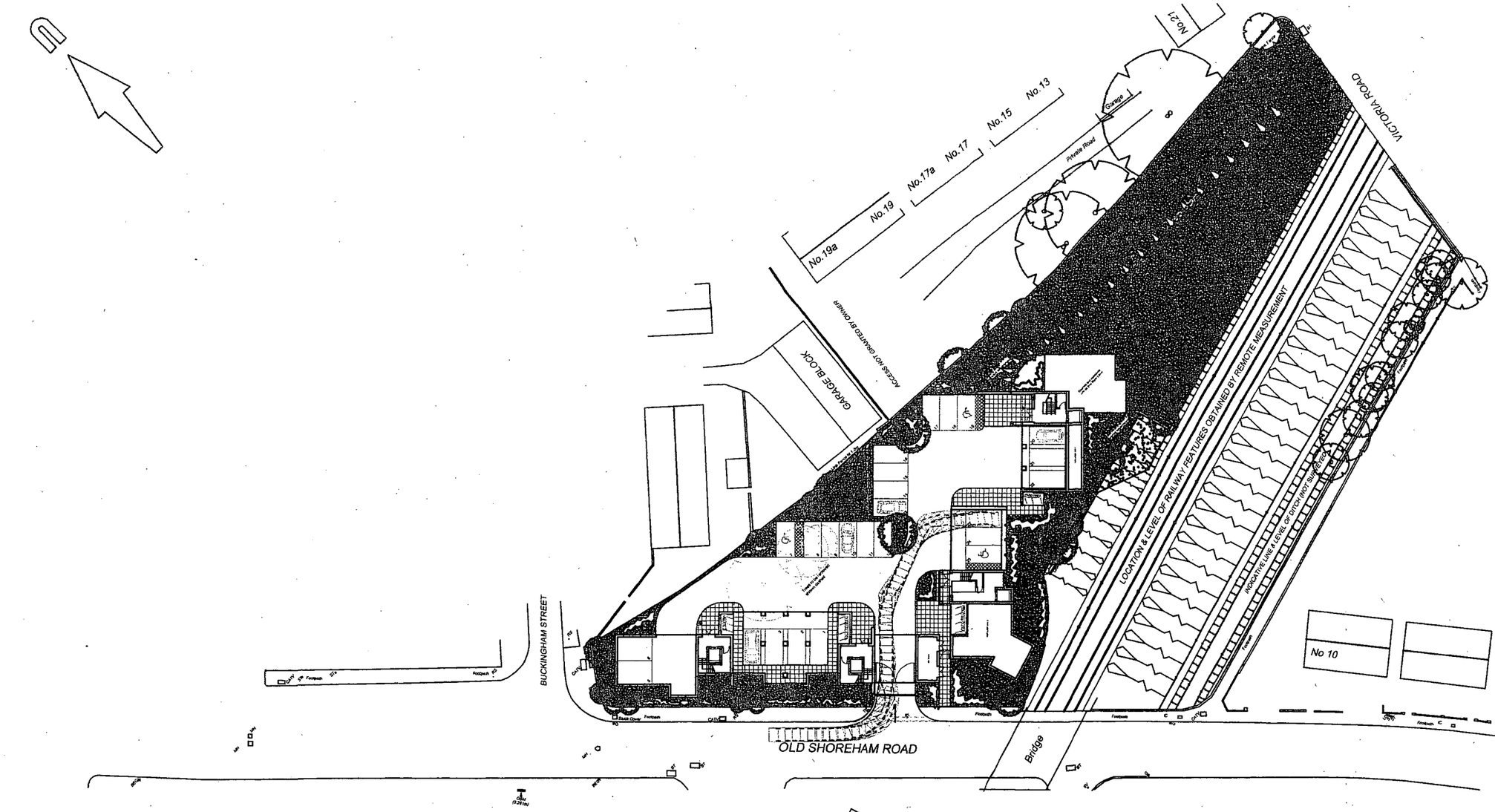

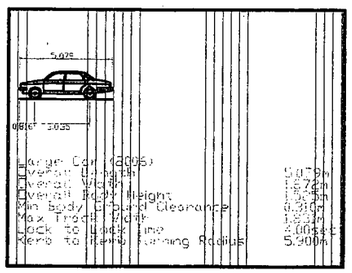

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title
LARGE CAR MANOEUVRING
INTO PARKING BAY 23

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date	MAY 2007	cad file	01.DWG		

drawing number
DWASHOREHAM2.1/TK07

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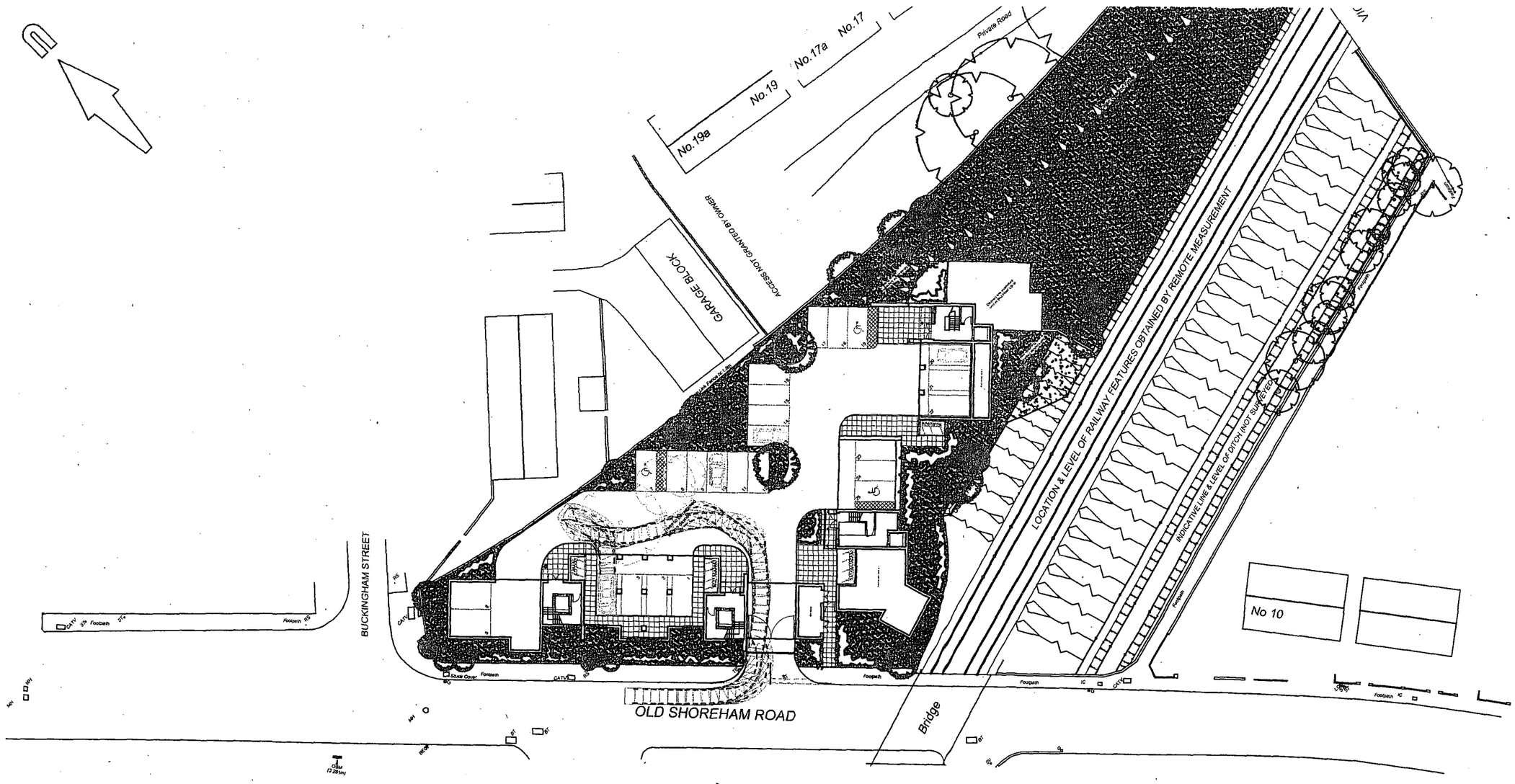

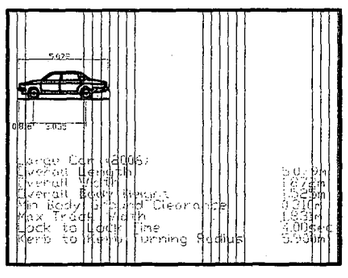

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title
LARGE CAR MANOEUVRING
INTO PARKING BAY 4

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drawing number
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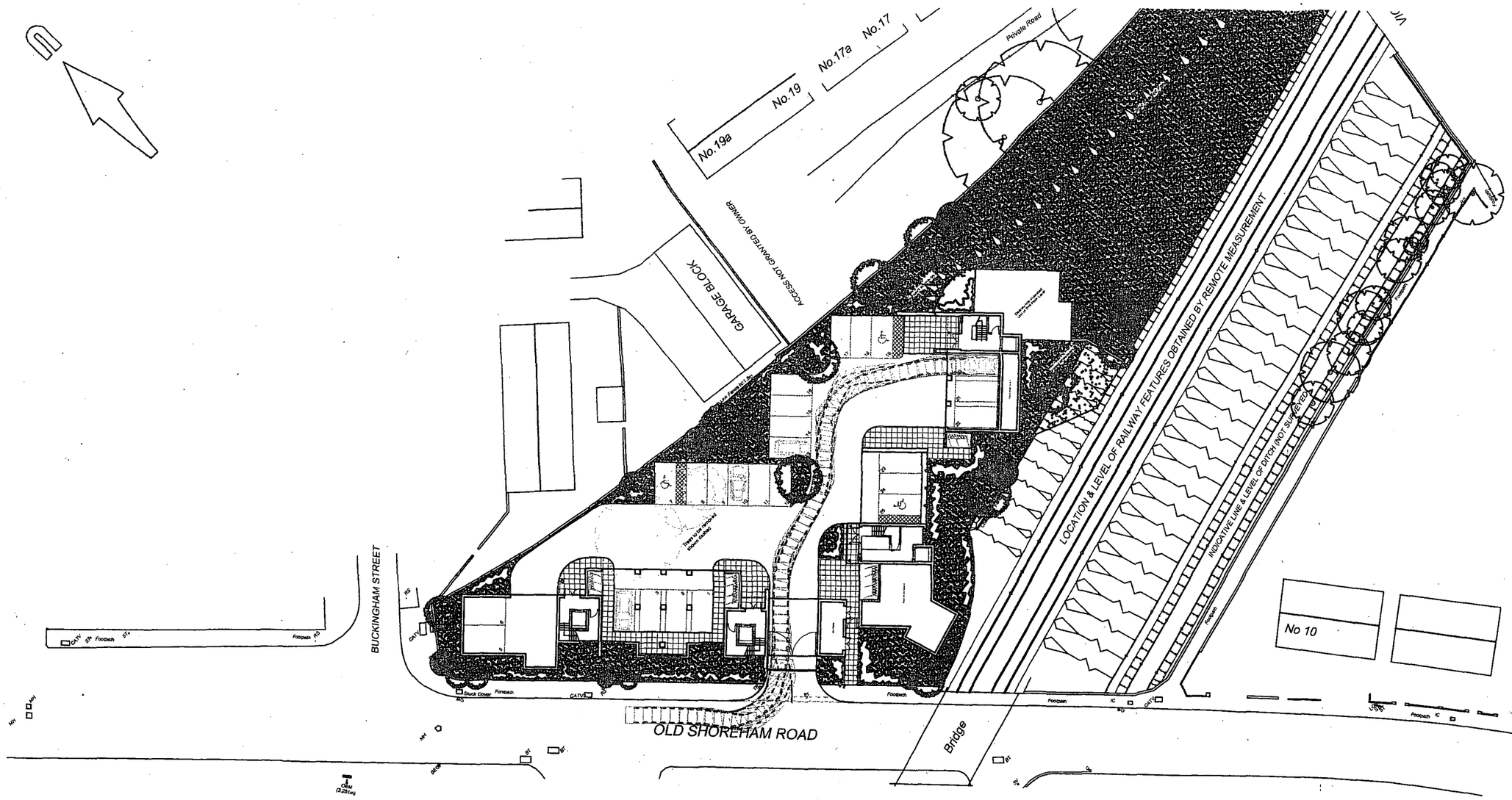
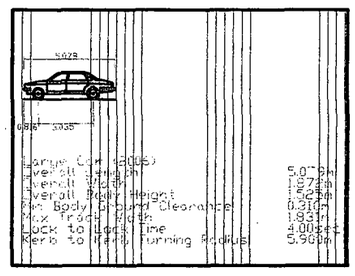
rev.





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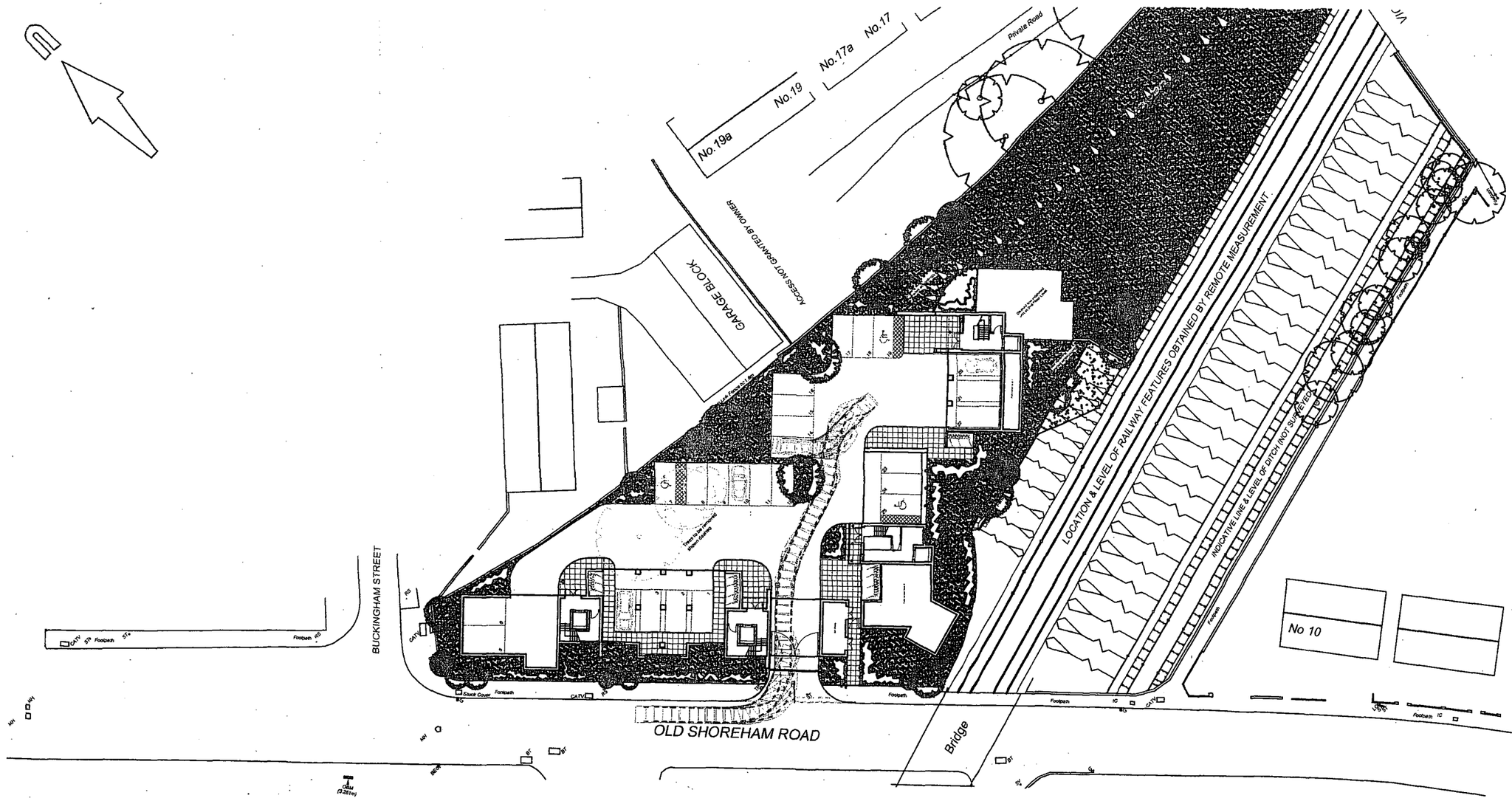
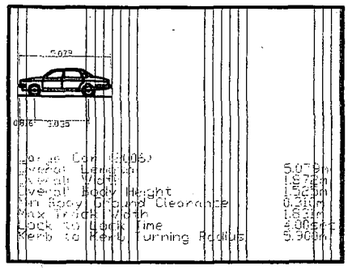
title
LARGE CAR MANOEUVRING
INTO PARKING BAY 20

scale	1:500 @ A3	drawn by	OAN	checked by	SS
date	MAY 2007	cad file	TK09.DWG		

drawing number
DWASHOREHAM2.1/TK09

rev.





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title
LARGE CAR MANOEUVRING
INTO PARKING BAY 13

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drawing number
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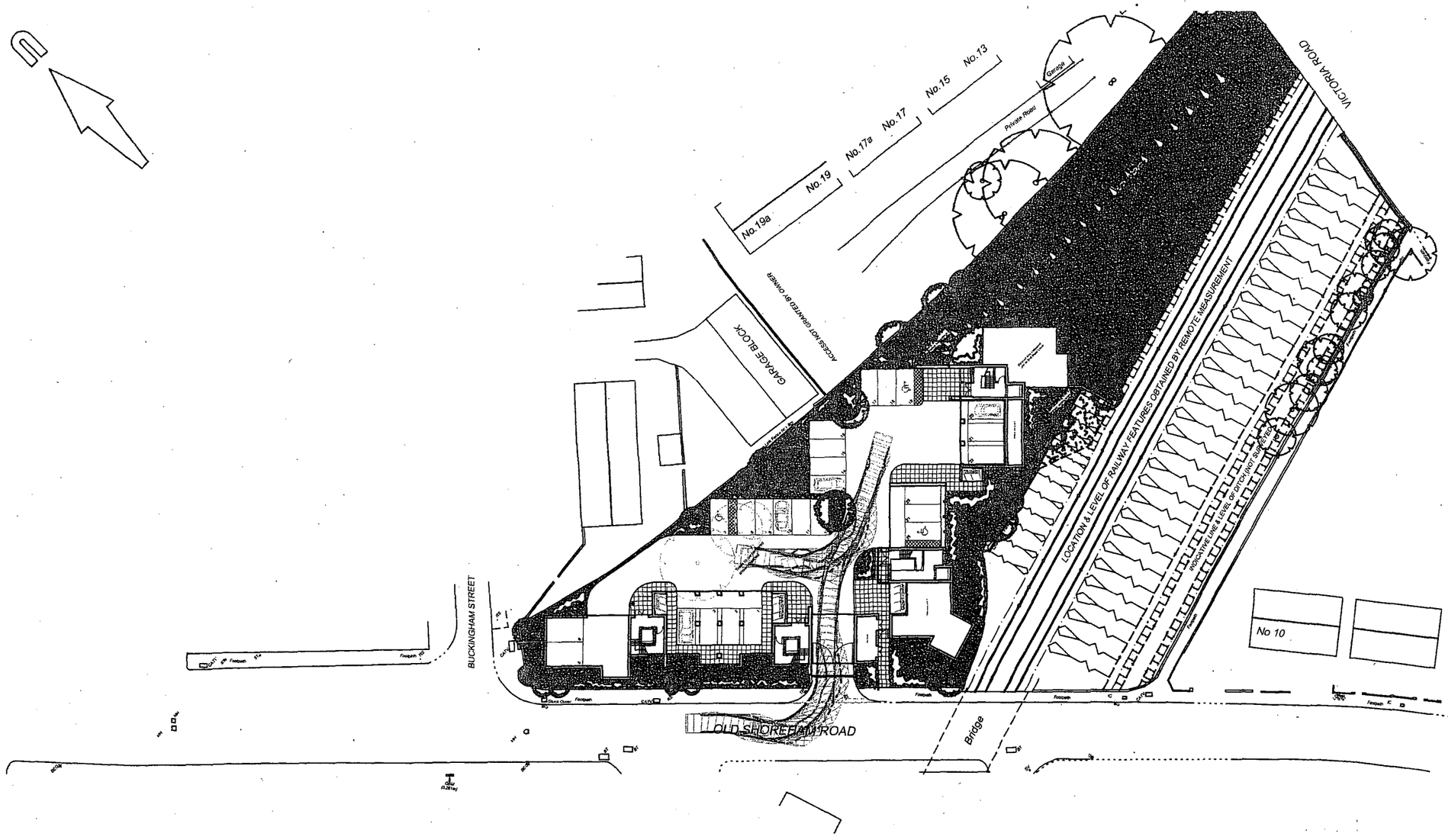
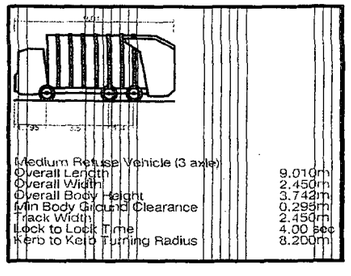
rev.





Medium Refuse Vehicle (3 axle)	
Overall Length	9.010m
Overall Width	2.450m
Overall Body Height	3.742m
Min Body Ground Clearance	0.299m
Track Width	2.450m
Lock to Lock Time	4.00 Sec
Kerb to Kerb Turning Radius	8.200m

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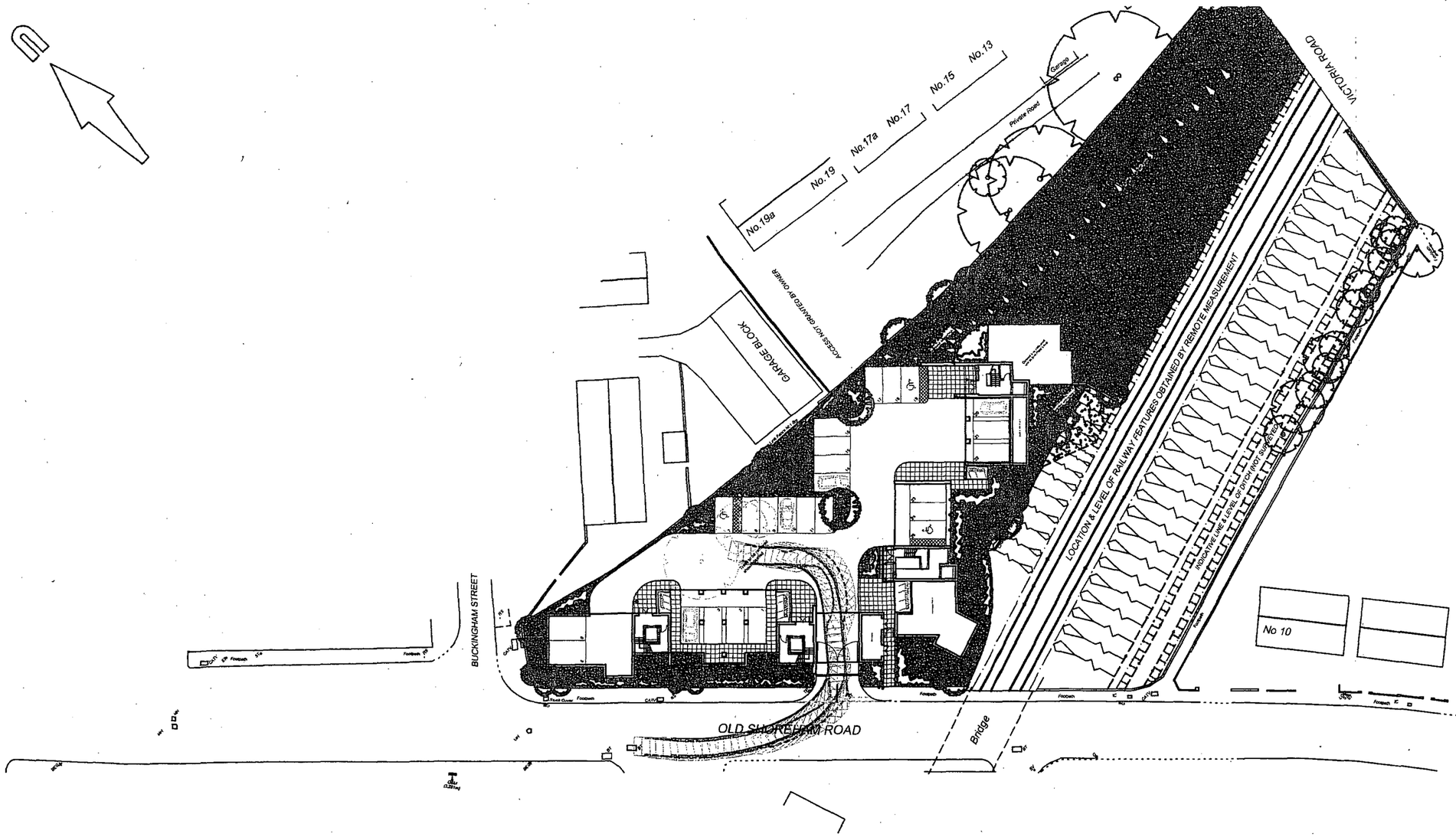
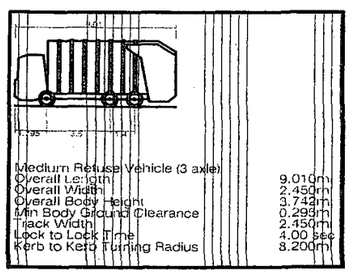
title
MEDIUM REFUSE VEHICLE
ENTERING SITE

scale	1:500 @ A3	drawn by	OAN	checked by	SS
date	MAY 2007	cad file	TK11.DWG		

drawing number
DWASHOREHAM2.1/TK11

rev.





Medium Refuse Vehicle (3 axle)	
Overall Length	9.010m
Overall Width	2.450m
Overall Body Height	3.742m
Min Body Ground Clearance	0.295m
Track Width	2.450m
Lock to Lock Time	4.00 sec
Kerb to Kerb Turning Radius	8.200m

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SHOREHAM BY SEA

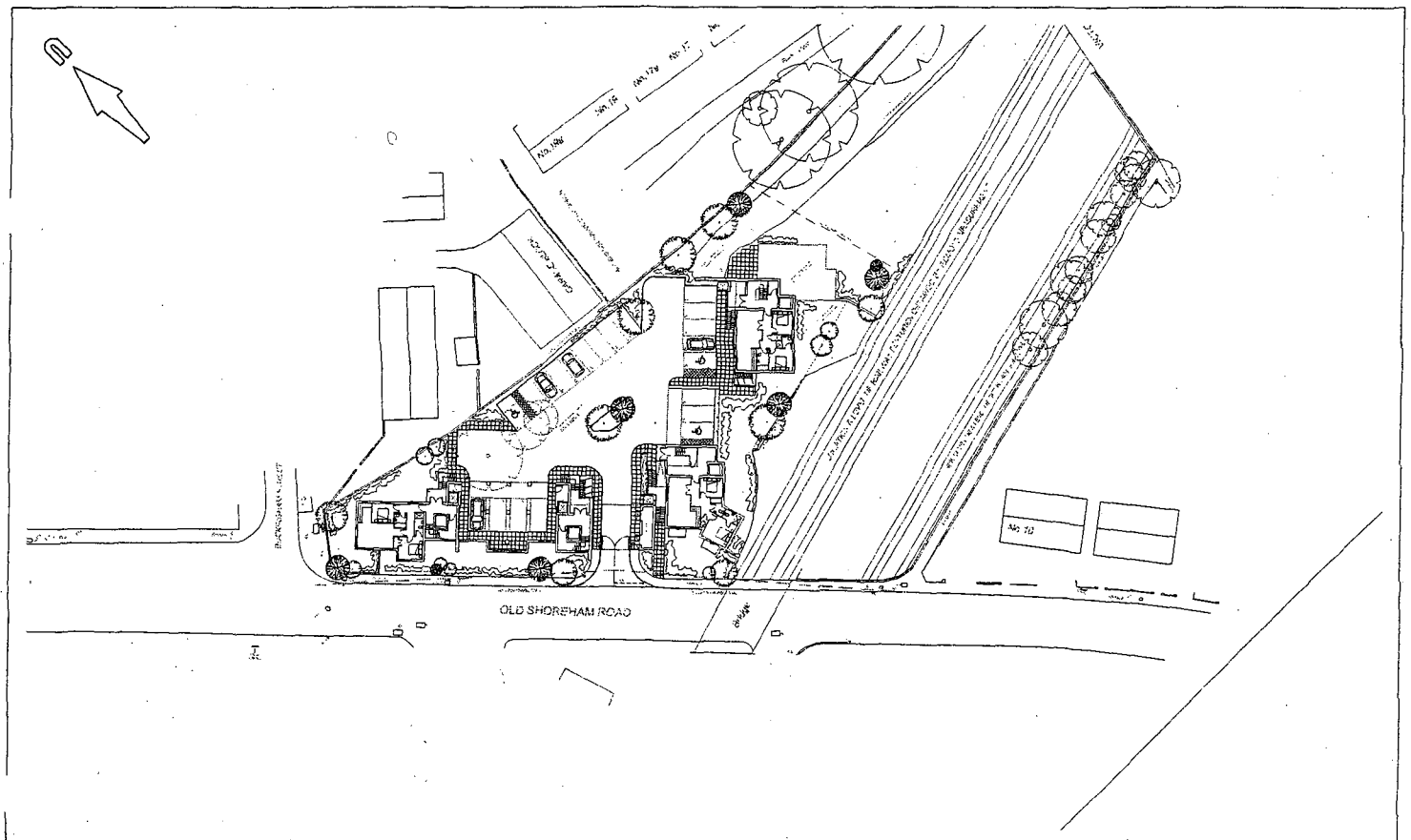
title
MEDIUM REFUSE VEHICLE
EXITING SITE

scale	1:500 @ A3	drawn by	OAN	checked by	SS
date	MAY 2007	cad file	TK12.DWG		

drawing number
DWASHOREHAM2.1/TK12

rev.

APPENDIX D: Visibility Splays Drawing



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project
SHOREHAM BY SEA

title
2.4 X 43m VISIBILITY SPLAYS
FROM PROPOSED ACCESS

scale	1:500 @ A3	drawn by	OAN	checked by	SS
date	MAY 2007	cad file	01.DWG		

drawing number
DWASHOREHAM2.1/01

rev.