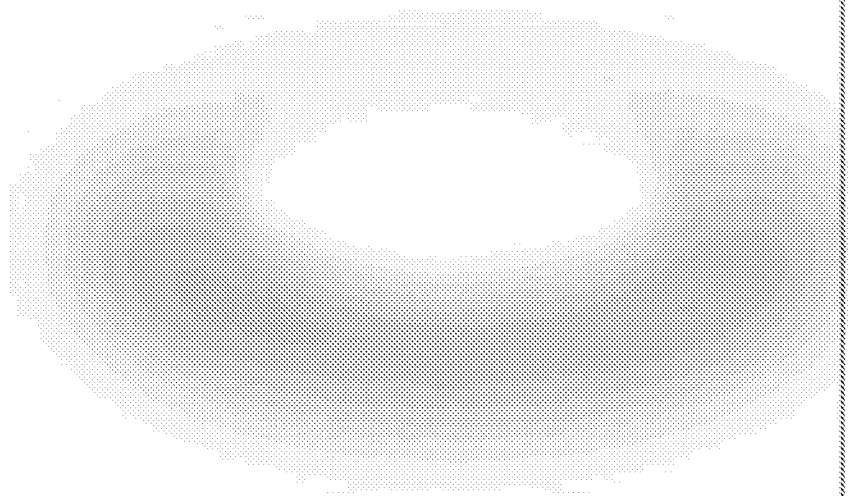




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Project: 46a and 46b Pier Road, Phase 1 Flood Risk Assessment (FRA)
Prepared for: Dowsett Mayhew Planning Partnership Ltd
Reference: FRA 4023
Date: August, 2018
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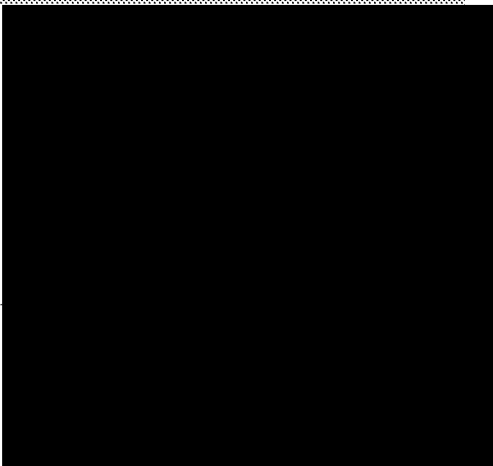
Project: 46a and 46b Pier Road, Phase 1 Flood Risk Assessment

Prepared for: Dowsett Mayhew Planning Partnership Ltd.

Reference: FRA 4023

Site Location: 46a and 46b Pier Road, Littlehampton, West Sussex, BN17 5LW.

Proposed Development: It is understood that the development is for the demolition of the existing structures on site and the construction of two new buildings to provide commercial (A1) at ground floor, with four residential units above.

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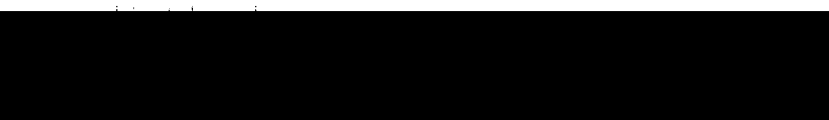
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1. Summary

- 1.1 Ambiental has been appointed by Dowsett Mayhew Planning Partnership Ltd to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at 46a and 46b Pier Road, Littlehampton, West Sussex, BN17 5LW.
- 1.2 It is understood that the development is for the demolition of the existing structures on site and the construction of two new buildings to provide commercial (A1) at ground floor, with four residential units above.
- 1.3 The EA Flood Map for Planning indicates that the proposed development site is located in Flood Zone 3.
- 1.4 Due to the proposed mixed use scheme, the proposed development is considered to be a “Less Vulnerable” and “More Vulnerable”, for the development of the commercial (ground floor) and residential use (first floor) respectively, under the National Policy for Planning Framework (NPPF).
- 1.5 The EA previously accepted a similar scheme on the wider site at 46a-47 Pier Road, Arun District Council Ref LU/287/17/PL), for which it was agreed to set all residential development at 5.23mAOD (300mm above the 1:200 year (2115) undefended flood level), to be conservative, as the nearby defences could fail or be overtopped.
- 1.6 The developer has agreed to set residential FFLs no lower than 5.23mAOD.
- 1.7 As such and given that:
 - a) The proposed development is for the demolition of the existing structures and the construction of a mixed use scheme to provide commercial uses on the ground floor and residential above;
 - b) All residential units will be set no lower than 5.23mAOD (300mm above 1:200 year (2115) undefended flood level);
 - c) The site lies within an area of tidal flood risk and therefore is not required to provide flood compensatory storage;
 - d) Given the nature of tidal flooding, prior evacuation can be sought;
 - e) In terms of flood vulnerability betterment can be achieved through the implementation of formal flood warnings/alerts and prior evacuation, an area of safe refuge can be provided via internal stairwells to the upper floors;

following the guidelines contained within the NPPF, the proposed development is considered **to be suitable** assuming appropriate mitigation (including adequate warning procedures) can be maintained for the temporary lifetime of the development.

Development Description	Existing	Proposed
Development Type:	Retail unit with store to rear	Demolition of existing structures and the construction of two new buildings to provide two commercial units (A1) at ground floor, with four residential units above
(Number of Bedrooms):	N/A ¹	3 x 1 bed flats, 1 x 2 bed flat
EA Vulnerability Classification:	Less Vulnerable	Less and More Vulnerable
Ground Floor Level:	Ground levels vary between approximately 2.12mAOD and 3.16mAOD (2m LiDAR data)	No change. FFL raising not required for ground floor commercial use
Level of Sleeping Accommodation:	N/A ¹	5.23mAOD and above
Impermeable Surface Area:	Brownfield site considered 100% impervious	No change
Surface Water Drainage:	N/A ¹	N/A ¹
Site Size:	Approximately 206m ²	No change
Risk to Development	Summary	Comment
EA Flood Zone:	3	
Flood Source:	Tidal	River Arun/ English Channel
1 in 200yr undefended flood level (2012):	3.73mAOD	
1 in 200yr undefended flood level (2115):	4.93mAOD	River Arun to East Head model, completed in 2016 (Node 1) - undefended
1 in 1000yr undefended flood level (2012):	4.05mAOD	
Recorded Flood Events in Area:	Yes	1975, 1983, 1985
Recorded Flood Events at Site:	Yes	Site within EA recorded extent for 1985 event
SFRA Available:	Yes	Arun District SFRA (2016)
Management Measures	Summary	Comment
Ground floor Finished Floor Levels above extreme flood levels:	No	Ground floor to be used for commercial use
Safe Access/Egress Route:	Warning & Evacuation Plan	Safe egress can be provided through prior evacuation.
Flood Resilient Design:	Yes	All sleeping accommodation located on the first floor and above. Internal stairwell to higher floors should be available
Site Drainage Plan:	N/A ¹	It is recommended that the developer attenuate runoff and net volume in accordance with the Supplementary Requirements for Surface Water Drainage Proposals of the Arun District Council
Flood Warning & Evacuation Plan:	Yes	EA Flood Warning Service and EA Flood Alert
Offsite Impacts	Summary	Comment
Displacement of floodwater:	N/A ²	Site is in an area of tidal flood risk
Increase in surface runoff generation:	None	Attenuation following the NPPF guidance and the Supplementary Requirements for Surface Water Drainage Proposals of the Arun District Council
Impact on hydraulic performance of channels:	None	

Table 1: Summary of flood risks, impacts and proposed flood mitigation measures.

N/A¹ not required for this assessment; N/A² data not available.

2. Development Description and Site Area

Proposed Development and Location

- 2.1 The proposed development site is located at 46a and 46b Pier Road, Littlehampton, West Sussex, BN17 5LW (*Figure 1*).
- 2.2 It is understood that the development is for the demolition of the existing structures on site and the construction of two new buildings to provide commercial (A1) at ground floor, with four residential units above.

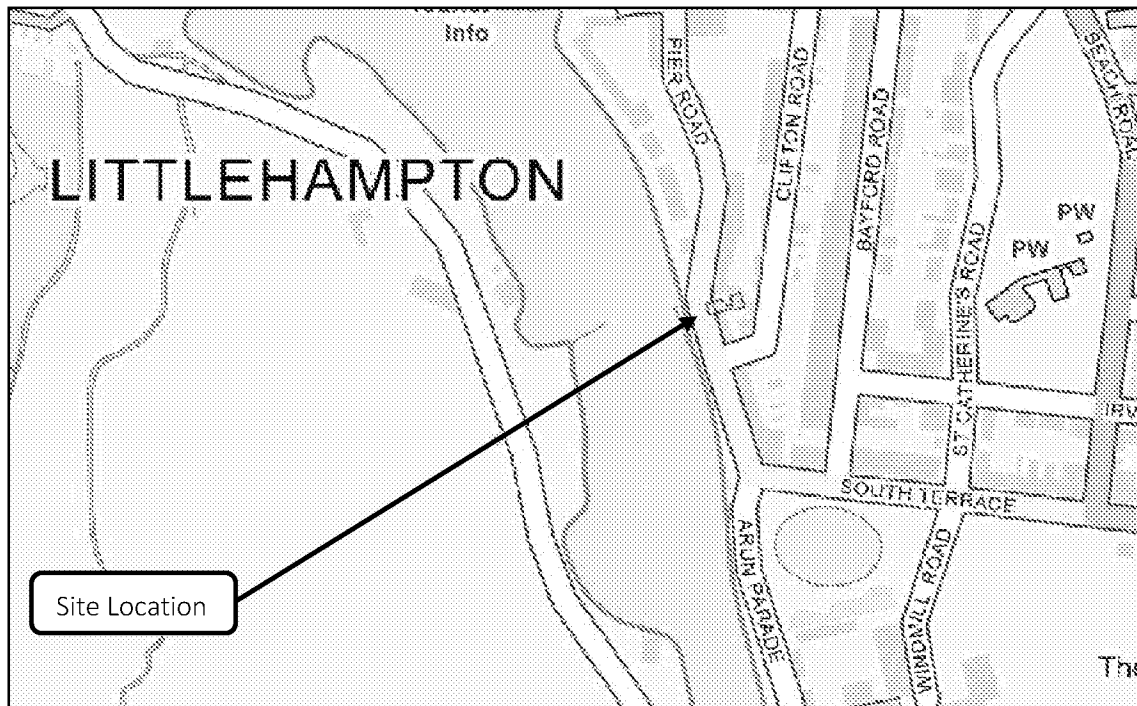


Figure 1 – Site Location Map, site boundary shown in red. (Source: OS StreetView).

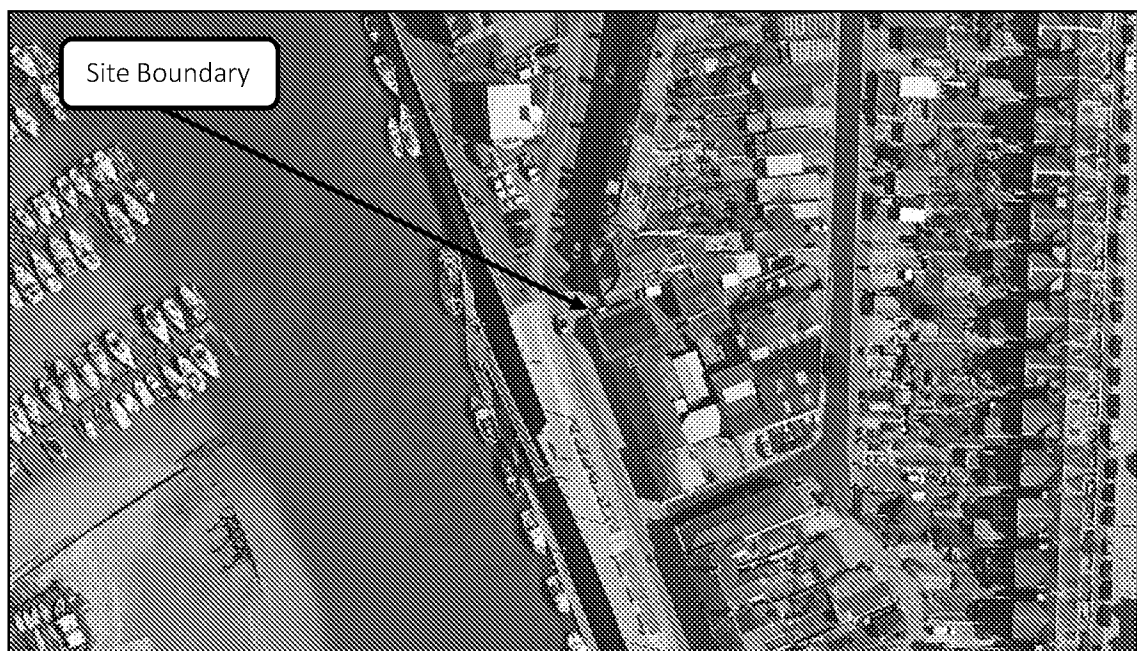


Figure 2 – Aerial View of Development Site (Source: Google Earth).

- 2.3 Ground levels on site vary between approximately 2.12mAOD and 3.16mAOD (*Source: 2m LiDAR data*).
- 2.4 The nearest watercourse to the site is the River Arun, located approximately 20m west of the site. The River Arun has been classified as an EA main river. The site is also located approximately 430m north of the Mean High Water line of the English Channel.

Vulnerability classification

- 2.5 The existing site use (commercial) would be considered “Less Vulnerable” under the NPPF.
- 2.6 Due to the proposed mixed use scheme, the proposed development is considered to be a “Less Vulnerable” and “More Vulnerable” development for the commercial (ground floor) and residential use (first floor) respectively, under the vulnerability classifications of the NPPF.
- 2.7 The proposed development site is located within Flood Zone 3 according to the EA Flood Map for Planning (*Figure 3*).

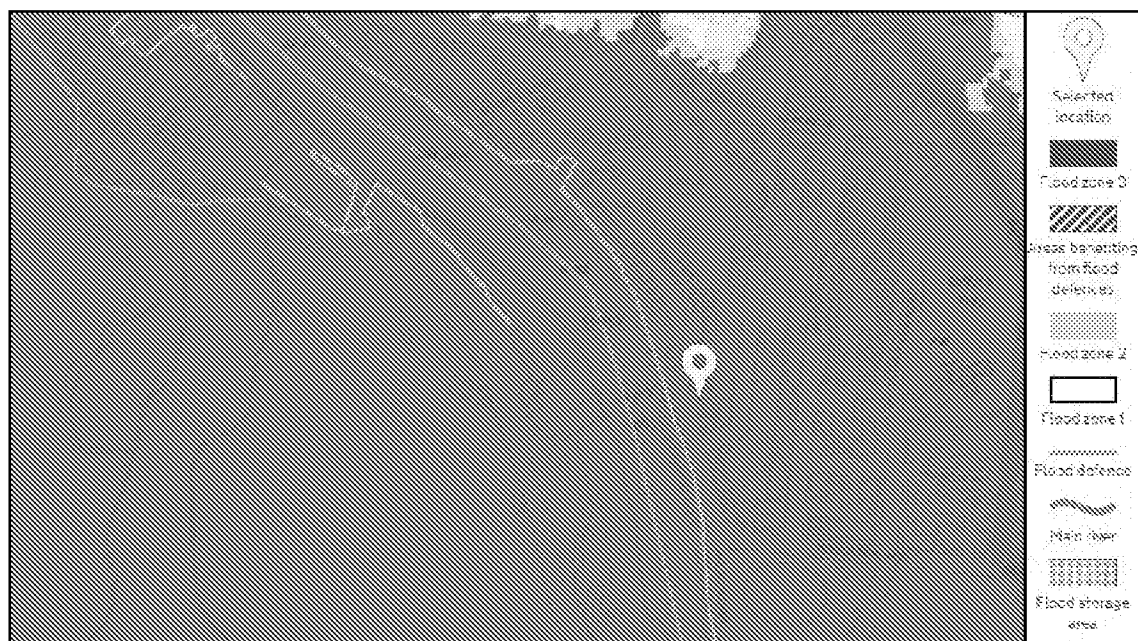


Figure 3: EA Flood Map for Planning (*Source EA Online*)

Geology

- 2.8 The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock geology at the site is the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation.
- 2.9 The BGS Viewer also indicates that the superficial deposits at the site are Raised Beach Deposits, comprised of sand and gravel.
- 2.10 The site is not underlain by a Groundwater Source Protection Zone (SPZ), as defined by the EA, however the DEFRA Magic Map service does indicate that the site is underlain by a major aquifer of high vulnerability.

3. Sequential Test/Exception Test

- 3.1 Under the NPPF, all new planning applications should undergo a *Sequential Test*. This test should be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g. residential, hospitals, mobile homes etc.) outside of the floodplain.
- 3.2 The test refers to the EA Flood Zones shown in *Figure 3*. For reference, the NPPF *Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table* is reproduced below:

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test Required	✓	✓
Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
Zone 3b Functional Floodplain	Exception Test Required	✓	✗	✗	✗

Table 2: The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Please note:

✓ means development is appropriate;

✗ means the development should not be permitted.

- 3.3 It is important to note that a previous application was granted permission at 46a to 47 Pier Road (Arun District Council Ref LU/287/17/PL) to which the EA subsequently had no objection, and for which the LPA did not require a Sequential Test.
- 3.4 The site resides within Flood Zone 3 (as defined by the EA) and as such, under the NPPF, would normally be required to further implementation of the Exception Test.
- 3.5 As Table 2 demonstrates, the Exception Test would normally be required for this development. For the Exception Test to be passed, the proposed development would need to meet the following criteria:
- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, as informed by a Strategic Flood Risk Assessment;
 - a Flood Risk Assessment demonstrates that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- 3.6 As such, and in order to address part two of the Exception Test requirements, the planning application submitted by the client is required to be accompanied by a FRA which shows that the development can be achieved in a sustainable manner, with an overall reduction of flood risk to the site and surrounding area.

- 3.7 To address part one of the Exception Test, the development will improve the amenity of the local area by removal of an old commercial development and introduction of a new mixed use commercial/housing scheme. The proposed housing will go towards the local council meeting its housing targets.

4. Site Flood Hazards

Sources of Flooding

- 4.1 As outlined in *Figure 3*, the proposed development is located within Flood Zone 3 (high risk of flooding). The development is considered to be “Less and More Vulnerable” under the NPPF. Communication with the Environment Agency (EA) and information provided in the Arun District Council Level 1 and 2 SFRA (2016) has identified the following potential sources of flooding to the site:

Source	Description
Fluvial	N/A
Tidal	River Arun / English Channel
Surface	On site
Groundwater	In Area
Sewer	Local Sewer Network

Table 3: Summary of flood sources.

Mechanisms of Flooding

- 4.2 According to the EA Flood Map for Planning, the proposed development site is located in Flood Zone 3. While according to the EA Flood Map for Planning, the site does not technically benefit from the presence of defences, the EA data provided in support of this FRA does include defended and undefended scenarios.
- 4.3 The Flood Zones shown in *Figure 3* outlines only the potential floodplain; and the mitigating effects of flood defences currently in place are not considered. The EA have stated that “*steel Pile Walls to the North-West of the site reduce the risk of flooding in this area to a standard of protection of a 1 in 75 year flood. There is also a flood wall to the West of the site with a concrete capping beam that offers a standard of protection of a 1 in 300 year flood*”.

Tidal

- 4.4 As the site is located in Flood Zone 3 based on the EA Flood Map for Planning, it has a 1 in 200 or greater annual probability of flooding from tidal sources (>0.5%).

- 4.5 The nearest watercourse to the site is the River Arun, located approximately 20m west of the site. The River Arun has been classified as an EA main river. The site is also located approximately 430m north of the Mean High Water line of the English Channel.

Modelled Flood Extents

- 4.6 The EA have provided modelled flood extents from their Arun to Adur Flood Model (2012) which includes defended and undefended scenarios.
- 4.7 The EA modelled defended scenario mapping indicates that the proposed development site would remain unaffected for the 1:20 year (2012) event, but affected for the 1:200 year (2115) and 1:1000 year (2012) events (*Figure 4*).

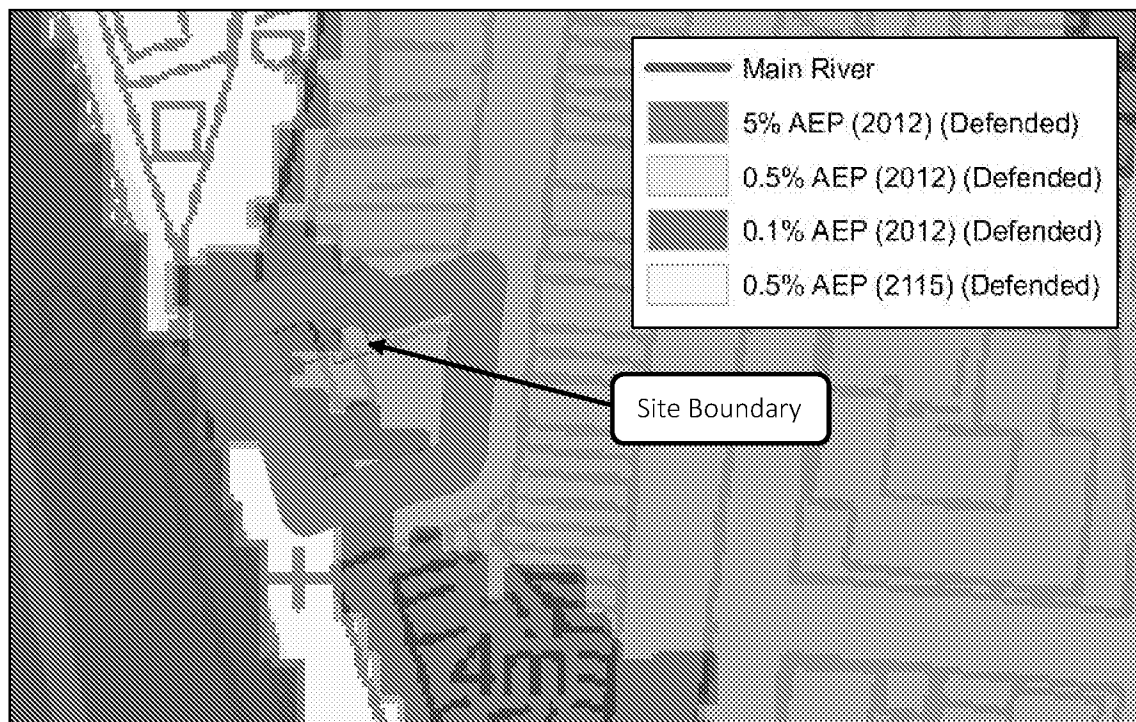


Figure 4: EA Modelled Defended Flood Extents (Source: EA).

- 4.8 The EA modelled undefended scenario mapping indicates that the proposed development site would be affected for both the 1:20 year and 1:1000 year (present day) events, along with the 1:200 year (2115) event (*Figure 5*).
- 4.9 However, the EA have stated that there are defences in the area which provide a 1:75 year standard of protection and therefore it could be argued that these defences protect the site from flooding for the 1:20 year event. As such, the site should not be considered Flood Zone 3b.

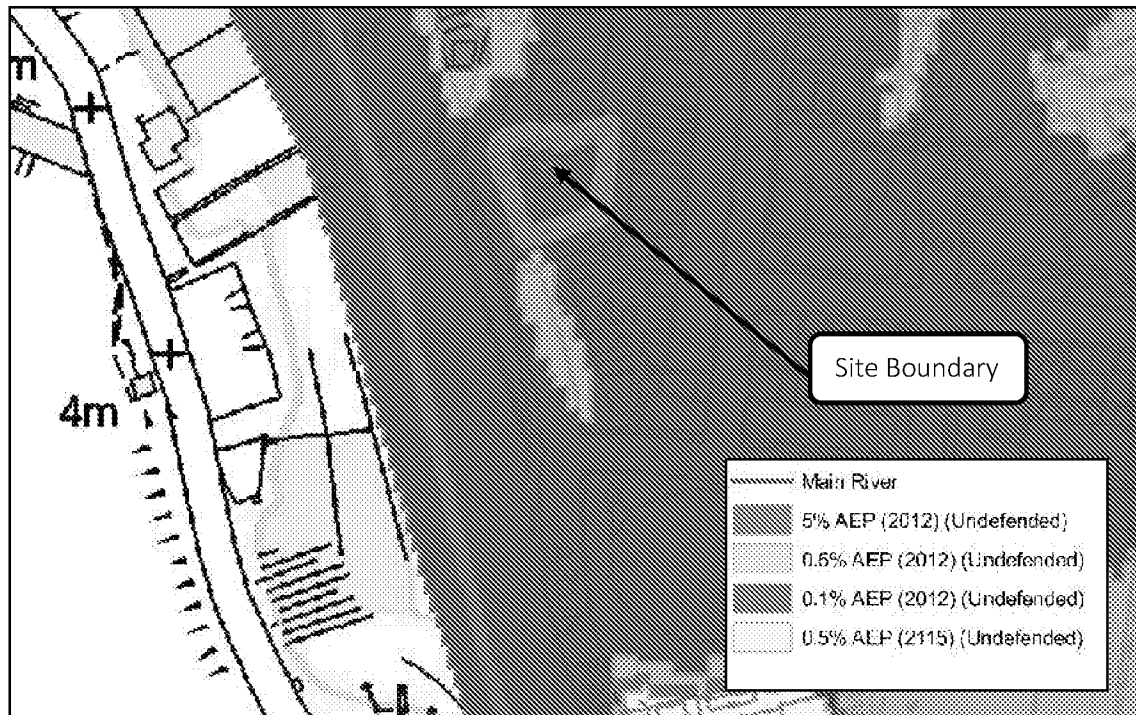


Figure 5: EA Modelled Undefended Flood Extents (Source: EA).

Modelled Flood Levels

4.10 The EA have also provided modelled flood levels at several data points on site, taken from within their modelled flood extents. The location of these data nodes within the wider side of 46a-47 Pier Road is demonstrated in Figure 6. It can be identified that Node 1 is most representative of the proposed development at 46a and 46b Pier Road.

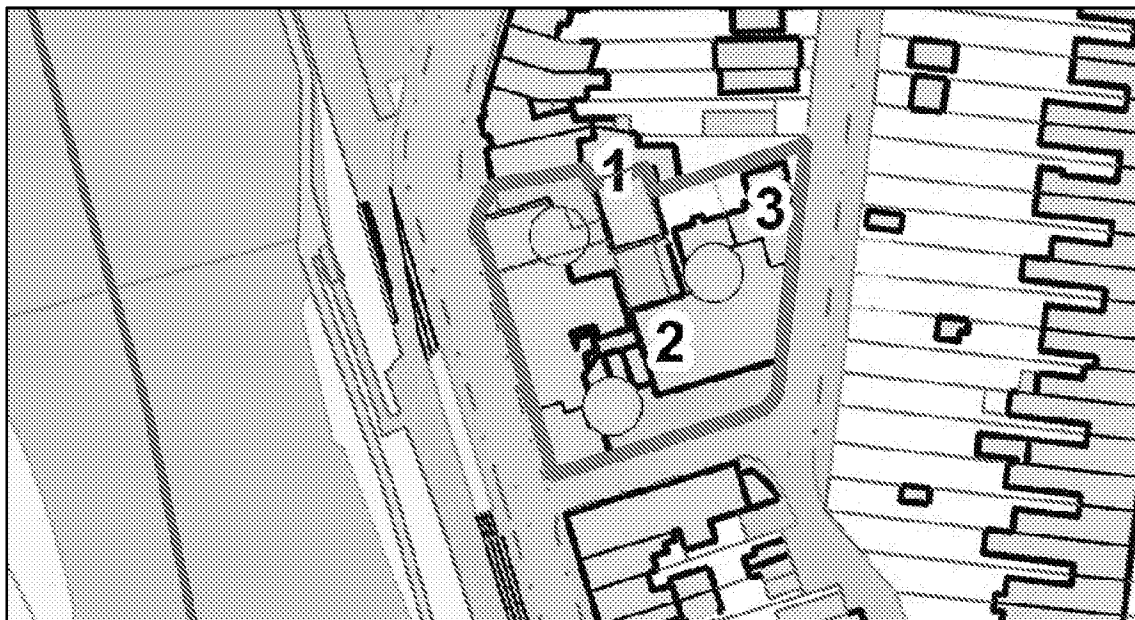


Figure 6: EA Modelled 2D data nodes (Source: EA)

4.11 The EA data provided at Node 1 indicates no recorded value for the 1:20 year and 1:200 year present day defended events, indicating that the site would remain unaffected for these events.

- 4.12 The EA data provided at Node 1 indicates a modelled flood level of 4.88m AOD and 2.94m AOD for the defended 1:200 year (2115) and defended 1:1000 year (present day) events, respectively.
- 4.13 Ground levels on site vary between approximately 2.12m AOD and 3.16m AOD (*Source: 2m LiDAR data*).
- 4.14 As such, a comparison between modelled flood levels and site topography indicates that the proposed development site could experience a potential maximum flood depth of 2.76m for the 1:200 year (2115) defended flood event.
- 4.15 The EA data provided at Node 1 indicates a modelled undefended flood level of 2.87m AOD, 4.93m AOD and 4.05m AOD for the 1:20 year, 1:200 year (2115) and 1:1000 year events respectively.
- 4.16 As such, a comparison between modelled flood levels and site topography indicates that the proposed development site could experience a potential maximum flood depth of 2.81m for the 1:200 year (2115) undefended flood event.
- 4.17 Previous correspondence with the EA for the wider site (November 2017) has indicated that the undefended modelled flood levels should be used to define mitigation as there is a residual risk that the nearby defences could fail or overtop. As such, the EA previously stated that residential FFLs set to 5.23m AOD would be acceptable, as this is 300mm above the 1:200 year (2115) undefended flood level.
- 4.18 Management of defences in the area is stated in the Beachy Head to Selsey Bill Shoreline Management Plan (2006), the management policy for Angmering-on-Sea to Littlehampton (Policy Unit: 4d18) is "Hold the Line" – to maintain or upgrade the level of protection provided by defences. The management policy will continue to apply at present day and across the medium (2025 to 2055) to long term (2105). It could therefore be implied that the nearby defences will be maintained and upgraded in the future.
- 4.19 Based on the EA recorded flood outlines dataset, there were flood events within the vicinity of the site and Littlehampton in 1975, 1983 and 1985. Based on the recorded outlines, the proposed development site is partially within the recorded extent of the 1985 flood event. The depths on site during this event are unknown.
- 4.20 It is important to note that tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that an early warning will be issued before such an event strikes. As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.
- 4.21 As such the risk of flooding is considered to be **high**, however the proposed dwellings ("More Vulnerable" use) will be located at the first floor and above.

Surface Water (Pluvial)

- 4.22 The EA's Risk of Surface Water Flooding map (*Figure 7*) demonstrates that the majority of the site is at a "Very Low" risk of surface water flooding, with the rear courtyard area at a "Low" risk. Land east of the site is at a "Medium" risk of surface water flooding.
- 4.23 The EA Online Surface Water Flood Depth Map for the High Risk Scenario indicates that the proposed development site would remain unaffected for the High Risk Event.
- 4.24 The EA Online Surface Water Flood Depth Map for the Medium Risk Scenario indicates that the proposed development site would remain unaffected for the Medium Risk Event. However, land east of the site could experience depths of less than 300mm for the Medium Risk Event (*Figure 8*).
- 4.25 The EA Online Surface Water Flood Depth Map for the Low Risk Scenario indicates that the proposed development site would be partially affected for the Low Risk Event (*Figure 9*). The courtyard area to the rear of the existing commercial unit could experience depths of between 300mm and 900mm, as could land east of the site.

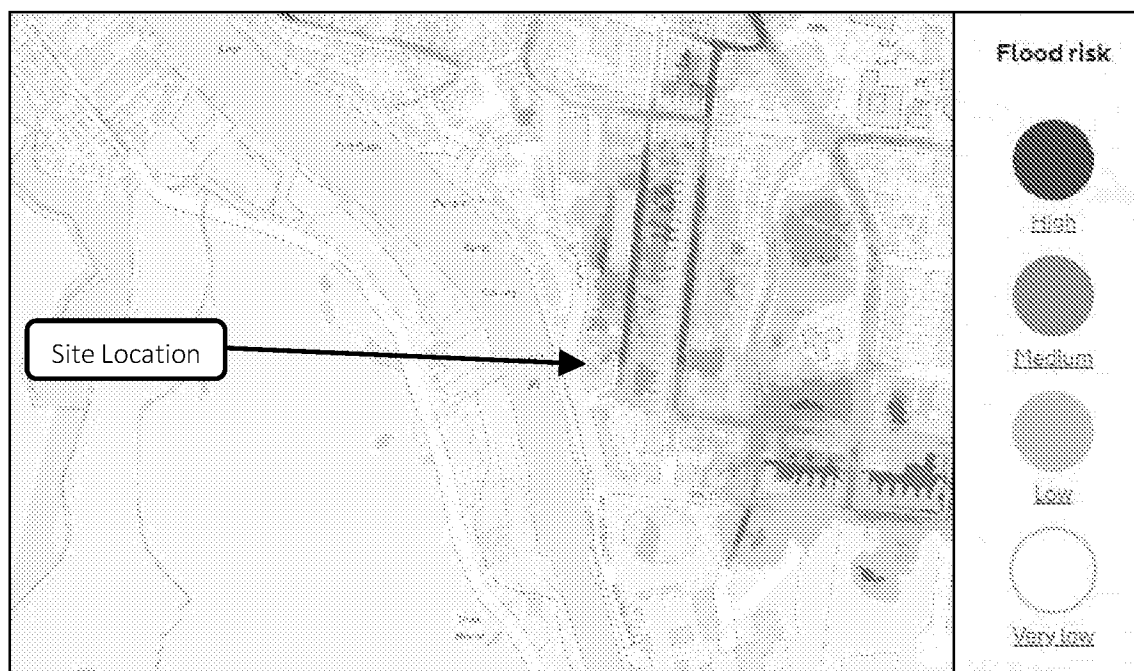


Figure 7 – EA Surface Water Flood Risk Map. (Source: EA Online)

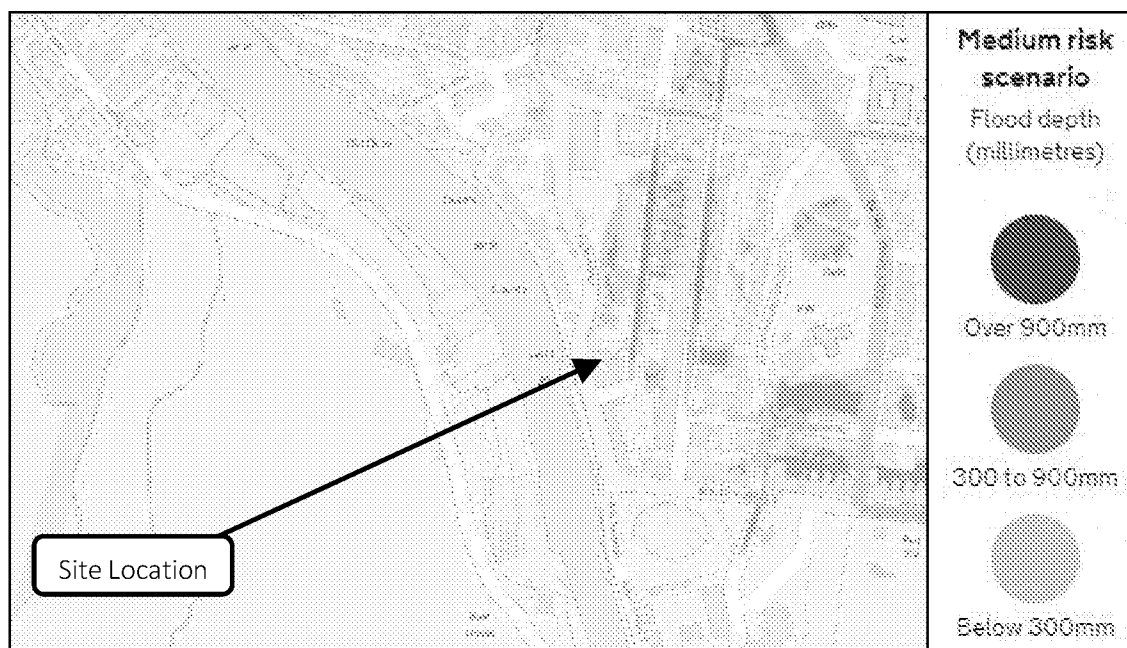


Figure 8 -- Surface Water Depth -- Medium Chance of Occurring (Source: EA Online)

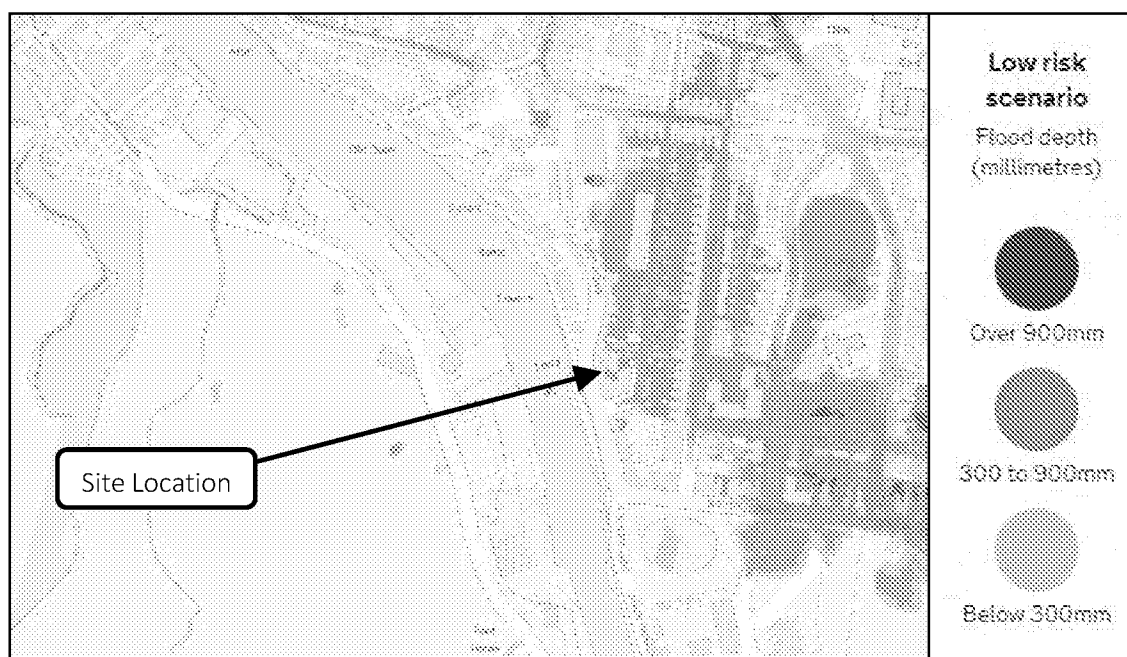


Figure 9 -- Surface Water Depth -- Low Chance of Occurring (Source: EA Online)

- 4.26 Appendix H of the Arun District Council Level 1 SFRA maps historic flood events within proximity of the proposed development site (*Figure 10*). It indicates that the nearest recorded surface water flood extent to the proposed development site was approximately 190m east of the site. The date, extent, or depth of flooding associated with this event is unknown.
- 4.27 As such the risk of flooding to the site from surface water is deemed to be **relatively low to moderate**.

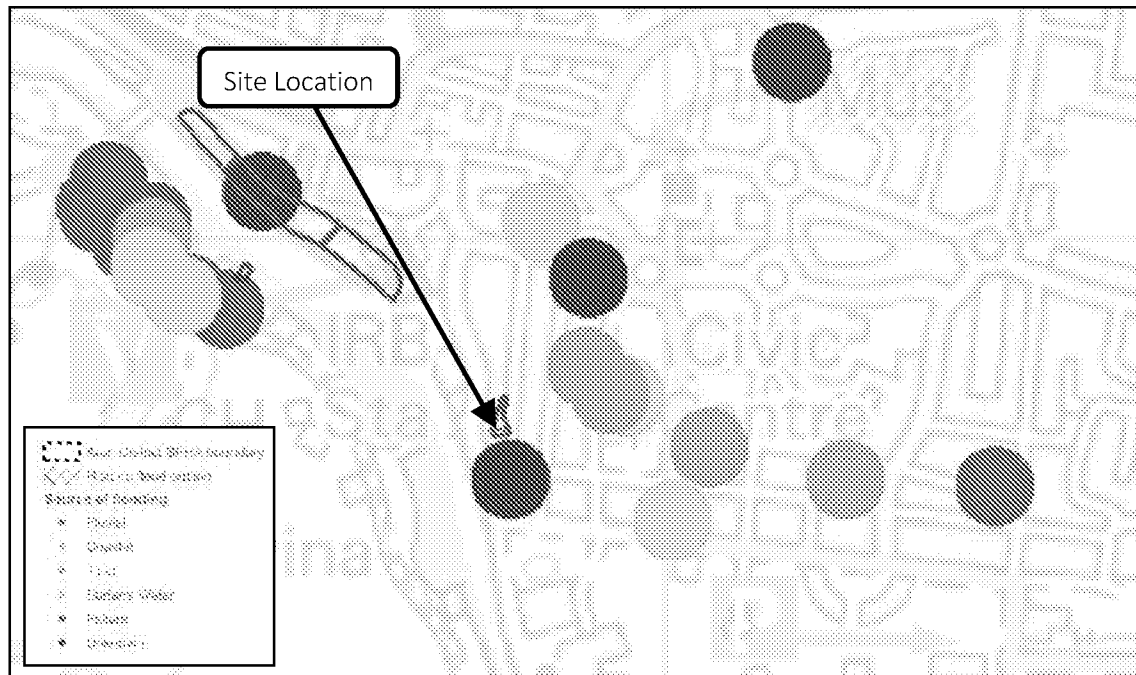


Figure 10 -- Historic Flood Records (Source: Arun District Council SFRA, 2016)

Groundwater

4.28 Appendix F of the Arun District Council SFRA (2016) indicates that the site is located in an area susceptible to groundwater flooding classified as $\geq 75\%$ (*Appendix C*).

4.29 No records could be found within the Arun District Council SFRA historic flood records mapping to indicate that the site had flooded from groundwater sources, previously.

4.30 As such, the risk of flooding from this source can be considered to be **moderate**.

Sewer

4.31 The Arun District Council SFRA (2008) Historic Incidents of Flooding from Sewers Map (*Appendix C & Figure 11*) shows that the area surrounding the site has had six historic sewer flooding incidents. However, the extent of flooding during these events is unknown, and no records could be found to indicate that there have been historic sewer flood events on site.

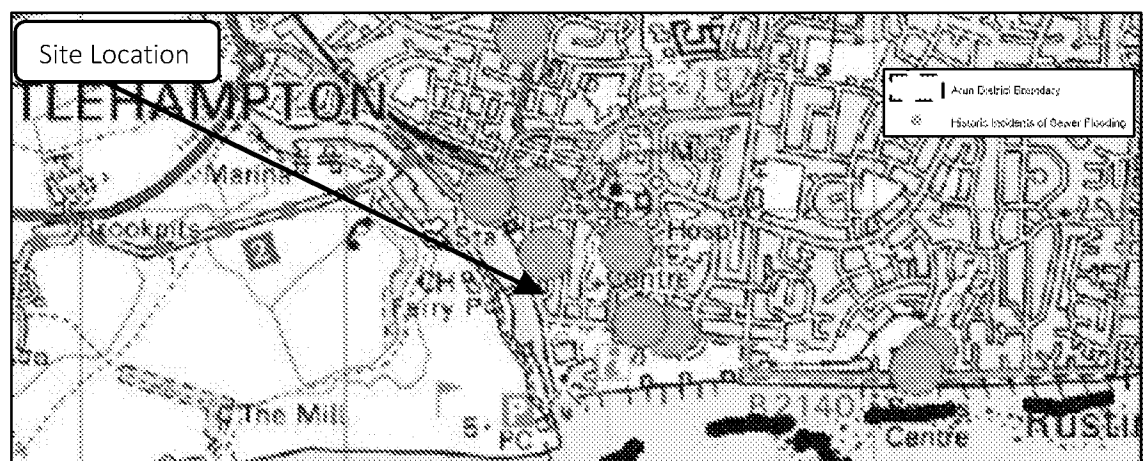


Figure 11 -- Historic Incidents of Sewer Flooding Map (Source: Arun District Council SFRA, 2008).

- 4.32 Although at the time of writing there are no records of flooding from this source at the site, this does not mean that it has not flooded from this source. Equally, it may or may not flood from this source in the future.
- 4.33 As such, the risk to the site from sewer flood sources can be considered **relatively low to moderate**.
- 4.34 Southern Water should be contacted to obtain a pre-development enquiry for surface and foul water, to ensure there is sufficient capacity in the existing system to ensure flood risk is not increased.

Surface Water Drainage Strategy

- 4.35 A review of an existing topographic survey provided by the client and area imagery indicate that the development site could be considered 100% impermeable as existing.
- 4.36 Proposed plans provided by the client indicate that the proposed development will not increase impermeable surfaces post-development. As such, any change in runoff rates post-development would be considered negligible.
- 4.37 Policy W DM3 of the Arun Local Plan (2018) states that proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design.
- 4.38 A review of the decision notice for the redevelopment of the wider site at 46a-47 Pier Road (Arun Ref LU/287/17/PL) indicates that details of foul and surface water drainage were conditioned.
- 4.39 The previous drainage strategy for the wider site (Arun Ref LU/287/17/PL) was to provide a green roof and Type C permeable paving to provide attenuation of runoff prior to discharging to the nearby public sewer at a restricted rate.
- 4.40 Sustainable Drainage Systems (SuDS) should be incorporated within the proposals to reduce runoff rates post-development.
- 4.41 Southern Water should be contacted when a Surface Water and Foul Water Drainage Strategy is produced to ensure there is capacity in the system for this proposed development, and sewer upgrade works undertaken where there is an incapacity.

Records of Historical Flooding

- 4.42 Appendix H of the Arun District Council Level 1 SFRA maps historic flood events within proximity of the proposed development site (*Figure 10*). This indicates approximately 13 historic flood incidents within a 500m radius of the site, from varying sources. The mapping indicates 2 incidents of fluvial flooding (on the west side of the Arun), 4 incidents of tidal flooding, 4 incidents of surface water flooding, and 3 from unknown sources. The extents of these recorded incidents are unknown and it is therefore unknown whether the site was affected during these events.
- 4.43 Based on the EA recorded flood outlines dataset, there was flood events within the vicinity of the site and in Littlehampton in 1975, 1983 and 1985. Based on the recorded outlines, the proposed

development site is partially within the recorded extent of the 1985 flood event. The depths on site during this event are unknown.

5. Probability of Flooding

- 5.1 According to the EA Flood Map for Planning, the site is located in Flood Zone 3. As such, the probability of tidal flooding at the site is greater than 0.5% annually.
- 5.2 The EA Flood Map for Planning indicates the potential spatial extent of a tidal flood event which has a magnitude that is, on average, likely to occur once in every two hundred years (i.e. the 1:200 year tidal floodplain). It is important to note that only the *potential* floodplain is shown; ***the mitigating effects of any flood defences currently in place are not considered***. For reference, the definition of the NPPF flood risk zones is included in Table 4.

Zone	Description
1	Low Probability. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium Probability. This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.
3a	High Probability. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
3b	The Functional Floodplain. This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).

Table 4 – Definition of the NPPF Flood Zones. Shaded cells denote the proposed development. (Source: EA).

Climate Change on Site

- 5.3 Climate change is likely to increase the river flow, storm intensity and raise sea levels.
- 5.4 The EA have recently updated the peak river flow allowances to use for different types of development. Communication with the EA, Flood and Coastal Risk Management Officer has confirmed that the changes are only focused to river flow and rainfall allowances. Tidal allowances are detailed in Table 3 of the new changes (<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>). As a result of this dialogue, it has been confirmed that the EA detailed data sets provided are relevant for the purposes of this assessment given that the dominant source of flooding is tidal.

- 5.5 The EA have also stated that the climate change will increase the peak rainfall intensity allowance in small and urban catchments (*Table 5*). As such, the risk of surface water flooding could increase, with the potential increase accounted for in the site drainage proposals.

River basin district	Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
South East	Upper end	25%	50%	105%
	Higher central	15%	30%	45%
	Central	10%	20%	35%

Table 5 — Peak river flow allowances by river basin district (Source EA)

6. Residual Risks

6.1 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- failure of a reservoir, or;
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with. At the time of writing, the EA has not provided tidal breach data.

6.2 Previous correspondence with the EA for the wider site (November 2017) has indicated that the undefended modelled flood levels should be used to define mitigation as there is a residual risk that the nearby defences could fail or overtop.

Defence Breach and Overtopping

6.3 No defence breach and overtopping data has been provided at the time of writing. As such, the undefended levels analysed in Section 4 should be used to inform mitigation from residual risks.

Reservoir Failure

6.4 The EA Online Maps indicate that the proposed development site is located outside the EA's modelled maximum flood extent following reservoir failure.

Drainage Failure

6.5 In the event of drainage failure, overland flows will be dictated by external levels. A review of 2m LiDAR data indicates that the site falls from higher elevations in the east, towards the lower lying west.

6.6 As such, in the event of drainage exceedance/ failure, overland flows would be directed towards the west of the site. The proposed dwellings are to be located at the first floor and as such, would remain unaffected following drainage exceedance. The lower lying east of the site is recommended to be used for parking for the proposed dwellings.

7. Flood Risk Management Measures

- 7.1 The site is located in Flood Zone 3 according to the EA Flood Map for Planning (High Risk of flooding as defined in the NPPF), as such the proposed development will require flood mitigation measures.
- 7.2 Previous correspondence with the EA for the wider site (November 2017) has indicated that the undefended modelled flood levels should be used to define mitigation as there is a residual risk that the nearby defences could fail or overtop.
- 7.3 As such the following mitigation measures are proposed;
- residential element of the proposed development should have a finished floor level of no lower than 5.23mAOD (300mm above 1:200 year (2115) undefended flood level);
 - this was previously agreed with the EA for the redevelopment of the wider site,
 - the client has agreed to set residential FFLs no lower than 5.23mAOD,
 - bringing down electrical services from ceilings toward sockets, where possible;
 - communal internal stairwell on first floor level to higher floor level where possible;
 - raised wiring and power outlets on ground floor level;
 - all plumbing insulation to be of closed-cell design;
 - use of MDF carpentry (i.e. skirting, architrave, built-in storage) to be avoided at ground floor level;
 - all sleeping accommodation to be located on the first floor and above;
 - raise internal ground floor levels/threshold levels 300mm above external ground levels to mitigate against extreme surface water flows, where possible;
 - sign up to the EA Flood Warning Service and ensure that this service is made available to all site users, future owners and residents, and;
 - formulate an evacuation plan to be implemented in the event of severe flood or weather warnings.
- 7.4 In addition, the proposed development should seek to incorporate the use of SuDS to reduce runoff rates post-development.

Safe Access/Egress

- 7.5 The site resides within Flood Zone 3 (tidal) and is located within an EA Flood Warning Service Area (*Figure 12*).
- 7.6 It is recommended that the site owner, occupants and site staff sign up to the EA flood warning service if they have not done so already, in order to provide betterment to the site. It is recommended that all new site owners and new site staff are made aware of the potential flood risk to the site and that they sign up to the EA flood warning service. It is recommended that all site users are also made aware of the potential flood risk posed to the site.

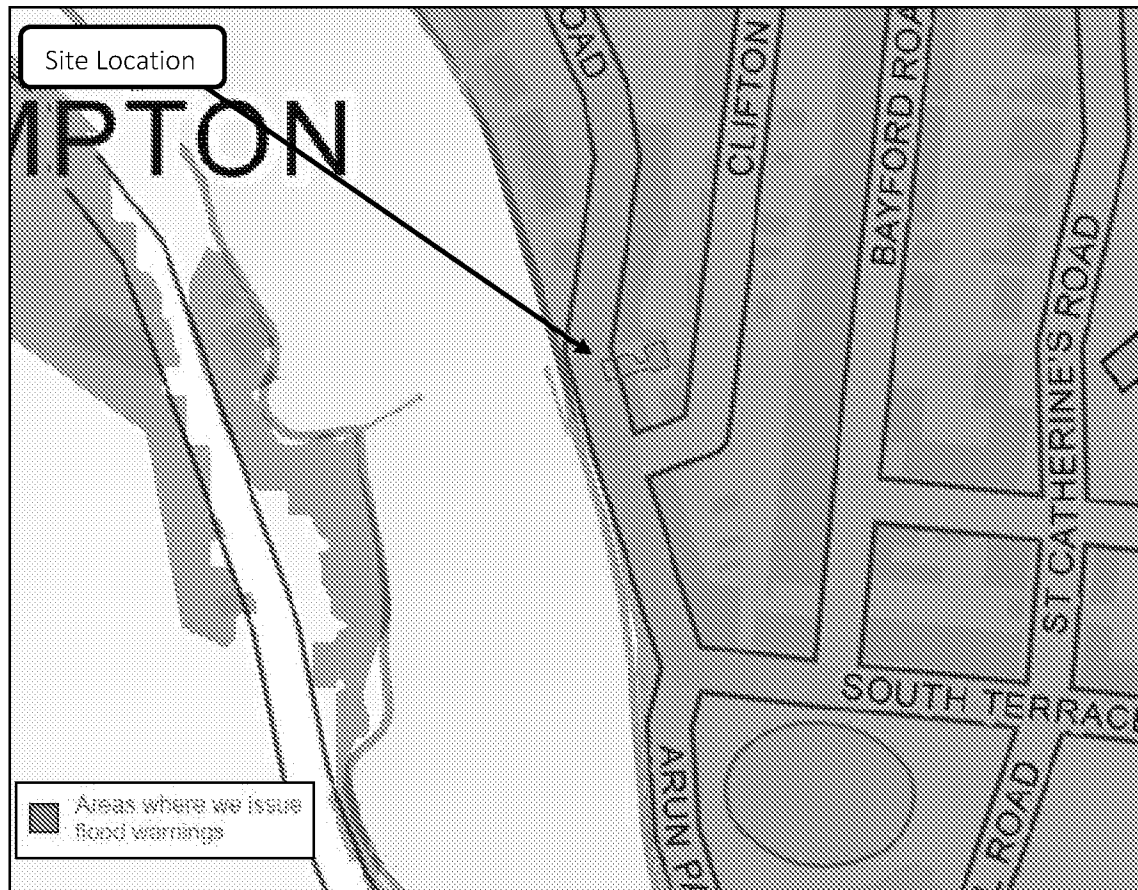


Figure 12 – EA Flood Warning Area (Sources: EA, OS).

7.7 The EA operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. Further information can be found on www.environment-agency.gov.uk/floodline. Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager.

- On receipt of a **FLOOD ALERT**, the owners/occupiers of the property should:
 - monitor the situation via local media;
 - make themselves aware of forecast local weather conditions;
 - alert others resident in the property of the situation;
 - prepare to evacuate if necessary.
- On receipt of a **FLOOD WARNING**, the owners/occupiers of the property should:
 - follow advice to “go in, stay in, and tune in”;
 - be prepared to follow instruction form the Emergency Services.
- On receipt of a **SEVERE FLOOD WARNING**, the owners/occupiers of the properties should:
 - follow advice to “go in, stay in, and tune in”;

- remain attentive to local media forecasts and news bulletins;
 - do not evacuate unless instructed to do so by the Emergency Services;
 - only when instructed to evacuate by the Emergency Services, leave the property and follow the agreed evacuation route.
- 7.8 Safe egress from the site can be achieved by migrating away from the source of flooding on receipt of a flood warning.
- 7.9 If flooding has already occurred prior to evacuation, it is advised to remain on the upper floors of the site and await instruction from the emergency services or until it is deemed safe to evacuate. Residents should move via internal stairwells to the upper floors of the property so as to be located within an area of safe refuge. No evacuation should be sought if flood depths exceed 25cm, evacuation should only be sought with the assistance of the emergency services in these circumstances.
- 7.10 It is the responsibility of the site owner(s) to keep the evacuation route known to all site users and visitors.
- 7.11 The maximum and minimum sea level (tidal peak and trough) are approximately 6 hours apart. As such, it is expected that tidal waters will drain away well within 6 hours. In practicality, the peak of the surge would last for a much shorter period of time and as such, it would be likely that water would recede much faster. However, due to the potential hazard of overtopping via wave-action, it is not recommended that occupants leave the building until low tide (or until the emergency services instruct them to do so).
- 7.12 Tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that early warning will be issued before such an event strikes.
- 7.13 **As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.**

8. Off Site Impacts

Impact to Flood Risk Elsewhere

- 8.1 Section 7.4.5 of the Arun District Council SFRA (2016) states that *“in most areas of fluvial flood risk, raising land above the floodplain would reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land”*. This implies that land in areas at risk of tidal flooding are not required to provide flood compensatory storage.
- 8.2 The site is located in Flood Zone 3, (tidal, as defined by the EA) and as such there is no requirement for compensatory flood storage.

Generation of Runoff

- 8.3 Proposed plans provided by the client indicate that the proposed development will not increase impermeable surfaces post-development. As such, any change in runoff rates post-development would be considered negligible.
- 8.4 Foul Flows post development is shown to increase over existing, as such a pre-development enquiry should be submitted to confirm that capacity is available in the sewer network to accommodate any increase in flows post development.
- 8.5 Policy W DM3 of the Arun Local Plan (2018) states that proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design.

9. Conclusion

- 9.1 Ambiental has been appointed by Dowsett Mayhew Planning Partnership Ltd to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at 46a and 46b Pier Road, Littlehampton, West Sussex, BN17 5LW.
- 9.2 It is understood that the development is for the demolition of the existing structures on site and the construction of two new buildings to provide commercial (A1) at ground floor, with four residential units above.
- 9.3 The EA Flood Map for Planning indicates that the proposed development site is located in Flood Zone 3.
- 9.4 Due to the proposed mixed use scheme, the proposed development is considered to be a “Less Vulnerable” and “More Vulnerable” for the development of the commercial (ground floor) and residential use (first floor) respectively, under the vulnerability classifications of the NPPF.
- 9.5 The EA previously accepted a similar scheme on the wider site at 46a-47 Pier Road Arun District Council Ref LU/287/17/PL), for which it was agreed to set all residential development at 5.23mAOD (300mm above the 1:200 year (2115) undefended flood level), to be conservative, as the nearby defences could fail or be overtopped.
- 9.6 The developer has agreed to set **residential** FFLs no lower than 5.23mAOD.
- 9.7 As such and given that:
- a) The proposed development is for the demolition of the existing structures and the construction of a mixed use scheme to provide commercial uses on the ground floor and residential above;
 - b) All residential units will be set no lower than 5.23mAOD (300mm above 1:200 year (2115) undefended flood level);
 - c) The site lies within an area of tidal flood risk and therefore is not required to provide flood compensatory storage;
 - d) Given the nature of tidal flooding, prior evacuation can be sought;
 - e) The proposed development should seek to incorporate SuDS to reduce runoff rates post-development;
 - f) That capacity is available or can be made available in the public sewer system for proposed discharge rates
 - g) In terms of flood vulnerability, betterment can be achieved through the implementation of formal flood warnings/alerts and prior evacuation, an area of safe refuge can be provided via internal stairwells to the upper floors;

following the guidelines contained within the NPPF, the proposed development is considered **to be suitable** assuming appropriate mitigation (including adequate warning procedures) can be maintained for the temporary lifetime of the development.

Dr. J. B. Butler
B.Sc., M.Phil., PhD.
Ambiental Technical Solutions Ltd.

August 2018

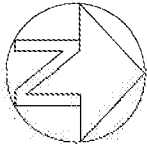
Appendix A — Development Plans



Proposed block plan Scale 1:500 @A3



Site location plan Scale 1:1250 @A3



Planning issue

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client: Emsdale Residential Limited

project: 46A Pier Road
Littlehampton

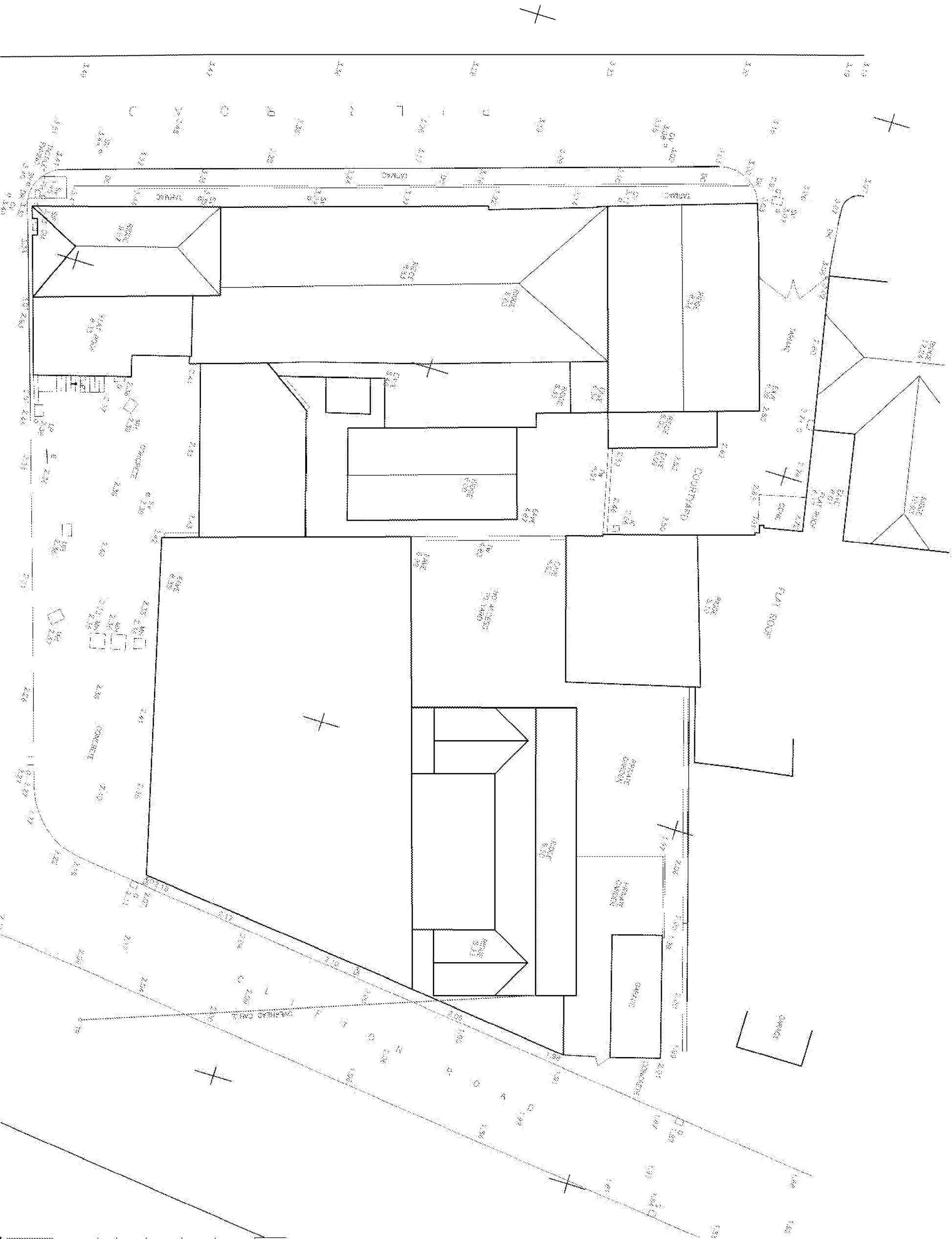
drawing: Block & site location plans

scale: Shown@A3 date: Feb 2018
drawn: MDOONCIE

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fax: 01273 511057
email: info@turnerassociates.co.uk

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tax	date
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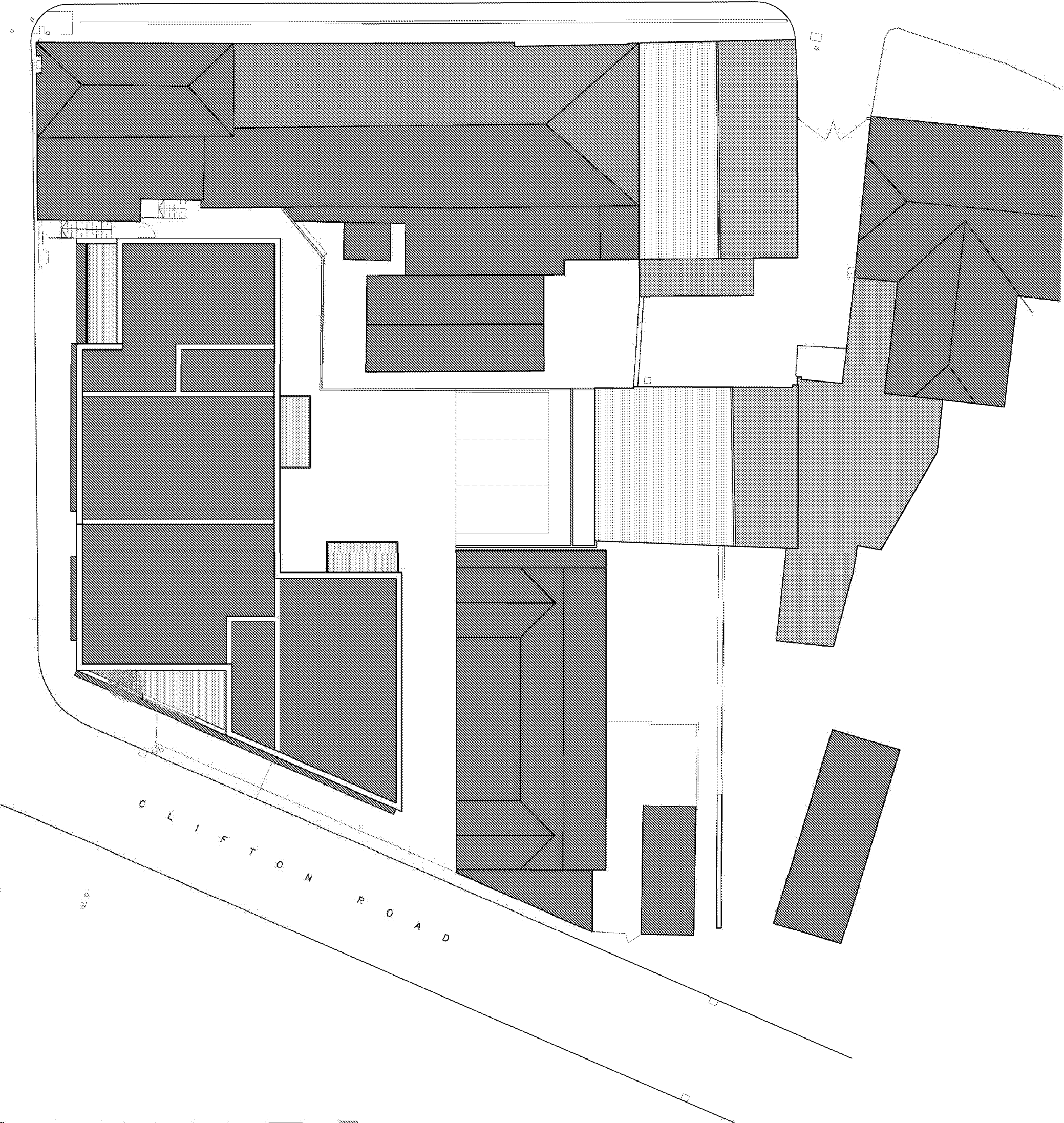
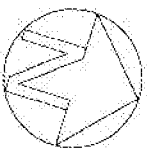
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Project: 46A Pier Road
Littlehampton, BN17 5LW
Drawing: Existing survey

scale	1:200@A3	date	FEB 98
		drawn by	JW
19a Wilbury Avenue		tel	01273 203230
Marble, Essex S108XX		fax	01273 211687
RN16HS		email	info@acornarchitects.co.uk

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project: 46A Pier Road
Littlehampton, BN17 5LW

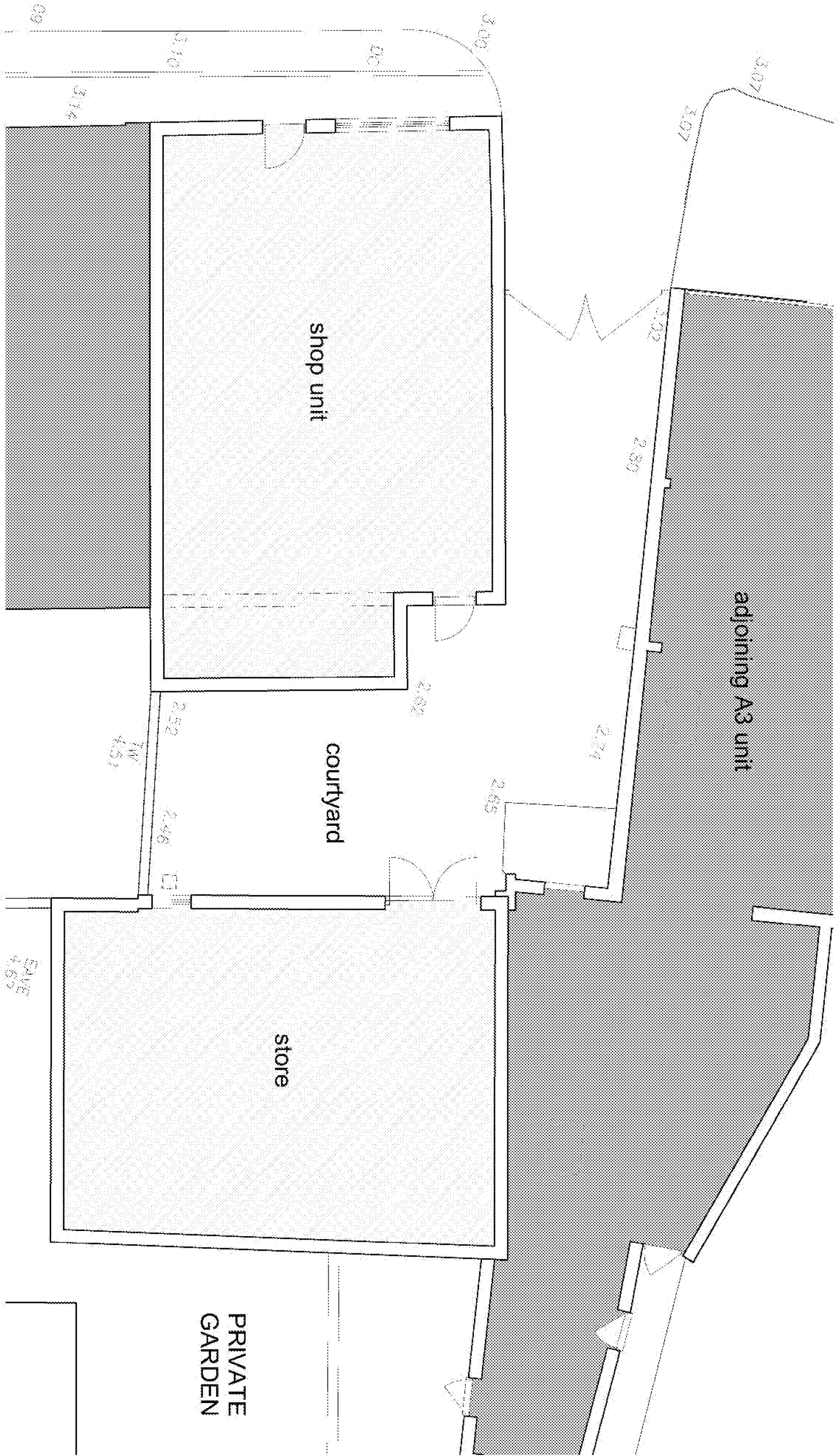
drawing: Existing Roof Plan

scale: 1:200@A3 date: FEB 98
drawn: JN

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Existing ground floor plan Scale 1:100 @A3

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client: Emsdale Residential Limited

project: 46A Pier Road
Littlehampton, BN17 5LW

drawing: Existing Floor Plan

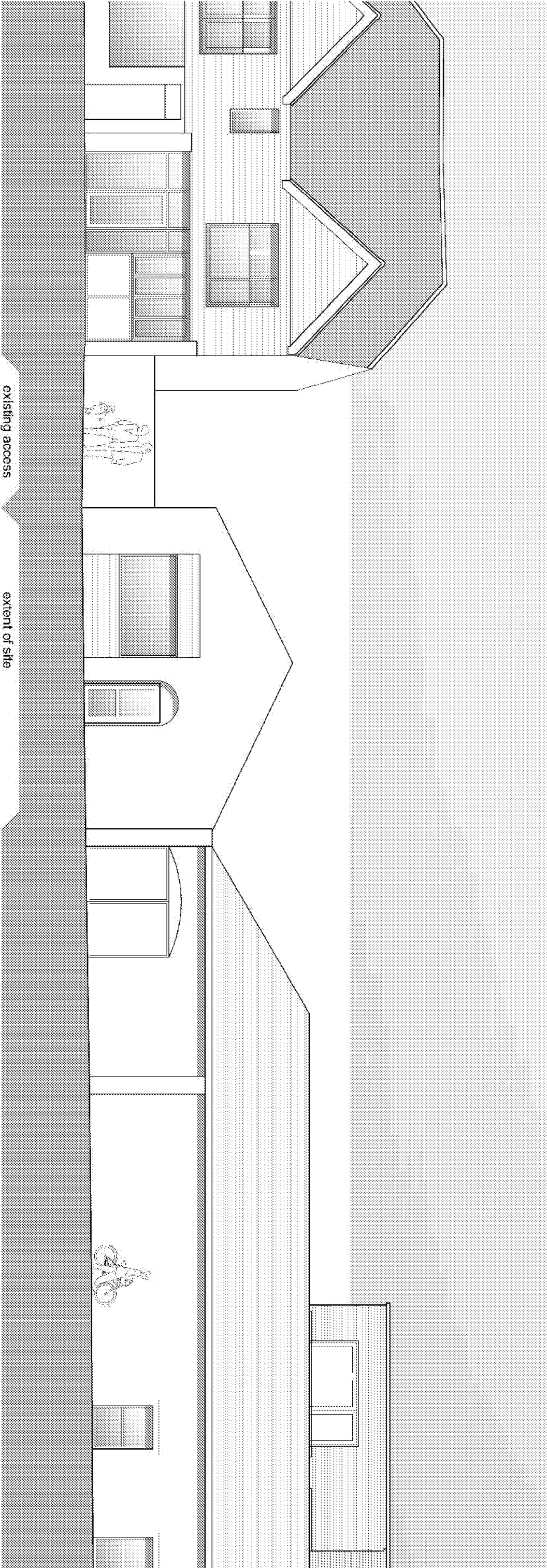
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Existing elevation (west) to Pier Road Scale 1:100 @A3

Planning issue

rev.	date
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client: Emsdale Residential Limited

project: 46A Pier Road
Littlehampton, BN17 5LW

drawing: Existing Elevation

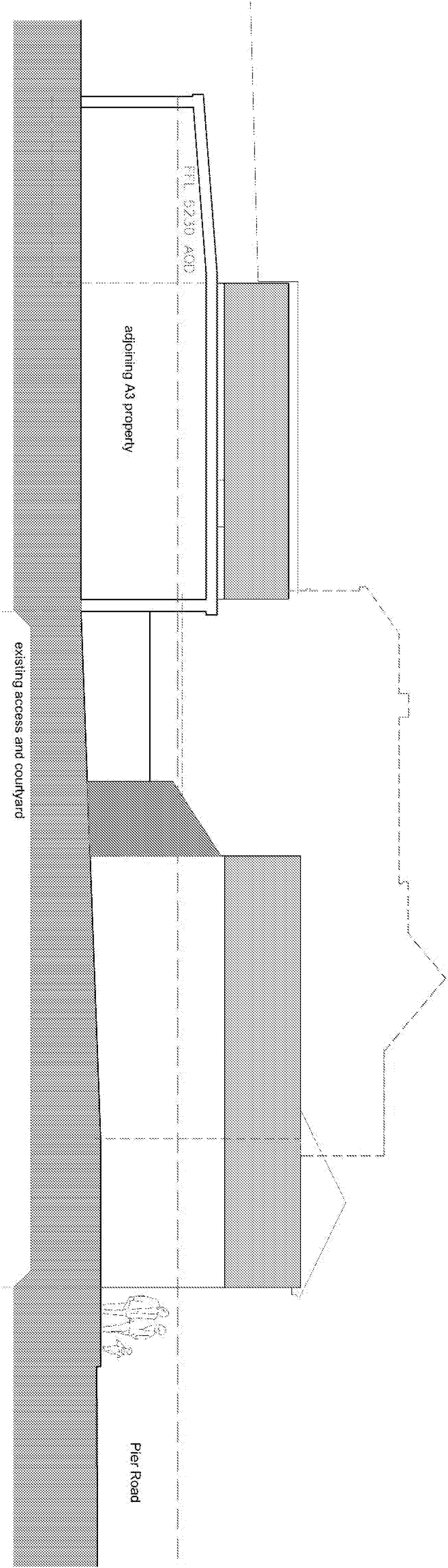
scale: 1:100@A3 date: MARCH 18
drawn: JN

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Hove, East Sussex fax: 01273 511065
BN1 6HS email: info@turnerassociates.co.uk

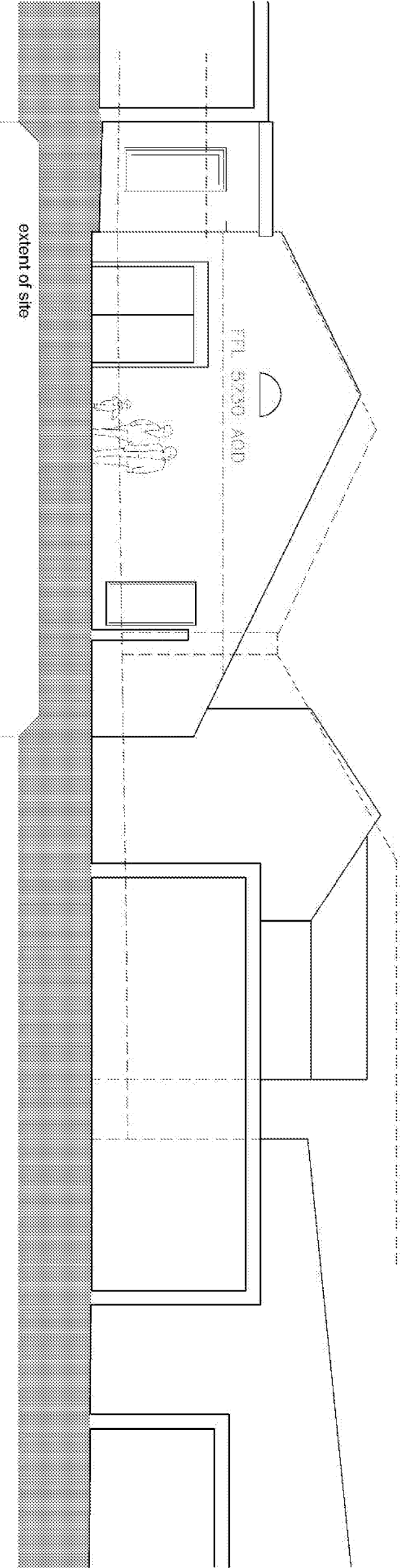
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Existing side (north) elevation Scale 1:100 @A3



Existing site section and courtyard elevation (west) to rear unit Scale 1:100 @A3

Planning issue

rev.	date

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client: Emsdale Residential Limited

project: 46A Pier Road
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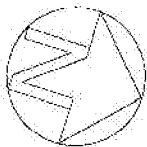
drawing: Existing Elevations

scale: 1:100@A3 date: MARCH 18
drawn: JN

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- key**
- A flat roof
 - B pitched roof laid in slate
 - C rooflights
 - D balcony terrace
 - E existing boundary wall

Planning Issue

rev.	date

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client: Emsdale Residential Limited

project: 46A Pier Road
Littlehampton, BN17 5LW

drawing: Proposed site plan

scale: 1:200@A3 date: FEB 98 drawn: JN

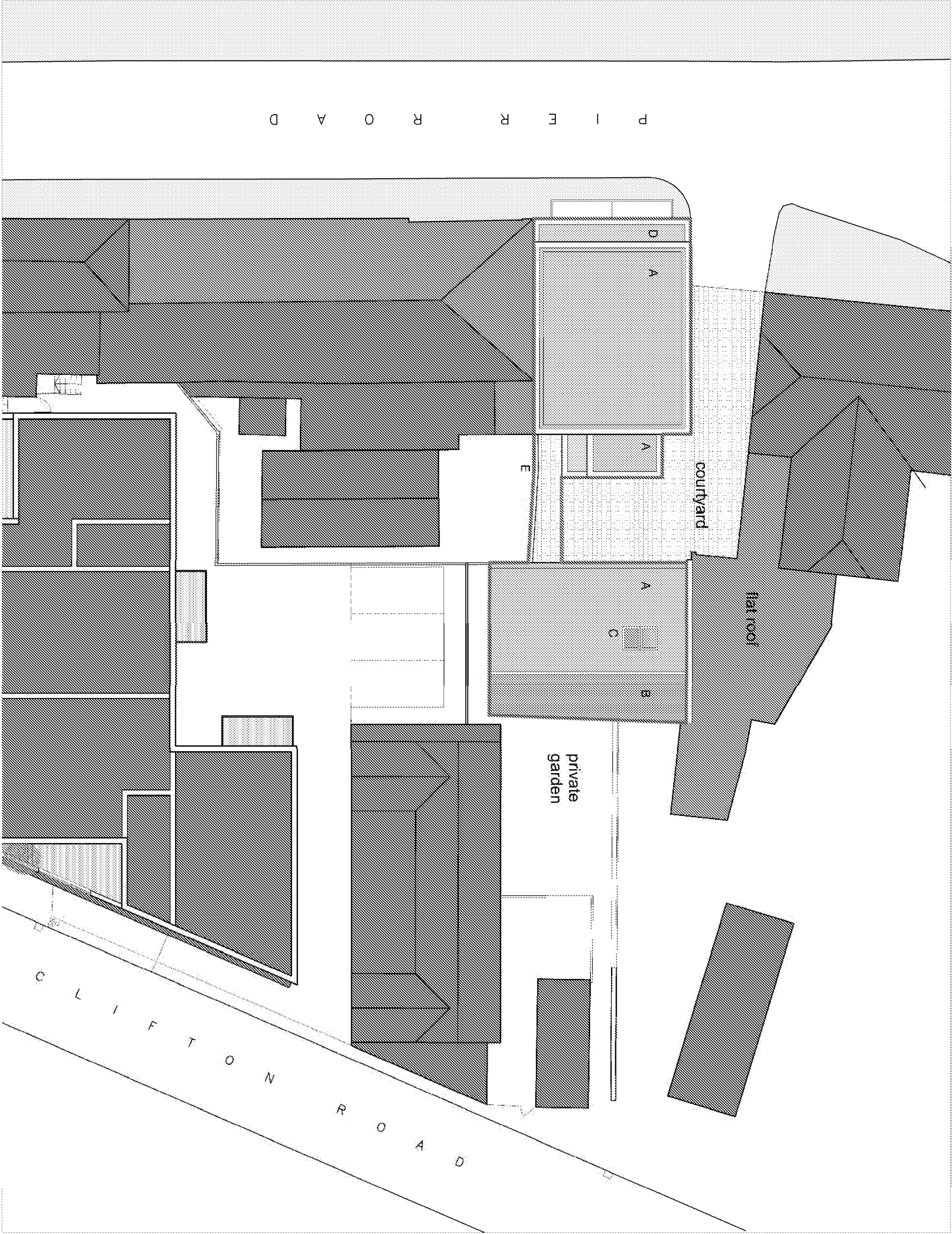
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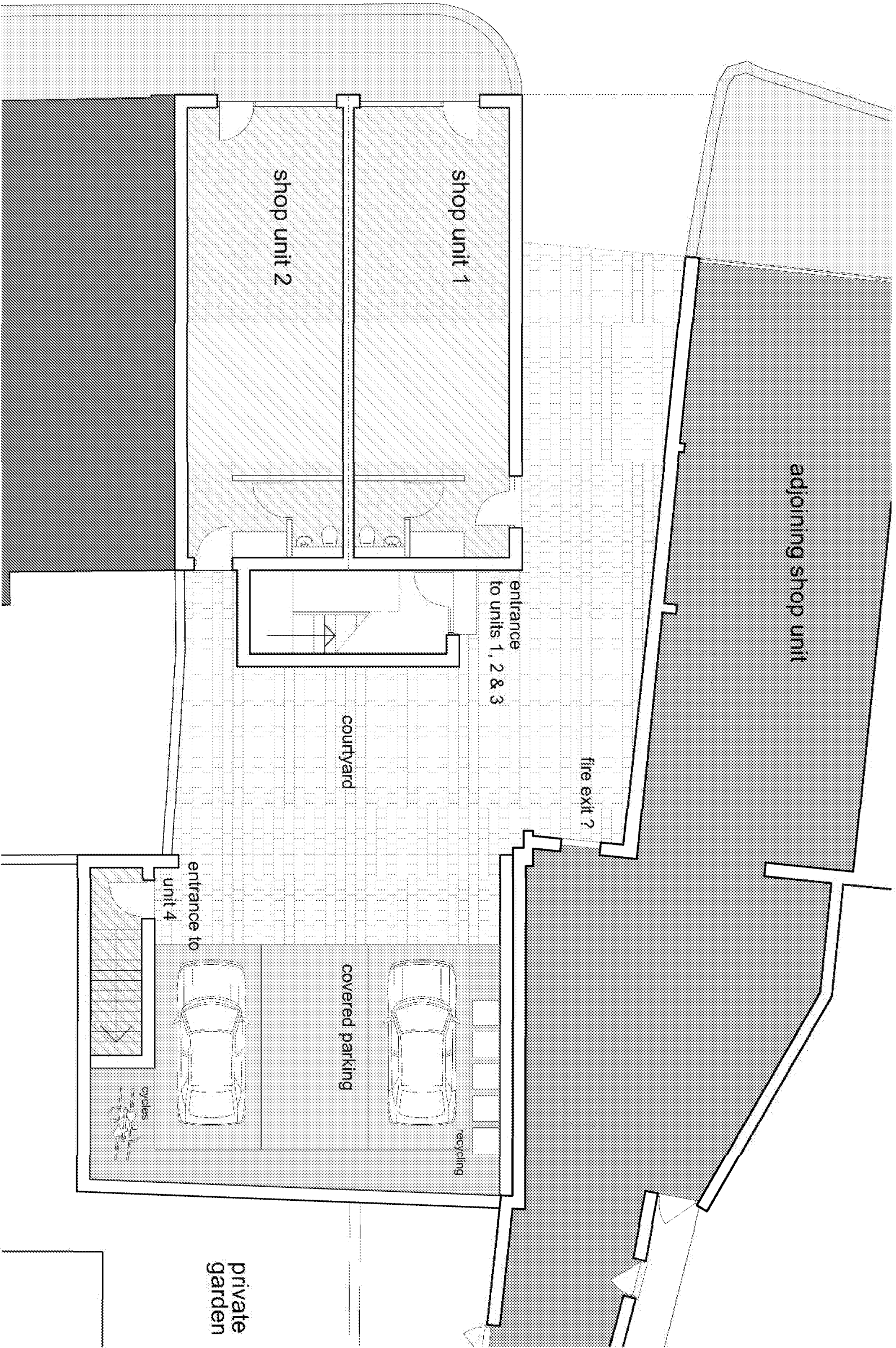
REV.

Proposed site plan Scale 1:200 @A3

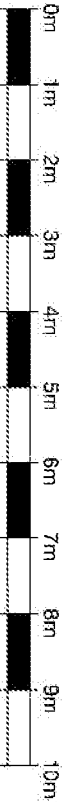


P I E R R O A D

C L I F T O N R O A D



Proposed ground floor plan Scale 1:100 @A3



Planning issue

rev.	date

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project: 46A Pier Road
Littlehampton, BN17 5LW

drawing: Proposed Ground Floor Plan

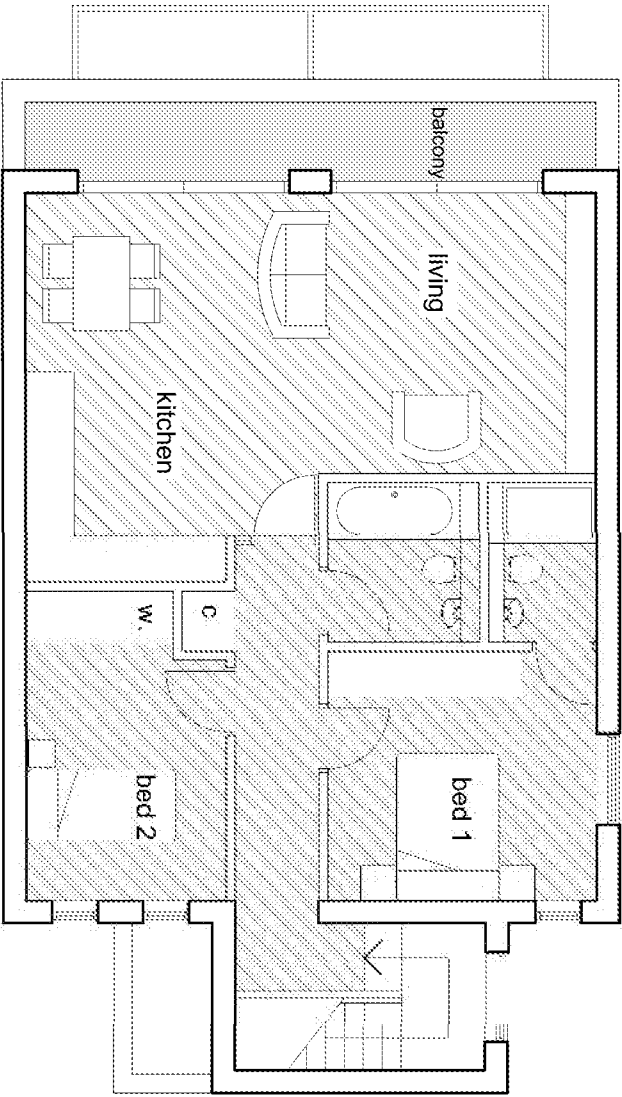
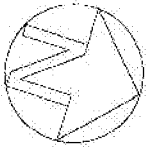
scale: 1:100@A3 date: FEB 2018
drawn: JN

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fax: 01273 511065
email: info@turnerassociates.co.uk

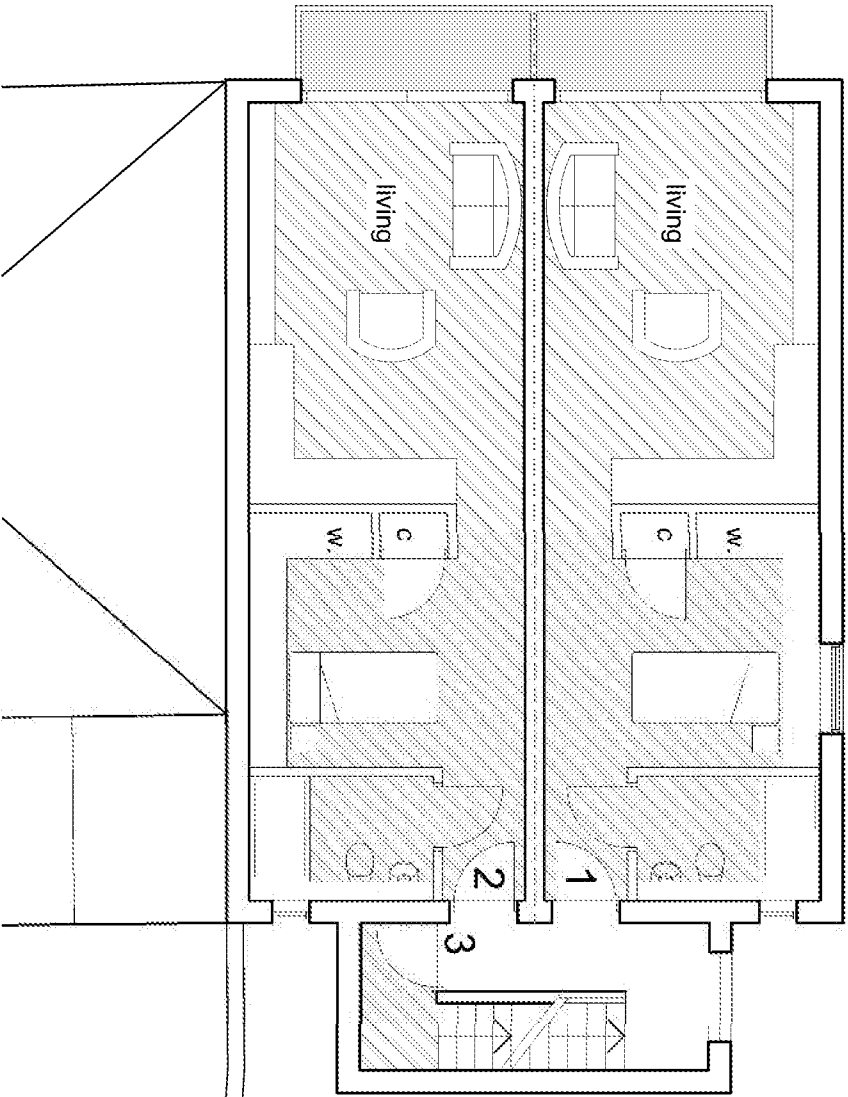
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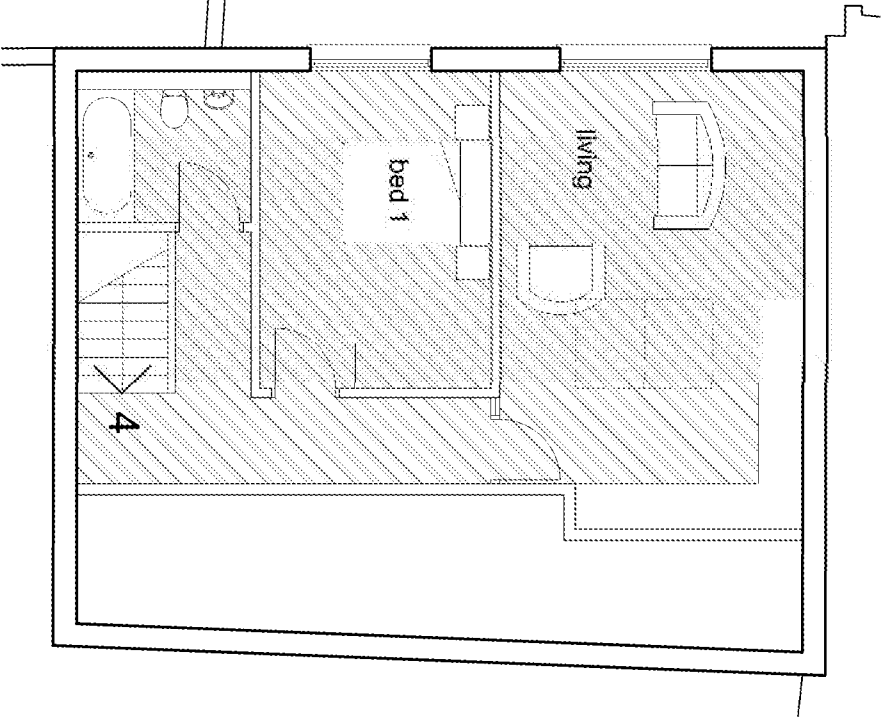
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Proposed second floor plan Scale 1:100 @A3



Proposed first floor plan Scale 1:100 @A3



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project: 46A Pier Road
Littlehampton, BN17 5LW

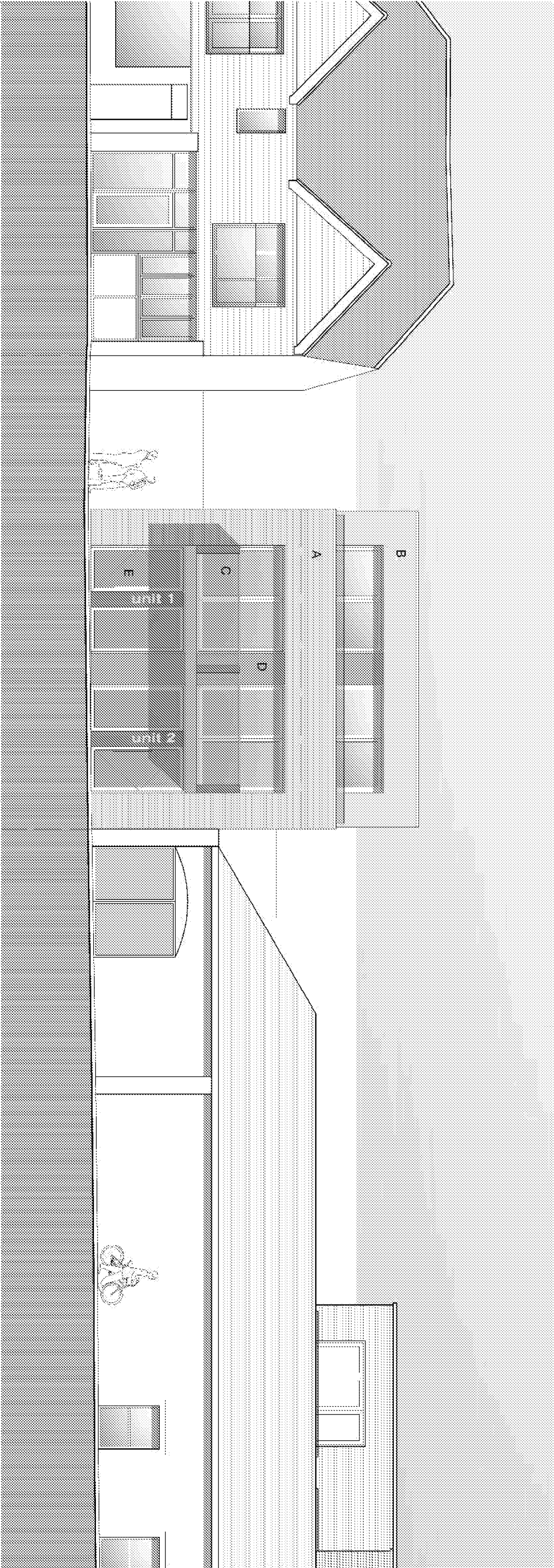
drawing: Proposed Upper Floor Plans

scale: 1:100@A3 date: FEB 2018
drawn: JN

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Proposed street elevation (west) to Pier Road Scale 1:100 @A3

Key

- A facing brickwork
- B painted render
- C glazed balcony
- D timber slatted cladding
- E glazed shop entrances

Planning issue

rev.	date

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client: Emsdale Residential Limited

project: 46A Pier Road
Littlehampton, BN17 5LW

drawing: Proposed street elevation

scale	1:100@A3	date	FEB 2018

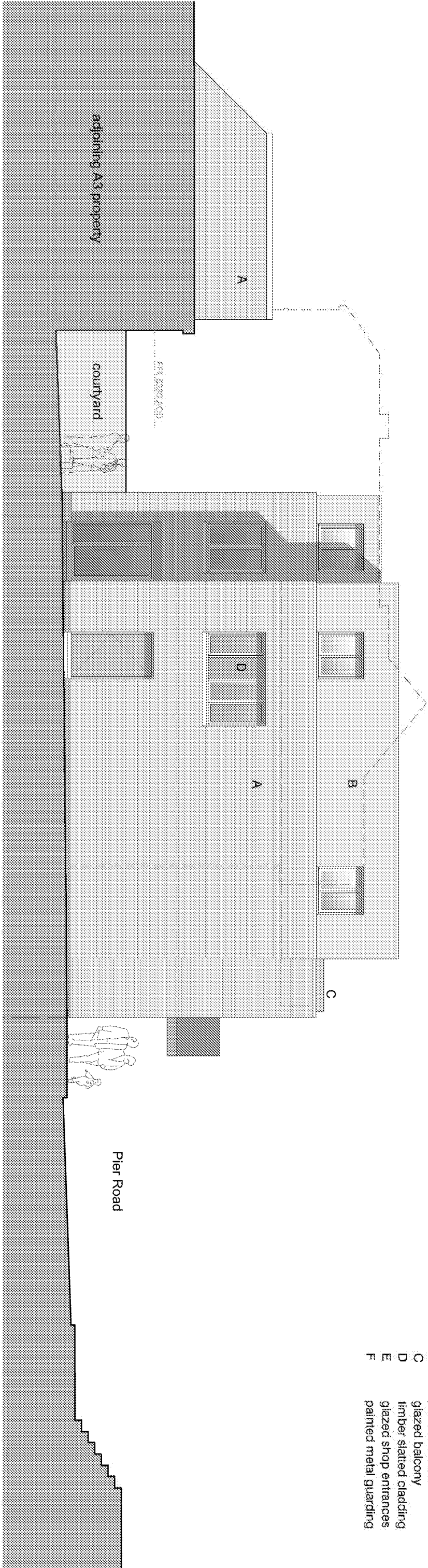
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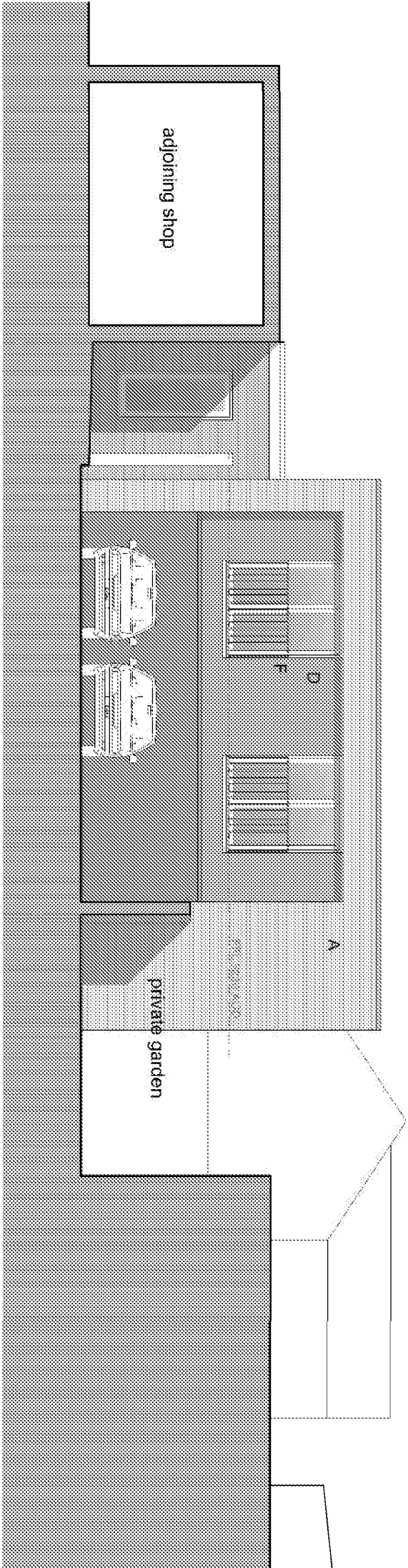
TA 1098 / 13
REV.

Key

- A facing brickwork
- B painted render
- C glazed balcony
- D timber slatted cladding
- E glazed shop entrances
- F painted metal guarding



Proposed side (north) elevation 1:100 @A3



Proposed courtyard (west) elevation to rear unit Scale 1:100 @A3

Planning issue

rev.	date

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project: 46A Pier Road
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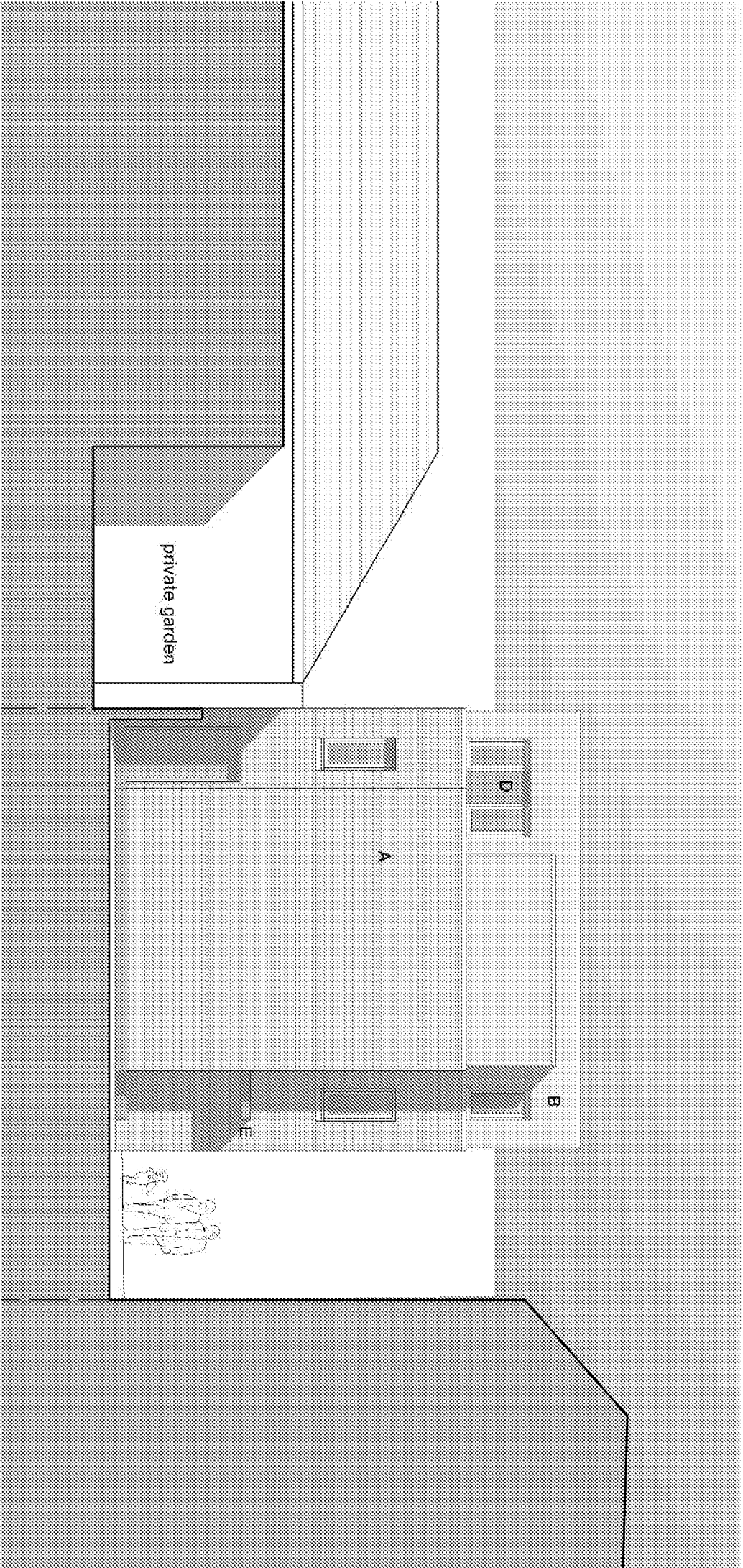
drawing: Proposed elevation

scale	1:100@A3	date	FEB 2018
		drawn	JN

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Key

- A facing brickwork
- B painted render
- C glazed balcony
- D timber slatted cladding
- E painted metal entrance canopy

Proposed rear (east) elevation to courtyard Scale 1:100 @A3

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project: 46A Pier Road
Littlehampton, BN17 5LW

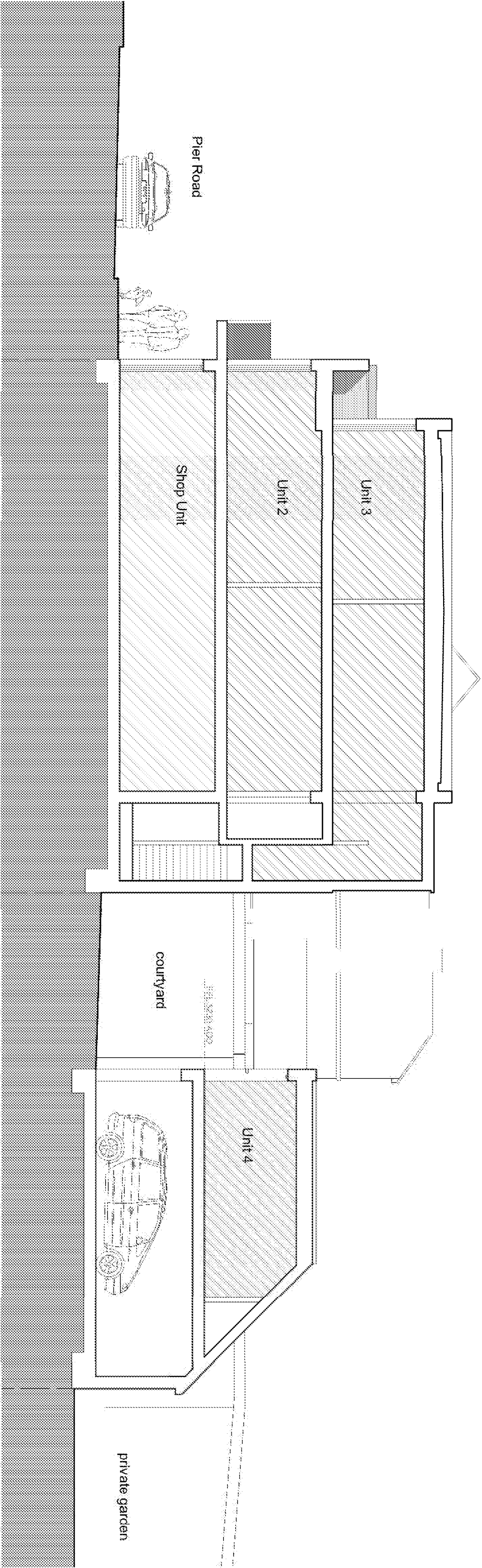
drawing: Proposed elevation

scale: 1:100@A3 date: FEB 2018
drawn: JN

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Proposed site section AA Scale 1:100 @A3

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project: 46A Pier Road
Littlehampton, BN17 5LW
drawing: Proposed Section AA

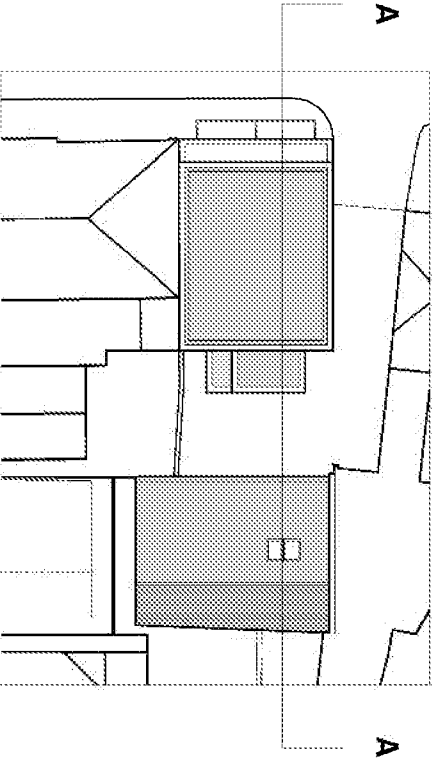
scale: 1:100@A3 date: FEB 2018
drawn: JN

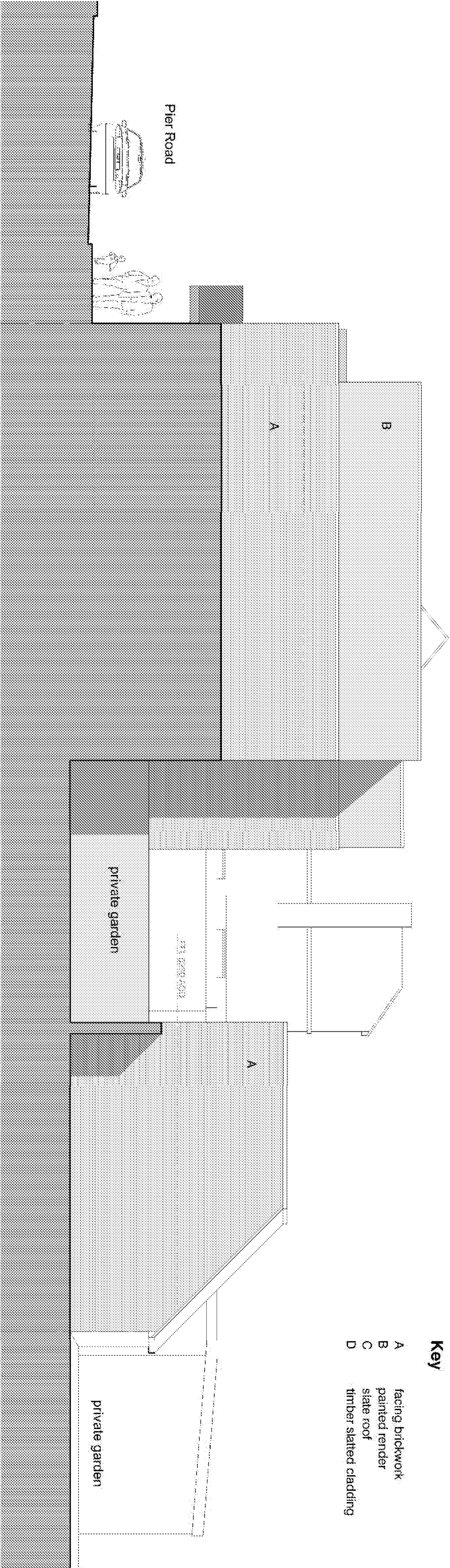
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BN1 6HS
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fax: 01273 511057
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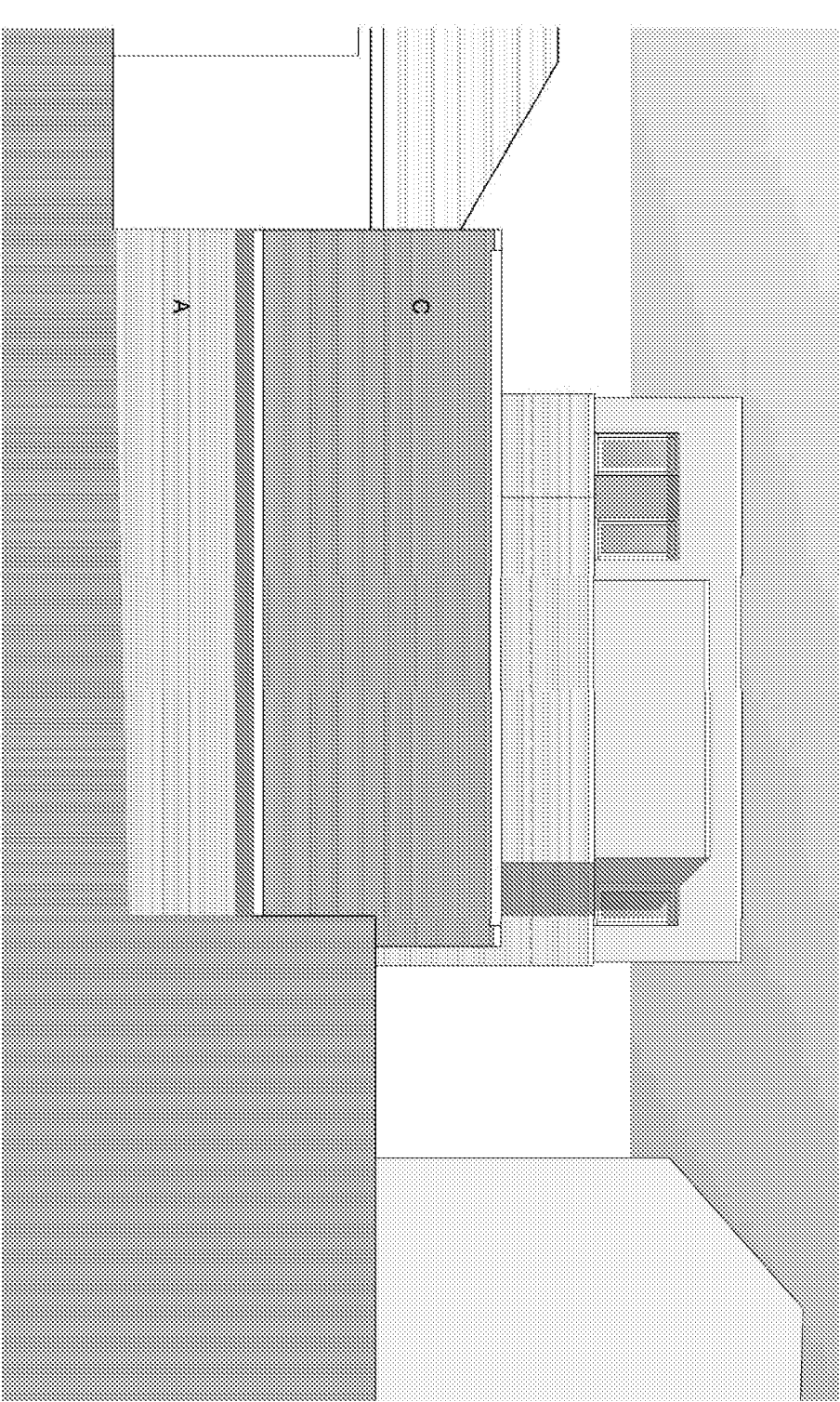
TA 1098 / 16

REV.

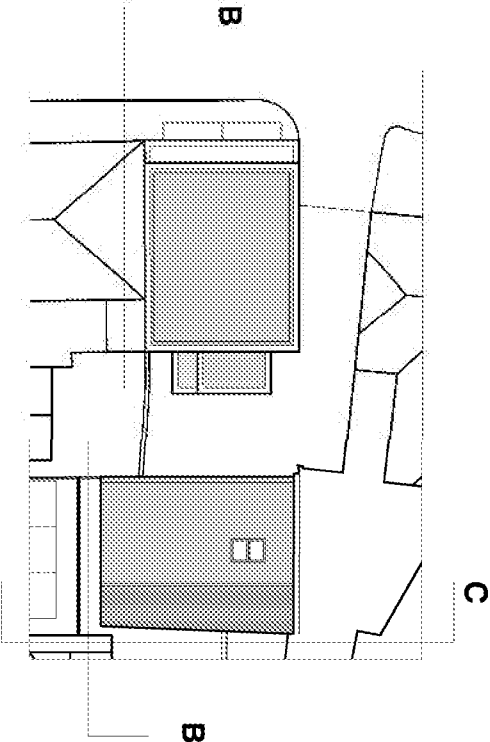




Proposed site section/boundary elevation (south) BB Scale 1:100 @A3



Proposed boundary elevation (east) CC Scale 1:100 @A3



Planning issue

rev.	date

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client: Emsdale Residential Limited

project: 46A Pier Road
Littlehampton, BN17 5LW

drawing: Proposed Elevations / Sections

scale: 1:100@A3 date: MARCH 2018
drawn: JN

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fax: 01273 511065
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Key

- A facing brickwork
- B painted render
- C slate roof
- D timber slatted cladding

Appendix B – Environment Agency Flood Data

Thea Powell
Ambiental
Science Park Square
Brighton
BN1 9SB

Our ref: SSD/42232

Date: 29/03/2017

Dear Thea

Provision of Product 4 for address: 46A to 47, Pier Road, Littlehampton, West Sussex, BN17 5LW

Thank you for your request on 23rd March 2017 to use Environment Agency data, Product 4. The information is attached.

The information on Flood Zones in the area relating to this address is as follows:

The property is in an area located within Flood Zone 3 shown on our Flood Map for Planning (Rivers and Sea).

Note - This information relates to the area that the above named property is in and is not specific to the property itself.

Please find attached a copy of the Flood Map for Planning (Rivers and Sea) for the area relating to your address.

Further details about the Environment Agency information supplied can be found on the GOV.UK website:

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for Flood Risk Assessments

<https://www.gov.uk/planning-applications-assessing-flood-risk>

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

Supporting Information

Flood Defences

Based on our records, Steel Pile Walls to the North-West of the site reduce the risk of flooding in this area to a standard of protection of a 1 in 75 year flood. There is also a flood wall to the West of the site with a concrete capping beam that offers a standard of protection of a 1 in 300 year flood.

Model Information

The flood outlines, depths and levels are taken from the Arun to Adur Flood Model, completed in 2012 by JBA Consulting.

Flood History

Our records show a previous flood event occurred near this area in 1983 due to overtopping of defences. I would suggest contacting Arun District Council for a more comprehensive flood history check.

Please note our records are not comprehensive and may not include all events, you can contact your Local Authority to check if they hold any relevant information regarding your application.

You are encouraged to use and re-use this information freely and flexibly, with only a few conditions. Details of which can be found here:

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

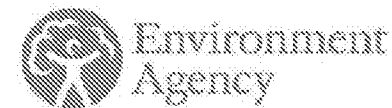
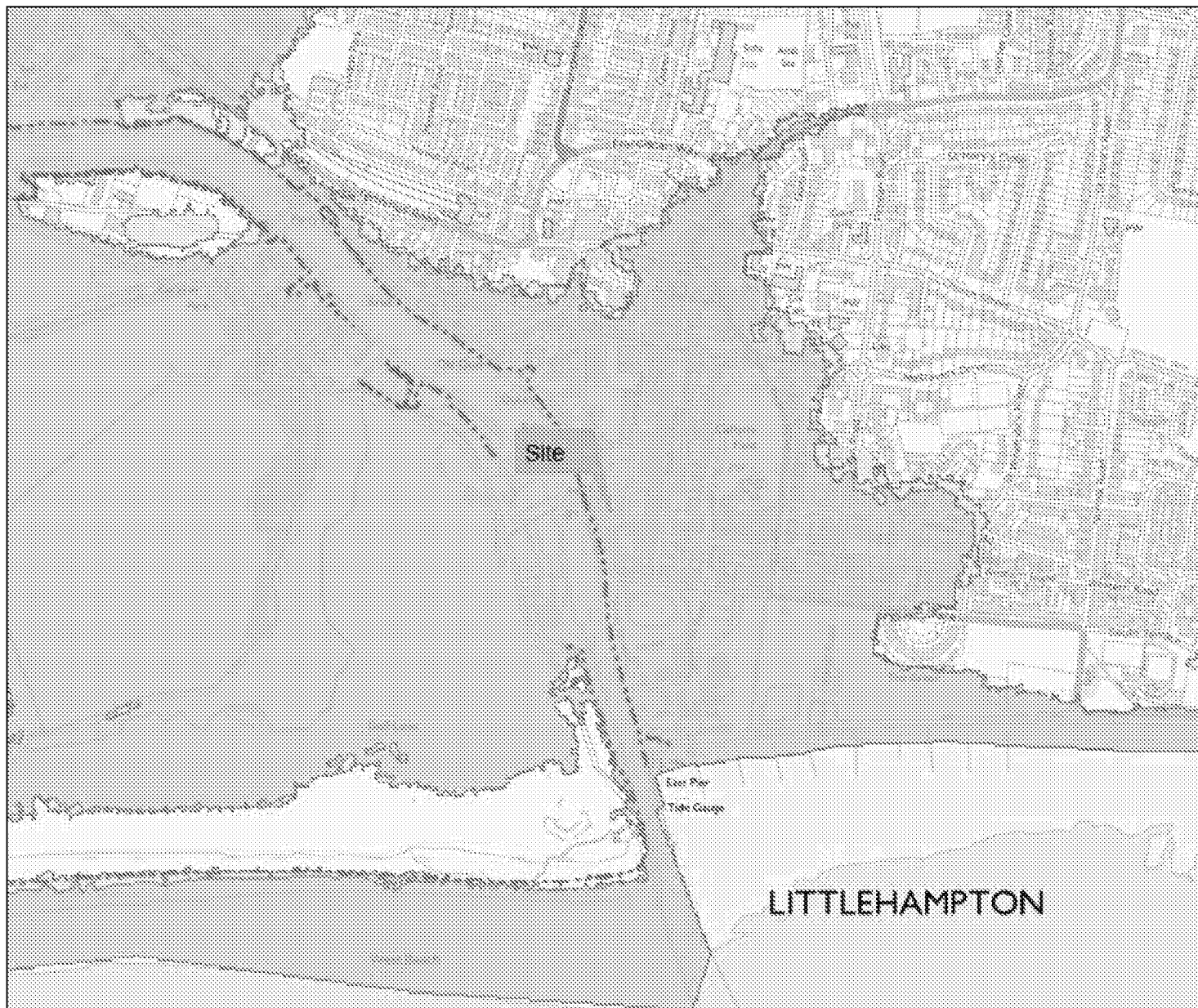
If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

If you have any queries or would like to discuss the content of this letter further please call us [REDACTED]

Yours faithfully
Freddie Fielding
PSO West Sussex

Enc. Flood Map for Planning (Rivers and Sea) / Node point locations / Flood levels/depths / Modelled flood outlines / Flood Defence Locations

Flood Map for Planning (Rivers and Sea). Centred BN17 5LW. Created 29/03/2017.



Scale 1: 10,000



Flood Map for Planning (Rivers & Sea)

- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

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Environment
Agency

N



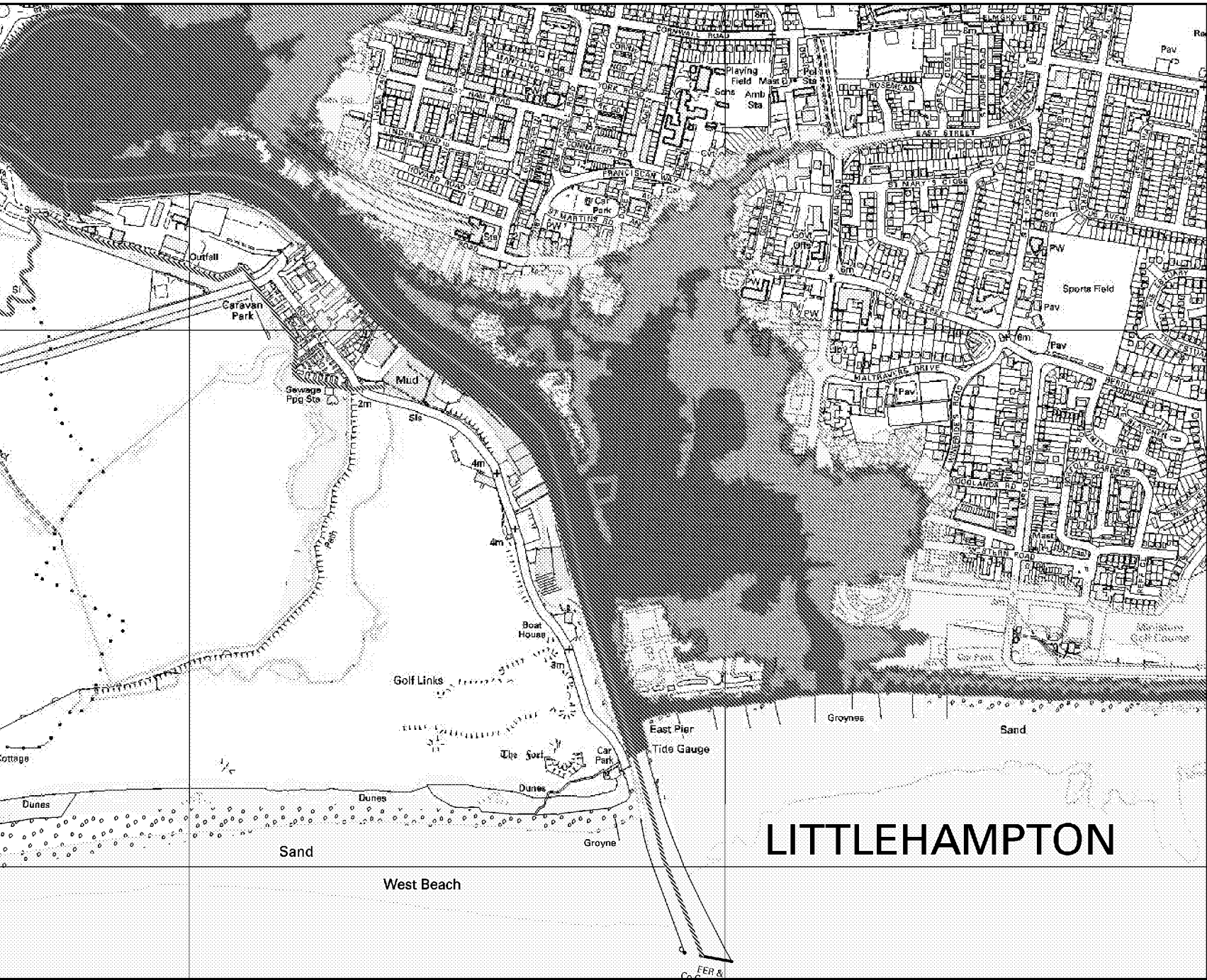
Legend

- Site Boundary
- Main River
- 5% AEP (2012) (Defended)
- 0.5% AEP (2012) (Defended)
- 0.1% AEP (2012) (Defended)
- 0.5% AEP (2115) (Defended)

Scale: 1:10,000

00.150.3

Kilometers





Environment
Agency

N



Legend

- Site Boundary
- Main River
- 5% AEP (2012) (Un defended)
- 0.5% AEP (2012) (Un defended)
- 0.1% AEP (2012) (Un defended)
- 0.5% AEP (2115) (Un defended)

Scale: 1:10,000

00.150.3

Kilometers





Environment
Agency

N



Legend

-  Site Nodes
-  Site Boundary
-  Main River

Scale: 1:2,000



0 0.03 0.06

Kilometers

Product 4 Flood Risk Data Requested by: Thea Powell

Site: 46A to 47, Pier Road, Littlehampton, West Sussex, BN17 5LW

Table 1: Water Levels: Tidal Undefended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	0.5%	0.5% (2115)	0.1%
1	502759	101712	2.87	3.73	4.93	4.05
2	502766	101687	2.66	3.73	4.93	4.05
3	502781	101707	2.55	3.73	4.93	4.05

Table 2: Water Levels: Tidal Defended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			5%	0.5%	0.5% (2115)	0.1%
1	502759	101712	-	-	4.88	2.94
2	502766	101687	-	-	4.88	2.94
3	502781	101707	-	2.37	4.88	2.94

Table 3: Water Depth: Tidal Undefended

Node Reference	NGR		Modelled Flood Depth in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	0.5%	0.5% (2115)	0.1%
1	502759	101712	0.41	1.27	2.47	1.58
2	502766	101687	0.24	1.31	2.52	1.63
3	502781	101707	0.49	1.67	2.87	1.99

Table 4: Water Depth: Tidal Defended

Node Reference	NGR		Modelled Flood Depth in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			5%	0.5%	0.5% (2115)	0.1%
1	502759	101712	-	-	2.42	0.47
2	502766	101687	-	-	2.47	0.52
3	502781	101707	-	0.33	2.84	0.90

All levels taken from: Arun to Adur Flood Model, completed in 2012 by JBA Consulting

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.

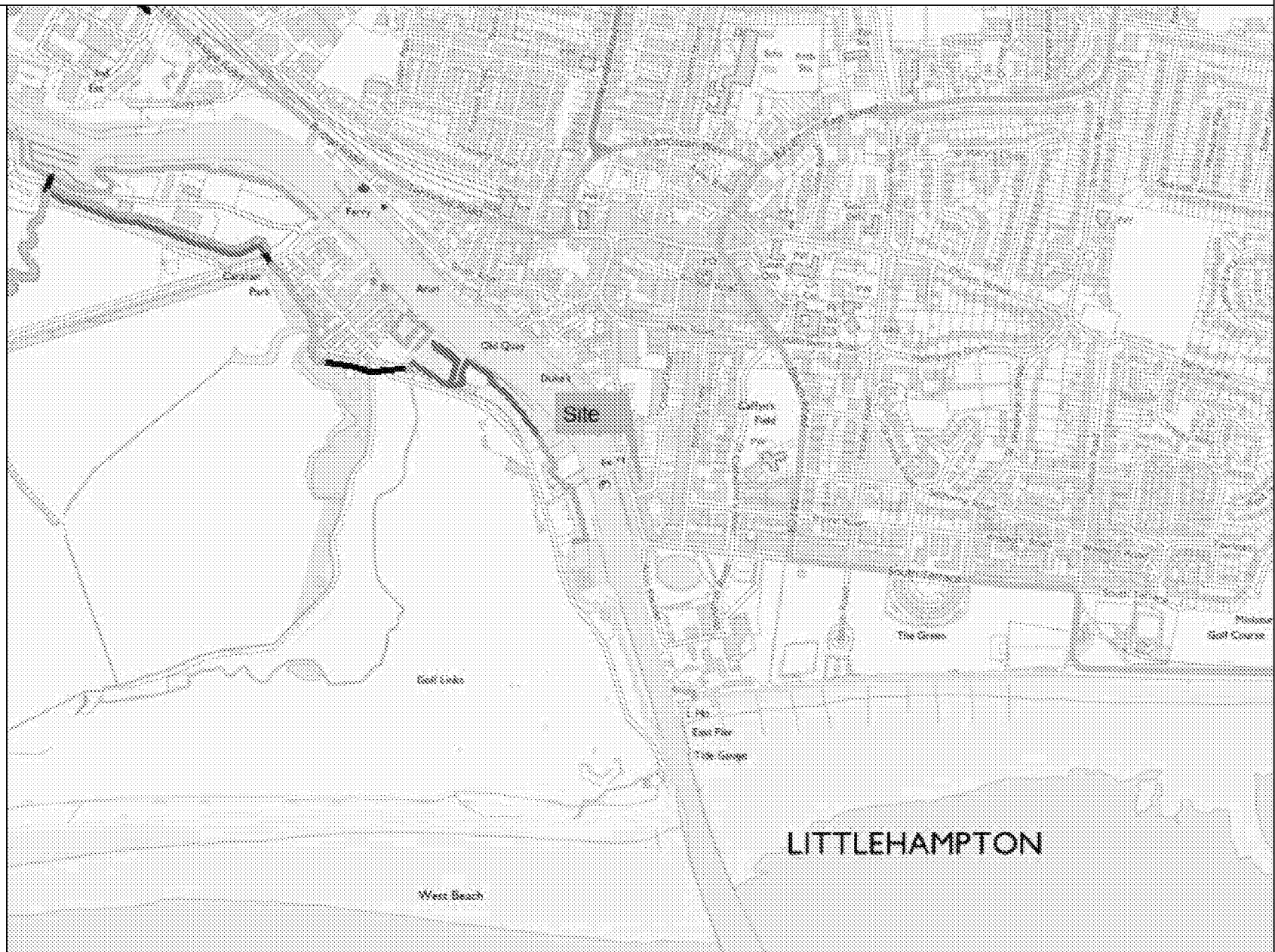
Produced on 29/03/2017

Flood Defence Locations. Centred BN17 5LW. Created 29/03/2017.

Legend

Defences

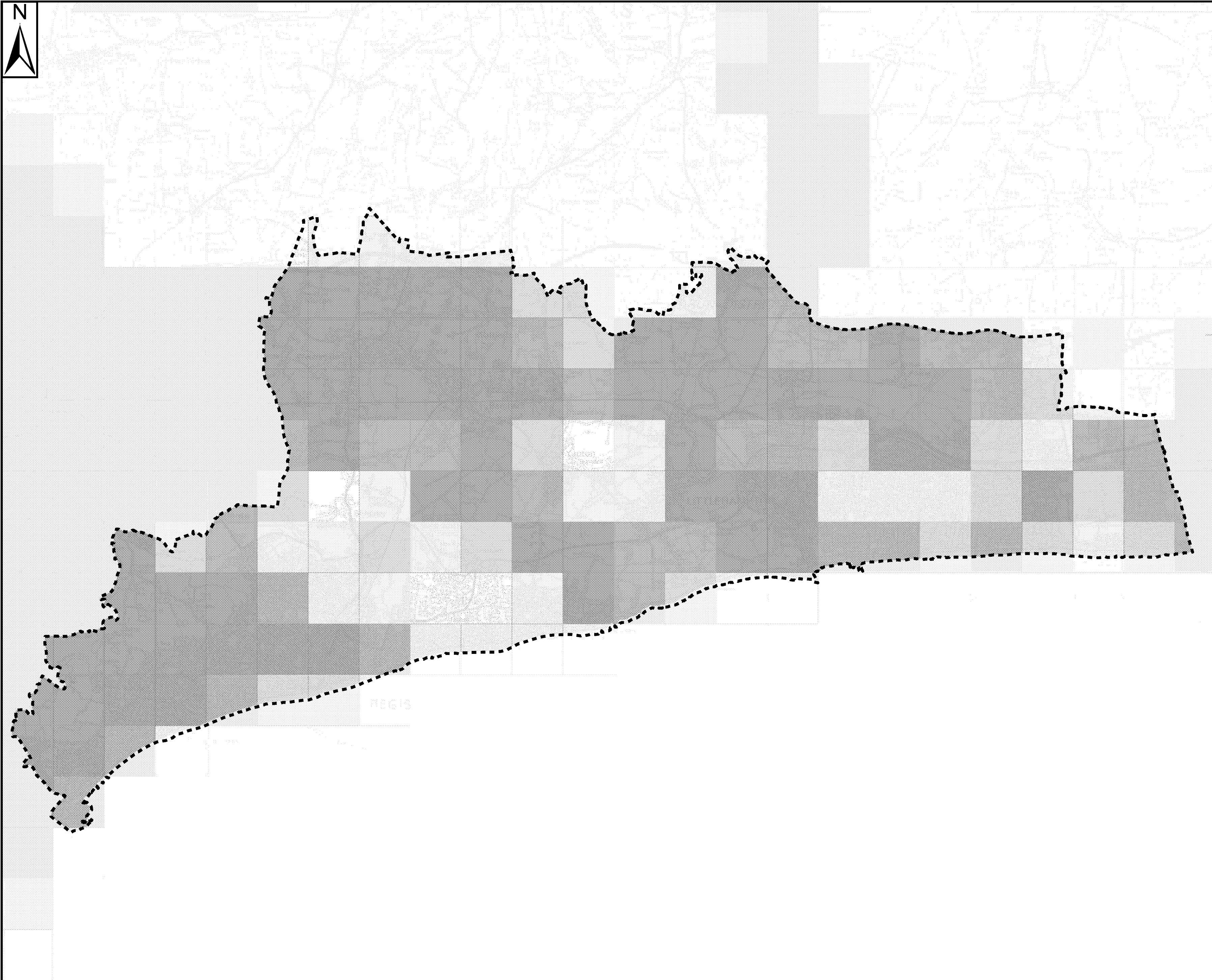
- Embankment
- Wall
- Flood Gate
- Demountable Defence
- Bridge Abutment
- High Ground
- Beach
- Barrier Beach
- Promenade
- Quay
- Cliff
- Dunes
- Culvert



0 100 200 300
Metres



Appendix C – Arun District Council SFRA Data



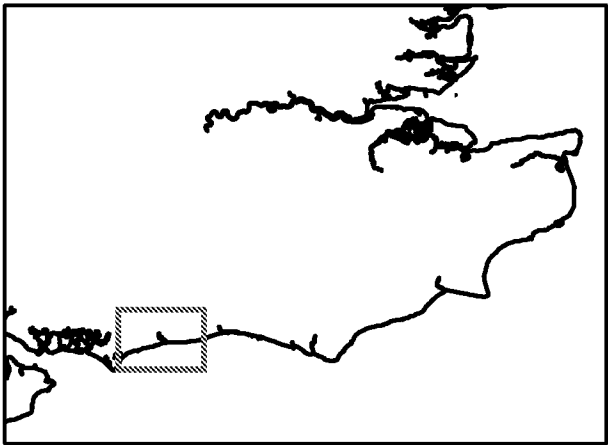
Notes

The Areas Susceptible to Groundwater Flooding (ASIGWF) is a strategic scale map showing groundwater flood areas on a 1km square grid. The data was produced to annotate indicative Flood Risk Areas for Preliminary Flood Risk Assessment (PFRA) studies and allow the Lead Local Flood Authorities (LLFAs) to determine whether there may be a risk of flooding from groundwater.

This data shows the proportion of each 1km grid square where geological and hydrogeological condition show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring. It does not take account of the chance of flooding from groundwater rebound. This dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The ASIGWF data should be used only in combination with other information, for example local data or historic data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.

Key Plan



Legend

- Arun District SFRA boundary
- Areas Susceptible to Groundwater Flooding**
- Classification
- < 25%
 - >= 25% <50%
 - >= 50% <75%
 - >= 75%

REF	Date	Comments
A	June 2016	-



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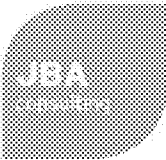
ARUN DISTRICT COUNCIL

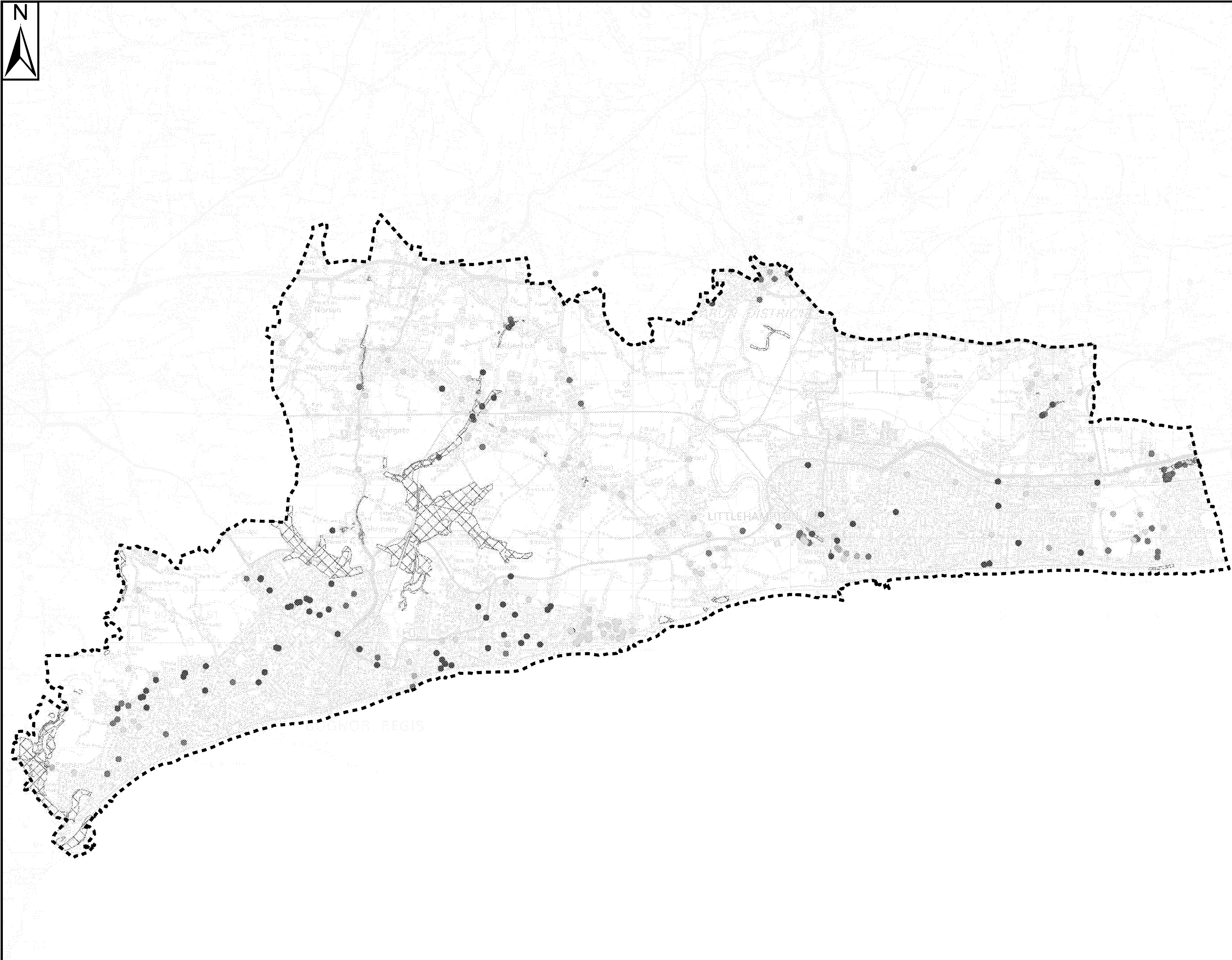
SFRA: APPENDIX F

AREAS SUSCEPTIBLE TO

GROUNDWATER FLOODING

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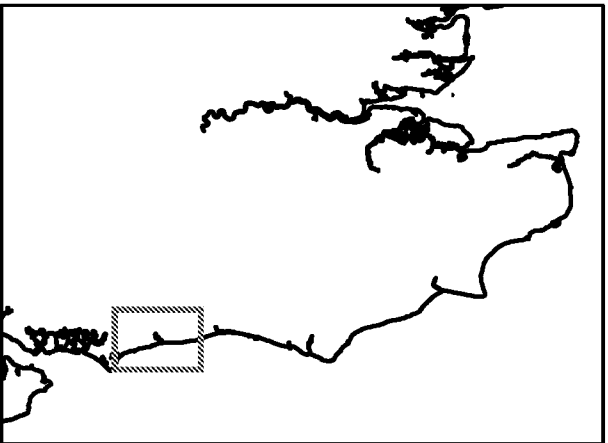
Notes

The Historic Flooding Map shows the recorded incidents and flood outlines provided by Arun District Council, West Sussex County Council, Southern Water and Environment Agency. Historical flood extent was obtained from the Environment Agency.

Flooding incidents provided have been categorised based upon the details provided in the records. Unknown flood points could not be determined from the information provided, and therefore could be from a number of sources.

Please note that not all historical records may be shown on this map, and that it is therefore advised you contact Arun District Council for updated information post 2015.

Key Plan



Legend

- Arun District SFRA boundary
- Historic flood outline

Source of flooding

- Fluvial
- Coastal
- Tidal
- Surface Water
- Failure
- Unknown

REF	Date	Comments
A	June 2016	-



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**SFRA: APPENDIX H
HISTORIC FLOOD RECORDS**

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Notes:

The Arun SFRA is a strategic assessment of flooding. Users of the SFRA should be aware of this when interpreting the information presented. The user is directed to the SFRA reports which outline the uncertainties associated with the studies. Particular attention is drawn to the following:

- Flood extent boundaries are not considered definitive. Land adjacent to these areas may also be at risk.
- Some flooding mechanisms have not been included in the assessment. The 'coastal risk area' is based on advice from LA Engineers and requires further assessment.

Arun District Council SFRA

Map S - Historic Incidents of Flooding from Sewers



CAPITA SYMONDS

Legend

- Arun District Boundary
- Historic Incidents of Sewer Flooding

0 2 4
Kilometres

Scale at A3: 1:80,000

Date: 31/01/2008

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Map_S.wor