

Flood Risk Assessment

Modular Logistics Extension
Plant Bognor Regis

BMW UK

7 August 2016

Quality information

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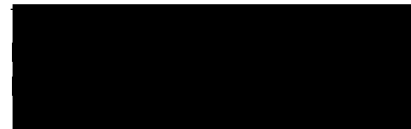
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1. Introduction & Executive Summary

- 1.1 BMW UK instructed AECOM UK to provide a Flood Risk Assessment in support of the application to erect a temporary structure within the truck manoeuvring area adjacent to their logistics facility at Oldlands in Bognor Regis.
- 1.2 This Flood Risk Assessment draws on the work carried out by Hydrock Consultants on behalf of Bericote Properties in 2014¹ in support of the planning application for the development of the site at that time.
- 1.3 The hydrological study, Flood Risk Assessment and drainage strategy resulted in a flood mitigation design that was implemented as part of the construction works for the development. This takes the site from a 'medium probability of flooding' classification (Flood Zone 2) and places it into a 'low probability of flooding' classification (Flood Zone 1) by raising the site above the modelled flood level and providing flood plain compensation to the north of the Relief Road.
- 1.4 This reclassification has yet to be reflected in the Flood Zone Mapping published by the Environment Agency shown in Figure 1, below. This has triggered the requirement for a Flood Risk Assessment to support this application.
- 1.5 The current proposal, for which consent is sought, is a temporary structure placed on an existing paved area that is fully drained. There is therefore no change to the impermeable area under consideration for which the Hydrock drainage strategy, implemented with the construction of the development, was designed.
- 1.6 This FRA concludes that the proposal under consideration (a) makes no change to flood risks either to the site itself or to any third-party land and (b) as the site is now outside the 0.1% annual flood risk contour it is only approximately 1400m² in area, according to the UK Government's current guidance, a Flood Risk Assessment is not required for the planning application.
- 1.7 In conclusion, there is no reason to refuse planning consent on the grounds of flood risk.

¹ Hydrock Consultants Ltd, June 2014. *Land at Oldlands Farm, Bognor Regis, West Sussex: Flood Risk Assessment and Drainage Strategy*. Ref R/14443/001

2. Background

- 2.1 On 24 August 2014, Arun District Council granted consent (Ref BE/73/14/PL) for the "Erection of 2 No. detached industrial/distribution units (B1(c)/B2/B8) including access & servicing arrangements, car parking, landscaping & associated flood compensation area"
- 2.2 Conditions 10 and 15 of this consent required the developer to carry out the development in accordance with the surface water drainage strategy and flood mitigation measures as set out in the approved Flood Risk Assessment (FRA) prepared by Hydrock (Ref R/14443/001) and subsequent details submitted in support of the application. A precis of this FRA is attached in Appendix B.
- 2.3 The Environment Agency's predicted 100-year fluvial flood level at the site was 1.82m AOD according to the 2014 FRA Report.
- 2.4 The finished floor levels of the two Distribution Units is 3.00m AOD and the surface levels of the truck manoeuvring yard form a channel at a level of 2.35m AOD.
- 2.5 A flood compensation area was provided to the north of the Bognor Northern Relief Road and a scheme was designed and implemented in accordance with the Environment Agency policy and Appendix 3 of the CIRIA guide C624 entitled "Development and flood risk guidance for the construction industry" where compensatory storage is provided on a "volume for volume" and "level for level" basis to ensure no loss of floodplain contours.
- 2.6 A sustainable drainage scheme was approved by Arun District Council (Planning Ref BE/121/14/DOC clearing Conditions 5 & 10 of original consent), providing an open attenuation storage area between the site and the railway line immediately to the southeast of the



development.

Figure 1: Current Flood Map for Planning²

² Environment Agency 2018. <https://flood-map-for-planning.service.gov.uk> [Accessed 3 August 2018]

- 2.7 The flood plain compensation works were carried out in 2015/16 as part of the construction works together with the surface water drainage system.
- 2.8 The current Flood Zone Mapping is shown in Figure 1 above. This is clearly showing the extent of the Zone 2 area prior to the construction works as the two B2 buildings and associated hardstanding are now at a level of between 2.35m and 3.0m AOD which has taken them out of this Flood Zone.

3. Development Proposals

- 3.1 BMW UK is proposing to erect a 40m x 25m temporary storage facility, together with associated covered access cover and canopy areas. It will be erected on the south-eastern part of the truck hardstanding as shown in Drawing No RR-ACM-00-GF-DR-A-61000B in Appendix A and in the 3D massing views in Figure 2 (below). For a full description of the development, please refer to the Application Form and Planning Statement.

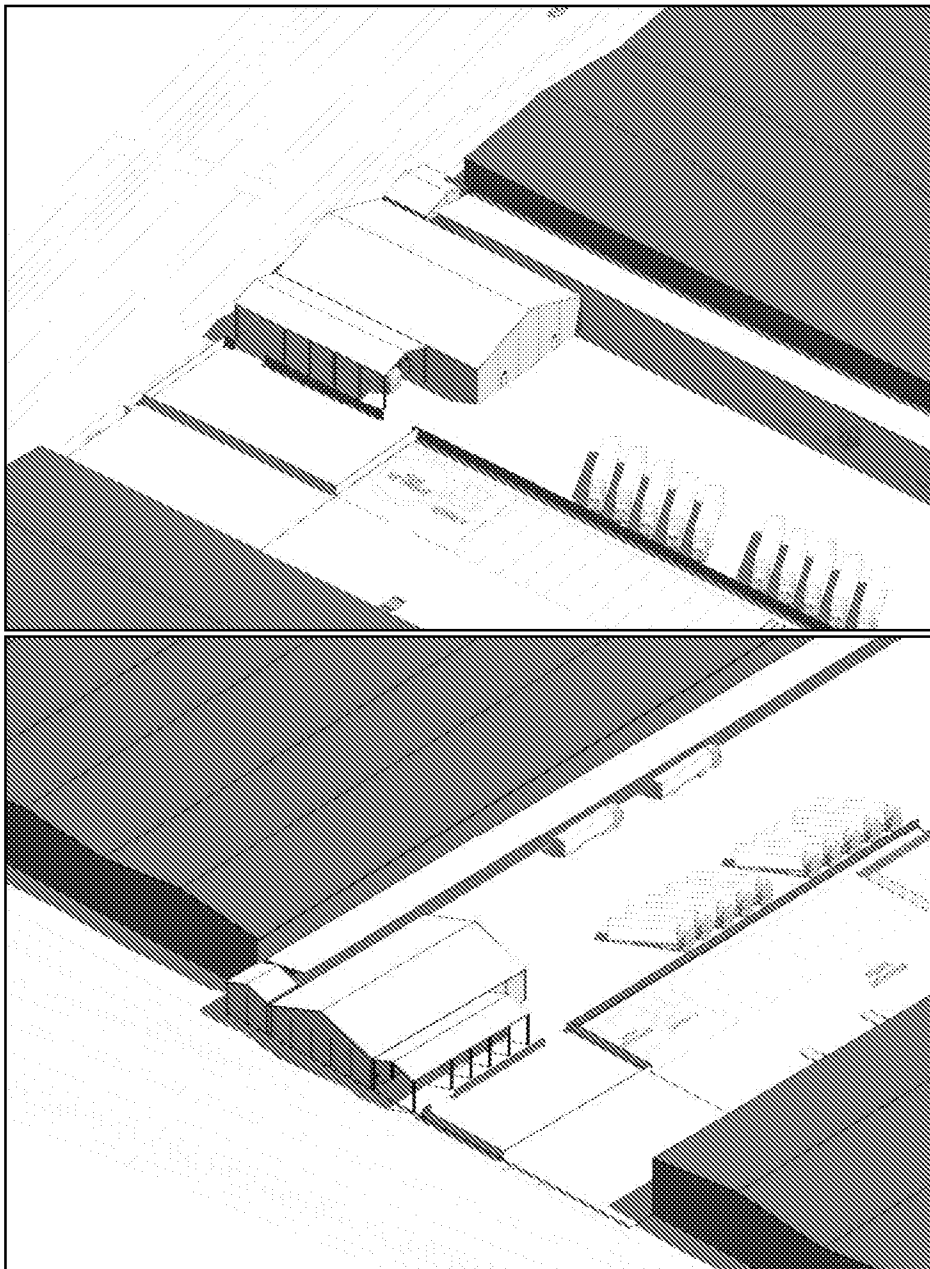


Figure 2: Modular Logistics Extension - 3D Views

4. Discussion

- 4.1 The proposed temporary structure and associated works cover an area of approximately 2,200m², that is, less than 1 hectare.
- 4.2 The approved works carried out as part of this development in 2015/16 to manage the flood risks at the site involved raising the floor levels and hardstanding areas above the 1% annual flood level (1.82m AOD) by a margin of some 800mm.
- 4.3 Strictly this area should now be classified as Flood Zone 1 and, as such, a flood risk assessment is not required in accordance with current guidance³, to support a planning application for such a development.
- 4.4 The temporary structure will be erected on a concrete-paved hardstanding area forming part of the truck manoeuvring area that is currently positively drained as part of the sustainable surface water drainage system approved as part of the 2014 planning consent (refer to paragraph 2.1 above). As such the drainage areas contributing to the designed drainage system will not be increased and the associated flood risks will remain unchanged.

5. Conclusions

- 5.1 The works carried out in implementing the 2014 Planning Consent (ref BE/73/14/PL) mean that a corrected classification for the development site, that is Flood Zone 1, deems that a Flood Risk Assessment for the current Application for Consent to erect a temporary structure would not be required.
- 5.2 Apart from that, however, the proposed temporary structure will not increase the positively drained areas of the current development and, as such, any identified or residual flood risks in the 2014 study remain unchanged and therefore acceptable.
- 5.3 The proposed application for consent should not be refused on flood risk grounds.

³ Gov.UK, March 2014. *Guidance: Flood risk assessment for planning applications* <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications> [Accessed 6 August 2018]

Appendix A

Drawing No RR-ACM-00-GF-DR-A-61000B

Modular Logistics
Extension
Plant Bognor Regis

Rolls Royce Motor Cars
Bognor Regis
PO22 9NN

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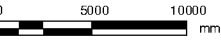
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NOTES

Temporary Structure Area: 1108.0m²

KEY

- Empties Area
- Existing Unit 1 & 2
- New fence line

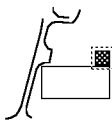


SCALE: 1:200

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KEY PLAN



PROJECT NUMBER

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SHEET TITLE

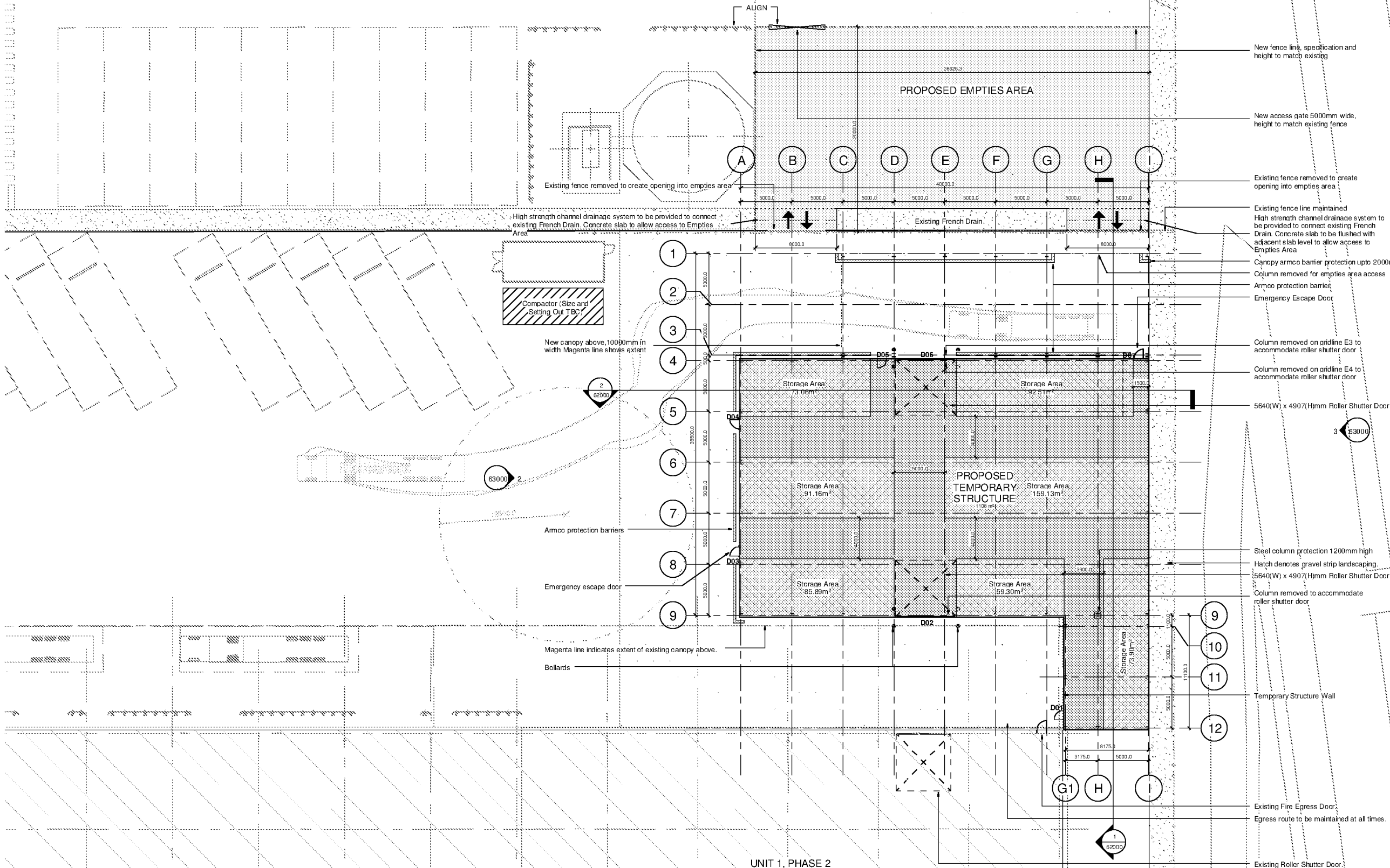
Planning Application Drawings
Temporary Structure
Proposed Ground Floor Plan
1:200@A1

SHEET NUMBER

RR-ACM-00-GF-DR-A-61000

REV

B



1 Ground Floor Plan

61000 SCALE: 1 : 200



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Appendix B

Flood Risk Assessment

Hydrock Consultants Ltd, June 2014. *Land at Oldlands Farm, Bognor Regis, West Sussex: Flood Risk Assessment and Drainage Strategy*. Ref R/14443/001

Note: for the purposes of this report and to reduce the size, some of the Appendices have been removed from the attached FRA. Specifically, the Appendices removed are:

Appendix B Topographical Survey
from Appendix C Southern Water correspondence from 2013
Appendix D Sewer Records (Southern Water)



**Land at Oldlands Farm,
Shripney Road,
Bognor Regis,
West Sussex**

**Flood Risk Assessment
and Drainage Strategy**

for

Bericote Properties Limited

June 2014

Hydrock Ref: R/14443/001



DOCUMENT CONTROL SHEET

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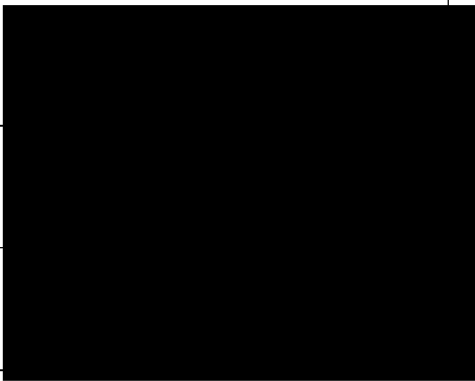
Project: Oldlands Farm, Bognor Regis, West Sussex

Title: Flood Risk Assessment and Drainage Strategy

Status: Final

Date: 20th June 2014

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Appendix B – Topographical Survey

Appendix C – Statutory authority Correspondance

Appendix D – Southern Water Sewer Records

Appendix E – Hydrock Drawings

Appendix F – Hydrock Hydraulic Calculations



Executive Summary

It should be highlighted from the outset that the site already benefits from planning permission for a mixed-use development of up to 33,116 square metres (Arun District Council ref. BE/61/13). That application, which was approved on 19 March 2013, included a Flood Compensation Area and on-site attenuation ponds. The FRA which supported that scheme was found to be acceptable by the Environment Agency and Arun District Council, and sets clear precedent for the full planning permission now sought by Bericote Properties Limited. Moreover, whilst the application now being pursued is essentially an alternative development to the consented scheme in terms of the B1(c), B2 and B8 uses, the enabling development, envisaged in Phase 1a of BE/61/13, can be implemented alongside Bericote's proposals.

Flood Risk

The proposal is for the construction of an industrial/warehouse development on land at Oldlands Farm, Bognor Regis, West Sussex. The scheme will consist of two buildings, service yards, car parks, landscaping, and an associated Flood Compensation Area (FCA) the need for which is outlined within the Hydrock detailed FRA.

The Hydrock FRA considered the flood risk posed to the site from a variety of flood risk sources, as defined by the National Planning Policy Framework (NPPF) and the West Sussex Local Flood Risk Management Strategy (LFRMS). The report identified that the proposed development is currently located within Flood Zones 1, 2, and 3 and the Environment Agency's predicted 100 year fluvial flood level is 1.82m AOD. However, this has been increased to a level of 2.0m AOD to include climate change and this level is to be adopted as the minimum required floor level for the development. The designed finished floor level of the buildings is likely to be in the order of +3.0m AOD to allow for a balanced earthworks design between the proposed development and the flood compensation area, on land adjacent to the Bognor Northern Relief Road, and to achieve an enhanced level of flood protection for the end user. The proposed site levels drawing (no. C14443/200) is included in Appendix E.

The FRA report also found the site to be at low risk from tidal, surface water, sewer, groundwater flooding and artificial sources.

There is no residual flood risk from the development site to the surrounding district, due to the restriction imposed on allowable storm water peak flow rates, from the development to Oldlands Farm drainage ditch. Therefore the development does not increase the risk of surface water flooding to other adjacent neighbourhoods. Out of chamber or gully flooding for the extreme 100 year plus climate change event may potentially occur within the development site and is classed as exceedance flows. Flood water from such events will be contained within the site in the lower lying external areas.



Drainage Strategy

The outline surface water drainage strategy is to control the surface water discharge from the new development and restrict peak flows to a maximum rate of greenfield runoff, to be agreed with the Environment Agency. The surface water drainage network has been designed to mimic the existing catchment division, with the majority of run-off being taken east towards the watercourse, adjacent to the Bognor to Chichester railway line. This then connects to an open ditch drain that runs east along the northern boundary of the site. The drainage ditch is then culverted under the railway line, it ultimately discharges to the Lidsey Rife approximately 300m to the east of the development. The catchment boundary line is shown on the drainage strategy drawing (no C14443-210) contained within Appendix E.

The highway drainage for the proposed carriageway access will connect into the open drainage ditch to the north of the development and attenuated in oversized pipes.

Sustainable Drainage Systems (SuDS) in the form of Prevention, Source Control and Site Control methods will be considered and where appropriate incorporated. A drainage strategy assessment and outline strategy plan which corresponds with a full surface water hydraulic model accompanies the Hydrock FRA report.

Foul water generated by the development will be discharged by gravity to a pumping station located within the site. The station will then pump via a rising main to a point into the foul public sewer located in Shirpley Road, as indicated by Southern Water Sewer records.

The proposed pumping station and rising main to serve the development is being secured under a Section 98 off site sewer requisition with Southern Water. The design process for this is currently with Southern Water's consultants.

Summary

The detailed Hydrock FRA report demonstrates that the proposed scheme:

- Is at low risk from fluvial flooding but is partly in Flood Zone 2 and 3.
- Is not at risk from all other flood sources.
- Would be safe and flood resilient.
- Would not adversely increase flood risk elsewhere, as a result of the proposed development, through increase in surface water run-off.
- Incorporates a comprehensive and flood resilient drainage and SuDS strategy.
- Has an agreed foul discharge location.



1.0 INTRODUCTION

- 1.1 This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of our Client, Bericote Properties Limited, in support of a full planning application to be submitted to Arun District Council for a proposed employment development on Land at Oldlands Farm, Shripney Road, Bognor Regis, West Sussex. A Site Location Plan and Site Layout Plan appear at Appendix A.
- 1.2 The report has been commissioned to identify any flood related issues associated with the proposed development and any likely constraints that could be imposed. The following issues have been suggested by the Environment Agency (EA), Arun District Council (ADC), and Southern Water (SW) following detailed correspondence and are subsequently addressed within this report;
- Identify all available data relating to flood risk at the site.
 - Review the historical application relevant to the site and the associated findings and conditions imposed.
 - Determine whether the site is at risk from flooding from all sources, including but not exhaustive, from breach or overtopping of any existing flood defences, watercourse flooding, surface water flooding and/or groundwater flooding.
 - If at risk from any source, devise appropriate measures to prevent flood risk whilst not compromising the flood risk elsewhere.
 - Determine the current surface water drainage regime and assess any potential increase in surface water runoff as a result of the proposed development.
 - Consider Sustainable Drainage Systems (SuDS) as an option for reducing surface water flood risk.
 - Devise an appropriate surface water drainage strategy (and provide supporting calculations) to deal with any increase in surface water runoff and include an allowance for climate change.
 - Consider the recommendations of the EA, Arun District Council and Southern Water.
 - Consider the recommendations of the West Sussex Local Flood Risk Management Strategy (LFRMS).
 - Prepare the Flood Risk Assessment and Foul & Surface Water Drainage Strategy report.
 - Assess flood risk mitigation measures & off site impacts, and define any residual risks.



2.0 **DEVELOPMENT DESCRIPTION AND LOCATION**

2.1 **Site Location**

The site is referenced in Table 1, and a site location map is provided in Figure 1.

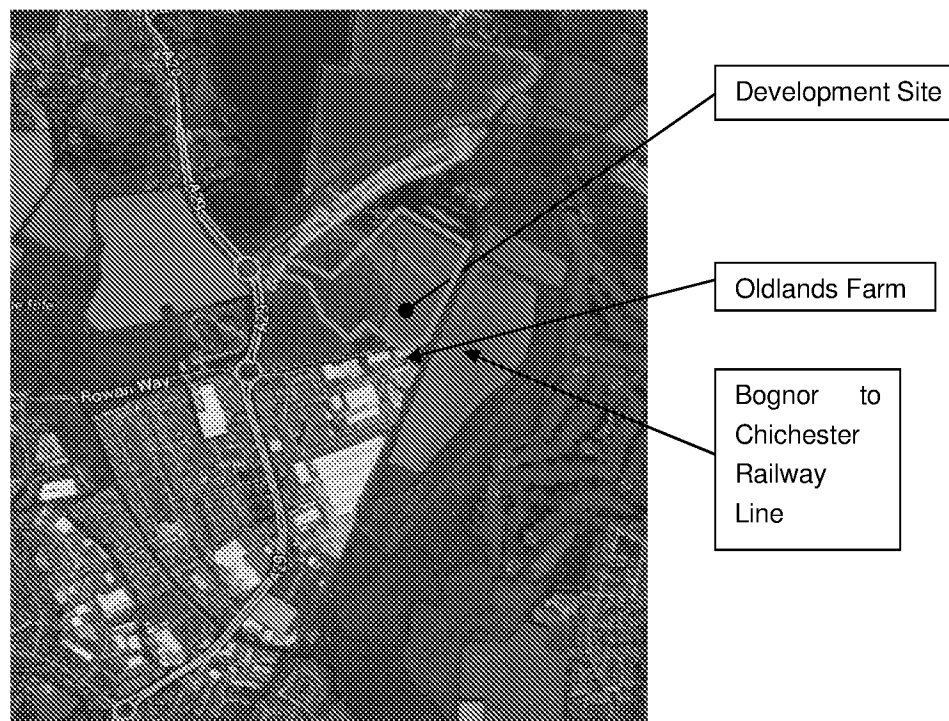
Table 1: Site Referencing Information

Item	Brief Description
Site name	Land at Oldlands Farm
Site address and location	Land at Oldlands Farm, Shripney Road, Bognor Regis, West Sussex, PO22 9QF
Council Area	Arun District Council
Grid Reference	OS: 494360E, 101662N
General Locality	The site is located to the northeast of Bognor Regis town centre, off the A29 Trunk Road, and lies between the Southern Cross Industrial estate and the Bognor Northern Relief Road, currently under construction.

2.2 **Existing Site Description**

2.2.1 Location Plan

Figure 1 General Location Plan





2.2.2 Area

The Development Site extends to approximately 15.87ha, this includes the Flood Compensation Area (FCA).

2.2.3 Boundaries and Surrounding Land

The development site is classed as agricultural fields, located off the A29 Trunk Road to the west and lies between the Southern Cross Industrial Estate to the south and the Bognor Northern Relief Road, currently under construction to the north. The Bognor to Chichester Railway Line is to the east of the proposed development.

2.2.4 Existing Land Use and Access

The site is currently open agricultural land used for arable crops. The existing site access is situated on the southern boundary, through Oldlands Farm, off Steyning Way. In March 2014, a hybrid application was approved, comprising full permission for the access road and flood compensation area, and outline permission for up to 33,316 square metres of a A1, B1, B2, B8 and sui generis car sales uses (ADC Ref: BE/61/13).

2.2.5 Elevation and Topography

A specific site topographical survey has been undertaken and indicates the ground generally falls from the A29 boundary easterly to the Oldlands Farm watercourse and the railway line. The site levels range from 4.00m AOD to 1.20m AOD at the watercourse.

The full topographical survey can be viewed in Appendix B.

2.3 **Development Proposals**

- 2.3.1 The proposed development is for the erection of 2no. detached industrial/distribution units (B1(c)/B2/B8) including access and servicing arrangements, car parking, landscaping and associated works, with a gross external area of circa 39,000m². Access to the site for both HGVs and staff cars will be directly from the new accessway off the A29 roundabout on the western boundary. The Site Layout Plan is included in Appendix A. The proposed finished floor level for the development will be set at a minimum level of +2.0m but to achieve a balanced earthworks design with an increased level of protection for the end user the designed floor level is likely to be in the order of +3.00m AOD.



2.3.2 Development Design Life

The generally accepted design life for a development such as the proposed commercial site for the assessment of flood risk is 50 years. This assessment therefore considers flood risk over the period 2014 to 2064.



3.0 PLANNING POLICY AND CONSULTATION

3.1 Planning Policy Framework

3.1.1 The flood maps provided by the Environment Agency locate the site is currently within Flood Zones 1, 2 and 3. Flood Zone 1 is land assessed as having a less than 1 in 1000 (<0.1%) annual probability of flooding, Zone 2 is land assessed in having between a 1 in 100 year and 1 in 1000 year annual probability of flooding, while Zone 3 is land assessed as having between a 1 in 100 year or greater annual probability of flooding from a river or stream in any year. As a requirement of the new NPPF (2012), the proposed development has to satisfy the requirements of the Sequential Test and where applicable the Exception Test.

3.1.2 Sequential Test:

Under the NPPF (2012), Zone 3 is defined as high probability flood risk. The proposed development is for industrial and warehousing uses which in line with table 2 is classified as 'Less Vulnerable'.

Placing both these criteria into Table 3 (Flood Risk Vulnerability and Flood Zone 'Compatibility'), Less Vulnerable development in Flood Zone 3 determines that 'Development is Appropriate'. Therefore the Exception test is not required, although this does not exempt the site from further consideration and it is the developer's intention to lift the site out of Flood Zone 2 and 3 and into Flood Zone 1, by designing the finished floor levels to a minimum of +2.0m AOD. To do this they intend to provide floodplain compensation within close vicinity to the proposed site.

3.2 Floodplain Compensation

3.2.1 As previously stated the proposed development currently lies partially within flood zones 2 and 3, with existing ground levels ranging from 0.2m AOD to 2.0m AOD. It is proposed to lift the area of the site located within zones 2 and 3 to a minimum of +2.0m AOD. Floodplain compensation will be provided by excavating adjacent land, to the north-west of the site which currently lies above the 2.0m AOD contour. The Environment Agency's predicted 100 year fluvial flood level is 1.82m AOD. However, this has been increased to a level of 2.0m AOD to include climate change and this level is to be adopted as the minimum required floor level for the development. The designed finished floor level to the buildings is likely to be in the order of +3.0m AOD to allow for a balanced earthworks design between the proposed development and the flood compensation area, and to achieve an enhanced level of flood protection for the end user.

3.2.2 The flood compensation has been designed in accordance with the Environment Agency policy and Appendix 3 of the CIRIA guide C624 entitled "Development and flood risk



guidance for the construction industry” where compensatory storage is provided on a “volume for volume” and “level for level” basis to ensure no loss of floodplain contours.

3.2.3 Floodplain compensation has been used on the Bognor Northern Relief Road (BNRR) where the road crosses Oldlands Farm Ditch. The location of this is adjacent to the northern boundary of the road and lies either side of the watercourse. The proposed floodplain compensation area is to the north of the new BNRR. Drawings are indicated within Appendix E.

3.2.4 Flood Compensation areas and volumes are calculated as follows:

Existing site area below 2.0m

Existing Ground Level (m AOD)	Total Area (m ²)
2.0m – 1.8m	62025
1.8m – 1.6m	57800
1.6m – 1.4m	53185
1.4m – 1.2m	41710
1.2m – 1.0m	13545
Total Area =	228265m²

Flood compensation areas

Proposed Flood Area (m AOD)	Total Area (m ²)
2.0m – 1.8m	62313
1.8m – 1.6m	58296
1.6m – 1.4m	54338
1.4m – 1.2m	42208
1.2m – 1.0m	13958
Total Area =	231113m²

3.3 Strategic Flood Risk Assessment (SFRA)

3.3.1 SFRA's assess the risk associated with all types of flooding and provide the information required to identify the amount of development permitted in an area, how drainage systems in the area should function and also how risks in vulnerable areas can be reduced and/or mitigated. The NPPF states that regional planning bodies (RPB's) or local planning authorities should prepare SFRA's in consultation with the EA.



3.3.2 In January 2010, West Sussex County Council, as Lead Local Flood Authority for the area, published their **Strategic Flood Risk Assessment of West Sussex** documents Volume 1 and 2. These documents perform the function of an SFRA, as described above, but also expand upon this to define a management strategy and guidance to deal with and mitigate the flood risks identified. The overarching aim of this strategy is to provide a robust local framework that employs a full range of complementary approaches towards managing and communicating the risks and consequences of flooding arising from surface runoff, groundwater and ordinary watercourses in West Sussex and the surrounding area.

3.3.3 A summary of the main elements from the LFRMS associated with the site is detailed below. The full report can be obtained from the West Sussex County Council website.

- The LFRMS provides a detailed understanding of flood risks across all areas of the county of West Sussex from all sources.
- Full sequential and exception tests to be carried out (where applicable).
- Development should be designed so there is no flooding to the development in a 1 in 30 year event and so there is no property flooding in a 1 in 100 year plus climate change event.
- Surface water management including the use of Sustainable Drainage Systems should be incorporated.
- No potential for groundwater flooding anticipated.
- No flooding incidences identified at the site.

3.4 Statutory Authority Correspondence

3.4.1 In compiling this report, liaison has taken place with the relevant authorities. Correspondence has been received from the Environment Agency and from Southern Water. Listed below is a summary, with the full responses located in Appendix C.

3.4.2 Environment Agency – Kelly Jaggard

- Site Located within Flood Zone 1, 2 and 3.
- Scale of development requires production of an FRA.
- The FRA should consider other aspects of flood risk for the proposed development and the potential impact on people and property within the catchment.

Southern Water

- At the time of writing, discussions have been held with Southern Water's Consultants Atkins, with regards to the Section 98 progress for this development, but to date



Hydrock have been unable to secure written confirmation of progress further to their letter dated 17th September 2013.

4.0 DEFINITION OF FLOOD HAZARD

Flood risk to the proposed development site is considered from all sources of flooding, as defined by the NPPF (2012).

4.1 Sources of information

The NPPF (2012) requires the developer to consider the impact of runoff, generated by the proposed development onto the downstream catchment, and to assess the risk of runoff from the surrounding district impacting on the development's footprint. Further, the report is to consider flood risk from all other sources. This section defines the flood risk receptors and anticipated flood risk. Section 5 then discusses in further detail the probability of flooding and the likely impacts.

Table 2: Sources of information used in the identification of flood risk

Source of Information	Details
Environment Agency	Indicative Flood Map
Environment Agency	Pre-development enquiry response
Southern Water Sewer Records	Various Plans

4.2 Flooding from Tidal Flood Risk

- 4.2.1 The tidal flood risk to the site is extremely low. Sea defences are well maintained and provide sufficient defence against the predicted 1:200 year tidal level. If a more extreme event or a localised breach occurs the risk to the site is minimal due to the distance to the sea defence.

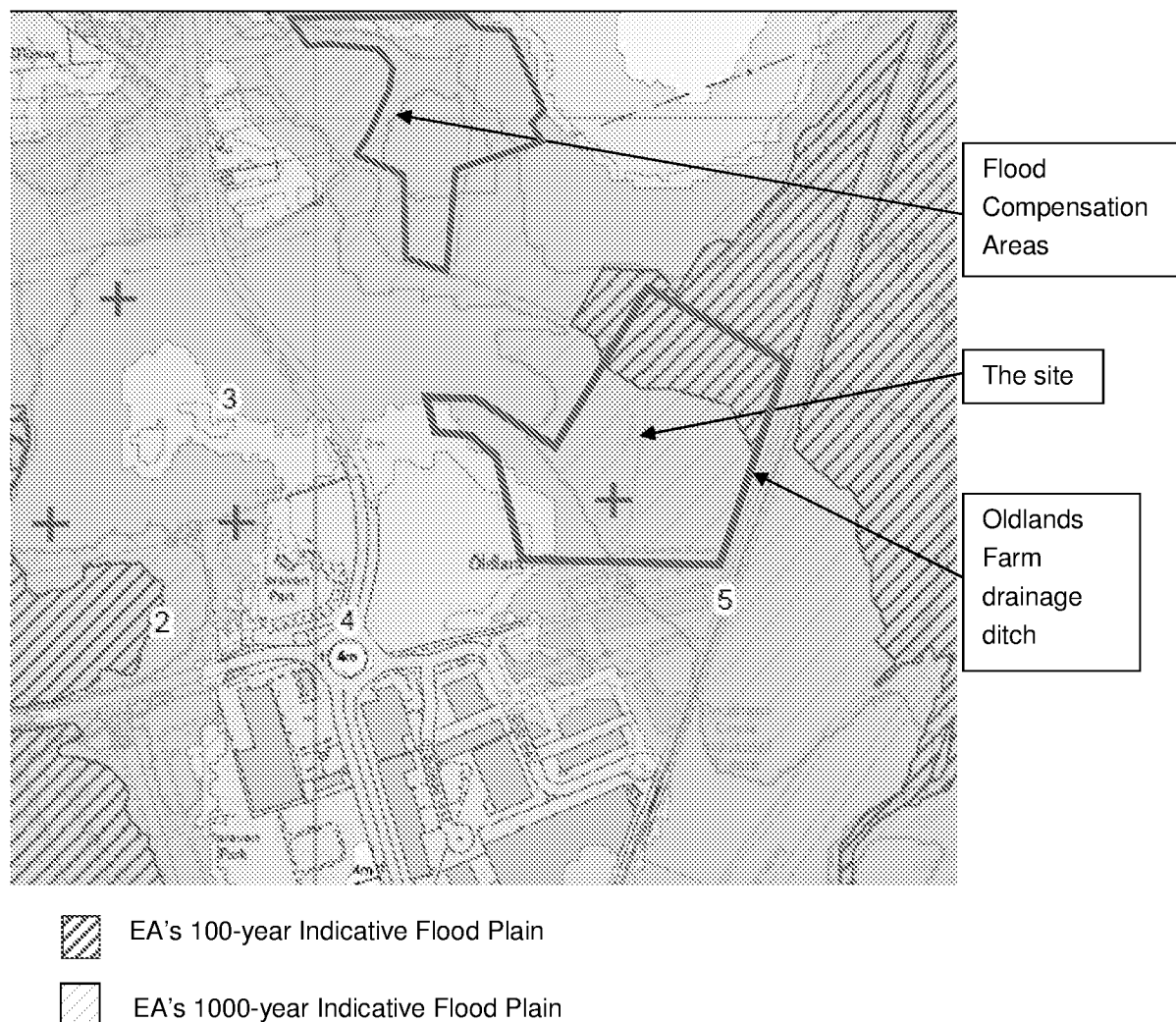
Environment Agency Flood Zones

- 4.2.4 Figure 3 locates the site on the Environment Agency's indicative flood plain map. It is clear from this that the red line boundary lies inside of the current statistical fluvial floodwater model footprint generated by any local watercourses i.e. probability of annual fluvial flooding of greater than 1 in 100 in any one year. It is proposed that the site levels will be raised, and so the levels the development will be located within an amended flood zone 1 (lowest Risk). Therefore the risk from fluvial flood water is diminished to acceptable levels.



- 4.2.4 The Environment Agency are currently revising peak flood levels for this area and results are expected in August 2014.

Figure 3 – The Environment Agency’s Indicative 100-year Flood Plain Map



4.3 Flooding from the Land (Surface Water)

- 4.3.1 The site is currently arable farming fields, and has a nominal fall from the A29 towards Oldlands Farm Ditch and the railway line on the eastern boundary. The A29 and Royal Oak Way North has an existing and effective highway drainage system with a drainage pond to the north of development. This poses no risk.

4.4 Flooding from Rivers (Fluvial)

- 4.4.1 Flows from the watercourse known as Oldlands Farm Ditch which runs along the northern boundary are the main cause of on-site flooding. The Environment Agency have



acknowledged that the catchment responds slowly and mirrors the flood levels on the Lindsey Rife.

- 4.4.2 As it is proposed to lift site levels out of the floodplain, the risk to the site from overland flooding now considered to be low.

4.5 Flooding from Groundwater

- 4.5.1 The Environmental Agency mapping indicates no risk of groundwater flooding.
- 4.5.2 The Environment Agency has confirmed there are no recorded incidents of groundwater flooding on this development site.

4.6 Flooding from Sewers / Highway Drains

- 4.6.1 The review of the Southern Water public sewer records would indicate there are no sewers within the development site. Public foul and surface water sewers are located to the west of the site within the A29 Trunk Road.
- 4.6.2 As these sewers and drains are located outside the site there is a low risk of flooding from exceedance failure or blockage. However, the risk is the same as that from new on site drainage and so as long as adequately maintained, the risk can be considered low.
- 4.6.3 Southern Water have confirmed no recorded incidents of flooding from public sewers within a 500m radius of the site.

4.7 Flooding from Private On-Site Drainage

- 4.7.1 The drainage strategy is discussed in greater detail later in this report. However, the design will be in line with current guidance with any overland flood flows from the extreme events identified to make sure they do not pose a risk to future occupiers.

4.8 Flooding from Artificial Sources

- 4.8.1 There are no identified artificial sources in close proximity to the site. Therefore the flood risk from artificial sources can be considered negligible.



5.0 **ASSESSMENT OF FLOOD RISK ON DEVELOPMENT SITE (PROBABILITY)**

5.1 **Table 3: Flood Risk Summary**

Source	Probability of Flood Risk	Impacts	Remarks / Mitigation
Fluvial	High	Low	The Development is partly Flood Zone 2 and 3, but the proposal is to raise the levels and provide flood compensation. Therefore the development is at low risk of flooding.
Surface (Overland Flood Flow)	Low	Low	No surrounding terrain or properties are considered to give rise to any significant degree of surface water runoff and subsequent flood flows
Sewers and drains	Low	Low	There are no public sewers within the development site. New drainage is to be designed to best practice guidance to reduce flood risk.
Groundwater	Low	Low	Site level are raised in relation to its locality and geotechnical report (see 6.4) does not indicate any risk from groundwater.
Artificial Sources	Low	Low	There are no artificial sources in close proximity.



6.0 Drainage Strategy

6.1 Overview

- 6.1.1 As part of this study Southern Water (SW), and the Environment Agency (EA) have been consulted.

6.2 External Consultation

Southern Water (SW)

- 6.2.1 As discussed in Section 4, the SW sewer records have been reviewed and confirm no public sewers are within the development site. SW were previously consulted in 2013 by another consultant with regard to a different (albeit similar in nature) development. At that time they responded in the form of a letter enclosed in Appendix C, which confirmed that the proposed foul sewer drainage will be accepted into the existing sewers through Section 98 of the Water Industry Act 1991.

Environment Agency

- 6.2.2 As mentioned in section 3.4.2, the EA have provided a response stating their requirements for this FRA with respect to the development surface water runoff and attenuation requirements.

6.3 Existing Surface Water Runoff

- 6.3.1 As described in previous sections the runoff currently drains primarily into the ground through the arable fields, or runs overland towards the eastern boundary, following the natural contours of the site.
- 6.3.2 For drainage design purposes, the proposed development is classed as being constructed on greenfield land. Therefore greenfield runoff rates should be applied. These can be found in Table 4 below and, as requested by the EA, the greenfield rate is based on the greenfield runoff for the Southern Region 7. See Appendix F for micro drainage calculations.

Table 4: Existing Surface Water Runoff

Total Area (ha)	Greenfield Runoff Rates for Respective Storm Events		
	QBar	30 Year	100 Year
9.745	35.3l/s	79.9l/s	112.5/s



6.4 Geology

- 6.4.1 The geotechnical data is based on the Hydrock ground investigation report ref. R/14459/001, dated June 2014. The site is underlain by Raised Marine Deposits in the east and River Terrace Deposits in the west. These superficial deposits overlie Undifferentiated Chalk deposits.

6.5 Sustainable Drainage Systems

6.5.1 SuDS Objectives:

Sustainable drainage, developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed to manage both the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. Therefore SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C697, 2007).

6.5.2 SuDS Design Themes

A strong design theme is essential if the maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale the SuDS should link with the individual plot structures, planting, public open space requirements and amenity areas, gaining multiple benefits from a limited area of land.

6.5.3 The SuDS Management Train

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

1. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
2. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
3. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
4. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.



The drainage techniques for this development will seek to include where possible Prevention, Source Control and Site Control measures.

6.5.4 SuDS Site Constraints

SuDS techniques are not suitable for all sites; therefore an assessment of the existing site is required so that SuDS limitations can be determined.

- i. Land Use Characteristics: The significant size and type of development plot enables a range of prevention, source control and site control SuDS devices to be considered both above and below ground.
- ii. Site Characteristics: Local trial pits (R14459/002) indicate soft silty clays and clayey silts with chalks underneath with a high water table and would be unsuitable for infiltration. Furthermore the site is being raised which would make it also unsuitable for an infiltration drainage solution
- iii. Catchment Characteristics: The site is classified as 'greenfield' in terms of drainage. Current guidance would limit the discharge rate from the post-developed site to not exceed existing discharge rates.
- iv. Environmental and Amenity Performance: The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. These will also assist in offsetting the loss of predeveloped natural habitat. Maintenance plans will be prepared for all SuDS devices.

6.5.5 SuDS Design Philosophy

The SuDS philosophy for the development site is the promotion of Prevention, Source Control and Site Control Techniques:

The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the local watercourse(s).
- Surface water discharge into the local watercourse(s), at the lower point of the site, at a controlled rate.
- Prevention measures by the potential inclusion of rainwater harvesting (TBC).
- Site Control features in the form of open attenuation ponds or below ground oversized pipes to accommodate the additional surface water runoff generated by the development site.



- Provision of suitable oil separators in line with Pollution Prevention Guidance 3 criteria (where applicable)
- Aim to limit where possible the impermeable fraction of development.

6.5.6 SuDS Parameters

It is proposed that the development site has two levels of treatment. Prevention and source control are considered as the first level of treatment and the site control as the second level of treatment.

6.5.7 Prevention and Source Control – Principals and Objectives

The main objective of prevention and source control is treatment and control of runoff as near to source as possible. Application of these techniques will require reduction of impermeable areas and techniques to restrict the runoff rates.

Prevention measures to be considered, where possible, as part of the overall approach to the management train at this site include rainwater harvesting. Typical examples are given in the SuDS Manual (Ciria C697) and are briefly described below. It must be noted that the effectiveness of each system is dependent on the final design as well as the actual site conditions.

Rainwater Harvesting;

Similar to the use of water butts this prevention method stores rainwater runoff from roofs and external areas in below ground tanks. The water can then be used for irrigation purposes to the soft landscaping areas or alternatively pumped to an internal storage tank where the 'Grey' water can be used for WC's and washing machines.

Swales;

Swales are linear grassed ditches that provide conveyance and storage of surface water runoff. They can be inexpensive to construct as they are very similar to normal landscaping areas, but require land.

These features can be directed towards storage features such as detention basins and possibly balancing ponds before discharge to existing watercourse or ditches at controlled rates. Swales can be sized to accommodate a broad variety of flow rates.

They differ from normal drainage channels in that the flow of water is designed to be slower, so filtration, and to a lesser degree sedimentation, may occur as the water flows over and through vegetated soils. They are most effective on shallow gradients where water flow is slowest. On relatively steep sections of land swales are locally deepened at regular intervals, effectively providing on-line detention basins and simple check dams, typically at 15m centres.



6.5.8 Site Control – Principals and Objectives

Site control features such as ponds and basins can be designed to attenuate storm runoff and provide conditions for settlement of suspended solids. The benefits are that they satisfy the full range of SuDS requirements in terms of reducing the quantity of water, improving the quality of water and also providing the bio diversity enhancements.

Detention Basins;

Detention Basins or dry ponds remain dry during periods of low rainfall and are located to receive runoff from conveyance systems prior to discharge the watercourses/ditches at controlled flow rates. Basins can be sized to allow storage of excess flows until they can drain, and should be located to receive runoff from conveyance systems prior to discharge to watercourses/ditches at controlled flow rates. Discharge will generally be controlled via vortex flow control device or reduced sized orifice plate as appropriate. Some removal of pollutants would occur in a detention basin by filtration through vegetated soils.

Conventional piped drainage;

Conventional piped drainage would be in areas of the proposed scheme where 'over-the-edge' drainage is unsuitable. This would typically be at areas where kerbs are required due to road user safety reasons, such a roundabouts or marshalling yards. Surface water run-off would be collected via conventional trapped gullies or combined kerb drainage systems, before discharging appropriately into SuDS units.

Geocellular Systems;

Geocellular Systems can be used to control and manage runoff either as a soakaway or as a storage tank and can be tailored to suit the requirements of most sites. In addition they can be used for storing roof/rainwater before recycling. Geocellular Systems used for storage can be tailored to be used in contaminated land conditions to prevent infiltration.

6.6 Surface Water Drainage Strategy

- 6.6.1 Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account. This is line with current guidance and site specific recommendations from the EA.
- 6.6.2 In light of the findings from the SuDS review in Section 6.5, the following surface water drainage strategy will be implemented.
1. Due to the increase in impermeable areas from the predevelopment situation, the SuDS management train approach will be incorporated.



2. Prevention measures in the form of rainwater harvesting (potentially but to be confirmed) will be the initial means of retaining the runoff. Infiltration is unlikely to be considered feasible at this development site and therefore many source control options will have to be discounted.
3. Rainwater runoff from roofs and hard paved areas will be directed through the prevention measures above and then via a new surface water gravity network within the service yards to an on-site attenuation pond at the eastern boundary. The new on-site pond together with oversized pipes will accommodate the additional surface water runoff generated by the site, and prevent increased discharge to the downstream watercourses, for the extreme events.
4. Discharge from the pond to downstream watercourses will be restricted to greenfield rates for the respective storm events to mimic the pre development scenario.

6.7 Surface Water Drainage Proposals

- 6.7.1 Surface water runoff from the roof and external areas will be directed to the below ground gravity network. This water is considered to be generally clean and with limited contamination, and may be discharged directly to the new drainage infrastructure and SuDS Facilities. Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps, infiltration trenches with silt traps or by the use of Sustainable Drainage techniques.
- 6.7.2 A new gravity pipe network will serve the new buildings, service yards and car parks, and direct runoff to the attenuation pond at the eastern boundary. Taking into account the existing greenfield discharge rates, and assuming that no infiltration to ground is possible from the base of the pond, then the worst case attenuation volumes are defined in Table 5 below. Note however that the attenuation volumes shown are conservatively those required to limit the overall maximum peak discharge from the site to 35.3l/s as dictated by the EA QBar rate. This is indicated within the Hydrock hydraulic drainage calculations in Appendix F.
- 6.7.3 A hydraulic model of the site has been created to determine the peak flows generated from the development, and the resulting attenuation volumes required. In order to accurately assess the storage volumes required for the 1:30 year and 1:100 year storm events (including climate change), a hydraulic modelling programme has been used which uses storm hydrographs to assess the inflows and outflows from a restricted system across the entire storm duration, on a minute by minute basis. This method gives confidence that adequate storage volumes have been provided for any particular critical moment during the severe storm event.



Table 5: Outline Attenuation Volumes Attenuation Volumes based on Return Period Storm Events with Allowable discharge rate in Brackets		
QBar (35.30l/s)	30 Year (35.3l/s)	100 Year + 30% Climate Change (35.3l/s)
784m ³	2530m ³	5530m ³

- 6.7.4 It is a requirement of building regulation guidance that the drainage systems be designed not to flood any part of the site in a 1 in 30 year return period design storm (3.33% annual probability of occurrence). The below ground surface water design may require that some areas of car park or the hard standing areas experience minor flooding in extreme conditions beyond the 30 year design criteria. This is classed as Exceedance flooding or Secondary Storage and is common for this type of development. Any such flood water will be directed away from door thresholds to the periphery of the site, where it will discharge into the drainage infrastructure as water levels recede.

All exceedance flood water will be retained on site up to the 100 year return period to prevent flood impact to the adjoining neighbours. All drainage designs will include the appropriate climate change allowance, in this case a 20% increase in rainfall. Refer to Appendix E for details of the Hydrock proposed drainage strategy layout.

6.8 Foul Water Drainage Strategy and Proposals

- 6.8.1 The foul water drainage strategy is to construct a separate foul water drainage network serving the whole development. This will drain by gravity, to the new pumping station, indicated on the Drainage Strategy drawing (14443/210). This will then be pumped to the Southern Water Apparatus on Shripney Road under a Section 98 Agreement with Southern Water.



7.0 Management Measures, Off Site Impacts and Residual Risk

7.1 Flood Risk Management Measures

- 7.1.1 The report has determined that the site is at low risk from all forms of flooding.
- 7.1.2 The surface water drainage strategy for the new development site is to direct all the surface water runoff from the new development plots to new surface water networks that flow to the east to correspond with the new topography of the site. The Flood risk management for this development is to locate the site out of flood zone 2 and 3, and to provide flood compensation to allow this. A detention (attenuation) pond and below ground oversized pipes will be situated on the network to retain the excess rainwater due to the outflow restriction set by the predevelopment greenfield runoff rates. The new private surface water networks will be designed in line with current British Standard guidance up to the 100 year storm return period including an allowance for climate change. Beyond the 30 year criteria, minor surface flooding may occur with flood water contained in low lying external areas where it will then drain back in to the drainage network as the pipe water levels recede. No flood water will be allowed to discharge off the development site. A full hydraulic model has been prepared to prove this scenario.
- 7.1.3 The use of SuDS such as rainwater harvesting and an attenuation pond with controlled (restricted) outflow to the local watercourse in line with the required runoff rates will help mitigate any flood risk impact to the surrounding areas.
- 7.1.4 There will be a site management health and safety document prepared in respect of the final development. This will include the required maintenance regime for the on-site drains and drainage facilities such as the channels, gullies, pipes, manholes and all SuDS facilities.
- 7.1.5 The respective site users will be responsible for site cleanliness, gully emptying and drain cleansing to ensure that the surface water drainage system will always operate at its maximum efficiency.
- 7.1.6 Access and egress arrangements to and from the new development should exceedance flooding occur will be through the proposed main access off the A29 roundabout.

7.2 Off Site Impacts

- 7.2.1 The report has justified that the risk of flooding to the new development layout is low. Thus the development site has a very low risk of flooding from fluvial or by all other sources of flood risk due to the flood compensation proposals.
- 7.2.2 By including SuDS into the drainage system, this will reduce surface water flooding impact onto the downstream catchments.



- 7.2.3 By mimicking the predevelopment peak runoff at its point of discharge into the receiving watercourse by the inclusion of SuDS, this will reduce surface water flooding impact onto the downstream catchments.

7.3 Residual Risk

- 7.3.1 Flood risk to people and property can be managed but it can never be completely removed; a residual risk remains after flood management or mitigation measures have been put in place. This relates to a rainfall event beyond what can be fully quantified. Should this occur then some flooding of external areas could occur.



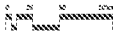
APPENDIX A – ARCHITECTURAL SITE PLAN

CONTENTS	
Identifier	Name
Michael Sparks Architects	Proposed Location Plan – 30699-PL-100 Revision B
Michael Sparks Architects	Proposed Site Layout – 30699-PL-101 Revision A



01
100

SITE LOCATION
1:2500



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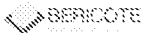
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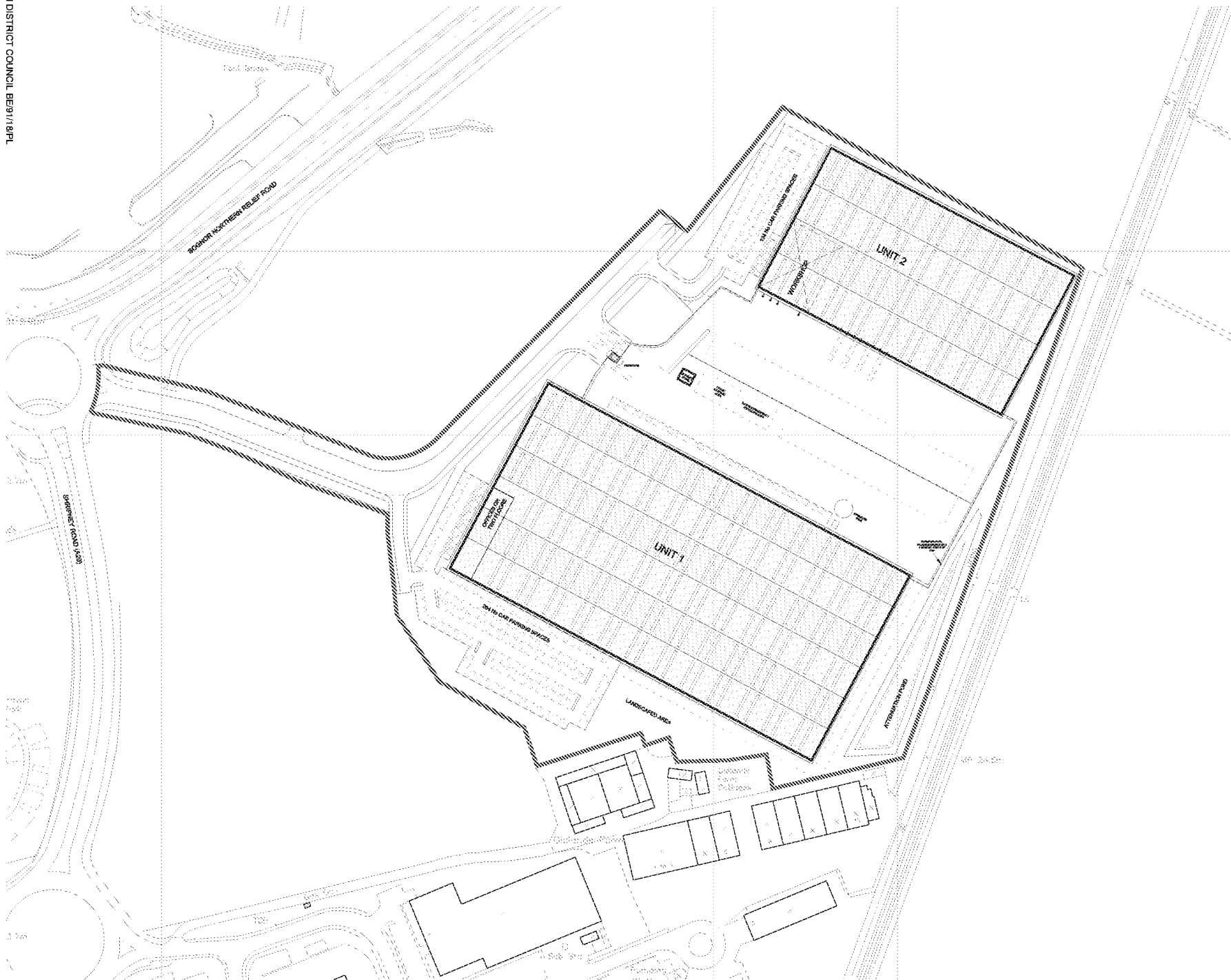


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DRAWING
SITE LOCATION PLAN

CLIENT
BERICOTE PROPERTIES LTD

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STATUS	PLANNING	NSC

DRAWING NUMBER
30699-PL-100B



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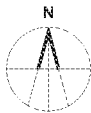
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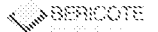
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REV	DATE	NOTE	BY	CHK



Michael Sparks
10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000



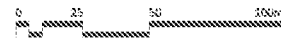
BERICOTE
PROPERTIES LTD

THIS
OLDLANDS FARM, BOGNOR REGIS
DRAWING
SITE LAYOUT PLAN

OWNER
BERICOTE PROPERTIES LTD

DATE JUNE 2014	SCALE 1:1000@A1	SWORN PF
	STATUS PLANNING	CHECKED NSC

DESIGNED BY
30698-PL-101A





APPENDIX B – TOPOGRAPHICAL SURVEY

CONTENTS	
Identifier	Name
Malcolm Hughes Land Surveyors	Topographical Survey Drawing No. 16473/1-3

Topographical Survey removed to reduce file size



APPENDIX C – STATUTORY AUTHORITY CORRESPONDANCE

CONTENTS	
Identifier	Name
Environment Agency	Correspondences and guidance notes
Southern Water	2013 Preplanning correspondence for a previous planning application

Southern Water correspondence removed to
reduce file size

Sophie Eaton
Hydrock
St Baldred's Hall
239 Ashley Road
Hale, Cheshire
WA15 9NE

Our ref: SSD/3278/
Your ref:

Date: 31/03/2014

Dear Ms Eaton

Provision of Product 4 for Land off Shripney Roadm Bognor Regis

Thank you for your request to use Environment Agency data. The information is attached.

If you have requested this information to help inform a development proposal, then you should note the detail in the attached advisory text on the use of Environment Agency Information for Flood Risk Assessments / Flood Consequence Assessments.

Supporting Information

This information is provided subject to the enclosed notice, which you should read.

Flood History

Our records show that Shripney has suffered flooding in 1960 and 1974. Both of these events are listed in our records as road and property flooding as a result of overwhelmed land drainage rather than Main River. Please see the attached Historic Flood Outline map for spatial extents. I would suggest contacting Arun District Council for a more comprehensive flood history check.

Flood Defences

There are no formal raised flood defences to protect this area from river flooding. Coastal flood defences offer a standard of protection of approximately 1in200 (0.5%).

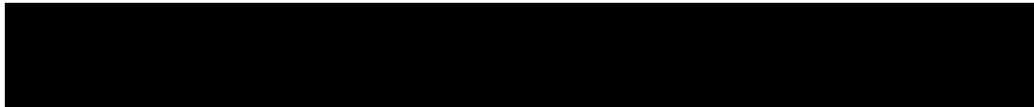
Guildbourne House, Chatsworth Road, Worthing, West Sussex BN11 1LD
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

If you have any queries or would like to discuss the content of this letter further please don't hesitate to contact me.

Yours faithfully



Jon Denman
FCRM Officer
Partnership and Strategic Overview Team – West Sussex



Enc. Detailed FRA/FCA Map, Modelled Levels and extents, Historic Flood Outlines
[Standard Notice]

Modelled Outputs Centered on Land off Shripney Road, Bognor Regis - Created 31/03/2014 [Ref: SSD/3278/]

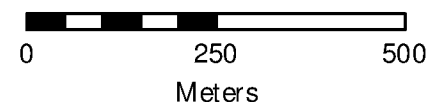


- Fluvial 1% [1in100yr]
- Fluvial 0.1% [1in1000yr]
- Tidal 0.5% [1in200yr]
- Tidal 0.1% [1in1000yr]
- Tidal 0.5% [1in200yr] +CC

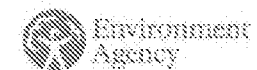


Node Point	Easting	Northing	Modelled levels in mAOD [model type below]					
			FLUVIAL			TIDAL		
			1% AEP [1in100yr]	1% AEP [1in100yr] +CC [2115]	0.1% AEP [1in1000yr]	0.5% AEP [1in200yr]	0.5% AEP [1in200yr] +CC	0.1% AEP [1in1000yr]
1	493318	101543	0.96	Not Available	1.52	2.74	4.43	3.05
2	493669	101501	Not Available	Not Available	Not Available	2.74	4.43	3.05
3	493754	101772	Not Available	Not Available	Not Available	2.74	4.43	3.05
4	493903	101494	Not Available	Not Available	Not Available	2.74	4.43	3.05
5	494371	101520	Not Available	Not Available	2.36	2.78	4.43	3.06
6	494856	101426	1.50	1.61	2.35	2.74	4.42	3.05
			2009 JFLOW	2010 TUFLOW	2003 Hydro-1d (Outputs not suitable for site specific FRA)			

1:10,000 *
*when printed at A4.

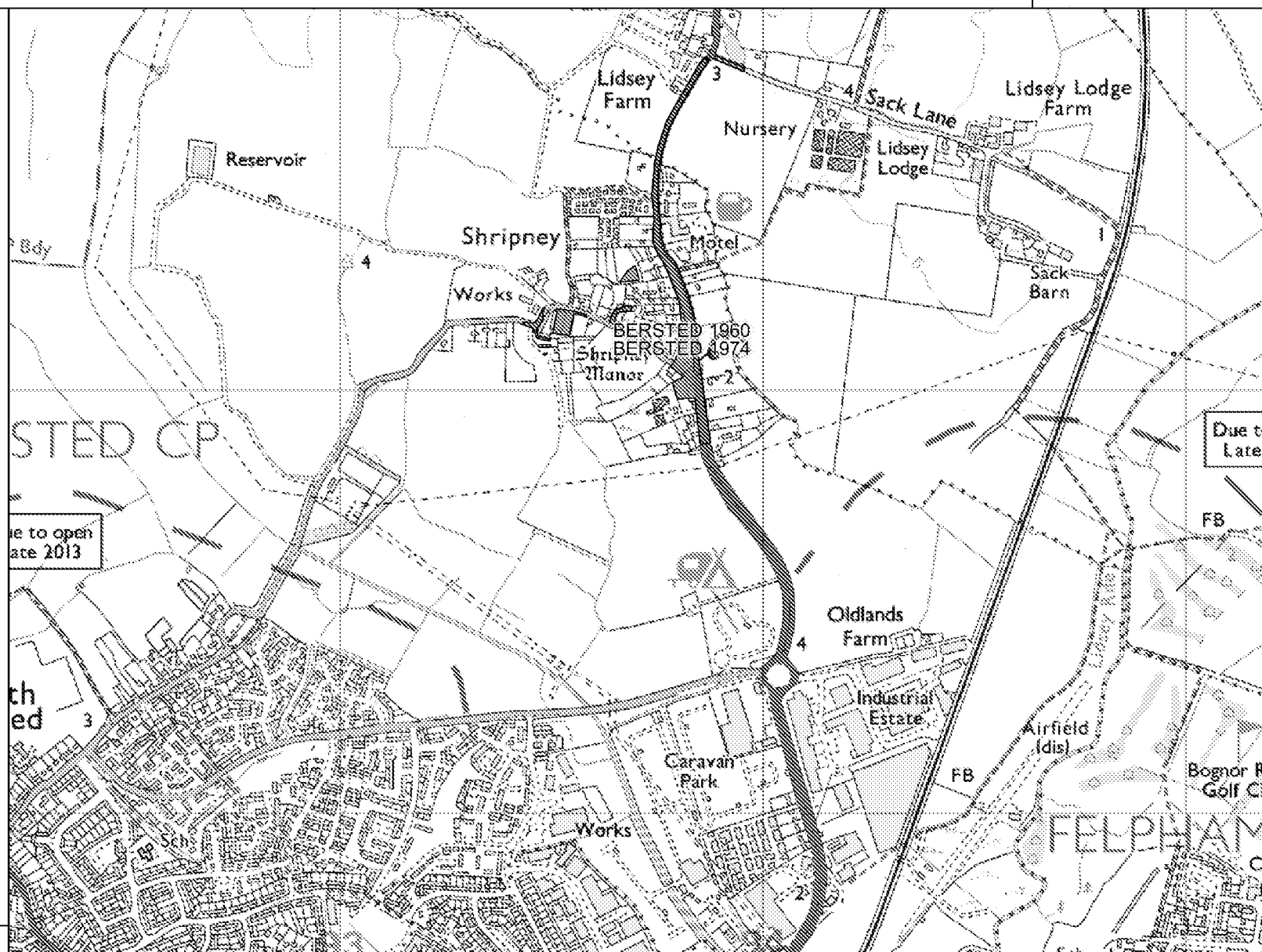


SSD/3112/BM Flood Event Outlines



Legend

 Flood Event Outlines

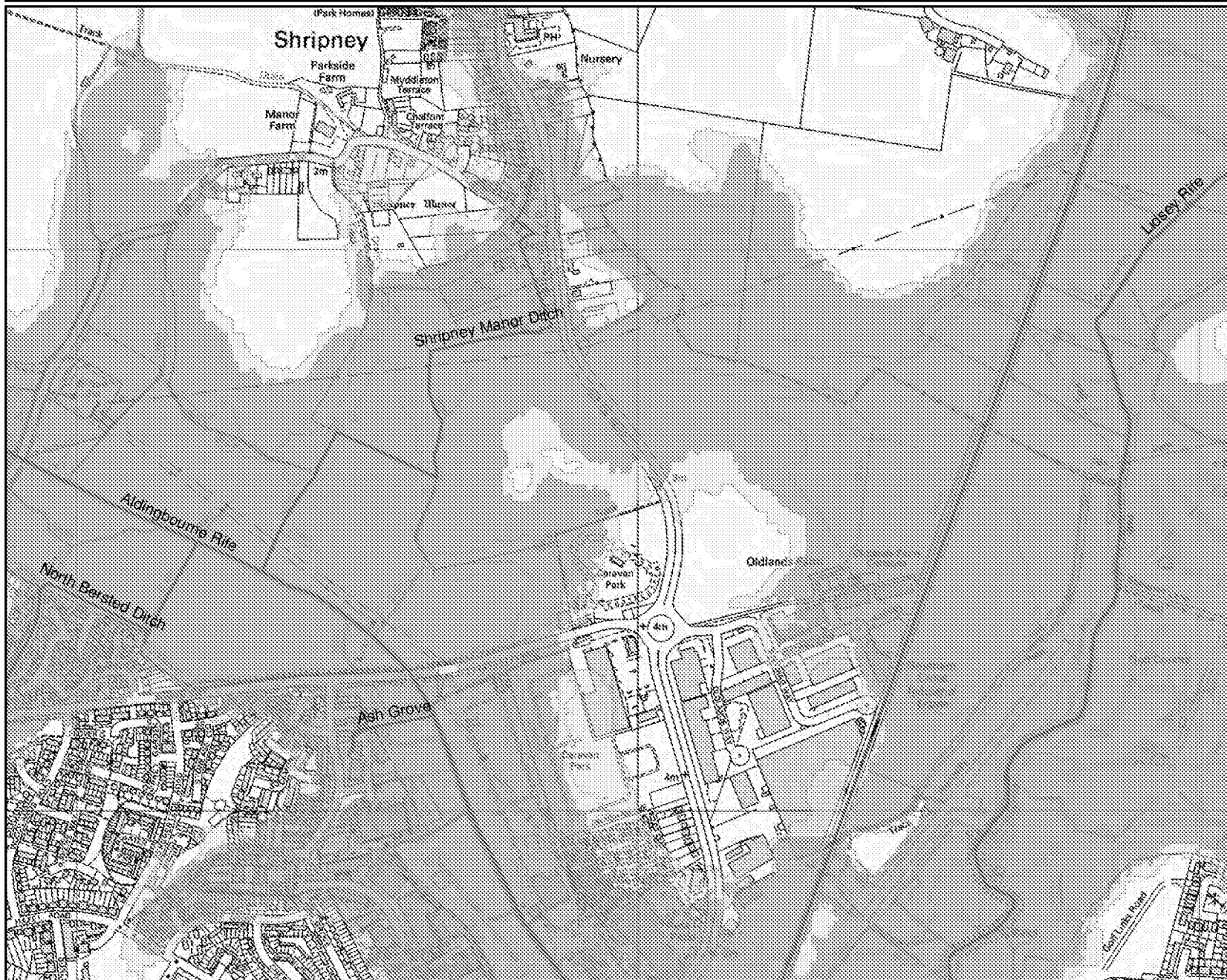


0 130 260 390 m.



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Flood Map for Planning Centered on Land off Shripney Road, Bognor Regis - Created 31/03/2014 [Ref: SSD/3278/]



- Main River
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3

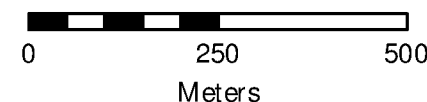
Shows the area that could be affected by flooding:
- from the sea with an 1 in 200 or greater chance of happening each year.
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2

Shows the extent of an extreme flood from rivers of the sea with up to a 1 in 1000 chance of occurring each year.

1:10,000 *

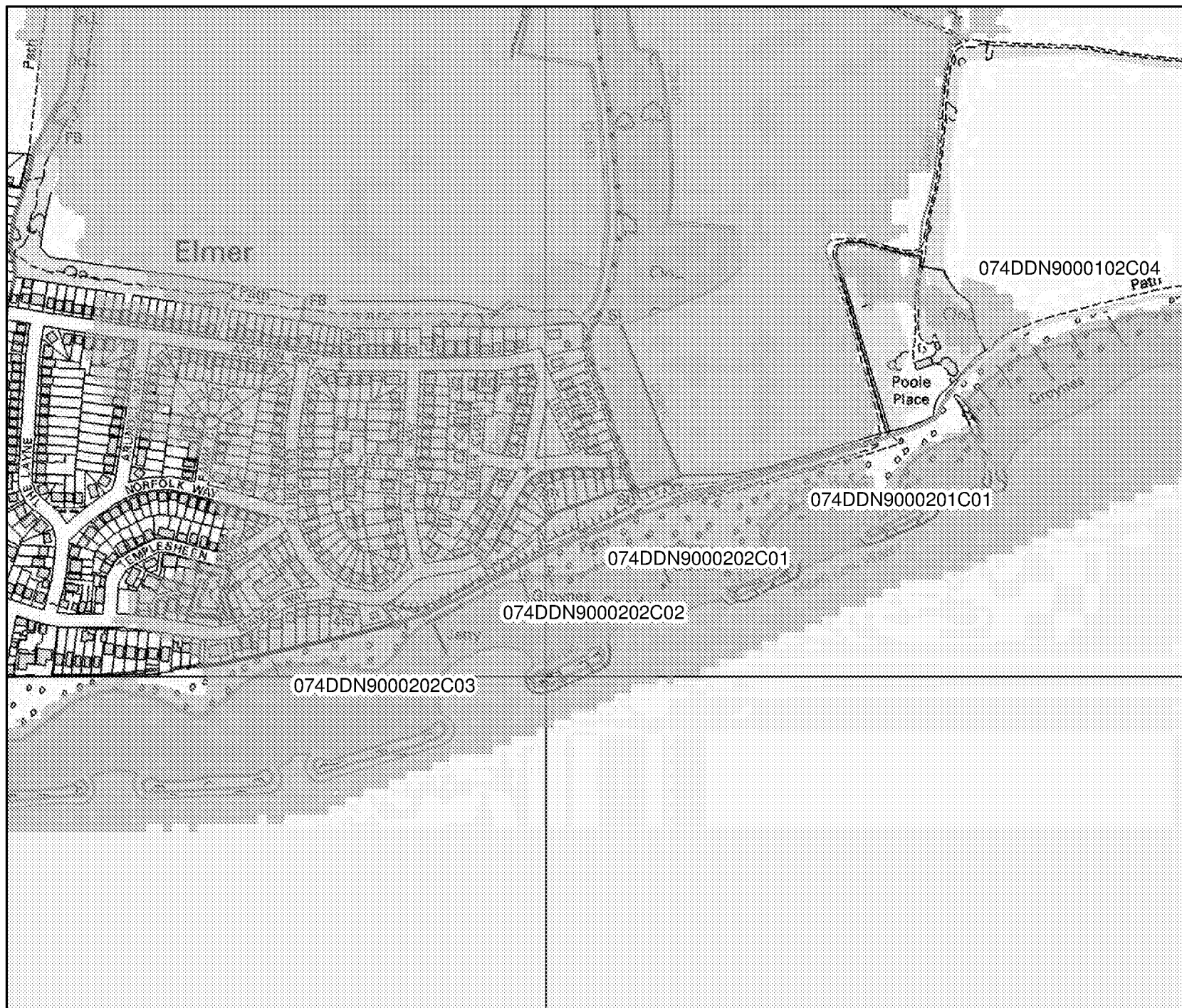
*when printed at A4.



Elmer Coastal Defences

Legend

 Extreme Flood Outline



0 50 100
Meters



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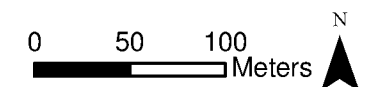
Bognor Regis Coastal Defences

Legend

Coastal Defence

Asset Reference

- 074DDN9000305C01
- 074DDN9000305C02
- 074DDN9000305C03
- 074DDN9000305C04
- 074DDN9000305C05
- Extreme Flood Outline

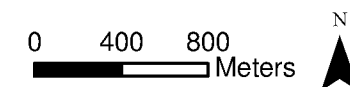




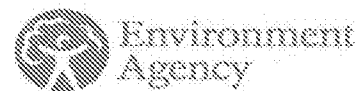
Bognor Regis & Elmer Coastal Defences

Legend

-  Selected Defences
-  Extreme Flood Outline



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Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

Important

If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:-

<http://www.environment-agency.gov.uk/research/planning/33580.aspx>

Depending on the enquiry, we may also provide advice on other issues related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice and PPS25 and its associated Practice Guide for information about what flood risk assessment is needed for new development in the different flood zones. These documents can be accessed via:

<http://www.environment-agency.gov.uk/research/planning/82587.aspx>

<http://www.communities.gov.uk/publications/planningandbuilding/pps25floodrisk>

<http://www.communities.gov.uk/publications/planningandbuilding/pps25practiceguide>

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

In **Wales**, you should refer to TAN15 for information about what flood consequence assessment is needed for new development in the different flood zones

<http://new.wales.gov.uk/splash.jsessionid=8vIGTfGZthmB0t2vhp6hS1GcB1LXvZzB3Yiczf20Xn7LK3zk0nMkl981825250?orig=/topics/planning/policy/tans/tan15/>

You should also consult the Strategic Flood Consequence Assessment if one has been produced by your local planning authority.

In both **England and Wales** you should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk / Consequence Assessment (FRA / FCA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as

groundwater or overland runoff. The information produced by the local planning authority referred to above may assist here.

3. Where a planning application requires a FRA / FCA and this is not submitted or deficient, the Environment Agency may well raise an objection.
4. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your local planning authority.



APPENDIX D – SOUTHERN WATER SEWER RECORDS

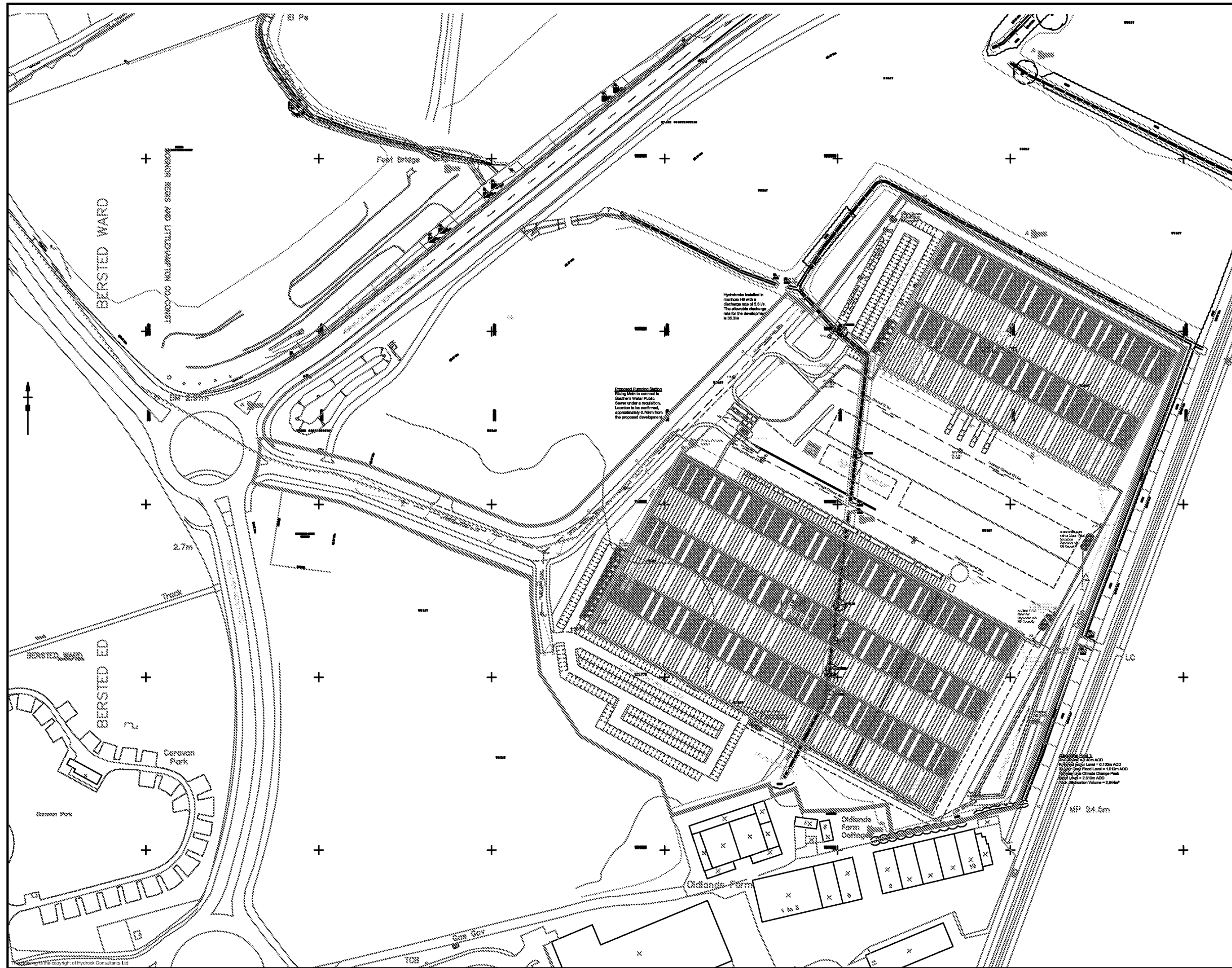
CONTENTS	
Identifier	Name
Southern Water	Sewer Records

Southern Water Sewer Records removed to
reduce file size



APPENDIX E – HYDROCK DRAWINGS

CONTENTS	
Identifier	Name
Hydrock	C14443/210 Proposed Drainage Strategy
Hydrock	C14443/200 – 204 Proposed Floodplain Compensation drawings



- Notes:**
1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
 2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

- Key:**
- Proposed Roof Drainage
 - Proposed SW Drainage
 - Proposed Foul Drainage
 - Site Boundary

Rev	Date	Description	By	Chk
P2	25.05.14	Red line boundary amended	JH	SB
P1	20.05.14	First Issue	JH	SB

www.hydrock.com

OLDLANDS FARM
BOGNOR REGIS

PROPOSED DRAINAGE
STRATEGY

PRELIMINARY

C14443

Drawn	Check	Rev	Date	Rev	Date
JH	MG	1:500	20.06.2014	21.05.14	

210

P2

