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Proposed Industrial Unit – Shoreham Technical Centre, Shoreham-by-Sea, West Sussex

Flood Risk Assessment

Final Report

For

Ricardo PLC

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1.0 INTRODUCTION

This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of our client Ricardo PLC in support of a planning application to be submitted to Adur District Council for a proposed temporary industrial unit within Shoreham Technical Centre, Shoreham-by-Sea, West Sussex.

Local Planning Authorities are advised by the Government's Planning Policy Statement *PPS25 Development and Flood Risk* (*PPS25*) to consult the Environment Agency (EA) on development proposals in areas at risk of flooding and / or for sites over 1ha in area. For a development of this nature the EA require a Flood Risk Assessment to be submitted in support of the planning application.

In order to satisfy any concerns the EA would have in connection with the development of this site, this report has been prepared to address Section C of the Exception Test, as defined within Paragraph D9 of *PPS25*, through:

- Providing an assessment of whether the proposed development is likely to be affected by flooding and whether it would increase flood risk elsewhere; and,

- Detailing any measures necessary to mitigate any flood risk identified, to ensure that the proposed development and occupants would be safe and that flood risk would not be increased elsewhere.

The report considers the requirements for undertaking a FRA stipulated in Annex E of *PPS25*. Only those requirements that are appropriate to a development of this nature have been considered in the compilation of this report.

This report has been developed in accordance with current EA policy.

2.0 SITE INFORMATION

2.1 Site Location

The site is referenced in Table 2.1, and a site location map is provided in Appendix A.

Table 2.1: Site Referencing Information

Item	Brief Description
Site name	Shoreham Technical Centre
Site address and location	Shoreham Technical Centre, Shoreham-by-Sea, West Sussex
Council Area	Adur District Council
Approximate Grid Reference	OS: 520306, 106121 NGR: TQ203061

The site is located approximately 1.5km north of Shoreham-by-Sea town centre and around 13km west of the centre of Brighton.

2.2 Existing Site

2.2.1 Boundaries and Surrounding Land

The boundary of both Shoreham Technical Centre and the proposed location of the temporary industrial unit is shown in Appendix A.

Shoreham Technical centre is a triangular parcel of land which is bordered by the River Adur to the east, A27 road (Shoreham bypass) to the north, and Old Shoreham Road to the south. To the south of Old Shoreham Road lies Shoreham Airport.

The footprint of the proposed industrial unit is located to the northwest of the site and is bounded by A27 Shoreham Bypass. To the South lies an existing staff car park and to the east lies industrial units.

2.2.2 Land use

The proposed development footprint is an existing car park which is hard standing. The proposed development area is effectively 100% impermeable.

2.2.3 Access

Access to the site is provided off Old Shoreham Road, via the existing main site entrance.

2.2.4 Elevation and Topography

The proposed development footprint is relatively flat, ranging in level between around 1.7m AOD and 2.0m AOD. The A27 Shoreham Bypass to the north and west of the proposed industrial unit is set above site levels and is located on a raised embankment. Old Shoreham Road to the south of the site is approximately 1.8m above the site and is separated by a planted bank. Shoreham Technical Centre is also bounded to the east by flood defence earth embankments. The site is effectively enclosed to all sides.

2.3 Proposed Development

2.3.1 Outline of Development Proposals

The proposed development consists of the construction of a temporary industrial unit. The intention is that once constructed the building would only be in place for three years.

The proposed site layout for this application is shown in Appendix B

2.3.2 Development Design Life

The generally accepted development design life of industrial development for the assessment of flood risk is 60 years. Ricardo PLC have expressed that the proposed development will be a temporary facility with a design life of three years. This assessment therefore considers flood risk over a period of three years.

2.3.3 *PPS25* Vulnerability Classification

PPS25 considers industrial development as 'less vulnerable' development in respect of flood risk.

3.0 IDENTIFICATION OF FLOOD RISK

Flood risk to the proposed development site is considered from all sources of flooding, as defined by the *PPS25 Practice Guide*.

3.1 Sources of information

Table 3.1 summarises the main sources of information used in the identification of flood risk.

Table 3.1: Sources of information used in the identification of flood risk

Source of Information	Details
EA flood modeling information	Dated September 2009. Appendix C.
Strategic Flood Risk Assessment (SFRA) of Worthing Borough Council and Adur District Council	Dated January 2008. Relevant maps in Appendix C.

The assessment of flood risk draws primarily on assessment of the site and surrounding watercourses and coast via the EA provided data and the Local Authority SFRA.

3.2 Flooding from Rivers (Fluvial) and Sea (Tidal)

3.2.1 EA Flood Zone Mapping

The EA's Flood zone Mapping, included in Appendix C, indicates that the site lies within Flood Zone 3 (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). It should be noted that the current EA Flood Zone Map ignores the presence of any existing flood defences offering protection to the site.

3.2.2 The Hydrological Regime

The River Adur flows immediately adjacent to the eastern boundary of site and is tidally influenced. The proposed development needs to be assessed against both fluvial and tidal sources of flooding, considering critical events for each (1 in 100 year plus climate change event for fluvial flooding and 1 in 200 year plus climate change event for tidal flooding).

An EA maintained earth embankment flood defence separates the site from the River Adur. The EA have confirmed that the flood defences offer protection up to a 1 in 200 year flood event.

The SFRA provides modelling of the River Adur for both fluvial and tidal sources of flooding and taking into account the presence of flood defences. The relevant mapping, included in Appendix C, shows the site to be situated outside the 1 in 100 years plus climate change fluvial floodplain, but being situated within the 1 in 200 year plus climate change tidal floodplain. Due to the design life of the proposed unit only being three years it is considered that the effects of climate change would be negligible over this time, and would result in the EA maintained earth embankment flood defences providing adequate protection.

The SFRA indicates that the risk of tidal flooding is a result of sea defence being overtopped at the lower reaches of the River Adur, rather than overtopping of the flood defences immediately adjacent to the site.

Flood depth mapping for the 1 in 200 year tidal event, included in Appendix C, indicates that the depth of flooding during such an event would vary across the site; however the footprint for the proposed temporary unit is shown to be at risk of flooding to depths between 0.75-1.0m.

3.3 Flooding from the land (Surface Water)

The SFRA indicates that whilst the site or immediate area has not historically experienced surface water flooding, the site is considered to be at a 'medium to high' risk area prone to surface water flooding. Mapping from the SFRA showing the vulnerability of areas to surface water flooding is included in Appendix C.

The site is effectively enclosed by raised ground (highways and flood defences) to all sides, reducing the risk of surface water flows entering the site from the surrounding area. Furthermore the site currently has a positive surface water drainage system in place, with underground pipes and an open ditch / swale network. As such, the risk posed by surface water flooding to the site is considered low.

3.4 Flooding from Groundwater

The SFRA indicates that the site is underlain by clay which overlies chalk of the Newhaven Chalk Formation. A large chalk aquifer lies beneath the Adur area. The water level within chalk aquifers can fluctuate notably corresponding to seasonal rainfall and West Sussex is one of the better-known counties for groundwater flooding. Groundwater flooding occurs in lower lying regions of the Adur area between the South Downs and the sea when the water level is higher within the aquifer than ground level.

The SFRA indicates (mapping included in Appendix C) that whilst the area is not within an area that has previously experienced groundwater flooding or within a groundwater emergence zone, the site is at a 'high' risk of groundwater flooding. This is supported by previous ground investigations for the site which has identified groundwater at a relatively shallow depth (around 1.0 - 1.5m below ground level).

However, given the positive drainage system in place and that much of the site is hard standing the site is considered to be at an acceptable risk from groundwater flooding.

3.5 Flooding from Sewers

Given that the site is surrounded by raised structures and that the SFRA indicates that the area has not previously experienced sewer flooding (mapping included in Appendix C), the site is considered to be at a low risk of sewer flooding.

3.6 Flooding from Artificial Sources

No artificial bodies of water, such as ponds, are located within the vicinity of the site and therefore this potential source of flooding is not considered further.

3.7 Summary

The EA and SFRA data for the area indicates that the proposed development is not at risk of flooding from the fluvial 1 in 100 year plus climate change flood event, but is at risk of flooding from the tidal 1 in 200 year plus climate change flood event. However due to the design life of the building the true impact of the 1 in 200 year plus climate change flood event would be minimal. It is considered that the EA maintained earth embankment flood defence would provide adequate protection to the proposed temporary industrial unit for the three year design life.

Furthermore the site is considered to be at a low, but acceptable, risk of surface water and sewer flooding but at a higher risk of flooding from groundwater.

4.0 *PPS25* AND THE PROPOSED DEVELOPMENT SITE

4.1 Planning Policy Requirements

This assessment has demonstrated that the proposal site has been correctly classified as Flood Zone 3a.

Industrial development is considered 'less vulnerable' in terms of flood risk.

The *PPS25* flood risk vulnerability and flood zone compatibility matrix (*PPS25*, Table D.3) indicates that 'less vulnerable' development is appropriate in Flood Zone 3a.

The following section details any measures necessary to mitigate any identified flood risks, to ensure that the proposed development and occupants would be safe and that flood risk would not be increased elsewhere.

4.2 Resistance and Resilience of Proposed Building

Due to the nature of the proposed temporary building, finished floor levels will be set close to existing ground level, at around 1.96m AOD, to allow practical level access. As such the proposed building should be flood resilient, i.e. reduce the impact of flood water should it enter the building, in line with *PPS25 Practice Guide* (Paragraph 6.27). This is aimed to reduce the impact of flooding and subsequent damage through utilising materials and construction techniques to facilitate drying and cleaning of the building should the building be flooded. The techniques appropriate to the proposed temporary industrial unit are:

- Use of materials for wall construction that have low water penetration, are quick drying and retain pre-flood dimensions. The currently proposed temporary building materials should fulfil these criteria.

- Sensitive equipment should be raised as high as is feasible above floor level, with vulnerable services brought in from a high level and non-return valves fitted to waste water services where appropriate.

4.3 Flood Warning and Evacuation

The site is covered by the EA's flood warning service. As such it is recommended that the site, if not already, register with the EA's service. This would allow safe and timely evacuation of personnel and preparation of the building for the potential onset of flooding (i.e. fitting of temporary barriers and/or 'drop in boards' for all low level access points).

4.4 Flood Risk within Catchment

The proposed temporary development is not considered to increase flood risk within the catchment. Details regarding the measures to manage any increase in surface water run-off as a result of the proposed development are provided in Chapter 5.0.

5.0 SURFACE WATER DRAINAGE STRATEGY

5.1 Existing Surface Water Drainage System

Currently the proposed development footprint is 100% impermeable. A previous site drainage investigation identified that the development footprint area currently drains to a open drainage channel running northwards. This is believed to discharge into the existing drainage ditch that that runs around the perimeter of the site. The ditch is understood to ultimately discharge into the River Adur to the north eastern corner of the site via a 300mm diameter outfall, with a flap valve.

5.2 Proposed Surface Water Drainage System

The proposed scheme is developed on an area that is 100% impermeable and as such there would be no increase in surface water run-off from the site.

Table 5.5 in The SUDS Manual (CIRIA C697 – 2007) states that:

Discharge to coastal or estuarial waters will not generally require peak flow or volume control as there will be no deterioration in flood risk as a result of increased runoff.

As such, and for the proposed temporary unit, it is proposed to retain the existing drainage regime of discharging to the existing drainage ditch running around the perimeter of the site and ultimately discharging into the River Adur.

The existing flap valve outfall into the River Adur is set at a level above the typical river level. It is expected that during high tides and/ or flood events the outfall is likely to be submerged and as such surface water would be unable to discharge via the pipe. It is likely that the surface water from the site would peak prior to peak water levels in a fluvial flood, as such reducing the risk of a significant surcharge of the outfall pipe. Secondly, and due to the tidal nature of the river, the outfall is only likely to be submerged for several hours during high tide. Once the river levels fall the outfall would be operational again. Thirdly, if the outfall pipe was submerged for a prolonged period of time, it is considered there would be adequate capacity within the existing drainage ditch to ensure water would be contained within channel and highly unlikely to overtop onto the site.

6.0 CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS

This report has considered the flood risk posed to the proposal site from a variety of sources of flooding, as defined by the *PPS25 Practice Guide*.

The report has identified that the proposed development is not at risk of flooding from the fluvial 1 in 100 year plus climate change flood event, but is at risk of flooding from the tidal 1 in 200 year plus climate change flood event. However due to the design life of the building (three years) the true impact of the 1 in 200 year plus climate change flood event would not be effected. It is considered that the EA maintained earth embankment flood defence would provide adequate protection to the proposed temporary industrial unit for the three year design life. Furthermore the site is considered to be at a low, but acceptable, risk of surface water and sewer flooding but at a higher risk of flooding from groundwater.

This analysis demonstrates that the site has been correctly classified as Flood Zone 3a. However, the proposed industrial development, considered 'less vulnerable', is appropriate in the proposed location under *PPS25* criteria.

It is recommended that the site, if not already, register with the EA's flood warning service to allow safe and timely evacuation of personnel and preparation of the building in the event of a flood being forecast.

The site is currently 100% impermeable and would remain so following the proposed development. It is proposed to retain the existing drainage strategy via disposal of surface water to a drainage ditch running around the perimeter of the site and discharging to the River Adur via a flap valve outfall. This proposal is in accordance with The SUDS Manual. In the unlikely event of the outfall being submerged the drainage ditch is considered to have sufficient capacity to ensure the risk of the drainage system surcharging and causing out of bank flooding highly unlikely.

This report therefore demonstrates that the proposed scheme would:

- be safe and designed to be resilient to flooding in the critical design flood events;
- have a safe means of flood warning and evacuation; and,
- not increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage, impedance of flood flows or increase in surface water run-off.

Accordingly the application is shown to pass the Sequential and Exception Tests, as defined within *PPS25*.

Hydrock Consultants Limited

Appendix A – Site Details

CONTENTS	
Identifier	**Name**
Drawing No. 11155-001	Site Location Plan
Drawing No. 11155-002	Topographical Survey

Drawing No.	1115S - 001		
Revision	-		
Drawn	JD	MS	
Checked			
Date at A3	MAY 11	MAY 11	
Date			
Issue Date			

INFORMATION

Status Building

Location Plan
Redevelopment

title

WEST SUSSEX
SHOREHAM-BY-SEA
TECHNICAL CENTRE

project

RICARDO PLC

client

Hydrock
Consultants

rev	by	description	date

Proposed Building footprint

Shoreham Technical Centre site

A27
Shoreham By-Pass
Old Shoreham Road
Brighton
Shoreham-By-Sea
Lancing
Southlands Hospital
Shoreham Beach
Shoreham Airport
Worthing
Adur
Ferry
Sussex
Coastal Path
Adur Ferry Bridge
Shoreham Beach
Shoreham Airport
Lancing



Appendix B – Proposed Development Details

CONTENTS	
Identifier	**Name**
Drawing No. 11155-003	Proposed Site Plan

INTERNAL UNAPPROVED DRAFT

Building location

Temporary building

INTERNAL UNAPPROVED DRAFT

RICARDO

Elevation drawings of temporary building

2 ELEVATION A
1:100

4 ELEVATION C
1:100

3 ELEVATION B
1:100

4 ELEVATION D
1:100

3D representation of temporary building

South elevation

South –East elevation

INTERNAL UNAPPROVED DRAFT

3D representation of temporary building

North elevation

Appendix C – Flood Risk Information

CONTENTS	
Identifier	**Name**
EA ref. SSD2009001253	EA Flood Zone Mapping
SFRA Map C1-F	1 in 100 year event plus climate change fluvial floodplain mapping
SFRA Map C1-T	1 in 200 year event plus climate change tidal floodplain mapping
SFRA Map A2-T	1 in 200 year event tidal flood depth mapping
SFRA Map L	Surface water flood risk mapping
SFRA Map G1	Groundwater flood risk mapping
SFRA Map S	Historic sewer flooding mapping
PPS25 Table D.1	Flood Zones.
PPS25 Table D.2	Flood Risk Vulnerability Classification.
PPS25 Table D.3	Flood Risk Vulnerability and Flood Zone 'Compatibility'.
PPS25 Table B.1	Recommended contingency allowances for net sea level rise.
PPS25 Table B.2	Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights.

Worthing and Adur SFRA

Map G1 - Indicative Risk of Groundwater Flooding

CAPITA SYMONDS

Worthing

Adur

Legend

Worthing and Adur Boundaries

Administrative Boundaries

Main River

Groundwater flood event

Recorded areas of groundwater flooding

Groundwater Emergence Zones

Groundwater Flood Risk

Medium

High

Scale at A3 1: 50,000

Date 09/01/2009

0 5 10 15

kilometres

Map_G1.wor

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