Mr Marcus Whitworth

Proposed Commercial Re-development
Units 10-13 Denard Industrial Estate
Tanyard Road
Huddersfield

Flood Risk Assessment

Prepared by EWE Associates Ltd
Draft Rev0 October 2016

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CLIENT DETAILS

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CONTRACT

This report describes work commissioned by Mr Marcus Whitworth following written instruction by their representatives. Mr Marcus Whitworth representative for the contract was Mr Jim Granger. Lea Favill of EWE Associates Ltd carried out the work.

Date: 4th October 2016

Prepared by: …… …… Lea Favill
Director

REVISION HISTORY

Draft Report Rev0 issued 4th October 2016
- 1No copy issued to Mr Jim Granger

EXECUTIVE SUMMARY

The site is currently a 4 commercial units located within the Denard Industrial Estate located between Tanyard Road and the River Colne. There is existing residential and commercial development to all sides of the development site.

The buildings cover an area of less than 150m² and is considered to be 100% impermeable. The land within the site lies at a level of between 89.8mOD adjacent to the River Colne and 91mOD adjacent to Tanyard Road. The existing ground floor level of the buildings is 90.30mOD.

The proposal is to maintain several of the existing buildings as at present with minor refurbishments. It is estimated that the impermeable area following completion of the works will remain as existing.

The site is shown to be at risk from overtopping during the 1 in 100 year plus climate change and the 1 in 1000 year events from the River Colne.

The 1 in 100 year plus climate change flood level has been estimated at 90.30mOD. The existing ground floor level of the buildings is also 90.30mOD therefore shallow flooding may be experienced.

The development involves the refurbishment of the buildings with no changes to the buildings being proposed. As such, the levels within the site will need to be maintained. Due to access restriction this means the ground floor level of the buildings will need to be maintained as existing floor level of is 90.30mOD.

It is recommended that flood resilience measures are provided up to a level of 0.3m above the proposed ground floor level to reduce the impact of the flood events that could affect the site.

As the development is commercial, it is considered that dry access and egress from the development site will be desirable during extreme flood events.

It is considered that the site will not flood during the 1 in 100 year flood events. As such during this event dry access and egress will be available at all times. However, during the 1 in 100 year plus climate change the site could be inundated up to 0.3m. Therefore, an evacuation plan should be devised and the site evacuated prior to the flood water reaching the development.

Based on the results of this flood risk assessment it is considered there is a risk of flooding from the River Colne during the overtopping scenarios. However, the proposed mitigation measure should provide considerable betterment.

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1. INTRODUCTION

Terms of Reference

This report was commissioned by Mr Marcus Whitworth to support a planning application for a commercial re-development at the existing Denard Industrial Esate off Tanyard Road, Huddersfield. The location of the site is shown on Table 2-1.

The development site lies wholly within Zone 2 of the Environment Agency Flood Map (version 2.8.2), being the zone with risk of 1 in 1,000 year (0.1% AEP) or greater for river flooding. The overall size of the development is less than 1 hectare.

It is usual for the Agency to raise an objection to development applications within the floodplain or Zone 2 or 3 of the flood map until the question of flood risk has been properly evaluated. The Agency will also object to developments where the total site area is in excess of 1 hectare until suitable consideration has been given to surface water runoff.

Approach to the Assessment

As there are three sources of flood risk – River Colne, Huddersfield Narrow Canal and surface water runoff – it is necessary to determine flood water levels at the site for the desired return periods emanating from these sources. Consideration has also been given to the site flooding from ponding and overland flow within the site.

Kirklees Council, Wakefield Council & Calderdale Council commissioned JBA Consulting to produce a joint Calder Catchment Strategic Flood Risk Assessment for the area. The report was finalised in April 2016. References have been taken from the SFRA.

The main channel of the River Colne is located directly adjacent to the northern boundary of the Industrial Estate. The River Colne is considered to be Main River. The Environment Agency have been approached for modelled flood level for the River Colne in line with the proposed redevelopment.

The proposed development involves the refurbishment of four existing industrial units located within an existing industrial estate which is supported by formalised drainage, as such, it is unlikely to increase the paved and roofed area within the site. The existing area is already supported by roof drainage which conveys flows below ground and then into the adjacent River Colne. The total impermeable area within the site is approximately 150m² which is considered to be small. As such, no further consideration will be given to this mechanism.

A walk over survey of the site was conducted by Mr Lea Favill, a senior river engineer during September 2016; during the visit a photograph survey of the site was undertaken. A topographical survey of the site was provided by the client's representative. The survey was calibrated to GPS and was carried out to establish the existing ground levels within the site boundary.

The requirements for flood risk assessments are generally as set out in NPPF and technical guidance. The detail and complexity of the study required should be

appropriate to the scale and potential impact of the development. For the purposes of this study, the following have been considered:-

- Available information on historical flooding in the area.
- Site level information.
- Details of structures, which may influence hydraulics of the watercourse and consideration of the effect of blockage of structures.
- Estimates of design levels, equivalent to a 200-year (coastal/tidal) and a 100-year (fluvial) return period flood event.
- Allowances for increased flows resulting from the effects of climate change.
- Allowances for sea level rise resulting from the effects of climate change.

Assess the existing runoff characteristics and the potential impact the proposed development will have on the runoff.

Further guidance is also provided in the CIRIA Research Project 624 “Development and Flood Risk: Guidance for the Construction Industry”.

Application of Sequential & Exceptions Test

The buildings within the development site lies within Zone 2 of the Environment Agency Flood Map (version 2.8.2), being the zone with risk of 1 in 1,000 year (0.1% AEP) or greater for river flooding. The proposed development is commercial, as such, is considered to be less vulnerable.

Table 1: Flood Risk Vulnerability and Flood Zone ‘Compatibility’

Flood Risk Vulnerability classification		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	**Exception Test required**	✓
	Zone 3b	Exception Test required	✓	×	×	×

✓ Development is appropriate

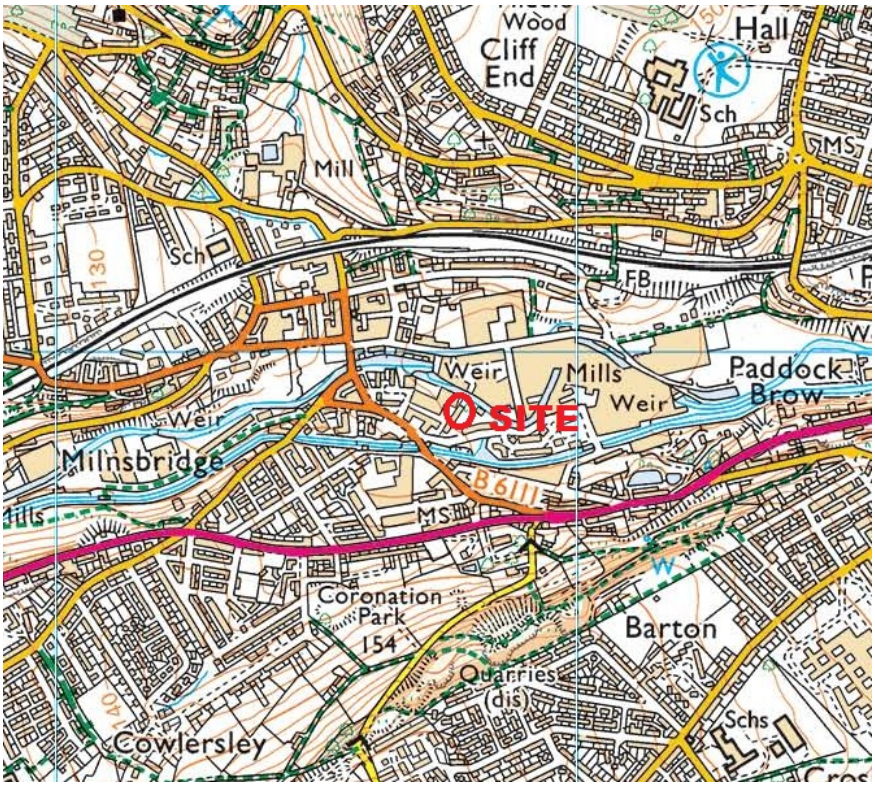
× Development should not be permitted

It is therefore considered that the exceptions test will not be required for the site.

2. DETAILS OF THE SITE

Site Location

Table 2-1: Location Plan



Ordnance Survey Licence no.: WL1005160

Site Details

Table 2-2: Site Details

Site Name	Units 10-13 Denard Industrial Estate Tanyard Road Huddersfield
Existing Land Use	Commercial
Proposed Development	Commercial
Grid Reference	SE 11801 15881
County	West Yorkshire
Local Planning Authority	Kirklees District Council
Internal Drainage Board	Not Applicable
Others	Not Applicable
Nearest Post Code	HD3 4NQ

Site Description

The site is currently a 4 commercial units located within the Denard Industrial Estate located between Tanyard Road and the River Colne. An aerial photograph of the site is provided below in Figure 2.1 which clearly shows the site includes large areas of roof and pavement. There is existing residential and commercial development to all sides of the development site.

The buildings cover an area of less than 150m² and is considered to be 100% impermeable. The land within the site lies at a level of between 89.8mOD adjacent to the River Colne and 91mOD adjacent to Tanyard Road. The existing ground floor level of the buildings is 90.30mOD. A plan of the site showing ground levels is provided at Appendix A.

The proposal is to maintain several of the existing buildings as at present with minor refurbishments. It is estimated that the impermeable area following completion of the works will remain as existing. The indicative plan of the development is provided at Appendix B of this report.

Site Photographs

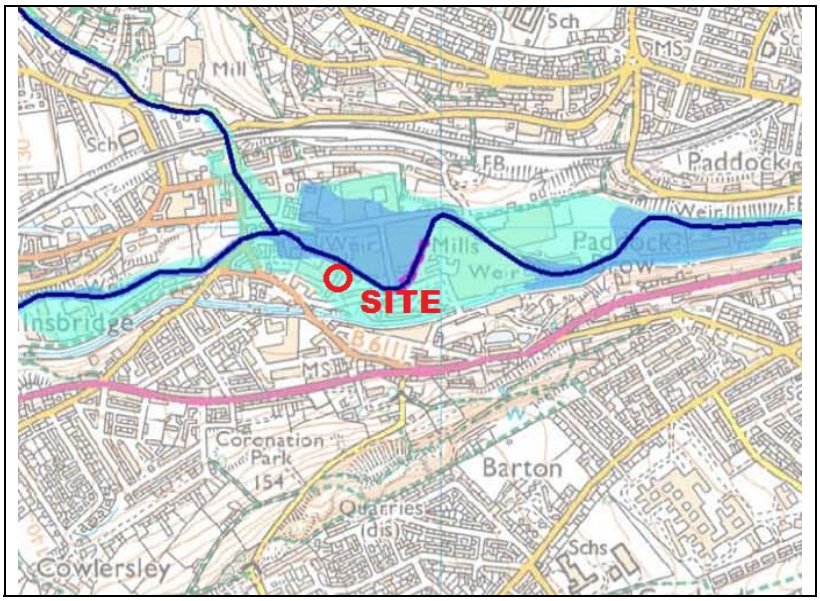
Figure 2.1: Aerial Photograph of the Existing Site



3. INITIAL ASSESSMENT

Environment Agency Flood Map

Figure 3.1: Environment Agency Flood Zones



Past Flooding History

A search on the British Hydrological Society Chronology of British Hydrological Events website[1] found no record of past flooding within the area local to the site.

Undertaking an internet based search for flooding in the area provided no record of past flooding within the area local to the site.

SFRA Flooding History

The SFRA could not provide any additional historical flooding for the area local to the proposed development site.

Reservoir Flooding

The Environment Agency reservoir risk map shows that the site is located in an area which could be affected by a reservoir failure. There are several reservoirs to the west of Huddersfield which could impact on the site if they breached. The reservoir

[1] http://www.dundee.ac.uk/geography/cbhe/

flood map shows the consequences of a full breach of the dam structure with the reservoir at full capacity, as such a worst case scenario. However, the flood maps do not consider the probability of such a failure. Following discussions with Yorkshire Water it was commented that the probability of failure is low as the reservoir is inspected and maintained in accordance with the Reservoirs Act. As such the dam is regularly inspected for defects and any necessary works undertaken prior to a failure. As such the probability of a failure is extremely low.

Surface Water Flooding

The Environment Agency surface water risk map shows that the site is located in a low risk area. Furthermore, the Huddersfield Narrow Canal which is located to the south doesn't based on the surface water flood maps is not shown to impact on the site. It is therefore, considered that the Huddersfield Narrow Canal represents a low risk to the site and has not been considered further.

Possible Flooding Mechanisms

As there is a single source of flood risk – River Colne – it is necessary to determine flood water levels at the site for the desired return periods emanating from this source.

The River Colne is located directly to the north of the site and is not defended by raised flood defences. As such, consideration has been given to overtopping of the river defences in line with the proposed development site.

Due to the local topography, the site generally steeply slopes north east towards the River Colne. There is no significantly higher ground adjacent to the site.

There are no depressed areas within the site which could encourage significant ponding. As such, this mechanism has not been considered further.

Information on groundwater flooding is limited within the district. The SFRA provided no further information. In addition, reference to the Groundwater Vulnerability Map and Source Protection Zones produced by the Environment Agency indicate that the district is not underlain by an aquifer and as such groundwater is unlikely to be source of significant flood risk.

Yorkshire Water is the statutory water undertaker and is responsible for the public sewer systems within Huddersfield area. Yorkshire Water maintains a register of historical sewer flooding events (DG5 Register) within the area. There are no reported incidents close to the site.

4. FLOOD RISK ASSESSMENT

Requirements of the Environment Agency

The Environment Agency, as part of its development control procedures, generally require finished floor levels to be set above the 1% AEP plus climate change flood water level at the site. The development is commercial, as such, it is considered that access and egress from the development site will be desirable during times of extreme floods.

River Colne

The River Colne is located directly to the north of the site and is not defended by and recognised flood defences. The River Colne is considered to be main river, as such, is the responsibility of the Environment Agency.

The bank top level in line with the site is generally at a level of 90mOD.

Overtopping of the flood defences during 1 in 100 year Flood Event

Based on the Environment Agency flood zone maps the river bank appears to be the boundary between flood zone 2 and 3. As such, it is considered that flood zone 3 remains in channel which represents the extent of the 1 in 100 year flood. From the topographical survey of the site the bank top level is generally at 90mOD and below.

As such, for the purpose of this assessment the 1 in 100 year flood level has been conservatively taken as 90mOD.

The flood water is maintained within the main channel and the existing buildings remain dry.

Increase in estimated flood level due to Climate Change

NPPG states that '*…Flood risk assessment should be carried out to the appropriate degree at all levels of the planning process, to assess the risks of all forms of flooding to and from development taking climate change into account. The future users of the development must not be placed in danger from flood hazards and should remain safe throughout the lifetime of the plan or proposed development and land use*.'

As the proposed development is for commercial land use, consideration has therefore been given to take into account the potential effects of climate change over the next 75 years in accordance with NPPG.

For the purpose of this assessment an increase of 0.3m has been adopted in order to estimate the 1 in 100 year plus climate change flood level in line with the site.

As such, for the purpose of this assessment the 1 in 100 year plus climate change flood level has been conservatively taken as 90mOD plus 0.3m, equals 90.3mOD.

The flood water is likely to overtop the bank and flood the area adjacent to the buildings. The ground floor level of the existing buildings to be refurbished are at 90.30mOD and therefore could experience minor shallow flooding.

Overtopping of the defences during Extreme flood events

Consideration has been given to the extreme flood event and its likely impact on the site and its occupants.

Based on the Environment Agency flood zone maps the extent of flood zone 2 appears to coincide with the 90.60mOD contour.

As such, for the purpose of this assessment the 1 in 1,000 year flood level has been conservatively taken as 90.6mOD.

The flood water is likely to overtop the bank and flood the site and the buildings. The ground floor level of the existing buildings to be refurbished are at 90.30mOD and therefore could experience flood depth of approximately 0.3m.

5. MITIGATION MEASURES

Raising Floor Levels/Land Raising

The site is shown to be at risk from overtopping during the 1 in 100 year plus climate change and the 1 in 1000 year events from the River Colne.

The 1 in 100 year plus climate change flood level has been estimated at 90.30mOD. The existing ground floor level of the buildings is also 90.30mOD therefore shallow flooding may be experienced.

The development involves the refurbishment of the buildings with no changes to the buildings being proposed. As such, the levels within the site will need to be maintained. Due to access restriction this means the ground floor level of the buildings will need to be maintained as existing floor level of is 90.30mOD.

It is recommended that flood resilience measures are provided up to a level of 0.3m above the proposed ground floor level to reduce the impact of the flood events that could affect the site.

Emergency Access & Egress

As the development is commercial, it is considered that dry access and egress from the development site will be desirable during extreme flood events.

It is considered that the site will not flood during the 1 in 100 year flood events. As such during this event dry access and egress will be available at all times. However, during the 1 in 100 year plus climate change the site could be inundated up to 0.3m. Therefore, an evacuation plan should be devised and the site evacuated prior to the flood water reaching the development.

Flood Evacuation

For health and safety reasons there is a preference to evacuate, as failure to do so, would put the occupants and others (e.g. rescuers) at risk of injury. Therefore, it is highly recommended that the sites occupants are advised to devise a flood plan and evacuation route from the site to a safe area above the 1 in 100 year plus climate change flood level, should a flood warning be issued by the Environment Agency.

A procedure for monitoring flood warnings should be developed with designated responsible persons able to monitor and disseminate flood warnings. Following a flood warning by the Environment Agency a procedure should be triggered which will allow the River Humber river levels to be monitored. The plan will provide several trigger levels which will determine the actions of the occupants. The plan should also include a procedure to enable both personnel and high value goods to be moved to a safe area above the flood water and any flood protection equipment to be erected.

All staff should be made aware of the potential flood risk and inducted into the evacuation procedure. Notices should also be posted around the site warning the occupants that during times of high river level that the site could become inundated to depths considered hazardous to people. The primary emergency plan should be to evacuate people from the site to a safe location above the 1 in 100 year plus climate change flood level of 90.30mOD.

Flood Resilience Measures

Consideration should be given to flood proofing the building 0.65m above the proposed internal floor level to reduce the residual damages if a breach flood was to occur. Flood proofing is a technique by which buildings are designed to withstand the effects of flooding. There are two main categories of flood proofing, which are dry proofing and wet proofing.

Dry proofing methods are designed to keep water out of the building, and wet proofing methods are designed to improve the ability of the property to withstand the effects of flooding once the water has entered the building. Both would be required in this case, due to the possible failure of the dry proofing methods.

Where wet proofing is required it is important that a flood response plan should be prepared and practised regularly, so that any contents of the building can be moved to design flood level if required or are built to withstand immersion in water or are designed to be easily replaceable.

The differential pressures across load bearing walls and the flotation effect that will occur during flood events should be taken into account when considering dry proofing techniques. For most existing properties this means that dry flood proofing should only be considered if the expected flood depth is under 0.6m, which in this particular case is expected to be 0.3m in depth and as such dry proofing is likely to be successful. It is considered that flooding in excess of 0.3m will cause some damage to the building; however, this is considered to be acceptable.

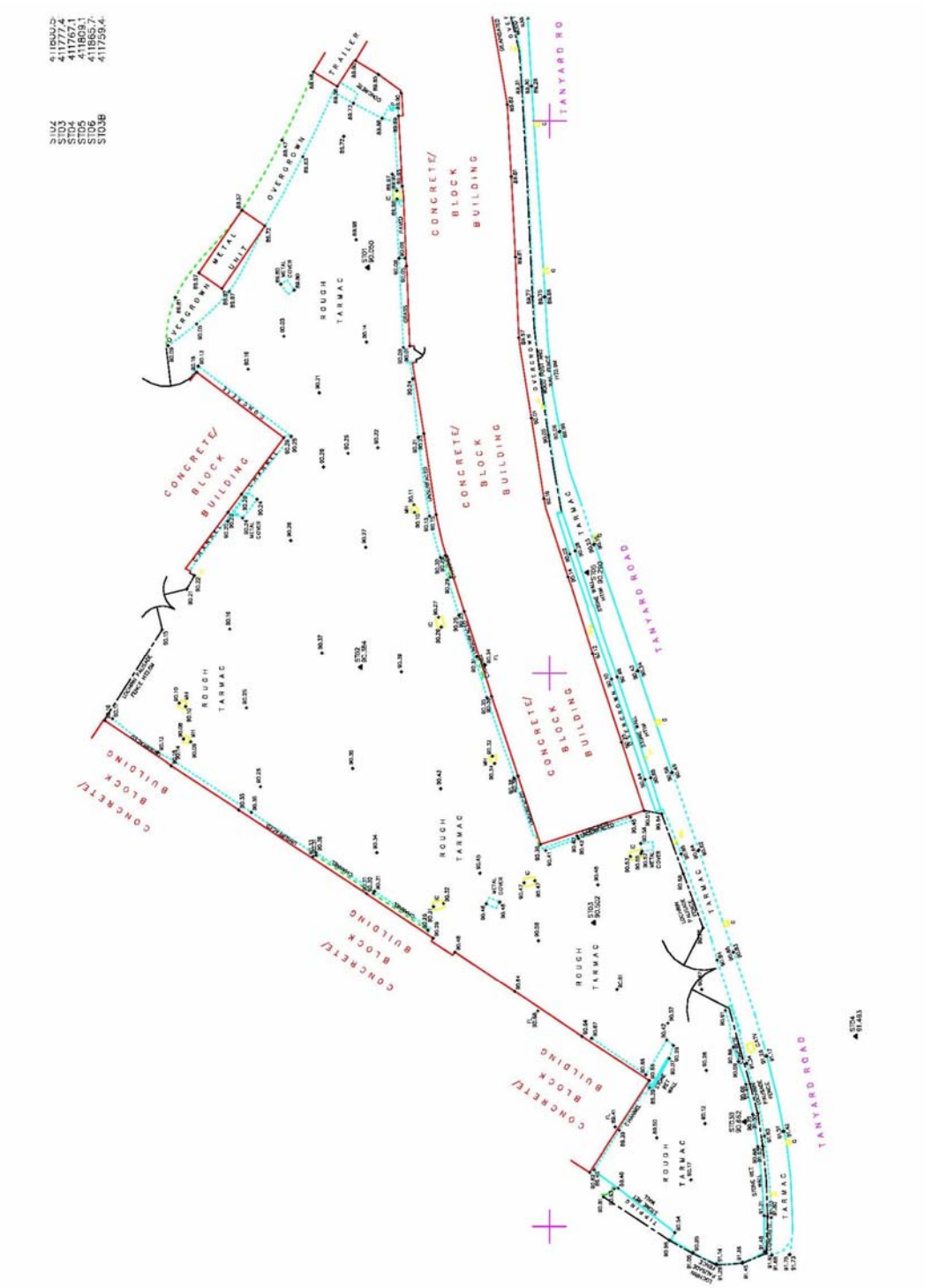
The following table summarises the proposed flood proofing measures which will be incorporated within the design of buildings:

Feature	Considerations To Improve Flood Proofing
External Walls	All windows have been elevated at least 650mm and engineering brick work used to 650m above ground floor level.
Internal Walls	Use more flood resistant linings (e.g. hydraulic lime, ceramic tiles). Avoid use of stud partition walls.
Floors	Suspended floor is to be used, provide facility for drainage of sub-floor void. Use solid insulation materials.
Fitting, Fixtures and Services	All electrical sockets to be 650mm above internal ground floor level.
Demountable flood defences	External doorways to be fitted with demountable flood barriers which are 650mm high. This will reduce the ingress of flood water significantly.

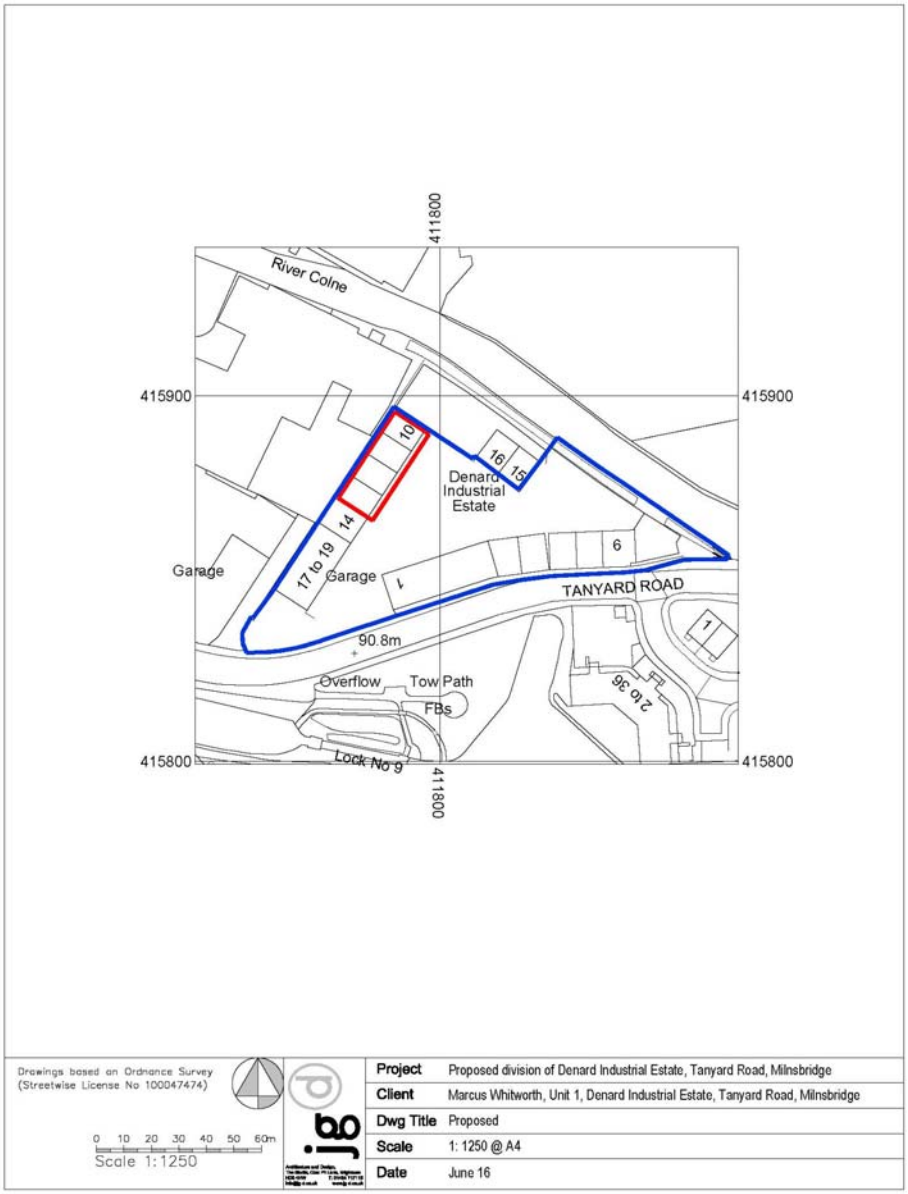
6. CONCLUSION

Based on the results of this flood risk assessment it is considered there is a risk of flooding from the River Colne during the overtopping scenarios. However, the proposed mitigation measure should provide considerable betterment.

Appendix A: - Existing Ground Levels



Appendix B: - Indicative Development Layout Plan



Appendix C: - EA flood level data