



**Welbeck Estates
Company Limited**

**Manor Farm,
Piper Lane,
Carburton**

Flood Risk Assessment

P21-00134

Revision 00

April 2021

**Professional, Innovative,
Practical Solutions**

Revision Record

<u>Revision Record</u>					
<u>Report Ref: P21-00134-FRA</u>					
<u>Rev</u>	<u>Description</u>	<u>Date</u>	<u>Originator</u>	<u>Checked</u>	<u>Approved</u>
00	Initial Issue	April 22	ATK	SS	IFL

This report is to be regarded as confidential to Welbeck Estates Company Limited. It is intended for your use only and may not be assigned. Consequently and in accordance with current practice, any liability to any third party in respect of the whole or any part of its contents is hereby expressly excluded. Before the report or any part of it is reproduced or referred to in any document, circular or statement and before its contents or the contents of any part of it are disclosed orally to any third party, our written approval as to the form and context of such a publication or disclosure must be obtained.

Prepared For :	Prepared By :
Welbeck Estates Company Limited. Portland Estate Office Cavendish House Welbeck Worksop S80 3LT	Met Engineers Ltd Southgate House Pontefract Road Leeds West Yorkshire LS10 1SW

Contents Page

1.0	Introduction.....	1
1.1	Objectives.....	2
1.2	Information Sources.....	2
2.0	Planning Policy Context.....	3
2.1	Approach to the Assessment.....	3
2.2	National Planning Policy Framework.....	3
2.3	Sources of Flooding.....	4
2.4	Flood Zones.....	5
2.5	Vulnerability of Different Development Types.....	5
2.6	Sequential and Exception Test.....	6
2.7	Climate Change.....	7
2.8	Sustainable Urban Drainage Systems.....	8
3.0	Details of the Site.....	10
3.1	Site Details.....	10
3.2	Site Description.....	11
3.3	Proposed Development Details.....	11
4.0	Historic Flooding.....	12
5.0	Initial Evaluation and Flood Risk.....	13
5.1	The Environment Agency Flood Map.....	13
6.0	Quantitative Flood Risk Assessment.....	21
6.1	National Planning Policy Framework.....	21
6.1.1	Site Specific Flood Risk Assessment Checklist.....	21
6.2	Fluvial River Poulter	23
6.3.	Fluvial Flood Defences... ..	24
6.4	Reservoir Flooding.....	25
6.5	Pluvial SW Flooding.....	25
6.6	Infrastructure Failure.....	25

7.0	Mitigation Measures.....	27
7.1	Finished Development Levels.....	27
7.2	Drainage for the Development.....	27
7.3	Management and Maintenance.....	28
7.4	Access and Egress.....	28
8.0	Conclusions and Recommendations.....	30

Appendices

Appendix 1 Site Layout Proposal

Appendix 2 Topographic Survey Plan

Appendix 3 Drainage Layout Plan

Appendix 4 Existing and Proposed Impermeable areas

1.0 Introduction.

- Client Instruction

We have been requested to undertake a flood risk assessment by The Welbeck Estates Company Limited for the refurbishment and redevelopment of Manor Farm to create a Hotel and restaurant, with associated access, parking and landscaped areas. A Site Location Plan is presented within figure 1

Site Description

- The site is located in the village of Carburton, approximately 6.6km south east of Worksop town centre. The site is irregular in shape and extends to approximately 4.6 hectares (Ha) in size. Both pedestrian and vehicular access to the site is currently taken via Piper Lane which connects to Limetree Avenue south east of the site.
- The central area of the site is occupied by St. Gile's Church, with associated graveyard, and semi-detached residential housing. Manor House and associated soft landscaping is located in the east of the site, and groups of buildings including barns and stables associated with Manor Farm are located in the eastern and western areas of the site.
- The site proposal includes the conversion of existing residential housing in the central area to self-catered accommodation, the partial demolition of barn buildings in the west, a new driveway and footpath in the north east, numerous areas of new/ upgraded soft landscaping, and car parks in the eastern, central and western areas. In addition, there is potential for a new stable block in the west of the site and shepherd huts in the south west and north east. The existing deconsecrated church is to remain, and does not form part of this application. A proposed site layout plan is included in Appendix IV.
- The River Poulter is designated Main River, and as such, falls under the administration of the Environment Agency. The River flows to the East beyond the southern boundary of the site. Flood Dyke runs immediately south of the western section of the site, crossing Piper Lane in culvert, to the north side of the Eastern section of the site. Flood Dyke is used to control water levels via a weir within Carburton Dam. The land between the two channels is sandy, and the Flood Dyke was used to irrigate the area, forming water meadows.

- The Development proposal is shown to be wholly within Zone 1 of the Environment Agencies indicative flood map and having a low probability of flooding. Definitions of these zones are provided in paragraph 2.4 of this report
- This flood risk assessment has been carried out in accordance with the National Planning Policy Framework (NPPF), the National Planning Practice Guidance for Flood Risk and Coastal Change and the Sheffield City Council Strategic Flood Risk Assessment (SFRA).

1.1 OBJECTIVES.

- The objective of an assessment is to evaluate the following issues in regard to flood risk at the application site i.e. Conversion of the existing buildings to provide a Hotel and Restaurant with ground floor sleeping accommodation.
- Suitability of the proposed development in accordance with current planning policy.
- Identify the risk to both the proposed development and people from all forms of flooding.
- Increasing the risk of flooding elsewhere e.g. surface water flows; flood routing; and loss of flood plain storage.
- Recommendation of appropriate measure to mitigate against flooding both within the proposed development, and neighbouring land and property.

1.2 INFORMATION SOURCES.

This assessment is based on a desk top study of information from the following sources;

- National Planning Policy Framework (2021 Update).
- Planning Practice Guidance at www.gov.uk (2021 Update)
- Building Regulations Approved Document H
- Environment Agency Flood Mapping
- North East Derbyshire Strategic Flood Risk Assessment (Oct 20)
- Bassetlaw Strategic Flood Risk Assessment (Jan 2019)
- Intrusive Ground Investigations

2.0 Planning policy context.

2.1 Approach to the assessment.

The project is currently at the Planning stage and consequently a detailed site specific flood risk assessment is required. The approach taken is in accordance with the Environment Agencies standing advice.

Level 2 scoping study is designed to provide a qualitative appraisal of flood risk both within the application site and any potential impact that the development will have on flood risk elsewhere and provide recommendations for mitigation measures which may be included within the design of the development to reduce the overall risk of flooding.

An initial assessment indicates that the primary flood risk at the proposed development is from fluvial sources i.e. River Poulter and Flood Dyke.

Consideration has also been given to the site flooding from secondary sources such as pluvial, groundwater, artificial water bodies, infrastructure failure, overland flow and ponding.

2.2 National Planning Policy Framework (NPPF).

The requirements for undertaking site specific flood risk assessments are generally set out in guidance point 10 from the Planning Practice Guide – Flood Risk and Coastal Change (www.gov.uk).

The information provided in the flood risk assessment should be credible and fit for purpose.

Site specific flood risk assessments should always be proportionate to the degree of flood risk and make optimum use of the information already available, including information in a strategic Flood Risk Assessment for the area, and the interactive flood risk maps available on the Environment Agencies web site.

A flood risk assessment should also be appropriate to the scale, nature, and location of the development.

Changes in the NPPF in February 2019 made SUDS (Sustainable Urban Drainage Systems) a material consideration while determining planning applications for major development with developers required to provide SUDS on major development where appropriate.

2.3 Sources of flooding.

- **Rivers (fluvial):** Flooding occurs when flows within river channels exceed capacity and the type of flood event experienced depends upon the characteristics of the river catchment.
- **The Sea (tidal).** Flooding from low lying coastal and tidal estuaries is caused by storm surges and high tides with overtopping and breach of failure of coastal defences possible during extreme events.
- **Pluvial (Surface flooding/ overland flows)** Heavy rainfall that is unable to soakaway through infiltration or enter drainage systems, can flow overland, resulting in localised flooding.
- **Groundwater:** Caused when ground water levels rise to the surface and is most likely to occur in low lying areas underlain by aquifers and permeable soils.
- **Sewers and Drains:** Generally occurs in more urban areas where sewers and drains are overwhelmed by heavy rainfall, blocked pipes, culverts, and gullies.
- **Artificial sources (reservoirs, canals, lakes and ponds):** Reservoir and canal flooding may occur as a result of capacity exceedance or structural failure.

2.4 Flood zones.

The EA Flood maps identify 3 zones;

- **Flood Zone 1.** This zone comprises of land with less than 1 in 1000 annual probability of river or sea flooding in any one year ($<0.1\%$)
- **Flood Zone 2.** This zone comprises of land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding ($1\%-0.1\%$) or between 1 in 200 and 1 in 1000 annual probability of sea flooding ($0.5\%-0.1\%$) in any one year.
- **Flood Zone 3a.** This zone comprises of land assessed as having a high probability 1 in 100 year (1%) 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.
- **Flood Zone 3b.** This zone comprises of land where water has to flow or be stored in times of flood. Land which would flood with an annual probability of 1 in 20 ($5\%AEP$), or is designed to flood in an extreme flood (1%) should provide a starting point for discussions to identify functional flood plain.

2.5 Vulnerability of different development types.

NPPF categorizes development use within vulnerability classifications;

- **Essential Infrastructure.** Transport infrastructure (railways and motorways etc.), utility infrastructure (primary sub stations, water treatment facilities, power stations, and wind turbines).
- **Water compatible Development.** Flood control infrastructure; water and sewage infrastructure; navigation facilities.
- **Highly Vulnerable:** Emergency services, basement dwellings, mobile home parks, industrial or other facilities requiring hazardous substance consent.

- **More Vulnerable:** Hospitals, residential Institutions / dwellings, educational facilities; landfill sites, caravan and camping sites.
- **Less Vulnerable.** Commercial premises, emergency services not required during a flood, agricultural land.

2.6 Sequential and Exception test.

The Sequential Test.

The Technical Guidance to the National Planning Policy Framework defines the flood vulnerability of all use types within Table 2. Table 3 then defines the flood zone compatibility of the flood risk vulnerability.

Table 3 below shows that a more vulnerable use type within flood zone 1, is appropriate development, therefore the sequential / Exception test is not required.

Table 3: 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

2.7 Climate change

National Planning Policy Framework (NPPF) sets out how the Planning system should help minimise vulnerability and provide resilience to the impacts of climate change. Table 1 shows anticipated changes in extreme rainfall intensity in small and urban catchments. For flood risk assessments and strategic flood risk assessments, assess both the central and upper end allowances to understand the range of impact. Residential development is usually designed with a lifetime approximating 100 years; and therefore 20% and 40% must be applied to peak rainfall intensities (see table 1).

Table 1. Peak rainfall intensity allowances in small and urban catchments



When applying peak River flow allowances for flood risk assessments the flood zone and appropriate flood risk vulnerability classification should be consulted to decide which allowances apply to the development.

It is becoming increasingly accepted that Global Climate Change is one of the principal challenges facing us in the 21st Century. It is also considered that the major contributory cause to global climate change is the man-made emissions of greenhouse gases, of which Carbon Dioxide (CO₂) associated with the burning of fossil fuels is by far the largest single contributor. Climate change

will increase flood risks in Carburton for two reasons. Firstly, because more intense rainfall, especially in winter, will increase peak river flows, and secondly, because soils will tend to be wetter on average in winter. The following paragraphs regarding climate change are taken from the EA's website:

"Current estimates are that peak river flows in Britain could be 20 percent higher by 2080. This could have important implications for the flood zones of rivers - in a review of flood defences last year, the Environment Agency found that a tenth of the population in England and Wales now lives on flood plains. Information posted on the Meteorological Office website reports that autumn 2000 (September to November) was the wettest autumn in England and Wales since records began in 1766. In addition the period October to December 2000 ranks as the second wettest three-month sequence for England and Wales in the last 200 years "The Foresight Future Flooding report was released on 22 April 2004 by the Department of Trade and Industry (DTI)... The report is the most wide-ranging analysis of flood risk in the UK. It predicts that climate change will be an important factor in increasing flood risk, and that both the number of people in danger from flooding and the costs of damage from floods will significantly rise. It uses scenarios of potential social and economic changes, as well as information on climate change to help us understand the risks of flooding in future, and inform both public and Government bodies on what will need to be done to meet these risks."

2.8 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS).

The key planning objectives in the NPPF are to appraise, manage and where possible, reduce flood risk. Sustainable Urban Drainage Systems (SUDS) are designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges, thereby providing a suitable way of achieving some of these objectives. Furthermore the NPPF and Building Regulations Approved Document Part H direct developers towards the use of SUDS wherever possible.

The Flood and Water Management Act 2010 also reinforces the requirements for SUDS to be implemented where practicable. Since 6th April 2015 local planning policies and decisions on planning applications relating to major development (developments of 10 dwellings or more; equivalent non-residential development or mixed development [as defined in Article 2(1) of the Town and Country Planning (Development Management Procedure) (England) Order 2010] will ensure that sustainable drainage systems (SUDS) for the management of surface water runoff are put in place unless demonstrated to be inappropriate.


Part H of the Building Regulations requires that surface water should be discharged from new development in accordance with the following hierarchy in order of preference;

- By infiltration to the ground via soakaway or other infiltration device.
- Discharge into a watercourse.
- Discharge into a public sewer.

3.0 DETAILS OF THE SITE

3.1 SITE DETAILS

Table 2: Development Location

Site Name	Manor Farm, Piper Lane, Carburton.
Purpose of development	Hotel and Restaurant.
Existing Land use	Brownfield
OSNGR:	461072, 373272
Country	England
County	Nottinghamshire
Local Planning Authority	Bassetlaw District Council
Lead Local Flood Authority	Nottinghamshire City Council
Internal Drainage Board	None
Other Authority	None
	
Manor Farm, Piper Lane, Carburton.	

3.2 SITE DESCRIPTION

The application site comprises of the conversion of existing residential housing in the central area to self-catered accommodation, the partial demolition of barn buildings in the west, a new driveway and footpath in the north east, numerous areas of new/ upgraded soft landscaping, and car parks in the eastern, central and western areas. In addition, there is potential for a new stable block in the west of the site and shepherd huts in the south west and north east.

Table 3: Boundaries

North	The site is bound to the north by Flood Dyke and Agricultural land.
East	The eastern site boundary comprises of a stock proof fence with agricultural land beyond and Clumber Park.
South	The south of the site is bounded by the flood meadow to the River Poulter.
West	The western site boundary comprises of a stock proof fence with agricultural land beyond.

The River Poulter is the closest watercourse, designated Main River, and as such, falls under the administration of the Environment Agency. The River flows to the East beyond the southern boundary of the site. Flood Dyke runs immediately south of the western section of the site, crossing Piper Lane in culvert, to the north side of the Eastern section of the site. Flood Dyke is used to control water levels via a weir within Carburton Dam. The land between the two channels is sandy, and the Flood Dyke was used to irrigate the area, forming water meadows.

Welbeck Estate manage and maintain the Lakes running through the Estate and regulate the level of flow through Flood Dyke during peak storm events, to limit the depth of flooding on Lime Tree Avenue from the River Poulter.

3.3 PROPOSED DEVELOPMENT DETAILS.

The site proposal includes the conversion of existing residential housing in the central area to self-catered accommodation, the partial demolition of barn buildings in the west, a new driveway and footpath in the north east, numerous areas of new/ upgraded soft landscaping, and car parks in the eastern, central and western areas. In addition, there is potential for a new stable block in the west of the site and shepherd huts in the south west and north east. An indicative Site Layout Proposal is attached in Appendix 1.

Figure 1: Aerial View of the proposed site (2022)



Image courtesy of Google

4.0 HISTORIC FLOODING EVENTS.

There are no historic flood issues reported on the site or its immediate environs. The only available information relates to the flooding of Lime Tree Avenue just west of the Piper Lane Entrance, and this is restricted to the carriageway.

This is as a result of flooding from the River Poulter.

Flood waters are held back on the flood meadow due to the mining subsidence that has created a slight back fall in this reach of the river. Water builds to a head and is then passed forward towards Clumber Lake. During these peak periods, water levels rise and create flooding on Lime Tree Avenue.

The Welbeck Estate are very focused on this and during Peak storm events, increase the flow within Flood Dyke by lowering the weir. This reduces the amount of time Lime Tree Avenue is flooded.

5.0 INITIAL EVALUATION OF FLOOD RISK

5.1 THE ENVIRONMENT AGENCY FLOOD MAP

The Environment Agency Flood Map illustrated within Figure 3 below, confirms that the proposed development site is located within Flood Zone 1 and is therefore considered to be at low risk. The definition for each of the flood zones highlighted above is provided for reference within Section 2.4 of this report.

Table 4: Possible Flooding Mechanisms.

Source/ Pathway	Significant?	Comment / Reason
Fluvial	Yes	The River Poulter lies beyond the southern boundary of the site. Flood Dyke lies immediately south of the western section of the site, crossing to the North of the eastern section.
Canal	No	There are no canals in the vicinity of the site
Tidal/Coastal	No	The River Poulter is not tidally influenced
Reservoir	Yes	Carburton Dam lies 1200m upstream of the site
Pluvial (Urban Drainage)	No	The site is brownfield and there are no historic reports of urban drainage creating flooding issues
Surface water flooding	No	The Environment Agencies maps shows the site is at low risk of flooding from Surface water.
Groundwater	No	Site located within area identified has having less than <25% risk of groundwater emergence
Overland Flows	No	There are no identified overland flow routes through the scheme
Blockage	Yes	The River Poulter and Flood Dyke pass under Piper Lane in a Bridge structure and culvert respectively.
Infrastructure failure	Yes	The River Poulter and Flood Dyke pass under Piper Lane in a Bridge structure and culvert respectively.
Rainfall ponding	No	No depressed areas of land identified where rainfall could pond.

From the initial assessment it is concluded that the primary source of flood risk will be from fluvial sources i.e. River Poulter.

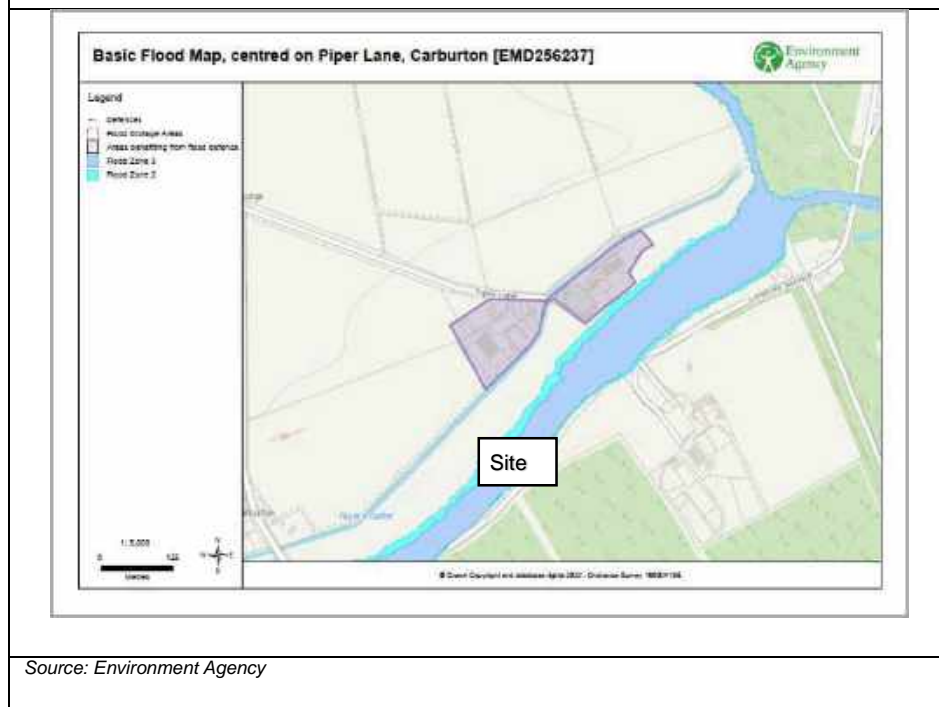
Fluvial: River Poulter.

The River Poulter which rises near Scarcliffe in Derbyshire, England is a tributary river of the River Idle in Nottinghamshire. It supplied power to mills along its route, most of which are now gone, although their mill ponds remain. Cuckney mill building is used as a primary school. The river has been dammed to create several lakes in the Dukeries estates of Welbeck Abbey and Clumber House now the National Trust property of Clumber Park. The ornamental Gouldsmeadow Lake, Shrubbery Lake and Great Lake on the Welbeck estate are supplied by a tributary of the Poulter, while Carburton Forge Dam and Carburton Dam were built to power a forge and a mill. Clumber Lake, consisting of an upper and lower lake, which is spanned by a Grade II* listed ornamental bridge, is part of the Clumber estate, and has suffered from subsidence.

Beyond the parklands, the river flows eastwards past Elkesley, to join the River Idle just outside the village close to the A1 road.

The catchment for the River Poulter covers some 12 square miles (31 km²),^[32] which has an average annual rainfall of 610 mm (based on figures from 1961 to 1990). About a third of this finds its way into the river.

As the main development is located wholly within Flood Zone 2 (Defended) the risk of fluvial flooding from this source is regarded as low and has been evaluated further within section 6.

Figure 3: EA Flood Map.**Reservoir Flooding.**

There are 20 reservoirs located within Bassetlaw and a number located outside of the area whose inundation mapping is shown to affect Bassetlaw. There are no records of flooding from reservoirs impacting properties inside the Bassetlaw study area. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. Welbeck Estates have appointed a Panel Engineer to assess, inspect and Model the impacts of Dam Failure under their responsibilities under the Reservoir Act 1975. No inspection reports or modelling have been made available at the time of writing this report.

Beyond Cukney Mill site are two channels, the western at the level of the mill pond, and the eastern at a lower level. Both channels head towards the first ornamental lake supplied by the river.

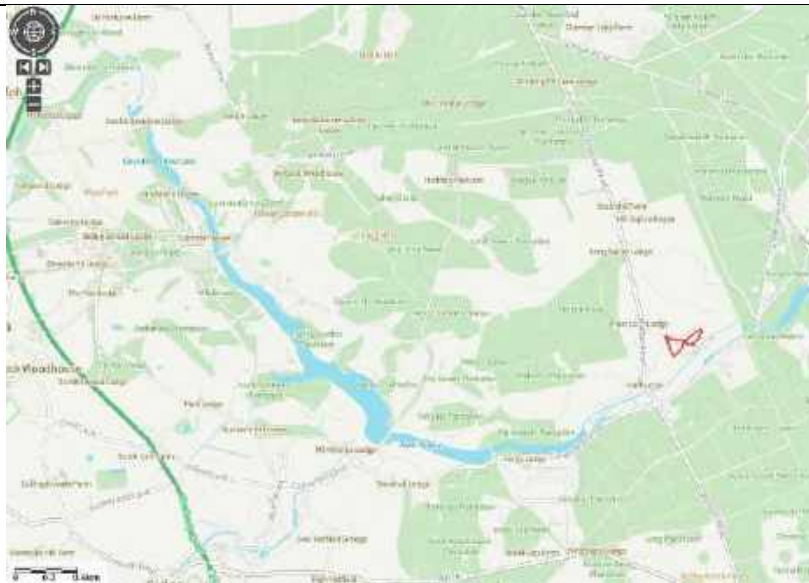
Welbeck Great Lake is part of the Welbeck estate, which was owned by the Dukes of Portland, and now owned by the Bentinck family. Millwood Brook flows into Gouldsmeadow Lake and through Shrubbery Lake, before joining the Great Lake. The western channel of the Poulter flows

through a culvert into the Great Lake, while the lower eastern channel flows through a culvert into Carburton Forge Dam. Beyond the lake, a weir with a track over it drops the level to Carburton Forge Dam, built to provide power for a forge. The five Welbeck lakes cover an area of 151 acres (61 ha)

Again there are two channels below the lake, with the main southern channel at a lower level than the northern one, which is called the Flood Dyke. Both cross under the B6034 Worksop to Ollerton road, and leave the Welbeck estate. The land between the two channels is sandy, and the Flood Dyke was used to irrigate the area, forming water meadows. Restoration of the historic structures was undertaken by the County Council in 2010/11, and interpretation boards have been erected to enable visitors to understand the process

Welbeck Estates actively monitor Water Levels within Carburton Dam during Peak rainfall events and control water levels within the Lake and the River Poulter through adjustment of the weir feeding Flood Dyke. This reduces flood risk to the development and was historically focused on reducing the depth of flood water on Lime Tree Avenue, to the west of Piper Lane, and maintaining access

Figure 5: Aerial: Reservoir System.



Source: Magic maps



Pluvial; Urban Drainage

Many of the buildings are drained through rainwater down pipes, but it is not always clear where these drain to. Some of the buildings adjacent to Flood Dyke connect down pipes straight into the dyke and this is visually obvious. Drainage of the western barn is clearer as there is a perimeter drainage network with manholes. The courtyard enclosed by the U shaped barn has an outlet chamber at the low end of the courtyard discharging direct to the dyke. Various gullies are evident around the site but these do not drain all the hard standing areas. Regardless of all this, the site slopes from the north to the south by around 4m giving average gradients of 1 in 20 towards the River and Flood Dyke.

The Buildings and hard standing areas on the western site run almost up to flood dyke with no up stand to prevent overland flows running directly into the watercourse. The eastern site is some distance from the River Poulter but run off will still be directed to the river, through the flood meadow. Two drainage networks have been mapped from this area draining into the flood meadow.

This is unlikely to provide a source of pluvial flooding, however the drainage systems on the proposed Hotel and restaurant will capture run off from all roof areas and harstanding and direct these into the new drainage network serving the site. These will slowed and cleaned utilising suds techniques where possible, and stored within underground surface water storage tanks with restricted outlet discharge rates into the watercourse. Storm tanks are designed to fully contain the 100 year + climate change event, providing considerable benefit to the watercourse network.

Pluvial Surface Water Flooding/ Overland flows.

The Environment Agency's flooding from surface water map, shows the site to be at low risk of Surface water flooding. Routes are shown along the route of the River but it is evident that a route exists along Piper Lane .From the site up to Ollerton Road, Piper Lane is an unmade farm track and this focuses overland flows from the track and surrounding farmland. This channels water onto the metalled surface of Piper Lane, through the site, gathering before the bridge crossing of the River Poulter. Silty deposits settle out leaving a silty sand covering over the full width of Piper Lane at this point. This is evaluated further in section 6.

Figure 6: EA Surface Water Flood Map



Groundwater.

Groundwater flooding is caused by the emergence of water originating from underground. The water may emerge from either point or diffuse locations. The occurrence of groundwater flooding is usually very local.

The underlying bedrock to the Site consists records the Chester Formation comprising gravelly sandstone underlying the site and the surrounding area. The British Geological Survey indicates there is a Principal Aquifer within the bedrock.

The site and surrounding area is located within a Source Protection Zone 3.

There are no ground water abstractions within the vicinity of the site.

The risk of on-site groundwater flooding is recorded to be predominantly MODERATE across the site with a HIGH risk in the south beyond the development proposal.

There is no evidence of ground water emergence in, or around, the site. As such the risk of groundwater emergence at the development site is considered to be low, and not assessed further.

Blockage

Culverts and bridges have not been a problem in Carburton in respect of blockage problems.

Blockages can result in flooding events of a severity disproportionate to rainfall events. These would increase flood risk at a site and to prevent this regular maintenance is required to channels and culverts. But it is acknowledged that this is not always cost effective.

There are very few bridges or culverts crossing the River Poulter. The only bridge crossing below Carburton Dam is the Bridge crossing of Piper Lane. Due to the historic mining subsidence this becomes completely submerged during peak flood events, with flood water not only passing through the bridge, but circumventing via Piper Lane and Lime Tree Avenue. This has never caused any flooding issues to the buildings on the site. Flood Dyke contains a couple of field crossings, and a bridge structure under Piper Lane. All these structures are considerable in size, and have not historically caused any issues with flooding of the buildings on the site. High water levels within flood dyke would trigger the irrigation pipes to feed water into the flood meadow, away from property. As such the risk of blockage is considered low, and not assessed further.

Infrastructure failure

Where a site benefits from a degree of protection due to existing infrastructure the possibility of a failure of performance of that infrastructure should be taken into account in the risk assessment. Section 6 gives further consideration of this with reference to culverted structures.

6.0 QUANTITATIVE FLOOD RISK ASSESSMENT.

6.1 NATIONAL PLANNING POLICY FRAMEWORK.

6.1.1 SITE SPECIFIC FLOOD RISK ASSESSMENT CHECKLIST.

The following checklist has been extracted from Flood Risk & Coastal Change Section available from www.gov.uk published in March 2014.

1. Development Description and Location.

- What type of development is proposed (e.g., new development, an extension to existing development, a change of use etc.) and where will it be located?
- What is its flood risk vulnerability classification?
- Is the proposed development consistent with the Local Plan for the area? (Seek advice from the local planning authority if you are unsure about this).
- What evidence can be provided that the Sequential Test and where necessary the Exception Test has/have been applied in the selection of this site for this development type?
- Will your proposal increase overall the number of occupants and/or users of the building/land, or the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? (Particularly relevant to minor developments (alterations & extensions) & changes of use).

2. Definition of the Flood Hazard.

- What sources of flooding could affect the site?
- For each identified source, can you describe how flooding would occur, with reference to any historic records where these are available?
- What are the existing surface water drainage arrangements for the site?

3. Probability.

- Which flood zone is the site within?
- If there is a Strategic Flood Risk Assessment covering this site (check with the local planning authority)? Does this show the same or a different flood zone compared with the Environment Agency's flood map?
- What is the probability of the site flooding, taking account of the maps of flood risk from rivers and the sea and from surface water, on the Environment Agency's site, and the Strategic Flood Risk Assessment, and of any further flood risk information for the site?
- If known, what (approximately) are the existing rates and volumes of surface water runoff generated by the site?

4. Climate Change.

- How is flood risk at the site likely to be affected by climate change? (The local planning authority's Strategic Flood Risk Assessment should have taken this into account. Further information on climate change and development and flood risk is available on the Environment Agency's website.

5. Detailed Development Proposals.

- Where appropriate, are you able to demonstrate how land uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding (including providing details of the development layout)?

6. Flood Risk Management Measures.

- How will the site/building be protected from flooding, including the potential impacts of climate change, over the development's lifetime?

7. Off-site Impacts.

- How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?
- How will you prevent run-off from the completed development causing an impact elsewhere?
- Are there any opportunities offered by the development to reduce flood risk elsewhere?

8. Residual Risks.

- What flood-related risks will remain after you have implemented the measures to protect the site from flooding?
- How, and by whom, will these risks be managed over the lifetime of the development? (E.g., flood warning and evacuation procedures).

6.2 FLUVIAL: RIVER POULTER.

The proposed development site is situated to the North of the River Poulter and is designated by the Environment Agency flood map as being located in Flood Zone 1 (low risk).

There are no reports of any historic flooding at the site, however the site sits adjacent to a flood meadow from the River Poulter. The risk of flooding from this flood meadow needs to be considered in terms of its potential impact on the proposal.

It is well documented that the route of the River, and Buildings on the site, have been affected by subsidence from the historic Coal mining activities in the area. The Coal Authority have fifteen records at the site for past underground mining of the Top Hat and Parkgate coal seams at depths between 640m below ground level and 873m below ground level, last mined between 1961 and 2004. Sixteen claims for damages have been lodged with the Coal Authority for claims relating to coal mining related subsidence for any property within 50m of the site since 1994. Fourteen of these claims relate to the site itself, two of these were rejected, the remainder of claims were settled with a combination of repair works and compensation.

Subsidence has impacted on the River, and the bridge crossing on Piper lane, resulting in lengths of the river bed having a negative fall and the bridge soffit almost becoming completely submerged.

The normal water level within the River Poulter is recorded at 33.93m AOD, with levels on Piper Lane adjacent to the bridge crossing shown to be 34.54m AOD on the site side, and 34.46m AOD on the Lime Tree Avenue side. During peak rainfall events Flood water rises in the flood meadow and floods Lime Tree Avenue. Flood water rises to a level that generates enough head to push this flood water downstream following the course of the River Poulter and flowing over Piper Lane. Flood water has never reached the buildings on the site. The lowest existing Floor Level on the site sits at an elevation of 37.54m AOD, 3m above these levels.

Welbeck Estates are very focused on this and control the weir on Carburton Dam to divert flood waters down Flood Drain to try reduce the length of time that Lime Tree Avenue is flooded, and maintain access to Clumber Park.

The Environment Agencies Flood Map (Figure 3) shows the site sits above the Zone 3 extents.

The site has no history of previous flooding from the River Poulter or Flood Dyke.

6.3 FLUVIAL FLOOD DEFENCES.

To manage future flood risk to the Site and the wider River Poulter catchment flood mitigation measures exist throughout the Welbeck Estate to store water within several large Lakes.

The river has been dammed to create several lakes in the Dukeries estates of Welbeck Abbey and Clumber House now the National Trust property of Clumber Park. The ornamental Gouldsmeadow Lake, Shrubbery Lake and Great Lake on the Welbeck estate are supplied by a tributary of the Poulter, while Carburton Forge Dam and Carburton Dam were built to power a forge and a mill. The five Welbeck lakes cover an area of 151 acres (61 ha) and this provides over 61 cumecs of storage for every 100mm the water level is raised in the lakes.

These huge Lakes are managed and maintained by the estate and each contain a level of freeboard that is utilised during Peak storm events through the control of the outlet weir structures. This provides the site with a level of protection greater than 1%AEP.

Since 2004 Large reservoirs within England that are either greater than 25,000m³ in capacity, or may pose an immediate risk to life as a result of failure, are managed and maintained in accordance with current UK legislation (i.e. Reservoirs Act 1975). The Water Act 2003 amended the Reservoirs Act 1975, requiring the preparation of dedicated Flood Plans for reservoirs by the reservoir owners.

We believe that Carburton Dam upstream of the Site is registered as category C but at the time of writing this report full details of this assessment are not available. All the reservoirs are inspected and maintained in accordance with the Reservoirs Act.

Considering all the above the risk of flooding from reservoir seems highly unlikely.

6.4 PLUVIAL SURFACE WATER FLOODING/ OVERLAND FLOWS.

Overland flows from adjacent agricultural lands will be directed to the south and into Flood Dyke or the River Poulter. The eastern half of the Hotel and Restaurant is protected from this by Flood Dyke intercepting these flows. The western half will direct overland flows to the south through the gravel access and parking areas. Entrances to buildings will have localised ramped access with ground levels to building perimeters 150mm lower, to direct any overland flows around buildings, and to the south into Flood Dyke.

6.5 INFRASTRUCTURE FAILURE

The River Poulter below Carburton Dam flows mainly in open channel the only structure that crosses is the bridge structure at Piper Lane. This is a stone built arch structure and is considered a Heritage asset. In the unlikely event that this structure collapsed, flood waters would pass around the structure completely, similar to what happens in peak flood events. Whilst water levels could rise significantly, it is highly unlikely that they would reach a point where the proposed buildings would be at risk of flooding.

Flood dyke is also largely in open cut with only two stone built arch structures, one under Piper Lane (fig 5) and a field access crossing. (fig 5a) These structures are robust, in good condition, and have not previously been subjected to any failure or blockage. Future maintenance of these structures will lie with the operator of the Hotel, so it will be in their best interests to ensure these are kept clear of obstruction and maintained in good order. In the unlikely event that any one of these structures failed, flood water would very quickly breach the low lying south bank to the west of Piper Lane spilling water into the flood meadow, away from the development.

Figure 5: Flood Dyke Culvert Piper Lane.



Figure 5a: Flood Dyke Field access Culvert.



7.0 MITIGATION MEASURES.

7.1 FINISHED DEVELOPMENT LEVELS.

The site proposal includes the conversion of existing residential housing in the central area to self-catered accommodation, the partial demolition of barn buildings in the west, a new driveway and footpath in the north east, numerous areas of new/ upgraded soft landscaping, and car parks in the eastern, central and western areas. In addition, there is potential for a new stable block in the west of the site and shepherd huts in the south west and north east. The existing deconsecrated church is to remain, and does not form part of this application. Environment Agency and Strategic Flood maps for the area shows the site to be located within Flood Zone 1 (low risk) but immediately adjacent to Flood Zone 2 (medium risk).

Environment Agency guidelines recommend that finished floor levels are set 150mm above the 1 in 100 year plus climate change flood level. The 1 in 100 year Climate Change flood level for the River Poulter in the vicinity of the site is not known. The floor levels of the existing buildings around the site vary between 37.54 and 41.58m AOD with the River Poulter sat at 33.92m. All floor levels will provide a 150mm step above external levels to allow overland flows to be directed around buildings to the south. This fully mitigates the risk of flooding from the River Poulter.

7.2 DRAINAGE FOR THE DEVELOPMENT.

7.2.1 EXISTING

Many of the existing buildings and hard standing areas around the site drain directly and indirectly to the River Poulter or Flood Dyke. Many buildings are drained through rainwater down pipes, but it is not always clear where these drain to. Some of the buildings adjacent to Flood Dyke connect down pipes straight into the dyke and this is visually obvious. Drainage of the western barn is clearer as there is a perimeter drainage network with manholes. The courtyard enclosed by the U shaped barn has an outlet chamber at the low end of the courtyard discharging direct to the dyke. Various gullies are evident around the site but these do not drain all the hard standing areas. Piper Lane has no drainage at all, surface water flows towards Lime Tree Avenue and finds it's way into the River Poulter. Regardless of all this, the site slopes from the north to the south by around 4m giving average gradients of 1 in 20 towards the River and Flood Dyke. Many buildings on the Eastern section Drain roof water through rainwater pipes, Enclosed courtyards contain gullies, but not all hard paved areas contain adequate drainage and rely on water running off to

the south. Having reviewed these areas on site we have assessed the current catchment areas as shown on the attached Catchment Area Plan. All positively Drain roof areas are included, but only half the hard paved area. This totals an impermeable area of 0.62Ha, and these areas could reasonably contribute flows in the order of 87L/sec for a peak 1 year run-off to the River Poulter. The catchment area plan attached in Appendix 4, highlights the drainage features around the site.

7.2.2 PROPOSED

Proposed roof areas will not be increased as a result of the re-development proposal, but their outfalls will be focused towards a storm crate attenuation tank with restricted discharge rate into both The River Poulter and Flood Dyke. There will be no increase in hard paved areas as a result of re-development. The access road from Ollerton Road will become a formalised Gravel access with formation drainage provided to maintain the integrity of the access. The formation will be cut to a cross fall with a filtration trench provided on the low side. This filtration trench will slow down, and clean the flow of grits and silts, before perforating through a perforated carrier pipe. Draining these areas in this way will also recharge ground water levels and reduce flows at the final outfall point. The carrier pipe will terminate in the same storm crate attenuation tank before discharge to the surrounding River network. The same theory will be applied to all new access tracks and Parking areas on the site. Soakaway' tests have been taken around the site, but their performance was fairly limited. It is thought that not only will some of these areas recharge ground water levels, but they will certainly not contribute any flow from the first 5mm rainfall event. Benefits to the upstream and downstream catchments will be achieved by restricting flows to a maximum rate of 87L/second from all sources through utilising vortex flow control units.

7.3 MANAGEMENT AND MAINTENANCE

A Management and Maintenance Plan will be prepared and implemented by the Hotel Tenants.

This will set out the expected design life of each of the drainage elements utilised, recommend periodic inspection and cleaning, and provide an inspection report to be completed as a permanent record.

7.4 ACCESS AND EGRESS.

In accordance with the requirements set out within the National Planning Policy Framework, it is essential to ensure that a safe route of escape from the application site, during a breach event, will not present a danger to people during a flood event. The Environment Agency predicted Flood Map

and surface water flood maps, indicates that the main entrance access from Ollerton Road, to the North is the shortest route to safety beyond the extent of flood water. As such, safe access and egress from the development site should be achievable during an extreme flood event.

8.0 CONCLUSIONS AND RECOMMENDATIONS.

The site proposal includes the conversion of existing residential housing in the central area to self-catered accommodation, the partial demolition of barn buildings in the west, a new driveway and footpath in the north east, numerous areas of new/ upgraded soft landscaping, and car parks in the eastern, central and western areas. In addition, there is potential for a new stable block in the west of the site and shepherd huts in the south west and north east. The existing deconsecrated church is to remain, and does not form part of this application. The Environment Agency, and Strategic Flood Map indicates that the proposed development site is situated within Flood Zone 1 (Low risk) therefore the site is at Low risk of fluvial flooding.

The primary source of flood risk to the development site is identified to be from the River Poulter located adjacent to the south boundary of the development site.

The proposed finished floor levels of the buildings will sit 150mm above external levels with opportunities to shape external levels to focus water away from the buildings and to the south. This is in accordance with the Environment Agency's (EA) current working practice.

An evacuation plan will be in place prior to the building being occupied so that in the event of an extreme flood scenario the building management team can take appropriate action and implement the agreed strategy.

Surface water generated from the development will be restricted to a maximum rate of 87L/second from all sources through the use of vortex flow control units with associated attenuation. Surface water storage volumes will be designed to fully cater for the 100 year +40% climate Change event.

Following detailed appraisal of secondary flood sources i.e. pluvial; groundwater; infrastructure failure; blockage; overland flow; and Infrastructure failure it is concluded that overall they present a low risk to the development site. Advisory mitigation measures include;

- External levels around the buildings shall be reduced to provide at least 150mm difference in level below finished floor to allow overland flood water to be routed around the buildings and to the River Poulter to the south.
- Occupiers should be aware of the location and route to areas of high ground which are located outside of Flood Zones 2 and 3.

- Periodic inspection of the Culverts on both Flood Dyke and the River Poulter to ensure their structural integrity. Management and maintenance of the trees adjacent to flood dyke to prevent partial blockage of the channel through fallen tree's

Adaptations of the existing buildings in the manner indicated in this report will reduce the end users risk to flooding from the River Poulter and not be detrimental to its surroundings. Therefore it is concluded that the redevelopment should be permitted on this site.

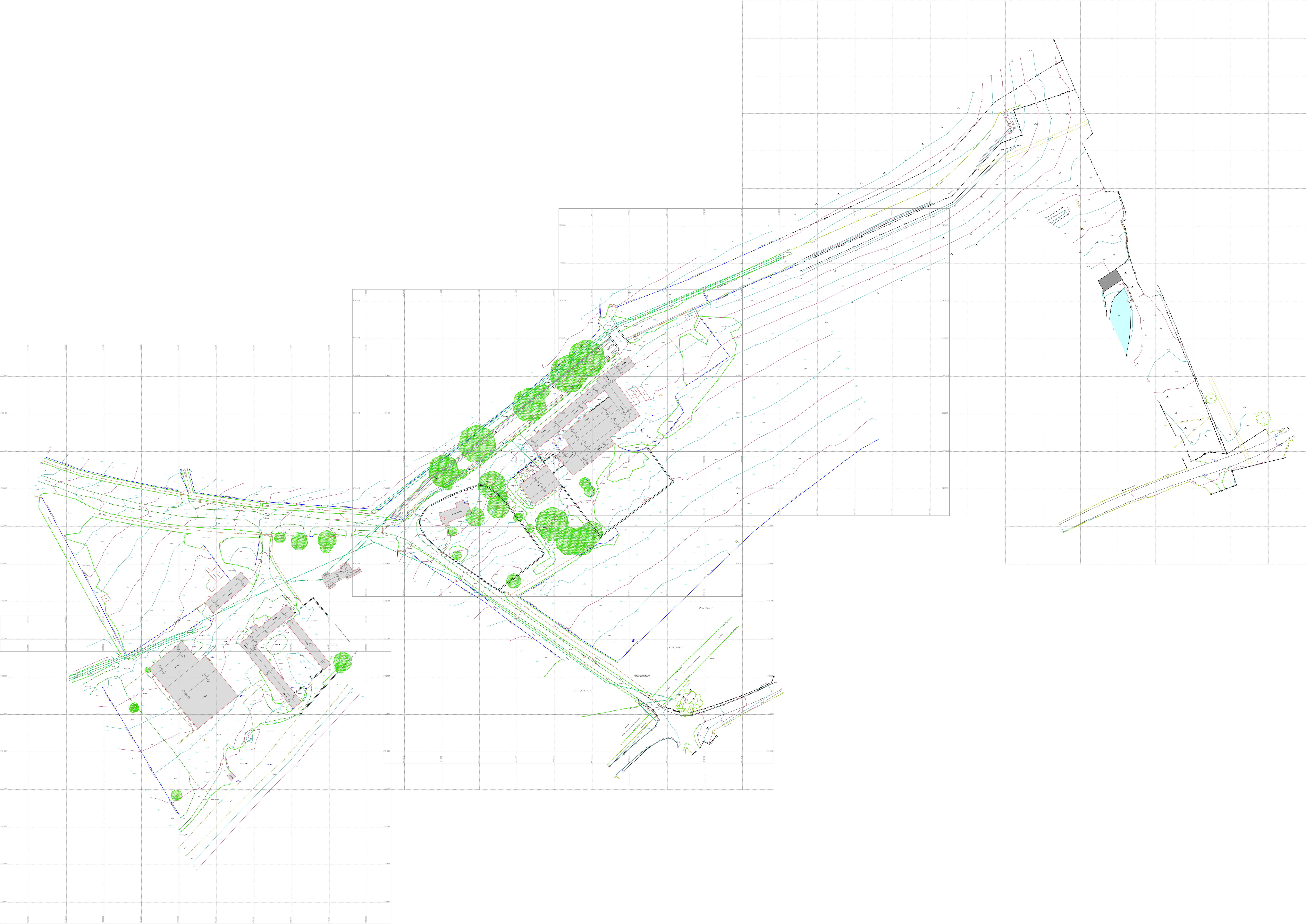
APPENDIX 1

Proposed Layout



APPENDIX 2

Topographic Survey



APPENDIX 3

Drainage Layout Proposal



WEST BARN CAR PARK
66 NO CAR PARKING SPACES TOTAL
29 No for West Barns guests
8 No for West Barns 2 guests
18 No for West Barns 3 guests
6 No for pod guests
6 No for Cottage guests
(includes 4 No accessible spaces)
4 No Horse Box spaces

- Hauraton Recyfix Monotec 200 Channel Drain or similar
- Filtration Drainage trench with perforated pipe (to detail)
- Rodding eye access

Met Engineers Ltd
Southgate House
Pontefract Road
Stourton, Leeds
West Yorkshire
LS10 1SW

Tel: 0113 200 8900
Fax: 0113 200 8901
email: admin@metengineers.com
www.metengineers.com

1. Do not scale dimensions from this drawing in either paper or electronic format.

2. To be read in conjunction with all relevant Engineer's, Architect's and Other drawings and specifications.

3. All building products to be used in strict accordance with the manufacturer's recommendations.

4. Any discrepancies are to be reported to the Engineer immediately.

5. Main Contractor to provide a detailed method statement for all works prior to commencement on site.

#	Hazard/Risk	Mitigation / Residual Risk
1.	XXX (Risk-High)	XXX (Risk-Low)
2.	XXX (Risk-High)	XXX (Risk-Low)
3.	XXX (Risk-High)	XXX (Risk-Low)
4.	XXX (Risk-High)	XXX (Risk-Low)
5.	XXX (Risk-High)	XXX (Risk-Low)

Issue	Date	Drawn	Description	Chk'd
02	26.06.21	NA	Layout updated	AK
01	09.03.21	NA	Initial Issue	AK

Client: Welbeck Estates Company Limited

Project: Manor Farm, Carburton

Title: Outline Drainage Plan West Barns

Drawn	NA	Checked	AK	Scale
Date	Mar 21	Date		1/250

Status	Planning	Original Size
		A1

Drawing No	Version
P21-00134-Met-C-002	02

APPENDIX 4

Existing and Proposed Catchment areas