

Land at Dragon Parc engineering works FCA

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Contract

This report describes work commissioned by Huntley Wood Investments Ltd, by an email dated 21st September 2019. Kate Drewett and Amy Evans of JBA Consulting carried out this work.

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Purpose

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Abbreviations

AEP	Annual Exceedance Probability
BGS	British Geological Survey
DAM	Development Advice Map
FCA	Flood Consequence Assessment
FRMP	Flood Risk Management Plan
LDP	Local Development Plan
MTCBC	Merthyr Tydfil County Borough Council
NRW	Natural Resources Wales
PPW	Planning Policy Wales
TAN-15	Technical Advice Note 15

1 Introduction

1.1 Terms of Reference

JBA Consulting were commissioned in September 2019 to prepare a Flood Consequence Assessment (FCA) in support of proposed engineering works as part of a flood mitigation strategy at land at Dragon Parc, Abercanaid.

1.2 FCA Requirements

This FCA follows Welsh Government guidance on development and flood risk set out in the Technical Advice Note 15: Development and Flood Risk¹ (TAN-15). Where appropriate the following aspects of flood risk will be addressed in all planning applications over its expected lifetime:

- The likely mechanisms of flooding
- The likely source of flooding
- The depths of flooding through the site
- The speed of inundation of the site
- The rate of rise of flood water through the site
- Velocities of floodwater across the site
- The impacts of the proposal on flood risk elsewhere

¹ Welsh Assembly Government. Planning Policy Wales. Technical Advice Note 15: Development and Flood Risk. July 2004.

2 Site Description

2.1 Site location

The land at Dragon Parc was formerly a factory site in Abercanaid, Merthyr Tydfil. The brownfield site is bound to the south and west by an unnamed link road with residential dwellings beyond. To the north, the site is bound by commercial units and to the east by the Afon Taff. Table 2-1 and Figure 2-1 summarise the key characteristics of the site. This FCA provides an assessment of flood risk in relation to the proposed engineering works to facilitate the regeneration of the site.

Table 2-1 Site Description

Site Name	Dragons Park
Site Area	78 ha
Existing Land-use	Brownfield
Purpose of development	Flood mitigation
OS-NGR	SO05400420
Country	Wales
County	Merthyr Tydfil, Glamorgan
Local Planning Authority	Merthyr Tydfil County Borough Council
Lead Local Flood Authority	Merthyr Tydfil County Borough Council

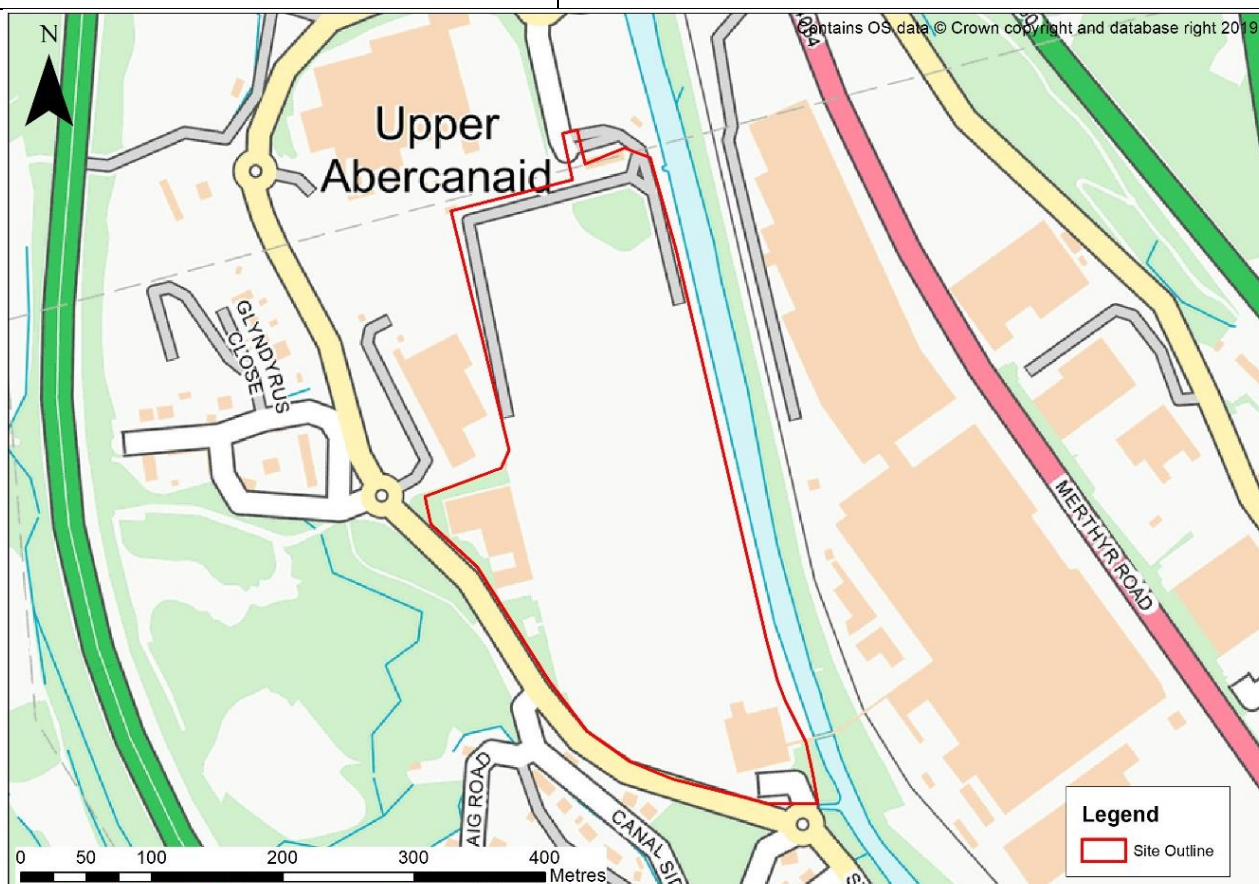


Figure 2-1 Site location

2.2 Site topography and existing land use

The brownfield site is currently vacant, following the demolition of the former factory as shown in Figure 2-2. Elevations across the site generally decrease from north (157mAOD) to south (153mAOD) and from west (160mAOD) to east (157mAOD) across the site. A steep bank is present on the western boundary forming a sloping topography from approximately 160mAOD to 157mAOD into the site. Lower elevations are present at the most southern section of the site, as shown in the LiDAR data in Figure 2-3. Outside the eastern site boundary, the bank steeply drops by ~6m into the Afon Taff channel.

Two access points currently exist to the site, one to the north via the Abercanaid Industrial Estate roundabout and one from to the south via an unnamed link road which connects to Stanfield Close.



Figure 2-2: Existing land-use

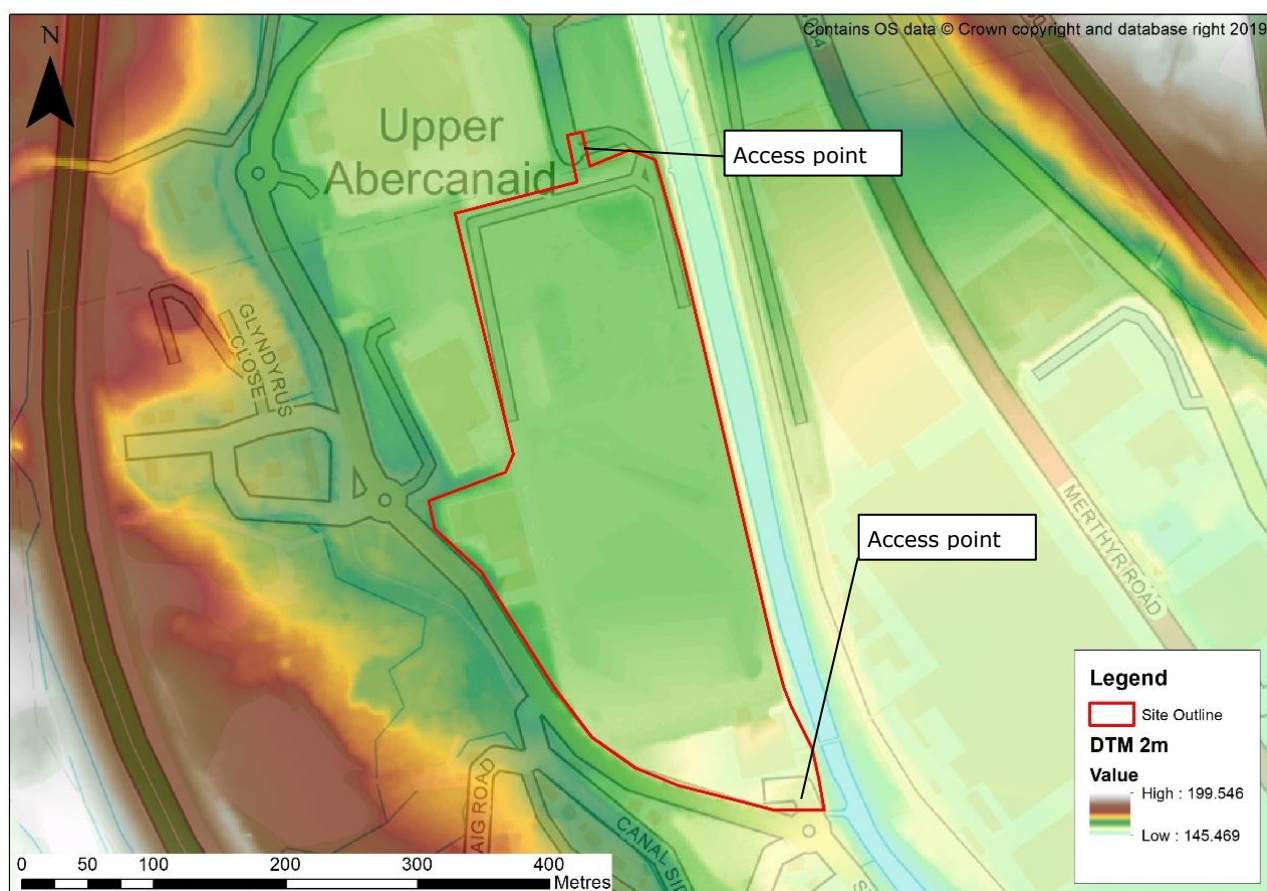


Figure 2-3 Topography of the site

2.3 Site soils and geology

The existing site is largely surfaced with rubble and made ground as shown in Figure 2-2. However, the British Geological Survey (BGS) Geology of Britain² viewer was consulted to identify local underlying geological conditions. The site is part of the South Wales Middle Coal Measures Formation, which consists of mudstone, siltstone and sandstone. The majority of the site is underlain by superficial deposits of Alluvium, consisting of clay, silt, sand and gravel – the western part of the site is underlain by Till.

The soils of the site were determined from the Cranfield University Soilscape viewer³, The site soils are described as slowly permeable wet very acid upland soils with a peaty surface.

2.4 Watercourse and drainage networks

The site is bounded to the east by the Afon Taff which flows in a southerly direction before flowing into the Seven Estuary approximately 60km downstream. To the west of the site a small 'ordinary watercourse', the Nant Canaid, enters a culverted system which approximately follows the site boundary to discharge into the Afon Taff at the site's southern boundary as shown in Figure 2-4. Photos of the culvert inlet and outlet are shown in Figure 2-5.

Small drainage gullies are present parallel to the internal access roads to capture surface water run-off which is conveyed into the combined sewers located beneath the site.

² BGS Geology of Britain viewer <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html> Accessed 09/08/2019

³ Cranfield University Soilscape Viewer <http://www.landis.org.uk/soilsapes> Accessed 09/08/2019

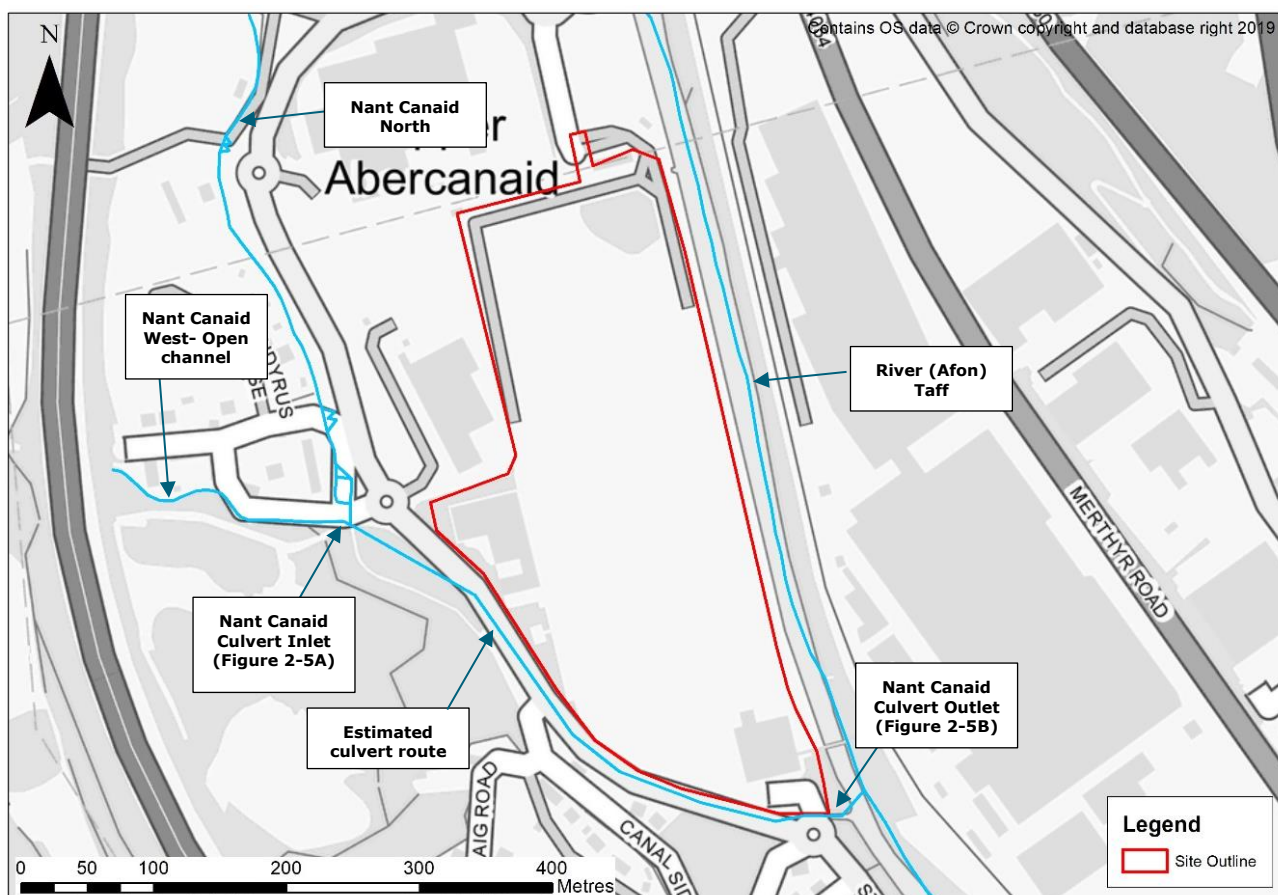
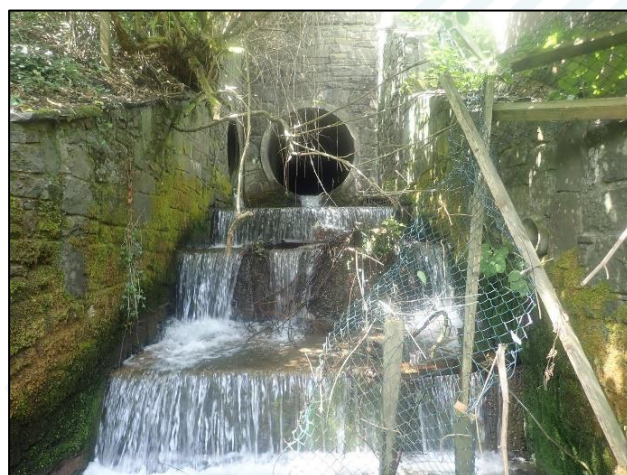


Figure 2-4 Watercourses and site location



A



B

Figure 2-5 Nant Canaid culvert inlet (A) and outlet (B)

2.5 Review of existing flood risk data

A review of the existing flood risk data related to the site has been undertaken. The main sources of current risk have been published by Natural Resources Wales (NRW) and within the Merthyr Tydfil County Borough Council (MTCBC) Flood Risk Management Plan (FRMP) (2015)⁴. Table 2-2 below summarises these findings.

Table 2-2 Summary of the current flood risk based on existing flood risk data

Source of Flooding	Onsite Presence	Description
Fluvial	✓ (see section 2.6)	The site is partially located in Flood Zones 2 and 3.
Tidal	x	The site is not at risk of tidal flooding
Surface Water	✓ (see section 08)	The boundaries of the site are subject to medium to high risk of surface water flooding according to NRW mapping. The north-western part of the site is shown to be at low to high risk of surface water flooding.
Reservoirs	✓ (see section 9)	The site is at risk of flooding from reservoirs according to NRW mapping.
Groundwater	x (see section 2.10)	The site is at low risk of flooding from groundwater
Canals	x	The site is not at risk of flooding from canals
Sewers	x	The site is at a low risk of flooding from sewers

2.6 Existing flood zone mapping (fluvial risk)

Figure 2-6 shows the NRW Flood Zones within Abercanaid. Parts of the site are located within Flood Zones 2 and 3. Zone 3 describes areas which are predicted to flood in events more frequent than the 1% annual exceedance probability (AEP) event. Zone 2 describes areas which are predicted to flood in events more frequent than the 0.1% AEP but less frequent than the 1% AEP event. The source of the flood zone mapping is unknown, however, the site is not thought to be at risk from flooding from the Afon Taff, as it is raised well above the predicted extreme flood level of the Taff.

⁴ Merthyr Tydfil County Borough Council, 2015. Flood Risk Management Plan
<https://www.merthyr.gov.uk/media/1810/mtcbc-frmp.pdf> Accessed 09/10/2019

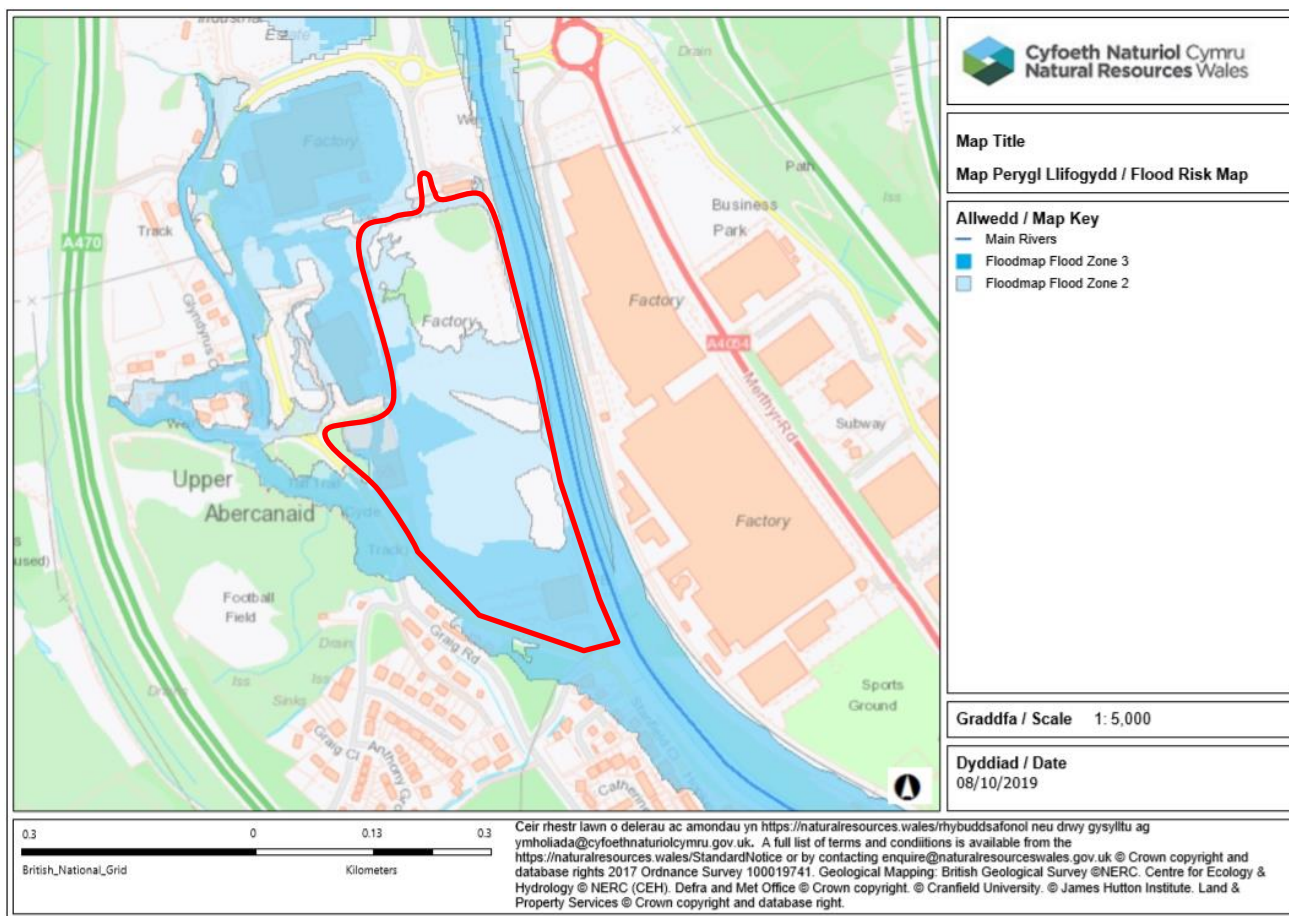


Figure 2-6 NRW Flood Risk Zones

2.7 Historical flooding

NRW's map of historic flood outlines, shown in Figure 2-7, illustrates that the site has not previously flooded. However, MTCBC's FRMP states that flooding from the Nant Canaid to Lewis Square and Glyndyrus Close has occurred historically, due to the inadequacy of the culvert inlet.

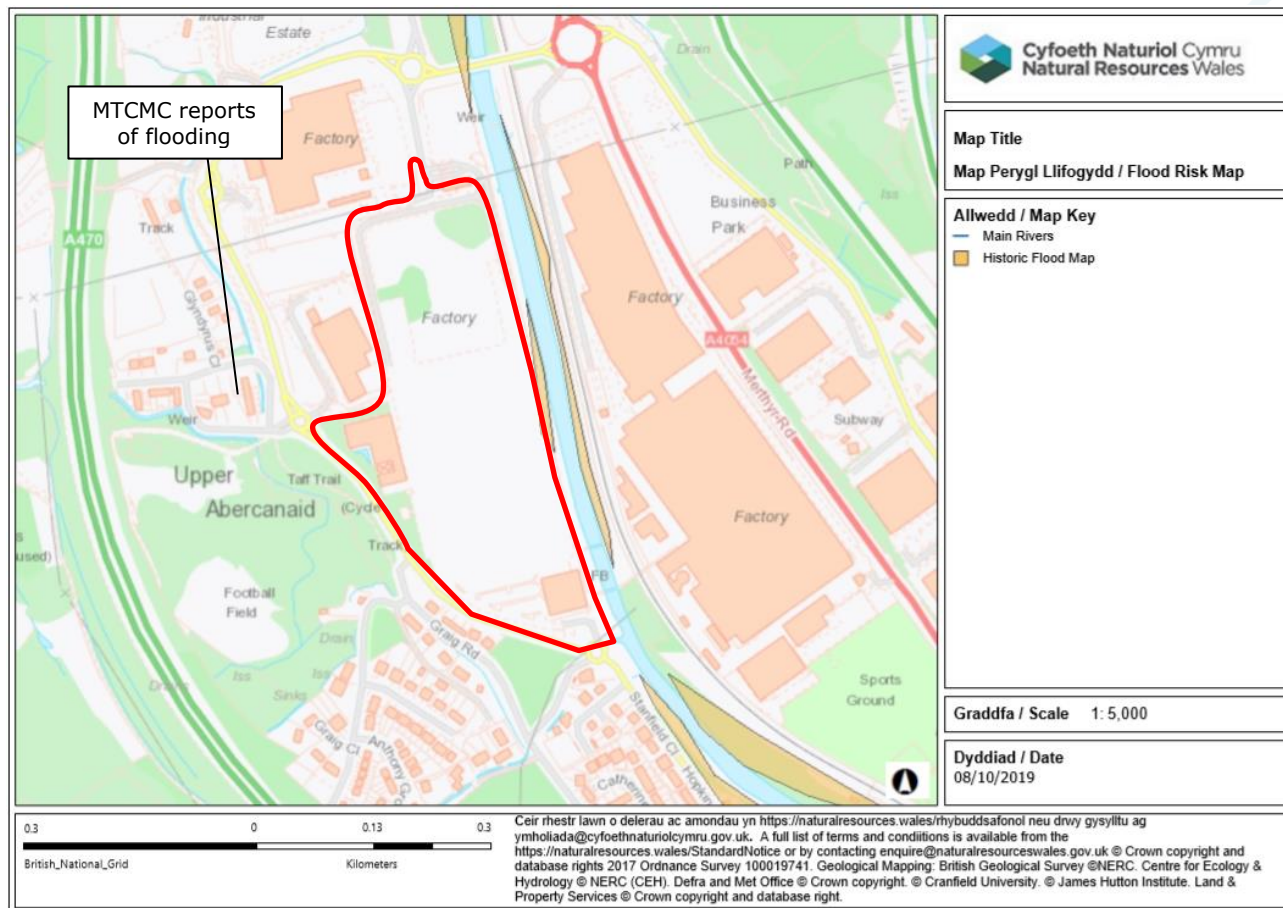


Figure 2-7 NRW Historic Flood Map

2.8 Risk of surface water flooding

According to NRW's flood map for surface water the site has localised areas at low to high risk of surface water flooding at the boundaries and the north-western area of the site, as shown in Figure 2-8. Gullies located along internal access roads convey surface water flow into combined sewers and prevent it from entering the rest of the site. Future development of the site should adopt a sustainable drainage strategy to manage surface water flows.

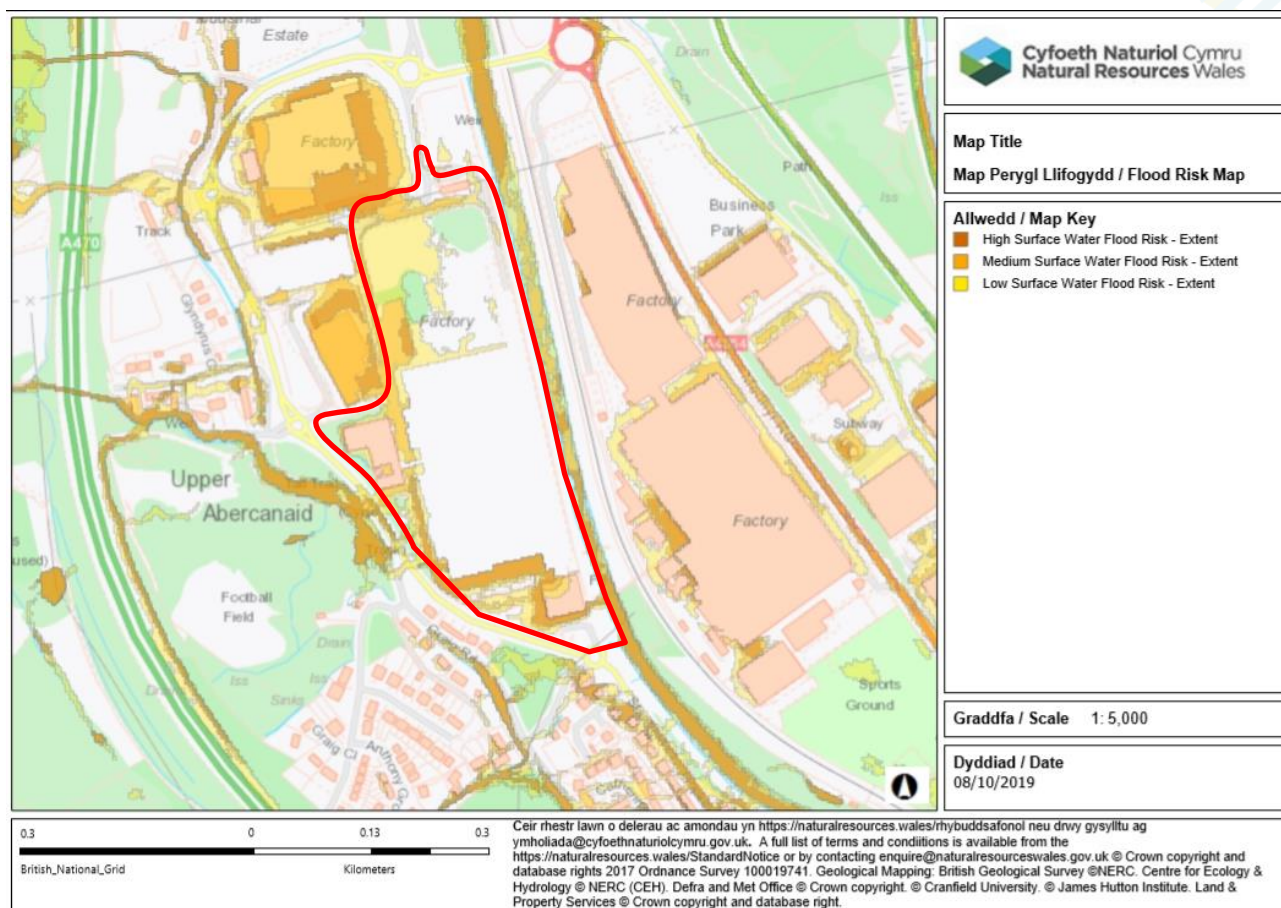


Figure 2-8 NRW Flood Risk Map for Surface Water

2.9 Risk of flooding from reservoirs

NRW flood risk mapping illustrates that the site could experience flooding as a result of reservoir failure as shown in Figure 2-9,. The flood extent is derived from the potential failure of five reservoirs which are located over 7km upstream of the site.

The heavily regulated nature of statutory reservoirs means that the probability of reservoir failure is extremely low. It is therefore reasonable to conclude that the risk of reservoir failure flooding at the site is very low.

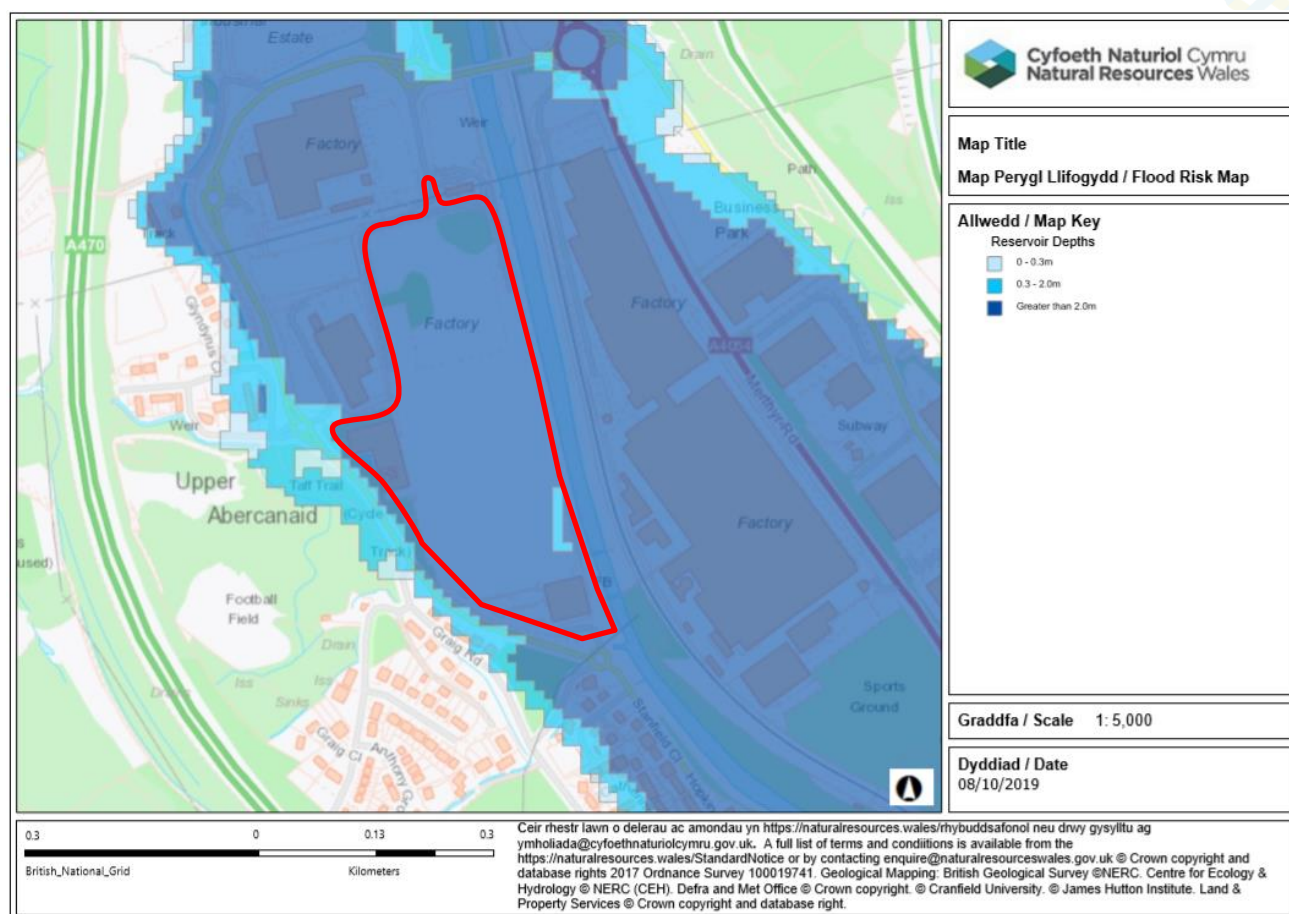


Figure 2-9 NRW Flood Risk Map for Reservoirs

2.10 Risk of flooding from groundwater

Groundwater flooding is caused by unusually high groundwater levels. It occurs as excess water emerging at the ground surface or within manmade structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and can result in significant damage to property. The risk of groundwater flooding depends on the nature of the geological strata underlying the site, as well as on the local topography. Groundwater flooding is described as “not a major problem” in the MTCBC’s FRMP.

Old mine workings exist to the west of the site (west of the A470). The MTCBC’s FRMP states that “occasionally water from old mine workings discharges at unexpected locations particularly on hillsides below the workings”. However, it is believed any groundwater discharge would be captured by the network of watercourses which flow eastwards and south-eastwards towards the site and therefore the risk of groundwater flooding from old mine workings is considered to be ‘very low’.

2.11 Risk of flooding from sewers

There are a number of combined sewers along the boundaries of the site as shown in the Welsh Water sewer plan in Figure 2-10. There have been no known incidents of flooding associated with these sewers on or within proximity to the site.

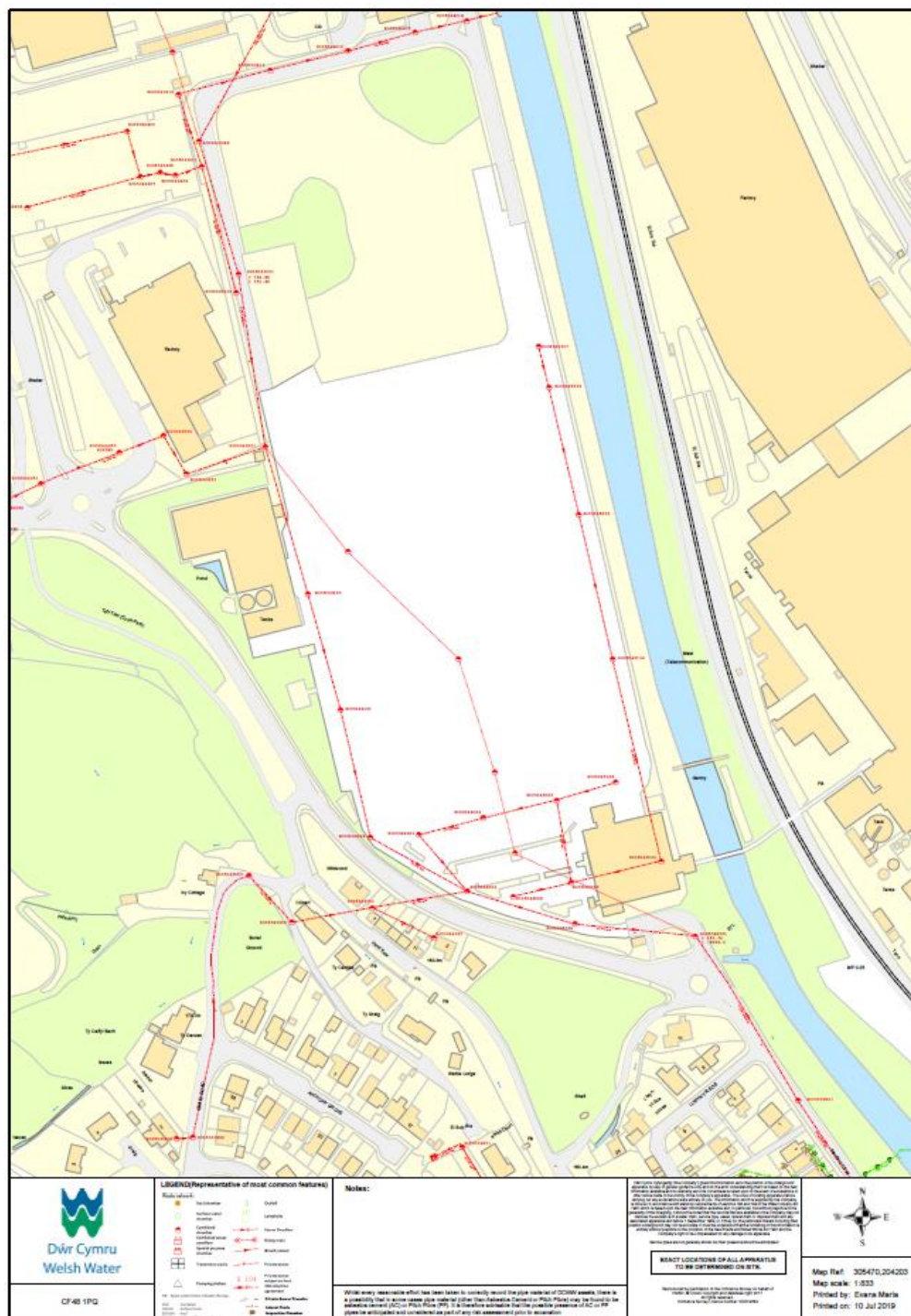


Figure 2-10 Welsh Water sewer plan

Table 3-1: TAN-15 vulnerability classifications

Development category Types	Development category Types
Emergency services	hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood
Highly vulnerable development	all residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development (e.g. power stations, chemical plants, incinerators), and waste disposal sites
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites

Section 5.3 of TAN-15 states that exceptions to these categories such as 'water compatible development' will not be subject to the Justification Test but will be subject to the required demonstration of the Acceptability of Consequences as outlined in Section 7 of TAN-15. The application of Section 7 requires that "the consequences of flooding can be managed down to a level which is acceptable for the nature/type of development being proposed, including its effects on existing development." The Acceptability of Consequences with regards to third-party flood risk impact is discussed further in Section 4.

3.4 Local Development Plan

The Local Development Plan (LDP)⁵ is a land use document which sets out how the County Borough of Merthyr Tydfil will be developed over 15 years (2006–2021). The current LDP, was adopted in May 2011. The land at Dragon parc is brownfield in nature, within the settlement boundary and is covered by *Policy AS24 Business Employment Sites to be Protected*.

The Council is required to monitor and review its LDP. The First Replacement Local Development Plan 2016-2031 was prepared in June 2018 and is currently out for public consultation. This replacement plan places the Dragon Parc site within the *Hoover Strategic Regeneration Area (Policy SW6)*. The *Hoover Strategic Regeneration Area* is a key regeneration site identified to facilitate a major mixed-use development containing:

"A significant proportion of housing (440 dwellings), new employment and local retail provision..."

⁵ Merthyr Tydfil County Borough Council, 2016. Local Development Plan 2006-2021
<https://www.merthyr.gov.uk/media/2165/merthyr-tydfil-local-development-plan-2006-2021-review-report-april-2016.pdf> Accessed 09/10/2019

4 Detailed Assessment of Fluvial Risk

4.1 Hydraulic modelling history

In 2017, Thomas Mackay Ltd. developed a 1D-2D ESTRY-TUFLOW hydraulic model of the Afon Taff and Nant Canaid at the study area. The baseline (existing) scenario was reviewed and accepted by NRW in May 2019.

JBA Consulting received and reviewed the latest version of the Thomas Mackay Ltd flood model in October 2019. This model has been used as the baseline scenario for this study (see Section 4.3). This was further updated to represent the proposed development (see Section 4.4).

4.2 Existing culvert arrangement

As noted in Section 2.4, there are two watercourses in the area. The River Taff and the Nant Canaid which is culverted alongside the site and discharges into the River Taff immediately downstream of the site. The Nant Canaid feed by two smaller watercourses, the Nant Canaid North and Nant Canaid West. The confluence of these two watercourses is culverted west of the proposed site.

Between the Nant Canaid North and Nant Canaid West., there are four culvert entrances. Three of these entrances are located on Nant Canaid North, the fourth is located on Nant Canaid West as shown in **Error! Reference source not found..**

Some of the culvert inlets in the study area have been classified by Merthyr Tydfil County Borough Council (MTCBC) as 'critical'. The northern most culvert entrance is not classified critical, although all other entrances are. These are culverts which are considered most likely to block during a storm event. MTCBC FRMP states "If intense rainfall has been forecast these intakes are inspected as priority, cleaned where necessary, and inspections continue during and immediately after significant rainfall".

4.2.1 Culvert CCTV survey

In March 2019, a CCTV survey of the culvert was undertaken by PM Surveys Ltd to inform the modelling process. The aim of the CCTV survey was survey all culverts between the Nant Canaid and River Taff.

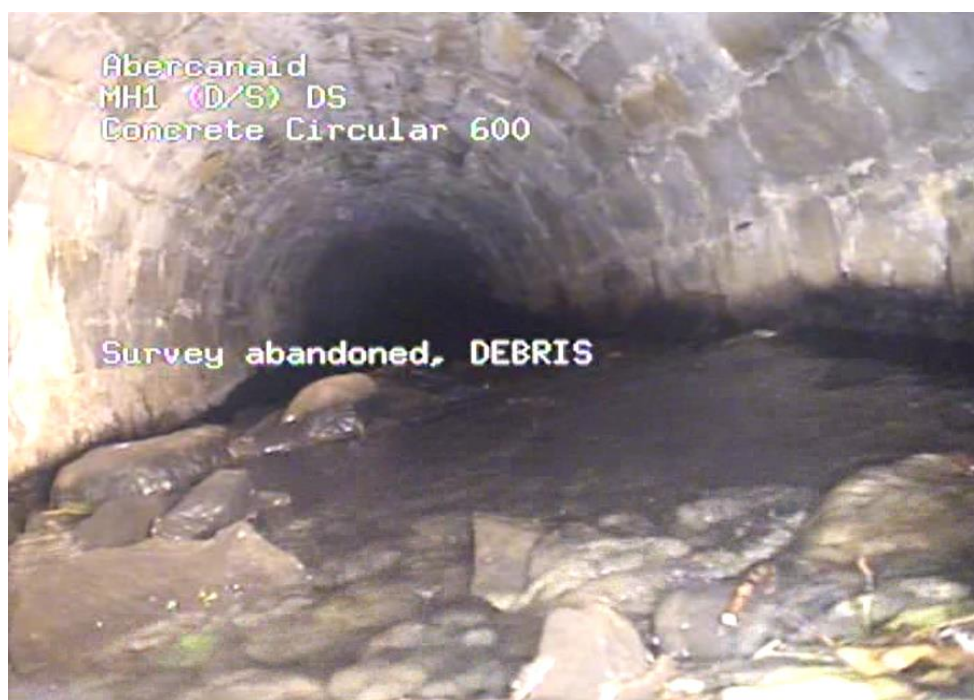


Figure 4-1: CCTV survey abandoned due to uneven terrain

This survey was able to obtain the dimensions and locations of the inlets and key connections. However, access to the full length of the culvert not possible as the equipment used was unable to navigate the uneven terrain of the river bed (see Figure 4-1). This was further frustrated by a lack of manholes to provide access to the culvert. The images obtained from the CCTV show an effective culvert with no visible defects and little evidence of blockage. That the survey was aborted does not reflect the condition of the channel, but the limitations of the survey equipment used that are design for pipe systems and not culverted watercourses.

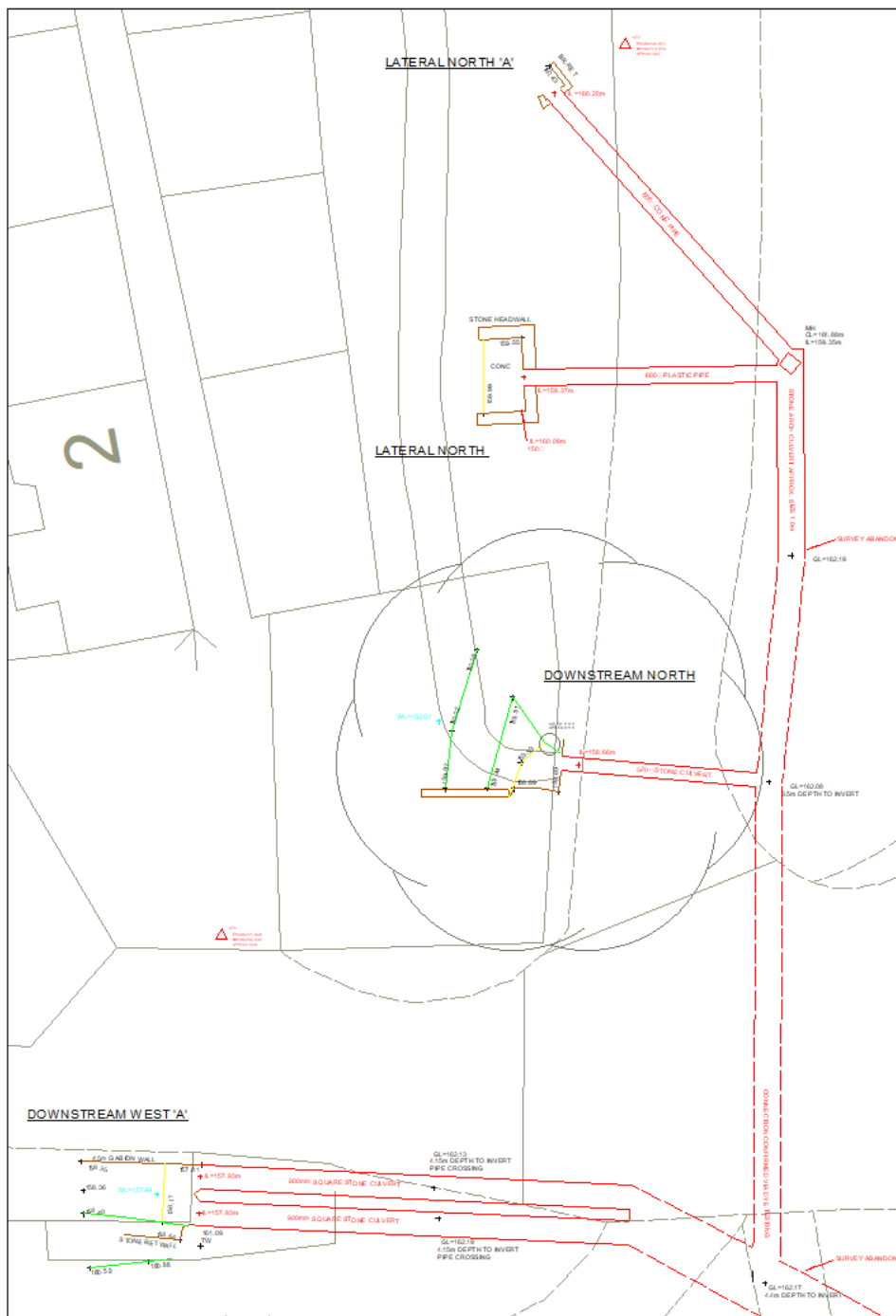


Figure 4-2 Existing culvert inlet arrangement (Strom Geomatics, 2019)

4.2.2 NRW Culvert blockage advice

NRW have advised (15th Dec 2020) that as *"the Nant Canaid culvert has not been fully surveyed beneath the site due to obstacles. Therefore, assumptions have been included in the model regarding the capacity of the culvert. Given the presence of broken ground within the culvert and the historical risk of blockage at the inlet, as highlighted within the Section 4.1 of the (Hafren Water) FCA we believe it is appropriate to add a 95% blockage factor when considering the flood events referred to above (i.e. 1% +CCA +blockage and 0.1% +blockage flood events)."*

We disagree with NRW's description of the CCTV system being abandoned due to 'obstructions' and 'broken ground'. The culvert in this section has a natural bed that is difficult for CCTV cameras designed for pipes to navigate.

These most recent comments from NRW also appear to contradict their previous model review comments (Emily Harris, 09/04/2019), that stated *"The culvert route looks reasonable however this is not a confirmed route as there is no survey. The inlet and outlet sizes are modelled appropriately; however, it has been assumed that the culvert maintains its capacity (2.2m rectangular culvert) until it joins with the outfall. This is not the 'worst case scenario' and will need to be reviewed. When looking at the proposed site from an FCA point of view, the blockage scenario should be taken in to account by NRW."*

We acknowledge that there is some uncertainty over the condition and dimensions of the culvert over its full course, and that sensitivity analysis is appropriate. However, we see no justification to support an assumed 95% failure of the asset as the 'design event'. Such a scenario would require a total collapse of the culvert or the near total blockage of all four culvert inlets. We regard this as extremely improbable and have therefore also included testing of a 30% blockage scenario which we consider to be more realistic.

Applying any blockage scenario as the 'design event' would be a departure from NRW's Flood Map, the requirements of TAN15 and the well-established norms for Flood Consequence Assessments. As such, whilst we have undertaken all of the model runs and analysis requested by NRW, the risk of culvert blockage has been reported as a 'residual risk' in Section 4.6 and not as the design event.

4.3 Baseline flood model results

4.3.1 1% AEP plus climate change

The baseline modelling shows that the existing site is predicted to partially flood during the modelled 1% AEP event plus climate change, as shown in Figure 4-1. Maximum depths are generally less than 300mm and the northern section of the site is flood-free during this event.

The primary flooding mechanism is from a channel and culvert capacity exceedance of the Nant Canaid to the west of the site at Lewis Square. Once overtopping of the Nant Canaid North bank has occurred, flood water flows onto the access road along the northern edge of the site. Overtopping of the Nant Canaid West results in water flowing down the link road and entering the southern part of the site. The baseline modelling shows that no overtopping of the Afon Taff along the eastern site boundary occurs, up to and during the 0.1% AEP event.

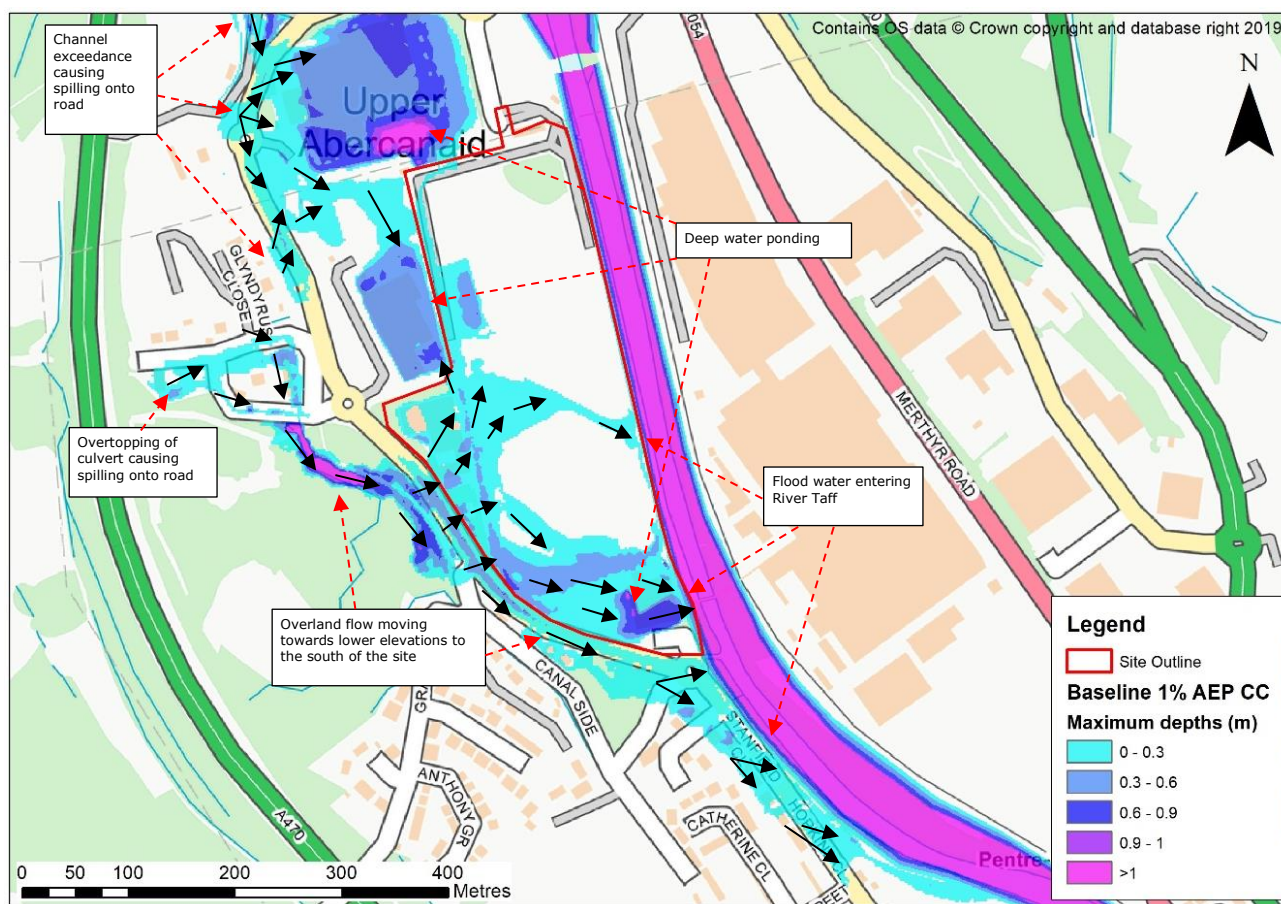


Figure 4-3 Baseline 1% AEP plus climate change Maximum Depths

4.3.2 0.1% AEP

During the 0.1% AEP event flood depths are predicted to be similar to those predicted in the 1% AEP event plus climate change, as shown in Figure 4-4.

The flood extent is predicted to increase to cover the majority of the central and southern sections of the site, whilst the north of the site remains largely flood-free. In this event, flood waters convey across the site and along the site road discharging into the Afon Taff at various points.

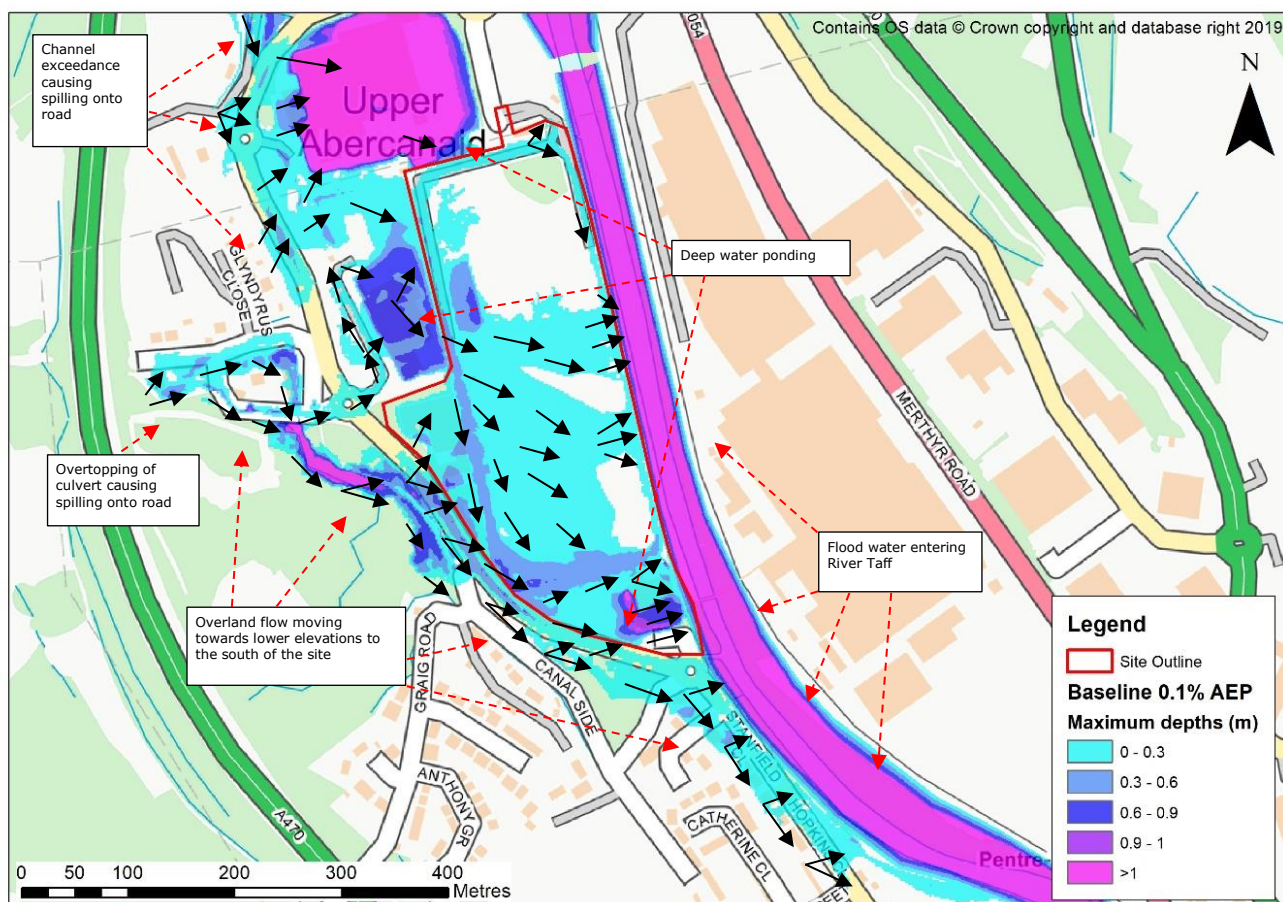


Figure 4-4 Baseline 0.1% AEP Maximum Depths

4.4 Proposed development

The proposed engineering works covered by this FCA have been designed to mitigate against the flood risk posed by the Nant Canaid. The proposed engineering works will improve the future development potential of the site and will include:

1. Site re-profiling to 157mAOD, with the southern section being raised to 155mAOD. The re-profiling has been designed to raise ground elevations across the site to be above the 0.1% AEP fluvial flood level.
2. A proposed 6m wide dry swale along the western boundary of the site with depth ranging between 0.19m in the north to 2m in the south. This feature will work to convey floodwater around the site and into the Afon Taff and is also designed to prevent an increase in flood risk to third-party areas caused by the site re-profiling.
3. A pair of new 2.4m wide pre-cast box culverts at the southern end of the site that will convey water from the swale into a new outfall structure that will discharge into the Afon Taff.

Figure 4-5 shows the proposed engineered extents with more detail included in Appendix A.

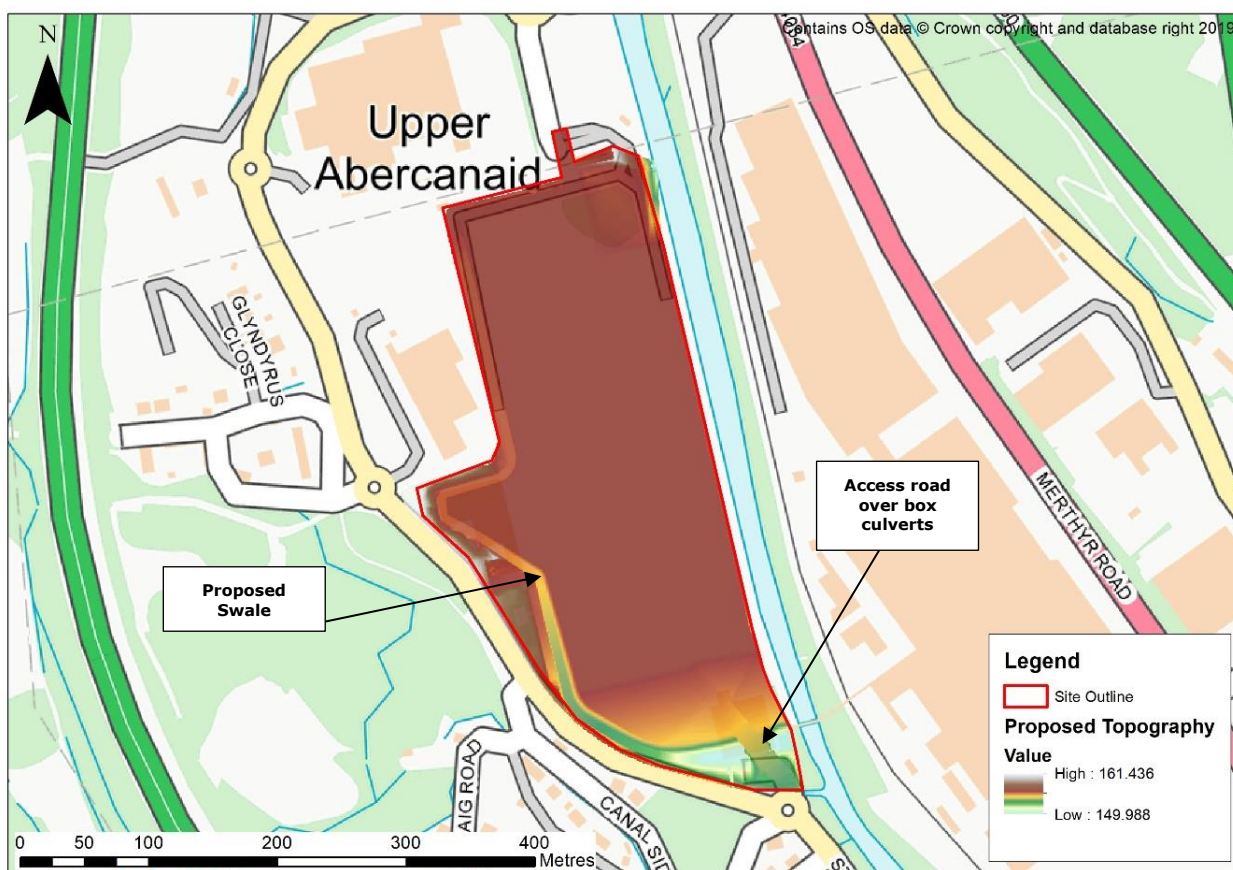


Figure 4-5 Proposed swale and site re-profiling

4.5 Post-developed flood model results

The proposed engineering works were incorporated into the 2D model domain using a proposed Digital Elevation Map (DEM). The proposed culvert was represented in the 1D model domain with SX links. The proposed model scenario was simulated for the 1% AEP plus climate change and the 0.1% AEP events (including scenarios with 30% and 95% blockage of the existing culverts).

4.5.1 1% AEP plus climate change

During the proposed scenario, the flow from the Nant Canaid is conveyed via the swale to the lower lying area at the south east of the site where it enters the Afon Taff at a single discharge point upstream of the existing culvert outfall. The volume of water entering the Afon Taff is unchanged compared to the baseline. The majority of the site is flood free in the proposed 1% AEP plus climate change event as shown in Figure 4-4.

TAN-15 Section 7 indicates that any new development should not have adverse impacts on third-party flood risk. A comparison of the baseline and proposed modelled results for the 1% AEP plus climate change event is shown in Figure 4-7. This demonstrates that there are no adverse impacts on third-party flood risk as a result of the proposed engineering works. In some places, such as north and south-west of the site, a reduction in water levels are predicted.

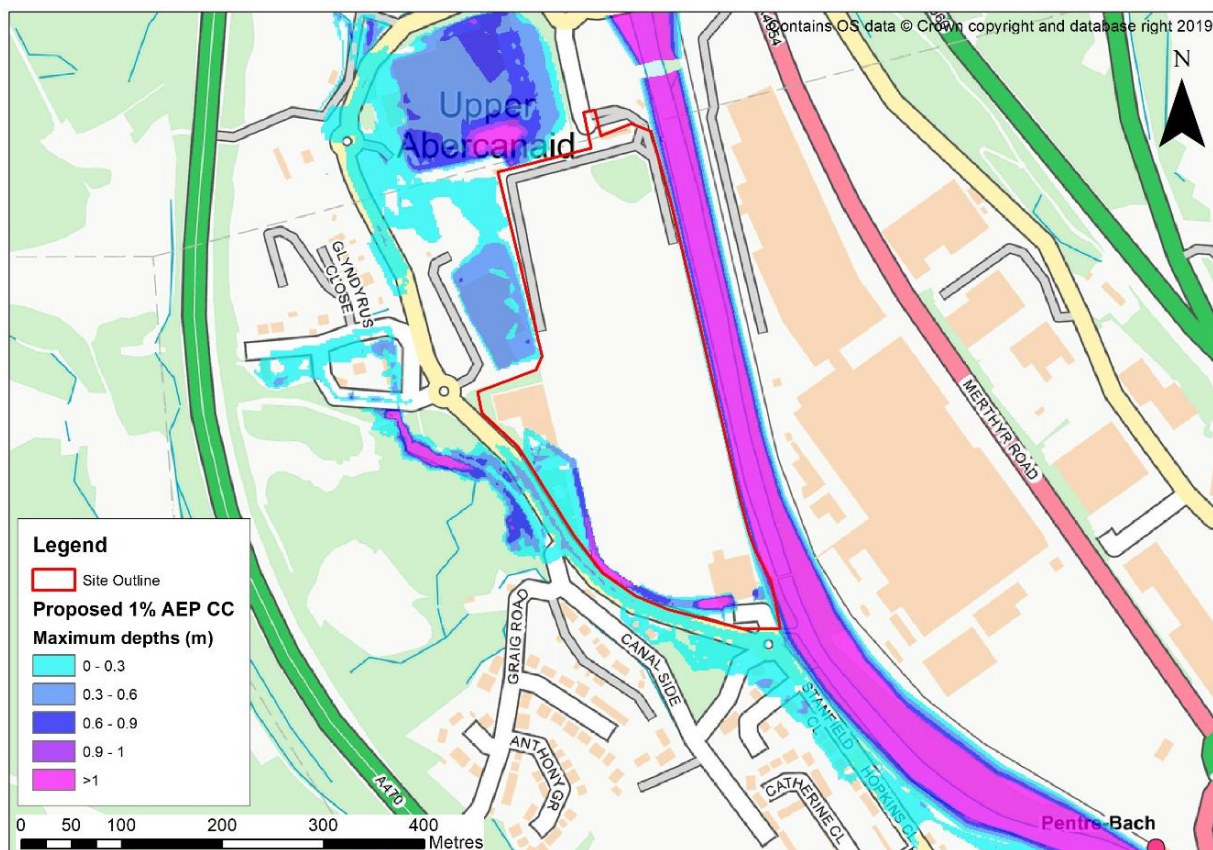


Figure 4-6 Proposed 1% AEP plus climate change maximum depths

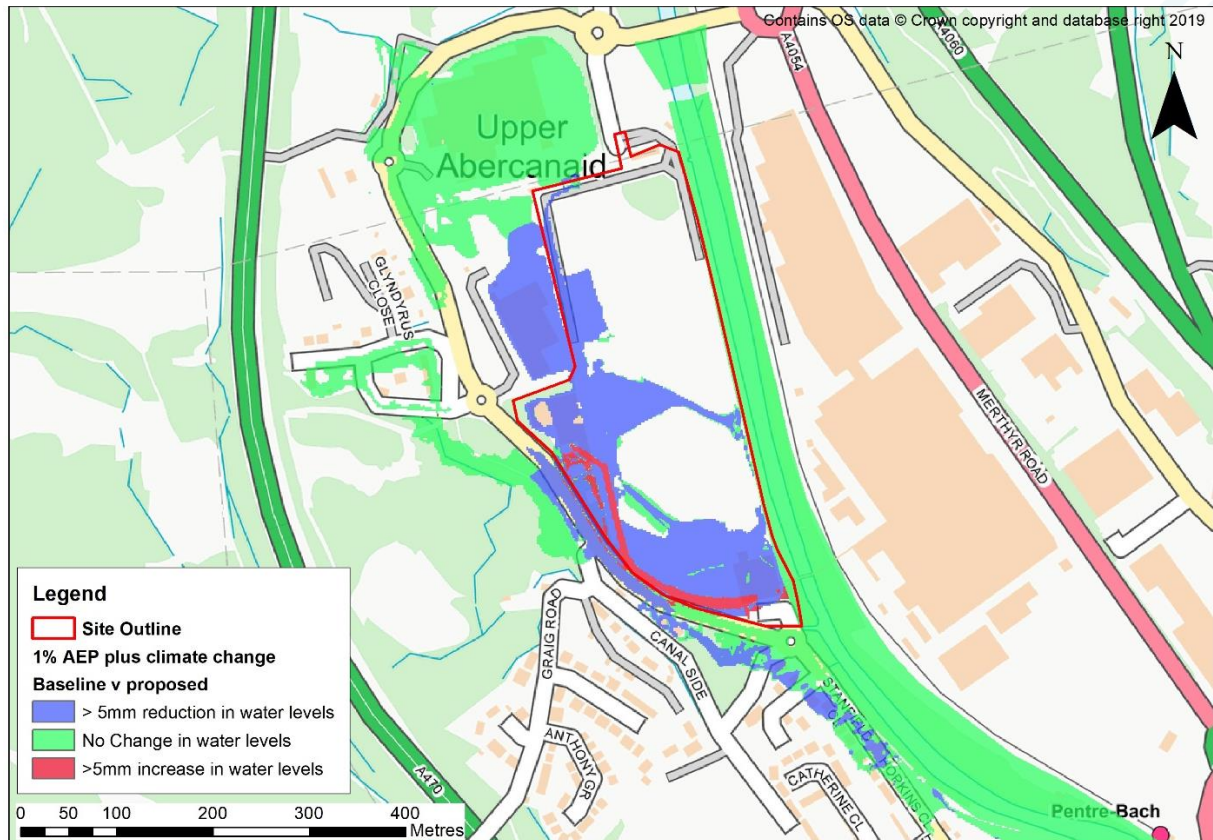


Figure 4-7: Baseline v proposed 1% AEP plus climate change

4.5.2 0.1% AEP

The maximum depths during the 0.1% AEP modelled event for the proposed scenario are shown in Figure 4-6. The majority of the site is flood free during this event. A comparison of the baseline and proposed modelled results for the 0.1% AEP event is shown in Figure 4-9 and demonstrates that there are no adverse impacts on third-party flood risk as a result of the proposed engineering works. In some places, such as north and south-west of the site, a reduction in water levels are predicted.

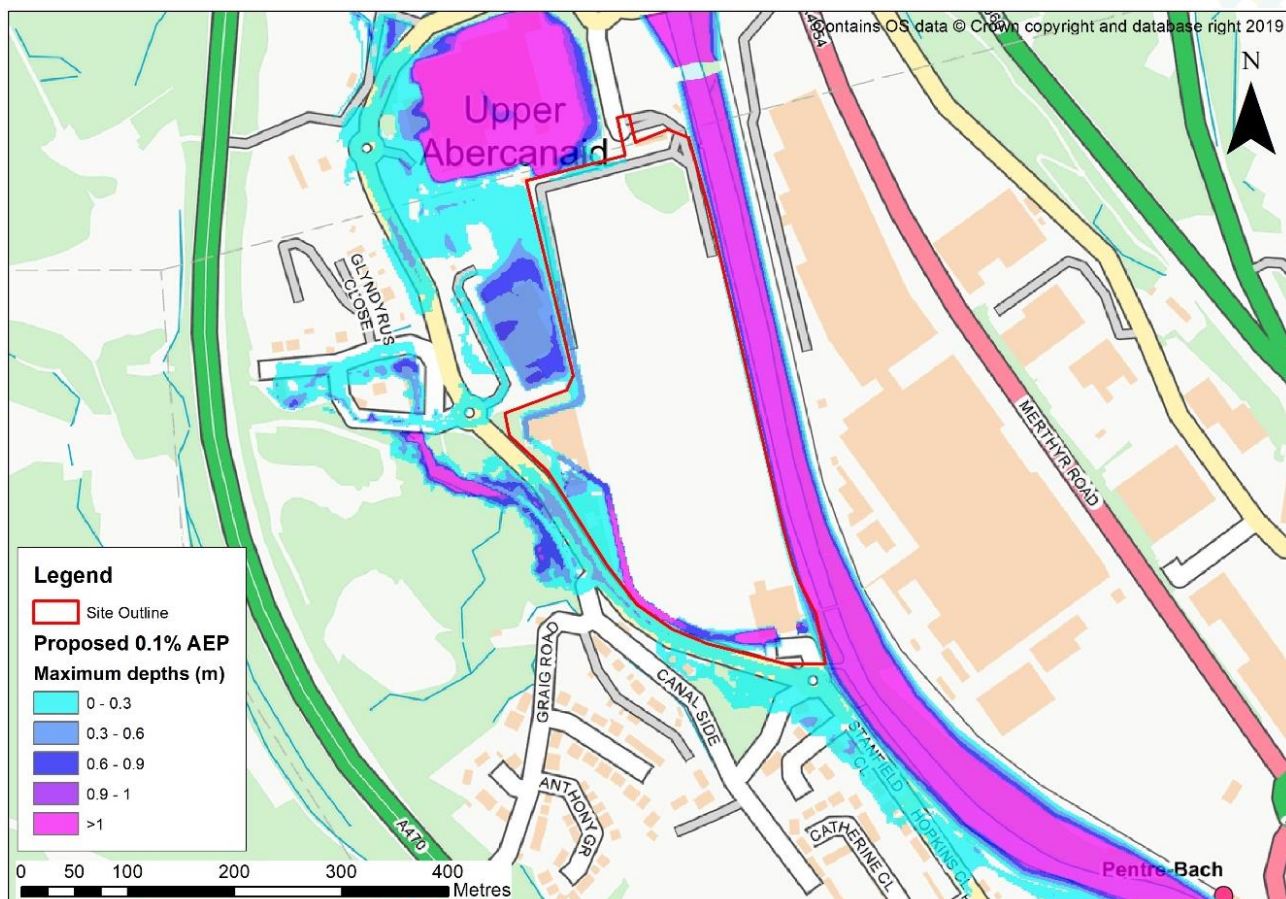


Figure 4-8 Proposed 0.1% AEP Maximum Depths

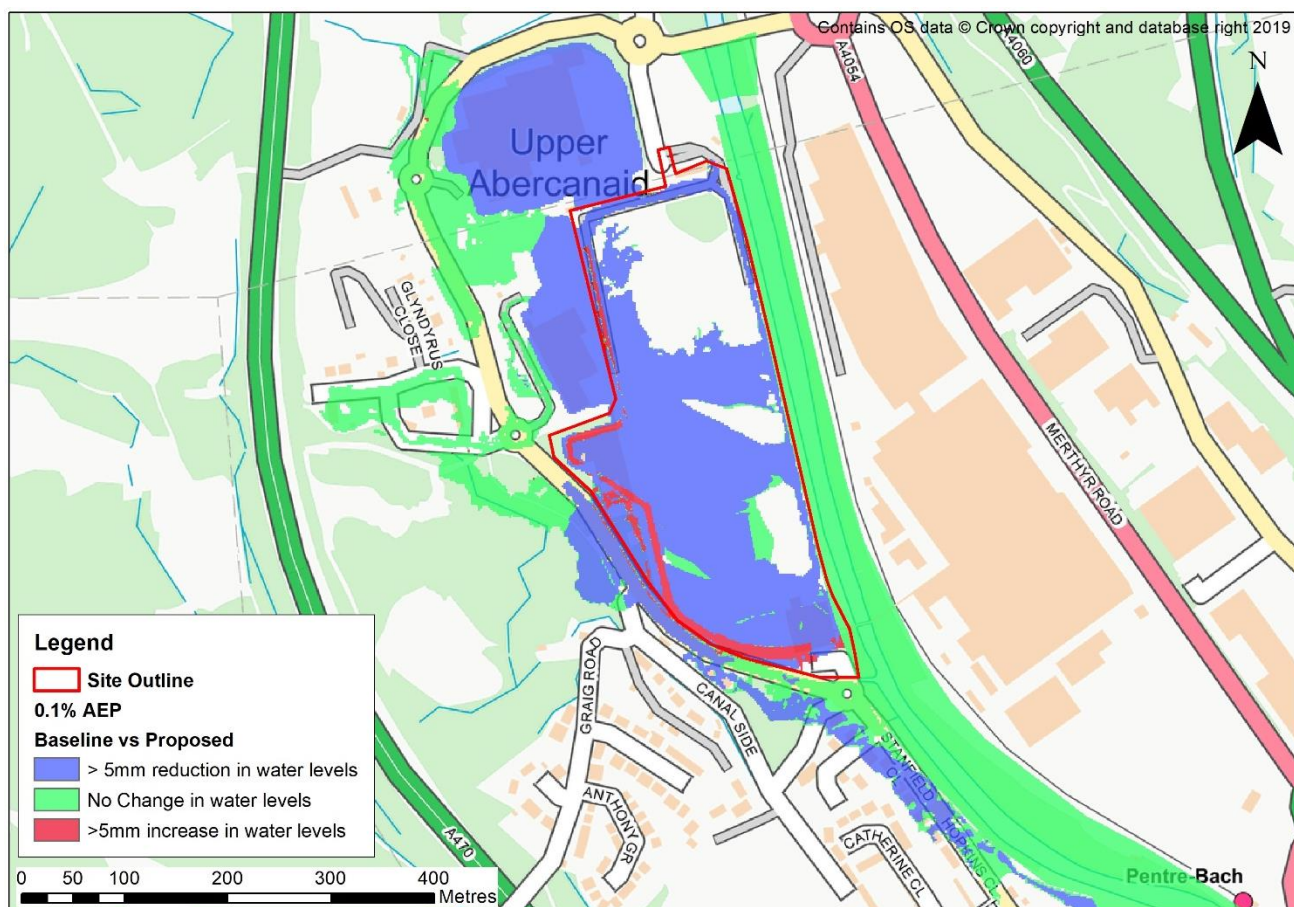


Figure 4-9: Baseline v proposed 0.1% AEP

4.6 Residual Flood Risk - Blockage scenarios

The culvert on the Nant Canaid is critical in conveying flows to the Taff. To understand the residual flood risks posed by the failure of this asset or the blockage of the four inlets, the impacts of two blockage scenarios (30% and 95%) have been modelled for the 1%, 1% AEP plus climate change and 0.1% AEP events. At the request of NRW, these scenarios have been run for both the pre- and post-development scenarios.

Pre-development

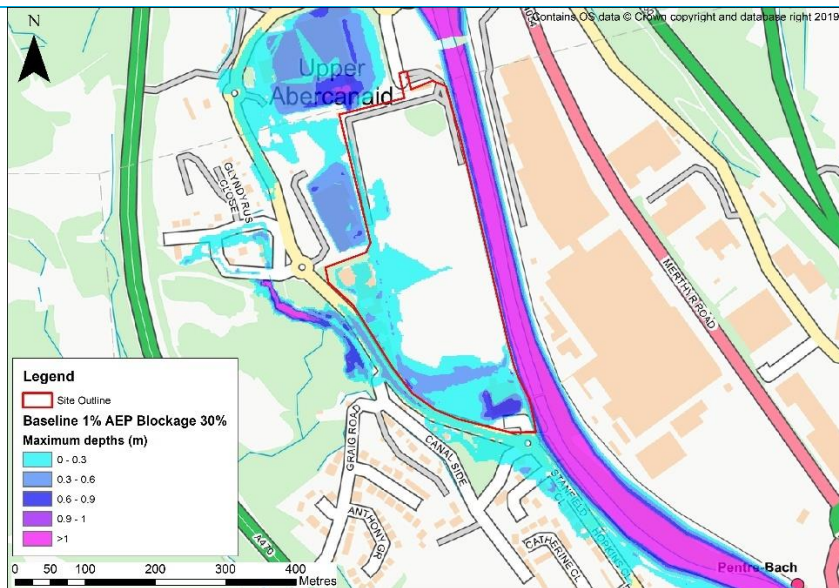
For the baseline event, a 95% blockage has been applied to all four culverts in the study area. **Error! Reference source not found.** and **Error! Reference source not found.** demonstrates the maximum flood depths experienced during the modelled blockage scenarios. During the 1%+CC AEP event, the extent of flooding increases, however the depths generally remain the same. There is a single area of deep ponding towards the south of the site, however this was already flooding to greater than 0.6m without blockage and therefore isn't a significant increase in depths.

Post-Development

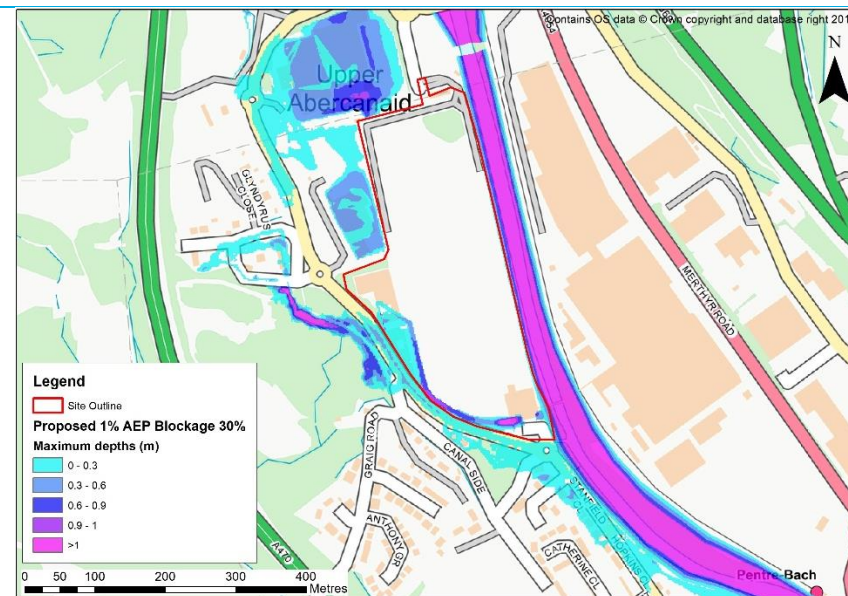
The proposed model scenario was used for this blockage analysis.

Error! Reference source not found. to **Error! Reference source not found.** demonstrate the maximum flood depths during the modelled blockage scenarios. Although maximum flood depths increase, the flood extents during the blockage scenarios do not change significantly until there is a 95% blockage on the culvert during the 0.1% AEP modelled event. During this scenario depths of <100mm would be present at the Dragon Parc site as shown in Figure 4-16.

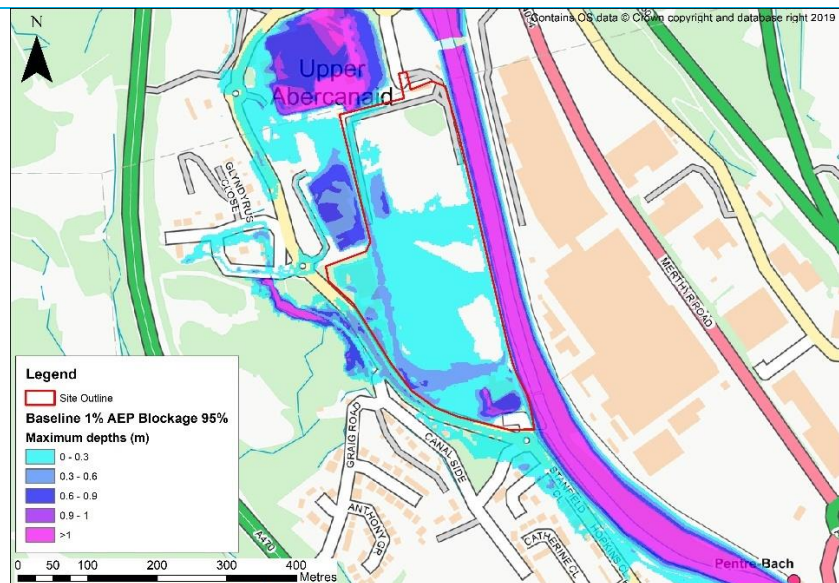
Figure 4-10: 1% blockage analysis



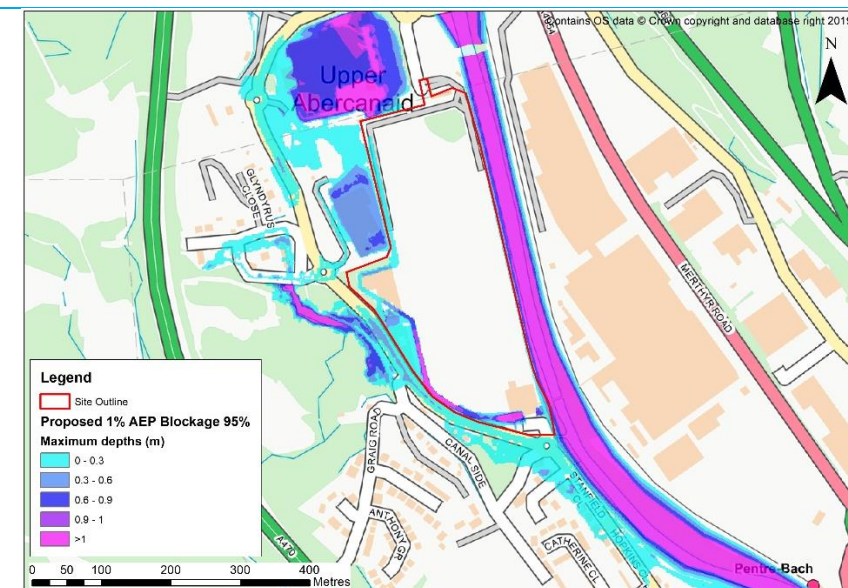
Pre-development 1% AEP- 30% blockage



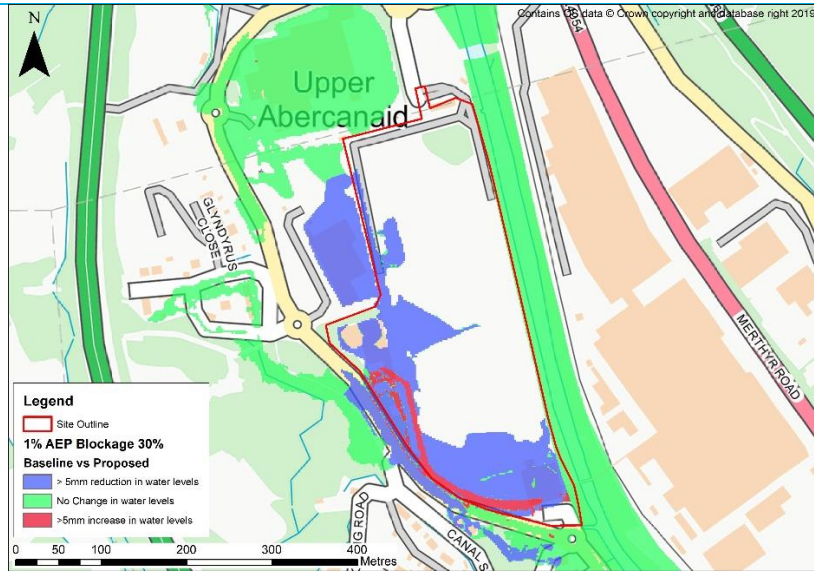
Post-development 1% AEP- 30% blockage



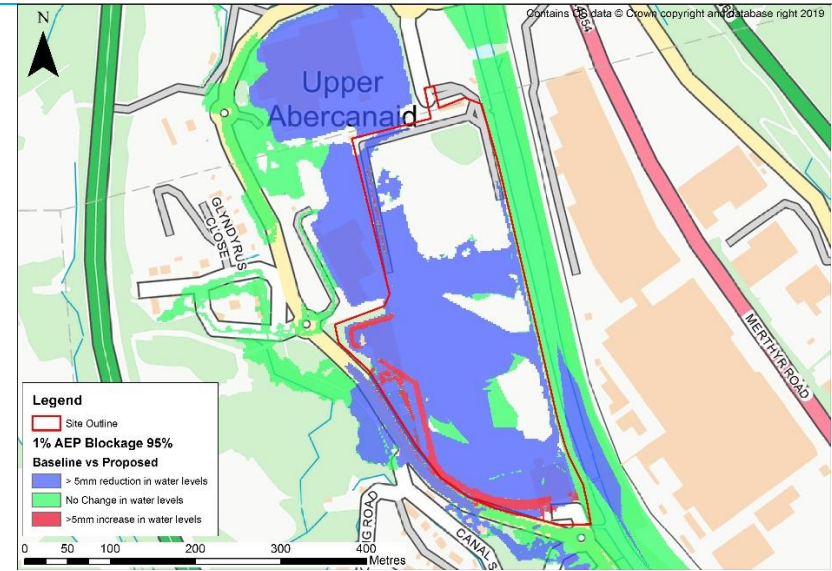
Pre-development 1% AEP - 95% blockage



Post-development 1% AEP - 95% blockage

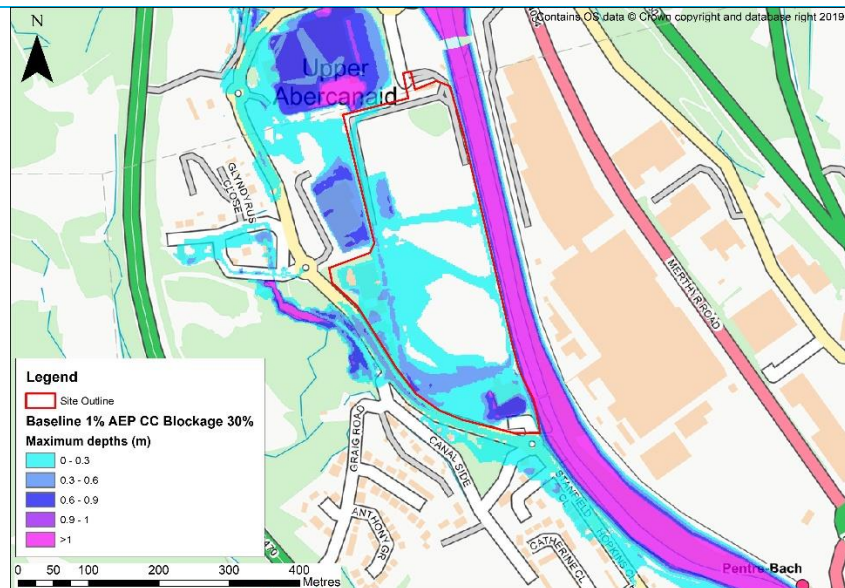


1% AEP 30% blockage depth comparison

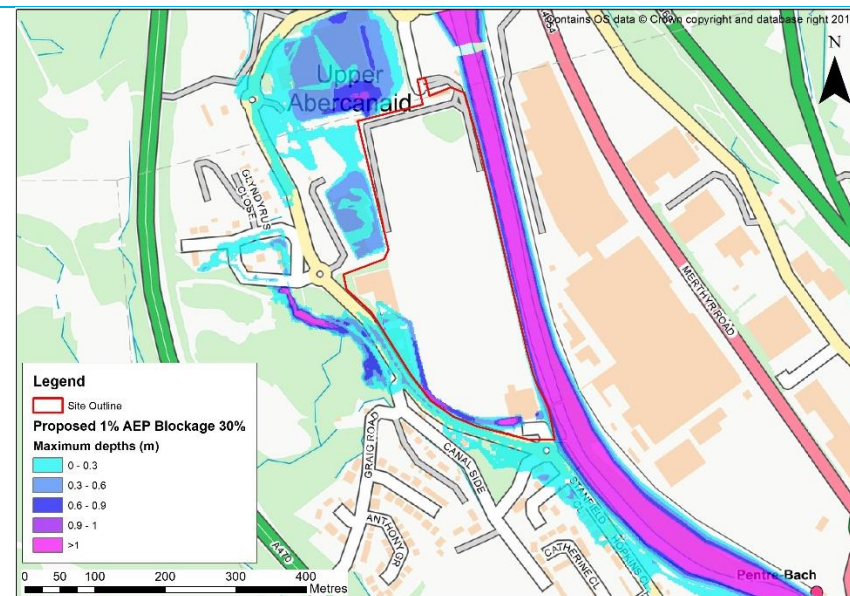


1% AEP 95% blockage depth comparison

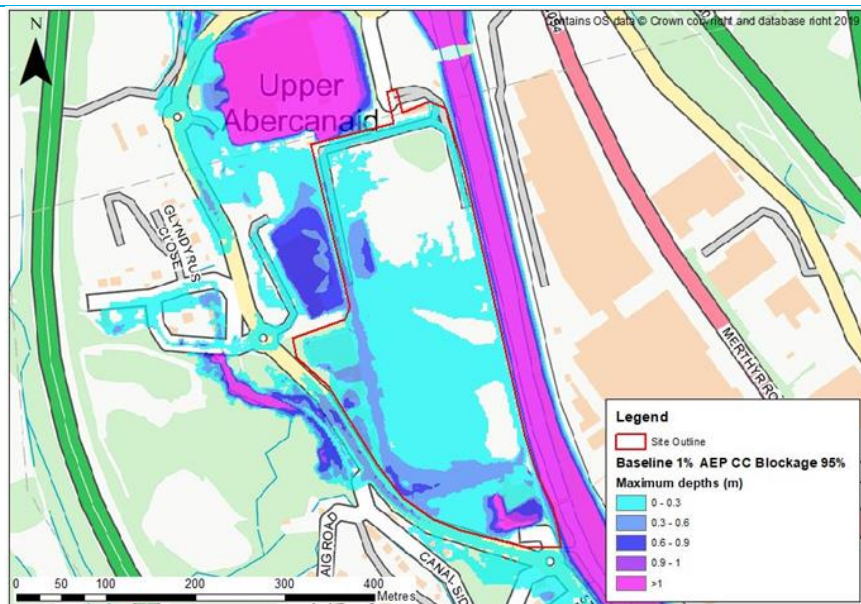
Figure 4-11: 1%+CC blockage analysis



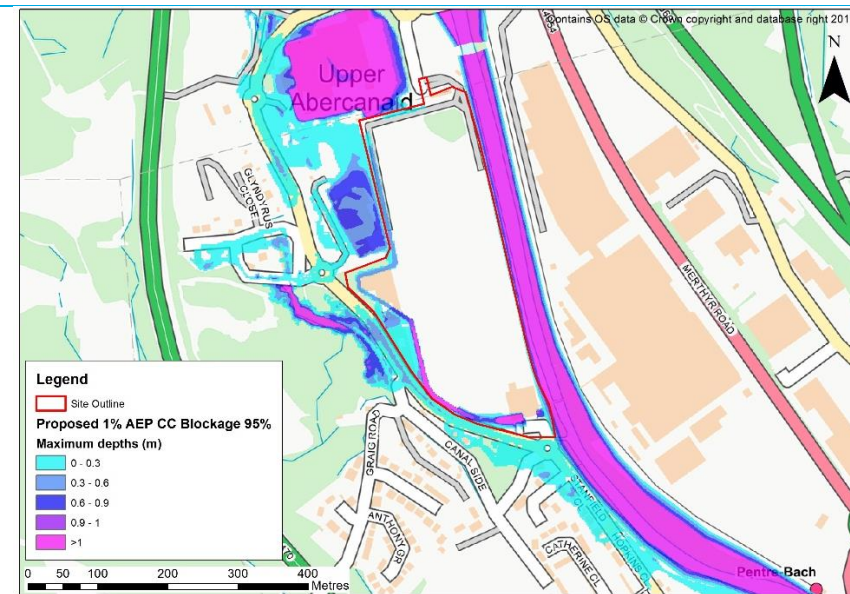
Pre-development 1%+CC AEP- 30% blockage



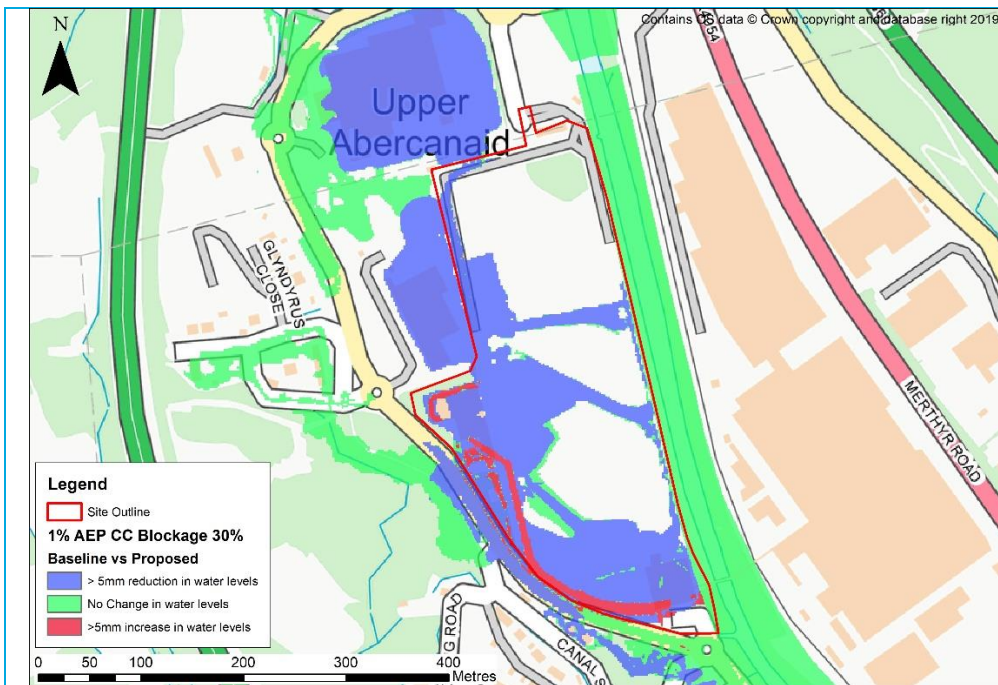
Post-development 1%+CC AEP- 30% blockage



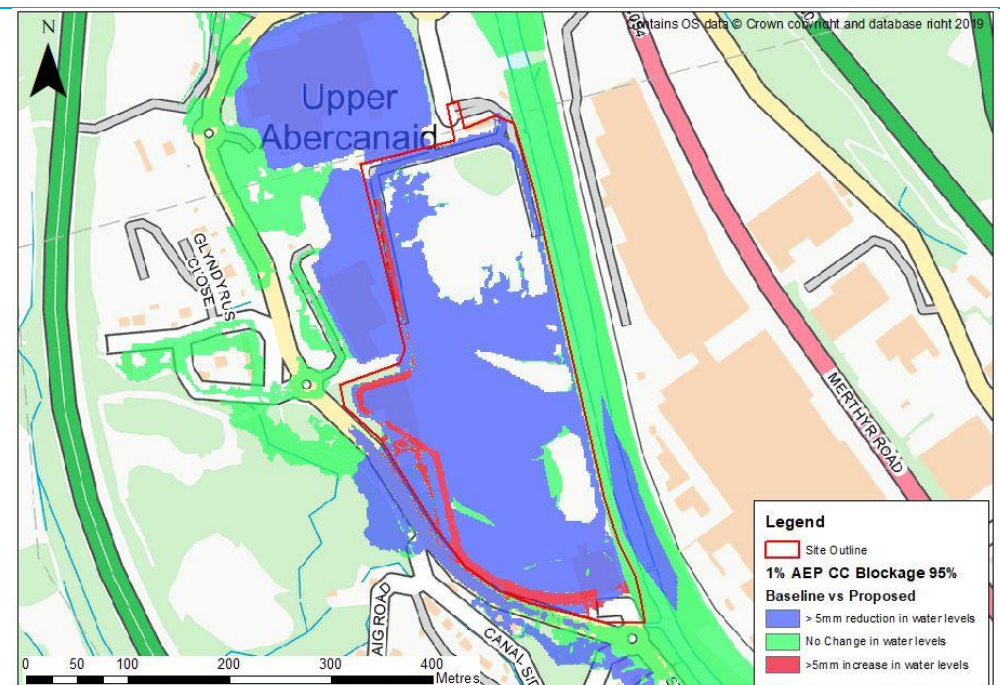
Pre-development 1%+CC AEP - 95% blockage



Post-development 1%+CC AEP - 95% blockage

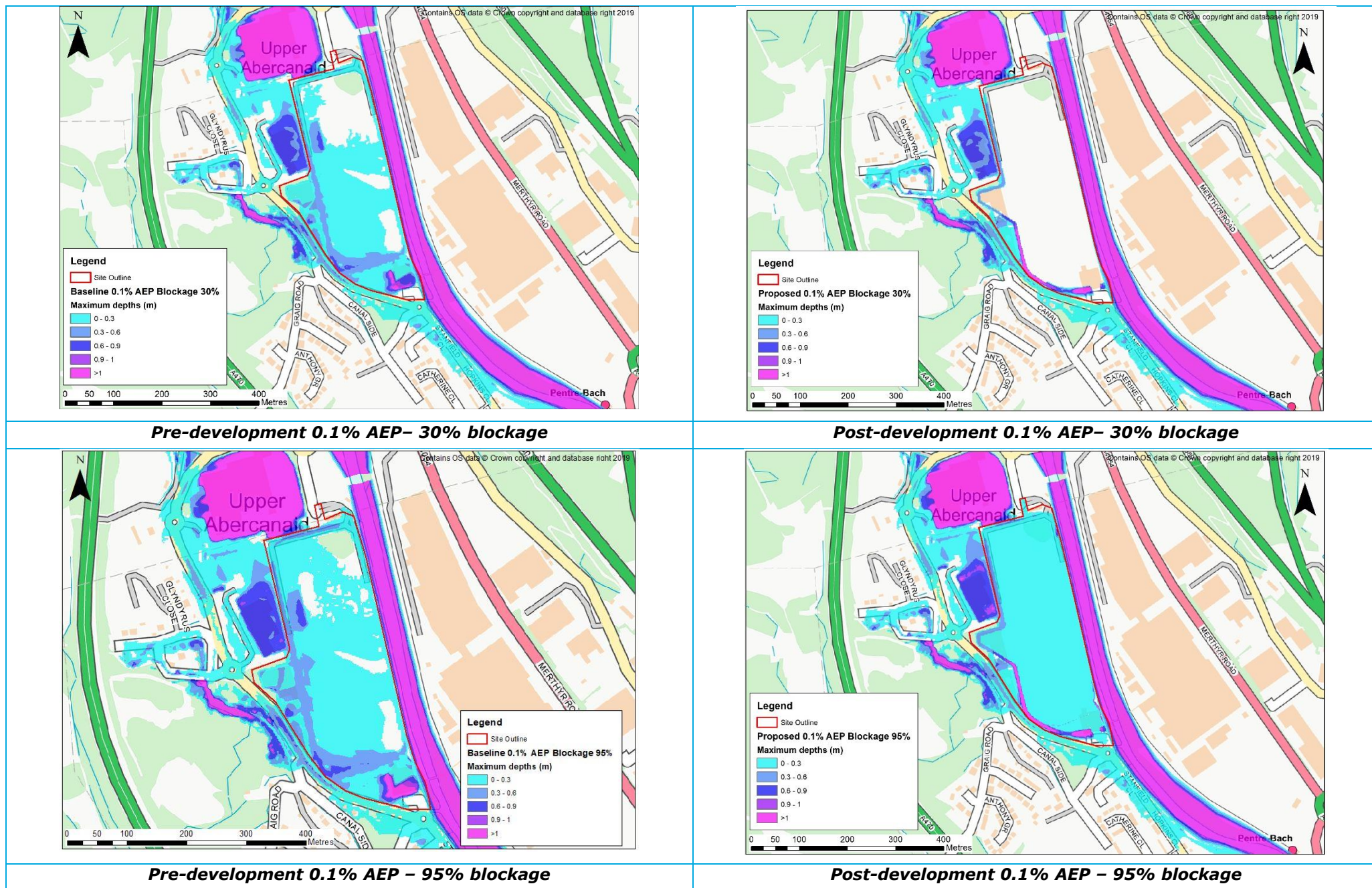


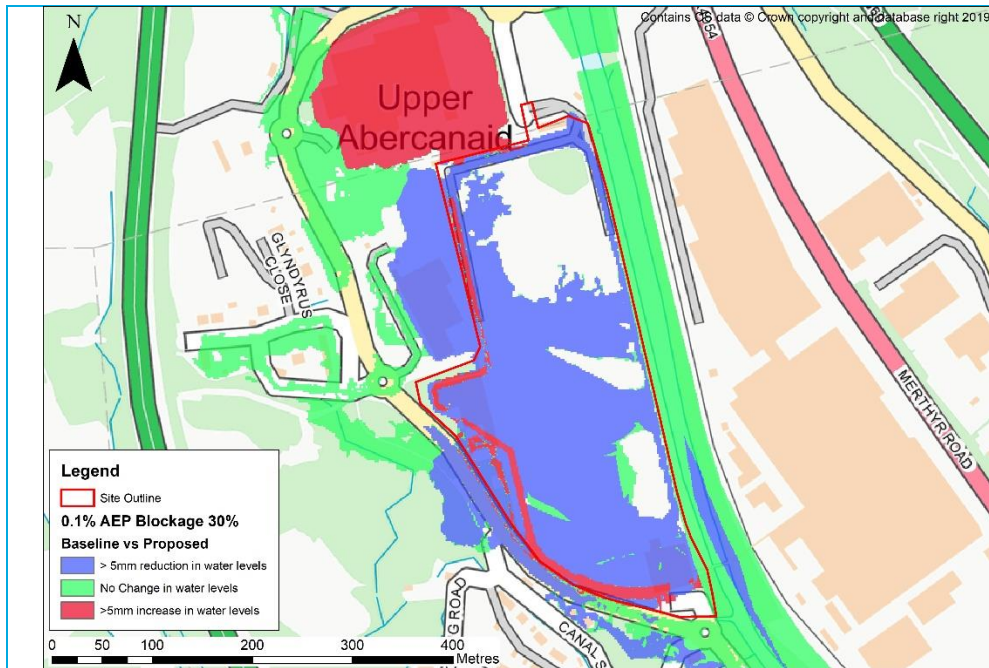
1%+CC AEP 30% blockage depth comparison



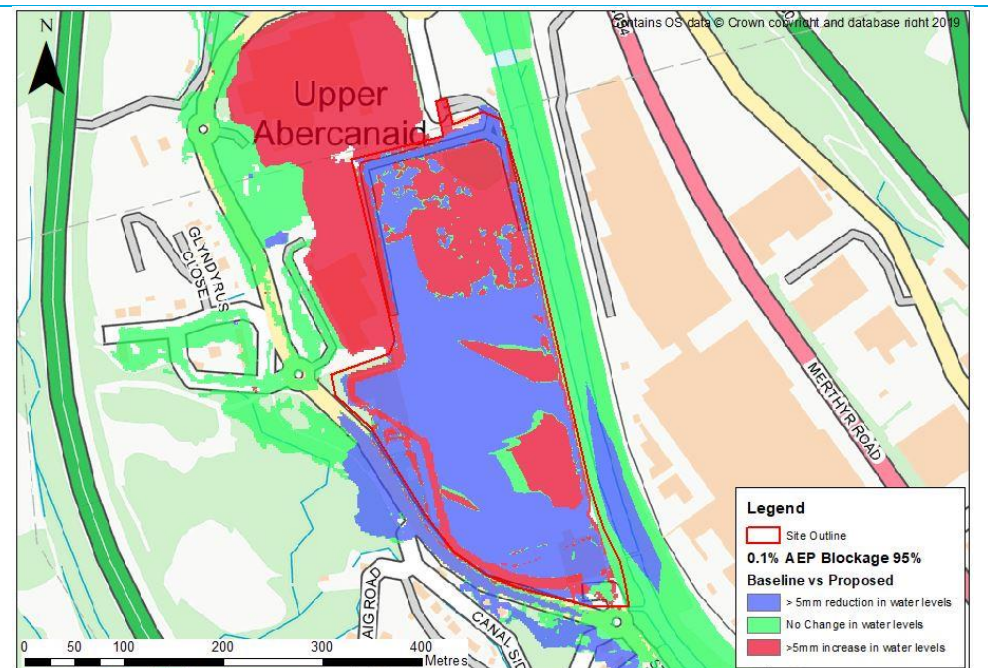
1%+CC AEP 95% blockage depth comparison

Figure 4-12: 0.1% blockage analysis





0.1% AEP 30% blockage depth comparison



0.1% AEP 95% blockage depth comparison

4.6.1 Discussion of blockage modelling results

The blockage scenario testing shows the following:

- During all 30% blockage events the site will remain flood free post-development.
- With a 95% blockage scenario, the site will remain flood free in the 1% +CC AEP event.
- In the 0.1% AEP event with 95% blockage, shallow flooding of the site may occur. Predicted flood depths on the site are <100mm with an average depth of just 50mm.
- The proposed flood alleviation scheme reduces off-site flood depth in the 1% AEP and 1% +CC AEP events, in some places by more than 100mm.
- In the 0.1% AEP event with blockage there is more variability in the changes in flood depths. Residential areas to the south of the site continue to see a reduction flood depths. However, the industrial areas to the north of the site see flood depths increase very slightly.
 - In the 30% blockage scenario depth in an area to the north of the site increase by 23mm. This area is already flooded to depths of between 1.1m and 1.75m.
 - In the 95% blockage scenario depth in an area to the north of the site increase by 58mm. Maximum flood depth in this area have now reached 2m.
 - In the 95% blockage scenario depth in an area to the north-west of the increase by upto 100mm. Maximum flood depth in this area are generally between 0.5m and 0.75m.
 - This increase in flood appears to be related to the slight raising of the site.

The result show clearly that proposed flood mitigation scheme continues to effectively management flood risk even during extreme blockage scenarios. Furthermore, the scheme delivers widespread benefits off-site in flood events up to the 1%+CC AEP event. In events greater than this, off-site benefits remain to the south of the site but there are some very marginal increases to the northwest of the site.

TAN-15 states in section 7.3 that development must have '*minimal impact of the proposed development on **flood risk generally***'. Appendix 1 of TAN-15 provides additional guidance on assessing flooding consequences. Section A1.12 states that development should result in '*no flooding elsewhere*'.

The increases in flood depths should be considered in the context of:

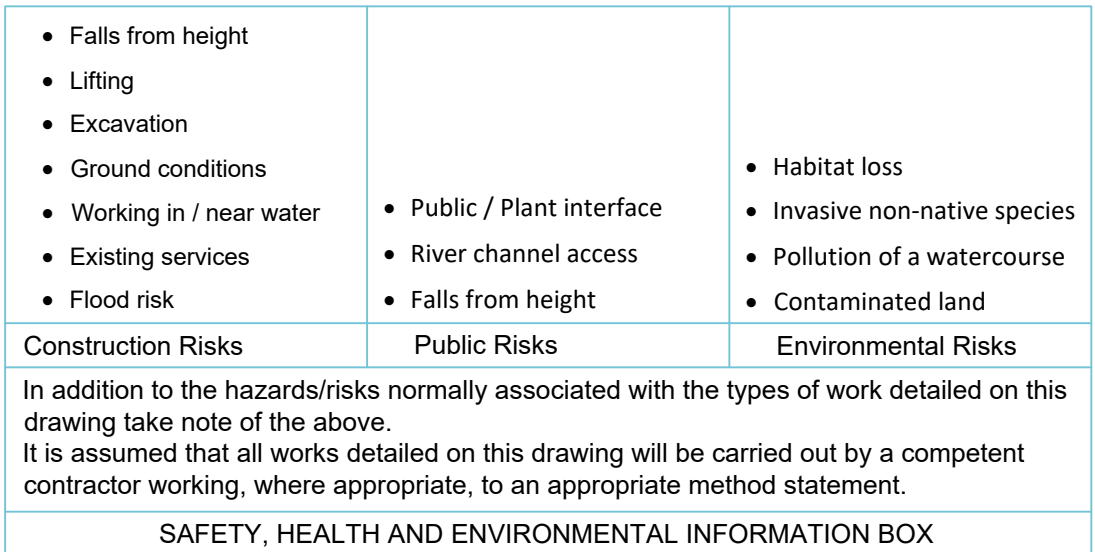
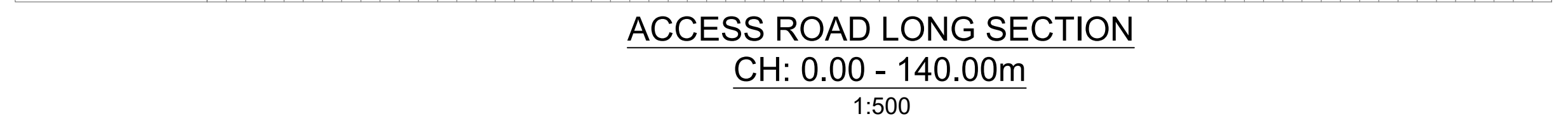
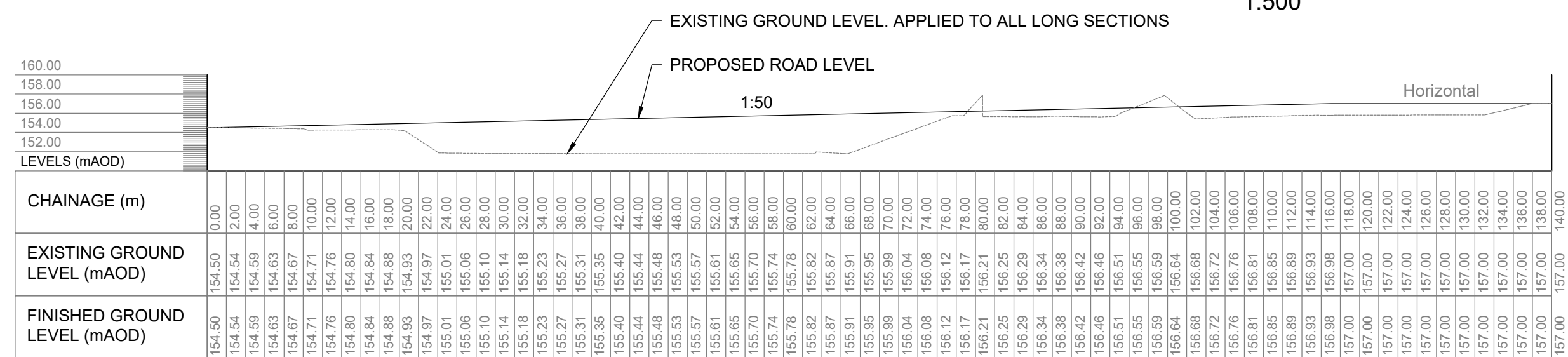
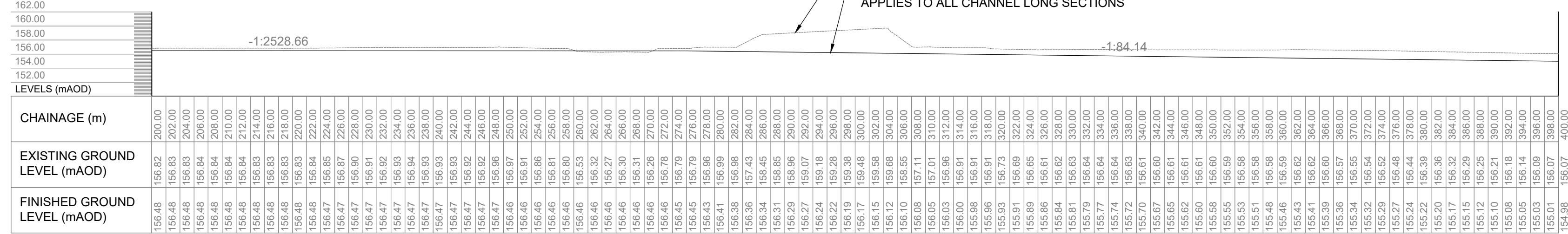
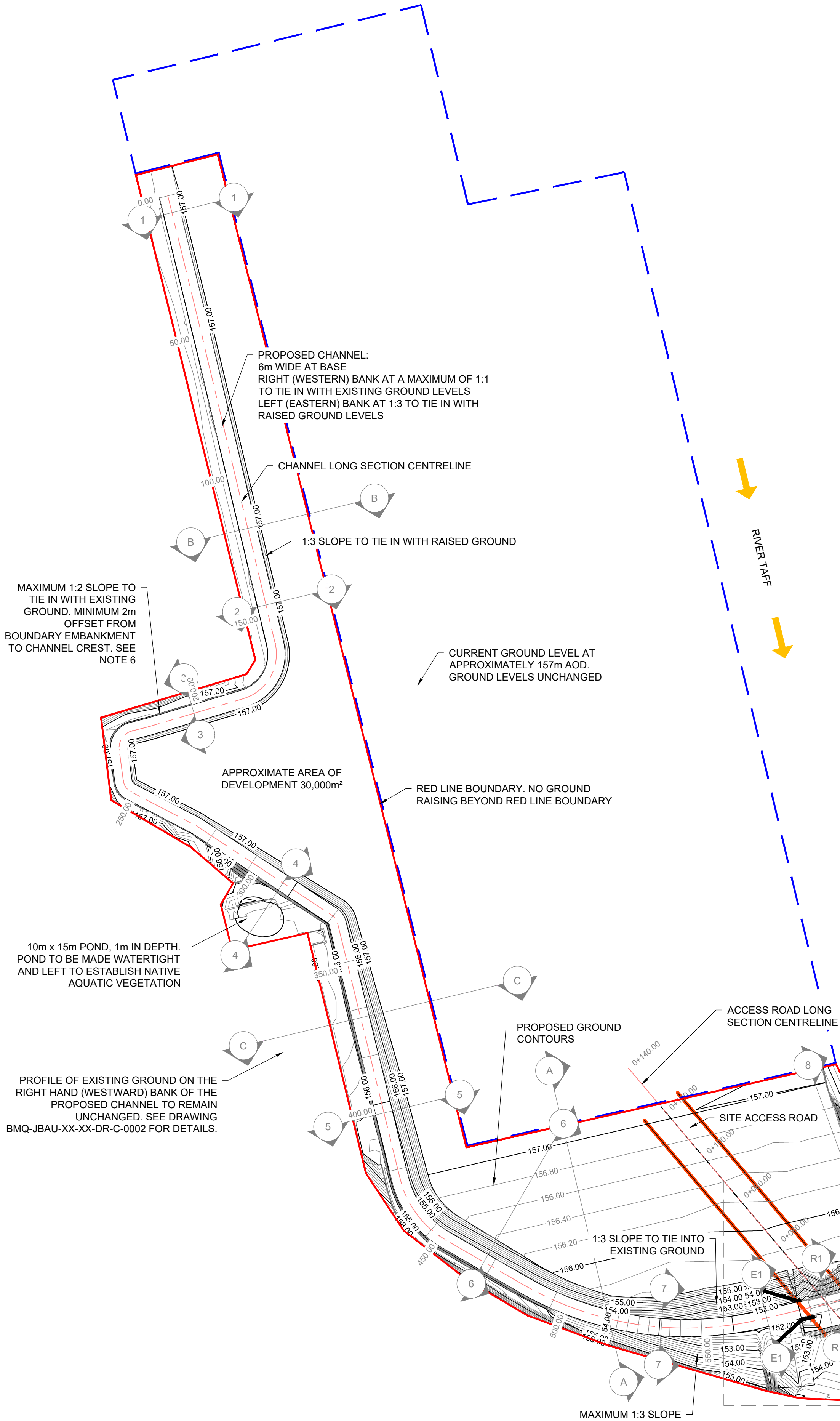
- a) The extreme nature of the event paired with an extreme blockage scenario.
- b) The very small relative increases in flood depth, do areas already experiencing significant flooding. Any increase would therefore have negligible impact.
- c) The results show that there is not increase in the extent or frequency of flooding.
- d) These areas benefit from the proposals in all less events or when blockage is not assumed. Consequently, it can safely be said that their **flood risk generally** is reduced overall.

6 Conclusions and Recommendations

- JBA Consulting were commissioned to prepare a Flood Consequence Assessment (FCA) in support of proposed engineering works as part of a flood mitigation strategy at land at Dragon Parc, Abercanaid. The proposed engineering works aim to facilitate the regeneration of the site in the future.
- The First Replacement Merthyr Tydfil Local Development Plan 2016-2031 places the Dragon Parc site within the *Hoover Strategic Regeneration Area* (Policy SW6). The Hoover Strategic Regeneration Area is a key regeneration site identified to facilitate a major mixed-use development.
- This FCA follows Welsh Government guidance on development and flood risk set out in the Technical Advice Note 15: Development and Flood Risk (TAN-15).
- The 78ha brownfield site is currently vacant, following the demolition of a former factory. Elevations across the site vary from 153m AOD to 160m AOD and generally slope down towards the south-east corner. Outside the eastern site boundary, the bank steeply drops by ~6m into the Afon Taff channel.
- The proposed site is located within Zone C2 as categorised by NRW's Development Advice Map (DAM). Zone C2 is defined as "areas of floodplain without significant flood defence infrastructure". The proposed engineering works do not fall into any of the three vulnerability categorisations outlined in TAN-15.
- TAN-15 is more commonly applied towards proposed property developments. Whereas, the aim of the proposed engineering works covered by this FCA are to provide flood mitigation to enable the site to be developed in the future. The proposed works are considered to be Water Compatible Development and as such the proposals are not subject to the application of the Justification Test but are required to meet the Acceptability Criteria contained within TAN-15.
- A review of existing flood data demonstrates that the flood risk from the Afon Taff at the Dragon Parc site is considered to be low as the site is raised well above the extreme Afon Taff flood levels.
- To the west of the site a small 'Ordinary Watercourse', the Nant Canaid, enters a culverted system which approximately follows the site's western boundary to discharge into the Afon Taff to the south of the site. When the Nant Canaid channel and culvert inlet capacity is exceeded the Dragon Parc is at risk of flooding.
- A 1D-2D model of the Nant Canaid and Afon Taff has been accepted by NRW and was used to determine the current flood risk posed by this 'Ordinary Watercourse'.
- The baseline hydraulic modelling demonstrates that when the channel and culvert capacity of the Nant Canaid is exceeded, the flood water travels across the site in a south-easterly directly, before discharging into the Afon Taff at multiple locations. Maximum modelled depths on the Dragon Parc site, in both the 1% AEP plus climate change and 0.1% AEP events, are generally <300mm.
- The proposed engineering works covered by this FCA have been designed to mitigate against the flood risk posed by the Nant Canaid. The proposed engineering works will improve the future development potential of the site.
- The proposed flood mitigation works consist of site re-profiling, the development of a dry 6m wide swale along the western boundary and a pair of new pre-cast box culverts at the southern end of the site to convey water from the swale into a new outfall structure which will discharge at a single point into the Afon Taff.
- The proposed engineering works were incorporated within the 1D-2D hydraulic model to develop a proposed model scenario.

- The model results from the proposed scenario demonstrate that the engineering works would prevent the site flooding during the 1% AEP plus climate change and 0.1% AEP events.
- TAN-15 indicates that under normal conditions the development will not have adverse impacts on third-party flood risk. A comparison of the baseline and proposed modelled results demonstrate that there are no adverse impacts on third-party flood risk as a result of the proposed engineering works. In some places, such as north and south-west of the site, a reduction in water levels are predicted.
- The existing culvert on the Nant Canaid is critical in conveying baseflows to the Taff outfall. Therefore, to understand the residual flood risks posed by the failure of this culvert, a number of blockage scenarios have been modelled. Blockages of 30% and 95% were modelled a range of events. The flood extents during the blockage scenarios do not change significantly until there is a 95% blockage on the culvert during the 0.1% AEP modelled event. During this scenario depths of <100mm would be present on the Dragon Parc site, whereas the site is modelled to be flood-free during all other residual risk simulations.
- Flood risk from groundwater, surface water, sewers and as a result of reservoir failure are considered to be low. Future development of the site should adopt a sustainable drainage strategy to manage surface water flows.
- The proposed engineering works comply with the requirements of TAN-15, do not result in adverse impacts to third-party flood risk and will enable the future development of this brownfield site identified within the LDP as an important regeneration area.

Appendix A: Proposed engineering works



Drawing to be read in conjunction with:-
 BMQ-JBAU-XX-XX-DR-C-0002-Sections
 BMQ-JBAU-XX-XX-DR-C-0003-Sections
 BMQ-JBAU-XX-XX-DR-C-0010-Road_GA
 BMQ-JBAU-XX-XX-DR-C-0011-Road_Section
 BMQ-JBAU-XX-XX-DR-C-0020-Outfall
 RMO-IRAI-XX-XX-DR-C-0021-Road and Outfall

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Project			
Land at Dragon Parc, Merthyr			
Title			
General Arrangement Plan and Long Sections			
Client _____ for _____			
Huntley Wood Investments Ltd.			
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Checked: G Baker	15/10/19	Approved: A Tyndel	17/10/19
Project Reference: 2019s0875		Scale: As Shown @ A1	
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