

5 Strategic Site Analysis⁵

5.1 Site 1: Former Maerdy Colliery, Rhondda Fach

5.1.1 Site Description

The former Maerdy Colliery site is located in the upper reaches of the Rhondda Fach catchment (Figure 5-1) immediately below Castell Nos Reservoir (Plate 5-1). The site covers an area of approximately 68 ha and was operated as a colliery from 1875 until 1985.

The Rhondda Fach Valley has not been subject to glacial erosion. The valley has steep sides and the associated floodplain therefore contained in extent. The Rhondda Fach River denotes the site's eastern boundary. Due to the areas industrial legacy sections of the watercourse and the surrounding land have been heavily engineered. The watercourse flows in a partially concrete lined channel through the northern section of the site. There are also a number of minor watercourses and artificial ditches that cross the site, in both open and culverted channels.

Plate 5-1: Viewed south-west from Castell Nos Reservoir across the former Maerdy Colliery Strategic Development Site.



5.1.2 Proposed Development

The proposed redevelopment will focus on employment led, mixed use development, with medium and small light industrial units. As a gateway to the valley and its reservoirs, it is envisaged the site will also have an outdoor recreation focus, with a visitor's centre type structure. Rhondda Cynon Taf CBC have stated that redevelopment on this site must be aimed at re-establishing the natural environment, provide benefits for the community and specifically provide a high quality, low carbon environment.

5.1.3 Flooding History

From discussions with the Environment Agency and the Local Authority Drainage Engineers and from undertaking the research associated with this SFCA there is no known fluvial flooding history at the Former Maerdy Colliery Site.

5.1.4 Fluvial Flood Risk

Fluvial erosion in the Rhondda Fach valley has created a "V" shaped valley with a narrow floodplain. This is highlighted by the narrow Flood Zones on both WAG and the Environment Agency Flood Maps (Figure 5-2 and Figure 5-3). No detailed hydraulic modelling exists for this site however using GIS mapping techniques, as detailed in Section 2, it has been calculated that greater than 97% of the site lies outside the areas highlighted as being at risk of flooding from the Rhondda Fach River (Figure 5-4).

Detailed assessment of the location and the risk from the minor watercourses has not been undertaken as it is not within the scope of the SFCA. This risk would need to be further assessed in a site specific FCA or as a part of a surface water management scheme.

5.1.5 Groundwater Flood Risk

No groundwater flooding risks have been highlighted at this site during the compilation of this report.

5.1.6 Overland Flow

Due to the steep sided valley and shallow soils, the underlying bedrock is near the surface. This typically results in a flashy stream response to rainfall events. Peak flow occurs soon after rainfall events can therefore be predicted. Rapid overland flow has also been known to cause flooding, for example at Rhydyfelin in 1998¹. However, no flood events attributed to surface water have been recorded at this site.

In addition there is an existing surface water management system on site from previous coaling mining operations, which includes man made concrete channels and earth ditches. During the site visit it was observed that the channels and ditches have fallen into a state of disrepair (Plate 5-2). The current lack of maintenance may increase the potential flood risk.

⁵ Whilst it is recognised that there elements of repetition within this section, the formatting and structure has been set up to allow the reader to have a complete summary of each of the nine study areas independently of each other.

Plate 5-2: Illustration of a blocked entrance (outlined in red) to a surface water culvert at the former Maerdy Colliery.



It is envisaged that on site storage of surface water will be required due to the inadequate capacity of the receiving watercourses. A study will need to be undertaken to ascertain the required "Greenfield run-off" from the development site and to establish the storage requirements, which must also be agreed with the Local Planning Authority and the appropriate adopting body.

5.1.7 Sewers

Due to the sites location at the very top of the catchment, above all other development, there is unlikely to be sewer infrastructure present. Therefore the flood risk from these sources is estimated to be low. This will need to be clarified with DCWW during the undertaking of a surface water management plan or a site specific FCA.

5.1.8 Artificial Sources

Immediately upstream of the former Maerdy Colliery Site is Castell Nos Reservoir. Construction work began on the reservoir in 1881 which has a capacity of 91,000m³ over an area of 275 ha and is on average 11.5m deep.

In 1969, flooding disaster was narrowly avoided when the dam wall subsided into a large hole that appeared just above the water line. Local police evacuated residents from Station Terrace and Oxford Street, Maerdy, and throughout the Rhondda Fach valley. The reservoir was drained and the necessary repairs made. In order to protect the dam against mining subsidence, coal was not extracted from beneath the dam post this event. However, coal has been worked under part of the reservoir and the effects of mining subsidence have been seen.

Plate 5-3 : Castell Nos Reservoir



Today the reservoir is owned and operated by Dwr Cymru Welsh Water (DCWW). They have an annual maintenance and inspection regime which the Environment Agency has the duty to regulate. There are no known issues with the reservoir or its inspection or maintenance programme.

Utilising GIS and DTM the flood risk afforded from the failure of the dam has been estimated. The peak water level, derived from the top of the dam wall, has been extrapolated down through the site and the flood risk area highlighted graphically (Figure 5-5). This method of calculating flood risk is in keeping with the precautionary approach of TAN15. However it does not evaluate the flow or depth of water as it flows through the site. It can be estimated that velocities and flood depths would be in excess of the policy requirements.

In the future DCWW will have to prepare reservoir flood plans (as detailed in Section 3.2). These will include inundation analysis to identify the extent and severity of flooding which could result from an uncontrolled release of water, and are expected to become a legal requirement in spring 2009.

5.1.9 TAN15 Constraints

Recognising that highly vulnerable development should not be permitted in zone C2, all other new development should only be permitted in zone C if it can be justified by the LPA. As part of this justification, the development should be proven to: be flood free in the 1% (plus climate change) flood event (A1.14, TAN15); have acceptable consequences of flooding in the extreme 0.1% flood event (A1.15, TAN15); and not cause flooding elsewhere (A1.12, TAN15).

With regards to the former Maerdy Colliery, the floodplain is so narrow that the above mentioned constraints are unlikely to affect the development potential of the site. However, the current access road through the site is located within the 1 in 100 year floodplain extent (Flood Zone 3) (Figure 5-3) contrary to the guidance laid out in TAN15. We would therefore recommend that any new development would need to include an additional access road outside the extreme flood outline to comply with the policy requirement.

5.1.10 Flood Risk Summary

The former Maerdy Colliery is located in the upper reaches of the Rhondda Fach catchment. The valley is “V” shaped with its associated floodplain, even in the extreme 1 in 1000 year return period flood event, being confined to a narrow strip of the site in the valley bottom. Therefore GIS calculations have concluded that 97.6% (66.4 ha) of the site is outside the 1 in 1000 year return period flood outline and could accommodate either lower or highly vulnerable development under the guidance laid out in TAN15 (Table 5-1).

However, the current access road through the site is located within the 1 in 100 year floodplain extent (Flood Zone 3) contrary to the guidance laid out in TAN15 (Figure 5-3). We would therefore recommend that any new development would need to include an additional access road outside the extreme flood outline to comply with the policy requirement.

Detailed assessment of the location and the risk from the ordinary watercourses and surface water ditches that traverse the site (both in open and culverted channels) has not been undertaken. Broad scale assessment of the topography, geology and maintenance regime of existing surface water watercourses has identified that there is a potential flood risk. This would need to be further assessed in a site specific FCA or as a part of the surface water management scheme.

In addition, from the information received on other forms of flood risk it is estimated that there is little flood risk associated with the sewer and groundwater. The risk of flooding from the reservoir is also regarded as low based on DCWW inspection and maintenance regime for the structure. Flood depth analysis was not possible at this site as the Environment Agency hydraulic modelling does not extend to the non main river stretches of the Rhondda Fach at the top of the catchment. Due to the steep “V” shaped valley flood depth analysis would have been of limited benefit as the topography of the land meant that the flood extent would be similar for various return periods.

as minor water features or isolated areas of raised ground). However, precise developable land available for each site should be confirmed in a detailed FCA as mitigation measures may also increase this area.

Table 5-1: Former Maerdy Colliery Constraints Table

Former Maerdy Colliery Site	Area (Hectares)	Percentage of the Site
Total Area	68	100
Flood Zone C2	1.6	2.5
Total Flood Zone 3	1.6	2.5
Potential Highly Vulnerable Development	66.4*	97.8*
Potential Lower Vulnerability Development	66.4*	97.6*

** For the purpose of this report the “developable area” quoted is an approximation of the land that is identified outside the flood zones where policy will permit a development type. The actual area of developable land may be different from the figure quoted due to site specific constraints (such*

Figure 5-1: Former Maerdy Colliery Site – Site Overview

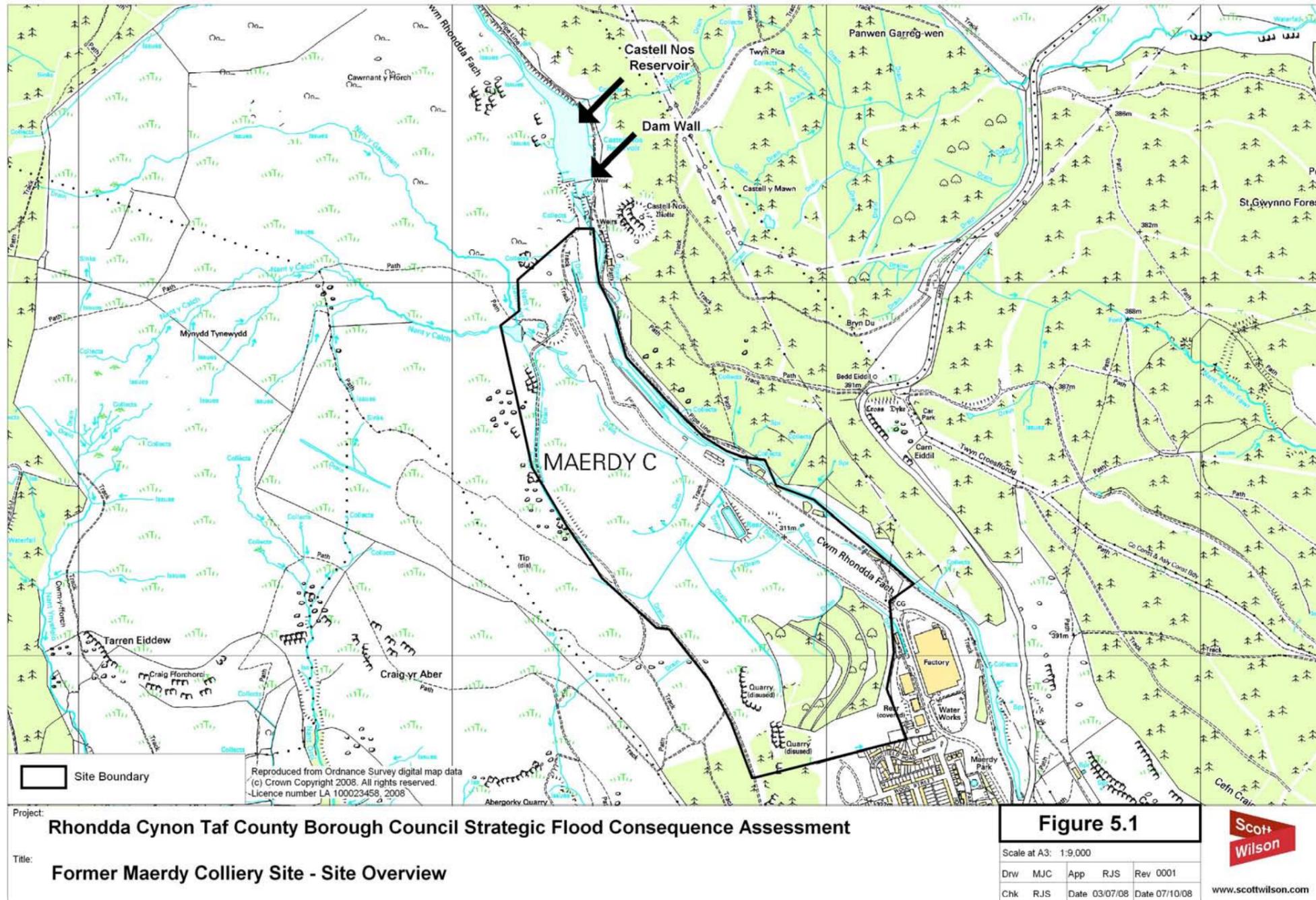


Figure 5-2: Former Maerdy Colliery - WAG DAM

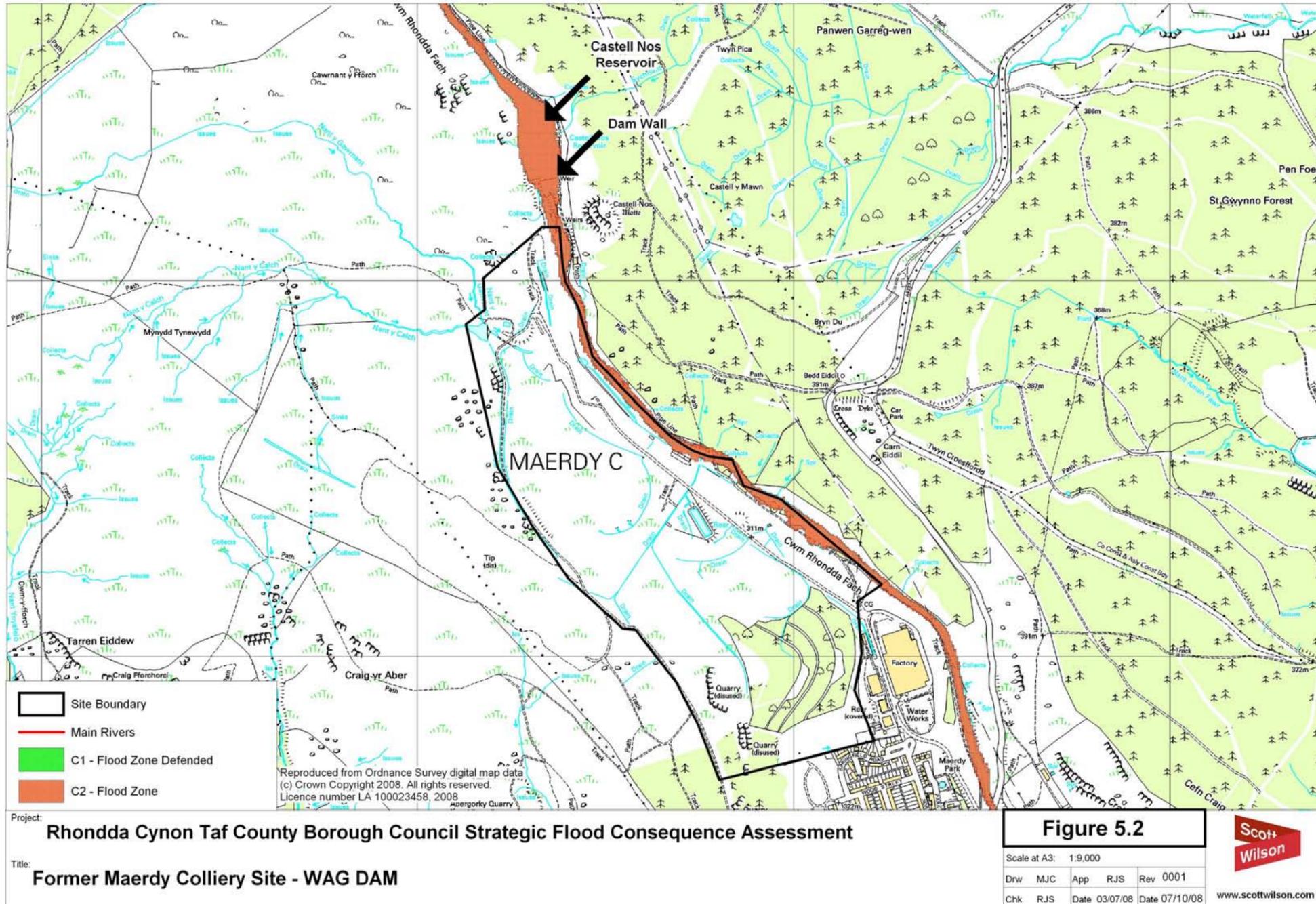


Figure 5-3: Former Maerdy Colliery Site - the Environment Agency Flood Zones 2 and 3

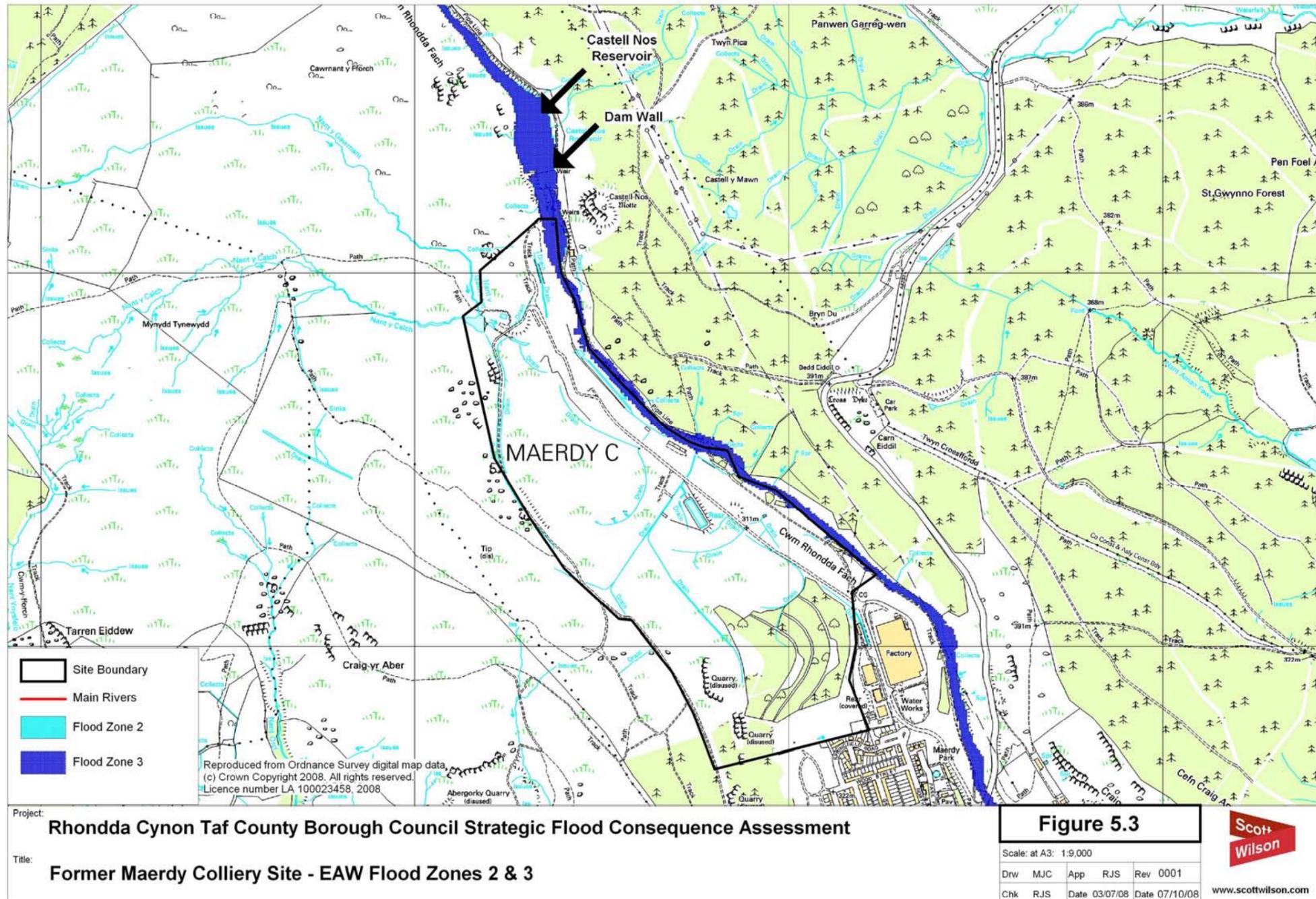


Figure 5-4: Former Maerdy Colliery Site – the Environment Agency Flood Zone 3 and WAG Flood Zone C2

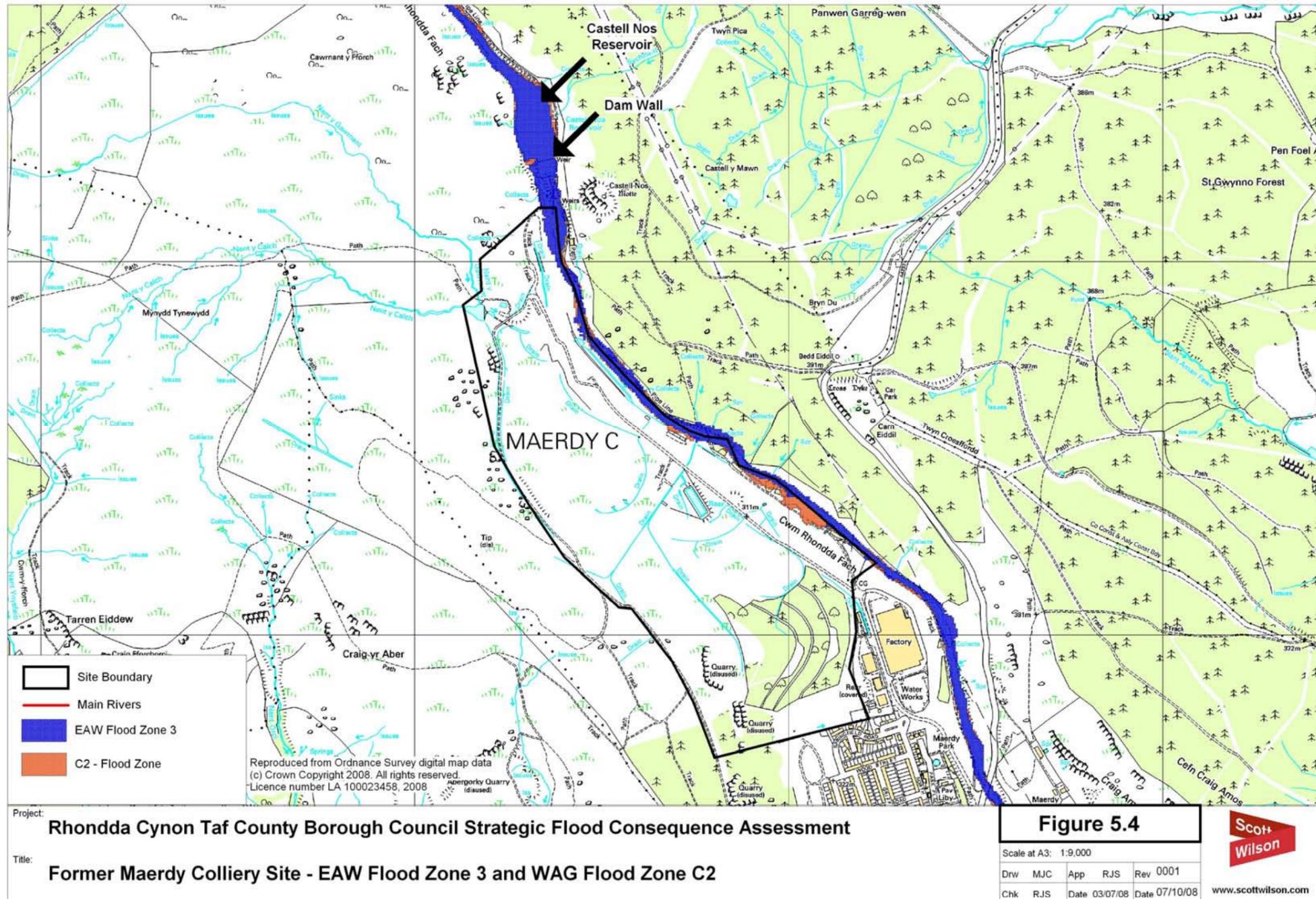
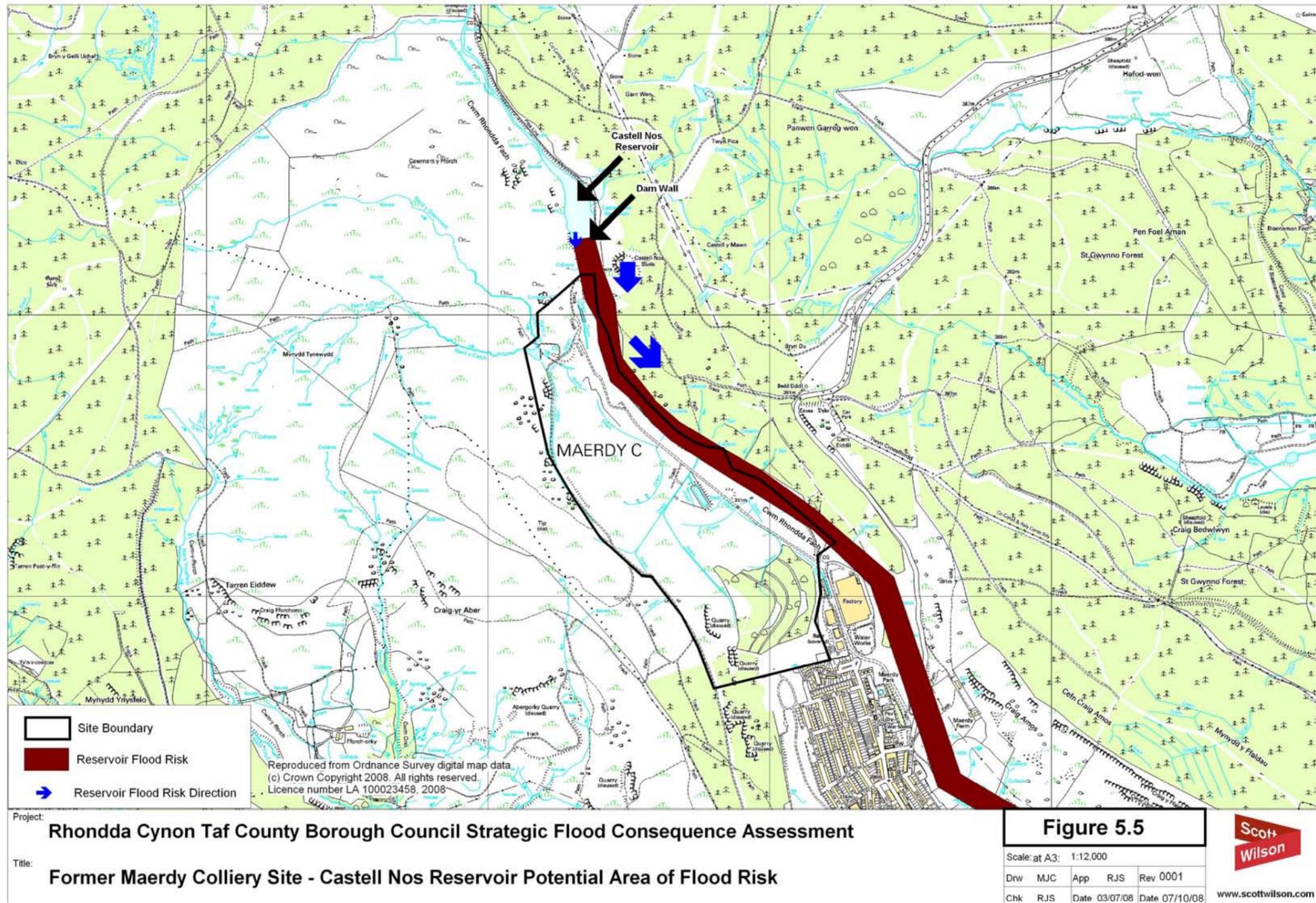


Figure 5-5: Castell Nos Reservoir Potential Area of Flood Risk



5.2 Site 2: Former Fernhill Colliery, Blaenrhondda

5.2.1 Site Description

The former Fernhill Colliery is located in the headwaters of the Rhondda Fawr Valley to the north of Blaenrhondda. The site covers an area approximately 45 ha and was operated as a colliery from 1869 to 1978.

Post closure the River Rhondda flows in a deep channel through the site and is culverted for part of its length through the centre of the site. Due to the sites location at the top of the Rhondda Fawr catchment, there are numerous minor tributaries that flow from the valley sides through the site to the Rhondda Fawr River. The site has undergone some minor restoration resulting in steeply sloping spoil tips and three distinct artificial plateaus (illustrated in Plate 5-4). The Rhondda Fawr valley has been subject to glacial erosion, however the valley is incised and the associated floodplain very narrow. This can, in part, be attributed to the sites location in the headwaters of the catchment. In addition, historic mining activities at Fernhill Colliery have influenced the river channel morphology. This is evident by the narrow floodplain of the culvert within the site.

Plate 5-4: View looking south across the former Fernhill Colliery site within the Rhondda Fawr Valley. The Rhondda Fawr River is culverted beneath the spoil tip in the foreground before emerging and flowing in a deep channel through the south of the site.



5.2.2 Proposed Development

The redevelopment aspirations at this site are to provide benefits for the wider community through re-establishing the natural environment and creating a distinctive and high quality place to live. It is proposed that development will be a residential led, mixed use development including small offices, a food store, a public house and potentially a library or medical centre.

5.2.3 Flooding History

There is no known flooding history at this site and no recorded flood incidents. The colliery has been closed since 1978 and any flooding at the site is unlikely to have been witnessed or of concern due to its location with respect to existing development.

5.2.4 Fluvial Flood Risk

The Rhondda Fawr valley is incised and the associated floodplain very narrow. This can, in part, be attributed to the site location in the headwaters of the catchment. In addition, the historic mining activity at the former Fernhill Colliery has influenced the river channel morphology and is highlighted by the narrow Flood Zone downstream of the culvert within the site (Figure 5-7 and Figure 5-8). The Environment Agency's hydraulic modelling for this catchment does not extend up to the former Fernhill Colliery site. Analysis using GIS techniques, as detailed in Section 2, has calculated that greater than 90% of the site lies outside the area highlighted as being at risk of flooding from the Rhondda Fawr River.

However, the Rhondda Fawr River is partially culverted beneath the site. Above the culverted section of watercourse, both the Environment Agency Flood Maps and WAG DAM maps (Figure 5-7 and Figure 5-8) highlighted the area as being at risk of flooding.

Rhondda Cynon Taf drainage engineers provided a copy of a 1989 Halcrow report which evaluated the condition of the three major culverts beneath the site. From this report we were able to extract data that highlighted that the invert of the northern most culvert beneath the site was of concrete arch construction some 3m in width, 2.5m in height and fell from an elevation of 278m AOD (metres Above Ordnance Datum) to 262m AOD over a distance of 282m.

Information provided by the Environment Agency indicates that during a flood event with a 1 in 1000 year return period flows in the River Rhondda Fawr will be 62m³/s (cumecs) and during a flood event with a 1 in 100 year return period flows would be 31m³/s.

Utilising culvert design software it has been concluded that the culvert can convey the 62m³/s (the flow in a flood event with a 1 in 1000 year return period) with approximately 1m free board to the soffit, which would mitigate against blockage scenarios.

The Halcrow report also identified that there were 6 minor branch culverts that were not surveyed and that the Nant Y Bwlch culvert was in a dangerous condition. It was concluded that the Nant Y Bwlch culvert was beyond repair and would require demolition. As part of a detailed FCA, the impact of flow from these should be considered in terms of the receiving capacity of the Rhondda Fawr river culvert capacities.

5.2.5 Groundwater Flood Risk

No records of groundwater flooding have been identified at the former Fernhill Colliery. However during the presentation of the draft report it was highlighted that there are issues with groundwater within the tips at the site. While these concerns are primarily linked to tip stability and not flooding it is recommended that any site specific FCA ensures that this is thoroughly evaluated.

5.2.6 Overland Flow

Due to the location of the former Fernhill Colliery in the headwaters of the Rhondda Fawr valley and the associated spoil tips created through historic mining, the valley and spoil tip sides are very steep. In areas where there is no spoil, the valley sides are predominately bedrock. This typically results in a flashy stream response to rainfall events with relatively quick time to peak flows. No flood events attributed to surface water have been recorded at this site.

It is envisaged that on site storage of surface water will be required due to the inadequate capacity of the receiving watercourses. A study will need to be undertaken to ascertain the required "Greenfield run-off" from the development site and to establish the storage requirements, which must also be agreed with the Local Planning Authority and the appropriate adopting body.

5.2.7 Sewers

Due to the sites location at the very top of the catchment above all other development there is unlikely to be sewer infrastructure present. This will need to be clarified with DCWW during the undertaking of a surface water management plan or a site specific FCA.

5.2.8 Artificial Sources

No flood risk from any artificial sources has been identified as potentially impacting on the proposed development site.

5.2.9 TAN15 Constraints

Recognising that highly vulnerable development should not be permitted in zone C2, all other new development should only be permitted in zone C if it can be justified by the LPA. As part of this justification, the development should be proven to: be flood free in the 1% (plus climate change) flood event (A1.14, TAN15); have acceptable consequences of flooding in the extreme 0.1% flood event (A1.15, TAN15); and not cause flooding elsewhere (A1.12, TAN15).

5.2.10 Flood Risk Summary

The former Fernhill Colliery is located in the upper reaches of the Rhondda Fawr catchment. The site has undergone some minor restoration resulting in steeply sloping spoil tips and three distinct artificial plateaus (Plate 5-4).

While the current Environment Agency flood maps and DAM maps highlighted a section of the site above the culvert as at risk of flooding the modelling methodology for the Environment Agency generalised flood risk model does not factor in the culvert. Instead, for the purpose of identifying the area potentially at risk of flooding certain assumptions would have been made on flows, depths and topography.

However, based on the current the Environment Agency flow calculations and the records from Halcrow's culvert survey we have been able to demonstrate that the culverts on site can take the 1 in 1000 year flood flow with freeboard for potential blockage scenarios.

As such we would therefore suggest that the flood maps are inaccurate in highlighting that the area above the culvert is at risk of flooding. As such the majority of the 45ha of the site is developable within the guidance laid out in TAN15.

Flood depth analysis was not possible at this site as the Environment Agency hydraulic modelling does not extend to the non main river stretches of the Rhondda Fawr river however the potential developable area for the site is highlighted in Table 5-2.

Table 5-2: Former Fernhill Colliery Constraints Table

Former Fernhill Colliery Site	Area (Hectares)	Percentage of the Site
Total Area	46	100
Flood Zone C2	4	9
Total Flood Zone 3	3.7	8
Potential Highly Vulnerable Development	45*	98*
Potential Lower Vulnerability Development	45*	98*

** For the purpose of this report the "developable area" quoted is an approximation of the land that is identified outside the flood zones where policy will permit a development type. The actual area of developable land may be different from the figure quoted due to site specific constraints (such as minor water features or isolated areas of raised ground). However, precise developable land available for each site should be confirmed in a detailed FCA as mitigation measures may also increase this area.*

There is a further flood risk from the ordinary watercourses and surface water ditches that traverse the site (both in open and culverted channels). At a strategic level, detailed assessment of the location and risk from these other watercourses and surface water features has not been undertaken as a part of this SFCA. These risks should be explored further, and management systems designed accordingly, during the pre-planning surface water management scheme design phase pre-planning. The Halcrow report on the culverts beneath the site has highlighted that the Nant Y Bwlch culvert requires demolition and that there 6 minor branch culverts beneath the site. In addition, based on available data, the flood risk from the sewer and groundwater is believed to be low.

It is current Environment Agency practice not to permit development above a culverted watercourse. This is to safe guard against riparian ownership and the future complications that occur when owners are not aware of their responsibilities and are not adequately insured. Additionally, this practice ensures that the culvert can be accessed for the purpose of maintenance in perpetuity. The Environment Agency would normally impose these restrictions through the planning consultation process and through the flood defence consenting process. However the culverted section of the Rhondda Fawr is classified as an "ordinary watercourse" which are consented under the Land Drainage Act 1991. This Act states that works are only consentable if they affect flow and therefore no Flood Defence Consent would be required from the Environment Agency to develop above the culvert. This limits the powers that the Environment Agency have to enforce their requirements. Should the Environment Agency request a development free zone for the above mentioned purposes then this area could still be used as an amenity feature such as a park or a public open space. While this requirement is not a barrier to development it is a key consideration.

Figure 5-6: Former Fernhill Colliery Site – Site Overview

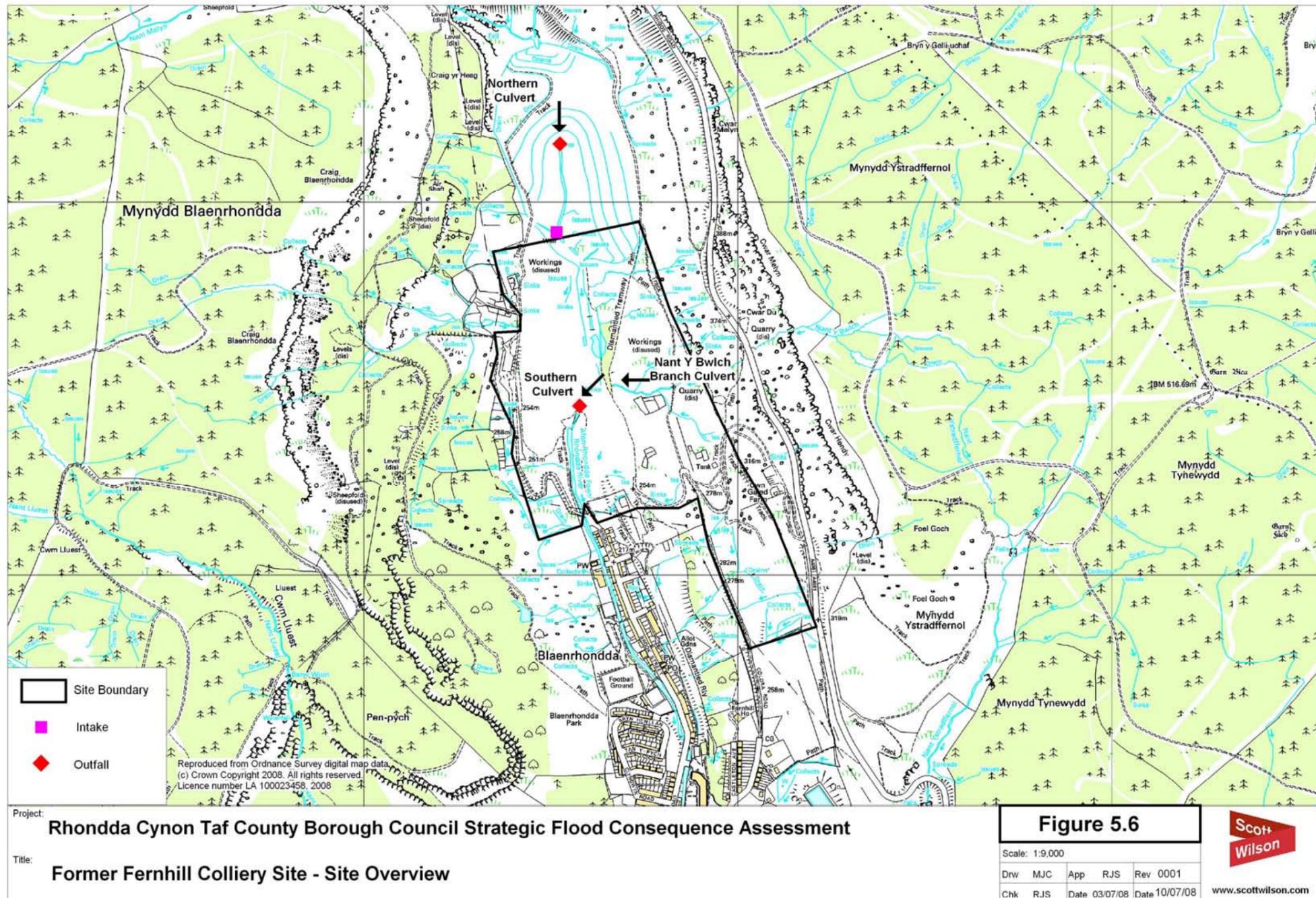
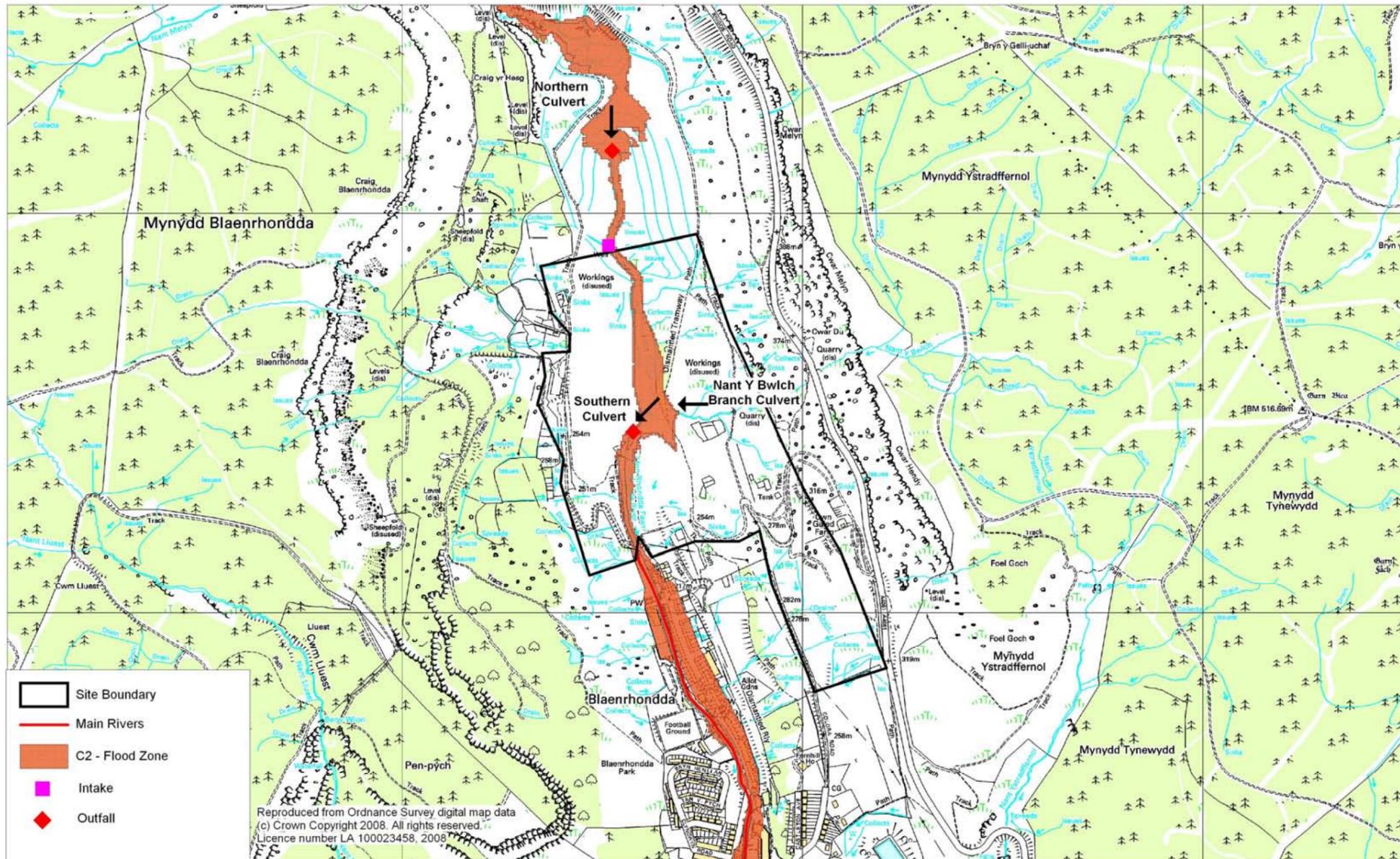


Figure 5-7: Former Fernhill Colliery Site - WAG DAM



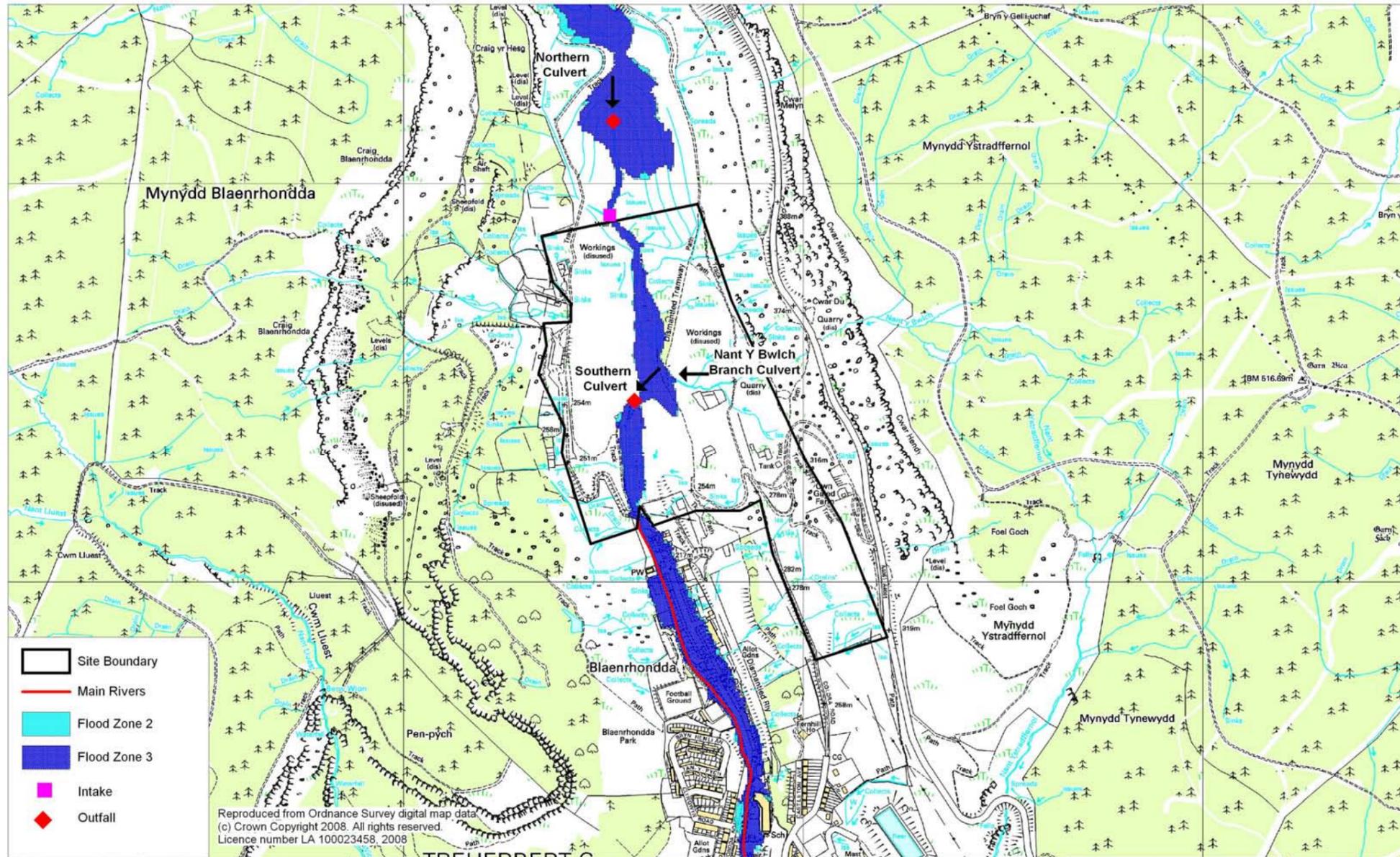
Project: **Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment**
Title: **Former Fernhill Colliery Site - WAG DAM**

Figure 5.7
Scale at A3: 1:9,000

Drw	MJC	App	RJS	Rev	0001
Chk	RJS	Date	03/07/08	Date	07/10/08

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Figure 5-8: Former Fernhill Colliery Site - the Environment Agency Flood Zone 2 and 3



Project: Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment
Title: Former Fernhill Colliery Site - EAW Flood Zones 2 & 3

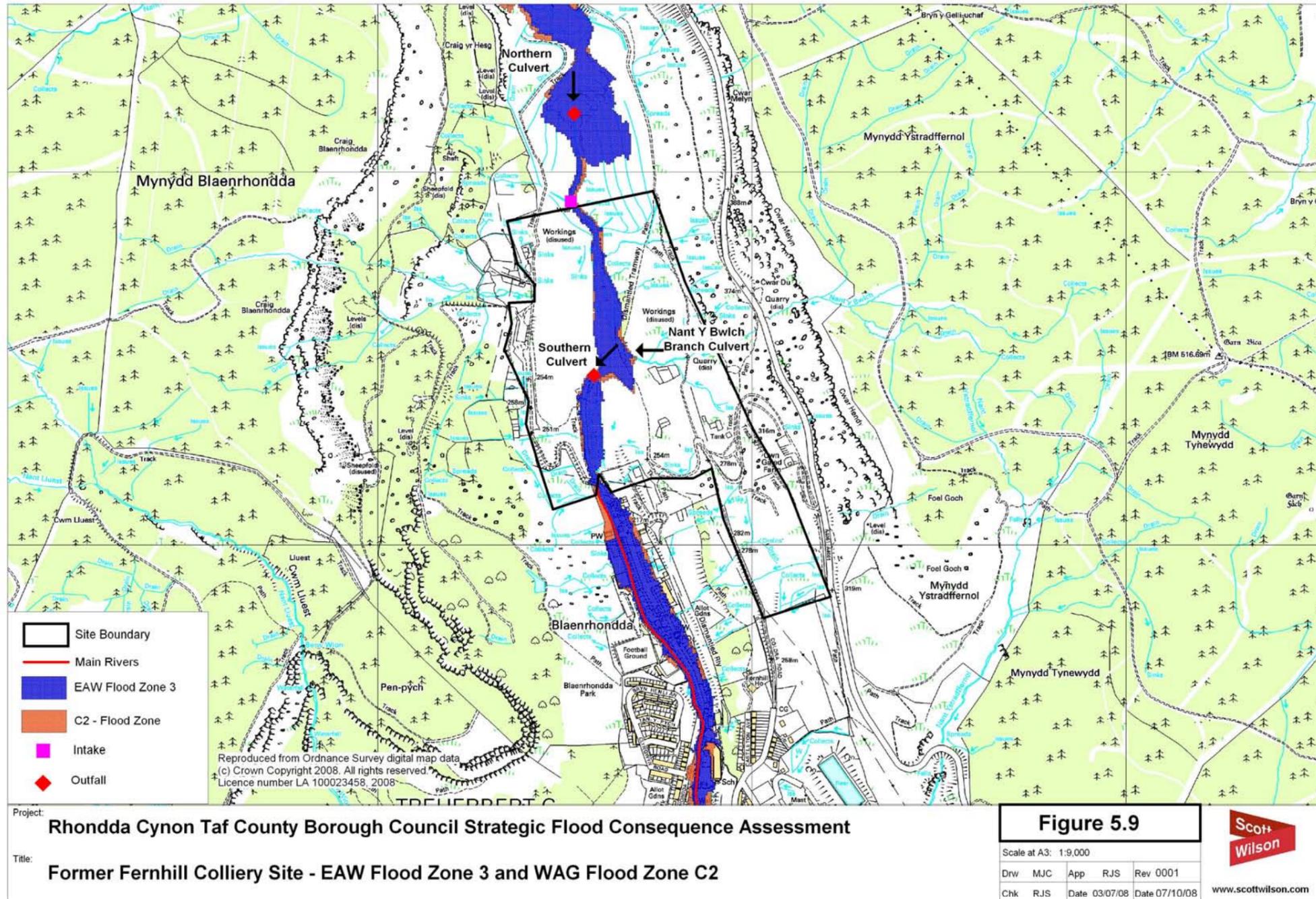
Figure 5.8

Scale at A3: 1:9,000

Drw	MJC	App	RJS	Rev	0001
Chk	RJS	Date	03/07/08	Date	07/10/08

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Figure 5-9: Former Fernhill Colliery Site - the Environment Agency Flood Zone 3 and WAG Flood Zone C2



5.3 Site 3: Former Phurnacite Plant, Abercwmboi, Cynon Valley

5.3.1 Site Description

The former Phurnacite Plant site covers an area approximately 60 ha of land in the middle reaches of the Cynon catchment just north of the town of Mountain Ash. The plant opened in 1939 and produced briquettes from waste steam coal that was too small to sell. The site employed over 1000 people but closed in the late 1980's when permission for a new plant was denied.

The site lies in the base of the Cynon Valley that has been subject to past glaciation with the River Cynon flowing through the site. The majority of the proposed development site is located to the west of the river (on its right bank). The Cardiff to Aberdare valley railway line bisects the site north to south adjacent to the right bank of the River Cynon.

The site comprises of rough grassland and large areas of concrete hard standing (Plate 5-5) which remain from when the plant was operational. In addition there are three large lakes which from part of the previous surface water management system (Figure 5-10).

Plate 5-5: Looking west across the former Phurnacite Plant site to the village of Abercwmboi.



5.3.2 Proposed Development

The aim of development at the site will be to retain the existing lakes and re-establish the natural environment to provide wider benefit to the community in the form of new sports pitches and green space and employment development. In addition, medium density residential development and a school are also proposed for the site.

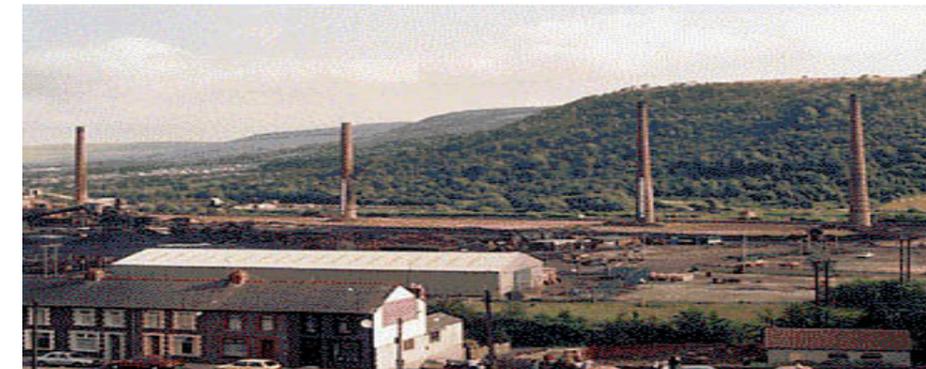
5.3.3 Flooding History

Throughout South Wales the flooding of December 1979 is regarded as the most notable and widespread in living memory. The Environment Agency have provided a GIS layer showing the

extent of the flood event which illustrates that approximately 100% of the site (60 ha) was affected (Figure 5-11). However, no records of this specific site flooding have been identified. In December 1992 there was flooding throughout the catchment caused, by a series of heavy rainfall events after several months of above average rainfall, but as the site was abandoned at this time the flooding was not an issue and nothing was reported officially.

In addition to the above records, the Environment Agency have commented that the railway line that traverses the site along the River Cynon's right bank has been "regularly" overtopped by floodwaters resulting in the suspension of rail services to Aberdare⁶.

Plate 5-6: Looking east over the former Phurnacite Plant in the early 1990's prior to demolition. The River Cynon flows along the tree line in the distance.



5.3.4 Fluvial Flood Risk

The former Phurnacite Plant is located on the floor of a previously glaciated valley where the land is very flat and the floodplain very wide.

GIS evaluation has shown 95% of the site (57 ha) is highlighted as being with Flood Zone C2 as shown on WAG's DAMs (Figure 5-12). However, the Environment Agency's Flood Map highlights 100% (60 ha) to be located within their extreme flood outline; Flood Zone 2 (Figure 5-13).

The same calculations have highlighted that approximately 72% (40 ha) of the site is potentially developable in line with the guidance laid out in TAN15, which is land where the risk of flooding is less than 1 in 100 year return period. However this area of land can only be developed if it is demonstrated by the submission of an acceptable FCA.

Land assessed as having a flood risk greater than 1 in 100 year return period (Flood Zone 3) extends in land of the railway embankment and up to the A4059 on the left bank of the River Cynon (Figure 5-13). It has been calculated that this area equates to approximately 28% of the site (20 ha). Discussions with the Environment Agency have confirmed that the railway line to the north of the site is regularly overtopped by floodwaters.

Utilising GIS and floodwater levels from the Environment Agency's HEC-RAS hydraulic model (as described in Section 2) it has been calculated that in an extreme flood event (1 in 1000 year return period flood event) water within the site could reach up to 3 metres in depth (Figure 5-14). This would not meet the policy requirement laid out in TAN15 (Table 3-4). However this depth of water is only experienced in a small corner of the site and the method of hydraulic modelling must

⁶ the Environment Agency Flood Risk Management Assets team.

be regarded as conservative as it does not consider that water will flow across parts of the site and pool in others.

A review of the topographical data within the HEC-RAS model has highlighted that the site slopes away from the channel of the River Cynon towards Abercwmboi. Flood water escaping onto the River Cynon's right bank will therefore flow over much of the site and pool at low points, potentially along the southern boundary and within the lakes. In addition, the modelling has also shown that the north corner of the site, on the River Cynon's right bank, is afforded some protection by an earth embankment / levee structure, as shown in Plate 5-7.

Plate 5-7: A levee or earth bund structure along the right bank of the River Cynon which potentially offers flood protection to part of the former Phurnacite Plant site.



5.3.5 Groundwater Flood Risk

No groundwater flooding issues have been highlighted during the compilation of this report.

5.3.6 Overland Flow

As the Cynon valley has been subject to glacial erosion it is "U" shaped. As such the bedrock is near the surface on the valley walls which typically results in a flashy stream response to rainfall events. High flow peaks soon after rainfall events are therefore typical with water being discharged on to the flat, wide valley floor. This process has been attributed to flooding nearby in Mountain Ash¹ but no flood events attributed to surface water have been recorded at this site.

It is envisaged that on site storage of surface water will be required due to the inadequate capacity of the receiving watercourses. A study will need to be undertaken to ascertain the required "Greenfield run-off" from the development site and to establish the storage requirements, which must also be agreed with the Local Planning Authority and the appropriate adopting body.

5.3.7 Sewers

No sewer flooding issues have been identified at this site during the compilation of this report.

5.3.8 Artificial Sources

There is an existing surface water management system on the site. This consists of three large lakes which are inter-connected and discharge to the River Cynon. During site visits it was

observed that the overflow channels and trash screens had fallen into a state of disrepair (Plate 5-8). It was also noted that they still had the ability to discharge waters to the River Cynon and as such it is estimated that they do not currently pose a flood risk to the site. However it is recommended that a detailed study of their functionality be undertaken as part of a site specific FCA.

Plate 5-8: Photo of the primary outfall from the surface water lagoons to the River Cynon. While it has fallen into a state of disrepair it is not thought to have a significant impact on existing flood risk.



5.3.9 TAN15 Constraints

Recognising that highly vulnerable development should not be permitted in zone C2, all other new development should only be permitted in zone C if it can be justified by the LPA. As part of this justification, the development should be proven to: be flood free in the 1% (plus climate change) flood event (A1.14, TAN15); have acceptable consequences of flooding in the extreme 0.1% flood event (A1.15, TAN15); and not cause flooding elsewhere (A1.12, TAN15).

5.3.10 Flood Risk Summary

The former Phurnacite Plant is located in the middle reaches of the Cynon catchment, in the base of the valley that was previously subject to glaciation. The resulting floodplain is very wide with 95% (57 ha) of the site being within the extreme flood outline (DAM Flood Zone C2; Figure 5-12). In addition, there is also a flood history associated with the site, most notably in 1979, the extent of which is shown on Figure 5-11.

From calculating the extent of the Environment Agency flood data approximately 66% (40 ha) of the site has the potential for re-development (Table 5-3). Policy will only permit lower vulnerability development, as described in Table 3-1, and a full site specific FCA would be required to demonstrate that any development meets the requirements of TAN15 and ensure that there is no adverse affect on third party flooding.

The same calculations have highlighted that approximately 33% (20 ha) of the site is assessed as having a risk of flooding greater than 1 in 100 year return period (the Environment Agency Flood Zone 3). Under guidance laid out in TAN15 no development should be permitted in this area.

Flood depth analysis has highlighted that up to 3m depth of floodwater could be experienced on site during a 1 in 1000 year return period flood event. However this analysis has also highlighted that there are parts of the site not affected by flooding in the 1 in 1000 year return period event contrary to the Environment Agency and WAG flood maps. Utilising GIS we have highlighted this potentially developable area in Figure 5-14B. This developable areas is calculated to be approximately 11ha and includes only land that are dry in the 1 in 1000 year return period flood event with dry access, i.e. land dry in the 1 in 1000 year return period flood event but with no dry access is not regarded as “developable land”.

Table 5-3: Former Phurnacite Plant Constraints Table

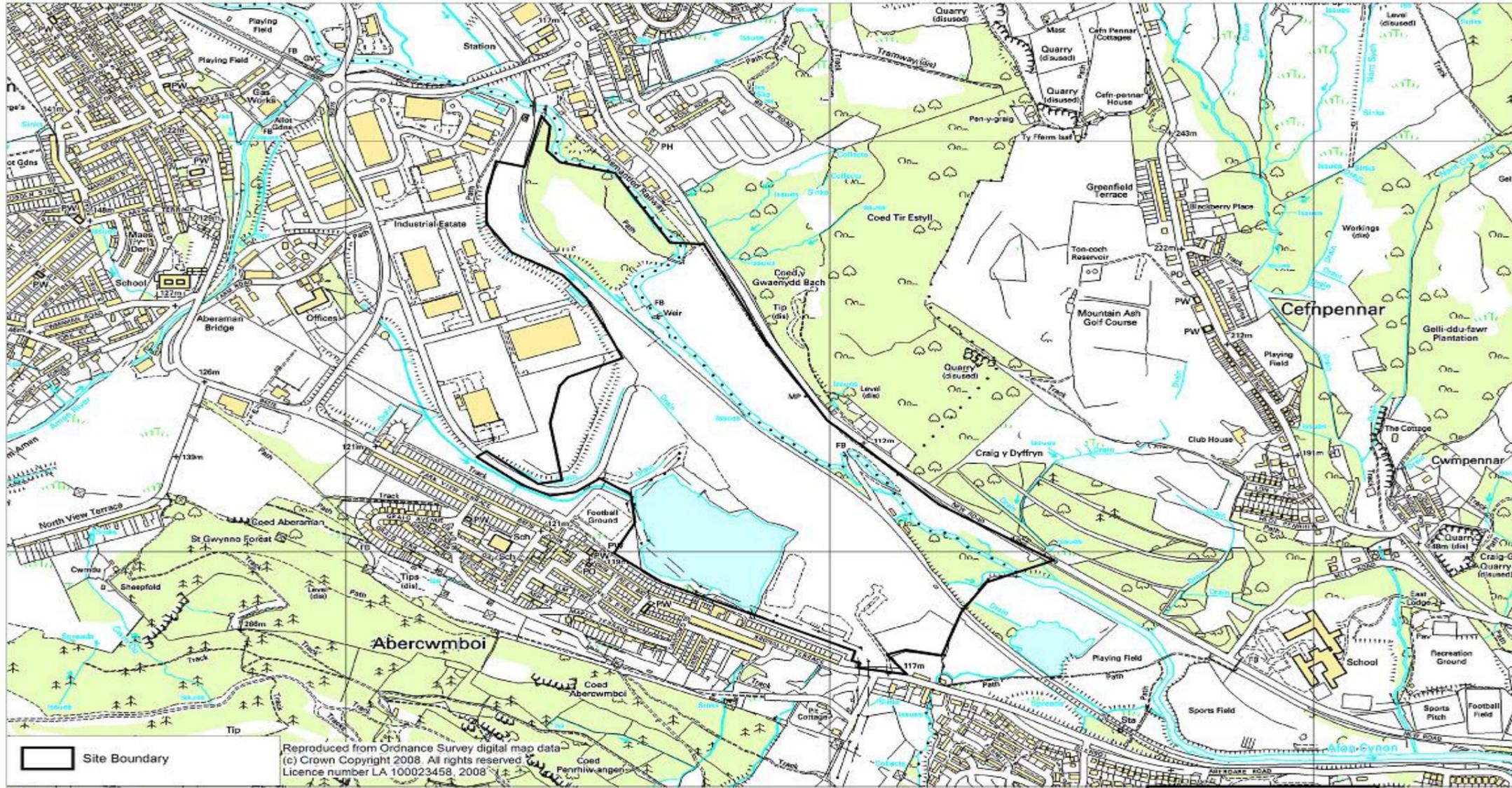
Former Phurnacite Plant	Area (Hectares)	Percentage of the Site
Total Area	60	100
Flood Zone C2	57	95
Total Flood Zone 3	20	33.3
Potential Highly Vulnerable Development (Based on DAMs and Environment Agency Flood Maps).	0	0
Potential Lower Vulnerability Development (Based on DAMs and Environment Agency Flood Maps).	40*	66.6*
Potentially Highly Vulnerable Development (Based on Flood Depth Analysis)	11*	18*

** For the purpose of this report the “developable area” quoted is an approximation of the land that is identified outside the flood zones where policy will permit a development type. The actual area of developable land may be different from the figure quoted due to site specific constraints (such as minor water features or isolated areas of raised ground). However, precise developable land available for each site should be confirmed in a detailed FCA as mitigation measures may also increase this area.*

At a strategic level, detailed assessment of the flood dynamics and risk are not undertaken. Due to the complex nature of the flooding mechanisms at the site it is recommended that the risks should be explored further in a site specific FCA. This study should include 2-dimensional hydraulic modelling which will map the fluvial overland flow and movement of water across the site. The current 1-dimensional studies reply upon extrapolating a surface water level across the floodplain. This method does not map the overland movement of water.

In addition, from information received on other forms of flood risk, it is suggested that surface water flooding is manageable and risks associated with sewer and groundwater flooding are likely to be low but would require further investigation through a site specific FCA.

Figure 5-10: Former Phurnacite Plant – Site Overview



Project: **Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment**

Title: **Former Phurnacite Plant - Site Overview**

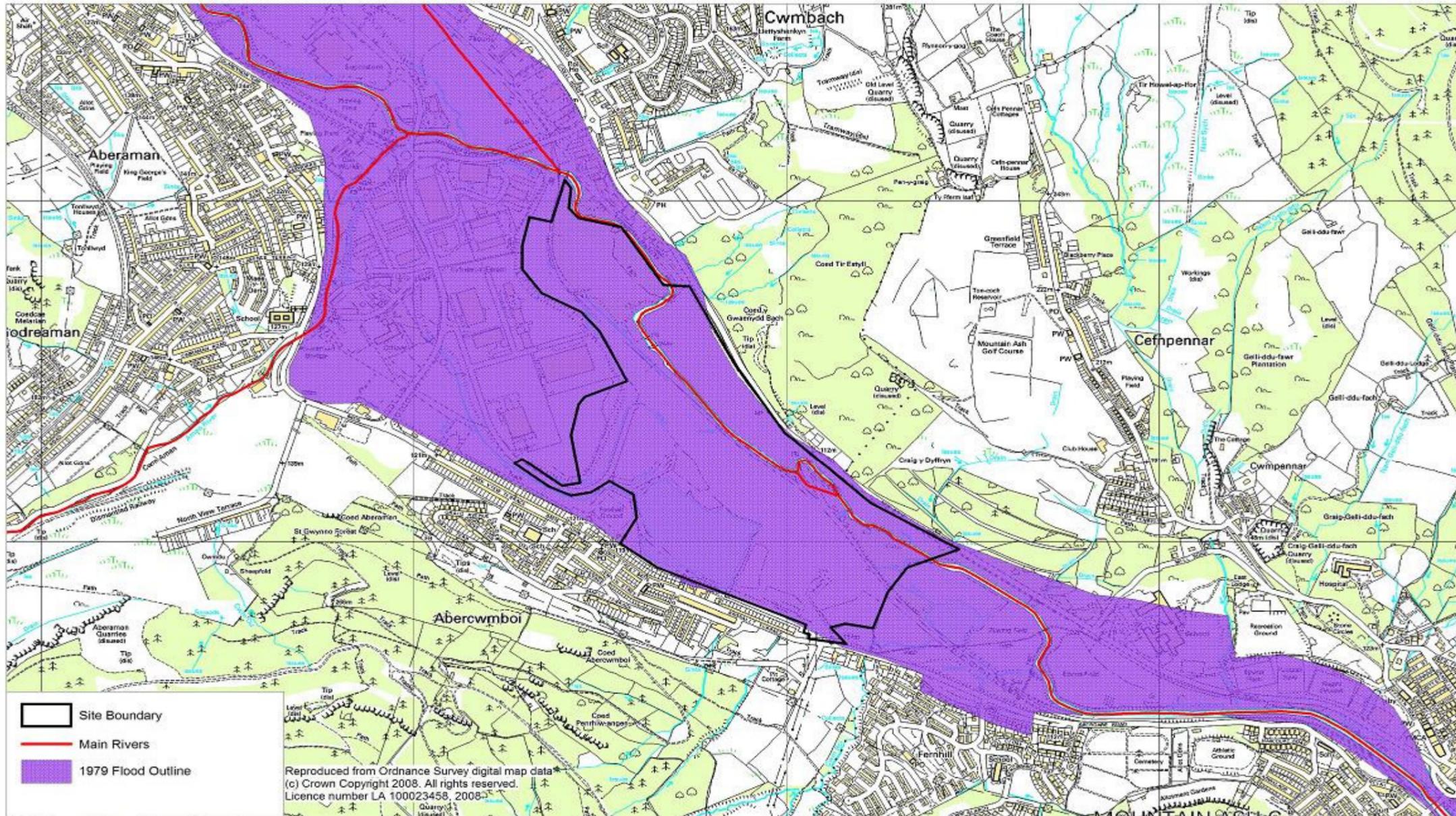
Figure 5.10

Scale at A3: 1:8,000

Drw	MJC	App	RJS	Rev	0001
Chk	RJS	Date	03/07/08	Date	10/07/08

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Figure 5-11: Former Phurnacite Plant - 1979 Flood Outline



- Site Boundary
- Main Rivers
- 1979 Flood Outline

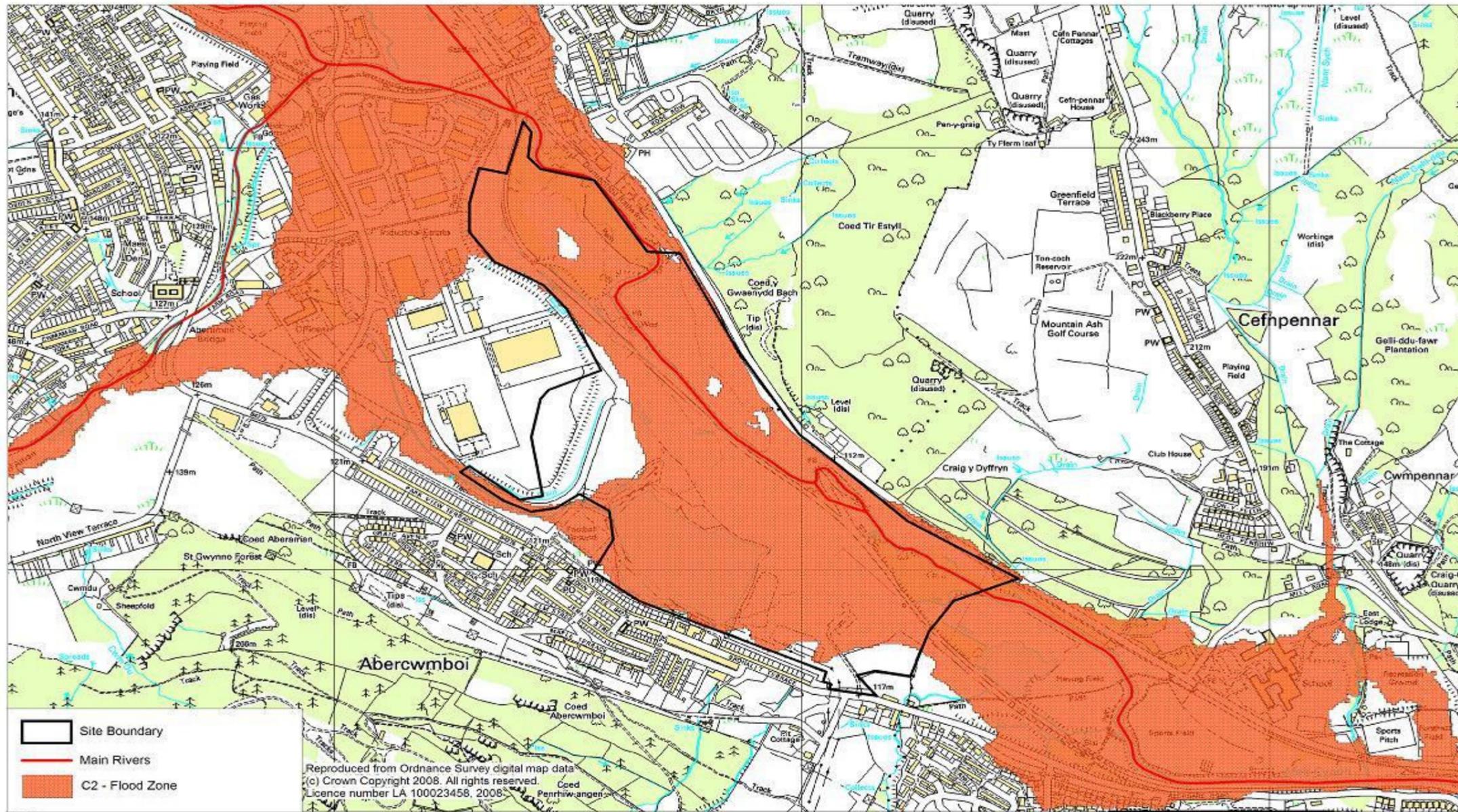
Reproduced from Ordnance Survey digital map data
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Project: **Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment**
Title: **Former Phurnacite Plant - 1979 Flood Outline**

Figure 5.11			
Scale at A3: 1:10,000			
Drw	MJC	App	RJS
Rev	0001	Date	03/07/08
Chk	RJS	Date	10/07/08

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Figure 5-12: Former Phurnacite Plant - WAG DAM

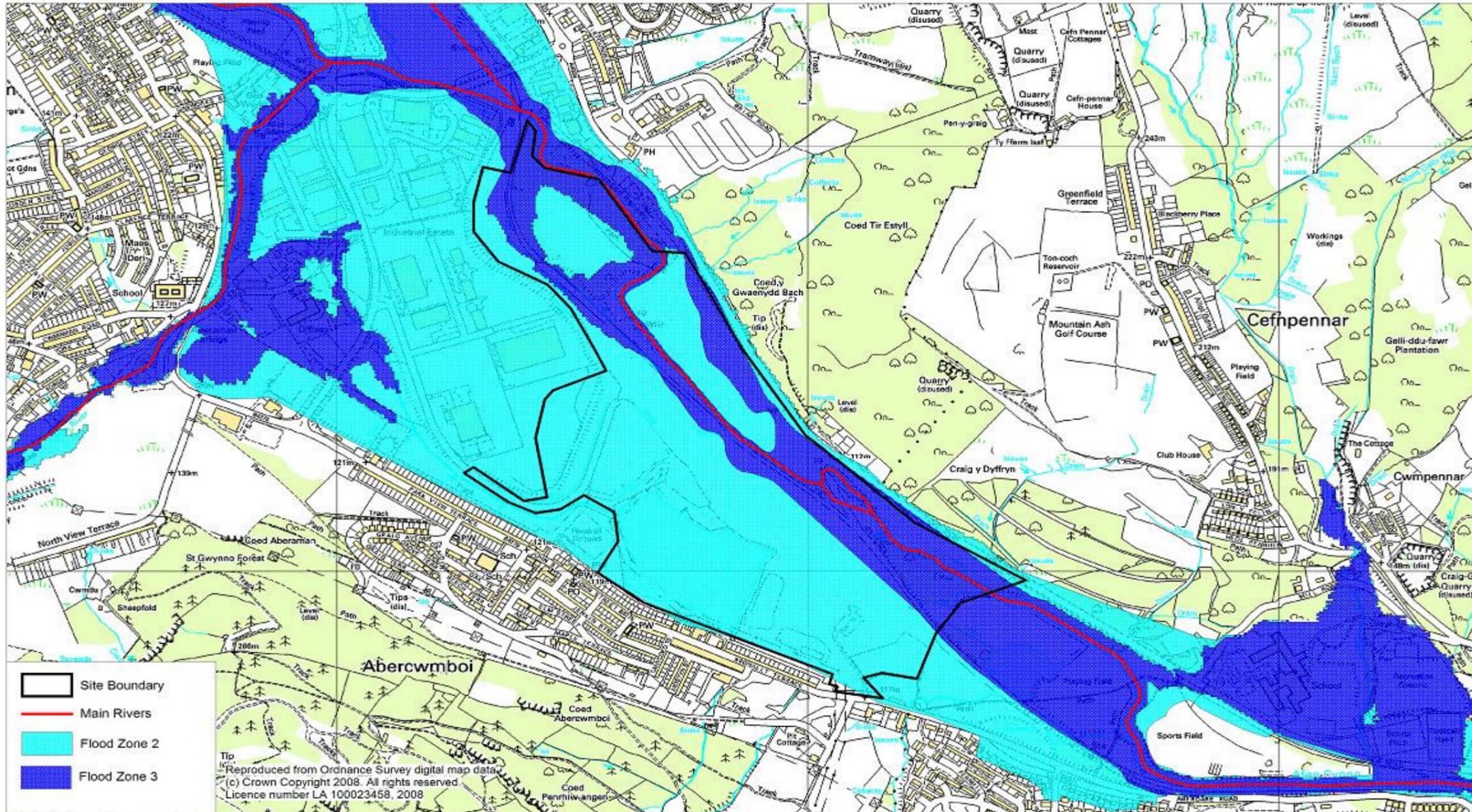


Project: **Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment**
Title: **Former Phurnacite Plant - WAG DAM**

Figure 5.12				
Scale at A3: 1:8,000				
Drw	MJC	App	RJS	Rev 0001
Chk	RJS	Date	03/07/08	Date 10/07/08

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Figure 5-13: Former Phurnacite Plant – the Environment Agency Flood Zone 2 and 3

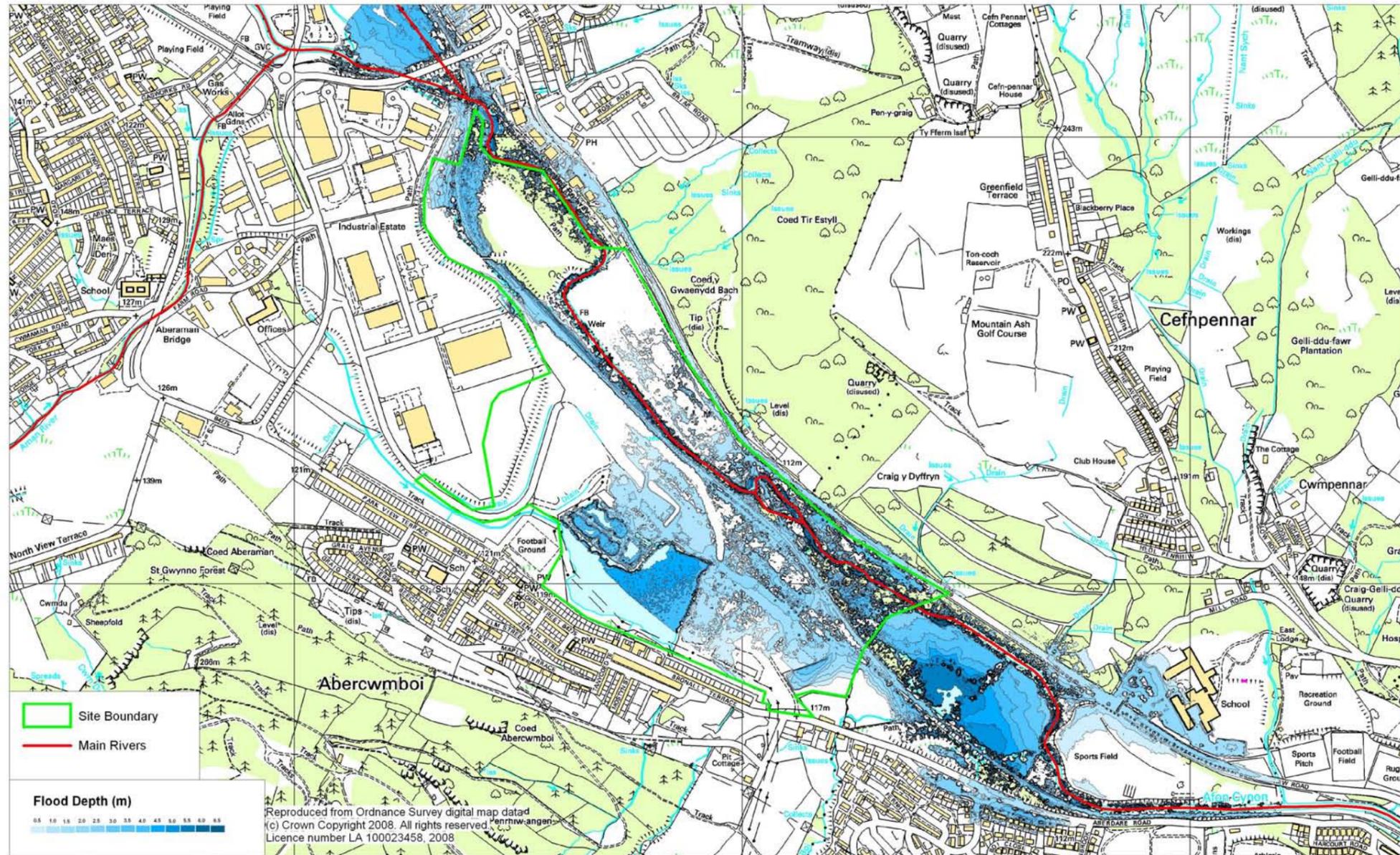


Project: **Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment**
Title: **Former Phurnacite Plant - EAW Flood Zones 2 & 3**

Figure 5.13			
Scale at A3: 1:8,000			
Drw	MJC	App	RJS Rev 0001
Chk	RJS	Date 03/07/08	Date 10/07/08

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Figure 5-14: Former Phurnacite Plant - Flood Depth Analysis – 1000 year flood event.



Project: Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment
Title: Former Phurnacite Plant - Flood Depth Analysis - 1000 Year Flood Event

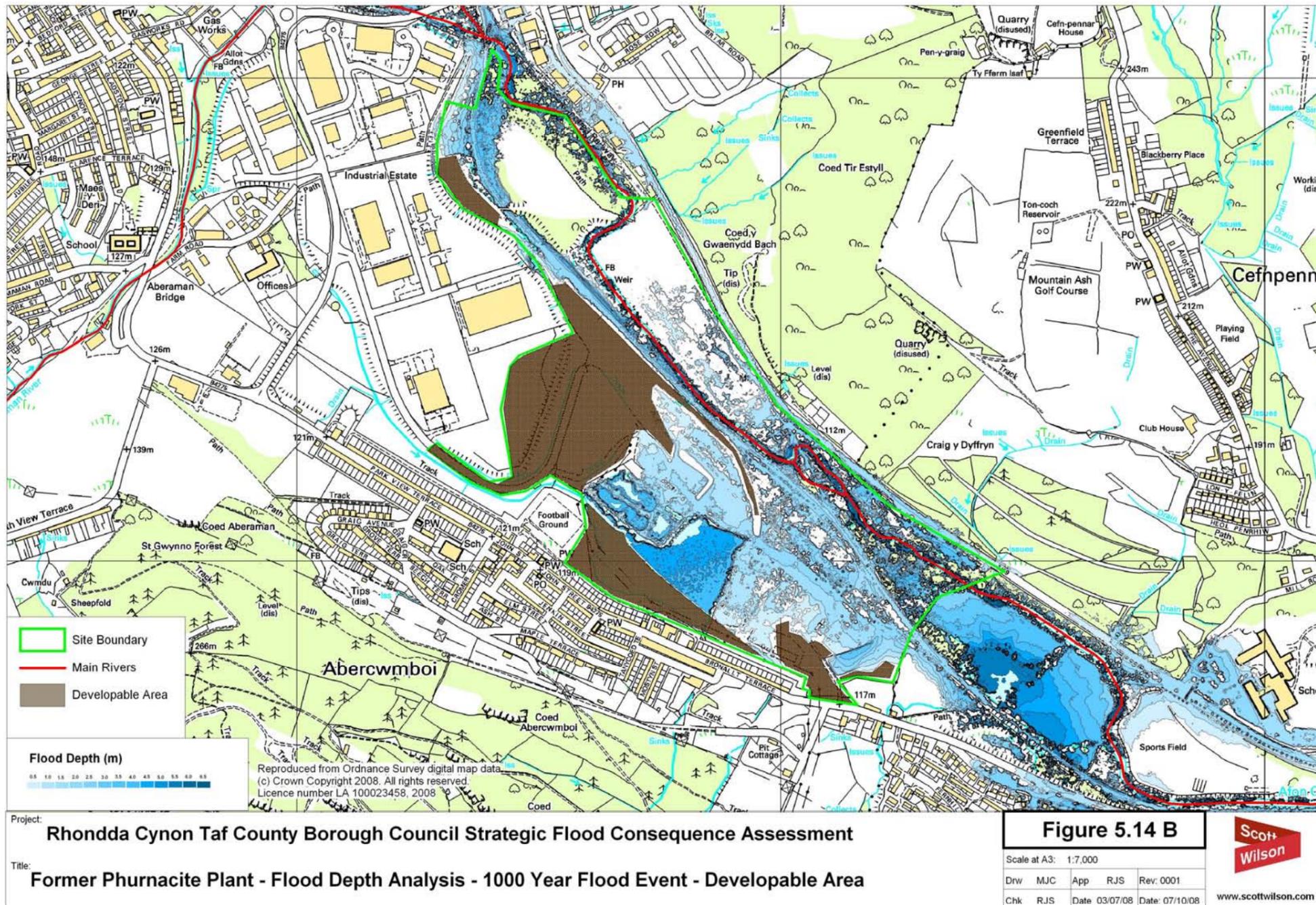
Figure 5.14

Scale at A3: 1:8,000

Drw	MJC	App	RJS	Rev:	0001
Chk	RJS	Date	03/07/08	Date:	10/07/08

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Figure 5-14B: Former Phurnacite Plant – Developable area based on Flood Depth Analysis of the 1000 year flood event.



5.4 Site 4: Robertstown and Abernant, Aberdare

5.4.1 Site Description

The development site is located immediately to the west of Aberdare town centre and immediately south of the village of Robertstown. The site covers an area of approximately 33.5 ha with the River Cynon flowing through the centre of the site. However the River Cynon's floodplain is primarily confined to its right bank due to the topography of the valley. For the purpose of flood risk analysis the development site can be divided into two distinct areas, namely the Robertstown site on the right hand bank and the Abernant site on the left hand bank.

The Robertstown site lies on a relatively flat area of land in the valley floor of the River Cynon. This land comprises of old railway sidings and previously developed industrial and commercial buildings. The Abernant site is elevated above the floodplain of the River Cynon. An ordinary watercourse, the Nant y Wennall flows partially along its eastern boundary. In addition to the Aberdare hospital site, development will also extend to neighbouring green fields.

5.4.2 Proposed Development

Due to its close proximity to Aberdare town centre, it is proposed that development on the Robertstown site would be focused on community, civic and complementary town centre uses such as a hotel and/or a primary care centre. In the centre of the site between the river and Wellington Street, an office park is proposed and light industrial or trade between Wellington Street and the railway. In addition, promotion of a new riverside walkway within this area would provide flood protection to the existing residential development in Robertstown.

On the Abernant site, the existing grassland and mature trees are to be maintained and high density 2/3 storey apartments and townhouses constructed on the hospital site. Medium density housing is proposed above the parkland and low density housing at the top of the site above this. It is also proposed that there be a new school / community facility located within the site to serve the wider Abernant area.

5.4.3 Flood History

The flooding event of December 1979 is regarded as the most notable and widespread causing flooding across South Wales and the catchment. The Environment Agency have provided a GIS layer showing the extent of this flooding event, which shows that the whole of the Robertstown site was affected (Figure 5-16). However the exact details of this flood event at this location are unknown. Information provided by the Environment Agency also confirms that the village of Robertstown, to the north of the proposed development site, was affected by flooding.

In 1998, a comparatively minor flooding event occurred at the Robertstown site after a wetter than average summer, and following a sequence of frontal systems passed over the catchment. No further details of this flooding have been made available¹.

There are no reports of fluvial flooding affecting the Aberdare hospital development site from the River Cynon or the Nant y Wennall which passes along the hospitals' eastern boundary.

5.4.4 Fluvial Flood Risk

The Robertstown site is located on the floor of the valley with an extensive, level floodplain. The entire site is highlighted as being at risk of flooding during the extreme flood event (1 in 1000 year; Figure 5-17) and the majority of the site is within the 1 in 100 year return period flood event (and Figure 5-18). In line with the policy guidance within TAN15, no development should be undertaken.

More detailed analysis has been undertaken using DTM in combination with GIS. Flood water levels have been extracted from the Environment Agency's hydraulic modelling and have been used, as detailed in Section 2, to calculate the predicted flooding depths at the site. This analysis highlights that floodwaters could be in excess of 1.5m in depth in a 1 in 1000 year return period flood event (Figure 5-19).

Land at the Abernant site is not affected by floodwaters from the River Cynon as the site is located on the valley slopes above the floodplain. The ordinary watercourse, the Nant Wennall also has no known flood risk that could affect the site.

5.4.5 Groundwater Flood Risk

No groundwater flood issues have been identified at this site.

5.4.6 Overland Flow

As the Cynon Valley has been subject to glacial erosion it has eroded a "U" shaped valley. The topography is steep which typically results in a flashy stream response to rainfall events. High flow peaks soon after rainfall events are therefore typical with water being discharged on to the flat wide valley floor.

It appears that surface water flooding has occurred in the recent past in the village of Robertstown, immediately to the north of the development site¹. The Robertstown site and the village of Robertstown are lower than the bank levels of the River Cynon. During increased flow levels, the River Cynon can rise to a level above that of the neighbouring land. This results in the surface water system having insufficient head to discharge, causing drains to surcharge and flood.

With regards the Abernant site there are no known issues with surface water flooding issues. However it is envisaged that on site storage of surface water will be required due to the inadequate capacity of the receiving watercourses. A study will need to be undertaken to ascertain the required "Greenfield run-off" from the development site and to establish the storage requirements, which must also be agreed with the Local Planning Authority and the appropriate adopting body.

5.4.7 Sewers

No sewer flooding issues have been identified at this site.

5.4.8 Artificial Sources

At the downstream boundary of the Robertstown development site the River Cynon passes beneath Wellington Street Road Bridge before being culverted beneath the railway line and the A4059. The railway culvert (Plate 5-9) comprises of three brick arch culverts with two piers

extending upstream of the structure. While this assessment has not undertaken an evaluation of the capacity of the structure, site observations suggest that it is unlikely to be able to convey the 1 in 100 year return period flood event. Its design is susceptible to blockage. As such water could be held back upstream and overtop the channel when capacity is reached. This will impact on the site and its primary access road. Similar observations were recorded with regards to the bridge upstream of the culvert. While having no piers to increase blockage risk, it will impact on the movement of floodwaters downstream.

Plate 5-9: Looking downstream at the brick arch culvert channelling the River Cynon beneath the Valley Line railway.



5.4.9 TAN15 Constraints

Recognising that highly vulnerable development should not be permitted in zone C2, all other new development should only be permitted in zone C if it can be justified by the LPA. As part of this justification, the development should be proven to: be flood free in the 1% (plus climate change) flood event (A1.14, TAN15); have acceptable consequences of flooding in the extreme 0.1% flood event (A1.15, TAN15); and not cause flooding elsewhere (A1.12, TAN15).

The Abernant site will need to meet the surface water requirements of TAN15, namely that in areas of undeveloped land any development will be required to attenuate surface water flows to the required Greenfield rate and utilise Sustainable Drainage Systems (SUDS).

5.4.10 Flood Risk Summary

The Robertstown and Abernant development site covers an area within the base of the valley and land elevated above the River Cynon's floodplain on the valley side. The Robertstown site, being located within the base of the valley, is principally at risk of flooding. The Abernant site is located above the floodplain of the River Cynon. Evaluation of information from the Environment Agency and the Local Authority has not identified any records or anecdotal evidence that the Robertstown site maybe at risk of flooding, therefore the flood risk is considered to be low.

The Environment Agency data in the form of their Flood Maps and their HEC-RAS hydraulic model for the catchment confirms the flooding risk at the Robertstown site to be greater than 1 in 100 year return period and that the depth of flooding could be in excess of 1.5m in the 1 in 1000 year return period. TAN15 states development is unacceptable based on the flood frequency and depths at this location.

However the hydraulic modelling used to calculate these flood levels does not consider the flow of water across the site and must be viewed as a conservative estimate. 2-dimensional hydraulic modelling may give a more realistic flood level as it considers the flow of water across a site in addition to storage.

Table 5-4: Robertstown / Abernant Constraints Table

Robertstown / Abernant	Area (Hectares)	Percentage of the Site
Total Area	33.5	100
Flood Zone C2	15	44
Total Flood Zone 3	11.5	34.5
Potential Highly Vulnerable Development	18.5*	56*
Potential Lower Vulnerability Development	22*	65.5*

** For the purpose of this report the "developable area" quoted is an approximation of the land that is identified outside the flood zones where policy will permit a development type. The actual area of developable land may be different from the figure quoted due to site specific constraints (such as minor water features or isolated areas of raised ground). However, precise developable land available for each site should be confirmed in a detailed FCA as mitigation measures may also increase this area.*

To a lesser extent there are also flooding risks associated with surface water on the site. There is anecdotal evidence of surface water flooding issues at the Robertstown site because of its location below the level of the River Cynon's banks and the inability of the surface water system to discharge when levels in the River Cynon are above that of the landward ground level. This poses less of a risk than that of fluvial inundation. In addition, the Robertstown access bridge and the culvert downstream will need to be fully assessed so that their affects on flood flows are understood. All of these issues should be further assessed in a site specific FCA.

Figure 5-15: Robertstown / Abernant Site – Site Overview

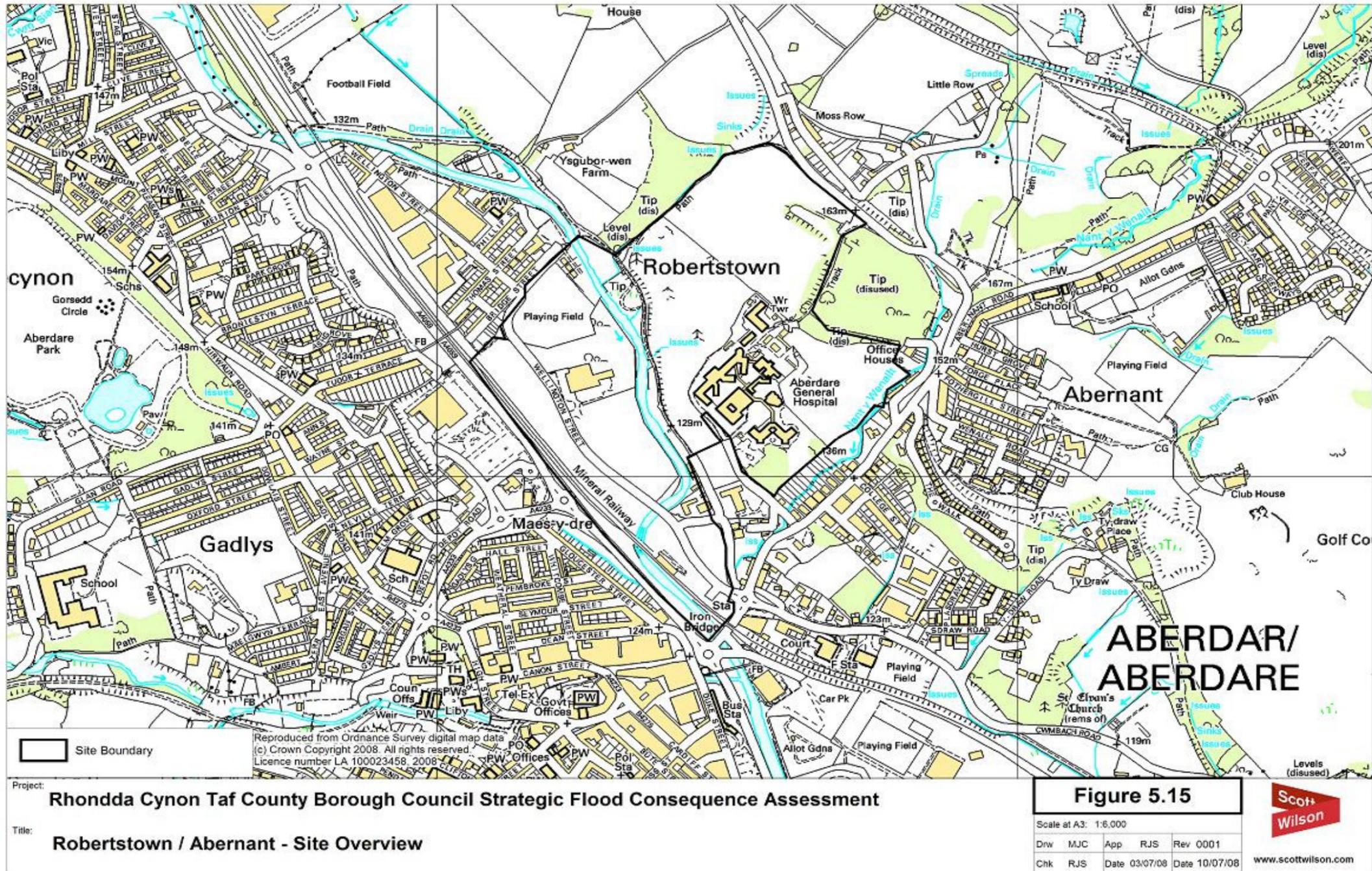
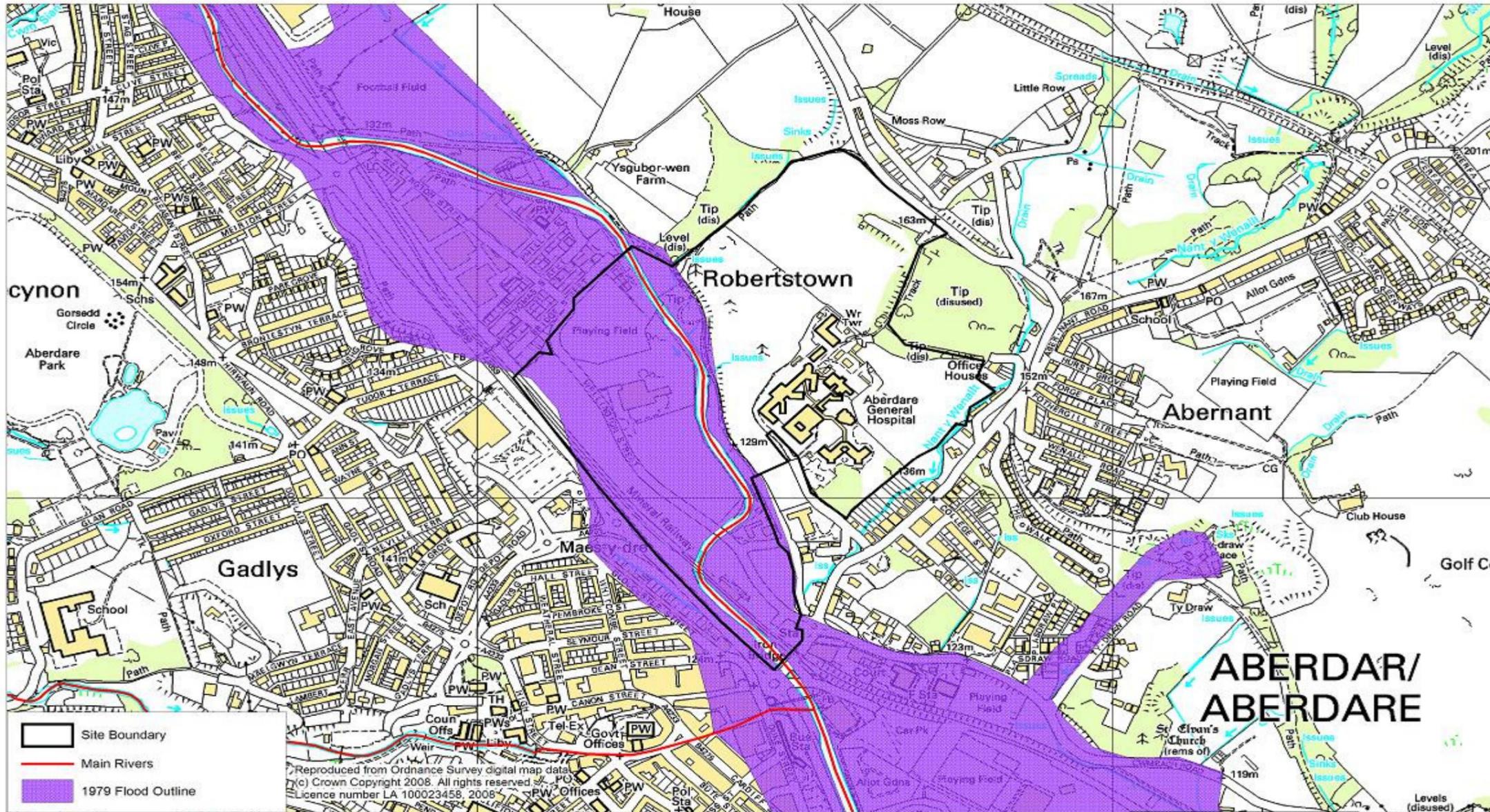


Figure 5-16: Robertstown / Abernant - 1979 Flood Outline.



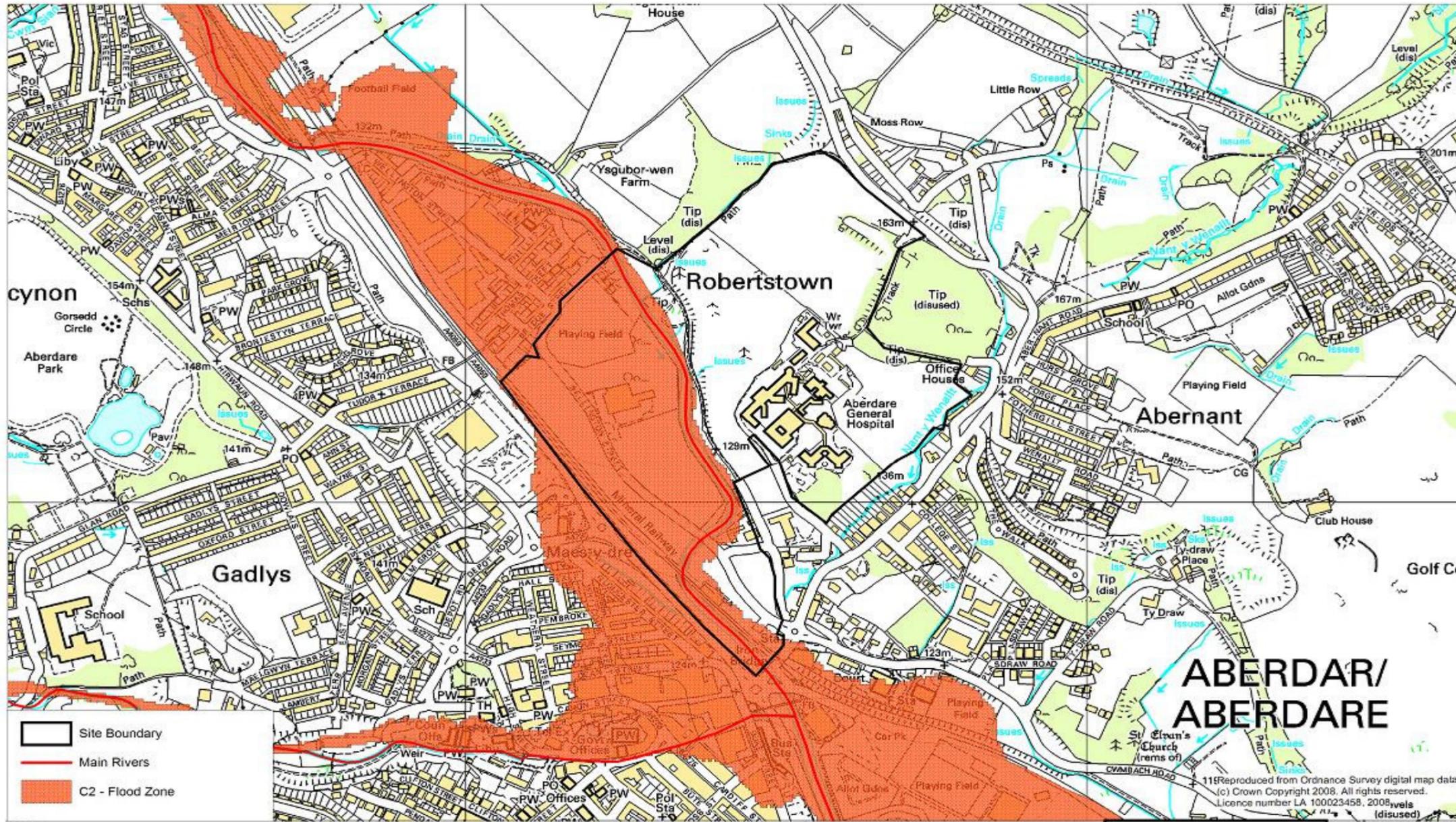
Project: **Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment**
 Title: **Robertstown / Abernant - 1979 Flood Outline**

Figure 5.16
 Scale at A3: 1:6,000

Drw	MJC	App	RJS	Rev	0001
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Figure 5-17: Robertstown / Abernant - WAG DAM.



Project: Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment
 Title: Robertstown / Abernant - WAG DAM

Figure 5.17

Scale at A3: 1:6,000

Drw	MJC	App	RJS	Rev	0001
Chk	RJS	Date	03/07/08	Date	10/07/08

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Figure 5-18: Robertstown / Abernant - The Environment Agency Flood Zones 2 and 3.

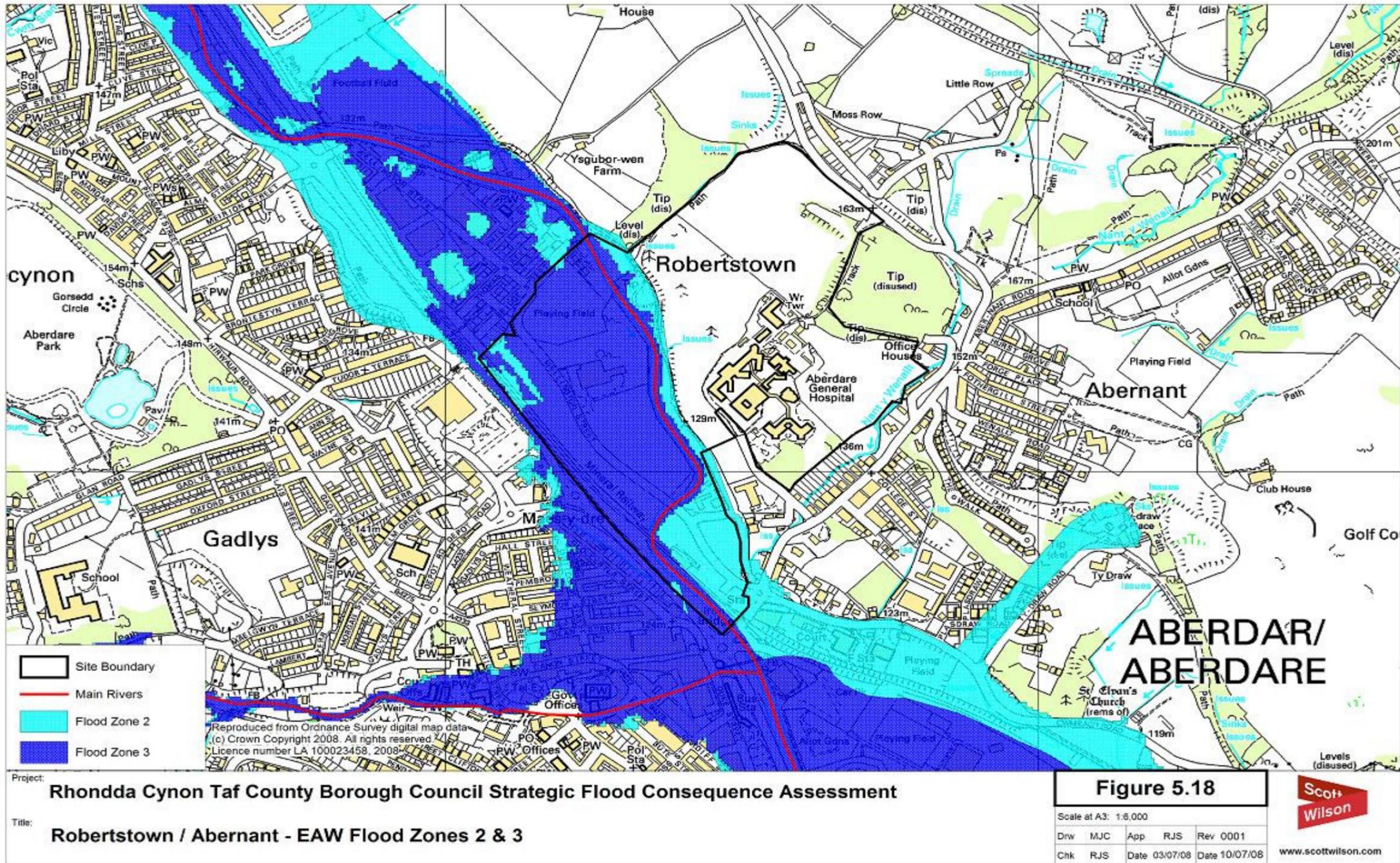


Figure 5-19: Robertstown / Abernant - Flood Depth Analysis – 1000 year flood event.

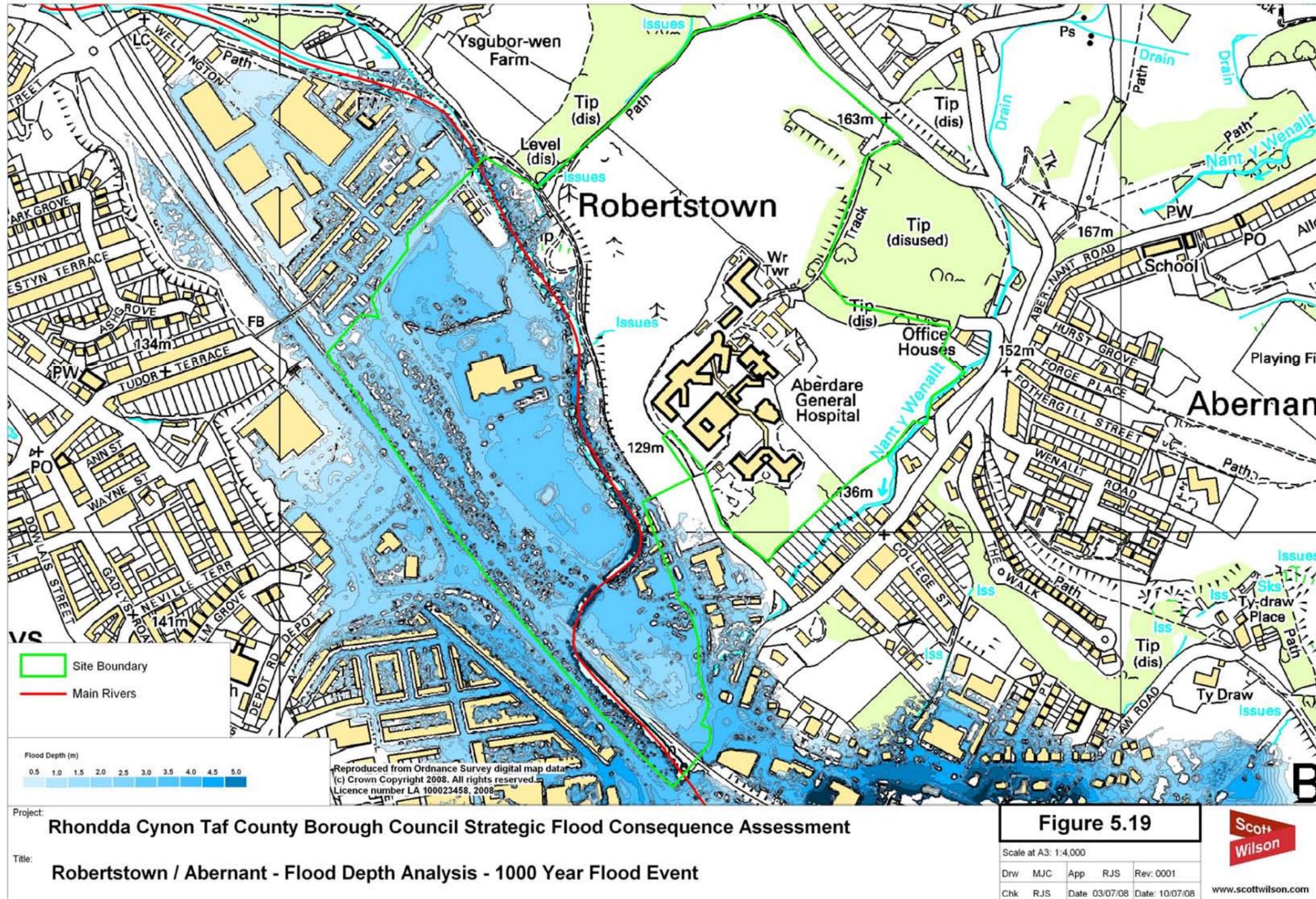
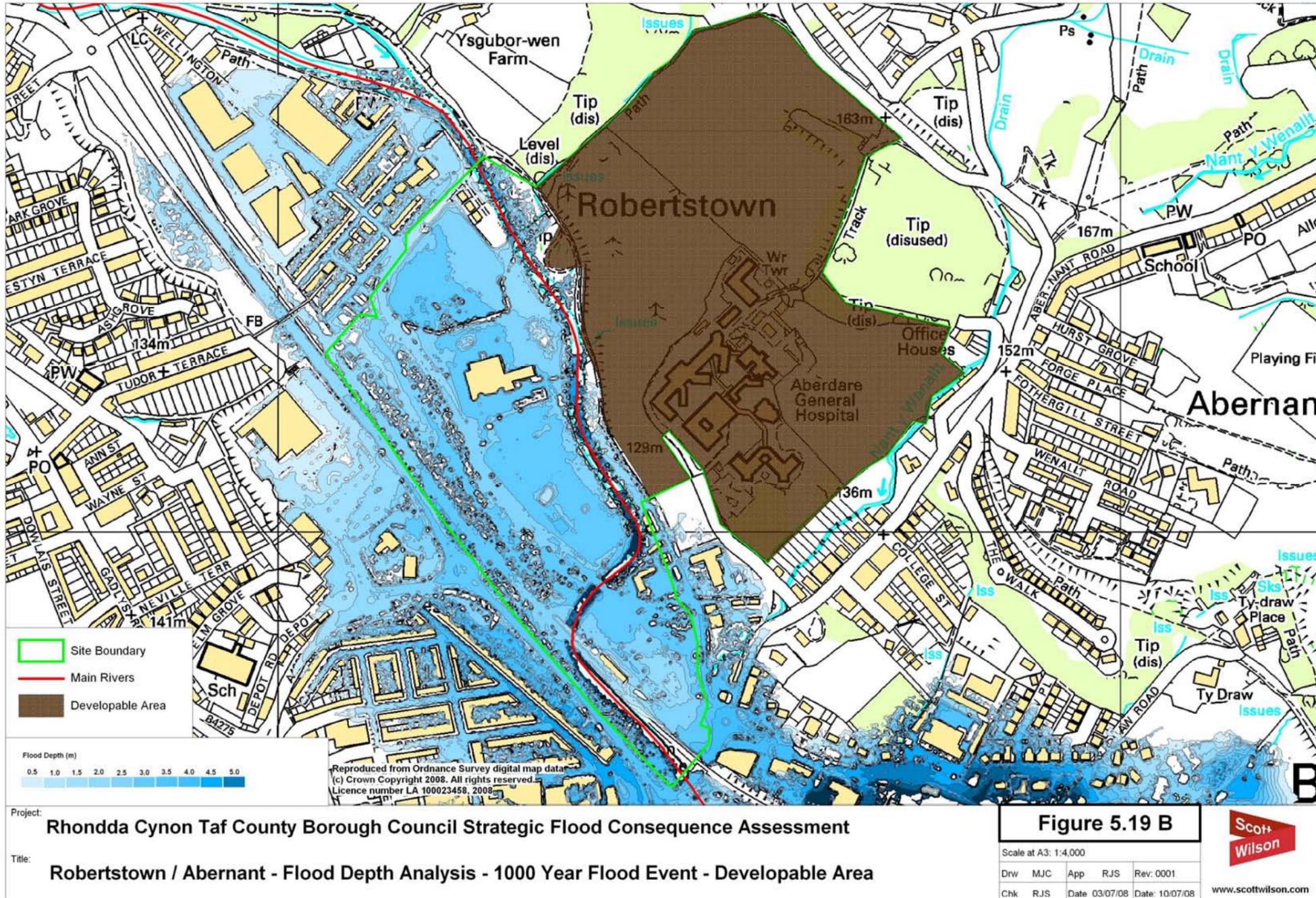


Figure 19B Robertstown / Abernant - Flood Depth Analysis – 1000 year flood event – Developable Area



5.5 Site 5: Land South of Hirwaun and Penywaun, Aberdare

5.5.1 Site Description

The proposed development site lies on land south of the town of Hirwaun and the village of Penywaun just south of the Beacon Beacons National Park in the uppermost reaches of the River Cynon catchment. The site covers an area of approximately 340 ha. It is located on the northern slopes of Mynydd Cefn-y-Gyngon and is predominately elevated above the River Cynon floodplain. There are also numerous tributaries that cross the site. In addition, there are man made surface water channels and lagoons remaining from the open cast coaling surface water management systems.

Plate 5-10: Photo looking north-east across the land south of Hirwaun and Penywaun.



5.5.2 Proposed Development

It is understood that the site will comprise of schools, medical centre library, food and retail units and small offices. There are to be two main residential areas, one to the south of Hirwaun and a second to the south of Penywaun. In addition, it is proposed that the western end of the site be set aside for employment development, as this is adjacent to the existing industrial estate. There is also a provision for the realignment of the A465 trunk road.

5.5.3 Flood History

The River Cynon has a history of flooding at Hirwaun but not within the boundary of the development site. The Environment Agency have provided a GIS layer showing the extent of the 1979 flood. This illustrates that parts of Hirwaun were affected; however the proposed development site remained unaffected (Figure 5-21).

There are no other reports of fluvial flooding affecting the site.

5.5.4 Fluvial Flood Risk

The development site is predominately located on the right bank of the River Cynon above the extreme flood outline and therefore has limited fluvial flood risk. Only 0.02 hectare of the proposed development site is highlighted as being within the C2 floodplain (Figure 5-22) but this area is also a SSSI and is unlikely to be developed.

The primary fluvial flood risk to the development site is from the numerous tributaries that traverse the site from Cefn-y-Gyngon Mountain located to the south. From site observations (Plate 5-11) high velocities are likely to be experienced in these rivers during peak flows and careful management will be required to ensure that flood risk and erosion issues are addressed. For the purpose of this SFCA, further evaluation is beyond the scope of this report. At the planning application stage, the Environment Agency are likely to require the submission of a surface water management plan. This will capture these issues ensuring that suitable SUDS techniques are implemented and that flood risk is managed.

5.5.5 Groundwater Flood Risk

No groundwater flooding risks have been highlighted at this site.

5.5.6 Overland Flow

The local geology in this area affects the site topography and surface water flood risk. Upslope and to the south of the site, Cefn-y-Gyngon Mountain directs overland flow towards the development site. Due to its position in the catchment, bedrock is predominantly near to the surface. This combined with the steep topography typically results in a flashy stream response to rainfall events. High flow peaks soon after rainfall events are therefore typical. Rapid overland flow has not been known to cause flooding but surface water management in the form of lagoons and ditches was used during past site operations to prevent water from entering the open cast void. Field observations identified that the existing surface water management system has fallen into a state of disrepair. Evidence of channel collapse and blockage was observed that would impede flows and increase flood risk.

It is envisaged that on site storage of surface water will be required due to the inadequate capacity of the receiving watercourses. A study will need to be undertaken to ascertain the required "Greenfield run-off" from the development site and to establish the storage requirements, which must also be agreed with the Local Planning Authority and the appropriate adopting body.

Plate 5-11: Photo viewed south across the site to Cefn-y-Gyngon Mountain in the distance. The high velocity in which water enters the site is evident from the highly eroded channel and the large boulders which it transports. To the right is one of the surface water lagoon systems which remain from the coaling operations at the site.



5.5.7 Sewers

While no information on the sewerage infrastructure has been received from DCWW it has been concluded that due to the past mining activities that sewerage infrastructure is unlikely to exist beneath the majority of the site. While the flood risk should be evaluated further in a site specific FCA, for the purpose of this report, it is concluded that the risk is low.

5.5.8 Artificial Sources

From observations during a site walkover, the lagoons appeared to be functioning and discharging as designed and any significant flood risk would only result from their structural failure.

5.5.9 TAN15 Constraints

Recognising that highly vulnerable development should not be permitted in zone C2, all other new development should only be permitted in zone C if it can be justified by the LPA. As part of this justification, the development should be proven to: be flood free in the 1% (plus climate change) flood event (A1.14, TAN15); have acceptable consequences of flooding in the extreme 0.1% flood event (A1.15, TAN15); and not cause flooding elsewhere (A1.12, TAN15).

5.5.10 Flood Risk Summary

Less than 0.01% (0.02 ha) of the site is located in one of the Environment Agency's or WAG's Flood Zones. It is not envisaged that fluvial flooding from the River Cynon will constrain development. The site is traversed by ordinary watercourses and old drainage systems from the previous land use. At a strategic level, detailed assessment of the location and risk from these other watercourses has not been undertaken. These risks should be explored further and

management systems designed accordingly, during the surface water management scheme design phase pre-planning.

Flood depth analysis was not possible at this site as the Environment Agency hydraulic modelling does not extend to the non main river tributaries of the River Cynon.

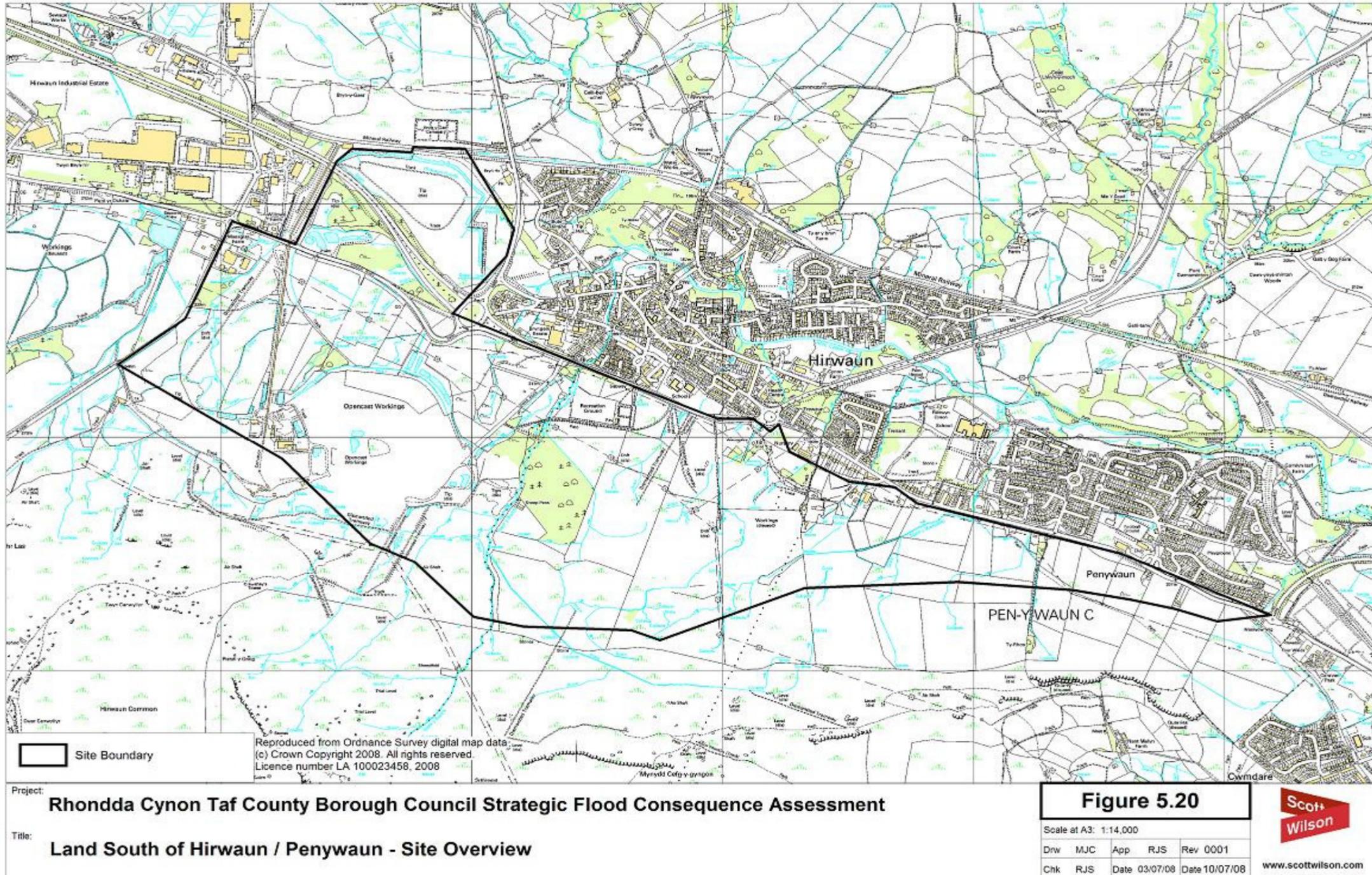
In addition, flood risk associated with groundwater and the sewers are estimated to be low.

Table 5-5: Land South of Hirwaun and Penywaun Constraints Table

Land South of Hirwaun and Penywaun	Area (Hectares)	Percentage of the Site
Total Area	340	100
Flood Zone C2	0.02	0.01
Total Flood Zone 3	0	0
Potential Highly Vulnerable Development	339*	99.9*
Potential Lower Vulnerability Development	339*	99.9*

** For the purpose of this report the "developable area" quoted is an approximation of the land that is identified outside the flood zones where policy will permit a development type. The actual area of developable land may be different from the figure quoted due to site specific constraints (such as minor water features or isolated areas of raised ground). However, precise developable land available for each site should be confirmed in a detailed FCA as mitigation measures may also increase this area.*

Figure 5-20: Land South of Hirwaun / Penywaun – Site Overview



Project: **Rhondda Cynon Taf County Borough Council Strategic Flood Consequence Assessment**

Title: **Land South of Hirwaun / Penywaun - Site Overview**

Figure 5.20			
Scale at A3: 1:14,000			
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Figure 5-21: Land South of Hirwaun / Penywaun - 1979 Flood Outline

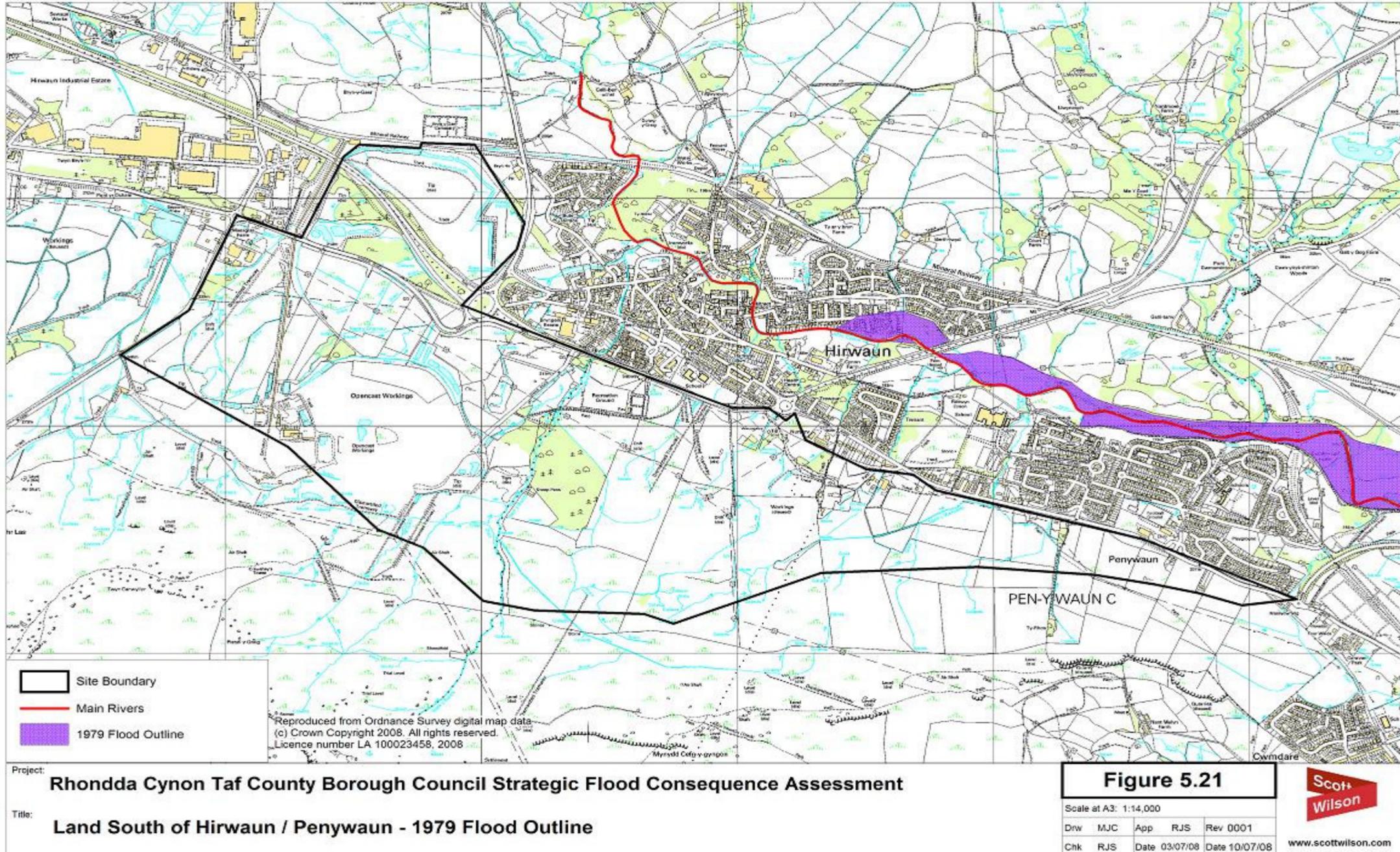


Figure 5-22: Land South of Hirwaun / Penywaun - WAG DAM

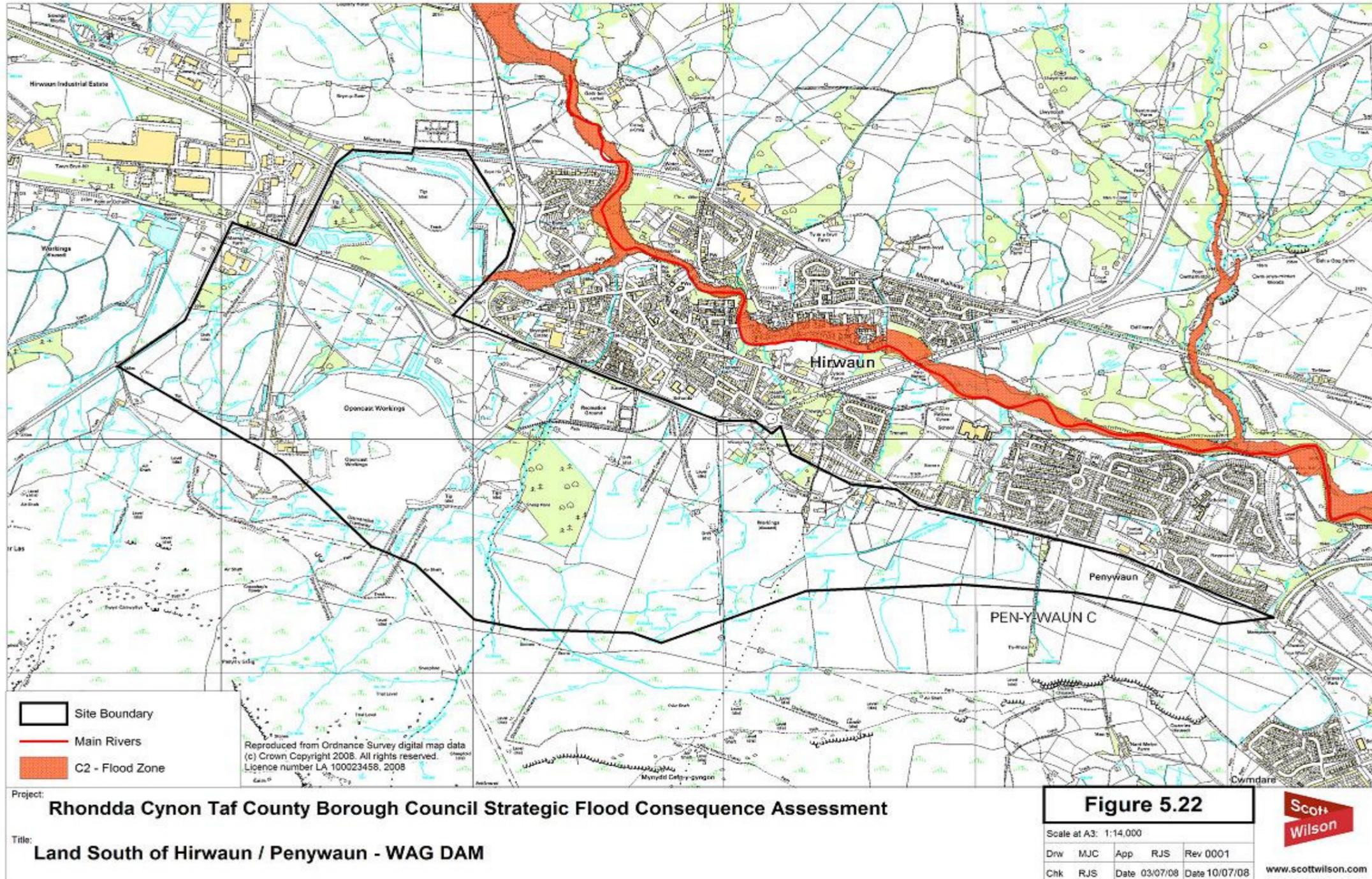


Figure 5-23: Land South of Hirwaun / Penywaun - the Environment Agency Flood Zone 2 and 3

