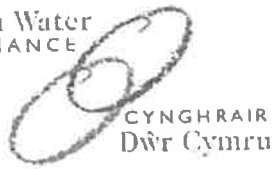
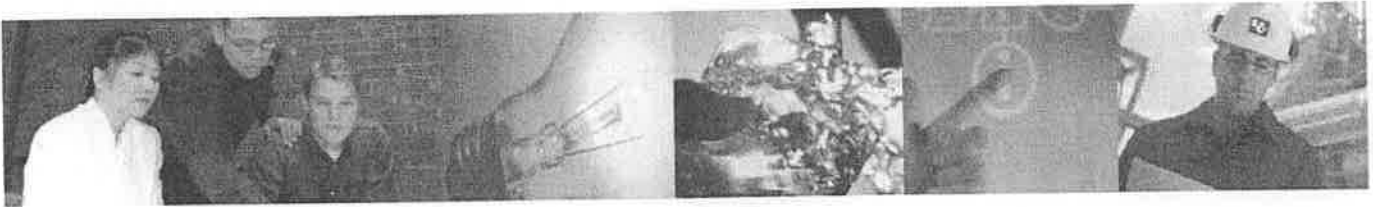


Welsh Water
ALLIANCE



BRECON BEACONS NATIONAL
PARK
RECEIVED

31 AUG 2007



FLOOD CONSEQUENCES ASSESSMENT

CRAI WTW, GLYNTAWE

March 2007



SPARE COPY.

29.8.07.

06/02/2007

CH
e™



ENERGY WATER INFORMATION GOVERNMENT

Black & Veatch Limited

Tel: +44 (0)1737 774155
Fax: +44 (0)1737 772767
www.bvlbv.com

GENERAL

DOCUMENT NO:	1401303-00-1
TITLE:	FLOOD CONSEQUENCES ASSESSMENT
TAG NO:	N/A
CLIENT:	DWR CYMRU WELSH WATER
CONTRACT TITLE:	Crai WTW
B&V CONTRACT NO:	1401303

REASON FOR ISSUE

☐ FOR ENQUIRY ☐ FOR REVIEW ☐ FOR APPROVAL
☐ FOR PURCHASE ☒ FOR INFORMATION ☐ FOR CONSTRUCTION

[illegible]

The design shown on the document is the property of Black & Veatch Limited and is not to be used, copied, communicated or disclosed, in whole or in part, except in accordance with a contract, licence or agreement in writing with BLACK & VEATCH LIMITED.

CRAI WTW FLOOD CONSEQUENCES ASSESSMENT**CONTENTS**

1.0	INTRODUCTION.....	1
2.0	EXISTING SITE.....	3
3.0	EXTENT OF FLOODING.....	3
4.0	IMPACT OF REVISED EFO ON PROPOSED SCHEME.....	4
5.0	CONCLUSIONS.....	5

APPENDICES

Appendix 1	Letter from Environment Agency Wales to Brecon Beacons National Park Authority, dated 18 January 2007, ref: SE/2006/100191/01-L01
Appendix 2	Location Plan
Appendix 3	Extract from Development Advice Map showing Extreme Flood Outline
Appendix 4	Hydrology, Model Results, Revised Extreme Flood Outline and 1 in 100 year outline
Appendix 5	Plates

Notice:

This report was prepared by Black & Veatch Limited (BVL) solely for use by Dwr Cymru Welsh Water. This report is not addressed to and may not be relied upon by any person or entity other than Dwr Cymru Welsh Water for any purpose without the prior written permission of BVL. BVL, its directors, employees and affiliated companies accept no responsibility or liability for reliance upon or use of this report (whether or not permitted) other than by Dwr Cymru Welsh Water for the purposes for which it was originally commissioned and prepared.

In producing this report, BVL has relied upon information provided by others. The completeness or accuracy of this information is not guaranteed by BVL.

ABBREVIATIONS

AMA	Asset Management Alliance
DAM	Development Advice Map
DCWW	Dwr Cymru Welsh Water
EAW	Environment Agency Wales
EFO	Extreme Flood Outline – the 1 in 1000 year flood outline
FCA	Flood Consequences Assessment
PPW	Planning Policy Wales
TAN	Technical Advice Note
WTW	Water Treatment Works

1.0 INTRODUCTION

Black & Veatch Ltd, as part of the Asset Management Alliance (AMA), have produced this Flood Consequences Assessment (FCA) in support of a planning application for improvements to be carried out at Crai Water Treatment Works (WTW) at Glyntawe. Crai WTW supplies the whole of the **Swansea Valley** (including the towns of Ystradgynlais, Ystalyfera, Pontardawe, Clydach) and a large proportion of the **city of Swansea**. Water from Crai WTW can also be diverted to supplement existing supplies to other areas and towns across South Wales, such as Port Talbot and Bridgend.

An upgrade to the existing process at the Crai Water Treatment Works is required in order for the process to be made more robust in meeting the "Water Quality (Water Supply) Regulations 2001". In particular, there is a need to improve turbidity, iron and manganese levels. A review of the options available to address this situation has been undertaken and an upgrade of the existing works is required in order for potable water within the supply zone to meet the requirements of the "Water Quality (Water Supply) Regulations 2001".

The proposed improvement works for Crai WTW comprise the construction of water filtration process plant and ancillary chemical dosing equipment, to be located adjacent to Dwr Cymru Welsh Water's existing water works site on the opposite bank of the Nant Tywynni, due north west. It is also intended to carry out grading, landscaping and screening to minimise the visual impact of the proposed structures.

In a previous planning application which included consultation with the Environment Agency Wales (EAW), EAW confirmed that as the site is shown within the 1 in 1000 year/Extreme Flood Outline (EFO) that in accordance with Technical Advice Note (TAN) 15, EAW would require the preparation of an FCA and that in the meantime would request that the planning application be deferred.

TAN 15 was issued in July 2004 by the Welsh Assembly Government to provide technical guidance and supplement the policy set out in Planning Policy Wales (PPW) 2002 in relation to development and flooding. TAN 15 provides a framework within which risks arising from both river and coastal flooding can be assessed. The general approach of PPW, supported by the TAN, is to advise caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions.

The operation of the precautionary framework is governed by a Development Advice Map (DAM) containing three zones A, B and C, with Zone C (the EFO), sub-divided further into C1 and C2 (refer to Table 1.1).

Table 1.1 Zone Descriptions and Uses within the Precautionary Framework

Description of Zone		Use within the precautionary framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding	A	Used to indicate that justification test is not applicable and no need to consider flood risk further
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
Based on Environment Agency extreme flood outline, equal to or greater than 0.1% - 1 in 1000 year (river, tidal or coastal)	C	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test, including assessment of consequences.
Areas of the floodplain which are developed and served by significant infrastructure including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

The letter from EAW to Brecon Beacons National Park Authority (Appendix 1) confirms that the site is categorised as Zone C2 as defined by the DAM and requests a FCA in support of a planning application.

Based on Figure 2 of TAN 15 and discussions with EAW, the extension is classed as a 'less vulnerable development'.

2.0 EXISTING SITE

The WTW is situated on the left bank of the Nant Tywynni. The Nant Tywynni rises near the A4067 at Bwlch Bryn-rhudd and discharges into the River Tawe approximately 200m downstream of Crai WTW. A location plan of the site is provided in Appendix 2 of this FCA.

A meeting was held on site with a representative from EAW. The site is not located near to main river and therefore, the EAW do not hold records of the flood history of the site.

3.0 EXTENT OF FLOODING

The Extreme Flood Outline (EFO) shown on the DAM is given in Appendix 3 of this FCA. These outlines are based on a combination of historical flood data, if available, or computer models. Within Paragraph 4.3 of the TAN, it is acknowledged that "while robust for triggering the application of the tests (for both forward planning and decision making) at the present time it is inevitable that information will be improved and refined over time."

The first stage of this FCA was to confirm the location of the EFO shown on the DAM and also to establish the extent of the 1 in 100 year flood outline. During the site visit with EAW, they confirmed that any new development proposed for the latter would be rejected.

Hydraulic Modelling and Hydrology Study

A topographic survey data was undertaken which included river cross-sections (Appendix 2) and spot levels. This data was used to construct a hydraulic model of the site (Appendix 4) and run with estimated flows to generate water levels to plot flood outlines.

Hydrology study

Flood flows were calculated using three methods: the statistical and rainfall runoff methods in the Flood Estimation Handbook (FEH) and the Institute of Hydrology Report No 124 method. The latter was considered a good check on the first two methods as it is particularly suited to small catchments such as the Nant Tywynni. The results are summarised in Table 3.1.

Table 3.1 Design Flow Results

Return Period (years)	Flow (m ³ /s)				
	Method 1		Method 2		Method 3
	Unadjusted Pooling Group	Adjusted Pooling Group	FEH Rainfall Runoff	Revitalised Rainfall Runoff	IoH Report 124
100	24	18	38	40	22
1000	35	26	66	80	32

As shown in Table 3.1, Method 2, the rainfall runoff method, produces substantially higher design flow estimates than the other methods considered. The indication from the 1 in 100-year design flow is that runoff would equate to approximately 6m³/s/km², which is considered excessive.

There is a strong case for using the adjusted pooling group values from Method 1 because the Hepste catchment, which is included the calculation of the QMED adjustment factor, is local to the subject site and is of a similar size. This suggests that the unadjusted QMED derived from catchment descriptors is too high although, to err on the conservative side, it is recommended that values from the unadjusted pooling group are used. This approach is

supported by the similar values obtained using Method 3, the IoH No.124 Report methodology.

It should be noted that the absence of flow measurement for this watercourse presents difficulties in determining estimations for design flows, and as such the results are not calibrated.

Hydraulic Model

A small hydrodynamic model was constructed using the ISIS software package (v2.4). The model extents are the upstream limit of the site and the confluence of the Nant Tywynni with the River Tawe, approximately 200m downstream of the site proposed for development.

Three structures were included in the model – the disused bridge, the culvert under the A4076 and the weir approximately 20m downstream of the culvert. Model runs were undertaken for the 1 in 100 year and 1 in 1000 year events along with a number of sensitivity runs. These included:

- raising the level of the downstream boundary of the model
- changing roughness values of channel and floodplain and increasing flows to represent climate change
- testing the effects of removing floodplain at the site of the proposed development
- changing the coefficient of the weir
- containing flow within the left bank

The 1 in 100 and 1 in 1000 year water levels generated by the model were most sensitive to the run when roughness and flows were changed together and the model levels least sensitive to removing the floodplain at the site of the proposed development. The maximum change was a 0.52m increase in levels when the 1000 year flow was increased by 20% and roughness values increased. This is an extremely unlikely scenario and therefore can be considered an uppermost value.

Flood Outlines

The peak water levels from the hydraulic model were used to replot the EFO and define the 1 in 100 year outline. The outlines for the proposed site are shown in Figure A4.1.

As shown in Figure A4.1, the revised EFO covers a much smaller area than the original (Appendix 3).

4.0 IMPACT OF REVISED EFO ON PROPOSED SCHEME

The drawings of the proposed works, to be submitted to the local planning authority, have been amended following the replotting of the EFO and moved outside the new EFO. It is therefore, considered that no further work will be required as part of this FCA.

5.0 CONCLUSIONS

The following conclusions may be made with regard to the proposed development and site:

- The extension to the existing works is required to ensure the plant complies with European water quality directives.
- The EFO is incorrect at this location and requires amendment.
- There is no calibration data at the site to check the validity of the calculated flows or the water levels generated by the hydraulic model.
- The proposed works have been moved outside the revised EFO and therefore are no longer in Zone C as defined by TAN15.