Report: *TA1037/05*
Date: *August 2017*

SURFACE WATER DISCHARGE RISK ASSESSMENT

ABERTHAW WORKS
EAST ABERTHAW
BARRY
VALE OF GLAMORGAN
CF62 3ZR

Prepared for
Tarmac Cement & Lime Ltd

Prepared by

The Beacon Centre for Enterprise
Dafen
Llanelli
SA15 8LQ

Tel: 01554 780544
Fax: 01554 759988
Web: www.thesiriusgroup.com

Project Quality Assurance
Information Sheet

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ABERTHAW WORKS, EAST ABERTHAW, BARRY

Report Number	:	TA1037/05	***Report Status***	:	FINAL
Report Date	:	August 2017			
Prepared for	:	Tarmac Cement and Lime Limited			
Prepared by	:	Sirius Environmental Limited The Beacon Centre for Enterprise Dafen Llanelli SA14 8LQ			

Written by:

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Kellie-Marie P. Burston
Environmental Consultant

Reviewed and Approved by:

_____

Dylan Thomas
Senior Environmental Consultant

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1.0 INTRODUCTION

1.1 Scope

1.1.1 Sirius Environmental (Sirius) have been commissioned by Tarmac Cement & Lime Limited ('Tarmac') to prepare a risk assessment to satisfy the requirements of Improvement Condition (IC) 5 of Environmental Permit Number **EPR/BL3986ID** for the operation of a cement manufacturing process at their Aberthaw Works, near Barry in the Vale of Glamorgan.

1.1.2 The IC5 requires an assessment of the potential discharge of any priority hazardous substances in line with current Environment Agency guidance *"How to carry out a risk assessment if you're applying for a bespoke permit that includes discharging hazardous pollutants to surface water",* last updated on 21st March 2017.

1.2 Site Setting and location

1.2.1 The site is located just north of the village of East Aberthaw, South Glamorgan and comprises of an active cement works and quarry, a closed marl tip and future quarry reserve, as shown on **Drawing No. A331-OSiAug15**. The main works site is separated from the active quarry by the B4265 that runs north-south.

1.2.2 The western area comprises of the main works, with access signposted from the B4265 to the north of the village of East Aberthaw. The site is located at Ordnance Survey Grid Reference: ST 0330 6740.

1.2.3 The eastern areas comprise an active limestone and shale quarry. The quarry is accessed from the main works through a tunnel beneath the B4265. The quarry is located at Ordnance Survey Grid Reference: ST 895 507. The future mineral reserve area is located to the south of the active quarry area. A landfill taking ash from the nearby power station is active to the immediate west of the active quarry.

Installation- Main works

1.2.4 The main works forms an elongated area to the west of the B4265, and measures approximately 470 metres by 720 metres at their maximum extents with an operational footprint of c. 11.8Ha.

1.2.5 The River Thaw and Kenson bound the works to the west and north, and a railway line to the west. To the east by the B4265 with the quarry beyond and open farmland and the village of East Aberthaw to the south.

1.2.6 The northern boundary of the main works is marked by the works feeder aqueduct, that acts as a reservoir for all the non-mains water used on site. The southernmost part of the site is occupied by a vehicle repair shop with associated hard standing and a wooded area.

1.2.7 The kiln is located along the western edge of the site, which consists of a rotary kiln with preheater tower, electrostatic precipitator, chimney stack and overflow clinker store. To the north of the electrostatic precipitator is the raw mill used to grind the raw materials prior to introduction to the preheater tower.

Quarry

1.2.8 The active quarry is located to the east of the B2465 and connected to the main works by an access tunnel beneath the highway. The active quarry extends across an area of c. 34.8Ha and includes to surface water lagoon and historic marl tips in the northern section, for which the licences have been surrendered. Active operations relating to the crushing and storage of site-won and imported limestone, and other additives are carried out within the approximate centre of the active quarry site. The blended materials are subsequently transferred by enclosed conveyor to the main works site, adjacent to the main quarry access route.

Former landfill and Adjacent farmland

1.2.9 There is a second disused marl tip located to the north of the main works, for which the licence has been surrendered. This landfill is now heavily overgrown with trees and undergrowth. Located to the west of this landfill is an area of farmland consisting of several fields.

2.0 CONCEPTUAL MODEL

2.1 Source

Site Discharges

2.1.1 The risk assessment considers the discharges to surface water from rainfall dependant surface run-off from operational areas of the facility. Surface run-off from the site is channelled via gullies and drains which is then directed into the works feeder aqueduct, which acts as a reservoir to supply process water to the main works at an average rate of c. 5,000 m^3/day. At full capacity, the aqueduct overflows to the River Kenson. The capacity of the feeder aqueduct is determined by a manually adjustable weir system located at its north-western tip, as identified by discharge point 'W1' on **Drawing No. A331-OSiAug15.** Discharge flow rates are not measured at the site.

2.1.2 A second point of discharge (Ref.: W2) is listed in the site's Environmental Permit. This discharge point authorised the release of surface run-off collected from the southern and western-most areas of the site. This discharge point is not currently used, whereby the waters are now pumped from the final chamber of the three-stage interceptor within this drainage network and discharged into the feeder aqueduct – to be used for process waters or discharged via discharge point W1. Consequently, for the purposes of this assessment, discharge point W2 is not considered further.

2.1.3 Surface water run-off from the adjacent quarry are managed within two lagoons to promote the settlement of fines. The waters are largely used to balance the volume of water available in the feeder aqueduct. Retention times with the first lagoon is provided by the means of a weir system. However, overtopping of the weir rarely occurs, with mechanical pumping required to ensure that water levels in the aqueduct are maintained.

2.1.4 On this understanding of the site drainage arrangement, it is considered the run-off volumes and flows from the active quarry areas will be at attenuated by the quarry lagoon systems and is therefore unlikely to combine with discharges to the aqueduct associated with run-off from the main works areas. Additionally, process waters are likely to be extracted from the aqueduct at an average daily rate of 5,000m^3.

2.1.5 On this basic conceptualisation, the cumulative run-off from the active quarry and main works site would be overly conservative for the calculation of likely discharge rates via W1. Consequently, consideration of the run-off from the main works site is considered appropriate for the estimation of the likely rates of discharge from W1.

2.1.6 Daily average rainfall figures for the site have been derived from historical hourly sequential data recorded at St Athans. This data indicated an average daily rainfall event of 5 hrs in duration with a mean hourly precipitation of

0.73mm, which equates to an average daily runoff rate from the main works site of 0.024m³/s

2.1.7 Peak run-off volumes from the main work site are based on potential volumes during a 1 in 100 year return storm event with a 20% allowance for climate change, as calculated using Microdrainage. The maximum daily runoff volume during a storm event is calculated at 11,032m³, which equates to an average daily flow into the aqueduct of 0.13 m³/s, with a peak rate of 0.32 m³/s. A copy of the Microdrainage outputs are presented in **Appendix 1.**

Water Quality

2.1.8 Discharges from W1 comprises a mixture of surface run-off and recycled process waters. A materials inventory which identifies the priority hazardous substances present within raw, waste and product materials handled at the site, and an assessment of the likelihood of their entry into surface runoff is presented in **Appendix 2**. The priority hazardous substances identified within materials handled on site that are likely to enter these waters to be discharge from W1 are limited to:-

- Cadmium
- Lead
- Mercury
- Nickel
- Benzene
- Polyaromatic Hydrocarbons (PAHs)

2.1.9 A total of three samples were collected on three separate dates during or immediately following rainfall events and issued to a UKAS accredited laboratory for analysis. A summary of the results is present in **Table 1.** Laboratory reports are presented in **Appendix 3.**

Table 1: Priority Hazardous Substance Concentrations of Feeder Aqueduct waters (µg/l)

Substance	EQS		Result		
	AA	*MAC*	*26/07/17*	*28/07/17*	*02/08/17*
Cadmium (dissolved)	0.2	-	0.11	0.13	0.09
Lead (dissolved)	1.3	14	0.4	<0.3	<0.3
Mercury (dissolved)	-	0.07	<0.05	<0.05	<0.05
Nickel (dissolved)	8.6	34	3	3	3
Benzene	8	50	<1	<1	<1
Naphthalene	2	130	0.01	0.01	0.02
Benzo(b)fluoranthene	-	0.017	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	-	0.017	<0.01	<0.01	<0.01
Benzo(a)Pyrene	-	0.027	<0.01	<0.01	<0.01
Indeno(123-cd)-pyrene	-	-	<0.01	<0.01	<0.01
Benzo(ghi)-perylene	-	0.00082	<0.01	<0.01	<0.01
PAH (Total of Benzo(a)-pyrene (BaP), Benzo(b)-fluoranthene, Benzo(k)-fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene only)	0.0017	-	<0.01	<0.01	<0.01

AA = Annual Average; MAC = Maximum Allowable Concentration

2.1.10 During each round of sample collection there was no discharge at W1, even during or following a rainfall event. Samples were therefore collected from within the aqueduct at a point immediately adjacent to the weir.

2.2 Pathways

2.2.1 Once the feeder aqueduct reaches capacity, waters will discharge over the weir level control system into the Kenson River, at a point which is less than 100m upstream of its point of confluence with the River Thaw.

2.2.2 Prior to discharge into the River Thaw, the works feeder acts as a reservoir that also promotes the settlement for suspended solids.

2.3 Receptors

2.3.1 The site boundary is defined by the River Thaw to the west and the River Kenson to the north. The River Thaw and Kenson confluence at the north-western corner of the main works site, where waters subsequently flow southwards, towards the sea. The stretches of the River Kenson and River Thaw in the vicinity of the Aberthaw Works are within the upper reaches of an estuary, where flows in each channel are mainly freshwater.

2.3.2 The primary receptor from site discharge W1 is the River Kenson before convergence with River Thaw. Given the lack of flow data available for the River Kenson, and the relatively short distance between the point of discharge and the confluence point, the River Thaw is considered to be the primary receptor to discharges from the Aberthaw Works.

2.3.3 The nearest WFD monitoring station for the River Thaw is located at NGR ST02950 67650 which is 200m upstream from the Aberthaw Works. **Table 4** summarises the latest Water Framework Directive classification (published 2015).

Table 2: Summary of river quality status at the River Thaw monitoring station

Name	Length	Catchment	Overall Status	Chemistry Status	Ammonia	pH	Dissolved Oxygen	Phosphate
Thaw	20.18 km	Tawe to Cadoxton	Moderate	Good	High	High	High	Moderate

2.3.4 The phosphate is largely due to the sewage treatment works situated lower down this waterbody at Cowbridge outside of the Rhonda Cynon Taff boundary.

2.3.5 Currently the overall status of the water body is 'moderate', The Water Framework Directive objective for this waterbody is to achieve 'Good' ecological and overall status by 2021.

2.3.6 There are no gauging stations present within the River Kenson. The nearest gauging station within the River Thaw is located at Gigman Bridge, c. 5km upstream of Aberthaw Works. The 95th percentile exceedance of gauged daily flow is 0.171m^3/s, with a mean of 1.037 m^3/s.

2.4 Environmental Quality Standards

2.4.1 Environmental Quality Standards (EQSs) for this assessment have been derived for estuaries and coastal waters. The relevant EQSs are summarised in **Table 3.**

Table 3: Environment Quality Standards

PAH's Substance	Annual Average (µg/l)	Maximum Allowable Concentration (µg/l)	Annual Significant Load Limit (kg)
Cadmium and its compounds - dissolved	0.2	-	5
Lead and its compounds - dissolved	1.3	14	-
Mercury and its compounds - dissolved	-	0.07	1
Nickel and its compounds - dissolved	8.6	34	-
Benzene	8	50	-
Benzo(a)-pyrene (BaP)	See PAHs	0.027	See PAHs
Benzo(b)-fluoranthene	See PAHs	0.017	See PAHs
Benzo(k)-fluoranthene	See PAHs	0.017	See PAHs
Benzo(g,h,i)-perylene	See PAHs	0.00082	See PAHs
Indeno (1,2,3-cd)-pyrene	See PAHs	-	See PAHs
Naphthalene	2	130	See PAHs
Polyaromatic Hydrocarbons (PAH) - Total of Benzo(a)-pyrene (BaP), Benzo(b)-fluoranthene, Benzo(k)-fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene	0.00017	-	5

3.0 RISK ASSESSMENT

3.1 Risk Screening

3.1.1 Screening tests for the discharge of surface water run-off from site have been undertaken in accordance with Environment Agency guidelines[1]. The screening tests were performed using the H1 software tool (version 2.7.8 – January 2017). A copy of the H1 screening assessment is presented in **Appendix 4.**

Test 1

3.1.2 The concentrations of all relevant priority hazardous are less than their associated EQS. Pollutant discharges from the feeder aqueduct does not therefore present a risk to the environment.

Significant Load Limits

3.1.3 Calculated annual loads of cadmium and mercury (assumed at 50% of the limit of detection) were 0.08kg and 0.02kg respective. The potential loadings are well below their respective annual limits of 5kg and 1kg. The pollutant discharges are therefore considered insignificant.

[1] *https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit*

4.0 CONCLUSION

4.1.1 The potential risks associated with priority hazardous substances that have the potential to be present within run-off and process waters discharged via the feeder aqueduct at Aberthaw Works has been screened in accordance with current Environment Agency guidance.

4.1.2 The screening tests demonstrate that the concentration of priority hazardous substances within the discharge waters are less than the appropriate Environmental Quality Standards associated with discharges to estuaries and coastal waters. Similarly, the calculated annual pollutant loadings are well below relevant significant load limits.

4.1.3 Based on the results of the screening assessments, the discharge from the feeder aqueduct is considered insignificant and does not present a significant risk to the environment.