Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Bryn Posteg Landfill Site

Sundorne Products (Llanidloes) Limited

Environmental Permit Variation Application

Supporting Document

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Document Title: Supporting Document

Document Ref: 4299-CAU-XX-XX-RP-V-0300.A0.C1

Client: Sundorne Products (Llanidloes) Limited

Caulmert Project Manager: Andy Stocks

Issued by: Caulmert Limited, 14 Farrington Way, Eastwood Link Business Park, Eastwood, Notts, NG16 3BF

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BRYN POSTEG LANDFILL SITE - ENVIRONMENTAL PERMIT VARIATION APPLICATION

SUPPORTING DOCUMENT

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APPENDICES

1.0 INTRODUCTION

1.1 Application Context

1.1.1 Bryn Posteg Landfill Site (hereafter referred to as 'the Site') in Llanidloes, Powys is operated by Sundorne Products (Llanidloes) Limited, trading as Potters Waste Management ('the Operator') under Environmental Permit ref. EPR/BU7766IC/V009.

1.1.2 Caulmert Limited have been appointed by the Operator to prepare an environmental permit variation application to vary the existing bespoke permit for the following:

- To provide further information on a proposed new surface water treatment process at the Site, including process description;
- To formalise an increase in the Chloride compliance limit for groundwater monitoring point G1/W1, from 69mg/l to 500mg/l (as agreed with Natural Resources Wales);
- To add waste code 20 03 01 to the list of waste codes in Table S2.4 of the Permit for physico-chemical treatment (Section 5.4 Part A (1)(a)(ii);
- To add two waste codes 19 08 05 and 19 08 12 to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A(1)(a)(i)) - specifically restricting the use of these wastes to reseeding of leachate in the existing leachate treatment plant on-site;
- To add waste code 19 05 99 to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A(1)(a)(i) - specifically for composting liquor waste generated from the existing composting activity on-site, to be sent into the leachate treatment plant on-site; and,
- To add two waste codes 02 01 03 and 02 01 06 to Table S1.1 of the Permit for the incineration of straw wastes in the existing biomass plant on-site (Section 5.1 Part B (a)(v));

1.1.3 Further details on the above changes are provided in Sections 3.1 and 3.5 of this document.

1.2 Document Structure

1.2.1 This Supporting Document has been prepared to provide additional information to support the information provided in forms Part A, C2, C3 and F1 of the environmental permit application for varying a bespoke permit. To aid cross-referencing between this document and the application forms, the answers to questions are presented in the same order as in the application forms and the headings in this document include the specific question number to which the information relates.

2.0 PART A FORM – ABOUT YOU

2.1 Part A – Qu. 6a: Your main (registered office) address

2.1.1 The Site is operated by Sundorne Products (Llanidloes) Limited, which trades as Potters Waste Management and therefore the main registered address on record at Companies House is Potter House, Henfaes Lane, Welshpool, Powys, Wales, SY21 7BE.

3.0 PART C2 FORM – GENERAL - VARYING A BESPOKE PERMIT

About the Permit

3.1 Part C2 – Qu. 1a: Pre-application Discussions

3.1.1 Ongoing discussions have been taking place with Natural Resources Wales (specifically Lara Cubley, a Senior NRW Officer) regarding the treatment of surface water at the Site and they have advised that a normal variation application needs to be submitted to cover the treatment of surface water, as detailed in Improvement Condition 11 of the Site's Environmental Permit.

3.1.2 In response to Action 8 in the NRW Compliance Assessment Report (CAR) ref. NRW0037617 (attached), the Operator also wishes to formalise an agreed increase in the Chloride compliance limit for groundwater monitoring point G1/W1 in Table S3.5 of the Permit. NRW has agreed with the Operator that the Chloride compliance limit can be raised from its current limit of 69mg/l at G1/W1 to a new limit of 500mg/l, as part of a permit variation.

3.1.3 It has also been discussed and agreed between the Operator and NRW to add three new waste codes to the existing landfill permit as follows:

- Add waste code 20 03 01 (mixed municipal waste) to Table S2.4 of the Permit for physico-chemical treatment (Section 5.4 Part A (1)(a)(ii)); and,
- Add waste codes 19 08 05 (Sludge from treating waste water) and 19 08 12 (Sludge from biologically treating industrial waste water not containing hazardous substances) to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A (1)(a)(i)) - specifically restricting the use of these wastes to reseeding of leachate in the existing leachate treatment plant on-site.

3.1.4 The Operator also proposes to add the following three new waste codes to the existing landfill permit as follows:

- Add waste code 19 05 99 (wastes from aerobic treatment of solid wastes – wastes not otherwise specified) to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A(1)(a)(i) - specifically for composting liquor waste from the existing composting activity on-site, into the leachate treatment plant on-site;
- Add two waste codes 02 01 03 (plant-tissue waste) and 02 01 06 (including spoiled straw) to Table S1.1 of the Permit for the incineration of straw wastes in the existing biomass plant on-site (Section 5.1 Part B (a)(v)).

3.2 Part C2 – Qu. 1b: Permit Number

3.2.1 The Environmental Permit to which the application relates is ref. EPR/BU7766IC/V009.

About your Proposed Changes

3.3 Part C2 – Qu. 2a: Type of Variation

3.3.1 This application has been prepared on the basis of a normal variation and the appropriate fee has been submitted by BACs payment to NRW.

3.4 Part C2 – Qu. 2b: Provide a Non-Technical Summary of your application

3.4.1 A non-technical summary has been provided as part of this application, attached as document referenced 4299-CAU-XX-XX-RP-V-0301 (Appendix 1).

3.5 Part C2 – Qu. 2b: Details of Proposed Changes

3.5.1 Question 2b of application form Part C2 requests that information should be given about changes to existing activities. The permit currently relates to the installation which is Bryn Posteg Landfill along with its related activities. The permit controls the landfill as a 'stationary technical unit' and 'directly associated activities' serving the landfill.

3.5.2 In response to Improvement Condition 11 of the Environmental Permit, Natural Resources Wales (NRW) have requested that the Operator submit a normal permit variation to cover the treatment aspects of the surface water at the site and its ultimate discharge off-site, including details on infrastructure and specifics on the treatment process. The Process Description & Operating Techniques document ref. 4299-CAU-XX-XX-RP-V-0303 is attached as Appendix 2.

3.5.3 The surface water management system at Bryn Posteg Landfill Site is currently divided into two different sub-catchment areas, the eastern and western catchments, a consequence of its geography and engineered landform. Surface water in the eastern catchment is currently directed to and discharged at surface water point P1 (into the Nant y Bradnant stream) on the eastern boundary. Surface water from the western catchment is collected and discharged at surface water point P2 (into the Afon Dulas stream) on the western boundary.

3.5.4 It is proposed to amend this activity to upgrade the surface water treatment process to chemically treat surface water captured in Lagoon 3, by using additives to encourage settlement of suspended solids, in order to bring suspended solids levels in the surface water to within the compliance limits of the permit, prior to being discharged from P1.

3.5.5 As part of this variation application, a Surface Water Pollution Risk Assessment and associated modelling for the site has been undertaken and is attached in Appendix 3 as report ref. 3400-CAU-XX-XX-RP-O-0302.

3.5.6 In addition to the above, this permit variation is to also include an amendment to Table S3.5 of the permit to increase the compliance limit of Chloride from 69 mg/l to 500 mg/l for groundwater monitoring point G1/W1 only. This is as a result of investigations conducted by the Operator (see Potter's report ref. 'Bryn Posteg Chloride Report 2020' in Appendix 6 and Caulmert report ref. 3428-CAU-XX-XX-CO-V-9101 in Appendix 7) and subsequently agreed by Natural Resources Wales (NRW) in CAR report ref. NRW0037617 (in Appendix 8). This has been

accepted in principle by NRW, as stated in the CAR form, and now needs formalising and the permit amending as part of this permit variation.

3.5.7 Furthermore, the Operator wishes to add six new waste codes to two tables within the existing landfill permit (EPR/BU7766IC) as follows:

- Waste code 20 03 01 (mixed municipal waste) to be added to Table S2.4 of the Permit for physico-chemical treatment (Section 5.4 Part A (1)(a)(ii)) – this waste is already accepted onto Site under the Environmental Permit ref. WML 47120 for the Material Recycling Facility (MRF) on Site and therefore a risk assessment is not considered necessary; and,

- Waste codes 19 08 05 (Sludge from treating waste water) and 19 08 12 (Sludge from biologically treating industrial waste water not containing hazardous substances) to be added to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A (1)(a)(i)) - specifically restricting the use of these wastes to reseeding of leachate in the existing leachate treatment plant on Site only.

- Waste code 19 05 99 (wastes from aerobic treatment of solid wastes – wastes not otherwise specified) to be added to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A(1)(a)(i) - specifically for composting liquor waste generated from the existing composting activity on-site, to be sent into the leachate treatment plant on-site;

- Waste codes 02 01 03 (plant-tissue waste) and 02 01 06 (including spoiled straw) to Table S1.1 of the Permit for the incineration of straw wastes in the existing biomass plant on-site (Section 5.1 Part B (a)(v)).

Your Ability as an Operator

3.6 Part C2 – Qu. 3a: Relevant Offences

3.6.1 The application form specifies that details of any relevant offences only need to be provided when applying to add waste installations or waste operations to a permit that has not previously had them. No waste installations or waste operations are being added as part of the variation application.

3.7 Part C2 – Qu. 3b: Technical Ability

3.7.1 The Operator already provides technically competent managers with relevant qualifications under the CIWM/WAMITAB scheme for technical competence to manage the landfill operations on site. Their requirement is not affected by this application.

3.8 Part C2 – Qu. 3b: Finances

3.8.1 This question is not relevant to this application as no waste installations or waste operations are being added as part of the permit variation.

3.9 Part C2 – Qu. 3d: Management System

3.9.1 Bryn Posteg Landfill Site and the associated activities on Site are managed by the Operator in accordance with their own management system. A summary of the Environmental Management System is provided below.

3.9.2 The Operator will implement a number of site-specific procedures and documents to control the operations at the Site, as follows:

Identifying and minimising risks of pollution

3.9.3 Environmental risk assessments have been carried out for the purpose of this application which assesses the environmental risks from all the relevant activities affected by this application.

3.9.4 The risk assessment was also used as a tool for identifying the risk management measures that are important in minimising the risks of pollution. The identified risk management measures are considered to be the minimum technical standards which the Site should operate to.

Operations and maintenance

3.9.5 With regards to the proposed activities, the control measures identified within the 'Amenity and Accident Risk Assessment' and 'Surface Water Pollution Risk Assessment' will form part of the technical standards for the Site.

3.9.6 Maintenance is managed through maintenance schedules for all equipment on Site.

Incidents and non-conformances

3.9.7 Any incidents or non-conformances will be recorded in the daily site records. A daily site inspection is carried out by a technically competent manager. Staff are also encouraged to report any issues immediately to the technically competent manager.

Complaints

3.9.8 The company has a Complaints Procedure, which forms part of the management system for the Site.

Staff training and competence

3.9.9 Training is provided so that all workers have a satisfactory understanding of their duties in relation to environmental and health & safety issues on Site.

3.9.10 For machine and equipment operators, the company ensures that training and certification and continued competence in relation to that particular machine or equipment is undertaken by all machine operators prior to their use of that machine.

Odour, noise and emissions management

3.9.11 The management system includes measures that will be taken to manage odour, noise and other emissions.

3.9.12 In addition, the technical standards proposed for the management of odour, noise and other emissions, which were identified through the Amenity and Accident Risk Assessment for this application, will form part of the management system for the Site.

3.9.13 The management measures are supported by the daily checks which are carried out by the technically competent managers who will consider the most appropriate action to take.

Documentation of legislative and other requirements

3.9.14 Copies of planning permissions, environmental permits and other relevant permissions are kept either as paper records or electronically in the Site Office.

3.9.15 The technically competent manager will keep up to date with other legal requirements and changes to relevant environmental legislation through trade magazines and the Natural Resources Wales and Environment Agency websites.

Management reviews

3.9.16 Management will periodically review the environmental performance of the company through their review of environmental audit reports and the daily site records.

3.9.17 The environmental policy statement is also reviewed periodically to ensure it reflects the company's operations and its environmental objectives.

Application Supporting Information

3.10 Part C2 – Qu. 5a: Provide a Plan for the Site

3.10.1 This question requires that where an operator is seeking to add land as part of the variation application, a revised site plan that identifies all of the land on which the activities will take place must be submitted. There is no additional land to be added as part of this permit variation.

3.11 Part C2 – Qu. 5b & 5c: Extra Land and Site Report

3.11.1 There will be no additional land or installations added as part of this permit variation and therefore it is not necessary to submit a site report or a baseline report.

Environmental Risk Assessment

3.12 Part C2 – Qu. 6: Provide an Environmental Risk Assessment

3.12.1 This question requires an environmental risk assessment of the risks of the proposed activities as part of the application.

3.12.2 A Surface Water Pollution Risk Assessment has been conducted and the report is attached in Appendix 3 as document ref. 3400-CAU-XX-XX-RP-O-0302.

3.12.3 An Amenity and Accidents Risk Assessment has been completed and is attached in Appendix 4 as report ref. ref. 4299-CAU-XX-XX-RP-V-0302.

4.0 PART C3 FORM – VARIATION TO A BESPOKE INSTALLATION PERMIT

4.1 Part C3 - Relevant Questions to the Application

4.1.1 The answers to the questions relevant to this variation application in the Part C3 form are presented within the Process Description & Operating Techniques report ref. 4299-CAU-XX-XX-RP-V-0303 (attached as Appendix 2).

5.0 PART F1 FORM – OPRA, CHARGES AND DECLARATIONS

Working out charges

5.1 Part F1 – Qu.1 Table 1 & Table 2: Working out charges

5.1.1 The current OPRA profile spreadsheet for the site shows the OPRA charging score is 177, resulting in a fee, according to Table 1, of £10,089.00 for a normal variation.

5.1.2 The fee of £10,089.00 has been paid to Natural Resources Wales via credit card.

5.1.3 A copy of the current OPRA profile spreadsheet for the Site is attached as Appendix 5.

APPENDIX 1

Non-Technical Summary ref. 4922-CAU-XX-XX-RP-V-0301

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Bryn Posteg Landfill Site

Sundorne Products (Llanidloes) Limited

Environmental Permit Variation Application

Non-Technical Summary

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APPROVAL RECORD

Document Title: Non-Technical Summary

Document Ref: 4299-CAU-XX-XX-RP-V-0301.A0.C0

Client: Sundorne Products (Llanidloes) Limited

Caulmert Project Manager: Andy Stocks

Issued by: Caulmert Limited, 14 Farrington Way, Eastwood Link Business Park, Eastwood, Notts, NG16 3BF

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Reviewer	Andy Stocks Associate Director	**Date**	26/05/2021
Approved	Andy Stocks Associate Director	**Date**	26/05/2021

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BRYN POSTEG LANDFILL SITE ENVIRONMENTAL PERMIT VARIATION APPLICATION

NON-TECHNICAL SUMMARY

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1.0 INTRODUCTION

1.1 Variation Application Context

1.1.1 Bryn Posteg Landfill Site (the 'Site') in Llanidloes, Powys is operated by Sundorne Products (Llanidloes) Limited, trading as Potters Waste Management ('the Operator') under Environmental Permit ref. EPR/BU7766IC/V009.

1.1.2 Caulmert Limited have been appointed by the Operator to prepare a normal variation application to vary the existing landfill permit (EPR/BU7766IC) for the following reasons:

- To provide information on a new surface water treatment process at the Site, in accordance with Improvement Condition (IC) 11 of the Permit;
- To formalise an increase in the Chloride compliance limit for groundwater monitoring point G1/W1, from 69mg/l to 500mg/l (as agreed with Natural Resources Wales);
- To add one waste code 20 03 01 to the list of waste codes in Table S2.4 of the Permit for physico-chemical treatment (Section 5.4 Part A (1)(a)(ii);
- To add two waste codes 19 08 05 and 19 08 12 to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A(1)(a)(i) - specifically restricting the use of these wastes to reseeding of leachate in the existing leachate treatment plant on-site;
- To add waste code 19 05 99 to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A(1)(a)(i) - specifically for composting liquor waste generated from the existing composting activity on-site, to be sent into the leachate treatment plant on-site; and,
- To add two waste codes 02 01 03 and 02 01 06 to Table S1.1 of the Permit for the incineration of straw wastes in the existing biomass plant on-site (Section 5.1 Part B (a)(v)).

1.1.3 This document is the Non-Technical Summary of these proposed changes, as part of the bespoke environmental permit variation application for the Site.

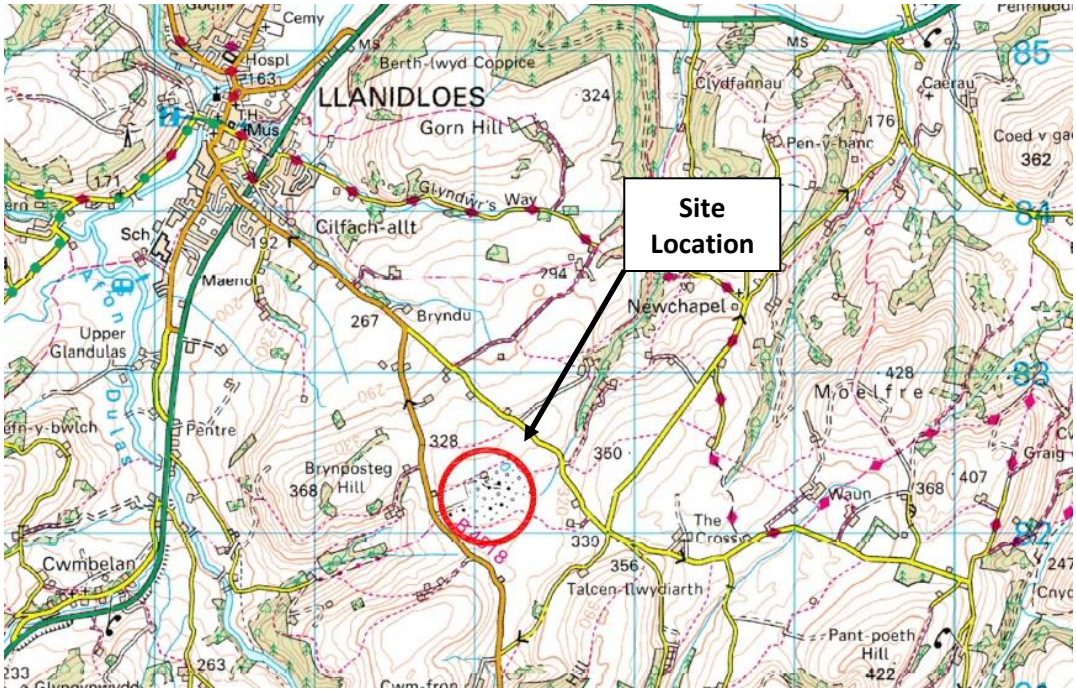
2.0 SITE LOCATION

2.1 Bryn Posteg Landfill Site

2.1.1 Bryn Posteg Landfill Site is located approximately 2.8 km south east of Llanidloes, Powys, at NGR SN970822. The Site is operated by Sundorne Products (trading as Potters Waste Management). The Site is accessed via the B4518, the Llanidloes to Tylwch Road. The Site location is indicated within the red circle in Figure 1 below.

2.1.2 The Site is situated amongst predominantly agricultural land. It is bound to the west by the B4518 road. Few residential properties are situated within close-proximity to the Site.

Figure 1 - Location of Site



3.0 SITE HISTORY

3.1 Landfill Site History

3.1.1 Bryn Posteg Landfill Site is located at the site of a former lead mine. The landfill site has been developed over a number of years with the first waste being accepted into Phase 1 in 1982. The landfill site is currently divided into 9 Phases which, in turn, are divided into sub-cells. The current tipping operations are continuing in Phase 9c and 9d. The landfill site phases are: 1, 2, 3A, 3B, 3C, 4A, 4B, 5, 6, 7, 8, 9A, 9B, 9C, 9D, 9E. Waste is currently accepted in Cell 9D and Cell 9E; all other cells are complete. Cells 1 to 9B are all capped.

3.1.2 Phases 1-5 were operated by Montgomeryshire, later Powys County Council, between 1982 and 1997. Evans Logistics Ltd operated Phases 6 – 8. Potters acquired the site in 2005. Phases 9A-9E have been developed in the southern part of the site. Between 2008 and 2017 additional tipping was also 'piggy-backing' onto the existing site (Phases 3A, 3B, 4A and 4B).

3.1.3 As a result of significant over-tipping, predominantly over the central part of the site (now mostly complete and capped) a revised final restoration profile has been developed to account for the over-tipping and to enable the satisfactory completion of the site.

3.2 Surface Water Management History

3.2.1 The surface water management system at Bryn Posteg Landfill Site is divided into two different sub-catchment areas, the eastern and western catchments. Surface water in the eastern catchment is directed to and discharged at surface water point P1 (into the Nant y Bradnant stream) on the eastern boundary. Surface water from the western catchment is collected and discharged at surface water point P2 (into the Afon Dulas stream).

3.2.2 Historically, there were no positive means of treating surface water runoff from either catchment. Any water treatment was undertaken passively, achieved by a combination of flow attenuation provided by slope angle and vegetation, and by accumulation that affords some solids settlement. There was also a degree of ground infiltration should there be a favourable hydraulic gradient between surface flow and subterranean groundwater pipework.

3.2.3 There are three surface water storage lagoons located on the eastern edge of the eastern catchment. The two primary lagoons, Lagoon 1 and Lagoon 2, were established as outfall points from an earlier (now decommissioned) surface water treatment facility. These lagoons allowed surface water to settle post-treatment, promoting the settlement of suspended solids by gravity. A surface water 'supernatant' with a lower suspended solids content was allowed to outfall to the Nant y Bradnant headwater. Lagoon 3 was created sometime after the first two lagoons, formed in an excavation created by a borrow pit.

4.0 PROPOSED CHANGES

4.1 Surface Water Treatment

4.1.1 This normal permit variation is to upgrade the current surface water treatment process at the Bryn Posteg Landfill Site to chemically treat surface water captured in Lagoon 3 of the site to reduce suspended solids concentrations in the surface water, to within permit compliance limits prior to discharge off-site via discharge point P1.

4.1.2 The Environmental Permit for the Site (ref. BU7766IC/V009) relates to the installation, which is Bryn Posteg Landfill along with its related activities, which includes surface water management. The permit controls the landfill as a 'stationary technical unit' and 'directly associated activities' serving the landfill.

4.1.3 In response to Improvement Condition 11 of the Environmental Permit, Natural Resources Wales (NRW) have requested that the Operator submit a normal permit variation to cover the treatment aspects of the surface water management scheme at the site and its ultimate discharge off-site, including details on infrastructure and specifics on the treatment process. Further technical details on the proposed surface water treatment process can be found in the Operating Techniques/Process Description document ref. 4299-CAU-XX-XX-RP-V-0303, included as part of this application.

4.1.4 Currently Bryn Posteg Landfill Site is divided into two different sub-catchments areas, the eastern and western catchments, a consequence of its geography and engineered landform. Surface water in the eastern catchment is directed to lagoons on the site and then discharged at surface water point P1 into the Nant y Bradnant watercourse. Surface water from the western catchment is discharged at point P2 into the Afon Dulas watercourse.

4.1.5 It is proposed to amend this activity to chemically treat the surface water that has been collected into Lagoon 3 from the eastern and western catchments via a dosing structure to encourage settling out of suspended solids and reduce levels in surface water down to within suspended solids compliance limits, before being discharged from site.

4.1.6 The risk assessments submitted as part of this permit variation considers the environmental implications of the proposed scheme. Consequently, the operation of the proposed surface water treatment and discharge process within this application is considered to be the environmentally acceptable option, compared with continuing to use the current passive scheme.

4.1.7 Additional technical assessment and modelling has been undertaken to assess the potential impact of the updated surface water treatment and discharge system and these reports are as follows:

- Surface Water Pollution Risk Assessment ref. 3400-CAU-XX-XX-RP-O-0302;
- Amenity and Accidents Risk Assessment ref. 4299-CAU-XX-XX-RP-V-0302.

4.1.8 Bryn Posteg Landfill and the associated activities on Site are managed by the Operator in accordance with a management system. The Operator has implemented an environmental management system across the company to control the sites-specific operations at the Site.

4.2 Revised Chloride Compliance Limit - Groundwater Monitoring Point G1/W1

4.2.1 As part of this permit variation, in addition to the above surface water treatment, it is also proposed to amend Table S3.5 of the Environmental Permit to increase the Chloride compliance limit of groundwater monitoring point G1/W1 only, located just inside the site entrance.

4.2.2 NRW have agreed with the Operator's conclusions presented in the Potters report ref. 'Bryn Posteg Chloride Report 2020' (with reference to investigations undertaken by Caulmert in report ref. 3428-CAU-XX-XX-CO-V-9101), that the groundwater quality in monitoring point G1/W1 is affected by seasonal fluctuations of road salt from the adjacent B4518 Llanidloes to Twylch Road and therefore the current compliance limit of 69mg/l for G1/W1 is not suitable.

4.2.3 In the NRW's Compliance Assessment Report (CAR) form ref. NRW0037617, NRW agree to formalising in a permit variation the increase of the Chloride compliance limit for monitoring point G1/W1 from 69mg/l up to 500mg/l. This is for monitoring point G1/W1 only and does not apply to any other monitoring points at the site. The NRW CAR form, Operator's 2020 report on Chloride and Caulmert's report are all attached to this variation application within the Supporting Document.

4.3 Addition of Waste Codes

4.3.1 The Operator also wishes to add three new waste codes to the landfill permit as part of this normal variation application, as follows:

- Waste code 20 03 01 (mixed municipal waste) to be added to Table S2.4 of the Permit for physico-chemical treatment (Section 5.4 Part A (1)(a)(ii)) – this waste is already accepted onto Site under the Environmental Permit ref. WML 47120 for the Material Recycling Facility (MRF) on Site and therefore a risk assessment is not considered necessary;

- Two waste codes 19 08 05 (Sludge from treating waste water) and 19 08 12 (Sludge from biologically treating industrial waste water not containing hazardous substances) to be added to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A (1)(a)(i)) - specifically restricting the use of these wastes to reseeding of leachate in the existing leachate treatment plant on Site only;

- Waste code 19 05 99 (wastes from aerobic treatment of solid wastes – wastes not otherwise specified) to be added to Table S2.3 of the Permit for leachate storage and treatment (Section 5.4 Part A(1)(a)(i) - specifically for composting liquor waste generated from the existing composting activity on-site, to be sent into the leachate treatment plant on-site; and,

- Waste codes 02 01 03 (plant-tissue waste) and 02 01 06 (including spoiled straw) to Table S1.1 of the Permit for the incineration of straw wastes in the existing biomass plant on-site (Section 5.1 Part B (a)(v)).

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APPENDIX 2

Process Description & Operating Techniques ref. 4299-CAU-XX-XX-RP-V-0303

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Bryn Posteg Landfill Site

Sundorne Products (Llanidloes) Limited

Environmental Permit Variation Application

Surface Water Treatment Process Description & Operating Techniques

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Document Ref:	4299-CAU-XX-XX-RP-V-0303.A0.C0
Client:	Sundorne Products (Llanidloes) Limited
Caulmert Project Manager:	Andy Stocks
Issued by:	Caulmert Limited, 14 Farrington Way, Eastwood Link Business Park, Eastwood, Notts, NG16 3BF

Author	Samantha Bowler Environmental Consultant	**Date**	26/05/2021
Reviewer	Andy Stocks Associate Director	**Date**	26/05/2021
Approved	Andy Stocks Associate Director	**Date**	26/05/2021

DISCLAIMER

BRYN POSTEG LANDFILL SITE

SURFACE WATER TREATMENT PROCESS DESCRIPTION & OPERATING TECHNIQUES

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1.0 INTRODUCTION

1.1 Report Overview

1.1.1 Caulmert Limited have been appointed by Sundorne Products (Llanidloes) Limited, trading as Potters Waste Management ('the Operator'), to prepare this report as part of a normal permit variation application for Bryn Posteg Landfill Site operated under Environmental Permit referenced EPR/BU7766IC.

1.1.2 This report is written in response to information requested in application form Part C3 and outlines the general process description and operating techniques of the proposed surface water treatment activity on Site at Bryn Posteg Landfill Site. The activity will involve treating surface water collected at the Site to remove suspended solids prior to being discharged from Site.

2.0 PROCESS DESCRIPTION

2.1 Site Background

2.1.1 Bryn Posteg Landfill Site is an operational landfill site which is operated by Sundorne Products (Llanidloes) Limited (trading as Potters Waste Management) and is permitted to accept non-hazardous and inert commercial, industrial and municipal wastes for treatment and disposal to landfill.

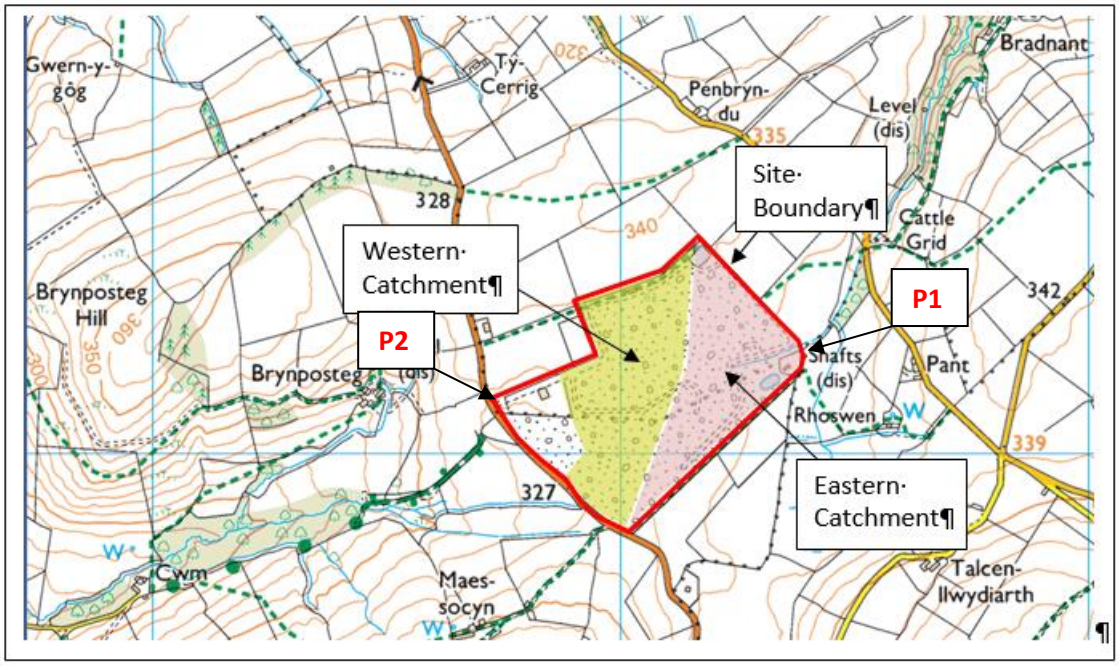
2.1.2 The Operator proposes to undertake surface water treatment at the Site and further information on this process is provided in this report, in response to Improvement Condition 11 of the Environmental Permit and as requested by Natural Resources Wales (NRW). Specifically, NRW have asked the Operator to submit a normal permit variation to cover the treatment aspects of the surface water at the Site and its ultimate discharge off-site, including details on infrastructure and specifics on the treatment process.

2.1.3 Only surface water from Bryn Posteg Landfill Site will be treated at the proposed new surface water treatment facility, in order to remove suspended solids concentrations to levels below permitted compliance limits for discharge to surface water off-site.

2.2 Application Proposal

2.2.1 The current surface water management system at Bryn Posteg Landfill Site is divided in two different sub-catchment areas (see Figure 1.), the eastern and western catchments, as a consequence of its geography and engineered landform. Surface water in the eastern catchment is directed to and discharged at surface water point P1 (into the Nant y Bradnant stream) on the eastern boundary. Surface water from the western catchment is collected and discharged at surface water point P2 (into the Afon Dulas stream).

Figure 1. Site Boundary, Drainage Catchments & Discharge Points

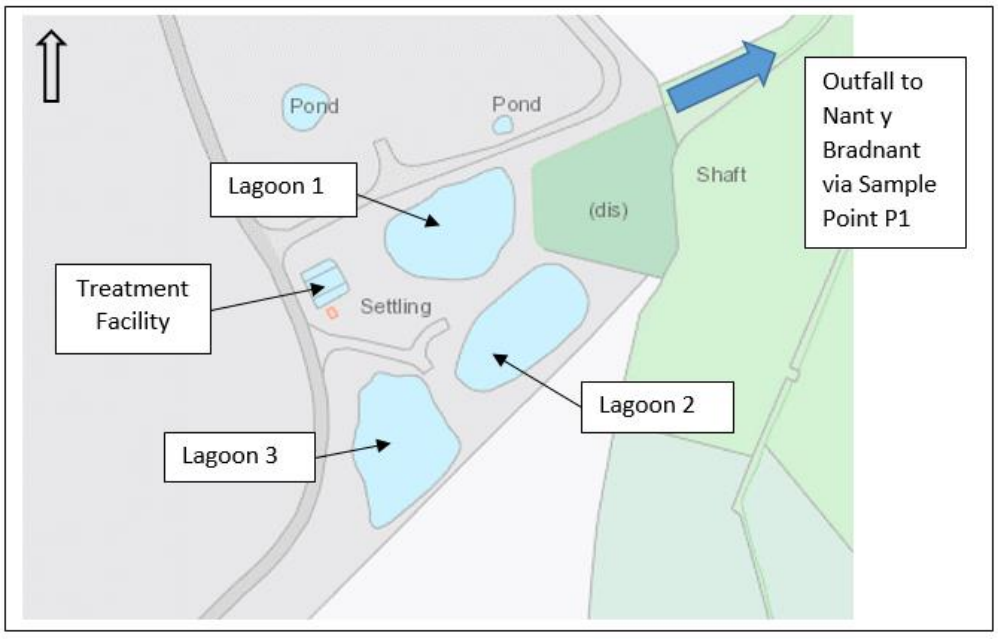


2.2.2 Surface water samples collected from the Site have on occasions exceeded the permitted values for the Site. Suspended solids exceedances were experienced in 2013 and in 2015 at Sampling Point P1 (eastern outfall, to the Nant y Bradnant). It also noted that the suspended solids are more frequently elevated above the compliance limit at Sampling Point P2 (western outfall to the Afon Dulas) from 2015. The 2019 Annual Review reported that suspended solids concentration exceeded the compliance limit in July 2019 at P1 with a concentration of 69 mg/l, which was lower than the previous year (2018) when the maximum was 200 mg/l.

2.2.3 Historically, there were no active means of treating surface water runoff from either catchment. Any water treatment was undertaken passively, achieved by a combination of flow attenuation provided by slope angle and vegetation, and by accumulation that affords some solids settlement. There was also a degree of ground infiltration should there be a favourable hydraulic gradient between surface flow and subterranean groundwater pipework.

2.2.4 There are three surface water storage lagoons located on the eastern edge of the eastern catchment. The two primary lagoons, Lagoon 1 and Lagoon 2, were established as outfall points from an earlier (now decommissioned) surface water treatment facility. These lagoons allowed surface water to settle post-treatment, promoting the settlement of suspended solids by gravity. A surface water 'supernatant' with a lower suspended solids content was allowed to outfall to the Nant y Bradnant headwater. Lagoon 3 was created sometime after the first two lagoons, formed in an excavation created by a borrow pit. The general arrangement of the three lagoons is shown in Figure 2, below.

Figure 2. General Arrangement of the existing lagoons (eastern drainage catchment)



2.2.5 The surface water management system has been designed to enable the installation of a surface water treatment facility comprising a series of balancing ponds, dosing and flocculation plant and silt traps to reduce the suspended solids to within the current permitted discharge limits. The maximum capacity of the plant will be designed to treat 30 l/s, although balancing ponds are proposed to manage the peak runoff. In order to mitigate any

environmental impacts and comply with the Environmental Permit, the system infrastructure will be inspected and maintained regularly by trained site staff, which will include checking for evidence of contamination, excessive sedimentation and structural integrity. The surface water management system as a whole will comprise drains around the foot of landfill areas and haul roads, lagoons and a surface water treatment facility.

2.2.6 The new surface water treatment facility will be installed in the eastern drainage catchment area of the Site. This facility will receive untreated surface water captured in Lagoon 3 from the eastern and western drainage catchments. The facility will chemically treat the water using a Serpentine dosing structure to encourage solids settlement and then the treated surface water will flow into Lagoons 1 and 2 and be discharged to the Nant y Bradnant watercourse via discharge point P1 (see Figure 2.). The surface water treatment process will enable the Operator to better comply with permitted surface water compliance limits for suspended solids within the Permit.

2.2.7 In support of the surface water treatment process, it will be necessary to provide the following:

- A surface water treatment facility;
- Flow balancing;
- Inter-stage pumping;
- De-sludging;
- Quality monitoring;
- Operation and maintenance.

2.3 Proposed Surface Water Treatment Facility

2.3.1 The following provides design rationale and detail of the surface water treatment facility:

2.3.2 In order for consent limits within the permit to be met for suspended solids in surface water discharged off-site, there is a requirement to treat the water using chemical additives to remove the suspended solid load. Without the use of chemical additives, there would be insufficient lagoon capacity on site for the settlement of suspended solids to meet consent limits.

2.3.3 There is to be a single surface water treatment facility that will receive and treat flows from Lagoon 3, which captures surface water from both the eastern and western drainage catchments on the Site. Surface water will be taken from Lagoon 3 where it will be chemically treated to encourage the settlement of suspended solids within the facility, before the treated water is discharged into Lagoons 1 and 2 and allowed to outfall from the Site to the Nant y Bradnant watercourse on the eastern boundary.

2.3.4 The treatment process has been assessed and designed by Aquatreat Limited on behalf of the Operator. The treatment process has been designed specifically to enhance the flocculation and precipitation of suspended solids and will comprise the dosing of a primary coagulant and a polymer for flocculation and settlement of solids and an additive for pH adjustment.

2.3.5 Primary coagulant dosing will use Ferric Chloride (44%) (datasheet in Appendix 2) and be introduced via a dosing pump that will accept a 4-20mA signal from the influent flow meter and as a result, dosing of the coagulant will be dosed proportionally to the flows from Lagoon 3.

2.3.6 The pH adjustment will rely on the introduction of Sodium Hydroxide (32%) (Appendix 3). Water pH will be monitored by means of a pH probe and a controller, that will proportionately adjust a dosing pump up or down by means of a 4-20mA signal. The pH will be monitored immediately after discharge from the serpentine.

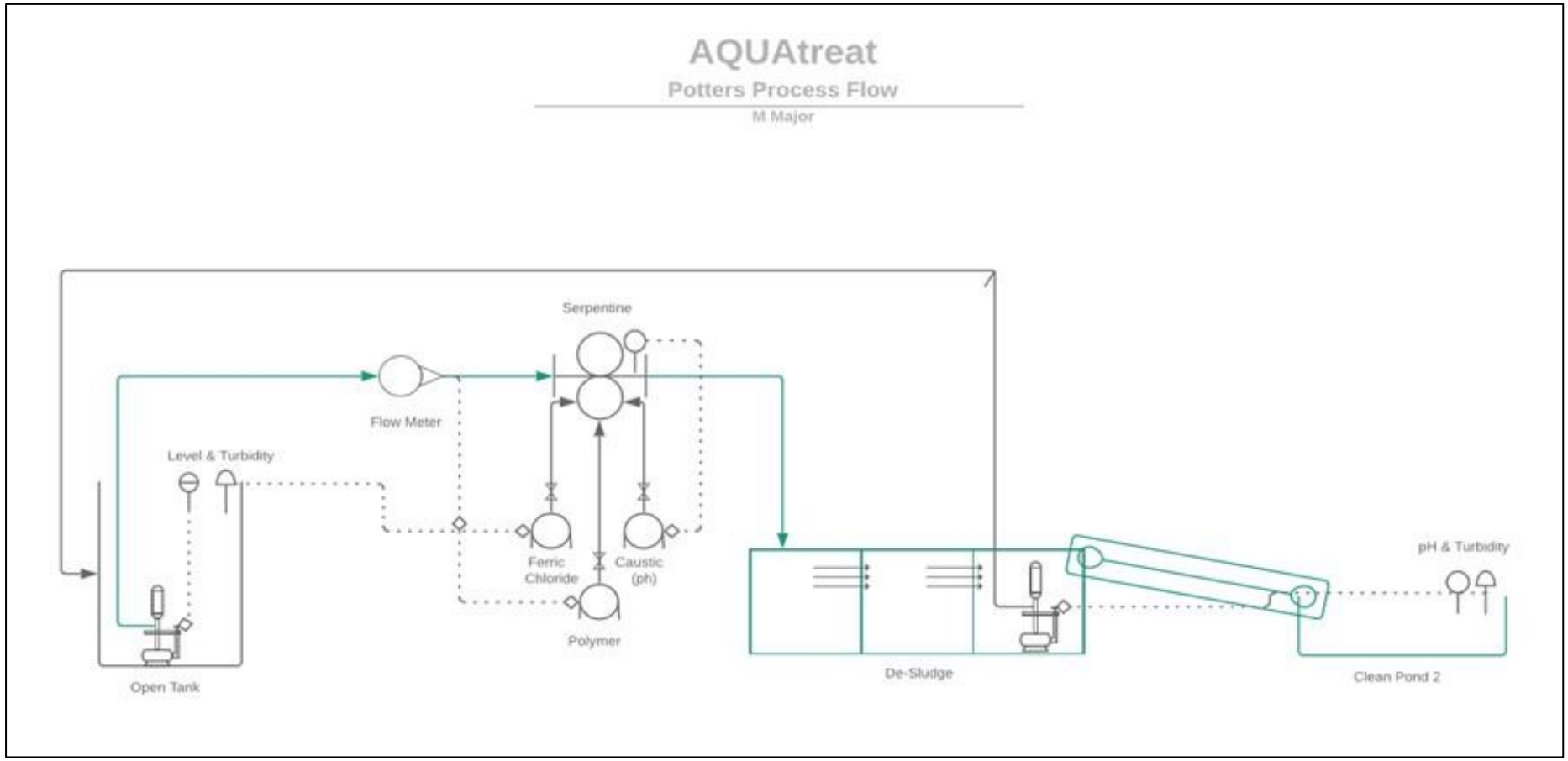
2.3.7 The coagulation stage will be complemented by flocculation with the subsequent addition of an Anionic Polymer called Aquatreat 156. The polymer will be diluted to produce a 0.1% working solution. The dosing of the polymer will also be proportional to the influent via a 4-20mA signal from the flow meter, same as dosing of the Ferric Chloride. Due to commercial sensitivity, the chemical make-up of Aquatreat 156 is unknown however the material data sheet (Appendix 4) states that this has no hazard ratings. It also states that the material decomposes to ammonia, carbon oxides and nitrogen oxides. It is therefore considered that any impact from this compound would be regulated by the existing ammonia compliance discharge limit within the Permit.

2.3.8 The surface water treatment system is designed such that iron (in Ferric Chloride) and the polymer will both precipitate out of solution and would not be expected to be present in the surface water discharge but will end up in the sludge deposits. The dosing systems will have pre-set maximum control parameters to prevent overdose situations and water monitoring equipment will also have set alarm functions to prevent overdosing. Treated surface water would be tested prior to discharge to ensure all discharge compliance limits are met.

2.3.9 The monitoring of the surface water discharge at P1 is regulated under the existing environmental permit. Ammoniacal nitrogen and BOD provide a general indication of the overall surface water quality. With the addition of Aquatreat 156 Polymer during the treatment process, the monitoring of ammoniacal nitrogen as part of the discharge limits within the Permit would remain appropriate to be protective of pollution from this additive, as Aquatreat 156 degrades to ammonia, carbon oxides and nitrogen oxides.

2.3.10 The chemical additives will be administered to the untreated surface water by a dosing Serpentine structure with settlement tank, as shown in Figure 3 below:

Figure 3 – Aquatreat Chemical Dosing Serpentine



2.3.11 The Ferric Chloride and Sodium Hydroxide will be contained in Bulk Bunded Storage Tanks. The Bunded Tanks will be located on concrete bunded bases within a covered area with a roof. All delivery pipework will be doubled walled. The powder Aquatreat 156 polymer will be stored in a secure dry container within the covered area. Similarly, the dosing infrastructure will be set on an impermeable concrete slab within a timber framed-building with roof covering.

2.3.12 Suspended solids in the treated surface water will settle out of the water into the de-sludge tank section of the treatment facility and then the water will discharge to Lagoons 1 and 2 before leaving the site. A two-stage lagoon system will be used: the first stage is used for normal flows, and the second stage used during 'high rainfall' conditions. In times of overflow or storm events, the lagoon system will have emergency overflow outlets and in normal conditions there will be bypass outlets to allow flow for water that does not require treatment.

2.3.13 A V-notch weir will help to establish a volumetric flow rate of treated flows. The flows will also be monitored by a multi-parameter monitoring station to ensure that the treated water meets the permitted quality values, particularly for pH and suspended solids. This will include telemetry that notifies should water quality fall outside a consented parameter, for example if pH is detected above 8.5 or below 6.0 then alarms will activate and the treatment plant will shut down, stopping flows of water into Lagoons 1 and 2 and the dosing of chemical additives will temporarily cease, until the situation can be rectified.

2.3.14 The treatment of surface water will be made by a proprietary system supplied by Siltbuster Process Solutions. This will take the form of chemical dosing and polymer dosing administered via a Siltbuster inline pipe flocculator PF150. The unit will receive pumped flow and as such has no individual power requirement and no moving parts, relying instead on induced water turbulence invoked by its arrangement of pipework. Details of Siltbuster's pipe flocculator PF150 is shown in Appendix 1.

2.3.15 The proposed surface water treatment facility will be located in an area close to the existing surface water lagoons in the eastern area of the site. Vehicular access will be afforded to the facility via the existing haul road network. Access will be necessary for routine operation and maintenance duties, and for carrying out de-sludging of settled solids in the tank.

2.3.16 The treatment facility will be sized to accommodate a throughput of up to 30l/s. The flow through the facility will be controlled via a variable-speed pump set within a sump fed by existing Lagoon 3. The rate of treatment will be measured by an electromagnetic flow meter within the feed pipework of the pipe flocculator.

3.0 OPERATING TECHNIQUES

About Your Activities

3.1 Part C3 – Qu.1a Table 1a: Tell us about the activities you want to do

3.1.1 There are no proposed changes to the listed activities, directly associated activities, waste tonnages or waste types at the site listed in the Environmental Permit as part of this variation application.

3.1.2 This application is in response to Improvement Condition 11, as requested by NRW, which requires a normal variation application for the treatment of surface water at the site.

3.2 Part C3 – Qu.1b Table 1b: Types of Waste

3.2.1 There are no proposed changes to the waste types to be accepted at the site, as listed in the Environmental Permit, as part of this variation application.

Emissions to Air, Water and Land

3.3 Part C3 – Qu.2 Table 2: Emissions (releases)

3.3.1 *Point Source Emissions to Air:* There are no proposed changes to existing emissions to air as part of this variation application.

3.3.2 *Point Source Emissions to Land:* There are no proposed changes to existing emissions to land as part of this variation application

3.3.3 *Point Source Emissions to Water:* A Surface Water Pollution Risk Assessment (ref. 3400-CAU-XX-XX-RP-O-0302) has been undertaken as part of this variation application and there are no proposed changes to the current monitoring regime and compliance limits within the permit.

Operating Techniques

3.4 Part C3 – Qu.3a: Technical Standards

3.4.1 As part of this variation application, the following guidance in Table 1 below was used:

Table 1 - Relevant Technical Guidance

Description of Schedule 1 activity or directly associated activity	Relevant technical guidance note or Best Available Technique as described in BAT conclusions under IED	Document Reference
<u>Directly associated activities:</u> Surface water management e.g. physico / chemical treatment of surface water Water discharges to controlled waters	Sector Guidance Note S5.06: recovery and disposal of hazardous and non-hazardous waste 'How to comply with your environmental permit' NRW - Version 8 October 2014	This report: Process Description & Operating Techniques Report (ref. 4299-CAU-XX-XX-RP-V-0303) Amenity & Accidents Risk Assessment (ref. 4299-CAU-XX-XX-RP-V-0302) Surface Water Pollution Risk Assessment (ref. 3400-CAU-XX-XX-RP-O-0302)

3.5 Part C3 – Qu.3b: General Requirements – Risk Assessments

3.5.1 It is a general requirement for all applications to consider the risk of emissions in relation to possible accidents, fugitive emissions, odour, surface water pollution and noise and vibration. Risk assessments were carried out using the NRW's templates and the following risk assessments are provided as part of this permit variation application:

- Amenity & Accidents Risk Assessment ref. 4299-CAU-XX-XX-RP-V-0302;
- Surface Water Pollution Risk Assessment ref. 3400-CAU-XX-XX-RP-O-0302.

3.6 Part C3 – Qu.3c: Types and amounts of Raw Materials

3.6.1 The raw materials used in the surface water treatment process will consist of additives which will chemically treat the water, causing suspended solids to flocculate and then settle out of the water. The additives will be Ferric Chloride, Sodium Hydroxide and Polymer.

3.6.2 The chemical usage figures of the additives are based on hourly rates relative to water flow rate, rather than calculated as annual tonnages. It is proposed by Aquatreat that based on surface water flow rates of 10, 20 and 30 litres per second, the hourly additive usage rates will be as presented in Table 2 below. The annual rate will depend on annual rainfall data/trends.

Table 2 – Hourly chemical requirements based on various surface water flow rates

Flow Rate (litres per second)	Ferric Chloride 44% (litres per hour)	Sodium Hydroxide 32% (litres per hour)	Polymer (grams per hour)
10	1.8	7.2	7.2
20	3.6	14.4	144
30	5.05	20.2	202

*The chemical usage figures are based on hourly rates. The yearly rate will depend on annual rainfall data/trends.

3.6.3 The purpose of each raw material used in the surface water treatment process, with reference to the relevant data sheet, is as follows:

- Ferric Chloride – the primary coagulant agent (data sheet in Appendix 2);
- Sodium hydroxide – for pH adjustment (data sheet in Appendix 3);
- Anionic polymer – for flocculation and to aid settlement (data sheet in Appendix 4).

3.6.4 The Operator will select the least harmful products to use in the operation wherever possible. All the additives will be kept in an enclosed area within sealed containers and bunded storage tanks sat on an impermeable concrete surface. Bunds will hold 110% capacity of the stored material.

3.6.5 The Operator will keep Material Safety Data Sheets for all products used at the facility and any relevant recommendations in relation to the handling or storage of the materials will be followed and in accordance with the Site's management procedures. Records of the quantities of raw materials will be recorded with periodic reviews on usage with a view to identify opportunities for improved efficiency.

3.6.6 The Operator will have a regular review of new developments in raw materials and for the implementation of any suitable ones with an improved environmental profile. This will be based on a number of factors such as price, process suitability, environmental impact including impurities content. Quality-assurance procedures for controlling the impurity content of raw materials will be assessed when purchasing raw materials from suppliers and requesting information and the raw material content of that product. Where any potentially-less polluting options for process materials are identified, the operator can trial the alternative raw process materials to assess its suitability.

3.6.7 Any containers or drums for the storage and usage of additives will be returned to the supplier for reuse. In the event that the supplier cannot accept any empty containers for reuse, opportunities for reconditioning will be considered.

3.7 Sludge Removal & Disposal

3.7.1 A sludge blanket will accumulate on the bottom of the settlement tank of the facility after a period of time and sludge removal will be necessary when the sludge reaches a nominated marker point. It is anticipated sludge will need to be removed weekly in winter, due to higher rainfall at the site, and only as required in summer because of lower rainfall and reduced surface water throughput.

3.7.2 The sludge will consist of inert fines from the Site's surface water and also remnants of the Ferric Chloride and Polymer additives. The sludge will therefore be classed as a non-hazardous waste. Upon sludge removal, the sludge will be kept on Site, excess liquid removed and then deposited within the landfill site as a sludge waste already covered by the waste codes within the existing landfill permit (EPR/BU7766IC) (provided the sludge is not a liquid and is dewatered appropriately).

4.0 MONITORING

4.1 Part C3 – Qu.4a: Measures for monitoring point source emissions

4.1.1 The Operator should consider the need for environmental monitoring to assess the effects of point source emissions to air, controlled waters, groundwater or land.

4.1.2 This section details the potential point source emissions associated with the surface water treatment activity and describes the environmental monitoring procedures, methods and frequencies for each emission source.

4.2 Point Source Emissions to Air

4.2.1 There are no point source emissions to air to consider as part of the surface water treatment activity.

4.3 Point Source Emissions to Sewers, Effluent Treatment Plants or Other Transfers Off-Site

4.3.1 There are no point source emissions to sewers, effluent treatment plants or other transfer off site to consider as part of the surface water treatment activity.

4.4 Point Source Emissions to Water (other than sewers)

Point source emissions to surface water

4.4.1 The treated surface water will outfall from Lagoons 1 and 2 to be discharged at surface water discharge point P1, on the eastern boundary of the site, directly into the Nant y Bradnant stream, adjacent to Site. The location of monitoring and discharge point P1 is shown in Figure 1 (Section 2.2).

4.4.2 To prevent any potential environmental impact from the release of treated surface water from the site, the treated surface water will be sampled monthly at discharge point P1, as per the Environmental Permit and sent for quality testing at an MCERTS accredited laboratory to identify the following parameters:

- Suspended solids
- pH
- Biological oxygen demand (BOD)
- Ammoniacal nitrogen (NH_4-N)

4.4.3 The environmental monitoring, including sampling and testing procedures will be conducted in accordance with the Environmental Permit.

Point source emissions to groundwater

4.4.4 There will be no direct discharges to groundwater from the surface water treatment activity.

4.5 Point Source Emissions to Land

4.5.1 There are no point source emissions to land to consider as part of the surface water treatment activity.

5.0 MANAGEMENT

5.1 Environmental Management System

5.1.1 The Site and all activities will be operated in accordance with the procedures outlined within the Site's Environmental Management System (EMS).

5.1.2 Effective operational and maintenance systems will be employed on all aspects of the treatment process and the system will have in place documented operational procedures for all elements of the Site operations that could have significant environmental impact. Following on from the introduction of the new surface water treatment facility, any additional procedures to be incorporated in the system will be included in the planned preventative maintenance programme for the plant and its associated infrastructure. All relevant staff will be trained and aware of any new procedures or documentation relating to the effective operational running of the surface water treatment facility. To monitor and record training the company's management system includes internal auditing and reporting of results to senior management and this will ensure that the appropriate skills and competencies necessary are carried by the relevant persons and identify any further training needs.

5.1.3 Any contractors attending Site will complete a site induction which includes measures that must be taken to protect the environment whilst working on Site. Contractors will be supervised at all times whilst on Site by trained site staff and will be required to sign in and out of Site when arriving and leaving.

5.2 Accidents, Incidents and Non-Compliances

5.2.1 Written procedures for handling, investigating, communicating and reporting non-compliances with operating procedures or emissions limits will form part of the Site's EMS. Any non-compliances in the Environmental Permit will be reported to NRW.

5.2.2 Site management will conduct audits at least annually to check and monitor that all activities are being carried out in conformity with clear and logical systems for keeping records, including those of accidents, incidents and non-compliances.

5.2.3 An emergency action plan will form part of the plant operational procedures, ensuring that all foreseeable accidents are mitigated against and action plans prepared which should be followed by site staff in the event of an accident occurring. The emergency plan will identify the hazards and assess the risks of each and set out control measures to reduce the risk of a potential accident occurring on Site.

APPENDIX 1

Surface Water Treatment Information – Siltbuster Data Sheet

PIPE FLOCCULATOR RANGE

(Pipe Flocculator range for effluent dosing / conditioning)

Equipment Data Sheet

Siltbuster Ltd & Siltbuster Process Solutions Ltd
Unipure House, Wonastow Road West,
Monmouth NP25 5JA
Tel: 01600 772256
E-mail: sps@siltbuster.com

A. Overview of Pipe Flocculator Range:

Compact Pipework with integral dosing points, Instrument Mounts and Sample/Drain points to enable controlled dosing for conditioning / pre-treatment of effluent (usually ahead of Lamella clarifier or Dissolved Air Floatation solids removal stage).

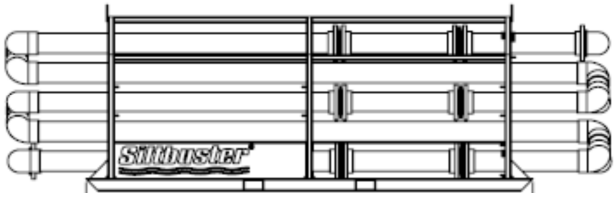
Note how this PF160 unit (left) is located under an MT30 Mix Tank side walkway to keep site layout compact.

Handling: Skid Mounted: FLT slots and top level built in lifting eyes.

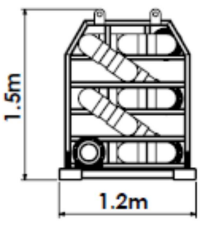
C. Weights and Dimensions

Product Ref:	Nominal Bore (mm)	Weight Empty (kg)	Dimensions		
			Height (m)	Width (m)	Length (m)
PF63	50	250	0.9	0.65	1.8
PF90	80	500	1.4	0.8	3.3
PF100	100	800	1.5	1.2	4.9
PF150	150	1200	1.5	1.2	4.9

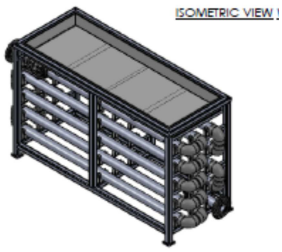
Larger sizes (DN200 etc) are fabricated to order in SS304 pipework, Glav Frame (or as required).



(PF150 Side View)



(PF100 End View)

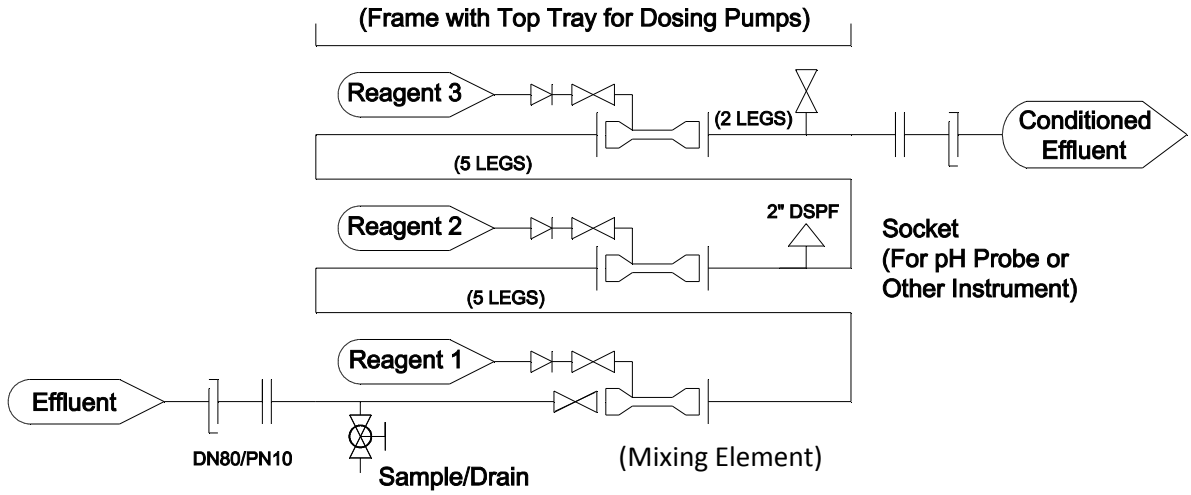


(PF63 Isometric)

2 Stage Dose Skid

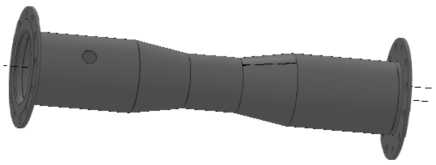
Equipment Data Sheet Continued

Typical P & I D drawing for Pipe Flocculator:



Mixing Element:

Flocculators typically include 3No Mixer stages:



Typically pipe diameter reduces to 75% of main diameter (to nearest equivalent pipe size) then enlarges back. 1" socket placed upstream of restriction, for reagent dosing.

Example:

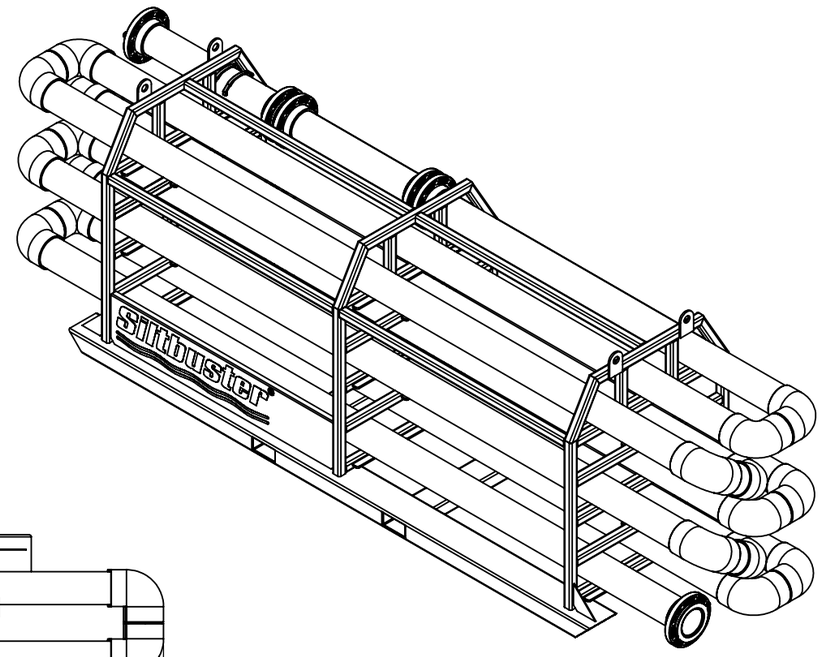
Example of DN200 Stainless Flocculator.
Please note:

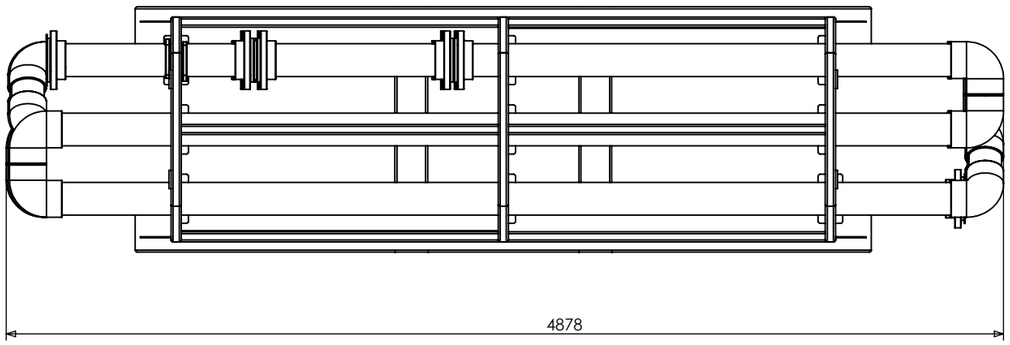
- Compact Design
- Sample Point (Top Left)
- pH Probe Mount (Bottom Left)
- Self Standing Galv Frame
- Located under walkway of DAF unit

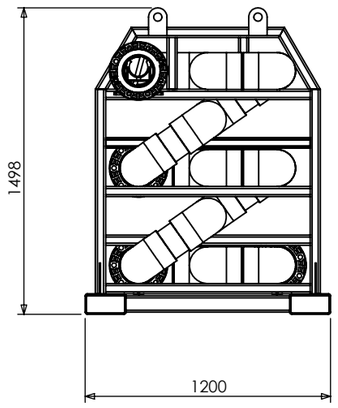
Note: In the interest of product development, the above specifications may change without warning. E&OE.

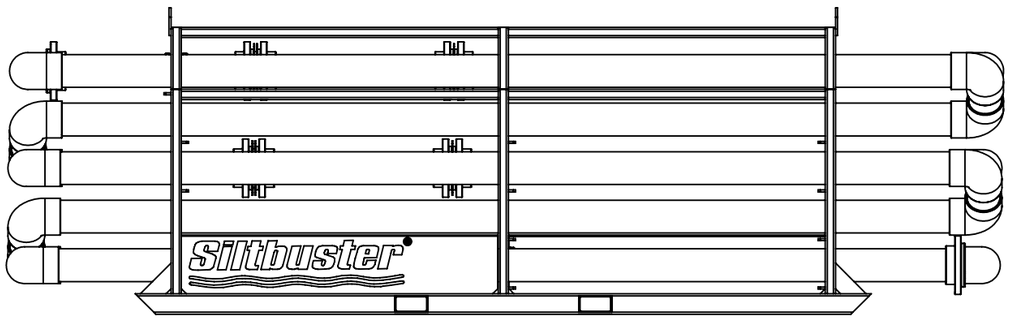
MODEL REF:

PF150









Project	Title	
GA DRAWINGS	PF150	Siltbuster

SILTBUSTER LTD.
UNIPURE HOUSE,
WONASTOW ROAD, WEST
MONMOUTH
MONMOUTHSHIRE
NP25 5JA

TEL: 01600 772256
FAX: 01600 775312

APPENDIX 2

Ferric Chloride Data Sheet

Pencco
Customer Service 800-864-1742
FAX 888-273-6226

Material Safety Data Sheet (MSDS)
Ferric Chloride Solution

SECTION 1 – CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: Ferric Chloride Solution **Chemical Family:** Inorganic Iron Salts
Product Use: Water Treatment Chemical **CAS #:** 7705-08-0
Product Formula: $FeCl_3$

Manufacturer's Name: Pencco, Inc.
Manufacturer's Address: P.O. Box 600, San Felipe, TX 77473
Emergency Phone Number: PENCCO (979) 885-005
CHEMTREC (800) 424-9300 – 24 hours a day

Revision Date: February 4 2014

SECTION 2 – COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS #	Weight Percentage	ACGIH TLV	OSHA PEL	STEL
Water	7732-18-5	58 – 72%	N/A	N/A	N/A
Ferric Chloride	7705-08-0	28 – 42%	1 mg/m^3	1 mg/m^3	N/A
Ferrous Chloride	7758-94-3	<0.5%	1 mg/m^3	1 mg/m^3	N/A
Hydrochloric Acid	7647-01-0	<0.5%	5 ppm	5 ppm	N/A

Section 313 Supplier Notification: The hydrochloric acid mentioned above is subject to the reporting requirements of SARA TITLE III Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372). This notification must be included in all MSDS's that are copied and distributed for this material.

SECTION 3 – HAZARD IDENTIFICATION

Appearance and Odor: Reddish-brown liquid with a slightly acidic odor.
Emergency Overview: A corrosive chemical. Harmful or fatal if swallowed. Harmful if inhaled. Eye or skin contact may cause irritation. Contact with liquid or vapor form of this chemical may cause severe injury or death. Avoid overexposure.
Fire and Explosion Hazards: Substance itself does not burn, but may decompose upon heating to produce corrosive and/or toxic fumes, such as hydrogen chloride and phosgene gas. Ferric chloride can react with metals to form flammable and potentially explosive hydrogen gas.
Carcinogenicity: None of the components of this material are listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Summary of Acute Health Hazards
Ingestion – Toxic by ingestion. May cause irritation to the mouth and stomach. Higher doses may lead to abnormal liver function with nausea or vomiting, stomach pain, diarrhea, fast and weak pulse, lethargy, pallor, shock, hypertension, dilated pupils, fever, coma and even death.

Individuals with pre-existing liver diseases may have increased susceptibility to the toxicity of exposure.
Inhalation – May cause irritation of the upper respiratory tract, resulting in difficulty breathing.
Skin Contact – Irritation and possibly burns.
Eye Contact – Irritation and possibly burns.

SECTION 4 – FIRST AID MEASURES

Eye Contact First Aid: Immediately flush eyes for 15 minutes with large amounts of water while holding eyelids apart. Washing within one minute is essential to achieve maximum effectiveness. Obtain medical attention IMMEDIATELY after flushing.

Skin Contact First Aid: Flush skin with water. Remove contaminated clothing; wash before reuse. If irritation is still present, seek medical attention IMMEDIATELY.

Inhalation First Aid: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Obtain medical attention IMMEDIATELY.

Ingestion First Aid: DO NOT INDUCE VOMITING. Give 1 or 2 glasses of water or milk. Never give anything by mouth to an unconscious individual. Obtain medical attention IMMEDIATELY.

SECTION 5 – FIRE FIGHTING MEASURES

Flash Point: Not applicable.

Upper/Lower Explosion Limits in Air: Not applicable.

Auto Ignition Temperature: Not applicable.

Extinguishing Media: Will not burn; use materials appropriate for surrounding fire.

Fire and Explosion Hazards: Substance itself does not burn, but may decompose upon heating to produce corrosive and/or toxic fumes, such as hydrogen chloride and phosgene gas. Ferric chloride can react with metals to form flammable and potentially explosive hydrogen gas.

Fire Fighting Instructions: Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face-piece operated in a positive pressure mode. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers and tanks cool.

Hazardous Product of Decomposition or Combustion: Hydrogen chloride, hydrogen, phosgene.

	NFPA Rating	HMIS Rating	4 = Extreme / Severe
Health	**2**	**2**	**3 = High / Serious**
Reactivity	**0**	**0**	**2 = Moderate**
Flammability	**0**	**0**	**1 = Slight**

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Review safety precautions before proceeding with cleanup. Use appropriate personal protection equipment. Do not touch spilled material. Neutralize spill with lime (calcium hydroxide), limestone (calcium carbonate), or soda ash (sodium carbonate). Restrict access to area until completion of clean up.

Caution: limestone and soda ash will evolve CO2; ventilation should be provided in enclosed areas. Dike area around spill to prevent spreading, and use absorbent material to pick up spill.

CERCLA Reportable Discharge (RQ): 1000 lbs. (454 kg), Based on anhydrous ferric chloride. Divide by solution concentration to obtain solution weight.

Disposal: Under the Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user to determine whether a substance should be classified as a hazardous waste at the time of disposal. This is due to the fact that product use, transformation, synthesis, mixtures, etc. may change the nature of the product. Dispose of waste in accordance with applicable federal, state, and local laws.

RCRA: Test waste material for corrosivity, DOO2, prior to disposal.

Steps To Be Taken In Case Material Is Released Or Spilled: Notify the appropriate environmental authorities. Note that spills may need to be reported to the National Response Center ((800) 424-8802)

SECTION 7 – HANDLING AND STORAGE

Handing: Store and handle in corrosion-proof materials (and area). Use FRP or PVC pipes. Be cautious of substance residue in empty containers. Act according to precautions and warnings set forth.

Storage: Store in a tightly closed container. Do not store in metal containers. Fiberglass, plastic, or rubber-lined tanks may be used for storage. Protect from damage and keep separated from incompatible substances.

SECTION 8 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

Respiratory Protection: Adequate general ventilation should be provided to keep vapor and mists below exposure limits. The exposure limits for some components are listed in Section 2. Wear a NIOSH/OSHA approved respirator with a dust/mist cartridge if there is potential of exposure to mists in excess of applicable limits, in any situation where product vapor or mists may be present, such as in confined spaces.

Eye Protection: Wear splash resistant goggles and/or safety glasses with side shields. Wear a full face shield if possibility of material splashing or spraying exists. Maintain eye wash fountain. Water should be supplied through insulated and heat-traced lines to prevent freeze-ups in cold weather.

Skin Protection: Where there is possibility of skin contact, use the following as appropriate, to avoid skin contact: gloves impervious to material, apron, boots, hood, pants, and jacket. Maintain a safety shower with quick opening valves. Water should be supplied through insulated and heat-traced lines to prevent freeze-ups in cold weather.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point:	**106°C (223°F)**	**pH:**	**< 2.0**
Melting Point:	**N/A**	**Solubility in Water:**	**Complete**
Specific Gravity:	**1.2 – 1.6**	**Vapor Pressure:**	**40 mm Hg @ 20°C**
% Volatile:	**60 – 75 (Water)**	**Evaporation Rate:**	**N/A**
Vapor Density (Air = 1):	**N/A**	**Molecular Weight:**	**162.2**
Appearance:	**Red/Brown Colored Liquid**	**Odor:**	**Slightly acrid**

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable at normal conditions
Polymerization: Will not occur.
Decomposition: Decomposes upon heating to produce corrosive and/or toxic fumes, such as hydrogen chloride. Contact with metals may evolve flammable hydrogen gas.
Incompatibility: Rapidly corrodes most metals (titanium is one exception); may generate flammable, potentially explosive hydrogen gas. Avoid contact with nylon, aluminum/aluminum alloys, carbon steel, stainless steel, and copper / copper alloys. Metals, bases, halocarbons, acids, and combustible materials can be considered incompatible.

SECTION 11 – TOXOLOGICAL INFORMATION

Chronic Effects: Repeated dosage may cause hemosiderosis, including possible damage to liver and pancreas.
Toxicological Data: Anhydrous Ferric Chloride Solid Oral LD_{50} (rat) = 450 mg/kg
Carcinogenicity: None of the components of this material are listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.
Reproductive Effects: TDLo Rat 1 day (intratesticular) 12976 $\mu g/kg$; TDLo Rat 1 day (intravaginal) 29 mg/kg pre pregnancy continuous.
Target Organs: No data available.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicological Information: TLm Daphnia 15 ppm/96 hr fresh water/ conditions of bioassay not specified.
Persistence and Degradation: No data available

SECTION 13 – DISPOSAL CONSIDERATIONS

Under the Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user to determine whether a substance should be classified as a hazardous waste at the time of disposal. This is due to the fact that product use, transformation, synthesis, mixtures, etc. may change the nature of the product. Product containers should be thoroughly emptied before disposal. Dispose of waste in accordance with applicable federal, state, and local laws.

SECTION 14 – TRANSPORTATION INFORMATION

DOT Shipping Name: Ferric Chloride Solution
Hazard Class: 8 – Corrosive Material
UN Number: UN 2582
Packing Group: III
Reportable Quantity: 1000 lbs (454 kg)
Shipping Containers: Rubber-lined steel tank cars/trucks; polyethylene drums, bottles
Storage Conditions: Keep containers closed

SECTION 15 – REGULATORY INFORMATION

OSHA: Hazardous Corrosive Liquid – 29 CFR 1920.1200
OSHA Process Safety (29 CFR 1910.119): No

CERCLA: Hazardous Substance – Reportable Quantity (RQ) = 1000 lbs (454 kg)

SARA Regulations: 313 and 40 CFR 372: No
SARA Hazard Categories, SARA Sections 311/312 (40 CFR 370.21):
Acute: Yes; Chronic: No; Fire: No; Reactive: No; Sudden Release: No

Clean Water Act: Designated as a hazardous substance under Section 311(b)(2)(A) of the Federal Water Pollution Control Act; ferric chloride is also regulated by the Clean Water Act Amendments of 1977 and 1978. This chemical is subject to regulations regarding its discharge.

TSCA Inventory Status: Yes
California Proposition 65: No
Right-To-Know Lists: Massachusetts, California, Pennsylvania, New Jersey. This substance does not contain nor is manufactured with ozone-depleting substances.

SECTION 16 – OTHER INFORMATION

IMPORTANT! Read this MSDS before use or disposal of this product. Pass along the information to employees and any other persons who could be exposed to the product to be sure that they are aware of the information before use or other exposure.

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Appendix 3

Sodium Hydroxide Data Sheet

Revision Date 16/02/2015
Revision 10
Supersedes date 24/05/13

SAFETY DATA SHEET
Caustic Soda (Sodium Hydroxide Solution), 5 - 51%

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product name	Caustic Soda (Sodium Hydroxide Solution), 5 - 51%
Synonyms, Trade Names	Caustic Soda Liquor, Sodium Hydroxide Solution, Lye
REACH Registration number	01-2119457892-27
CAS-No.	1310-73-2
EC No.	215-185-5

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses	Treatment of drinking water, has received approval by the European Committee for Standardisation. Treatment of waste water. Raw material. Neutralising agent. pH regulating agent Manufacture of substances. Absorbant for gases and liquids Manufacturing soaps Washing and cleaning products

1.3. Details of the supplier of the safety data sheet

Supplier

Industrial Chemicals Limited
Hogg Lane
Grays
Essex
RM17 5DU
United Kingdom
T:+44 (0)1375 389000
F:+44 (0)1375 389110
sds@icgl.co.uk

1.4. Emergency telephone number

+44 (0)1865 407333 (24-hour)

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Classification (EC 1272/2008)

Physical and Chemical Hazards	Met. Corr. 1 - H290
Human health	Skin Corr. 1A - H314;Eye Dam. 1 - H318
Environment	Not classified.

Classification (1999/45/EEC) C;R35.

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16.

Human health

Corrosive. Prolonged contact causes serious eye and tissue damage.

Environment

Substantial amounts of the product may lead to a local change in acidity in small water systems which may have adverse effects on aquatic organisms.

2.2. Label elements

EC No.	215-185-5
Contains	SODIUM HYDROXIDE

Label In Accordance With (EC) No. 1272/2008

Caustic Soda (Sodium Hydroxide Solution), 5 - 51%

Signal Word	Danger	
Hazard Statements		
	H290	May be corrosive to metals.
	H314	Causes severe skin burns and eye damage.
	H318	Causes serious eye damage.
Supplementary Precautionary Statements		
	P234	Keep only in original container.
	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P260	Do not breathe vapour/spray.
	P264	Wash contaminated skin thoroughly after handling.
	P321	Specific treatment (see medical advice on this label).
	P301+330+331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
	P303+361+353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
	P304+340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
	P305+351+338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P310	Immediately call a POISON CENTER or doctor/physician.
	P363	Wash contaminated clothing before reuse.
	P390	Absorb spillage to prevent material damage.
	P405	Store locked up.
	P406	Store in corrosive resistant/… container with a resistant inner liner.
	P501	Dispose of contents/container to …

2.3. Other hazards

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2. Mixtures

SODIUM HYDROXIDE	**40-60%**
CAS-No.: 1310-73-2 **EC No.: 215-185-5**	
Classification (EC 1272/2008) Met. Corr. 1 - H290 Skin Corr. 1A - H314 Eye Dam. 1 - H318	Classification (67/548/EEC) C;R35

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16.

REACH Registration number 01-2119457892-27

CAS-No. 1310-73-2

EC No. 215-185-5

Composition Comments

Mercury (Rayon) grade contains a low level of mercury, typically less than 0.1 ppm. Diaphragm grade contains up to 1.3% sodium chloride, which increases the density of the solution.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General information

Get medical attention immediately! CAUTION! First aid personnel must be aware of own risk during rescue!

Inhalation

Rinse nose, mouth, and throat with running water.

Ingestion

Do not induce vomiting. If confined to the mouth, rinse mouth thoroughly and ensure water is not swallowed. If swallowed, drink plenty of water. If substance has been swallowed, give water or milk to drink immediately. Get medical attention immediately!

Skin contact

Remove contaminated clothes and rinse skin thoroughly with water. Get medical attention immediately!

Eye contact

Promptly wash eyes with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes.

4.2. Most important symptoms and effects, both acute and delayed

General information

Strong corrosive action on all body tissue, causing burns and frequently deep ulceration, and ultimately scarring.

Inhalation

Mist/droplets are irritating to the respiratory tract, and will cause a burning sensation in the throat, coughing, and breathing difficulties. Pulmonary oedema (excessive liquid in the lungs) can occur after inhalation of higher amounts.

Ingestion

Causes severe damage to gastrointestinal tract. Can cause perforation and scarring.

Skin contact

Burning pain and severe corrosive skin damage. Causes burns, deep ulceration, and scarring. Frequent contact with lower concentrations may cause eczema.

Eye contact

Corrosive to eyes. May cause severe corneal damage, reduced vision, or even blindness.

4.3. Indication of any immediate medical attention and special treatment needed

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Extinguishing media

The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

5.2. Special hazards arising from the substance or mixture

Hazardous combustion products

Contact with some metals can liberate flammable hydrogen gas.

5.3. Advice for firefighters

Protective equipment for fire-fighters

Self contained breathing apparatus and full protective clothing must be worn in case of fire.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Wear protective clothing as described in Section 8 of this safety data sheet. In case of spills, beware of slippery floors and surfaces.

6.2. Environmental precautions

Do not discharge into drains, water courses or onto the ground. Contain spillages with sand, earth or any suitable adsorbent material. Release to rivers will cause a strong increase in pH, resulting in death to aquatic organisms. Spillages or uncontrolled discharges into watercourses must be IMMEDIATELY alerted to the Environmental Agency or other appropriate regulatory body.

6.3. Methods and material for containment and cleaning up

Small Spillages: Neutralise with weak acid and wash away with water. Alternately, drench spill with water and wash away. Large Spillages: Isolate and pump into a tank. Dispose of via a licensed hazardous waste contractor. Keep people and animals away from contaminated areas.

6.4. Reference to other sections

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Following prolonged storage in metal tanks, a black sludge will collect at the bottom of the tank. This will contain iron, sodium carbonate, and when Mercury (Rayon) grade is stored, mercury. Test the atmosphere in the tank for oxygen and mercury vapour before entering. Appropriate care must be taken when removing and handling this sludge, including control of atmospheric levels. Handle with care as an alkaline material. Take care when diluting with water (heat generation). Avoid contact with skin and eyes. Avoid generation of sprays or mists.

7.2. Conditions for safe storage, including any incompatibilities

Store in vessels of mild steel. Keep away from acids and other chemicals that react with this product. Build-up of white metal carbonate crystals may occur if tank is open to air.

7.3. Specific end use(s)

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Name	STD	TWA - 8 Hrs		STEL - 15 Min		Notes
SODIUM HYDROXIDE	WEL				2 mg/m3	

WEL = Workplace Exposure Limit.

8.2. Exposure controls

Protective equipment

Engineering measures

Provide adequate ventilation, including appropriate local extraction, to ensure that the defined occupational exposure limit is not exceeded.

Respiratory equipment

If ventilation is insufficient, suitable respiratory protection must be provided.

Hand protection

Wear protective gloves. Rubber or plastic.

Eye protection

Goggles/face shield are recommended.

Other Protection

Chemical suit and boots if handling large quantities.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance	Colourless liquid.
Odour	Odourless.
Solubility	Miscible with water
Initial boiling point and boiling range (°C)	142
	For 50% Membrane grade
Melting point (°C)	12
	For 50% Membrane grade
Relative density	1525 20
	For 50% Membrane grade
Viscosity	78 cP 20
	For 50% Membrane grade

9.2. Other information

Caustic Soda (Sodium Hydroxide Solution), 5 - 51%

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

10.2. Chemical stability

10.3. Possibility of hazardous reactions

10.4. Conditions to avoid

Vessels should not be open to air; substance absorbs water and carbon dioxide. In extreme cases, the carbonate can form white floating crystals. Do not store adjacent to incompatible materials, such as acids and amphoteric metals eg aluminium, magnesium, zinc, tin and bronze - may release hydrogen gas.

10.5. Incompatible materials

Materials To Avoid

Reaction with ammonium compounds releases ammonia. May react violently with acrolein, acrylnitrice, and allyl alcohol. Heating with trichloroethylene will form explosive mixtures of dichloroacetylene. Some plastics, leather and textiles are destroyed on contact. Mixture with water or acids will release large quantities of heat.

10.6. Hazardous decomposition products

Thermally stable to boiling point; does not decompose. Precipitation of metal hydroxide crystals can occur below 12C.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

General information

Strong corrosive action on all body tissue, causing burns and frequently deep ulceration, with ultimate scarring.

Inhalation

Mist/droplets are corrosive to the respiratory tract, and will cause a burning sensation in the throat, coughing and breathing difficulties. Pulmonary oedema (excessive liquid in lungs) can occur after inhalation of higher amounts.

Ingestion

If ingested will cause severe damage to gastrointestinal tract. Can cause perforation and scarring.

Skin contact

Corrosive to body tissue, causing burns, deep ulceration, and scarring. Frequent contact with lower concentrations may cause eczema.

Eye contact

Vapour or spray may cause eye damage, impaired sight or blindness.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity

Spillage will cause localised damage to animals and plants on the ground. Do not allow release into controlled waters; resulting high pH will affect aquatic life forms. If allowed to enter drains will damage effluent treatment organisms. Neutralisation and dilution will greatly reduce these effects. Product is chemically degradable into sodium carbonate.

12.1. Toxicity

LC 50, 96 Hrs, Fish mg/l	45.4

12.2. Persistence and degradability

12.3. Bioaccumulative potential

12.4. Mobility in soil

12.5. Results of PBT and vPvB assessment

12.6. Other adverse effects

Caustic Soda (Sodium Hydroxide Solution), 5 - 51%

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Neutralise with dilute acid and wash away with large amounts of water. Confirm disposal procedures with environmental engineer and local regulations.

SECTION 14: TRANSPORT INFORMATION

14.1. UN number

UN No. (ADR/RID/ADN) 1824

14.2. UN proper shipping name

Proper Shipping Name SODIUM HYDROXIDE SOLUTION

14.3. Transport hazard class(es)

ADR/RID/ADN Class Class 8: Corrosive substances.

Transport Labels

14.4. Packing group

ADR/RID/ADN Packing group II

IMDG Packing group II

ICAO Packing group II

14.5. Environmental hazards

14.6. Special precautions for user

Hazard No. (ADR) 80

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.2. Chemical Safety Assessment

No chemical safety assessment has been carried out.

SECTION 16: OTHER INFORMATION

General information

The material must only be loaded and unloaded from tankers by trained personnel, such as those with a Hazchem certificate.

Sodium hydroxide solution is used as a chemical for the treatment of drinking water, as approved by the European Committee for Standardisation under EN 896:2005.

This data sheet was prepared in accordance with EC 1907/2006 concerning REACH.

Revision Comments

Updated Section(s) 1,

Issued By D.Kelly

Caustic Soda (Sodium Hydroxide Solution), 5 - 51%

Revision Date	16/02/2015
Revision	10
Supersedes date	24/05/13

Risk Phrases In Full

R35	Causes severe burns.

Hazard Statements In Full

H318	Causes serious eye damage.
H314	Causes severe skin burns and eye damage.
H290	May be corrosive to metals.

Appendix 4

Anionic Polymer Data Sheet - Aquatreat 156 Anionic Potable Water Grade (PWG)

Material Safety Data Sheet

Section 1: Identification of Substance/mixture and of the company undertaking

1.1: Product Identifier

Product Name AQUATREAT 156

1.2: Relevant Identified use of substance/mixture and uses advised against

1.3: Details of the Supplier of the safety data sheet

Company Name: Aquatreat

Albany House
North Dock
Llanelli
Carmarthenshire
SA15 2LF

Telephone: 01554 775236

Fax: 01554 772253

E-mail: enquiries@aquatreat.co.uk

Website: www.aquatreat.co.uk

1.4: Emergency Telephone Numbers:

Emergency Telephone: 0333 333 949

Section 2: Hazards Identification

2.1: Classification of substance/mixture according to Regulation (EC) No 1272/2008

Classification under CLP: NC Not Classified as Hazardous

Additional Information:

2.2: Label Elements: Labelling according to Regulation (EC) No 1272/2008 [CLP/GHS]

Label elements under CLP: NC Not Classified as Hazardous

Signal Words:

Hazard Pictograms:

Precautionary Statements

Wear protective gloves/protective clothing/eye protection/face protection.

Keep out of reach of children.

2.3: Other Hazards

Section 3: Composition information on hazardous ingredients

Does not contain any compnents classified as hazardous

EINECS	CAS No	CLP Classification	Percent

Section 4: First Aid Measures

4.1: Description of First Aid measures

Skin Contact: Remove contaminated clothing. Wash contaminated area well with soap and water. If irritation persists obtain medical attention.

Eye Contact: Irrigate eye with water for 15 minutes. If irritation or redness persists seek medical attention.

Ingestion: Do not induce vomiting. Do not give anything by mouth to an unconscious person. If conscious rinse out mouth with water and give water to drink. Rest and reassure patient and obtain medical attention

Inhalation: Remove person to fresh air. If recovery is delayed seek medical attention.

4.2: Most important symptoms and effects both accute and delayed

Skin Contact: No data available

Eye Contact: No data available

Ingestion: No data available

Inhalation: No data available

4.3: Indication of any immediate medical treatment and special treatment required

Section 5: Fire fighting measures

5.1: Extinguishing media

Foam, dry powder, CO2

Unsuitable Media

None

5.2: Special hazards arising from the substance/mixture

Product does not burn readily, but flammable dust clouds may be formed in air.

5.3: Advice for firefighters

Chemical protection suit, gloves, goggles, self-contained breathing apparatus.

Section 6: Accidental Release Measures

6.1: Personal precautions, protective equipment and emergency procedures

For personal protection see section 8.

6.2: Environmental precautions

Should not be released into the environment.

6.3: Methods and Materials for containment and clean up

Do not flush into surface waters or sanitary sewer system. Sweep up and shovel into suitable containers for disposal. Residues and small spillages may be hosed away with water. Spilled product which becomes wet may cause a slip hazard.

6.4: References to other sections

Section 7.0: Handling and Storage

7.1: Precautions for safe handling

Avoid dust formation during handling. For personal protection see section 8.

7.2: Conditions for safe storage.

To avoid product degradation and equipment corrosion, do not use iron, copper or aluminium containers or equipment. The product is hygroscopic. Protect from moisture.

7.4: Specific End Use(s)

Section 8: Exposurecontrols/PersonalProtection

8.1: Control Parameters

Contains no substances with occupational exposure limit values.

WORKPLACE EXPOSURE		Respirable Dust	
8 Hour TWA	15MinSTEL	8 HoursTWA	15MinSTEL

8.2: Exposure Controls

Engineering Measures	Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Ensure that eyewash stations and safety showers are close to the workstation location.
Respiratory Protection	In case of inadequate ventilation wear respiratory protection. (filter P2)
Hand Protection	Nitrile rubber gloves
Eye Protection	Safety glasses/gogles
Skin Protection	Normal work overalls

Section 9.0: Physical and ChemicalProperties

9.1: Information on basic physical and chemical properties

State:	Solid
Colour:	White
Odour:	Odourless
Relative Density:	n/a
pH:	n/a

9.2: Other Information

Section 10: Stability and Reactivity

10.1: Reactivity

10.2: Chemical Stability

Stable at ambient temperature.

10.3: Possibility of Hazardous Reactions

None known

10.4: Conditions to Avoid

Wet, damp, and humid conditions

10.5: Incompatible Materials

Strong oxidizing agents

10.6: Hazardous Decomposition Products

ammonia, Carbon oxides (COx), Nitrogen oxides (NOx)

Section 11: Toxicological Information

AQUATREAT 156

ORAL	RAT	LD50	>2500 mg/kg

Section 12: Ecological Information

12.1: Toxicity

96 Hr LC50 (fish) expected to be > 100ppm by analogy to similar products

12.2: Persistence and Biodegradable

Ready biodegradability/OECD Test Guideline 301 D/28 d: < 10 %

12.3: Bioaccumulative Potential

Bioaccumulation is unlikely. Because of the high molecular weight of the polymer diffusion through biological membranes is very small.

12.4: Mobility in Soil

12.5: Results of PBT and vPvB Assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and
toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6: Other adverse effects

Section 13: Disposal Information

Recycling, recovery and reuse of materials is recommended if permitted by regulations.The organic ingredients can be incinerated in a suitable installation when in accordance with local regulations.Packages must be disposed of according to local and national regulations.

Section 14: Transport Information

UN Number	
Shipping Name	Not classified as dangerous for transport
Transport Class	
Packing Group	
Environment Hazard	
Special Precautions	

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Section 15: Regulatory Information

15.1: Safety, Health and Environmental regulations/legislation specific for the substance/mixture

15.2: Chemical safety assessment

Section 16: Other information

The above information is based on our present knowledge of the product at the time of publication. It is given in good faith, no warranty is implied as to the quality or specification of the product. Information contained in this data does not constitute an assessment of workplace risks. The user must satisfy himself that the product is entirely suitable for their purpose

Caulmert
engineering environmental planning

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APPENDIX 3

Surface Water Risk Assessment document ref. 3400-CAU-XX-XX-RP-O-0302

CAULMERT LIMITED

Engineering, Environmental & Planning

Consultancy Services

Sundorne Products (Llanidloes) Ltd

BRYN POSTEG LANDFILL SITE (EPR/BU7766IC)

Surface Water Pollution Risk Assessment

Prepared by:

Caulmert Limited

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Doc ref 3400-CAU-XX-XX-RP-O-0302.A0.C3

Issue date: 1st March 2021

APPROVAL RECORD

Site: Bryn Posteg Landfill Site

Client: Sundorne Products (Llanidloes) Ltd

Project Title: Surface water discharge treatment Assessment

Document Title: Surface Water Pollution Assessment – H1

Document Ref: 3400-CAU-XX-XX-RP-O-0302.A0.C3

Report Status: Final for issue

Project Director: Andy Stocks

Project Manager: Sarah Venning

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Tel: 01773749132

Author	Sarah Venning	**Date**	01/03/2021
Reviewer	Andy Stocks	**Date**	01/03/2021
Approved	Andy Stocks	**Date**	01/03/2021

DISCLAIMER

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Drawings

Appendices

1 SURFACE WATER POLLUTION RISK ASSESSMENT OF TREATED SURFACE WATER FROM LAGOON 3 AT BRYN POSTEG LANDFILL SITE

1.1 Background

1.1.1 Sundorne Products (Llanidloes) Limited (hereafter referred to as the 'Operator') have instructed Caulmert Limited to undertake a surface water pollution risk assessment associated with the discharge of treated surface water from Lagoon 3 at Bryn Posteg Landfill Site.

1.1.2 The surface water treatment system has been designed to enable the installation of a surface water treatment system comprising a series of balancing ponds, dosing and flocculation plant and silt traps to reduce the suspended solids to within the current discharge.

1.1.3 The maximum capacity of the plant will be designed to treat 30 l/s, although balancing ponds are proposed to manage the peak runoff. This report aims to assess the potential pollution risk as a result of the proposed treatment system and includes the assessment of the parameters currently stipulated within the Environmental Table S3.3 within the Permit EPR/BU7766IC issued 16/10/17.

1.1.4 The surface water pollution risk assessment reviews the potential impact from the introduction of chemicals / flocculants used within the treatment process together with the permitted discharge quality. This report has been produced following preliminary discussions between the Operator and NRW with respect to the potential treatment options and the requirement to assess the pollution risk to surface water.

1.1.5 The report follows the methodology set out in the online guidance[*] on surface water pollution risk assessment which NRW has indicated remain applicable in Wales.

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

2 STAGE 1: IDENTIFY THE POLLUTANTS RELEASED FROM YOUR PLANT

2.1.1 The proposed surface water treatment facility at Bryn Posteg is designed specifically to enhance the flocculation and precipitation of silt during the treatment process. A number of additives have been considered during the trials including aluminium chloride, ferric chloride and Aquatreat 256 and Aquatreat 156. It is understood that during initial discussions with NRW the preferred option included aluminium chloride.

2.1.2 All additives achieved the desired effect of reducing suspended solids within the surface water samples. In reviewing the potential risks to the surface water environment, the potential additives for the treatment system were reviewed against the materials safety data sheets (Appendix 1) with respect to hazard codes and the environmental water quality standards for the active ingredients.

2.1.3 Following this review the preferred treatment system at Bryn Posteg will rely on ferric chloride rather than aluminium chloride as a flocculant.

2.1.4 Two patented chemicals proposed to enhance the chemical treatment were considered: Aquatreat 256 and Aquatreat 156. Aquatreat 156 has been chosen over Aquatreat 256 as it contains no hazardous materials in accordance with the provided Materials safety data sheet (Appendix 1).

2.1.5 Due to the commercial sensitivity, the chemical make-up of Aquatreat 156 is unknown however the material data sheet states that this has no hazard ratings. It also states that the material decomposes to ammonia, carbon oxides and nitrogen oxides. It is therefore considered that any impact from this compound would be regulated by the existing ammoniacal nitrogen limit on the discharge. The potential pollution risk for Aquatreat 156 is therefore not considered directly but is included within the assessment of ammoniacal nitrogen.

2.1.6 The quality of the surface water runoff from the site is monitored in accordance with the environmental permit and as such it is not proposed to vary the monitoring parameters.

2.1.7 Therefore the likely pollutants to be released as part of the discharge will comprise:

- Parameters limited as part of the Environmental Permit:
  - Ammoniacal nitrogen,
  - pH,
  - BOD, and
  - Suspended solids:
- Ferric chloride
- Aquatreat 156

2.1.8 The current limits on the discharge of surface water from the site are presented in Table 1 below:

Table 1: Current limits on discharge of surface water (P1)

Determinand	Units	Point Source Emissions Limit
Ammoniacal Nitrogen as N	mg/l	0.25
pH	pH Units	6-9
BOD, unfiltered	mg/l	20
Suspended solids	mg/l	50

3 STAGE 2 GATHERING DATA

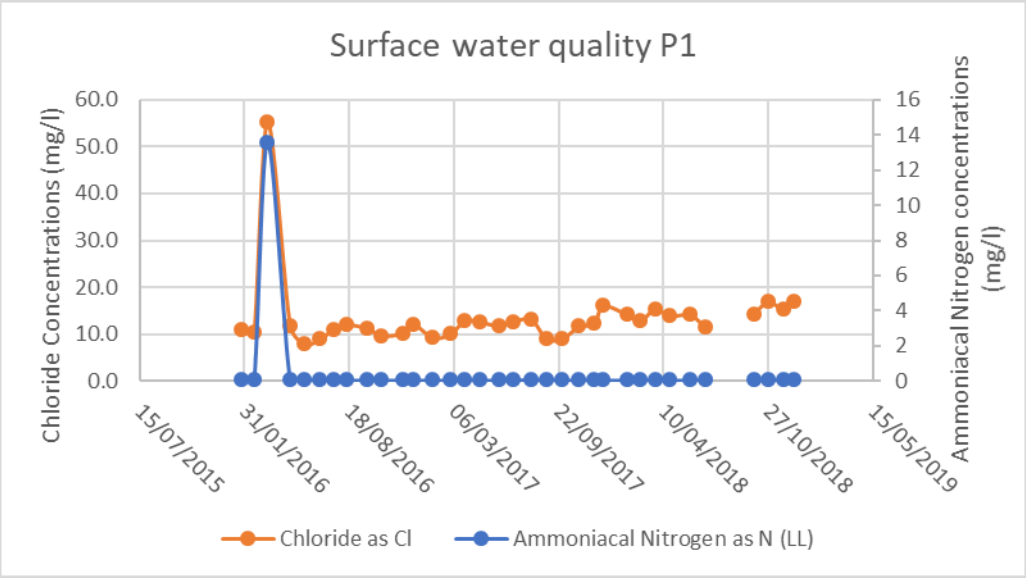
3.1.1 The guidance requires a number of parameters to be gathered prior to being able to complete the screening assessment. It is noted that this proposed discharge is likely to vary with time and particularly in response to rainfall events. Therefore, until the system is operational information such as average discharge volumes are unknown, the assessment is based on the maximum treatment volumes. The required data is detailed in Table 2 below:

Table 2: Discharge and receiving water data

	Chemical name	Ammoniacal nitrogen as n	pH	BOD	Suspended solids	Iron	Aquatreat	Justification
Units		mg/l	-	mg/l	mg/l	mg/l	-	
Discharge (2016 - 2018 site data)	Min	0.1	6.2	1.0	1.0		N/A	No data for iron – back calculation to determine acceptable concentration See below for site data
	Average	0.1	6.9	1.6	8.2			
	95%ile	0.1	7.5	4.0	30.0			
	Max	13.6	7.8	10.0	38.0			
	Count	34	34	34	34			
Emissions limits		0.25	6-9	20	50			
Maximum flow l/s		30l/s						Maximum treatment rate
Average flow l/s								No average flow data
Fresh water upstream	Maximum conc	0.3	7.3	3.5		10.8	N/A	See below
	Average conc	0.2	6.6	2.2		5.18		
	Min conc	0.1	5.8	1		0.6		
LOD		0.06		1				
EQS	Annual average	ND	ND	ND	ND	1.0		Fresh water
	MAC	ND	6-9	20*	ND	ND		Fresh water

ND - not determined / available, NA Not applicable, * taken to be the emissions limit in the absence of a published standard

3.1.2 Routine surface water monitoring data is undertaken at P1 located at the discharge point of the eastern catchment. This data indicates that with the exception of an event occurring in early 2016, the contaminant concentrations are low (data is contained in Appendix 2)



3.1.3 The data collected from this event has been excluded from the calculation of the average and 95%ile values in the table above. All concentrations below the laboratory detection limit of 0.06 mg/l for ammoniacal nitrogen have been taken to be at this detection limit within the graph above.

3.1.4 The environmental water quality standard for ammoniacal nitrogen as NH4 (0.5mg/l) has been withdrawn and therefore the Water Framework Directive classification standards have been used as an indication of background water quality.

Table 1.1: Standards for ammonia

Total Ammonia (mg/l) (annual 90-percentile)				
Type of river	High	Good	Moderate	Poor
Upland and low alkalinity	0.2	0.3	0.75	1.1
Lowland and high alkalinity	0.3	0.6	1.1	2.5

3.1.5 The discharge from the Lagoon 3 ultimately discharges to and comprises the headwaters of the Nant y Bradnant and therefore there are no upstream concentrations available. In absences of such data, it is considered appropriate to use historic data collected prior to the development of the landfill site to present natural surface water and groundwater quality within this catchment. It is noted that this is spot data.

3.1.6 This information predating the development of the landfill site dated 21.2.1980 (appendix 3) indicates that spot samples of the surface water and groundwater quality indicate that the ammoniacal nitrogen ranges from 0.09 mg/l to 0.6 mg/l prior to the development of the site and that the Iron concentrations in surface water between 0.6 and 10 mg/l which

represents the natural concentrations for this environment (pre landfill development). It is likely to reflect the presence of peat deposits with concentrations in groundwater (2 – 40 mg/l) being recorded higher than those in surface water. The high concentrations of iron are likely to suggest the presence of colloidal iron within the natural environment.

Table 3: relevant baseline data (Aspinwall 1980) pre landfill development

	Ammoniacal Nitrogen (mg/l)	Fe (mg/l)	BOD (mgl)	pH
Mire Standing water	0.25	2.09	3.5	6.1
Bryn Posteg Stream	0.12	10.8	2	7.3
Bryn Posteg Spring	0.18	8.8	1	7.0
Bradnant Adit	0.2	1.17	3	6.8
Site Stream by road	0.16	7.6	2	6.9
Stream leaving the site	0.21	0.63	1.7	5.8
GROUNDWATER				
BH1	0.09	5.2	2	6.1
BH2	0.15	21.2	2	9.5
BH3	0.17	3.11	2.5	7.8
BH4	0.14	4.5	7	8.1
BH4A	0.42	10.1	7	7.6
BH5	0.01	4.1	3.5	7.2
BH5A	0.15	2.61	2	7.1
BH6	0.25	25.7	10.2	7.4
BH6A	0.22	3.59	10	8.3
BH7	0.32	2.56	4.5	7.4
BH7A	0.3	7.5	5	7.4
BH8	0.23	2.45	3	7.3
BH9	0.29	10.2	4	6.6
BH10	0.28	7.3	6	9.6
BH10A	0.6	40	14	9

3.1.7 The above table indicates that the environmental water quality standards for iron were exceeded prior to the development of the landfill site. Caution should be used as these represent spot samples and no further information is available on whether these represent dissolved or total iron concentrations.

4 SCREENING TESTS FRESH WATER

4.1 Test 1: Check whether the concentration of the pollutant is more than 10% of the EQS Limits.

4.1.1 This screening test assesses whether the concentrations of the discharged substances exceed 10 percent of the EQS, irrelevant to the quality and flow of the receiving body of water. Therefore it purely assesses the quality of the discharged effluent.

4.1.2 The current EQS standards have been sourced from the following two environment Agency spreadsheets:

- Fresh waters specific pollutants and operational environmental quality standards (EQS) accessed 12/3/2019
- Freshwaters priority hazardous substances, priority substances and other pollutants – accessed 12/3/2019

4.1.3 The H1 access database tool has been utilised to assess the pollution potential and is included in Appendix 4.

Table 4: Results of screening against 10%EQS

Substance	P1 compliance limit conc. (µg/l)	Annual Average EQS (µg/l)	MAC conc. (µg/l)	MAC EQS (µg/l)	Pass/Fail
Ammoniacal Nitrogen as N	250	300		300	Fail
Iron	5000	1000	-	-	Fail
BOD	20 mg/l	20 mg/l	-	-	Fail

4.1.4 The iron concentrations have been back calculated from acceptable concentrations in Test 3. The above table indicate that all parameters associated with the treatment of surface water and regulated by the emissions limits at P1 are above 10% of the EQS.

4.2 Test 2: Does the process contribution (PC) exceed 4 percent of the EQS

4.2.1 The discharge from the site comprises forms the base flow within the Nant y Bradnant at its headwaters and as such, there is no receiving water body at the site. Therefore, the quality of the discharge represents the quality of the Nant -y- Bradnant at this point. In order to assess the impacts on the downstream water quality, the assessment has been undertaken on a theoretical assessment point for the Nant y Bradnant where the combined flow (including the discharge) is 60L/s. This is both an arbitrary and theoretical assessment point and assumes that the Nant y Bradnant increases in size along its course to the confluence with the River Severn. There are no gauging stations present on the Nant y Bradnant.

4.2.2 In addition, the risks from the treated discharge from the site are also assessed at the point where the Nant y Bradnant enters into the River Severn. The nearest gauging station is located

on the River Severn at Dolwen which is immediately down stream of the confluence with the Nant Y Bradnant.

4.2.3 Following the assessment methodology of Test 2 – Surface Water Discharges, for the H1 the process contributions released to the Nant y Bradnant and Severn were calculated as follow:

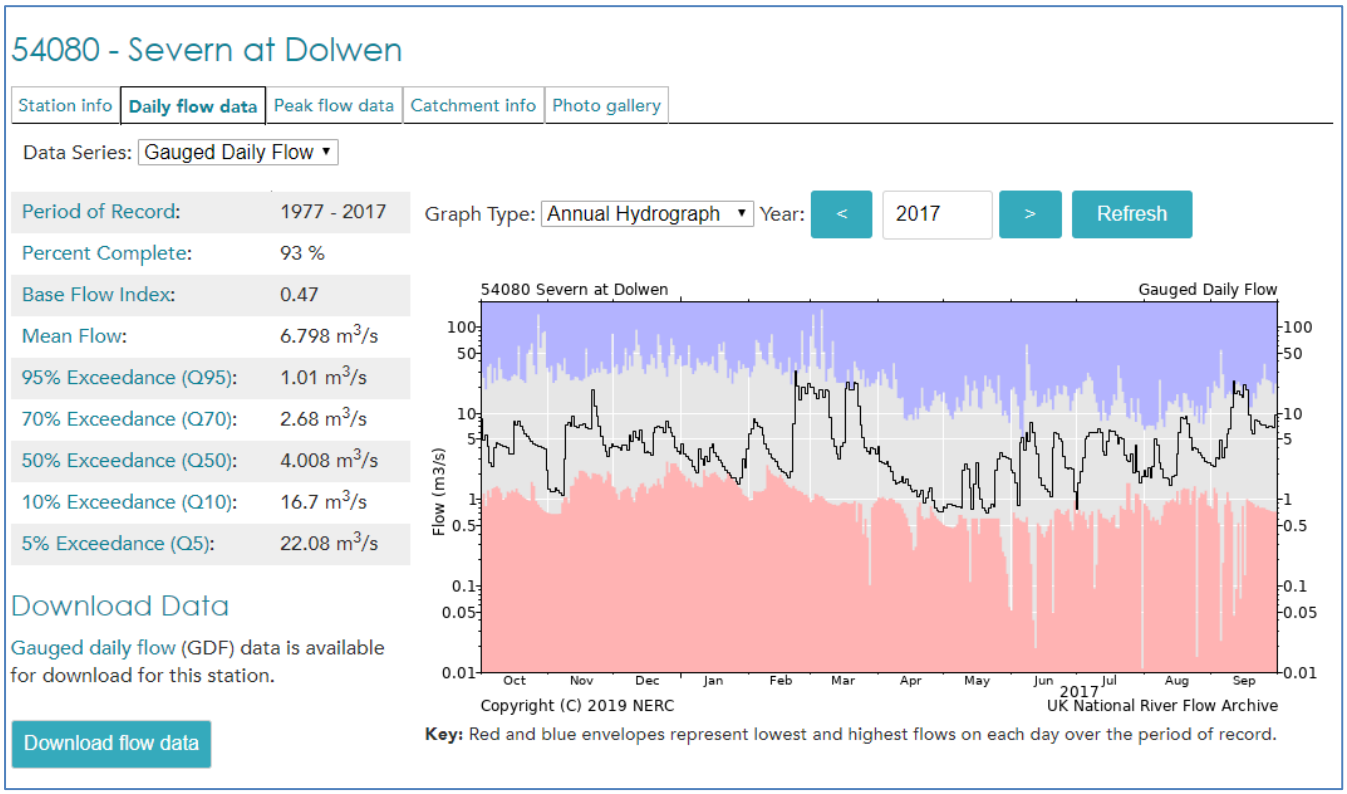
$$PC = \frac{(EFR * RCperm)}{(EFR + RFR)} \quad (1)$$

Where

PC = process contribution (µg/l)
EFR = effluent flow rate (m^3/s)
RC_{perm} = release concentration from RO treatment work
RFR= river flow rate (m^3/s)

4.2.4 As indicated above, the assessment on the Nant y Bradnant is based on a theoretical point with a discharge of 30L/s such that the combined flow is 60 L/s. This is an arbitrary flow based on double the discharge rate, i.e. equal proportions of discharge to accumulated flow with the Nant y Bradnant.

4.2.5 An extract from the Nation River Archives is presented below. This indicates that the Q95 flow within the R. Severn at Dolwen is 1.01 m^3/s. The maximum discharge from the site is 0.03m^3/s (30 L/S).



Data was sourced from http://nrfa.ceh.ac.uk/data/search.

Table 5a: Process contributions (Nant Y Bradnant)

Substance	MAC conc. (µg/l)	EFR (m^3/s)	RFR (m^3/s)	PC	4% EQS	
Ammoniacal Nitrogen as N	250	0.03	0.03	125	12	Fail
Iron	5000	0.03	0.03	2500	40	Fail
BOD	20	0.03	0.03	10	0.8	Fail

Table 5b: Process contributions (R. Severn)

Substance	MAC conc. (µg/l)	EFR (m^3/s)	RFR (m^3/s)	PC	4% EQS	
Ammoniacal Nitrogen as N	250	0.03	1.01	7.2	12	Pass
Iron	5000	0.03	1.01	144	40	Fail
BOD	20	0.03	1.01	0.6	0.8	Pass

4.3 Test 3: does the difference between upstream quality and the Predicted Environmental Concentration (PEC) exceed 10 percent of the EQS?

4.3.1 The PEC is the predicted concentration in the receiving water downstream of the discharge and is calculated using the following formula:

$$PEC = \frac{(EFR * RC_{perm}) + (RFR * BC)}{(EFR + RFR)}$$

Where

PEC = Predicted Environmental Concentration (µg/l)
BC = Background concentration (µg/l)
RC- Release concentration (ug/l)

4.3.2 As indicated above, the background concentrations are taken from an investigation that predate the development of the site and therefore is considered to represent baseline conditions. Please note that the results presented below are based on the calculation above which differs from the H1 tool which assumes that the PEC can be added to the BC. Due to the flow rates this has an impact on the results in the H1 model. The spreadsheet calculations are included in Appendix 4.

Table 6a: Predicted Environmental Concentrations (mg/l) Nant y Bradnant

	Units	RC	BC	PEC	PEC-BC	EQS	10%EQS
Ammoniacal Nitrogen	ug/l	250	200	225	25	300	30
Iron	ug/l	5000	5180	5090	-90*	1000	100
BOD	mg/l	20	2.2	11.1	8.9	20	2

***** The negative number is due to the discharge having a lower iron concentration than the background pre landfill data.

4.3.3 The above table indicates that there is no discernible deterioration in the concentrations above 10% with the exception of BOD. It is noted that whilst the predicted concentrations are below the EQS that the emission limit for BOD fails this 10% deterioration assessment. However when using site specific discharge data which indicates that the concentrations of BOD are rarely above 5 mg/l (95%ile value was 4 mg/l), the BOD passes this screening test.

4.3.4 This peculiarity arises due to the difference between the background concentrations and the emission limits set at the EQS.

Table 6b: Predicted Environmental Concentrations (mg/l) River Severn

	BC	RC	PEC	PEC-BC	10%EQS
NH4 (mg/l)	0.2	0.25	0.2	0.001	0.03
Fe (mg/l)	5.18	5	5.17	-0.005	0.1
BOD (mg/l)	2.2	20	2.7	0.5	2

Note: concentrations have been converted to mg/l for ease of interpretation

4.3.5 The surface water risk assessment indicates that the predict concentrations within the River Severn are extremely low and would not be discernible above background concentrations.

4.3.6 In conclusion, it is considered that the treatment system will meet the requirements of step 3 provided that the current emission limits within P1 are met. This includes for limited dilution within the Nant y Bradnant which is the initial receiving water body. It is noted that this stream arises from within the boundaries of the landfill and therefore the assessment is undertaken at a theoretical point downstream where the accumulated flow within the stream matches the discharge rate.

4.4 Part A Freshwater screening test 4: does the PEC exceed the EQS in the receiving water downstream of the discharge?

4.4.1 The final test of the part A of the Freshwater screening is to determine whether the PEC exceeds the EQS. The test is split into two sections, test 4A and 4B, with test 4A relating to the average concentration and test 4B relating to the max concentration.

Table 7a: STEP 4 is PEC > EQS Nant Y Bradnant

	Units	RC	BC	PEC	EQS
Ammoniacal Nitrogen	ug/l	250	200	225	300
Iron	ug/l	5000	5180	5090	1000
BOD	mg/l	20	2.2	11.1	20

4.4.2 Ammoniacal nitrogen at the current emission limit of 0.25 mg/l passes the test at the maximum concentrations as presented in Table 7 above. BOD concentrations also pass this test. The concentrations of iron fail this test due to the high background of iron in the receiving water body (based on background concentrations pre-development of the landfill site). This indicates that the natural (pre development) surface water quality was inferior to the current water quality standards.

4.4.3 The predicted concentrations in the River Severn. These indicate that as the concentrations are limited to the EQS or background data, there is no discernible effects on the water quality.

Table 7b: STEP 4 is PEC > EQS River Severn

	Units	RC	BC	PEC	EQS
Ammoniacal Nitrogen	ug/l	250	200	201	300
Iron	ug/l	5000	5180	5175	1000
BOD	mg/l	20	2.2	2.7	20

4.5 Water impact: Significant loads

There are no priority substances as defined within the guidance identified the discharge and therefore no assessment of significant loads is required. The discharge is of treated surface water from the site to remove the fine particles from suspension.

5 MODELLING

5.1.1 No modelling of the river needs has been undertaken to derive the appropriate ammoniacal nitrogen discharge criteria for the site. The assessment is based on a conservative assumption that the maximum discharge concentration of ammoniacal nitrogen occurs during the periods of lowest flow in the receiving water body. In practise, the discharge from the site is likely to be significantly less during these periods of low flow based on the assumption that this is a discharge of surface water runoff.

5.1.2 Therefore any additional modelling which would allow the correlation between flows and concentrations would result in a higher permissible discharge concentration.

6 SENSITIVITY OF RECEIVING ENVIRONMENT

6.1 Environmental Designations

6.1.1 There are no statutory designated sites immediately down stream of the discharge and the assessed water body comprising the River Severn. However it is recognised that the Nant y Bradnant was recorded as of good water quality during the first water directive assessment and therefore may be regarded as being a moderate sensitivity. Accordingly the risks to the Nant y Bradnant have been included within this assessment.

6.1.2 It is noted that the Nant Y Bradnant drains an area with a significant industrial lead mining heritage and local enrichment of metal species would be expected. This is confirmed by the historic data which indicates high concentrations of iron in excess of the current environmental water quality standards.

7 Monitoring Requirements

7.1 Review of existing requirement on eastern catchment.

7.1.1 The monitoring of the surface water discharge from the eastern catchment is regulated under the existing environmental permit via monitoring point P1. Ammoniacal nitrogen and BOD provide a general indication of the overall surface water quality.

7.1.2 The additional treatment using ferric chloride and Aquatreat 156 is discussed above. Aquatreat degrades to ammonia, carbon oxides and nitrogen oxides and therefore the monitoring of ammoniacal nitrogen as part of the discharge consent would remain appropriate to be protective of pollution from this additive.

7.1.3 During the establishment of the treatment technology, it would be advisable to monitor for **dissolved** iron concentrations in the discharge, however the treatment system is designed such that iron would precipitate out of solution and would not be expected to be present in the surface water discharge. A period of 12 months monitoring of iron is proposed in addition to the existing permitted monitoring regime to demonstrate the removal of iron from the discharge.

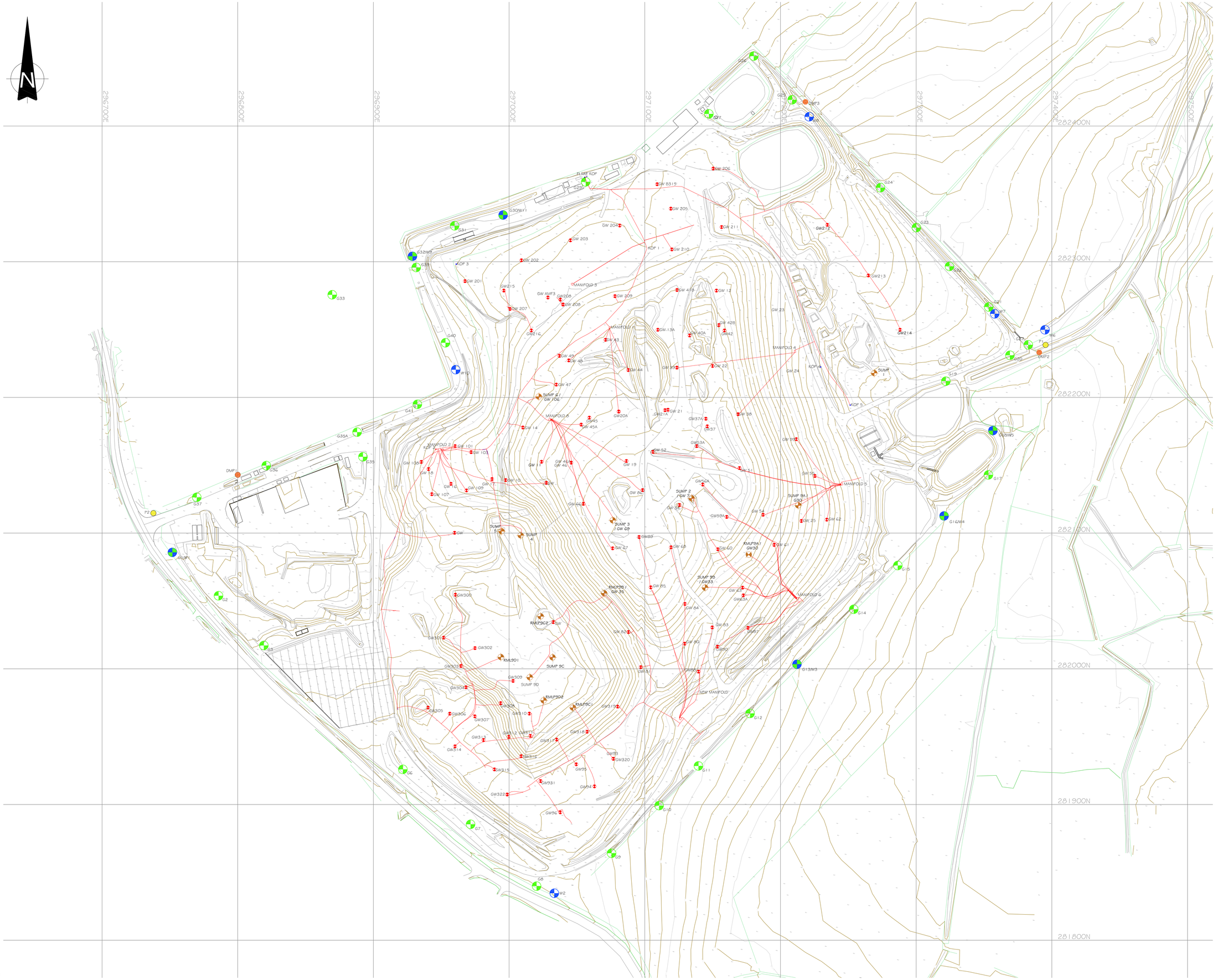
8 CONCLUSION AND DISCUSSION

8.1.1 This surface water risk assessment has reviewed the potential pollution risk of the proposed surface water treatment system associated with Lagoon 3 at Bryn Posteg Landfill Site together with the existing limits on the surface water discharge in accordance with the permit requirements. This review has shown that the baseline quality (pre development of the landfill site) is inferior to the current environmental water quality standards through the natural concentrations of iron in both groundwater and surface water samples obtained in 1980.

8.1.2 The assessment of the risk as indicated that the net contribution of iron from the treatment system is limited to less than 10% of the EQS with a control limit of 5 mg/l.

8.1.3 The current Ammoniacal nitrogen concentrations and BOD criteria are considered to remain appropriate.

DRAWINGS



NOTE

1. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.

2. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING WILL BE ALLOWED WITHOUT THE PRIOR PERMISSION IN WRITING.

3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

4. MAXIMUM SURCHARGE LOAD ON 50.0m FLOOR 20KN/m2 UNLESS OTHERWISE STATED.

LEGEND

- IN WASTE GAS WELL
- LEACHATE COLLECTION / MONITORING POINT
- PERIMETER GAS MONITORING BOREHOLE
- PERIMETER GROUNDWATER MONITORING BOREHOLE
- PERIMETER GAS & GROUNDWATER MONITORING BOREHOLE
- SURFACE WATER MONITORING LOCATION
- DUST MONITORING POINT

REV	MODIFICATIONS	BY	RE	AP	DATE
P3	MINOR AMENDMENTS	DA	SO	SO	31.05.18
P2	MINOR AMENDMENTS	DA	SO	SO	29.05.18
P1	ISSUED FOR COMMENT	RWG	SO	SO	04.05.18

POTTERS WASTE MANAGEMENT

PROJECT:

BRYN POSTEG LANDFILL SITE

TITLE:

GAS EXTRACTION AND MONITORING INFRASTRUCTURE PLAN

DRAWN BY	DATE	
RWG	04.05.2018	
REVIEWED BY	SCALE @ A1	JOB REF:
SO	1:1250	3376
AUTHORISED BY	ISSUE	REVISION
SO	S1	P3

DRAWING NUMBER
3376-CAU-XX-XX-DR-V-1801

Caulmert
engineering environmental planning
WWW.CAULMERT.COM

Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG Company Registered No: 06716319

APPENDIX 1

Material Safety Data Sheet

Section 1: Identification of Substance/mixture and of the company undertaking

1.1: Product Identifier

Product Name AQUATREAT 156

1.2: Relevant Identified use of substance/mixture and uses advised against

1.3: Details of the Supplier of the safety data sheet

Company Name: Aquatreat

Albany House
North Dock
Llanelli
Carmarthenshire
SA15 2LF

Telephone: 01554 775236

Fax: 01554 772253

E-mail: enquiries@aquatreat.co.uk

Website: www.aquatreat.co.uk

1.4: Emergency Telephone Numbers:

Emergency Telephone: 0333 333 949

Section 2: Hazards Identification

2.1: Classification of substance/mixture according to Regulation (EC) No 1272/2008

Classification under CLP: NC Not Classified as Hazardous

Additional Information:

2.2: Label Elements: Labelling according to Regulation (EC) No 1272/2008 [CLP/GHS]

Label elements under CLP: NC Not Classified as Hazardous

Signal Words:

Hazard Pictograms:

Precautionary Statements

Wear protective gloves/protective clothing/eye protection/face protection.

Keep out of reach of children.

2.3: Other Hazards

Section 3: Composition information on hazardous ingredients

Does not contain any compnents classified as hazardous

EINECS	CAS No	CLP Classification	Percent

Section 4: First Aid Measures

4.1: Description of First Aid measures

Skin Contact: Remove contaminated clothing. Wash contaminated area well with soap and water. If irritation persists obtain medical attention.

Eye Contact: Irrigate eye with water for 15 minutes. If irritation or redness persists seek medical attention.

Ingestion: Do not induce vomiting. Do not give anything by mouth to an unconscious person. If conscious rinse out mouth with water and give water to drink. Rest and reassure patient and obtain medical attention

Inhalation: Remove person to fresh air. If recovery is delayed seek medical attention.

4.2: Most important symptoms and effects both accute and delayed

Skin Contact: No data available

Eye Contact: No data available

Ingestion: No data available

Inhalation: No data available

4.3: Indication of any immediate medical treatment and special treatment required

Section 5: Fire fighting measures

5.1: Extinguishing media

Foam, dry powder, CO2

Unsuitable Media

None

5.2: Special hazards arising from the substance/mixture

Product does not burn readily, but flammable dust clouds may be formed in air.

5.3: Advice for firefighters

Chemical protection suit, gloves, goggles, self-contained breathing apparatus.

Section 6: Accidental Release Measures

6.1: Personal precautions, protective equipment and emergency procedures

For personal protection see section 8.

6.2: Environmental precautions

Should not be released into the environment.

6.3: Methods and Materials for containment and clean up

Do not flush into surface waters or sanitary sewer system. Sweep up and shovel into suitable containers for disposal. Residues and small spillages may be hosed away with water. Spilled product which becomes wet may cause a slip hazard.

6.4: References to other sections

Section 7.0: Handling and Storage

7.1: Precautions for safe handling

Avoid dust formation during handling. For personal protection see section 8.

7.2: Conditions for safe storage.

To avoid product degradation and equipment corrosion, do not use iron, copper or aluminium containers or equipment. The product is hygroscopic. Protect from moisture.

7.4: Specific End Use(s)

Section 8: Exposurecontrols/PersonalProtection

8.1: Control Parameters

Contains no substances with occupational exposure limit values.

WORKPLACE EXPOSURE		Respirable Dust	
8 Hour TWA	15MinSTEL	8 HoursTWA	15MinSTEL

8.2: Exposure Controls

Engineering Measures	Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Ensure that eyewash stations and safety showers are close to the workstation location.
Respiratory Protection	In case of inadequate ventilation wear respiratory protection. (filter P2)
Hand Protection	Nitrile rubber gloves
Eye Protection	Safety glasses/gogles
Skin Protection	Normal work overalls

Section 9.0: Physical and ChemicalProperties

9.1: Information on basic physical and chemical properties

State:	Solid
Colour:	White
Odour:	Odourless
Relative Density:	n/a
pH:	n/a

9.2: Other Information

Section 10: Stability and Reactivity

10.1: Reactivity

10.2: Chemical Stability

Stable at ambient temperature.

10.3: Possibility of Hazardous Reactions

None known

10.4: Conditions to Avoid

Wet, damp, and humid conditions

10.5: Incompatible Materials

Strong oxidizing agents

10.6: Hazardous Decomposition Products

ammonia, Carbon oxides (COx), Nitrogen oxides (NOx)

Section 11: Toxicological Information

AQUATREAT 156

ORAL	RAT	LD50	>2500 mg/kg

Section 12: Ecological Information

12.1: Toxicity

96 Hr LC50 (fish) expected to be > 100ppm by analogy to similar products

12.2: Persistence and Biodegradable

Ready biodegradability/OECD Test Guideline 301 D/28 d: < 10 %

12.3: Bioaccumulative Potential

Bioaccumulation is unlikely. Because of the high molecular weight of the polymer diffusion through biological membranes is very small.

12.4: Mobility in Soil

12.5: Results of PBT and vPvB Assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and
toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6: Other adverse effects

Section 13: Disposal Information

Recycling, recovery and reuse of materials is recommended if permitted by regulations.The organic ingredients can be incinerated in a suitable installation when in accordance with local regulations.Packages must be disposed of according to local and national regulations.

Section 14: Transport Information

UN Number	
Shipping Name	Not classified as dangerous for transport
Transport Class	
Packing Group	
Environment Hazard	
Special Precautions	

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Section 15: Regulatory Information

15.1: Safety, Health and Environmental regulations/legislation specific for the substance/mixture

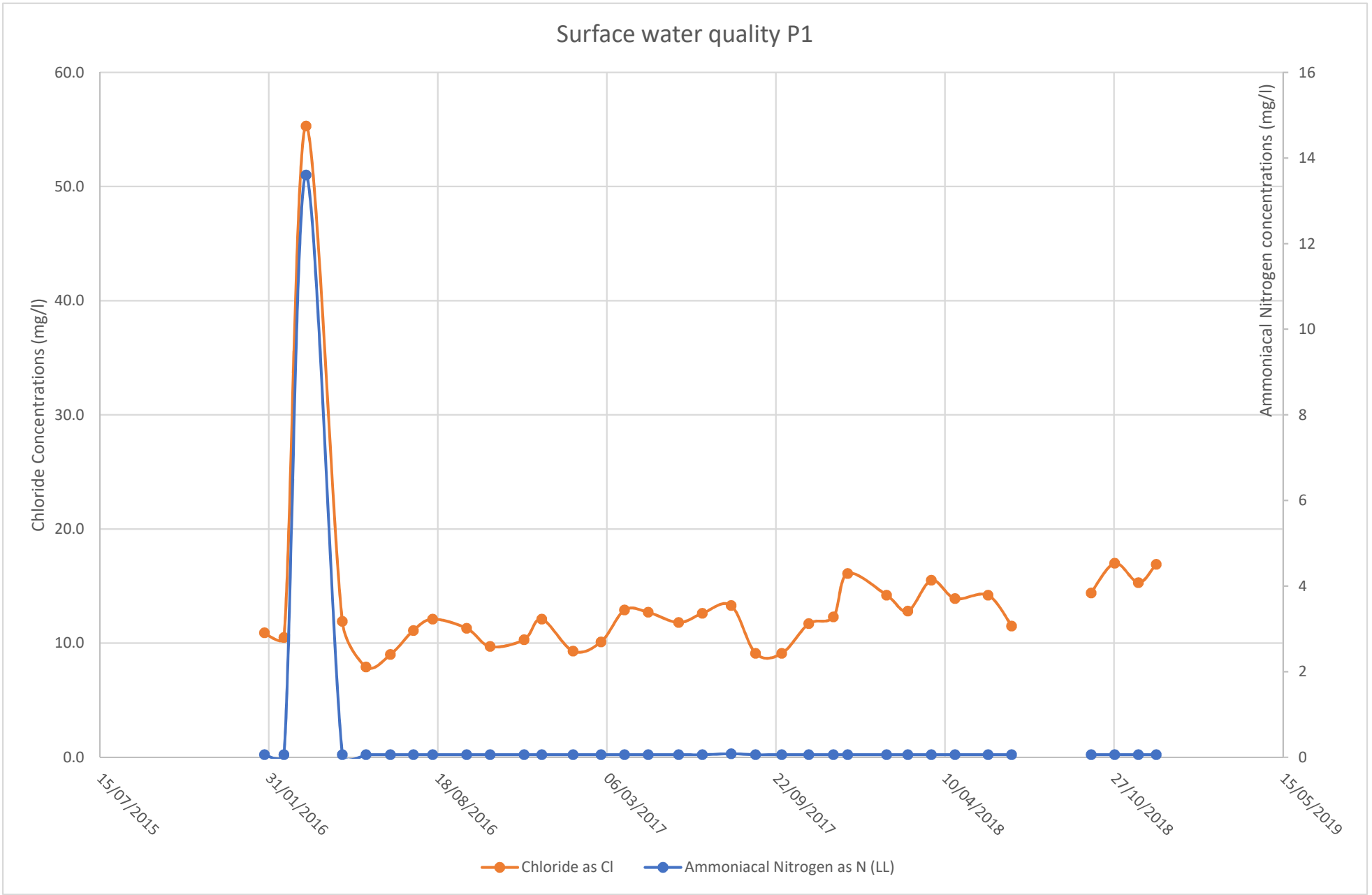
15.2: Chemical safety assessment

Section 16: Other information

The above information is based on our present knowledge of the product at the time of publication. It is given in good faith, no warranty is implied as to the quality or specification of the product. Information contained in this data does not constitute an assessment of workplace risks. The user must satisfy himself that the product is entirely suitable for their purpose

APPENDIX 2

compliance Level		6 - 9	N/A	0.25	N/A	50	20	N/A	N/A	N/A	N/A	N/A	N/A
LOCATION	DATE	pH	Conductivity- Electrical 20C	Ammoniacal Nitrogen as N (LL)	Chloride as Cl	Total Suspended Solids	BOD + ATU (5 day)	EH >C6 - C40	EH >C6 - C8	EH >C8 - C10	EH >C16 - C24	EH >C24 - C40	EH >C10 - C16
		pH units	µS/cm	mg/l	mg/l	mg/l	mg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
SW 1	26/01/2016	6.9	95	0.06	10.9	11	1	<10	<10	<10	<10	<10	<10
SW 1	18/02/2016	7.4	99	0.06	10.5	20	1	<10	<10	<10	<10	<10	<10
SW 1	15/03/2016	6.7	459	13.6	55.3	30	10	<10	<10	<10	<10	<10	<10
SW 1	27/04/2016	7.4	103	0.06	11.9	1	1	12	<10	<10	<10	12	<10
SW 1	25/05/2016	7.2	97	0.06	7.9	2	2	<10	<10	<10	<10	<10	<10
SW 1	23/06/2016	7.5	101	0.06	9.0	1	1	25	<10	<10	<10	25	<10
SW 1	20/07/2016	7.3	106	0.06	11.1	3	2	36	<10	<10	<10	36	<10
SW 1	12/08/2016	7.8	111	0.06	12.1	5	4	<10	<10	<10	<10	<10	<10
SW 1	21/09/2016	7.0	105	0.06	11.3	5	1	<40	<40	<40	<40	<40	<40
SW 1	19/10/2016	6.5	105	0.06	9.7	11	2	<10	<10	<10	<10	<10	<10
SW 1	28/11/2016	6.9	113	0.06	10.3	2	1	<10	<10	<10	<10	<10	<10
SW 1	19/12/2016	6.9	110	0.06	12.1	3	1	<100	<100	<100	<100	<100	<100
SW 1	25/01/2017	6.6	110	0.06	9.3	4	1	21	10	10	10	21	10
SW 1	27/02/2017	6.6	108	0.06	10.1	6	1	10	10	10	10	10	10
SW 1	27/03/2017	6.6	111	0.06	12.9	25	1	10	10	10	10	10	10
SW 1	24/04/2017	6.9	117	0.06	12.7	4	3	27	10	10	10	27	10
SW 1	30/05/2017	7.1	113	0.06	11.8	38	5	10	10	10	10	10	10
SW 1	27/06/2017	7.2	112	0.06	12.6	8	2	10	10	10	10	10	10
SW 1	31/07/2017	6.8	113	0.08	13.3	30	1	40	10	40	40	40	40
SW 1	29/08/2017	6.8	111	0.06	9.1	2	1	20	10	20	20	20	20
SW 1	29/09/2017	6.8	111	0.06	9.1	2	3	10	10	10	10	10	10
SW 1	31/10/2017	6.5	117	0.06	11.7	2	2	40	40	40	40	40	40
SW 1	29/11/2017	6.3	126	0.06	12.3	1	1	10	10	10	10	10	10
SW 1	16/12/2017	6.4	134	0.06	16.1	5	1	10	10	10	10	10	10
P1 (SW 1)	31/01/2018	7.1	109	0.06	14.2	2	1	10	10	10	10	10	10
P1 (SW 1)	25/02/2018	6.9	132	0.06	12.8	6	1	10	10	10	10	10	10
P1 (SW 1)	25/03/2018	7	117	0.06	15.5	2	1	10	10	10	10	10	10
P1 (SW 1)	22/04/2018	6.6	129	0.06	13.9	10	2	10	10	10	10	10	10
P1 (SW 1)	31/05/2018	6.9	117	0.06	14.2	13	1	10	10	10	10	10	10
P1 (SW 1)	28/06/2018	7.6	111	0.06	11.5	9	4	10	10	10	10	10	10
P1 (SW 1)	02/08/2018												
P1 (SW 1)	23/08/2018												
P1 (SW 1)	30/09/2018	6.7	249	0.06	14.4	4	1	20	20	20	20	20	20
P1 (SW 1)	28/10/2018	6.4	123	0.06	17	2	1	13	10	10	10	13	10
P1 (SW 1)	25/11/2018	6.4	124	0.06	15.3	2	1	46	10	10	10	46	10
P1 (SW 1)	16/12/2018	6.2	126	0.06	16.9	8	1	40	40	40	40	40	40
min		6.2	95.4	0.1	7.9	1.0	1.0	10.0	10.0	10.0	10.0	10.0	10.0
Average		6.9	127.2	0.1	12.2	8.2	1.6	18.8	13.2	15.0	15.0	18.8	15.0
95%ile		7.5	174.2	0.1	16.4	30.0	4.0	40.0	39.0	40.0	40.0	40.0	40.0
max		7.8	459.0	13.6	55.3	38.0	10.0	46.0	40.0	40.0	40.0	46.0	40.0
count		34	34	34	34	34	34	25	22	22	22	25	22


Surface water quality P1
Chloride Concentrations (mg/l)
Ammoniacal Nitrogen concentrations (mg/l)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
16
14
12
10
8
6
4
2
0
15/07/2015
31/01/2016
18/08/2016
06/03/2017
22/09/2017
10/04/2018
27/10/2018
15/05/2019
Chloride as Cl
Ammoniacal Nitrogen as N (LL)

APPENDIX 3

THE HYDROGEOLOGICAL INVESTIGATION AND LANDFILL DESIGN OF AN UPLAND LANDFILL IN POWYS

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THE HYDROGEOLOGICAL INVESTIGATION AND LANDFILL DESIGN OF AN UPLAND LANDFILL IN POWYS

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1. BACKGROUND

1.1 This paper summarises work executed to a brief prepared by Montgomery District Council, to locate and develop a new landfill facility which would meet the Council's statutory responsibility to dispose of waste in an environmentally acceptable manner. The District Council's Chief Environmental Health Officer, Mr Tegwyn Roberts, explains the Council's position in his paper, which should be read in conjunction with this.

1.2 Figure 1 sets out the sequence of steps which were taken to identify and secure the facility in this case. Figure 2 shows our standard "blueprint" approach, whilst Figure 3 identifies the licencing and planning decision routes in full. The consultants' brief commenced with an analysis of some twenty-two potential sites identified by the Environmental Health Department. Major constraints on landfill development in the District Council's area were seen to be:

i) Much of the area is within the catchment of the River Severn, a major regulated surface water resource and fishery.

ii) Other rivers have high amenity and recreational values as well as local water resource values.

iii) The area is one of high landscape value.

iv) Upland areas are characterised by relatively steep slopes and thin

cover material, giving difficult conditions for controlled landfill.

v) Lowland areas have adequate cover material but are heavily and profitably farmed.

1.3 The District Survey essentially comprised an appraisal of the merits and demerits of each site for development as an engineered landfill, and included aspects of the geology, hydrogeology, hydrology, and meteorology to determine the likely generation and fate of leachate in each case. An essential part of the analysis was however to attempt to find a self-sufficiency of earth materials of a kind which would permit a high degree of environmental control over the basic design, operation and restoration of the site. Of all the options considered only Bryn Posteg revealed, at this early stage, considerable potential.

1.4 Having identified Bryn Posteg the next stage was to carry out a Reconnaissance Survey of the site, the first stage shown on Figure 2. Such a survey is essentially a relatively low cost appraisal of the site, but aims to identify those major constraints at a particular site which would render the project non-viable, and those which would require significant engineering works to overcome. Systematic records are also made of all matters considered to be relevant to the proposal, and generally fall under the headings shown on Figure 2.

At Bryn Posteg, the reconnaissance survey was fortified by the construction of 16 trial pits on site, and the use of either this technique and/or rotary augering is, in our experience, very often a worthwhile addition to the data bank at moderate cost.

1.5 The Reconnaissance Survey did not reveal any insuperable constraints, given that the District Council were only prepared to operate a modern ethical landfill, and therefore instructions were received to carry out a full site investigation which comprised twelve boreholes with suitable instrumentation and twenty-seven trial pits. The scope of the full site investigation covered most of the topics shown on Figure 3, but in addition included investigation of the relevance of a disused lead mine which underlies much of the site.

1.6 The full site investigation enabled a costed draft landfill design to be advanced to the District Council for its approval, which was granted, so that full landfill design could proceed.

This paper summarises some of the major features of this project, which follows a logic found to be productive for both public and private sector clients in the Waste Management field.

2. HYDROGEOLOGY OF THE SITE AREA

2.1 Basic Geology

2.1.1 General

The geology of the site can be divided into the solid geology of the older rocks occuring in the area and the superficial geology of more recent deposits which have been emplaced by the processes of weathering, glaciation and organic activity.

In general terms the site consists of a downward succession of Recent clays and weathered shales overlying solid shales of the Upper Llandovery Series of the Silurian era. In the topographically lowest part of the area there is however a deposit of peat which in turn overlies clays and shale. A diagramatic section through the site is shown on Figure 4.

2.1.2 Peat

The Peat deposit is a post glacial formation of organic material. There are a number of classification methods for peat and mire types, although a mire is a continuously developing formation which can be at one of many stages. It is thought that the development of a mire occupies five main stages.

a) In a basin of standing or slowly flowing surface water organic material collects to form either a slow growing heavy peat over which water flows or a light peat which forms a vegetation mat on the water.

b) The accrual of peat tends to canalise the main flow of water.

c) Continued peat growth diverts the inflow from the basin, so that the water supply to the mire is restricted to precipitation.

d) Further accrual of peat leaves large areas of mire surface unaffected directly by flowing water, but subject to inundation when the water level within the peat rises during period of rainfall.

e) The continued peat growth causes the mire surface to rise above the effect of vertical oscillations of the flowing water. This dome is known as a cupola and possesses its own water table directly

fed by precipitation.

The research carried out at this site during the reconnaissance survey revealed an early map of the area (1607) which showed a small lake in the position of the current peat area known as Llynbarre, although the depth of the lake was unknown. Boreholes drilled in the centre of the deposit showed the peat to be around 7.5 m thick underlain by soft silty clays which represent lake sediments. Trialpits on the edge of the deposit indicated a peat thickness of between 0.6 m to 4.0 m. These results indicate an infilled depression with the thickest peat in its centre.

The peat at Bryn Posteg was typically dark brown and very soft with some large remains of birch timber. The peat exposed in trial pits along the northern end of the deposit was firmer and more cohesive.

We formed the view that the peat deposit was formed in a depression, the overall topography of which caused surface water to be trapped into a relatively stagnant lake in which the development of a mire has commenced. The mire is still in the process of development and is considered to be at a stage between b and c of the five stages listed.

2.1.3 Lake Sediments

The site investigation proved grey silty clay at least 2.5 metres deep becoming firmer with depth below the peat. This clay is considered to be lacustrine in nature and will have formed as a basal deposit in the original lake.

2.1.4 Weathered Shales and Clay

In all boreholes over the site a thickness of firm grey clay with pebbles and fragments of shale was found to vary between 1.2 and 13.5 m in thickness. The nature of the clay was variable from very firm dry weathered shale, weathered shales containing thin bands of broken shales with some clay binding, and green grey silty horizons containing rounded shale pebbles. It is considered that this clay is the product of two mechanisms, firstly the weathering of solid shales by continual freeze thaw action until the practical size of the rock is clay sized, but with larger fragments of the parent rock which were more resistant to this weathering attack; secondly, the removal and placement of weathered shales and broken shales by the action of glaciers and/or water. This secondary type of deposit will undergo a further alteration by the breakdown of the larger rock fragments by subsequent weathering and chemical alteration.

2.1.5 Unweathered rocks

The details on the geology in the immediate area were found to be scarce, with little work being done since publication of the old series one inch maps. These show no detail, but indicate that the rocks are of the Lower Silurian era. The rocks belong to the Upper Llandovery Series, which are generally blue, black and grey, very fine grained graptolitic shales and mudstones. The shale proved in the site investigation boreholes was typically very hard and no significant water entries were encountered. These rocks are normally highly cleaved and fissured, especially for the first few metres, and could therefore provide a conduit for groundwater flow. Our view was that whilst no

water bearing fissures were encountered during the drilling it is reasonable to expect their presence beneath the site, and in working up the landfill design we considered it prudent to leave in-situ a layer of clay above the shales to prevent either leachate migration or the entry of groundwater from this formation.

2.1.6 Mining

There were obvious manifestations of mining at Bryn Posteg, with dereliction in the form of spoil heaps and the remains of three shafts and buildings. At the reconnaissance and site investigation stages old mine records and plans were obtained and scrutinised, so that the investigation could consider to what extent the mining might place a constraint on the landfill development.

2.1.7 Surface Water Hydrology

An attractive feature of the site, identified at an early stage, is that its surface water catchment is only some 28 hectares, and lies principally to the north on sloping land whose average gradient is 1 in 13. Rain falling on this area flows across the surface and through the sub soil into the peat area. There are also field drains installed in part of this catchment which discharged into the site area. An artificial drain, probably constructed during the active mining period, drained the peat area towards the east, but minimum gradient was 1 in 800, it was heavily vegetated and drainage of the mire was not effective.

Consideration of the geology and topography of the catchment would lead to the view that runoff from the catchment should be 'flashy'; however, because of the nature of the peat and its inefficient drainage, the mire tended to attenuate flows leaving the site within the drain. During the summer months, the drain ceased to flow, commencing again in November, when a small flow was evident in response to a period of heavy rainfall and an increase in mire water levels.

As no flow records existed for this drain, the catchment was modelled to determine the approximate expected low flow discharges. The modelling was based on the Institute of Hydrology low flow study (1978) and by this method the average daily flow is calculated from average meteorological data for the area. This flow is then broken down by statistical and empirical methods based on known data from other similar catchments. The result of the model is to produce a flow duration curve which gives the chance of a particular flow being exceeded for a given period. This model predicted that there is a 95% chance of the flow in the drain exceeding 2 m^3/hour on any one day of the year. This is clearly not the case as no flows were observed during the summer months. This deviation from the model is caused because average annual volumes for rainfall and evaporation are used by the model and these will not actually apply throughout the year since most of the annual evaporation takes place during the summer. However, a more significant factor in this case is the storage effect of the poorly drained mire. The combination of these effects is that the model's prediction of summer flows out of the catchment will be too high and winter flows too low.

Another approach was also taken which considered meteorological data which showed that during summer the actual average evapotranspiration is only just less than the actual rainfall, and therefore in the absence of any significant base flow contribution from an aquifer, the nett average effect is that theoretically there would be little or no flow from the catchment and the maximum average summer flow is calculated to be 18.5 m^3/day. However, during the winter months when there is minimal evapotranspiration a large percentage of the rainfall will cause runoff. The average flow from the catchment under these conditions has been calculated at around 110 m^3/day. Consideration of the geological, meteorological and hydrological data led us to the view that during the summer the existing mire accepts the low flow of 18.5 m^3/day from the catchment, holding the water in storage due to the poor drainage. This water is then available for evaporation.

It was calculated there is a potential evaporation of up to 75 m^3/day from the mire area during the summer period, and this excess potential evaporation explains the lowering of water levels within the mire below the drain invert and the consequential cessation of stream flow during the summer. In the Autumn and Winter however, rainfall greatly exceeds evaporation and runoff to the mire increases with a consequential increase in mire water levels which increase until they overflow down the drain.

Approximately 50 m downstream of the site boundary the drain has a confluence with a larger stream draining a catchment to the south of the site area. This catchment is steeper and has a measured area of around 64 hectares. There is a similar peat area in the lowest section of the catchment which is drained by the stream mentioned and there is a perennial flow in this stream which was observed at all times. It has been calculated that during the summer months the maximum expected average flow just upstream of the confluence with the site drain will be around 85 m^3/day and 2500 m^3/day during the winter. This order of flow agrees with our observation estimates.

Evaluation of the surface water hydrology gave firm indications that an important part of the landfill design, at Bryn Posteg, would be an efficient designed surface runoff diversion ditch around the perimeter of the consented area discharging into the stream. Summer storage of this water would not then take place over the mire area, thereby reducing evaporation losses so that the net flow in the stream leaving the site during the summer period might be expected to be slightly increased from the existing flow.

2.1.8 Groundwater Hydrology

Aquifers which can be defined as bodies of rock or sediment that are capable of storing, transmitting and yielding water are important natural resources and have to be protected from potential sources of pollution. The investigations at Bryn Posteg have demonstrated that no such body of rock or sediment is present. The weathered shales and clays can in general be described as aquicludes, that is they are essentially impervious but contain water which cannot be

transmitted in significant quantities. However, they do contain thin bands of broken shale which will have minor fissure permeability and can therefore transmit groundwater in a localised fashion, which could provide leakage paths for leachate. The peat is an aquitard which will transmit water very slowly.

The groundwater hydrology of the site area has been studied and evaluated by surface evaluation, by observations made by hydrogeologists during the drilling of the boreholes and from information gained by the monitoring of piezometers installed in the boreholes.

Dealing firstly with the deeper boreholes which were sunk to observe the underlying shales, it was observed that there were no seepages of groundwater into any of the boreholes whilst drilling through the solid shales. In fact, water had to be added to the boreholes to remove the drilling cuttings. Following the installation of piezometers water levels rose only very slowly, indicating that the shales have a very low permeability and that no significant fissure flow was intercepted.

During drilling, the weathered shales and clays above the solid shales were found to be generally dry in all boreholes except when seepages were encountered in the bands of gravelly broken shales. Again, in all cases water had to be added as a drilling fluid so that drilling cuttings could be recovered.

It was observed that the bands of broken shale occurred predominantly at the lowest part of the site. Piezometers installed in the weathered shales elsewhere either remained dry for several days, or showed a very slow rise in water levels, indicating very low permeabilities. Observations of groundwater levels extended over a significantly long period from Autumn through to the winter period.

As a laboratory back-up on permeability data, undisturbed samples were taken for permeability determination and these gave results ranging between 1×10^{-3} and 3×10^{-7} cm/sec. for a loosely clay bound broken shale and a firm clay with shale fragments respectively.

Peat has a complex hydrogeology being highly compressible. It is known to compact if water content is reduced. Methods of evaluating the permeability of a deposit generally rely on Darcy's Law, which implies that the flow of water through a saturated medium is proportional to the hydraulic potential gradient, the constant of proportionality being the coefficient of permeability. In the case of peat, the coefficient of permeability is found to vary disproportionately to the hydraulic gradient. Experience in similar deposits elsewhere has shown the permeability to vary between 10^{-5} and 10^{-7} cm/sec. Another hydrogeologically significant feature of peat is that it has a very low storage coefficient which when coupled with the low permeability results in a rapid rise in groundwater levels in response to precipitation. This quickly reaches a point where further infiltration is not possible and water will run-off or pond on the surface depending on the topography. All of these features were observed at Bryn Posteg and were considered to be relevant to the

drainage works identified as being necessary on the peat prior to and during the landfilling operation.

2.1.9 Water Quality

An important part of any hydrogeological appraisal is to carry out an analysis of existing surface and groundwaters. Water samples were taken from all boreholes and significant surrounding surface waters and springs. The purpose of this was twofold; firstly to provide a datum point of background water quality for comparison with future samples during the landfill operation, and secondly as part of the overall investigation, since the quality of a water will yield some information on the medium through which it has travelled. Selected water quality analyses are included in Appendix A, which also shows the location of the sampling points in and around the site. All of the analyses of groundwater from the boreholes show that the waters are typical of groundwater from shales. The waters are typically sodium bicarbonate in character but vary significantly in the degree of mineralisation, possibly reflecting variations in the residence time of infiltrating rainfall in the shales.

Sulphate is present in all samples in significant quantities. This sulphate together with small quantities of iron, manganese, zinc, copper, and nickel may be derived from oxidation of small quantities of disseminated pyrite in the shales. The alternative, oxidation of sulphide bearing mineral veins, is unlikely because the sulphate values are not particularly high and the only low pH values reflect a low residence time of the rainfall in the shales rather than acid mine drainage.

Albuminoid nitrogen and ammoniacal nitrogen are present in all samples at significant concentrations but generally below 1 mg/l, indicating that nitrogenous organic matter is present, probably derived from infiltration through the fairly acid soils of this area.

Some significant values of COD and BOD were found in groundwaters, all associated with higher phosphate concentrations and reflect movement of animal excreta through the soil profile into the shallow groundwater system.

All of the surface waters reflect the high antecedent rainfall and the streams in particular have characteristics of relatively unaltered rainfall. The low natural pH of the stream leaving the site reflects both rainfall and the peat in the catchment.

The waters have typically moderate concentrations of Albuminoid Nitrogen and ammoniacal nitrogen but less than 1 mg/l and very low phosphate. There was therefore no indication of contamination except by natural organic materials from vegetation.

Various springs and a mining adit were sampled as part of the survey. These waters are slightly more mineralised than the surface waters reflecting passage through soil and rock profiles. In particular manganese iron and nickel are higher and phosphate is detectable. However, sulphate and alkalinity are both low and the waters are considerably less mineralised than the groundwaters analysed from the boreholes. They are also of a calcium carbonate rather than sodium carbonate type and therefore reflect a lower residence time in the shales than the groundwaters. Since the waters taken from

the boreholes are relatively highly mineralised and indicate long residence times, they are quite different from the waters occuring in the springs and streams which are more typical of a more rapid groundwater flow path. This evidence added to our conclusions, arrived at by other technical arguments that the shallow groundwaters under the site are not able to drain away from the site through the shales but form a relatively immobile situation isolated by the various clay horizons already described.

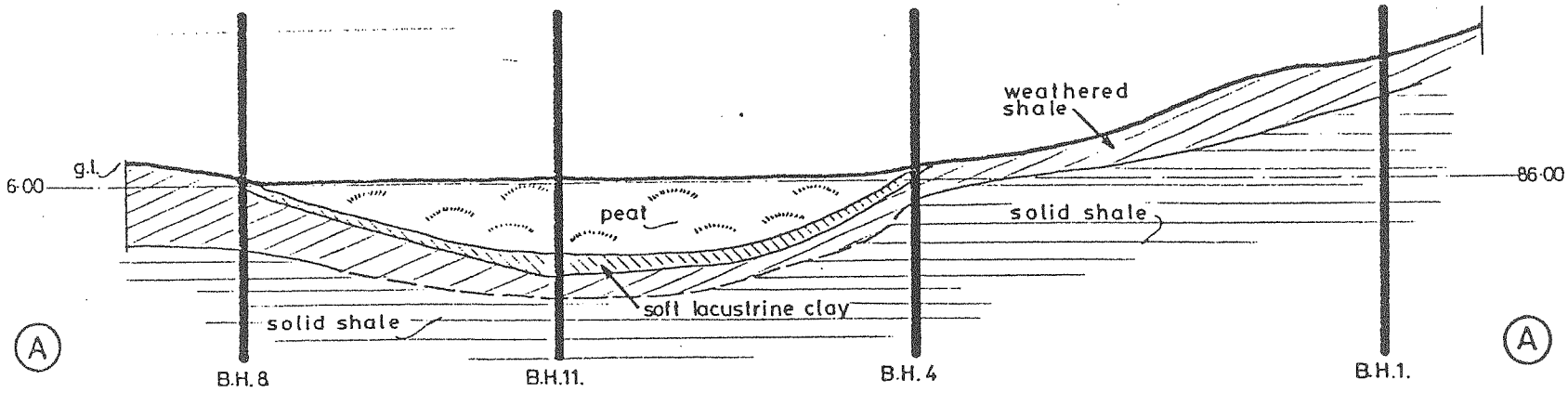
It was found that the quantities of lead are below the limits of detection in waters emerging from Bryn Posteg Spring and Bradnant Adit, and this together with the low sulphate concentrations indicate that these waters are not at all typical of mine drainage, but represent natural spring water.

2.1.10 Hydrogeological conclusions

1) Groundwater makes a contribution at relatively shallow levels (<5 m) to the prospective landfill area and must be diverted to avoid continuous formation of leachate.
2) Surface water contribution to leachate would be considerable and designed surface water cut-off system would be required.
3) No evidence for a direct hydraulic connection between shallow groundwaters and the lead mine workings or the reported drainage from the adits to the mine. However, all mine shafts and associated works would need to be rendered secure, both physically and hydraulically.
4) Water quality analyses establish a low but detectable level of 'natural' pollution in surface and groundwaters.

5) The natural clays present at the site were found to be suitable for use in a modern engineered landfill, developed in a phased manner, and covered by a low permeability cap to reduce infiltration and therefore leachate generation.

6) The natural peat could, after some drainage, be usefully incorporated in the final agricultural restoration of the site, thereby upgrading land standards, enhancing evapotranspiration and again reducing infiltration.



(REDUCTION – N.T.S.)

notes

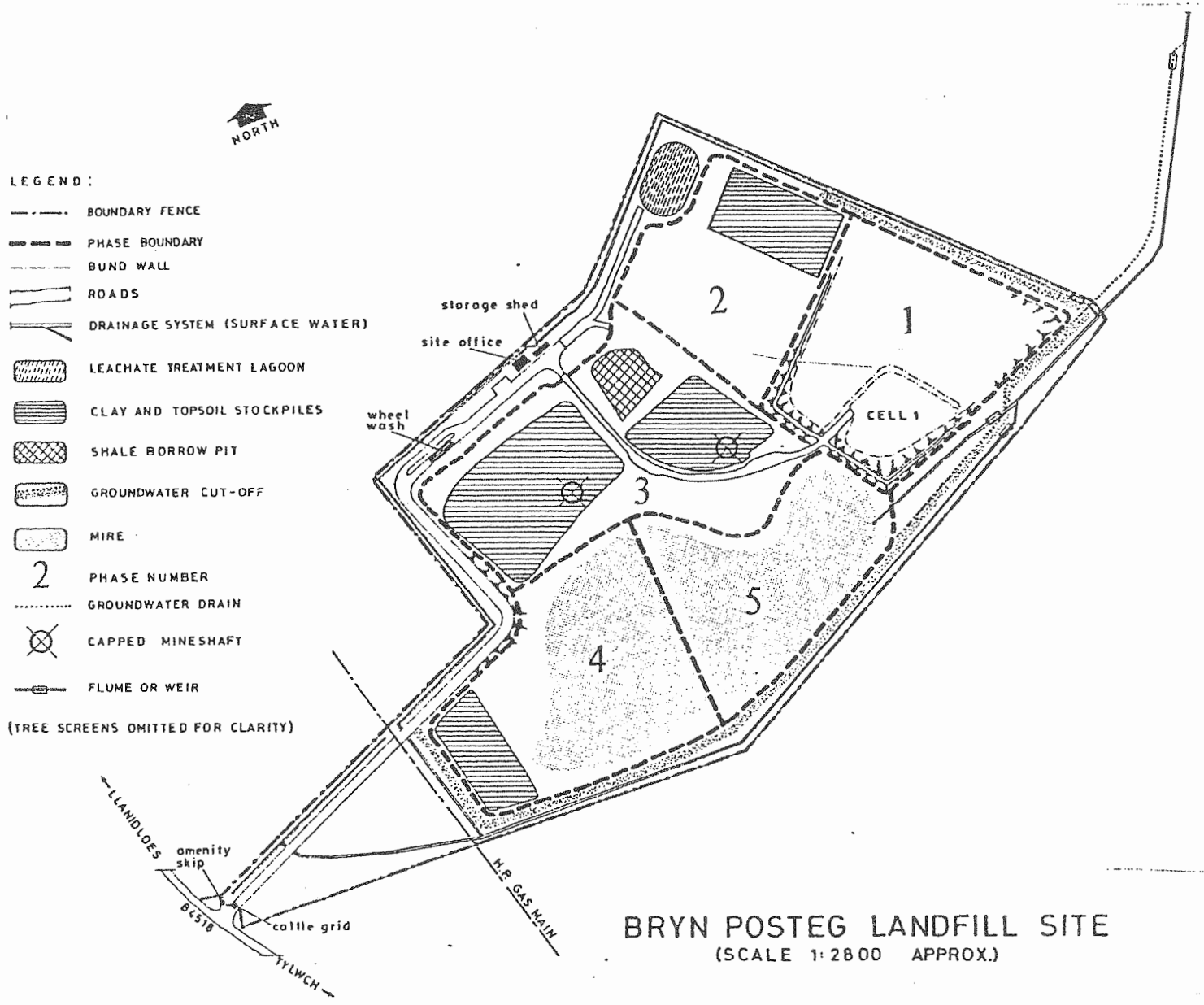
client
MONTGOMERY DISTRICT COUNCIL

job
BRYN POSTEG.

drawing
SKETCH GEOLOGICAL SECTION A·A.

number	scale
FIG. 1.	HORIZ. 1:1000 VERT. 1·500
drawn P·S·W.	checked K.B.
date JANUARY 1980	

Aspinwall
Hydrogeologists · Hydrologists · Water Engineers
PENGWERN COURT · HIGH
SHREWSBURY · SALOP ·



BRYN POSTEG LANDFILL SITE

(SCALE 1:2800 APPROX.)

(REDUCTION — N.T.S.)

APPENDIX A

Water Quality Analyses

	BH1	BH2	BH3	BH4	BH4A	BH5	BH5A	BH6	BH6A	BH7
pH	6.1	9.5	7.8	8.1	7.6	7.2	7.1	7.4	8.3	7.4
Electrical Conductivity (micro mhos)	87	705	510	1100	800	345	130	250	1070	330
Chloride	13	25	13	27	20	12	13	18	25	19
Hardness Total	19	20	60	74	216	42	38	52	68	80
Carbonate	3	20	60	74	216	42	30	52	68	80
Non Carbonate	16	0	0	0	0	0	8	0	0	0
Alkalinity	3	300	190	450	355	107	30	69	470	104
Dissolved Solids	55	520	355	755	570	245	97	200	770	220
Nitrate	2	4	LT 0.1	0.4	LT 0.1	3.2	3.2	5.2	1.1	LT 0.1
Ammoniacal Nitrogen	0.09	0.15	0.17	0.14	0.42	0.01	0.15	0.25	0.22	0.32
Albuminoid Nitrogen	0.19	0.27	0.17	0.33	1.14	0.17	0.35	1.28	0.24	0.08
Ca	4	7	18	20	60	12	12	13	20	24
Mg	3	1	4	6	16	3	2	5	4	5
Na	8	187	106	259	128	69	15	45	267	44
K	2	8	3	7	6	3	2	4	4	4
CO_3	2	180	114	270	213	64	18	41	282	62
SO_4	17	83	82	150	115	58	14	40	138	48
Cl	13	25	13	27	20	12	13	18	25	19
NO_3	9	18	0	2	0	14	14	23	5	0
Si	5	7	10	9	10	8	6	10	7	10
Fe	5.2	21.2	3.11	4.5	10.1	4.1	2.61	25.7	3.59	2.56
Zn	0.28	0.25	0.15	0.14	0.79	2.02	1	0.22	0.08	0.44
Cu	0.12	0.11	0.08	0.06	0.08	0.08	0.04	0.11	0.05	0.05
Pb	LT 0.03	0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	0.07	LT 0.03	LT 0.03
Mn	0.2	0.32	0.66	0.39	2.61	0.08	0.08	1.85	1.18	4
Cd	0.003	0.005	0.006	0.005	0.006	0.006	0.004	LT 0.001	0.006	LT 0.001
B	0.51	0.73	0.22	0.21	0.25	0.10	0.17	0.22	0.21	0.11
Ni	0.06	0.09	LT 0.03	0.04	0.07	0.03	LT 0.03	0.13	0.05	LT 0.03
Cr	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03
PO_4	0.08	0.31	0.31	0.55	0.25	LT 0.05	LT 0.05	0.8	0.61	0.18
BOD	2	2	2.5	7	7	3.5	2	10.2	10	4.5
COD	LT 20	27	16	27	94	27	31	47	43	20
Phenols	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.04	LT 0.05	LT 0.05	LT 0.05	LT 0.05

BH7A	BH8	BH9	BH10	BH10A	Stream leaving the site	Mire standing water	Bryn Posteg stream	Bryn Posteg spring	Bradnant Adit	Site stream by road	
7.4	7.3	6.6	9.6	9	5.8	6.1	7.3	7.0	6.8	6.9	pH
320	145	85	2050	2200	65	62	120	225	160	75	Electrical Conduct (micro mhos)
15	10	12	26	33	11	11	22	20	19	10	Chloride
94	18	22	26	46	18	18	28	96	60	16	Hardness Total
94	18	13	26	46	6	8	11	70	20	10	Carbonate
0	0	9	0	0	12	10	17	26	40	6	Non Carbonate
137	44	13	1050	1135	6	8	11	70	20	10	Alkalinity
230	106	58	1450	1670	36	42	80	156	105	40	Dissolved Solids
LT 0.1	LT 0.1	0.8	1.7	LT 0.1	20.1	LT 0.1	1.6	2.4	7.1	0.4	Nitrate
0.30	0.23	0.29	0.28	0.60	0.21	0.25	0.12	0.18	0.20	0.16	Ammoniacal Nitroger
0.14	0.12	0.34	1.06	1.16	0.20	0.26	0.33	0.17	0.05	0.15	Albuminoid Nitroger
27	5	6	7	14	5	5	8	29	17	4	Ca
6	1	2	2	3	1	1	2	6	4	2	Mg
46	29	8	578	583	5	5	14	13	10	6	Na
2	2	1	5	6	1	1	1	3	1	1	K
82	26	8	630	705	4	5	7	42	12	6	CO_3
38	27	12	188	275	7	5	12	20	10	6	SO_4
15	8	12	26	33	11	11	22	20	19	10	Cl
0	0	4	8	0	0	0	7	12	32	0	NO_3
13	6	8	6	9	3	9	5	12	8	4	Si
7.5	2.45	10.2	7.3	40	0.63	2.09	10.8	8.8	1.17	7.6	Fe
0.07	0.10	0.20	0.17	0.30	0.17	0.17	0.11	0.07	LT 0.03	0.21	Zn
0.25	0.03	0.20	0.11	0.30	0.12	0.36	0.07	0.24	0.30	0.08	Cu
LT 0.03	LT 0.03	0.03	0.03	0.07	LT 0.03	0.09	0.03	LT 0.03	LT 0.03	LT 0.03	Pb
2.70	0.21	0.42	0.40	0.91	0.04	0.09	0.40	1.08	0.08	0.20	Mn
0.008	0.007	0.009	0.005	0.007	0.002	0.001	0.001	0.003	0.003	0.006	Cd
0.25	0.15	0.22	0.22	0.32	0.07	0.05	0.06	0.07	0.06	0.08	B
0.06	LT 0.03	0.13	0.14	0.16	0.06	0.11	0.13	0.10	0.10	0.15	Ni
LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	LT 0.03	0.04	LT 0.03	LT 0.03	0.04	Cr
LT 0.05	32	0.8	0.8	1.6	LT 0.05	LT 0.05	0.37	LT 0.05	1.1	LT 0.05	PO_4
5	3	4	6	14	1.7	3.5	2	LT 1	3	2	BOD
24	LT 20	39	67	145	LT 20	43	28	LT 20	LT 20	LT 20	COD
LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	Phenols

CHEMICAL ANALYSES OF SAMPLES

TAKEN ON 21.2.1980

3. LANDFILL DESIGN

Having completed the full site investigation which indicated to Montgomery District Council a draft operational framework and landfill design, a brief was obtained to design the landfill in full. The detailed design for the development allowed for basic preparation works, under a Preliminary Site Works Contract, followed by periodic development of the site in five Phases over the 25 year site life. Figure 5 is a diagramatic presentation of the full scope of the development. The Preliminary Site Works and Phase One Preparatory Works were carried out as conventional Civil Engineering Contracts, and comprised the following sections whose costs are summarised in Appendix 3.

3.1 Preliminary Site Works

3.1.1 Site Works

This section comprised bulk earthmoving, gas main protection and mineshaft sealing. Although there was no apparent connection between the mine drainage and local streams it was considered prudent to seal the two mineshafts with reinforced concrete slabs, using the NCB specification for coal mines as a guideline. The original (No 1) shaft was, as anticipated, found to be 3 m diameter with rockhead at 5 m depth. The upper metre of shaft was excavated and refilled with a mass concrete plug, above which were placed blinding concrete and the capping slab, 6.45 m square and 0.45 m thick, containing 3.13 T of reinforcement. Before backfilling, a layer of clay 0.3 m thick was placed over the slab as a final leachate/gas barrier. The position of the mineshaft was marked with a concrete post, as tipping is

restricted to inert materials for 5 m around the shaft. The most recent shaft (Old Engine Shaft) was found to be 5 to 6 m diameter, but tapering. Excavations were carried out to obtain a shaft diameter of 4.5 m, but as the NCB specification slab would have been six times the volume of the No 1 shaft slab, a new design was carried out to CP110 using the specific site loading conditions for a slab of 10 m length x average 4.5 m width x 0.7 m thickness, with 3.5 T of reinforcement. The other details were as for No 1 shaft.

A 150 mm diameter high pressure gas main crosses the site near to its western boundary, and forms the limit of the landfill on that edge. As the site entrance road crosses the main it was necessary to provide a slab to Wales Gas specifications to bridge the main. The slab was 11 m x 2.5 m wide x average 0.3 m thick, with mesh reinforcement.

The site originally contained a large quantity of mine spoil which, being rich in metals, was required by the Water Authority to be removed or isolated from the refuse. As the route of the access road passed through an area which would ultimately be raised it was decided to incorporate the mine spoil, which was generally broken shales, into an embankment to raise the road level to that of the final restored surface. As the final contours indicated a limited amount of infill external to the site it was decided to do this work in conjunction with the road fill. The total volumes for the earthmoving were 1950 m^3 of cut and 10300 m^3 of fill, including a quantity of shale obtained from an on-site borrow pit.

3.1.2 Surface Water Diversion and Drainage

As revealed by the site investigation the generation of leachate needed to be kept to a minimum, and one of the measures deployed was to construct a peripheral channel to intercept all surface water run-off and flows from the numerous field drains discharging onto the site. The channel was designed to carry a 1 in 5 year storm run-off at a velocity of 0.5 m/s; the design depth was 0.35 m, but this was increased to a minimum of 1 m to ensure the channel's continued operation. In addition, a deep channel was excavated into the mire to encourage drainage of the peat, and road drainage channels were provided as necessary.

The total length of the channels was 1850 m, and the volume of material excavated was 7270 m^3.

This section also included 115 m of french drain to intercept road run-off, 167 m of 225 and 300 mm overflow pipes from the lagoon and wheelwash, 61 m of 100 and 150 mm foul drain, 22 m of 500 mm road crossings, associated manholes and headwalls, a septic tank and soakaways. Flumes were provided to measure the flow in each arm of the interception system, and these together with recorded rainfall and metered pumped leachate discharges will be used to calculate the water balance from the site as part of a continuing research programme. A water main, 345 m of 50 mm dia UPVC pipe, was laid to connect with the proposed area service reservoir adjacent to the site.

3.1.3 Groundwater Diversion and Drainage

A further leachate reducing measure was the installation of a cut-off and drainage system to the shallow groundwater seepage system. This was installed initially around the lower half of the site (775 m) with a provision to increase the installed length if necessary around the remainder of the site. The system used was "Trammel", one of several systems available which incorporates a layer of woven permeable fabric allowing controlled infiltration to a central coarse bonded drainage layer, further infiltration being prevented by a subsequent layer of impermeable polyethylene. The system was installed against the side of the trench such that the intercepted groundwater passes down the central layer to a slotted 150 mm pipe laid up to 6.5 m below ground level. The pipe discharges 200 metres downstream of the site via a weir box into an adjacent stream. The flow to date has been approximately 40 m^3/day, or 16000 m^3/year. At an approximate and conservate cost of leachate disposal of £1/m^3 the system will have paid for itself within 3 years, assuming that the seepages would have otherwise entered the landfill.

3.1.4 Roadworks, Access and Cattlegrid

The earthworks for the road system have been described earlier. The site entrance road could not use the existing track because of leasing difficulties and because of inadequate visibility at the junction with the highway. The entrance road was constructed as a 5.5 m wide pavement of dense bitumen macadam from the highway to the site office (510 m), and as a 4 m wide hardcore road to the active cell

and to the lagoon. It was decided that a 4 m wide tarmacadam road with passing places would not offer significant savings, as the bulk of the earthworks, being on the corners, would in any event require to be 5.5 m wide to permit refuse vehicles and low-loaders to negotiate the tight radii. The 25 year site life, and the extremes of weather conditions experienced at Bryn Posteg, do not allow consideration of anything other than a waterproof surfacing. In accordance with the Planning requirements, a car park, turning bay, wheelwash and amenity skip area were provided in the road network, together with a cattle grid designed to Ministry of Agriculture guidelines. The gateposts between the grid and the grid bypass are removeable to permit the entry of low-loaders carrying plant.

3.1.5 Wheelwash

Planning requirements specified the provision of a wheel cleaning area. It was felt that a system which did not rely on external power sources would be desirable, and after consideration of the available alternatives it was decided to construct a "dip" type wheelwash, comprising a submerged grid 5 m long with 5 m long entry and exit ramps, the submerged length being approximately 7.5 m, with a depth of immersion between 250 and 300 mm, controlled by a weir chamber. De-sludging is by a disc flushing valve set 1 m below the grid level. The cost of the wheelwash was approximately half the capital cost of the pressure jet alternative.

3.1.6 Leachate Treatment Lagoon

Calculations of leachate generation indicated that the maximum flow rate would be 100 m^3/day. In order to reduce the trade effluent charges payable for discharge at the STW it was decided to construct a pretreatment plant, comprising an aerated lagoon and post aeration settlement. A mimimum retention time of 10 days was adopted, giving a capacity of 1000 m^3. In order to treat a leachate with a COD of 10 000 mg/l and a BOD of 7 000 mg/l by removing half of the BOD, an oxygen uptake of 350 kg/day would be required. Based on a transfer efficiency of 1.4 kg/hr/KW and an oxygen coefficient of 1.5 this required an aeration capacity of 375 KWh/day, or 17 hours per day for two 11 KW aerators. The remaining 7 hours of each day would be used for settlement and pumping of the treated leachate to the Llanidloes sewerage system at the maximum acceptable rate of 5 l/s. Two floating aerators were chosen to ensure adequate mixing, and for simplicity of operation.

Draw-off of the top 150 mm of settled effluent will be via a fixed bellmouth to a standard manhole equipped with a submersible pump. The control equipment provides manual start/stop with auto star/delta starting of aerators, low level and safety cut-outs, and interlocks to prevent simultaneous aerator and pump operation. It is possible that automatic time controlled starting may be introduced in future to permit shorter treatment cycles.

The lagoon itself is constructed in the natural clay and shale materials and is 3 metres deep with 1 m freeboard, with side slopes of 1:2½ internally and 1:2 externally. A liner of 1.5 mm HDPE is installed to

prevent erosion damage and as a safeguard against leachate seepage. De-sludging is provided for using a hydrostatic discharge. It is calculated that pretreatment may achieve a net saving in overall leachate disposal costs of £0.5/m^3, or £18250/year at maximum generation rate. Lower generation rates should of course achieve a higher standard of treatment.

3.1.7 Fencing, Tree Planting and Seeding

The site is bounded by a 1685 m long security fence of 50 mm galvanised chain link with 3 strands barbed wire on 2 metre high cranked posts, with 2 x 3 m wide pairs of gates.

The outline landscape design which we produced using an expert landscape architectural input, and which was accepted by the Planning Department, included a comprehensive tree screen around the site. Part of this is to be planted on the restored surface of Phase One of the landfill, but the initial development included the planting of some 440 Beech, Pine, Spruce, Rowan, Alder and Sycamore in rows and groups around the site. In addition to this, the lagoon flanks and selected areas of road verge were topsoiled, and these areas and the surface water channels were then seeded.

3.1.8 Miscellaneous Items

Entrance, road and warning signs in Welsh and English were erected at appropriate locations. A concrete slab was placed for the permanent site cabin, and a slab and plinths were constructed for the fuel storage tanks.

3.2 Phase One Preparatory Works

3.2.1 Earthworks

The development of Phase One entailed the stripping of topsoil from Phase One and from the designated clay stockpile areas, totalling 12900 m^3, and the excavation to 5 m depth of the maximum available volume of clay from the Phase consistent with the retention of a minimum depth of 1 m of clay below the site. Certain areas were deficient in clay, and were therefore raised in compacted layers to the required thickness. In addition, 2 metre bunds were raised to contain refuse and leachate, and to minimise the catchment area of the active cell. The total volume of clay excavated was 31 500 m^3, 24 400 m^3 being stockpiled for future sealing and capping and the remainder being used in bunds and deficient areas.

3.2.2 Leachate and Surface Water Drainage

This section comprised the excavation of a shallow ditch upstream of the Phase boundary, and adjacent to the Phase access road, and the construction of 4 leachate control manholes and connecting pipes, to allow the abstraction of leachate and future control of leachate flows between Phases. A 375 m long 80 mm diameter uPVC rising main was laid to the treatment lagoon.

3.2.3 Phase One Access Road

The site entrance road was extended to Cell One of Phase One by a 195 m long 4 m wide access road with two passing bays. The road construction was 250 mm of Type 1 sub-base on a minimum thickness of 400 mm of shales obtained on site, placed on a layer of separation membrane over natural sub-soil.

3.3 Programme

The construction period lasted approximately 12 months, commencing on 13 July 1981. The site opened on schedule on 28 June 1982, though minor works have continued sporadically since that time. The Main Contractor for both Contracts was Alun Griffiths (Contractors) Ltd, and the Nominated Sub Contractors for the Preliminary Site Works Contract were Whitehead and Poole Ltd (Aerators, Pumps and Controls), Butyl Products Ltd (Lagoon Liner) and Severn Vale Seeding Company (Fencing and Planting).

3.4 Environmental Monitoring

The site is now operational and an environmental monitoring programme has been approved by Montgomery District Council so that both the performance of the landfill and its impact on the external environment can be monitored. Both the Welsh Office and the Department of the Environment are supporting further Research and Development activities being carried out by Montgomery District Council and their Consultants.

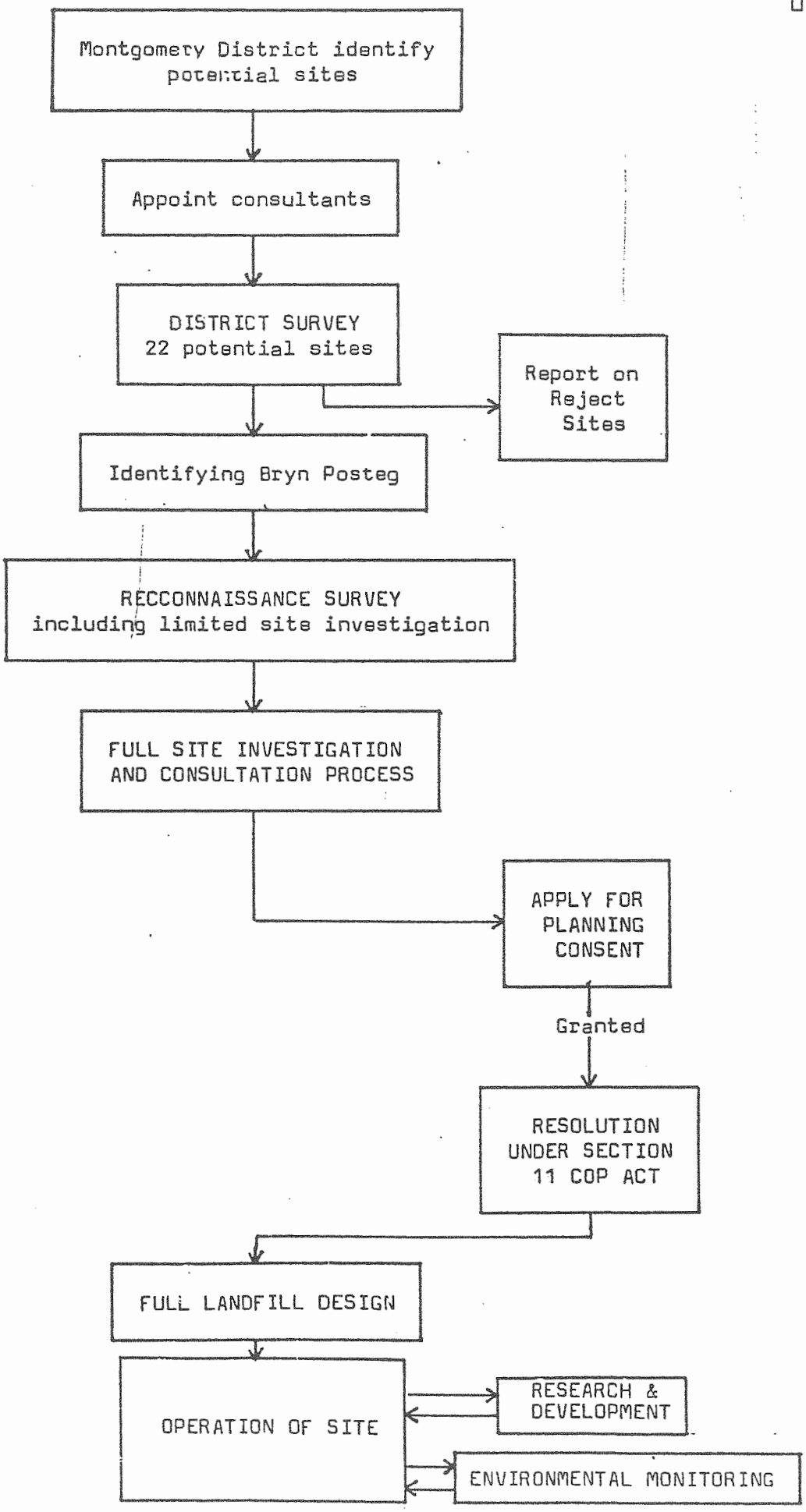
TABLE 1

Summary of Costs

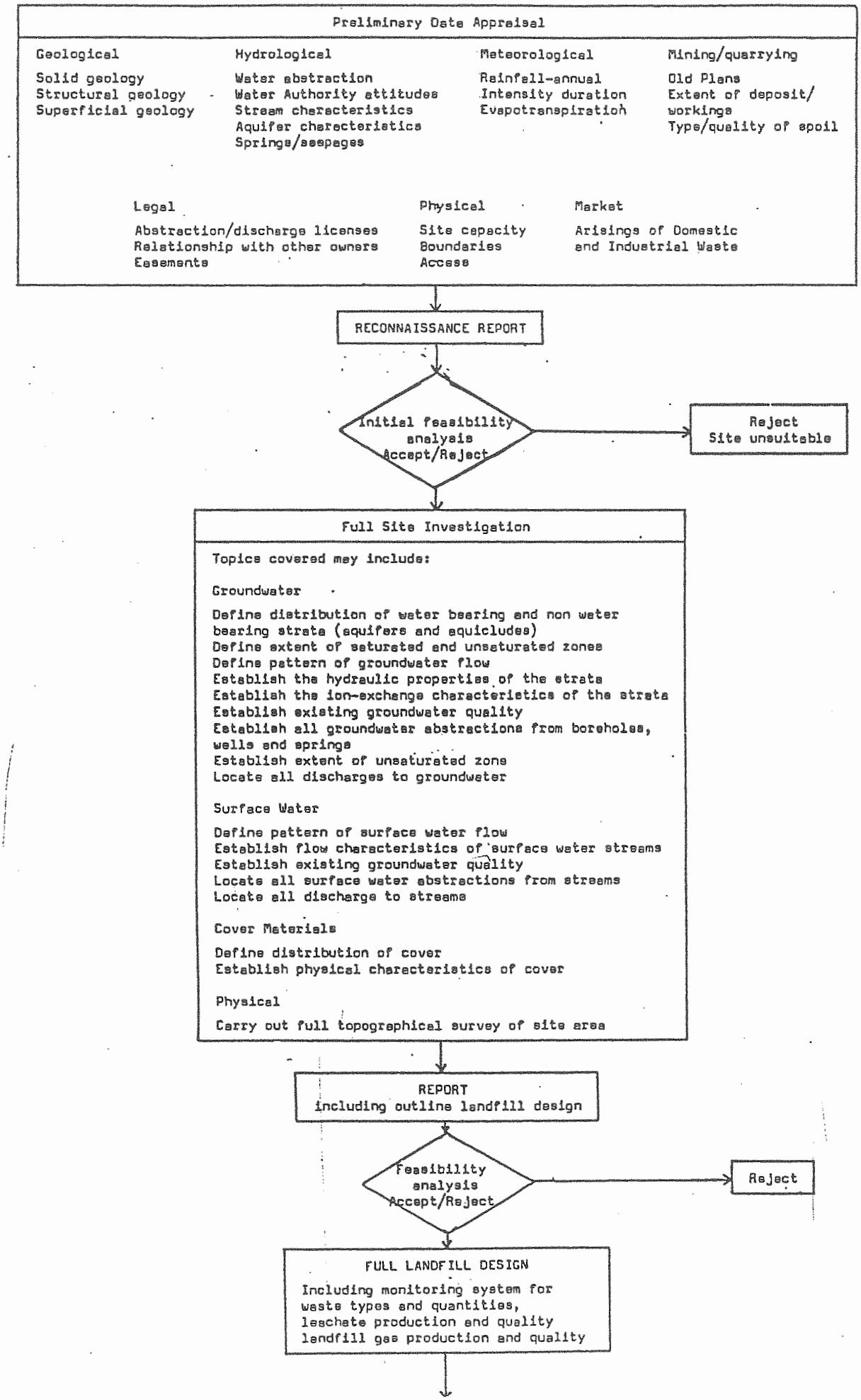
Category	(Preliminary Site Works)	Contract Price (£)
1	Preliminary Items	13350.00
2	Mineshaft capping	7812.71
3	Roads, earthworks, infill, access, cattlegrid	61507.83
4	Surface water diversion and drainage	27003.73
5	Groundwater diversion and drainage	42856.12
6	Wheelwash	5382.65
7	Lagoon and Pipework (Civil work + lining)	21170.09
8	Aerators, pumps and controls	24840.39
9	Electricity supply	7794.00
10	Fencing	11851.77
11	Tree planting, seeding and topsoiling	4530.45
12	Site signs	843.58
13	Miscellaneous items, (trialholes, gas main protection)	835.67
14	Additional items, (diesel tank plinths, etc)	1610.62
	TOTAL PSW	231389.41
	(PHASE ONE)	
15	Preliminary items	8500.00
16	Earthworks	38469.80
17	Leachate and surface water drainage	11923.70
18	Access road	5669.83
	TOTAL PHASE ONE	64563.33

FIGURES

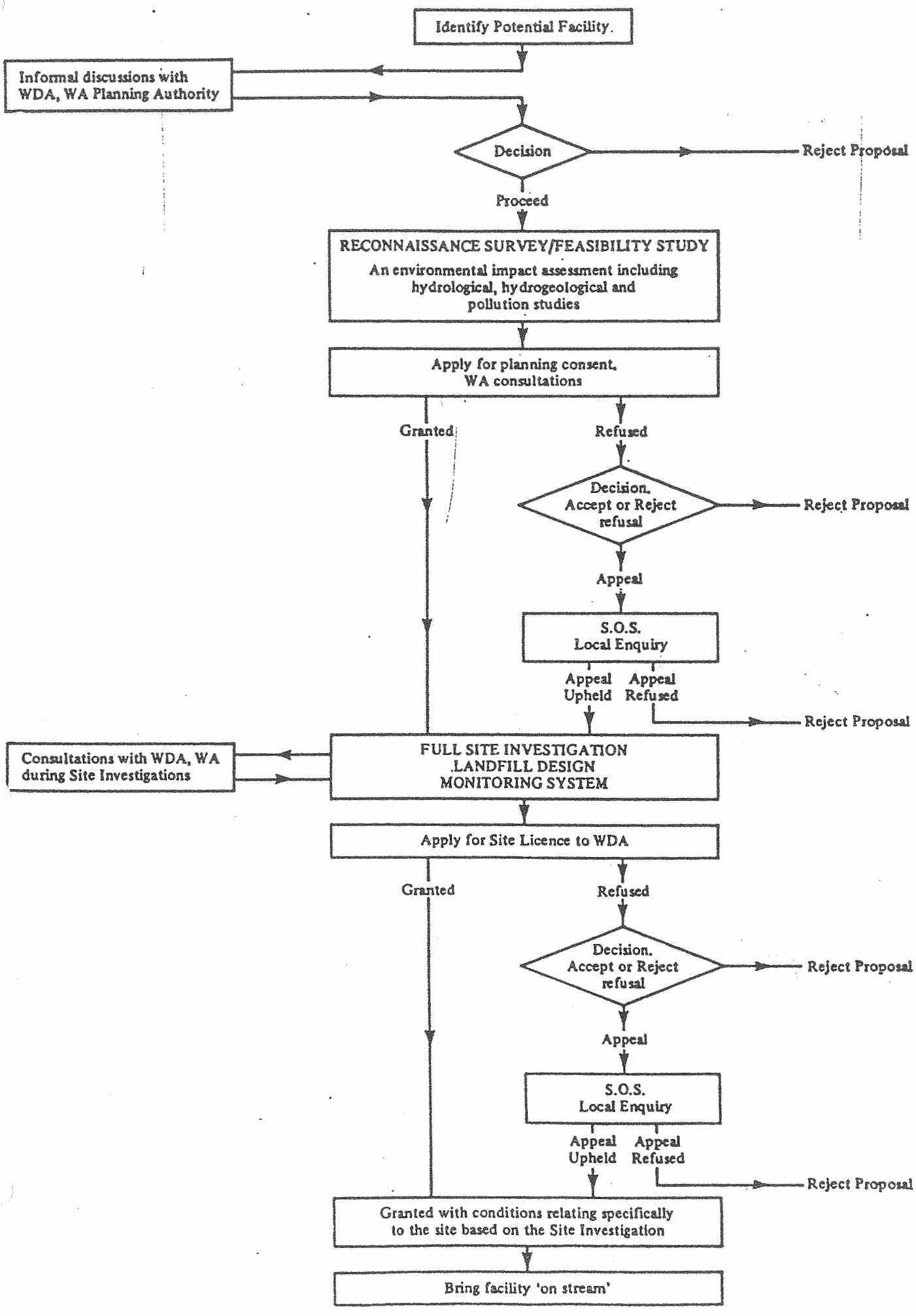
BRYN POSTEG FLOW CHART OF LANDFILL DEVELOPMENT



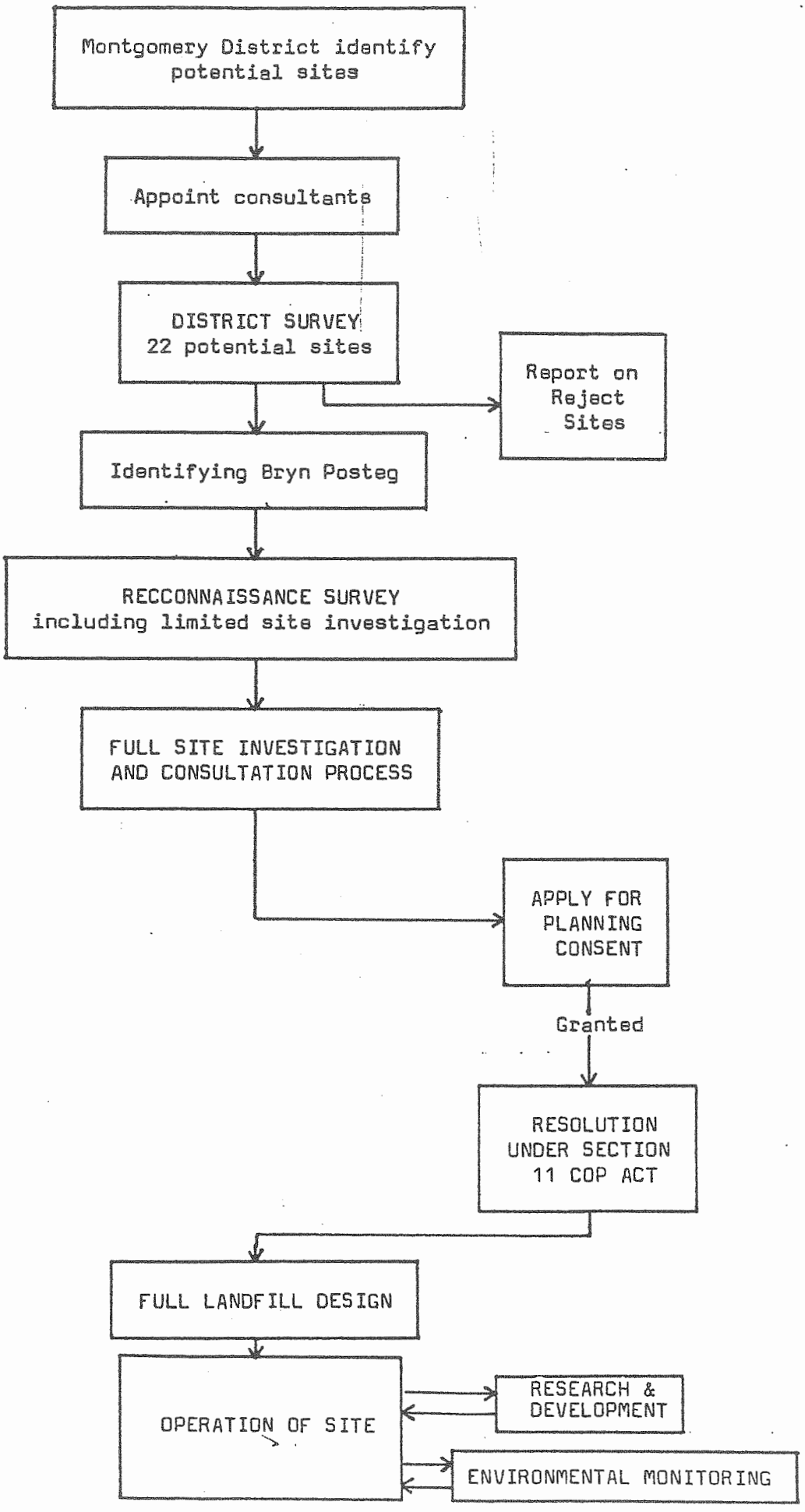
STAGES IN THE INVESTIGATION OF LANDFILL SITES



LICENSING/PLANNING DECISION ROUTE



BRYN POSTEG FLOW CHART OF LANDFILL DEVELOPMENT



APPENDIX 4

STEP 1 is RC > 10% EQS

RC- Effluent concentration ug/l

	Units	RC	EQS	10%EQS	RC>10%EQS
Ammoniacal Nitrogen	ug/l	250	300	30	FAIL
Iron	ug/l	7000	1000	100	FAIL

STEP 2 is PC<4% EQS

where PC = EFR*RC/(EFR+RFR)

EFR - effluent flow rate	0.05 m3/s		max treatment capacity
RFR - rvier flow rate	1.01 m3/s		Q95 River Severn

PC process contribution

	Units	RC	PC	EQS	4%EQS	PC > 4%EQS
Ammoniacal Nitrogen	ug/l	250	11.79245	300	12	PASS
Iron	ug/l	7000	330.1887	1000	40	FAIL

STEP 3 is (PEC -BC) > 10%EQS

where PEC=((EFR*RC)+(RFR*BC))/(EFR+RFR)

BC - background concentration

	Units	RC	BC	PEC	PEC-BC	EQS	10%EQS	PC > 4%EQS
Ammoniacal Nitrogen	ug/l	250	200	202.3585	2.358491	300	30	PASS
Iron	ug/l	7000	5180	5265.849	85.84906	1000	100	PASS

If PEC is calculated by PC +BC 5510.189

STEP 4 is PEC > EQS

	Units	RC	BC	PEC	EQS	PC > 4%EQS
Ammoniacal Nitrogen	ug/l	250	200	202.3585	300	PASS
Iron	ug/l	7000	5180	5265.849	1000	FAIL

NOTE: Natural background concentrations fail the EQS pre landfill development

GROUNDWATER PRE LANDFILL

	pH	NH4-N (mg/l)	Fe (mg/l)	BOD
BH1	6.1	0.09	5.2	2
BH2	9.5	0.15	21.2	2
BH3	7.8	0.17	3.11	2.5
BH4	8.1	0.14	4.5	7
BH4A	7.6	0.42	10.1	7
BH5	7.2	0.01	4.1	3.5
BH5A	7.1	0.15	2.61	2
BH6	7.4	0.25	25.7	10.2
BH6A	8.3	0.22	3.59	10
BH7	7.4	0.32	2.56	4.5
BH7A	7.4	0.3	7.5	5
BH8	7.3	0.23	2.45	3
BH9	6.6	0.29	10.2	4
BH10	9.6	0.28	7.3	6
BH10A	9	0.6	40	14
Average	7.76	0.241333	10.008	5.513333

SURFACE WATER PRE LANDFILL

	pH	NH4-N (mg/l)	Fe (mg/l)	BOD
Mire Standig water	6.1	0.25	2.09	3.5
Bryn Posteg Stream	7.3	0.12	10.8	2
Bryn Posteg Spring	7	0.18	8.8	1
Bradnant Adit	6.8	0.2	1.17	3
Site Stream by road	6.9	0.16	7.6	2
Stream leaving the site	5.8	0.21	0.63	1.7
Average	6.65	0.186667	5.181667	2.2

Summary Parameter Table

	Chemical Na	niacal Nitrog	pH	**BOD**	**Suspended solids**	**Iron**	**Aquatreat**	**Justification**
Units		mg/l	-	mg/l	mg/l	mg/l	-	
Discharge (2016 -2018 site data)	**min**	0.1	6.2	1	1			No data for Iron – back calucaltion to determine acceptable concentration. ,See above for site data
	Average	0.1	6.9	1.6	8.2			
	95%ile	0.1	7.5	4	30			
	max	13.6	7.8	10	38			
	count	34	34	34	34			
Maximum Flow L/S		50l/s						Maximum treatment rate
Average Flow L/S								No average flow data
Fresh Water upstream	Maximum Co	0.3	7.3	3.5		10.8		See above tables for SW
	Average Con	0.2	6.6	2.2		5.18		
	Min Conc	0.1	5.8	1		0.6		
LOD								
EQS	Annual Avera	ND	ND	ND	ND	1		
	MAC	ND	6-9	ND	ND	ND		

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Caulmert
Engineering, Environmental and Planning

APPENDIX 4

Amenity & Accidents Risk Assessment document ref. 4299-CAU-XX-XX-RP-V-0302

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Bryn Posteg Landfill Site

Sundorne Products (Llanidloes) Limited

Environmental Permit Variation Application

Amenity and Accidents Risk Assessment

Prepared by:

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Document Reference: 4299-CAU-XX-XX-RP-V-0302.A0.C0

May 2021

APPROVAL RECORD

Document Title: Amenity and Accidents Risk Assessment

Document Ref: 4299-CAU-XX-XX-RP-V-0302.A0.C0

Client: Sundorne Products (Llanidloes) Limited

Caulmert Project Manager: Andy Stocks

Issued by: Caulmert Limited, 14 Farrington Way, Eastwood Link Business Park, Eastwood, Notts, NG16 3BF

Author	Samantha Bowler Environmental Consultant	**Date**	21/05/2021
Reviewer	Andy Stocks Associate Director	**Date**	21/05/2021
Approved	Andy Stocks Associate Director	**Date**	21/05/2021

DISCLAIMER

BRYN POSTEG LANDFILL SITE - ENVIRONMENTAL PERMIT VARIATION APPLICATION

AMENITY AND ACCIDENTS RISK ASSESSMENT

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1.0 INTRODUCTION

1.1 Background

1.1.1 This report is an Amenity and Accident Risk Assessment of the impact of the surface water treatment process and subsequent treated surface water discharge at point P1 in the eastern portion of Bryn Posteg Landfill Site ('the Site'), as part of a normal environmental permit variation application for the Site.

1.1.2 This assessment will assess the risks posed by the surface water treatment activity and surface water discharge within the eastern portion of the Site and this report has been compiled in accordance with the current Gov.UK guidance on 'Risk assessments for your environmental permit' (updated 10th December 2020).

1.1.3 Sundorne Products (Llanidloes) Limited operates the entire Site, trading as Potters Waste Management (hereafter referred to as 'the Operator') and they have appointed Caulmert Limited to prepare a normal environmental permit variation application for the proposed upgraded surface water treatment process in the eastern part of the site and subsequent discharge to controlled waters at monitoring point P1.

1.1.4 The Environmental Permit for the Site which this variation application related to is permit ref. EPR/BU7766IC/V009.

1.1.5 This report includes the assessment of the impact the proposed upgraded surface water treatment and discharge activities on Site could have on local sensitive receptors identified in Section 3 below.

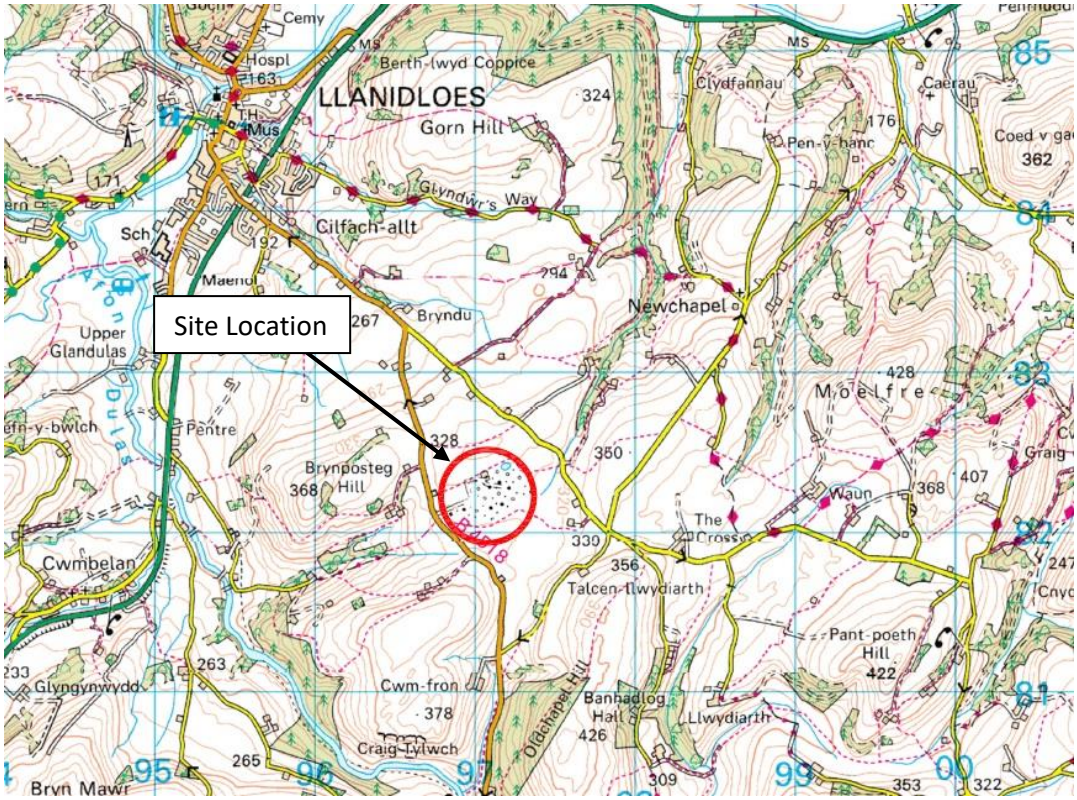
2.0 SITE BACKGROUND

2.1 Site Setting

2.1.1 The Site is an operational landfill site which was developed in the surface void of an old lead mine and between 1982 and 1997 was operated by Montgomery County Council and later Powys County Council. Since April 1997 it has been owned and operated by Sundorne Products (Llanidloes) Limited (now trading as Potters Waste Management).

2.1.2 The Site is situated approximately 2.8km southeast of Llanidloes, Powys in Wales, with postcode SY18 6JJ and National Grid Reference SN 971 822. The site location is shown below in Figure 1:

Figure 1 – Site Location



2.1.3 The landfill site is permitted to accept non-hazardous and inert commercial, industrial and municipal wastes. The site also operates a waste treatment plant for physico-chemical treatment of wastes prior to disposal to landfill, a biological waste treatment plant, and a small waste incinerator plant for energy recovery from 'Grade A' wood.

2.1.4 The risk assessments are based on the proposed surface water treatment and discharge processes at the Site, as outlined by the Operator and has been compiled in accordance with Natural Resources Wales' guidance on risk assessments.

2.1.5 The Site is situated within a rural setting, with no close areas of dense human populations, the nearest settlement being the town of Llanidloes 2.8km to the northwest of the site. The closest residential property to the surface water treatment area in the eastern portion of the Site is the Rhoswen property 200m to the east.

2.1.6 Nany y Bradnant stream is located next to the eastern boundary of the Site and this is where surface water discharge point P1 is located. The nearest major watercourse is the River Dulas located approximately 1.5km west of the landfill site boundary.

2.1.7 The B4518 road runs along the southwest boundary of the landfill site, 375m southwest of the surface water treatment area, and provides the main access to the Site. To the north, northeast and southeast of the Site is predominantly agricultural land.

3.0 SENSITIVE RECEPTORS

3.1 Overview

3.1.1 The Site is situated within a rural setting, surrounded by agricultural fields and scattered residential properties, with the closest densely populated settlement, Llanidloes town, located over 2.8km to the northwest. There are also no schools or hospitals within 1km.

3.1.2 A search on the Defra Magic Maps website indicates that there are no RAMSAR sites, Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs) or Special Areas of Conservation (SACs) or other sensitive ecological designations within 2km of the boundary. The nearest SSSI named Coed Craig-Iar is located over 2.3km away. There are no groundwater source protection zones located within 1km of the Site.

3.1.3 A review of nearby sensitive receptors within 500m are summarised below in Table 1. All distances to receptors have been measured from where the area of the proposed surface water treatment plant will be located, in the eastern corner of Site. The locations of the sensitive receptors are shown on drawing ref. 4299-CAU-XX-XX-DR-V-1800.

Table 1. Sensitive Receptors

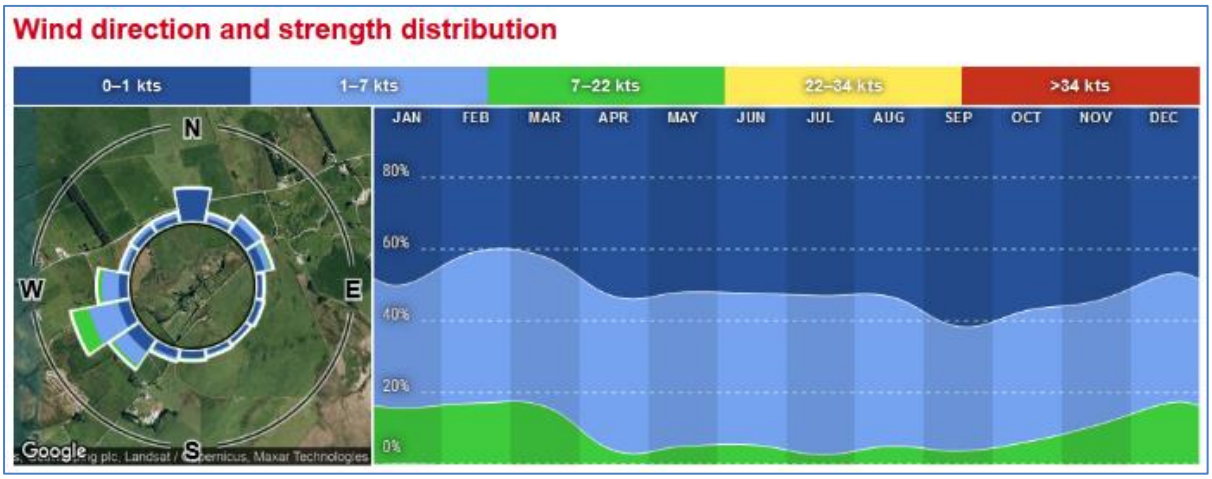
Receptor	Receptor Type	Distance and Direction
Nant-y-Bradnant	Surface Watercourse	0m NE
Agricultural Fields	Agricultural	120m N, 10m E, 10m S
Rhoswen	Residential	220m SE
Un-named road	Public Road	200m NE
Pant	Residential	230m E
B4518 Road	Public Road	360m SW
Un-named road	Public Road	430m SE
Talcen-Llwydiarth	Residential	480m SE

3.2 Meteorological Setting

3.2.1 Potential emissions, such as noise from the surface water treatment and discharge activities at the Site, are likely to be affected by local weather conditions, in particular by wind direction.

3.2.2 Wind statistics observed from the closest weather station, Pant-y-dwr/Powys, located approximately 7.5 km southeast of the Site is considered to be representative of the typical wind conditions at the Site (Figure 1. below). A review of the data recorded daily between 2013 and 2020 on the Windfinder.com website indicates that the most dominant annual wind direction is from the west southwest towards the east northeast.

Figure 1 - Pant-y-dwr/Powys wind statistics – average annual wind direction & strength between 2013 and 2020



3.2.3 A review of the sensitive receptors in Table 1 indicates that prevailing wind conditions for most of the year are likely to be towards agricultural fields and sparsely distributed rural properties to the east northeast.

4.0 RISK ASSESSMENTS

4.1 Assessments for the Proposed Operations

4.1.1 Risk assessment tables have been completed for potential odour, noise and vibration and accidents in line with the GOV.UK guidance on 'Risk assessments for your environmental permit' (updated 10th December 2020).

4.2 Risk Assessments – Odour, Noise & Vibration and Accidents

4.2.1 Possible hazards as a result of operations at the Site that require risk assessment include:

- Sources of Odour (Table 2);
- Noise and Vibration (Table 3);
- Accidents inc. surface water overflow and contamination (Table 4).

4.2.2 The hazards identified above which could be caused by surface water treatment and discharge activities at the Site have the potential to escape beyond the Permit boundary. These hazards could cause an amenity nuisance to sensitive receptors, or harm the environment and human health, if not mitigated with suitable control measures. For each possible hazard, an assessment of the risk that it poses to potential sensitive receptors has been carried out, taking into account the control measures that will be in place and the distance and location of each receptor.

4.2.3 It is considered that the risks of the surface water treatment and discharge activities producing fugitive emissions such as dust or litter, attracting pests, causing fire or producing visible plumes is negligible and therefore are not assessed further in this report.

4.2.4 The following Tables 2 to 4 give further detail on each hazard source, pathway and sensitive receptor, the risk management measures to be implemented, probability of exposure, consequences of exposure and an overall risk rating from Low (little or no risk) to High, once all risk management measures have been taken into account.

Table 2. Odour Risk Assessment

What do you do that can harm and what could be harmed			Managing the risk	Assessing the risk		
Hazard	**Receptor**	**Pathway**	**Risk management techniques**	**Probability of exposure**	**Consequence**	**What is the overall risk?**
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains?
Odour from surface water treatment chemicals – dosing of additives such as flocculants	Residents of local properties. Users of local public roads.	Through air.	Dosing chemicals/additives used will be of low Volatile Organic Content (VOC) and not be inherently odorous. The dosing of additives will be measured precisely, and overdosing will be avoided by careful supervision by trained staff. All dosing chemicals/additives will be stored securely in sealed containers, within bunded areas with 110% containment to prevent leakages and spills and any subsequent release of odours. Suitably trained site staff will conduct daily site inspections to check integrity of additive storage containers. Site staff will monitor the activity for odour emissions and conduct regular olfactory monitoring, particularly when actively treating the surface waters.	**Unlikely** as dosing additives not inherently odorous and dosing concentrations will be closely supervised to prevent overdosing or spillages. Odour is transient in nature which means any potential odour released will quickly dissipate with distance and wind movement outside. No nearby receptors within 100m.	Amenity nuisance / disturbance to local people – users of public roads and local residents.	**Low Risk - if using the management techniques**

Odour released from stagnant waters or anaerobic muds exposed by low water levels or by desludging of surface water treatment tank	Residents of local properties. Users of local public roads.	Through air	Suspended solids from the surface water will be typically low in organic content and high in clay and silt particles, and therefore unlikely to biodegrade and become a source of odour. Water levels will be maintained as much as is practicable, with tank and lagoons regularly dredged to remove accumulations of sediment and to prevent anaerobic conditions and stagnant waters. Site staff will monitor the activity for odour emissions and conduct regular olfactory monitoring, particularly when actively treating the surface waters.	**Unlikely** as rainfall typically high in this location, so droughts less likely. Sediment likely to be low in organic content. Odour is transient in nature which means any potential odour released will quickly dissipate with distance and wind movement outside. No nearby receptors within 100m.	Amenity nuisance / disturbance to local people – users of public roads and local residents.	**Low Risk - if using the management techniques**

Table 3. Noise & Vibration Risk Assessment

What do you do that can harm and what could be harmed			Managing the risk	Assessing the risk		
Hazard	**Receptor**	**Pathway**	**Risk management techniques**	**Probability of exposure**	**Consequence**	**What is the overall risk?**
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains?
Noise and vibration from water pumps	Residents of local properties. Users of local public roads.	Through air and ground.	The water pumps and pipework will be maintained in accordance with manufacturers instructions to minimise noise and vibrations due to malfunctioning equipment. Daily site inspections by trained site staff will include a walkover of surface water management system to ensure there are no excessive noises or vibrations being emitted.	**Unlikely** due to distance to any sensitive receptors	Amenity nuisance / disturbance to local people – users of public roads and footpaths	**Low - if using the management techniques**

Noise and vibration from machinery / equipment used to de-sludge	Residents of local properties. Users of local public roads.	Through air and ground.	Desludging activities will be undertaken periodically depending on suspended solid load within surface water and the season (during winter rainfall will be higher and suspended solids more likely to become entrained, generating more sludge, whereas in summer rainfall will be lower). Machinery and equipment used will be maintained to manufacturers recommendations, to ensure noise levels kept to a minimum. Desludging activities will be planned to ensure minimal noise and vibration generation i.e. reducing drop heights of sludge from bucket loader, reducing travelling distances of machinery between point of collection and deposition of sludge loads or pumping sludge out using pipework. Excessive revving of machinery or leaving the engine on when not in use will be avoided.	**Unlikely** due to infrequency of activity and distance to any sensitive receptors.	Amenity nuisance / disturbance to local people – users of public roads and footpaths	**Low - if using the management techniques**

Noise and vibration from site traffic attending surface water treatment plant	Residents of local properties. Users of local public roads.	Through air and ground.	Daily inspections of the surface water treatment facility will require staff to use site vehicles to access the area via existing haul roads. Site vehicles will be maintained to manufacturers specifications and be regularly serviced and checked. Excessive revving or leaving the engine on when not in use will be avoided.	**Unlikely** due to small vehicles attending and distance to any sensitive receptors. Background noise and vibration already generated by vehicles using existing haul roads on site daily for site traffic associated with the landfill.	Amenity nuisance / disturbance to local people – users of public roads and footpaths	**Low - if using the management techniques**

Table 4. Accidents Risk Assessment

What do you do that can harm and what could be harmed			Managing the risk	Assessing the risk		
Hazard	**Receptor**	**Pathway**	**Risk management techniques**	**Probability of exposure**	**Consequence**	**What is the overall risk?**
What has the potential to cause harm?	What is at risk? What do I wish to protect?	How can the hazard get to the receptor?	What measures will you take to reduce the risk?	How likely is this contact?	What is the harm that can be caused?	What is the risk that still remains?
Overdosing of surface water with additives / chemicals	Surface water course – Nant-y-Bradnant	Surface water discharge point P1	Trained site staff will ensure the dosing system and multi-parameter monitoring station is inspected daily and working correctly and that alarm systems are functioning. Any indication that overdosing is occurring, the dosing plant will be stopped immediately and reported to site management. It will be unlikely treated surface waters will contain elevated levels of additives due to the nature of the treatment process, where Ferric Chloride and Polymer with drop out of the treated water into the sludge during flocculation and settlement. The pH and suspended solid load of treated water will be continuously monitored by the multi-parameter monitoring station and the facility shut down and water flows ceased if set limits breached, until situation is rectified and levels restored to acceptable levels to meet the Environmental Permit compliance limits prior to discharge off-site. Site staff will endeavour to prevent future overdosing incidents by identifying preventative procedures in the management system and ensuring dosing equipment is regularly serviced and maintained in accordance with manufacturers specifications.	**Unlikely** due to careful supervision of dosing system and regular servicing of monitoring and dosing equipment and alarms.	Pollution risk of suspended solids and additives / contaminants leaving site lagoons and entering natural watercourses	**Low - if using the management techniques**

Contaminated surface water run-off percolating down through ground. **Leaking pipework**	Groundwater and local surface waters	Through ground	Regular inspections of lagoons and pipework. Any damage detected that could impair the integrity of the system should be recorded and repairs carried out as soon as possible. Lagoons will have been constructed with an impermeable clay liner to act as a barrier to infiltration of water down through ground.	**Unlikely** due to all surface waters diverted by site drainage system and relatively uncontaminated . Lagoons will have been constructed with an impermeable clay liner to act as a barrier to infiltration of water through ground.	Pollution risk of contaminants leaving site surfaces and entering groundwater	**Low - if using the management techniques**

Leaks and Spillages of dosing additives / chemicals **Leaks / spillages of oils/lubricant used on equipment**	Underlying ground, groundwater, surface water	Through site surface / ground	Dosing additives / liquid products used in the dosing process and also oils and lubricants used on equipment may have hazardous properties and may leak or be spilled accidentally. All staff handling dosing additives / hazardous liquids will be fully trained and wear appropriate Personal Protective Equipment and be inducted in the emergency procedures regarding the safe and efficient handling of spills. All dosing chemicals which are in liquid form and oils/lubricants will be appropriately stored in lockable and bunded tanks / containers, with 110% containment. Spill kits will be available for emergency spills. Regular inspections will be undertaken by site staff to check for integrity of storage containers.	**Unlikely** as all liquids will be stored securely and only used by trained staff.	Pollution to ground below site, groundwaters and potentially other surface waters	**Low - if using the management techniques**

Flooding / Overflow of Lagoons	Surface waters	Via site drainage and Over ground	In periods of high rainfall there is a risk the surface water management system may be overwhelmed. The Site has numerous ditches and lagoons, where overflow can be redirected if one lagoon is over-full i.e. Lagoon 2 is used as a back up lagoon should too much water be stored in Lagoon 1. The Site's surface water management system is designed to be capable of handling a 1-in-10-year storm even. The treatment facility will be sized to accommodate a throughput of up to 30l/s. During a high-rainfall event, a two-stage system will be used where water is transferred between Lagoons 1 and 2 and by-pass valves. Normal rainfall conditions will only require the use of Lagoon 1.	**Unlikely** due to rediverting surface waters to other lagoons and by-pass options.	Pollution to surface waters	**Low - if using the management techniques**

Site Plant Failure / Break Down – surface water pumping system	Surface waters	Over ground	Pump breakdown may cause flooding or overflow of surface water storage areas in western portion of site if not pumped away. Daily site inspection walkovers will identify any problems with pumps and equipment, accumulation of sediment or blockages. Pump and associated equipment will be maintained to manufacturers recommendations preventing likelihood of breakdown. Any problems identified likely to affect operations will be reported quickly to site management.	**Unlikely** as pumps and equipment will be regularly checked and maintained to manufacturers recommendations preventing likelihood of breakdown.	Pollution to surface waters with high suspended solids or potential contaminants	**Low - if using the management techniques**

5.0 CONCLUSION

5.1 Risk Assessment Tables – Overall Risk

5.1.1 The risk assessments above enable identification of appropriate mitigation measures to control the amenity and accident risks from the proposed surface water treatment activities. All identified risk mitigation measures will be incorporated into the Site's Environmental Management System.

5.2 Report Conclusions

5.2.1 This Amenity and Accident Risk Assessment report indicates that provided the identified risk mitigation measures (as identified above in Tables 2 to 4) are implemented, the risk of nuisance or pollution from odour, noise and vibration, and accidents is low.

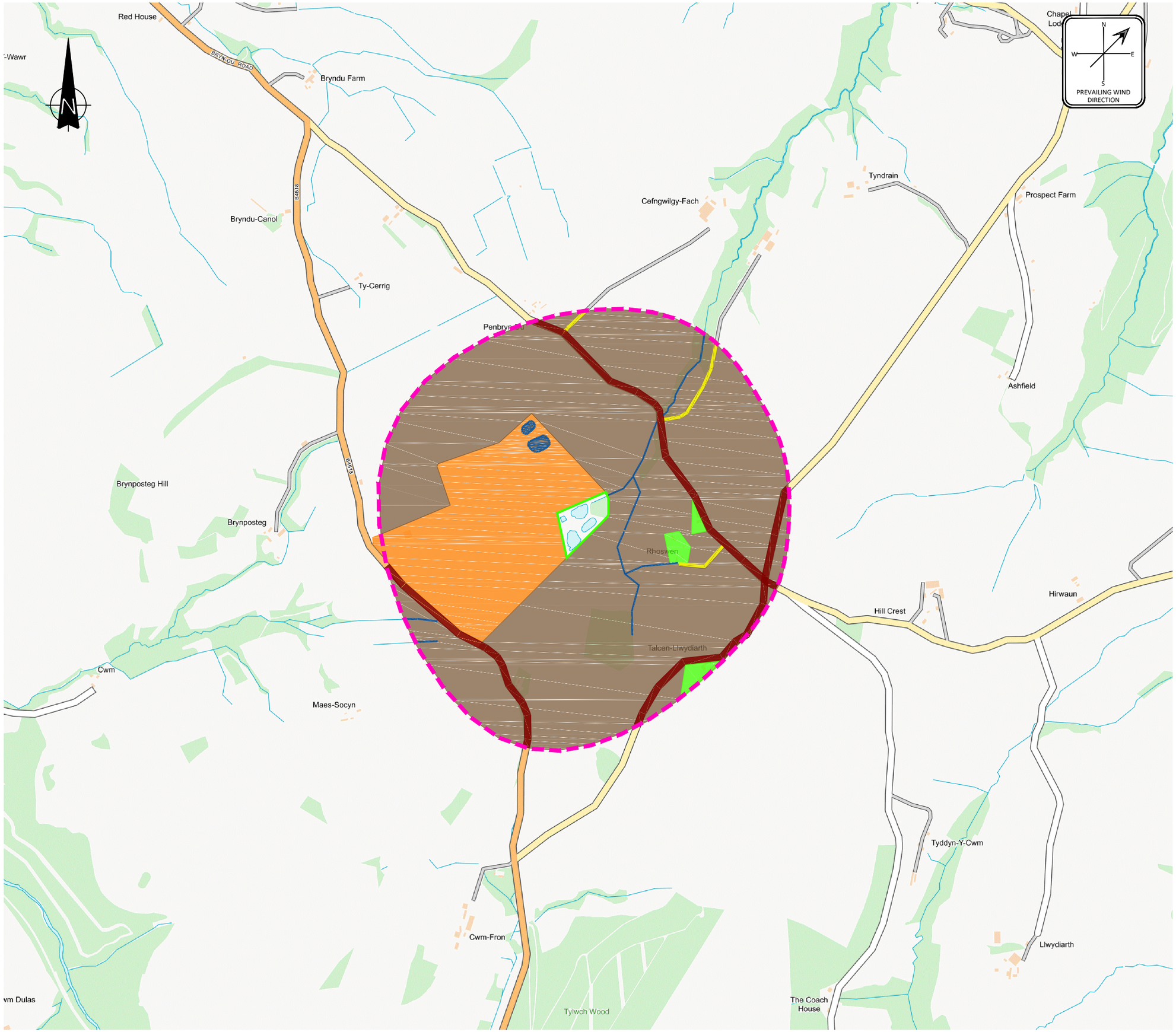
5.2.2 Overall, the Site is set within a rural setting, with very few residential receptors within 1km of the Site and a very low likelihood that emissions of odour, noise & vibrations and accidents will occur, which means potentially sensitive receptors are unlikely to be affected by potential emissions from the Site.

6.0 REFERENCES

- Environment Agency and DEFRA (1st February 2016) – 'Risk assessments for your environmental permit', from Gov.UK website: https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit (updated 10th December 2020).

DRAWINGS

4299-CAU-XX-XX-DR-V-1800 Bryn Posteg Landfill Sensitive Receptors Plan



LEGEND

- ACTIVITY BOUNDARY
- 500m OFFSET
- SURFACE WATER
- PUBLIC AREAS
- COMMERCIAL
- LANDFILL SITE
- RESIDENTIAL
- MAJOR ROAD
- MINOR ROAD
- AGRICULTURAL
- EDUCATION
- SSSI

P01	ISSUED FOR INFORMATION	EJD	SB	SB	19.02.21
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR IMFORMATION

STATUS: S2

CLIENT: PotterGroup

PROJECT: BRYN POSTEG LANDFILL

TITLE: SENSITIVE RECEPTORS PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
EJD	EJD	SB	SB

DATE	SCALE @ A3	JOB REF:	REVISION
19.02.2021	1:10,000	4299	P01

DRAWING NUMBER: 4299-CAU-XX-XX-DR-V-1800

Caulmert engineering environmental planning

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APPENDIX 5

Current OPRA Profile Spreadsheet

APPENDIX 6

Potter's 'Bryn Posteg Chloride Report 2020'

Bryn Posteg Chloride Report 2020

FEBRUARY 25 2020

Potter Group
Authored by: Deborah Hall

Bryn Posteg Chloride Report 2020

Introduction

Water quality at groundwater monitoring point W1, located just inside the site entrance adjacent to the B4518 Llanidloes to Tywlch Road, has been consistently failing the permitted chloride limit of 69 mg/l for over 15 years. Indeed, there have only been three occasions since 1st January 2005 where this compliance level has been achieved (September 2006, June and September 2007 and October 2019). Every monthly sample taken, aside from the four mentioned, have exceeded the limit with typical ranges from 200 mg/l to 500 mg/l and a peak of 727 mg/l in March 2010. Chloride levels in adjacent groundwater boreholes have not shown any notable variation during the same time period.

A previous report, issued by Caulmert in April 2017, analyses the trends in Chloride, Sodium and Ammoniacal Nitrogen from 2005 to 2017. That report clearly shows that the borehole is not being contaminated from leachate as the ammoniacal nitrogen concentrations are not elevated. It also shows that there is a direct correlation between chloride and sodium levels over the time period, which led Caulmert to suggest that the elevated chloride level was as a result of contamination from road salt.

NRW rejected these suggestions, claiming that there was not enough evidence supporting the link to road salt. As such, further analysis has been completed which correlates the chloride, sodium, potassium and calcium levels in W1 and adjacent boreholes and shows their relationship with temperature.

Analysis

Results from W1, the adjacent groundwater borehole W2, and the nearest leachate monitoring point LCP6 have been used as comparisons in this study.
In order to determine the relationship with chloride levels in W1 and a road salt source, a correlation graph was produced to show the effect of temperature on W1 chloride levels.

Figure 1: Correlation between temperature and chloride levels - Jan 2012 to June 2020

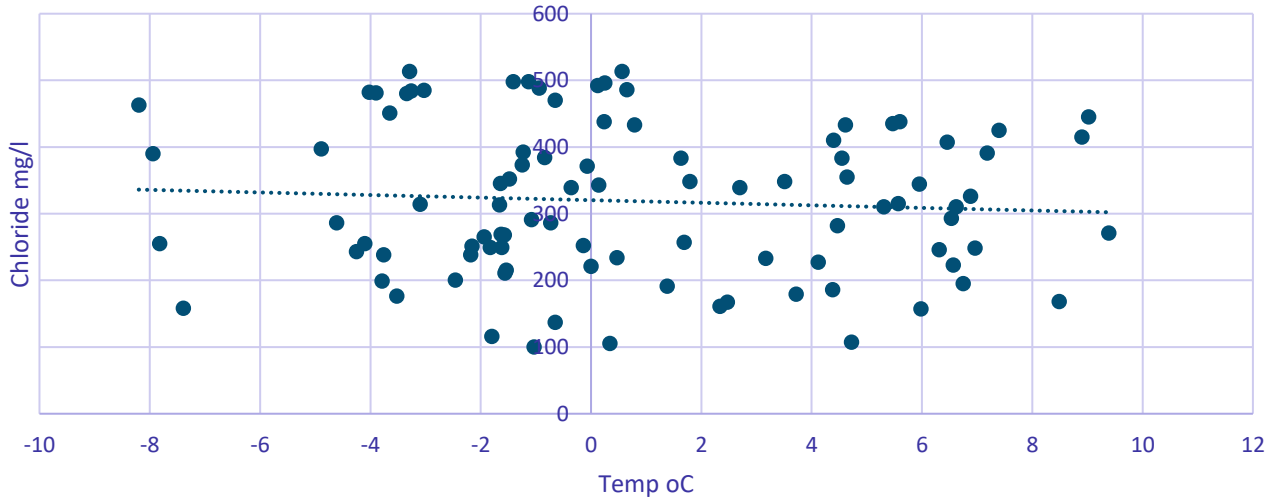
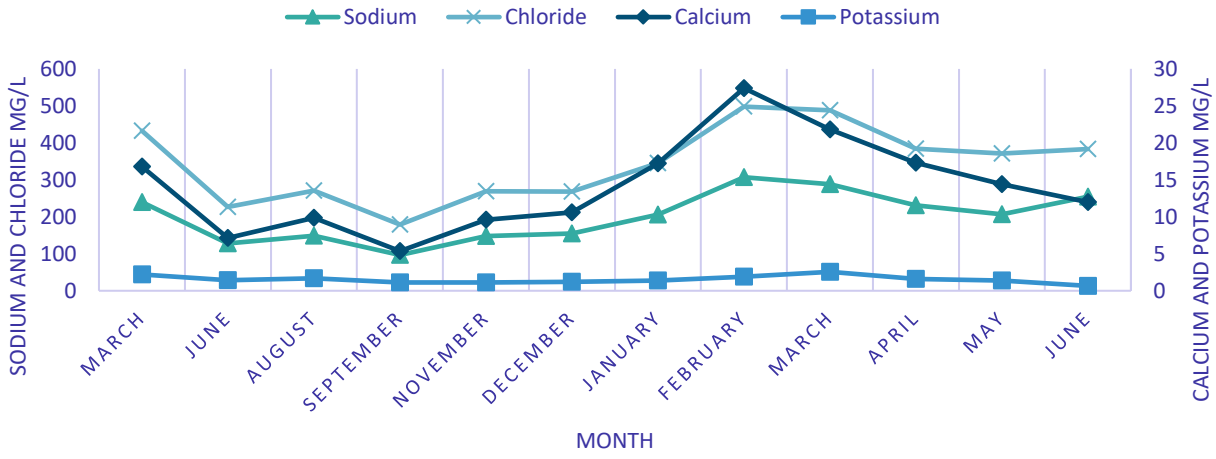
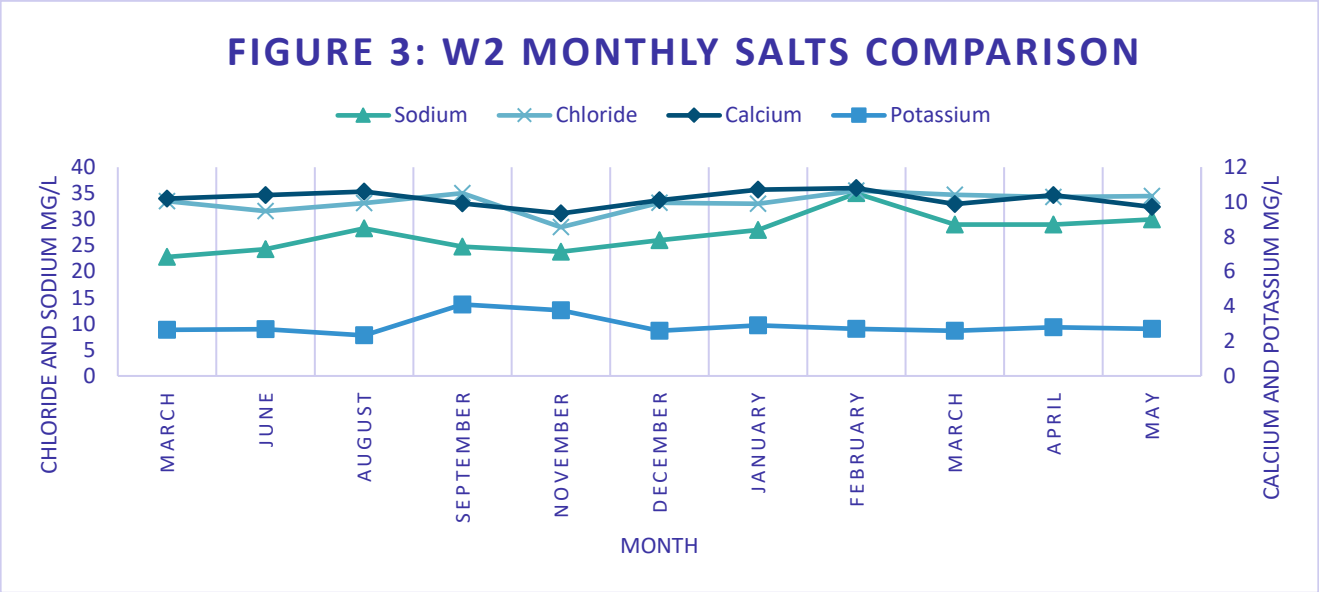


Figure 1 shows that the chloride levels are higher in colder weather than they are during the milder summer months, thereby suggesting that the rock salt, which is spread on the road during the colder winter months, is a likely source of contamination for this borehole.

FIGURE 2: W1 MONTHLY SALTS COMPARISON





Figures 2 and 3 compare the monthly patterns of chloride, calcium, potassium and sodium concentrations in W1 and W2. These graphs show that there is a strong relationship between chloride, sodium and (to a lesser extent) calcium in W1 with strong variations between summer and winter month concentrations. These variations and relationships are not apparent in the W2 results.

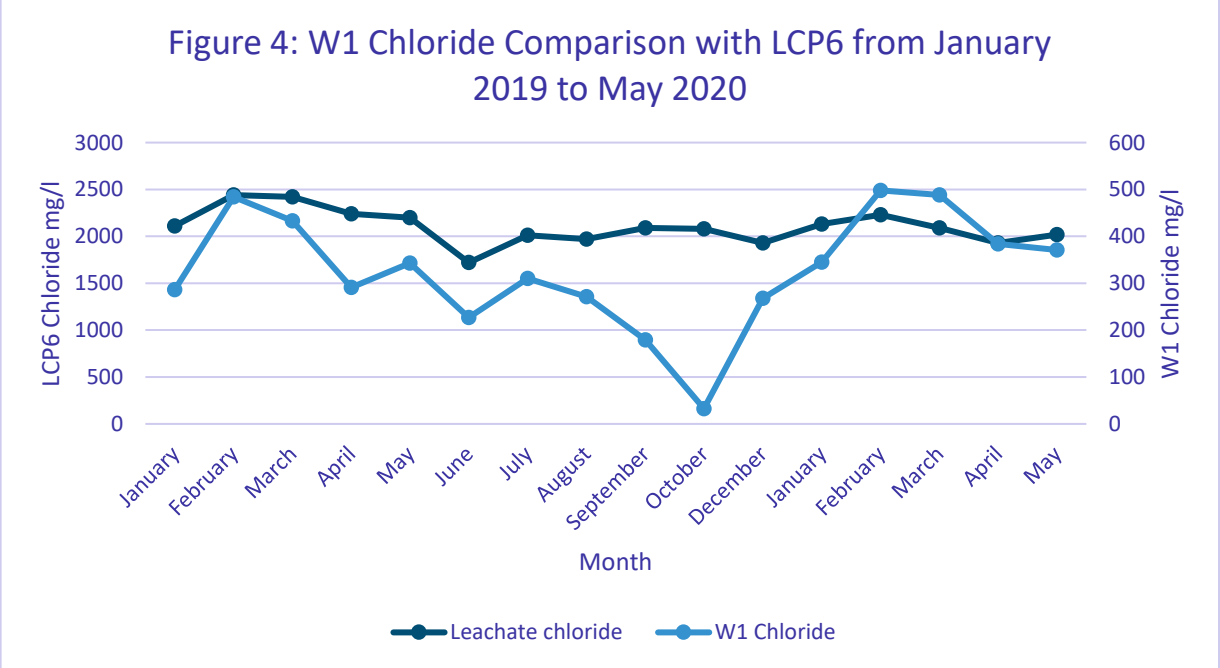


Figure 4 shows the relationship between chloride levels in LCP6 and W1. This graph clearly shows that there is no correlation between the two boreholes, therefore providing strong evidence that W1 is not contaminated from a source of leachate. This

graph supports the findings of the Caulmert report, with regards to the comparison between ammoniacal nitrogen and chloride levels in W1 and Leachate.

Ratios

A comparison of ratios between the four salts in W1 and W2 was also carried out. The results are shown in Table 1 below.

Table 1

Ratios	Calcium	Potassium	Sodium	Chloride
W1	5	1	100	200
W2	5	1	10	30

Ratios between chloride levels in W1, W2 and LCP6 was also completed with the results shown in Table 2 below.

Table 2

Borehole	LCP6	W1	W2
Chloride	33	7	1

These ratio calculations show that there is no obvious relationship between the chloride concentrations in the three boreholes (W1, W2 and LCP6).

W1 construction

W1 was drilled and constructed at the in 1998. The construction log for W1 provides detail of the surrounding geology, with the first half a metre being topsoil, followed by 5.5 metres of grey clay with gravel, before merging with approximately 8.7 metres of mudstone, terminating at a depth of 15 metres. The drill log explains that the first six metres is plain pipe, followed by 9 metres of slotted pipe. There is a bentonite seal between 0.3 and 5.5 metres. The drill log details groundwater seepage at 4 metres.

Conclusion

Figure 1 shows a definite relationship between colder weather and elevated chloride levels, however, there is a notable lag time between the onset of colder weather and the chloride levels reaching their peak levels. The data indicates that the peak levels are usually seen in February or March, thereby suggesting that the chloride is taking between 4 and 6 weeks to enter the groundwater, if road salt is the source of contamination. Due to the age of the W1 borehole and the use of over 5 metres of

bentonite as a seal, it is possible that there is a track through this seal which has provided an entry route for road run-off. Alternatively, there may be a gravel lens through the adjoining clay, which provides a direct route from the surface to the groundwater. The borehole head itself is located approximately 0.4 metres below the level of the road, the edge of which is less than a metre away. It is proposed that the lag time occurs as the surface water is percolating through the adjacent gravel clay mix.

Figure 2 shows a very definite correlation between chloride and sodium concentrations, with a 2:1 ratio between the two salts. Calcium concentrations also show a similar profile, with a chloride:calcium ratio of around 40:1. In borehole W2 (Figure 3) there is no obvious correlation between the salts with the sodium:chloride ratio drifting to around 3:1 and the chloride:calcium ratio being around 6:1; however, there is more variation in these ratios over the measured 18 month period. In LCP6 (Figure 4), chloride concentrations have remained fairly constant at between 2000 mg/l and 2400 mg/l since January 2019. Conversely, the chloride concentrations in W1 have varied by a factor of 16 over the same timescale. This confirms that the source of contamination is not leachate.

Proposal

There is significant evidence provided here that shows the contamination source is not from leachate. Whilst it is not possible to definitively say that the source is from road salt, the correlation with temperature is compelling. As such, it is proposed that Sundorne Products (Llanidloes) Ltd apply for a permit variation to increase the current chloride limit for W1 to 750mg/l. The highest measured concentration since 2010 is 727mg/l, so this limit would provide a small buffer.

APPENDIX 7

Caulmert Chloride Letter Report ref. 3428-CAU-XX-XX-CO-V-9101

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Paul Williams
Natural Resources Wales,

By e-mail

Our ref: 3428-CAU-XX-XX-CO-V-9101.A0-C1
16th October 2018

Dear Paul,

Re: Review of chloride levels in W1

Further to the previous email of 10th August 2018 and your subsequent discussions with Andy Stocks please find detailed below further information to support the Applicant's request to remove the chloride compliance limit at groundwater monitoring borehole. W1 which routinely exceed the current compliance limit.

Groundwater monitoring location W1 is situated near the site entrance adjacent to the B4518 Llanidloes to Tywlch road. Both groundwater and perimeter gas are monitored at this location.

Water quality at W1 is subject to compliance limits set within the Environmental Permit for the site (number EPR/BU7766IC/V004). The permit stipulates that the compliance limit for chloride at all groundwater monitoring locations around the site is 69 mg/l. The concentrations at W1 were below the permit level only on 3 occasions since 2005, in September 2006 and June and September 2007. All other concentrations recorded at W1 to date have exceeded this limit. Historically, chloride concentrations at this location peaked at 727 mg/l in March 2010, and since 2013 fluctuate typically between 200 mg/l and 500 mg/l (see historic data for this location compared to chloride concentrations in the other groundwater monitoring locations around the site, shown in Figure 1 below).

The purpose of this correspondence is to review the available information, evaluate the possible reason for the elevated chloride concentrations at this location and propose a variation to the conditions of the permit in relation to chloride in W1.

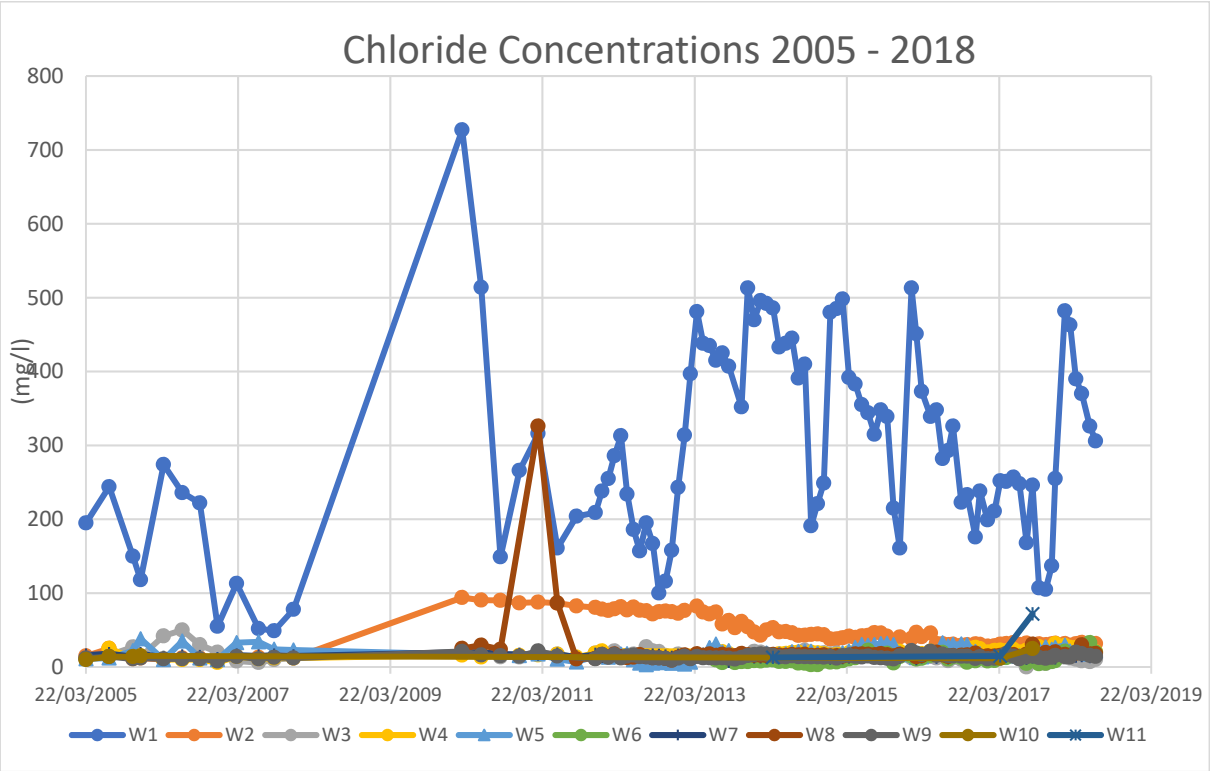


Figure 1. Chloride concentrations at all groundwater monitoring locations at Bryn Posteg Landfill Site.

The chloride concentrations at W1 were reviewed in relation to sodium and ammoniacal nitrogen concentrations at this location. Sodium is part of the annual suite, therefore the chloride and ammoniacal nitrogen concentrations for the corresponding monitoring occasions were collated. These are presented graphically, on Figure 2.

Ammoniacal nitrogen is found in very high concentrations in the leachate for the site (up to 2660 mg/l in 2016), and as such is commonly used as an indicator of impact from landfill leachate on surrounding water receptors. It can be seen on Figures 2 and 3, that throughout the available data period (since 2009), ammoniacal nitrogen concentrations remained very low at W1, often being below the detection limit (highest ammoniacal concentration at W1 was 1.78 mg/l recorded in March 2011). There is no discernible correlation between the concentration of chloride and that of ammoniacal nitrogen at this location (see Figure 3). The discrepancy between the concentrations of chloride and ammoniacal nitrogen suggest that the source of high chloride concentrations at this location is not related to leachate from the site but reflects a non-landfill offsite source.

It has been suggested previously, that the high chloride concentrations result from impact from rock salt, for example due to the proximity of this location to a road, which may be treated with salt during the winter months. To explore this possibility, the chloride concentrations were compared to the sodium concentrations at W1 (see Figure 2 below for the time-series graph, and Figure 4 for a correlation between chloride and sodium at W1). It can be seen that chloride and sodium concentrations fluctuate similarly over time and are well correlated (with a regression coefficient (R^2) of 0.93). This indicates that chloride and sodium at this location are controlled by the same factor.

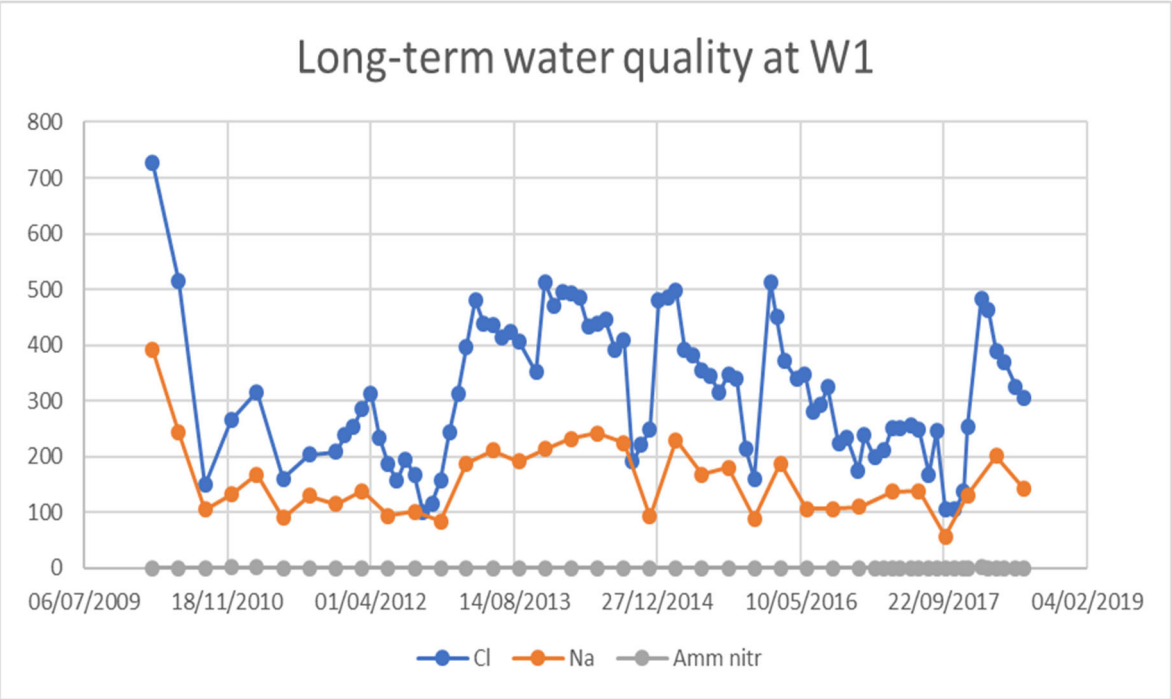


Figure 2. Chloride, sodium and ammoniacal nitrogen concentrations at W1.

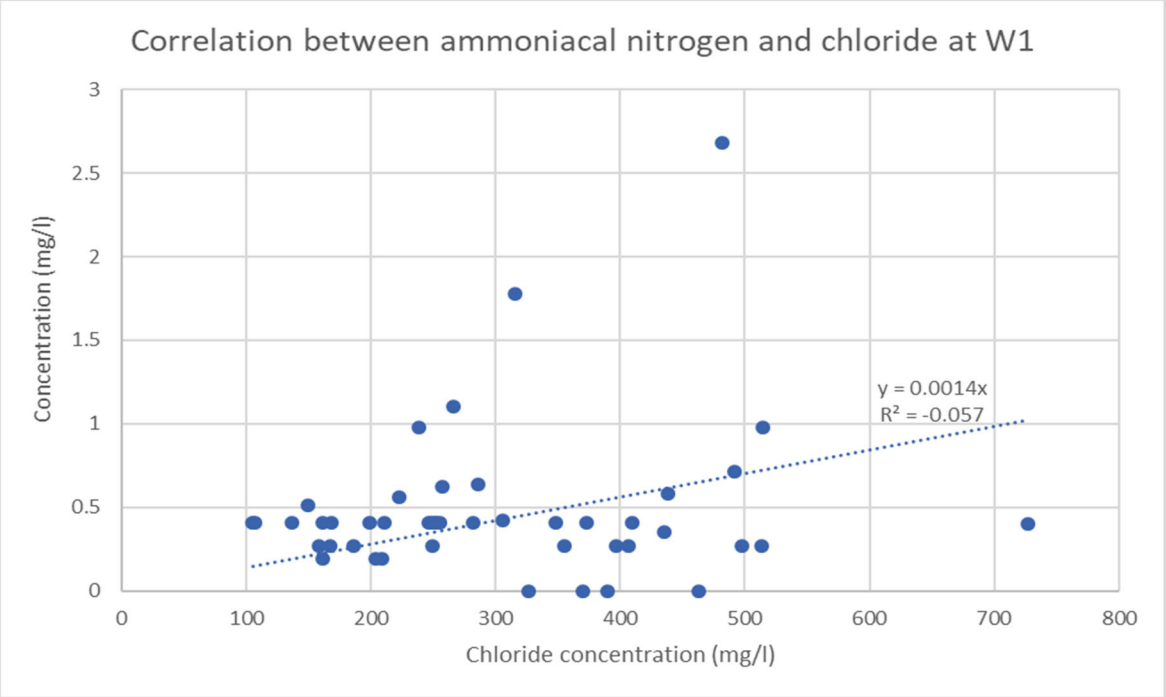


Figure 3. Correlation between chloride and ammoniacal nitrogen concentrations at W1

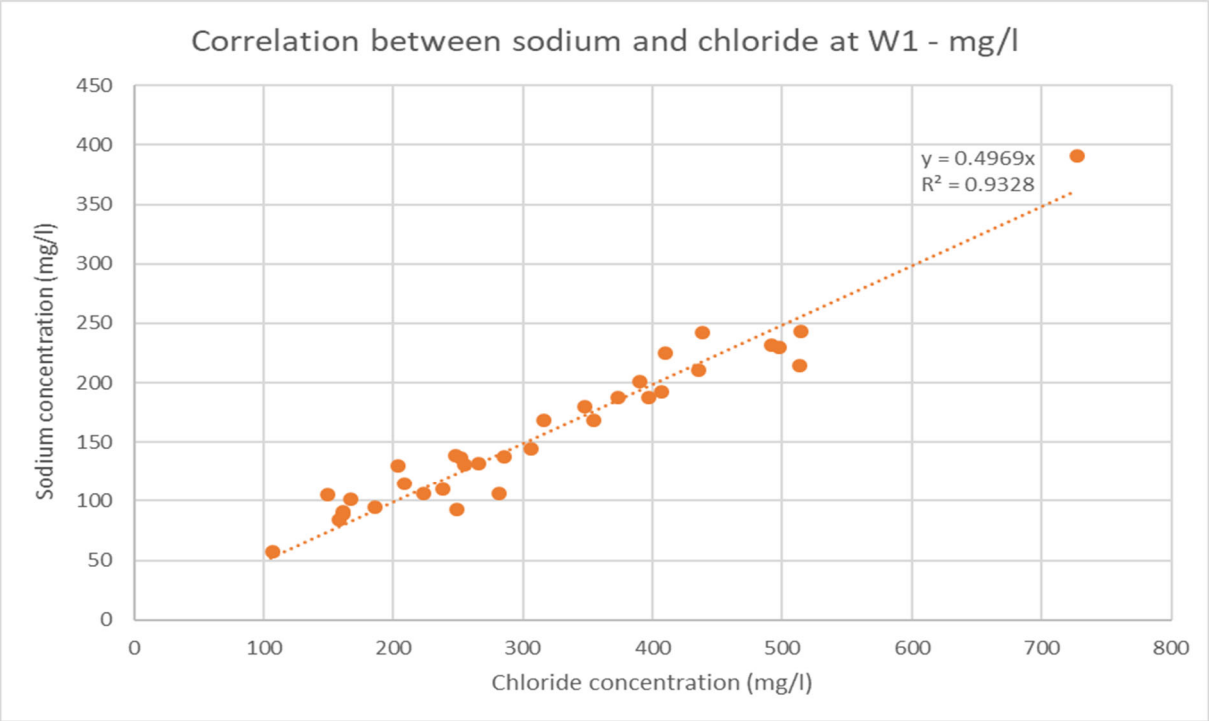


Figure 4. Correlation between chloride and sodium concentrations at W1

The results are consistent with the influencing factor being salt. The molar ratio of chloride to sodium in salt (NaCl) is 1:1. When converted to mmol/l, the chloride and sodium concentrations at W1 have an average ratio of 1.3, with slightly higher molar concentrations of chloride compared to sodium. This likely reflects the geochemical behaviour of the two ionic species, with Na^+ potentially adsorbing to available sorption sites, while Cl^- represents a conservative tracer, unlikely to sorb or precipitate in the environment.

It has been commented previously that if chloride levels are high at W1 due to periodic application of grit along the road, then high levels should also be recorded at W2 located approximately 500 m south east of W1, also along the B4518. Drawing 3376-CAU-XX-XX-DR-V-1803.A0-C5 shows the locations of these sample points. It is likely that this difference is due to the different horizons intercepted by these boreholes. The 2018 HRA (3400-CAU-XX-XX-RP-O-3001) highlights that the groundwater levels within the superficial deposits are heavily dependent on the presence or absence of sand and gravel lenses, and therefore there does not appear to be a uniform water body or gradient across the site. Within the Llandovery series, groundwater level interpretation is complicated by the juxtaposition of screened sections and intersected fractures. The groundwater levels reported at different locations were reviewed in the 2018 HRA in detail and indicated that W1 and W2 monitor different horizons based on this information. W1 has significantly lower groundwater levels, consistent with the response zone coinciding with the deeper aquifer, the Llandovery shale. W2 consistently has higher groundwater levels than W1, indicating that groundwater in this well it is in continuity with the perched groundwater within the superficial boulder clay deposits. The discussed observations support the interpretation that a localised pathway could be causing an impact at W1, but not W2.

To explore the seasonality of the observed chloride concentrations, the concentration of chloride in each month was averaged for the years 2005 to present. The results are included in Figure 5 below. Concentrations of chloride typically peak in the first quarter of the year, and then decrease gradually

through the rest of the year. The error bars represent the standard error of the datasets. The error bars for data in the first quarter of the year do not overlap with those for data in the last quarter of the year, indicating that the average concentrations in the first and last quarter are significantly different from each other. This supports the interpretation of seasonal variation within this data. This seasonality is consistent with a periodic impact during the winter months.

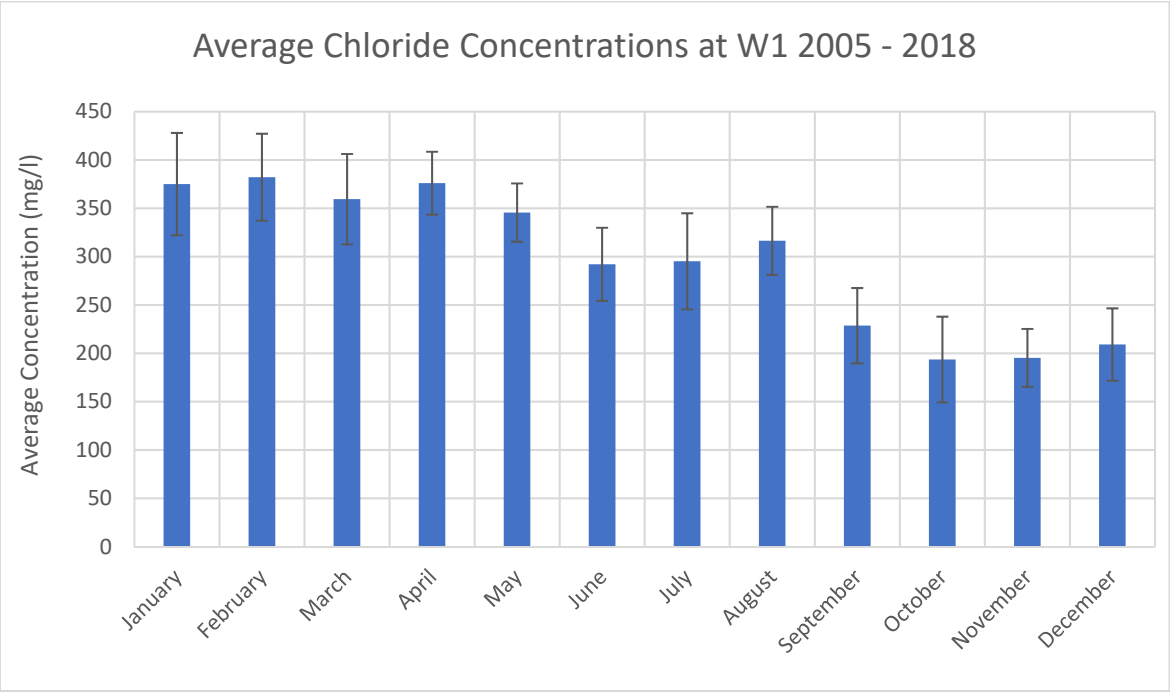


Figure 4. Correlation between chloride and sodium concentrations at W1

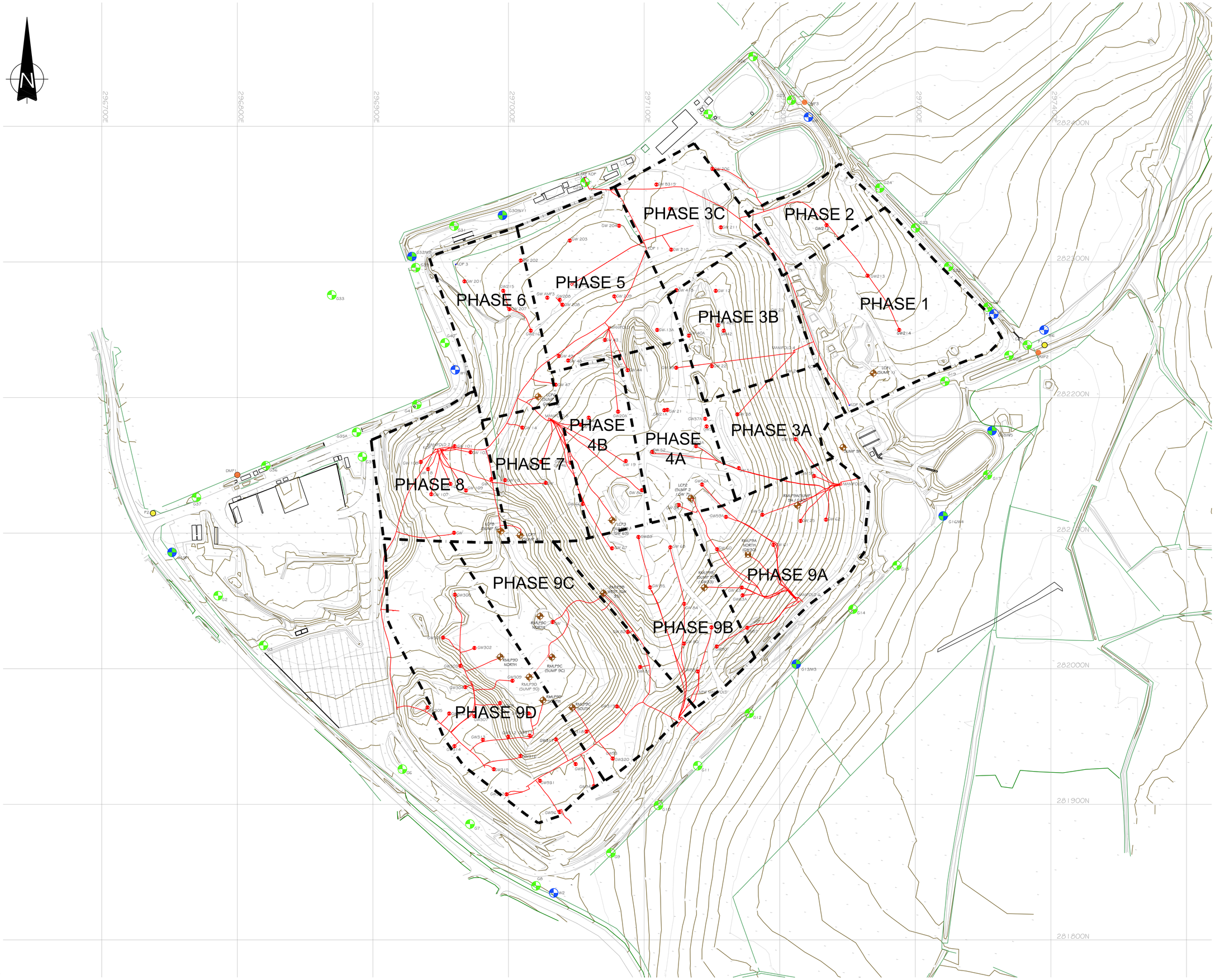
The evidence reviewed above indicates that W1 is impacted by a source of salt, possibly by a localised pathway, which is causing chloride concentrations to exceed the current compliance limit for this parameter at this location. It is further noted, that chloride concentrations at this location can vary over a range more than 200 mg/l within a year. This hinders the identification of an impact from the landfill using chloride as an indicator species over this localised chloride concentration. We therefore propose that the chloride compliance limit requirement for W1 is removed, as exceedances in other parameters at this location (such as ammoniacal nitrogen) are more diagnostic of potential impact from the site.

I trust the data presented here provides the required evidence to support the proposed amendment to the compliance limit for chloride at W1. Please do not hesitate to contact me to discuss any aspect of this correspondence in greater detail.

Yours sincerely,

Diana R. Brookshaw
Principal Environmental Scientist
For Caulmert Ltd

3376-CAU-XX-XX-DR-V-1803.A0-C5: Infrastructure Plan and Phase Layout



NOTE

1. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.

2. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING WILL BE ALLOWED WITHOUT THE PRIOR PERMISSION IN WRITING.

3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

4. MAXIMUM SURCHARGE LOAD ON 50.0m FLOOR 20KN/m2 UNLESS OTHERWISE STATED.

LEGEND

- IN WASTE GAS WELL
- LEACHATE COLLECTION / MONITORING POINT
- PERIMETER GAS MONITORING BOREHOLE
- PERIMETER GROUNDWATER MONITORING BOREHOLE
- PERIMETER GAS & GROUNDWATER MONITORING BOREHOLE
- SURFACE WATER MONITORING LOCATION
- DUST MONITORING POINT

APPROVED AND ISSUED

C5	BOREHOLE NAME CHANGE	DA	HC	HC	16.10.18
C4	PHASE 1 AMENDMENTS	EJD	DB	DB	13.07.18
C3	APPROVED AND ISSUED	DA	DB	DB	02.07.18
C2	APPROVED AND ISSUED	DA	DB	DB	14.06.18
C1	APPROVED AND ISSUED	DA	SO	SO	08.06.18
P2	MINOR AMENDMENTS	DA	SO	SO	31.05.18
P1	ISSUED FOR COMMENT	DA	SO	SO	29.05.18
REV	MODIFICATIONS	BY	RE	AP	DATE

POTTERS WASTE MANAGEMENT

PROJECT:

BRYN POSTEG LANDFILL SITE

TITLE:

INFRASTRUCTURE PLAN AND PHASE LAYOUT

DRAWN BY	DATE	
DA	29.05.2018	
REVIEWED BY	SCALE @ A1	JOB REF:
SO	1:1250	3376
AUTHORISED BY	ISSUE	REVISION
SO	A0	C5

DRAWING NUMBER

3376-CAU-XX-XX-DR-V-1803

Caulmert
engineering environmental planning

WWW.CAULMERT.COM

Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG Company Registered No: 06716319

APPENDIX 8

Natural Resources Wales (NRW) CAR report ref. NRW0037617

Compliance Assessment Report CAR_NRW0037617

Permit being assessed: BU7766IC.
For: Bryn Posteg Landfill , held by Sundorne Products (llanidloes) Ltd
At: Bryn Posteg Landfill Site Tylwch Road , Llanidloes, Powys, SY18 6JJ.

Type of assessment carried out: Report/Data Review, Reason: Routine.
On 30/09/2020.
Parts of permit assessed: Routine Emissions Monitoring & Returns

NRW Lead Officer: Lara Cubley.
Report sent to: David Williams / Deborah Hall, Technical Manager / EH&S Compliance Manager on 12/02/2021.

1. Summary of our findings (full details in section 4)

Part of permitted activity assessed (criteria)	Assessment result	Permit condition
G1 - Monitoring and Records, Maintenance and Reporting - Monitoring of emissions and environment	C4 No impact	4.2.3/3.7.1/3.5.1
E2 - Emissions - Land and groundwater	C3 Minor	2.7.1, 3.5.1, 3.1.7
E4 - Emissions - Sewer	C3 Minor	3.1.2
E3 - Emissions - Surface water	C3 Minor	3.1.2
E1 - Emissions - Air	Action only (X)	
B1 - Infrastructure - Engineering for prevention and control of emissions	Action only (X)	
G4 - Monitoring and Records, Maintenance and Reporting - Reporting and notification to Natural Resources Wales	C4 No impact	4.2.3, 4.3

Result types are explained in more detail in the 'Important Information' section below.

Total number of non-compliances recorded	Total non-compliance score
5	12.2

How we use the non-compliance score to calculate your annual fee is explained in the 'Important Information' section below.

2. What action is required?

Criteria	Action needed	Complete by
G1	See Action 4, 9, 13 in report body	29/04/2021
E2	See Action 2, 3, 7, 8, 10, 11, 12 in report body	29/04/2021
E4	See Action 5 in report body	29/03/2021
E3	See Action 6 in report body	29/04/2021
E1	Action 14	29/03/2021
B1	See Action 12 & 15 - submit plans for leachate/gas well re-	29/04/2021

Criteria	Action needed	Complete by
	drill 9C/GW325	
G4	see Action 1 &16 in report body	29/04/2021

Action criteria codes are listed in the 'Important information' section below.

3. What will happen next?

Any non-compliance we have identified and recorded on this form is an offence. It can result in criminal prosecution and/or suspension or revocation of your permit.

You are non-compliant with your permit.

At this time, we are issuing you with a warning for the non-compliance recorded above. Warnings may influence future enforcement response for continued or further non-compliance.

This statement does not stop us from taking additional enforcement action if further relevant information comes to light or offences continue.

4. Details of our assessment

Introduction

We have reviewed the report '*Sundorne products (Llanidloes) Limited - Bryn Posteg landfill site, Permit: BU7766IC, 3rd quarterly monitoring report 2020*.'

This report was submitted to NRW on 17/11/20. Condition 4.2.3 requires that quarterly returns are submitted to NRW within 28 days of the end of the reporting period (29/10/20).

This permit condition has been breached as the monitoring returns were submitted late (G4 CCS4 - consolidated). The Operator informed us of a delay in reporting on 29/10/20 due to laboratory scheduling issues unrelated to COVID 19.

ACTION 1- Please ensure monitoring returns are submitted to NRW within 28 days of the end of the reporting period (29/04/21). If you are experiencing delays due to COVID 19 which may impact your ability to submit quarterly returns by the deadline, please notify NRW in advance and agree an extension date for submission.

Leachate levels -Table S3.1

Monthly leachate levels for the monitoring points have been provided.

Condition 2.7.1 requires leachate levels to be less than 1m above the sump base. Leachate levels provided show compliance at all monitoring points throughout the period apart from LCP3 and RMLP9C which marginally exceeded this level in September only with a level of 1.01 metres.

NRW considers the operator to have breached Condition 2.7.1 with no potential risk to the water environment as the breach is marginal (E2 CCS4- consolidated with

Conditions 3.5.1 and 3.7.1).

ACTION 2- The operator shall use suitable resources (financial and technical) to keep leachate levels at this low level and reduce leachate heads in phases 4B and 9C to below the 1m above sump base compliance limit listed in the permit.

NRW note that the exact leachate monitoring points being monitored and nomenclature still require addressing fully as required by CAR_NRW0036811 Actions 8 & 9. This could have an impact on the accuracy of reported monitoring data and could attract further permit non-compliances if not addressed by the Operator in a timely manner.
ACTION 3 – Complete Outstanding actions 8 & 9 from CAR_NRW0036811.

Leachate quality -Table S3.9

The Operator has provided monthly raw leachate quality data for the points specified in table S3.9 of the permit. The report only provides data for pH.

Monthly measurements of NH4-N and chloride for the raw leachate are not included.
In the Q1 monitoring report review (CAR_NRW0036858) the operator was asked to include monthly NH4-N and chloride measurements for raw leachate in subsequent quarterly returns going forward.

6 monthly raw leachate quality data has not been provided as required by permit Condition 4.2.3. **NRW considers this to be a breach (G1 – CCS4 consolidated).**

ACTION 4- The operator must report this data and ensure that scheduled analysis and reporting for raw leachate is as required in quarterly/6 monthly monitoring returns going forward (no later than 29/04/21).

Treated leachate quality - Table S3.4

The operator has reported monthly leachate quality data following treatment at the effluent treatment plant as required by table S3.4. However, units have not been provided.

It is assumed that data provided refers to mg/l. If so, then the permitted limit for Suspended Solids of 500mg/l was exceeded in July with a concentration of 2,984mg/l and soluble methane limit of 0.14mg/l was exceeded in August with a concentration of 0.73mg/l.
NRW Considers this to be a breach of Permit Condition 3.1.2 (E4 – CCS3).

All other reported results provided are in compliance with the permitted limits.

ACTION 5 - The operator must provide an investigation into the 2 above breaches in form of Part B notification by 29/03/21).

Surface water-Table S3.3

Condition 3.1.2 states that the limits in Table S3.3 shall not be exceeded. Monthly monitoring data has been provided and shows that location SW2 (P2) exceeded the permitted limit of 50mg/l for Suspended Solids in August with a recorded concentration of 326mg/l.

NRW considers the Operator to have breached Condition 3.1.2 with the potential for minor impact on surface waters (E3-CC3).

ACTION 6 - The operator should use all suitable resources (financial and technical) to ensure compliance with the limits specified in table S3.3. Documents have been submitted to NRW in response to improvement conditions 10 &11 of the recent permit variation. Operator to progress improvements.

Groundwater -Tables S3.5 and S3.10

The operator has provided groundwater monitoring data. However, they have provided monthly readings for water levels rather than weekly readings as specified in Table S3.10. Not all monitoring data has been provided for all determinands. The Operator states that this was due to a laboratory error.
NRW considers this to be a breach of Condition 2.7.1/4.2.3 (G1 – CCS4 consolidated). ACTION: Ensure monitoring and reporting as required by permit in future monitoring returns by 29/04/21.

Condition 3.1.5 states that the trigger levels for emission to groundwater for the parameters and monitoring points set out in Table 3.5 shall not be exceeded. The recorded Chloride concentration of between 189 – 310mg/l for the period in G1/W1 exceeded the limit of 69mg/l. The Operator has made an informal submission to NRW proposing to increase the compliance limit for Chloride in G1/W1 due to road salt. NRW is satisfied that the compliance limit could be increased to 500mg/l with review on a regular basis.
ACTION 7 - The Operator must formalise this by applying for a permit variation and continue to review monitoring data.

The recorded Ammoniacal Nitrogen concentration of 2 – 2.9mg/l in W5/G18 exceeded the limit of 2mg/l.

NRW considers the operator to have breached Condition 3.5.1 with the potential for a minor impact on the water environment (E2 CCS3 consolidated with Conditions 2.7.1 and 3.1.7).

ACTION 8 - The operator must continue to monitor and review results of W5/G18 and investigate any trends and issues associated with exceedances.

Landfill gas in external monitoring boreholes - Table S3.6

The operator has submitted monitoring data for landfill gas in external boreholes situated

around the perimeter of the waste mass. Data now includes relative pressure.

No data for monitoring points G6, G33 or G35A have been provided. **NRW considers this to be a breach of Condition 2.7.1/4.2.3 (G1 – CCS4 consolidated).**
ACTION 9: Ensure monitoring and reporting as required by permit in future monitoring returns by 29/04/21. If monitoring points have been destroyed, please submit plans for replacement or otherwise to NRW for review and approval.

In total, there were 33 occurrences when the Methane result exceeded the compliance limit of 1%v/v and 55 occurrences when the Carbon Dioxide result exceeded the compliance limit of 1.5%v/v which is more frequently than in the last quarter.

Methane concentrations as high as 74.1% (G22) and Carbon Dioxide concentrations as high as 28% (G12) were recorded.

Monitoring points G19 – G24 and G38 are located around the Phase 1 which is relatively shallow and unlined. These appear to show consistently elevated concentrations of Methane and Carbon Dioxide in excess of permitted limits. Relative pressures have now been supplied and appear to be negative or relatively low, with the highest pressure recorded in August at G22 with a recording of 1.5mb. Monitoring points G16 – G18 are located further from the waste mass and on the far side of the surface water lagoons and appear to be in compliance with permitted limits. Based on the source pathway receptor approach NRW is satisfied that the likelihood of risks being realised from the noted landfill gas migration from the Phase 1 area is low. This is subject to constant review of monitoring data and the Operator must continue to follow their gas management plan and ensure efficient collection and utilisation of landfill gas.
NRW notes that monitoring point G22 had a high flow rate of 41.9l/h in, **which should be investigated.**

Other monitoring locations around the site were found to breach permit limits for Methane and Carbon Dioxide at various locations along the north site boundary, i.e. G25, G26, G29, G31, G35, G36 (near weighbridge building), and G37. Relative pressures have now been supplied and appear to be negative or relatively low. High flows were also noted at G25. Monitoring point G12 also contained elevated concentrations of Methane and Carbon Dioxide exceeding permitted limits along the southern boundary of the site adjacent to Phase 9B. Relative pressures at this location were negative. Gas extraction points closest in Phase 9B (GW88 & GW90) appear to have occasions during this period where balance gas exceeds 20%. This suggests air ingress and requires investigation (**see Action below**).
NRW considers Condition 3.1.7 to be breached with the potential for a minor environmental impact based on the source pathway receptor approach (E2 CCS3 - consolidated with conditions 2.7.1 and 3.5.1).

ACTION 10 - The operator should follow the gas management plan, i.e Action Plan B and report back regarding the gas control and collection system particularly in the vicinity of the breaches. Please provide a summary report of actions taken with findings and further recommended improvements should gas migration continue to be evident by 29/03/21.
ACTION 11 – Investigate high flows noted and report back to NRW by 29/03/21.

Landfill gas - other monitoring requirements Table S3.8

The operator has provided monthly in waste landfill gas collection system data. However, no comments or actions have been provided as previously where Oxygen levels exceed 5% and balance gas exceeds 20%.

The data shows there have been 31 instances where Oxygen levels have risen above 5% in the gas wells and 102 instances where the gas balance has been recorded above 20%, a slight increase on last quarter.

There have been 4 instances where Carbon Monoxide (CO) concentrations have been above 100ppm at three different monitoring points. Carbon Monoxide concentrations as high as 188ppm have been recorded (BPIW0308).

The permit requires that investigations shall be undertaken by the operator where the concentration of CO exceeds 100ppm. The Operator submitted a review to NRW on the 17/11/20 as required by the Gas Management Plan into investigation of elevated CO. This concluded that data did not reveal aerobic conditions which would be considered to be the first step for concern for potential heating. The review also identified 19 wells with air leaks and recommended seal repairs be instigated.

ACTION 12 - The operator shall provide an update to NRW in writing regarding progress with seal repairs to the 19 wells identified.

The Operator has provided weekly data for gas composition and vacuum pressure for the inlet to the gas compound. It appears that these are weekly spot readings, but this requires Operator confirmation. **NRW is of the opinion that this is a breach of Condition 4.2.3 as table S4.1 requires summary data such as max/min, average and total gas quantity (G1-CCS4).**
ACTION 13: The Operator is to ensure that weekly summary data is provided by 29/04/21 and going forward.

Ambient air -Table S3.11

The operator has provided data for particulate matter for the quarter as required by Condition 3.7.1 (e). This shows the limit of 200mg/m3/day required by Condition 3.1.8 table S3.11 of the permit was complied with. However, there appears to be a discrepancy in the calculations and number of days monitored.
ACTION 14: The Operator must check calculations and re-submit monitoring data by 29/03/21.

Notifications

The following table summarises the notifications received from the Operator for the period July-September 2020 as required by condition 4.3 of the permit.

Date NRW notified	Part A	Part B
16/07/20	Incident 15/07/20. RMPL9C/GW325 leachate	Part B received 14/10/20 – CCTV shows partial

	& gas well failure at approximately 12m unable to desilt.	collapse with leachate level reportedly below 1m compliance limit and thick foam. Dip tape is reportedly snagging meaning measurement not accurate. Pump is still running but stuck. Possible re-drill. **ACTION 15**: Submit proposals for re-drill & CQA plan by 29/04/2021.

NRW has not received any part A or B notifications for non-compliances relating to breaches of permit limit detailed above for this quarter. **Breach of Condition 4.3 (G4 – CCS4).**
ACTION 16 - Ensure that all part A and B notifications are submitted to NRW as required by Condition 4.3 of the permit. As previously discussed, these can be updated on a quarterly basis for ongoing permit breaches (29/04/21).

If you have any queries about this report, or to discuss completion of any actions, please contact the NRW Officer named above.

Important information

Legal status of this report

Your permit is issued to you under the Environmental Permitting Regulations. You have a responsibility to comply with the conditions of your permit and prevent pollution/harm of the environment. You must also ensure that you comply with any other relevant legislation that may apply to your site's operations.

This report explains the findings of our assessment and any action you are required to take. We categorise non-compliance using our guidance for assessing non-compliance at regulated sites.

When we find potential non-compliance/s we will normally give you advice on how to maintain compliance.

To correct non-compliance, we may:

- require you to take specific actions
- issue a notice
- review the conditions of your permit.

Any advice and guidance we give will be without prejudice to any other enforcement response that we consider may be required.

Assessment results and non-compliance categories (used in section 1):

Assessment result	Description
Assessed (A)	Assessed or assessed in part, no evidence of non-compliance found
Action only (X)	Action only relating to the activity assessment
Ongoing (O)	Ongoing non-compliance, not scored

Non-compliance category	Description	Score
C1 Major	Potential to have a major, serious, persistent and/or extensive impact or effect on the environment, people and/or property	60
C2 Significant	Potential to have a significant impact or effect on the environment, people and/or property	31
C3 Minor	Potential to have a minor or minimal impact or effect on the environment, people and/or property	4
C4 No environmental impact	Non-compliance at a regulated site that cannot foreseeably have any impact on the environment, people and/or property	0.1

How we use assessment scores

The number and severity of non-compliances recorded in a year will affect your annual subsistence fee the following year. A non-compliance factor is added to your site's Operator

Performance Risk Appraisal (OPRA) score when we calculate your fee to reflect the additional resource we use to assess permit compliance.

What are suspended scores?
In line with our guidance, we may suspend scores for up to six months to allow time for remedial action to be taken. Suspended scores will be re-instated if the action is not completed.

Full list of Industry and Waste action criteria (used in section 1 and 2):

A: Permitted activities
- A1 Specified by permit

B: Infrastructure
- B1 Infrastructure – Engineering for prevention and control of emissions
- B2 Infrastructure – Closure and decommissioning
- B3 Infrastructure – Site drainage engineering (clean and foul)
- B4 Infrastructure – Containment of stored materials
- B5 Infrastructure – Plant and equipment

C: General management
- C1 General management – Staff competency/training
- C2 General management – Management system and operating procedures
- C3 General management – Materials acceptance
- C4 General management – Storage, handling, labelling and segregation

D: Incident management
- D1 Incident management – Site security
- D2 Incident management – Accidents, emergency and incident planning

E: Emissions
- E1 Emissions – Air
- E2 Emissions – Land and groundwater
- E3 Emissions – Surface water
- E4 Emissions – Sewer
- E5 Emissions – Waste

F: Amenity
- F1 Amenity – Odour
- F2 Amenity – Noise
- F3 Amenity – Dust/fibres/particulates and litter
- F4 Amenity – Pests/birds and scavengers
- F5 Amenity – Deposits on road

G: Monitoring and records, maintenance and reporting
- G1 Monitoring and records, maintenance and reporting – Monitoring of emissions and environment
- G2 Monitoring and records, maintenance and reporting – Records of activity, site diary/journal/events
- G3 Monitoring and records, maintenance and reporting – Maintenance records
- G4 Monitoring and records, maintenance and reporting – Reporting and notification to Natural Resources Wales

H: Resources efficiency
- H1 Resource efficiency – Efficient use of raw materials
- H2 Resource efficiency – Energy efficiency

Enforcement response
Any permit condition non-compliance is an offence and we may take legal action against you. Action we take can include prosecution, serving a notice on you and/or suspension or revocation of your permit. See our Enforcement and Sanctions Guidance for further information.

Data protection notice
You should make sure that anyone named in this report knows that the information it contains will be processed by Natural Resources Wales to fulfil its regulatory and monitoring functions and to maintain the relevant public register(s).

We may also use and/or disclose the report in connection with:

- offering or providing you with our literature or services relating to environmental matters
- consulting with the public, public bodies and other organisations (e.g. Health and Safety Executive, local authorities) on environmental issues
- carrying out statistical analysis, research and development on environmental issues
- providing public register information to enquirers
- investigating possible breaches of environmental law
- assessing customer service satisfaction and improving our service
- Freedom of Information Act or Environmental Information Regulations requests.

We may also pass it on to our agents or representatives to do these things on our behalf.

Disclosure of information – this report will be available to view on-line
If you think this report contains commercially confidential information that should not be placed on our public register, you must contact your local Natural Resources Wales office within **fifteen working days** of receiving this report, using the contact details in the accompanying email or letter. You must give a full explanation of why it should not be added to our public register, including specifying which information is commercially confidential. We will assess your request and respond to you within 20 working days to let you know if we agree to your request.

What do I do if I disagree with the report or have a complaint?
If you disagree with this compliance assessment report, you should contact the lead officer without delay to discuss your concerns.

If you are unable to resolve the issue with the lead officer or their line manager you should contact our Customer Contact team on 0300 065 3000 (Monday to Friday 08:00 – 18:00), or email enquiries@naturalresourceswales.gov.uk for details of how to raise your dispute further through our Complaints and Commendations procedure.

If you are dissatisfied with our response, you can contact the Public Services Ombudsman for Wales by phone on 0300 7900203 or by email at ask@ombudsman.wales

Welsh Language Standards
We are committed to establishing Natural Resources Wales as a naturally bilingual organisation. We will provide compliance reports in your preferred language.

Caulmert
engineering environmental planning

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