

Technical Note:

Hendy Quarry Inert Landfill Permit Variation (PAN-003267): Schedule 5 response

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Prepared for Tarmac Trading Limited

Document reference: 62847TN4, March 2019

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APPENDICES

Appendix A Schedule 5 Notice

Appendix B Application report (revised) 62847R1rev2

1 Introduction

Stantec UK Ltd (Stantec) has been instructed by Tarmac Trading Ltd (Tarmac) to compile a response to a Schedule 5 notice raised by Natural Resource Wales (NRW) in its 'notice of request for more information', dated 08 February 2019. A copy of the notice is provided in Appendix A.

The previously submitted application was marshalled by document reference 62847R1rev1, which is referred to as the Application Report in this document. A revised copy of the Application Report is provided as Appendix B.

2 Question 1: Waste acceptance procedures

2.1 Q1a: Pre-acceptance – basic characterisation and compliance testing

The report (624871rev1) accompanying your application in section 2.2 states that waste acceptance at the site will be in accordance with your existing Waste Acceptance Procedure (WAP) provided in Appendix C. The procedure does not clearly explain the pre-acceptance procedures, which need to include:

- *if all wastes are subject to basic characterisation;*
- *which wastes require testing; and*
- *at what stage in the waste acceptance process, waste acceptance criteria (WAC) limits for inert wastes are applied*

Additionally, compliance testing is carried out by the operator according to section 7.1 of your WAP. This is in contradiction to section 2.2 of the report (624871rev1) which confirms that compliance testing is carried out by the waste producer in accordance with current guidance and legislation.

ACTION: Please amend the Waste Acceptance Procedure in Appendix C to clearly show the pre-acceptance process, including confirming:

- all waste streams that are subject to basic characterisation;
- what waste types require testing;
- at what stage the WAC limits for inert wastes are considered, as well as how and who has responsibility for this; and
- what wastes are subject to compliance testing and who has responsibility for completing this.

2.2 Question 1a response

2.2.1 Level 1 Basic characterisation

Tarmac's Waste Acceptance Procedure (WAP), provided as Appendix C to the Application Report is employed across the whole of the UK and is considered to fully comply with landfill waste acceptance requirements in England, Scotland and Wales.

Section 5.0 of the WAP refers to Landfill Acceptance Procedure (MS-EP-A&A-01/01). This procedure provides a flow of the checks to be carried out at each site. The pre-acceptance part of this process outlines that all waste will be recorded on the Site Notification (SN) database. This requires the completion of the requirements of basic characterisation. This is detailed further in Section 2.2 of the revised Application Report (see Appendix B).

2.2.2 WAC (chemical) testing (Level 1-3)

The list of waste currently permitted to be accepted at Hendy Quarry Landfill (Schedule 3 of the Environmental Permit) are acceptable for inert landfills without Waste Acceptance Criteria (WAC) testing (EC, 2003).

The additional list of wastes which are proposed to be added to the Environmental Permit (Table 2.2 of Application Report), testing (Levels 1-3), primarily in the form of inert Waste Acceptance Criteria (WAC) for landfill testing which will be carried out by the waste producer.

It is considered that each waste table may be listed separately in the varied Environmental Permit detailing wastes acceptable without testing and waste requiring testing. The Environmental permit will be adhered to by Tarmac in accordance with their WAP.

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2.2.3 WAC limit application

In accordance with Tarmac's Landfill Acceptance Procedure (MS-EP-A&A-01/01), WAC limits for individual waste streams will be considered in the following ways;

- At the pre-acceptance stage; if the waste is in the table of inert wastes acceptable with testing, WAC analysis data will be required to be provided by the waste producer. These data will be assessed by the Landfill and Recycling team, who are responsible for enforcing the pre-acceptance checks; and
- At the operational stage; if verification testing is due to be scheduled, this will be organised as part of the 'duty of care check' (see Verification testing) step of the process flow, which are carried out by the on-site Operations team, for which the Unit Manager or their delegate is responsible.

2.2.4 Level 2 - Compliance testing

Wastes which are regularly generated should be routinely checked for continued compliance with inert WAC. The waste producer is responsible for carrying out compliance testing. The landfill operator is responsible for requesting sight of compliance testing checks are regular intervals, appropriate for the waste generating process.

It is acknowledged that Tarmac's WAP states that compliance testing will be carried out. This is decided by the Landfill and Recycling team which is deemed to be an additional internal check, over and above regulatory requirements, at the discretion of the landfill operator.

2.3 Q1b. On-site verification

The WAP provided as Appendix C to the application does not include the following information on:

- *how long samples and results of analysis will be retained for*
- *sampling procedures, including the process for defining the sampling plan and Best Practice used for example BS EN 14899:2005*
- *what action is taken if verification testing does not match the basic characterisation and compliance testing provided or WAC limits for inert waste*

The report (624871rev1) accompanying your application in section 2.2 states that verification testing for WAC will be at least 1 per 100 loads (or 1 test per 4,000 tonnes) and 1 test per source. It also states that the frequency may be increased if the waste is heterogeneous.

The verification testing frequencies specified are insufficient and are not in accordance with current guidance.

ACTION: Please amend the Waste Acceptance Procedure in Appendix C and/or the report (624871) to clearly show the on-site verification process and testing frequencies in accordance with current guidance, including further information on:

- how long samples and analysis results are retained
- the process for defining sampling plans and sampling procedure
- what action is taken if verification testing fails

Additionally, in the WAP provided, section 6.1 refers to the rejection of unacceptable loads procedure at section 4.6.4, this appears to be a typo. And MS-EP-A&A-01/05 refers to 'removal of unacceptable loads process Level 3a', which has not been provided.

ACTION: Please confirm the correct rejection of unacceptable loads procedure and provide the removal of unacceptable loads process Level 3a.

The report (624871rev1) accompanying your application in section 2.2 states that verification testing is not proposed for waste which is already on site. The information provided is insufficient [sic] for us to understand what is meant by 'waste which is already on site'. It is assumed that this is waste that is produced at and stored at the inert waste transfer station operated under EPR/FB3633RD.

Verification testing must be carried out in accordance with waste acceptance procedures as specified in the Council Decision 2003/33/EC and guidance on the testing and acceptance of wastes for disposal at landfills. Therefore, the statement above as taken from section 2.2 of your report (624871rev1) is not appropriate. However, verification testing can be carried out at the point of dispatch where the waste producer is also the operator of the landfill where the waste is to be deposited.

ACTION: Please ensure that your WAP clearly defines when wastes streams will be verified on site and when they will be verified at the point of dispatch.

2.4 Q1b response

2.4.1 WAP additional information

Level 3 verification waste samples will be retained by the contracted laboratory for a period of a month, as per standard laboratory practice. Records will be kept for a period of 6 years, in accordance with Environmental Permit condition 4.1.1(d), unless otherwise agreed in writing with NRW.

Level 3 verification waste sampling at the site is undertaken in accordance with BS EN 14899:2005 which for inert waste verification will comprise a composite sample from multiple locations of the target load, at the required frequency (see Section 2.4.3).

If level 3 verification testing does not match level 1 basic characterisation / level 2 compliance testing, the Rejection of Unacceptable Waste procedure (Section 6.4 of WAP), will be followed.

2.4.2 Waste rejection procedure

It is acknowledged that there is a typo in the WAP. Reference in Section 6.1 of the WAP referring to 'Section 6.4.' is a typo and should instead reference 'Section 6.4' as is done in the subsequent Section 6.2. The reference to 'Level 3a' in procedure MS-EP-A&A-01/05 is imprecise and refers to Section 6.4 of the WAP.

The removal of unacceptable/ non-permitted wastes from site will be carried out in accordance with Section 6.4 of the WAP – Rejection of Unacceptable Waste.

As mentioned previously, the WAP is a Tarmac country-wide procedure. These procedures will be undergoing a thorough review as all procedures are merged into a Tarmac integrated management system. The identified typos will be rectified at that point. It is considered that all of the essential information required for the acceptance of waste to site is present in the provided documents, in the intervening period.

2.4.3 Level 3 verification testing

In accordance with the relevant guidance (EC, 2003; Environment Agency, 2013), level 3 verification testing will be carried out at as follows for all waste accepted for deposit in the landfill;

- Visual testing for each load;
- Chemical testing: 1 test per year per waste stream/ waste source/ waste carrier for homogenous wastes; and
- Chemical testing: 3 tests per year per waste stream/ waste source/ waste carrier for heterogenous wastes.

Section 2.2 of the Application Report has been updated to reflect this (Appendix B).

Previous reference to 'on-site waste' was in reference to existing wastes present on site, which require testing and treatment, prior to landfilling. The rationale for providing no testing on this waste related to the required high frequency of level 1 basic characterisation and level 2 compliance testing which will be carried out by the appointed treatment contractor.

It is proposed the above frequency of Level 3 verification testing is also applied to this waste stream.

3 Question 2: Environmental Risk Assessment

The Environmental Risk Assessment provided in section 3.5 of the report (624871rev1) accompanying your application considers the risk of acceptance of inert wastes requiring testing. The risk assessment does not clearly consider the risk of accepting waste that is not inert. Additionally, the management measures identified for the risk to the Ely Valley SSSI of accepting inert wastes requiring testing do not include Waste Acceptance Procedures.

ACTION: Please amend your risk assessment to:

i) include the risk of accepting non-inert waste using the source-pathway-receptor approach, with an assessment of the likelihood.

ii) confirm if Waste Acceptance Procedures are part of your risk management measures for risk to the Ely Valley SSSI.

The Environmental Risk Assessment provided identifies the risk management measures for acceptance of inert wastes requiring testing and increase of discharge volume to 5,000m³/day to soakaway. Ongoing monitoring has not been considered in the risk assessment, this should be an essential and integral part of the risk assessment approach to help determine whether the mitigation measures are performing.

ACTION: Identify any ongoing monitoring as part of your risk assessment to check mitigation/management measures are working, for example groundwater monitoring. Amend your risk assessment accordingly.

The Environmental Risk Assessment has identified accidents and fugitive emissions including litter, dust and pests. However, predicted storm events have not been considered as a hazard. Predicted storm events are a foreseeable hazard and should be considered as part of emergency operating conditions.

3.1 Response

The risk of accepting waste which is not inert (i.e. a rouge load) has been assessed in the hydrogeological risk assessment (Caulmert, 2018) submitted with the original permit application.

The ERA has been updated as Stantec (2019), and accompanies this technical note as Appendix B.

4 Question 3: Conceptual Site Model

You have summarised the Conceptual Site Model for the site in report 62487R1rev1 and the Hendy Quarry – Assessment of discharge 2018 submitted with the application. Whilst it provides information on the geology and hydrogeology of the site and specifically of the relationship to the sump, it does not include information on the thickness of the unsaturated zone at the location of the soakaway. The information provided also does not confirm if the discharge to the soakaway is a direct or indirect discharge to groundwater.

ACTION: Please provide further information on the geology and hydrogeology of the soakaway location, including the thickness of the unsaturated zone at the discharge point. Also, please confirm if the discharge is a direct or indirect discharge to groundwater.

4.1 Response

The discharge is an indirect discharge to groundwater.

Water abstracted from the quarry sump is discharged at the soakaway location.

With reference to Figure 4.1, taken from the HRAR (Caulmert, 2018), the soakaway is located approximately north of the 'Tarmac contracting Area' (extreme left on the cross section). The section shows the inferred geology below the soakaway location and its location relevant to the sump.

The sump is located at c.45.7 mAOD which is where the watertable lies. The soakaway is located at an elevation of c.14 m above the quarry sump inferring that there is c. 14m of unsaturated zone at the soakaway location.

Figure 4.2 shows the location of the cross-section through the Hendy landfill site.

Figure 4.1 Cross section B-B' (Caulmert, 2018)

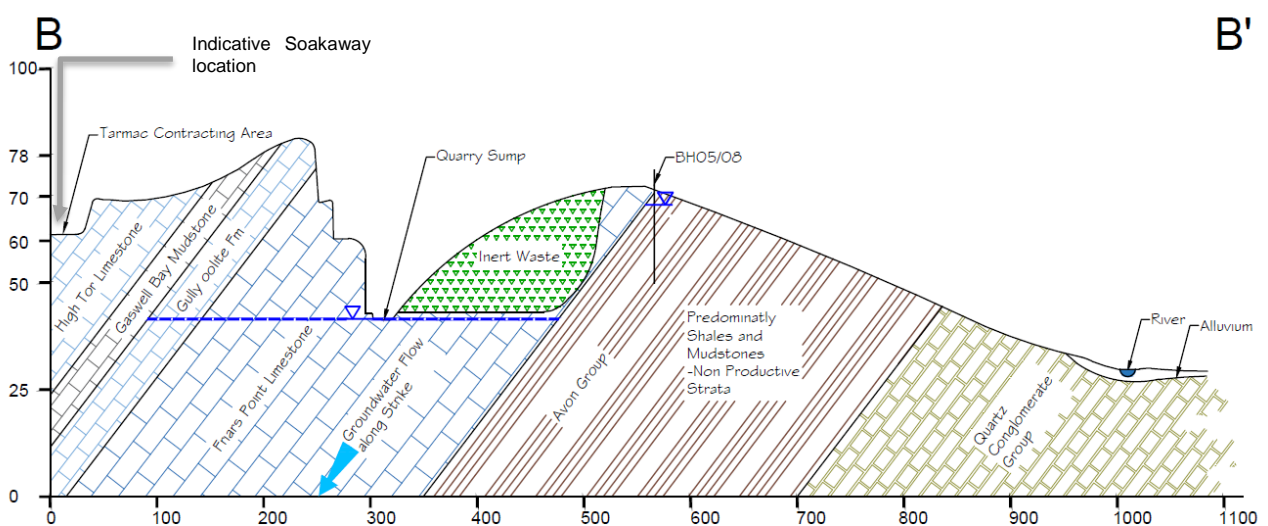
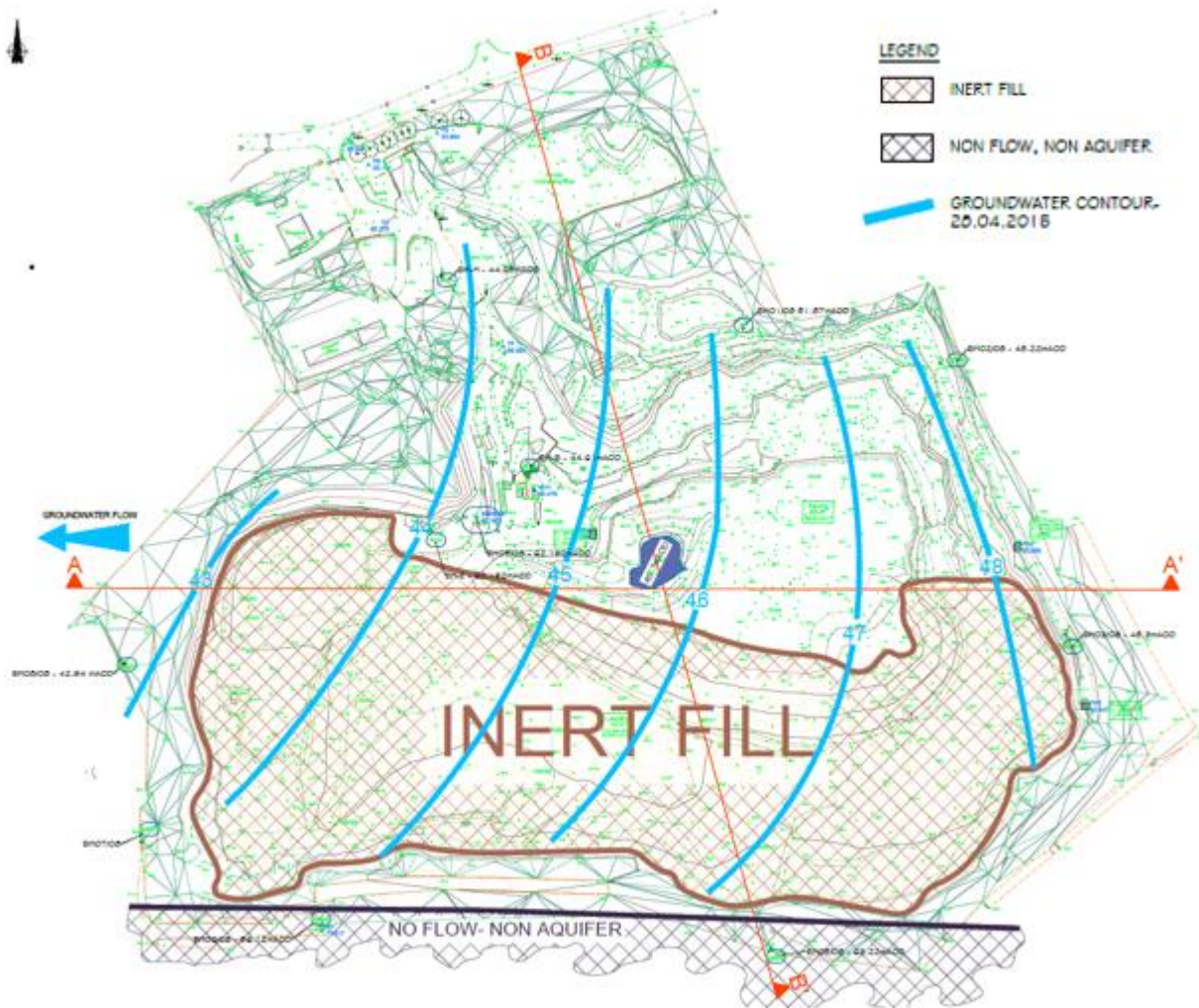


Figure 4.2 Cross section pan (Caulmert, 2018)



5 Surface water management plan

In section 2.3 of the Surface Water Management Plan (SWMP) provided as Appendix H to the application, you have stated what contingency actions will be taken if a limit is breached. It is not clear if these are actions taken when a control/assessment limit is breached or when a trigger/compliance limit is breached.

Control limits are stated 'to have been breached if the three-point rolling average, relative to a particular limit demonstrates a rising trend'. It is unclear what the control limits are, and what is meant by 'relative to a particular limit'.

ACTION: Please confirm the control/assessment limits for discharge volume and rate, and when the contingency actions will be implemented. Please amend the SWMP to clarify these points. Note that any incidence of a non-compliance of the permit should be investigated to establish the root cause of the problem.

The SWMP outlines the inspections and maintenance requirements in section 4.1. This does not include the inspection and maintenance procedures for the surface water pipework. Additionally, this section references the following documents:

- 4.1.1 – MS-EP-CORE-06/01
- 4.1.2 – MS-QP-PROD-01PPM

these have not been included in your application.

ACTION: Please provide us with the above documents, including procedures for inspection and maintenance of pipework.

Section 4.1.6 of the SWMP states that the soakaway will be inspected as required and kept free of debris, whereas the inspection form in Appendix 1 of the SWMP indicates it will be checked weekly. No information has been provided on treatment of the surface water to remove suspended solids prior to discharge.

ACTION: Please confirm:

i) inspection frequency for the soakaway, including whether this will be increased during abnormal and emergency operating conditions. Amend the SWMP accordingly.

ii) how suspended solids are reduced or removed prior to discharge to the soakaway. If there is no treatment, please confirm how the build-up of sediments within pipework and the soakaway is managed.

The surface water drainage system should be designed to cope with predicted storm events. This has not been considered within your SWMP.

ACTION: Please confirm how you have considered predicted storm events with your surface water management.

5.1 Response

The proposed surface water emissions limits and monitoring frequencies are specified in Table S4.1 of the permit and are presented in Table 1 of the revised SWMP. The SWMP has been updated to include the new proposed volume limits and rates for the discharge. Contingency actions and timescales are provided in table 2 of the revised SWMP.

The procedures MS-EP-CORE-06/01 and MS-QP-PROD-01PPM are now included. Please note that the surface water management plant (SWMP) procedures form part of the Environmental Management System

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(EMS) and should be referred to as such in any issued Environmental Permit as the EMS is a working document and any amendment to them should not result in the need for an Environmental Permit variation.

The soakaway will be routinely inspected every three months and kept free of debris. When the daily discharge exceeds 50% of the total permitted volume i.e. 2,500m³ per day the inspection will be increased to weekly.

The settlement of suspended solids is provided in the quarry sump area. Surface water is settled in the sump area prior to being pumped to the discharge. The pump head is floated such that settled solids are not drawn into the pump. This prevents the build-up of solids in the pipework and soakaway.

The storage for storm event is provided by the quarry sump area and the surrounding quarry base. The rate of discharge is then controlled by the pump.

The above items have been added to the revised SWMP, see Appendix H of the revised Application Report in Appendix B to this technical note.

References

Caulmert, 2018. Hendy Landfill Site Hydrogeological Risk Assessment Review 2017, Doc ref: 3145-CAU-XX-XX-RP-O-0301.S0.C1, 12 January 2018.

Environment Agency, 2013. Waste Sampling and Testing for Disposal to Landfill, EBPRI 11507B, Environment Agency, March 2013.

EC, 2003. Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC, Official Journal of the European Communities, 16 January 2003.

Stantec, 2019. Hendy Quarry Landfill: Permit Variation Application (EPR/BT1088ID) report reference 62847R1rev2, March 2019.

Appendices

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Appendix A

Schedule 5 Notice

Notice of request for more information

Environmental Permitting (England and
Wales) Regulations 2016

Notice requiring further information

To:

Company Secretary
Portland House Bickenhill Lane
Solihull
Birmingham
B37 7BQ

Application number: PAN-003267

Natural Resources Wales, in exercise of its powers under paragraph 4 of Part 1 of Schedule 5 of the above Regulations, requires you to provide the information detailed in the attached schedule. The information is required in order to determine your application for a permit, dated **13/09/2018**.

The information requested should be sent to the following address by **25/02/2019**.

Information should be sent to:

Permitting Service (Cardiff)
Natural Resources Wales
Cambria House
29 Newport Road
Cardiff
CF24 0TP

OR

anna.palmer@naturalresourceswales.gov.uk

Name	Date
Anna Palmer	08/02/2019

Authorised on behalf of Natural Resources Wales

Schedule

1. Waste acceptance procedures

1a. Pre-acceptance – Basic characterisation and compliance testing

- The report (624871rev1) accompanying your application in section 2.2 states that waste acceptance at the site will be in accordance with your existing Waste Acceptance Procedure (WAP) provided in Appendix C. The procedure does not clearly explain the pre-acceptance procedures, which need to include:
 - if all wastes are subject to basic characterisation;
 - which wastes require testing; and
 - at what stage in the waste acceptance process, waste acceptance criteria (WAC) limits for inert wastes are applied

Additionally, compliance testing is carried out by the operator according to section 7.1 of your WAP. This is in contradiction to section 2.2 of the report (624871rev1) which confirms that compliance testing is carried out by the waste producer in accordance with current guidance and legislation.

ACTION: Please amend the Waste Acceptance Procedure in Appendix C to clearly show the pre-acceptance process, including confirming:

- all waste streams that are subject to basic characterisation;
- what waste types require testing;
- at what stage the WAC limits for inert wastes are considered, as well as how and who has responsibility for this; and
- what wastes are subject to compliance testing and who has responsibility for completing this.

1b. On-site verification

- The WAP provided as Appendix C to the application does not include the following information on:
 - how long samples and results of analysis will be retained for
 - sampling procedures, including the process for defining the sampling plan and Best Practice used for example BS EN 14899:2005
 - what action is taken if verification testing does not match the basic characterisation and compliance testing provided or WAC limits for inert waste

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Gwefan/Website www.cyfoethnaturiolcymru.gov.uk
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Croesewir gohebiaeth yn y Gymraeg a'r Saesneg
Correspondence welcomed in Welsh and English

The report (624871rev1) accompanying your application in section 2.2 states that verification testing for WAC will be at least 1 per 100 loads (or 1 test per 4,000 tonnes) and 1 test per source. It also states that the frequency may be increased if the waste is heterogeneous.

The verification testing frequencies specified are insufficient and are not in accordance with current guidance.

ACTION: Please amend the Waste Acceptance Procedure in Appendix C and/or the report (624871) to clearly show the on-site verification process and testing frequencies in accordance with current guidance, including further information on:

- how long samples and analysis results are retained
 - the process for defining sampling plans and sampling procedure
 - what action is taken if verification testing fails
- Additionally, in the WAP provided, section 6.1 refers to the rejection of unacceptable loads procedure at section 4.6.4, this appears to be a typo. And MS-EP-A&A-01/05 refers to 'removal of unacceptable loads process Level 3a', which has not been provided.

ACTION: Please confirm the correct rejection of unacceptable loads procedure and provide the removal of unacceptable loads process Level 3a.

- The report (624871rev1) accompanying your application in section 2.2 states that verification testing is not proposed for waste which is already on site. The information provided is insufficient for us to understand what is meant by 'waste which is already on site'. It is assumed that this is waste that is produced at and stored at the inert waste transfer station operated under EPR/FB3633RD.

Verification testing must be carried out in accordance with waste acceptance procedures as specified in the Council Decision 2003/33/EC and guidance on the testing and acceptance of wastes for disposal at landfills. Therefore, the statement above as taken from section 2.2 of your report (624871rev1) is not appropriate. However, verification testing can be carried out at the point of dispatch where the waste producer is also the operator of the landfill where the waste is to be deposited.

ACTION: Please ensure that your WAP clearly defines when wastes streams will be verified on site and when they will be verified at the point of dispatch.

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Correspondence welcomed in Welsh and English

You must consider the following guidance and legislation when amending your Waste Acceptance Procedures:

- [Waste Sampling and Testing for Disposal to Landfill \(Environment Agency\)](#)
- [Waste acceptance at landfills, Guidance on waste acceptance procedures and criteria \(Environment Agency\)](#)
- Landfill Directive Guidance (DEFRA)
- Council Decision 2003/33/EC
- The Landfill Directive
- The Landfill (England and Wales) Regulations

2. Environmental Risk Assessment

- The Environmental Risk Assessment provided in section 3.5 of the report (624871rev1) accompanying your application considers the risk of acceptance of inert wastes requiring testing. The risk assessment does not clearly consider the risk of accepting waste that is not inert. Additionally, the management measures identified for the risk to the Ely Valley SSSI of accepting inert wastes requiring testing do not include Waste Acceptance Procedures.

ACTION: Please amend your risk assessment to:

- i) include the risk of accepting non-inert waste using the source-pathway-receptor approach, with an assessment of the likelihood.
 - ii) confirm if Waste Acceptance Procedures are part of your risk management measures for risk to the Ely Valley SSSI.
- The Environmental Risk Assessment provided identifies the risk management measures for acceptance of inert wastes requiring testing and increase of discharge volume to 5,000m³/day to soakaway. Ongoing monitoring has not been considered in the risk assessment, this should be an essential and integral part of the risk assessment approach to help determine whether the mitigation measures are performing.
ACTION: Identify any ongoing monitoring as part of your risk assessment to check mitigation/management measures are working, for example groundwater monitoring. Amend your risk assessment accordingly.
 - The Environmental Risk Assessment has identified accidents and fugitive emissions including litter, dust and pests. However, predicted storm events have not been considered as a hazard. Predicted storm events are a foreseeable hazard and should be considered as part of emergency operating conditions.

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Correspondence welcomed in Welsh and English

ACTION: Consider all the risks, including predicted storm events, that may be affected by the proposed variation to increase the discharge volume and amend the environmental risk assessment provided accordingly.

You should use the following Environment Agency Guidance when amending the Environmental Risk Assessment:

- [Risk assessments for your environmental permit](#)
- [Groundwater risk assessment for your environmental permit](#)

As well as 'How to comply with your environmental permit, additional guidance for: Landfill (EPR 5.02)', as referenced in your application as the technical standard you are using.

3. Conceptual Site Model

- You have summarised the Conceptual Site Model for the site in report 62487R1rev1 and the Hendy Quarry – Assessment of discharge 2018 submitted with the application. Whilst it provides information on the geology and hydrogeology of the site and specifically of the relationship to the sump, it does not include information on the thickness of the unsaturated zone at the location of the soakaway. The information provided also does not confirm if the discharge to the soakaway is a direct or indirect discharge to groundwater.

ACTION: Please provide further information on the geology and hydrogeology of the soakaway location, including the thickness of the unsaturated zone at the discharge point. Also, please confirm if the discharge is a direct or indirect discharge to groundwater.

Environment Agency Guidance – [Groundwater risk assessment](#) provides further information on what should be included in your conceptual site model.

4. Surface Water Management Plan (SWMP)

- In section 2.3 of the Surface Water Management Plan (SWMP) provided as Appendix H to the application, you have stated what contingency actions will be taken if a limit is breached. It is not clear if these are actions taken when a control/assessment limit is breached or when a trigger/compliance limit is breached.

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Correspondence welcomed in Welsh and English

Control limits are stated 'to have been breached if the three-point rolling average, relative to a particular limit demonstrates a rising trend'. It is unclear what the control limits are, and what is meant by 'relative to a particular limit'.

ACTION: Please confirm the control/assessment limits for discharge volume and rate, and when the contingency actions will be implemented. Please amend the SWMP to clarify these points. Note that any incidence of a non-compliance of the permit should be investigated to establish the root cause of the problem.

- The SWMP outlines the inspections and maintenance requirements in section 4.1. This does not include the inspection and maintenance procedures for the surface water pipework. Additionally, this section references the following documents:

4.1.1 – MS-EP-CORE-06/01

4.1.2 – MS-QP-PROD-01PPM

these have not been included in your application.

ACTION: Please provide us with the above documents, including procedures for inspection and maintenance of pipework.

- Section 4.1.6 of the SWMP states that the soakaway will be inspected as required and kept free of debris, whereas the inspection form in Appendix 1 of the SWMP indicates it will be checked weekly. No information has been provided on treatment of the surface water to remove suspended solids prior to discharge.

ACTION: Please confirm:

- i) inspection frequency for the soakaway, including whether this will be increased during abnormal and emergency operating conditions. Amend the SWMP accordingly.
 - ii) how suspended solids are reduced or removed prior to discharge to the soakaway. If there is no treatment, please confirm how the build-up of sediments within pipework and the soakaway is managed.
- The surface water drainage system should be designed to cope with predicted storm events. This has not been considered within your SWMP.
- ACTION:** Please confirm how you have considered predicted storm events with your surface water management.

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Croesewir gohebiaeth yn y Gymraeg a'r Saesneg
Correspondence welcomed in Welsh and English

Appendix B

Application report (revised) 62847R1rev2



Hendy Quarry Landfill: Permit Variation Application (EPR/BT1088ID)

For the addition of waste types and increase in
the maximum water discharge volume



11 March 2019

T1.02



Hendy Quarry Landfill: Permit Variation Application (EPR/BT1088ID)

Prepared for

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Final

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Hendy Quarry Landfill: Permit Variation Application (EPR/BT1088ID)

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The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Stantec at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

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Revision record:

Rev.	Date	Status	Comment	Author	Checker	Reviewer
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Appendix C	Waste acceptance procedure
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Appendix E	Summary EMS and ISO 14001 certification
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1 Introduction

1.1 Background

Tarmac Trading Ltd (Tarmac) instructed ESI Ltd (ESI) (now Stantec UK Ltd (Stantec)) to prepare and submit an Environmental Permit variation application to facilitate: the inclusion of additional inert waste types; and an increase in the maximum volume limit of the existing water discharge consent. The existing Permit (EPR/ BT1088ID/V006, issued 11 November 2015) allows the operation of an inert landfill accepting 450,000 tonnes per annum (tpa) of waste and a water discharge consent to soakaway 750 m³/day at Hendy Quarry Landfill, School Road, Miskin, Pontyclun, Mid Glamorgan (the Site).

The Site (Figure 1.1) is currently permitted to accept a limited number of inert waste types; those acceptable without testing at an inert landfill. Following the testing of an existing stockpile of material within the recycling area on the Site, intended for deposit within the landfill, it was determined that it did not comply with inert waste acceptance criteria (WAC) due to elevated concentrations of some hydrocarbons. It was decided that this waste would be treated by the deployment of a mobile treatment plant by a third party, with the aim of producing material suitable for deposit in the inert landfill.

The purpose of this variation is to broaden the waste types which can be accepted to include those acceptable at inert landfill with testing, consistent with other inert landfills that Tarmac operates.

Following the preparation of a Run-off Assessment in 2014 (ESI, 2014), it was determined that the actual discharge to soakaway of rainfall run-off from the Site, was likely to regularly exceed the consented volume (750 m³/day). Indeed, some measured volumes had already exceeded the permitted water discharge limit. As such, this variation application seeks to increase the maximum permitted volume, though the actual volume of water discharged from the Site will remain unchanged.

1.2 Variation

This Environmental Permit variation application was prepared by Stantec in September 2018, on behalf of Tarmac and serves to add the waste codes in Table 2.2 and increase the permitted discharge volume for the Site to 5,000 m³/day to more accurately reflect existing conditions.

It was agreed with National Resource Wales (NRW) that the variation would constitute a *normal variation* application (NRW pre-application correspondence, Appendix A).

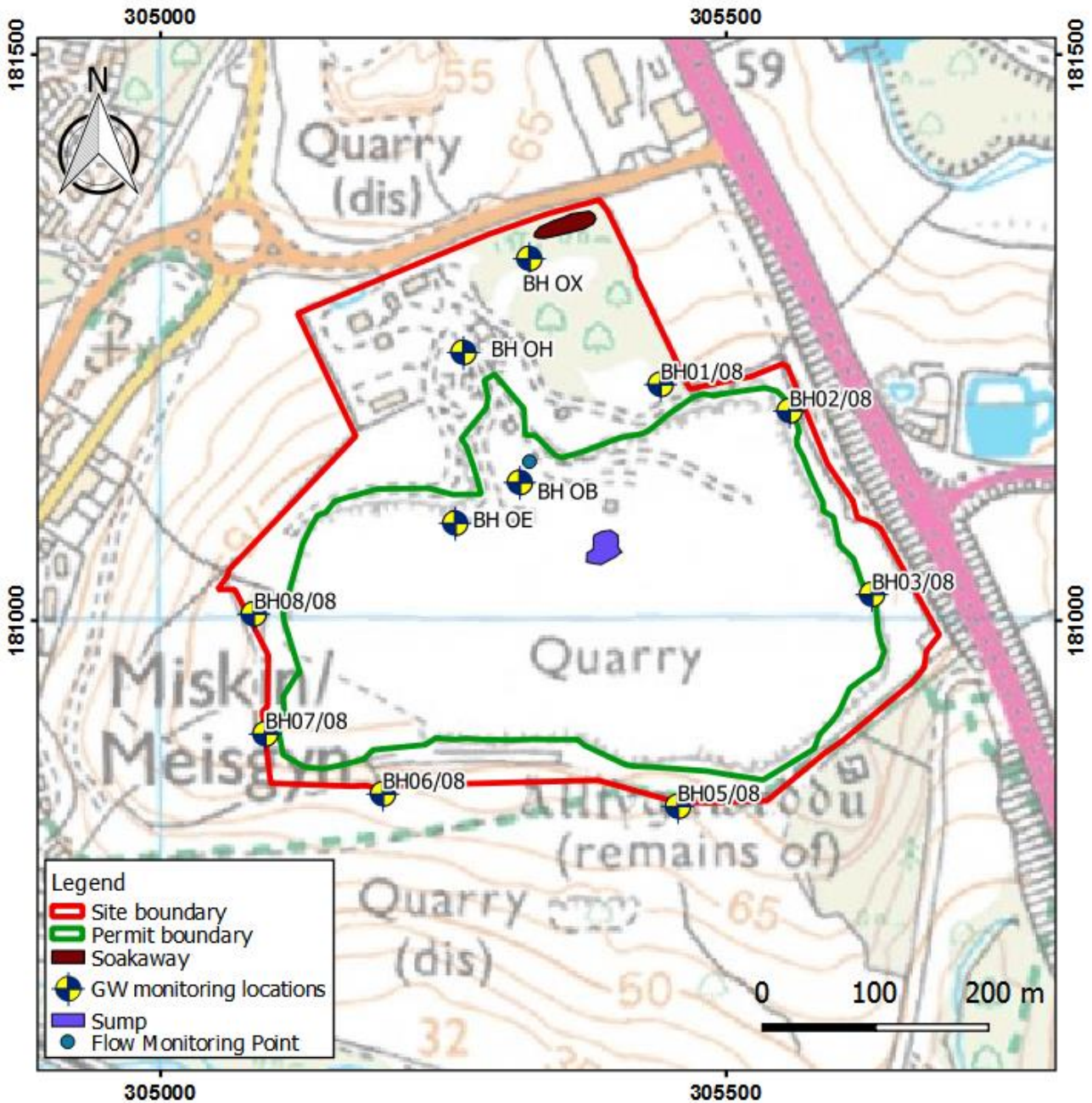
A revision to this report was prepared in November 2018 to include consideration of an Environmental Risk Assessment (ERA) in relation to the proposed additional waste types and the increase in water discharge volume, in accordance with appropriate guidance (Environment Agency, 2006, 2017 and 2018).

The application is accompanied by the appropriate application forms;

- Part A: About you;
- Part C2: General: Varying a bespoke permit;
- Part C4: Varying a bespoke waste operation permit;
- Part C6: Variation to a bespoke water discharge activity and groundwater (point source) activity;
- Part F1: Opra, charges and declarations; and
- Part F2: Charging for discharges charges and declarations.

The normal variation application fee has been determined from the Operational Risk Appraisal (Opra) for the Site, which is presented as Appendix B (electronic). The Opra submitted with the original application had an Opra score of 54. Following inclusion of some NRW requested amendments, the Opra score is now 55. Payment of the additional fee (£139) has been processed electronically.

Figure 1.1 Site plan and monitoring locations



1.3 Site Setting

The Site occupies approximately 13.5 ha of the wider Hendy Quarry site located in Miskin, Pontyclun centred approximately at National Grid Reference (NGR) ST 05425 80991. It is situated c.0.5 km to the east of Miskin and c.2 km south of Llantrisant, Mid Glamorgan.

This Site is surrounded by predominately agricultural land to the east, former quarries to the north and south (now agricultural land or woodland) and residential development associated with the towns of Miskin and Hendy to the west and north west. The A4119 bounds the quarry to the east and the M4 runs broadly east-west c.700 m to the south.

The Ely Valley Site of Special Scientific Interest (SSSI) runs broadly north west to south east c.260 m south of the Site, at its closest approach. There are also a number of issues and brooks to the east and south of the Site. These are discussed in more detail in the Surface Water Feature Survey technical note (ESI, 2018a).

1.4 Conceptual site model

The Conceptual Site Model (CSM) remains unchanged from those presented in the series of HRA's produced and submitted to NRW for approval (Caulmert, 2018; BCL,2009). Table 1.1 provides a summary of the CSM.

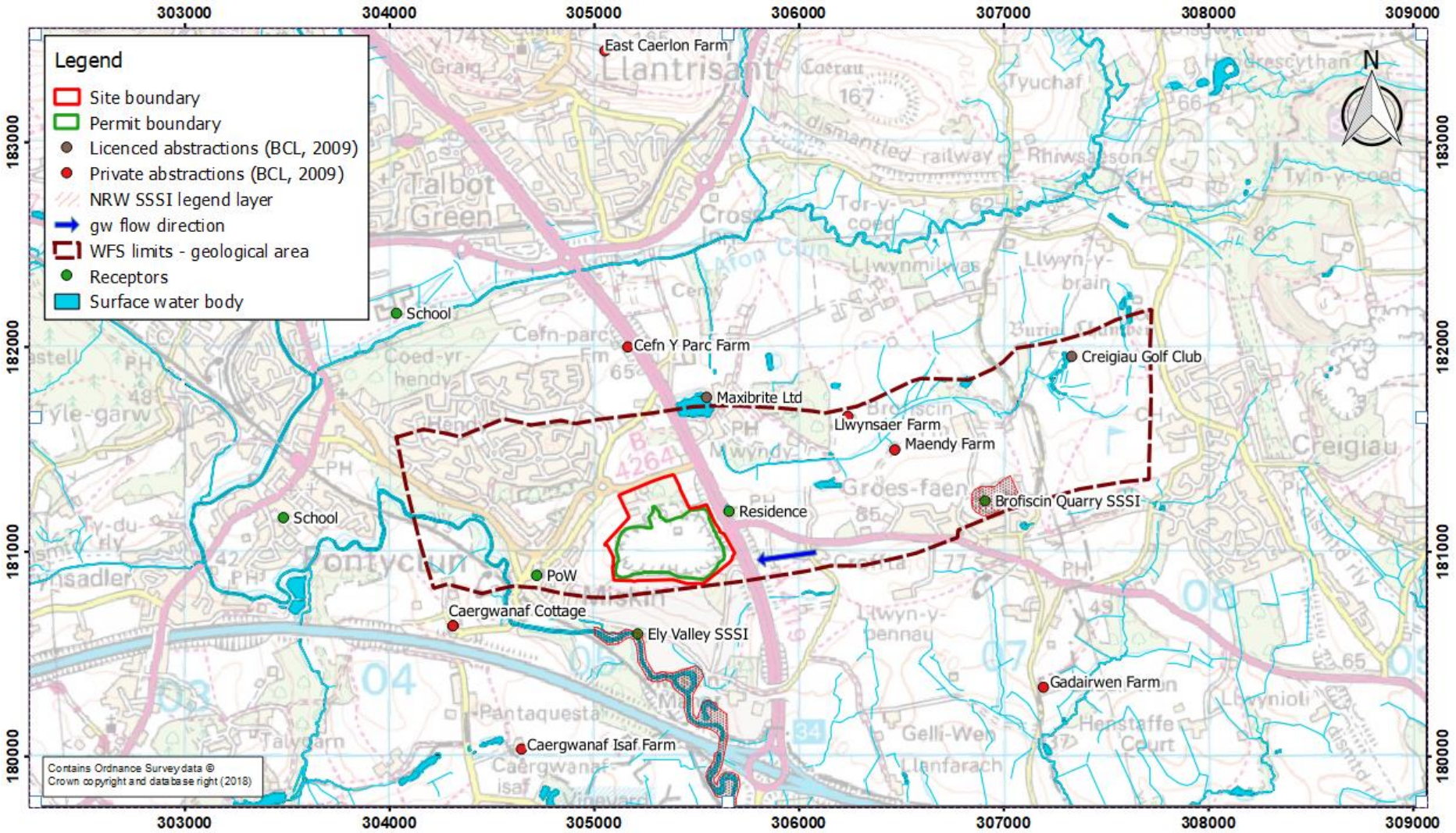
Table 1.1 Summary conceptual site model

Topography	<p>The Site and local topography comprise an area of low hills with summit elevations ranging from 80-91 mAOD (metres Above Ordnance Datum). The quarry has been excavated at the summit of one of these hills. Ground elevation at the quarry boundary is c.80 mAOD.</p> <p>To the south and west of the Site, land slopes steeply to the valley of the River Ely to c.32 mAOD.</p>
Geology	<p>Superficial deposits, (now excavated within the quarry void) comprise glacial sands and gravels, boulder clay and recent alluvium (Diametcon) and cover much of the surrounding area.</p> <p>Bedrock deposits comprise;</p> <ul style="list-style-type: none"> • Upper Old Red Sandstone Group; • Overlying Lower Carboniferous Limestone Series; • The Lower Limestone Shale Group; • The Black Limestone Group (into which the quarry is excavated); and • The Hunts Bay Oolite Group.
Hydrology	<p>The Site lies within the catchment of the River Ely. At its closest approach, the river flows towards the south east, passing some 300 m to the south west of the Site.</p> <p>Tributaries of the River Ely drain the area of hills within which the quarry is situated.</p> <p>'Croffta Stream' arises c. 550 m east of the quarry boundary (in the vicinity of Croffta Farm) and flows westwards under the A4119 before veering south towards the River Ely some 250 m southeast of the Site at its closest approach. Its confluence with the River Ely is at Miskin Manor, 750 m south of the Site.</p> <p>'Brofiscin Quarry/Farm Stream' arises in the vicinity of Creigiau Golf Course and joins a stream coming from Brofiscin Quarry, the confluence being 1.5 km to the east of the Site. It flows westwards towards the quarry (coming within 200 m of the north east boundary of the Site) then heads northwards to its confluence with Afon Clun, some 1.1 km north of the Site.</p> <p>The Afon Clun flows from east to west and, 1.7 km north west of the Site, discharges into the River Ely.</p> <p>The Site is not in an area at risk of fluvial flooding.</p>
Hydrogeology	<p>The Black Rock Limestone Group, into which the quarry is excavated, is part of the Carboniferous Limestone Series, a Principal Aquifer.</p> <p>Based on groundwater level data, groundwater flow is determined to be broadly from east to west in the Carboniferous Limestone.</p> <p>The Avon Group (Lower Limestone Shale) is classified as Secondary A. It is noted that this stratum was previously classified as a non-aquifer. Although the change in classification reflects a greater understanding of the potential for this stratum to transmit groundwater, site investigation and monitoring data collected over the development of the site confirm that the original CSM remains valid where there is no groundwater migration towards the south. This is confirmed</p>

	<p>by the presence of two boreholes along the southern boundary (installed within the Avon Group) which have significantly higher groundwater levels in comparison to those installed within the permeable fractured limestone.</p> <p>Therefore, notwithstanding the permeability contrast between the limestone and Avon group, the hydraulic gradient is such that there is no possible groundwater flow towards the south. The water levels within the Avon Group boreholes are considered to represent water in the superficial deposits and weathered zone. Therefore, it is considered that these strata effectively form a barrier to flow in a southern direction at the site. The orientation and dip of this strata is considered to constrain the groundwater flow to the south and therefore the principal groundwater flow is along the strike of the beds towards the west.</p>
Abstractions	<p>Environment Agency data indicate that the only licensed groundwater abstraction within 3 km radius of the Site is the on-Site abstraction (Licence Number 21/57/31/0010) borehole at NGR 30532 18111, taking groundwater from the Carboniferous Limestone. The permitted rate of abstraction is 56,825 m³/yr for mineral washing.</p> <p>Two licenced surface water abstractions are present within 3 km radius of the Site (see Figure 1.2).</p> <p>Maxibrite Limited (Licence Number 21/57/31/0043) is authorised to abstract from Mwyndy Pool (NGR 30555 18175), some 300 m to the NNE of the Site.</p> <p>Mwyndy Pool exhibits a surface water level of some 55 mAOD (based upon topographic detail shown on the OS map). It is considered that the Pool lies hydraulically up-gradient from the Site, given that groundwater levels in the Permit Area declines from 50/51 mAOD (eastern boundary) down to 44 mAOD (western limit).</p> <p>Creigiau Golf Club Limited (Licence Number 21/57/31/0034) is authorised to abstract from a spring-fed pond at NGR 30733 18195 (67.5 mAOD), which is some 1.85 km to the ENE (hydraulically up-gradient) of Hendy Quarry.</p> <p>The permitted rate of abstraction is 7,000 m³/yr (spray irrigation) and 8,052 m³/yr (topping up a series of conservation ponds).</p> <p>A total of eight private water abstractions are recorded within the vicinity of the Site, see Figure 1.2. It is unknown if they are from surface or groundwater, so have conservatively been assumed to be groundwater. The abstractions are listed against farm locations, so it is assumed that they are for irrigation purposes.</p>
Designated habitat and protected species	<p>The closest water-related Site of Special Scientific Interest (SSSI) is a stretch of the Ely Valley, some 2 km south/downstream from the Site, between NGR 3061 1789 and NGR 3097 1767. The SSSI, which occupies some 87 ha, is the best location in Wales for <i>Aconitum anglicum</i>. This rare plant has a population alongside several miles of the River Ely.</p> <p>Brofiscin Quarry SSSI at Groes Faen (NGR 3070 1813) is located some 1.3 km to the east of the Site. This site shows an important section through the Lower Carboniferous Limestone Black Rock Group, including the Brofiscin Oolite.</p> <p>The SSSI comprising Llantrisant/Cymdda Common and Pastures (113.2 ha) lies immediately to the north of the hill-top town of Llantrisant, approximately 2.6 km north of Hendy Quarry. It is of special interest for its extensive area of predominantly acidic marshy grassland in a lowland setting and for smaller areas of species-rich neutral and acidic grassland and soligenous flush. The site lies over Coal Measures and drains via ditches towards tributaries of the River Ely.</p> <p>Nant Myddlyn (a woodland alongside a tributary of the Afon Clun) is centred upon NGR 3073 1835, this being 2.75 km to the northeast of the Site.</p> <p>The local nature reserve at Coed Llwyn Rhyddid comprises wet woodland,</p>

	<p>supporting the third largest heronry in Wales. It is centred upon NGR 3041 1778, some 3.25 km to the SSW of the quarry.</p> <p>There are no other protected sites within 4 km radius of Hendy Quarry. The search not only included SSSI and National Nature Reserves (NNRs) but also sites of international importance (e.g. Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites) and Landscape Protected Areas (e.g. Areas of Outstanding Natural Beauty (AONBs) and National Parks).</p>
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Figure 1.2 Receptors plan



2 Proposed variation

2.1 Additional Waste Types

The Site is currently permitted to accept the waste types as listed in Schedule 3 of the permit (EPR/BT1088ID/V003), which are reproduced in Table 2.1. These wastes are consistent with wastes acceptable without waste acceptance testing (EC, 2003).

Table 2.1 Permitted waste types

EWC code	Description	Restrictions
10	Thermal Processes	
10 11	Manufacture of glass and glass products	
10 11 03	Waste glass based fibrous materials	Only without organic binders
15	Packaging, absorbents, wiping cloths and filters	
15 01	Packaging (including separately collected municipal packaging waste)	
15 01 07	Glass packaging	
17	Construction and demolition waste	
17 01	Concrete, bricks tiles and ceramics	
17 01 01	Concrete	Selected C&D waste only
17 01 02	Bricks	Selected C&D waste only
17 01 03	Tiles and ceramics	Selected C&D waste only
17 01 07	Mixtures of concrete, bricks, tiles and ceramics	Selected C&D waste only
17 02	Wood, glass and plastic	
17 02 02	Glass	
17 05	Soil (including excavated soil from contaminated sites) stones and dredging spoil	
17 05 04	Soil and stones	Excluding topsoil, peat; excluding soil and stones from contaminated sites
19	Materials from waste and water treatment	
19 12	Mechanical treatment of waste (for example sorting, crushing, pelletising) not otherwise specified	
19 12 05	Glass	
20	Municipal waste and similar materials from commerce industry	
20 01	Separately collected fractions	
20 01 02	Glass	Separately collected glass only
20 02	Garden and park wastes (including cemetery waste)	
20 02 02	Soil and stones	Only from garden and parks waste; Excluding topsoil, peat

It is proposed that the waste types are increased to include the wastes in Table 2.2 which will comply with inert Waste Acceptance Criteria (WAC) as defined in EC, 2003.

Table 2.2 Proposed additional waste types

EWC code	Description	Restrictions
01	Mining, quarrying, mineral treatment	
01 01	Mineral excavation	
01 01 02	Wastes from mineral non-metalliferous excavation	
01 04	Physical and chemical processing of non-metalliferous minerals	
01 04 08	Waste gravel and crushed rock other than those mentioned in 01 04 07	
01 04 09	Waste sand and clays	
10	Thermal processes	
10 12	Manufacture of ceramic goods, brick, tiles and construction products	
10 12 08	Waste ceramics, bricks, tiles and construction products (after thermal processing)	
17	Construction and demolition waste	
17 05	Soil (including excavated soil from contaminated sites) stones and dredging spoil	
17 05 08	Track ballast (other than those mentioned in 17 05 05)	
17 09	Other construction and demolition wastes	
17 09 04	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	
19	Materials from waste and water treatment	
19 12	Mechanical treatment of waste (for example sorting, crushing, pelletising) not otherwise specified	
19 12 09	Minerals (except for sand, stones)	
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	
19 13	Soil and groundwater remediation	
19 13 02	solid wastes from soil remediation other than those mentioned in 19 13 01	

Wastes having any of the following characteristics shall not be accepted:

- Consisting solely or mainly of dusts, powders or loose fibres
- Wastes that are in a form which is either sludge or liquid.

2.2 Waste Acceptance

Waste acceptance at the Site will be strictly controlled in accordance with Tarmac's existing Waste Acceptance Procedure (WAP), which is presented as Appendix C and includes provision for acceptance, checking and rejection.

2.2.1 Level 1 – Basic characterisation

Basic characterisation and compliance testing will be carried out by the waste producer and will be checked in accordance with the WAP. Tarmac will ensure basic characterisation checks are carried out at the pre-acceptance stage, with entry of the waste information on the Site Notification (SN) Form and database.

Prior to acceptance of waste a basic waste characterisation procedure will be undertaken by the waste producer to ensure that the waste is appropriate for acceptance at inert landfill classification sites. This will be by means of the Site Notification (SN) Form, which will include the necessary information for a Level 1 Basic Characterisation as specified in the Landfill Regulations. The following information will be required as minimum

- Waste source and origin;
- The code applicable to the waste under the European Waste Catalogue (EWC);
- Determination if the waste has any hazardous properties as per WM3 In the case of hazardous waste, the properties which render it hazardous;
- The process producing the waste (including a description of the process, its SIC code and characteristics of its raw materials and products which may affect its behaviour under landfill conditions);
- The waste treatment applied, or a statement of why treatment is not considered necessary;
- The appearance of the waste (including smell, colour, consistency and physical form);

- Confirmation that the waste is not prohibited from disposal to landfill (for example liquid waste and whole used tyres);
- The class of landfill the waste can be disposed at;
- Confirmation of whether the waste requires testing; and if so,
- Copies of the Level 1 (and Level 2, if appropriate) WAC testing data from the waste producer.

2.2.2 Level 3 - On-site verification testing

Level 3, on-site verification testing will be carried out as follows for all waste accepted for deposit within the landfill:

- Visual testing for each load;
- Chemical testing; 1 test per year per waste stream/ waste source/ waste carrier for homogenous wastes; and
- Chemical testing; 3 tests per year per waste stream/ waste source/ waste carrier for heterogenous wastes.

For wastes requiring testing (Table 2.2), verification chemical testing will comprise Waste Acceptance Criteria (WAC) to verify that the waste is inert as defined in EC (2003). The verification testing will be in accordance with BS EN 12457-2:2002, or BS EN 12457-4:2002 leaching test (L:S 10 l/kg) which will be compared to the WAC results provided by the waste producer, to ensure it is consistent.

All samples sent for analysis will be retained at the testing laboratory for a period of one month, in line with standard practice.

2.3 Water Discharge Volume Increase

The Site is currently consented to discharge 750 m³/day of water to soakaway under the existing permit (EPR/BT1088ID).

Following some exceedances of this limit, a technical assessment (ESI, 2014) was commissioned, which found that the rainfall contribution was greater than that originally calculated. ESI (2014) determined that in order to cope with the potential rainfall run-off at the Site, a water discharge volume rate of 2,500 m³/day was more appropriate.

A Drainage Assessment (ESI, 2018b), was prepared to assess the relative rainfall / groundwater contribution to the water discharged from Site. The assessment concludes that the discharge is predominately rainwater. A copy of this assessment is included as Appendix G. This assessment also considered the maximum water discharge rates based on measured discharge (flow rate) data between 2014 and 2018. As such, it was considered that a water discharge limit of **5,000 m³/day** was deemed to be more appropriate. This is based on monitored water discharge flow data (2014-2018) and simulated maximum rainfall run-off calculations, which were calculated to be 5,281 m³/day, see Section 3 of ESI (2014).

2.3.1 Data limitations

The water discharge flow rate is measured on a continual basis by a flow monitor. The flow rate data collection is manual and as such, may not be at regular (e.g. 24 hr) intervals. It is possible that inconsistencies in data collection, may cause some 'spike' results in the flow rate measurements. However, it is acknowledged that the discharge rate is rainfall dependant and therefore likely to produce 'spikes' following rainfall events.

The pump operates on a continuous (24 hour) basis, when required. The maximum pump rate is not known.

It is important to note that the request to increase the water discharge limit is simply an administrative correction for actual discharge of incident rainfall at the Site, which has been ongoing since 1998. The rate of water discharge is limited by the pumping rate to the soakaway,

discharge point. The pump has operated at maximum pumping capacity over 24 hr periods during rainfall events without problem.

To answer the questions in application form Part C6, Q4, ESI (2014) was used to answer each question in Table 2.3.

Table 2.3 Discharge calculations

Application reference Part C6	Question	Answer	Justification
Q4a	Daily dry weather flow (m ³ /day)	100	Discharge is predominately for the removal of rainfall ingress to the quarry void. Estimate is based on measured flow rates during dry weather conditions (2014 – 2018).
Q4b	Maximum discharge (m ³ /day)	5000	Based on measured discharge flow rates 2014-2018 (Figure 2.2 of ESI, 2018b)
Q4c	Maximum discharge (l/s)	58	As above
Q4d	Maximum non-rainfall dependant discharge (m ³ /day)	100	Section 3 of ESI 2018b discusses dry weather flow rates of <100m ³ day
Q4e	Maximum rate of rainfall dependant discharge (l/s)	58	As for Q4c, based on the majority of discharge comprising of rainfall

2.3.2 Soakaway design

The soakaway has not been formally designed. However, during its operation, it has demonstrated that it can adequately convey the water discharge flow rates related to the incident rainfall at the Site, without adverse (e.g. flooding) impacts.

As the water discharge is clean, rainfall runoff only, no treatment is required. The water discharge quality must meet the limits specified in the Permit (Table S4.1).

2.3.3 Discharges to groundwater – risk assessment

Application form Part C6 Q10 requires that water discharges to groundwater are accompanied by a quantitative risk assessment in accordance with “H1 Risk Assessment Horizontal Guidance Note H1 – Groundwater sections”. It is acknowledged that this guidance is now withdrawn and is replaced with the guidance at Environment Agency (2018).

Environment Agency (2018) provides that a qualitative assessment is appropriate where;

- *“the discharge has acceptably low concentrations of hazardous substances, or in concentrations that are the same as the natural background levels in the groundwater (whichever is the higher concentration);*
- *the discharge has concentrations of non-hazardous pollutants that are within the relevant environmental standards, or in concentrations that are the same as the natural background levels in the groundwater;*

- *there's a very low risk to groundwater-fed receptors due to the presence of unproductive drift or unproductive bedrock strata (and there are no aquifers present or near your activity) and remoteness from surface waters; or*
- *the volume or hydraulic loading rate of the discharge is so small such that only minimal dilution in underlying groundwater will be needed to avoid pollution by non-hazardous pollutants."*

It is considered by ESI (2018b), that the discharge comprises predominately rainwater collected from the quarry sump with a minor contribution from groundwater, which is returned to the aquifer within close proximity from where it is removed. Quality limits imposed on the water discharge by the Permit (Table S4.1) will still serve to monitor the quality of the discharge.

In addition, there is no change proposed to those activities over and above those already occurring at the Site. No adverse impacts have been recorded.

As such, it is considered that, given the nature of the discharge, a qualitative risk assessment is appropriate. The risk assessment is detailed in Section 3.5.

3 Operating techniques

In accordance with the respective form guidance (NRW, 2016 and 2017) this section sets out the operating techniques and how the Site will be managed in order to ensure there is no risk to the environment.

3.1 Technical Competence Management

In accordance with Part C2, Question 3b1, the Tarmac will continue to provide Technically Competent Management (TCM) at the Site. TCM will continue to be provided by Andrew Bevan who is certified under the WAMITAB scheme. Copies of Andrew's up-to-date certificates are included in Appendix D.

3.2 Financial Provision

Due to the nature of the changes, the existing financial provision remains appropriate and there is no change.

3.3 Environmental Management System

The Site will continue to be managed in accordance with Tarmac's Environmental Management System (EMS) which is accredited to ISO 14001. A summary of the EMS together with the current ISO 14001 certification, is provided in Appendix E.

3.4 Hydrogeological Risk Assessment

A review of the Site's Hydrogeological Risk Assessment (HRA) was produced in 2017 by Caulmert (2018) and was submitted to NRW. A copy of the HRA is included as Appendix F for completeness.

The HRA concluded;

"The review has indicated that there has been no significant change in the conceptual model over the review period. The waste material permitted at the site remains inert waste as defined by the LFD and appropriate waste acceptance procedures are employed at the site.

Therefore, under the LFD there is no requirement to collect leachate from the site, install an artificial sealing layer nor provide a low permeability cap to the site.

Future areas for disposal will meet the requirements for a geological barrier with a minimum of 1 m at 1×10^{-7} m/s or equivalent placed in all new areas in accordance with the a CQA plan.

This report has demonstrated that the site remains in a high sensitivity setting with respect to the groundwater environment and that the assessment of accidents and consequences has indicated that there would be no discernible impact on the receptor.

Requisite surveillance has been detailed to monitor the performance of the site and enable its compliance with the Environmental Permitting Regulations. The current groundwater monitoring regime is considered to be adequate based on the site's environmental setting.

Recommendations include the instatement or refurbishment of PZ07/08 to comply with the minimum requirement of 2 down gradient monitoring boreholes."

Section 3.5.11 of Caulmert (2018) considered the acceptance of inert waste and allowed provision for the acceptance of a rouge load at a conservative rate of 1 in 100 loads.

The waste types to be accepted at the Site will remain inert and the provision of 1 in 100 rogue loads is considered conservative enough to apply to inert waste which requires testing. As such, the conclusions of Caulmert (2018) remain appropriate for this variation.

3.5 Environmental Risk Assessment

An Environmental Risk Assessment (ERA) (Crestwood, 2000) was submitted with the original Permit application in accordance with H1 guidance, which assessed the risk associated with the currently permitted waste types (Table 2.1) and the risk associated with the consented water discharge at 750 m³/day.

The risks associated with the water discharge has been assessed in line with the relevant guidance (Environment Agency, 2018).

As the risks associated with the water discharge has been previously assessed, it is considered that this assessment considers the potential risks associated with;

- discharging 5,000 m³/day (of predominately rainfall) compared to the permitted 750 m³/day; and
- the additional proposed inert waste types.

The process of risk assessment is an evaluation of the probability of harm, and comprises the identification of sources of contamination, receptors that may be affected by the contamination and pathways by which the receptors may be harmed. This is consistent with the approach advocated by Environment Agency (2017 and 2018).

Table 3.1, Table 3.2 and Table 3.3 are derived from CIRIA C552 (2001) and have been used to define the risk rating presented in the Preliminary Risk Assessment (Table 3.4). It is appreciated that the risk assessment approach advocated by CIRA 552 is focused on risks associated with contaminated land, however this industry best practice approach is considered applicable for the purpose of this assessment of risks to groundwater receptors and also aligns with requirements of EA Remedial Targets Methodology (Environment Agency, 2006) and Environment Agency (2018).

Table 3.1: Classification of consequence

Classification	Definition
Severe	Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Statutory Guidance for Part IIA of the Environment Protection Act 1990. Short term risk of pollution (note; Water Resources Act contains no scope for considering significant pollution) of sensitive water resource. Catastrophic damage to building/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.
Medium	Chronic damage to human health ('significant harm', as defined by the Statutory Guidance for Part IIA of the Environment Protection Act 1990). Pollution of sensitive water resources (note; Water Resources Act contains no scope for considering significant pollution). A significant change in a particular ecosystem, or an organism forming part of such an ecosystem.
Mild	Contamination present although unlikely to constitute a significant chronic health risk. Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.

Classification	Definition
Minor	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc.). Potential minor release of contamination to local water features. Easily repairable effects of damage to buildings, structures and services (harm which may result in a financial loss or expenditure to resolve). Short term, localised damage may occur to eco-systems; consequences are spatially and temporally limited.

Table 3.2: Classification of probability

Classification	Definition
High likelihood	There is a contaminant linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a contaminant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period that such an event would take place, and is even less likely in the shorter term.
Unlikely	There is a contaminant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table 3.3: Matrix of consequence against probability to gain a risk classification

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table 3.4 considers the CSM and remaining uncertainties and in this context assesses likely risks to identified receptors in relation to the proposed increased water discharge.

Table 3.4: Contaminant linkage assessment

Source / hazard	Pathway	Receptor	Consequence	Probability	Risk	Risk management / comment
Acceptance of inert waste	Leaching through unsaturated zone	Groundwater in the High Tor Limestone Formation (Principal A aquifer)	Medium	Low likelihood	Moderate/ Low risk	<p>Tarmac employs strict waste acceptance controls at the Site (Appendix C). Thorough checks are made of waste producers Level 1 basic characterisation and Level 2 compliance checking data before loads are accepted to the Site.</p> <p>In addition, Level 3 verification testing (Section 2.2) provides confidence that non-inert waste will not be accepted to the Site, removing the source.</p> <p>Ongoing groundwater monitoring will confirm that risk to groundwater, remains low.</p>
Acceptance of waste types which are not inert (i.e. a rouge load)	Leaching through unsaturated zone	Groundwater in the High Tor Limestone Formation (Principal A aquifer)	Medium	Low likelihood	Moderate/ Low risk	<p>As above plus:</p> <p>In the unlikely event of acceptance of non-inert waste, volumes will be minimal due to acceptance procedure checks.</p>
Acceptance of inert waste	Leaching through unsaturated zone and subsequent groundwater pathways	Groundwater including nearest abstraction point (Maxibrite Ltd 300 m NNE)	Medium	Low likelihood	Moderate/ Low risk	<p>As above plus:</p> <p>All known groundwater abstractions are located upgradient of the Site.</p> <p>Downgradient abstractions (>3 km) mean that any effluent will be subject to significant dilution.</p> <p>Ongoing groundwater monitoring will confirm that risk to groundwater and subsequent receptors, remains low.</p>
Acceptance of waste types which are not inert (i.e. a rouge load)	Leaching through unsaturated zone and subsequent groundwater pathways	Groundwater including nearest abstraction point (Maxibrite Ltd 300 m NNE)	Medium	Low likelihood	Moderate/ Low risk	<p>As above plus:</p> <p>In the unlikely event of acceptance of non-inert waste, volumes will be minimal due to acceptance procedure checks.</p>
Acceptance of	Leaching	Ely Valley	Medium	Low	Moderate/	Groundwater flow is determined to be from east to west

Source / hazard	Pathway	Receptor	Consequence	Probability	Risk	Risk management / comment
inert waste	through unsaturated zone, subsequent groundwater and surface water pathways	SSSI, 230 m south of Site		likelihood	Low risk	<p>through the Site, within the Carboniferous Limestone meaning that there may be a pathway between the Site and the River Ely.</p> <p>It is unlikely that there will be a source due to WAP. Tarmac employs strict waste acceptance controls at the Site (Appendix C). Thorough checks are made of waste producers Level 1 basic characterisation and Level 2 compliance checking data before loads are accepted to the Site.</p> <p>Level 3 verification testing (Section 2.2) provides confidence that non-inert waste will not be accepted to the Site, removing the source.</p> <p>In addition to above;</p> <p>The is c 530 m of groundwater pathway followed by 500 m of surface water pathway along the River Ely until it meets the SSSI designation, downstream.</p> <p>Risk of adverse impact from the Site on the Ely Valley SSSI is considered unlikely due to significant attenuation and dilution potential.</p> <p>It is considered that no pathway exists between the Carboniferous Limestone and the Avon Group (Mudstone) as groundwater levels indicate distinct aquifers.</p>
Acceptance of waste types which are not inert (i.e. a rouge load)	Leaching through unsaturated zone, subsequent groundwater and surface water pathways	Ely Valley SSSI, 230 m south of Site	Medium	Low likelihood	Moderate/ Low risk	<p>As above plus:</p> <p>In the unlikely event of acceptance of non-inert waste, volumes will be minimal due to acceptance procedure checks.</p>
Increase of discharge volume from 750 m ³ /day to 5,000 m ³ /day to existing	Leaching through unsaturated zone	Groundwater in the Carboniferous Limestone (Principal A)	Medium	Unlikely	Low risk	<p>The risk rating reflects the possible presence of a potential contaminant linkage, though it is not certain if this pathway exists.</p> <p>The discharge has been demonstrated to be predominately rainfall, with a small volume of groundwater. The discharge is</p>

Source / hazard	Pathway	Receptor	Consequence	Probability	Risk	Risk management / comment
soakaway		aquifer)				<p>to groundwater via soakaway, which is likely to be dominated by fracture flow.</p> <p>Site operating procedures (Appendix H) for the Site ensure that fuel and oil are stored securely and appropriately at the Site. Refuelling procedures ensure that spills from re-fuelling do not occur or are addressed in a timely manner such that fuel cannot enter the water management system.</p> <p>As such fuel and oil are unlikely to pose a risk to groundwater or subsequent receptors from the Site.</p> <p>As mentioned previously, strict waste acceptance procedures will ensure negligible risk of incident rainfall coming into contact with non-inert waste and resulting leachate potential.</p> <p>Ongoing groundwater monitoring will confirm that risk to groundwater and subsequent receptors, remains low.</p> <p>As such it is considered that the water discharge poses very low risk</p>
Increase of discharge volume from 750 m ³ /day to 5,000 m ³ /day to existing soakaway	Risk of localised flooding	School Road and users of School Road.	Severe	Unlikely	Moderate/ Low risk	<p>A risk of flooding exists as the increase from 750 m³/day to 5,000 m³/day is large. However, it should be acknowledged that the 5,000 m³/day reflects actual volumes which have been discharged at the Site since it began operating.</p> <p>There are no existing issues relating to flooding at the Site.</p> <p>There are no increased risks of contaminant transport or loading with the increased discharge volumes. In fact, a lowered risk may be attributed in the form of dilution of groundwater.</p> <p>Ongoing groundwater monitoring will confirm that risk to groundwater and subsequent receptors, remains low.</p>
Accidents i.e. fire, vandalism	Airbourne, unmitigated release to environment	Nearby residential receptors (closest 100 m west on A4119)	Medium	Unlikely	Low risk	There is no more risk of accidents, noise and vibration emissions from the proposed increase in discharge volume and acceptance of additional inert waste types.
Noise and	Airbourne		Medium	Unlikely	Low risk	

Source / hazard	Pathway	Receptor	Consequence	Probability	Risk	Risk management / comment
vibration						
Fugitive (dust, litter, pests)	Windblown, airbourne, overland		Medium	Unlikely	Low risk	There is the potential to accept waste with additional potential for litter, or material which may attract pests, however given the strict waste acceptance criteria, this risk is considered to be negligible.
Predicted storm events	Risk of localised flooding, Leaching through unsaturated zone and subsequent groundwater pathways	Groundwater including nearest abstraction point (Maxibrite Ltd 300 m NNE) Ely Valley SSSI, 230 m south of Site	Medium	Low likelihood	Moderate/ low risk	Storm events may result in additional rainfall ingress resulting in the need to abstract more water. This could result in localised flooding at the discharge point. Permeability in the limestone means flooding is unlikely. In addition, water levels at the discharge can be monitored and water retained within the void, if necessary. Additional rainfall ingress means that more infiltration to groundwater may occur. More infiltration also means increased dilution potential, resulting in a lower risk to groundwater and downgradient SSSI receptors. Ongoing groundwater monitoring will confirm that risk to groundwater and subsequent receptors, remains low.

3.5.1 Waste types

The perceived risk from the acceptance of additional waste types, i.e. the increased potential to accept a rogue load has undergone prior assessment (Caulmert, 2018) and has been determined to be acceptable. In addition, strict WAP (Appendix C) and verification testing (Section 2.2) will be employed, which will serve to mitigate any potential risk. It is considered that these measures will ensure the Site will not cause harm to the environment.

3.5.2 Discharge volume increase

The dewatering of Hendy Quarry void comprises predominately rainfall run-off from the quarry catchment area (ESI, 2018b). The increase serves to represent water discharge rates already occurring at the Site and does not represent an increased risk to the environment.

It is acknowledged that the quarry sump, from where rainwater collects and is pumped from, is in continuity with the groundwater. As such, there may be an element of groundwater within the discharge, though it is almost entirely rainwater. A small volume of groundwater may be abstracted during dry weather conditions for use in the wheelwash.

3.6 Stability Risk Assessment

The physical properties of the waste to be accepted to the Site (mixture of granular and cohesive waste), upon which the original Stability Risk Assessment (SRA) was based, will remain unchanged (Crestwood, 2004). As such, it is considered that no update is required to the existing SRA.

3.7 Landfill Gas Risk Assessment

The waste types to be accepted to the Site will remain inert, with inherently low organic content. It is considered that the principles contained within the Landfill Gas Risk Assessment section of the Working Plan (Crestwood, 2004), remain appropriate for the Site.

3.8 Monitoring

Monitoring is currently undertaken at the Site in accordance with Schedule 4 of the Permit (EPR/BT1088ID/V004) for the point source discharge, groundwater (level and quality) and landfill gas. It is proposed that Table S4.1 of Permit EPR/BT1088ID/V004 is updated to reflect the values in Table 3.5.

Table 3.5 Proposed amendments to Table S4.1 of the Permit - point source emissions to water

Emission point	Parameter	Limit including unit	Monitoring frequency	Reference period	Source
Discharge to soakaway at NGR 0538 8136	Volume	5,000 m ³ /day	Daily	Spot sample	Discharge from the quarry
	Rate of discharge	58 l/s	Weekly		
	Suspended solids	100 mg/l	Quarterly		
	Mineral oil	5 mg/l	Quarterly		
	pH	6-9	Quarterly		

There are no other proposed changes to the existing Site monitoring.

It was requested by NRW (Appendix A) that monitoring infrastructure allowed representative samples to be taken from the outset. It is acknowledged that at present, samples cannot be

obtained from downgradient locations PZ07-08 and PZ08-08. Monitoring data collected from these wells suggest that they have collapsed internally, such that water samples cannot be obtained.

It is proposed that both boreholes are replaced in approximately the same locations. The existing installations will be appropriately decommissioned. A Construction Quality Assurance (CQA) Plan will be produced for both the installation and decommissioning of the boreholes for review by NRW.

3.9 Closure and Aftercare

There are no proposed changes to the closure and aftercare plans for the Site.

4 REFERENCES

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- EC, 2003.** Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC, Official Journal of the European Communities, 16 January 2003.
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- ESI, 2018a.** Hendy Quarry Water Features Survey, ESI report reference 62847TN2, August 2018.
- ESI, 2018b.** Hendy Quarry Drainage Assessment, ESI report reference 62847TN3, August 2018.
- NRW, 2016.** National Resource Wales, form guidance (Part a, c2, c6, f1 and f2), National Resource Wales, 01 July 2016
- NRW, 2017.** National Resource Wales, form guidance (Part c4, c6, f1 and f2), National Resource Wales, 02 August 2017
- NRW, 2018.** Email from National Resources Wales (Tyrone Ward) to Tarmac (Lisa Sumner), dated 03 July 2018.

APPENDICES

Appendix A

NRW pre-application correspondence



Lisa Sumner <lisa.sumner@tarmac.com>

RE: Permit Variation Enquiry NRW:00682954

1 message

Ward, Tyrone <Tyrone.Ward@cyfoethnaturiolcymru.gov.uk> 10 April 2018 at 16:28
To: Lisa Sumner <lisa.sumner@tarmac.com>, Enquiries <enquiries@cyfoethnaturiolcymru.gov.uk>
Cc: "Harvey, Caitriona" <Caitriona.Harvey@cyfoethnaturiolcymru.gov.uk>, "Lewis, Gareth" <Gareth.E.Lewis@cyfoethnaturiolcymru.gov.uk>, "Doherty, Martin" <Martin.Doherty@cyfoethnaturiolcymru.gov.uk>, "Roberts, Kay" <Kay.Roberts@cyfoethnaturiolcymru.gov.uk>, "Taylor, Richard" <Richard.Taylor@cyfoethnaturiolcymru.gov.uk>

Afternoon Lisa,

We've received your enquiry and I confirm the proposal would constitute a normal variation.

<http://naturalresources.wales/media/682401/environmental-permitting-charging-guidance-2017-18.pdf>

<https://naturalresources.wales/media/682402/environmental-permitting-charging-scheme-2017-18.pdf>

Charges for 2018/19 are unchanged.

The 2 waste streams are.....

19 13 02 solid wastes from soil remediation other than those mentioned in 19 13 01

19 12 12 other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11

Experience has shown these particular wastes can be problematical; we therefore expect Tarmac would need to demonstrate rigorous sampling and testing procedures (WAP) We would also expect that monitoring infrastructure allows representative samples to be taken at the outset.

As NRW have some potential concerns I suggest we discuss further as part of our next site meeting and inspection.

Regards Ty

T W Ward

Swyddog Rheoleiddio/Regulatory Officer

Tîm Rheoli Diwydiant a Gwastraff – Rhymni ac Ebwy / Industry and Waste Regulation Team – Rhymney and Ebbw

Cyfoeth Naturiol Cymru / Natural Resources Wales

Ffôn/Tel: 03000 653151

Ffôn symudol /Mb: 07795 390168

E-bost/E-mail: tyrone.ward@cyfoethnaturiolcymru.gov.uk

Gwefan / Website: www.cyfoethnaturiolcymru.gov.uk / www.naturalresourceswales.gov.uk

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

----- Original Message -----

From: lisa.sumner@tarmac.com

Received: Mon Mar 26 2018 16:14:10 GMT+0100 (GMT Daylight Time)

To: Enquiries Queue; HZW-005344; HZW-006866

Subject: Permit Variation Enquiry

Hi Enquiries,

We are looking at the possibility of varying our inert landfill permit at Hendy permit reference BT1088ID, to add a couple of waste coded namely 19.13.02 and 19.12.12. The waste would WAC tested to confirm it complied with the waste acceptance criteria for inert landfills prior to acceptance.

Would this constitute a minor technical variation?

Regards,

Lisa

Lisa Sumner

Permitting and Compliance - Technical Manager

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Appendix B

Site-specific Opra spreadsheet (electronic appendix)



Appendix C

Waste acceptance procedure

CONTROLLED DOCUMENT

Document Issued For Use From:

December 15

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1 Introduction

This procedure is written specifically for Tarmac Landfill and Recycling sites to ensure that waste materials and substances are handled, treated, stored and disposed of in accordance with legislation and environmental best practice.

Failure to comply with the controls set out in this procedure could lead to prosecution for both Tarmac and any employee or contractor found guilty of environmental negligence.

2 Scope

This procedure applies to all operations and Landfill and Recycling locations for which Tarmac has responsibility.

3 Definitions

Permit

Any EPR permit, exemption or Waste Management Licence in England, Scotland or Wales

RAP Manager

Recycled Asphalt Plantings (RAP) Manager.

Regulator

Environment Agency, Scottish Environment Protection Agency or Natural Resources Wales.

RM

Recycling Manager.

Site

Any Landfill, Recycling or Recycled Asphalt Plant (RAP) facility.

Site Manager

Site Manager or Supervisor.

SN Database

Site Notification Database.

TCM

Technical Competent Manager.

WAC Coordinator

Waste Acceptance Criteria (WAC) Coordinators.

4 General Management Requirements: All Sites

4.1 Information displayed

In addition to the other requirements of the environmental management procedures, the following information should also be

displayed at the weighbridge area:

- The waste related permits for the site
- Site waste acceptance list
- Technical Competent Manager (TCM) Certificates, including current Continual Competence certificates
- Any local and emergency rules specific to the site
- Banned drivers

All documents should be updated as and when required.

4.2 Checks

The Site Manager should complete their daily and weekly inspections in order to comply with the permit and the Environmental Management System. In addition to this, the following should be considered specific to Landfill & Recycling:

4.2.1 Daily Checks

- Condition of tipping area
- Condition of haul roads
- Wheel wash is operational (if applicable)
- Housekeeping of any quarantined area
- Site diary is completed in accordance with this procedure

4.2.2 Weekly Checks

- The TCM has attended the site for the required frequency
- Waste Carrier File is up to date
- Materials are within permitted area

4.3 Landfill Site Grid Plan or GPS Device

All Landfill sites will produce and maintain a gridded site plan or have a working GPS device to be able to easily identify and record tipping locations on a weekly basis in the site diary.

4.4 Site Diary

A Site Diary will be completed on a daily basis with details of:

Landfill Sites	Recycling Sites
Weather	Weather
Personnel on site including the person providing any TCM cover and the time the TCM is on site	Operations carried out on site
Site development works	Details of any rejected loads

Area of landfill currently being infilled including GPS location or grid reference	TCM attendance on site
Plant breakdowns	Any emergencies, Environmental Incidents and Audits
Environmental monitoring or sampling undertaken	Number of loads
Details of rejected loads	Number of duty of care checks
Any emergencies, Environmental Incidents, Audits and observations	
Number of loads	
Recorded duty of care checks at landfill face	

4.5 Site Files

The site manager will ensure the following files are produced and maintained on site in the weighbridge area and copies placed into the Site Environmental Management Plan (SEMP) (where applicable):

- 2 years of Duty of Care checklist files with sheets in date order
- Waste rejection report file with sheets in date order (waste rejection reports uploaded to Section 9 of the SEMP)
- Weekly site inspection file with sheets in date order (added into Section 9)
- Waste Carriers licence file filed alphabetically with index listing name and expiry date

5.0 Duty of Care Checks and Waste Inspections at all sites

Forms [MS-EP-A&A-01/01](#) Landfill Acceptance Procedure and [MS-EP-A&A-01/02](#) Recycling Acceptance Procedure provide a flow chart for the acceptance of waste at Landfill and Recycling sites, as well as who has responsibility for each stage.

5.1 Acceptable Waste

Whilst the exact type and quantity of waste able to be received onto site will be stipulated in local permits, [MS-EP-A&A-01/03](#) provides guidance on the restrictions on waste permissible for inert landfills in general, detailing the checks required to understand whether or not waste can be received.

Additionally, [MS-EP-A&A-01/04](#) provides site level guidance of the process for receiving compliant waste onto site. This should be used to ensure that only acceptable waste is received onto site.

5.2 Weighbridge Duty of Care Checks

Every load will be checked at the weighbridge to ensure it complies with the Site Acceptable Waste list and Permit. The flow chart in [MS-EP-A&A-01/05](#) should be consulted and followed to ensure that the site undertakes sufficient verification.

The weighbridge reception should check that the details on Apollo match the customer and the material origin and that there is a valid SN reference on the database (Restore) (the pre-acceptance checks). The SN reference should be then recorded on the weighbridge ticket and the ticket generated.

If the weighbridge reception is unable to validate the customer and material origin, and/or no SN reference is found on Restore, or the system is not working, then they should contact the Landfill & Recycling Team immediately. Customers that arrive on site without pre-notification should be directed to the Landfill & Recycling Team.

A Waste Transfer Note must accompany each load of waste received and that it is carried by a Waste Carrier with an up to date Waste Carriers Licence (03708 506506 is the enquiry line to check).

Any doubts of material acceptability will be brought to the attention of the TCM (or the Landfill & Recycling Team) for further checks. The material will not be accepted and the vehicle will not be allowed to proceed to the tipping point until these checks are complete. The vehicle may wait at a designated point at the site until the matters are resolved.

In cases where a load will be presented without a transfer note you should offer the driver of the vehicle a blank Waste Transfer Note (see MS-EP-CORE-07/01). The driver must complete it themselves.

Under no circumstance should any employee of Tarmac complete or modify a Waste Transfer Note on behalf of any third party. The driver must initial any modification to a Waste Transfer Note.

The weighbridge must then complete a visual inspection of the waste in any un-sheeted or open top vehicle to see that it conforms to the Waste Transfer Note accompanying it and the Site Acceptable Waste List. Only once the Duty of Care Checks are completed and are all found to be in order should the Duty of Care Note be signed as this demonstrates that checks have been undertaken and the waste is acceptable at the site. Both the driver and the weighbridge operator will also sign the weighbridge tickets and this will also indicate that the waste has passed the Duty of Care checks. The Duty of Care record sheet should also be completed.

Any doubts of material acceptability will be brought to the attention of the TCM (or the Landfill and Recycling Team if TCM not available) for further checks/advice. The material will not be accepted and the vehicle will not be allowed to proceed to the tipping point until these checks are complete. The vehicle may wait at a designated point at the site until the matters are resolved.

Any load that does not comply will be rejected and recorded in the site diary and a waste rejection form.

5.3 Site System Failure

If for any reason, eg internet connection failure, site systems cannot be accessed, then the Landfill and Recycling should be informed and they will provide further advice as to how the site can continue to operate in order to continue to comply with this procedure eg the L&R team provide pre-acceptance confirmation for each load.

If the site cannot comply with this procedure, then waste must cease to be accepted

The Site Manager/TCM shall be informed of the systems failure and it shall be recorded in the site diary.

6.0 Waste Inspections following deposit

6.1 Landfill and Recovery Sites Only

Every landfill must have supervised tipping face while waste is accepted.

Site operatives should inspect all loads as they are ejected from the carrier to see they conform to the material the vehicle should be carrying and in accordance with the Site Acceptable Waste list detailed in the Permit. Two random inspections should be recorded on the instigation of the weighbridge operator (each load if fewer than 2 loads received). A record should be kept of the check in the site diary, detailing time, ticket number and that it conforms.

Should any of the load be found to contain wastes not acceptable at that site the rejection of unacceptable loads procedure should be followed in section 4.6.4.

6.2 Recycling Sites Only

All Recycling sites must have waste and product stockpiles signposted. Acceptable material must be visually inspected to ensure it complies with the Site Acceptable Waste List, the Permit, and the material in the stockpile, and then mechanically handled into the correct material stockpile.

If it does not comply then the load will be rejected.in accordance with section 6.4.

6.3 RAP Sites Only

Material must be PAK tested at the frequency set out in the scheme relevant to the job in accordance with the current version of 'Testing for tar in Road Planings' Document.

Material failing the PAK test will be isolated and separately stockpiled until classification of its hazardous nature confirmed or otherwise and its ultimate acceptance or rejection is determined in accordance with procedures in the current version of 'Testing for tar in Road Planings' document.

Acceptable material must be also visually inspected to ensure that it complies with the Site Acceptable Waste List, the Permit and the material in the stockpile, and then mechanically handled into the correct material stockpil

6.4 Rejection of Unacceptable Waste

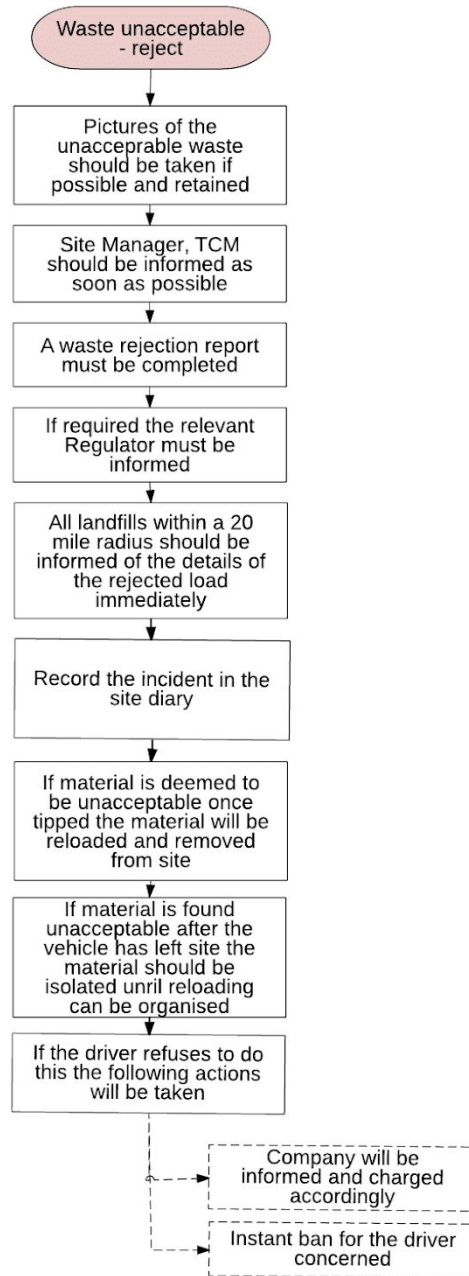
If material is deemed to be unacceptable once tipped and the Waste carrier is still on site then if safe to do so the material will be reloaded and removed from site.

1. If material is found unacceptable after the vehicle has left site, or if the Waste Carrier is still on site but refuses to remove the waste, the material should be quarantined if safe to do so and the Landfill & Recycling Team informed so they arrange removal of the material.
2. Pictures of the rejected load should be taken
3. Site Manager or TCM should be informed as soon as possible, who should report it as required by the Environmental Incident Procedure and to the Landfill and Recycling Team.
4. Complete a waste rejection form.
5. If required the relevant Regulator must be informed.
6. Record the incident in the site diary and on Apollo

- 7. All Tarmac recycling and landfill sites within a 20 mile radius should be informed of the details of the rejected load immediately

The below flow diagram should be consulted:

15
St



7.0 Testing and Sampling at Landfills

7.1 Compliance Testing

Compliance testing for a given waste stream should be carried out in accordance with the schedule identified by the Landfill and Recycling Team at the Basic Characterisation waste acceptance stage.

If any sampling or testing is required then the weighbridge operative shall inform the Site Manager and/or TCM and make a record in the Site Diary of which load is being sampled (including duty of care information so that checks can be made once

the sampling results are returned). The appropriate testing or sampling will then be organised and carried out and recorded in the Site Diary, including the final location of the waste in the landfill. Once received sampling results should be cross checked against the pre-acceptance information, and the Duty of Care Note/weighbridge ticket, and recorded in the site diary. All sample results should be forwarded to the Landfill and Recycling Team for assessment..

7.2 On-site verification sampling

On-site verification sampling should be done at the frequency outlined in permit conditions, or at the frequency specified for the site by the Landfill & Recycling Team. The Site Manager and/or TCM will then arrange for the sampling to be carried out and a record will be kept in the Site Diary, including the location of the waste in the landfill. Once received sampling results should be cross checked against the pre-acceptance information, and the Duty of Care Note/weighbridge ticket, and recorded in the site diary. Any sampling results found to not be in compliance with the original waste classification should be forwarded to the Landfill and Recycling Team for further action.

8.0 Technical Competence and Training

8.1 Training

The Site Manager must ensure that **all** site personnel and contractors involved in any permitted activity on site, including the site engineering, reception and handling of the waste, is given adequate training on these instructions: the permit, any material testing and PAK spraying operation and requirements and company procedures relevant to their area of work.

Records of training, and any training review should be recorded on a training record and stored in Section 1 of the SEMP.

8.2 TCM Arrangements

The TCM is a legal requirement that enables us to demonstrate that we have technically competent people with the right knowledge and skills to ensure waste sites comply with the Environmental Permitting Regulations 2010, and the condition of the permit for the site. Every site must have a nominated TCM that attends the site on a regular basis as stipulated in the EA/NRW/SEPA guidance, please contact the Permit and Compliance Team for more information. Organisation and provision of the TCM arrangements is the responsibility of the site in conjunction with the Landfill and Recycling Team.

Any changes to the TCM arrangements must be notified to the Landfill and Recycling Team by the site or production manager immediately so they can monitor TCM arrangements. Changes to TCM should also be notified to the relevant Regulator if required by the permit conditions. The training record must also be updated.

9.0 Landfill Development Plan

A Landfill Development Plan must be developed for each site, one copy retained on site and one sent to the Landfill & Recycling Team. This is to identify how the site will comply with the permit improvement conditions and pre-operational conditions, as well as including current and planned lined areas and including phasing in line with the

permit, planning permission and operational extraction plan. This should be uploaded into Section 12 of the SEMP. The Landfill Development Plan should be reviewed and updated annually, usually at the same time as the SEMP.

Landfill Development Plans should be reviewed regularly, not less than every 12 months, to enable forward planning for the site and to ensure that they remain current.

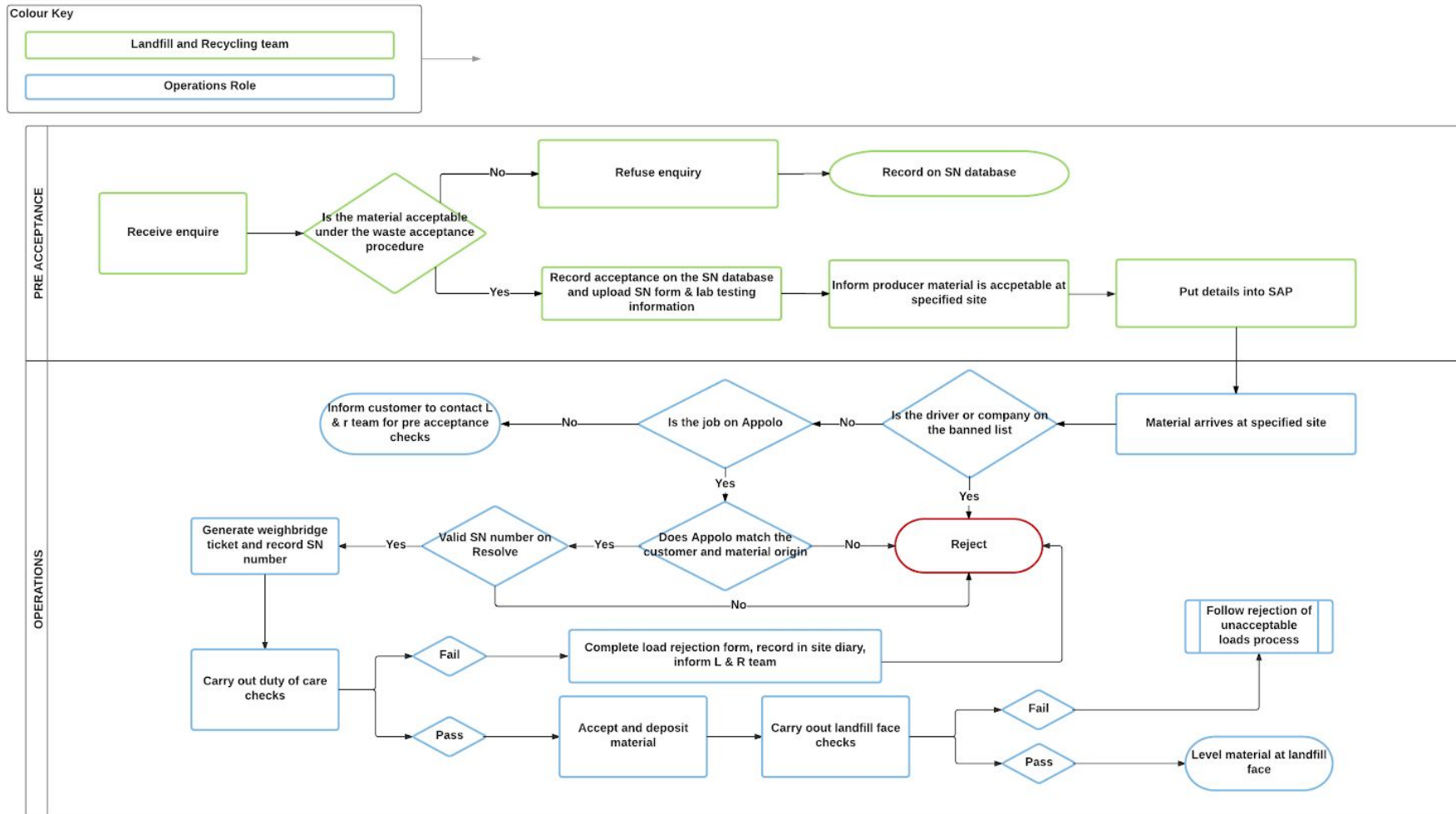
10 ASSOCIATED DOCUMENTS

Document Name	Type	Retention Period
Environmental Incident Procedure	Procedure	N/A

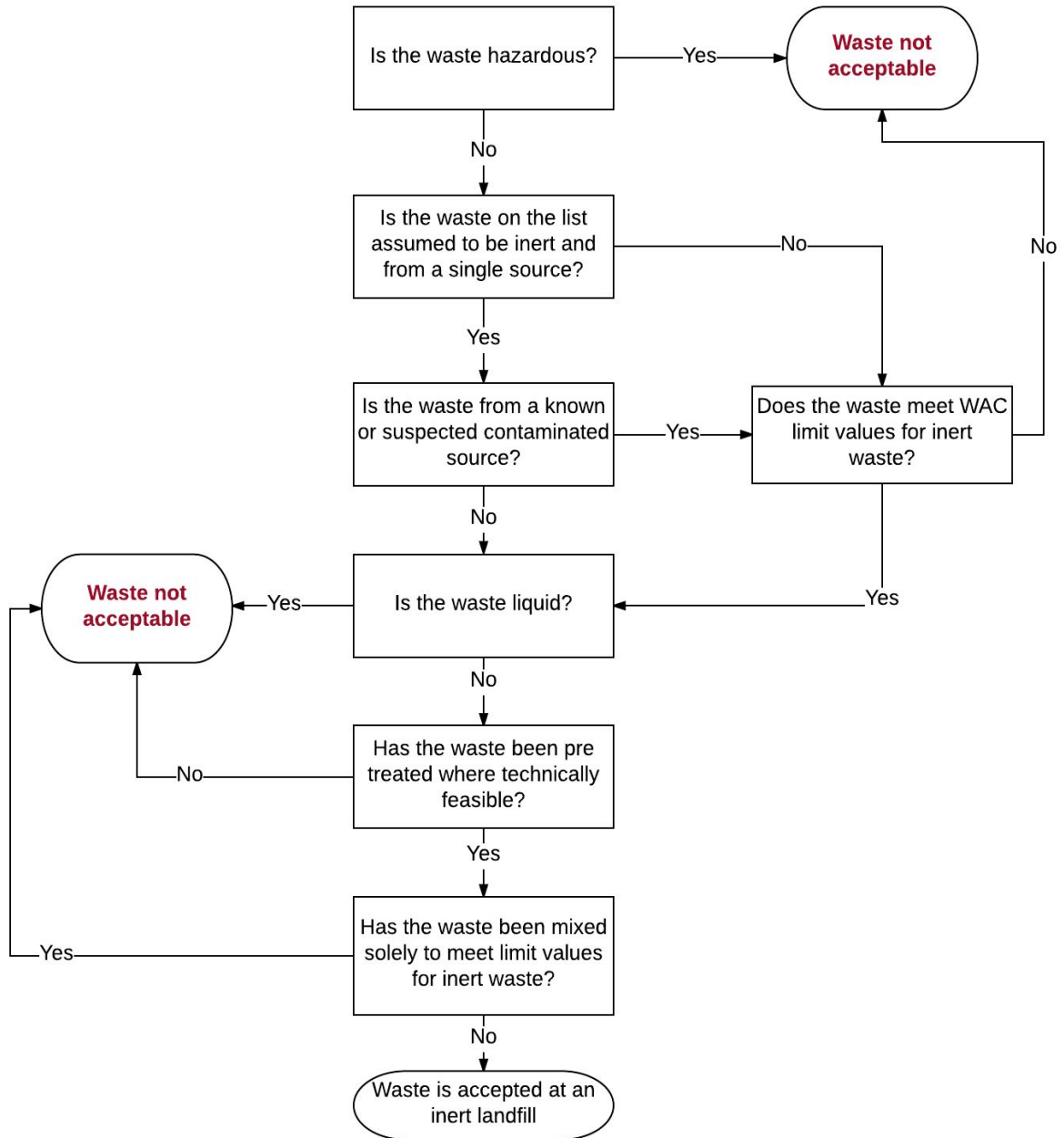
*C (Commercial) - Tarmac requirement; *S (Statutory) - Legal Requirement

11 DOCUMENT CONTROL

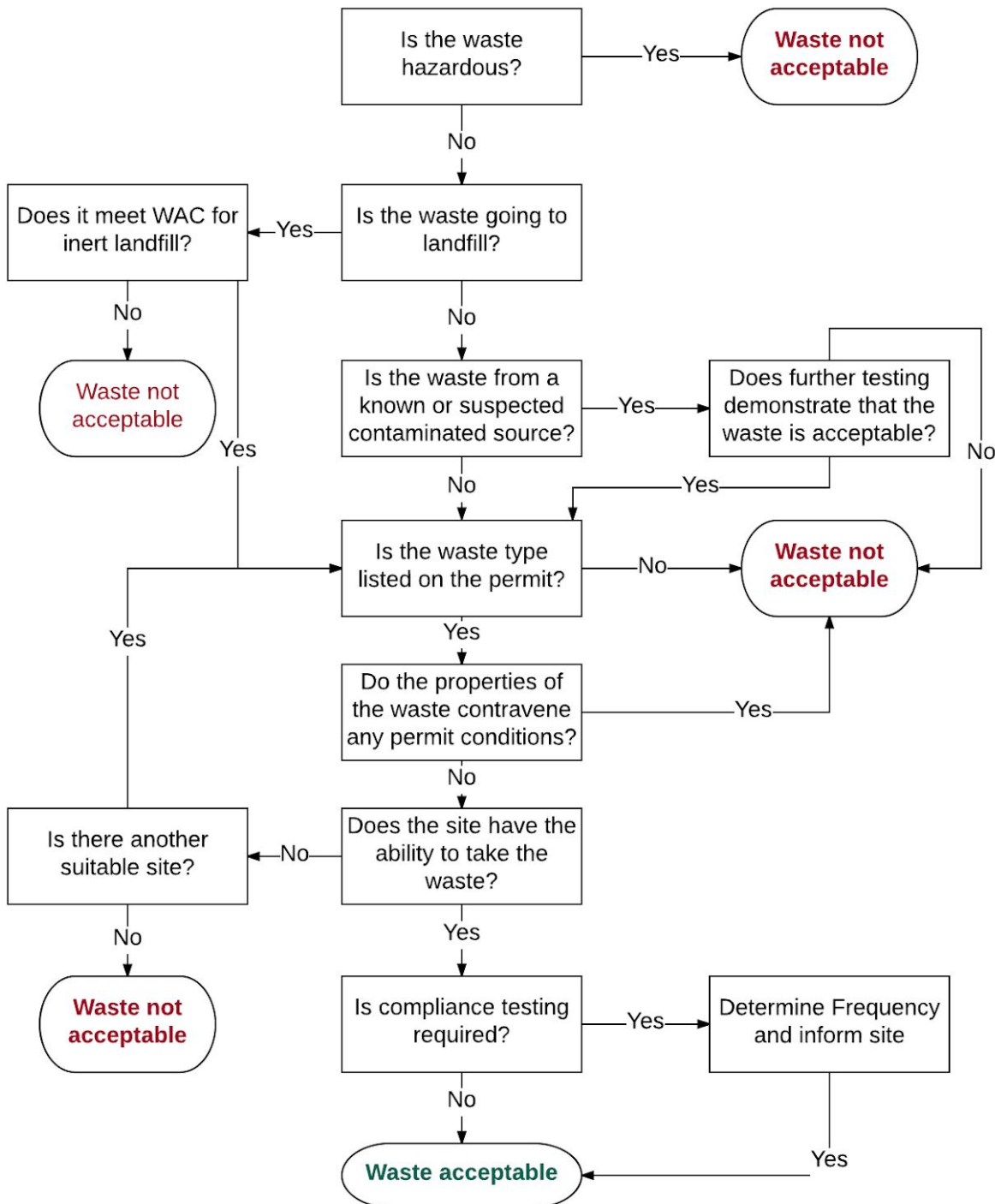
Issue Date	Revision No.	Details of Change	Owner
September 15	1	First Copy	Environment Manager
August 16	2	Document Re-Issue	Environment Manager



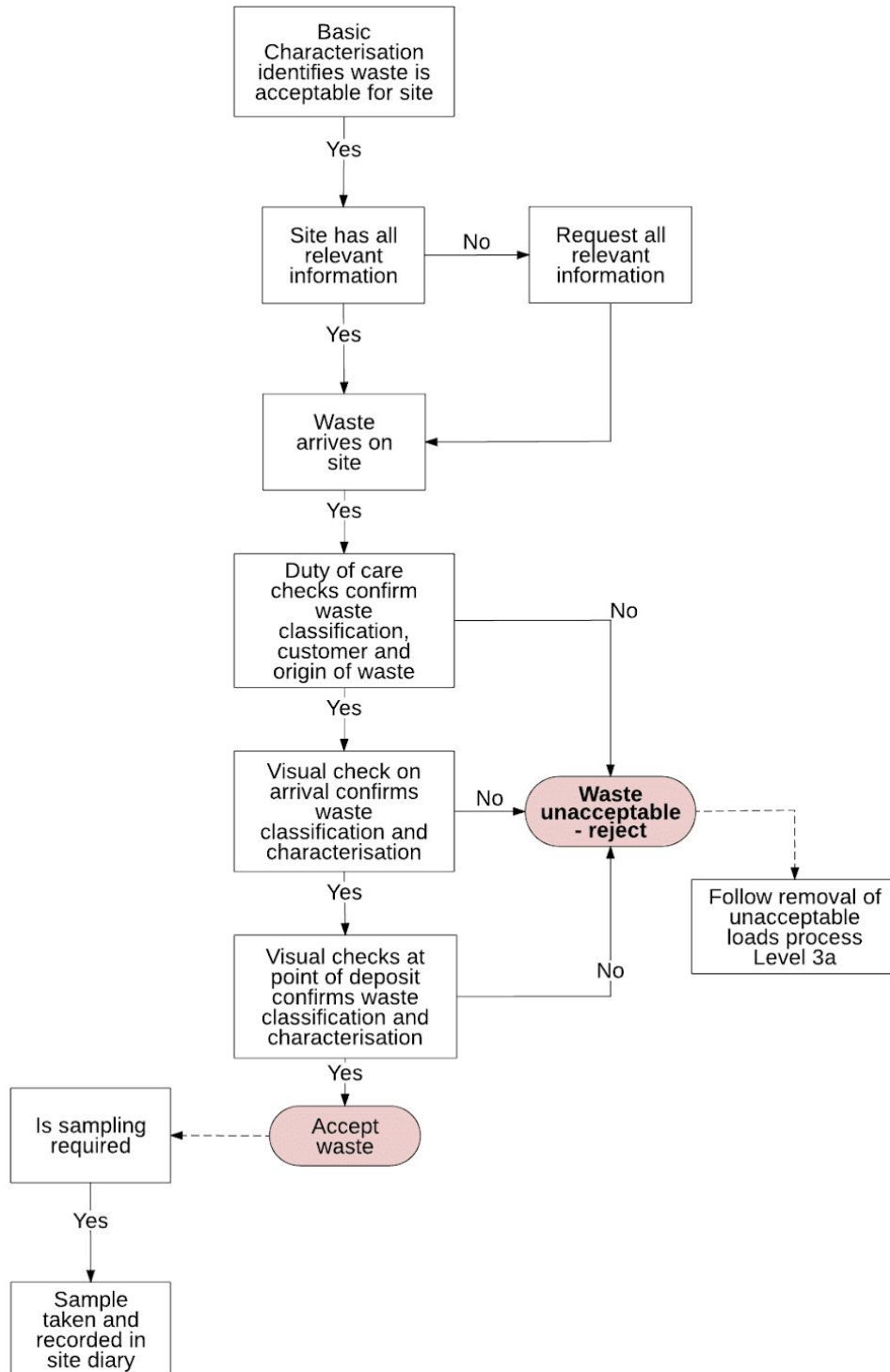
The below process flow must be followed for determining any waste that can be received into an inert landfill:



The below process flow must be followed for any waste being received into an inert landfill:



The below processflow must be followed for any waste being received into an inert landfill:



Appendix D

Evidence of technical competence management



Certificate No. OCC7319

Operator Competence Certificate

Title:

Managing Landfill - Non Hazardous Waste - 4MLNH

This Certificate is awarded to

Andrew Bevan

Awarded: 22/11/2016

Authorised

WAMITAB Chief Executive Officer

CIWM Chief Executive Officer

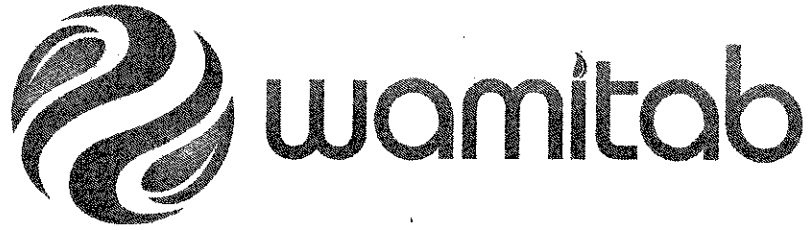


The Chartered Institution
of Wastes Management

This certificate is jointly awarded by WAMITAB and the Chartered Institution of Wastes Management (CIWM) and provides evidence to meet the Operator Competence requirements of the Environmental Permitting (EP) Regulations, which came into force on 6 April 2008.



00092091



Qualification Title:

**WAMITAB Level 4 Diploma in Waste Management Operations : Managing
Landfill - Non Hazardous Waste - 4MLNH**

Qualification Accreditation Number:

600/0329/7

This Certificate is awarded to

Andrew Bevan

Awarded: 22/11/2016

Serial No:25707/4MLNH/1

Authorised

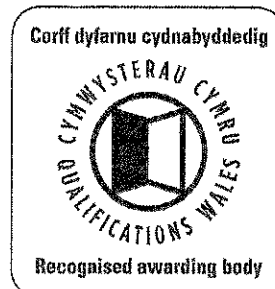
A handwritten signature in black ink, appearing to read "Chris James".

Chris James
Chief Executive Officer, WAMITAB

Regulated by

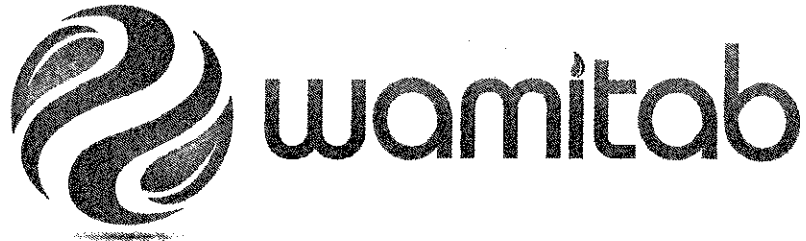
Ofqual

For more information see <http://register.ofqual.gov.uk>



The qualifications regulators logos on this certificate indicate that the qualification is accredited only for England, Wales and Northern Ireland.

00092096



Credit certificate

This certificate determines credit awarded to:
Andrew Bevan

Units gained:

		Credit Value	Credit Level
Y6015875	Monitor procedures to safely control work operations	4	3
K6009711	Manage physical resources	3	4
M6009712	Manage the environmental impact of work activities	5	4
K6021423	Procedural compliance	6	4
M6021424	Manage and maintain effective systems for responding to emergencies	19	4
D6021435	Control maintenance and other engineering operations	13	4
T6009601	Provide leadership and direction for own area of responsibility	5	4
Y6021451	Develop schemes for the restoration and aftercare of non hazardous waste landfill sites	18	4
R6021609	Manage the reception of non hazardous waste	7	4
A6021670	Manage the movement, sorting and storage of waste	7	3
L6021897	Manage site operations for the disposal of non hazardous waste to landfill sites	13	4
K6021504	Manage improvements to waste management operations	7	4

Awarded: 22/11/2016

Serial No.: 25707/HSS3/1

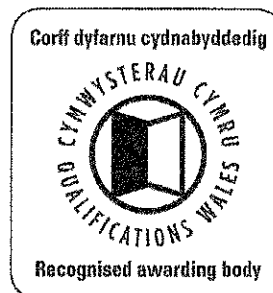
Authorised

Chris James
Chief Executive Officer, WAMITAB

Regulated by



For more information see <http://register.ofqual.gov.uk>



The qualifications regulators logos on this certificate indicate that the qualification is accredited only for England, Wales and Northern Ireland.



00092095



Certificate No. OCC7318

Operator Competence Certificate

Title:

Open Inert Landfill

This Certificate is awarded to

Andrew Bevan

Awarded: 22/11/2016

Authorised

WAMITAB Chief Executive Officer

CIWM Chief Executive Officer



The Chartered Institution
of Wastes Management

This certificate is jointly awarded by WAMITAB and the Chartered Institution of Wastes Management (CIWM) and provides evidence to meet the Operator Competence requirements of the Environmental Permitting (EP) Regulations, which came into force on 6 April 2008.



00092090



Qualification Title:

WAMITAB Level 4 Medium Risk Operator Competence for Open Inert Landfill

Qualification Accreditation Number:

601/8529/6

This Certificate is awarded to

Andrew Bevan

Awarded: 22/11/2016

Serial No:25707/MROC7/1

Authorised

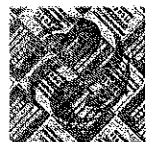
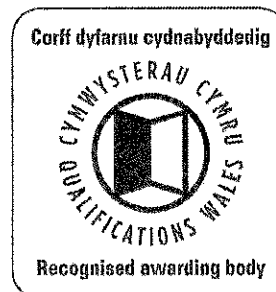
A handwritten signature in black ink, appearing to read "Chris James".

Chris James
Chief Executive Officer, WAMITAB

Regulated by

Ofqual

For more information see <http://register.ofqual.gov.uk>



The qualifications regulators logos on this certificate indicate that the qualification is accredited only for England, Wales and Northern Ireland.

00092097



Credit certificate

This certificate determines credit awarded to:
Andrew Bevan

Credit Value Credit Level

Units gained:

Y6015875	Monitor procedures to safely control work operations
M6009712	Manage the environmental impact of work activities
A6021670	Manage the movement, sorting and storage of waste
L/508/0888	Manage the reception of inert waste
Y/508/1008	Managing disposal operations of inert waste to land
Y/508/1011	Prepare landfill sites for the acceptance of inert waste

5	4
8	4
8	4

Awarded: 22/11/2016

Serial No.: 25707/OCS01/1

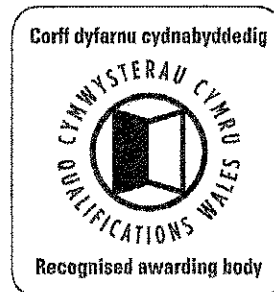
Authorised

Chris James
Chief Executive Officer, WAMITAB

Regulated by



For more information see <http://register.ofqual.gov.uk>



The qualifications regulators logos on this certificate indicate that the qualification is accredited only for England, Wales and Northern Ireland.



00092098

Appendix E

Summary EMS and ISO 14001 certification

Certificate of Registration

ENVIRONMENTAL MANAGEMENT SYSTEM - ISO 14001:2015

This is to certify that:

Tarmac
part of Tarmac Holdings Limited
Portland House
Bickenhill Lane
Solihull
Birmingham
B37 7BQ
United Kingdom

Holds Certificate Number:

EMS 506166

and operates an Environmental Management System which complies with the requirements of ISO 14001:2015 for the following scope:

Please see scope page.



For and on behalf of BSI:

Andrew Launn, EMEA Systems Certification Director

Original Registration Date: 2006-03-23

Latest Revision Date: 2018-02-09

Effective Date: 2016-12-09

Expiry Date: 2021-02-12

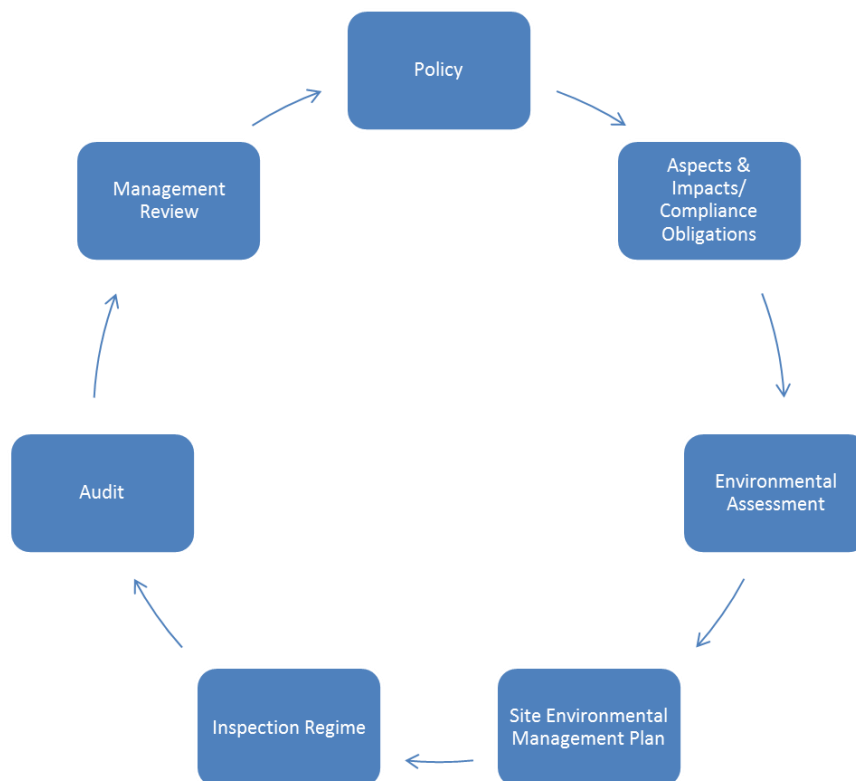


Page: 1 of 48

...making excellence a habit.™

Summary of Environmental Management System

Lafarge Tarmac Trading Limited (LT) has in place an Environmental Management System (EMS) that is certified to the international standard: ISO 14001. The site will be operated under the overarching Core EMS which covers a number of LT sites across the UK. The specific EMS procedures to support the operation of this type of regulated facility under an Environmental Permit in England have been developed with reference to relevant guidance produced by the EA. The EMS follows the Plan Do Check Act (PDCA) cycle described in EA guidance ¹ as illustrated below:



A copy of the EMS will be held at the site and will be available for inspection once the site is operational following the issue of the Environmental Permit for the site. A summary of the key elements of the EMS is provided below.

Company Environmental Policy

The EMS is underpinned by the company Environmental Policy which outlines its' high level vision, how it expects operations to be managed and its environmental performance to be

¹ England and Wales - How to comply with your environmental permit.
Scotland –
Northern Ireland -

communicated to its stakeholders and to enable the effective deployment of the related principles across its operational sites.

LT is committed to preventing its activities polluting the environment and the continual improvement of its environmental performance. Through a dedicated environmental and sustainability panel business objectives are developed. Environmental performance measures are also monitored by these forums and targets set to enable performance levels to be continuously improved.

LT aims to minimise the environmental impact of its activities by:

- regularly monitoring the effective deployment of the EMS through a series of graded audits
- prior to undertaking work on behalf of LT, all sub-contract personnel will be made aware of site-specific environmental concerns and vulnerabilities through the site induction process
- reducing the amount of waste materials generated by their activities; attempting to recycle and reuse such materials wherever practical and where this is not achievable, disposing of such waste in a responsible manner
- seeking to use raw materials in an efficient manner, replacing them with substitute recycled raw materials where practicable and safe to do so
- promoting the efficient and reduced use of water, fuels and energy, thereby reducing carbon emissions and mitigating the potential for climate change
- purchasing, utilising and storing materials in a manner which poses minimal risk to both individuals and the environment, as far as is practical.

The EMS will be deployed effectively through the company's management organisation. Managers and employees will be assigned environmental responsibilities and will be expected to play a full and active part in managing the environmental aspects of the activities for which they have responsibility. Operational management will be supported by a team of competent advisors and performance will be monitored by environmental auditors.

Company Environmental Standards

All operational sites will be the subject of an Environmental Assessment and will maintain an up to date Site Environmental Management Plan (SEMP). This will identify specific activities

that its' aspects impact upon the environment, enabling the site to control them which is then supported by our audits which help to monitor compliance.

Landfill

The following aspects have been identified having regard to the protection of the environment, compliance with any environmental permits and the highest standards of operation. These are in addition to the core company aspects described above.

The following aspects relevant to the Landfill site at Hendy will be managed in accordance with any relevant company policies and procedures, site authorisations and statutory obligations.

1. Dust and particulate matter – LANDFILL, RECYCLING, RECOVERY
2. Mud, litter and other debris - LANDFILL, RECYCLING, RECOVERY
3. Noise - LANDFILL, RECYCLING, RECOVERY
4. Security - LANDFILL, RECYCLING, RECOVERY
5. Waste acceptance and rejection - LANDFILL, RECYCLING, RECOVERY
6. Water management - LANDFILL, RECYCLING, RECOVERY
7. Working face operations – LANDFILL
8. Gaseous management – LANDFILL INSTALLATIONS
9. Leachate management - LANDFILL INSTALLATIONS

Environmental Assessment

The site manager shall be responsible for the Environmental Assessment of the operations, in normal and abnormal conditions, to identify the key environmental aspects of its activities. Through this process the aspects of the operations, that may have a significant impact on the environment, can be identified, prioritised for corrective action and improvement together with an evaluation of legal compliance at the site. The site manager/ supervisor, together with representatives from the site/area and the compliance and environmental permitting personnel shall identify and prioritise the potential significant environmental impacts of the operations. The potential impacts most relevant to the Landfill site at Hendy have been identified to be:

1. Bio-diversity and Ecological Management Visual Impact
2. Dust
3. Fuel & Chemical Storage
4. Gaseous emissions monitoring

5. Groundwater monitoring Management
6. Legislation and Documentation
7. Noise
8. Solid Waste Management
9. Vegetation Management
10. Vibration
11. Traffic
12. Surface water management
13. Gas management
14. Groundwater management

Site Environmental Management Plan

The Environmental Assessment provides the prioritised potential significant environmental impacts for inclusion in the SEMP. The plan shall identify objective(s) and target(s) for each significant impact and ensure that they are relevant to achieving the overall objectives of the Business Unit. The objective (the improvement action) shall be specific to the corrective/preventative action. The target for the improvement shall have a date for completion, the person responsible for the action and verification of the completion by the authorising person. The SEMP shall be reviewed regularly and shall be consistent with legislation, environmental procedures and the LT environmental policy. The SEMP may be updated at any time in order to implement changes/corrective actions identified by any management mechanism.

Each site shall undertake all necessary monitoring and measuring of operational activities, as required by legislation, such as environmental permits and planning consents. All such monitoring and measuring information shall be documented and recorded on a monitoring schedule.

Environmental occurrence/non-conformance reporting system

The environmental occurrence/non-conformance reporting system has been developed in order to document, investigate and mitigate significant impacts on the environment and for initiating and implementing corrective and preventative action. All incidents shall be reported, whether or not an external person/agency is involved. Any system non-conformances are also to be documented for corrective and preventative action.

Inspection regime and audit

The Environment Manager shall establish and monitor an annual inspection programme ensuring that all sites are audited by an 'independent' manager who has no responsibility for the site. The auditor shall complete an associated audit summary sheet, agreeing and summarising as necessary a list of recommended actions in consultation with the site manager. The audit summary sheet shall then be included in the SEMP and priorities and timescales assigned. A date for a follow-up visit to ensure close out of any actions has been completed will be set up by the visiting auditor and the manager/ supervisor. The follow up visit must also be used to ensure previous actions implemented are continuing to work and are effective.

Management Review

There will be a tiered review of the EMS at top management level, local area level and at site management level including the procedures, environmental policy and the objectives and targets for the company in order to support its ongoing effectiveness, suitability, adequacy and stability.

Appendix F

Hydrogeological risk assessment review 2017

CAULMERT LIMITED

Engineering, Environmental & Planning

Consultancy Services

Hendy Landfill Site

Tarmac

Hydrogeological Risk Assessment Review 2017

Prepared by:

Caulmert Limited

5 Farrington Way, Eastwood Link Business Park, Eastwood, Nottingham, NG16 3BF

Tel: 01773 749132

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Email: sarahvenning@caulmert.com

Web: www.caulmert.com

Doc ref: 3145-CAU-XX-XX-RP-O-0301.S0.C1

Issue date: 12th January 2018



APPROVAL RECORD

Site: Hendy Landfill Site

Client: Tarmac

Project Title: Hydrogeological Risk Assessment

Document Title: HRA Review Report

Document Ref: 3145-CAU-XX-XX-RP-O-0301.S0.C1

Report Status: Final

Project Manager: Andy Stocks

Caulmert Limited: 5 Farrington Way, Eastwood Link Business Park, Eastwood, Nottingham, NG16 3BF

Tel: 01773 749132

Author	Sarah Venning	Date	12/01/2018
Reviewer	Andy Stocks	Date	12/01/2018
Approved	Andy Stocks	Date	12/01/2018

DISCLAIMER

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1 INTRODUCTION

1.1 Report Context

- 1.1.1 Caulmert Limited have been commissioned Tarmac Trading Limited (the operator) to review the current hydrogeological assessment of Hendy Quarry Landfill Site, Miskin, in accordance with their Permit BT1088ID Condition 3.2.4
- 1.1.2 The current hydrogeological risk assessment review was submitted in May 2009. The current guidance requires the hydrogeological risk assessment to be reviewed every six years. This submission forms the next review. It is our understanding that no reviews have been submitted in the interim period. Therefore the objective of this review is to assess whether there has been any significant change in conditions at the site, whether the site remains in compliance with the Groundwater Daughter Directive. The review will also reflect changes in the regulatory environment.
- 1.1.3 A summary of Permit variations since the original permit was granted is included in Table 1 below. It is noted that Permit Variation BT1088ID/VAR004 added a series of improvement conditions to the permit. Specifically these included the assessment of groundwater compliance levels.

Table 1: Summary of Permit Variations.

Permit/ Variation No.	Date	Description
BT1088ID	17th Sept 2002	Original Permit granted
Variations		
VP3130LA (EPR/BT1088ID/V002)	20/12/05	Removal of daily limit for the importation of waste
XP3933MR (EPR/BT1088ID/V003)	22/06/07	Consolidation and update by EA to standard Permit Template
PP3738XM (EPR/BT1088ID/V004)	09/10/09	Amendments to tables S1.2, S1.4, S4.1, S4.2, S4.3, S4.4, S5.1 and added Table S1.3
KP3795FU (EPR/BT1088ID/V005)	01/11/13	Variation to change: company name, registered office address and correspondence address to Lafarge Tarmac Trading Limited.
KP3795FU (EPR/BT1088ID/V006)	16/11/15	Variation to change company name to Tarmac Trading Limited

- 1.1.4 This report utilises the Environment Agency's template for Hydrogeological Risk Assessment Reviews (2009) and adopts the terminology within the Groundwater Daughter Directive and Environmental Permitting Regulations 2016.

1.1.5 The following reports have been used for reference purposes:

- BCL Consultant Hydrogeologists Ltd, 2000, Hendy Quarry: Hydrogeological Assessment to support Planning Application for Restoration of Quarry Infill with Inert Materials.
- BCL Consultant Hydrogeologists Ltd, 2009, Review of Hydrogeological Risk Assessment for Inert Landfill.
- Tarmac Ltd, Oct 2016, Hendy Landfill (BT1088ID) Improvement Conditions 6 & 7, Review of Groundwater Monitoring Results and Monitoring Frequency.
- Crestwood Ltd, Nov 2009, Environmental Management and Monitoring Programme: Groundwater Management and Monitoring Plan, Hendy Quarry Landfill BT1088ID.
- Tarmac Ltd, January 2017, Hendy Quarry Landfill, Annual Report Permit Reference BT1088ID, January 1st 2016 to December 31st 2016.
- ESI, December 2014, Hendy Quarry – Assessment of Run-off, 62847TN1

1.1.6 Third party information supplied by Tarmac Trading Ltd has been used in good faith within this document. Caulmert Ltd has not attempted to verify the information.

2 CONCEPTUAL HYDROGEOLOGICAL SITE MODEL

2.1 Introduction:

- 2.1.1 The conceptual model for the site was developed in 2000 as part of the Planning application for the restoration of the quarry via landfilling.
- 2.1.2 The hydrogeological risk assessment presented by BCL in 2009 updates the hydrogeological setting and presents the risks associated with the infilling of the quarry with inert material. A number of new piezometers were installed prior to the 2009 risk assessment review. These were assessed as part of the improvement conditions 6 & 7 and compliance levels were determined. It was recognised within the submission that these compliance limits would need to be reviewed as more data became available and recommended that these were re-assessed as part of any subsequent HRA review. These are assessed as part of the groundwater pathway below.
- 2.1.3 A summary of the conceptual model is presented below.

2.2 Source term:

- 2.2.1 Inert waste was first accepted into the site in September /October 2002 (Ref. BCL 2009). A permit was granted for the site in 2002 under the transitional arrangements of the Landfill Directive.
- 2.2.2 The site accepts strictly inert waste under the definition within the Landfill Directive which defines the waste as one which does not undergo any physical, chemical or biological transformations; It does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. Its' total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater.
- 2.2.3 It is acknowledged that waste acceptance procedures are paramount to ensuring that only inert waste in accordance to the definition above are accepted at the site. The operator has waste acceptance procedures in place. It is understood that no non-conformances have been raised by NRW with respect to the waste acceptance procedures at the site. It is however recommended that compliance testing be undertaken of regular waste streams in accordance with industry guidance.

2.2.4 Under the transitional arrangements, there was no requirement for leachate infrastructure to be installed, neither is there any requirement to collect leachate for inert sites under the LFD.

Offsite source of contamination

2.2.5 The 2009 HRA Review states that the Tynwydd Farm Landfill site is located approximately 200m east of the site boundary. This site is reported to have accepted similar waste streams including construction and demolition waste along with dredging waste. This site is considered to be up gradient of the site based on the current groundwater flow direction.

2.2.6 Llwynpennau Farm Landfill is also present approximately 700m east of the site, although the operator went into administration in 2009 and it is not known whether this remains active. This site is also considered to be up gradient of the site based on the current groundwater flow direction.

2.2.7 Three historic landfill sites have also been identified in close proximity to the site these include:

- Bute Quarry 250m WNW (down gradient of the site)
- Bute Cottages Quarry 300m N (cross gradient from the site)
- Brofiscin Quarry 1.25km E (up gradient of the site). Records indicate it accepted industrial and chemical waste including toxic substances, solvents, heavy metals and PCBs. (reference HRA 2009).

2.2.8 The above off-site sources indicate that there is the potential for poor quality groundwater to be present up gradient of the site. This is discussed further below.

2.3 Pathways

2.3.1 No additional information has been attained on the pathways from the site. Pre-landfill Directive waste was placed directly in the base of the quarry, which was industry practise at the time. There are no records available to confirm if an engineered geological barrier has historically been placed at the site. All future areas of waste deposit will require the placement of a geological barrier in accordance with the Environmental Permitting Regulations. The conceptual model for the site assumes that the geological barrier is absent across the base of the current waste footprint.

2.3.2 The remaining conceptual model remains largely unaltered. It is summarised below for completeness.

Geology

2.3.3 The geological setting remains unaltered however, the nomenclature has changed and is summarised in accordance with the terms used within the BGS Lexicon¹ of geological names.

Table 2: Summary of Geology

	Group description	Thickness	Formations/ members
Hunts Bay Oolite Group	Mainly ooidal limestones, with subordinate skeletal, peloidal and oncolitic limestones and calcite mudstones	245m	Hunts Bay Oolite Group (undifferentiated)
			Cefnyrhendy Oolite Member
Pembroke Group	Skeletal and ooidal limestones with some calcite and dolomite-mudstones, sandstones and mudstones	Up to 1250m	High Tor Limestone Fm
			Caswell Bay Mudstone Fm
			Gully Oolite Fm
Black Rock Limestone Group	Thin- to thick-bedded, dark grey to black, foetid, fine- to coarse-grained skeletal [mainly crinoid] packstones with subordinate thin beds of shaly argillaceous skeletal packstone and mudstone	500m	Friars Point Limestone Fm
			Brofiscin Oolite Fm
			Barry Harbour Limestone Fm
Avon Group (formerly Lower Limestone Shales)	Interbedded grey mudstones and thin- to medium-bedded skeletal packstones with one to several thick units of ooidal and skeletal grainstones. Thin units of calcite mudstone and mudstone locally present. Sparse thin ironstones. Represents mid to inner shelf/ramp deposits with coeval barrier, back barrier and coastal plain sediments.	140m	Cwmyniscay Mudstone Fm
			Castell Coch Fm
			Tongwynlasi Fm

Note: Thickness of groups taken from the BGS Lexicon of descriptions for the Vale of Glamorgan and represent maximum thicknesses.

2.3.4 The quarry is excavated into the Black Rock Limestone Subgroup which is described as skeletal and argillaceous packstones with minor oolites, shales and mudstones. Karstic

¹ British Geological Survey, Accessed July 2017, The BGS Lexicon of Named Rock Units: <http://www.bgs.ac.uk/lexicon/home.html>

features have been observed in the top 5m (pre quarrying levels). These have been widened and infilled with clays, silts and sands.

- 2.3.5 Faults and major joint sets within the Lower Carboniferous Limestone Series are orientated north northwest to south southeast with a second joint set orientated east northeast to west southwest. A third set of joints is reported to coincide with the bedding orientation (30-35 degrees to the north).

Hydrogeology

- 2.3.6 The Carboniferous Limestone is defined as a principal aquifer with flow dominated by fracture flow. Karstic behaviour is reported to be present in upper 5m of the strata which is above the base of the quarry.

- 2.3.7 The Avon Group (Lower Limestone Shale) is classified as Secondary A. It is noted that this strata was previously classified as a non-aquifer. Although the change in classification reflects a greater understanding of the potential for this strata to transmit groundwater, site investigation and monitoring data collected over the development of the site confirm that the original conceptual model remains valid where there is no groundwater migration towards the south. This is confirmed by the presence of two boreholes along the southern boundary (installed within the Avon Group) which have significantly higher groundwater levels in comparison to those installed within the permeable fractured limestone. Therefore notwithstanding the permeability contrast between the limestone and Avon group, the hydraulic gradient is such that there is no possible groundwater flow towards the south. The water levels within the Avon Group boreholes are considered to represent water in the superficial deposits and weathered zone. Therefore it is considered that these strata effectively form a barrier to flow in a southern direction at the site. The orientation and dip of this strata is considered to constrain the groundwater flow to the south and therefore the principal groundwater flow is along the strike of the beds towards the west.

- 2.3.8 Limited information is available in the permeability of the underlying limestone. Records of a regional permeabilities and transmissivities are limited. A search of the BGS Physical Properties of the major aquifers of England and Wales² has indicated that there is only one transmissivity value available within 10km of the site. This is from a former abstraction

² British Geological Survey & Environment Agency, 1997, The physical properties of major aquifers in England and Wales, BGS technical Report WD/97/34, EA R&D publication 8

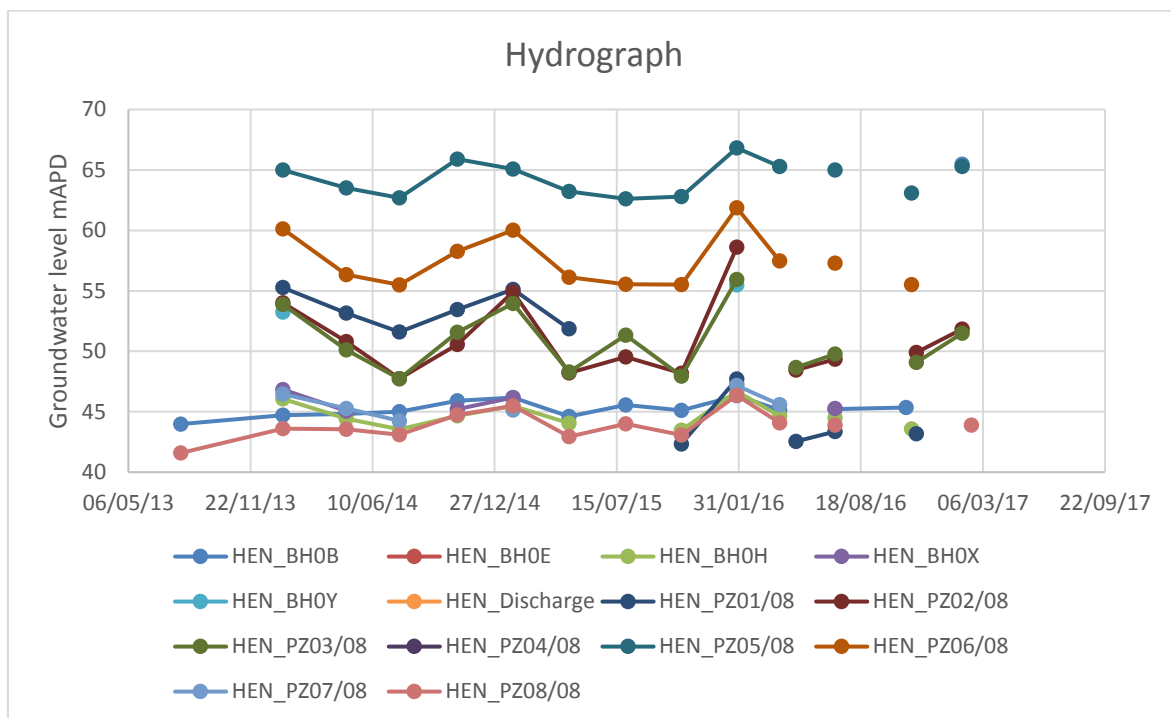
borehole at the Crown Brewery (now a housing estate) located 1.2km to the north-north west. The borehole appears to be located within the Hunts Bay Oolite Group. The transmissivity was reported as 130m²/day. Assuming at 30m saturated thickness this would equate broadly to a permeability of 4.3m/day or 5 x 10⁻⁵m/s. This value is at the upper end of the range of transmissivities reported for the region which is between 4 m²/day to 130 m²/day with a geometric mean of 34m²/day.

- 2.3.9 There is additional evidence from the quarry soakaway in support of the high transmissivity values. The discharge limit (to soakaway) is 750m³/day, however in the assessment of runoff³, ESI stated that volumes of up to 8,031m³/day have been discharged.
- 2.3.10 Many reference within the literature are made to the potential for high permeability conduits within the limestone formation and fracture flow with limited potential for attenuation is considered to dominate the hydrogeological regime at the site.

Groundwater Levels and Unsaturated zone

- 2.3.11 Groundwater levels have been monitored routinely throughout the development of the site.
- 2.3.12 The groundwater levels have remained relatively consistent with time. The location PZ05/08 and PZ06/08 are located on the outcrop of the Avon Group. These two locations display a significantly higher groundwater level than all other locations at the site and are considered to represent water levels within the weathered shale units. The locations of these boreholes is shown on Drawing 01.
- 2.3.13 Groundwater levels within the other boreholes indicate consistent groundwater gradient from the east to the west. The quarry sump appears to be in continuity with the groundwater with the water level in the sump recorded as 44.6 mAOD on the June 2017 survey. The depth of the sump is unknown. The nearest borehole to the sump is HEN-BH0B (which typically has levels recorded circa 45 mAOD. It is noted that the boreholes to the east of the sump (up gradient wells PZ02/08 and PZ03/08) display a higher seasonal variation compared to those to the west of the sump.

³ ESI, Dec 2014, Hendy Quarry – Assessment of runoff, Ref 62847TN1



2.3.14 The base of the quarry is circa 45-46 mAOD. This is similar to the minimum water levels monitored within the up gradient boreholes which indicates that there is no significant (>1m) unsaturated zone beneath the base of the site, however there is no reported groundwater ingress within the base of the quarry.

Groundwater Monitoring and Quality.

2.3.15 The groundwater quality is monitored in two up gradient (PZ02/08, PZ03/08) and two down gradient monitoring wells (PZ07/08, PZ08/08), however previously groundwater quality has been monitored across the wider quarry area and all data available has been assessed with respect to the groundwater quality around the site.

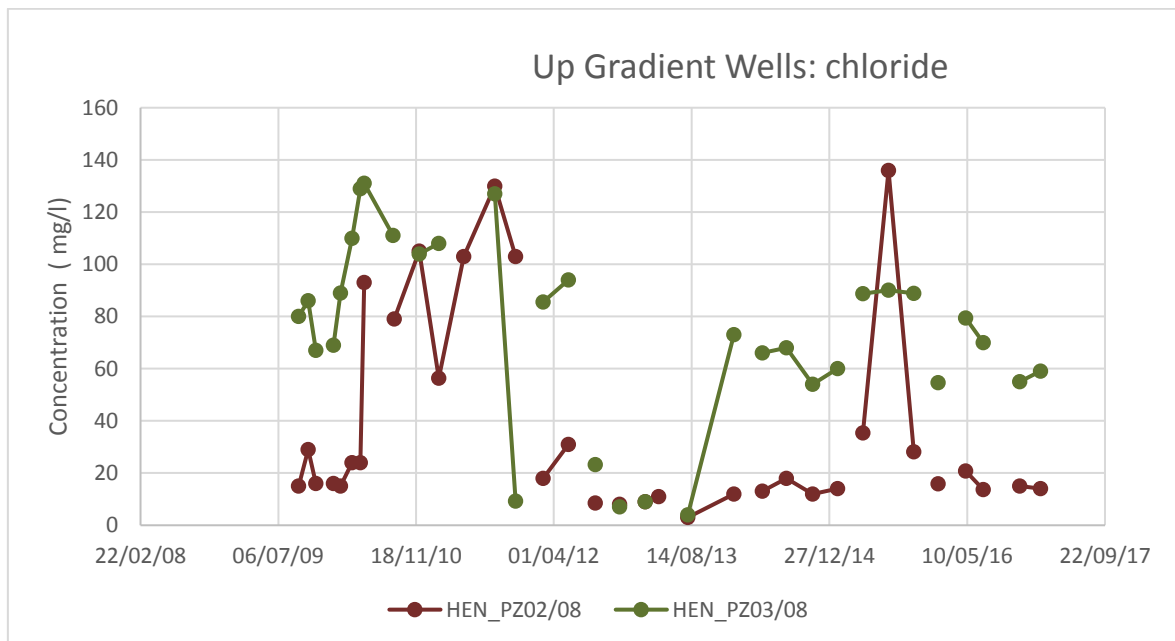
2.3.16 All available monitoring data between 2009 and 2017 has been used within this section. It is noted that a number of boreholes were dry or had insufficient liquid to sample on a number of occasions throughout this review period. Most significantly the down gradient monitoring well PZ07/08 has been dry for the past 4 years and therefore is not suitable to monitor the groundwater in this location.

2.3.17 The time series data presented in Appendix 1 has been assessed in terms of likely putrescible waste indicator species that is ammoniacal nitrogen and chloride, in order to identify if the inert waste mass is performing as expected.

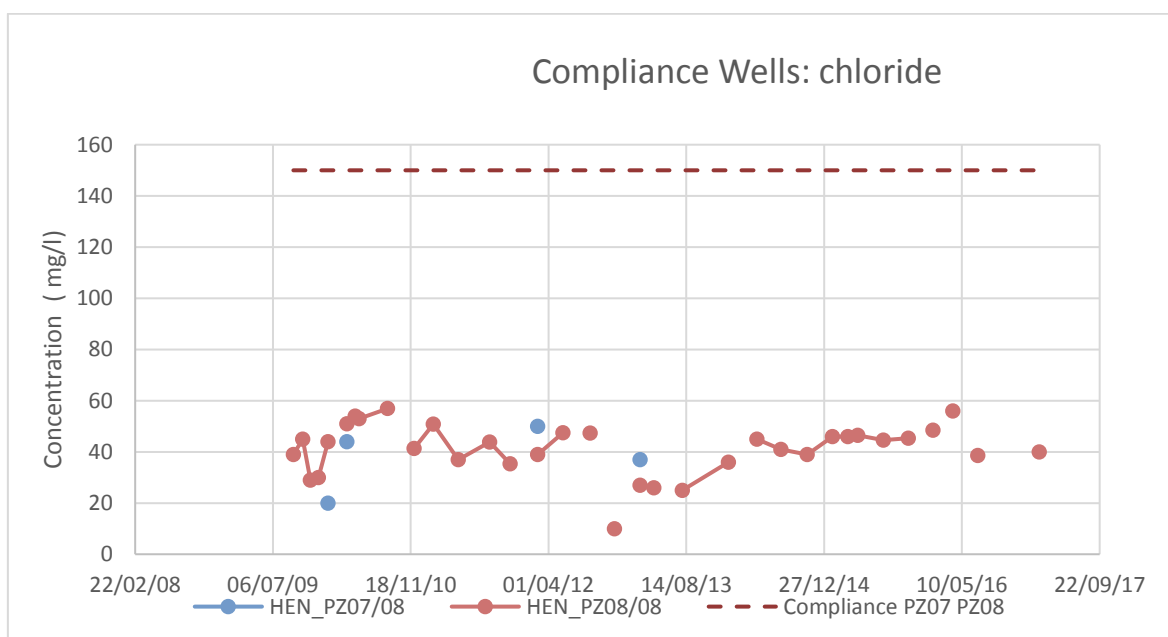
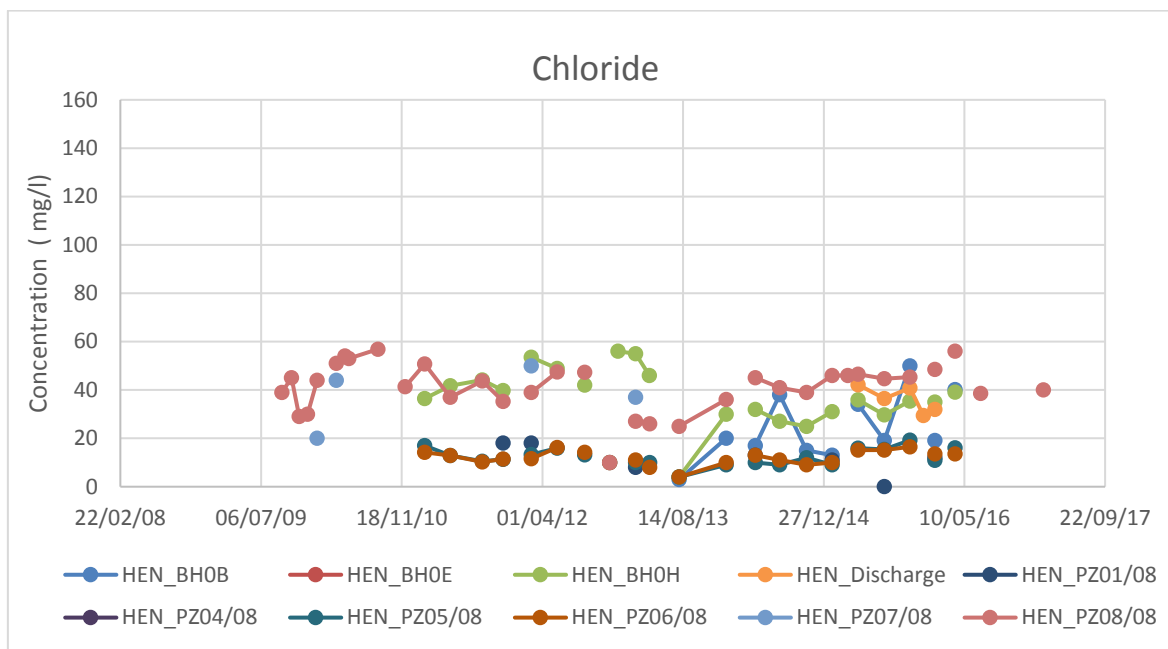
2.3.18 The graphs and statistics assume that all results recorded at less than the laboratory detection limit are at this level to enable them to be displayed and conservatively included in the statistic.

2.3.19 The chloride concentrations presented in the graphs below indicates that there is a distinct difference in concentrations observed in the up gradient boreholes (particularly PZ03/08) and all other locations. The time series graph below indicates that consistently higher chloride concentrations are observed in PZ03/08 which is up gradient of the site. Although this is not accompanied by any discernible increase in ammoniacal nitrogen concentrations, there is a discernible difference in sodium concentrations between PZ02/08 and PZ03/08. An ionic balance between the chloride and sodium concentrations is variable with time and on occasion within 10% (Jan 2017) which may indicate an impact from salt, however the concentrations are very low and therefore if the source is salt, it is unlikely to be in close proximity to this borehole. It is noted that recent data for PZ02/08 is comparable to the other borehole since 2014 with one exception.

2.3.20 All results for PZ07/08 and PZ08/08 are lower than the compliance level of 150 mg/l.



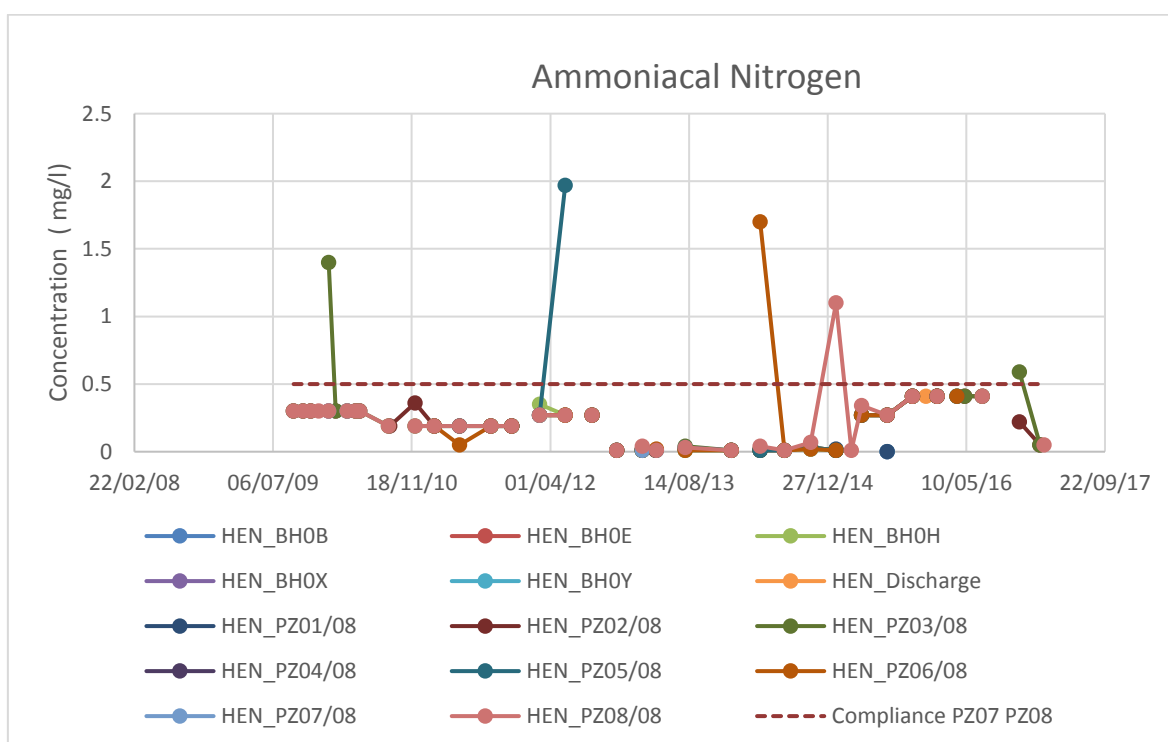
2.3.21 There are no discernible trends within the down gradient data.

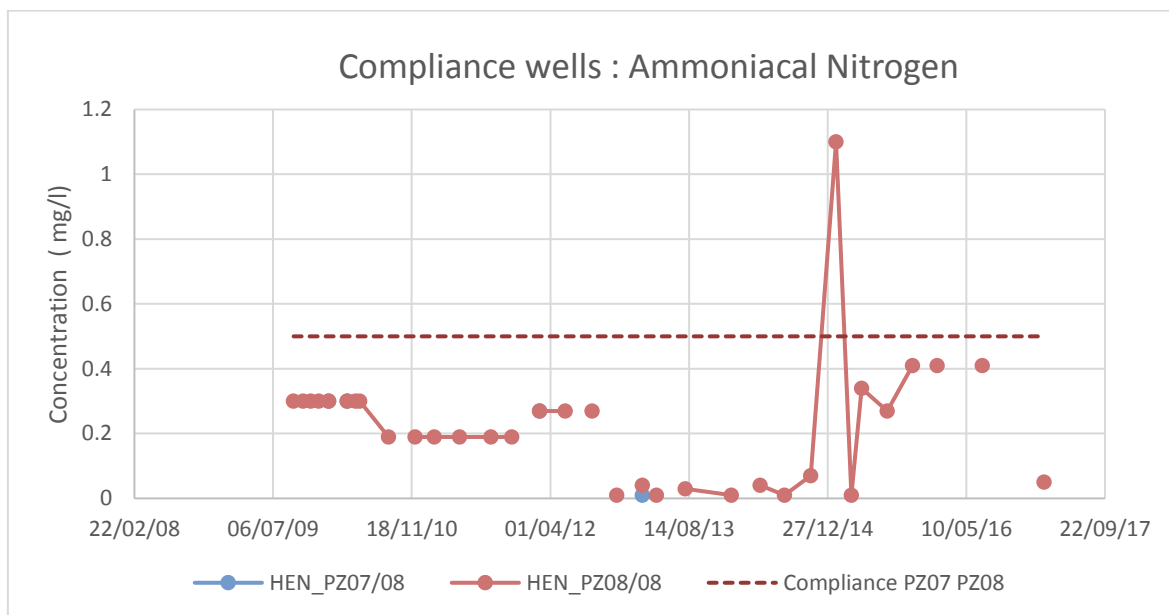


2.3.22 The ammoniacal nitrogen concentrations are typically recorded at less than the lab detection limit, however it is noted that this has varied between <0.41 mg/l and <0.01 mg/l. In recognition of this issue, the detection limit from April 2017 onwards is <0.05 mg/l. Where recorded the ammoniacal nitrogen concentrations are generally lower than the compliance criteria of 0.5 mg/l. Within the compliance wells, only one exceedance of the compliance criteria is recorded in PZ08/08 with an additional value of 10.7 mg/l excluded on the basis that previous and following samples had results of <0.3 mg/l, in addition there is no increase of similar magnitude in other parameters (particularly chloride) and therefore

the result is not considered to be due to 'leachate' from the waste mass. Any such 'leachate' would be expected to have a similar proportionate rise in concentrations of other indicator species and be sustained over a longer period.

2.3.23 A second exceedance was observed in December 2014 with a value of 1.2 mg/l. The timeseries graphs below also show that this was not part of any prolonged deterioration in groundwater quality nor associated with any of the 'spikes' in non-compliance borehole, neither is it associated with any increase in chloride concentrations within the borehole. Therefore it is very unlikely that this result is due to an impact from waste deposited under the conditions of the Permit.



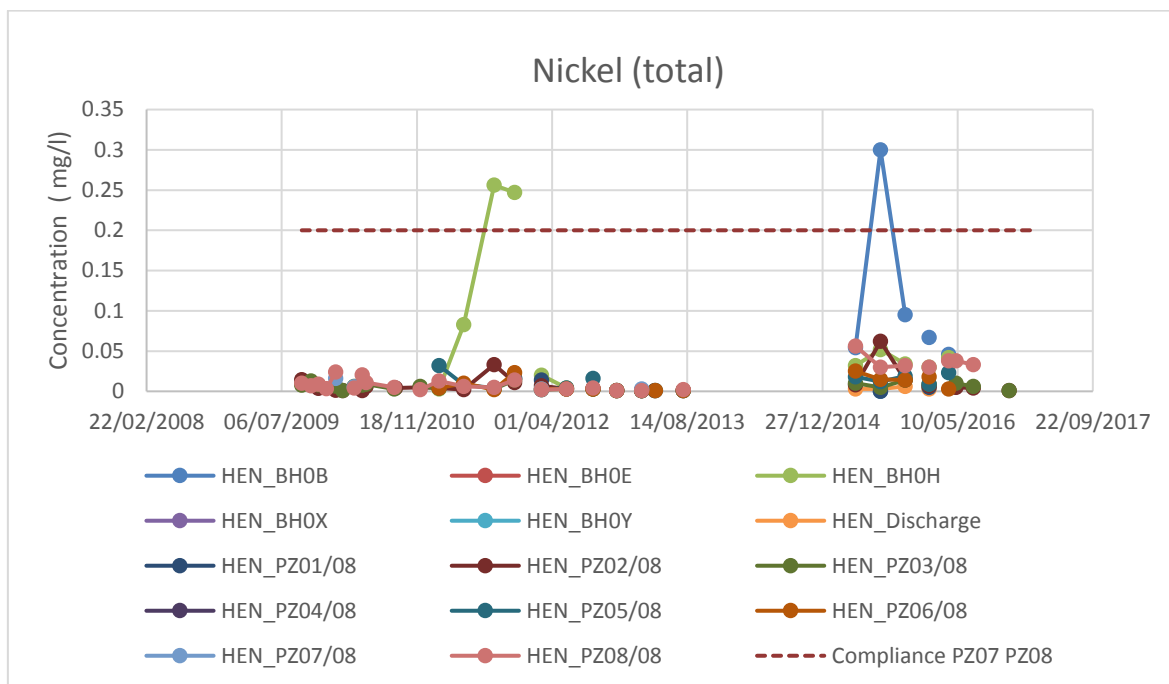


2.3.24 Nickel is reported as total and dissolved concentrations. The latter is only present for a short period between March 2013 and March 2014 (see Appendix 1 for timeseries graph) whereas all other periods it is reported as total Nickel (mg/l). In recognition of this issue all metal concentrations since April 2017 have been monitored as dissolved concentrations and all timeseries data has been separated between total and dissolved concentrations with only selected graphs presented below.

2.3.25 The dissolved nickel concentrations are significantly below the compliance limit for PZ07/08 and PZ08/08 and are also significantly lower than the total nickel concentrations preceding and postdating this monitoring. This difference between total and dissolved concentrations illustrates the issues of particulate matter and colloidal matter which could occur within the samples.

2.3.26 The total nickel concentrations are generally significantly below the compliance limit for PZ07/08 and PZ08/08. The time series chart below indicates that there are two results higher than this level in BH0H in 2011 which then drop from 0.25 mg/l to 0.02 mg/l by the next result. The cause of this initial peak (2 results) is unknown however due to its limited longevity it is not considered to be associated with the waste operations as it is not associated with any increase in other parameters. In addition, there is a single isolated result in July 2015 in BH0B which is also above this level, however this considered to be a sporadic result and is not considered further. The sporadic nature of the results is considered to reflect the potential impact of sediments within the sample when analysed

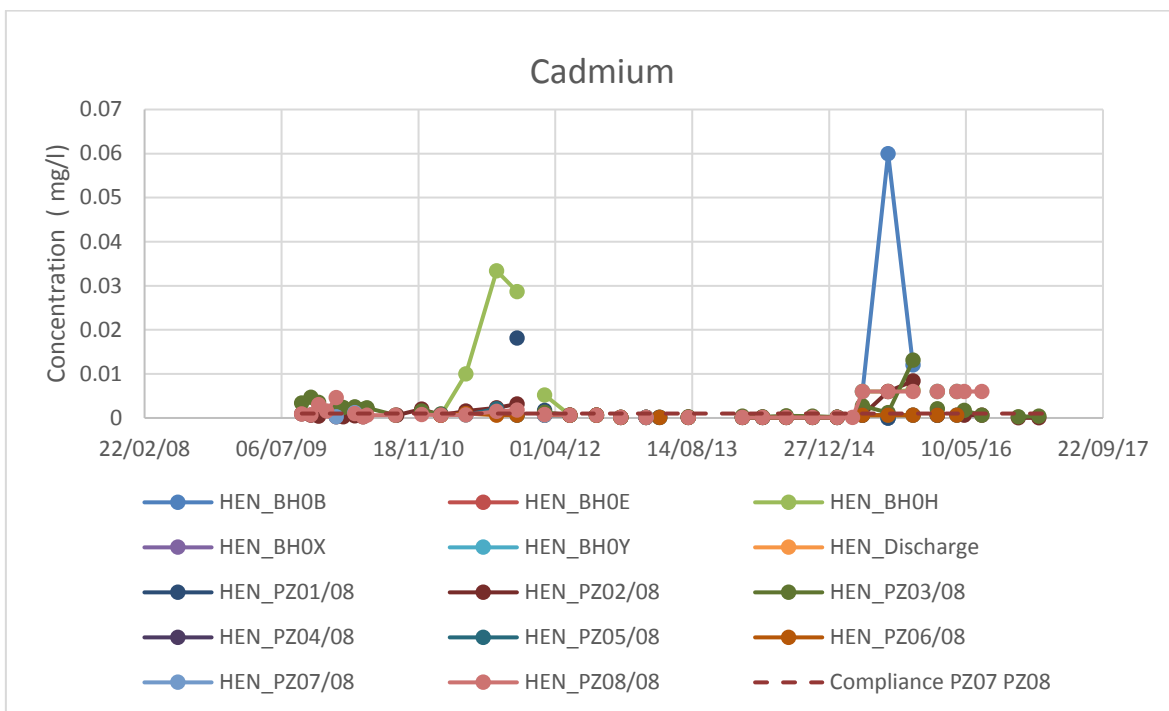
for total metal concentrations. It is therefore not considered to be representative of dissolve pollution within the groundwater.



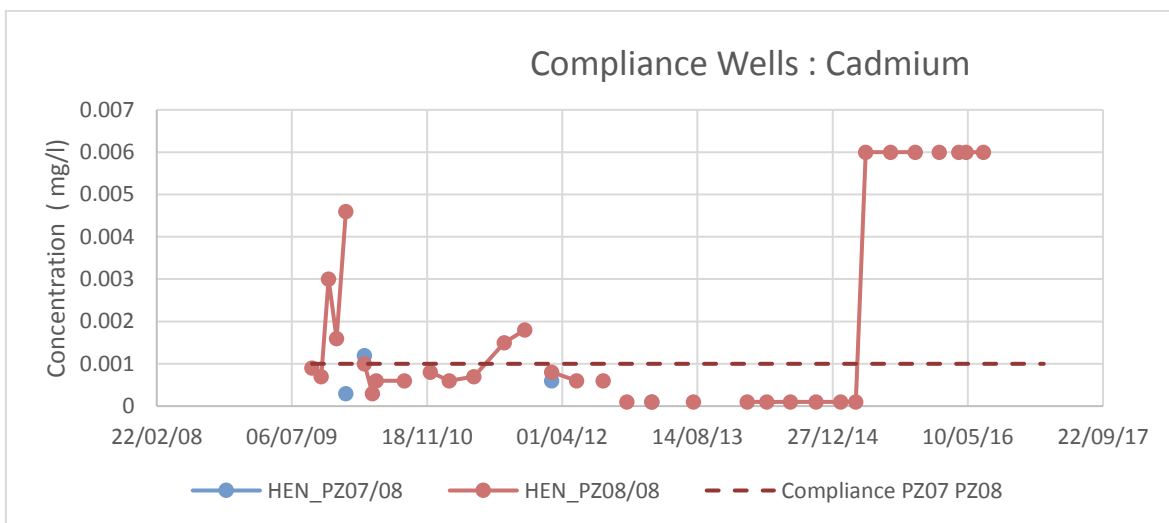
2.3.27 A review of the cadmium monitoring data indicates that prior to 2013 the cadmium concentrations were more varied across the site. No limits of detection are present in the data between 2009 and 2013 and therefore all concentrations are recorded as 'real' results. The most apparent feature is a spike in cadmium in borehole BH0H. The cause is unknown however it appears to mirror the nickel concentrations and may be due to sediment within the sample.

2.3.28 Post 2013, the boreholes with the exception of PZ03/08 generally record cadmium below the detection limit with only one recorded concentration in BH0H (0.0063 mg/l) and two recorded concentrations in PZ02/08 (0.006 mg/l and 0.0084 mg/l). In contrast, the results for PZ03/08 only have one result recorded as being less than the detection limit over the same time period with all other results marginally above the detection limit range between 0.0002 mg/l to 0.0131 mg/l). This is consistent with the conclusions of the previous HRA review which identified relatively higher concentration of cadmium in PZ03/08 compared to the remaining boreholes.

2.3.29 The data within the graphs are presented at their detection limit and therefore the spike portrayed for BH0B in July 2015 is misleading as this value is less than the detection limit.

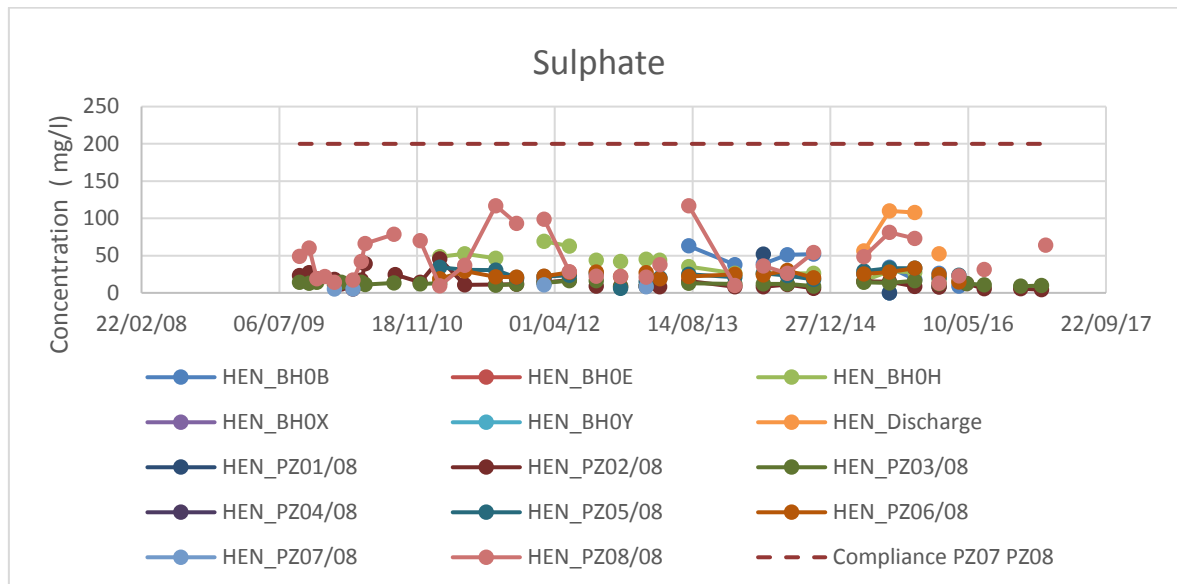


2.3.30 The cadmium concentrations for the compliance wells are presented in the graph below. This implies that the compliance criteria was exceeded in PZ08/08 from April 2016 onwards, however this is a result of the laboratory detection limit increasing to 0.006 mg/l within the database. All samples were recorded below this level and prior to April 2016 the concentrations were generally below 0.0001 mg/l. Therefore these results are not considered to represent an increase in concentrations with time but reflect the change in lab detection limits and consequently unable to demonstrate compliance. In reflection of these observations, the monitoring of cadmium since April 2017 has been reviewed and targeted for dissolved metal with a detection limit of 0.02ug/l.



2.3.31 The cadmium concentrations appear consistent with the previous HRA, with respect to no consistent results above the detection limit other than in PZ03/08 (up gradient).

2.3.32 Sulphate concentrations remain below the compliance limit for the duration of this review period. This remains consistent with the previous HRA review in 2009.



2.3.33 Naphthalene concentrations are consistently low across the site. The detection limit for all samples take on 7/7/2016 was <2 ug/l which is higher than the usual detection limit of <0.01ug/l. Therefore the graph below appear to show an increase on this occasion, however it is a reflection of the variation in detection limits. Naphthalene remains in compliance with permit criteria.

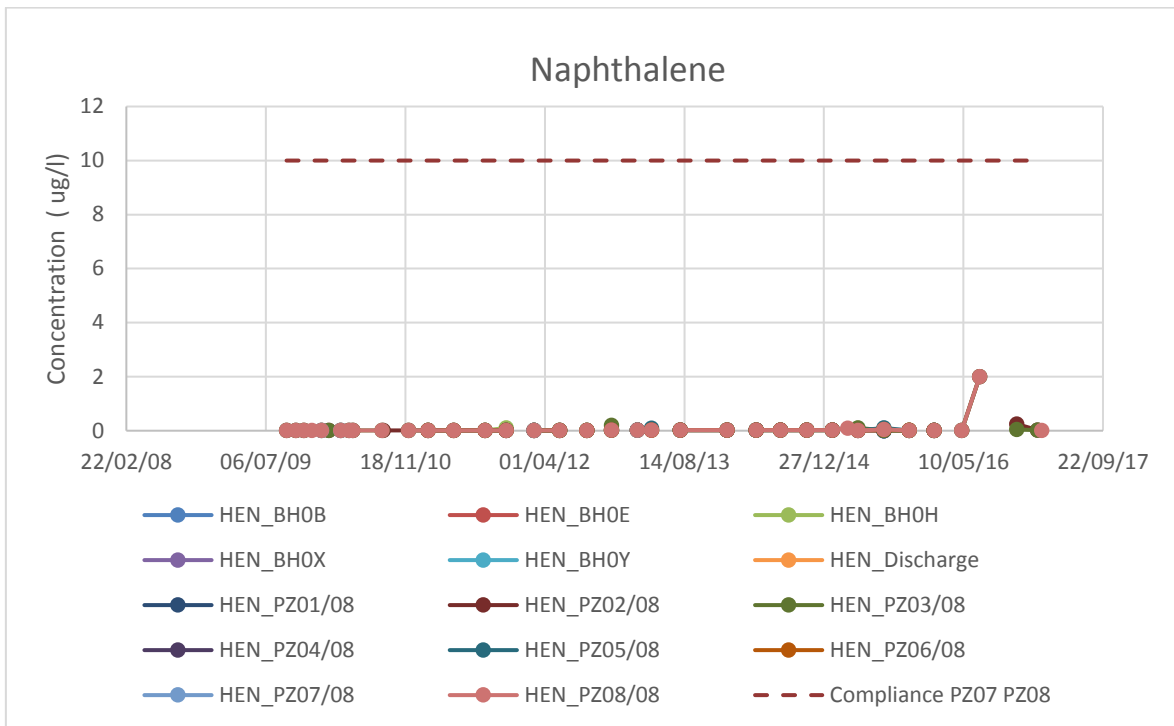


Table 3: Summary Statistics 2009-2017 for parameters with compliance limits

	HEN_BHOB	HEN_BHOE	HEN_BH0H	HEN_BHOX	HEN_BHOY	HEN_Discharge	HEN_PZ01/08	HEN_PZ02/08	HEN_PZ03/08	HEN_PZ04/08	HEN_PZ05/08	HEN_PZ06/08	HEN_PZ07/08	HEN_PZ08/08
Chloride (mg/l)														
Compliance													150	150
Min	3		4			29.5	8	3	4		4	4	20	10
Average	24		38			36	13	37	73		12	12	38	41
Max	50		56			42.2	18	136	131		19.2	16.5	50	56.9
Count	11		21			5	6	34	32		21	21	4	34
Ammoniacal Nitrogen (mg/l)														
Compliance													0.5	0.5
Min	0.01		0.01			0.27	0.01	0.01	0.01		0.01	0.01	0.01	0.01
Average	0.16		0.18			0.35	0.15	0.21	0.26		0.25	0.24	0.22	0.23
Max	0.41		0.41			0.41	0.41	0.41	1.4		1.97	1.7	0.3	1.1
Count	12		20			5	6	34	32		21	21	4	33
Cadmium (mg/l)														
Compliance													0.001	0.001
Min	0.0001		0.0001			0.0006	0.0001	0.00002	0.0001		0.0001	0.0001	0.0001	0.0001
Average	0.0082		0.0053			0.0006	0.0035	0.0010	0.0017		0.0005	0.0004	0.0006	0.0019
Max	0.06		0.0334			0.0006	0.0181	0.0084	0.0131		0.0021	0.001	0.0012	0.006
Count	11		21			4	6	34	32		21	21	4	33
Nickel (mg/l) (total)														
Compliance													0.2	0.2
Min	0.046		0.001			0.003	0.001	0.0009	0.0009		0.001	0.001	0.003	0.001
Average	0.112		0.054			0.004	0.0091	0.008	0.006		0.010	0.008	0.007	0.015
Max	0.3		0.256			0.006	0.0165	0.062	0.014		0.032	0.025	0.016	0.056
Count	5		15			4	4	28	26		16	16	4	27

	HEN_BH0B	HEN_BH0E	HEN_BH0H	HEN_BH0X	HEN_BH0Y	HEN_Discharge	HEN_PZ01/08	HEN_PZ02/08	HEN_PZ03/08	HEN_PZ04/08	HEN_PZ05/08	HEN_PZ06/08	HEN_PZ07/08	HEN_PZ08/08
Nickel Dissolved (mg/l)														
Compliance													0.2	0.2
Min	0.001		0.001			0	0.001	0.001	0.001		0.001	0.001	0	0.001
Average	0.001		0.001				0.001	0.001	0.001		0.001	0.001		0.001857
Max	0.001		0.001			0	0.001	0.001	0.001		0.001	0.001	0	0.004
Count	6		6			0	2	6	6		6	6	0	7
Sulphate (mg/l)														
Compliance													200	200
Min	9.1		16			52.5	8.5	4.3	8	0	6	14.7	0	9.6
Average	35.5		33.1			81.7	21	12.8	12.5	0.0	25.4	24.9		53.0
Max	63		69.2			110	52	45.6	16.4	0	34.3	33.1	10.7	117
Count	10		19			4	5	34	32	0	21	21	4	33
Naphthalene (ug/l)														
Compliance													10	10
Min	0		0.01			0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01
Average	0.02		0.02			0.01	0.015	0.08	0.08		0.02	0.02	0.01	0.07
Max	0.02		0.1			0.017	0.02	2	2		0.1	0.04	0.02	2
Count	10		20			4	6	34	32		20	20	4	34

Assessment of Hazardous Organic Contaminants

2.3.34 The publication of the assessment of hazardous substances by UKTAG in 2017, reclassified lead as a hazardous substance and consequently this has been discussed separately below.

2.3.35 Organic contaminants have been recorded above the detection limit in all locations between 2013 and 2017. Prior to this date the database does not include less than identifiers and for the purpose of assessing the occurrence has been exclude for the table below. The number of occasions above detection limit is presented in Table 4 below:

Table 4: Number of recorded occurrences of Hydrocarbons in Groundwater

	HEN_PZ 05/08	HEN_PZ 01/08	HEN_PZ 06/08	HEN_Dis charge	HEN_PZ 02/08	HEN_PZ 08/08	HEN_PZ 03/08	HEN_B HOB	HEN_B H0H
TPH	1	2	2	6	3	6	4	6	6
TPH Band >C16-C24)	1	2	2	6	3	6	4	6	6
TPH Band >C24-C40	1	2	2	6	3	6	4	6	6
Total PAH	1	2	2	4	5	8	9	10	11
Chrysene	1	2	2	2	3	6	5	7	8
Benzo-b- fluoranthene		1	1		1	1	1	2	2
Benzo-k- fluoranthene	1	2	2	2	3	6	5	7	8
TPH (ug/l)				3	2	2	4	2	2
Fluoranthene	1	2	2	2	3	6	5	7	8
Benzo-ghi- perylene	1	2	2	2	3	6	5	7	8
Benzo-a- anthracene	1	2	2	2	3	6	5	7	8
Benzo-a- pyrene	1	2	2	2	3	6	5	7	8
Naphthalene	1	2	2	4	5	8	9	9	10
Dibenz-ah- anthracene	1	2	2	2	3	6	5	7	8
Indeno-123- cd-pyrene*	1	2	2	2	3	6	5	7	8
Fluorene	1	2	2	2	3	6	5	7	8
Pyrene	1	2	2	2	3	6	5	7	8
Phenanthrene	1	2	2	2	3	6	5	7	8
Anthracene*	1	2	2	2	3	6	5	7	8
Acenaphthene *	1	2	2	2	3	6	5	7	8
Acenaphthyle ne	1	2	2	2	3	6	5	7	8

2.3.36 The table indicates that Borehole BH0B and BH0H have the highest number of occurrences of organics in the samples. The highest concentration are observed in BH0B and BH0H rather than BH08/08 which implies that the source of the contamination lies to the north

of the waste mass. It is noted that these boreholes are located close the weighbridge and yards areas. It is considered unlikely that these concentrations are due to the landfilled inert waste due to the distance of these boreholes from the waste mass (cross-gradient). Similar number of occurrences are observed within the surface water discharge, the up gradient wells (PZ02/08 and PZ03/08) and the down gradient well PZ08/08.

2.3.37 The maximum and average concentrations (calculated based on the assumption that concentrations < detection limit are at detection), are presented below.

Table 5: Maximum concentrations of Hydrocarbons recorded in Groundwater

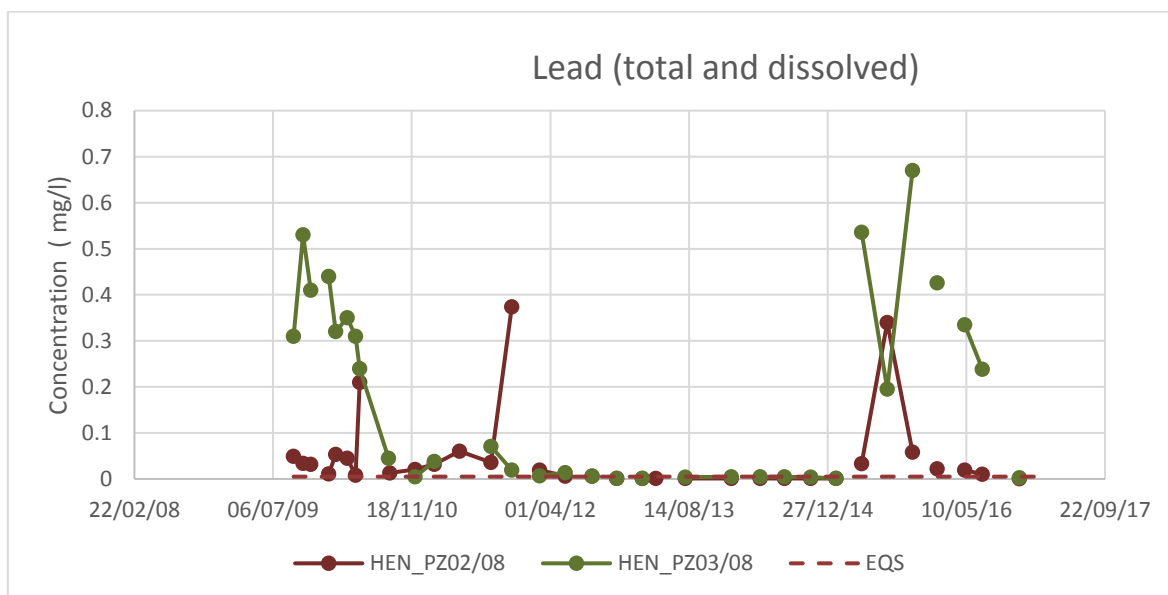
		Max	Associated well	Date
TPH	mg/l	1.67	BH0H	14/01/2014
TPH (ug/l)	ug/l	98	PZ03/08	04-May-16
TPH Band >C16-C24)	mg/l	1.16	BH0H	14/01/2014
TPH Band >C24-C40	mg/l	0.37	BH0H	14/01/2014
Acenaphthene	ug/l	0.124	BH0H	28/04/2015
Acenaphthylene	ug/l	0.031	BH0B	27/10/2014
Anthracene	ug/l	0.071	BH0B	27/10/2014
Benzo-a-anthracene	ug/l	0.415	BH0B	27/10/2014
Benzo-a-pyrene	ug/l	0.558	BH0B	27/10/2014
Benzo-ghi-perylene	ug/l	0.489	BH0B	27/10/2014
Benzo-k-fluoranthene	ug/l	0.258	BH0B	27/10/2014
Benzo-b-fluoranthene	ug/l	0.915	BH0B	27/10/2014
Chrysene	ug/l	0.479	BH0B	27/10/2014
Dibenz-ah-anthracene	ug/l	0.168	BH0B	27/10/2014
Fluoranthene	ug/l	0.544	BH0B	27/10/2014
Fluorene	ug/l	0.15	BH0H	14/01/2014
Indeno-123-cd-pyrene	ug/l	0.544	BH0B	27/10/2014
Naphthalene	ug/l	0.25	PZ02/08	17/11/2016
Phenanthrene	ug/l	0.155	BH0B	26/01/2015
Pyrene	ug/l	0.479	BH0B	27/10/2014
Total PAH	ug/l	10	Hen (Discharge)	29/10/2015

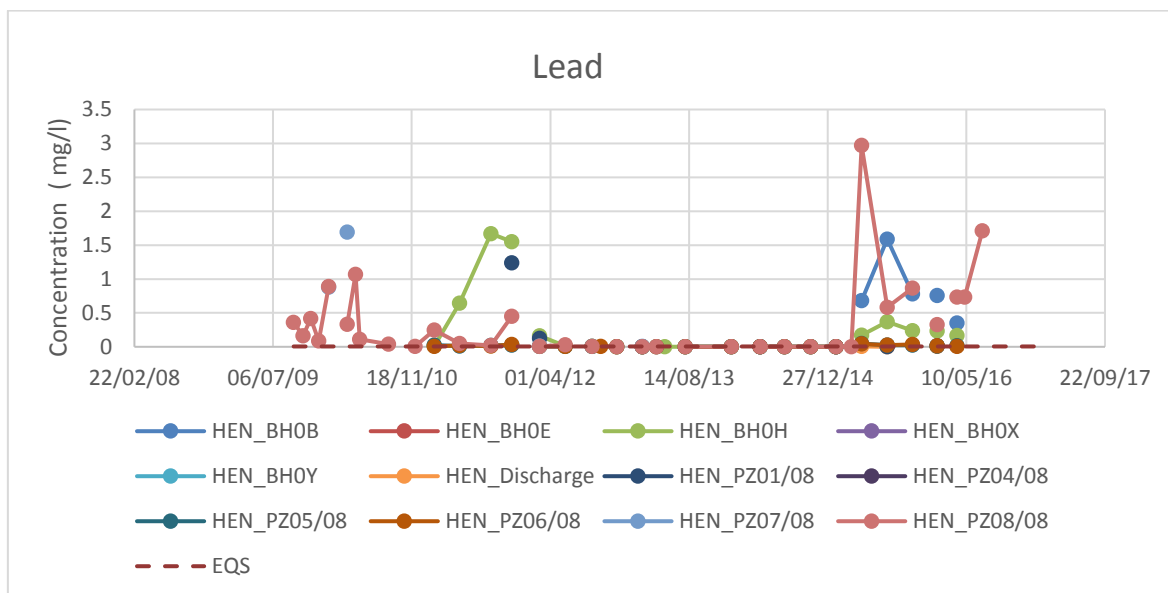
Lead

2.3.38 Lead is found naturally occurring within groundwater. UKTAG defines values for hazardous substance which 'concentrations in groundwater below which the danger of deterioration in the quality of the receiving groundwater is avoided (an annual mean ug/l). For lead this value is 5 ug/l. It is noted that this technical report postdates the values (AA of 1.2 ug/l and MAC of 14 ug/l) presented by the EA(England) in their guidance on surface water risk assessment and that the UKTAG values are specific to groundwater as opposed to surface water environments. Therefore it is considered more consistent with the technical

guidance to adopt the values presented for groundwater for the hydrogeological review for the site.

2.3.39 The up gradient groundwater quality is inferior to this as indicated in the time series chart below. It is recommended that future analysis is for dissolved lead only to avoid and spikes in concentration associated with sediments with the sample and to allow direct comparison to the relevant standard. The period of dissolved lead monitoring between 2012 and 2015 indicated consistent levels below this criteria. The high concentrations are reported for samples where total lead has been monitored.





2.3.41 In order to set compliance limits for this parameter, it is necessary to have confidence in the natural concentrations of dissolved lead within this environment. Therefore due to the uncertainties within the database displayed as erratic results, it is not proposed to include this hazardous substance in the list of parameters for compliance monitoring.

Other Parameters:

2.3.42 Timeseries charts are presented in Appendix 1 for all other parameters monitored at the site. The graphs indicate that there has potentially been issues with units for the total iron concentrations and total manganese concentrations. Alternatively there is the potential for these results to represent colloidal sediment in the sample.

2.3.43 The potassium and sodium concentrations are relatively stable however the calcium and magnesium concentrations show a spike in July 2015 in both the up gradient and down gradient locations. The cause of this spike is unknown however the concentrations returned rapidly to background levels.

2.3.44 The chromium concentrations have a higher degree of variability from 2015 onwards in BH0B, BH0H and PZ08/08, however this may reflect the change from dissolved concentrations to total chromium concentrations. It is noted that the detection limit also increases accordingly at this time. Boreholes BH0B and BH0H are down gradient of the waste mass and as this event is observed in all three locations, it is not considered to represent a deterioration in the water quality associated with the waste mass.

Technical Precautions

2.3.45 All new areas will be engineered in compliance with the Landfill Directive. The technical precautions will include the placement of a geological barrier with a minimum thickness of 1m and permeability of 1×10^{-7} m/s.

2.3.46 The current site relies on the waste acceptance policy and procedures to ensure that only inert waste is accepted at the site.

2.4 Receptors

2.4.1 The primary receptor remains the groundwater within the Carboniferous Limestone which ultimately discharges to the River Ely. A recent review of the licenced and unlicensed abstractions was undertaken in 2009. It is assumed that these receptors remain valid.

2.4.2 The 2009 report also identifies the presence of a SSSI along a stretch of the Ely Valley located approximately 2km down gradient of the site. Due to the distance from the SSSI, the site is considered to be a low to moderate sensitive locations with respect to the potential impact on the SSSI.

2.5 Suitability of Environmentally Acceptable Levels

2.5.1 In 2009 the background water quality data was reviewed to provide site specific compliance limits for the groundwater quality at the site. The priority contaminants selected were based on the likely potential contaminants such as hydrocarbons, ammoniacal nitrogen and chloride which may be associated with contaminated soils and top soils within rogue loads. It is considered that these remain valid. The assessment levels were based on a combination of background water quality and water quality standards at the time. We note that a number of the water quality standards (specifically Nickel) have been revised in accordance with the Water Framework Directive, together with the reclassification of cadmium as a non-hazardous substance. (UKTAG January 2017).

Table 6: Environmentally Acceptable Levels

Parameter	Quality standard		Standard	Up Gradient groundwater 95%ile	Selected EAL
	AA	MAC			
Ammoniacal Nitrogen		0.5	Water supply Regulations	0.41^	0.5
Naphthalene ug/l	2	130	EQS (WFD)	0.035	2
Nickel ug/l	4 (bio)	32	EQS (WFD)	14	20
Cadmium ug/l	0.25*	1.5*	EQS (WFD)	3.4#	3.4
Chloride mg/l		250	Water supply Regulations 2016	128	150
Sulphate mg/l		400	Water supply Regs 2016	26	75

Notes: ^ 95%ile values is the same as the laboratory detection limit.

*Average alkalinity for up gradient locations is 288 mg/l CaCO₃. Standard selected on this basis

- anomalous data point of removed from calculation of 95%ile (0.0131mg/l discarded)

2.6 Summary/Discussion

2.6.1 The key conclusions with regards to the conceptual site model since the last HRA/HRA Review was submitted are:

- No change in permitted waste types accepted at the site ;
- No change in pathways;
- A geological barrier will be installed in all new areas providing additional protection;
- Groundwater quality indicates no discernible change in quality.
- Receptors - no change in receptors.

3 HYDROGEOLOGICAL RISK ASSESSMENT

3.1 The Nature of Hydrogeological Risk Assessment

- 3.1.1 The Groundwater Directive does not apply to the site since the materials to be imported are strictly inert as defined by the Environmental Permitting Regulations. The site is located in a high sensitivity setting with respect to the groundwater and surface water environment. However the Environment Agency's technical guidance (as adopted by NRW) indicates that the appropriate complexity of risk assessment for a landfill site should be determined from the potential risks posed by the development which is linked to the sensitivity of the site setting.
- 3.1.2 The guidance provides indicative risk assessment levels for a range of scenarios. Adopting this guidance, the site is an inert waste facility, located on a highly permeability principal aquifer and with the base sub water table. Based on this setting the guidance recommends a generic risk assessment. It is noted that previous assessments for the site have been based on risk screening approach.
- 3.1.3 It is therefore considered that a simple risk assessment for the site is required to ensure compliance with the Environmental Permitting Regulations. This deviated from the 2004 risk assessment where only risk screening was undertaken.

3.2 The Proposed Assessment Scenario

Life Cycle Phase, Accidents and their Consequences

- 3.2.1 It is considered that a risk assessment of life cycle phases is not appropriate, given that the landfill by definition, will not produce any leachate that could result in a significant discharge of hazardous substances or non-hazardous pollutants throughout the development of the site.
- 3.2.2 Strict waste acceptance procedures will be adopted at the site to minimise the risk of noncompliant loads being accepted at the site. Any waste material not meeting the waste acceptance criteria will be removed from site.
- 3.2.3 The technical precautions comprising the geological barrier will not be subject to long term degradation.

3.3 The Priority Contaminants to be Modelled

3.3.1 There are no proposed changes to the priority contaminants identified in 2009. These were selected to represent potentially non inert component of a rogue load such as organic contamination of soils from fuel spills etc., degradable material which would be identified by chloride and ammoniacal nitrogen concentrations and mobile metal ions nickel.

3.4 Review of Technical Precautions

3.4.1 Under the Landfill Directive all new areas of disposal are required to be lined with a geological barrier. The specification for an inert facility is 1m at 1×10^{-7} m/s or equivalent with the geological barrier being a minimum of 0.5m thick. No construction details are available with regards to the current area and therefore conservatively, it is assumed within the assessment that no geological barrier is present.

3.4.2 Due to the nature of the waste, there is no technical requirement for leachate management infrastructure or engineered cap.

3.5 Numerical Modelling

3.5.1 *Justification for modelling approach and software*

3.5.2 As indicated above, site is considered to meet the requirement for a simple /generic risk assessment. This has been undertaken by reviewing the potential flow in the underlying aquifer, the potential leakage rates based on infiltration through the surface of the waste mass. This is based on a deterministic approach with realistic worst case values used within the calculations.

3.5.3 *Model parameterisation*

Assessment of Dilution in Limestone

3.5.4 The conceptual model presented above indicates that the flow within the Carboniferous Limestone is limited to fracture flow. The parameter used within this assessment are discussed in Section 2 above. It is assumed that the majority of flow will usually occur within the top 10 -30 m of the water table. The transmissivity is adopted from the nearest literature value which is 130m²/day.

3.5.5 Based on Darcy's law the flow within the limestone immediately below the base of the site is calculated to be:

$$Q = K * I * A$$

Where K is 13 m/day (transmissivity divided by the saturated thickness 10m)

I is 0.02 (groundwater contours see Drawing 3145HRA 02)

A is thickness (10m) * flow width (300m - base of site perpendicular to groundwater flow)

$$Q = 702 \text{ m}^3/\text{day}$$

If the average transmissivity of the unit is used within the calculation (34 m²/day) the predicted groundwater flow is 183 m³/day.

Calculation of potential leakage rate

- 3.5.6 Under steady state conditions, the potential leakage from the site will be controlled by the infiltration through the restoration soils. No site specific long term rainfall data is available and this generic assessment is based on long term annual rainfall figures taken from Technical bulletin 35⁴. It is recognised that this reference is old and a further 10% has been added to account for climate change.
- 3.5.7 Based on the rainfall of 1172 mm/yr and potential evapotranspiration rate of 510 mm/yr (for grass land), the effective rainfall to the site would be 660 mm/ yr. Therefore taking into account climate change (10%) 720 mm/yr potential infiltration to the site. Such high rainfall rates are likely to generate runoff from the site such that not all rainfall would infiltrate the waste mass. Information presented in the ESI report¹ indicates a run off coefficient of 0.67 would apply. This reduces the potential infiltration rate to 238 mm/yr.
- 3.5.8 Therefore based on a surface area of the restored quarry of (15Ha) the volume of leakage through the base of the site is equivalent to 97 m³/day.
- 3.5.9 In addition it is important to consider that this is inert waste and only rogue loads would have the potential to generate any leachate of discernible quality. Therefore assuming a 1

⁴ Ministry of agriculture Fisheries and Food, Technical Bulletin 35, The Agricultural Climate of England and Wales.

in 100 rogue load, the generation of potentially contaminating water would be approximately 1m³/day.

3.5.10 Therefore there is 700 times more water flowing beneath the site than the potential contaminated leakage rate.

3.5.11 Rogue loads within inert waste sites are unlikely to contain significant putrescible waste or hydrocarbons as such load would be identified as being unacceptable in accordance with the waste acceptance procedures. Therefore with 700 times dilution, it is considered unlikely that there is any potential risk to the groundwater environment from the waste mass.

3.5.12 *Sensitivity analysis*

3.5.13 Limited information is available on the permeability of the underlying limestone. Therefore the sensitivity of the model to this parameter will be assessed.

3.5.14 Assuming the average literature value for groundwater flow there is 180 times dilution within the aquifer. However evidence from site on the discharge rates to soakaway indicates that the permeability is likely to be close to the maximum literature value.

3.5.15 *Model validation*

3.5.16 The model indicates that there should be no discernible impact from the site on the groundwater quality in the down gradient monitoring boreholes. The examination of the groundwater monitoring data presented in Section 2 above indicates that there is no evidence of contamination from the waste mass itself.

3.6 Emissions to Groundwater

Assessment of significance of leachate

3.6.1 The above calculations indicate that the potential to generate a leachate is very small in comparison to the flow within the aquifer beneath the base of the site. In order to understand the significance of these finds an arbitrary assessment of a nominal contaminant loading indicates that there would be no unacceptable discharge at the point of groundwater emergence. This assessment is based on dilution within the aquifer only and no attenuation or dispersion has been considered.

3.6.2 *Hazardous substances*

3.6.3 The waste accepted at the site will be inert waste in accordance with article 2 of the LFD. Therefore, by definition, it will not pose a risk to groundwater with respect to hazardous substances.

3.6.4 *Non-hazardous pollutants*

3.6.5 The waste accepted at the site will be inert waste in accordance with article 2 of the LFD. Therefore, by definition, it will not pose a pollution risk to groundwater with respect to non-hazardous pollutants.

3.7 Hydrogeological completion criteria

3.7.1 The site accepts inert waste which by definition does not degrade. Therefore no completion criteria are applicable to the site.

3.8 Review of Technical Precautions

3.8.1 Capping – the waste comprises inert fill material and as such does not require a low permeability capping layer.

3.8.2 Lining Design - a geological barrier will be placed in all new areas in accordance with the landfill Directive. The geological barrier is required to have a minimum thickness of 0.5m with a permeability equivalent to 1m at 1×10^{-7} m/s.

3.8.3 Leachate drainage systems and head control - due to the inert nature of the waste, there is no requirement to collect and manage the leachate at the site.

3.8.4 Groundwater management - there is no requirement for groundwater management at the site.

4 REQUISITE SURVEILLANCE

4.1 Risk Based Monitoring

4.1.1 Environmental Permitting Regulations transpose the Landfill Directive requirement that Requisite surveillance is undertaken where disposal of hazardous substances or non-hazardous pollutants has been authorised. Although the waste stream is inert as defined by article 2 of the LFD, there remains a requirement to monitor groundwater to demonstrate that there is no adverse impact on the groundwater environment.

4.2 Leachate Monitoring

4.2.1 Due to the nature of the waste, no leachate collection infrastructure is required at the site and no monitoring is required.

4.3 Groundwater Monitoring

4.3.1 The environmental permit (PP3738XM 9 Oct 2009) states that the following monitoring is required to monitor the performance of the site (waste area).

Table 7: Groundwater Monitoring Requirements

Location	Frequency	Parameter
Groundwater		
Upgradient: PZ02/08, PZ03/08	Quarterly	Water level (mbgl). pH, EC, DO, temp, ammoniacal nitrogen, chloride, alkalinity, TON, TOC, sulphate, Sodium, Potassium, Calcium, Magnesium, iron, manganese, cadmium, chromium, copper, nickel, lead, zinc, TPH, PAH, naphthalene
Down gradient PZ07/08, PZ08/08	Quarterly	

4.3.2 All groundwater monitoring is undertaken in compliance with the groundwater management plan (HNDY_GMMPv1.0 FINAL).

4.3.3 The following recommendations have been made:

- PZ07/08 and PZ08/08 are refurbished or reinstatement to meet the requirements of two down gradient boreholes
- the laboratory detection limits for ammoniacal nitrogen, nickel and naphthalene are reviewed against the compliance limits and lower detection limits are adopted where appropriate.
- metal ion concentrations are for dissolved concentrations only.

4.3.4 Review of compliance levels

The compliance levels were derived in response to the improvement conditions IC6 and IC7. These were based on a combination of site specific values and environmental water quality standards. These values have been further reviewed as part of this assessment as indicated in section 2.5 environmentally acceptable limits. Control levels have been proposed for early identification of atypical groundwater quality at the site. These have been based on the time series graphs and are between the 95%ile up gradient water quality values and the compliance standard.

Table 8: Groundwater Control and Compliance Limits

Determinand	PZ07/08		PZ08/08	
	Control Limit*	Compliance Limit	Control Limit*	Compliance Limit
Chloride (mg/l)	100	150	100	150
Ammoniacal Nitrogen (mg/l as N)	0.3	0.5	0.3	0.5
Cadmium (ug/l)	-	1	-	1
Nickel (mg/l)	0.02	0.034	0.02	0.034
Sulphate (mg/l)	100	200	100	200
Naphthalene (ug/l)	2	10	2	10

Note: Greyed out cells represent proposed change to reflect change in status to nickel and reduction in the water quality standard.

4.4 Surface Water Monitoring

4.4.1 There are no surface water receptors in close proximity to the site. Surface water runoff from the site is currently discharged to soakaway.

Table 9: Surface Water Monitoring Requirements

Location	Frequency	Parameter	Limit
Surface Water			
Discharge to soakaway at ST 0538 8136	Daily	Volume	750 m ³ /day
	Weekly	Rate of discharge	25 l/s
	Quarterly	Suspended solids mineral oils, pH	100 mg/l 5 mg/l 6-9

4.4.2 There are no proposed changes to the monitoring regime however it is noted that the daily volume limitation on the discharge is currently under review. The site discharges to soakaway and therefore there are no external surface water monitoring locations.

5 CONCLUSIONS

5.1 Compliance with the Environmental Permitting Regulations 2016

- 5.1.1 The review has indicated that there has been no significant change in the conceptual model over the review period. The waste material permitted at the site remains inert waste as defined by the LFD and appropriate waste acceptance procedures are employed at the site. Therefore under the LFD there is no requirement to collect leachate from the site, install an artificial sealing layer nor provide a low permeability cap to the site.
- 5.1.2 Future areas for disposal will meet the requirements for a geological barrier with a minimum of 1m at 1×10^{-7} m/s or equivalent placed in all new areas in accordance with the a CQA plan.
- 5.1.3 This report has demonstrated that the site remains in a high sensitivity setting with respect to the groundwater environment and that the assessment of accidents and consequences has indicated that there would be no discernible impact on the receptor.
- 5.1.4 Requisite surveillance has been detailed to monitor the performance of the site and enable its compliance with the Environmental Permitting Regulations. The current groundwater monitoring regime is considered to be adequate based on the site's environmental setting. Recommendations include the instatement or refurbishment of PZ07/08 to comply with the minimum requirement of 2 down gradient monitoring boreholes.

REFERENCES

NRW 2017, Webpages Protecting groundwater link: <https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/protecting-groundwater/?lang=en>

Environment Agency, March 2017, Groundwater Protection Position statements

Environment Agency, Feb 2016, indicative risk assessment levels for a range of scenarios

Environment Agency, Feb 2016, groundwater risk assessment for your environmental permit, <https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit>




Environment Agency, Feb 2016, Landfill Developments: groundwater risk assessment for leachate <https://www.gov.uk/guidance/landfill-developments-groundwater-risk-assessment-for-leachate>

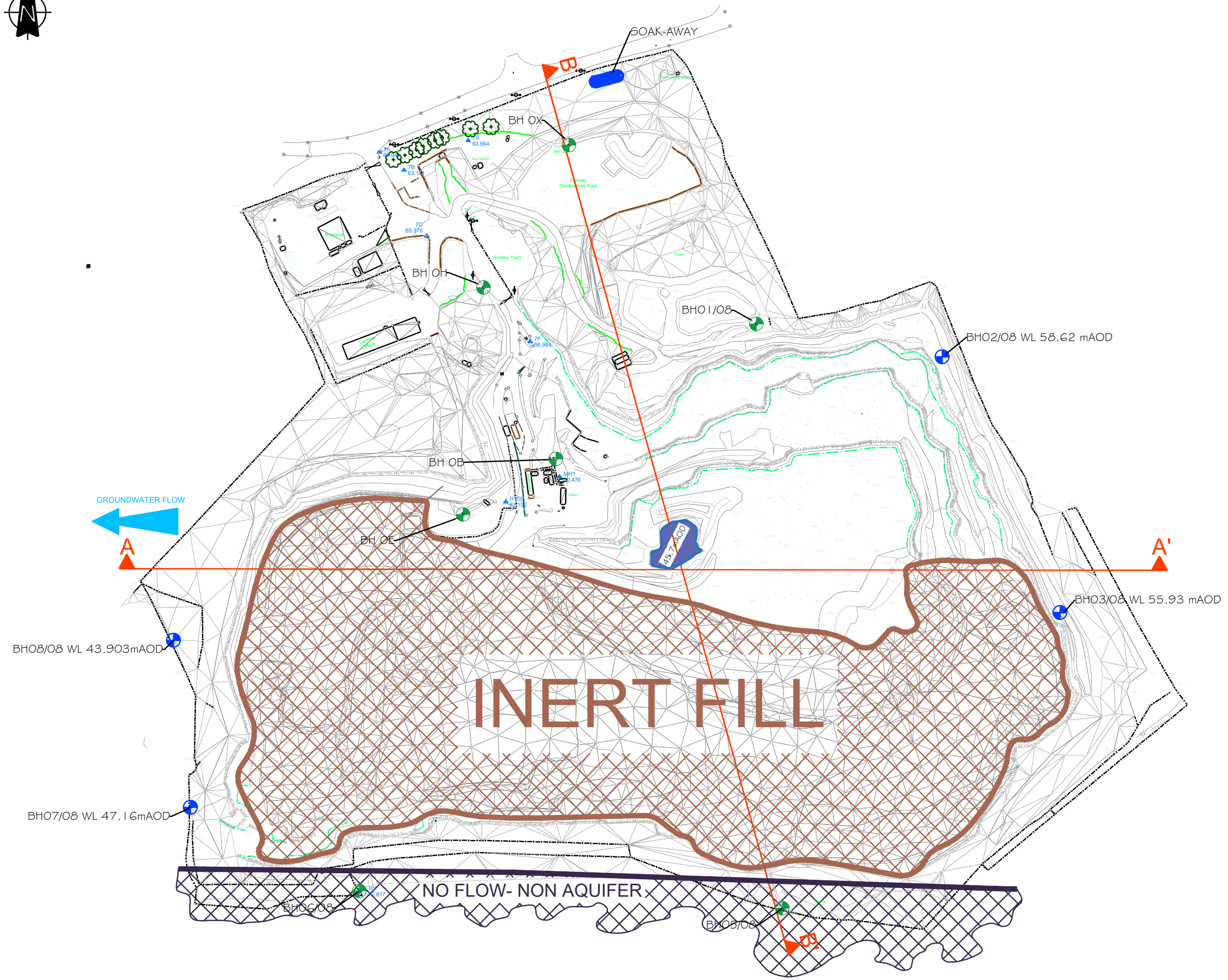
Environment Agency 2014, Hydrogeological risk assessment for landfills: 4 yearly review template <https://www.gov.uk/government/publications/hydrogeological-risk-assessment-for-landfills-4-yearly-review-template>

DRAWINGS



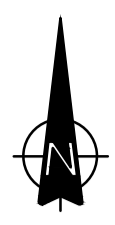
LEGEND

-  PZ02/0 PERMIT BOREHOLE LOCATION
-  PZ ADDITIONAL BOREHOLE LOCATIONS
-  SOAK-AWAY



PROJECT	HENDY	
REPORT TITLE	BOREHOLE LOCATION PLAN	
HRA 01	REPORT REF	3145






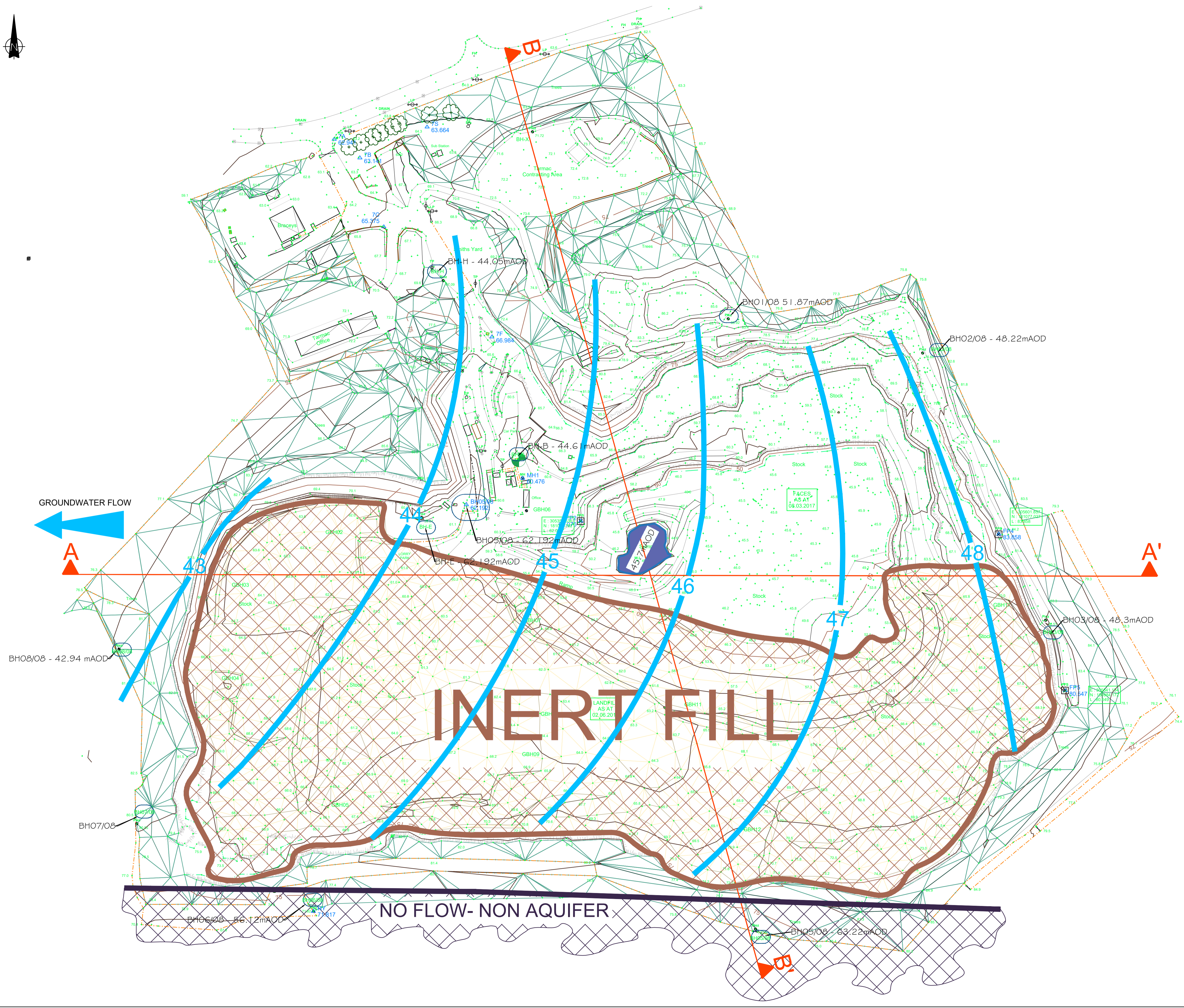


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LEGEND

-  INERT FILL
-  NON FLOW, NON AQUIFER
-  GROUNDWATER CONTOUR- 28.04.2015



PRELIMINARY DRAWING FOR INFORMATION PURPOSES ONLY

B	BOREHOLES ID AMENDED	EJD	SV	SV	09.01.18
A	GROUNDWATER CONTOURS	RP	SV	SV	18.09.17
REV	MODIFICATIONS	BY	RE	AP	DATE

PROJECT: TARMAC

HENDY

TITLE: CONCEPTUAL MODEL

DRAWN BY	RP	DATE	04.07.2017
REVIEWED BY	SV	SCALE @ A1	N.T.S.
AUTHORISED BY	SV	ISSUE	REVISION
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DRAWING NUMBER 3145.02



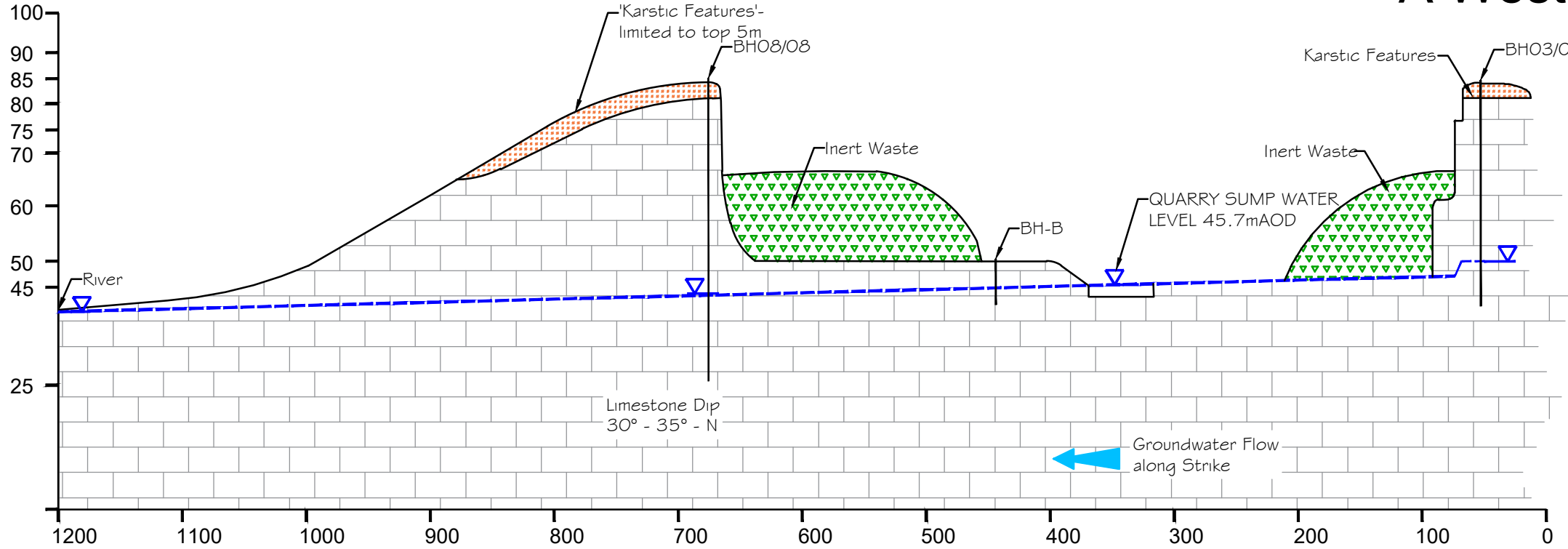
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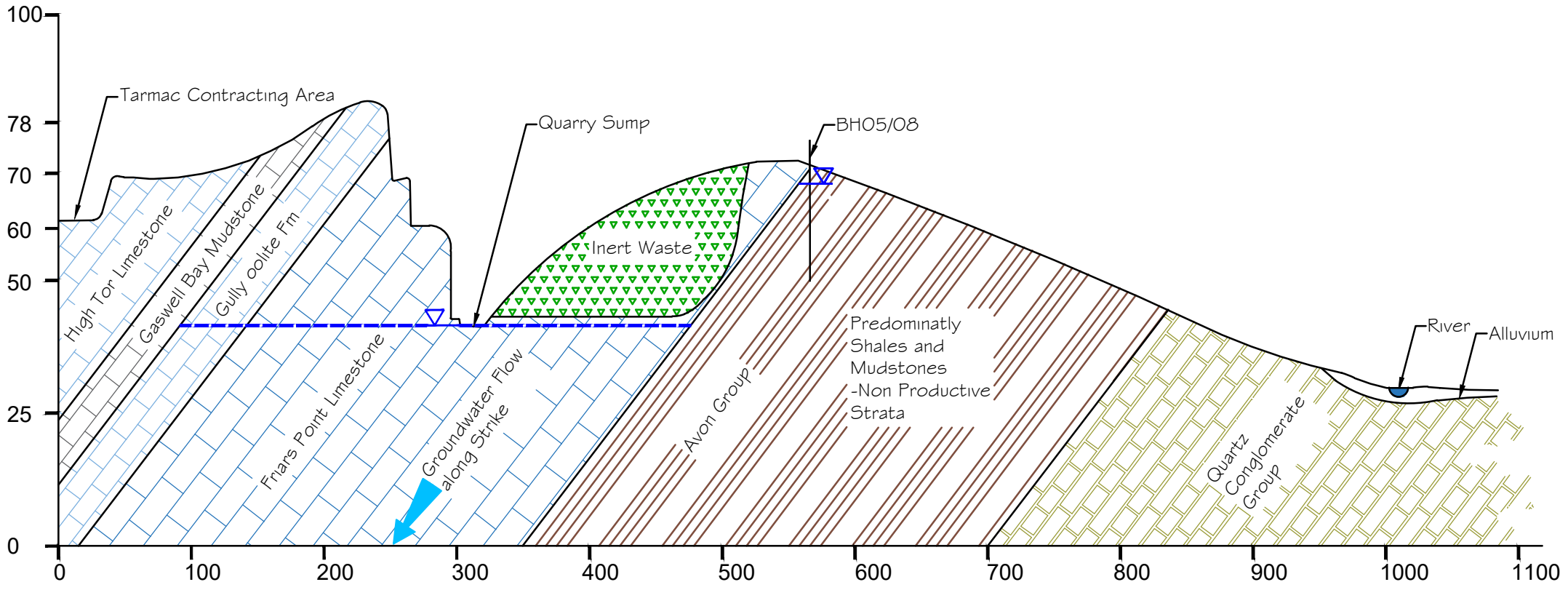
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PROJECT	
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REPORT TITLE	
CONCEPTUAL MODEL	
CROSS SECTION A-A	REPORT REF
	3145.03

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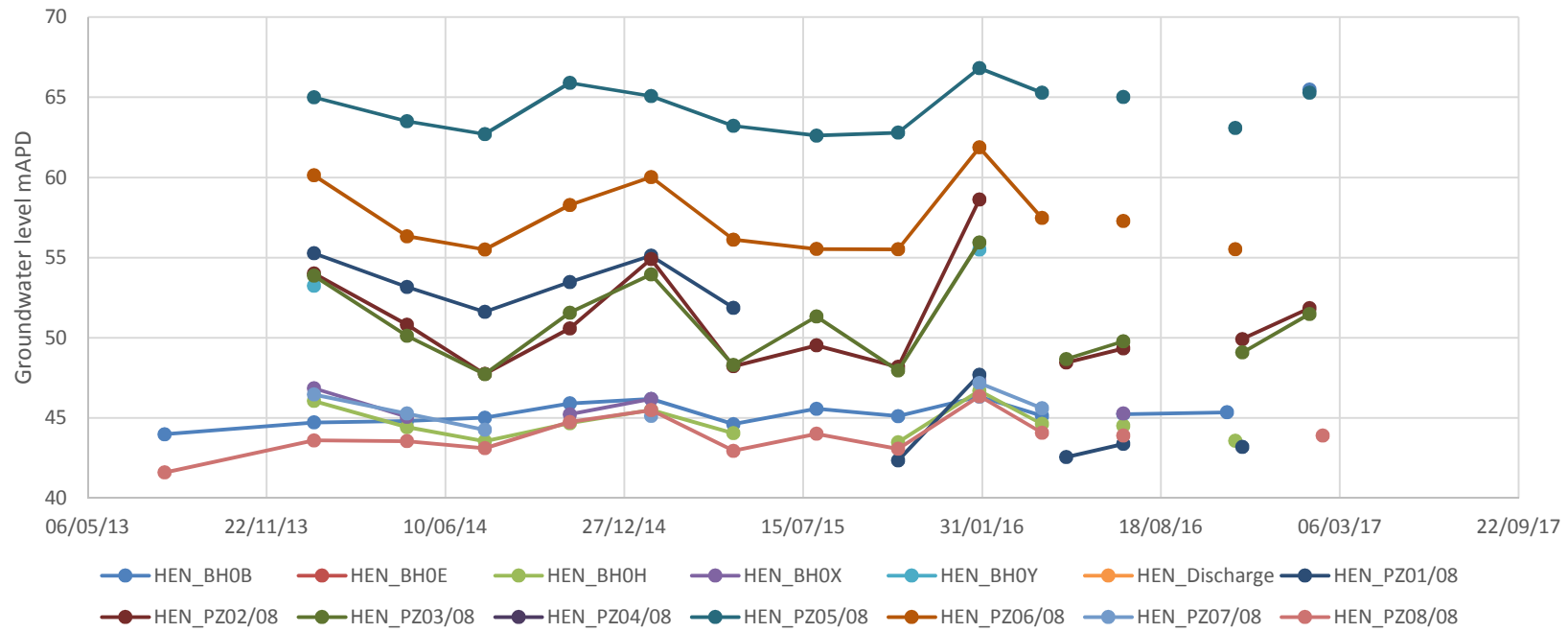


PROJECT	
HENDY	
REPORT TITLE	
CONCEPTUAL MODEL	
CROSS SECTION B-B	REPORT REF
3145.04	3145.04
	

APPENDIX 1

Environmental Monitoring Data

Hydrograph



	HEN BH01	HEN BH02	HEN BH03	HEN BH04	HEN BH05	HEN Disc	HEN PZ01	HEN PZ02	HEN PZ03	HEN PZ04	HEN PZ05	HEN PZ06	HEN PZ07	HEN PZ08
Chloride (mg/l)														
Compliance														
Min	3		4			29.5	8	3	4		4	4	20	10
Average	24		38			36	13	37	73		12	12	38	41
Max	50		56			42.2	18	136	131		19.2	16.5	50	56.9
Count	11		21			5	6	34	32		21	21	4	34
Ammoniacal Nitrogen (mg/l)														
Compliance														
Min	0.01		0.01			0.27	0.01	0.01	0.01		0.01	0.01	0.01	0.01
Average	0.16		0.18			0.35	0.02	0.21	0.26		0.25	0.24	0.22	0.23
Max	0.41		0.41			0.41	0.41	0.41	1.4		1.97	1.7	0.3	1.1
Count	12		20			5	6	34	32		21	21	4	33
Cadmium (mg/l)														
Compliance														
Min	0.0001		0.0001			0.0006	0.0001	0.00002	0.0001		0.0001	0.0001	0.0001	0.0001
Average	0.0082		0.0053			0.0006	0.0035	0.0010	0.0017		0.0005	0.0004	0.0006	0.0019
Max	0.06		0.0334			0.0006	0.0181	0.0084	0.0131		0.0021	0.001	0.0012	0.006
Count	11		21			4	6	34	32		21	21	4	33
Nickel (mg/l)														
Compliance														
Min	0.046		0.001			0.003	0.001	0.0009	0.0009		0.001	0.001	0.003	0.001
Average	0.112		0.054			0.004	0.009	0.008	0.006		0.010	0.008	0.007	0.015
Max	0.3		0.256			0.006	0.0165	0.062	0.014		0.032	0.025	0.016	0.056
Count	5		15			4	4	28	26		16	16	4	27
Nickel Dissolved (mg/l)														
Compliance														
Min	0.001		0.001				0.001	0.001	0.001		0.001	0.001		0.001
Average	0.001		0.001				0.001	0.001	0.001		0.001	0.001		0.001857
Max	0.001		0.001				0.001	0.001	0.001		0.001	0.001		0.004
Count	6		6			0	2	6	6		6	6	0	7
Sulphate (mg/l)														
Compliance														
Min	9.1		16			52.5	8.5	4.3	8		6	14.7	0	9.6
Average	35.5		33.1			81.7	21.0	12.8	12.5		25.4	24.9		53.0
Max	63		69.2			110	52	45.6	16.4		34.3	33.1	10.7	117
Count	10		19			4	5	34	32		21	21	4	33
Naphthalene (ug/l)														
Compliance														
Min	0		0.01			0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01
Average	0.02		0.02			0.01	0.02	0.08	0.08		0.02	0.02	0.01	0.07
Max	0.02		0.1			0.017	0.02	2	2		0.1	0.04	0.02	2
Count	10		20			4	6	34	32		20	20	4	34

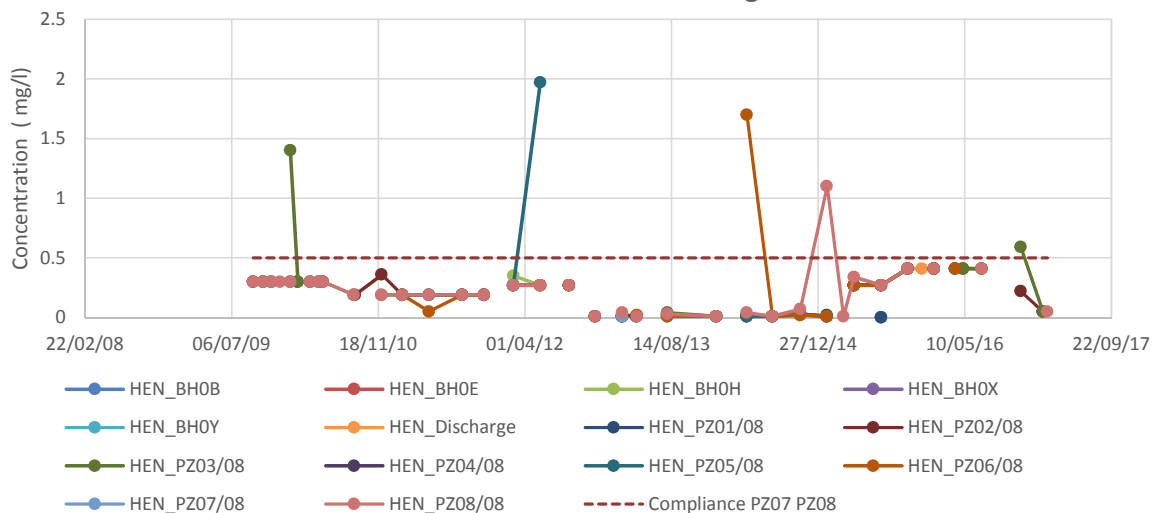
	HEN BH0E	HEN BH0E	HEN BH0H	HEN BH0X	HEN BH0Y	HEN Discharge	HEN PZ01/08	HEN PZ02/08	HEN PZ03/08	HEN PZ04/08	HEN PZ05/08	HEN PZ06/08	HEN PZ07/08	HEN PZ08/08
pH														
Min	7.70		7.30			7.50	7.00	7.3	6.7		7.50	7.50	7.40	7.10
Average	8.10		7.78			8.02	7.67	8.0	7.8		7.83	7.83	7.90	7.75
Max	8.80		8.70			8.70	8.20	8.8	8.5		8.50	8.50	8.30	8.80
95%	8.69		8.20			8.52	8.14	8.6	8.4		8.30	8.40	8.29	8.44
no.	12		22			19	7	34	32		21	21	4	33
Electrical Conductivity (US/cm)														
Min	390		462			558	265	241	312		425	443	666	601
Average	490		601			694	362	342	776		536	531	666	724
Max	613		863			884	483	699	950		655	605	666	885
95%	593		760			839	458	482	929		610	603	666	829
no.	11		13			8	6	15	14		21	13	1	16
Alkalinity (mg/l as CaCO3)														
Min	183		235			0	132	108	124		217	240	279	222
Average	961		605			0	164	265	312		299	301	279	406
Max	2650		4125			0	210	1470	546		376	370	279	1230
95%	2370		1840			0	205	877	393		348	356	279	743
no.	11		20			1	6	23	21		20	20	1	22
Calcium (mg/l)														
Min	55		51			77	44	45	8		78	74	109	7
Average	274		141			89	361	111	106		93	101	150	230
Max	909		518			98	1890	1010	174		121	226	214	1280
95%	745		474			97	1437	198	165		115	141	204	620
no.	11		21			4	6	34	32		21	21	4	34
Chromium total (mg/l)														
Min	0.001		0.000			0.002	0.001	0.001	0.001		0.001	0.001	0.001	0.001
Average	0.026		0.009			0.002	0.002	0.003	0.004		0.003	0.002	0.004	0.010
Max	0.046		0.035			0.002	0.004	0.009	0.010		0.009	0.006	0.007	0.037
95%	0.044		0.032			0.002	0.004	0.009	0.010		0.007	0.006	0.007	0.031
no.	5		15			3	4	27	25		14	15	4	26
Copper (Total) (mg/l)														
Min	0.002		0.001			0.009	0.0001	0.001	0.001		0.001	0.001	0.002	0.001
Average	0.083		0.077			0.009	0.0398	0.012	0.027		0.006	0.005	0.020	0.029
Max	0.180		0.347			0.009	0.169	0.065	0.206		0.012	0.015	0.048	0.144
95%	0.173		0.343			0.009	0.139	0.042	0.069		0.012	0.013	0.045	0.090
no.	5		14			1	5	26	24		14	14	4	27
Dissolved Oxygen (mg/l)														
Min	0.9		3.6			3.0	2.4	0.1	0.5		0.7	1.9	4.8	2.4
Average	5.2		6.7			6.9	8.6	6.3	5.4		4.4	4.7	6.7	5.1
Max	8.3		11.3			10.3	11.1	11.3	9.9		8.7	7.4	8.2	9.4
95%	8.2		10.0			9.9	11.0	10.4	9.3		8.5	7.1	8.1	8.7
no.	11		19			4	6	34	32		21	21	4	34
Iron (total) (mg/l)														
Min	16.60		0.01			0.23	0.01	0.01	0.01		0.01	0.01	0.01	0.01
Average	31.46		66.95			0.57	8.8	3.02	2.24		4.54	6.86	3.35	6.85
Max	57.20		286.00			1.36	28.2	16.10	5.20		16.10	30.40	9.22	24.70
95%	51.44		247.00			1.22	24.9	7.98	4.99		12.80	22.98	8.43	23.85
no.	5.00		14.00			5.00	4	27.00	25.00		16.00	16.00	4.00	28.00
Potassium (mg/l)														
Min	2.0		0.8			3.8	0.65	0.5	0.8		2.1	2.5	2.4	1.0
Average	4.4		3.6			5.0	2.4	1.7	2.4		3.8	4.4	2.9	2.9
Max	18.0		13.9			6.2	6.7	4.3	3.6		5.3	6.4	3.5	5.8
95%	11.1		9.9			6.1	5.9	3.0	3.4		5.1	6.0	3.5	5.1

	HEN BH0E	HEN BH0E	HEN BH0H	HEN BH0X	HEN BH0Y	HEN Discharge	HEN_PZ01/08	HEN_PZ02/08	HEN_PZ03/08	HEN_PZ04/08	HEN_PZ05/08	HEN_PZ06/08	HEN_PZ07/08	HEN_PZ08/08
no.	11		21			4	4	34	32		21	21	4	33
Magnesium (mg/l)														
Min	14		12			21	16	6	2		23	21	33	2
Average	74		36			24	225	35	37		27	27	45	59
Max	247		132			28	842	437	115		33	36	70	271
95%	199		126			27	719	72	59		32	32	66	176
no.	11		21			4	4	34	32		21	21	4	32
Manganese (mg/l)														
Min	0.002		0.002			0.044	0.002	0.002	0.002		0.002	0.002	0.044	0.002
Average	3.05		8.73			0.08	3.32	0.40	0.30		0.30	1.19	0.83	1.80
Max	13.10		67.60			0.16	11.7	6.36	1.04		2.25	7.85	1.92	15.70
95%	9.67		57.00			0.15	10.2	0.82	0.85		0.92	6.56	1.82	8.26
no.	11		21			4	4	34	32		21	21	4	34
Sodium (mg/l)														
Min	3		0.5			16	4.1	5	4		5	5	11	7
Average	16		19			21	6.5	19	41		7	7	17	22
Max	31		33			24	9.3	65	72		8	8	22	41
95%	31		30			24	9.0	56	66		8	7	22	34
no.	11		21			4	5	34	31		21	21	4	34
TOC (mg/l)														
Min	3.90		0.97			2.60	0.70	0.07	0.55		0.28	0.07	0.70	0.70
Average	5.68		1.98			4.10	0.70	1.32	1.78		1.02	0.63	1.08	2.34
Max	8.90		3.90			5.60	0.70	7.00	9.00		4.60	0.70	1.72	11.00
95%	8.47		3.25			5.45	0.70	3.79	4.75		2.68	0.70	1.63	5.10
no.	4		11			2	3	24	23		11	11	3	22
TPH (mg/l)														
Min	0.05		0.02			0.03	0.02	0.01	0.01		0.01	0.01	2.88	0.02
Average	0.11		0.27			0.07	0.07	0.05	0.02		0.04	0.04	2.88	0.06
Max	0.19		1.67			0.17	0.13	0.17	0.04		0.24	0.17	2.88	0.17
95%	0.18		1.14			0.14	0.12	0.17	0.04		0.17	0.12	2.88	0.15
no.	6		8			6	3	8	7		8	8	1	9
TPH Band (C16-C24) (mg/l)														
Min	0.02		0.01			0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01
Average	0.04		0.09			0.02	0.01	0.01	0.01		0.01	0.01	0.07	0.01
Max	0.06		1.16			0.05	0.02	0.09	0.02		0.01	0.01	0.23	0.08
95%	0.06		0.29			0.04	0.02	0.01	0.01		0.01	0.01	0.20	0.04
no.	6		17			10	5	25	25		16	16	4	27
TPH Band >C24-C40 (mg/l)														
Min	0.03		0.01			0.02	0.04	0.01	0.01		0.01	0.01		0.01
Average	0.07		0.10			0.04	0.06	0.01	0.02		0.01	0.01		0.03
Max	0.13		0.37			0.11	0.07	0.02	0.03		0.01	0.01		0.06
95%	0.12		0.30			0.09	0.07	0.02	0.03		0.01	0.01		0.05
no.	6		6			6	2	6	6		6	6	0	7
Total PAH (mg/l)														
Min	0.00		0.01			0.17	0.01	0.01	0.01		0.01	0.01	0.01	0.01
Average	1.90		0.55			2.67	0.09	0.11	0.05		0.09	0.09	0.09	0.07
Max	5.15		2.35			10.00	0.18	1.72	0.17		0.24	0.17	0.32	0.24
95%	4.85		2.07			8.54	0.17	0.20	0.17		0.17	0.17	0.28	0.19
no.	11		20			4	6	34	32		21	20	4	35

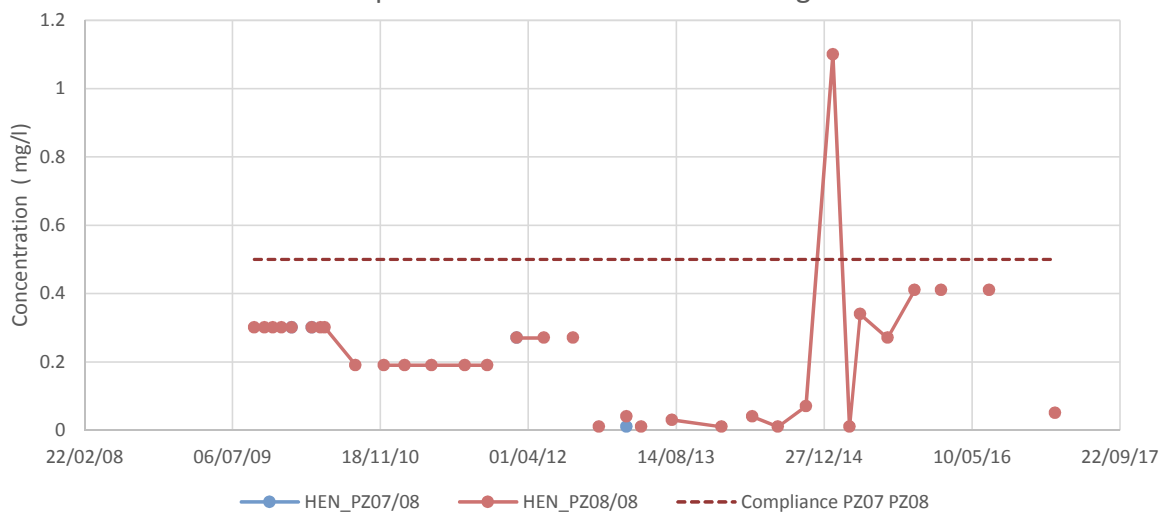
All values at less than detection are assumed to be at detection

Anomalous results (defined as visually significant above the data or >5x max) have been removed from above stats.

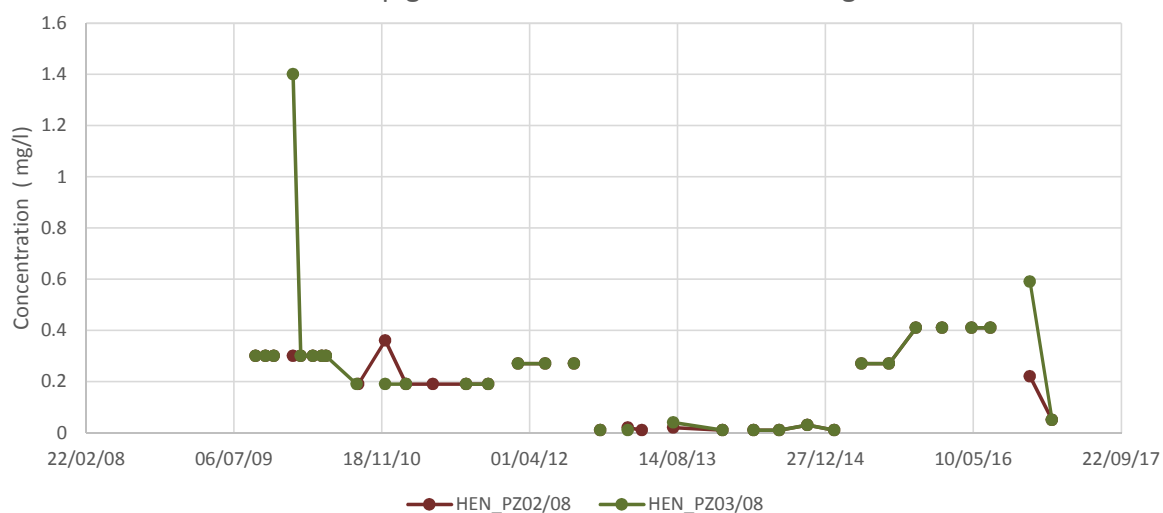
Ammoniacal Nitrogen



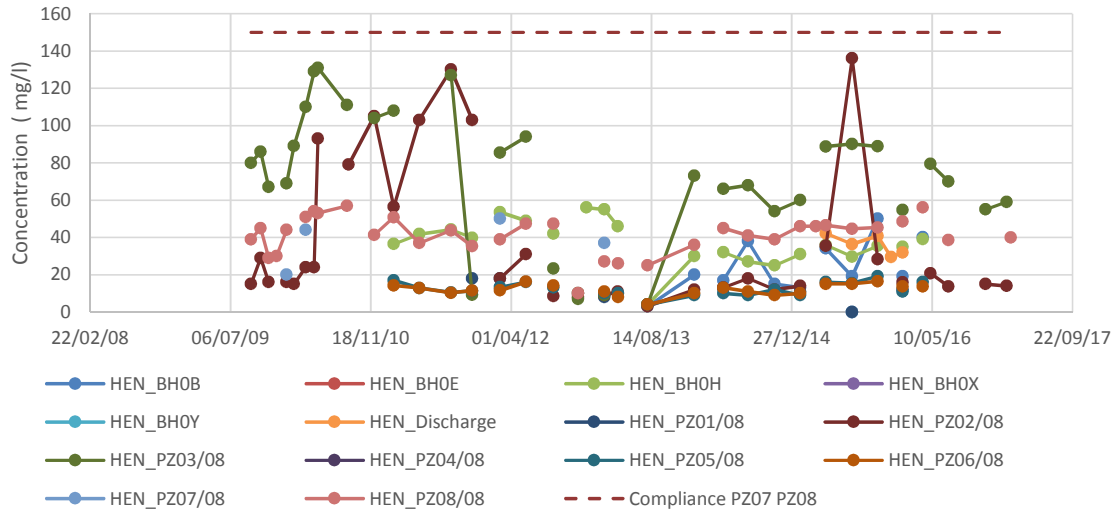
Compliance wells : Ammoniacal Nitrogen



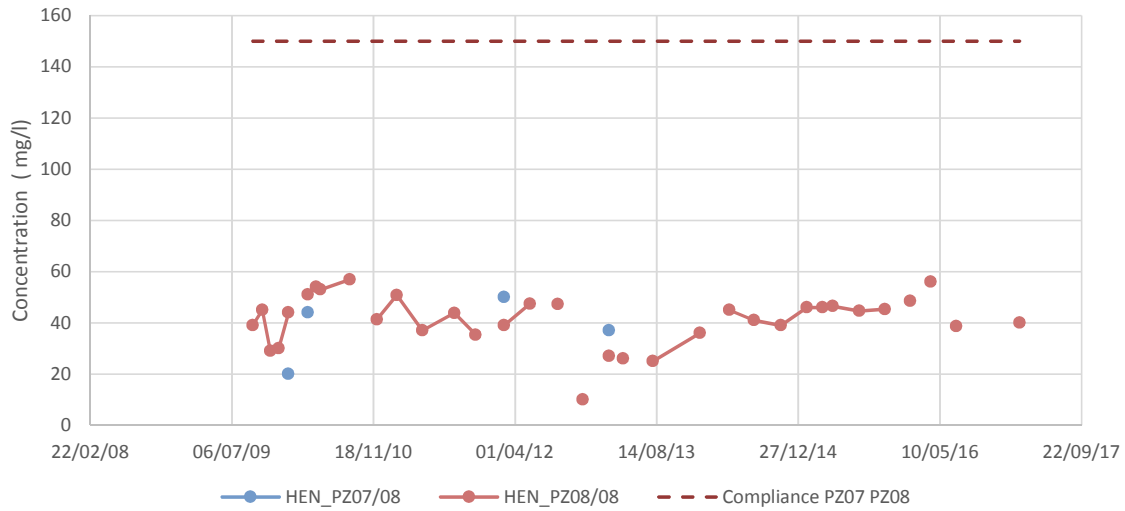
up gradient wells : Ammoniacal Nitrogen



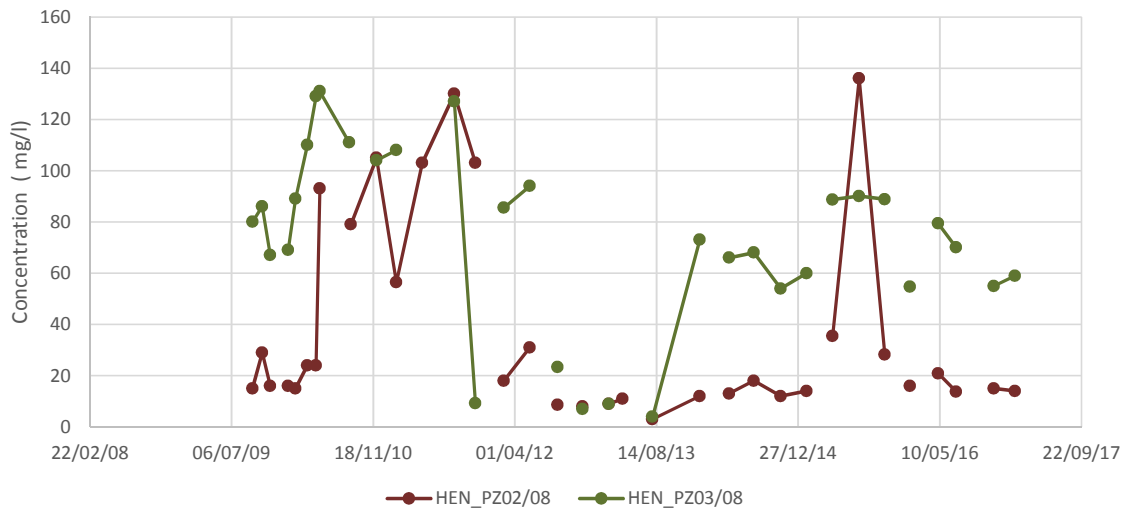
Chloride



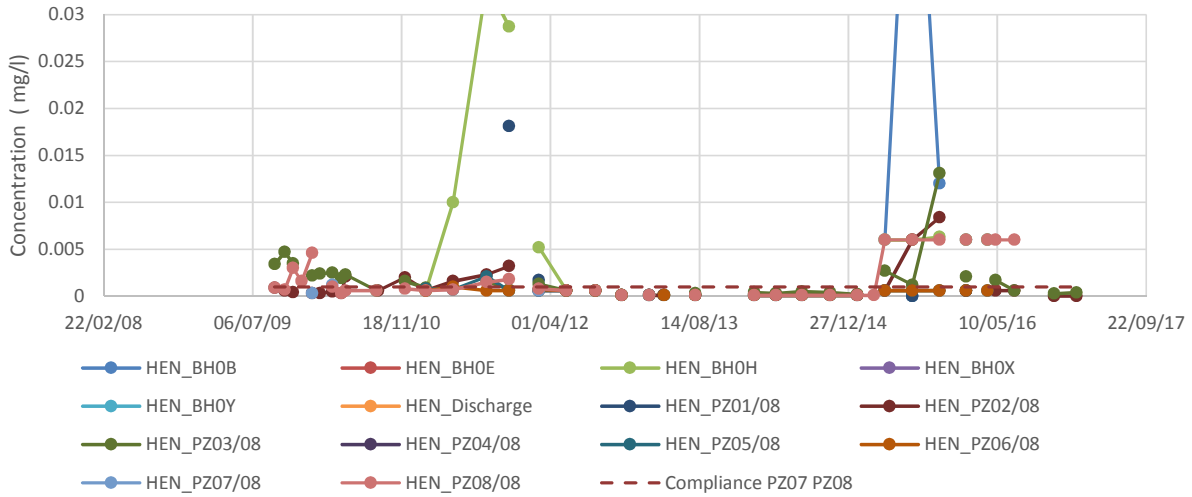
Compliance Wells: chloride



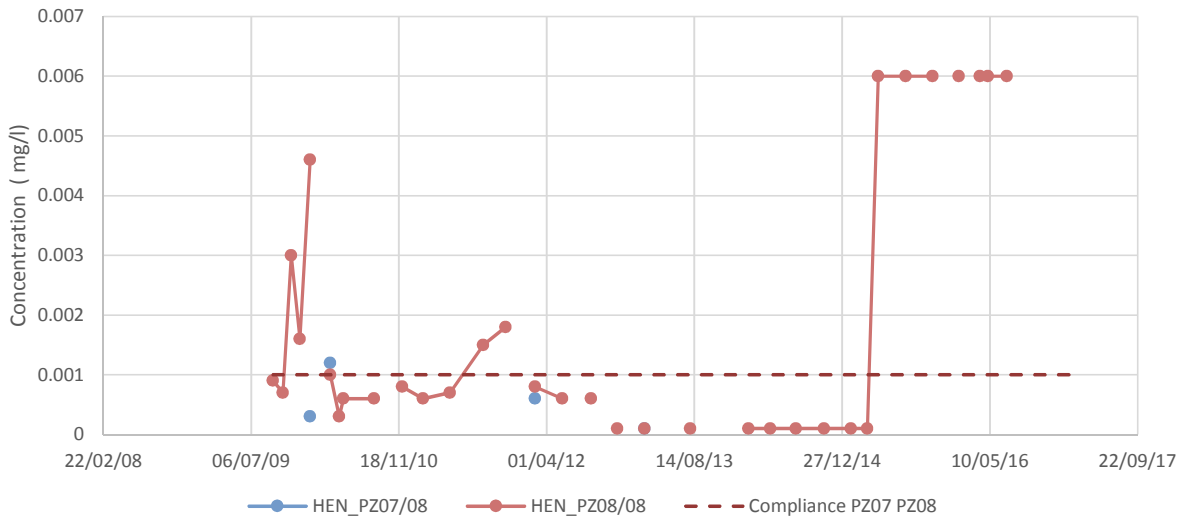
Up gradient Wells: chloride



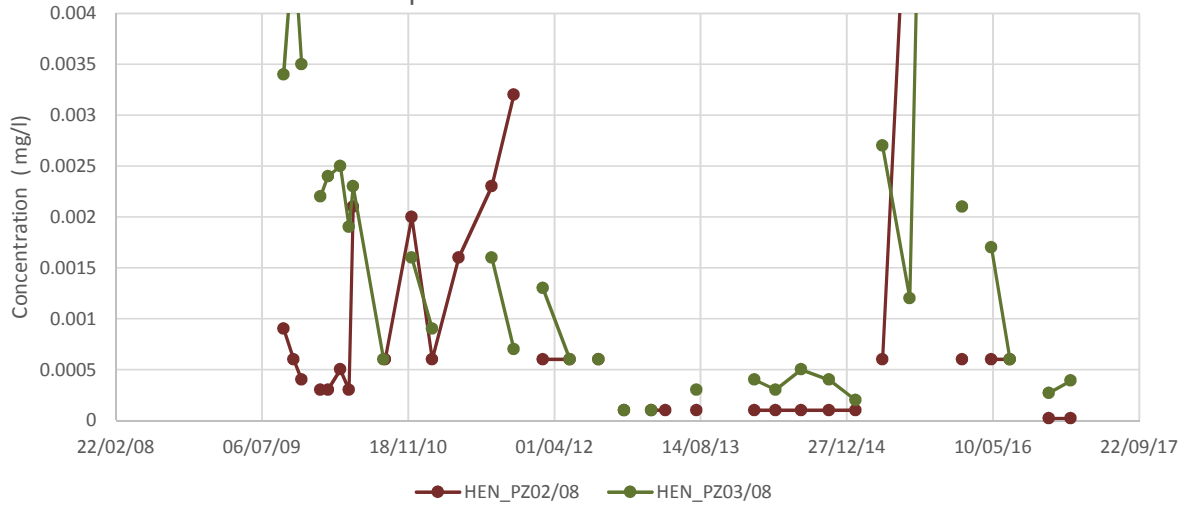
Cadmium

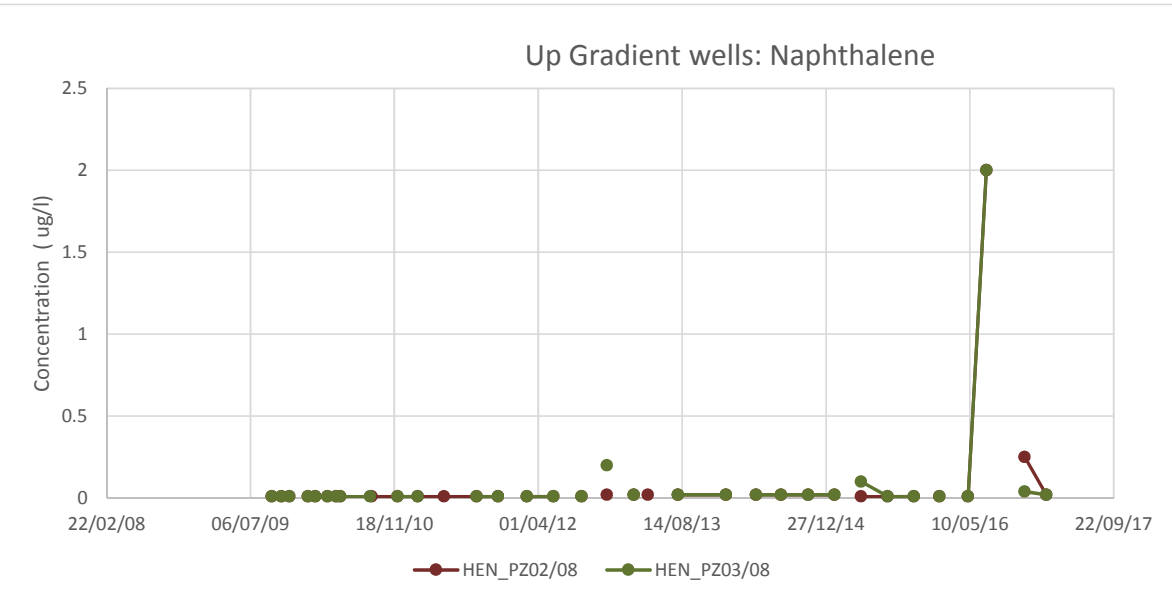
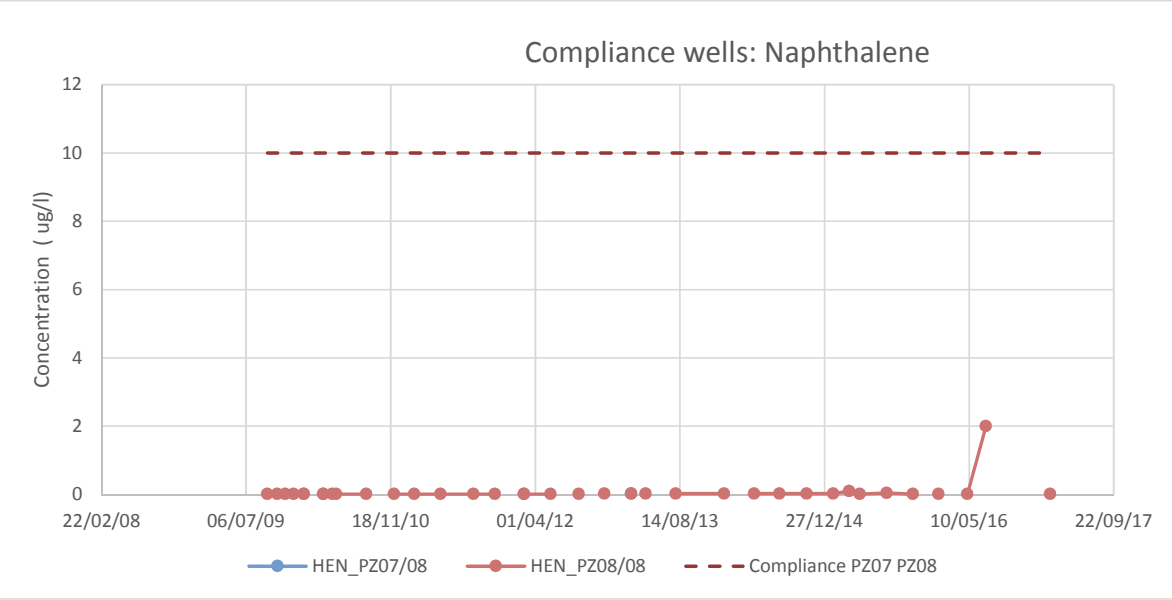
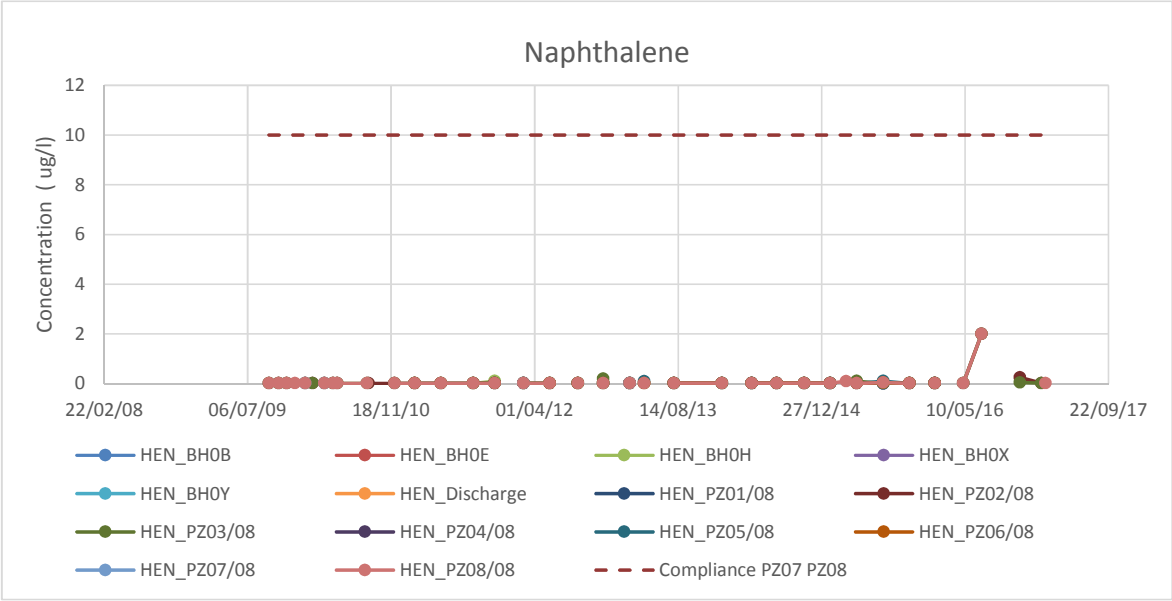


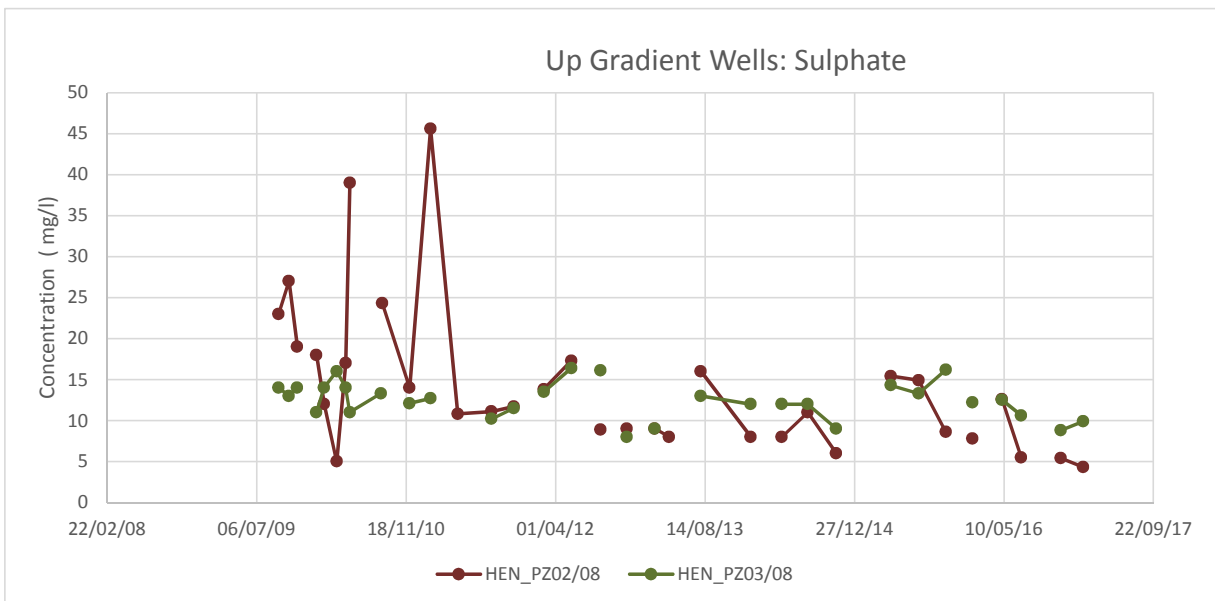
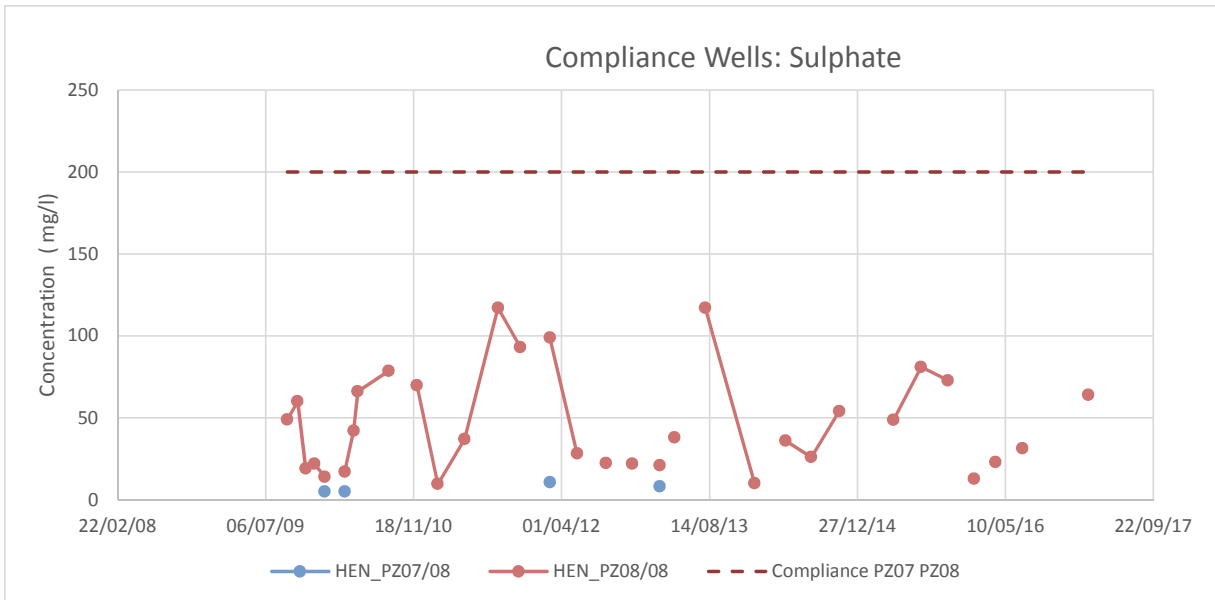
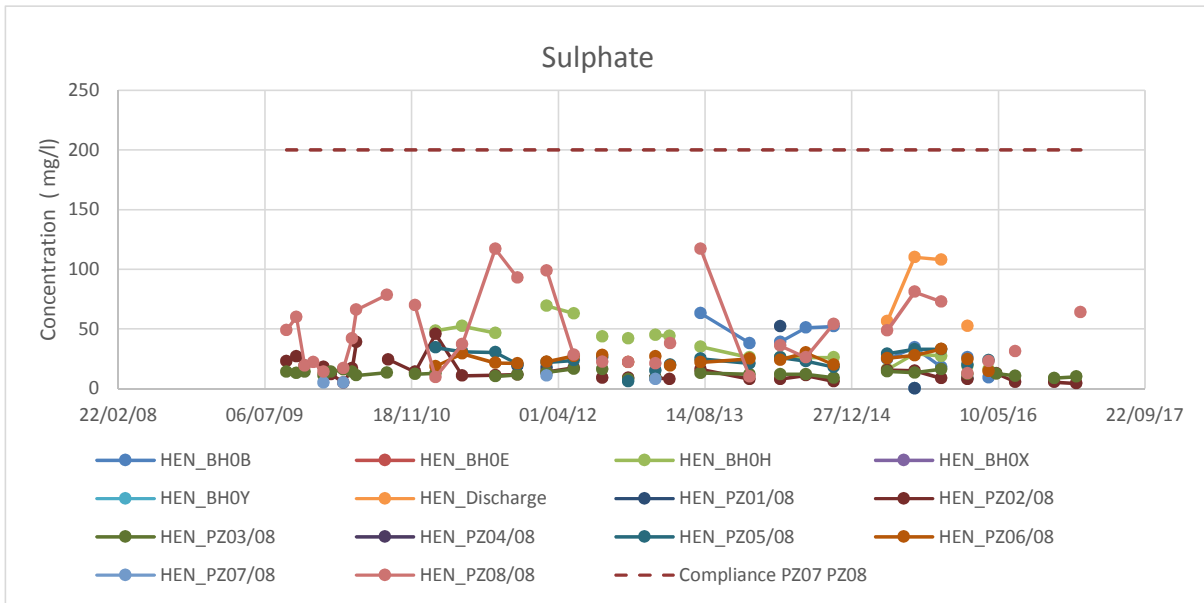
Compliance Wells : Cadmium

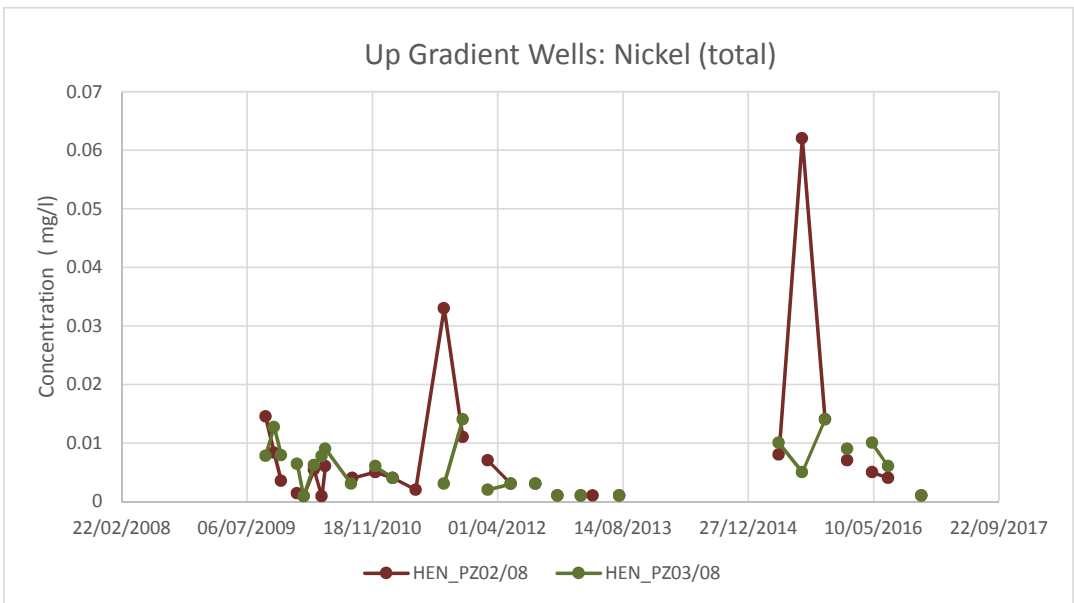
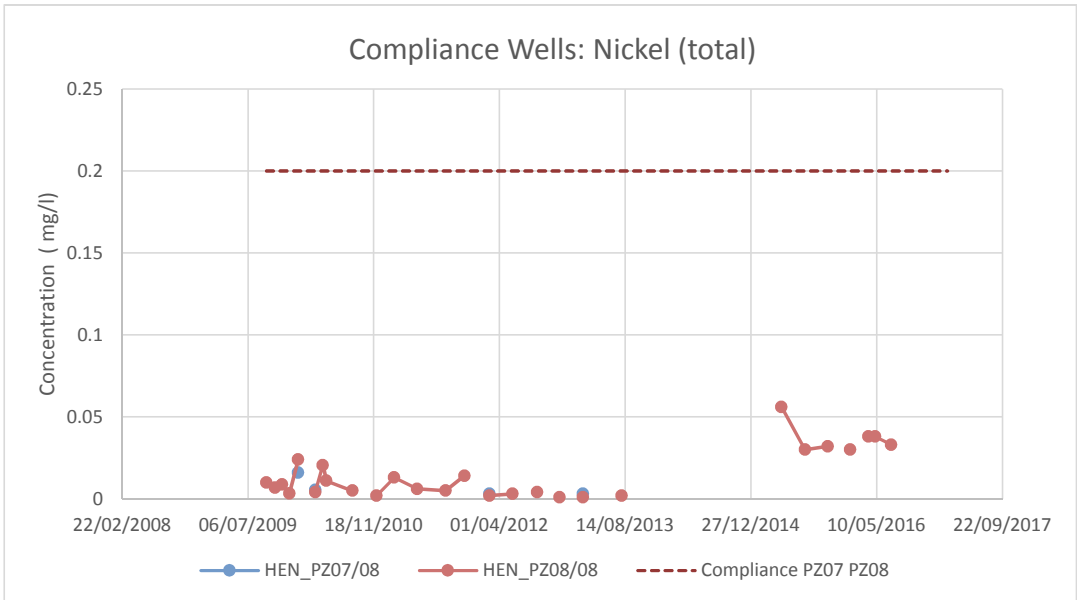
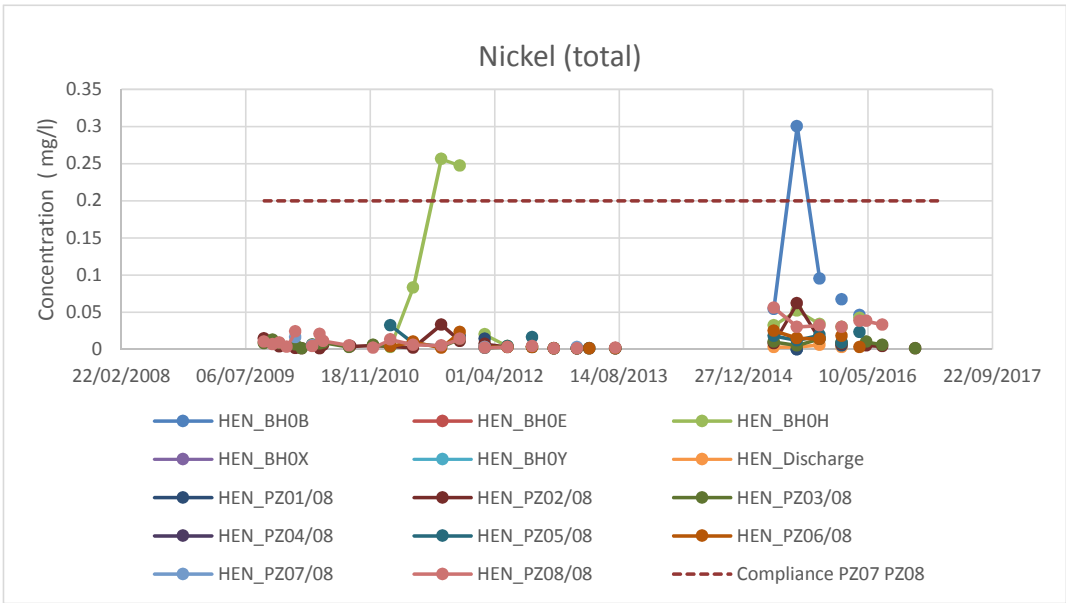


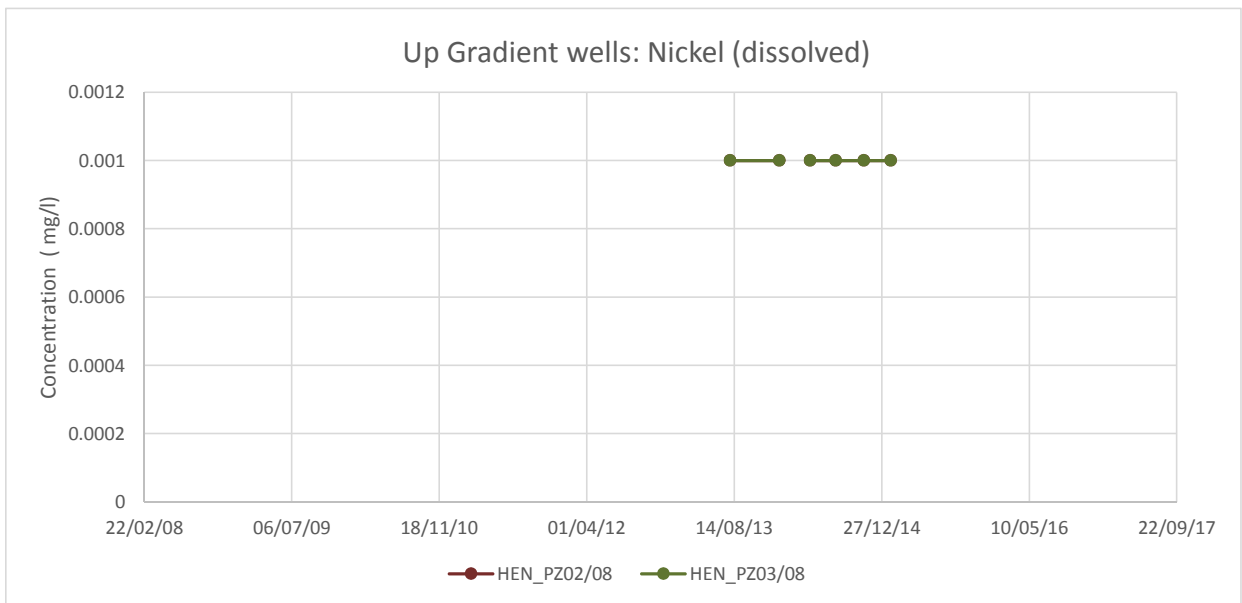
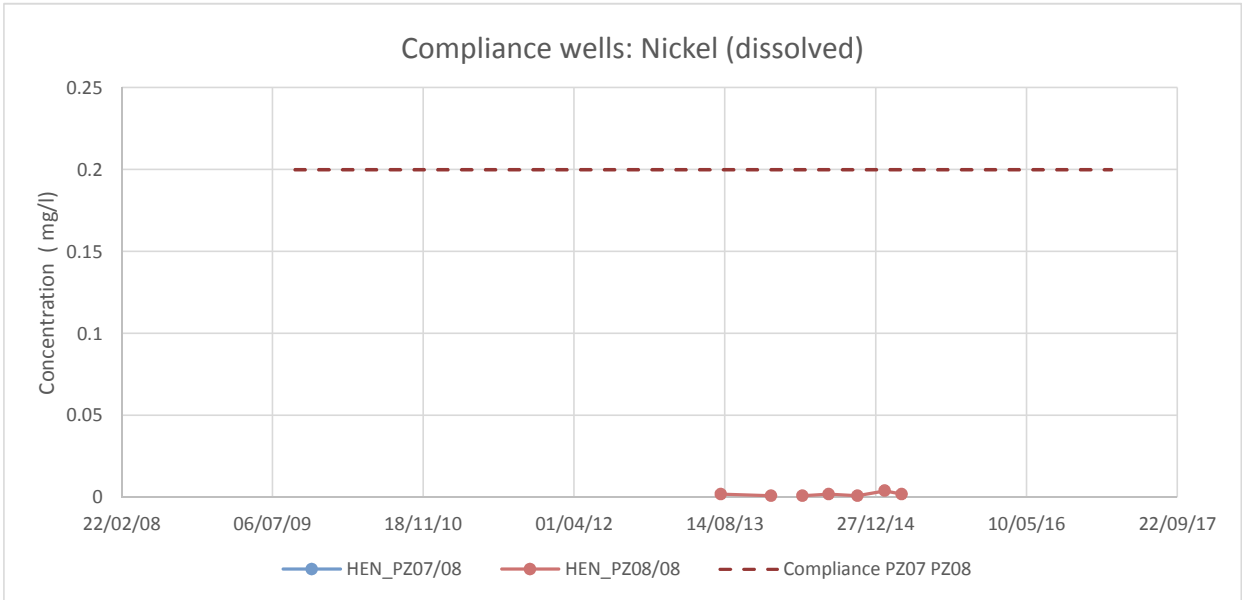
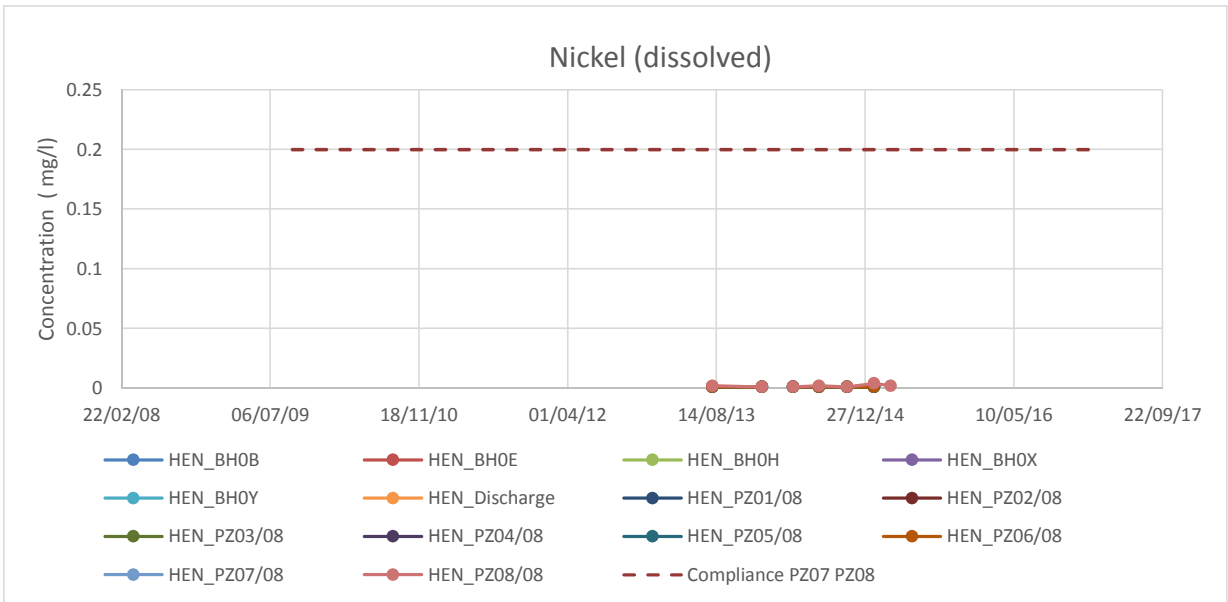
Up Gradient Wells : Cadmium

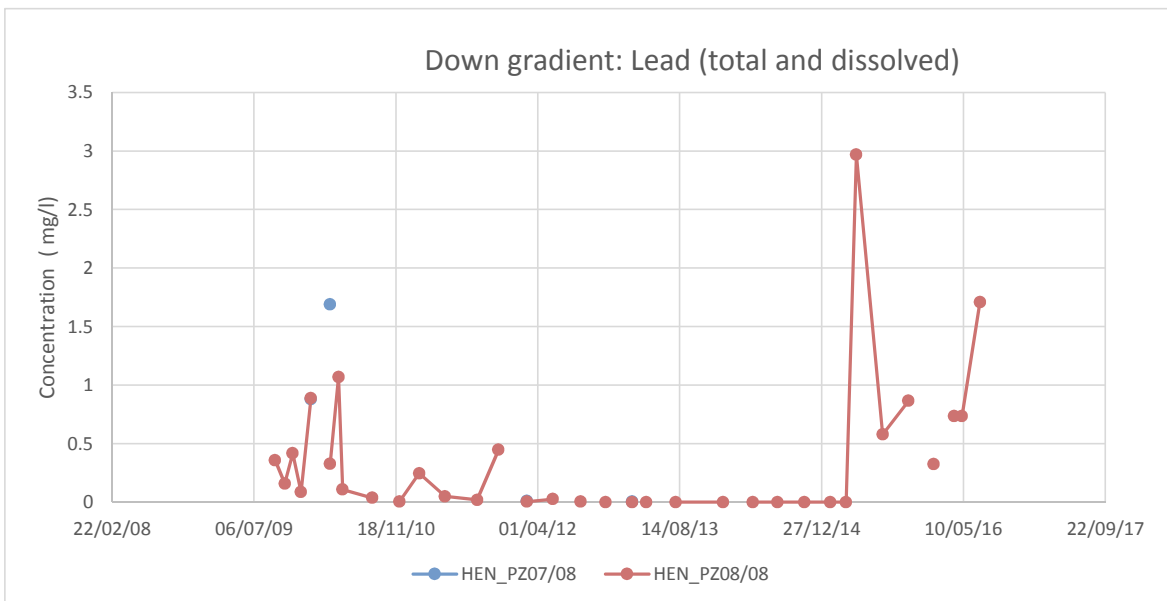
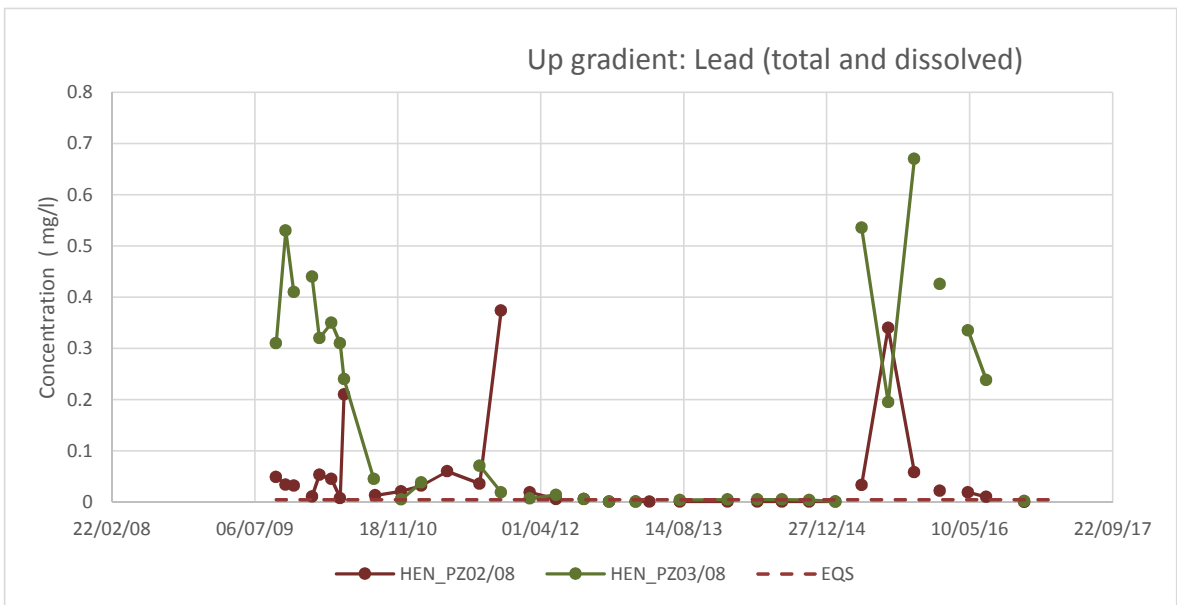
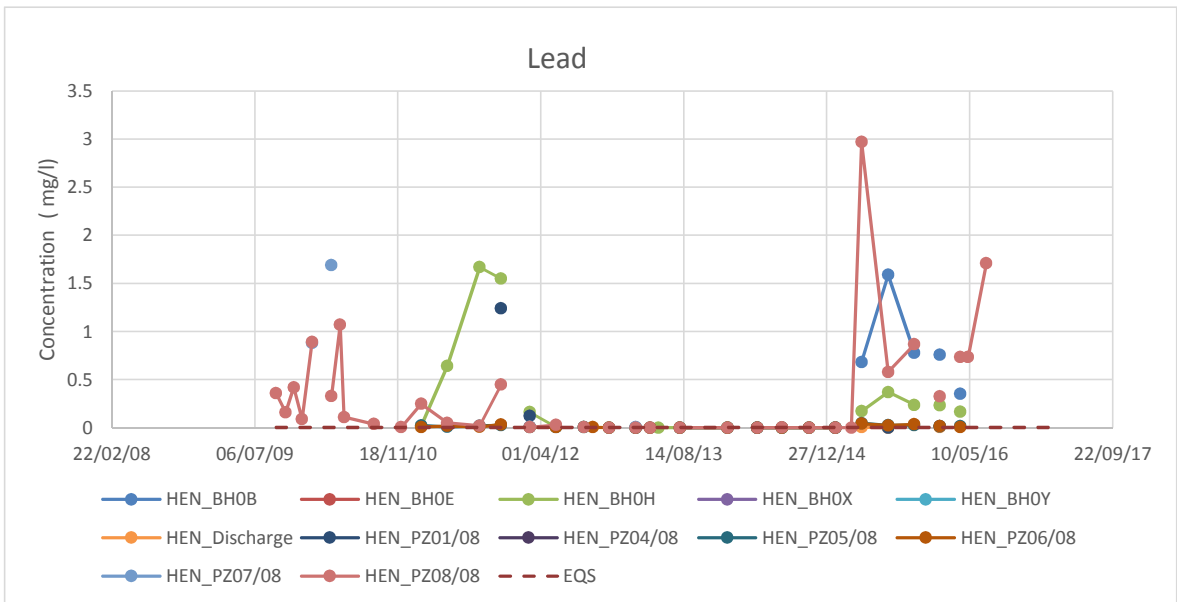




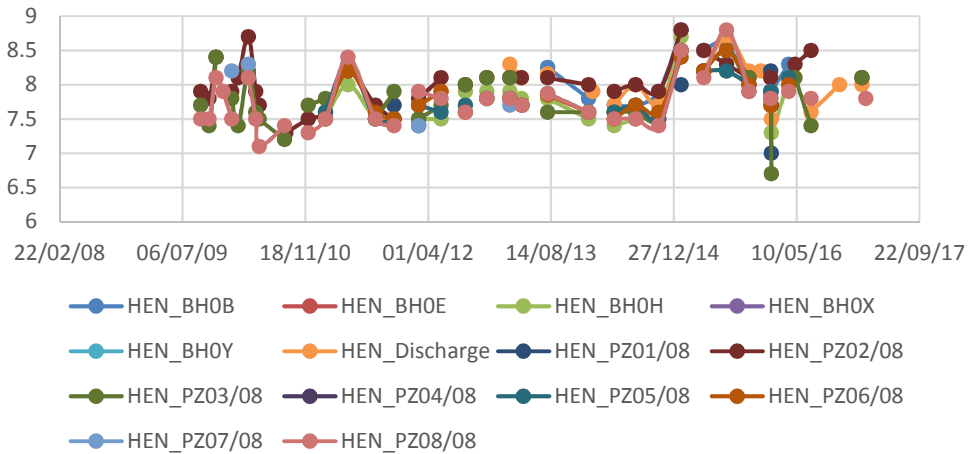




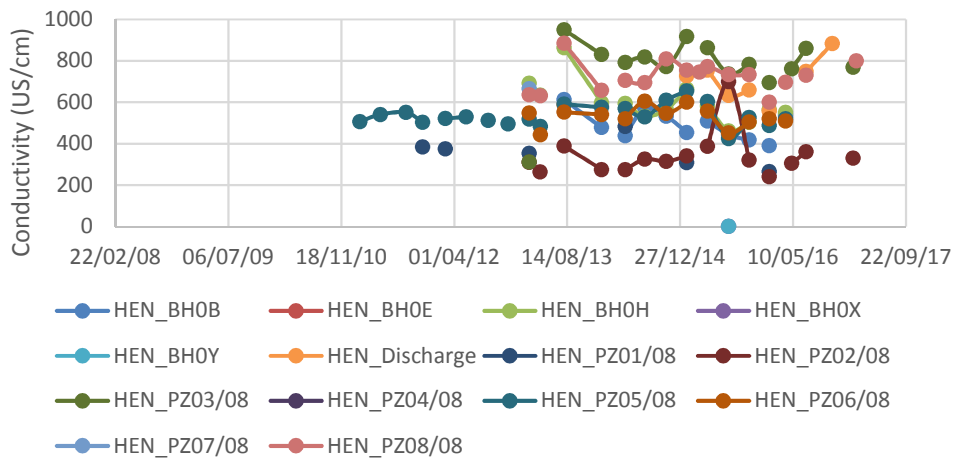




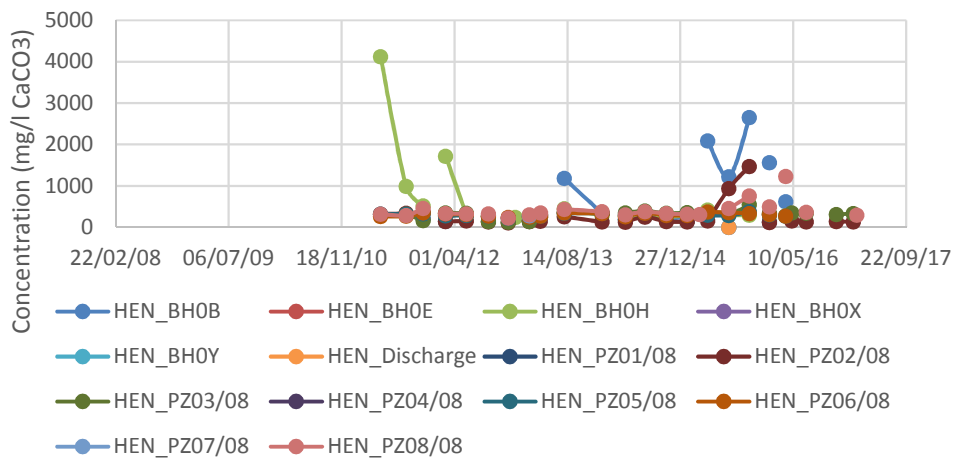
pH



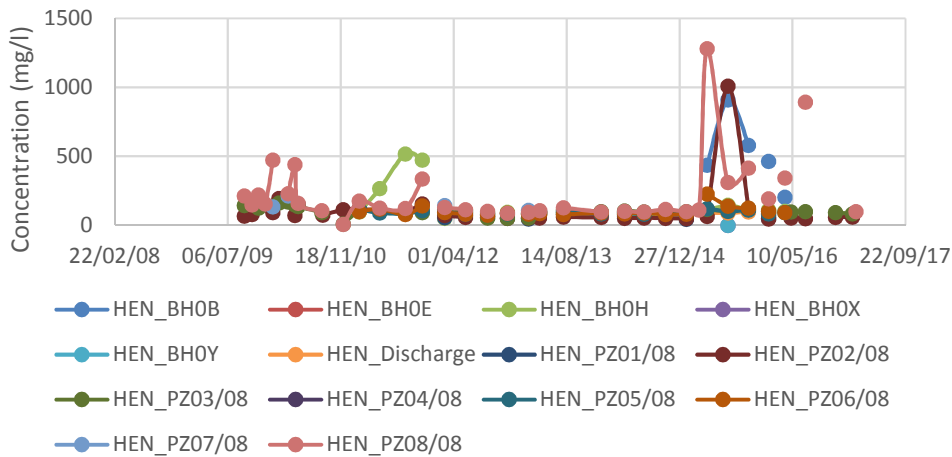
EC



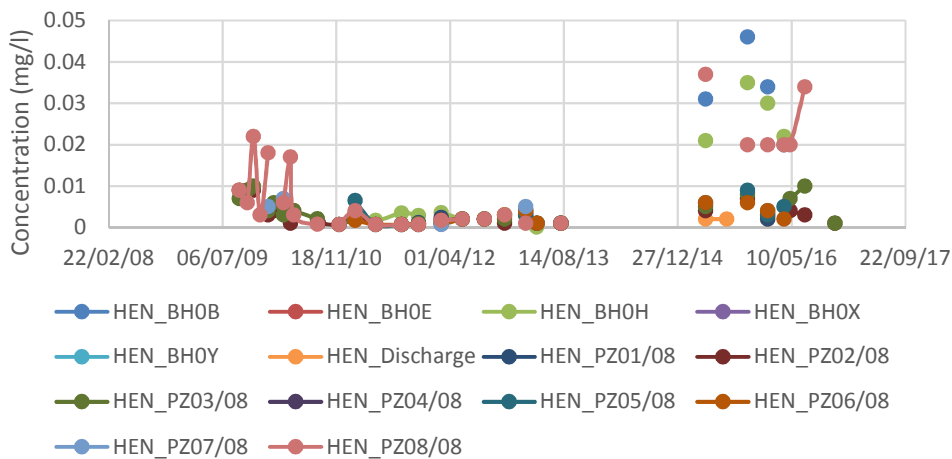
Alkalinity



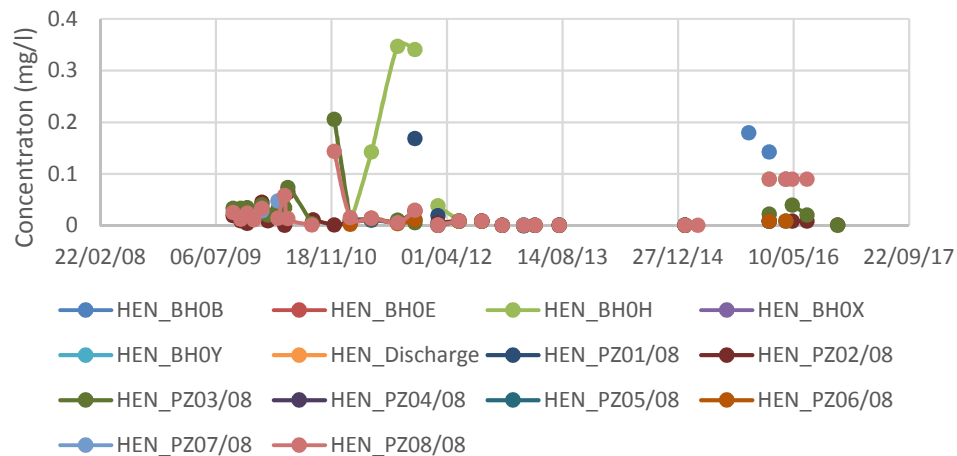
Calcium



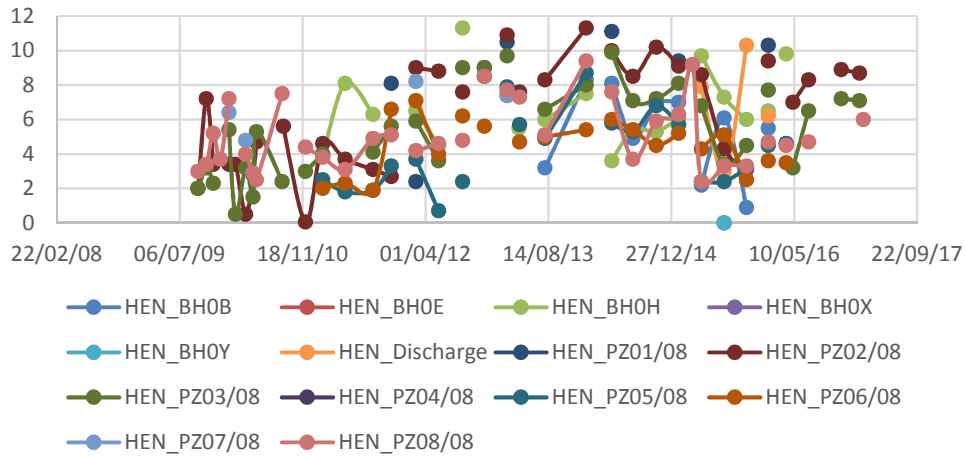
Chromium



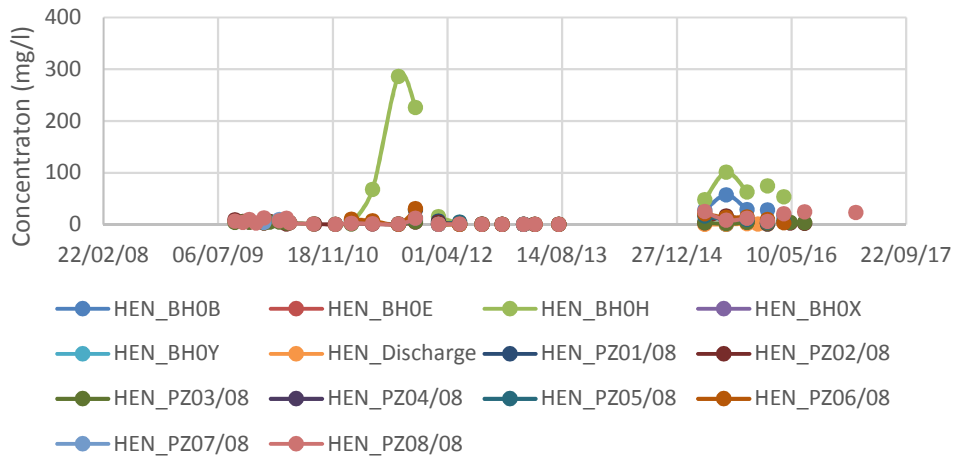
Copper (total)



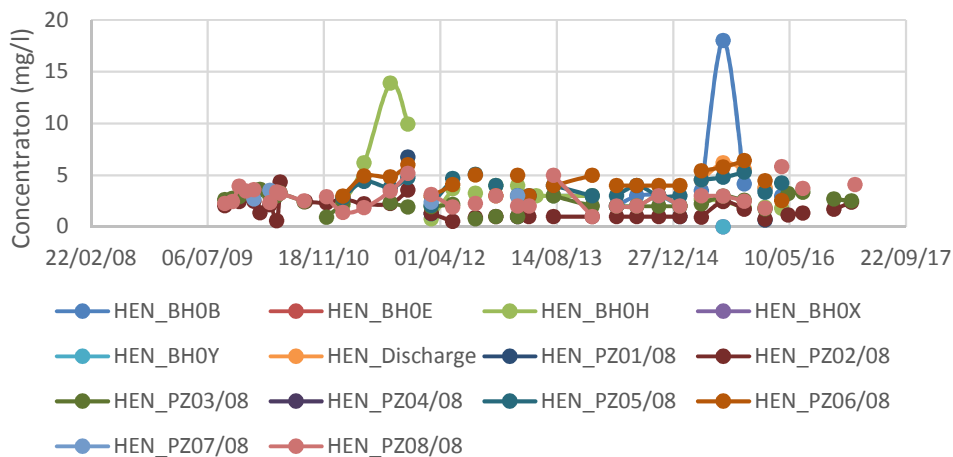
Dissolved Oxygen



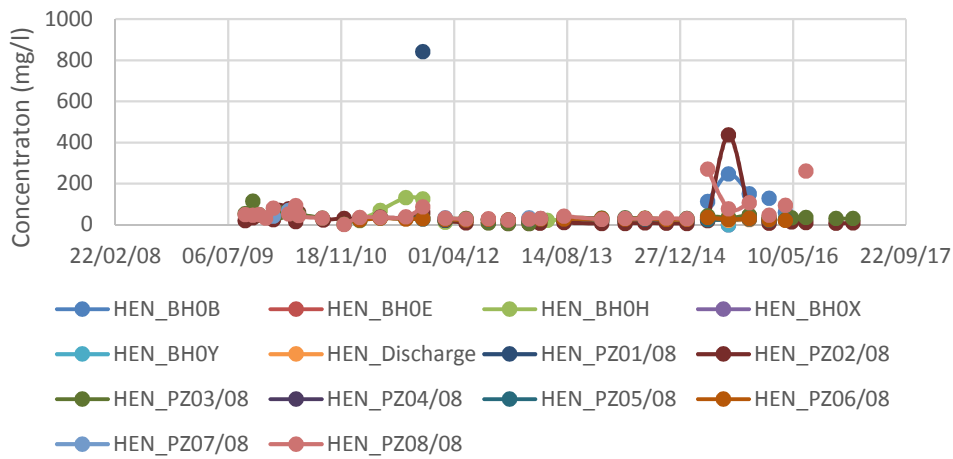
Iron (total)



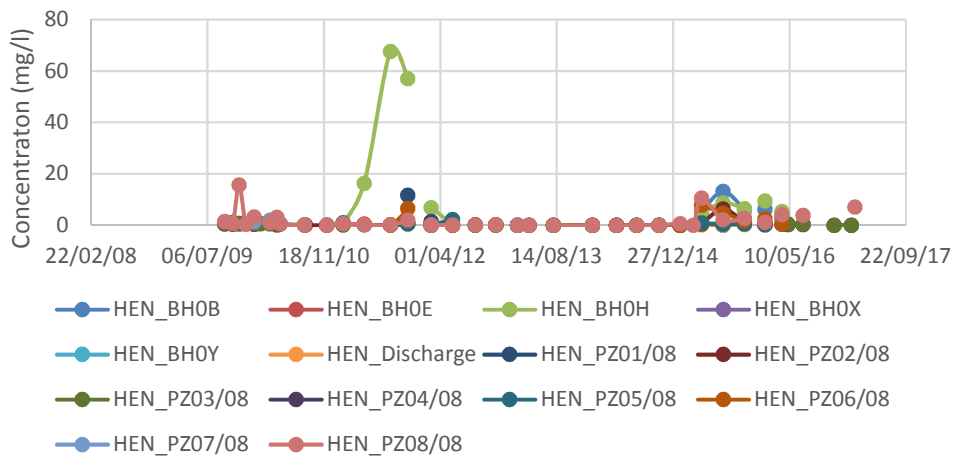
Potassium



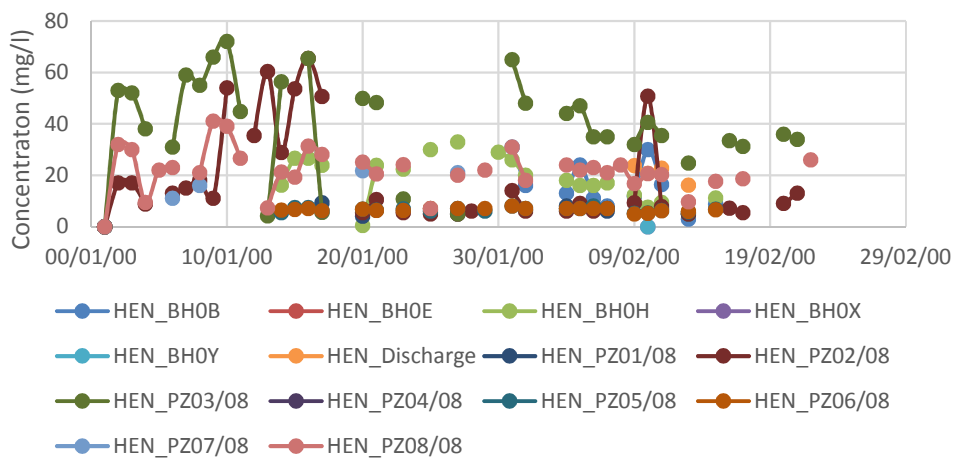
Magnesium



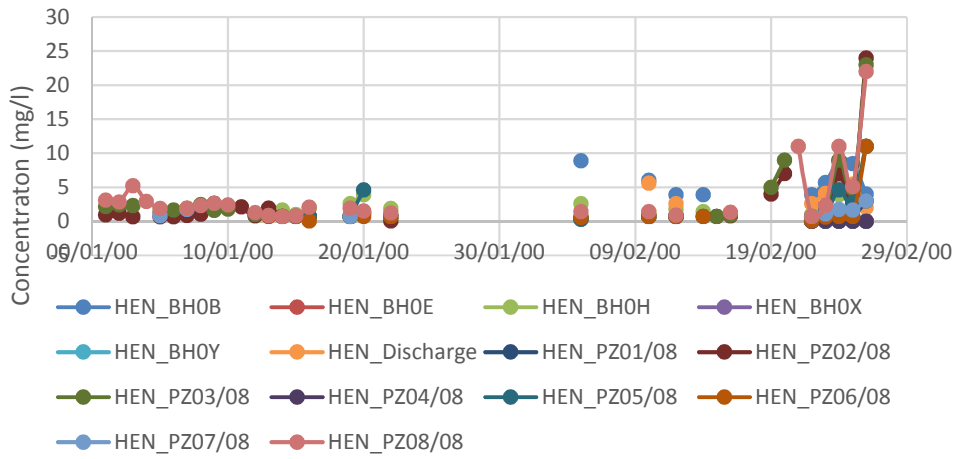
Manganese



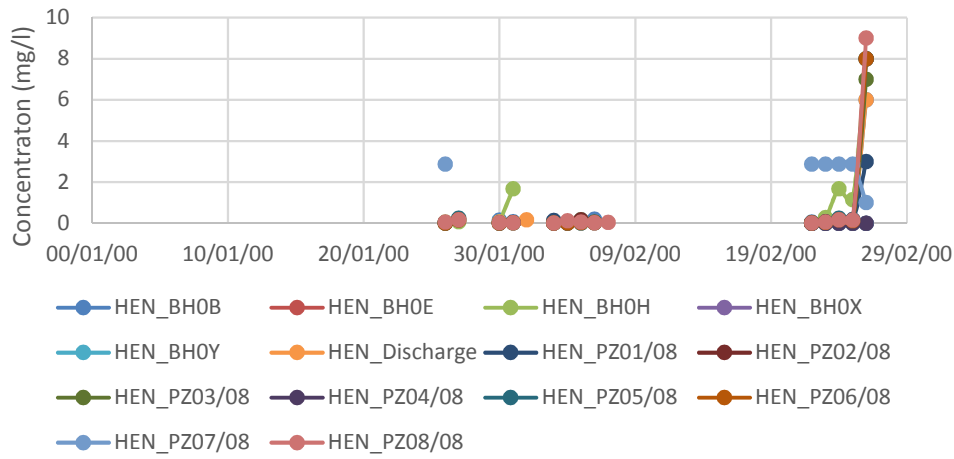
Sodium (mg/l)



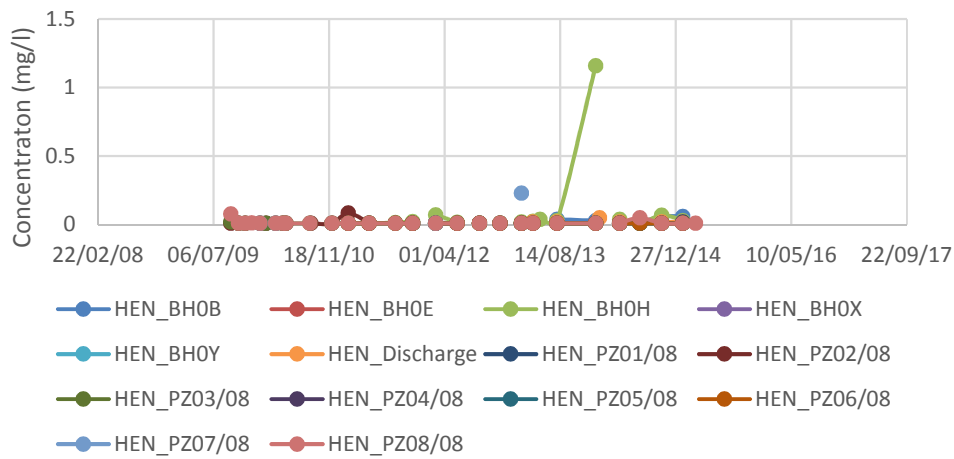
TON



TPH (mg/l)



TPH (C16-C24)



APPENDIX 2

Proposed Enhanced Monitoring

In recognition of the absence of an artificially enhanced geological barrier under the existing waste mass, it was agreed between Tarmac and NRW to enhance the monitoring regime at the site to provide additional confidence with regards to the environmental impact on the groundwater regime.

The report above has been amended to further discuss the potential groundwater flow and therefore discharge zones associated with the site and has concluded that although the Avon Group has been reclassified as a Secondary A aquifer, the groundwater levels monitored within the former Lower Limestone Shale Formation indicate that there is no groundwater flow path towards the south (higher groundwater head in the shale formation compared to the limestone). Therefore groundwater flow/discharge is considered to remain along strike towards the west and the River Ely.

No 'new' receptors have been identified and groundwater within the limestone remains the primary receptor with the River Ely being the ultimate receptor of groundwater from beneath the site. The Ely Valley SSSI referred to by NRW is designated based on a particular plant species (monk hood) which thrives along the wooded river banks. The data appears to indicate that that the soil and woodland conditions appear to control its distribution rather than any specific groundwater quality.

Monitoring Infrastructure

It is acknowledged that the groundwater monitoring network requires the reinstatement of the down gradient monitoring borehole BH07/08 and BH08/08. It is considered that replacement boreholes within similar locations would be sufficient to identify any significant contamination arising from the site. The borehole BH07/08 is considered to be downgradient of the long flow path with respect to the existing waste mass. The replacement of BH8/08 adjacent to its existing positions would provide a similar flow path on completion of the site. The boreholes are broadly 100m apart and are considered to meet the requirements of current guidance.

Monitoring frequency

It is proposed (following installation of boreholes) that the groundwater monitoring frequency be increased to monthly with a review after 12 months. This increased monitoring will focus upon leachate indicator species, specifically ammoniacal nitrogen and chloride (together with field

parameters of pH, EC, Temp, and DO). These parameters have been selected following consideration of the potential types 'non inert' material of which topsoil and organic degradable material is considered to be the most likely. These could potential release both ammoniacal and chloride to the environment. It is considered that enhancing the monitoring frequency for metal ions is unlikely to provide any additional confidence in the impact of the site due to the low concentrations of these substances in any leachate and the likely dilution within the aquifer. This may be reconsidered should and significant increase in chloride or ammoniacal nitrogen become apparent. Metals and other parameters will still be monitored as part of the routine monitoring requirements.

Monitoring of surface water

The potential monitoring of the surface water has been considered however boreholes BH07/08 and BH08/08 (or their replacements) are considered to intercept the pathway between the site and the ultimate groundwater discharge to the River Ely and therefore are considered sufficient to monitor this pathway. In addition the rate of groundwater discharge (from beneath the site) is considered to be very low in comparison to the surface water flow within the River Ely and therefore the large dilution within the river raises questions over the suitability for surface water monitoring point to be able to identify any impact from the site.

Although not material consideration in the assessment of whether surface water monitoring is required, the status of the river bank as a SSSI may restrict the ability to site suitable and safe monitoring points in locations suitable to meet the monitoring objectives.

Therefore in consideration of the above factors, it is considered that an enhanced monitoring regime comprising monthly groundwater monitoring in (reinstated) down gradient monitoring wells would reduce the uncertainty with respect to the impact of no artificially enhanced geological barrier below the existing waste. Due to the permeable nature of the limestone and the period over which waste has been placed, it is expected that any impact would be apparent in these down gradient monitoring wells.



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Appendix G

Drainage Assessment



now



Technical Note:

Hendy Quarry - Assessment of discharge 2018

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Report status:
Final

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Prepared for Tarmac Trading Ltd

Document reference: 62847TN03, September 2018

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	Name	Signature
Author	Henry Kelly	
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Reviewed by	Barnaby Harding/ Robert Sears	

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1 Introduction

1.1 Background

Surface water run-off at Hendy Quarry (the Site) is discharged via a soakaway located at the northern end of the Site immediately adjacent to School Road (B4264) (Figure 2.1). All runoff within the main quarry catchment drains into the quarry sump and is then discharged to the soakaway location. A topographical survey is included in Appendix A and photos of the sump and soakaway are included in Appendix B.

Tarmac currently hold an Environmental Permit (EPR/BT1088ID/V003) for inert landfill, with the Directly Associated Activity (DAA) to discharge, predominately rainfall runoff to a soakaway, with a daily limit of 750 m³. An informal agreement between Tarmac and NRW exists, which permits the reporting of the monthly average discharge values to account for the fluctuations in discharge requirements caused by the variation in receiving rainfall. Despite this allowance, the mean daily discharge regularly exceeds the consented volumetric limit.

A technical assessment was undertaken by ESI (2014) to investigate the likely rainfall runoff rates from at the Site and therefore inform an application to revise the volumetric discharge limit. This report concluded that rainfall runoff was the primary component of the discharge water and that the receiving geological stratum at the soakaway location (fractured Carboniferous Limestone) was capable of receiving the quantities of water which have been discharged to the feature in recent years.

Natural Resources Wales (NRW) has subsequently requested further information as to the makeup of water being discharged to the soakaway (NRW, date unknown) and how much of this, if any, is groundwater derived (as opposed to surface water runoff). Further to this, if there is a groundwater component to the discharge water, what impact is this having on the surrounding groundwater and is there an element of water recycling occurring i.e. water being discharged to the soakaway and abstracted again from the sump.

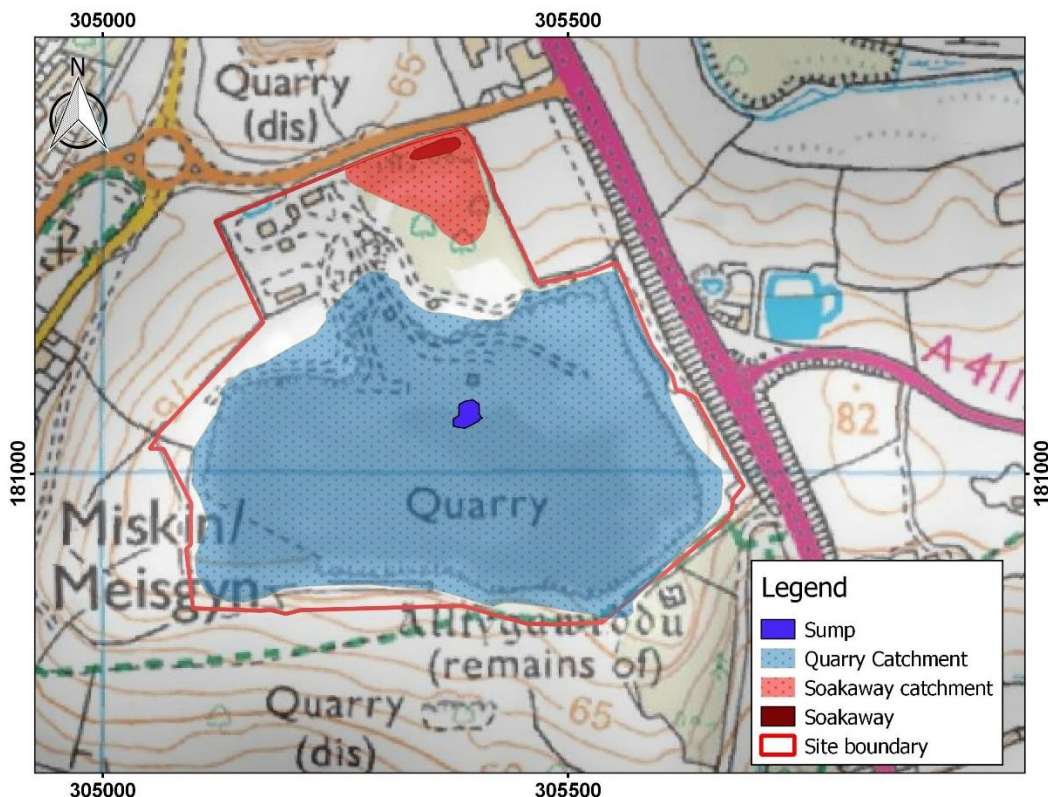
This technical note provides further analysis and information to provide answers to NRW's question above.

2 Site details

2.1 Current Conceptual Model

Mineral extraction at Hendy Quarry has created a sub-catchment across much of the Site which drains to the quarry sump. The soakaway in the north of the Site also has a separate sub-catchment. A site plan is included in Figure 2.1.

Figure 2.1 Site plan



The main quarry catchment is principally covered with bare rock with some areas of inert fill. ESI (2014) estimated the proportion of runoff from incoming rainfall (the runoff coefficient) using the established Coal Board (1982) nomogram method as being 0.67. Linear Regression of daily pumping and rainfall data yielded a coefficient of 0.71 which appeared to validate the high proportion of rainfall being diverted to runoff which may be expected in a heavily modified quarry catchment.

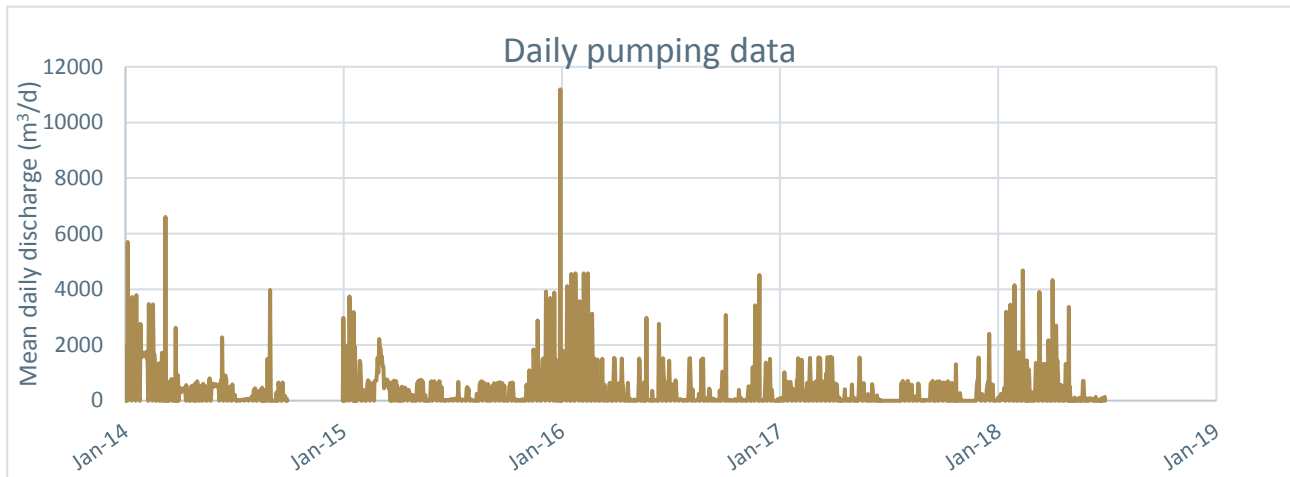
The sump is at an elevation of around 45 mAOD (Appendix A). Water levels are not regularly recorded in this feature although historic site topographical surveys put the sump water level at between 44.5 and 46.0 mAOD. Water level in the sump was noted to be 44.7 mAOD in June 2018. The sump level is controlled by submersible pump which is engaged manually by quarry staff.

The Site's 2017 Hydrogeological Risk Assessment Review (HRAR) (Caulmert, 2018) provided an updated hydrogeological conceptual model for the Site – Appendix C provides an excerpt of the figures which graphically show the conceptual model and groundwater contours across the Site. In general, the base of the quarry is inferred to be very close to the ambient groundwater level, with no significant unsaturated zone (<1 m). However, there is no evidence of groundwater flooding over the base of the void. Water in the sump is considered by Caulmert to be in continuity with groundwater. During a site visit in August 2018 water was observed in the sump following a period of very dry weather. The Quarry Manager (2018) stated at this time that following the occasional pumping that was undertaken over the 2018 summer, water levels in the sump would recover, confirming the connection with groundwater. A comparison of groundwater and sump levels is presented in Section 4.

2.2 Pumping Data

Raw daily pumping data was provided by Tarmac for the period January 2014 to June 2018 inclusive and is presented in Figure 2.2 below. An electronic copy of this data is provided as Appendix D. This shows the high variability of the pumping rate on a daily basis. Note that the high recorded value in December 2015 is likely a summed value over several days and should be discounted.

Figure 2.2 Raw daily discharge data



Over the observed period, the monthly discharge totals (expressed as a daily average) exceeded the consented volumetric limit on 8 occasions – this represents 16% of the data record.

The discharge record is highly variable. The pump capacity is currently unknown although values in excess of 6,000 m³/d (69 l/s) seem unlikely to be accurate and are probably a result of accrued totals. The maximum daily totals are considered likely to be in the order of 4,000 m³/d – 5,000 m³/d. The Site has confirmed the pump runs for 24 hrs following periods of heavy rainfall and that no flooding of the soakaway occurs during these times.

3 Rainfall runoff analysis

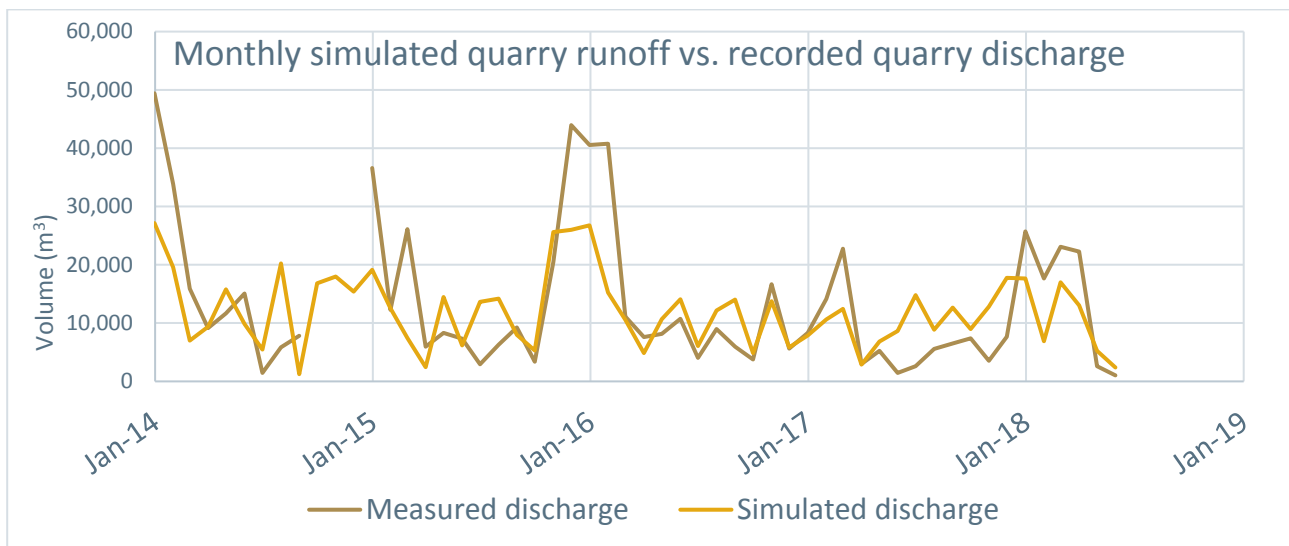
This work builds upon that undertaken in ESI (2014). Using rainfall data obtained from the gauge at the Rhiwsaeson sewage treatment works, 2.25 km northeast of the Site, monthly runoff totals were calculated based upon the runoff coefficient previously established through Linear Regression (0.71). Monthly simulated runoff totals were compared with monthly sum discharge figures, which have previously been used as a proxy for total site runoff, to gauge the relative proportion of total discharge which is likely to be sourced from runoff alone. The latest quarry topographic survey was reviewed as part of this work to assess any change in the catchment area.

The results are presented below as mean totals per quarter, with the first quarter being January to March and so on. This is to show the variability over the year. Monthly totals are also presented in Figure 3.1.

Table 3.1 Recorded discharge vs simulated runoff at the Site (mean values for period Jan 2014 to June 2018)

Quarter	Average of recorded discharge (m ³)	Average of simulated runoff (m ³)	Difference (m ³)
Q1	25,216	13,959	11,257
Q2	7,966	8,452	-486
Q3	5,603	10,948	-5,344
Q4	12,485	14,264	-1,779
Sum	51,271	47,623	3,648

Figure 3.1 Monthly simulated runoff vs recorded site discharge



The results in Table 3.1 suggest that overall runoff is expected to represent the majority of all site discharge, with total simulated flow being 93% of the total recorded discharge (when comparing the summed values). Over the year there is a lot of variation, with recorded discharge being significantly above the simulated flows in the first quarter – this is also clear to see in Figure 3.1. This possibly indicates that the contribution of groundwater to total discharge increases at this time of year, when the water table is at its maximum elevation.

It was noted during a site visit in August 2018 that off-site discharge has been minimal over the dry summer of 2018. Over May and June 2018, recorded rainfall at the Rhiwsaeson rain gauge totalled just 50.0 mm and 22.6 mm, with recorded discharge averages being just 86 m³/d and 34 m³/d

respectively. The maximum daily simulated runoff, as calculated for the period 2014-2018, was 5,281 m³ which was as a result of 47.4 mm of rainfall on 21st July 2017 (Appendix D).

Based on an assessment of the data provided in Figure 2.2 and the maximum daily simulated runoff for the Site (5,281m³), it is considered that it would be appropriate to increase the discharge limit, which is currently being exceeded due to a gross underestimate of rainfall to the Site, to **5,000 m³/day**.

4 Groundwater levels

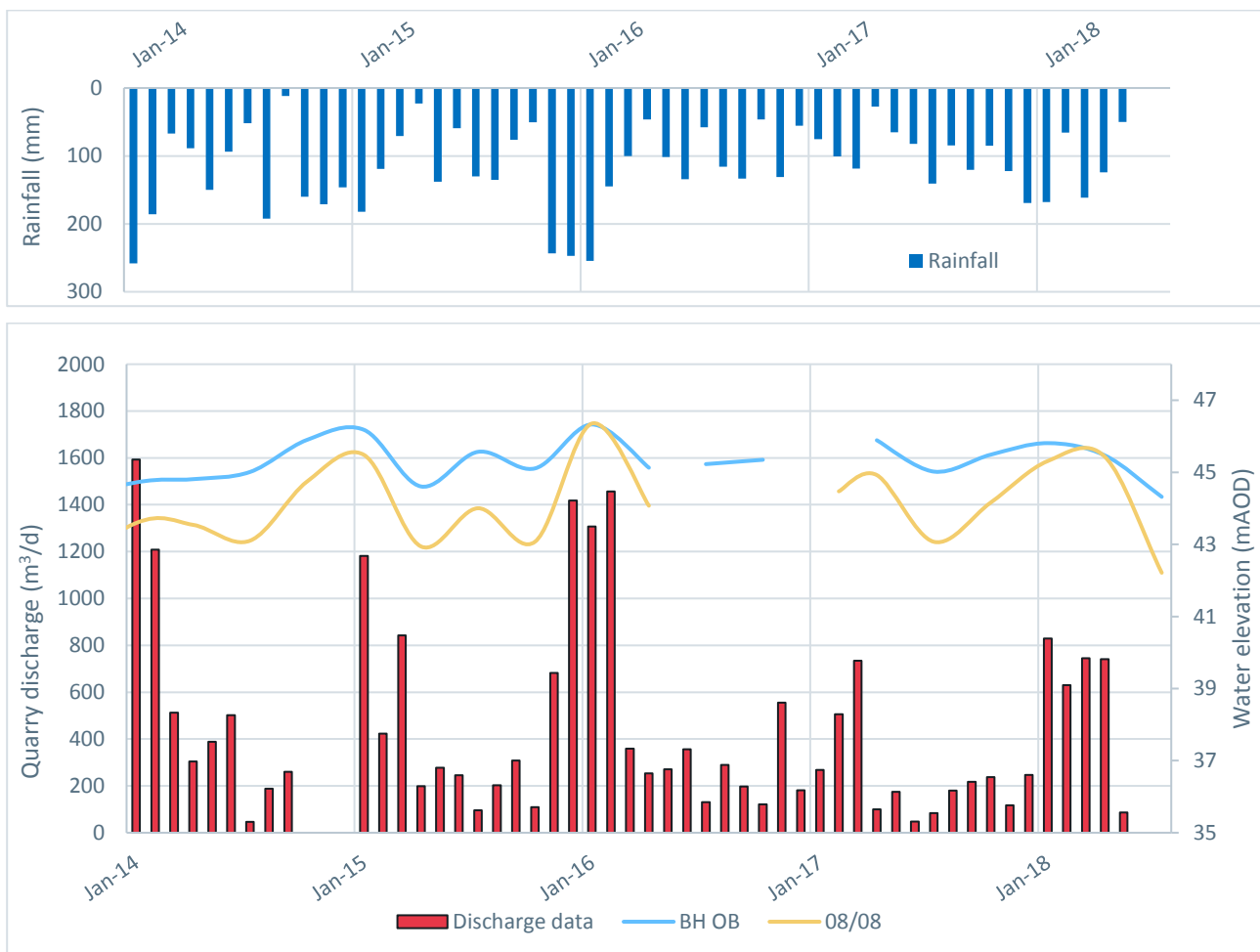
Groundwater monitoring is undertaken at ten locations around the Site. Locations of the monitoring locations are shown on Figure 4.2 and Figure 4.3. In general, the groundwater gradient is from east to west across the Site.

The most proximal borehole to the sump is BH OB, located 70 m to the northwest. Groundwater levels at BH OB and PZ08-08 (a more remote location from the sump) have been plotted below along with pumping rates (monthly average data) and rainfall (monthly sums). The data show that groundwater levels and pumping rates both appear to correlate well with total rainfall i.e. in wetter periods there is more runoff to the sump and the groundwater levels rise such that there is also likely to be an increased groundwater discharge to the sump.

Whilst there are no groundwater monitoring wells very close to the sump, there is no evidence that pumping from the sump actually draws groundwater in i.e. there is unlikely to be any zone of depression in groundwater forming due to pumping. The pumping simply removes excess groundwater which has discharged into the sump due to the prevailing hydraulic gradient.

What is also evident in the Figure 4.1 is the BH OB has a smaller amplitude than PZ08/08. This is most likely due to variations in storage which might well be related to the relative degree of fissuring at the locations.

Figure 4.1 Comparisons of rainfall, discharge and groundwater elevation at the Site



Summer and winter groundwater contours have been calculated for the Site using data collected in July 2017 and January 2018 respectively. These are presented in Figure 4.2 and Figure 4.3 along

with an east-west profile through the Site showing topography data (LiDAR) and interpolated groundwater levels.

The profiles confirm that the summer groundwater level is similar to or below the sump level, whilst the winter groundwater level is higher than it. This confirms that there is likely to be a component of groundwater discharge to the sump in the winter months with a reduced or absence of discharge in the summer months. Winter groundwater levels do not show any influence from sump pumping.

Figure 4.2 Summer groundwater contours at the Site – data recorded in July 2017

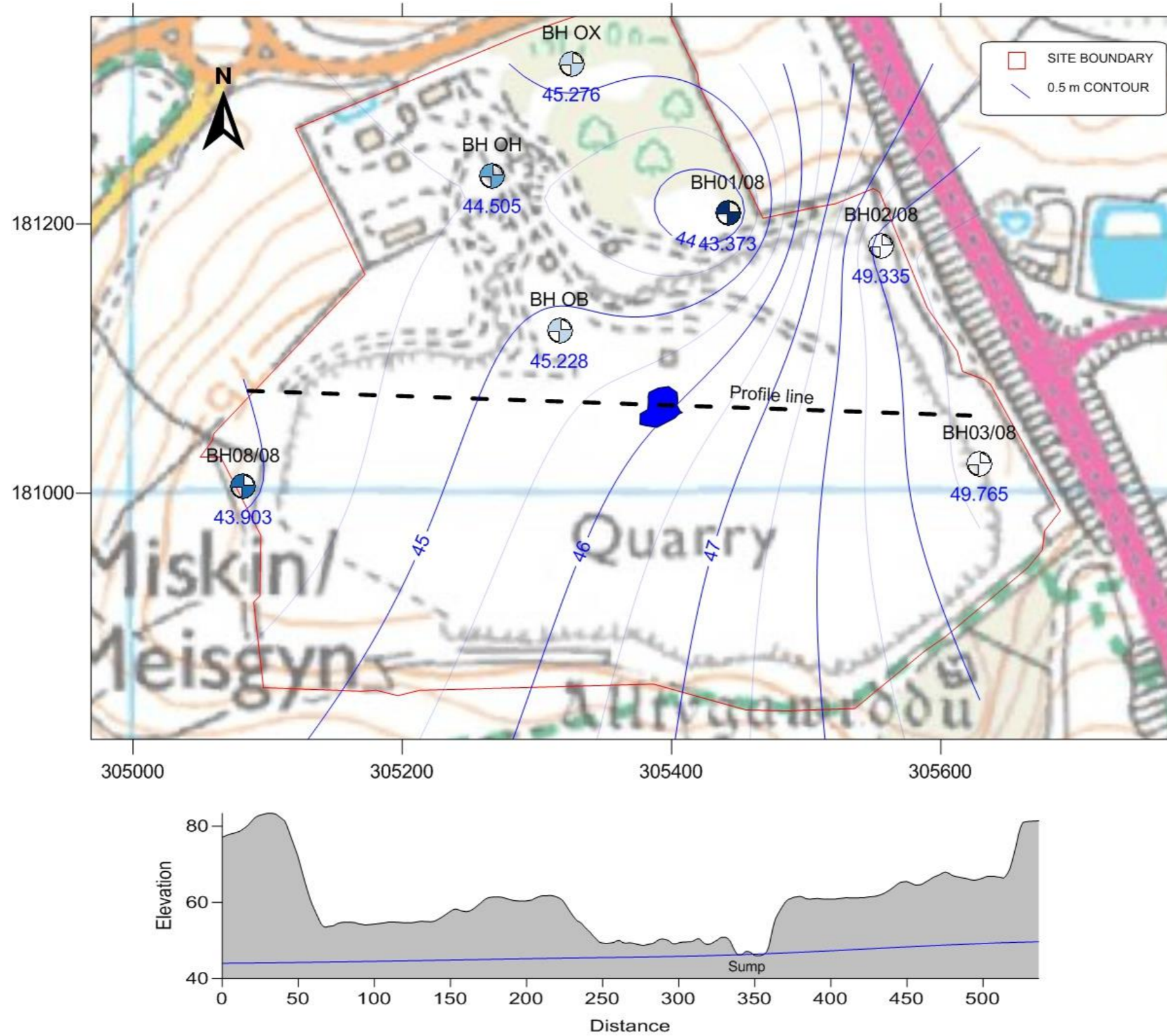
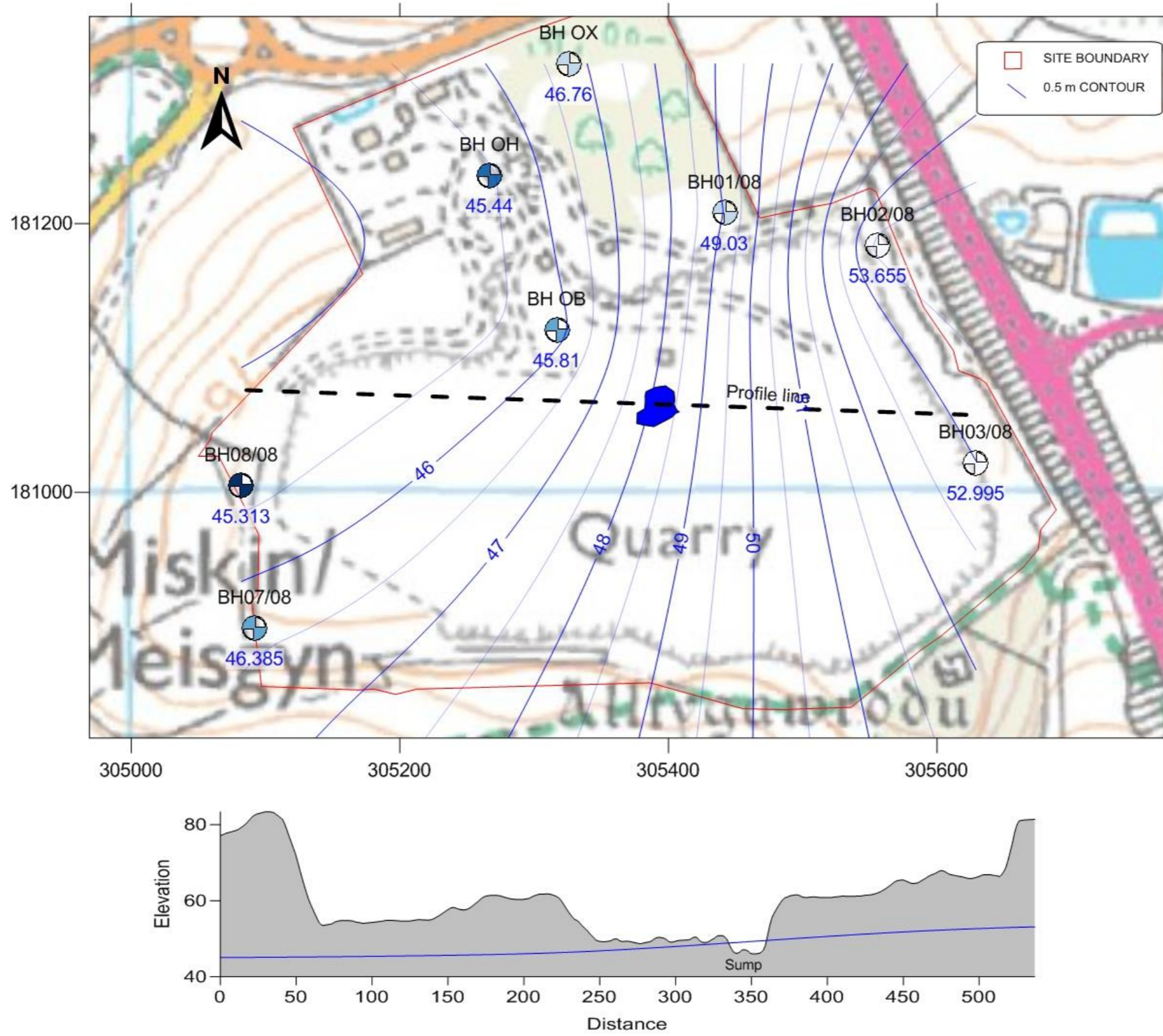


Figure 4.3 Winter groundwater contours at the Site – data recorded in January 2018



5 Conclusions

The Hendy quarry sump is at an approximately equal elevation to the local groundwater table (within the Carboniferous Limestone). Water within the sump is likely to be in hydraulic continuity with groundwater, at least during the wetter winter months. When groundwater levels are high, groundwater discharges to the sump and this water, along with runoff, is pumped out to the soakaway. During the drier, summer months, the groundwater level falls below the base of the sump and the only contribution to the sump is runoff.

There is no evidence that removal of excess groundwater that discharges into the sump has any significant effect on groundwater flow rate or direction. There will be a very small effect as a volume of groundwater is being removed at one location and returned to ground in another location, but this does not appear to affect overall flow rates or directions.

The proportion of rainfall diverted to runoff in the quarry catchment is relatively high, being in the order of 71% as demonstrated in previous work (ESI, 2014). Calculated rainfall runoff on a monthly basis using the established coefficient gives volumes which approach the total magnitude of the recorded discharge totals. In general, pumping rates correlate very well with rainfall totals which would not be expected if the major component of abstracted water was derived from groundwater. This suggests that the majority of pumped water in any given year from the sump is derived from surface water runoff.

The degree of any recycling of water between the soakaway and the sump is likely to be negligible. This is due to the distance between the sump and soakaway and the absence of a hydraulic gradient between the sump and the soakaway.

REFERENCES

Caulmert, 2018. Hendy Landfill Site - Hydrogeological Risk Assessment Review 2017. Doc ref: 3145-CAU-XX-XX-RP-O-0301.S0.C1

ESI, 2014. Hendy Quarry - Assessment of run-off. 62847TN03.

National Coal Board, 1982. Technical Management of Water in the Coal Mining Industry. National Coal Board, Mining Department. Brighton

Natural Resources Wales, date unknown. Letter from Natural Resources Wales to Tarmac – exact date unknown although assumed to be early 2017. Subject of letter: Response to SLR/Tarmac request to vary volumetric discharge limit and ESI's technical note 6284TN03.

Quarry Manager, 2018. Conversation between Henry Kelly (ESI) and Hendy Quarry Manager (Owen Llewellyn) during site visit, 02 August 2018.

APPENDICES

Appendix A

Topographical survey



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 2018 Ordnance Survey 100049885
 Tarmac Limited Patent House, Solihull, B37 7YQ

NOTE: Careful attention on this plan has been
 applied and no liability is accepted for
 omissions. Do not scale off plan/plotting locations.



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 Tel +44(0)1275 465714
 e-mail: stuart.blackhurst@tarmac.com

H074 - HENDY

TOPOGRAPHIC PLAN
 4th JUNE 2018

LSS Models Used To Create Plot
 H074 HENDY QU 2018-06-04

Drawn By
 SJB

Date
 JUNE 2018

Scale
 1 : 1250

Drawing No.
 H074 QU 2018-06-04_A1L.pdf

Appendix B

Site photos

Site photos – 02/08/2018



Hendy sump






Hendy soakaway

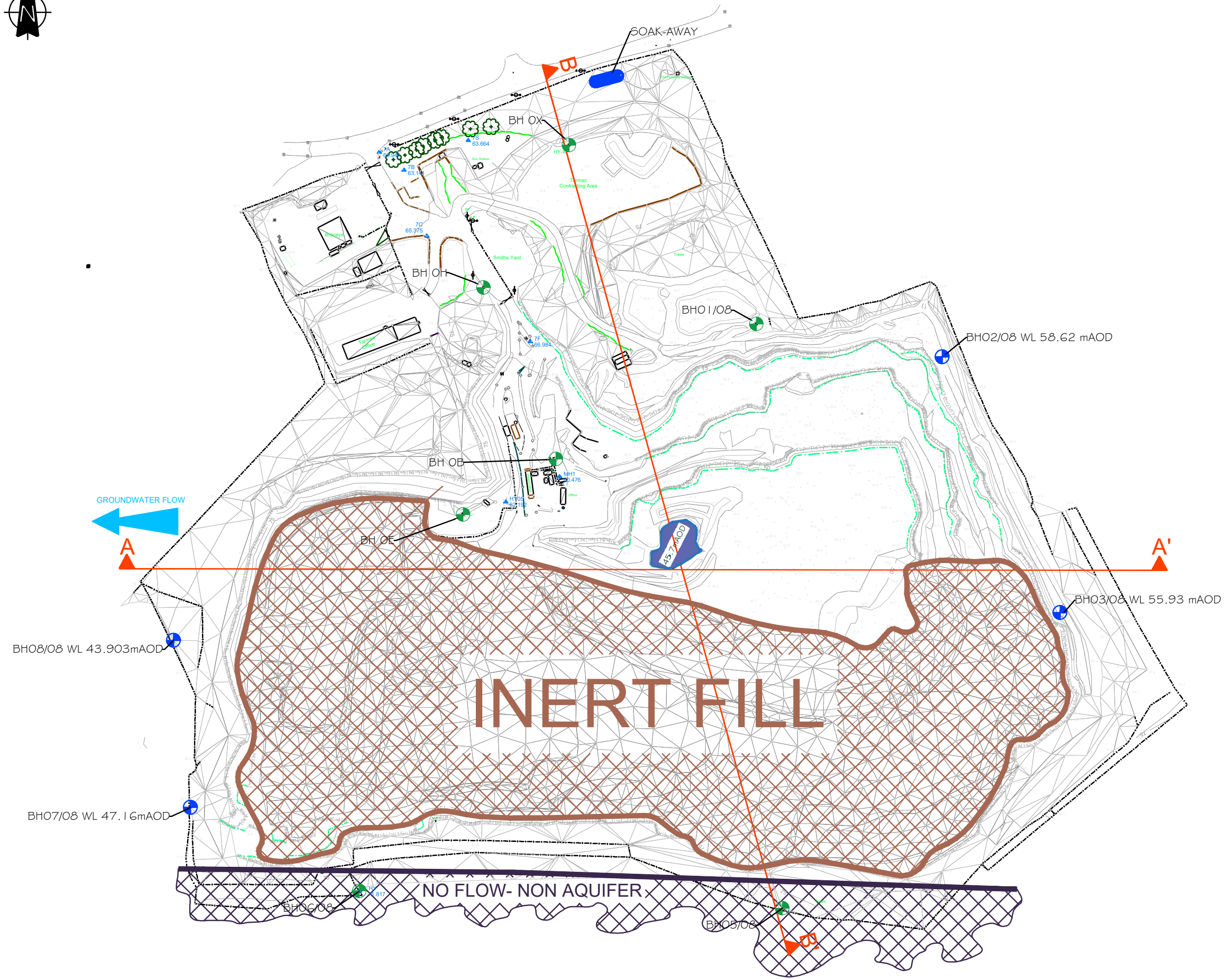
Appendix C

Hydrogeological conceptual model drawings (Caulmert, 2018)



LEGEND

-  PZ02/0 PERMIT BOREHOLE LOCATION
-  PZ ADDITIONAL BOREHOLE LOCATIONS
-  SOAK-AWAY



PROJECT	HENDY	
REPORT TITLE	BOREHOLE LOCATION PLAN	
HRA 01	REPORT REF	3145



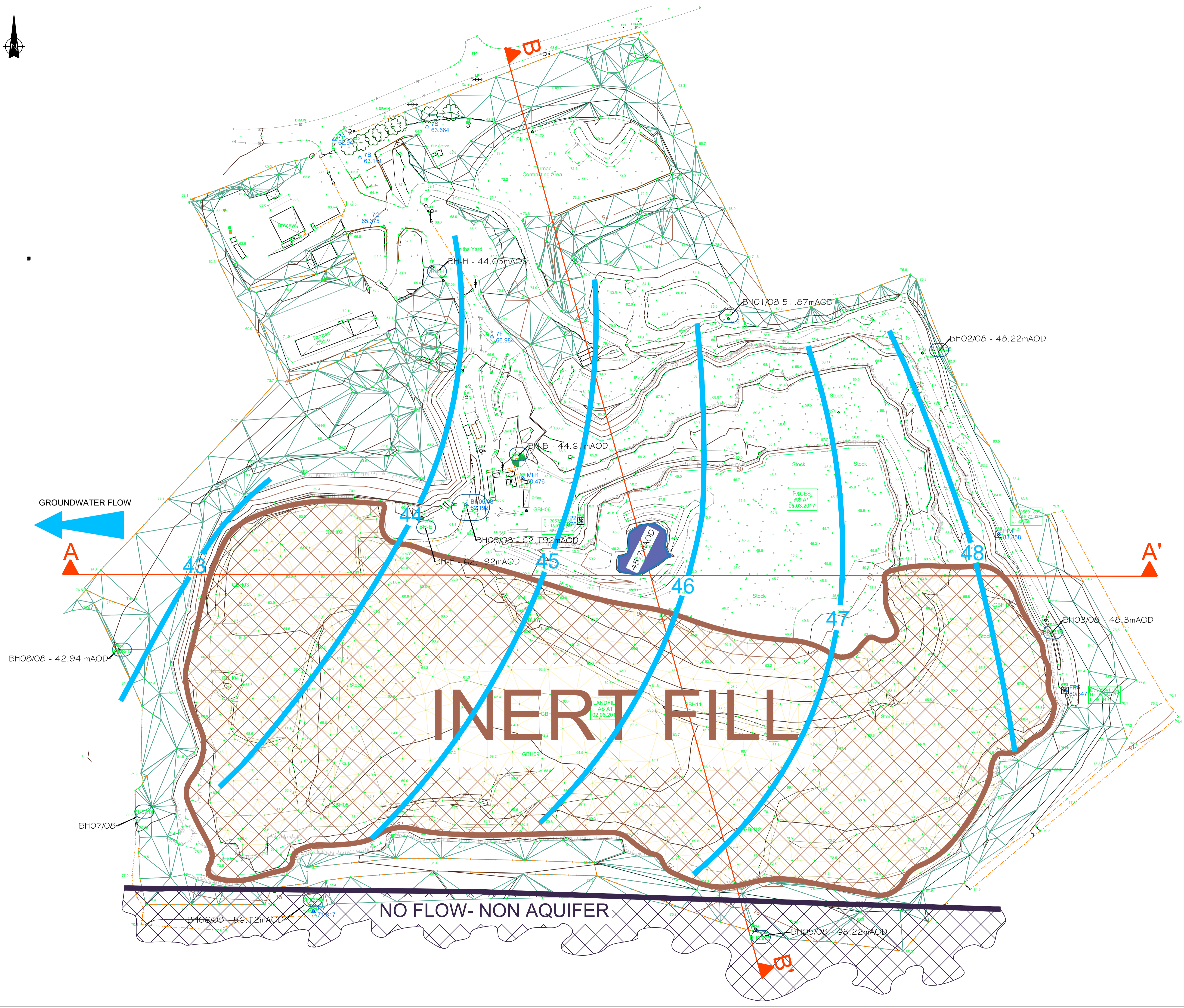


NOTE

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.

LEGEND

- INERT FILL
- NON FLOW, NON AQUIFER
- GROUNDWATER CONTOUR- 28.04.2015



PRELIMINARY DRAWING FOR INFORMATION PURPOSES ONLY

B	BOREHOLES ID AMENDED	EJD	SV	SV	09.01.18
A	GROUNDWATER CONTOURS	RP	SV	SV	18.09.17
REV	MODIFICATIONS	BY	RE	AP	DATE
TARMAC					
PROJECT: HENDY					
TITLE: CONCEPTUAL MODEL					
DRAWN BY		DATE			
RP		04.07.2017			
REVIEWED BY		SCALE @ A1		JOB REF:	
SV		N.T.S.		3145	
AUTHORISED BY		ISSUE		REVISION	
SV		-		B	
DRAWING NUMBER 3145.02					
Caulmert engineering environmental planning					

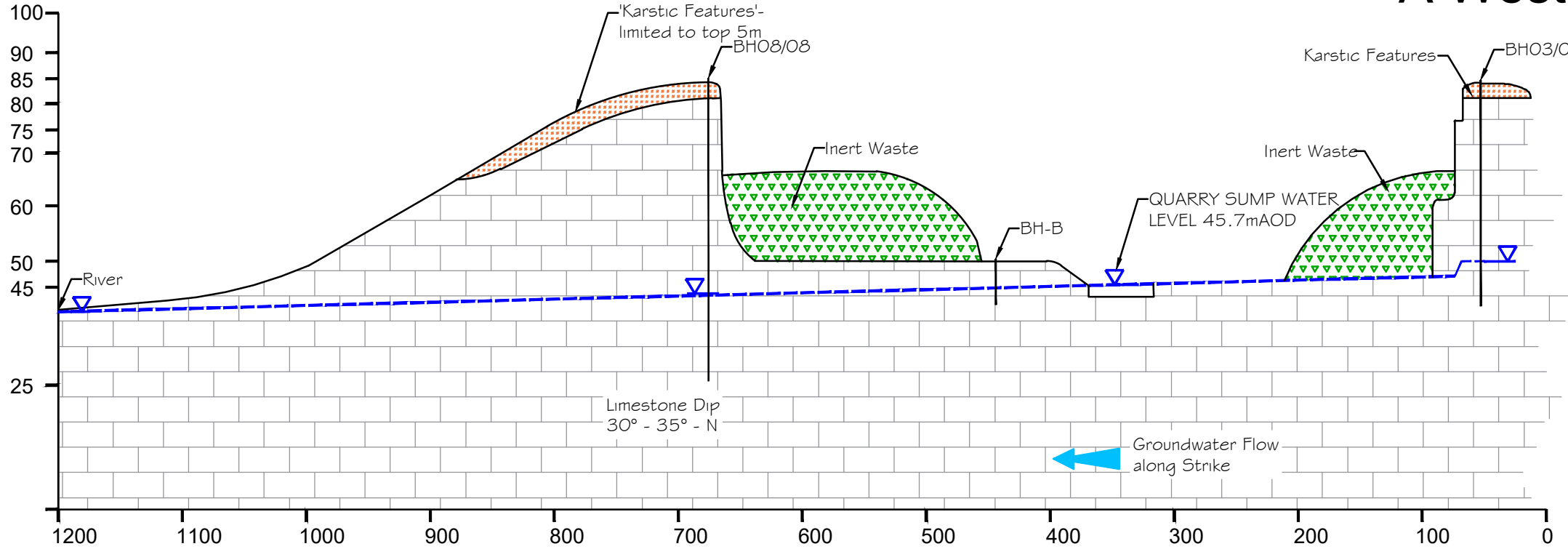
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A' East

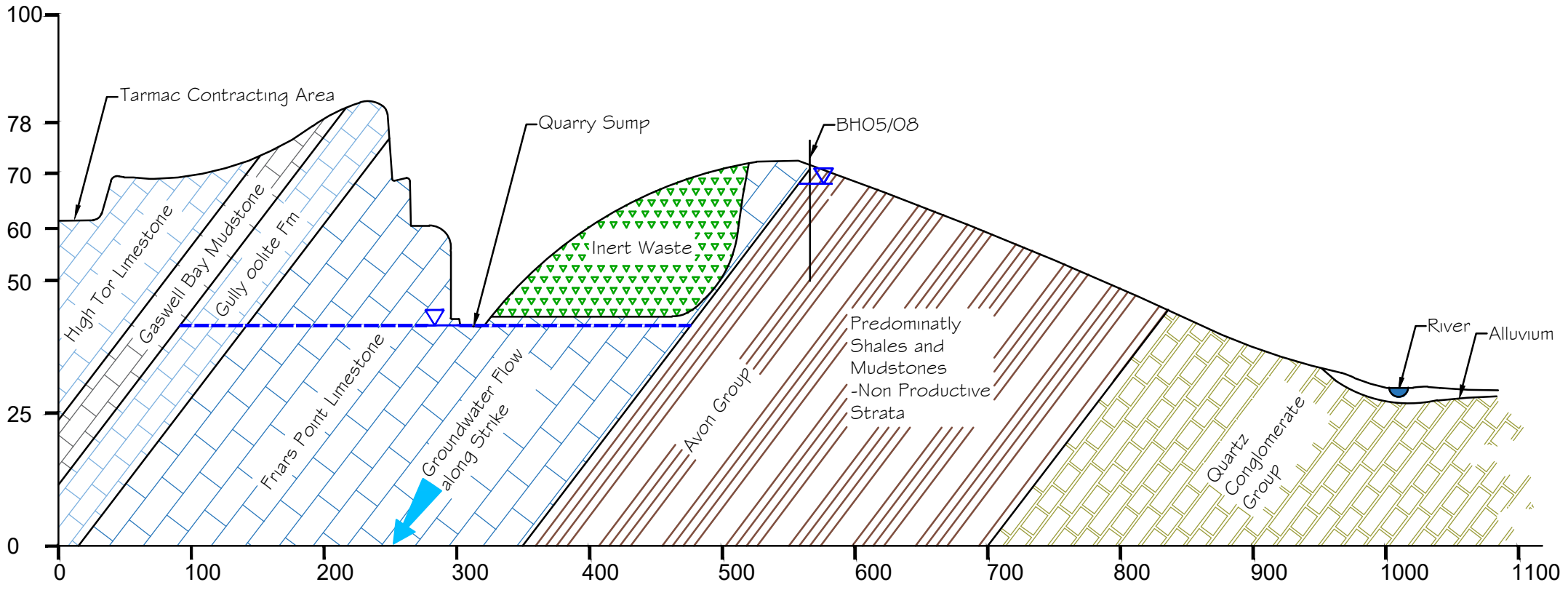
A West




PROJECT	
HENDY	
REPORT TITLE	
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	3145.03
	

B

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PROJECT	
HENDY	
REPORT TITLE	
CONCEPTUAL MODEL	
CROSS SECTION B-B	REPORT REF
3145.04	3145.04
	

Appendix D

Raw data calculation worksheet (electronic) 

Appendix H

Surface water management plan



Environmental Management and Monitoring

Surface Water Management Plan

Hendy Quarry Landfill

Permit Reference EPR/KP3795FU

Plan Reference HNDY/SWMP

March 2019

Version 3.2

SURFACE WATER MANAGEMENT PLAN

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Drawings

HNDY/SWMP/01 Surface Water Monitoring Location Points

Appendix 1

Example Site Inspection Form

1. INTRODUCTION AND BACKGROUND

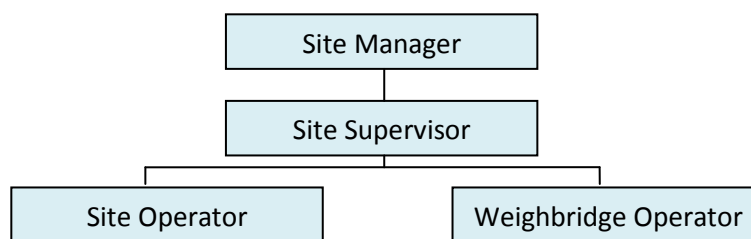
1.1 Report Context

1.1.1 The Surface Water Management Plan (SWMP) provides a framework for the management of surface water at the Hendy Quarry landfill Site, Miskin, Pontyclun, National Grid Reference ST 05425 80991. The SWMP forms part of the Environmental Management and Monitoring Program for the site that covers all the different monitoring regimes at the installation.

1.1.2 This SWMP complies with the requirements of the Environmental Permitting regime and regulatory guidance note LFTGN02 'Guidance on Monitoring Landfill Leachate, Groundwater and Surface Water' issued by the Environment Agency and forms part of the Environmental Permit (EP) for the site, reference EPR/KP3795FU.

1.2 Management Structure

1.2.1 The Site Manager, who is supported by the Site Supervisor undertakes overall management and supervision of the site. The management structure for the site is as follows:



1.2.2 Suitably qualified technicians who are experienced and trained in the use of monitoring and sampling equipment and interpretation of the data obtained will carry out all water monitoring at the installation. Standard operating procedures are in place for surface water monitoring.

1.3 Summary of Conceptual Hydrogeological Model.

1.3.1 The quarry is excavated into the Black Rock Limestone Subgroup which is described as skeletal and argillaceous packstones with minor oolites, shales and mudstones. The Carboniferous Limestone is defined as a principal aquifer with flow dominated by fracture flow.

1.3.2 The Avon Group (Lower Limestone Shale) is classified as Secondary A. It is noted that this strata was previously classified as a non-aquifer. Although the change in classification reflects a greater understanding of the potential for this strata to transmit groundwater, site investigation and monitoring data collected over the development of the site confirm that the original conceptual model remains valid where there is no groundwater migration towards the south. This is confirmed by the presence of two boreholes along the southern boundary (installed within the Avon Group) which have significantly higher groundwater levels in comparison to those installed within the permeable fractured limestone. Therefore notwithstanding the permeability contrast between the limestone and Avon

group, the hydraulic gradient is such that there is no possible groundwater flow towards the south. The water levels within the Avon Group boreholes are considered to represent water in the superficial deposits and weathered zone. Therefore it is considered that these strata effectively form a barrier to flow in a southern direction at the site. The orientation and dip of this strata is considered to constrain the groundwater flow to the south and therefore the principal groundwater flow is along the strike of the beds towards the west.

- 1.3.3 To the south and west of the site the land steeply slopes to the river valley of the Ely, approximately 300m from the boundary of the site.
- 1.3.4 The site lies within the catchment of the River Ely, with the river flowing towards the south east. At its closest reach the river passes some 300m from the site. Tributaries of the River Ely drain the hilly area the quarry is located within. The River Ely is the principal watercourse in the vicinity.
- 1.3.5 An un-named stream arises 550m east of the quarry boundary (in the vicinity of Croffta Farm) and flows south westwards towards the River Ely. At its closest approach it passes some 250m south of the site. A second un-named stream passes 200m to the north east of the site. It arises at Brofiscin Farm, some 1.5km to the east of the site and flows westward towards the site then northwards to its confluence with Afon Clun, some 1.1km to the north of the site. Ultimately the stream discharges into the River Ely.
- 1.3.6 A detailed summary of the hydrogeological regime local to the site is referenced in the report entitled 'Hydrological and Hydrogeological Assessment to Support Planning Application for Restoration of Quarry by Infill with Inert Materials' produced by BCL Consultant Hydrogeologists Ltd in August 2000 and 'Hendy Landfill Site, Hydrogeological Risk Assessment Review 2017', produced by Caulmert.
- 1.3.7 Surface water within the site is collected in the sump located in the base of the quarry. The water is pumped from the quarry sump to a soakaway located at NGR ST 0538 8136. The discharge is a directly associated activity of permit reference EPR/KP3795FU.

2. MONITORING REQUIREMENTS

2.1 Monitoring Scheme

- 2.1.1 The proposed surface water emissions limits and monitoring frequencies are specified in Table S4.1 of the permit and are presented in Table 1 below, the table has been updated to include the new proposed volume limits and rates for the discharge.
- 2.1.2 Control limits for suspended solids and mineral oils are set at 95% of the compliance limits.

Table 1 – Hendy Quarry Surface Water Emissions Limits and Monitoring Frequencies.

Emission Point Reference and Location	Parameter	Compliance Limit	Monitoring Frequency
S1 – discharge to soak away.	Volume	5,000 m ³ /day	Daily
	Rate of discharge	58 lts / sec	Weekly
	Suspended Solids	100mg/l	Quarterly
	Mineral oil	5 mg/l	Quarterly
	pH	6 - 9	Quarterly
Emission Point Reference and Location	Parameter	Control Limit	Monitoring Frequency
S1 – discharge to soak away.	Suspended Solids	95 mg/l	Quarterly
	Mineral oil	4.75 mg/l	Quarterly

2.2 Measurement Techniques and Monitoring Strategy

- 2.2.1 All water monitoring at the site will be carried out by suitably qualified technicians who are knowledgeable and experienced in the use of equipment when taking field measurements and interpretation of the data obtained.
- 2.2.2 Any field measurements, if necessary, will be monitored utilising a hand held portable meter which will be regularly tested and calibrated and maintained to the manufacturer's guidance.
- 2.2.3 Laboratory analysis will be undertaken by a third party UKAS accredited laboratory.
- 2.2.4 The flow meter on site will be regularly inspected and maintained to the manufacturer's specifications.

2.3 Assessment Criteria and Contingency Actions

- 2.3.1 The compliance limits for the surface water monitoring point S1 are specified in Table 1. Compliance limits will be deemed to have been breached when the limits outlined in Table 1 are exceeded:

Table 2 – Contingency Actions – Compliance Limits

Contingency Action	Response Time
Quality Parameters	
For quality parameters inform Unit Manager	As soon as practicable
Advise NRW and submit Schedule 6 Notification.	As soon as practicable
If quality parameter is exceeded arrange for additional spot sample to be taken.	1 month
Investigate the source / cause of the poor water quality.	1 month
Update site improvement plan with any required actions following	3 month

the investigation.	
Update Schedule 6 Part B Notification any further monitoring management activities associated with the incident.	3 months
Volume or Rate	
Advise NRW and submit Schedule 6 Notification.	As soon as practicable
Investigate the cause of the breach including review of weather conditions.	1 month
Update site improvement plan with any required actions following the investigation.	3 month
Update Schedule 6 Part B Notification any further monitoring management activities associated with the incident.	3 month

2.3.2 If a control limit is breached on three occasions the following actions will be undertaken:

- Review if there have been any changes to site activities.
- Assess the variability of the dataset and whether additional sampling is required.
- Assess whether additional inspection of the surface water management system is required.
- Update site improvement plan to document any required actions.

2.3.3 If during routine visual inspection of the quarry sump by Site Management a potential issue such as cloudiness of water indicate it is likely to exceed the suspended solids limit then the following actions will be undertaken:

- Inform Unit Manager.
- If pump is operational shut down pump to prevent discharge of water.
- Undertake visual inspection to identify source of poor water quality.
- Confirm if there has been off site release of water.
- If confirmed off site releases of water submit Schedule 6 Notification.
- Arrange spot samples with the Monitoring Team if required.
- Update site action plan with any further management and monitoring requirements associated with the incident to demonstrate the issue has been addressed.

2.4 Emergency Actions

2.4.1 Emergency contingency measures will be employed at the site in the event of a fuel spillage from a storage tank as a result of a leak or from poor re-fuelling or filling procedures. The procedure is included as part of the Sites Environmental Management System.

3. MONITORING PROTOCOLS

3.1 Surface Water sampling

3.1.1 The type of sampling equipment used will depend on the size and type of water body to be sampled. Where surface water bodies are accessible safely the sample bottles can be filled directly from the water body. This method cannot be used if the sample bottles contain fixatives or preservatives.

-
- 3.1.2 If the sampling cannot be safely accessed lower clean bailer or bucket into the surface water from safe access point. If the location is further away throw the bucket or bailer from the bank or use a long reach sampler
 - 3.1.3 Discard the first sample on to the ground not back into the water body as it will cause further disturbance.
 - 3.1.4 Allow the bottle to fill to the brim to exclude air unless otherwise specified. Clearly labelled with the company name, site, location code and date.
 - 3.1.5 Take field readings as required.
 - 3.1.6 Make a note of the colour of the sample, any odour and other relevant comments on the sample such as presence of solids.
 - 3.1.7 For discharge permits note if there is any visible oil or grease present or not and make a record if there is no discharge at the time of the visit.
 - 3.1.8 Avoid getting any disturbed debris in the sample or excess vegetation and solids.

3.2 Sample Storage and Transport

- 3.2.1 On completion of sampling check that all the bottles are labelled correctly.
- 3.2.2 Samples should be kept upright to prevent spillage and wrapped in bubble wrap provided by the laboratory.
- 3.2.3 Samples should be transferred into suitable boxes for transportation to the laboratory. Storage in cool boxes with ice packs or refrigerated transport should be used.
- 3.2.4 Analysis requested should be completed and checked. (chain of custody). The request should accompany the samples to the laboratory and a copy of the request should be kept.

3.3 Reporting

- 3.3.1 All data is entered into a central Environmental Monitoring database. The data is reviewed against the compliance limits and where limits are exceeded the Environmental Monitoring Manager shall be informed.

Data will be submitted to NRW on a quarterly basis in accordance with the requirements of the permit.

4. INSPECTION AND MAINTENANCE




4.1 Inspection and Maintenance Requirements

- 4.1.1 Section 5.1.2 of MS-EP-CORE-06 Water Management requires that Quarry Operations have in place a Water Management Folder (MS-EP-CORE-06/01). The sets out the requirements for monitoring, measuring the discharge in accordance with the requirements of the permit and inspection to ensure that the water management system operates pro-actively. In addition it sets out the requirements for non-conformance reporting and non-conformance reporting.
- 4.1.2 Plant inspection and maintenance procedures are outlined in MS-QP-PROD-01PPM.
- 4.1.3 At Hendy Quarry the water management system comprises:
- Quarry sump
 - Electric submersible pump
 - Pipework to discharge point
 - Soak away.
- 4.1.4 Weekly inspections will be undertaken of the quarry sump, pump and associated pipework the soak away will be inspected as outlined in 4.1.8. An example inspection form is presented in Appendix 1
- 4.1.5 Pumps and flow meters will be maintained in accordance with the manufacturer's requirements.
- 4.1.6 Where faults are identified on pumps or flow meters specialist contractors will be used to service, repair or replace.
- 4.1.7 Where leaks are identified on pipework through visual inspection they will be repaired / replaced.
- 4.1.8 The soakaway will be routinely inspected every three months and kept free of debris. When the daily discharge exceeds 50% of the total permitted volume ie 2,500m³ per day the inspection will be increased to weekly.
- 4.1.9 The settlement of suspended solids is provided in the quarry sump area. Surface water is settled in the sump area prior to being pumped to the discharge. The pump head is floated such that settled solids are not drawn into the pump. This prevents the build up of solids in the pipework and soak away.
- 4.1.10 The storage for storm event is provided by the quarry sump area and the surrounding quarry base. The rate of discharge is then controlled by the pump.

DRAWINGS



Legend:

-  Environmental Permit Boundary Reference BT10881D
-  Permitted Restoration Contours
-  Location of Surface Water Monitoring Point

Final revision:	Date:	Description:
-	-	-

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Site: HENDY QUARRY LANDFILL

Drawing Title: SURFACE WATER MONITORING LOCATION POINTS

Drawn By:	Date:	Scale:	Page Size:
J.D.	21 August '08	1:2,000	A3
Status:	Final Revision:	Drawing No:	
FINAL	-	HNDV/SWMP/01	

APPENDIX 1

Surface Water and Lagoon Inspection Checklist

Site: Hendy Quarry	Inspection Point: A – Quarry Sump
---------------------------	--

Frequency of Inspection Required:	Monthly during periods of inactivity, weekly once operational	
Inspection Detail Inspector	Day of Inspection confirm status ok Y/N	Initials

	Date of Inspection DD/MM							
Inspection detail what to look for								
Question 1 Is there any visible sign of oil?								
Question 2 Is the water murky or clear?								
Question 3 Is the sump being actively pumped?								
Question 4 Is the pump functioning?								
Question 5 Is the pipework from the pump intact?								
Question 6 Is a spill kit available?								
Question 6 Is flow meter functioning?								
Question 7 Are there any leaks on the pipework that require repair?								
Question 8 Is the soakaway clear of debris (three monthly routine inspection weekly when discharge exceeds 2,500m ³ per day)								
Weather Conditions								

Remedial Action Required

Escalation and Action

- If any instability is identified seek geotechnical advice for remediation.
- If water is murky arrange for sample to determine chemical composition and compliance with permit conditions.
- If oil is identified visually cast around for potential source and isolate.
- If the monitoring regime identifies any permit breaches, consider additional treatment systems (dosing, etc).



Sign at the end of the week on completion of daily inspections, retain in file

Name.....

Signature.....

Aggregates & Recycling Production Procedures Manual

5. Plant Inspection & Maintenance

General

This section is designed to ensure that a corrective and preventive schedule of inspection and maintenance is employed to provide the required level of plant operating efficiency.

Please contact your local Maintenance Manager if you require any further information.

Responsibilities

The Unit Manager is responsible for the formulation and implementation of a fully documented inspection and maintenance schedule for all items of plant.

In addition he must ensure that records are maintained of any inspections carried out, items requiring attention and details of maintenance carried out.

Suitably trained personnel are responsible for the operation of the inspection schedule and for carrying out the necessary maintenance identified.

Plant Inspections

The inspection schedule should identify the items of plant to be inspected, the object of the inspection together with frequencies.

Screens

Due to the nature of the screening equipment fitted to most plants, a meaningful inspection of the condition of the screens is not possible without dismantling the screens and removal of the upper screen meshes, this is likely to have adverse effects which outweigh the benefits yielded by a scheduled inspection regime.

When the screen has to be dismantled for other reasons, an opportunity should be taken to assess the state of wear and general condition of the screen mesh.

Preventive Maintenance

A plant inspection and maintenance schedule should be implemented with records maintained of any actions deemed necessary to ensure the correct and efficient operation of processing plant, repairs to items of the plant either affecting production or product quality must be recorded.

Any other items found by works staff requiring action should be reported to the Unit Manager whether already actioned or not.

Quality Management

Aggregates & Recycling Production Procedures Manual

5. Plant Inspection & Maintenance

Maintenance Management System

The Tarmac Maintenance Management System (MMS) can be used to plan maintenance.

Effectiveness of Preventive Maintenance

The overall effectiveness of the maintenance scheme must be monitored by the Unit Manager and reported as an operating efficiency KPI.

Tool Storage Best Practice

Storage in a lockable cabinet with a designated place for each item provides security and prevents loss and misplacement of tools.



CONTROLLED DOCUMENT

Document Issued for use from: August 2015

CONTENTS

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1 Introduction

This procedure is written to ensure that water resources are used efficiently and managed effectively throughout our sites. Care must be taken when working on or near water, including any structures which lead directly to a source of water. This procedure will help to prevent water wastage and will offer a structure to ensure that our sites meet the compliance obligation requirements with respect to water discharges and abstractions, as well as providing a means to effectively manage and control the migration and use of water within our sites.

Disclaimer: Failure to comply with the controls set out in this procedure could lead to prosecution for both Tarmac and any employee or contractor found guilty of environmental negligence.

2 Scope

This procedure applies to all operations and locations for which Tarmac has responsibility. This document replaces any previously worked to Water Management Standard or Procedure.

3 Definitions

Term	Definition
Abstraction	The process of removing water from a river or other source.
Catch Pit	A system to prevent sand, silt, stones etc from blocking drainage systems (this does not prevent fuel, oil or chemicals from entering these systems).
Consent/Permit	An Environmental permit/consent is issued by a Regulatory Authority (such as the Environment Agency in England), to allow the abstraction and/or discharge of water. These may also be known as 'Consents' or 'Licences'.
Discharge	The act of allowing water to flow out from site.
Effluent	Liquid waste or sewage discharged into a river or the sea.
Foul Water (Trade Effluent)	Water that has been used in the process, or passed through or over the site where a process or activity is taking place. This water will usually have picked up contaminants as it passes through the process or site, such as suspended solids, oils and chemicals. It may also have had its properties changed, such as an increase or decrease in pH.
Grey Water	Grey water is industrial water that has been used in another process by a third and is then passed to Tarmac to use.

Groundwater	Water found below ground level. Ground water is often extracted via a borehole.
Interceptors	An oil interceptor (also known as an oil separator) is a device designed to remove oil and oily liquids from a flow of water.
Mains Water	Water supplied through a supply network (taps, pipes etc).
Potable Water	Water which is suitable for human consumption.
Regulator	An organisation or body with the authority to issue and enforce licences or Permits for water abstraction and discharge.
Site Manager	People with the day-to-day on-site responsibility for managing a specific site (including ships), this may include Quarry Managers, Plant Managers, Ship Masters, General Managers etc.
Standpipe	A portable pipe that connects to the mains water supply through a valve to provide a temporary supply of water, usually for contracting services.
Surface Water (Storm Water)	Water that sits or flows above the ground (such as rivers, canals, streams, reservoirs, ponds, ditches and coastal waters).
Water Company	Provider of mains water and sewerage services.

Table 1. Relevant definitions pertinent to this document.

4 Responsibilities

It is the responsibility of Business Unit (BU) Managing Directors to ensure that this procedure is communicated and implemented throughout their BUs.

Site Managers are responsible for ensuring that this procedure is implemented and followed. It falls to the Site Manager to ensure that all necessary requirements for the implementation of the water procedure discussed here (including permits and licences) are acquired and maintained. It is, however, the responsibility of the Health, Safety and Environment (HSE) Team to ensure that this procedure is updated and maintained in line with legal and company led changes.

5 Process

5.1 Water Management Plan

All sites must have a Water Management Plan in place which is readily available to view. A Water Management Plan outlines the water management strategy for each site. This plan will ensure that the water management and movements on site are clearly understood by all staff and contractors, as well as assisting in the management of both clean water and effluent. It should also be used as

part of any incident or emergency response procedure. The Water Management Plan forms part of the Site Environmental Management Plan.

5.1.1 Non-Quarry Operations

When developing or updating a water management plan, contact the Drawing Office (drawingoffice@tarmac.com) requesting a base map for your site. Water management plans must include:

- Water sources (mains, abstraction points)
- Water inputs to drainage systems
- Water storage areas (e.g. pits, lagoons and tanks)
- Drains
- Drainage routes below ground
- Clear distinction between surface water and sewers
- Discharge points/outfalls
- Abstraction points
- Bore holes
- Pipe layouts
- Spill kit locations
- Monitoring points
- Wash down areas

For further assistance contact the HSE Team, your Estates Manager or the Geology Team.

5.1.2 Quarry Operations

Quarry operations should continue to follow the 'Water Management Folder' (MS-EP-CORE-06/01) setup. If you are unsure of your Water Management Plan, or how to develop one, contact your geologist.

5.2 Water Supply

5.2.1 Water Hierarchy

The table below highlights the preferred consumption order of water. This order is based on the most sustainable source of water and should be followed where possible.

Hierarchy Position	Water Type	Summary
1st Option	Recycled or Rain Water	Recycled (greywater) or rainwater should be collected from site run-off or water previously used operationally. This is the best option environmentally, whilst also offering advantages economically too.
2nd Option	Abstracted Water	Utilise abstracted water (such as from river or groundwater) to support recycled or rainwater use.
3rd Option	Mains (Potable) Water	Mains water is the least sustainable option and should be regarded as a last resort for operational water use. Mains water should only be used when other water sources are insufficient or unavailable (for example at times of low flow we are prevented from abstracting) or for welfare facilities.

Table 2. Water hierarchy.

5.2.2 Water Use Recording

Water use should be recorded in line with any permits or licences referring to water use. If there are no permits, water use needs to be recorded on a monthly basis in line with the Tarmac Environmental Reporting requirements. This should be recorded in the Environmental Database (N.B. water is recorded in M³)(Figure 1). This information should come from calibrated water meters where possible.

Water Supply														
Potable water (m ³)	?	593	473	648	640	661	644	835	668	718	1,000	756	625	8,261
Ground Water Abstracted (m ³)	?	0	0	0	0	0	0	0	0	0	0	0	0	0
Surface Water Abstracted (m ³)	?	0	0	0	0	0	0	0	0	0	0	0	0	0
Sea Water Abstracted (m ³)	?	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey Water (m ³)	?	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 1. Water use recording on the Environmental Database.

5.2.3 Potable Mains Water

Although potable mains water should be considered as a last resort for operations, it is expected that most sites will use it as some part of their process (e.g. for welfare facilities).

Permissions are usually required from the local water company when making any modifications or connections to a mains water supply. All connections, fittings and equipment connected to a mains water supply must comply with any regulatory requirements. Check with the water company or regulator for further details.

Any mains water use must be metered (with sub-meters used where necessary). Safe access to these meters should be provided to allow for inspections by both Tarmac and external contractors. These water meters need to be calibrated at regular intervals depending on factors such as the type of meter, how it is used (continuously, intermittently, seasonally etc) and the quality of the source of the water. Checks should be made with the environmental regulators if you are unsure of how frequently your water meters should be calibrated. Calibration certificates must be retained on site and uploaded to Section 7 of the Site Environmental Management Plan.

To ensure that mains water use is as accurate as possible, annual inspections should be carried out for leaks. The most effective way to carry out these tests is to switch off all taps, valves and other equipment connected to the mains and check the consumption of water from the water meter. If the meter reading is still increasing there is a leak and further investigations are required. Routine checks should also be carried out to confirm there are no leaks, identifying not only waste water but also wasted money. During these inspections, checks should also be made to assess and identify any pipes, tanks or storage ponds which may be corroding or in need of repair. These are likely to lead to leaks and should be monitored.

5.2.4 Standpipes

Standpipes are used to connect into the mains water supply via manholes, usually in public roads and pavements. This is necessary for some operations that require a water supply whilst working away from a Tarmac site (for example road surfacing).

Licences are usually required for standpipes and are issued by the mains water provider for that area. Typically, each water company will issue its own licence and standpipe, meaning that if an operation moves from one water company area to another, a new licence will likely be required. Standpipes not approved by the water company for a specific area must not be used as doing so presents a risk of prosecution.

If you are in doubt about whether a licence is required contact the Permitting Team.

5.2.5 Water Abstraction

Water can be abstracted from surface water sources (rivers, lakes, ponds etc) or from groundwater sources (boreholes, wells, pumped from extraction areas etc).

Water taken from surface or groundwater sources usually requires a permit/consent. It is worth noting that permit/consent applications may take several months, therefore applications should be made well before the water is needed. In the UK it may be possible to abstract a limited quantity of water without the need to obtain a permit/consent.

The quantity of water capable of being abstracted per site without the need for a permit/consent varies throughout the UK. Checks should be made with the local environmental regulators regarding this matter. Within England and Wales, abstractions of 20 cubic metres or less a day, provided the abstraction is part of a single operation, are exempt from requiring a permit/consent. If you abstract from the same source at multiple points, the exemption only applies if the combined total of all abstractions is 20 cubic metres or less a day. Within Scotland, this limit is 10 cubic metres a day.

If a water abstraction permit/consent is required it will specify how much water can be abstracted and what it can be used for. Records of the amount of water abstracted are usually required, with these sent to the regulator at specified intervals (even if records are not required legally, abstracted water needs to be recorded in the Environmental Database). Any water abstraction permits/consents and their conditions must be available on site.

If you are unsure of details of your permit/consent, or whether a permit/consent is required for your operations, contact your Estates Department or the Permitting Team.

As with potable water, any meters fitted to monitor water use must be calibrated at specified intervals depending on the factors previously discussed (type, frequency of use and quality of water source), with calibration certificates retained on site.

Meters must be calibrated between once a year and seven years depending on a combination of the following:

- Type of meter
- How it is used (continuously, intermittently or seasonally)
- Whether the water source is clean or contains sand, grit or weeds

Checks should be made with environmental regulators regarding this matter.

5.2.5.1 Water Abstraction Returns

Water Abstraction Return information is required for all sites with a water abstraction licence and deadlines are set by the Regulators.

These are in place to ensure that you are compliant to your abstraction licence, even if you have not abstracted anything you must complete a 'nil' return.

If returns are not submitted in line with your relevant Regulators' deadline, the below can be enforced:

- If your licence has a time limit, you may not be able to renew it
- They may assume you no longer need your licence and take action to cancel it
- Future abstraction charges may be increased, to cover the extra costs of following up on non-submission of returns

Returns can be submitted to your regulator below, please find links to their online guidance:

- Environment Agency - Returns can be done through their online system ([please click here for Guidance](#)) or form which can be returned by email
- NRW - Returns can be done through their online system website ([please click here for Guidance](#)) or via form that can be returned by email
- SEPA - Returns can be returned via email (preferable option) or post, [please click here for forms & information](#)

5.2.6 Water Impounding

An impoundment is a structure within inland waters that can permanently or temporarily change the water level or flow. This includes:

- Dams
- Weirs
- Fish passes
- Hydropower turbines
- Sluices
- Culverts
- Lock gates
- Retaining walls
- Flumes
- Reservoir embankments

- Temporary diversions during construction work

You must have an impoundment licence before you start to work on an impoundment structure, even in an emergency, unless one of the exemptions found [here](#) applies. Please contact the Permitting Team if you believe you need an impoundment licence.

5.2.7 Recycled Water, Rainwater and Rainwater Run-Off

Recycled water can be collected from many processes (including mineral washing, dust suppression, yard cleaning or vehicle washing) for recycling and re-use. Additionally, rainwater and rainwater run-off can be collected from roofs, roadways, yards etc. The use of this form of water should be used wherever possible and this should be reflected in the water management plan.

5.2.8 Vehicle, Plant & Equipment Wash Areas/Bays

Any activities that produce run-off from vehicles, plant or equipment, should be carried out in areas that are clearly marked and isolated from surface water drainage systems, unmade ground and porous surfaces. These areas are called designated washing bays and should be clearly marked and identifiable on site and detailed in the Water Management Plan (Section 7 of the SEMP), whilst a sign should also be added to clearly define the area as a designated washing area.

A designated washing bay should be designed so that run-off from washing vehicles, plant or equipment is:

- On hardstanding (e.g. an area of concrete or asphalt)
- Contained on three sides (use of channels, gullies, gradient (fall on the surface) and kerbs)
- Isolated from surface water. Options for isolating the wash area are :
 - Contaminated water entering into a sealed system (collected in a sealed system for authorised disposal - tankered off site as waste water for authorised treatment)
 - Contaminated water entering into a closed loop/recycled system (collected for re-use)
 - Contaminated water entering directly into a consented discharge to foul system - oil interceptors will be required and silt traps or settlement tank maybe needed to remove larger particles of silt and sediment.
 - Engineering Options - This is only a last resort option and all the above systems must be considered first before going to the permit team to discuss this option further (as this is a lengthy, some times costly process and our proposal may not be accepted by the regulator at the end of it)

Sites must ensure that:

- Everyone, including contractors and drivers, understand where vehicle washing and cleaning activities should be carried out and that the potential for emergency spillage is covered in Section 13.2 of the SEMP and tested as per MS-EP-CORE-13
- Provide notices for designated washing bays saying what they are for and that washing and cleaning should only be carried out in the bay
- Consider whether a fence or barrier is required to prevent spray or wind drift out of the designated area
- Have procedures and equipment which minimises water use and solid waste production.

5.3 Water Discharge

In most cases, excavations below ground will accumulate water. Before work starts, a plan must be drawn up as to how you will treat and dispose of groundwater that enters your excavations shafts and tunnels, both during construction and in use. You may require authorisation from the regulator to treat and dispose of groundwater within the environment.

Water discharges from site must only be made when there is no further use for it or during times of heavy rainfall where storage tanks are full. Any discharges from the site must be via consented discharge points.

There are several ways of discharging water from sites, and most will require a permit/consent to discharge. These include:

- Water discharge to foul sewer
- Water discharge to surface water
- Quarry and pit dewatering operations
- Discharges from septic tanks/klargesters
- Vehicle washing and plant cleaning

All discharge/trade effluent permits/consents and their conditions should be available on site for inspection and be complied with at all times. Permits/consents to discharge water are usually dependent upon a number of conditions including factors such as discharge flow rates, volumes, suspended solids, pH, presence of oil, grease or chemicals etc. All requirements for the permits/consents must be complied with. All water treatment facilities and consented discharge points will be designed, engineered and constructed to maintain compliance with the discharge permit/consent conditions.

In order to ensure compliance with the discharge permits/consents a monitoring regime must be established and followed in accordance with the permit/consent (or monitored as a minimum on an annual basis, whichever is sooner). Where a flow meter is used this should be calibrated as per the manufacturer's guidelines (and re-calibrated at the required frequency), with the calibration certificates retained on site.

In the event of a sample or visual inspection identifying that the discharge permit/consent has been breached, all actions must be taken to cease the discharge and limit any environmental impacts. Such an incident will need to be fully investigated. Follow the incident response procedure for the correct process of reporting this (MS-EP-CORE-16).

In adverse weather conditions, further action should be considered to minimise polluted discharge and this should be reflected in the water management plan.

5.3.1 Water from Excavations

It is an offence to cause or knowingly allow a water discharge activity, unless authorised to do so by an environmental permit/consent. Discharge of water from excavations is trade effluent, and therefore requires a permit/consent. It is, however, noted that a permit/consent will not be required provided **all** of the following are true:

- The discharge is temporary, for an overall period of less than 3 months,
- The discharge is made to a surface water (such as a river, stream or the sea),
- The discharge does not pollute the surface water or adversely affect aquatic life,
- The discharge location is not within, or less than 500 metres upstream of, a riverine or marine European site or SSSI, or within a site designated for nature conservation (such as NNR, LNR, Local Wildlife Sites).
- The discharge does not cause flooding from the surface water,
- The discharge does not cause erosion of the banks or bed of the surface water,

Problems with disposal of water from excavations may be minimised or avoided by:

- Preventing water from entering excavations, by using cut off ditches
- Considering the impact on groundwater if you use well point dewatering or cut off walls
- Using pump sumps in excavations
- Supporting inlet hoses above the bed
- Discharging on to hard surfaces (concrete slabs/gravel) in to surface waters
- Use of appropriate pump rates – to avoid disturbance of bed or bank the maximum rate

should be set after consideration of the flow of the river, the location of the discharge and the risk of erosion

- Protection of the pump inlet to avoid drawing in aquatic life and other debris
- Minimising disturbance of standing water

5.4 Water Treatment

Some sites need to treat water before discharging or re-using it. There are a number of forms of commonly available water treatment:

- Settlement ponds or pits
- Settlement tank systems
- Classifiers and silt/sand recovery systems
- Oil interceptors
- Chemical Treatment
- Catch pits/Wedge pits

Water treatment processes will need to be regularly maintained and cleaned to ensure maximum efficiency whilst reducing potential risks. During cleaning and maintenance, risk of pollution should be assessed and mitigated. In most cases, the discharge will need to be stopped whilst these activities take place. Interceptors and catch pits are to be inspected every six months as a minimum.

When cleaning out water treatment processes, particularly oil interceptors or separators, waste may be considered as hazardous and should be treated as such. See Waste Management procedure for more information (MS-EP-CORE-07).

5.5 Waste Water Treatment

Normally waste water is discharged directly into the mains foul sewer without any further treatment. You should notify the sewerage undertaker or water company well in advance of connecting any new toilets or other sources of effluent discharge as consent may be needed.

Due to the remote location of many Tarmac sites, it may not be possible or practical to dispose of sewage effluent into the mains foul sewerage system. If this is the case there are a number of options available, including:

- Package sewage treatment plant
- Septic tank/klargestar

- Cess pit

When considering waste water treatment where it is not possible to discharge into the mains foul sewerage system, permits/consents may be required. The nature of certain treatment plants and septic tanks ensure that there may be a requirement for discharge permits/consents and these should be applied for well in advance of first discharge. Alternate sewage treatment works must also be regularly maintained and cleaned out in accordance with manufacturer's guidance.

Other options are available, such as reed bed systems and composting toilets. These are the most sustainable options, however further advice should be sought before considering these.

5.6 Incidents and Emergencies

5.6.1 Emergency Response Plan

All sites must have an environmental emergency response procedure which includes how to effectively manage water pollution incidents. All staff and contractors working on site must be aware of the emergency response procedure, with training given to all relevant people. This should be stored in the Site Environmental Management Plan.

Emergency response drills must be carried out at least annually (depending on your site risk score (see Environmental Assessment Procedure (MS-EP-CORE-04)) to test the effectiveness of the emergency response plan, with records and feedback from each drill kept on site. Any shortfalls or weaknesses must be addressed.

5.6.2 Pollution Control

Within the site all discharge points must be fitted with a means of stopping the discharge (either manually or automatically) in the event of an emergency.

Spill kits should be readily available throughout the site (particularly in areas vulnerable to spills (e.g. re-fuelling areas or near drains)) and clearly labelled to ensure that on-site staff can contain any pollution incident before specialist help arrives. Spill kit locations must be marked on the environmental layout plan and their details explained to any staff and contractor working on site, with training provided as necessary. The equipment contained within a spill kit must be adequate for dealing with the potential pollutants (e.g. if oil and fuel are kept on site, 'oil only' absorbents must be included to contain any oil spills on water (general absorbents will absorb water too and be ineffective)). Used spill kits may be considered as hazardous.

Spill kits and other environmental emergency response equipment must be inspected at least monthly to check for condition, location, suitability, access and replacement of used materials. The results of each inspection must be recorded and kept on site.

In the event of an incident, follow the Environmental Incidents procedure.

5.7 Water Transfer Licences

5.7.1 Environment Agency (EA) and Natural Resources Wales (NRW)

Dewatering of quarries does not currently require an abstraction licence from the Environment Agency or Natural Resources Wales. Due to new legislation brought in under the Water Act 2003, it is however, necessary to make adjustments as such operations will become licensable. This is expected to come into place by 2017, when mineral operators will be requested to apply for a new type of licence known as a Water Transfer Licence.

It is anticipated that there will be a transition period from end-2016 during which applications will need to be submitted and these will be co-ordinated through the Permitting Team. In anticipation of these applications it is essential that all sites currently dewatering need to accurately measure the volumes of water being pumped.

5.7.2 Scottish Environmental Protection Agency (SEPA)

SEPA Water transfer Licences are incorporated into the CAR system.

5.8 Flood Risk

5.8.1 Flood Risk Activity Permit/Consent (England & Wales) & Consents

For works undertaken near water, a permit/consent may be required to ensure works do not increase flood risk, damage flood defences, or harm the environment, fisheries, or wildlife.

You may need an environmental permit/consent for flood risk activities if you want to do work:

- in, under, over or near (within 8 metres) a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

You're breaking the law if you carry out these activities without a permit/consent if you should have

one. If you are carrying out work to an ordinary watercourse rather than a main river, you don't need an environmental permit/consent. You can use the [Flood map for planning](#) (England only) to check if your activity is on or near a main river or an ordinary watercourse. Main rivers are highlighted on the map with a dark blue line. Flood risk activities covered by the environmental permitting regulations include:

- erecting any temporary or permanent structure in, over or under a main river, such as a culvert, outfall, weir, dam, pipe crossing, erosion protection, scaffolding or bridge
- altering, repairing or maintaining any temporary or permanent structure in, over or under a main river, where the work could affect the flow of water in the river or affect drainage work
- building or altering any structure designed to contain or divert flood waters from a main river
- dredging or removing any material from a main river, including when you are intending to improve flow in the river or use the materials removed
- diverting or impounding the flow of water or changing the level of water in a main river
- activities carried out on the floodplain of a main river, more than 8m from the river bank (or 16m if it's a tidal main river), if you don't have planning permission
- quarrying or excavation within 16m of any main river, flood defence (including a remote defence) or culvert

There are some activities which are considered as exempt from requiring a permit/consent. These include:

- Activities carried out in an emergency
- Putting up ladders and scaffold towers
- Service crossings within an existing structure (This could be laying cables in a pavement over a bridge, for example.)
- Flood protection devices attached to buildings
- Post and rail or post and wire fencing
- Erection of notice boards more than 2 from the top of a river bank

Under the Land Drainage Act 1991, you will need the consent of the internal drainage board, or unitary or county council to construct or alter a culvert or flow control structure (such as a weir) on any ordinary (i.e. non-main river) watercourse. To carry out work on an ordinary watercourse you will need to contact the authority responsible for that particular watercourse and apply for an Ordinary Watercourse Consent. The responsible authority will be either an internal drainage board or lead local flood authority.

These Flood Risk Activity Permits should be added to the Site Environmental Management Plan.

For more guidance on flood risk activity permits please contact the Permitting Team.

5.8.1 Flood Risk Scotland

Scotland must still follow “The Water Environment (Controlled Activities) (Scotland) Regulations ” - [Please find link to guidance](#) for further information on licensing requirements.

6 Review Period and Circumstances

This Procedure should be reviewed annually, or when any changes to legislation or company policy is likely to dictate an accelerated review period. Any revisions will be communicated as appropriate.

7 Associated Documents

Document Name	Type	Retention Period
MS-EP-CORE-06/01 Water Management Folder	Procedure	N/A
MS-EP-CORE-13 Environmental Data	Procedure	N/A
MS-EP-CORE-16 Environmental Incidents	Procedure	N/A

Table 3. Documents within Tarmac’s EMS either linked or relevant to this procedure.

8 Document Control

Issue Date	Revision No.	Details of Change	Owner
June 15	1	First Copy	Environment Manager
September 15	2	Tarmac re-branding	Environment Manager
May 16	3	Added in information re meter calibration	Environment Manager
June 16	4	Update to flood defence consents	Environment Manager
November 16	5	Added new definitions, added “Wash down areas” to water plan. Amended “permit” to “permit/consent”.	Environment Manager
February 17	6	Added in 5.2.5.1 (water abstraction returns) and 5.2.8 (Vehicle, Plant and Equipment Wash Areas/Bays).	Environment Manager
November 17	7	Update all content to reflect new HSE structure within Tarmac. Complete re-brand of document headers and footers. Change of document owner. Clarified requirements for inspecting	HSE Director

		interceptors and catch/wedge pits (5.4).	
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Table 4. Documents control and ownership.