

Snowdonia VIP – Garth Compound Process Water Treatment

February 2023

This document sets out the water treatment proposals for extracted process water at Garth Construction Compound, Minffordd, Penrhyndeudraeth, Gwynedd, LL48 6HP.

Water will be extracted from the tunnel in a slurry mix. The following hierarchical treatment process is proposed:

- Process water will be directed to a Slurry Treatment Plant which will dewater the excavated material and recycle the recovered water back to the tunnel boring machine (TBM). The Slurry Treatment Plant will include the following sequence of treatment processes:
 - **Screens** for the physical separation of large solids from water
 - **Cyclonic** separation for the mechanical separation of fine solids from water
 - **Flocculation** sedimentation for the chemically enhanced settlement of fine solids
 - **pH** adjustment using carbon dioxide gas injection
 - **filter press** for the dewatering of waste water sludges.
- Excess water not used by the TBM will pass to on site settlement lagoons. The water stored in the lagoons will be available for re-use in the process or, when the lagoons are full, will be discharged off-site following further water treatment.
- Water from the lagoons which will be discharged off-site will be treated in a package water treatment plant supplied by Siltbuster Ltd. The Siltbuster water treatment plant will include the following water treatment processes:
 - **Flow chamber** to measure flow rate into the treatment plant
 - **Coagulant dosing pump (flow proportional mixing of Polyaluminium Chloride)**

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- **Flocculant addition and mixing (Anionic Flocculent)**
 - **pH monitoring and CO2 addition**
 - **Tilted plate separator**
 - **pH monitoring caustic sods (NaHO) addition (for peat geology or pyrite excavation)**
 - **Treated water quality, flow out, pH turbidity.**
- Monitoring will be included for salinity content in the extracted water. Where the extracted water is saline, the preferred discharge point is to the Afon Glaslyn at National Grid Reference: 258918, 338998. Where no saline content is found, the preferred discharge point is to the ordinary watercourse crossing the site at approx. National Grid Reference: 259245, 338576.

Details of the Siltbuster water treatment plant are included in Appendix A.

The water treatment proposals will achieve the following levels of treatment:

- **Total suspended solids 60mg/l**
- **pH 6-9**
- **Total iron <5mg/l**

The treatment process will be designed to cope with potential acid rich geology associated with a section of pyrite rich rock evidenced by borehole data.

Background water quality sampling has been undertaken and is included as Appendix B. Table 1 shows the existing levels of total suspended solids, pH and total iron for 3no. sample locations within the Garth Construction Compound. A corresponding sample location plan is also included in Appendix B.

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	Total Suspended Solids (mg/l)	pH	Total Iron (mg/l)
Sample Location 1	No data (sample re-taken, results awaited)	6.9	0.23
Sample Location 2	5	6.7	0.38
Sample Location 3	8	6.8	0.695

**Analysis taken in wet weather conditions with high flow / water levels witnessed. Additional sampling undertaken in dry conditions (results awaited).*

The temperature of the discharge will be similar to that of the water abstracted for use in the process (fresh river water) and will be subject to atmospheric temperature. Water temperatures above 25°C are not expected.

No hazardous chemicals or substances are expected or used within the water process / treatment system. As such, hydraulic modelling of the discharge is not required.

The potential impacts of the discharge to the receiving environment are considered within the supporting Habitats Regulations Assessment (HRA) (reference C0233-ATM-GES-ZZ-RP-X-004) prepared by Atmos Consulting in February 2023. The HRA is included as Appendix C.

The permit application is also supported by the following information which will be provided as supplementary information:

- Garth Site Layout Plan (Drawing C0233-HUK-AX-DR-W-0001 P04)
- Fish Habitat Assessment Report (reference C0233-ATM-GES-ZZ-RP-X-0005) prepared by Atmos Consulting in January 2023.
- Invasive Non-native Species Report (reference C0233-ATM-GES-ZZ-RP-X-0006) prepared by Atmos Consulting in January 2023.
- Ecological Baseline Report (reference C0233-ATM-GES-ZZ-RP-X-0001) prepared by Atmos

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Consulting in January 2023.

- Water Management Plan (reference C0233-HUK-PDR-ZZ-PL-W-0001 – P01) prepared by Hochtief UK Construction in January 2023.

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Appendix A – Siltbuster Proposals

File Ref: 15055-Garth Treatment Details-01





Siltbuster Ltd., Williams Building,
Kingswood Gate, Monmouth NP25 4EE
Tel: 01600 772256 Fax: 01600 775312
E-mail: enquires@siltbuster.com
Web: www.siltbuster.com

SE30755-JB-01
09 December 2022

David Grantham
Careys

By Email: David.Grantham@hochtief.co.uk

Dear David,

Siltbuster 2-stage + CO₂ MT8 and HB40R SPX40 water treatment plant for slow settling solids and alkaline conditions

Further to your request for a water treatment plant to support powerline works in Snowdonia, I provide an outline proposal for supply of a Siltbuster water treatment plant. The proposal and scope of supply will change as and when new information becomes available, such as laboratory testing on a representative sample of water from the site.

1.1 Introduction

It is our understanding of your particular application that:

- You are working on the Eryri Visual Impact Provision scheme in North Wales
- There will be 2No. construction compounds for the tunnel drive
- You request a water treatment plant at each location to tackle surface water runoff and excess water separated from tunnel arisings by the slurry dewatering system (by others)
- Excess water will be disposed to the environment and is a regulated activity
- The principal contaminants of concern are considered to be:
 - suspended solids, ranging in particle size from silt-sized through to clay-sized (circa 30µm to circa 1µm in diameter)
 - alkaline pH conditions associated with water coming into direct contact with cementitious materials
- Secondary, or possible, other contaminants are yet to be determined, but may include:
 - possible acidic pH conditions associated with soils including peat
 - the presence of 'ochre' is a possibility. Therefore dissolved and/or particulate iron may be present
- The treatable flowrate will be circa 20m³/hr for the initial phase(s) potentially reaching 60m³/hr in later phases
- Specific numeric quality criteria for release of water to the environment is not known, but the following may be appropriate:
 - Total suspended solids (TSS) less than 60mg/l (i.e. visually clear water – see below)
 - pH6 to pH9
 - Less than 5mg/l total iron

Hire, Sales & Technical Support

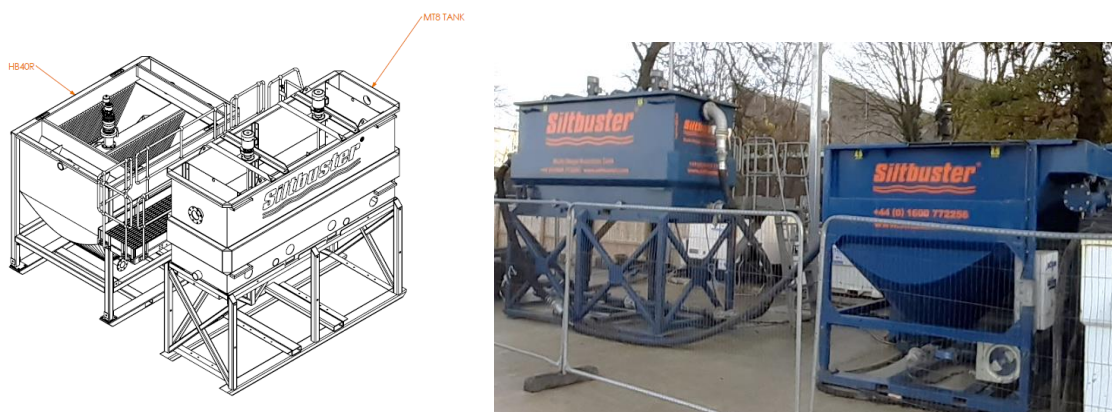
- Hochtief will create an attenuation lagoon to capture and store surface water runoff, you will use a submersible pump to transfer water to a Siltbuster treatment plant for gravity drain of treated water to the disposal point
- Hochtief will seal all water discharges from the lagoon thus ensuring only compliant water leaves the site via the Siltbuster unit
- Hochtief will create a designed sump with raised suction so that excessive solids are not drawn from the base of the lagoon and into the pump
- Coarse solids will accumulate in the lagoon and will require manual removal from time to time. The Siltbuster water treatment plant is designed to accept dirty/discooured water, not slurry and not large particles (sand/stones/gravel etc.)
- Hochtief will provide a laydown area, feed pump and controls, pipework, discharge pipework, power supply and attendance to operate and maintain the treatment plant
- Suspended solids (soil particles) which are removed from the water will be collected in a hopper with the consistency of thin slurry and will require timely removal and management
- The proposed system includes a hose pump for simple 'push-button' desludging on a manual or auto-timer basis
- Treated water will gravity drain from a 6" Bauer outlet to the nominated disposal point
- As with any water treatment plant and particularly when using chemical dosing, best performance is seen under **steady-state conditions**. That is to say, the pump should be trimmed/valved to give smooth and continuous flow as much as possible. Allowing the pump to 'slurp' water/air, or pump pulsing (very large flows over a short time period) WILL result in poor performance and inadequate treatment
- The proposed water treatment plant is comprised from standard modular hire fleet units, therefore typically additional units can be mobilised at a later date to add treatable flowrate capacity



CLAY particles suspended in water at different TSS concentrations

Hire, Sales & Technical Support

1.2 Plant Selection



Example setup – 3-stage +CO₂ MT8 HB50 (for pH correction, suspended solids reduction)

The proposed system will be in general accordance with:

1. Inlet magnetic flow meter, to record the volume of water treated and allow flow proportional dosing of coagulant and polymer
2. Elevated mixing tank with walkway to allow the controlled mixing of the treatment chemicals ensuring flocculation of the solids
3. Coagulant dosing pump and associated pipe-work to allow the automatic flow proportional addition of the coagulant. The use of flow proportional dosing system minimises the risk associated with the overdosing of the treatment chemicals
4. Automated, pH controlled release of carbon dioxide gas to maintain near neutral pH and minimise the risk of alkaline conditions
5. Flocculant make-up system complete with 1,000 litre make up tank, mixer bridge 110V (32 Amp) mixer complete with paddle (potable water will be required on site for polymer dilution – to be provided by others) and flow proportional dosing pump (peristaltic or similar)
6. 1 No iCDS3 secure bunded chemical containment for storage of duty chemicals
7. 1 No. Siltbuster HB40R Lamella Clarifier to retain the settling solids from the water
8. SPX40 hose pump with start/stop local controls and timer
9. Automated, pH controlled addition of caustic to maintain near neutral pH and minimise the risk of acidic conditions (optional, may be required for peat geology)
10. Treated water quality monitoring with local datalog to USB (total flow, pH and turbidity)

Hire, Sales & Technical Support

2.1 Costs

Item	Hire Rate
Hire of water treatment system, items 1 to 8 above	£1,605 per system per week or part thereof
Hire of caustic dosing capability to neutralise acidic conditions, item 9	£190 per week
Hire of water quality monitoring for flow, pH, turbidity/TSS	£412 per week
Setup, commissioning and training by Siltbuster Process Engineer (allow 3 days)	£495 per day including travel
Additional day rate, if required (e.g. decommission)	£495 per day including travel
Delivery from Monmouth to Snowdonia	£1,775 via HIAB (may be artic) non-FORS
Collection from Snowdonia to Monmouth	£ tbc at the time of offhire

Site-Specific lift plan by AP

Siltbuster cannot supply an AP for a site-specific lift plan. If a site-specific plan is required we suggest 'Standard' delivery with offloading by the client would be the most appropriate selection.

Transport Terms of Cancellation

*Before 12pm the day before - No Charge

*After 12pm and before end of play that day - 75% of chargeable rate

*Day of job - 100% chargeable rate

*85tpm cancelled at any point the day before the job - 50% of chargeable rate

Please do consult our [Pre Delivery Questionnaire](#) and advise us about your site-specific requirements for deliveries

We suggest it would be more cost effective and efficient for Hochtief make their own arrangements for chemical supply, however if supplied through Siltbuster, reagents are supplied at the following rates.

	25kg Drum	1,000 litre IBC
Coagulant (Poly Aluminium Chloride - PAC)		£705
Caustic		£2,262
Anionic Flocculent	£116.60	
Reagent re-order	£80 per order (min. order value of £250)	

Chemicals are typically supplied direct from the manufacturer on a 5-working day leadtime, on a curtain sided vehicle and require offloading by the client. At this stage and without laboratory testing, it is difficult to forecast chemical consumption.

If by Siltbuster, vapour withdrawal carbon dioxide will be supplied at the following rates.

Carbon Dioxide Cost	500Kg Gas Bank - (15 No. Bottles)
Gas bank rental	£45 per bank per week
Gas charge per cylinder bank	£1,100 per bank (comprises 15No. cylinders)
Deposit	£500 per Bank (Refundable upon return undamaged)
Reorder and delivery/collection charges (Applicable on each order for replacement cylinders)	£105 per visit Applicable on all gas deliveries to site

Hire, Sales & Technical Support

<p>delivered to site)</p> <p>BOC wagon requires offloading by the client</p> <p>Note, at the time of writing, supply issues for industrial CO₂ across the sector are causing lead times to extend beyond the normal 5-working days</p>	
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3.1 Lead Time

Currently 6 to 10-weeks from receipt and processing of your formal written purchase order but is dependent on the current status of the hire fleet and availability of transport and any necessary account processing requirements having already been completed (See note II of the Siltbuster Terms and Conditions listed below).

4.1 Exclusions and considerations

We have excluded the following items from our scope of supply:

- Electrical wiring, connections and protection not to the standard Siltbuster method
- Designed attenuation lagoon, sump, feed pump, controls and associated feed pipework to the 4" female Bauer coupling on the inlet of the water treatment plant
- Haul road to allow the HIAB delivery vehicle and engineer's van to access the proposed location of the treatment plant
- Level surface of sufficient bearing capacity to support the plant when full of water
- Power supply, mains supply 415V (3-phase+Neutral+Earth) with 300mA RCD or adjustable earth leakage and 32A or 63A sockets
- Supply of potable water for polymer make up, estimated at <1m³ per week
- Attendance to maintain and operate the equipment
- Pipework to attach to base of hoppers for desludging
- Disposal or management of wastes, sludges, excess chemicals or empty containers
- Large particles >10mm diameter should be prevented from entering the feed pump to avoid damage to the flowmeter sensors and accumulation in the mix tank
- Freeze protection (insulation and trace heating)
- Any approvals or permits required by the EA, Local Authority, etc.
- Monitoring or quality checks – we assume the site staff will adopt daily O&M
- Treatment or dewatering of sludges – the scope of supply is for a *water* treatment plant
- Treatment for contaminants other than those specified above (e.g. oil/water emulsions, dissolved metals)
- Site-specific lift plans. If this is required we suggest delivery on flatbed wagons with offloading organised by the client's AP
- Demurrage (charged at £65 per wagon per hour)

As with any water treatment plant and particularly when using chemical dosing, best performance is seen under steady state conditions. That is to say, the pump should be trimmed/valved to give smooth and continuous flow as much as possible. Allowing the pump to 'slurp' water/air, or pump pulsing (very large flows over a short time period) WILL result in poor performance and inadequate treatment

Hire, Sales & Technical Support

Note, we have allowed for a treatment system capable of handling 4m³/hr up to circa 35m³/hr. This upper figure is a **potential maximum** and the actual flowrate achieved will depend upon the characteristics of the particulate matter suspended in the water column and how well the chemical dosing is optimised to the variable instantaneous solids concentration.

The proposal and scope of supply will change as and when new information becomes available, such as laboratory testing on a representative sample of water from the site.

5.1 Our Standard Terms and Conditions of Hire & Sales are as follows:

- I. All costs are in pounds Sterling and exclude VAT
- II. Proforma invoice on all new accounts and those which have been dormant for 6 months or more, covering:
 - Hires: delivery, collection, installation costs and first months hire
 - Purchases: 40% of purchase cost
- III. Costs are valid for 30 days from 09 December 2022.
- IV. Hire terms are standard Construction Plant Hire Association Conditions, Latest Edition
- V. Equipment is supplied on a 7-day working week.
- VI. Sale terms are Siltbuster standard conditions of sale (available on request)
- VII. Invoices are raised monthly and payment terms are strictly 30 days from date of invoice.
- VIII. No other terms and conditions are accepted, including those purported to apply under any purchase or confirmation order placed by the Client.
- IX. Client is responsible for the operation/maintenance of the equipment whilst on hire and ensuring the treated water is discharged/disposed of in accordance with the relevant legislation. The client is also responsible for any site specific operational permits/authorisations/consents required and Health and Safety issues relating to the storage and use of chemicals on site.
- X. All hired units are to be visually cleaned of all settled sludge & oil residues before return. Units returned containing sludge and or oil residues will incur a cleaning cost plus any waste disposal fees (charged at cost) and the unit will remain on hire whilst the waste is tested to determine an appropriate disposal method in accordance with the relevant statutory regulations.
- XI. Transport costs for delivery & collection are as quoted above. Collection charge may vary if individual units from multiple unit deliveries are off-hired and collected separately.

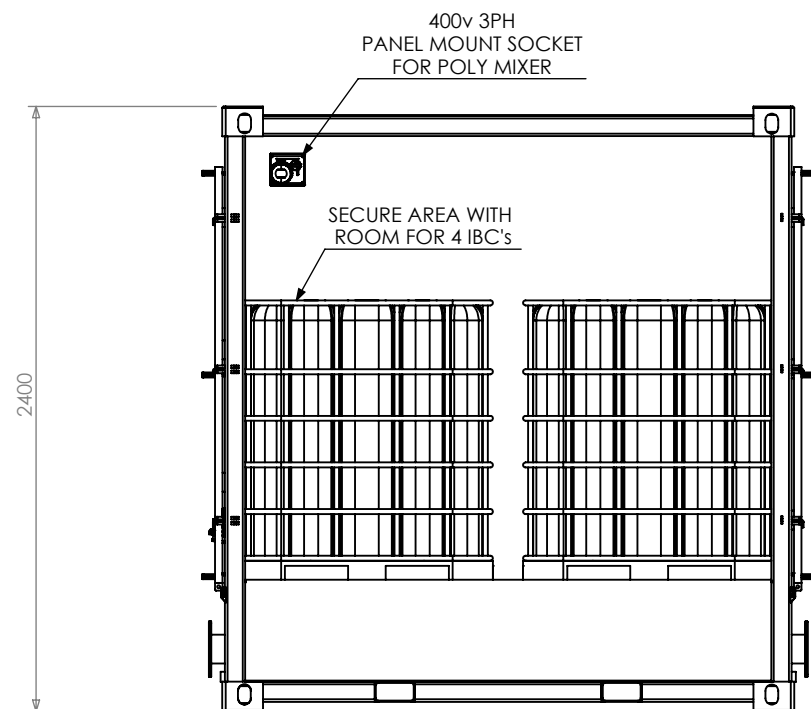
We trust that the above information is sufficient for your current needs. However, should you have any queries please do not hesitate to get in contact.

Yours sincerely,

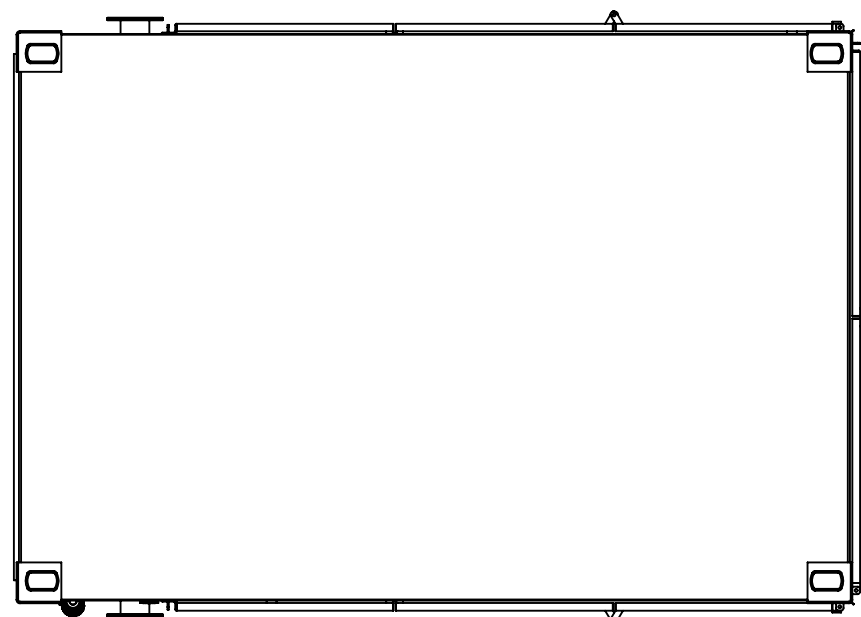
James Baylis
Technical Sales (Northern England and North Wales)

Tel: 01600 772256
 Fax: 01600 775312
 Mobile: 07889 535876
 Email: james.baylis@siltbuster.com
www.siltbuster.com

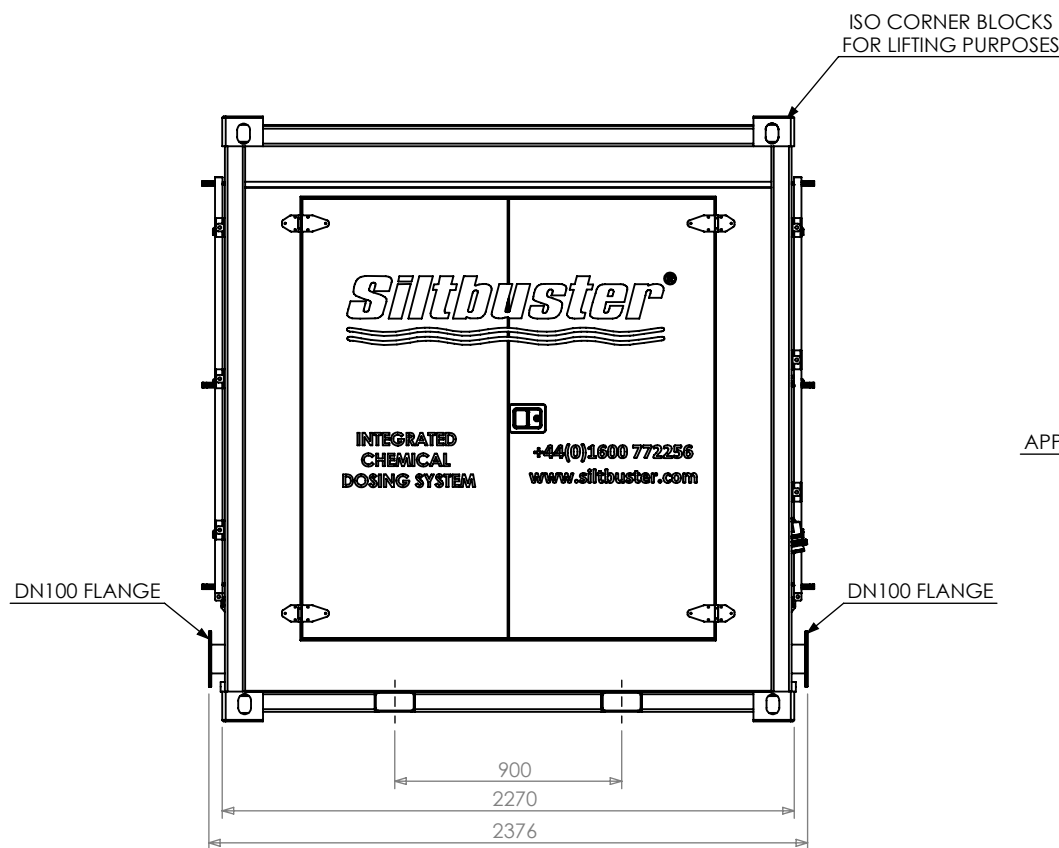
Hire, Sales & Technical Support



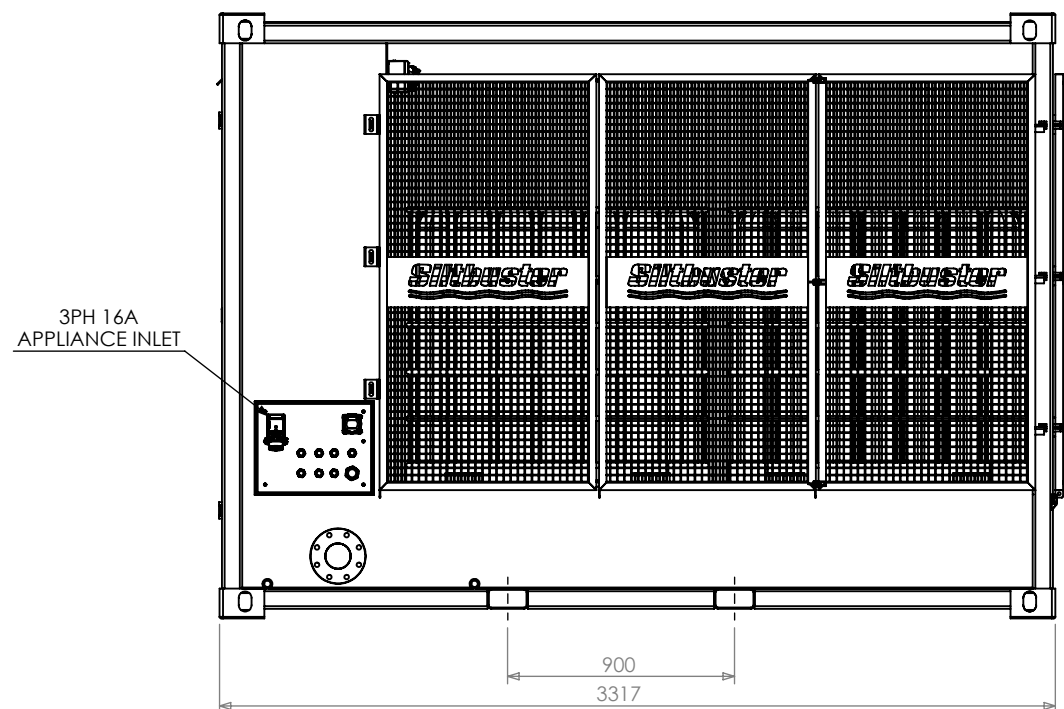
REAR ELEVATION
GUARD REMOVED
FOR CLARITY



PLAN VIEW



FRONT ELEVATION



SIDE ELEVATION

Unit Specifications:

1 Materials of Construction

Frame:	S275 Mild Steel
Pipework:	Stainless Steel 304

2 Corrosion Prevention (Primer Internal)

Frame	
Surface Prep:	Blast Clean SA2.5 (SSPC-SP-10)
Primer Coat:	2 Pack High Build Anti-Corrosive Epoxy Primer @DFT: 100µm
Top Coat:	Standard RAL 5001 (Blue/Green) @DFT: 50µm
Total Thickness:	DFT: 150µm

3 Weight

Empty:	1.9t
Operating:	5.9t (Approx.)

4 Additional Information

Lifting Eye Design:	Iso Corner Blocks
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5 Power Supply Requirements

Appliance Inlet	400v 16A 3PH+N+E
-----------------	------------------

6 Flow Rate

Flow Rate Range	4m ³ /hr - 100m ³ /hr
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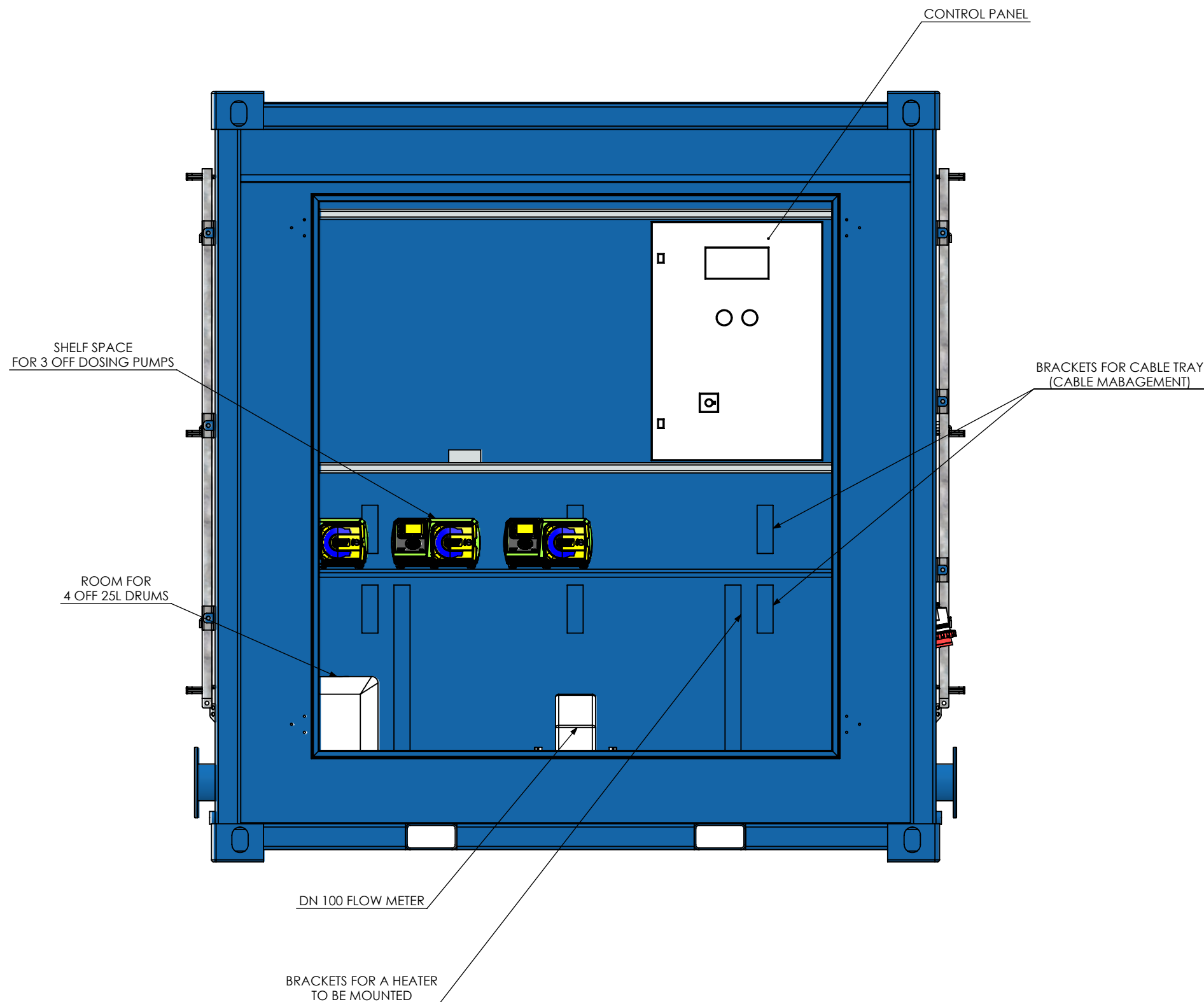
7 Bund Capacity

Bunded Area Capacity	2.06m ³
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TITLE:	Integrated Chemical Dosing System
MODEL:	ICDS 3.0
DATE:	11/05/2021

Siltbuster[®]

SILTBUSTER LTD.
WILLIAMS BUILDING,
KINGSWOOD GATE,
MONMOUTH,
MONMOUTHSHIRE
NP25 4EE
TEL: 01600 772256
FAX: 01600 775312
EMAIL: enquiries@siltbuster.com



Unit Specifications:

1 Materials of Construction

Frame:	S275 Mild Steel
Pipework:	Stainless Steel 304

2 Corrosion Prevention (Primer Internal)

Frame	
Surface Prep:	Blast Clean SA2.5 (SSPC-SP-10)
Primer Coat:	2 Pack High Build Anti-Corrosive Epoxy Primer @DFT: 100µm
Top Coat:	Standard RAL 5001 (Blue/Green) @DFT: 50µm
Total Thickness:	DFT: 150µm

3 Weight

Empty:	1.9t
Operating:	5.9t (Approx.)

4 Additional Information

Lifting Eye Design:	Iso Corner Blocks
---------------------	-------------------

5 Power Supply Requirements

Appliance Inlet	400v 16A 3PH+N+E
-----------------	------------------

6 Flow Rate

Flow Rate Range	4m ³ /hr - 100m ³ /hr
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7 Bund Capacity

Bunded Area Capacity	2.06m ³
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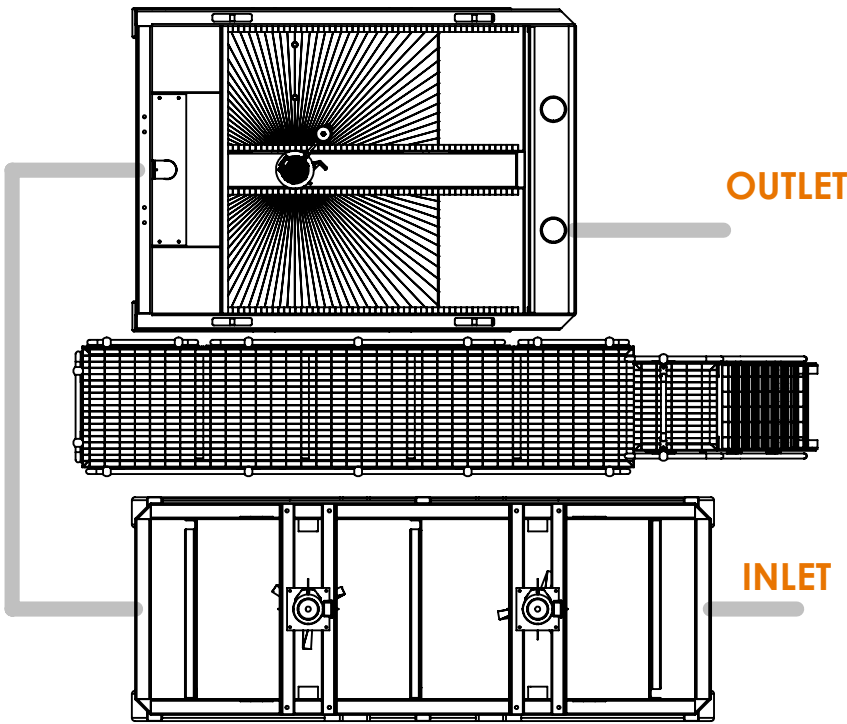
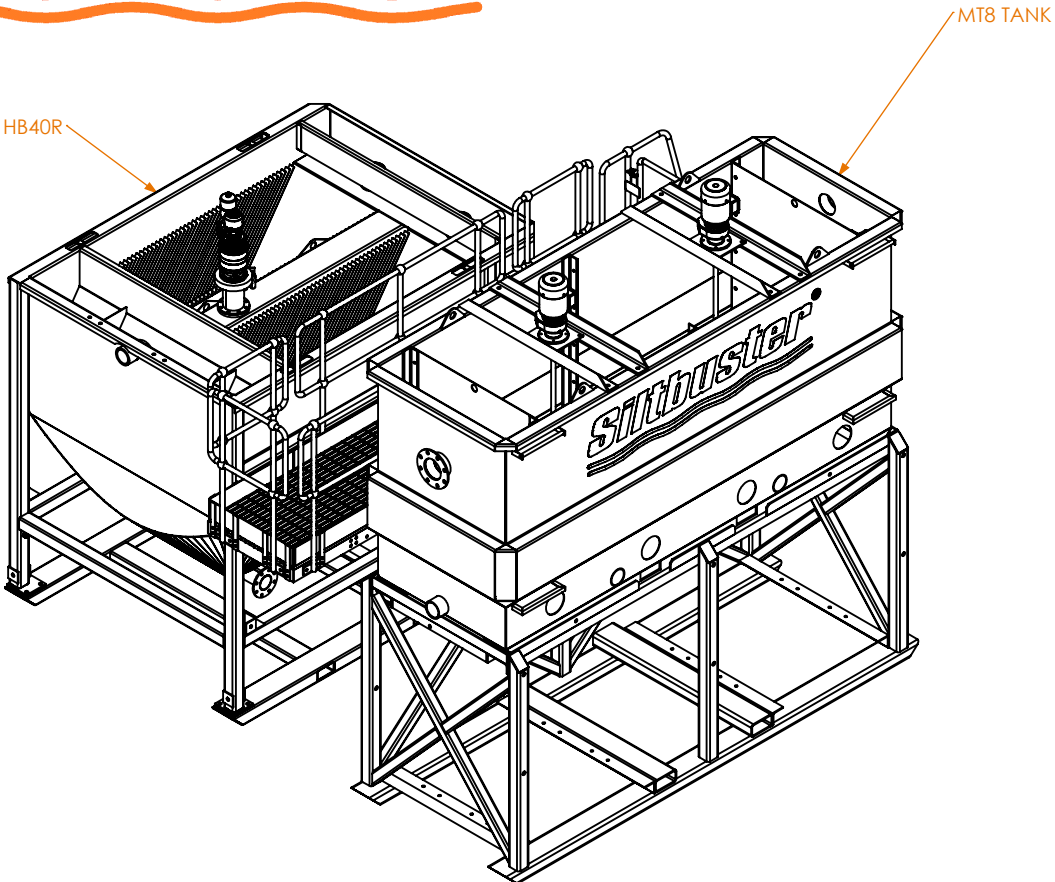
TITLE: Integrated Chemical Dosing System

MODEL: ICDS 3.0

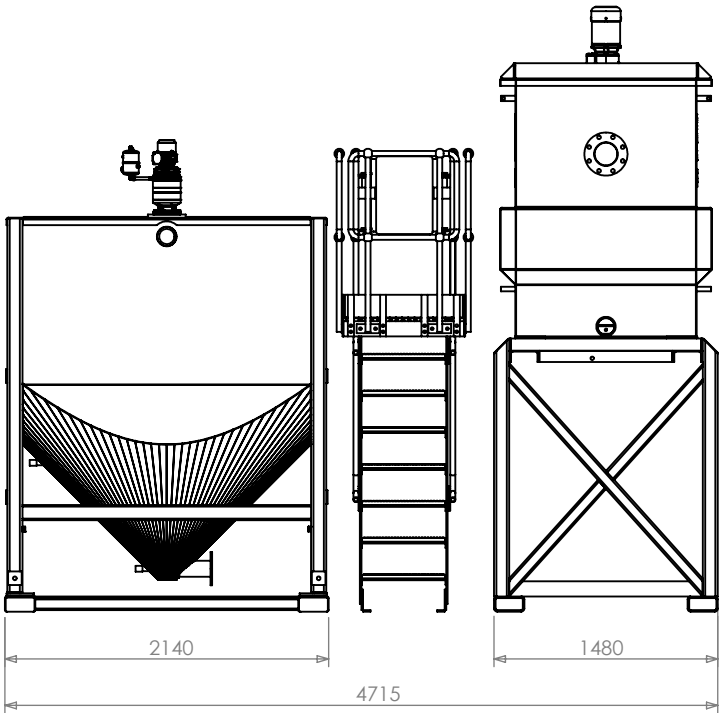
DATE: 11/05/2021

Siltbuster[®]

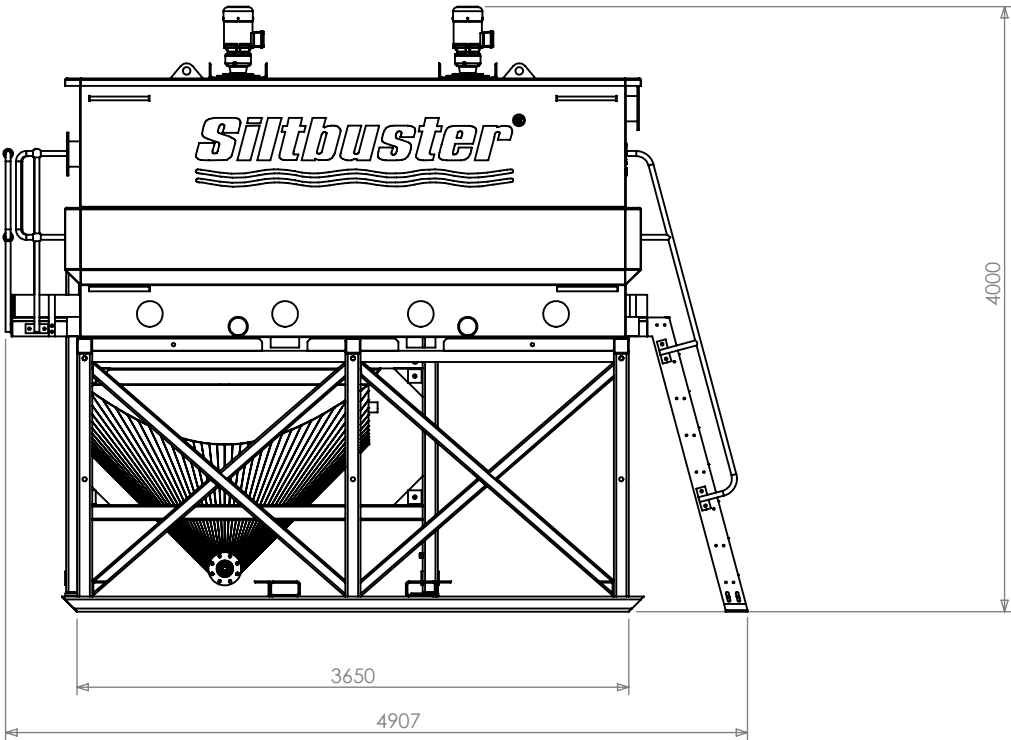
SILTBUSTER LTD.
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TEL: 01600 772256
FAX: 01600 775312
EMAIL: enquiries@siltbuster.com



PLAN ELEVATION



FRONT ELEVATION



SIDE ELEVATION

ISSUE	DESCRIPTION	DRN BY	CKD	DATE

Siltbuster is a registered trademark of Siltbuster Ltd.
Dimensions are indicative and due to ongoing product development are subject to change without notice.
This drawing and design are the copyright of Siltbuster Ltd and shall not be reproduced or used without written permission.

Project
HB40R and MT50
Title
Proposed GA

SILTBUSTER LTD.
WILLIAMS BUILDING,
KINGSWOOD GATE,
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NP25 4EE
TEL: 01600 772256
FAX: 01600 775312

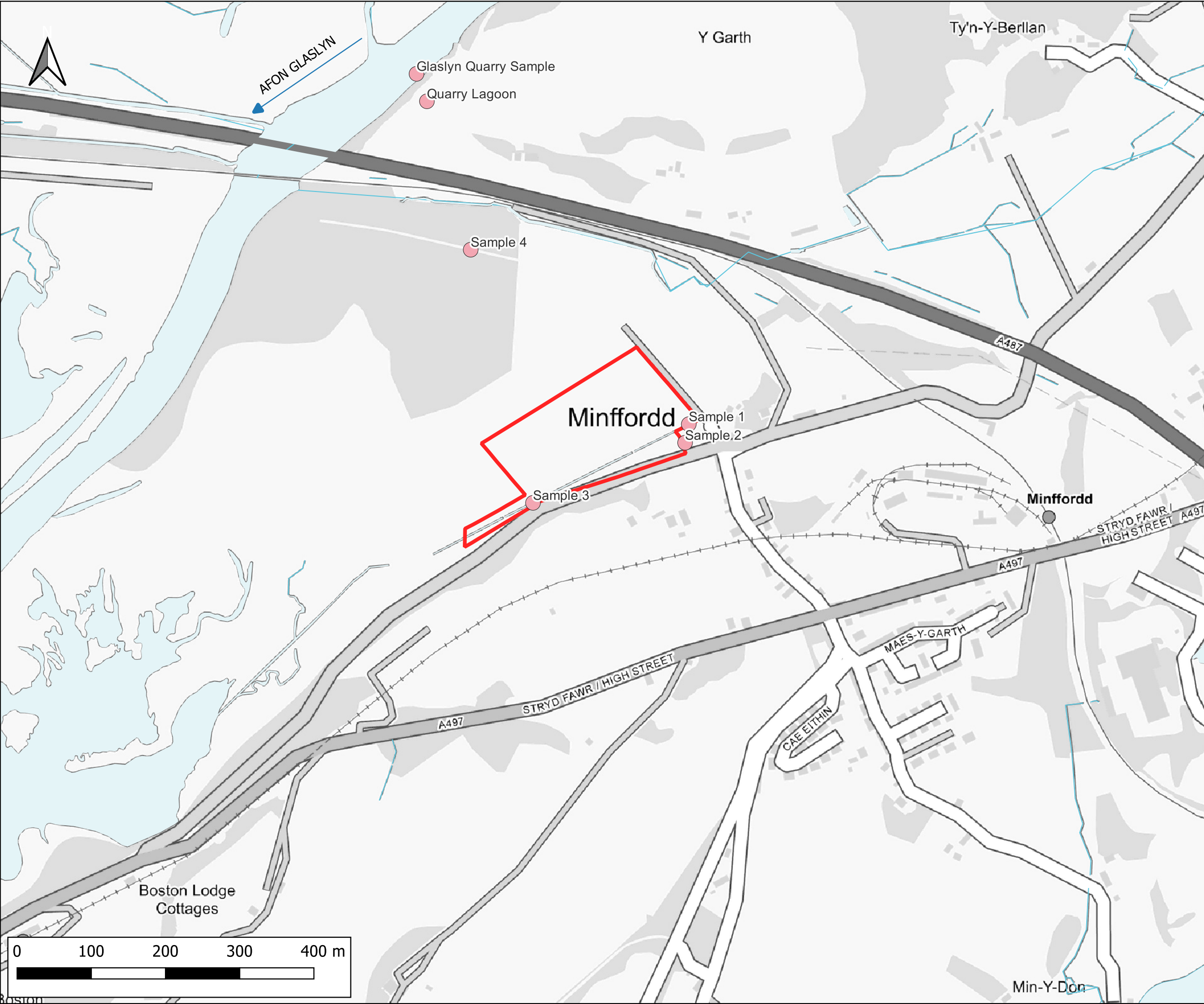
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Appendix B – Water Sampling Data and Sample Location Plan

File Ref: 15055-Garth Treatment Details-01





Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Water Sampling Locations
- Watercourses
- Waterbodies

CLIENT:

Hochtief (UK) Construction Ltd

waterco
www.waterco.co.uk

SCHEME:

Hochtief - Snowdonia VIP Tunnel

PLOT TITLE:

Garth Construction Compound
Water Sampling Location Plan

PLOT STATUS:		DATE:	
FINAL		06-02-2023	

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	AW	AW	1:5000

PLOT NAME:	REVISION:
15055_Garth_Water_Sampling_Location_Plan	-



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www.alsenvironmental.co.uk

Mr Williams
Waterco Ltd
Lon Parcwr Business Park
Ruthin LL15 1NJ

03 February 2023

Test Report: COV/2425753/2023

Dear Mr Williams

Analysis of your sample(s) submitted on 13 January 2023 is now complete and we have pleasure in enclosing the appropriate test report(s).

An invoice for the analysis carried out will be sent under separate cover.

Should you have any queries regarding this report(s) or any part of our service, please contact Customer Services on +44 (0)24 7642 1213 who will be happy to discuss your requirements.

If you would like to arrange any further analysis, please contact Customer Services. To arrange container delivery or sample collection, please call the Couriers Department directly on 024 7685 6562.

Thank you for using ALS Laboratories (UK) Limited and we look forward to receiving your next samples.

Yours Sincerely,

Signed:

Name:

A. Zunzunegui

Title:

Organics Chemistry Manager



1314



EMS675527

OHS 542058



Report Summary

ANALYSED BY

Mr Aled Williams
Waterco Ltd
Lon Parcwr Business Park
Ruthin
LL15 1NJ



Date of Issue: **27 January 2023**

Report Number: **COV/2425753/2023**

Issue **1**

This issue replaces
all previous issues

Job Description: Waterco Ltd

Job Location: Snowdonia VIP

Number of Samples
included in this report **10**

Job Received: **13 January 2023**

Number of Test Results
included in this report **207**

Analysis Commenced: **16 January 2023**

Signed:

Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

ALS Laboratories (UK) Limited was not responsible for sampling unless otherwise stated.

Information on the methods of analysis and performance characteristics are available on request.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. The results relate only to the items tested and where relevant sampled.

Tests marked 'Not UKAS Accredited' in this Report/Certificate are not included in the UKAS Accreditation Schedule for our laboratory.

This test report is not a statement of conformity to any specification or standard.

This communication has been sent to you by ALS Laboratories (UK) Limited. Registered in England and Wales. Registration No. 02391955. Registered Office: ALS Laboratories (UK) Limited, Torrington Avenue, Coventry, CV4 9GU.

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ALS Laboratories (UK) Limited

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Page 1 of 24

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412979**

Issue **1**

Sample **1** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Garth Sample 1**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 13:45**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N Cov	WAS049
pH	6.9	pH units	17/01/2023	N Cov	WAS039
Conductivity- Electrical 20C	177	uS/cm	17/01/2023	N Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N Cov	WAS036
Nitrogen, Total as N	1.4	mg/l	24/01/2023	N Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N Cov	WAS049
Total Suspended Solids	Analyst Com	mg/l	24/01/2023	N Cov	WAS006
Suspended Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N Cov	WAS006
Settleable Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N Cov	WAS006
Solids, Total	123	mg/l	18/01/2023	N Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N Cov	WAS001
COD (Total)	19.0	mg/l	18/01/2023	N Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N Cov	WAS059

Analyst Comments for 22412979:

ALS Laboratories (UK) Limited

Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}Unable to report for total suspended solids and 1 hour settled solids due to insufficient sample after quality check failure.

{*/}

This issue replaces all previous issues

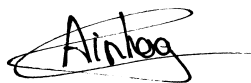
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412980**

Issue **1**

Sample **2** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Garth Sample 2**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 13:50**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	381	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	34.2	ug/l	19/01/2023	N	Cov	WAS049
pH	6.7	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	260	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	5.82	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	5.7	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	5.00	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	2.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	3.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	209	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	19.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412980:

ALS Laboratories (UK) Limited

Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412981**

Issue **1**

Sample **3** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Garth Sample 3**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 14:00**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	26/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	26/01/2023	N	Cov	WAS049
Iron, Total as Fe	695	ug/l	26/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	26/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	26/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	26/01/2023	N	Cov	WAS049
pH	6.8	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	170	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	3.64	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	1.9	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	26/01/2023	N	Cov	WAS049
Total Suspended Solids	8.00	mg/l	17/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	4.00	mg/l	17/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	4.00	mg/l	17/01/2023	N	Cov	WAS006
Solids, Total	115	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	44.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412981:

ALS Laboratories (UK) Limited

Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Copper Total as Cu, Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412982**

Issue **1**

Sample **4** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Garth Sample 4**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 14:20**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	934	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	0.02	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	4.98	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	40.8	ug/l	19/01/2023	N	Cov	WAS049
pH	7.1	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	203	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	22.9	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	1.1	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	47.0	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	7.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	40.0	mg/l	18/01/2023	N	Cov	WAS006
BOD + ATU (5 day)	3	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	78.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	2000	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412982:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

ALS Laboratories (UK) Limited

Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This issue replaces all previous issues


Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412983**

Issue **1**

Sample **5** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Garth Quarry Sample**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 14:50**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N Cov	WAS049
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N Cov	WAS049
pH	6.6	pH units	17/01/2023	N Cov	WAS039
Conductivity- Electrical 20C	37.6	uS/cm	17/01/2023	N Cov	WAS039
Turbidity	1.62	NTU	26/01/2023	N Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N Cov	WAS036
Nitrogen, Total as N	<0.5	mg/l	24/01/2023	N Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N Cov	WAS049
Total Suspended Solids	7.00	mg/l	17/01/2023	N Cov	WAS006
Suspended Solids 1hour Settle	3.00	mg/l	17/01/2023	N Cov	WAS006
Settleable Solids 1hour Settle	4.00	mg/l	17/01/2023	N Cov	WAS006
Solids, Total	42	mg/l	18/01/2023	N Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N Cov	WAS001
COD (Total)	16.0	mg/l	18/01/2023	N Cov	WAS040
Salinity	1600	mg/l	20/01/2023	N Cov	WAS059

Analyst Comments for 22412983:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

ALS Laboratories (UK) Limited

Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This issue replaces all previous issues


Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412984**

Issue **1**

Sample **6** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Cilfor Sample 1**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 15:30**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	3.02	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	5.7	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	63.2	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	1.00	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	1.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	<2.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	27	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	13.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412984:

ALS Laboratories (UK) Limited

Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412985**

Issue **1**

Sample **7** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Cilfor Sample 2**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 15:40**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N Cov	WAS049
pH	5.4	pH units	17/01/2023	N Cov	WAS039
Conductivity- Electrical 20C	67.2	uS/cm	17/01/2023	N Cov	WAS039
Turbidity	1.61	NTU	26/01/2023	N Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N Cov	WAS036
Nitrogen, Total as N	<0.5	mg/l	24/01/2023	N Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N Cov	WAS049
Total Suspended Solids	6.00	mg/l	18/01/2023	N Cov	WAS006
Suspended Solids 1hour Settle	1.00	mg/l	18/01/2023	N Cov	WAS006
Settleable Solids 1hour Settle	5.00	mg/l	18/01/2023	N Cov	WAS006
Solids, Total	50	mg/l	18/01/2023	N Cov	WAS010
BOD + ATU (5 day)	2	mg/l	22/01/2023	N Cov	WAS001
COD (Total)	14.0	mg/l	18/01/2023	N Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N Cov	WAS059

Analyst Comments for 22412985:

ALS Laboratories (UK) Limited

Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412986**

Issue **1**

Sample **8** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Cilfor Sample 3**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 15:50**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N Cov	WAS013
Nickel , Total as Ni	3.37	ug/l	19/01/2023	N Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N Cov	WAS049
pH	5.9	pH units	17/01/2023	N Cov	WAS039
Conductivity- Electrical 20C	69.0	uS/cm	17/01/2023	N Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N Cov	WAS049
Total Suspended Solids	4.00	mg/l	17/01/2023	N Cov	WAS006
Suspended Solids 1hour Settle	2.00	mg/l	17/01/2023	N Cov	WAS006
Settleable Solids 1hour Settle	2.00	mg/l	17/01/2023	N Cov	WAS006
Solids, Total	44	mg/l	18/01/2023	N Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N Cov	WAS001
COD (Total)	18.0	mg/l	18/01/2023	N Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N Cov	WAS059

Analyst Comments for 22412986:

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This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412987**

Issue **1**

Sample **9** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Cilfor Sample 4**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 16:00**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N Cov	WAS049
pH	6.3	pH units	17/01/2023	N Cov	WAS039
Conductivity- Electrical 20C	86.0	uS/cm	17/01/2023	N Cov	WAS039
Turbidity	1.53	NTU	26/01/2023	N Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N Cov	WAS049
Total Suspended Solids	Analyst Com	mg/l	24/01/2023	N Cov	WAS006
Suspended Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N Cov	WAS006
Settleable Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N Cov	WAS006
Solids, Total	53	mg/l	18/01/2023	N Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N Cov	WAS001
COD (Total)	14.0	mg/l	18/01/2023	N Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N Cov	WAS059

Analyst Comments for 22412987:

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This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour settled solids due to insufficient sample after quality check failure.
It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.

Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY



Report Number: **COV/2425753/2023**

Laboratory Number: **22412988**

Issue **1**

Sample **10** of **10**

Sample Source: **Waterco Ltd**

Sample Point Description:

Sample Description: **Garth Lagoon**

Sample Matrix: **Not In Project**

Sample Date/Time: **11 January 2023 14:55**

Sample Received: **13 January 2023**

Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N Cov	WAS049
Iron, Total as Fe	895	ug/l	19/01/2023	N Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N Cov	WAS049
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N Cov	WAS049
pH	8.0	pH units	17/01/2023	N Cov	WAS039
Conductivity- Electrical 20C	399	uS/cm	17/01/2023	N Cov	WAS039
Turbidity	2.03	NTU	26/01/2023	N Cov	WAS066
Ammoniacal Nitrogen as N	0.55	mg/l	17/01/2023	N Cov	WAS036
Nitrogen, Total as N	3.2	mg/l	24/01/2023	N Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N Cov	WAS049
Total Suspended Solids	20.0	mg/l	18/01/2023	N Cov	WAS006
Suspended Solids 1hour Settle	18.0	mg/l	18/01/2023	N Cov	WAS006
Settleable Solids 1hour Settle	2.00	mg/l	18/01/2023	N Cov	WAS006
Solids, Total	283	mg/l	18/01/2023	N Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N Cov	WAS001
COD (Total)	15.0	mg/l	18/01/2023	N Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N Cov	WAS059

Analyst Comments for 22412988:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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This issue replaces all previous issues


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Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.

For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.

I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed:



Name: **A. Zunzunegui**

Date: **27 January 2023**

Title: **Organics Chemistry Manager**

**ANALYST COMMENTS FOR REPORT COV/2425753/2023****Issue 1**

This issue replaces all previous issues

Date of Issue: 27 January 2023

Sample No	Analysis Comments
22412979	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}Unable to report for total suspended solids and 1 hour settled solids due to insufficient sample after quality check failure.
	{*/}
22412980	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412981	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Copper Total as Cu, Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412982	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412983	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412984	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412985	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412986	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412987	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}Unable to report for total suspended solids and 1 hour settled solids due to insufficient sample after quality check failure. It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412988	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {*/}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

Signed:

Name: **A. Zunzunegui**Date: **27 January 2023**Title: **Organics Chemistry Manager**

**DETERMINAND COMMENTS FOR REPORT COV/2425753/2023****ISSUE 1****Date of Issue: 27 January 2023**This issue replaces
all previous issues

Sample No	Description	Determinand	Comments

Signed:

Name: **A. Zunzunegui**Date: **27 January 2023**Title: **Organics Chemistry Manager**

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Appendix C – HRA

File Ref: 15055-Garth Treatment Details-01



Technical Document

Snowdonia Visual Impact – Discharge and abstraction Consents

Habitats Regulations Assessment

Hochtief UK Ltd

February 2023



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Version	Date	Reason
P01	7 th February 2023	Draft for client review



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1 Introduction

1.1 Terms of Reference

Atmos Consulting Ltd (Atmos) were commissioned by Hochtief UK Ltd (HUK) in October 2022 to provide ecological support in relation discharge consent being sought for four discharge locations at the Garth and Cilfor sites.

The Site is split over two locations, either side of the Dwyrdd Estuary, located in Gwynedd, Wales. The first site is the Cilfor site, which is located just outside of Llandecwyn, within Snowdonia National Park. The second site is the Garth site and this is located just outside of Minffordd, within the jurisdiction of Gwynedd County Council. The works involve undergrounding an existing overhead line, and the two tunnel head houses are located in each of the sites above. Planning permission has been granted for the works on the Cilfor site by Snowdonia National Park Authority (Ref: NP5/77/336B) and by Gwynedd County Council (Ref: C20/0244/08/LL) on the Garth site.

There are four locations, one located within the Pen Llyn a'r Sarnau/ Llyn Peninsula SAC and three which drain into existing watercourses, which are tributaries to the SAC. drain into. The works on the Garth side are in close proximity to Meirionnydd Oakwoods and Bat Sites SAC, with one point being within this SAC.

In Article 6(3) of the EC Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora – The Habitats Directive, any project or plan which is not directly connected with or necessary to the management of a European site but would be likely to have a significant effect either alone or in combination with other plans or projects shall be subject to an Appropriate Assessment of its implications for the European site in view of that site's conservation objectives. In light of the findings and subject to the provisions of Article 6(4) of the Habitats Directive, the Competent Authority shall agree to the plan or project only after ensuring that it will not affect the integrity of the European site. Whilst mitigation may be considered at the Appropriate Assessment stage it is not to be considered when initially screening the project in order to determine whether or not an Appropriate Assessment is needed.

Article 6(4) makes provision that if a negative assessment is made of the implications of the project on the site, and in the absence of other alternative solutions, the plan or project can go ahead for imperative reasons of overriding interest (IROPI) but that compensatory measures must be taken to ensure that the overall coherence of the site is protected/maintained. A distinction is to be drawn between mitigation and compensation.

Since this is a project, as defined by the Habitats Directive, and transposed into English and Welsh law in The Conservation of Habitats and Species Regulations (2017), which is not directly connected with or necessary to the management of the Llyn Peninsula and the Sarnau SAC, and Meirionnydd Oakwoods and Bat Sites SAC, then a Habitats Regulations Assessment (HRA) will be required. This will be carried out by the Competent Authority, advised by the Statutory Nature Conservation Body. Although the United Kingdom has now left the European Union, the requirement has been transposed over into English and Welsh law as part of the departure arrangements and so it is still necessary to be carried out.

Hochtief UK Ltd has commissioned Atmos Consulting to prepare the HRA on the behalf of National Grid. This report should be read in conjunction with the Fish Habitat Assessment (Atmos ref: c0233-ATM-GES-ZZ-RP-X0005) which was undertaken alongside the HRA to inform the assessment.

1.2 Objectives of this Report

The purpose of this report, which has been commissioned by Hochtief UK Ltd and National Grid is to carry out a HRA, for discussion with the statutory nature conservation advisor, Natural Resources Wales and to fulfil National Grid's legal requirement to carry out an HRA. To do this, a two-stage assessment will be carried out:

- Screening – the determination of whether there is a likely significant effect (LSE) on the qualifying features of the SACs; and
- Appropriate assessment (only if a likely significant effect is identified).
- The appropriate assessment assesses the LSE to determine the scale of the effect and if it could adversely affect the integrity of the site. This is done by assessing the potential impacts against the conservation objectives of the SACs to determine if the conservation objectives can be maintained in light of the project going ahead.

1.3 Proposed works

The proposed works are in addition to the works granted in the aforementioned planning applications.

Site Location

There are four locations in total, two on the Garth side, and two on the Cilfor side. Table 1 below includes grid references for these locations, and they are illustrated in Figure 1 & 2.

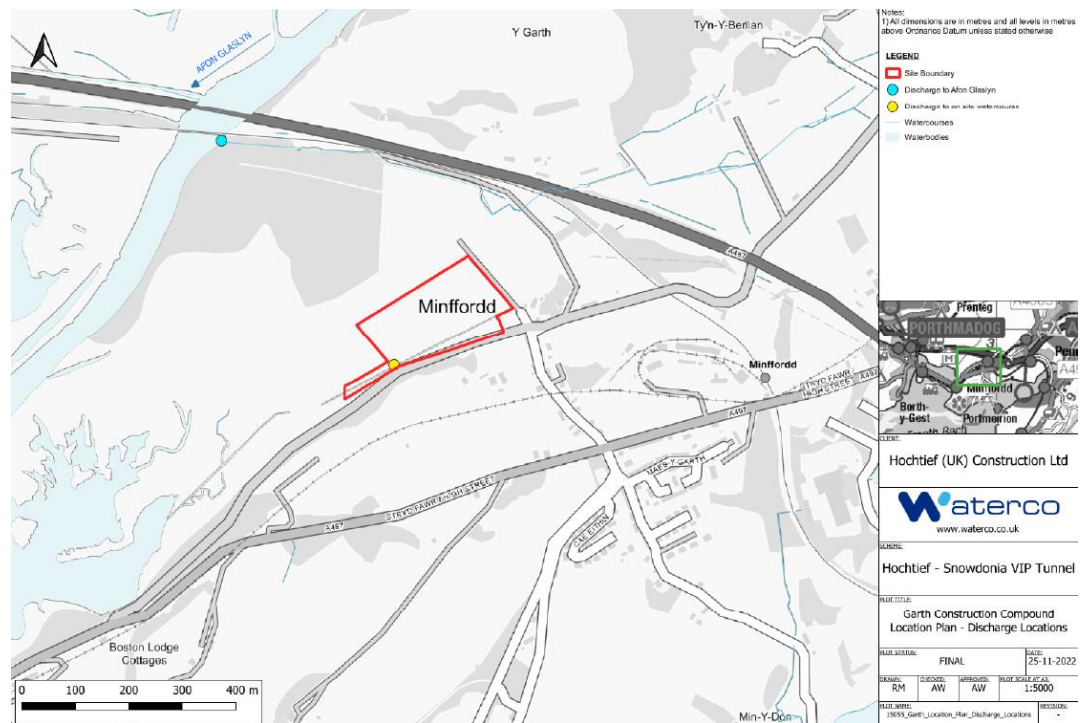
Table 1: Discharge/Abstraction Location Points

Location	Grid Reference	Proximity to designated site
Point 1 – Cilfor, discharge	SH6225337816	0.9 km from Oakwood Bat SAC and 0.4 km from Lley Peninsula SAC.
Point 2 – Cilfor, abstraction/discharge	SH61813788	1.6 km from Oakwood Bat SAC and within Lley Peninsula SAC.
Point 3 – Garth, discharge	SH59243857	0.1 km from Oakwood Bat SAC and 1.1 km from Lley Peninsula SAC.
Point 4 – Garth, abstraction/discharge	SH58963902	Within Oakwood Bat SAC and 1.3 km from Lley Peninsula SAC.

Nature of Works

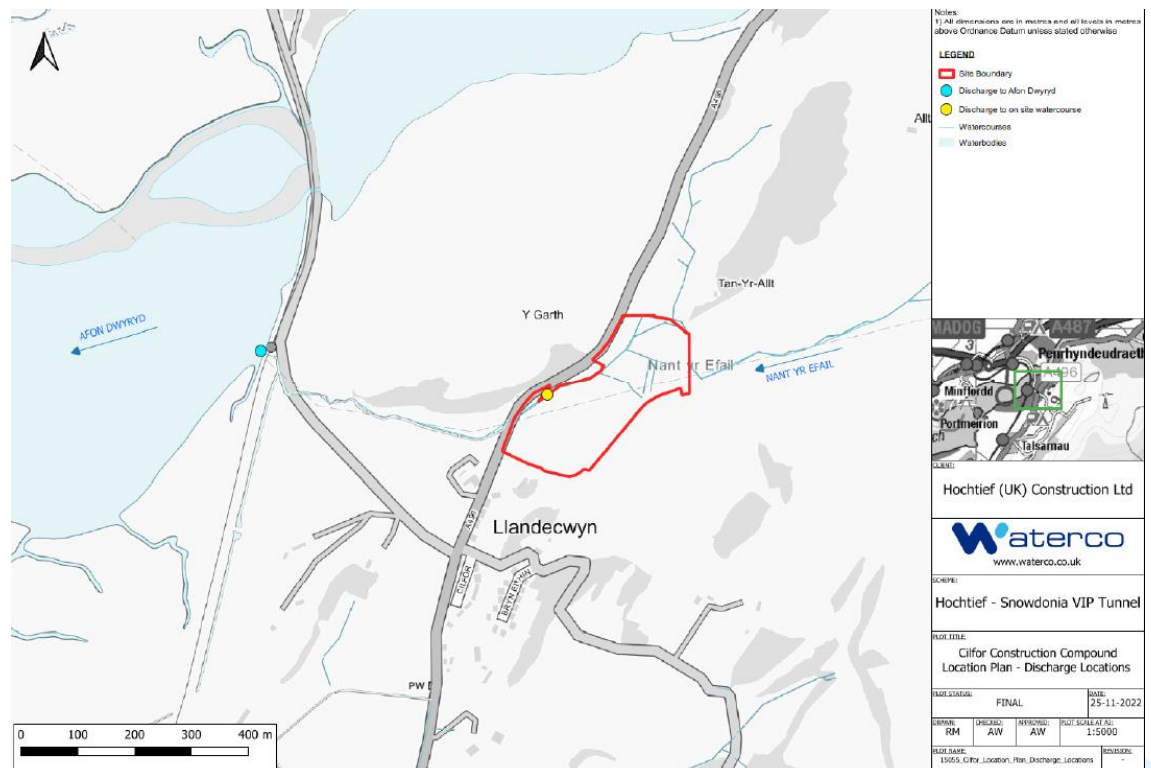
There are four points in total, with two discharge points located within ditches on site, one in Garth and one in Cilfor, shown as yellow dots in Figure 1 & 2 below. The remaining two points, which will be used for abstraction and discharge purposes, are located in Afon Glaslyn and Afon Dwyrdd, shown as blue dots also in Figures 1 & 2.

Figure 1



Source: Waterco Ref 15055_Garth_Location_Plan_Discharge_Locations

Figure 2



Source: Waterco Ref 15055_Cilfor_Location_Plan_Discharge_Locations

Discharge;

- Is of saline process water encountered during tunnelling and/or launch pit/shaft excavation works for Garth and Cilfor sites;
- Up to 400m³/day of water will be abstracted from each construction sites' excavations at Cilfor and Garth; and
- The maximum discharge rate will be 20m³/hr for most of the tunnel bore. 60m³/hr treatment plant capacity for clay rich geology.

Abstraction;

- The volume of fresh water required to operate the Tunnel Boring Machine (TBM) will vary depending on the geology being excavated. Most of the time during the tunnelling work 100m³/day will need to be supplied for the TBM's operation. The peak flow required is expected to be up to 500m³/day.

Treatment processes

A Slurry Treatment Plant (STP) will dewater TBM excavated material and recycle the recovered water back to the TBM.

Timescales

Works are due to commence in June 2023 and completed by December 2026.

2 Statutory Designations

All abstraction and discharge locations are situated within watercourses that directly drain into the estuary and therefore enter the Llyn Peninsula and the Sarnau SAC. Point 2 on the Cilfor side is located within this SAC.

Point 4 on the Garth side is located within the Meirionnydd Oakwoods and Bat Sites SAC and points 1, 3 and 4 are within 1.5 km of this SAC.

Due to the works taking place in or near these designated sites, before works can commence, SSSI Assent will be sought, and a Habitats Regulations Assessment (HRA) submitted to NRW.

2.1 Llyn Peninsula and the Sarnau SAC

The Pen Llyn a'r Sarnau/ Llyn Peninsula SAC encompasses 146,010 ha of sea, coast and estuary that support a wide range of marine habitats and species. It has been selected as an SAC for the presence of nine marine habitat types and associated species (Habitats Directive Annex I habitat types) and three mammal species (Habitats Directive Annex II species). Annex I habitats that are a primary reason for selection of this site is considered to be one of the best areas in the UK for:

- Reefs
- Large shallow inlets and bays
- Sandbanks which are slightly covered by seawater all the time
- Estuaries
- Coastal lagoons

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Mudflats and sandflats not covered by seawater at low tide
- Atlantic salt meadows (*Glaucopuccinellietalia maritima*)
- *Salicornia* and other annuals colonising mud and sand
- Submerged and partially submerged sea caves

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Grey seal *Halichoerus grypus*
- Bottlenose dolphin *Tursiops truncatus*
- Otter *Lutra lutra*

These features are distributed throughout the SAC with no single feature occupying the entire SAC and with features overlapping in some locations. A number of the habitats and species listed within the SAC are also listed in the Section 7 list of habitats and Species of Principal Importance (SPI) in Wales (Environment (Wales) Act, 2016) and in the OSPAR List of Threatened and/or Declining Species and Habitats.

2.2 Meirionnydd Oakwoods and Bat Sites SAC

The Meirionnydd Oakwoods and Bat Sites SAC comprises 2,812 ha of various woodlands and heaths that support a wide range of habitats and species. It has been selected as

an SAC for the presence of seven habitat types and associated species (Habitats Directive Annex I habitat types) and one mammal species (Habitats Directive Annex II species). Annex I habitats that are a primary reason for selection of this site is:

- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation
- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- *Tilio-Acerion* forests of slopes, screes and ravines
- Bog woodland

Annex II species that are a primary reason for selection of this site:

- Lesser horseshoe bat *Rhinolophus hipposideros*

Conservation Objectives

The conservation objectives for the Pen Llyn a'r Sarnau/ Llyn Peninsula SAC and Meirionnydd Oakwoods and Bat Sites SAC (Countryside Council for Wales, 2009) are listed below.

To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status.

- Range- The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing.
- Structure and function: The physical, biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded.
- Typical species- The presence, abundance, condition and diversity of typical species are such that habitat quality is not degraded.

3 Stage 1- Screening

In the first stage of HRA, a project is screened to establish if there will be a likely significant effect, either alone or in combination with other proposals/projects with potential to have an effect upon the SACs. In reaching this conclusion it is settled law that a precautionary approach should be taken to this assessment and that an LSE should be assumed unless the risk can be excluded. Essentially, this test of likely significant effect (LSE) determines whether the second stage of the process, Appropriate Assessment (AA) is required. Where no LSE is identified, then AA is not required; conversely, where LSE is identified, then AA is required to determine if there will be adverse impacts which would prevent the conservation objectives from being met and therefore the integrity of the European site being adversely affected.

3.1 Data Obtained to inform this Assessment

As part of a Fish Habitat Assessment (FHA), the watercourses in the areas, and their suitability to support protected and notable species was assessed (Atmos ref: C0233-ATM-GES-ZZ-RP-X-0004).

There are four points, with point 2 being located within the Llyn Peninsula and the Sarnau SAC and point 4 being within the Meirionnydd Oakwoods and Bat Sites SAC. All four points are within close proximity to both SACs.

Point 1 is located within the ditch on the western boundary of the Cilfor site. The ditch was heavily vegetated at the time of the survey with goat willow *Salix caprea* gorse *Ulex europaeus*, common reeds *Phragmites australis* and soft rush *Juncus effusus*.

Point 2 was surveyed from the station platform due to lack of access to this area. It is situated within the salt marsh in the SAC. The ditch up stream lies within an improved grassland grazed by sheep, species included perennial rye grass *Lolium perenne*, red fescue *Festuca rubra* and soft rush. The ditch held water at the time of the survey and the banks had recently been cut. Species on the ditch banks included common reeds, bramble *Rubus fruticosus*, gorse, bracken *Pteridium aquilinum* and goat willow.

Point 3 is on the western boundary of the Garth site. This discharge point lies within a densely vegetated ditch, species include bramble, perennial rye grass and cow parsley *Anthriscus sylvestris*. The surrounding fields are improved grassland used for grazing. The sward was short at the time of the survey with species such as perennial rye grass and ribwort plantain *Plantago lanceolata*.

Point 4 again was not accessible by foot, so the survey was carried out from the bridge. The abstraction/discharge point is situated on the eastern banks of Afon Glaslyn. It is within an area of trees which then leads to the salt marsh further south.

Data previously obtained from Cofnod, Local Environmental Records Centres (LERC) Wales was used. The highest number of otter records are around point 2 and point 4. There are records of otters at point 3, but these records are located further downstream. The nearest record to point 2 is located approximately 0.2 km south of the discharge point and dating from 2017. There is a record at point 4 dating from 2018. There are several records of spraints and feeding remains within this area. There is a record of a grey seal *Halichoerus grypus* located on the adjacent western bank of Afon

Glaslyn. Otter and grey seal are an Annex II species present as a qualifying feature of Lley Peninsula and the Sarnau SAC, but not a primary reason for site selection.

The nearest record of lesser horseshoe bat was located 0.15 km north of point 3 dating from 2018. The other records of the species were concentrated in the Gwaith Powdwr Nature Reserve located 0.75 km north of point 2. Lesser horseshoe bat is an Annex II species present as a qualifying feature of Meirionnydd Oakwoods and Bat Sites SAC, but not a primary reason for site selection.

3.2 Proposed Construction Works

The proposed works involves the discharge and abstraction of water. They are described in section 1.3. All four points are linked to Atlantic Salt Meadows, a habitat which is listed under the designated features within the Lley Peninsula and the Sarnau SAC. The habitat at point 2 is considered saltmarsh, but species identification was not possible due to access restraints.

The locations are not situated within any of the habitats listed under the designated features of the Meirionnydd Oakwoods and Bat Sites SAC.

3.2.1 Lley Peninsula and the Sarnau SAC

All four points are either located within the SAC or are directly connected and are located in proximity to Atlantic salt meadows.

The following features of the SAC do not occur in direct proximity to the discharge and abstraction points and they are sufficiently far enough away from the areas that it is considered there is no mechanism for a likely significant effect:

- Reefs
- Large shallow inlets and bays
- Sandbanks which are slightly covered by seawater all the time
- Coastal lagoons
- Submerged or partially submerged sea caves
- Salicornia and other annuals colonising mud and sand features
- Bottlenose dolphin *Tursiops truncatus*

The following features of the SAC are within a distance of the points that there is a potential for a likely significant effect:

- Atlantic salt-meadows
- Estuaries
- Otter *Lutra lutra*
- Grey seal *Halichoerus grypus*

Connectivity and Impact Pathways

As set out in Section 1.3, the proposed works involves discharge and abstraction points within existing watercourses in and near the SAC, therefore, habitats and species listed above could be affected by the works. There will be no habitat loss to the saltmarsh and the main potential impacts are pollution and sedimentation. There is potential for scouring of the riverbeds during discharge over and extended period of time, causing erosion of the habitats within the SAC. Otters may also frequent the watercourses for the discharge points and grey seal may be present at the Garth abstraction/discharge

point, without mitigation, actions could affect the species which could be part of the SAC population.

As a result, there is a finding of likely significant effect on features of the SAC, at all four points, in the absence of mitigation, and therefore AA is required in order to establish whether proposed works would have an adverse impact such that the integrity of the SAC could not be maintained and if so whether appropriate mitigation can be developed which would allow the integrity of the SAC to be maintained.

Meirionnydd Oakwoods and Bat Sites SAC

The Garth abstraction/discharge point is located within the SAC and does not support habitats for which the SAC is designated, nor could the species for which the SAC is designated be present. There is potential that the Annex II species lesser horseshoe bat may use the area for foraging as it is present in the wider area.

Disturbance

As set out in Section 1.3, all works to install the discharge and abstraction equipment, as well as monitoring, will take place during daylight hours. There will be no artificial lighting at the points.

Once installed, there will be minimal works at the points and no habitat loss. The points are in a relatively small, localised area compared to the extent of the SAC. Given the works are not likely to affect any terrestrial habitat, it is not considered to indirectly affect lesser horseshoe bats which may be utilising the woodland and surrounding habitats for foraging or roosting.

Disturbance effects on lesser horseshoe bats are therefore not considered to be significant.

There will be no adverse effects on site integrity for Meirionnydd Oakwoods and Bat Sites SAC. As a result, no further mitigation measures or appropriate assessment are required.

4 Stage 2 – Appropriate Assessment

Given that an LSE has been determined due to the effects of actions taken within the Llyn Peninsula and the Sarnau SAC to features indirectly linked to it, AA is required to determine if there is a potential adverse impact on the SAC, and if so whether it can be mitigated so as to avoid any such effect. In particular, an assessment must be made as to whether as a result of the works, without mitigation, the effects on the habitat feature are such that the conservation objectives could no longer be met/upheld.

4.1 Current Use of the Area

Point 1 is located at the Cilfor site and has recently been subject to reptile trapping. The area is also grazed by a small number of sheep. Point 2 is located within the Llyn Peninsula and the Sarnau SAC and during the drier months, is grazed by sheep. Point 3 is located within a ditch downstream from the Garth compound, the surrounding area is used for grazing. Point 4 is located on the bank of the Afon Glaslyn, south of the train line and the area is not currently in use.

4.1.1 Atlantic salt meadows

Baseline

Atlantic salt meadows develop when halophytic vegetation colonises soft intertidal sediments of mud and sand in areas protected from strong wave action. This vegetation forms the middle and upper reaches of saltmarshes, where tidal inundation still occurs but with decreasing frequency and duration. A wide range of community types is represented, and the saltmarshes can cover large areas, especially where there has been little or no enclosure on the landward side. The vegetation varies with climate and the frequency and duration of tidal inundation. Grazing by domestic livestock is particularly significant in determining the structure and species composition of the habitat type and in determining its relative value for plants, for invertebrates and for wintering or breeding waterfowl.

Likely Effects on Qualifying Feature

This habitat is situated at point 2 and functionally linked to the remaining points. There will be no habitat loss and the risk to this feature is from pollution, sedimentation and other materials that would affect the water quality and would have an effect on the integrity of the SAC in the short term. The salinity levels of the water to be discharged is unknown, there is likely to be a local effect on the habitat at discharge point 2 dependant on salinity levels.

4.1.2 Estuaries

Baseline

Pen Llyn a'r Sarnau has representative examples of bar-built estuaries in north-west Wales, and includes the Glaslyn/Dwyrdd, Mawddach and Dyfi estuaries. There is a continuous gradient between the clean sands near the entrance to the sea and the mud or muddy sands in the sheltered extremes of the estuaries. The intertidal sandflats

support communities of burrowing invertebrates, including dense populations of polychaete worms, crustaceans, bivalve molluscs and gastropod molluscs. Saltmarsh fringing the shores of the estuaries, and the saltmarsh creeks and pools, are important habitat features for juvenile fish. Again, dependant of the salinity levels, there is a potential for the estuarine habitats to become damaged.

Likely Effects on Primary Feature

Each point is directly or indirectly linked to this feature. There would be no habitat loss but there is potential to damage to the estuary in the form of scouring of the riverbeds during discharge of water. Other effects to this primary feature would be pollution, sedimentation and release of other materials into the estuary. Both events would have an effect on the integrity of the SAC in the short term.

4.1.3 Otter

Baseline

The highest number of otter records are around point 2 and point 4. There are records of otters at point 3, but these records are located further downstream. The nearest record to point 2 is located approximately 0.2 km south of the discharge point and dating from 2017. There is a record at point 4 dating from 2018. There are several records of spraints and feeding remains within this area. The ditches near each point are not considered suitable for otter holts, and there was no evidence of otter recorded during the survey. It is considered that the species may range through the areas, as they are present in the wider landscape.

Effects on Qualifying Feature

It is not deemed likely that otter holts will be present in the immediate surroundings of the points. Being highly mobile nocturnal animals, individuals could become injured or entrapped in the discharge/abstraction machinery at night or could suffer indirectly through pollution going into the watercourse. Point 2 lies adjacent to an active rail line, if present, they will be habituated to trains and disturbance during the daytime. Points 1, 3 and 4 are subject to less disturbance. Any effects on fish could also indirectly affect the otter population through food availability. It is therefore considered that without mitigation there will be a likely significant effect on otters based on disturbance to ranging otters or pollution.

4.1.4 Grey seal

Baseline

The south-west Wales population is the most southerly in Europe of any significant size and is relatively isolated from those elsewhere in the UK. It forms around 4% of the UK population or about 3.5% European population. This sub-population or stock is centred on the west Pembrokeshire coast. The grey seals of the Pen Llŷn a'r Sarnau SAC may be part of the west Wales breeding population. Grey seals present within the SAC at any one time are thought to be a part of a wider North Wales population. It is not known at present to what extent they form a discrete colony as part of the larger assemblage of seals found in Pembrokeshire (and whether this assemblage is a discrete Welsh

population), or whether they form part of a larger population, for example distributed throughout the Irish Sea. There are seal records adjacent to point 2 dating from 2011 and adjacent to point 4 dating from 2008.

Effects on Qualifying Feature

The points and the surrounding areas do not support breeding seal, but it is likely they range into the area to forage with North Wales's largest breeding colony at Bardsey Island being located 50 km west. The works are not likely to disturb the species as the points are situated within areas with regular human disturbance. Any pollution has the potential to cause ill-health and release of sedimentation has the potential to effect food resources. It is therefore considered that without mitigation there will be a likely significant effect on grey seal based on pollution.

4.2 Assessment of effects

A summary of the impacts of the works against the Conservation Objectives is provided in Table 2.

Table 2: Assessment of effects on Conservation Objectives

Attribute	Specified Limit	Predicted Effects from Proposed Works
Feature 1 & 2: Atlantic salt meadows and Estuaries		
Range	For estuaries this includes the stability of sandy sediments in proportion to the muddy sediments.	There will be no overall loss of habitat, however the points are directly or indirectly linked to these features. There could be damage to the habitats dependant on if there are significant variations to the base line salinity levels. It is worth noting that scouring could wash away estuary habitat at Cilfor site. Scour boards will be in place but flow over an extended period could lead to some habitat being lost.
Structure and Function	This includes a need for nutrient levels in the water column and sediments to be: • at or below existing statutory guideline concentrations • within ranges that are not potentially detrimental to the long-term maintenance of the features species populations, their abundance and range. Contaminant levels in the water column and sediments derived from human activity to be: • at or below existing statutory guideline concentrations • below levels that would potentially result in increase in contaminant concentrations within sediments or biota • below levels potentially detrimental to the long-term maintenance of the features	If sediments or pollution were to be released into the estuary it could potentially cause a change in nutrient levels, contaminating the water and having a negative impact on species present.

Attribute	Specified Limit	Predicted Effects from Proposed Works
	species populations, their abundance or range. For Atlantic salt meadows this includes the morphology of the saltmarsh creeks and pans	
Typical Species	As part of this objective, it should be noted that: • populations of typical species subject to existing commercial fisheries need to be at an abundance equal to or greater than that required to achieve maximum sustainable yield and secure in the long term • the management and control of activities or operations likely to adversely affect the habitat feature, is appropriate for maintaining it in favourable condition and is secure in the long term.	As mentioned above, is sediment or pollution is released into the estuary it could adversely affect the species present. Dependant on salinity levels, there may be an effect on species.
Feature 3 & 4: Otter and Grey seal		
Populations	As part of this objective, it should be noted that: • for otter and grey seal; contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression; and grey seal populations should not be reduced as a consequence of human activity	If the works resulted in the death of an otter, this would affect their population. Pollution has the potential to affect otter and grey seal food source and therefore negatively affect the population. Increase in human activity will be short-term primarily during installation and sporadically for maintenance. Each area is currently subject to varying levels of human disturbance.
Range	The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future. As part of this objective, it should be noted that for otter and grey seal • Their range within the SAC and adjacent inter-connected areas is not constrained or hindered • There are appropriate and sufficient food resources within the SAC and beyond the sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing	The works will not reduce the otter's or grey seals range nor introduce any permanent barriers that would change the way in which effects to their movement. Machinery and associated pipework will be installed along areas that will not impact ranging otters.
Supporting Habitats and Species	As part of this objective, it should be noted that; • The abundance of prey species subject to existing commercial fisheries needs to be equal to or greater than that required to achieve maximum sustainable yield and secure in the long term. • The management and control of activities or operations likely to adversely affect the species	Otter holts have not been found in and around the working area, but they are known to pass through. The works will not affect the availability of food resources for otter's and grey seal.

Attribute	Specified Limit	Predicted Effects from Proposed Works
	feature, is appropriate for maintaining it in favourable condition and is secure in the long term. • Contamination of potential prey species should be below concentrations potentially harmful to their physiological health. • Disturbance by human activity is below levels that suppress reproductive success, physiological health or long-term behaviour • For other there are sufficient sources within the SAC and beyond of high-quality freshwater for drinking and bathing.	

The review of the Conservation Objectives for the SAC has identified that there is the potential for features of the SAC to be affected and therefore would adversely impact the integrity of the SAC.

Given the sensitivity of the area, a review of mitigation which would be undertaken, including that designed into the works from an early stage has been provided in section 4.5.

4.3 In-combination effects

A HRA (Ref: C0233-ATM-GES-ZZ-RP-X-0003) for ground investigation works adjacent to the SAC has been submitted to NRW. The ground investigation works has the potential to cause pollution and sedimentation to the SAC and appropriate mitigation measures are in place. The ground investigation works will take place well in advance of any discharge/abstraction and therefore no in-combination effects are considered.

A search of the Gwynedd County Council and Snowdonia National Park Authority Planning Portal was carried out on 16th January 2023 to search for planning applications in the vicinity of the discharge/abstraction points. There were no pending planning applications on or adjacent to the points, upstream or downstream or the nearby surrounding area that are of a similar nature to these works. As such, there are not known to be any other works taking place on this area during this time, therefore no in-combination effects are considered.

4.4 Conclusions

Without mitigation the works will have an effect on the integrity of the SAC. As set out in Table 1, potential LSE are identified on features 1, 2, 3 and 4.

Mitigation is therefore required to reduce these LSE, as set out below.

4.5 Mitigation

Mitigation is required in order to pass the appropriate assessment as the work will be occurring within sensitive habitats where there would otherwise be direct and indirect effects on the primary and qualifying features. The following mitigation measures are incorporated into the proposals:

- All machinery and associated pipework will be installed along areas that will not impact ranging otters.
- Outfall pipe and scour boards will be installed to prevent scouring of the riverbanks. The discharge points will be regularly monitored, with scouring boards moved or extended if any scouring takes place.
- Treatment processes specified in Section 1.3 will be used to minimise any release of pollution, sedimentation or other materials into the SAC.
- The pH value of the discharge range will be 6 – 9 range, with a target of 6.9 – 7.5.
- Discrete spills of oils or grease within the tunnel will be collected using spill kits and then disposed of as hazardous solid waste.

Treatment processes

A Slurry Treatment Plant (STP) will dewater TBM excavated material and recycle the recovered water back to the TBM. The STP will include the following sequence of treatment processes:

- Screens for the physical separation of large solids from water;
- Cyclonic separation for the mechanical separation of fine solids from water;
- Flocculation sedimentation for the chemically enhanced settlement of fine solids;
- pH adjustment using carbon dioxide gas injection; - filter press for the dewatering of wastewater sludges.

Treated water from the STP will be recycled back to the TBM. Excess water not used by the TBM will pass to onsite settlement lagoons. The water in the lagoons will be available for reuse on site and or will be discharged off site following further water treatment.

Water from the lagoons to be discharged off site will be treated in a wastewater treatment plant prior to discharge. It is proposed to use a package water treatment plant supplied by Siltbuster Ltd. The Siltbuster wastewater treatment plant (Siltbuster WWTP) will include the following water treatment processes:

- Flow chamber to measure flow rate into the treatment plant;
- Coagulant dosing pump (flow proportional mixing of Poly Aluminium Chloride);
- Flocculant addition and mixing (Anionic Flocculent);
- pH monitoring and CO₂ addition;
- tilted plate separator;
- pH monitoring caustic soda (NaHO) addition (peat geology or pyrite excavation); and
- treated water quality: flow out, pH turbidity

5 Conclusions

A HRA has been carried out for the discharge and abstracted points at Cilfor and Garth. This went through the following stages:

- Stage 1 – the project was screened and a likely significant effect was identified for the proposed works;
- Stage 2 – a Appropriate Assessment was carried out which assessed features of the SAC within and immediately adjacent to the working areas. This showed that the habitats and species present would be significantly affected and that the conservation objectives of the SAC would not be maintained if the works went ahead without mitigation.
- Mitigation was introduced and has considered all the LSE anticipated on the primary and qualifying features and are reduced such that there is not anticipated to be any effects from the work on the integrity of the SAC, therefore, following the implementation of mitigation, the works pass appropriate assessment;

As a result, the HRA has shown that work can proceed without affecting the integrity of the Pen Llyn a'r Sarnau/ Llyn Peninsula and the Sarnau SAC and the Meirionnydd Oakwoods and Bat Sites SAC. Appropriate good working practices are to be put in place to minimise damage to habitats and minimise disruption of the typical species found within the SAC during the proposed works.