Form WRD: Application for a new abstraction licence or a technical variation to an abstraction licence

Application type

Reference number (The number you generated in form WRA). Example: WRNATURALRESOURCESWALES1101
WRCAMBRIANENVIRONMENTALTECHNOLOGIES1204

Are there any applications currently being assessed by us that are linked to this application?
No

Is the proposed abstraction going to be aggregated with another existing abstraction?
No

Are any applications, at the same site; being assessed by the Environment Agency?
No

Tell us when you want your abstraction licence to end: [DD/MM/YY]
30/04/2024

If you require a shorter or longer duration licence, please provide details and your justification
Temporary licence for field trials of a mine water discharge water treatment system on behalf of NRW. Two trials to be undertaken, one in summer conditions in summer 2023 and one in winter conditions in winter 2023 - 2024.

Abstraction details

Abstraction location name/reference
Nant y Mwyn Mine Lower Boat Level

Abstraction point type
Single point

National Grid Reference
SN7823543797

Do you have any further points of abstraction?

No

Means of abstraction

Provide full details of the equipment you propose to use to abstract water, such as maximum pump capacity and any relevant dimensions, e.g. pipe diameter. For groundwater abstractions, include details about the borehole (depth and diameter) and details of screening and lining.

The abstraction will be temporary and as such no permanent equipment will be designed or installed to abstract water from the shaft. There is flow monitoring equipment installed just downstream of the mine discharge (Fig. 1), and to avoid disturbing these measurements the abstraction will be taken just downstream of this installation (marked with a yellow star Fig. 2). The abstraction is ~8 m above the location of the trial, and a distance of ~0.06 km, as the water treatment system will sit on a field further downstream (Fig. 3). As such, a temporary flexible pipe is planned to be placed at the abstraction point in Fig. 2 and fed along the stream bed to the field and across the field to where the treatment system will be located. Given the height difference there will be minimal requirement to pump the water to feed the system, so the initial abstraction will be started using a small submersible pump and then it is expected to flow under gravity rather than using the pump. Should this not be the case the submersible pump will be used as the means of abstraction.

If necessary, continue on a separate sheet and upload below.

- File: Abstraction means photos.pdf - Download

Abstraction quantities

Abstraction location name/reference

Nant y Mwyn Mine Lower Boat Level

What purpose will the water be used for?

Mine water will be transferred to a treatment system to remove metals before treated water is returned to the existing watercourse. Two periods of approximately 2.5 weeks. Period one: June-August 2023. Period two: December 2023-February 2024.

Period of abstraction Will it be all year?

No

Start Date: [DD/MM/YY]

01/07/2023

End Date: [DD/MM/YY]

28/02/2024

Maximum quantities (cubic metres)

Annual 5780

Daily 289

Hourly 54

Peak abstraction rate (in litres per second)

15

Number of hours of abstraction per day

8

Add quantities for another location?

No

Calculations and supporting information

Use this section to show us how you have calculated the amount of water you require. This should include details of your operational regime (for example, number of hours and days you intend to abstract, number of units produced or area to be irrigated). We use this information to determine if the volumes you propose to abstract are appropriate for the purpose. Depending which industry you are in, you may need to provide additional information below.

If your proposal involves the provision of a residual flow via a notch or orifice, provide information on how this is being calculated. This should include details of the equation being used.

NRW's Metal (Non-Coal) Mine Programme has commissioned Cambrian Environmental Technologies to develop their Sustainable Active Treatment (SAT) mine water treatment solution. This includes field trials at Nant y Mwyn Mine, Carmarthenshire.
There will be two periods of field trials, one in summer conditions and one in winter conditions, each of approximately two weeks duration. The trials will involve capturing a portion of the mine water discharge from Nant y Mwyn's Lower Boat Level (Fig.1), transferring this to the SAT treatment system, before the treated water is discharged downstream into the existing watercourse. The treatment system will be housed in two 10 foot portable containers, similar to Fig.4 below. The water treatment system will sit in one container and the generator and compressor required for the system will sit in a separate container.
The treatment system will have a capacity of 10 L/s as this is the designed capacity that the system will be operated to (864 m3/day), although in practice actual abstraction rate will be much lower as the treatment system will only operate during normal working hours. The abstraction rate is likely to vary between 1.7 L/s and up to a maximum of 15 L/s, but with an average sitting at <10 L/s, based on whether it's running in either batch or continuous mode and the number of passes which are managed per day. As a conservative approach we have assumed we run the system for 8 hours a day at 10 L/s to calculate abstraction volumes. The current trial plan is to run the trial for four days under

batch mode and four days under continuous mode, with additional days in the schedule for contingency and set-up/pack-up of the system. The system, and thus the abstraction rate, will be increased from the lower end of the range towards the upper end of the range as the trial progresses. The maximum abstraction rate per day based on the highest abstraction rate will be 289 m3/day (operating at an average of 10 L/s for an 8 hour day). A maximum spot abstraction could range up to 15 L/s to fill the feed tank, but this would not be continuous over the full working day, likely only for an hour or so at maximum, thus the overall abstraction rate for the day will be lower. The total abstraction volume over a 2.5 week period is expected to be 2890 m3. NRW has a continuous flow logger on the Lower Boat Level discharge which indicates a mean flow of approximately 15 L/s with maximum flows up to approximately 50 L/s, therefore the abstraction range should sit within normal expected flows. The flowsheet and draft layout for the treatment system is shown in Fig. 5.
A description of the treatment system process is as follows:
A) First stage – Aeration:
This process begins with feed water, from the applicable adit, being fed by a submersible pump or gravimetric fed to the bottom of the system tank and the feed water's flow rate will be set by an adjustable manual valve, while monitoring through a flow meter. By feeding to the bottom of the system tank, operational short-circuiting is limited during the aeration stage.
The next step of the process will involve the aeration stage, where the water from the system tank will be circulated via the system pump through one of three aeration units (packing columns 1 or 2 or the REA200 unit), encounter air, while passing through the aeration units and returned to the tank. Only one aeration unit shall be operated at a time.
The concept of "Passes" is a term used during the Aeration stage and it relates to the total volume of water within the system tank, having passed through either of the aeration units. Once the entire volume has passed through an aeration unit once, this is termed as "1 Pass". If completed twice, this is termed as "2 Pass", etc.
Two methods of aeration operation shall be assessed during the trials: Batch and Continuous.
1) Method 1 – Batch:
This method shall involve filling the system tank with feed water and stopping the feed once full. Then the aeration stage shall be run until the desired amount of "Passes" is achieved. Once completed, the entire volume of the system tank shall be drained to the second stage of processing: Adsorption.
The transfer flow rate shall be monitored through a separate flow meter.
The process is repeated, once the system tank is empty.
2) Method 2 – Continuous:
This method also involves filling the system tank with feed water and stopping the feed once full. The aeration stage is then also run until the desired amount of "Passes" is achieved. However, once completed, the aeration stage is continued, and the feed water is opened to start feeding the system tank again. This will cause the system tank to overflow, and it is this overflow that is then fed to the second stage of processing: Adsorption.
Due to the system operating continuously and due to air being the only additional component added during the aeration stage, the reading on the feed flow meter may be used as the transfer flow rate too.

B) Second stage – Adsorption:
This process involves two IBCs (Intermediate Bulk Containers) filled with various adsorption material and is designed to remove all the precipitated metals from the aeration stage, together with remaining unwanted dissolved metals in the water.
The two IBCs shall be fed in series and the discharge from the second IBC shall be the main discharge from the T0020 unit.
This discharge shall be fed back to the original source stream of the feed water.

C) Additional Information:
• Power for the T0020 unit shall be supplied through a diesel-powered generator.
• Compressed air for the T0020 unit shall be supplied through a diesel-powered compressor.
• Both the generator and compressor shall be placed into their own container, from the other pieces of equipment, to limit the heat, exhaust, and noise generation of these units to the personnel who will be operating the T0020 unit.
• The system pump, the three aeration units and the two adsorption IBCs shall be placed in their own container.
• The system tank will be located outside of the two containers due to the size of this unit.
• Sampling shall be performed at continuous periods at various points within the T0020 unit.

The expected operational information for the two trials based on hours of operation and total abstraction for the day are outlined in the table below:

Additional document. (Spreadsheet file formats need to be: .xls, .xlsx, or .ods)

- File: WRD calcs supporting info.pdf - Download
- File: WRD Potential discharge locations.pdf - Download

Means of measurement

State how you intend to measure the quantity of water you abstract. You do not need to do this for a temporary or transfer licence.

Other (please specify):
There are flow measurements within the treatment system (Fig. 5) and these will be recorded during operation, as well as the length of time the system is operated for, to calculate the overall abstraction and discharge rates and volumes during the trial.

Water efficiency

Provide details of what measures you provide or intend to implement, to ensure efficient use of water. This could include water storage, re-use or recirculation, monitoring and checking for leaks, undertaking water audits or other industry specific good practice.

The treatment system will have a design capacity of 10 L/s and the overall maximum rate of abstraction will be up to 15 L/s for short periods of time, however the average abstraction rate will be <10 L/s over each 2.5 week period. The mine water discharge ranges from c.1.5 L/s to c.50 L/s, with an average of c.15 L/s. The system will include a feed header tank, therefore abstraction can be halted and managed by using the feed tank as the sole input if required. If the field trials encounter periods of low flows i.e. <10 L/s the treatment system will either operate at a lower flow rate, or water will be stored in feed tanks and ran for shorter periods of time rather than the full 8 hour day to fit with the lower flow. Treated water will be discharged back into the watercourse where the original mine water discharge feeds to.

Fish and eel considerations (surface water abstractions only)

Confirm the fish species present at your site. If you're not proposing any measures to protect fish and eels, you must justify this. For example, we may have confirmed in our pre-application response that the intake is inaccessible to fish or you undertook a fish survey to confirm.

N/A – abstraction location is a mine water discharge and there are no fish present.

Discharge details

If you intend to return any of the abstracted water to the environment, provide details below. Details of discharge location(s) should correspond with any maps submitted. Do not include discharges to a public sewage system.

	Discharge location name / reference	National Grid Reference of discharge point (12 digit)	Total volume to be discharged (cubic metres)	Environmental Permit for Water Discharge Activity number (if applicable)
	SAT mine water treatment trial discharge (Discharge location A)	The treated water will be discharged to the mine water discharge channel at NGR SN78174243714. This joins the Nant y Mwyn watercourse after approximately 45 m, which in turn joins the River Tywi a further 350 m downstream.	All treated water will be discharged back into the existing watercourse. The treatment system has a design capacity of ~ 10 L/s. If operating at capacity the total volume discharged will be a maximum of 289 m3 per day which is equivalent of what would be the maximum abstracted.	A discharge permit is not required. There is a regulatory position statement that covers mine water treatment trial such as this in Operational Instruction 17_13 Permitting of hazardous pollutants in discharges to surface waters.
	Alternative - Discharge location B	SN 78093 43678, should this drain location link directly into the watercourse (see Fig in 11.2) this maybe an alternative discharge location which could be fed under gravity rather than pumped. The drainage layout is to be confirmed with the council prior to the trial commencement. Only a direct discharge to the watercourse will be used during the trial (so Discharge location A if this option does not directly feed).	All treated water will be discharged back into the existing watercourse. The treatment system has a design capacity of ~ 10 L/s. If operating at capacity the total volume discharged will be a maximum of 289 m3 per day which is equivalent of what would be the maximum abstracted.	A discharge permit is not required. There is a regulatory position statement that covers mine water treatment trial such as this in Operational Instruction 17_13 Permitting of hazardous pollutants in discharges to surface waters.
	Alternative - Discharge location C	SN 78033 43624 should this drain location link directly into the watercourse (see Fig in 11.2) this maybe an alternative discharge location which could be fed under gravity rather than pumped. The drainage layout is to be confirmed with the council prior to the trial commencement. Only a direct discharge to the watercourse will be used during the trial (so Discharge location A if this option does not directly feed).	All treated water will be discharged back into the existing watercourse. The treatment system has a design capacity of ~ 10 L/s. If operating at capacity the total volume discharged will be a maximum of 289 m3 per day which is equivalent of what would be the maximum abstracted	A discharge permit is not required. There is a regulatory position statement that covers mine water treatment trial such as this in Operational Instruction 17_13 Permitting of hazardous pollutants in discharges to surface waters.
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Provide a description of the structure and equipment involved in discharge.

The discharge from the treatment system will be discharged at the same rate as the abstraction directly into the watercourse the mine water drains to. Potential discharge locations in relation to the watercourse are shown in Fig. 6. Discharge location A will be the default discharge location, and a small submersible pump and pipe maybe required to discharge the water to this location, as the treatment system is slightly downhill from the stream. The land drainage routing at discharge locations B and C are being investigated as potential alternative discharge locations, which would be fed gravimetrically through a plastic pipe directly to the stream watercourse. However, the exact drainage layout needs to be confirmed before these locations can be considered feasible.

Other abstractors / water users

Provide details of nearby abstractors or users of water who could be affected by your proposal. This should include deregulated users (exempt activities or abstractions < 20 cubic metres per day), anglers and canoeists.
Your local authority's environmental health will hold details of exempt domestic abstractors.

Water is to be abstracted from a mine water discharge so no impact on other users.

Planning application

Have you sought advice on your planning application?

No

Declaration

By signing below, you are declaring that, to the best of your knowledge; the information given in this form, on any map and in any supporting or additional information; is true.

Signed Steven Pearce

Print name Steven Pearce

position Principal Geoscientist / Director

Date

* 12/04/2023

Would you like a copy of your submission?

Yes

Your email address
jdent@cambrianenvirotech.co.uk