The Coal Authority

Resolving the impacts of mining

October 2019

Corrwg Mine Water Treatment Scheme - New licence application for a previously exempt abstraction - Additional Information

1. Introduction

The Corrwg Mine Water Treatment Scheme (MWTS) is located along the valley of the Afon Corrwg, north of Glyncorrwg. The site comprises a narrow strip of land stretching along the east bank of the river from approximately NGR SN 888 006 in the north to SS 885 997 in the south.

The mine water originally discharged into the Afon Corrwg causing a visual impact for 1km downstream.

To remediate this impact a reed bed treatment scheme was constructed. Eight of the reed beds exist at the northern end of the site and three at the southern end. The two sections of the treatment schemes are joined by a lined transfer channel.

On the east bank two mine water discharges are diverted by simple capture structures. On the west bank one mine water discharge is captured and transferred over a bridge to the eastern side for treatment. Blockstone cascade structures are provided between the reed beds to improve the oxygenation of the mine water and to increase iron removal.

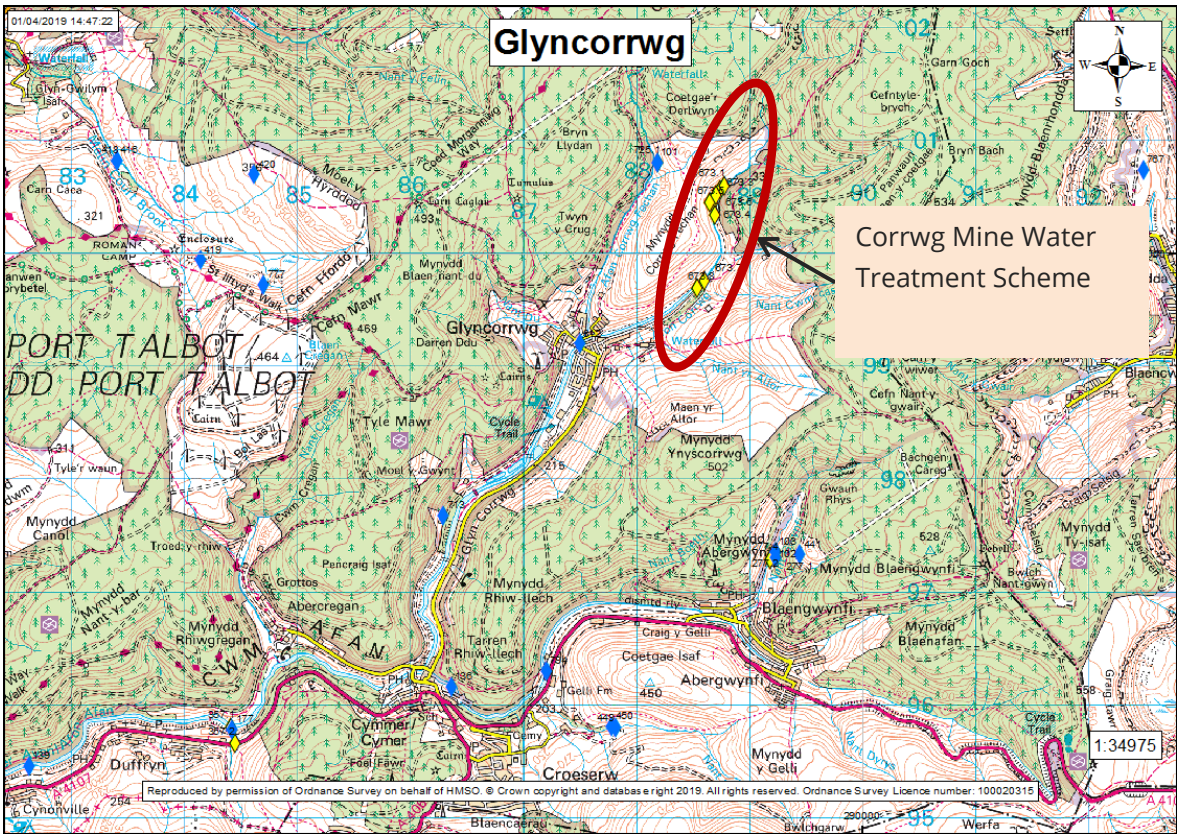


Figure 1: Location of Corrwg Mine Water Treatment Scheme

2. Pollution Remediation

The raw mine water has a current iron concentration of 8 mg/l from the East Bank and 10 mg/l from the West Bank.

Although not toxic in itself, iron within the mine water oxidises and precipitates out of solution within the water course and can result in the smothering of river beds.

The general principle of the mine water treatment scheme is to treat the mine water before it enters the river. The flows are generally net alkaline and hence no treatment is required to increase the alkalinity. However, dissolved oxygen levels are low and cascade structures are included to increase oxygenation. The 11 reed beds (A to K, Figure 2) are designed to remove the iron and polish the mine water prior to discharge.

Reedbeds A to D solely treat the 2 East Bank discharges. If after reedbed D, the mine water is sufficiently treated, then it may be discharged to the river (under consent BP0310101). Alternatively, water from reedbed D can continue into reedbed E, joining with the West Bank discharge. Treated mine water is discharged after reedbed K under consent BP0310201.

In 2018, the mine water discharged from the scheme with an average iron concentration of 0.35mg/l.

Figure 2 provides an overview of the mine water treatment scheme and the mine water pathways.

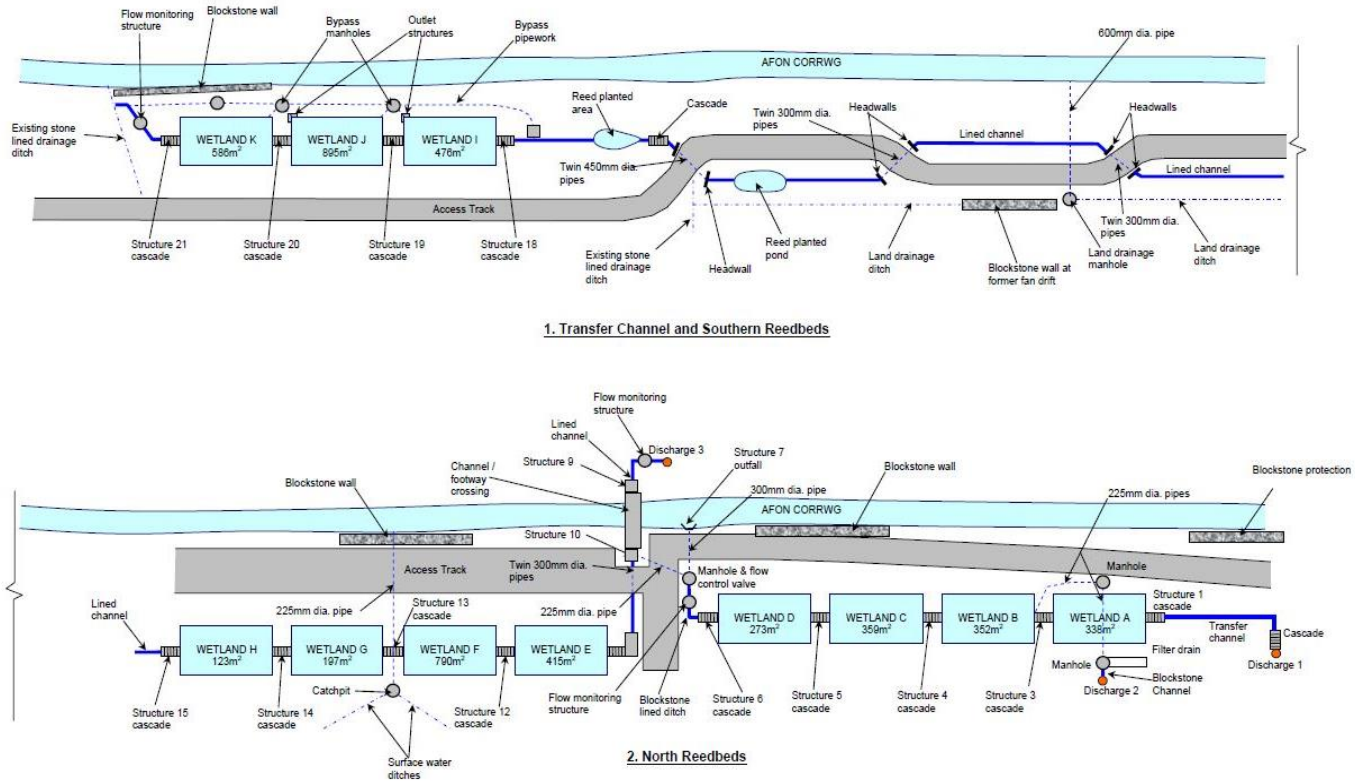


Figure 2: Overview of the Corrwg MWTS layout and mine water pathways.

3. Answers to Specified Sections of Form WRH

The following are responses to the application form sections, in cases where the referenced document is this one, i.e. "Corrwg Additional Information".

2.4 Abstraction Invoices and Records

	Main Contact	Address	Phone Number	Email
Site Operation	Chris Crowe	Chris Crowe The Coal Authority 200 Lichfield Lane Mansfield NG18 4RG	07917174577, 01623637363	ChrisCrowe@coal.gov.uk; EnvironmentMail@coal.gov.uk
Invoice Abstractions	Accounts Payable	Account Payable The Coal Authority 200 Lichfield Lane Mansfield NG18 4RG	01623637000	FinanceDepartment@coal.gov.uk EnvironmentMail@coal.gov.uk
Abstraction Records	Jack Cropper	Jack Cropper The Coal Authority 200 Lichfield Lane Mansfield NG18 4RG	07917093506	EnvironmentMail@coal.gov.uk JackCropper@coal.gov.uk

4.2 What is your connection to the land where the abstraction takes place?

The Coal Authority has ownership of the land where the water upwells and where the treatment scheme is currently located. Please see Appendix A, Figures A2 and A3 for maps outlining the abstraction/discharge points and land ownership details, respectively.

4.3 Do you have a legal right of access to the land where the abstraction takes place?

The Coal Authority has legal rights of access to the land where the abstraction takes place. Please see Appendix A, Figure A3 for a map outlining land ownership.

7 Abstraction details

Mine water treatment schemes are associated with abandoned and disused mines in which mine water rebound has occurred. During the operation of the mines, water levels are artificially lowered via pumps and drainage adits. When operations in the mine ceases the pumps are turned off and the water levels rebound, flooding the mines. As a result, mine water discharges at the surface from former adits or shafts of these abandoned and disused mine workings. Transfer of the mine water for the purpose of pollution remediation, usually occurs at the surface and is a passive process, facilitated by gravity. We have therefore considered the transfer to be for surface water.

7.1 Site Map

Please see Appendix A for maps outlining the site.

8.1 Abstraction history and evidence

Abstraction has taken place continuously since October 2006.

Since the MWTS is passive, visits are infrequent to avoid excessive management cost. As there is no power supply, only simple manual readings of flow are taken during visits.

The abstracted flows are measured at thin plate weirs. The combined flow from discharges 1 and 2 on the East Bank is measured by a v-notch weir at the end of the upper scheme, after reed bed D, immediately prior to the Upper Consented Discharge. The flow from Discharge 3 (West Bank) is measured by a rectangular notch weir immediately downstream of the discharge 3 itself. (See Appendix A and B for more images and diagrams of the scheme)

As the scheme is non-consumptive, the flow discharging from the Upper scheme reed beds is used as a proxy for the flow of the two East bank mine water abstractions, as inlet and outlet flows to the Upper reed beds are assumed to be equal.

The records of weir measurements are provided as evidence with this application. As the site is rainfall related, and infrequently monitored, the maximum quantities abstracted, given on form WRH, in Table 8.1, are estimated using the largest measured flow for the year. A period of high rainfall, following a prolonged period of dry weather, resulted in a sudden discharge of water from the mine workings causing high flows to pass through the scheme at the end of 2018. This high flow rate, compared to average flow rates, demonstrates the effect that changes mine workings, weather/ climate etc. can have upon flows.

For ease of visualisation of the amount of data, and the variability of flow measurements, the following trend chart is provided.

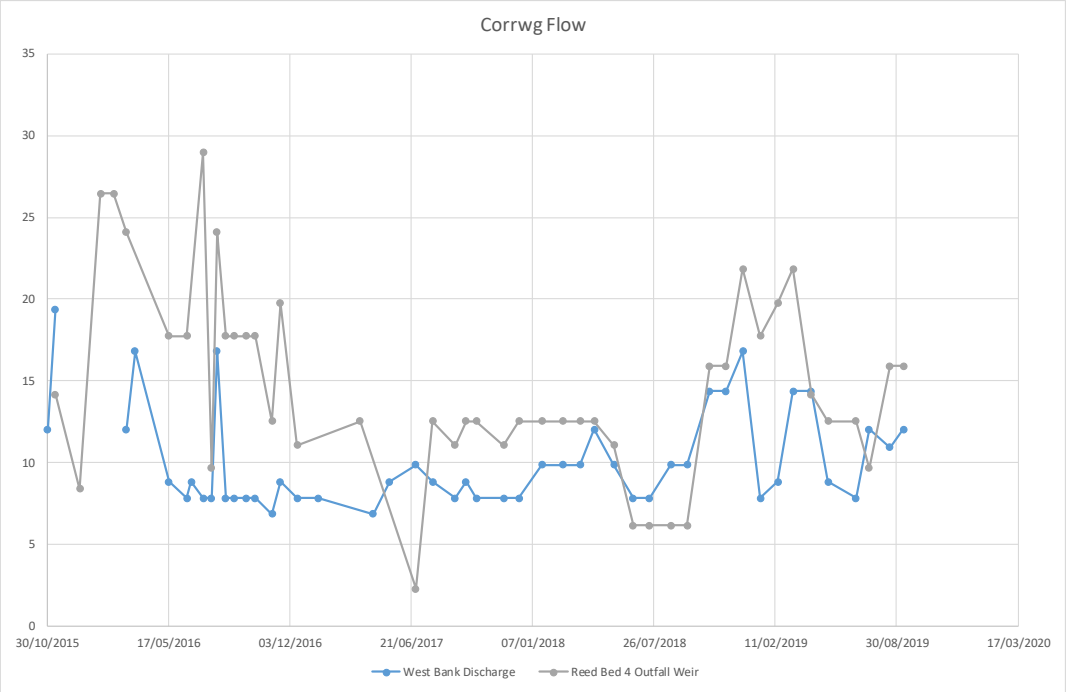


Figure 3: Graph showing Corrwg East Bank (Abstraction 1 and 2 are combined flows) and Corrwg West Bank (Abstraction 3).

8.4 Detailed description of how the abstraction has taken place

None of the mine water treatment schemes in operation by the Coal Authority are associated with current, or future mine workings – they are all draining abandoned coal workings which have historically flooded, and discharged to surface. The Coal Authority schemes do not dewater workings in the sense that water levels are not actively drawn down using pumps. The water treated emerges at surface as a result of water levels having fully recovered within the abandoned mines so that it naturally drains from the adits/ shafts. The drainage of the old workings may be considered to be passive dewatering (by gravity), as against active dewatering (with pumps). The main purpose of transferring the mine water is for pollution treatment. On the other hand, the passive dewatering is an integral first step in order to feed water into each treatment scheme.

There are three points where the mine water is collected within the valley.

The first mine water, discharge 1 (East bank), emerges from the superficial deposits near the location of a former adit (Coal Authority reference 288200-011) into drift workings in the northern end of the valley. The flow enters a lined transfer channel southwards towards wetland A.

The second area of mine water emergence, discharge 2 (East bank), is the smaller of the two East bank discharges, and is intermittent, or ephemeral in nature. It emerges from the superficial deposits in the vicinity of a former adit (Coal Authority reference 288200-008) into the drift workings in the northern end of the valley. The majority of the flow is collected by a blockstone lined channel which discharges into a manhole. A filter drain has also been installed to the north of the manhole to capture the more diffuse and below ground elements of the flow from an area of ocherous sludge.

The second mine water discharge is then transferred via a 225mm diameter pipe, initially north westwards under Reed bed A, then southwards to discharge into Reed bed B. The third discharge, discharge 3 (West bank), normally has the highest flow of the three. It emerges from an opening in the vicinity of a former adit (Coal Authority reference 288200-005). This is located approximately 150m south-southwest of the other two discharges and approximately 5m above the valley bottom on the west side of the river. It flows through a weir box, down a lined channel and across the river on a bridge.

See Appendix B, Figure B1, B2 and Appendix C, Figure C1 for photos and as-built drawings of the abstraction point.

Under normal operating conditions, all of the flow from the three mine waters is transferred into the MWTS. This is to allow all of the mine water to be treated prior to its discharge into Afon Corrwg. None of the abstractions have any means of adjusting either the flow rate, or the proportion of the flow abstracted.

The abstraction volume is **entirely rainfall dependent** and flows depend on the mine-water volumes within the workings.

There is **no physical upper limit** to the volume abstracted. This means that extreme rainfall events across the coalfield area could result in abstracted flows being higher than the maximum value recorded to date. In a similar way, if there are fundamental changes to flow paths in the abandoned coal mines (through roof falls etc.) then higher flows could occur.

The abstraction into the MWTS has run continuously since the MWTS construction.

Flows typically range from 5l/s -25l/s for the upper East Bank Abstraction. The lower West bank abstraction is typically between 6l/s and 15l/s. As mentioned earlier, variations in climate/ mine workings resulted in high flows passing through the scheme at the end of 2018 (Figure 2). Due to the flows being dependent on rainfall we ask that this be the basis for our abstraction licence

volumes. If this is not possible, we ask that the maximum recorded site flow of 29l/s (East bank-1 and 2) and 19l/s (West bank- 3)

The abstraction is **non-consumptive**, and following treatment, all the abstracted water is returned to Afon Corrwg. If the mine water is no longer captured into the treatment scheme then flows will naturally return to the Afon Corrwg. This would result in the iron rich mine water entering the river.

8.5 Please list the evidence you are providing to support your application

An excel spreadsheet entitled Corrwg Data has been included with this application. The excel spreadsheet shows the flow volumes measured at the two weirs.

Photos of the abstraction, treatment scheme and scheme discharge are also included in the appendices of this document.

9 Discharge Details

The site operates under two discharge consents:

- BP0310101 relates to Corrwg MWTS (East Bank) and states that 'the volume of the Discharge shall not exceed 1,426 cubic meters per day". This Upper Consented Discharge serves only the Upper part of the scheme, comprising reedbeds A to D, and treating the two discharges upwelling on the east bank.
- BP0310201 relates to Corrwg MWTS (West Bank) and states that 'the volume of the Discharge shall not exceed 4,675 cubic meters per day". This Lower Consented Discharge serves the whole scheme.

The scheme is non-consumptive and 100% of the water abstracted is discharged into the Afon Corrwg.

16 Licence Duration

The mine water will require treatment until water quality is significantly improved. Abstraction and treatment of the water is therefore likely to continue for >25 years. Due to this we ask that the licence be granted for the maximum permitted period of 18 years. However, we are also content if NRW choose to apply the common end date for the catchment.

As indicated above (response to 8.4) the abstraction into the MWTS can be physically stopped. However, this would result in the mine-water discharges returning to their original, natural, flow path and untreated mine water then then flow into the Afon Corrwg.

Appendix A: Corrwg Mine Water Treatment Scheme

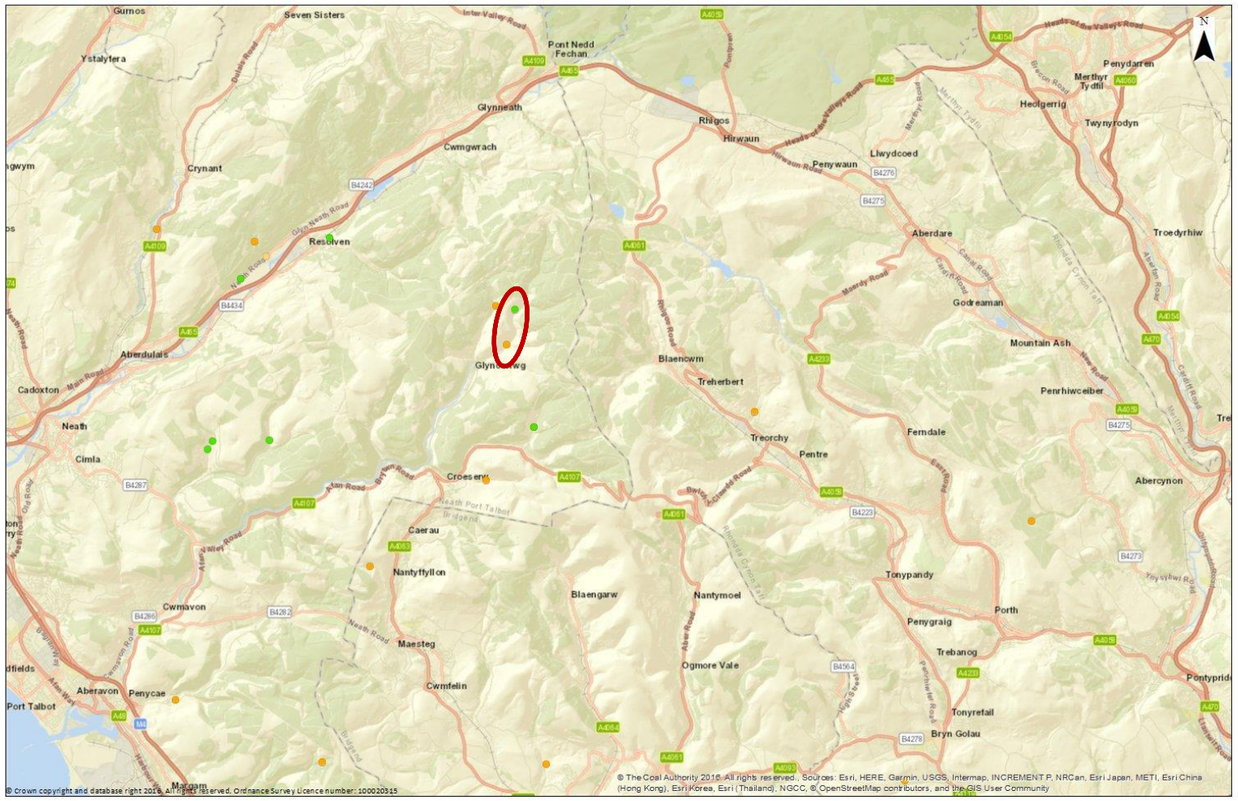
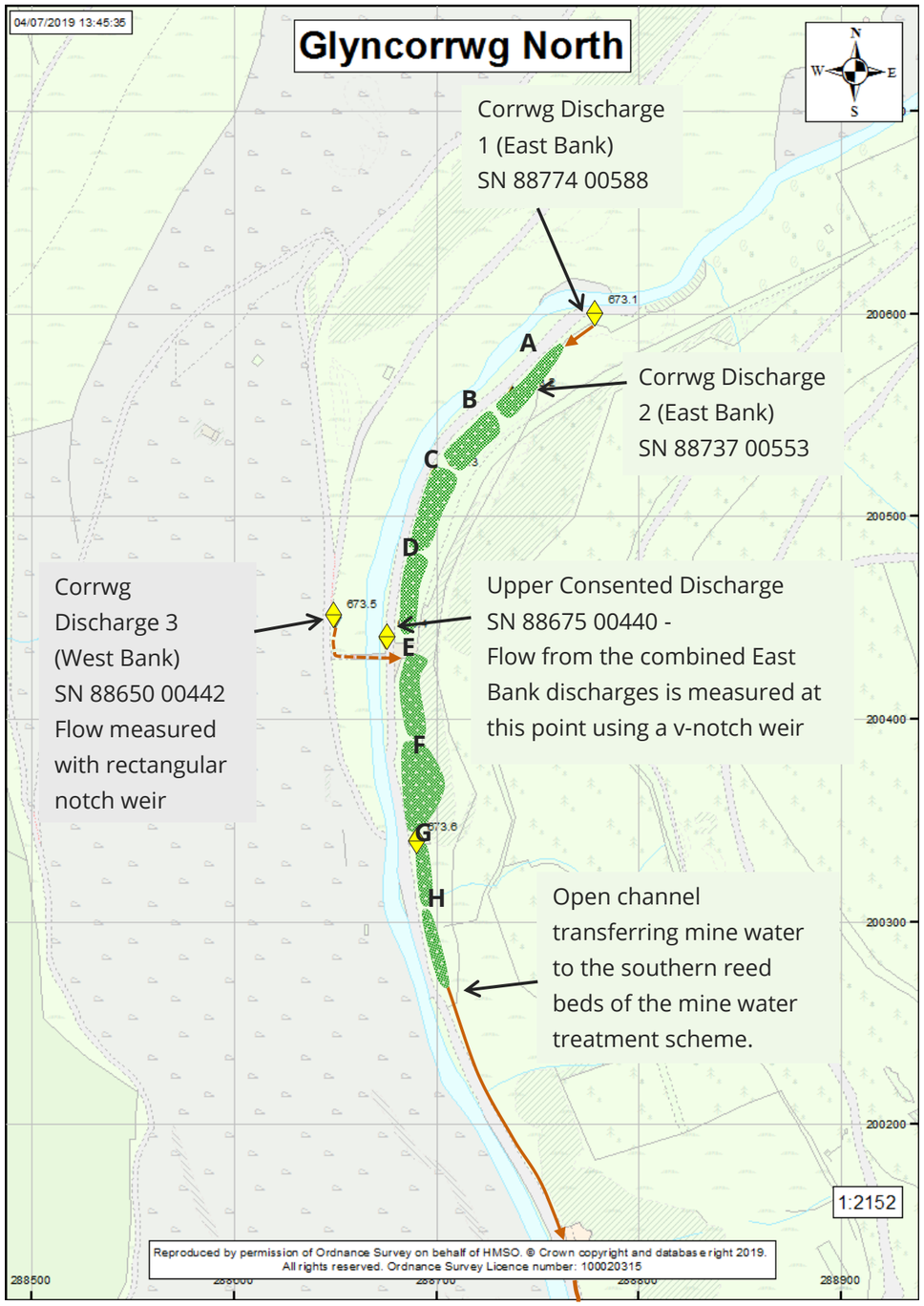
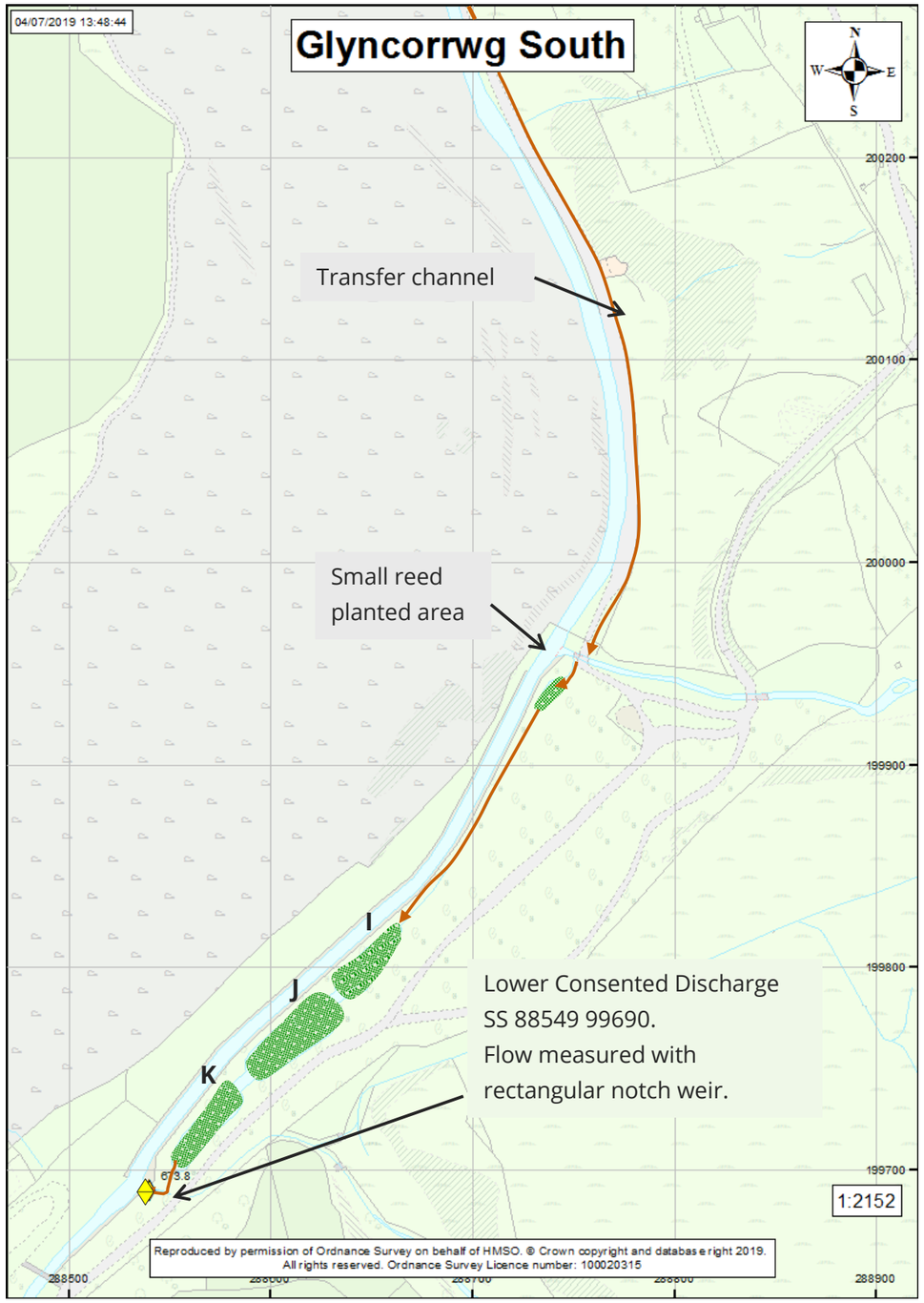


Figure A1: Corrwg Site Location Map; site circled in red.

Figure A2: Site plan of Corrwg; Yellow diamonds indicate scheme monitoring points.





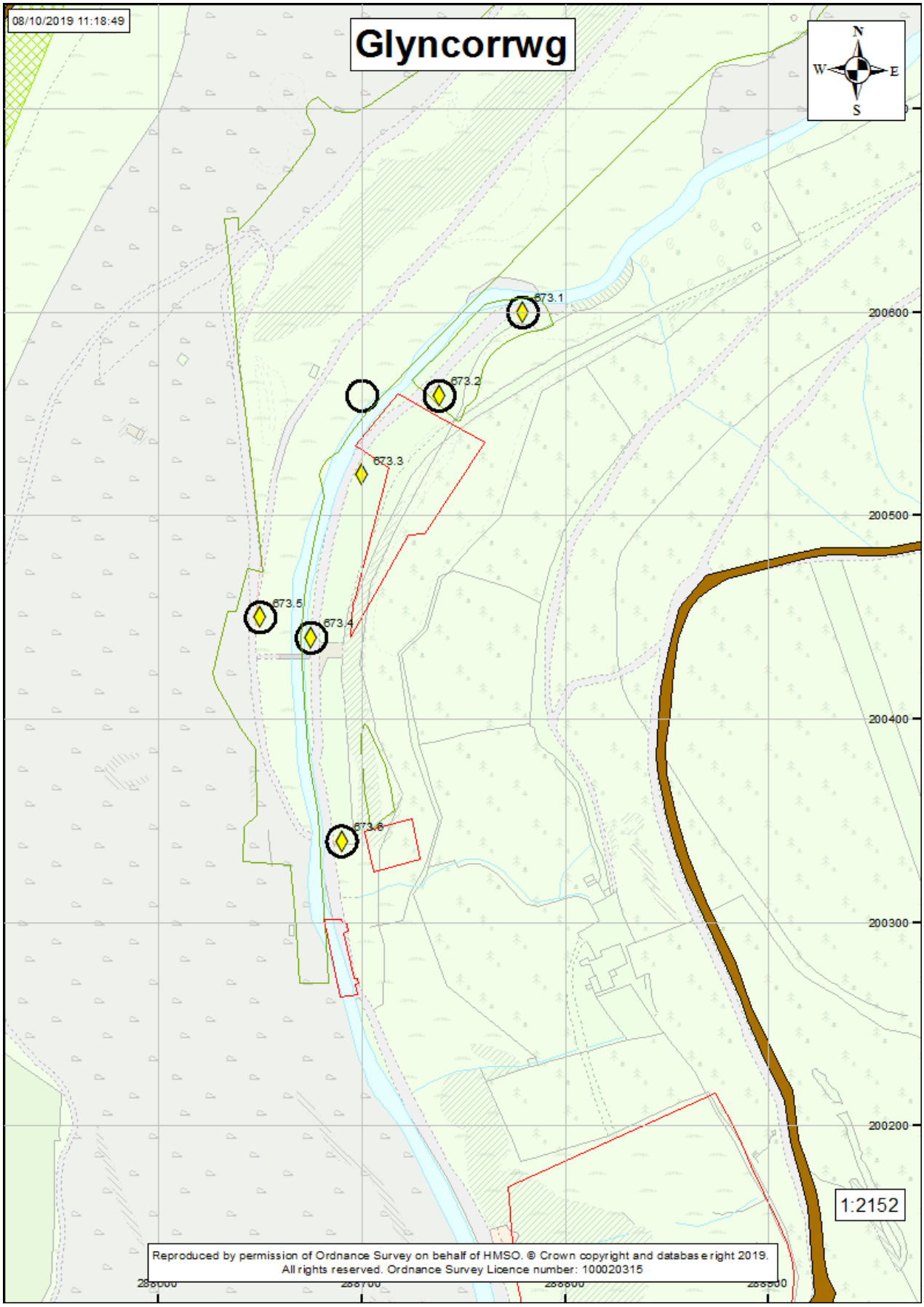


Figure A3: Property outline for Corrwg. The area ringed in red indicates owned property. Green outlines indicate leased land. .

Appendix B: Corrwg MWTS Site Photos

Figure B1: Photos show the East Bank discharges. Left: Discharge 1 is the main source of mine water from the East Bank. Right: Discharge 2 which flows intermittently, and is seen here during a period of no flow, during the summer months.

Figure B2: Photos showing measurement weirs. Left: the v-notch measuring the combined flows of the East bank discharges at the Upper Consented Discharge. Right: the rectangular notch weir measuring flows at Discharge 3, West bank.

Figure B3: Photos. Left: one of the blockstone aeration cascades at site. Right: some of the reedbeds used to remove iron from the mine water.

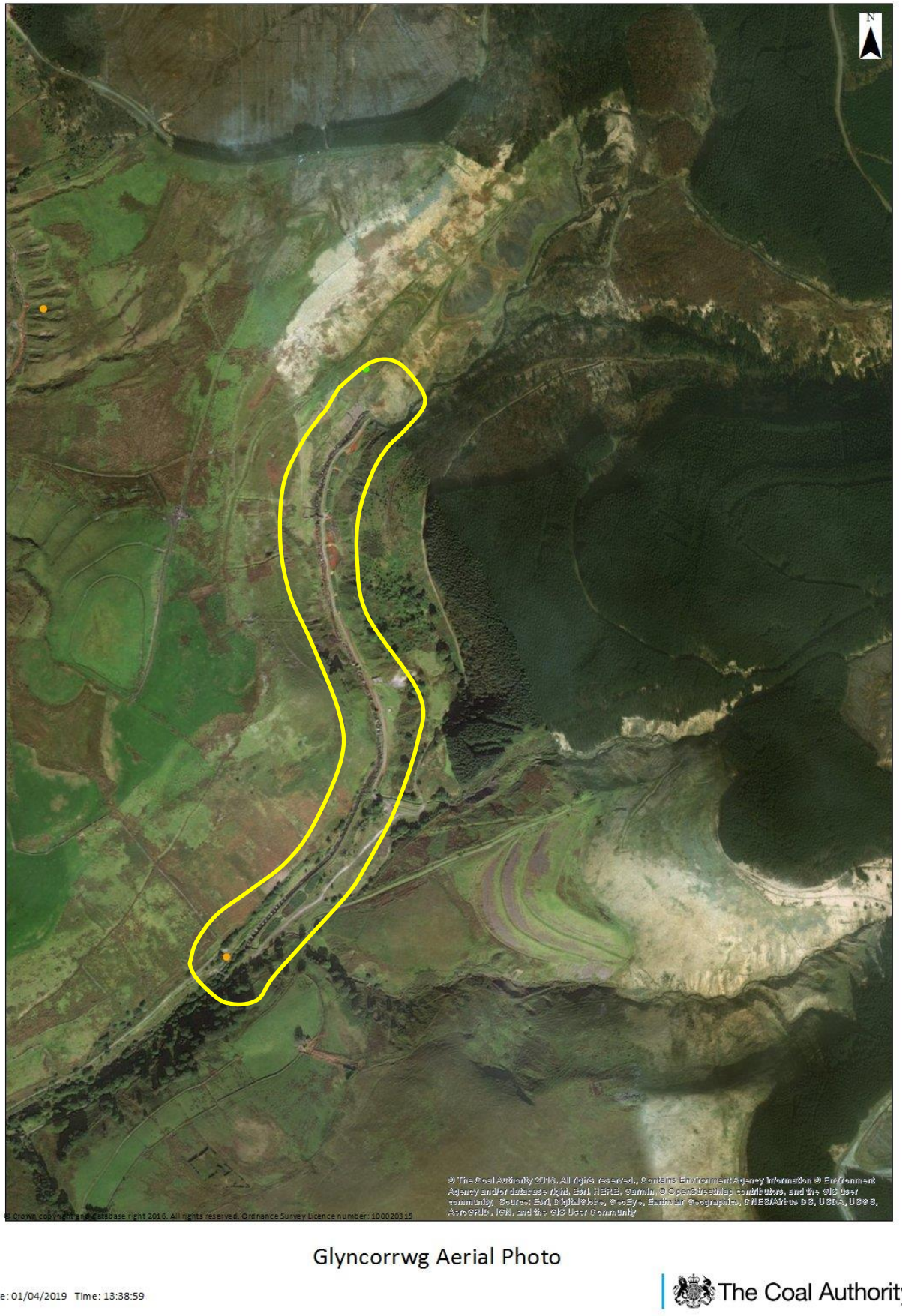


Figure B4: Aerial image of Corrwg Mine Water Treatment Scheme (MWTS)

Appendix C: Scheme as built drawings

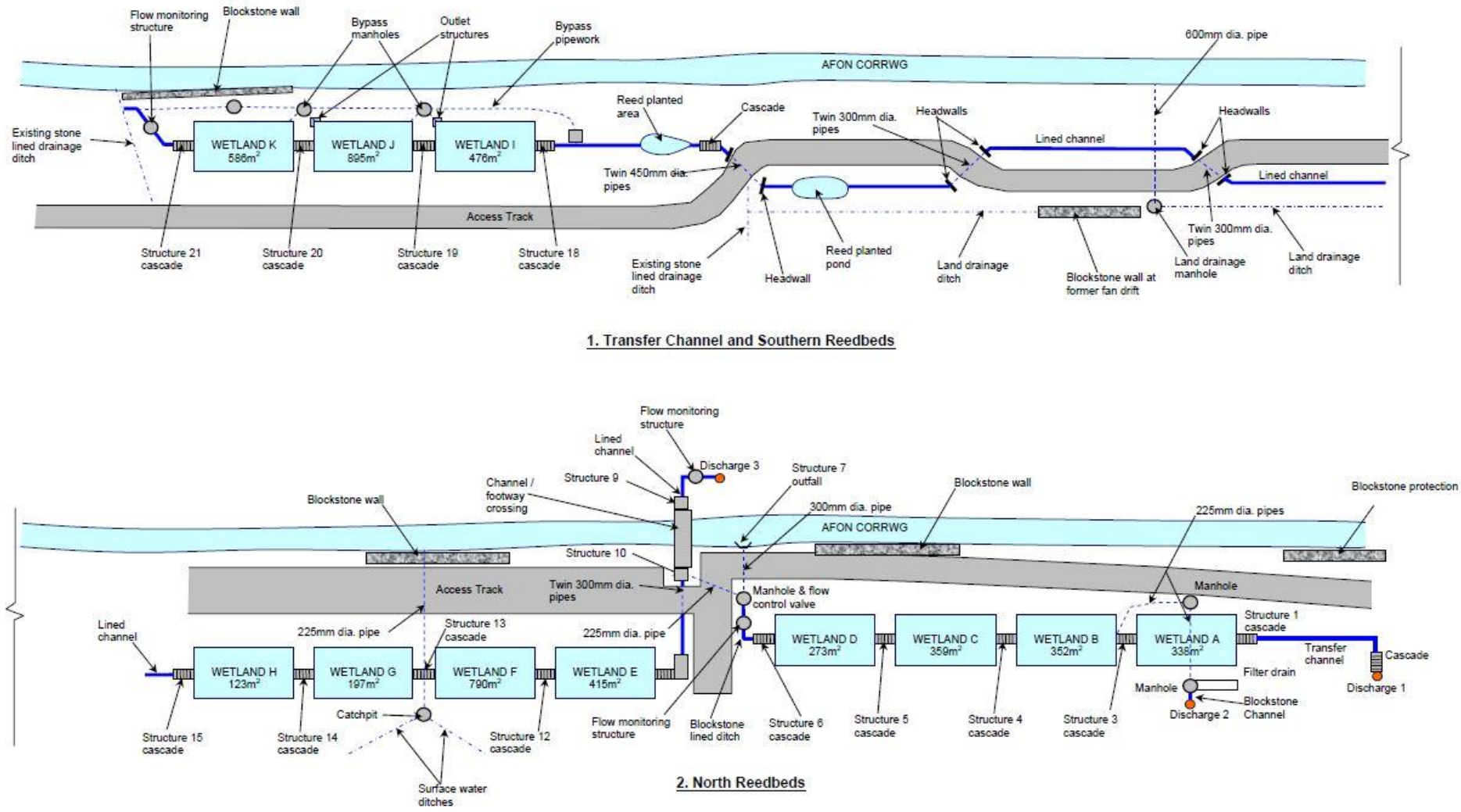


Figure C1: Diagram of the scheme layout.