Technical Note

CLIENT:	**Breedon Trading Limited**
PROJECT:	**Taffs Well Quarry**
SUBJECT:	**Transfer Abstraction Licence**
JOB NO.:	**ST19539**
DATE:	**7 November 2024**
PREPARED BY:	**Amelia Ebanks – Hydrogeologist** **Bethan Joule – Principal Hydrogeologist**
REVIEWED BY:	**Rik Ingram – Technical Director Hydrogeology**
APPROVED BY:	**Rik Ingram – Technical Director Hydrogeology**

1 INTRODUCTION

1.1 Background

1.1.1 Wardell Armstrong LLP (WA) has been appointed by Breedon Trading Limited (Breedon) to submit an application to Natural Resources Wales (NRW) to vary Breedon's consumptive abstraction licence (Licence No: 21/57/25/0047/V006) for Taffs Well Quarry (the Site). A Site location plan is presented in Drawing No. ST19539-013. The intention is to increase the abstraction rates and to vary the abstraction means and purpose set out in the original abstraction licence. The abstracted water will be transferred to the quarry sump and then discharged to the River Taff or if the water is clean (i.e., not requiring settlement) it will be discharged directly to the River Taff under the current discharge consent (Consent Number: AN0222302). The licence history is presented in Table 1.

Table 1: Licence History

Licence Serial Number	Issue & Effective Date	Summary for Changes
21/57/25/0047	01/02/1968	Original licence issued to Steetley Dolomite (Quarries) Limited
21/57/25/0047/V001	29/12/1969	Licence transferred to Steetley (Mfg) Limited Minerals Division
21/57/25/0047/V002	01/01/1987	Licence transferred to Steetley Quarry Products Limited
21/57/25/0047/V003	25/11/1992	Licence transferred to Redland Aggregates Limited
21/57/25/0047/V004	01/04/1999	Licence transferred to RMC Aggregates (UK) Limited
21/57/25/0047/V005	10/12/2007	Licence transferred to Cemex UK Materials Limited
21/57/25/0047/V006	21/06/2023	Licence transferred to Breedon Trading Limited

1.2 Purpose of Technical Note

1.2.1 WA made a pre-application enquiry to Natural Resources Wales (NRW) on 25 April 2023 to seek confirmation of the application type required (Appendix 1). NRW responded to this enquiry on 6 June 2023 confirming that two options are available:

> *Option 1: "You can apply to vary existing full abstraction licence 21/57/25/0047 for the changes proposed if the existing abstraction point at ST 1184 8235 and the proposed new abstraction point from the Garth Mine are both abstracting water from the same source of supply, such as the same underground strata. Each point of abstraction will need to be reflected within the varied full abstraction licence."*
>
> *Option 2: "We believe that your proposal could meet the criteria for a transfer abstraction licence (if both points of abstraction are from the same source of supply), providing that water is being transferred between two sources of supply with no intervening use. As such, you could apply for a new transfer abstraction licence to regulate the changes proposed."*

1.2.2 Breedon's intention is to pursue Option 2 and therefore to surrender the current abstraction licence (Licence No: 21/57/25/0047) and to apply for a new Transfer Abstraction Licence. This Technical Note provides information supporting that application.

1.2.3 As part of the pre-application consultation NRW also advised that:

> *"As the proposal involves an increase to the existing rates of abstraction you will need to apply for a Groundwater Investigation Consent (GIC) in the first instance."*

1.2.4 This is also discussed in the following Technical Note.

1.3 Contents

1.3.1 The sections in this technical note provide information supporting the application form for a transfer licence. The sections of the report and corresponding questions on the application form are as follows:

- Calculations and supporting information; and

- Other abstractors/water users

1.3.2 Information related to questions not listed above is provided in the form.

2 PROPOSED ABSTRACTION

2.1 Background

2.1.1 Breedon were granted planning permission (reference: 20/02351/MJR) on 12 September 2023 to allow the lateral extension and deepening of Taffs Well Quarry. There are a proposed 21 phases of work (see Drawing No. ST18210-002, ST18210-003, ST18210-004 and ST18210-005). The phases can be divided into three general 'stages' of work:

1. deepening works involving the excavation of limestone from the base of the void and lower benches of the southern and western side slopes (Phases 1 to 9);
2. lateral extension involving the excavation of limestone from the north west of the Site to 120 mAOD, infilling the base of the void whilst extending the base further westwards (Phases 10 to 15);
3. excavation of limestone from the upper benches of the northern and western side slopes to extend to the base of the void (Phases 16 to 21). Following the completion of Phase 21, the Site will be restored.

2.1.2 There are historic underground mine workings in the north-western corner of the quarry, in the proposed lateral extension area. The historic mine workings are now flooded (underground 'lakes') and could provide a further source of perched groundwater. Water levels within the underground 'lakes' are maintained by an adit at 91 mAOD, which drains away from the Site to the north into an unnamed watercourse and no ingress of water into the void has been observed during the ongoing quarrying works[1].

2.1.3 The proposed extension works in the north-western corner of the quarry will extract limestone to a maximum depth of 120 mAOD, which is approximately 15 m above the 105 mAOD upper extent of the mine workings. The flooded workings will therefore

[1] Wardell Armstrong, September 2020. Flood Consequences Assessment (Report Reference: ST18210/001/V2.0/FINAL)

not be exposed as part of the works and the adit will not be removed and will continue to drain water away from the Site.

2.1.4 The current deepening workings (stage 1) have intercepted groundwater levels within the quarry floor, with the deepest point being 30 mAOD. It is worth noting that Breedon have submitted another planning application (reference: 24/00306/VAR) for the further deepening of the main quarry void to a maximum depth of -6mAOD. Water also enters the quarry operations through direct rainfall, surface water runoff from surrounding land and groundwater seepage from quarry faces, which either runs to the quarry sump or infiltrates into the ground. Water in the historic mine workings may be encountered during lateral extension (stage 2) or further deepening. To enable this water source to be controlled, this water would be abstracted under the variation being applied for. Clean water (i.e., not requiring settlement) would be discharged directly into the River Taff. Water requiring settlement would be transferred to the quarry sump. The water in the quarry sump is abstracted via a pump under licence WA/057/0025/0015 and discharged to the River Taff.

2.2 Proposed Abstraction

2.2.1 The purpose of the new Transfer Abstraction Licence is to dewater the old mine workings both prior to and during quarrying works, with a maximum abstraction rate not exceeding 1,330m^3 per day. The details of the new Transfer Abstraction Licence compared with the existing abstraction licence are outlined in Table 2 below.

Table 2: Variation to Existing Licence

Item	Existing Licence (ref. 21/57/25/0047)	Transfer Abstraction Licence
Source of supply	Underground strata, old mine workings, in Pentyrch, Cardiff.	No change.
Point of abstraction	National Grid Reference (NGR) ST 1184 8235.	No change.
Means of abstraction	A pump with maximum output not exceeding 45.46 m^3 per hour (10 hour operation).	A pump with maximum output not exceeding 56 m^3 per hour (24 hour operation).
Purpose of abstraction	Industrial: for aggregate washing, cooling water in crushers, and dust suppression/washing lorries.	Dewatering from old mine workings (no consumptive use).
Period of abstraction	All year.	No change.
Maximum quantity of water to be abstracted during the specified period	454.6 m^3 per day. 136,380 m^3 per year.	1,330 m^3 per day.

2.2.2 The Site is not currently abstracting water from the old mine workings under Abstraction Licence Number 21/57/25/0047. Abstraction from mine workings used to be via a pipeline through the Little Pit. Gunn[2] estimated that the surface area of the underground reservoir as 1,850 m^2 with a total volume (down to 25 mAOD) of 120,000 m^3. There has been no adverse impact on water levels in the mine pit as a result of stopping abstraction.

2.2.3 In 1926, the underground 'lakes' in the mines were pumped dry over 18 months at a rate of 273 m^3 per hour[3] (6,552 m^3/d).

2.2.4 Breedon would like to ensure that the groundwater levels in the old mine workings are controlled during the proposed quarrying works. Taking into consideration the mine water abstraction history, a rate of 56 m^3 per hour is considered to be sufficient to control the groundwater levels throughout the quarrying works.

2.2.5 The abstracted water from the mine workings will be transferred into the quarry sump. The water in the quarry sump will be abstracted under Abstraction Licence Number WA/057/0025/0015, which has a maximum abstraction quantity of 255.5 m^3 per hour, 6,090 m^3 per day and 643,770 m^3 per year. The current actual rate of dewatering under this licence is approximately 3,000 m^3 per day from the quarry sump meaning that with the additional 1,330 m^3 per day from the old mine workings, the maximum abstraction quantity would not be exceeded.

2.2.6 The abstracted water will be discharged to the River Taff under the current downstream discharge consent (Consent Number: AN0222302) located at NGR ST 12720 82270. The upstream discharge consent (Consent Number: AN0222301), located at NGR ST 12600 82800, is currently not used. The discharge consents do not have a maximum discharge volume.

[2] Gunn Engineering & Environmental Consultancy (2002). Survey of Underground Workings at Garth Iron Mine, Taffs Well Quarry, Nr Cardiff

[3] Wardell Armstrong, October 2020. Hydrogeological Impact Assessment (Report Reference: ST18210/002/V2.0/FINAL)

3 GROUNDWATER INVESTIGATION CONSENT (GIC)

3.1 Introduction

3.1.1 As outlined on the NRW website[4], the primary objectives of a GIC are to establish whether:

- *there is groundwater is present, and*
- *what effect abstracting groundwater would have on the environment*.

3.2 Groundwater Presence

3.2.1 Given that the purpose of the of the proposed abstraction is to dewater the old mine workings and transfer the water to existing quarry sump, it is not considered necessary to establish whether groundwater is present. Historic abstraction under Licence Number 21/57/25/0047 has demonstrated that groundwater is present and records from 1926 cited above demonstrate that it is possible to extract groundwater at a rate of up to 273 m^3 per hour, which is significantly in excess of the proposed abstraction rate.

3.3 Impact Assessment

3.3.1 This section provides further detail for NRW Form WFD, specifically the 'calculations and supporting information' and 'other abstractors / water users' questions.

3.3.2 The range of potential impacts on the water environment associated with the proposed abstraction is well established. Many of these potential impacts can be avoided by good design and standard mitigation measures. These impacts can be grouped as summarised in Table 2 below.

[4] NRW (2024) Prepare an Application for a Groundwater Investigation Consent [online] Accessed: 21/08/2024 Available at: https://naturalresourceswales.gov.uk/permits-and-permissions/water-abstraction-and-impoundment/groundwater-investigation-consent/?lang=en#:~:text=You%20do%20not%20need%20a%20consent%20to%20investigate,an%20abstraction%20licence%20to%20continue%20to%20abstract%20groundwater.

Table 2: General Impacts Associated with the Proposed Abstraction	
Types of Impact	**Typical Mitigation Measures**
Extraction Phase	
Impacts from Proposed Abstraction	
Impacts of water levels on spring flows	Re-introduce water back to the aquifer system.
Impacts on habitats (ecological) sensitive to shallow groundwater levels in the vicinity of springs	
Impacts on water quantity on nearby abstractions	
Impacts on baseflow in watercourses sourced from springs draining Carboniferous Limestone	

3.3.3 A Radius of Influence (ROI) of 504 m was calculated for the proposed transfer abstraction located at NGR ST 1184 8235 using estimated recharge and the proposed abstraction rate (see Appendix 2). Within the ROI, the only potential receptors identified are the limestone groundwater body and the spring (S1) to Cwmrhyddgoed (see Drawing No. ST19539-011).

3.3.4 There are no licenced groundwater abstractions, private water supplies, surface water features or designated sites within the ROI.

3.3.5 The drawdown within the Carboniferous Limestone principal aquifer will be localised around the mine workings. Any impact will be minimal in comparison to the size of the aquifer. The overall balance of the groundwater in the aquifer will be unaffected because the abstracted water will be returned to the River Taff, which is in hydraulic connection with the groundwater.

3.3.6 The spring to Cwmrhyddgoed is located up hydraulic gradient of the quarry, coincides with a fault and geological boundary and is likely to be supported by preferential pathways along the fault (north-south trending). Due to the fractured nature of the limestone, there is still the potential of an impact on the spring however this is anticipated to be low.

3.4 Monitoring

3.4.1 The Site has an established monitoring scheme linked to the site planning permission. The monitoring scheme comprises eight monitoring boreholes (BH1 to BH6, BHF and BHH) and can be seen in Appendix 3 and Drawing No. ST19539-012. The scheme is intended to monitor the impact of quarrying and dewatering on both local groundwater levels and baseflow contribution to the River Taff. Monthly groundwater level monitoring data from September 2012 to August 2024 is available for BH1, BH2,

BH4, BH5, BHF and BHH. Monthly groundwater level monitoring data from September 2012 to May 2019 is available for BH3. Groundwater level monitoring in BH6 commenced in April 2023, so data for April and August 2024 is available.

3.4.2 The water abstracted from the mine workings under the proposed Transfer Abstraction Licence would be transferred to the quarry sump. The rate of transfer abstraction would be measured using a calibrated flow meter. The quarry sump is dewatered under Abstraction Licence Number: WA/057/0025/0015. During dewatering activities, monitoring includes recording daily pumping rates from the sump using a telemetry flow meter and hourly groundwater elevation monitoring in BH5.

3.4.3 Groundwater level monitoring will be continued during mineral extraction and following the completion of mineral extraction until restoration has been completed according to the approved planning permission.

3.5 Summary

3.5.1 It is concluded that a Groundwater Investigation Consent would not be necessary for the purpose of applying for a new Transfer Abstraction Licence in this case because the rate of groundwater abstraction has been proven, sensitive receptors are very unlikely to be affected by the proposed changes in abstraction rate and a groundwater monitoring scheme is already in place.

4 CONCLUSION

4.1.1 Based on the information presented above, the presence of groundwater has been established and that the impacts of abstracting groundwater on the environment have been assessed. It is considered that any potential impacts on the environment caused by the proposed abstraction will not affect sensitive receptors.

APPENDIX 1

NRW Pre-Application Response

Ebanks, Amelia

From: Cowell, Alex <alex.cowell@cyfoethnaturiolcymru.gov.uk>
Sent: 06 June 2023 15:53
To: chloe.parker@breedongroup.com
Cc: Joule, Bethan
Subject: PPN-01032 - Pre-application response

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon,

Many thanks for your pre-application enquiry received 25/04/2023, please see NRW response below.

Application type required

Option 1

You can apply to vary existing full abstraction licence 21/57/25/0047 for the changes proposed if the existing abstraction point at ST 1184 8235 and the proposed new abstraction point from the Garth Mine are both abstracting water from the same source of supply, such as the same underground strata. Each point of abstraction will need to be reflected within the varied full abstraction licence.

Option 2

We believe that your proposal could meet the criteria for a transfer abstraction licence (if both points of abstraction are from the same source of supply), providing that water is being transferred between two sources of supply with no intervening use. As such, you could apply for a new transfer abstraction licence to regulate the changes proposed.

Licencing guidance

The differences between full and transfer licence which you need to be aware of are as follows:

	Full Licence	**Transfer Licence**
Application Fee*	£135	£1500
Subsistence Fee*	Required – Please see NRW website here.	None
Licenced abstraction quantities	Included on licence	Not Routinely included on licence
Reporting and recording requirements	Included on licence	Not Routinely included on licence
Protected right?	Yes	No

*Please note that our fees and charges are subject to regular review and change, please refer to our website for updates.

The application forms for both options are form WRA (your details) and form WRD (about the abstraction), found on the NRW website here. We will make a decision on either application within 4 months of receiving a complete (valid) application if advertising is needed, or 3 months if advertising is not needed. It is likely that any formal application will be subject to advertisement.

Hands off Flows (HoFs) or Hands of Levels (HoLs)

For non-consumptive licences, where water is returned close to the point of abstraction, there is no need to protect flows at a wider catchment level. These licences may still be restricted to protect flows between the point of abstraction and the point of discharge. The level of the restriction will depend on the site-specific conditions. Each application will be dealt with on a case by case basis.

Other

As the proposal involves an increase to the existing rates of abstraction you will need to apply for a Groundwater Investigation Consent (GIC) in the first instance.

Information on applying for a Groundwater Investigation Consent can be found on the NRW website here. You must carry out a detailed, accurate desk study and field survey of all the water features in the area around your proposal. We will require a 2km radius for the survey to cover the potential karst nature of the limestone in the area.

A Hydrological Impact Appraisal (HIA) is required to support either an application to vary the existing full abstraction licence or for an application for a new transfer abstraction licence. You can use the results of the GIC to produce a HIA to submit with either formal application.

Licence Transfer

Please note that full abstraction licence 21/57/25/0047 will need to be transferred to Breedon Trading Ltd prior to progressing with the following licencing advice above.

If you have any questions, please don't hesitate to contact me on the details below.

Kind regards,
Alex

Swyddog Trwyddedu Adnoddau Dwr | Water Resources Permitting Officer
Cyfarwyddiaeth Tystiolaeth, Polisi a Thrwyddedu | Evidence, Policy and Permitting Directorate
Rhif ffôn | Phone number 0300 065 3888
Rhagenwau Ef/Ei | Pronouns His/Him

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi.
Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.

APPENDIX 2

Abstraction Radius of Influence Calculation

Data from National River Flow Archive Monitoring Point 57003 - Taff at Tongwynlais
NGR ST 131828 - (https://nrfa.ceh.ac.uk/data/station/info/57003)

$$effective\ rainfall = \frac{mean\ average\ flow}{catchment\ area}$$

mean average flow	21.37	m3/s
catchment area	4.87E+08	m2
effective rainfall	4.38961E-08	m/s
	1385.26	mm/yr

$$recharge = effective\ rainfall * baseflow\ index$$

effective rainfall	1385.26	mm/yr
baseflow index	0.44	
recharge	609.51	mm/yr

$$area\ of\ influence = \frac{abstraction\ rate}{recharge}$$

abstraction rate	1330	m3/d
recharge	1.67E-03	m/d
area of influence	796999	m2
area of influence	7.97E-01	km2

$$area\ of\ influence = \pi(radius\ of\ influence)^2$$

area of influence	7.97E-01	km2
radius of influence	0.504	km

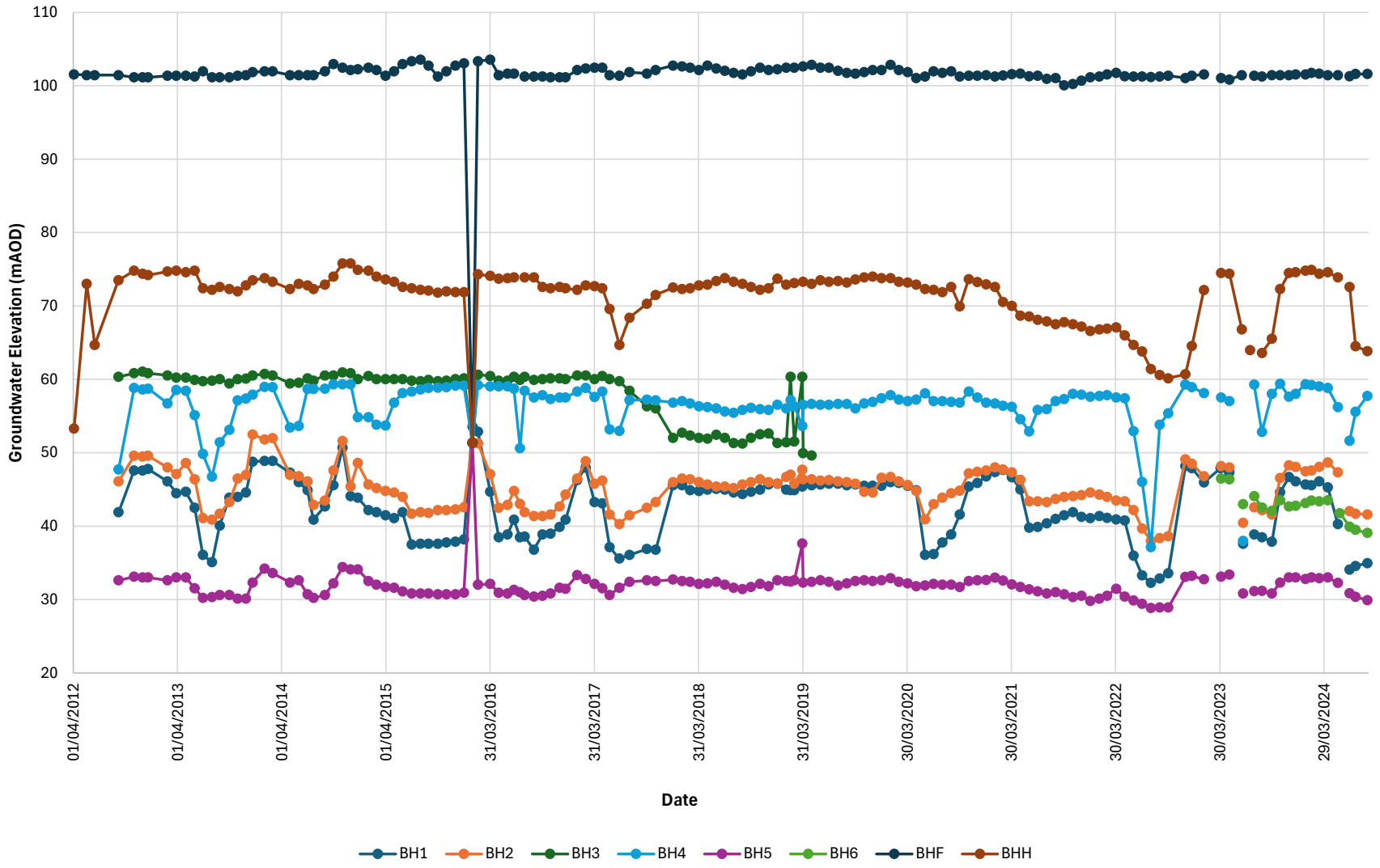
APPENDIX 3

Groundwater Elevation Data

Groundwater Elevation (mAOD)								
Date	**BH1**	**BH2**	**BH3**	**BH4**	**BH5**	**BH6**	**BHF**	**BHH**
03/04/2012							101.54	53.29
18/05/2012							101.44	72.99
15/06/2012							101.44	64.69
06/09/2012	41.88	46.09	60.33	47.73	32.62		101.44	73.49
31/10/2012	47.58	49.59	60.83	58.83	33.12		101.14	74.79
30/11/2012	47.58	49.49	61.03	58.63	33.02		101.14	74.39
19/12/2012	47.78	49.59	60.83	58.73	33.02		101.14	74.19
25/02/2013	46.08	47.99	60.53	56.73	32.62		101.34	74.69
28/03/2013	44.48	47.09	60.23	58.56	33.02		101.34	74.79
30/04/2013	44.68	48.59	60.23	58.43	33.02		101.34	74.59
31/05/2013	42.48	46.39	59.93	55.13	31.52		101.24	74.79
29/06/2013	36.08	41.09	59.73	49.83	30.22		101.94	72.39
31/07/2013	35.08	40.89	59.83	46.73	30.32		101.14	72.19
27/08/2013	40.08	41.69	60.03	51.43	30.62		101.14	72.59
30/09/2013	43.88	43.29	59.43	53.13	30.62		101.14	72.29
29/10/2013	43.98	46.49	60.03	57.13	30.12		101.34	71.99
27/11/2013	44.58	46.99	60.10	57.40	30.12		101.44	72.79
20/12/2013	48.78	52.49	60.53	57.93	32.32		101.84	73.49
31/01/2014	48.88	51.82	60.73	58.96	34.22		101.94	73.79
28/02/2014	48.88	51.99	60.53	58.93	33.62		101.94	73.29
30/04/2014	47.28	46.99	59.43	53.43	32.32		101.44	72.29
31/05/2014	45.98	46.79	59.53	53.63	32.62		101.44	72.99
30/06/2014	44.88	46.09	60.13	58.68	30.72		101.44	72.79
21/07/2014	40.88	42.89	59.83	58.68	30.22		101.44	72.29
30/08/2014	42.68	43.49	60.53	58.73	30.62		101.94	72.89
29/09/2014	45.58	47.59	60.53	59.33	32.22		102.94	73.99
31/10/2014	50.68	51.59	60.93	59.33	34.42		102.44	75.79
28/11/2014	44.08	45.39	60.83	59.33	34.12		102.14	75.79
23/12/2014	43.88	48.59	60.03	54.83	34.12		102.24	74.89
30/01/2015	42.18	45.69	60.43	54.83	32.52		102.44	74.79
27/02/2015	41.88	45.19	60.03	53.83	32.02		102.14	73.99
30/03/2015	41.48	44.79	60.03	53.73	31.72		101.34	73.59
29/04/2015	41.08	44.59	60.03	56.83	31.62		101.94	73.29
29/05/2015	41.88	43.99	60.03	58.13	31.12		102.94	72.59
30/06/2015	37.48	41.69	59.83	58.33	30.82		103.34	72.39
31/07/2015	37.58	41.89	59.73	58.63	30.82		103.54	72.19
28/08/2015	37.58	41.79	59.93	58.83	30.82		102.74	72.09
30/09/2015	37.58	42.19	59.73	58.88	30.72		101.24	71.79
30/10/2015	37.78	42.19	59.83	58.93	30.72		101.94	71.99
30/11/2015	37.88	42.29	60.03	59.13	30.72		102.74	71.89
30/12/2015	38.18	42.59	60.13	59.13	30.92		103.04	71.89
29/01/2016	53.53	51.34	51.34	51.34	51.34		51.34	51.34
17/02/2016	52.88	51.29	60.63	59.23	32.02		103.34	74.29
31/03/2016	44.68	47.09	60.43	59.03	32.12		103.54	74.09
30/04/2016	38.48	42.49	59.83	59.03	30.92		101.44	73.69
31/05/2016	38.88	42.89	59.83	59.03	30.82		101.64	73.79
22/06/2016	40.88	44.79	60.33	58.73	31.32		101.64	73.89
13/07/2016	38.46	43.04	59.93	50.63	31.02			
30/07/2016	38.58	41.89	60.33	58.43	30.62		101.24	73.89
31/08/2016	36.78	41.39	59.93	57.53	30.42		101.24	73.89
30/09/2016	38.88	41.39	60.03	57.83	30.52		101.24	72.59
28/10/2016	38.98	41.59	60.13	57.33	30.82		101.14	72.39
29/11/2016	39.88	42.69	60.13	57.53	31.62		101.14	72.59
20/12/2016	40.88	44.29	60.03	57.53	31.47		101.14	72.39
30/01/2017	46.28	46.49	60.53	58.33	33.32		102.14	72.19
28/02/2017	47.98	48.84	60.53	58.83	32.82		102.34	72.79
31/03/2017	43.28	45.79	60.03	57.58	32.12		102.44	72.69
28/04/2017	43.08	46.19	60.43	58.33	31.52		102.44	72.39
23/05/2017	37.13	41.60	60.03	53.18	30.62		101.44	69.59
26/06/2017	35.58	40.29	59.73	52.98	31.62		101.34	64.69
01/08/2017	36.08	41.49	58.43	57.16	32.42		101.84	68.39
01/10/2017	36.88	42.49	56.33	57.23	32.62		101.64	70.29
01/11/2017	36.78	43.29	56.03	57.13	32.52		102.14	71.49
01/01/2018	45.58	45.99	52.03	56.83	32.72		102.74	72.49
01/02/2018	45.58	46.49	52.73	57.03	32.52		102.64	72.29
01/03/2018	44.88	46.39	52.33	56.73	32.42		102.44	72.39
01/04/2018	44.78	45.99	52.03	56.33	32.12		102.14	72.79
01/05/2018	44.98	45.69	51.93	56.23	32.22		102.74	72.89
01/06/2018	45.08	45.39	52.43	56.03	32.42		102.34	73.39
01/07/2018	44.98	45.39	52.03	55.63	32.02		102.04	73.79
01/08/2018	44.58	45.19	51.33	55.43	31.62		101.74	73.29
01/09/2018	44.38	45.69	51.23	55.83	31.42		101.54	72.99
01/10/2018	44.68	45.99	52.03	56.13	31.72		101.94	72.59
01/11/2018	44.98	46.39	52.53	55.93	32.12		102.44	72.19
01/12/2018	45.68	45.99	52.63	55.83	31.82		102.14	72.39
01/01/2019	45.78	45.79	51.33	56.53	32.62		102.24	73.69
01/02/2019	44.98	46.69	51.43	56.03	32.52		102.44	72.89
16/02/2019	44.88	47.03	60.33	57.16	32.44			
01/03/2019	44.88	45.79	51.53	56.33	32.62		102.44	73.09
29/03/2019	45.38	47.69	60.33	53.63	37.62			

Groundwater Elevation (mAOD)								
Date	BH1	BH2	BH3	BH4	BH5	BH6	BHF	BHH
01/04/2019	45.88	46.39	49.93	56.53	32.32		102.64	73.29
01/05/2019	45.58	46.39	49.63	56.63	32.42		102.84	72.99
01/06/2019	45.68	46.19		56.53	32.62		102.44	73.49
01/07/2019	45.78	46.29		56.53	32.42		102.44	73.29
01/08/2019	45.78	46.09		56.63	31.92		102.04	73.39
01/09/2019	45.58	45.99		56.63	32.22		101.74	73.19
01/10/2019	45.68	45.79		56.03	32.52		101.64	73.59
01/11/2019	45.48	44.69		56.73	32.62		101.84	73.89
01/12/2019	45.48	44.59		56.93	32.52		102.14	73.99
01/01/2020	45.48	46.59		57.43	32.62		102.14	73.79
01/02/2020	45.98	46.69		57.83	32.92		102.84	73.79
01/03/2020	45.88	46.09		57.23	32.42		102.14	73.29
01/04/2020	45.48	45.59		57.03	32.22		101.84	73.19
01/05/2020	44.88	44.79		57.23	31.82		101.04	72.89
01/06/2020	36.08	40.92		58.08	31.92		101.24	72.29
01/07/2020	36.18	42.99		57.03	32.12		101.94	72.19
01/08/2020	37.78	43.89		57.03	32.02		101.74	71.89
01/09/2020	38.88	44.49		56.93	32.02		101.94	72.59
01/10/2020	41.58	44.84		56.83	31.72		101.24	69.94
01/11/2020	45.38	47.19		58.33	32.52		101.34	73.64
01/12/2020	45.88	47.39		57.53	32.62		101.34	73.24
01/01/2021	46.78	47.59		56.83	32.67		101.44	72.94
01/02/2021	47.38	47.99		56.71	32.97		101.24	72.59
01/03/2021	47.64	47.71		56.39	32.60		101.39	70.55
01/04/2021	46.66	47.34		56.25	32.08		101.56	70.02
01/05/2021	45.00	46.32		54.58	31.72		101.62	68.68
01/06/2021	39.77	43.40		52.91	31.39		101.30	68.56
01/07/2021	39.88	43.39		55.83	31.12		101.34	68.09
01/08/2021	40.38	43.29		55.93	30.82		100.94	67.89
01/09/2021	40.98	43.69		57.03	31.02		101.04	67.49
01/10/2021	41.48	43.99		57.33	30.72		100.04	67.79
01/11/2021	41.88	44.09		58.03	30.32		100.24	67.49
01/12/2021	41.28	44.24		57.93	30.52		100.69	67.19
01/01/2022	41.08	44.59		57.63	29.82		101.14	66.59
01/02/2022	41.38	44.29		57.73	30.12		101.24	66.79
01/03/2022	41.13	43.99		57.83	30.52		101.54	66.89
01/04/2022	40.90	43.49		57.53	31.47		101.74	67.09
01/05/2022	40.78	43.39		57.43	30.42		101.29	65.99
01/06/2022	35.98	42.19		52.93	29.87		101.24	64.69
01/07/2022	33.28	39.69		46.03	29.42		101.24	63.79
01/08/2022	32.28	37.99		37.13	28.87		101.19	61.39
01/09/2022	32.88	38.39		53.83	28.92		101.24	60.59
01/10/2022	33.58	38.64		55.38	28.92		101.34	60.14
29/11/2022	48.18	49.09		59.28	33.07		101.04	60.69
22/12/2022	47.88	48.49		58.94	33.22		101.34	64.54
02/02/2023	45.94	46.82		58.12	32.76		101.54	72.17
01/04/2023	47.88							
03/04/2023		48.19		57.53	33.12	46.47	101.04	74.49
01/05/2023	47.33							
02/05/2023	47.33	47.99		57.03	33.42	46.37	100.84	74.39
15/06/2023							101.44	66.79
19/06/2023	37.58	40.46		37.99	30.82	43.01		
14/07/2023								63.99
28/07/2023	38.88	42.59		59.29	31.14	44.10	101.37	
24/08/2023	38.48	42.19		52.83	31.18	42.52	101.24	63.59
28/09/2023	37.88	41.59		58.03	30.82	42.07	101.44	65.51
27/10/2023	44.63	46.55		59.38	32.32	43.53	101.44	72.29
27/11/2023	46.68	48.29		57.63	33.02	42.67	101.44	74.49
20/12/2023	46.08	48.09		58.03	33.02	42.77	101.54	74.59
24/01/2024	45.68	47.49		59.33	32.82	43.12	101.54	74.79
14/02/2024	45.58	47.59		59.23	33.02	43.47	101.74	74.89
12/03/2024	46.08	48.09		59.03	32.92	43.37	101.64	74.39
11/04/2024	45.28	48.69		58.83	33.02	43.52	101.44	74.59
16/05/2024	40.28	47.34		56.23	32.27		101.44	73.89
23/05/2024						41.77		
26/06/2024	34.08	42.03		51.63	30.85	39.94	101.29	72.59
17/07/2024	34.58	41.71		55.58	30.36	39.49	101.59	64.49
27/08/2024	34.95	41.59		57.73	29.92	39.07	101.59	63.84

Groundwater Elevation from April 2012 to August 2024



DRAWINGS

DO NOT SCALE FROM THIS DRAWING

KEY

- Site Boundary
- Pit Boundary
- Breedon Trading Ltd Abstraction Licence: WA/057/0025/0015
- Breedon Trading Ltd Abstraction Licence: 21/57/25/0047
- Breedon Trading Ltd Discharge Consents
- Spring
- Mine Workings

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

BREEDON TRADING LTD

PROJECT

TAFFS WELL QUARRY

DRAWING TITLE

SITE LOCATION PLAN

DRG No.		REV
ST19539-013		A
DRG SIZE: A3	SCALE: 1:7,500	DATE: October 2024
DRAWN BY: AE	CHECKED BY: BJ	APPROVED BY: RI

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0 250 500 m

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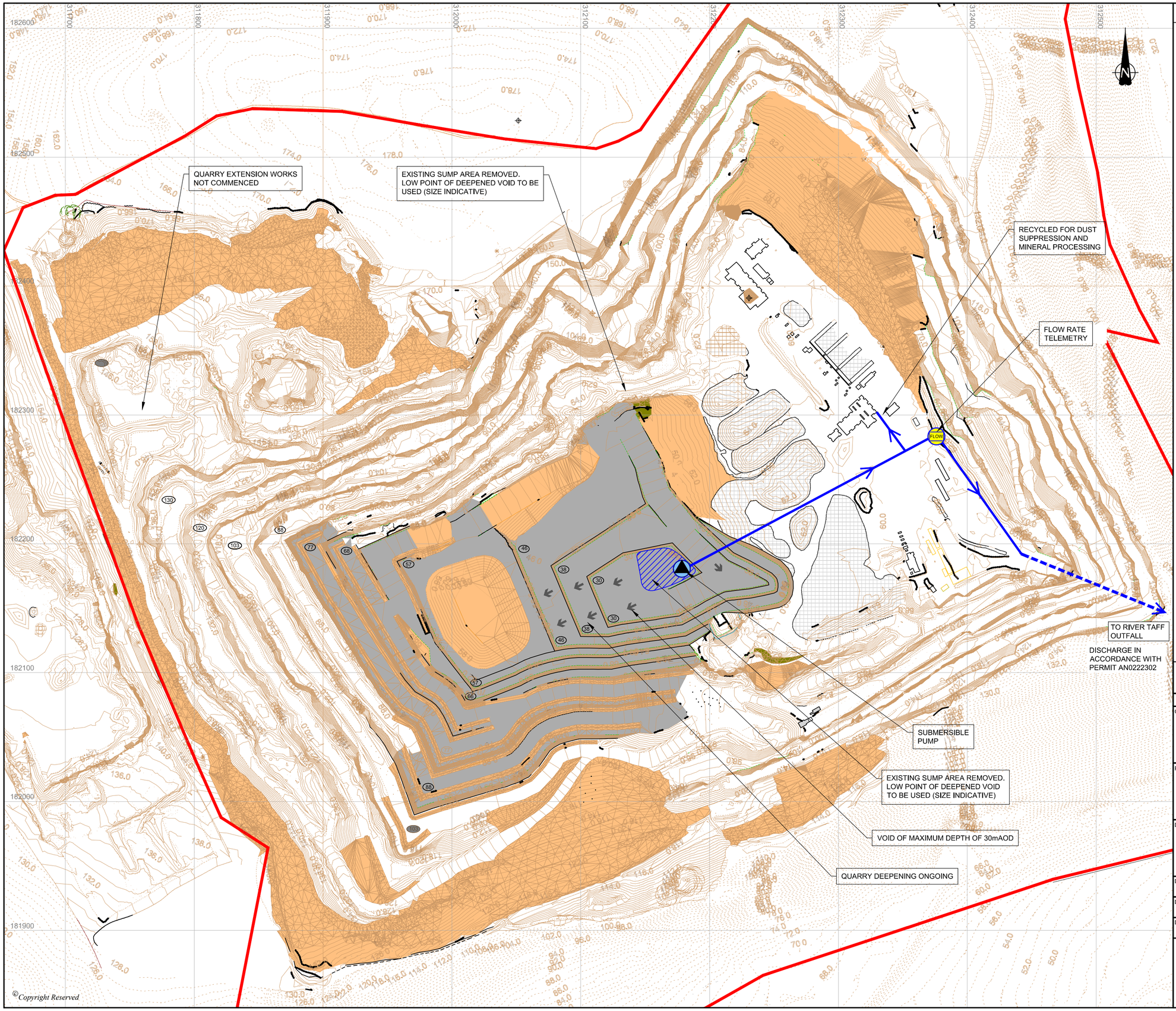

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NOTES

1. TO BE READ IN CONJUNCTION WITH FLOOD CONSEQUENCES ASSESSMENT (REF ST18210-0001).
2. LAYOUT PROVIDED BY QUARRY DESIGN LAND AND MINERALS CONSULTING LIMITED.
3. DRAWING SHOWS INDICATIVE STRATEGY FOR PHASES 6-8.

KEY

- APPLICATION BOUNDARY
- SURFACE WATER DRAINAGE
- DIRECTION OF FACE PROGRESSION
- 38 — LEVEL (mAOD)
- REMOVAL OF LIMESTONE
- TIP
- RECENTLY PLACED TIP
- FLOW — FLOW RATE TELEMETRY
- SUBMERSIBLE PUMP
- PROPOSED SUMP AREA

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	FIRST ISSUE	15-09-20	DR	BG	AD

CLIENT

PINNACLE CONSTRUCTION LTD

PROJECT

TAFFS WELL QUARRY FCA

DRAWING TITLE

DRAINAGE STRATEGY - PHASE 8

DRG No.	REV
ST18210-002	A

DRG SIZE	SCALE	DATE
A2	1:2000	02-09-20

DRAWN BY	CHECKED BY	APPROVED BY
DR	BG	AD

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OPTION TO RETAIN A PORTION OF ADDITIONAL RUNOFF WITHIN EXTENSION AREA DURING EXTREME STORM EVENTS TO REDUCE STORAGE REQUIRED WITHIN THE MAIN VOID (INDICATIVE VOLUME SHOWN = 2.500m³ @ 1m DEPTH)

QUARRY EXTENSION TO MAXIMUM EXTENT

RECYCLED FOR DUST SUPPRESSION AND MINERAL PROCESSING

FLOW RATE TELEMETRY

TO RIVER TAFF OUTFALL

DISCHARGE IN ACCORDANCE WITH PERMIT AN0222302

SUBMERSIBLE PUMP

LOW POINT OF MAIN VOID TO BE USED AS SUMP (SIZE INDICATIVE)

QUARRY VOID AT MAXIMUM DEPTH OF 30mAOD

CAPACITY OF MAIN SUMP AREA SUFFICIENT TO RETAIN RUNOFF AND SEEPAGE FROM MAIN VOID.

CAPACITY WITHIN MAIN SUMP SUFFICIENT TO RETAIN c.120,000m³ OF INFLOW IF EXTENSION INTERSECTS FLOODED MINE WORKINGS (VOLUME IS WORST-CASE ESTIMATE BASED ON STUDIES BY OTHERS)

DO NOT SCALE FROM THIS DRAWING

NOTES

1. TO BE READ IN CONJUNCTION WITH FLOOD CONSEQUENCES ASSESSMENT (REF ST18210-0001).
2. LAYOUT PROVIDED BY QUARRY DESIGN LAND AND MINERALS CONSULTING LIMITED.
3. DRAWING SHOWS INDICATIVE STRATEGY FOR PHASES 6-8.

KEY

- APPLICATION BOUNDARY
- SURFACE WATER DRAINAGE
- DIRECTION OF FACE PROGRESSION
- 38 — LEVEL (mAOD)
- REMOVAL OF LIMESTONE
- TIP
- RECENTLY PLACED TIP
- FLOW — FLOW RATE TELEMETRY
- SUBMERSIBLE PUMP
- PROPOSED SUMP AREA

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	FIRST ISSUE	15-09-20	DR	BG	AD

CLIENT

PINNACLE CONSTRUCTION LTD

PROJECT

TAFFS WELL QUARRY FCA

DRAWING TITLE

DRAINAGE STRATEGY - PHASE 15

DRG No.	REV
ST18210-003	A

DRG SIZE	SCALE	DATE
A2	1:2000	02-09-20

DRAWN BY	CHECKED BY	APPROVED BY
DR	BG	AD

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OPTION TO RETAIN A PORTION OF ADDITIONAL RUNOFF WITHIN EXTENSION AREA DURING EXTREME STORM EVENTS TO REDUCE STORAGE REQUIRED WITHIN THE MAIN VOID (INDICATIVE VOLUME SHOWN = 2.500m³ @ 1m DEPTH)

QUARRY EXTENSION TO MAXIMUM EXTENT

RECYCLED FOR DUST SUPPRESSION AND MINERAL PROCESSING

FLOW RATE TELEMETRY

TO RIVER TAFF OUTFALL

DISCHARGE IN ACCORDANCE WITH PERMIT AN0222302

SUBMERSIBLE PUMP

LOW POINT OF MAIN VOID TO BE USED AS SUMP (SIZE INDICATIVE)

QUARRY VOID AT MAXIMUM DEPTH OF 30mAOD

CAPACITY OF MAIN SUMP AREA SUFFICIENT TO RETAIN RUNOFF AND SEEPAGE FROM MAIN VOID.

CAPACITY WITHIN MAIN SUMP SUFFICIENT TO RETAIN c.120,000m³ OF INFLOW IF EXTENSION INTERSECTS FLOODED MINE WORKINGS (VOLUME IS WORST-CASE ESTIMATE BASED ON STUDIES BY OTHERS)

DO NOT SCALE FROM THIS DRAWING

NOTES

1. TO BE READ IN CONJUNCTION WITH FLOOD CONSEQUENCES ASSESSMENT (REF ST18210-0001).
2. LAYOUT PROVIDED BY QUARRY DESIGN LAND AND MINERALS CONSULTING LIMITED.
3. DRAWING SHOWS INDICATIVE STRATEGY FOR PHASES 6-8.

KEY

- APPLICATION BOUNDARY
- SURFACE WATER DRAINAGE
- DIRECTION OF FACE PROGRESSION
- LEVEL (mAOD)
- REMOVAL OF LIMESTONE
- TIP
- RECENTLY PLACED TIP
- FLOW RATE TELEMETRY
- SUBMERSIBLE PUMP
- PROPOSED SUMP AREA

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	FIRST ISSUE	15-09-20	DR	BG	AD

CLIENT

PINNACLE CONSTRUCTION LTD

PROJECT

TAFFS WELL QUARRY FCA

DRAWING TITLE

DRAINAGE STRATEGY - PHASE 20

DRG No.	REV
ST18210-004	A

DRG SIZE	SCALE	DATE
A2	1:2000	02-09-20

DRAWN BY	CHECKED BY	APPROVED BY
DR	BG	AD

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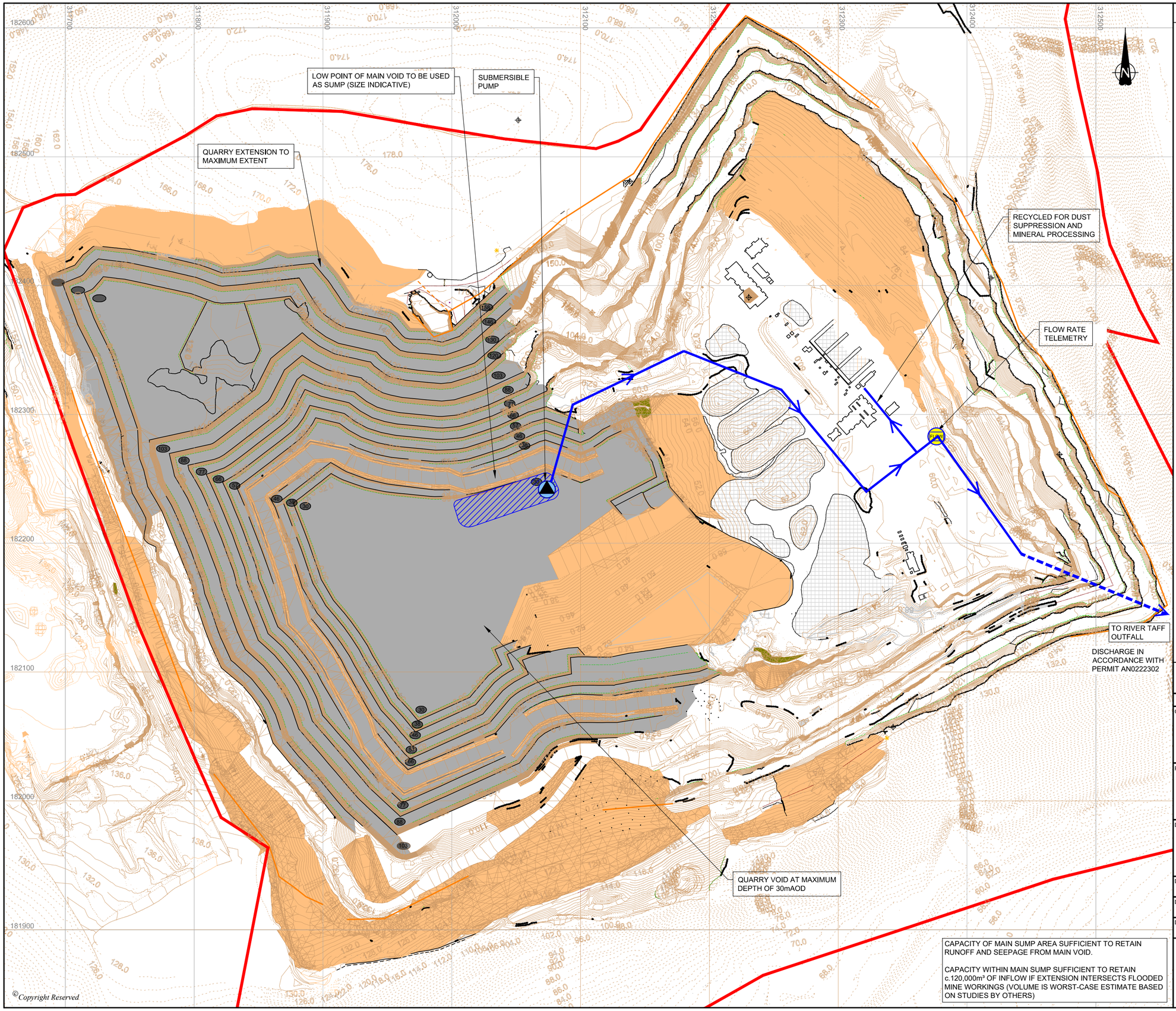

DO NOT SCALE FROM THIS DRAWING

NOTES

1. TO BE READ IN CONJUNCTION WITH FLOOD CONSEQUENCES ASSESSMENT (REF ST18210-0001).
2. LAYOUT PROVIDED BY QUARRY DESIGN LAND AND MINERALS CONSULTING LIMITED.

KEY

- APPLICATION BOUNDARY
- SURFACE WATER DRAINAGE
- DIRECTION OF FACE PROGRESSION
- LEVEL (mAOD)
- REMOVAL OF LIMESTONE
- TIP
- RECENTLY PLACED TIP
- FLOW RATE TELEMETRY
- SUBMERSIBLE PUMP
- PROPOSED SUMP AREA

REVISION	DETAILS	DATE	DRAWN	CHKD	APP'D
A	FIRST ISSUE	15-09-20	DR	BG	AD

CLIENT

PINNACLE CONSTRUCTION LTD

PROJECT

TAFFS WELL QUARRY FCA

DRAWING TITLE

DRAINAGE STRATEGY - PHASE 21

DRG No.	REV
ST18210-005	A

DRG SIZE	SCALE	DATE
A2	1:2000	02-09-20

DRAWN BY	CHECKED BY	APPROVED BY
DR	BG	AD

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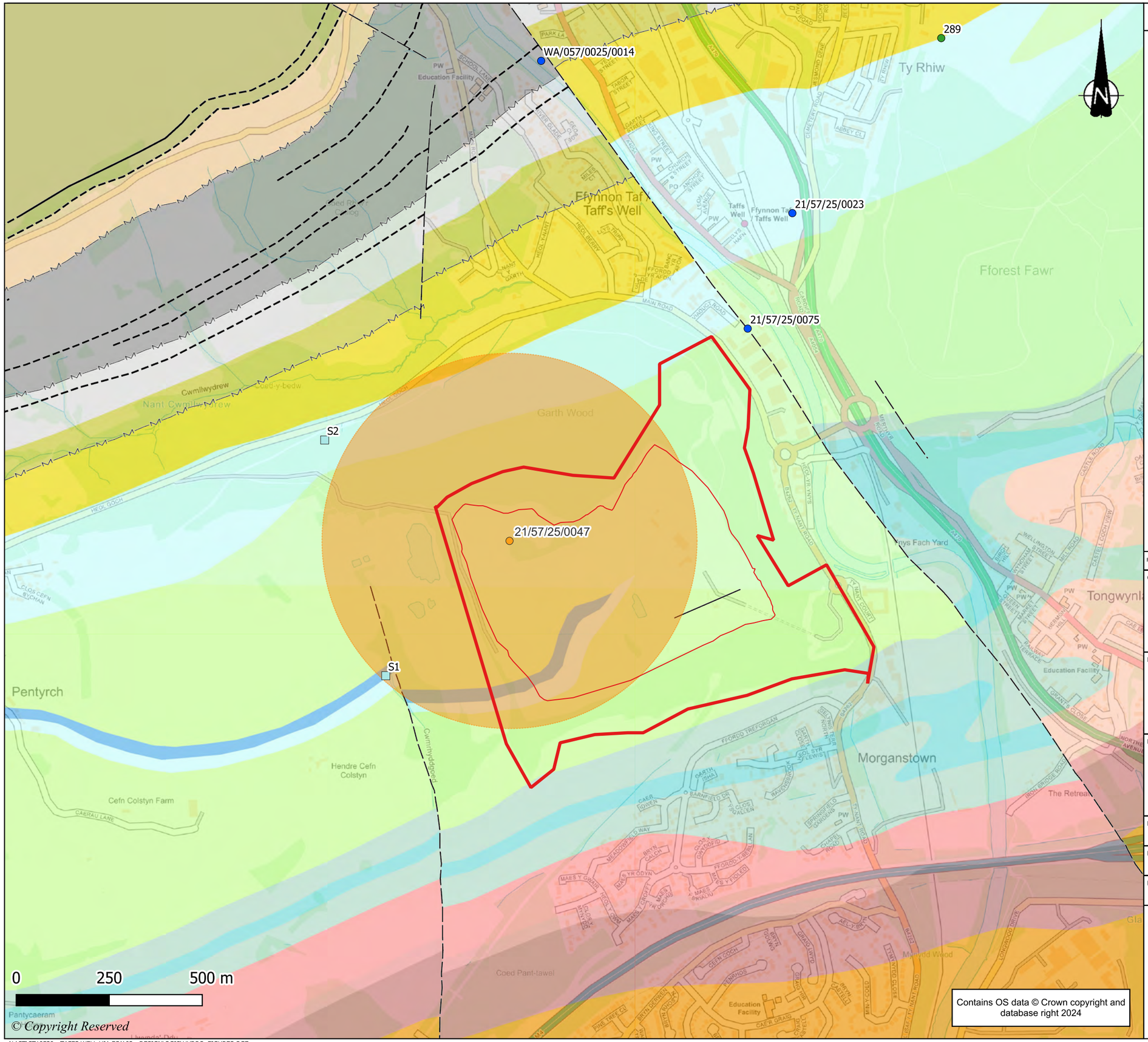
N:\ST\ST18210 - TAFFS WELL QUARRY FCA\03 - DESIGN\AUTOCAD\ST18210-005 DRAINAGE STRATEGY-PHASE 21.DWG



DO NOT SCALE FROM THIS DRAWING

KEY

- Site Boundary
- Pit Boundary
- Breedon Trading Ltd Abstraction Licence
- Abstraction Radius of Influence (504m)
- Spring
- Groundwater Abstraction
- Surface Water Abstraction
- Private Water Supplies (289: South View, CF15 7RZ)
- Pembroke Limestone Group
- Hunts Bay Oolite Subgroup - Limestone
- Marros Group - Mudstone, Sandstone and Conglomerate
- South Wales Lower Coal Measures Formation - Sandstone
- South Wales Lower Coal Measures Formation - Mustone Siltstone and Sandstone
- South Wales Middle Coal Measures Formation - Mudstone Siltstone and Sandstone
- South Wales Upper Coal Measures Formation - Mudstone Siltstone and Sandstone
- Rhonda Member - Sandstone
- Cwmyniscoy Mudstone Formation - Mudstone and Limestone, Interbedded
- Castell Coch Limestone Formation - Limestone
- Quartz Conglomerate Group (South Wales) - Sandstone and Conglomerate, Interbedded
- Quartz Conglomerate Group (South Wales) - Sandstone
- Marine Band
- Coal Seam (Inferred)
- Fault

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

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BREEDON TRADING LIMITED

PROJECT

TAFFS WELL QUARRY

DRAWING TITLE

ABSTRACTION RADIUS OF INFLUENCE - POTENTIAL RECEPTORS

DRG No.		REV
ST19539-011		A
DRG SIZE: A3	SCALE: 1:10,000	DATE: September 2024
DRAWN BY: AE	CHECKED BY: RI	APPROVED BY: RI

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KEY

- Site Boundary
- Pit Boundary
- Groundwater Monitoring Boreholes
- Breedon Trading Ltd Abstraction Licence
- Breedon Trading Ltd Discharge Consents
- Flow Rate Telemetry*

Note
* Flow rate telemetry located on pathway between abstraction licence and discharge consent

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

BREEDON TRADING LTD

PROJECT

TAFFS WELL QUARRY

DRAWING TITLE

CURRENT MONITORING NETWORK

DRG No.		REV
ST19539-012		A
DRG SIZE A3	SCALE 1:5,000	DATE September 2024
DRAWN BY AE	CHECKED BY RI	APPROVED BY RI

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