Castle Hill Quarry

784-B043634

Environmental Setting and Site Design

Environmental Permit Application

Castle Hill Quarry Co. Limited

April 2023

Document prepared on behalf of Tetra Tech Limited. Registered in England number: 01959704

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1.0 INTRODUCTION

1.1 REPORT CONTEXT

1.1.1 This Environmental Permit Application has been prepared by Tetra Tech on behalf of the Operator, Castle Hill Quarry Co. Limited (CHQC) in connection to their existing quarry site called Castle Hill Quarry at Cannington, Bridgwater, TA5 2QF.

1.1.2 CHQC are seeking to gain a bespoke waste recovery permit for the permanent deposit of inert waste to land to facilitate the infilling and restoration at two specific areas within the quarry site following the extraction of mineral. Further details of these areas are provided in Section 2 of this document.

1.1.3 This document corresponds to Question 1, Appendix 4 of Part B4 of the Environmental Permit application forms, which requires the provision of an Environmental Setting and Site Design (ESSD) report. According to the Environment Agency's (EA) 'Landfill operators: environmental permits' guidance, an ESSD document is only required for an application that comprises a landfill for inert waste or a deposit for recovery operation.

1.1.4 The aim of this report is to describe the regulated facility in relation to the environmental setting, identifying the source terms, pathways and receptors that will be used as the basis for the Environmental Risk Assessment for this permit application.

1.1.5 This document has been prepared based on the ESSD report guide that's provided in the EA's 'Landfill operators: environmental permits' guidance (updated April 2021).

2.0 SITE DETAILS

2.1 SITE LOCATION AND CONTEXT

2.1.1 The wider Castle Hill Quarry site is located approximately 960m north west from the village centre of Cannington in Bridgwater and is centred at National Grid Reference (NGR) ST 24562 40684.

2.1.2 This application relates to two extension areas at the quarry. The first area (known as 'Eastern Extension') is located to the south east of the existing quarry and is centred at approximate NGR ST 24834 40637. The second area (known as 'Old Golf Course Extension'), is located to the south of the Eastern Extension and is centred at approximate NGR ST 24834 40637. The location of both extension areas is shown on Drawing Number CHQC/B043634/PER/01.

2.1.3 The immediate surroundings of the site comprise predominantly of woodland and agricultural with commercial properties located to the immediate south of the proposed site.

2.1.4 A Scheduled Monument named 'Cynwit Castle' lies adjacent to the wider Castle Hill Quarry. A further Scheduled Monument named 'Settlement South East of Cannington Park' lies adjacent to the Eastern Extension area. The nearest residential properties, 1-2 Lime Kiln Cottages, lie approximately 30m southeast of the Old Golf Course Extension. These properties are in CHQC's ownership and rented to tenants.

2.1.5 The regional topography slopes from ~300mAOD in the Quantock Hills lying approximately 7km to the south-west; down to the River Parrett at ~10mAOD (at its closest approximately 2km north-east of the Extension). The Quantock Hills are designated as an Area of Outstanding Natural Beauty (AONB) and the River Parrett is part of the Bridgwater Bay Site of Special Scientific Interest (SSSI) and also the Severn Estuary (Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar site).

2.2 SITE CLASSIFICATION

2.2.1 The regulated facility comprises of deposit for recovery activity.

2.3 APPLICATION BOUNDARY AND SITE SECURITY

2.3.1 The proposed application boundary is shown on Drawing Number CHQC/B043634/PER/01.

2.3.2 Access to the site will be achieved by an access road off Combwich Road that runs in an east to west direction towards the existing quarry site and then south to the extension areas.

2.3.3 As part of the mineral extraction and restoration operations, the site will benefit from barriers that satisfy the requirements of the Quarry Regulations 1999 to prevent unauthorised access to the site. In addition, entrance to the site is gated which will be inspected on a daily basis. Any identified damage to the gate that could compromise the site security will be recorded and temporarily repaired as soon as practicable. Permanent repair or replacement will be undertaken as soon as practicable.

3.0 SOURCE TERM CHARACTERISTIC

3.1 HISTORICAL ACTIVITY

3.1.1 CHQC have been extracting limestone from Castle Hill Quarry for over 70 years. The extracted limestone is primarily used as a calcium additive in animal feed but is also used as lime for agricultural purposes and construction aggregates. Mineral and Gravel Working has taken place at the wider Castle Hill Quarry since 2006. All limestone is processed in the main quarry site as shown on Drawing Number CASH 1610/2/C and CHQC intend to transfer all limestone that's extracted from the extension areas to the main quarry site for processing.

3.1.2 In addition to the above, a concrete batching plant is situated at the main quarry site. This plant is currently operational by Hanson and is only a temporary installation that will primarily serve the initial site preparation at Hinkley Point.

3.1.3 The 'Interim Development Order' (IDO) planning permission was granted in 1947 for the continuation of quarrying at Castle Hill Quarry and Cannington Quarry which is located to the south east of Castle Hill Quarry and is centred at approximate NGR ST 25122 40421. The IDO was registered in 1994 (reference 1DO/S/11/B) when modern conditions were applied.

3.1.4 In February 2007, planning permission (reference 1/13/06/033) was granted by SCC to relocate processed stone stockpiles and lorry loading area into a low lying valley outside the quarry enclave (as identified on Drawing Number CHQOGC2109/5/B).

3.1.5 In November 2008, planning permission (reference 1/13/08/028) was granted by Somerset County Council (SCC) to allow a southern and western extension to the quarry site (as identified on Drawing Number CHQOGC2109/5/B).

3.1.6 In February 2017, a planning application was submitted to SCC for the extraction of limestone, infilling with imported materials including waste and restoration to woodland and pasture (reference 1/13/17/00012). The application was submitted to facilitate an extension to the east of the existing quarry site (known as Eastern Extension Area). Planning permission was granted in June 2019 by a Planning Inspector on appeal for non-determination (reference APP/G3300/W/18/3202520).

3.1.7 In November 2021, a further planning application (reference SCC/3894/2021) was submitted to SCC facilitate another extension to extraction and infilling activities in the 'Old Golf Course Extension' Area.

3.2 PROPOSED ACTIVITY

3.2.1 The proposal entails the importation of inert waste for infilling of the quarry void that will be created within the Eastern Extension and the Old Golf Course Extension Areas following the mineral extraction activities.

3.2.2 The Eastern Extension Area will be restored in accordance with the following plans that were approved by a Planning Inspector on appeal (reference APP/G3300/W/18/3202520):-

- CASH 1610/4/C – Proposed Restoration Landform
- CHILL016(D) – Composite Restoration Scheme
- CASH 1610/6/C – Final Restoration Plan – Whole Quarry

3.2.3 The Old Golf Course Extension Area will be restored in accordance with the restoration plan (Drawing Number 2109_006/012_CHILL025_OGC Rest Plan) that was submitted to Somerset County Council (SCC) under planning permission SCC/3894/2021.

3.3 PROPOSED WASTE TYPES AND QUANTITIES

3.3.1 In order to complete works, a volume of 119,000m^3 of inert materials will be required to restore the Eastern Extension Area and a volume of 550,000m^3 of inert materials will be required to restore the Old Golf Course Extension Area. This provides a total throughput of 669,000m^3.

3.3.2 When using a bulk density conversion factor of 1.5 tonnes/m^3, the total throughput equates to approximately 1,003,500 tonnes.

3.3.3 The site will only accept inert waste as classified under the Landfill Directive (1999/31/EC) and Council Decision (2003/33/EC) of 19 December 2002 'establishing criteria and procedures for the acceptance of waste landfills'.

3.3.4 Details regarding the proposed waste types including restrictions are provided in the Operating Techniques (Appendix C of the Environmental Permit Application).

3.4 PROPOSED OPERATIONAL PHASING

3.4.1 Extraction and progressive restoration in the Eastern Extension Area will commence in the north western section that adjoins the existing quarry site. Works will proceed progressively in a south easterly direction towards the Old Golf Course Extension Area.

3.4.2 Extraction and progressive restoration in the Old Golf Course Extension Area will commence from the quarry face in the Eastern Extension Area and progress in a south easterly direction in 3 Phases (as shown on Drawing Numbers CHQOGC2109/6/A, CHQOGC2109/7/A and CHQOGC2109/8/A.

3.5 FINAL LANFORM AND AFTER USE

3.5.1 According to the approved restoration plans for the Eastern Extension Area (listed in Section 3.2), the area will be restored to original ground levels and will comprise a mix of woodland and dry grassland thus enhancing the biodiversity of the site.

3.5.2 The Old Golf Course Extension area will also be restored to original ground levels and will comprise a mix of calcareous grassland and woodland (as detailed on Drawing Number 2109_006.12_CHILL025_OGC Rest Plan).

3.5.3 Cross sections of the restoration for the Eastern Extension Area and Old Golf Course Extension Area are provided on Drawing Numbers CASH 1610/5/C and CHQOGC2109/11/A respectively.

3.6 HYDROGEOLOGICAL RISK ASSESSMENT

3.6.1 A Hydrogeological Risk Assessment (HRA) has been prepared to provide the geological and hydrogeological setting of the site allowing the development of a conceptual model to determine the risk that the facility will pose to underlying groundwater. A copy of the HRA is provided as Appendix F of the Environmental Permit Application.

4.0 PATHWAY AND RECEPTOR TERM CHARACTERISATION

4.1 Sections 4.2 – 4.4 are taken from the HRA that accompanies this application as Appendix F and therefore should be referred to for completeness.

4.2 GEOLOGY

Regional Geology

4.2.1 The Castle Hill area's regional bedrock geology has been summarised following a review of supporting reports (BCL Hydro, 2022 and Stantec, 2021) and published geological mapping (British Geological Survey (BGS), 1984; 2021) in Table 1.

Table 1: Regional Geological Succession

Name	Stratigraphic Age	Thickness (m)	Lithological Description
Blue Lias Formation	Jurassic	0-60m	Thinly interbedded limestone and calcareous mudstones and siltstones
Mercia Mudstone Group (including Blue Anchor Formation)	Permo-Triassic	>300m	Red mudstones and silty mudstones (Blue anchor Formation comprises pale green-grey mudstones and siltstones)
Helsby Sandstone Formation	Perma-Triassic	30-60m	Red fine to medium grained sandstone
Unconformity			
Rodway siltstone Formation	Upper Carboniferous	> 100m	Micaceous siltstones with thin fine to medium grained sandstones
Carboniferous Limestone Supergroup	Lower Carboniferous	>1,000m	Fine grained, grey non-oolitic limestone and coarser grey/white oolitic limestone

Superficial Deposits

4.2.2 Superficial deposits predominately comprise River Terrace Deposits and Tidal Flat deposits which tend to be confined to the routes of watercourses. These deposits pass into a wide area of Tidal Flat Deposits associated with the River Parrett c. 1km to the north-east of the site. An area of Tidal Flat Deposits also widen westwards and passes immediately to the north of the Castle Hill Quarry (c. 600m to the north of the Extension areas) throughout the route of South Moor Main Brook.

4.2.3 The Tidal Flat Deposits contain a mixture of clays, silts and peats with occasional sand and gravel layers. Alluvium (which will tend to comprise clay, silt, sand or gravels) is present along the route of Cannington Brook c. 1.5km to the south of the extension.

Solid Geology

4.2.4 Carboniferous Limestone is anticipated to be present under the entire quarry complex inclusive of the application area, with the overlying Mercia Mudstone outcropping directly to the north-east. Exposures within the quarry complex indicate that the limestone is jointed in places with large sub-vertical faces formed throughout joints which are generally orientated north-south, however some east-west joints are also present.

4.2.5 At Cannington Park Quarry the bedding can be observed to dip slightly to the east. Sedimentary (Red stained Neptunian) dykes are present however other karstic features are uncommon in the exposed faces. Except for a small cave in the workings near the top of Castle Hill Quarry no large voids have been found within the quarried areas.

4.2.6 A BGS borehole (ST24SW1) was drilled at Knapp Farm, located almost 450m south of the eastern extension, to a depth of 1,153 m. Carboniferous rocks, including grey limestones with chert bands, were proved to a depth of 966 m. Underlying this unit was a further 140m of Carboniferous shales and mudstones with lower limestone layers. These underlying units were both argillaceous and disturbed, however there was no obvious sign of faulting. This thickness of limestone most likely extends west-north-west and east-south-east beneath the Permo-Triassic strata.

4.2.7 A second BGS borehole (ST24SW11) at Castle Hill Quarry itself penetrated limestone to the borehole completion depth of 80m. Four boreholes (BH1, BH2, BH3, BH4) were drilled as part of previous investigations at the quarry complex (ESI, 2001). There are no superficial deposits overlying the limestone at the quarry complex other than a layer of topsoil, which varies in thickness from around 0.3 to 3 m. A layer of weathered limestone underlies this which was up to 4.4 m thick, followed by limestone to the base of each borehole (which were progressed up to a 55m depth). A further three boreholes (Boreholes 5 to 7) were drilled at the quarry complex in 2021; they were positioned at locations to provide additional groundwater monitoring data for the Old Golf Course Extension. All three boreholes were drilled into the Carboniferous Limestone to a depth of 40m. (Stantec, 2021).

4.3 HYDROLOGY

Catchment Areas

4.3.1 The quarry complex is located within the lower reach of the River Parrett which flows north from Chedington in West Dorset, c.40km to the south-east of the site and reaches the coast c.7km to the north-east, where it flows into Bridgwater Bay.

4.3.2 Fiddington Brook lies c. 550m to the north of the main part of the permit application area (eastern extension and old golf course extension); and Cannington Brook lies c. 1km to the south. The application area lies across an undefined divide between the two catchment areas. Castle Hill Quarry and the northern part of the application area are located within the Fiddington Brook catchment. The southern part of the application area is located in a minor undefined sub-catchment that drains to the River Parrett to the east via various smaller ditches (locally referred to as rhynes). The distance between this undefined area and the Cannington Brook - Lower catchment is c. 350m. The upper reaches that drain into Cannington Brook are divided into two further catchments known as Currypool Stream and Cannington Brook Upper.

Rainfall

4.3.3 Section 2.3.3 of the Stantec report, (2021) states a standard average annual rainfall (SAAR) value for the area of 749mm (CEH, 2021a). This is based on rainfall data for two rain gauges. One is located at Wembdon on the outskirts of Bridgwater (NGR: ST27793793) which is c. 4km south-east of the application area and another is located at Rivers House (NGR: ST3012237803) which is c. 6km south-east of the application area.

Surface Water Abstractions

4.3.4 Stantec report (2021), section 2.3.4 references EA data which indicates that there are four licensed surface water abstractions near to the application area. An abstraction (16/52/007/S/158) from South Moor Main Brook at Mill Farm which is located c. 3km to the west of the application area. There is also an abstraction (16/52/007/S/069) from Ashford reservoir (for public water supply) which is c. 2km to the south-west of the application area; and the final two abstractions are both c. 3.2km to the south-west of the application area, from Currypool Stream (16/52/007/S/069) (which is also for public water supply and part of the same abstraction from Ashford reservoir) and from another tributary of Cannington Brook (16/52/007/S/136). All of the abstractions were identified to be up-stream from the application area and are therefore considered unlikely to be unaffected by the works proposed.

4.4 HYDRGEOLOGY

Aquifer Designations

4.4.1 The aquifer designations of the geology underlying and surrounding the Site are listed in the Table 2.

Table 2: Bedrock Aquifer

Bedrock aquifer		
Carboniferous Limestone	Principal aquifer Layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.	Karstic aquifer underlying the Eastern Extension & Old Golf Course Extension.
Blue Lias Formation	Secondary A aquifer Permeable layers capable of supporting water supplies at a local rather than strategic scale and can be an important source of base flow to rivers.	Crops out c. 1km to the north of the Eastern Extension & Old Golf Course Extension.
Mercia Mudstone Group	Secondary B aquifer Lower permeability layers that may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and/or weathering	Dominant bedrock geology of the region.
Helsby Sandstone Formation	Principal aquifer Layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.	Part of the Sherwood Sandstone aquifer. Crops out approximately 400m south of the Eastern Extension & Old Golf Course Extension.
Rodway Siltstone Formation	Secondary A aquifer Permeable layers capable of supporting water supplies at a local rather than strategic scale, and can be an important source of base flow to rivers.	Crops out to the south of the Helsby Sandstone Formation approximately 600m south of the Eastern Extension & Old Golf Course Extension.

4.4.2 The two main aquifers in the region are the Helsby Sandstone and the Carboniferous Limestone with the principal formation relevant to the application area being the carboniferous formation. The limestone matrix is considered to be of low porosity and permeability, with groundwater flows typically promoted via a network of karstic fractures and conduits. As stated, (Stantec, 2021) significant karstic features have not been observed within the formation following quarrying activity to date. (Section 2.2.2. Stantec, 2021 'A small cave was encountered in the workings near the top of Castle Hill Quarry but otherwise no large voids have been reported within the existing quarried areas.')

4.4.3 Mercia Mudstone Group is a boundary of the extent of the Carboniferous Limestone and Helsby Sandstone aquifers. Thus, flow through the confined part of the aquifer away from the outcrop area is expected to be limited.

Aquifer Properties

4.4.4 Karst rocks are rocks that can dissolve under the influence of water. The aquifer properties of Carboniferous limestones are not easy to predict because karst channels and fissures are unpredictable. The range of the Somerset hydraulic conductivity coefficient for limestone was determined as 0.0007 m/d to 110m/d. (Allen

et al.,1997). Hydraulic tests were carried out in four boreholes drilled in 2000 (ESI, 2001) and the average hydraulic conductivity of the first three boreholes was determined as 0.007 m/d. However, at the fourth borehole the permeability was higher, and hydraulic test could not complete due to the borehole having penetrated a zone of weathered and significantly fractured limestone (Stantec, 2021).

4.4.5 The limestone is not thought to be heavily fissured locally. Stantec, 2021 offered the following reasons to suggest why this may be the case.

- The limestone block is relatively isolated relevant to an active surface water basin, reducing through flow and active development of karstic features.
- Clay-filled features have been detected at depth in some boreholes, which may be due to the slow circulation of the flow at depth.

Source Protection Zone

4.4.6 Stantec report (2021), Section 2.3.5 identified no groundwater Source Protection Zones (SPZ) mapped within a 3km radius of the application area. The closest SPZ is located c. 5km to the west.

Groundwater Abstractions

4.4.7 Stantec report (2021), section 2.3.4 identified five nearby private water supplies / licenced groundwater abstractions. These were the private water supplies at Keepers Cottage (800m south-west of the application area), Horn Hill Cottage (1km west), Edbrook Farm (1.2km west) and Edbrook (1.3km west); and also the licenced groundwater abstraction (16/52/007/G/046) at Rodway Farm (700m east) with is part of Bridgwater College.

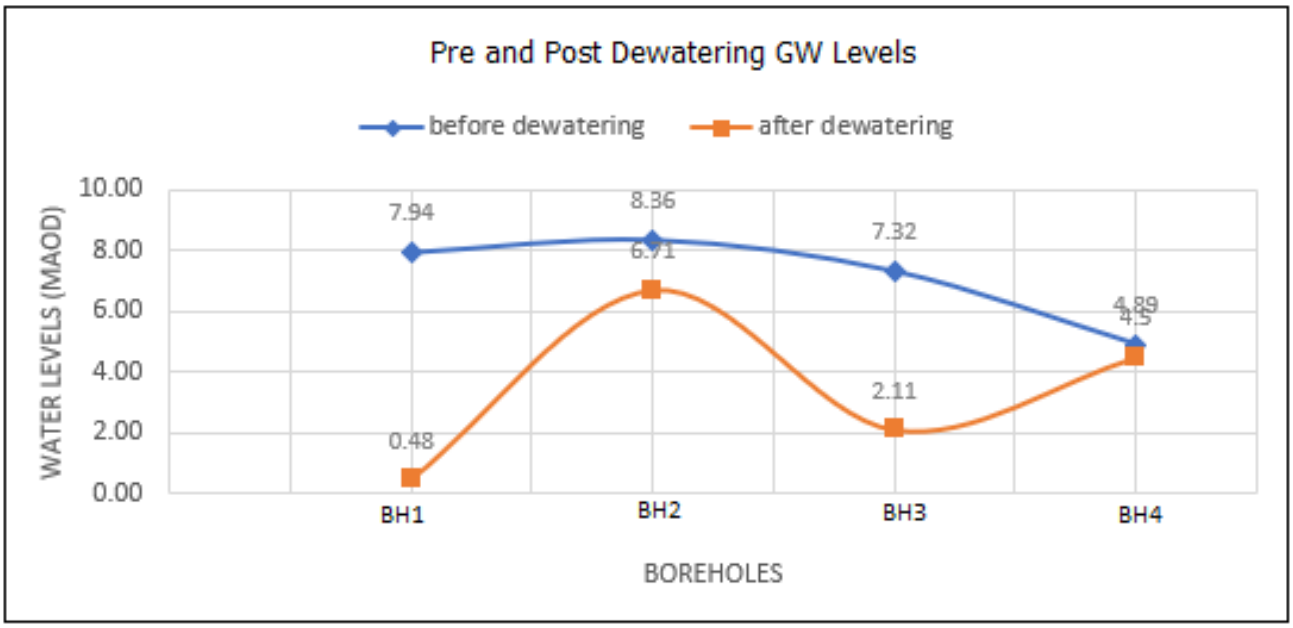
4.4.8 The local authority (Sedegmoor District Council) confirmed the presence of three other private water supplies in the area, located c. 1.4km, 1.5 and 2km from the application area. The EA were consulted (Stantec, 2021) with regard to licensed abstractions in the area. Other groundwater abstractions within 2km of the main part of the application area are located in / close to Cannington c. 1.1km south-east (16/52/007/G/043) and 1.4km to the south (16/52/007/G/081). Five other licenced groundwater abstractions are located between 2 and 4km to the north and west of the Extension.

Groundwater Levels and Flow

4.4.9 To characterise anticipated future hydrogeological conditions or post restoration conditions available groundwater monitoring data applicable to the application area has been reviewed. As part of the requirements of existing Water Management Plans (WMPs), groundwater levels have been measured monthly by CHQC from 4 monitoring wells (BH1, BH2, BH3, BH4) since 2000. Three new boreholes (BH5, BH6, BH7) have been drilled in close proximity to the eastern extension in 2021. The locations of these boreholes are shown on Drawing Number CHQC/B043634/BH/01. Levels measured pre and post dewatering commencement are presented below for monitoring wells BH1-BH4. The pre-dewatering anticipated dominant groundwater flow direction is south to north and is illustrated on Figure 8 of the HRA. Post dewatering water flow directions are south to north and north west (as shown on Figure 9 of the HRA) which is inclusive of monitoring data from the more recently installed boreholes BH5, 6 and 7.

4.4.10 Average groundwater levels were calculated for both periods and are presented below.

Figure 1: Pre and post dewatering groundwater levels



4.4.11 More recent groundwater level monitoring data is considered in the BCL, 2022 assessment following the cessation of dewatering Cannington Park Quarry in September 2020. Existing piezometer data has been reviewed and adjusted to best reflect anticipated groundwater levels post restoration across the application area. Table 5 of the BCL report presents a minimum (7.5mAOD) and maximum (12.3 mAOD) post restoration groundwater level with an average of 8.9 mAOD.

4.4.12 The site will be worked for the extraction of limestone deposits to a basal level of 6 mAOD. A conservative assumed groundwater level post restoration is 12.3 mAOD (maximum groundwater level post restoration, BCL, 2022) based on the latest available monitoring data applicable to the application area.. Adopting the anticipated post restoration groundwater levels will see a saturated zone of c. 6.3 m at the base of the imported restoration material assuming a basal level of extraction 6 mAOD.

4.4.13 Principal groundwater flow direction post-restoration is anticipated to be towards a series of drainage features or rhynes located c.450m to the north. Groundwater flow mapping (refer to Figure 8 of the HRA) has been developed to simulate anticipated post restoration hydraulic head on the basis of pre dewatering monitoring data for the period 2000-2010 (Stantec, 2021).

4.4.14 No significant superficial deposits are anticipated immediately surrounding the primary area of extraction with the primary aquifer considered be within the limestone deposits.

4.4.15 On the basis of pre dewatering hydraulic head measurements, a hydraulic gradient of 0.0081 has been calculated based upon anticipated post restoration groundwater levels. Groundwater flow within the deposits is anticipated to be via intergranular flow (primary porosity).

4.4.16 The hydraulic conductivity and porosity values for the limestone aquifer have been estimated from literature sources, 3.5 x 10^{-6}m/s (Allen et al. (1997) cite a range of hydraulic conductivity between 0.0007 m/d and 110m/d, with a geometric mean of 0.3 m/d, from tests carried out in the Mendips (Somerset)) and 0.275 for porosity (ConSIM). Hydraulic testing was undertaken in the four boreholes drilled in 2000 (ESI, 2001) and the average hydraulic conductivity at three of the boreholes was 0.007 m/d, which is towards the lower end of the range stated in the regional data. This value was increased by circa two orders of magnitude to reflect sensitivity of the principal aquifer. There was no evidence of significant fissure/voids in existing quarried areas (Section 2.2.2. Stantec HIS, 2021).

4.4.17 An artificial attenuation layer is to be installed on top of the Limestone Formation across the base of the site which will provide further attenuation and retardation to any leachable contaminants generated. The barrier will be constructed using suitable imported materials consisting of non-waste materials which will either be 1m in thickness with a permeability no greater than $1x10^{-7}$m/s or its EA approved equivalent of 0.5m with a permeability of no greater than $5x10^{-8}$m/s. Initial model iterations are not assuming retardation resultant from barrier construction which will increase the conservatism of modelling outcomes.

4.4.18 CHQC Limited have provided contemporary groundwater monitoring data from 8th February to 19th October 2022 for groundwater monitoring locations BH5-BH6-BH7 (as shown on Drawing Number CHQC/B043634/BH/01). Average determinand concentrations for the monitoring period are presented at Table 5 below.

Table 3: Average Water Quality Data (2022)

Average Water Quality Data(ug/l)	BH5	BH6	BH7
Antimony as Sb	<0.001	<0.001	<0.001
Arsenic as As	0.009438	0.0035	0.021375
Cadmium as Cd	6E-05	3.57E-05	4.73E-05
Copper as Cu	0.005438	0.003125	0.017625
Lead as Pb	<0.001	<0.001	<0.001
Mercury as Hg	<0.00003	<0.00003	<0.00003
Molybdenum as Mo	0.002938	0.0025	0.008938
Nickel as Ni	0.0013	0.001	0.0026
Selenium as Se	0.001	0.001	0.001
Total Chromium as Cr	0.002	0.001	0.001
Zinc as Zn	0.022	0.023688	0.0215
Barium as Ba	0.4325	0.211875	0.279333
Calcium as Ca	130	114.5	96.13333
Sodium as Na	44.25	184.375	25.26667
Total Sulphur as SO4	27.8125	70.25	18.13333
Fluoride as F	0.18125	0.1375	0.116667
Ammoniacal Nitrogen as N	0.0975	0.063333	0.079
Chloride as Cl	81.125	290.625	41.6875
Orthophosphate as P	0.975	0.131429	1.642
Total Oxidised Nitrogen	8.14375	3.8625	6.3625
Acenaphthene	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01
Benzo[a]anthracene	<0.01	<0.01	<0.01
Benzo[a]pyrene	<0.01	<0.01	<0.01
Benzo[b]fluoranthene	<0.01	<0.01	<0.01
Benzo[g,h,i]perylene	<0.01	<0.01	<0.01
Benzo[k]fluoranthene	<0.01	<0.01	<0.01

Chrysene	<0.01	<0.01	<0.01
Dibenzo[a,h]anthracene	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01
Indeno[1,2,3-cd]pyrene	<0.01	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01
Total PAH 16	0.21	0.2	0.272
PCB 101	<0.01	<0.01	<0.01
PCB 118	<0.01	<0.01	<0.01
PCB 138	<0.01	<0.01	<0.01
PCB 153	<0.01	<0.01	<0.01
PCB 180	<0.01	<0.01	<0.01
PCB 28	<0.01	<0.01	<0.01
PCB 52	<0.01	<0.01	<0.01
Dimethylphenols	<0.05	<0.05	<0.05
Methylphenols	<0.05	<0.05	<0.05
Phenol	<0.05	<0.05	<0.05
Total Phenols	<0.20	<0.20	<0.20
Trimethylphenols	<0.05	<0.05	<0.05
Total TPH >C8-C40	0.028571	0.033333	0.033333
Dissolved Organic Carbon	2.265625	1.878125	6.599375
Total Organic Carbon	2.40625	1.938125	16.05813
TDS as mg/L	503.6875	867.125	420.375

4.5 AMENITY

4.5.1 All receptors that may be affected by this proposal are identified in the Environmental Risk Assessment (ERA) that has been prepared as part of this Environmental Permit Application. A copy of the ERA is provided as Appendix D of the Environmental Permit Application.

4.6 COMPLIANCE POINTS (GROUNDWATER AND SURFACE WATER)

4.6.1 The risk of impact on groundwater and surface water and the selection of relevant compliance points is detailed in the HRA (Appendix F of the Environmental Permit Application).

5.0 POLLUTION CONTROL MEASURES

5.1 SITE ENGINEERING

Attenuation Layer

5.1.1 The Environmental Permitting Regulations (England and Wales) 2016 (as amended) specify that an attenuation layer to prevent leachate migration must be present at the base and sides of sites which accept inert materials for deposition. An artificial attenuation layer will be installed on top of the Limestone Formation across the base of the site. The barrier will be constructed using suitable imported materials consisting of non-waste materials which will either be 1m in thickness with a permeability no greater than $1x10^{-7}$m/s or its EA approved equivalent of 0.5m with a permeability of no greater than $5x10^{-8}$m/s.

5.1.2 An engineered side wall barrier is to be constructed along the sidewall of the quarry and is to have a thickness of 1m and a permeability of no greater than 1x10-7m/s or its EA approved equivalent.

5.1.3 The attenuation layer will be constructed from selected imported wastes, which will have sufficient clay content capable of achieving the required properties for the attenuation layer.

5.1.4 According to the EA's 'Engineering Construction Proposals for Deposit for Recovery' guidance, if waste is going to be used for the construction of the attenuation layer, the operator must confirm that the material is chemically and physically suitable. The chemical suitability will be achieved by implementing strict waste acceptance procedures which are outlined in the Operating Techniques document (Appendix C of the Environmental Permit Application). Physical suitability of the material will be assessed by the Site Manager in accordance with the measures outlined in Section 5.1.4 and Appendix A.

5.1.5 CQA of the attenuation layer will be achieved through a combination of the following: -

- Chemical suitability - review of site investigation information and Waste Information Form provided by the customer;
- Physical suitability (prior to import) using Chart 1 (Appendix A) - review of site investigation information and Waste Information Form provided by the customer;
- Physical suitability (prior to import) using Chart 1 (Appendix A) - visual inspection including a field strength and plasticity test as per Chart 1;
- Visual inspection of each load on tipping, prior to incorporation into the attenuation layer;
- Area completed each week recorded via a GPS coordinate and source of material identified and mapped on an attenuation layer location plan;
- Topographic surveys in accordance with the environmental permit;
- Periodic independent CQA visual inspection and site record check throughout construction period;
- In-situ permeability testing to demonstrate equivalence;
- Identification of works or procedures that do not comply with the requirements of the CQA Plan – 'Non Conformances';
- Recording of remedial works undertaken to rectify 'Non Conformances'; and
- Provision of CQA Completion Reports including full records of all inspections, checks and testing carried out including records demonstrating the compliance of the works and records

5.1.6 Full details of the arrangements for the CQA of the attenuation layer will be provided in advance of the commencement of construction in line with the anticipated permit conditions.

5.2 LEACHATE MANAGEMENT AND MONITORING

Leachate Generation

5.2.1 Leachate would be generated by rainfall infiltrating through areas of open inert restoration materials and through capped and restored areas. Due to the inert nature of the proposed waste types, there will be no polluting leachate generated at the site and therefore no leachate management or monitoring is needed.

5.3 GAS MANAGEMENT AND MONITORING INFRASTRUCTURE

Gas Generation and Management & Monitoring Infrastructure

5.3.1 A Gas Risk Assessment (GRA) has not been prepared for the site, as the Landfill Technical Guidance Note LFTGN03 indicates that new inert landfills do not pose a landfill gas hazard. Although the proposed activity comprises a Deposit for Recovery operation (using inert waste) as opposed to a disposal operation, it is considered that the principle is still applicable.

5.3.2 Nevertheless, a gas screening report has been prepared which has been submitted with the Environmental Permit application as Appendix H.

5.3.3 In accordance with the EA's 'Waste recovery plans and deposit for recovery permits' guidance, notes that if an operator intends to deposit waste more than 2 metres below the surrounding ground surface, they must monitor the waste for methane, carbon dioxide and oxygen. As such, in-waste monitoring boreholes will be installed in areas where waste deposits exceed 2m below the surrounding ground surface. The location of in-waste boreholes will be confirmed through the completion of site surveys which will confirm areas that comprise waste deposits that exceed 2m.

5.3.4 Further details regarding the monitoring of gas are provided in the Environmental Management and Monitoring Plan (Appendix I of the Environmental Permit Application).

5.4 SURFACE WATER MANAGEMENT AND MONITORING

5.4.1 Given the difference in proposed basal level of the development and current average groundwater elevations, CHQC expect to encounter groundwater inflows into areas where the water table is high. As such, dewatering will be required to ensure that the site can be worked dry. As part of the planning application for the Old Golf Course Extension area reference SCC/3894/2021), a Surface Water Management Plan (SWMP) was prepared to detail how surface water will be managed during the throughout the lifespan of the development. A copy of the SWMP is provided as part of the ERA (Appendix D of the Environmental Permit Application).

5.4.2 To facilitate the dewatering process, the SWMP notes that water will be transferred to the Wild Moor Middle Rhyne either directly or via a sump that's present within the wider quarry site. The dewatering process will also be regularised by a water abstraction licence and a water discharge permit.

5.4.3 Surface water monitoring is currently undertaken at two locations (SW1 and SW2) which are identified on Drawing Number CHQC/B043634/BH/01.

5.4.4 Further details regarding the monitoring of surface water are provided in the Environmental Management and Monitoring Plan (Appendix I of the Environmental Permit Application).

5.5 GROUNDWATER MANAGEMENT AND MONITORING

5.5.1 As mentioned in Section 5.4, dewatering may be required during the operational phase of the site to ensure that the site can be worked dry.

5.5.2 The HRA recommends that groundwater is monitored from the existing groundwater monitoring points (BH1, BH4, BH5, BH6 and BH7) as shown on Drawing Number CHQC/B043634/BH/01.

5.5.3 Further details regarding the monitoring of groundwater are provided in the Environmental Management and Monitoring Plan (Appendix I of the Environmental Permit Application).

5.6 AMENITY

5.6.1 An ERA (Appendix D of the Environmental Permit Application) has been prepared to consider the potential impact of the proposed site. The ERA indicates that the proposed changes will have no significant impacts in terms of odour, noise and vibration, and fugitive emissions. This is based on the control measures that are detailed in the ERA.

5.7 POST CLOSURE CONTROLS (AFTERCARE)

5.7.1 The EA's Guidance 'Landfill (EPR 5.02) and other permanent deposits of waste: how to surrender your environmental permit' details that where records demonstrate that a recovery site has accepted Landfill Directive compliance inert wastes during its lifetime, the site is applicable for a low-risk surrender based on records alone.

5.7.2 However, as a function of the planning permission, a 5-year aftercare scheme will be implemented to manage and maintain the landscaped areas. This will ensure the successful establishment and continued thriving of the landscape proposals.

6.0 MONITORING

6.1 The Environmental Management and Monitoring Plan (Appendix I of the Environmental Permit Application) provides details regarding the proposed monitoring schedule for the site.

DRAWINGS

CHQC/B043634/PER/01 – Environmental Permit Boundary

CASH 1610/2/C – Whole Site Plan

CHQOGC2109/5/B – Planning Boundary Plan

CHQOGC2109/6/A – Phase 1

CHQOGC2109/7/A – Phase 2

CHQOGC2109/8/A – Phase 3

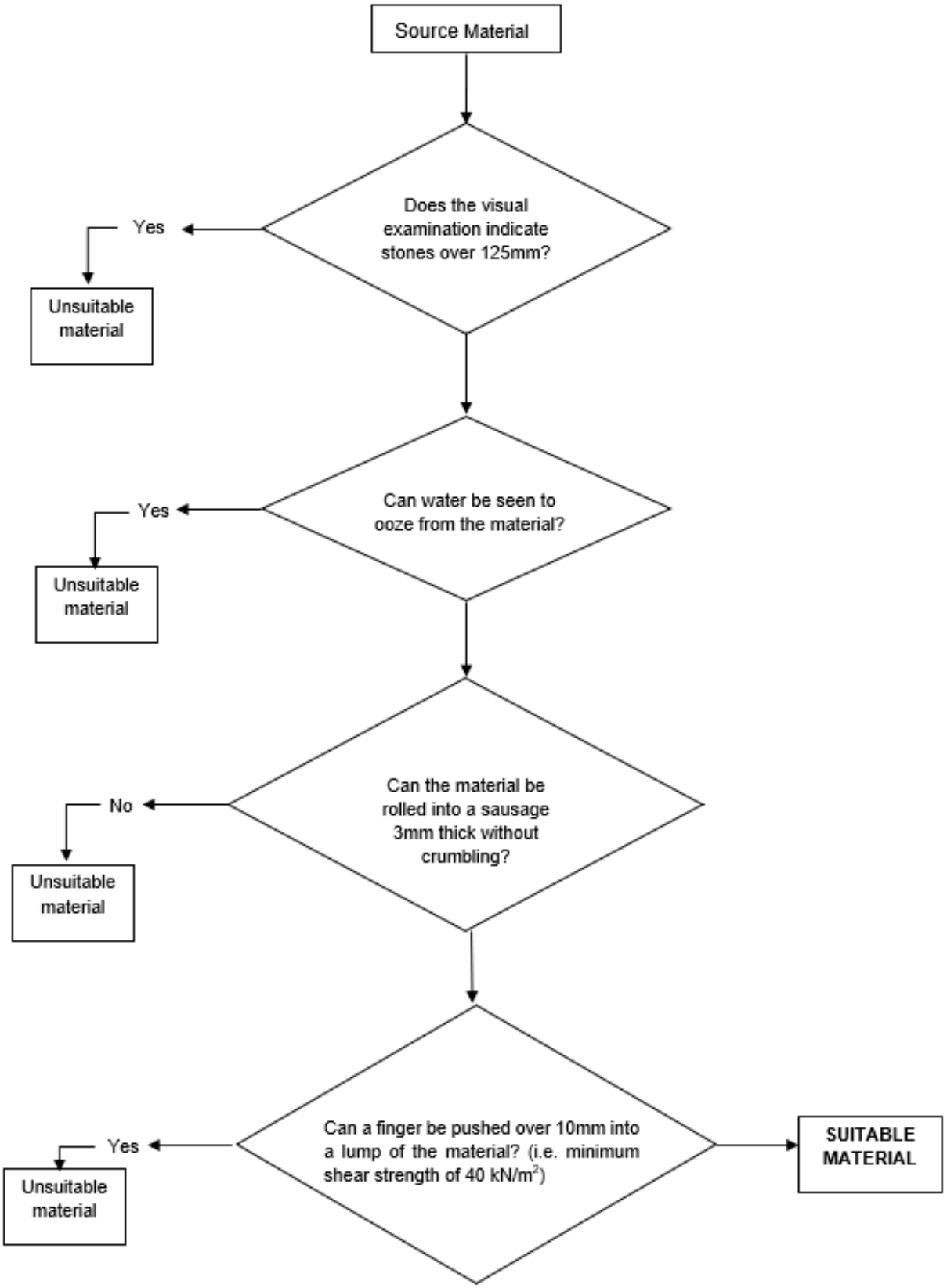
CASH 1610/5/C - Cross sections through proposed Eastern Extension area

CHQOGC2109/11/A - As existing and proposed sections

2109_006_CHILL_OGC Rest Plan

CHQC/B043634/BH/01 – Environmental Monitoring Location Plan

APPENDIX A - FLOWCHART FOR THE SELECTION OF SUITABLE MATERIAL FOR THE CONSTRUCTION OF AN ATTENUATION LAYER


Source Material
Does the visual examination indicate stones over 125mm?
Yes
Unsuitable material
Can water be seen to ooze from the material?
Yes
Unsuitable material
Can the material be rolled into a sausage 3mm thick without crumbling?
No
Unsuitable material
Can a finger be pushed over 10mm into a lump of the material? (i.e. minimum shear strength of 40 kN/m2)
Yes
Unsuitable material
SUITABLE MATERIAL