Transport, Environment & Design

Bovey Basin Ball Clay Workings – Central Area

Hydrogeological Risk Assessment

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1	Jamie Howourth	Minor updates to report	04-Apr-2025
2	Jamie Howourth	Minor updates to report	21-Aug-2025

1. Introduction

1.1 Commission

1.1.1 Horizon Consulting Engineers Limited (Horizon) was commissioned by Sibelco UK Ltd (Sibelco or "the Client") to prepare a Hydrogeological Risk Assessment (HRA) to support the restoration of the Bovey Basin Ball Clay Workings (Central Area), Kingsteignton, TQ12 3PR ("the Site").

1.1.2 This report specifically relates to the Central Area Quarries, located within the wider Bovey Basin Ball Clay Workings. It is proposed to incorporate the continued re-use of mine waste material (i.e "overburden" and"interburden") and imported waste soils ("restoration material") into one permit rather than to have a separate mine waste facility permit and deposit for recovery permit.

1.2 Background

1.2.1 A consolidating planning permission has recently been granted by Devon County Council (DCC) for the continued winning and working of permitted mineral reserves, associated development, and progressive restoration of the Site (DCC/4344/2023). Selected drawings showing the approved restoration plans are included in Appendix A of the Conceptual Site Model (CSM) Report[1].

1.2.2 It was agreed on 20 August 2024 (EA Ref: EPR/SP3427SW/P001) that the importation of material to complete the approved restoration would be deemed a recovery activity. The Waste Recovery Plan (WRP)[2] was agreed for the wider Bovey Basin Ball Clay Workings area however this permit application primarily relates to the restoration of the Central Area Quarries.

1.2.3 It is proposed to vary the permit to include restoration of other areas of the Bovey Basin (e.g Denistone Broadway) at a later date.

1.2.4 The permitted development includes an interim restoration strategy at the end of a 15-year period which aligns with the details and timescales associated with Planning Permissions 08/04411/DCC and 11/00371/DCC, requiring restoration of Rixey Park tip by 2029 and White Pit and Heathfield tips by 2042. It is noted that a final overall restoration plan has not been developed given cessation of quarry operations is not expected until approximately 100 years time and therefore Sibelco is currently working towards the interim strategy outlined in the planning application. As such, one of the conditions of works being deemed a recovery activity is that only the interim restoration strategy (i.e the first fifteen years, covering the Central Area Quarries) would be considered recovery at this stage.

1.3 Proposed Works (Importation of Material for Restoration)

1.3.1 The restoration design requires importation of soils to be deposited at the Site to facilitate the success of the approved planting scheme. It is proposed that this comprises sa cover of 30 cm of topsoil and 90 cm of subsoil over the tip faces.

1.3.2 In relation to the importation of material for restoration, the outline sequencing is as follows:

- The proposed works are to be undertaken in separate phases working only on specific deposition areas of the Site at any one time.

[1] Horizon (April 2025). Bovey Basin Ball Clay Workings. Conceptual Site Model. Ref: HCE1205.CSM.Rev2
[2] Horizon (March 2024). Bovey Basin Ball Clay Workings. Waste Recovery Plan. Ref: HCE1205.WRP.Rev2

- Prior to the commencement of deposition in each phase, any existing vegetation or unsuitable sub-grade material will be stripped and separately stockpiled.
- Suitable waste soil is to be sourced from local development sites and imported to Site using sheeted lorries. The lorries will enter and exit the Site using the same access as the main quarry processing facility in the centre of the Site adhering to the Site's Traffic Management Plan.
- Suitable holding areas (separate for topsoil and subsoil) will be created to allow for vehicles to deposit the soil before it is re-loaded onto dumpers to be taken to the deposition area within the workings of the quarry. Material will then be lightly compacted by the excavator or bulldozer.
- Finally, the land is to be seeded or planted in accordance with the Site Restoration Detailed Landscaping Plan (Drawing ST18876-035 included in **Appendix A**) agreed as part of the Planning Permission.

1.4 Aims and Objectives

1.4.1 The aim of this assessment is to provide the Environment Agency with sufficient detail in relation to the potential impacts of the proposed deposition of imported restoration soils on the water environment.

1.4.2 To achieve the above aim, this hydrogeological assessment provides the following:

(i) a review of existing data on ground conditions at the Site to allow development of a Hydrogeological Conceptual Site Model (CSM) based on available data;

(ii) a controlled waters risk assessment to evaluate the likely magnitude of environmental impacts from the deposition of waste materials at the Site; and

(iii) recommendations for further assessment, technical precautions, and Waste Acceptance Procedures (WAP) as appropriate.

1.5 Data Sources

1.5.1 Horizon has been provided with selected reports, correspondence and other data by the Client for use in the preparation of this report along with Site-specific data on ground conditions obtained by Horizon through ground investigations. The information provided is considered reasonable for developing a hydrogeological CSM for the purposes of preparing this HRA. Key reference documents include:

- Documents and plans of the approved Planning Permission (plans included in Appendix A of the CSM report[1]);
- Conceptual Site Model (CSM) Report (Horizon, March 2025[1])
- Environmental Setting and Site Design Report (ESSD[3]) (Horizon, March 2025);

[3] Horizon (April 2025) Bovey Basin Ball Clay Workings – Central Area. Environmental Setting & Site Design Report. Ref: HCE1205.ESSD

1.6 Methodology

1.6.1 The approach, scope and methodology of this risk assessment have been developed and conducted in general accordance with Client requirements, UK guidance (in particular relevant guidance presented on the GOV.UK website[4,5,6]) and standards including documents published by the Environment Agency, DEFRA, British Standards Institute (BSI), Construction Industry Research and Information Association (CIRIA) and Contaminated Land: Applications in Real Environments (CL:AIRE).

[4] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#risks-from-your-specific-activity [Accessed 01 November 2024]

[5] https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit [Accessed 01 November 2024]

[6] https://www.gov.uk/guidance/landfill-developments-groundwater-risk-assessment-for-leachate [Accessed 01 November 2024]

2. Site Setting

2.1 Conceptual Site Model

2.1.1 A standalone CSM report[1] has been developed for this project with reference to guidance on GOV.UK[7]. The CSM report looks to establish the environmental setting of the Site along with potential hazards associated the proposed restoration and receptors that might be affected by the works.

2.1.2 The CSM report[1] includes details relating to:

- Historical activities at the Site;
- The approved restoration works including proposed waste types, phasing plus outline management measures and technical controls;
- Precipitation data (i.e., rainfall record);
- Local surface water features;
- Geological and hydrogeological setting;
- Man-made pathways that may be affected by the restoration works; and
- Receptors in the vicinity of the Site including amenity, habitats and natural heritage.

2.1.3 Data and discussion presented in the CSM report[1] is generally not repeated in this HRA. The CSM report[1] should be read in conjunction with this HRA.

[7] https://www.gov.uk/guidance/landfill-operators-environmental-permits/plan-the-environmental-setting-of-your-site#conceptual-site-model [Accessed 11 November 2025]

3. Summary of Hydrogeological CSM

3.1 Context

3.1.1 Development and refinement of a CSM underpins the process through which risks associated with contaminated sites are evaluated in the UK irrespective of the context (e.g. whether the site is being developed under planning, assessed under Part 2A of the Environmental Protection Act 1990, or being evaluated under the environmental permitting regime). The CSM identifies the possible relationships between contaminants, pathways and receptors and is used to identify relevant contaminant linkages that may warrant further assessment and/or remedial actions.

3.1.2 Consistent with DEFRA guidance[8]:

- *"A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters;*
- *A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters; and*
- *A "pathway" is a route by which a receptor is or might be affected by a contaminant."*

3.1.3 This section presents a site-specific evaluation of individual contaminant linkages to further evaluate potential risks to controlled waters receptors from material imported and placed on-Site during the restoration works. A broader Conceptual Site Model for the Site is provided in the CSM report[1].

3.1.4 The 2023 Controlled Waters Risk Assessment (CWRA) for planning was specific to the expansion of the quarrying activities and did not take into account the importation of material to complete the restoration. Therefore this Hydrogeological CSM and associated risk assessment develops the 2023 CWRA for planning with specific discussion in relation to the imported material.

3.2 Sources: Historical Activity

3.2.1 In terms of operations on-Site, mineral is extracted with a hydraulic excavator selecting specific seams of ball clay and loading into articulated dump trucks. The clay is hauled along established routes to storage bays at Preston Manor Works. Interseam by-product ("interburden") is also excavated and loaded using the same method. Mineral by-product is hauled to tipping areas where the material is placed and compacted in layers by bulldozer.

3.2.2 Based on the description of the Site history above, contamination may have arisen from quarry operations. This would likely be from plant and machinery (both mobile and fixed). Specifically, fuel spills or oil spills may have occurred however contamination incidents are likely to be small-scale. There have been no known contamination incidents recorded on-Site.

[8] DEFRA (2012) Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance

3.3 Sources: Proposed Activity

3.3.1 Waste soils are to be deposited at the Site to complete the restoration agreed as part of the planning permission for the Central Area. For the purposes of this hydrogeological assessment, it is assumed that at a minimum, the material is to be not hazardous, classified with reference to current technical guidance on the classification of wastes[9], meet the definition of inert waste and meet the strict Waste Acceptance Procedures (WAP)[10].

3.3.2 Only waste soils complaint with the EWC codes in the WAP[10] will be deposited at the Site.

3.3.3 By definition, inert waste deposited at the Site for restoration purposes should be stable and non-reactive. There should be no reactive or hazardous substances in any leachate generated.

3.4 Pathways and Receptors: Aquifers

3.4.1 Due to the topography of the Site, it is anticipated that regionally, groundwater flow is towards the south and south-east towards Teignmouth into the English Channel. Given the size of the Site there may be a divide in hydrogeological conditions between the east and west. Extensive quarrying and associated water management within the quarry has an impact on the hydrogeological condition with minor inflows into the quarry occurring from the isolated sand layers.

3.4.2 Groundwater within the Bovey Formation is mostly found in isolated sand layers and lenses which are more permeable strata resulting in intergranular flow as opposed to the unproductive impermeably clay layers which restrict flow. Artesian groundwater is also common at the Site as a result of exposure of sand lens at the surface from quarrying activities. Specifically, the confined sand aquifer of the Abbrook Clay and Sand Member causes persistent inflows of water into the quarry. Submersible pumps are located within the Southacre, White Pit and John Acres Lane quarries which abstracts groundwater fed ponds and discharges them to the River Teign (Southacre) and the Ugbrooke Stream (White Pit and John Acres Lane) in accordance with licensed abstractions (ref: SW/046/0)

3.4.3 Alluvial units in connection with the River Teign may contain significant amounts of groundwater but these are not intercepted by mineral workings and there is no significant inflow to the pits from the river, through these units.

3.4.4 The underlying Aller Gravel and Upper Greensand layers make up the primary aquifer units, which are found at depth. The top of the Aller Gravel Formation is situated around 80 metres below White Pit Quarry's base.

3.4.5 In the White Pit area, the groundwater flow direction in the Aller Gravel Formation and Upper Greensand Formation aquifer is towards the south. This is likely to be similar all over the basin, with groundwater flowing towards discharge zones nearer the coast.

3.4.6 The following pathways for migration of contaminants have been identified with respect to aquifers:

- During the operational and post-operational phase of the restoration the principal pathway for the migration of any contamination from the Site will be leachate migrating through the waste deposits, via surface water or direct to outcrops of granular deposits of the Abbrook Clay and Sand Member.

[9] https://www.gov.uk/guidance/dispose-of-waste-to-landfill [Accessed 01 November 2024]

[10] Horizon (April 2025). Bovey Basin Ball Clay Workings. Waste Acceptance Procedures. Ref: HCE1205.WAP.Rev1

3.5 Pathways and Receptors: Surface Water

3.5.1 The River Teign, a main river, flows southwards adjacent to the western boundary. The river continues to flow generally southwards and eastwards to discharge to the English Channel at Teignmouth approximately 8 km to the east of the Site. Two further Main Rivers, the River Bovey and Ventiford Brook flow eastwards towards the Site to form a confluence with the River Teign adjacent to the western Site boundary.[11]

3.5.2 The Site lies within the catchment of the River Teign. The River Bovey joins the Teign just to the west of Southacre. The Ugbrooke Stream, a tributary of the River Teign, flows in a general southerly direction, adjacent to the eastern margin of White Pit and John Acre's Lane Quarries before meeting the River Teign approximately 1 km beyond the southern boundary of the Site.

3.5.3 The Ugbrooke Stream, an Ordinary Watercourse, flows southwards to the east of the B3193 before diverting south-westwards to flow adjacent to the southern Site boundary. The watercourse then diverts southwards to flow between a network of ponds to the south of the Site. The watercourse ultimately joins the River Teign approximately 1 km to the south of the Site.

3.5.4 Due to the low permeability of the cohesive soils of the Bovey Formation, precipitation and other surface water within the quarry does not infiltrate and flows overground via the drainage networks and sumps before being discharged to nearby watercourses. Precipitation is more likely to infiltrate through the ground in areas where the more granular sand layers outcrop at the surface.

3.5.5 There are several lagoons within the Site area, with a lagoon in the north-western corner of the Site adjacent to the Rixey Park Tip, two lagoons to the south-west of the South Acre Quarry at the western Site boundary and three lagoons to the south of the John Acres Quarry adjacent to the southern Site boundary. These are shown on Drawing ST18876/06/001 in Appendix A of the CSM report[1].

3.5.6 Phases of the restoration which are operational are graded to encourage surface water run-off and control overland flow. The management of surface water on-site will comprise a network of ditches and settlement basins which will be adjusted as necessary to facilitate the phased filling to an agreed final profile. Once completed, the establishment of habitats post-restoration will slow overland flow and reduce run-off into surface water receptors.

3.5.7 The following pathways for migration of contaminants have been identified with respect to surface water:

- During the operational and post-operational phase of the restoration the principal pathway for the migration of any contamination from the Site will be leachate migrating through the waste deposits, via surface water to lagoons and then subsequent discharge off-Site to the Ugbrooke Stream or River Teign; and / or
- Direct run-off of any contamination from the waste deposits to surface water receptors (i.e River Teign, Ugbrooke Stream, Abbrook Ponds).

[11] Wardell Armstrong (2023) Bovey Basin Ball Clay Works Central Area. Flood Risk Assessment. Ref: ST18876

4. Hydrogeological Risk Assessment

4.1 Contaminant Linkages

4.1.1 The risk assessment has been developed by Horizon on the basis of available information relating to the Site setting and the proposed waste deposition. A source-pathway-receptor linkage is required to exist in order for a risk to be present. This means that there has to be a contaminant present, a receptor that could be harmed by this contaminant, and a pathway linking the two. A summary of these contaminant linkages is present in **Table 4-1** below and shown on **Drawing 1205.103** included in **Appendix B**.

4.2 Nature of Risk Assessment

4.2.1 A qualitative risk screening which has been used to determine whether the development proposals represent, or potentially represent, a fundamental risk to groundwater and surface water receptors Considerations made in this assessment are summarised below:

- The nature of the overburden and imported material will have a to low contaminant potential with strict WAP[10] adopted.
- The underlying geology is a Secondary A Aquifer however the cohesive nature of the soils and topography will inhibit vertical migration of contaminants through the unsaturated zone with the predominant pathway being via overland flow directly to surface water receptors or via discharge from a settlement lagoon.
- Restoration is undertaken in a phased approach which will mitigate the risk of contaminant migration once habitats have begun to establish. Existing restoration has already been carried out at the toe of some existing slopes which is already attenuating run-off impacts from overland flow.

4.3 Summary of Contamination Source

4.3.1 Slightly elevated concentrations of contaminants may still be present in imported soils that meet the definition of waste soil and stones (EWC 17-05-04) and inert waste. These have the potential to be mobilised and impact groundwater and surface water.

4.3.2 Contaminated soils may be present within rogue loads. A rogue load assessment is provided in Section 5.2.

4.4 Risk Assessment

4.4.1 A discussion of the relative hydrogeological risk associated with each contaminant linkage is provided in **Table 4-1** below. In general, the risk to surface water and groundwater from the proposed restoration is considered to be low however some residual risks remain. These are to be managed by the mitigation and technical precautions as discussed in Section 5:

Primary Source	Secondary Source	Hazard	Pathway	Receptor	Discussion
Site Activities	Contamination associated with permitting activities such as plant / machinery, oil / fuel spills etc.	Degradation of water quality	Vertical / horizontal migration off-Site through more permeable soils	Controlled waters (surface water)	Potential to impact surface water from aquifer units that provides base-flow to surface water receptors such as Alluvium in the vicinity of the Ugbrooke Stream and the River Teign however migration through the unsaturated zone is expected to be limited given cohesive nature of bedrock deposits. Unlikely for contaminants to migrate significant distances through aquifer before reaching surface water receptors. Contamination is likely to be localised and small-scale in nature. On-Site surface water management including ditches and settlement ponds will aid attenuation of any contaminants and suspended solids and isolate contaminated water before being discharged. Residual risk considered to be low taking into account plant inspections and Sibelco's procedures and management system for handling pollution incidents from quarrying activities. Attenuation ponds and ditches on-Site will act to contain off-Site migration of contamination via overland flow. These are to be inspected on a routine basis as part of good management practices with any evidence of contamination investigated and dealt with.
				Controlled waters (groundwater)	
			Migration via surface water pathways to settlement lagoons	Controlled waters (Discharge to surface water)	
			Migration directly to surface water receptors via overland flow	Controlled Waters (surface water)	
Proposed Waste to be Imported	Deposited waste soil and stones [Chemical contaminants within deposited waste meeting inert waste criteria].		Vertical / horizontal migration off-Site through more permeable soils	Controlled waters (surface water)	Potential to impact surface water from aquifer units that provides base-flow to surface water receptors such as Alluvium in the vicinity of the Ugbrooke Stream and the River Teign however migration through the unsaturated zone is expected to be limited given cohesive nature of bedrock deposits. Slightly elevated concentrations of contaminants may still be present in soils that meet the definition of not hazardous and inert waste. These have the potential to be mobilised and impact groundwater and surface water. However, the likelihood of contamination at levels high enough to cause impact to the environment is considered to be low. Material import is to be selective to allow the best growing medium for the restoration to be complete with stringent waste acceptance procedures (i.e additional GAC to be met by all imported waste) Attenuation ponds and ditches on-Site will act to contain off-Site migration of contamination via overland flow. These are to be inspected on a routine basis as part of good management practices with any evidence of contamination investigated and dealt with.
				Controlled waters (groundwater)	
			Migration via surface water pathways to settlement lagoons	Controlled waters (Discharge to surface water)	
			Migration directly to surface water receptors via overland flow	Controlled Waters (surface water)	
Proposed Waste to be Imported	Contaminated soils (i.e. Rogue Loads) [Impacts within imported soils - unacceptable material that bypasses the checking process].		Vertical / horizontal migration off-Site through more permeable soils	Controlled waters (surface water)	Given the intended stringent testing and visual inspection regime to be adopted any unacceptable material will be limited in volume. On-Site surface water management including ditches and settlement ponds will aid attenuation of any contaminants and suspended solids and isolate contaminated water before being discharged. Attenuation ponds and ditches on-Site will act to contain off-Site migration of contamination via overland flow. These are to be inspected on a routine basis as part of good management practices with any evidence of contamination investigated and dealt with.
				Controlled waters (groundwater)	
			Migration via surface water pathways to settlement lagoons	Controlled waters (Discharge to surface water)	
			Migration directly to surface water receptors via overland flow	Controlled Waters (surface water)	

Table 4-1*:* Hydrogeological Conceptual Site Model

5. Mitigation and Technical Precautions

5.1 Material Suitability and Acceptance Procedures

5.1.1 Strict WAP[10] have been prepared to safeguard against taking material that does not meet Site's acceptance limits. The WAP[10] have been prepared with reference to GOV.UK guidance on the characterisation for waste for disposal at landfill. In summary, material imported to Site is to be non-hazardous and meet the inert WAC limits (with the exception of the inert WAC limit for Total Organic Carbon (TOC) for topsoil). Furthermore, to reduce the risk of contamination to the proposed restoration habitats, imported soils will also meet Generic Assessment Criteria (GAC) for selected phytotoxic elements (As, Cd, Cu, Ni and Zn). Although the primary purpose of the additional GAC is to reduce the risk to ecology, it will have a secondary benefit of reducing the contaminant load of heavy metals to controlled waters. Further information is provided in the WAP document and the ESSD[3].

5.1.2 Strict WAP[10] have been prepared to safeguard against taking material that does not meet Site's acceptance limits. These procedures will identify the actions and procedure to be taken including:

- All waste deliveries will be pre-arranged and will come from known sources on appropriately licensed haulage vehicles;
- Initial source checking of the waste characterisation data provided by the waste producer will be undertaken by a responsible person. Data to be reviewed to include details of source site history, locations of any samples, description of material and results of any laboratory testing;
- Confirming that the waste is as described prior to deposition, within agreed quantities and is permitted within the Environmental Permit; and
- Waste not permitted by the Environmental Permit being delivered to the Site will be returned immediately or retained in a defined quarantine area awaiting collection.

5.2 Rogue Loads

5.2.1 The principal aim of the rogue load assessment is to show that, should the stringent management procedures be bypassed and an acceptable load of unacceptable material be deposited at the Site, this would not represent an unacceptable risk to controlled waters receptors associated with the Site.

5.2.2 Technical precautions are included in the restoration design to minimise the impact of accidents (for the purposes of this risk assessment assumed to comprise placement of material that does not comply with the Site-specific assessment criteria) on the water environment.

5.2.3 For a rouge load to be deposited at the Site, a series of failures would need to occur in the WAP[10] such that non-permitted wastes bypass the stringent procedures and checks in the Site's management system and are accidentally deposited at the Site without being detected.

5.2.4 Given the intended stringent testing and visual inspection regime to be adopted any unacceptable material will be limited in volume.

5.2.5 In the extremely unlikely event of a rogue load of material bypassing the stringent checking processes and accidentally being deposited at the Site, it is assumed that the visual inspection regime adopted would result in any material that remains in-situ being limited in volume.

5.2.6 Any contaminants from a deposited rouge load would need to travel through the underlying low permeability non-target clay interburden and migrate through the aquifer to the receptor or travel via overland flow to surface water receptors. During this migration, contaminants would be subject to processes including biodegradation, attenuation, dispersion and dilution. On the basis of the above, it is considered that the risk of a rogue load causing an unacceptable effect on water quality at the closest receptor is very low.

5.3 Surface Water Management

5.3.1 As set out in the ESSD[3] and FRA[11], operational phases of the Site where tipping is taking place are graded to encourage surface water run-off and control overland flow. Ditches will be installed along the hydraulically downgradient edge of each phase (if not already in-place), draining to on-Site settlement and storage basins.

5.3.2 Wardell Armstrong Drawings from the FRA (ST20466-001 to ST20466-003 inclusive (representing the three phases of development)) are provided in **Appendix A** and demonstrate how surface water will be managed.

5.3.3 The drawings demonstrate how areas of the Site act as a "catchment" for surface water with water draining to sumps at the bottom of voids before being pumped to settlement lagoons and then discharged under the existing licensed discharge consents. A surface water run-off volume calculation (shown on the drawings) demonstrates the required attenuation capacity required for each catchment.

5.3.4 As the restoration develops, the impacts of the surface water run-off will be reduced as growing habitats will help mitigate volumes of run-off.

5.3.5 Pumping from quarry sumps to settlement lagoons is to be suspended when water levels are high. Discharge rates from the settlement lagoons are restricted by rates set out within the existing discharge consents.

5.4 Accidental Releases

5.4.1 Technical precautions are included in the engineering design to minimise the impact of accidents (for the purposes of this risk assessment assumed to comprise placement of material that does not comply with the Site-specific assessment criteria) on the water environment. Given the intended stringent testing and visual inspection regime to be adopted any unacceptable material will be limited in volume. Combined with the robust surface water management plan, the potential risk of accidents or impact of a rogue load is considered to be low.

6. Requisite Monitoring and Surveillance

6.1 Monitoring Infrastructure

6.1.1 Given the strict WAP[10] to be adopted, the proposed surface water management and low contamination potential of imported waste, no surface water or groundwater monitoring is proposed. Compliance with the existing discharge consents is to continue throughout the operation of the permit with ad-hoc samples taken as required to demonstrate compliance.

6.1.2 Given the low thickness of waste to be deposited, gas monitoring is also not required.

7. Discussion and Conclusions

7.1.1 This HRA has been prepared to assess impacts on the water environment associated with the proposed import and deposition of inert waste at the Bovey Basin Central Area Quarries, operated by Sibelco.

7.1.2 The quantitative assessment considers that risks to receptors associated with the water environment are generally low notwithstanding the presence of sensitive receptors such as the River Teign and the Ugbrooke Stream.

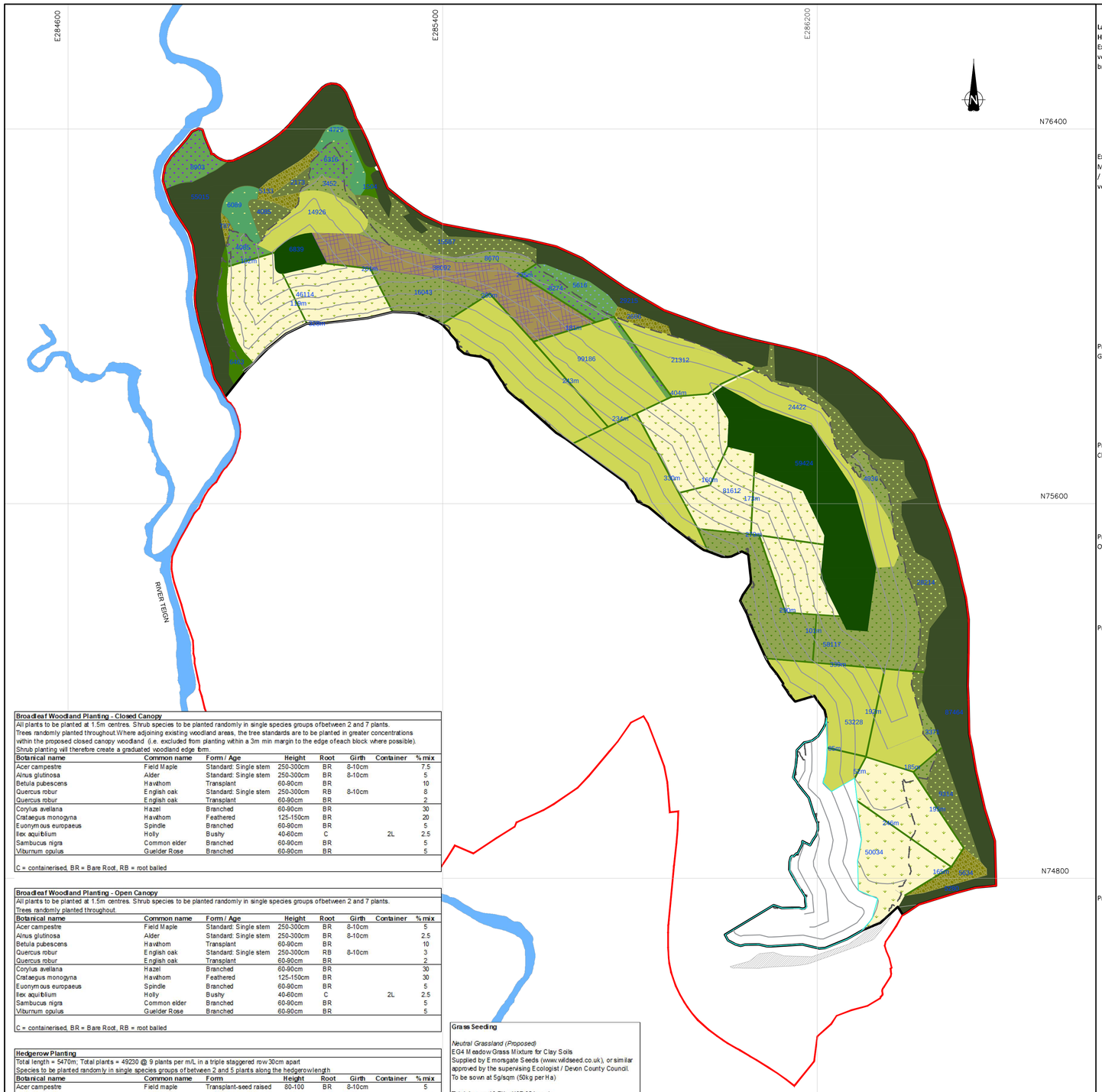
7.1.3 The main aim of the restoration is to establish a high quality suitable growing medium for the developed of habitats associated the proposed restoration of the quarry. A Controlled Waters Risk Assessment was submitted as part of the planning application for the development scheme.

7.1.4 This HRA specifically takes into account imported subsoil and topsoil required to form the final restoration layer.

7.1.5 Strict Waste Acceptance Procedures are proposed which will limit the potential for elevated concentrations within the inert waste and reduce the risk of rogue loads.

7.1.6 A surface water management plan was submitted as part of the planning application and provides details of how surface water is to be managed on-Site. The details of the surface water management plan provide additional mitigation for the risk to controlled waters from the placement of imported waste soils.

Appendix A
Drawings from Planning Permission



Broadleaf Woodland Planting - Closed Canopy

All plants to be planted at 1.5m centres. Shrub species to be planted randomly in single species groups ofbetween 2 and 7 plants.
Trees randomly planted throughout.Where adjoining existing woodland areas, the tree standards are to be planted in greater concentrations within the proposed closed canopy woodland (i.e. excluded from planting within a 3m min margin to the edge ofeach block where possible).
Shrub planting will therefore create a graduated woodland edge form.

Botanical name	Common name	Form / Age	Height	Root	Girth	Container	% mix
Acer campestre	Field Maple	Standard: Single stem	250-300cm	BR	8-10cm		7.5
Alnus glutinosa	Alder	Standard: Single stem	250-300cm	BR	8-10cm		5
Betula pubescens	Havithorn	Transplant	60-90cm	BR			10
Quercus robur	English oak	Standard: Single stem	250-300cm	RB	8-10cm		8
Quercus robur	English oak	Transplant	60-90cm	BR			2
Corylus avellana	Hazel	Branched	60-90cm	BR			30
Crataegus monogyna	Havithorn	Feathered	125-150cm	BR			20
Euonymous europaeus	Spindle	Branched	60-90cm	BR			5
Ilex aquifolium	Holly	Bushy	40-60cm	C		2L	2.5
Sambucus nigra	Common elder	Branched	60-90cm	BR			5
Viburnum opulus	Guelder Rose	Branched	60-90cm	BR			5

C = containerised, BR = Bare Root, RB = root balled

Broadleaf Woodland Planting - Open Canopy

All plants to be planted at 1.5m centres. Shrub species to be planted randomly in single species groups ofbetween 2 and 7 plants.
Trees randomly planted throughout.

Botanical name	Common name	Form / Age	Height	Root	Girth	Container	% mix
Acer campestre	Field Maple	Standard: Single stem	250-300cm	BR	8-10cm		5
Alnus glutinosa	Alder	Standard: Single stem	250-300cm	BR	8-10cm		2.5
Betula pubescens	Havithorn	Transplant	60-90cm	BR			10
Quercus robur	English oak	Standard: Single stem	250-300cm	RB	8-10cm		3
Quercus robur	English oak	Transplant	60-90cm	BR			2
Corylus avellana	Hazel	Branched	60-90cm	BR			30
Crataegus monogyna	Havithorn	Feathered	125-150cm	BR			30
Euonymous europaeus	Spindle	Branched	60-90cm	BR			5
Ilex aquifolium	Holly	Bushy	40-60cm	C		2L	2.5
Sambucus nigra	Common elder	Branched	60-90cm	BR			5
Viburnum opulus	Guelder Rose	Branched	60-90cm	BR			5

C = containerised, BR = Bare Root, RB = root balled

Hedgerow Planting

Total length = 5470m; Total plants = 49230 @ 9 plants per m/L in a triple staggered row 30cm apart
Species to be planted randomly in single species groups of between 2 and 5 plants along the hedgerowlength

Botanical name	Common name	Form	Height	Root	Girth	Container	% mix
Acer campestre	Field maple	Transplant-seed raised	80-100	BR	8-10cm		5
Corylus avellana	Hazel				8-10cm		30
Crataegus monogyna	Havithorn	Transplant-seed raised	80-100	BR			35
Ilex aquifolium	Holly	Transplant-seed raised	80-100	C	8-10cm		10
Prunus spinosa	Blackthorn	Transplant-seed raised	80-100	BR	1+1		10
Quercus robur	English Oak	Transplant-seed raised	80-100	BR	1+1		5
Rosa canina	Dog rose	Transplant-seed raised	80-100	BR	1+1		5
Hedgerow Standards							
To be planted along the hedgerowlengths at an average of 25m intervals at between 15m and 30m apart.							
Quercus robur	English Oak	Transplant-seed raised	80-100	BR	1+1		/

C = containerised, BR = Bare Root, RB = root balled

Heathland Establishment

A heathland seed source will be provided from mown areas of existing heath. The donor material is obtained as a by-product from heathland management operations such as those to create and maintain firebreaks and to provide areas of heath with differing age structures. Harvesting of donor areas is completed during the early winter months to minimise disturbance to the habitat and while the plants still carry much of their seed. The mowings consist of vegetative parts of the heather plant and, most importantly, the majority of the seed source.
The heathland litter will be spread across the reception area using an agricultural muck spreader towed by a tractor. This will be completed swiftly after harvesting as heathland regeneration has been proven to be much more successful using freshly harvested seed. Only a thin covering of litter is needed across the area as a small amount of litter contains large amounts of heather seed.
The reception area may be over-sown with *Agrostis curtisii grass seed at a light rate of 15kg/ha*. This grass cover is used to help prevent erosion and acting as a nurse crop whilst the heath plants are establishing themselves.

Grass Seeding

Neutral Grassland (Proposed)
EG4 Meadow Grass Mixture for Clay Soils
Supplied by E morsgate Seeds (www.wildseed.co.uk), or similar approved by the supervising Ecologist / Devon County Council.
To be sown at 5g/sqm (50kg per Ha)

Total Area = 10.7Ha (107,021sqm)
Total seed = 535.1 kg

Neutral Meadow (Proposed)
EM4 Meadow Mixture for Clay Soils
Supplied by E morsgate Seeds (www.wildseed.co.uk),
or similar approved by the supervising ecologist.
To be sown at 4g/sqm (40kg per Ha)

Total Area = 2.49Ha (24,847sqm)
Total seed = 99.4 kg

Neutral Meadow Grazed (Proposed)
EM4 Meadow Mixture for Clay Soils
Supplied by E morsgate Seeds (www.wildseed.co.uk),
or similar approved by the supervising ecologist.
To be sown at 4g/sqm (40kg per Ha)

Total Area = 20.4Ha (204,430sqm)
Total seed = 817.7 kg

Landscape Feature / Habitat Type	Description	Key Landscape and Ecological Benefits	Proposed Management
Existing Areas of Woody vegetation and broadleaf woodland	Woodland and scrub native species within the site: establishing areas of planted mixed deciduous native tree and shrub species, and mature established mainly native deciduous with holly woodland with upper canopy and scrub understorey layer below, with native flora ground layer in less shaded some areas.	Important landscape features adding sense of enclosure and landscape value. Possible screening value. Important general wildlife habitat, particularly important for dormice and bat flight routes on edges.	Manage to maintain as mixed woodland containing mature trees with understorey and a ground flora layer. Particularly seek to retain the older, mature trees which are generally of greatest landscape and ecological value, but seek to retain those younger trees which will eventually reach full maturity. Manage the woody nature of young / establishing tree cover to develop into mature woodland. The mosaic of scrub and trees on woodland edges is to be kept. Maintain the woodland edges to continue and encourage as bat flight routes through taller trees whilst having a lower shrub layer particularly beneficial to birds and small mammals.
Existing Grassland, Meadow and Ephemeral / Short perennial vegetation	Grassland is typically dominated by Yorkshire fog with frequent sweet vernalgrass, red clover, broadleaved dock, compact rush, creeping buttercup, ragwort, bird's-foot trefoil, creeping thistle. Unimproved neutral meadow is herb-rich and contains primarily species characteristic of mesotrophic soils. Grasses formed approximately 20% of the sward and were dominated by false-oat grass and cock's foot. Ephemeral habitat has colonised areas which have not been recently disturbed. Vegetation cover is relatively sparse due to the absence of topsoil.	Important ecologically, to enhance the foraging opportunities over the fields proposed for compensation so that bat population security is guaranteed. An ecologically important function for invertebrates and bats. The unimproved meadow habitat was currently analogous with the Priority Habitat: 'Lowland Meadow' and the Devon BAP Habitat: 'Flower-rich Meadows and Pastures'. The habitat was deemed to meet the County Wildlife Site criteria.	Management of the extent of bramble, European gorse and grey willow beginning to encroach into the existing and newly created Meadow areas. Where appropriate, both grassland and meadow can be managed through a hay cutting regimen. Hay meadows should be allowed to grow between March and end of August. Cut should be undertaken when the hay is ready between late July at the earliest and late August. The arisings should be collected and removed. Once cut the meadows should be grazed in combination with the pasture management regime with stock being removed by mid-March at the latest.
Proposed Neutral Grassland and Meadow	Proposed areas on the tip slopes, adjacent to and linking with existing areas of neutral grassland either with topsoil absent or with a range of depths from circa 25mm depth to circa 100mm to 150mm depth on proposed pastures	Important ecologically, to enhance the foraging opportunities over the fields proposed for compensation so that bat population security is guaranteed. New meadow areas enhance existing pockets of meadow, increasing opportunities for species diversity and supporting the John Acres Strip pCWS within the site.	Seek to deliver on-going grazing/hay cropping to maintain and enhance value of existing areas of pasture and lowland grassland in the vicinity. An increased number of pastures managed for grazing would provide increased bat food source. Hay meadows should be allowed to grow between March and end of August. A hay cut should be undertaken when the hay is ready between late July at the earliest and late August. Arisings should be collected and removed. Once cut the meadows should be grazed in combination with the pasture management regime with stock being removed by mid-March at the latest.
Proposed Woodland - Closed	Proposed more dense blocks of native species woodland trees and shrubs located adjoining existing woodland areas.	Landscape function includes screening, visually 'softening' road corridor, adding to the typical local landscape character. Primary ecological function is to reinforce the bat flight corridors where planted within the road corridor and to provide habitat for dormice and other species.	Aim to achieve maturity to woodland with upper tree canopy and with shrub layer below, the edges being shrubbier if possible. Thin as they mature. Seek to achieve and maintain woodland edge function of a flight route for bats and as a habitat for small mammals and birds.
Proposed Woodland - Open	Proposed more open blocks of native species woodland trees and shrubs located on the restored tip slopes and tops within the site.	Landscape function includes wooded blocks within field mosaic of restored tip slopes adding to the typical local landscape character. Primary ecological function is to reinforce the bat flight corridors where planted within the grassland/pasture areas and to provide habitat for dormice and other species.	Aim to achieve maturity to woodland with upper tree canopy and with shrub layer below, the edges being shrubbier if possible. Thin as they mature, with the least dense woodland being at the higher elevations. Seek to achieve and maintain woodland edge function of a flight route for bats and as a habitat for small mammals and birds.
Proposed Hedgerows	Proposed mixed native species hedgerows within the site primarily dividing and enclosing areas of grazed neutral grasland (pasture) comprising shrubs interspersed with hedgerow standards	Important new landscape features adding sense of enclosure and landscape value. Possible screening value. Important general wildlife corridor habitat,particularly important for dormice and as bat flight routes Also, particularly on the restored tip slopes, to rovide and improve shelter from strong winds and increase the value of the pastures to foraging bats when perching (at about 2m from ground level from projecting branches) and hawking (within 5m of linear features)	New hedgerow will create additional hedgerow habitat to enhance the network of commuting and dispersal routes for bats, dormice and other species. The measures described below pertain largely to greater horseshoe bats as maintaining and enhancing commuting routes is key to the conservation of the colony roosting at Chudleigh Caves However, these measures will also benefit other bat species, birds and reptiles. The aim is to improve the quality and extent of flight paths through the landscape and to provide increased hawking and perch-hunting opportunities for bats. To create hedgerows of nature conservation interest, native trees and shrubs that are common in the local area will be planted. Broad hedgerows will be createdby planting shrubs in staggered rows with tree species including oak and field maple. New plants will be adequately protected from stock and rabbit grazing damage through the use of suitable fencing enclosure. Hedges to be managed to create tall, bushy, broad hedges ideally 3-6m in width with an average height of 3m to provide sheltered flight paths and enhanced foraging opportunities for bats when perching and hawking and enhanced nesting habitat for birds. Hedgerow trees to be left to mature. Long term management includes cutting back to both sides to ensure hedgerow doesn't become top heavy and subject to collapse due top basal thinning thus reducing screening ability. Maintain to height suitable for bats to echolocate. Ensure trees planted in hedgerows are not cut back and encourage trees to grow through the hedgerow in suitable locations.
Proposed Pasture	Areas of new neutral grassland enclosed by woodland and hedgerows across the tip slopes to be managed via grazing.	Pastures add to the local landscape mosaic and fulfilling an important ecological function particularly where actively grazed and related invertebrate ecology important as a bat food source. Pastures will each be sub-divided into smaller grazing units with dividing hedgerows. The foraging value of the pastures will be significantly increased by this sub-division into a mosaic of smaller units that are sheltered from wind impacts. These will provide immediate benefits after creation, whilst trees & shrubs planted adjacently, and within the hedge rows, are establishing themselves. Gaps in the hedgerows provided with gates are to be provided to allow stock to either roam among all fields, or be restricted as dictated by the grazing situation. As such although the fields will be small, grazing animals can move between fields as they wish effectively creating larger grazing units if required.	Pasture habitat will be created within those fields described above by a grazing regime of livestock (cattle/sheep) to provide dung that will support dung beetles for the majority of the year. Small numbers of hardy cattle, from July to October, reducing in number from November to April). If sheep-worrying is not a problem, or can be controlled, sheep can be used from October to April. Jacob sheep may be the best choice (stocked at lower numbers over winter, and increasing in summer). A mixture of cattle, sheep and/or horses over winter is preferable. Rotation of animals and fields should assist with parasite control. No ivermectins should be used to treat livestock, and advice should be sought from NE as to the acceptable treatments for any horses. (Ref; Managing landscapes for the greater horseshoe bat. Anon. English Nature 1998.) To support grazing water troughs and shelters for stock will need to be provided at a sufficient density. Stock shelters will provide hanging up night roosts for bats foraging over the fields particularly juvenile bats. Stock shelters should comprise a single, partly open-fronted stock shelter minimum 5m long by 3m wide footprint that is 3m high at the apex will be built. Detailed features to benefit horseshoe bats will be incorporated. The shelter will provide cover in winter for cattle or other grazers and night-roosts for use by both adults and juveniles. They will be especially valuable to juveniles when they first forage, as they will provide security against predator attacks whilst resting between foraging bouts whilst foraging on Aphodius beetles.
Proposed Natural Regeneration / Colonisation	These to be left to recolonize on their own accord (as has already occurred on previously topsoiled tip slopes where restoration has already been undertaken). If natural colonisation of grassland does not occur, or only weak establishment occurs in areas to be used as pasture, overseeding with a suitable agricultural seed mix will be undertaken.	Important landscape element forming part of the mosaic of the tip slopes restoration character.	Manage to seek successful establishment of grassland natural colonisation of tip slopes and pastures, and then monitor how the pattern and types of habitat which occurs as a result of natural colonisation. In particular check on the extent of scrub establishment and how this affects the overall landscape and ecological objectives. It may be necessary to cut back or remove some areas if this is located in an unsuitable location whilst other areas could be left to establish through seer stages, potentially to woodland. During establishment of grasslands, manage to remove invasive/problematic species.

KEY

- SITE BOUNDARY
- Tipping footprint= 64.354Ha (Extent of landscape scheme= 95.074Ha)
- 45.6 New or existing habitat area to be retained or created (sqm) or hedge length (linear metres)
- Neutral Meadow (unimproved) 5616sqm
- Neutral Grassland 59373sqm
- Ephemeral / Short perennial 10815sqm
- Dense scrub 14240sqm
- Broadleaved Woodland 176974sqm
- Natural Regeneration - Proposed 213074sqm
- Neutral Meadow - Proposed 24847sqm
- Neutral Grassland - Proposed 94589sqm
- Neutral Grass (grazed) - Proposed 177760sqm
- Heathland - Proposed 38092sqm
- Woodland (Open) - Proposed 66263sqm
- Woodland (Closed) - Proposed 7967sqm
- Attenuation Pond - Proposed 2731sqm
- Hedgerows - Proposed 4985mL

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
B	POND REMOVED	06/10/23	SJB	CB	CB
A	FIRST ISSUE	22/01/23	SJB	MP	SR

CLIENT

SIBELCO Ltd.

PROJECT

BOVEY BASIN
BALL CLAY WORKINGS CENTRAL AREA
KINGSTEIGNTON, DEVON

DRAWING TITLE

SITE RESTORATION
DETAILED LANDSCAPING PLAN

DRG No.	REV	SUIT. CODE
ST18876-035	B	

DRG SIZE	SCALE	DATE
A1	1:5000	06/01/2023

DRAWN BY	CHECKED BY	APPROVED BY
KMS	MP	SR

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DO NOT SCALE FROM THIS DRAWING

NOTES

1. TO BE READ IN CONJUNCTION WITH FLOOD RISK ASSESSMENT REF: ST18876/APPENDIX 6.1
2. OVERLAND FLOW AND DRAINAGE CHANNEL ROUTES BASED ON TOPOGRAPHICAL SURVEY (REF: SDMP 2021-03-03 OSTN15).
3. OUTFALL CATCHMENT AREAS BASED ON DRAWING REF: DO3/P27/002.

KEY

- EXISTING PIPE
- EXISTING DRAINAGE DITCH
- SD9 OUTFALL CATCHMENT
- SD10 OUTFALL CATCHMENT
- EXISTING OUTFALL POINT
- OVERLAND FLOW (INDICATIVE)
- DIRECTION OF WATERCOURSE FLOW (INDICATIVE)
- EXISTING PUMP
- EXISTING SUMP
- EXISTING LAGOON

E284600
E285400
E286200
E286800
N76400
N75600
N74800
N74000

DISCHARGES TO RIVER TEIGN
RIXEY TIP
WHITE PIT TIP
AREA DRAINS VIA OVERLAND FLOW TO DRAINAGE DITCHES
SURFACE WATER AND GROUNDWATER PUMPED FROM QUARRY VOID
DISCHARGES TO RIVER TEIGN VIA EXISTING OUTFALL
SURFACE WATER AND GROUND WATER PUMPED FROM QUARRY SUMP TO SOUTH ACRE
WHITE PIT QUARRY
SOUTH ACRE QUARRY
HEATHFIELD TIP
UGBROOKE STREAM
RIVER TEIGN
AREA DRAINS VIA OVERLAND FLOW TO DRAINAGE DITCHES
SURFACE WATER AND GROUND WATER PUMPED FROM QUARRY SUMP TO SD9 VIA SETTLEMENT PONDS
SURFACE WATER PUMP
OPEN DITCH INTERCEPTS SURFACE WATER RUNOFF FROM OUTSIDE VOID
OUTFALL CONTROLLED BY VALVES
SD9
OUTFALL SD9 DISCHARGES TO RIVER TEIGN
JOHN ACRES QUARRY
SURFACE WATER AND GROUNDWATER PUMPED FROM QUARRY SUMP TO SD10 VIA LAGOONS
TIP TOP POND
DUNN'S POND
SAWMILLS POND
SD10
OUTFALL SD10 DISCHARGES TO UGBROOKE STREAM

REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
B	EXISTING DRAINAGE DITCH EXTENDED	21/09/23	DR	BG	AB
A	APPROVED ISSUE	21/09/23	DG	BG	AB

SIBELCO

BOVEY BASIN BALL CLAY WORKS

EXISTING DRAINAGE LAYOUT

DRG No.		REV
ST20466-004		B
DRG SIZE	SCALE	DATE
A1	1:5000	01/09/23
DR	BG	APPROVED BY AB

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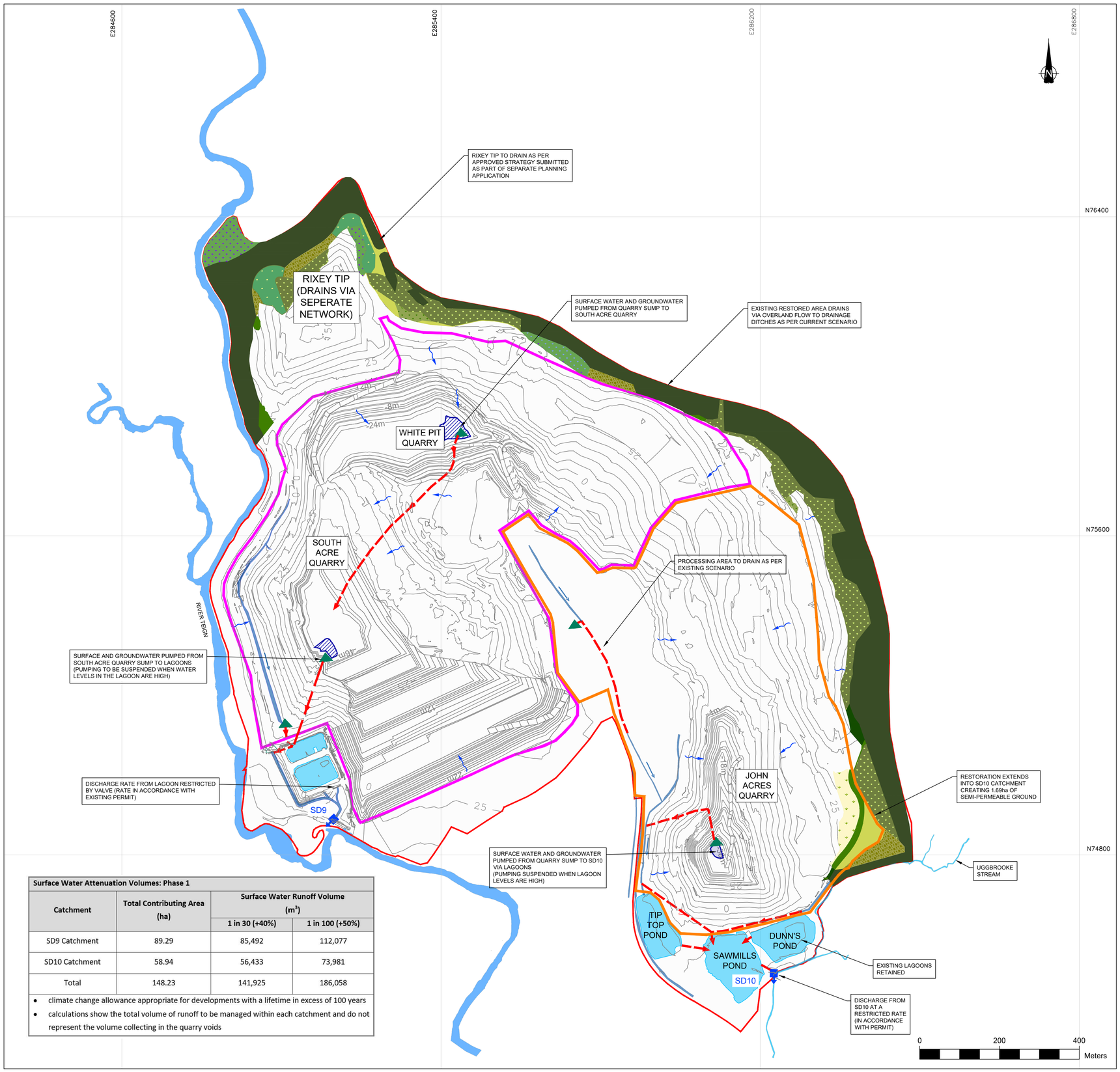

Surface Water Attenuation Volumes: Phase 1			
Catchment	**Total Contributing Area (ha)**	**Surface Water Runoff Volume (m^3)**	
		1 in 30 (+40%)	**1 in 100 (+50%)**
SD9 Catchment	89.29	85,492	112,077
SD10 Catchment	58.94	56,433	73,981
Total	148.23	141,925	186,058

- climate change allowance appropriate for developments with a lifetime in excess of 100 years
- calculations show the total volume of runoff to be managed within each catchment and do not represent the volume collecting in the quarry voids

NOTES

1. TO BE READ IN CONJUNCTION WITH FLOOD RISK ASSESSMENT REF: ST18876/APPENDIX 6.1
2. OVERLAND FLOW AND DRAINAGE CHANNEL ROUTES BASED ON TOPOGRAPHICAL SURVEY (REF: SDMP 2021-03-03 OSTN15).
3. OUTFALL CATCHMENT AREAS BASED ON DRAWING REF: DO3/P27/002.

LEGEND

- PLANNING BOUNDARY
- PROPOSED PIPE/PUMPING ROUTE
- EXISTING DRAINAGE DITCH
- SD9 OUTFALL CATCHMENT (C. 51.70ha)
- SD10 OUTFALL CATCHMENT (C. 95.45ha)
- EXISTING OUTFALL POINT
- DIRECTION OF OVERLAND FLOW (INDICATIVE)
- DIRECTION OF WATERCOURSE FLOW (INDICATIVE)
- PROPOSED PUMP
- EXISTING LAGOON/POND
- SUMP AREA (INDICATIVE)

EXISTING RETAINED (DRG ST18876-027)

- NEUTRAL MEADOW (UNIMPROVED)
- NEUTRAL GRASSLAND
- EPHEMERAL / SHORT PERENNIAL
- DENSE SCRUB
- BROADLEAVED WOODLAND

PROPOSED NEW (DRG ST18876-027)

- NEUTRAL MEADOW - PROPOSED
- NEUTRAL GRASSLAND - PROPOSED
- HEATHLAND - PROPOSED
- BROADLEAVED WOODLAND - PROPOSED
- WOODLAND EDGE - PROPOSED
- ATTENUATION POND - PROPOSED
- NATURAL REGENERATION - PROPOSED
- VEGETATION - PROPOSED

FOR MORE INFORMATION REFER TO LANDSCAPE RESTORATION PLAN DRAWING ST18876-027

REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
A	FIRST ISSUE	01/09/23	SJB	BG	DB

CLIENT

SIBELCO UK LIMITED

PROJECT

CENTRAL AREA CONSOLIDATION APPLICATION

DRAWING TITLE

PHASE 1 SURFACE WATER MANAGEMENT PLAN

DRG No.	REV	SUIT. CODE
ST20466-001	A	

DRG SIZE	SCALE	DATE
A1	1:5000	24/08/23

DRAWN BY	CHECKED BY	APPROVED BY
DR/SJB	BG	DB

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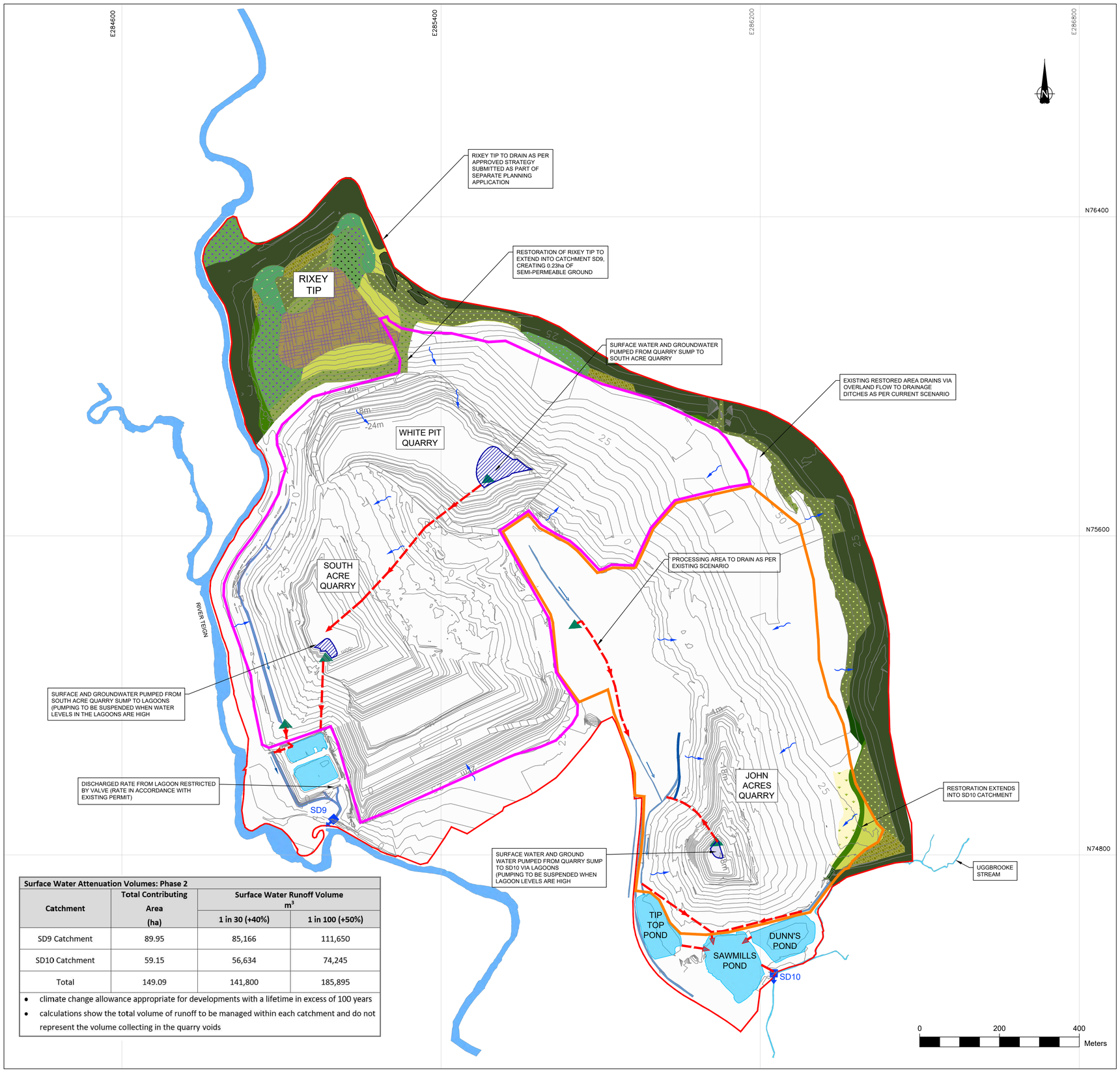

Surface Water Attenuation Volumes: Phase 2			
Catchment	**Total Contributing Area (ha)**	**Surface Water Runoff Volume m^3**	
		1 in 30 (+40%)	**1 in 100 (+50%)**
SD9 Catchment	89.95	85,166	111,650
SD10 Catchment	59.15	56,634	74,245
Total	149.09	141,800	185,895

- climate change allowance appropriate for developments with a lifetime in excess of 100 years
- calculations show the total volume of runoff to be managed within each catchment and do not represent the volume collecting in the quarry voids

NOTES

1. TO BE READ IN CONJUNCTION WITH FLOOD RISK ASSESSMENT REF: ST18876/APPENDIX 6.1
2. OVERLAND FLOW AND DRAINAGE CHANNEL ROUTES BASED ON TOPOGRAPHICAL SURVEY (REF: SDMP 2021-03-03 OSTN15).
3. OUTFALL CATCHMENT AREAS BASED ON DRAWING REF: DO3/P27/002.

LEGEND

- PLANNING BOUNDARY
- PROPOSED PIPE/PUMPING ROUTE
- EXISTING DRAINAGE DITCH
- SD9 OUTFALL CATCHMENT (C. 48.78ha)
- SD10 OUTFALL CATCHMENT (C. 79.70ha OPERATIONAL, 17.07ha RESTORED)
- EXISTING OUTFALL POINT
- DIRECTION OF OVERLAND FLOW (INDICATIVE)
- DIRECTION OF WATERCOURSE FLOW (INDICATIVE)
- PROPOSED PUMP
- EXISTING LAGOON/POND
- SUMP AREA (INDICATIVE)

EXISTING RETAINED (DRG ST18876-027)

- NEUTRAL MEADOW (UNIMPROVED)
- NEUTRAL GRASSLAND
- EPHEMERAL / SHORT PERENNIAL
- DENSE SCRUB
- BROADLEAVED WOODLAND

PROPOSED NEW (DRG ST18876-027)

- NEUTRAL MEADOW - PROPOSED
- NEUTRAL GRASSLAND - PROPOSED
- HEATHLAND - PROPOSED
- BROADLEAVED WOODLAND - PROPOSED
- WOODLAND EDGE - PROPOSED
- ATTENUATION POND - PROPOSED
- NATURAL REGENERATION - PROPOSED
- VEGETATION - PROPOSED

FOR MORE INFORMATION REFER TO LANDSCAPE RESTORATION PLAN DRAWING ST18876-027

REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
B	POND REMOVED	21/09/23	DR	BG	DB
A	FIRST ISSUE	01/09/23	SJB	BG	DB

CLIENT: SIBELCO UK LIMITED

PROJECT: CENTRAL AREA CONSOLIDATION APPLICATION

DRAWING TITLE: PHASE 2 SURFACE WATER MANAGEMENT PLAN

ORG No.	REV	SUIT. CODE
ST20466-002	B	

ORG SIZE	SCALE	DATE
A1	1:5000	29/08/23

DRAWN BY	CHECKED BY	APPROVED BY
DR/SJB	BG	DB

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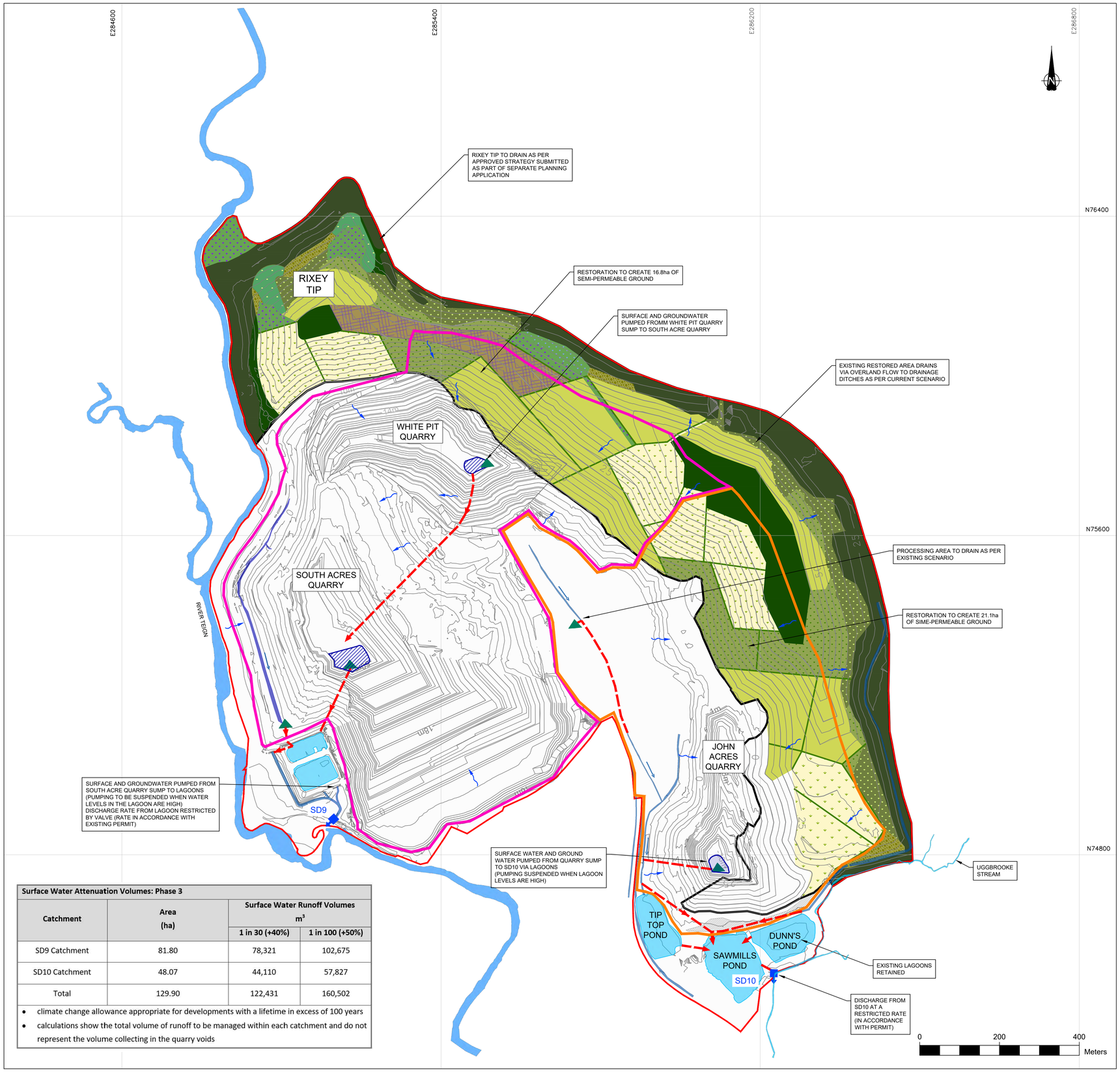

Surface Water Attenuation Volumes: Phase 3

Catchment	Area (ha)	Surface Water Runoff Volumes m^3	
		1 in 30 (+40%)	1 in 100 (+50%)
SD9 Catchment	81.80	78,321	102,675
SD10 Catchment	48.07	44,110	57,827
Total	129.90	122,431	160,502

- climate change allowance appropriate for developments with a lifetime in excess of 100 years
- calculations show the total volume of runoff to be managed within each catchment and do not represent the volume collecting in the quarry voids

NOTES

1. TO BE READ IN CONJUNCTION WITH FLOOD RISK ASSESSMENT REF: ST18876/APPENDIX 6.1
2. OVERLAND FLOW AND DRAINAGE CHANNEL ROUTES BASED ON TOPOGRAPHICAL SURVEY (REF: SDMP 2021-03-03 OSTN15).
3. OUTFALL CATCHMENT AREAS BASED ON DRAWING REF: DO3/P27/002.

LEGEND

- PLANNING BOUNDARY
- PROPOSED PIPE/PUMPING ROUTE
- EXISTING DRAINAGE DITCH
- SD9 OUTFALL CATCHMENT (C. 54.45ha)
- SD10 OUTFALL CATCHMENT (C. 48.76ha OPERATIONAL, 44.48ha RESTORED)
- EXISTING OUTFALL POINT
- DIRECTION OF OVERLAND FLOW (INDICATIVE)
- DIRECTION OF WATERCOURSE FLOW (INDICATIVE)
- PROPOSED PUMP
- EXISTING LAGOON/POND
- SUMP AREA (INDICATIVE)

EXISTING RETAINED (DRG ST18876-027)

- NEUTRAL MEADOW (UNIMPROVED)
- NEUTRAL GRASSLAND
- EPHEMERAL / SHORT PERENNIAL
- DENSE SCRUB
- BROADLEAVED WOODLAND

PROPOSED NEW (DRG ST18876-027)

- NEUTRAL MEADOW - PROPOSED
- NEUTRAL GRASSLAND - PROPOSED
- HEATHLAND - PROPOSED
- BROADLEAVED WOODLAND - PROPOSED
- WOODLAND EDGE - PROPOSED
- ATTENUATION POND - PROPOSED
- NATURAL REGENERATION - PROPOSED
- VEGETATION - PROPOSED

FOR MORE INFORMATION REFER TO LANDSCAPE RESTORATION PLAN DRAWING ST18876-027

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
B	POND REMOVED	21/09/23	DR	BG	DB
A	FIRST ISSUE	01/09/23	SJB	BG	DB

CLIENT

SIBELCO UK LIMITED

PROJECT

CENTRAL AREA CONSOLIDATION APPLICATION

DRAWING TITLE

PHASE 3 SURFACE WATER MANAGEMENT PLAN

DRG No.	REV	SUIT. CODE
ST20466-003	B	

DRG SIZE	SCALE	DATE
A1	1:5000	28/08/23

DRAWN BY	CHECKED BY	APPROVED BY
DR/SJB	BG	DB

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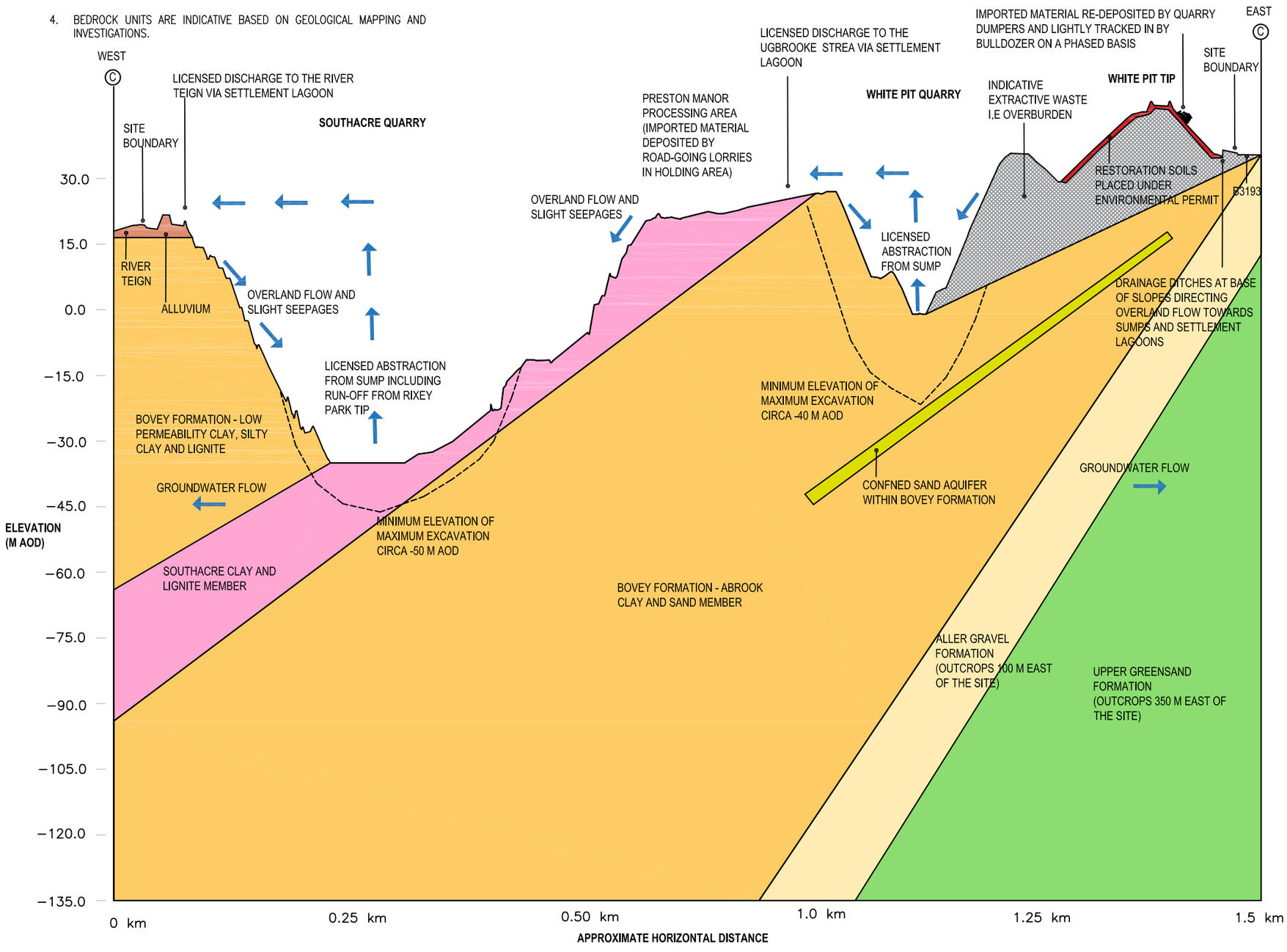
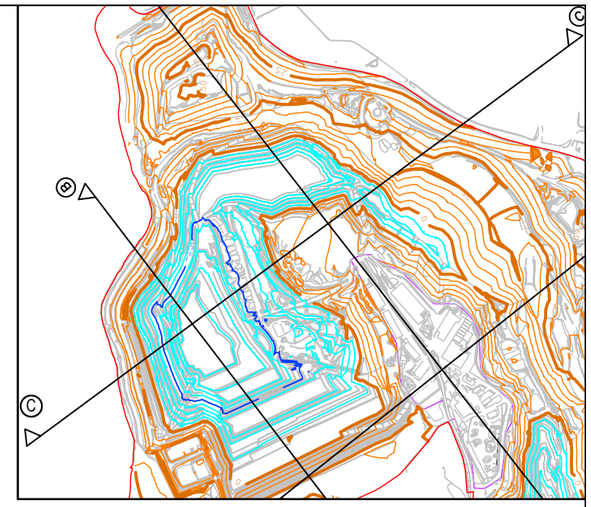
Appendix B
Horizon Drawings

NOTES: GENERAL

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT SCHEME DRAWINGS AND SPECIFICATIONS.
3. CROSS-SECTION DEVELOPED FOR SCHEMATIC PURPOSES. VERTICAL SCALE EXAGGERATED BY 5:1. RESTORATION PROFILE BASED ON DRAWING ST18876-008.
4. BEDROCK UNITS ARE INDICATIVE BASED ON GEOLOGICAL MAPPING AND INVESTIGATIONS.





PHASE 1 LANDFORM - WARDELL ARMSTRONG DRAWING ST18876-008

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SIBELCO UK

JOB TITLE
BOVEY BASIN BALL CLAY WORKINGS
KINGSTEIGNTON

DRAWING TITLE
CONCEPTUAL SITE MODEL (PROPOSED RESTORATION)

Rev	Description	Drn	Chk	Date
REVISIONS				

Preliminary		Approval		Tender		Const.	
DRAWING STATUS							

DATE	DRAWN	CHECKED	ISSUE CHECKBOX
NOV '24	JH	AL	

DRAWING No.	REV	SCALE	
1205.103	.	N.T.S	@ A3

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