OXFORDSHIRE COUNTY COUNCIL

APPROVED

DATE: 11/11/2020
APPLICATION No: Condition 36 of Planning Permission P18/V2610/CM (MW.0104/18)

SHELLINGFORD QUARRY, WESTERN EXTENSION, OXFORDSHIRE

LANDSCAPE AND ECOLOGICAL MANAGEMENT PLAN (INCLUDING BIODIVERSITY MANAGEMENT & MONITORING)

On behalf of

MULTI-AGG LTD

Final Report

9th November 2020

Prepared by

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Contents

1 Introduction

Multi-Agg Ltd operates Shellingford Quarry, Oxfordshire (NGR SU 325936). The quarry has been operational for approximately 25 years. Multi-Agg Ltd has received planning permission from Oxfordshire County Council to extend the quarry to the west.

The quarry is accessed from the A417, and the quarry extension encompasses the entirety of or part of five fields, which are currently under agricultural use. The proposed extension site is located to the immediate west of Shellingford Quarry, and approximately 150m east of the village of Shellingford. The site is immediately surrounded by a continuation of agricultural land to the north, west and south, with a complex of farm buildings located outside the western boundary. The existing quarry and light industrial units are located to the east.

The quarry extension comprises six excavation phases with land being progressively restored post-excavation. Post-extraction the site will be returned to a combination of agricultural land and a range of semi-natural habitats including species-rich grassland, open water, woodland and hedgerow as shown on the Restoration Plan (Drawing Ref. 2459-5-2-DR-0001-S5-P4) in Appendix A.

This Landscape and Ecological Management Plan (LEMP) has been produced in response to a number of Planning Conditions (see Section 2) to provide an appropriate level of information on the intended habitat creation, and the immediate after-care and longer-term management of the restored land and habitats within the application area.

This report therefore provides a framework for appropriate management of the land to unsure a fully-functioning landscape that protects and enhances landscape features and biodiversity within the application area. The LEMP also integrates and defines the following two components:

- Working methods to ensure protected/notable wildlife species present on-site are fully integrated and protected from adverse effects during planned operational activity; and
- Biodiversity monitoring to ensure the aims/objectives of habitat creation, restoration and management, as an integrated part of site use, are being met.

2 Report Scope and Objectives

2.1.1 Intro

As part of the draft planning consent, a number of Planning Conditions were established by Oxfordshire County Council. There are four Planning Conditions covered by this report:

- PC36: Need for an Environmental Management Plan for Biodiversity.
- PC37: Need for a pre-commencement walkover survey assessing for badger and other protected species to inform an Environmental Management Plan.
- PC38: Need for a Landscape and Ecology Management Plan.
- PC39: Need for a Biodiversity Monitoring and Remediation Strategy.

2.1.2 Environmental Management Plan (PC36)

No development shall take place (including demolition, ground works, vegetation clearance) until an Environmental Management Plan (Biodiversity) has been submitted to and approved in writing by the Minerals Planning Authority. The Environmental Management Plan shall include (not exhaustively) the following:

a) Risk assessment of all activities that may be damaging to biodiversity:

b) Identification of "biodiversity protection zones";

c) Practical measures (both physical measures and sensitive working practices) to avoid or reduce impacts (may be provided as a set of method statements);

d) Timing and scope of additional protected species surveys if required;

e) Lighting scheme and safeguards for light-sensitive wildlife;

f) No soil storage mounds should extend into root protection zones of hedges or trees;

g) The location and timing of sensitive works to avoid harm to biodiversity features (such as badger and nesting birds);

h) The times when specialist ecologists need to be present on site to oversee works;

i) Responsible persons, roles and lines of communication;

j) The role and responsibilities on site of an ecological clerk of works (ECoW) or similarly competent person; and

k) Use of protective fences, exclusion barriers and warning signs.

The approved Environmental Management Plan shall be adhered to and implemented throughout the quarrying operation strictly in accordance with the approved details.

2.1.3 Pre-commencement walkover survey (PC37)

No works of site clearance or development shall take place in any phase until a pre-commencement walkover survey has been undertaken in respect of badger and other protected species, and results submitted to and approved in writing by the Minerals Planning Authority. Any mitigation measures that are approved must be fully implemented and no work shall take place other than in accordance with the approved mitigation proposals. No more than two years shall elapse between the date of the protected species surveys and commencement of development in the relevant phase.

2.1.4 Landscape and Ecological Management Plan (PC38)

No extraction shall take place in any phase until a Landscape and Ecological Management Plan (LEMP) for the previous phase has been submitted to and approved in writing by, the Minerals Planning Authority. The LEMP shall include:

a) Description and evaluation of features to be managed within the site;

b) Ecological trends and constraints on site that might influence management;

c) Aims and objectives of management;

d) Appropriate management options for achieving aims and objectives;

e) Prescriptions for management actions;

f) Preparation of a work schedule;

g) Details of the body or organization responsible for implementation of the plan;

h) Ongoing monitoring and remedial measures.

The LEMP shall also include details of the legal and funding mechanism(s) by which the long-term implementation of the plan will be secured and details of an extended 20-year management programme. The plan shall also set out (where the results from monitoring show that conservation aims and objectives of the LEMP are not being met) how contingencies and/or remedial action will be identified, agreed and implemented so that the development still delivers the fully functioning biodiversity objectives of the originally approved scheme. The approved plan will be implemented in accordance with the approved details.

2.1.5 Biodiversity Monitoring and Remediation Strategy (PC39)

No development shall take place, including demolition, ground works and vegetation clearance, until a Biodiversity Monitoring and Remediation Strategy has been submitted to, and approved in writing by, the Minerals Planning Authority. The content of the Strategy shall include:

a) Aims and objectives of monitoring;

b) Identification of adequate baseline conditions prior to the start of development;

c) Appropriate success criteria, thresholds, triggers and targets against which the effectiveness of the various conservation measures being monitored can be judged;

d) Methods for data gathering and analysis;

e) Location of monitoring;

f) Timing and duration of monitoring;

g) Responsible persons and lines of communication; and

h) Review, and where appropriate, publication of results and outcomes.

A report describing the results of monitoring shall be submitted to the Minerals Planning Authority at intervals identified in the strategy. The report shall also set out (where the results from monitoring show that conservation aims and objectives are not being met) how contingencies and/or remedial action will be identified, agreed with the local planning authority, and then implemented so that the development still delivers the fully functioning biodiversity objectives of the originally approved scheme. The monitoring strategy will be implemented in accordance with the approved details.

3 Protecting Notable Wildlife

3.1 Introduction

An extended Phase 1 ecological survey was first undertaken on 23rd February 2016 with a second survey completed on 5th June 2018 to verify/update the original findings. The surveys comprised a walkover of the whole study area and immediate adjoining land, and assessed, *inter alia*, the presence of protected/notable wildlife. Additional site visits were also undertaken in May and July 2016, primarily to survey botany and breeding birds but also checking for presence of other notable wildlife such as badger setts.

Finally, to facilitate the production of this LEMP, an additional site survey was completed on 13th November 2019 to fulfil Planning Condition 37, which requires a pre-commencement survey to assess for the presence of badger setts and other protected/notable wildlife.

Based on these surveys the following are identified as wildlife constraints:

- Possible outlier badger sett;
- Foraging badger and brown hare; and
- Nesting birds (not ground nesting birds).

The actions required to protect the above ecological constraints are set out in the following sections.

3.2 Protecting potential badger sett

A small potential outlier badger sett is located adjacent to Phase 5 of the proposed quarry extension area (see Appendix A). Due to the long intervening period between commencing the scheme and Phase 5 that is adjacent to this potential sett, the status of the sett will be re-assessed prior to commencing Phase 5 of the quarry extension (as part of pre-commencement ecology surveys for all excavation and restoration phases, see Section 3.5).

If the pre-works survey finds this sett to be inactive/abandoned or confirmed to be not badger then the development will have a neutral impact, and works can commence without mitigation. However, if this is a confirmed active badger sett then the quarry extension does have potential to adversely impact the sett, and any potential adverse impacts will be removed through implementing appropriate mitigation.

The quarry extension therefore has potential to contravene the Protection of Badgers Act 1992 if implemented without appropriate safeguards. Badgers are legally protected under the 'Protection of Badgers Act 1992'. Of particular relevance for this scheme, it is an offence to:

- Wilfully kill, injure or take a badger, or attempt to kill, injure or take a badger [Section 1];
- Intentionally or recklessly damage a sett or any part of it, or destroy a sett [Section 3]; and
- Intentionally or recklessly obstruct access to or any entrance of a sett, cause a dog to enter a sett, or disturb a badger whilst it is occupying a sett [Section 3].

If this is a confirmed active badger sett, the sett will be left *in situ* and badgers will continue to be able to access surrounding foraging habitats by maintaining migration corridors along the existing quarry and extension boundaries.

Natural England has produced guidance on integrating badgers into development (Natural England, 2009a). For activities such as excavation work and use of heavy machinery, it states that work should be kept well away from where it could result in damage to the sett or disturbance to any badger occupying the sett. Disturbances such as loud noise or vibrations, that might agitate badgers occupying a sett, should be avoided or limited to areas well away from the sett. However, Natural England do not provide information on specific distances to maintain as an appropriate buffer zone. Guidance for mitigating against the adverse effects of badgers during construction work is contained within the Design Manual for Roads and Bridges, Volume 10 Section 4, Part 5 (Highways Agency, 2001). These guidelines state that all work (above and below ground) within 10m of a sett entrance, whether involving the use of machinery or of hand-held tools, requires a licence to do so lawfully from Natural England.

Therefore, if confirmed as an active sett a 10m buffer from the sett entrances will be maintained, ensuring the sett will remain free from ground disturbance. Therefore, the proposed quarrying operation will not adversely affect the badger sett or individual badgers using or accessing the sett.

3.3 Protecting foraging badger and hare

Badgers migrate and foraging through the farmland, and hare is also using the site. Badgers will be able to continue to access to and from setts to foraging grounds, while migration routes for badgers, hare and other mammals to move around the excavation area will be maintained with wide agricultural land buffers. The following actions will be implemented to protect foraging/commuting badgers and other mammals:

- All construction activity will be restricted to normal working hours, which will minimize impacts on the largely, nocturnal badgers;
- Topsoil stripping will proceed with care to allow animals to naturally disperse;
- The worked quarry area will be appropriately profiled or created with an access route (i.e. haulage road or ramp) connecting the floor of the quarry to the existing ground level to allow animals to move freely in and out of the excavated area; and
- Any other smaller excavations within or outside the worked quarry will be appropriately profiled or installed with an escape ramp to avoid entrapment and/or accidental injury/mortality to badgers and other mammals foraging through the site.

3.4 Protecting nesting birds

The scheme does not affect ground nesting birds. However, the proposed quarry extension will remove a small amount of plantation/scrub patches that can support low numbers of common nesting birds. This could result in the damage or destruction of breeding birds, their nests (while in use or being built) or the destruction of bird eggs unless appropriate mitigation action is taken. To ensure compliance with the Wildlife and Countryside Act, 1981 (as amended) the following action is required:

- Preferably undertake vegetation removal outside the bird breeding season, which is generally considered to be from 1st March to the 31st August (to cover all bird species, particularly multiple brood species). This option will avoid the need for a pre-works inspection to determine the presence of nesting/breeding birds.

If this option is not feasible then the following action will be taken:

- A nesting bird inspection immediately prior to the commencement of vegetation removal will be undertaken by a qualified ecologist, ornithologist or other suitably qualified

individual. If nesting birds or birds constructing a nest are subsequently identified to be present, work in that area must cease until the nest is clear. A watching brief on the area will be maintained to establish when the nest is clear.

Irrespective of time of year or if nesting birds move into the area post-survey then works in the immediate vicinity will stop and an ecologist consulted.

3.5 Pre-extraction and restoration surveys

An ecological walkover survey assessing for the presence of badger setts and potentially other protected species will be conducted prior to each extraction phase (soil stripping, bund removal and other vegetation removal) and each land restoration phase (bund removal) commencing. Surveys should be undertaken as near to the start of work as possible (to minimise chance of animals colonising the area in the time after the survey). Depending on the findings, two courses of action can be taken:

- If the area is clear then the development can commence as soon as possible: or
- If protected species are present then the development must:
    - Work areas free from ecological constraints, which requires a degree of flexibility in the approach. A strategy must then be developed to deal with the constraint, which could include avoiding the area and establishing a buffer zone, or developing a mitigation strategy; or
    - Stop work until an appropriate mitigation strategy has been developed and agreed with the Mineral Planning Authority. The time needed to get a mitigation strategy in place will depend on the problem being faced, the proposed solution, the need for a licence, and any timescales for aspects such as monitoring.

If the planned quarry extraction does not commence within 2 years of the ecological pre-extraction survey then a further ecological survey will be undertaken to establish if there have been any changes in the presence and/or abundance of protected/notable species.

3.6 Responsibility for implementation

The responsible organisation for funding and implementing the approved working methods, as described in Sections 3.2 to 3.4, is the quarry operator.

The responsible organisation for undertaking any surveys associated with the approved working methods, as described in Sections 3.2 to 3.4, is a qualified ecologist or ecological consultancy.

The responsible organisation for funding and commissioning the required pre-extraction and pre-restoration surveys, as described in Section 3.5, is the quarry operator.

The responsible organisation for undertaking the required pre-extraction and pre-restoration surveys, as described in Section 3.5, is a qualified ecologist or ecological consultancy.

4 Restored Habitats

Post-extraction the quarry extension site will be returned to mainly agricultural land with a mix of semi-natural habitats as shown on the Restoration Plan (Drawing Ref. 2459-5-2-DR-0001-S5-P3) in Appendix A, which complement some of the West Oxfordshire Heights CTA targets.

This LEMP defines the ecological management prescriptions for the following range of habitats:

- Woodland (3.52ha). Blocks of mixed, native broadleaved woodland will be created along part of the eastern boundary and within the south-western corner of the application area.
- Hedgerow (2,278m). Mixed, species-rich native hedgerow will be planted and established to delineate and separate restored agricultural fields.
- Species-rich grassland (3.42ha). Floristically-rich grassland, managed as a traditional hay-meadow, will be created within the southern part of the application area, which will link to an open waterbody and new woodland planting.
- Trees and scrub (0.24ha). Small scrub patches will be allowed to establish naturally bordering the woodland plantation and surrounding the waterbody. In addition, native trees/shrubs will be planted scattered through the species-rich grassland.
- Waterbody comprising open water (0.86ha) and marginal planting (0.13ha). A new pond will be created in the south-eastern corner of the application area within low-lying land to collect rainfall runoff.

There are no identified constraints to implementing future site management.

5 Aims and Objectives of Management

5.1 Landscape

Restoration proposals for the site have been drawn up to complement the enhancement objectives of the Oxfordshire Wildlife and Landscape Study (OWLS) and the West Oxfordshire Heights CTA (Conservation Target Area). These aims include:

- Proposed hedgerows should be managed to create green corridors through the site while reinforcing the historic agricultural character.
- Woodland copses are a key component of the local landscape character and the proposed woodland areas on site will provide ecological connections with those in the wider landscape.
- Proposed areas of new woodland and scrub planting should provide opportunity for the natural regeneration of vegetation.
- Proposed species rich grassland should be managed to provide potential for grazing pasture.

In addition, the following aims and objectives should be followed:

- Existing access along public right of way 338/6/10 and the proposed permissive path along the eastern site boundary should be maintained to the relevant health and safety requirements and allow access for the surrounding community.
- Ensure the long-term continuity of the proposed woodland, by where necessary, enhancing its resilience to the possible effects of climate change and potential pathogens and disease.

5.2 Ecology

The overall aim of habitat creation and management is to restore, establish and/or enhance a range of nationally and locally important habitats that will potentially allow a wider diversity of wildlife to inhabit and frequent the application area.

The following key principles developed by English Nature (now Natural England) for developing wildlife corridors provide the basis for habitat creation and management as set out in the Restoration Plan (Drawing Ref. 2459-5-2-DR-0001-S5-P3) in Appendix A:

- Restore and/or create habitat links and stepping stones between different habitat blocks;
- Manage the site to give optimal conditions for key species thereby boosting the effective population size and increasing the likelihood of expansion; and
- Increase the area of small habitat patches by habitat creation or restoration to reduce likelihood of local species extinction.

The main objective of habitat creation and management during the first 3-5 years after the restoration of each discrete quarry phase is to ensure the successful establishment of the different habitat types defined in Sections 4 and 6.

Longer-term management objectives deal mainly with maintaining a species- and structurally-diverse, robust and maturing habitat mosaic for the benefit of a wide range of wildlife.

The main focus in the early stages of the site restoration/management is therefore to establish and to ensure the survival of newly created or restored habitats and plants by suppressing/eradicating more vigorous and less desirable (i.e. non-native or invasive species) plant species and encouraging a more diverse and species-rich environment using appropriate management techniques.

Habitat management integrates post-restoration survey and monitoring of habitats, plants and animals to track and assess the success of habitat establishment and, if required, to enable improvements to be made by implementing appropriate management practices to rectify any undesirable elements manifest within the site.

6 Habitat Establishment and Management

6.1 Woodland

6.1.1 Habitat establishment

Blocks of mixed, native broadleaved woodland will be planted and established along the eastern boundary and within the south-western corner of the application area.

The proposed new woodland is based upon the NVC W10 (oak) woodland, and species for woodland planting will be native and sourced from a local provenance or reputable nursery. The suite of canopy tree and understorey shrub species is shown on the Restoration Plan (Drawing Ref. 2459-5-2-DR-0001-S5-P4) in Appendix A.

Woodland trees/shrubs will be planted on a 2m x 2m grid, in random groups of between 3 and 9 of the same species to ensure good heterogeneity, achieving a density of at least 1,600 trees per hectare. Trees and shrubs will be planted as 0.4-0.8m high feathered whips or saplings. Canopy trees will be planted in tree pits 200mm wider in diameter and 200mm deeper than the root spread. Within each pit 200g of slow release fertiliser will be added. All plants are to be thoroughly soaked immediately prior to planting.

Each whip, sapling or standard will have a tree-stake for support, will be mulched (approved bark mulch to a depth of 75cm for 1m diameter around each specimen) and will be protected from grazing animals using tree guards or protective fencing.

Planting will take place between November and March, during frost-free conditions when the site is not waterlogged. Newly planted areas will be inspected regularly for the first 3-5 years, and any significant gaps or dead plants will be replaced with new specimens.

Once it has been established that trees and shrubs have taken sufficiently any remaining tree stakes and tree guards/fencing will be removed.

6.1.2 Habitat management

Trees and shrubs will require annual maintenance after planting that will include:

- Weeding including hand-pulling and herbicide application (May-July) to remove vigorous grasses and ruderal plants.
- Single dose of evenly spread slow-release fertiliser to the base of trees/shrubs during March-April.
- Re-firming of specimens if required after high winds, frost heave or other disturbances.
- Watering as required during the growing season during times of water shortage to avoid stress.
- Review and implement crown thinning of young trees as required during October/November ensuring development of a single strong leader.

In the long-term, once woodland has become established and starts to mature, a range of management can be implemented depending on species present. This includes management techniques such as pollarding and coppicing, which are summarised below. However, the final management for each woodland block can only be established once the habitat has established and started to mature, and would be defined in future iterations of the LEMP.

- Pollarding

  Pollarding involves a periodic cut of all the recent growth on a tree bole. It was originally carried out on wood pasture sites to allow new growth to occur out of reach of browsing cattle, but pollarding also serves to prolong the life of a tree and can be a useful means of adding structural diversity.

  Cutting usually occurs at the first or second branch division of a tree forming a large round callous from where new growth arises. The new growth should be cut back to the original pollard height every five years to ten years depending on the tree species concerned. The cut should be made at an angle of approximately fifty degrees to the horizontal, outwards and down from the centre of the stool, so water cannot accumulate, thus preventing rot from setting in. After a tree is pollarded it should be allowed to grow for five to ten years before it is again cut.

  Pollarding trees should take place over the winter period during the months of October to March in the years required. Once the selected tree has been pollarded the cut wood can be stacked in strategically placed neat piles in the remaining woodland, preferably out of sight from the footpaths. It then adds further benefits to wildlife by providing an appropriate habitat for small mammals such as rodents, hedgehogs and shrews, invertebrates and fungus.

- Coppicing

  Coppicing is a traditional method of woodland management that extends the life of the tree and creates an ideal 'artificial' habitat that can be exploited by wildlife such as birds, mammals and invertebrates. Coppicing will also help to open up the woodland canopy, which in turn will encourage a more diverse ground flora to develop whilst providing a greater structural diversity.

  Coppicing involves the cutting of all the stems of a selected tree to ground level. The cut should be made at an angle of approximately fifty degrees to the horizontal, outwards and down from the centre of the stool, so water cannot accumulate, thus preventing rot from setting in.

  Once the selected tree has been coppiced the cut wood can be stacked in strategically placed piles in the remaining woodland, preferably out of sight from the footpaths. It then adds further benefits to wildlife by providing an appropriate habitat for small mammals such as rodents, hedgehogs and shrews, invertebrates and fungus.

  To maintain the three dimensional structure of the existing woodland, coppicing individually selected trees is the most appropriate method. This opens up the canopy enough to let sufficient light through to sustain and promote the growth of the shrub, field and ground layers - all essential parts of a well-balanced woodland.

  Ash, hazel, thorns and willows are the main trees that will benefit from coppicing, which will give a good woodland structure within a short period of time. Within each woodland block or management section only a third of the selected trees should be coppiced per year over that three year period. After a tree is coppiced it should be allowed to grow for nine to ten years before it is again cut. This management regime will maintain the woodland's structural and species diversity at all times whilst providing both continual cover and food for wildlife.

  For ash, willow and thorns, approximately 40-50% of the tree population should be coppiced, with the other 50-60% remaining as standards to add diversity to the woodland structure. All hazel present should be coppiced. Hazel produces fruit after between five and ten years growth. It is therefore essential to monitor and adjust the cutting

programme in accordance with the flowering and nut production of the hazel found on site.

Coppicing should always be carried out during the months of October and March, avoiding the tree's prime growth period and the bird nesting season.

- Selective thinning

  This involves the removal of individual trees from the woodland to stop them from growing too close together and developing into tall thin trees causing heavy mutual shading that suppresses the understorey growth. If this is undertaken, at least one in three (extending to 1 in 5 in some areas) trees (the least healthy) should be removed to allow for unrestricted growth of the remaining specimens and the development of a rich understorey. The need for this management technique should be reviewed following at least one round of pollarding/coppicing.

  In addition, canopy thinning may also be necessary to allow for greater light penetration to the woodland floor. This involves the careful selection and removal of boughs and branches of the larger trees to maximise light penetration without causing irreparable damage to the tree in question.

- Standing dead wood

  Any large trees that have died and are still standing should, wherever possible, remain *in situ* because these provide an ideal habitat for many species of insects which in turn act as a good food source for numerous species of woodland bird species for example, all of the three native woodpeckers. Large dead trees also serve to provide ideal nesting sites for many more species of birds normally associated with woodlands. Only if standing deadwood provides a health and safety risk should it be removed.

6.2 Hedgerow

6.2.1 Habitat establishment

Native mixed-species hedgerows will be established to delineate fields, while standard trees will be incorporated into hedges and along avenues across the site. Species for hedgerow and tree planting will be selected to complement hedgerows found locally, and plants will be native and sourced from a local provenance or reputable nursery. The suite of tree and shrub species is shown on the Restoration Plan (Drawing Ref. 2459-5-2-DR-0001-S5-P4) in Appendix A.

Hedgerows will be planted as a double-belt hedge (each row 0.5m apart) using feathered whips (0.4-0.6m) planted on a staggered 0.3m spacing. Small groups of the same species will be planted along the line of the hedgerow to ensure good heterogeneity. Hedgerow standard trees will be planted as saplings (1.5-1.75m) and spaced on average 15m apart (range of 3-30m).

Each whip or standard will have a tree-stake for support, will be mulched and will be protected from grazing animals using tree guards or protective fencing.

Planting will take place between November and March. Newly planted areas will be inspected regularly for the first 3-5 years, and any significant gaps or dead plants will be replaced with new specimens.

Once it has been established that trees and shrubs have taken sufficiently any remaining tree stakes and tree guards/fencing will be removed.

6.2.2 Habitat management

After planting trees and shrubs will require an annual maintenance regime as described in Section 6.1.2.

Once established, hedgerows will be managed to create a dense, bushy structure at a height of 2-3m with foliage down to ground level. This will be achieved by an appropriate cutting regime as follows:

- Cuts to the top of the hedge will be made on a two to three-year rotation with the sides managed less intensively (i.e. every five years). This will allow the sides to thicken-up and to maintain an 'A' shape, which is the best shape possible for wildlife. The cut will not reduce the hedge height lower than 2m, and top level should be varied and uneven.
- Cutting will take place in January or February to avoid bird nesting season, and maximise retention of berries.
- Hedgerow cutting will be staggered, ensuring some hedgerow remains untouched during the growing season, which will vary the structure of the hedgerows and allow some sections to develop berries.
- Leaving some clumps of bramble or suckering growth (i.e. blackthorn) to grow out from the base of hedges creating a scalloped edge and habitat for nesting birds.
- The specimens identified to grow into standard trees, including oak, field maple and wild cherry will be allowed to mature. In the long-term they may be managed as pollards (See Section 6.1.2) adding structural diversity.

Alternatively, once the new hedgerow planting is established some of the hedges could be 'laid' (partially cut and laid horizontally), which would further diversify habitat structure. If laid hedges can be maintained by light trimming and can last up to 50 years before needing to be re-laid.

A 6m wide grassland headland will be retained either side of each hedge within cultivated land, which will be managed as per the recommendations for grassland management (see Section 6.3.2).

6.3 Species-rich grassland

6.3.1 Habitat establishment

The southern part of the application area will be covered with low nutrient limestone processing fines, which will be created on site, to a minimum settled depth of 300mm. The land in this area will be seeded as dry, limestone wildflower grassland using an appropriate seed mix obtained preferably from a suitable local grassland meadow (i.e. to facilitate hay strewing), or alternatively from a reputable seed house.

If a commercial seed mix is used then it is recommended that Emorsgate EM6 (Meadow Mix for Chalk and Limestone Soils) be used. This rich meadow mixture is suitable for sowing onto thin lime-rich soils of low fertility and with a significant chalk or limestone content. Sowing EM6 directly onto exposed chalk or limestone can produce some of the most interesting results; establishment will be slower than on well-developed soils, but less management will be needed.

Before hay strewing or seeding, the ground will be harrowed or raked to produce a medium tilth, and then rolled to produce a firm surface.

A commercial seed mix will be sown at the rate specified by the supplier. Sowing rates are usually low to allow an extended period of establishment so as both fast growing grasses and slower germinating flower seeds can colonise.

The grassland seed mix will be sown preferably in the autumn (August-September) or alternatively spring (March-April). The seed will be surface sown and can be applied by machine, and must not be covered with additional soil but instead rolled to give good soil/seed contact.

6.3.2 Habitat management

Most sown meadow species will be perennial and will be slow to germinate and grow, and will not usually flower in the first growing season. There will often be a flush of annual weeds from the soil in the first growing season, which will be controlled by topping or mowing. A minimum of three cuts will be undertaken in the first year (when the crop exceeds 15cm) with the clippings removed. This regime may also be required in the second year.

From the second or third year onwards the grassland will be managed as a traditional hay meadow with the following regime:

- Grassland left un-cut from spring through to early August to give sown species an opportunity to flower and avoid the main bird nesting season.
- After flowering a cut will be undertaken to about 50mm sward height. The 'hay' will be left *in situ* to dry and shed seed for 1-7 days (depending on prevailing weather) then collected and removed of-site.
- A strip (ca. 6m wide) of uncut grass will be left in front of the hedgerows and woodland to provide habitat, refugia and migration routes for animals such as invertebrates, small mammals and reptiles, and to add further diversity to the habitat mosaic. A band of uncut grass is particularly important during the winter months.
- Re-growth will be controlled with after-math livestock grazing or mowing through to late autumn to keep the sward at about 50mm height before onset of winter. The level of grazing should be of a low intensity (for example, 1-2.25 livestock units (LU) per hectare).
- Weed control will be implemented when required, which will involve a combination of hand pulling (woody species) and the targeted use of herbicides for docks/thistles or other invasive or undesirable species which may appear.

6.4 Grassland trees and scrub

6.4.1 Habitat establishment

Individual trees and shrubs within the species-rich grassland will be planted as 1.25-1.50m or 2.5-3.0m high standards. Trees will be planted in tree pits 200mm wider in diameter and 200mm deeper than the root spread. Within each pit 200g of slow release fertiliser will be added. All plants are to be thoroughly soaked immediately prior to planting.

Each whip, sapling or standard will have a tree-stake for support, will be mulched (approved bark mulch to a depth of 75cm for 1m diameter around each specimen) and will be protected from grazing animals using tree guards or protective fencing.

Planting will take place between November and March. Newly planted areas will be inspected regularly for the first 3-5 years, and any significant gaps or dead plants will be replaced with new specimens.

Once it has been established that trees and shrubs have taken sufficiently any remaining tree stakes and tree guards/fencing will be removed.

For smaller areas of scrub within the species-rich grassland, the intention is to establish areas of native scrub by creating suitable conditions that allow for the colonisation of desirable species. Where practical, subsoils would be replaced over topsoils or mixed with them to reduce the nutrient status of the existing soils. The areas will not be seeded or planted initially but left for indigenous species to generate naturally.

6.4.2 Habitat management

Scrub requires little maintenance once established. The scrub will be formatively pruned or trimmed every 5-7 years. Scrub can become invasive and start to colonise areas where it is not desirable, for example, encroaching into the adjoining grassland/wetland habitats. If this happens, some scrub removal by cutting/pulling will be necessary. This action would be undertaken in the winter months.

6.5 Waterbody

The waterbody is designed to create differing water surface area, water depths and habitat niches depending on hydrological conditions. The pond will not be connected to any other surface water features and will be fed solely by rainfall and surface water run-off from adjacent fields. The pond is designed with a variety of shallow sloping sides (1:5 to 1:15) and a maximum depth of 1.5m in the winter, which will naturally draw down through the summer.

The bankside and riparian land will be planted using plugs, with the planting mix shown on the Restoration Plan (Drawing Ref. 2459-5-2-DR-0001-S5-P4) in Appendix A. Plant plugs should be planted at a density of 5 plants per m^2. Small groups of the same species will be planted, and planting will be staggered to encourage a diverse floristic mixture. Plants will be native and sourced from a local provenance or reputable nursery. Planting will take place in May or June following any risk of frost and to provide adequate growing time for the remainder of the year to allow plants to fully establish.

Weed control will also be implemented when required. This will involve a combination of hand pulling (particularly for woody species) and the targeted use of herbicides for invasive or undesirable species.

6.6 Responsibility for implementation

The responsible organisation for funding and implementing land and habitat creation/establishment and aftercare is the quarry operator in the first instance, before responsibility for implementing longer-term aftercare is handed over to the landowner.

7 Biodiversity Monitoring

7.1 Monitoring strategy and methods

The habitats being created as part of the land restoration proposals will take some time to establish. It is also very difficult to predict accurately the rate and direction of change/establishment of habitats, due to variations in micro-topography, ground conditions, water levels/inundation frequency etc., and therefore the subsequent response of wildlife.

The main objective of habitat management during the first five years is to ensure the successful establishment of all the target habitat-types, whereas longer-term management relates more to maintaining a species-rich, structurally diverse and robust habitat mosaic for the benefit of a wide range of wildlife. The main focus in the early stages of the site management is therefore to ensure the survival of restored or newly created habitats and vegetation by suppressing the more vigorous and less desirable (e.g. non-native or invasive) plant species and encouraging a more diverse species rich environment using appropriate management techniques.

However, to identify whether or not nature conservation objectives have been achieved it is essential to develop a post-restoration monitoring and appraisal programme, which would include auditable, scheme-specific success criteria as well as identified remedial actions and their triggers if the scheme is not performing as planned. However, the principles of 'adaptive-management' should be applied to the final restoration and implemented after-use scheme, which is to say that the site should be allowed to naturally adjust and develop through time as opposed to being viewed as a static system or constrained within defined boundaries.

Monitoring is an integral component of the scheme implementation, however, as long as the critical aspects are encompassed this does not have to be overly arduous. The following ecological monitoring components will be undertaken:

- ***Habitats and botany***. A review of restored/created habitats covering extent (plotted on a map), species diversity (identifying species with abundance rating [DAFOR]) and habitat quality (qualitative statements) undertaken twice in spring/summer (May-August) to review habitat/plant colonisation, establishment and survival, presence of invasive/undesirable plant species, as well as habitat development and diversification.
- ***Breeding birds***. A basic bird census (modified National and County Bird Atlas methodology) covering boundary/linear, grassland/agricultural and wetland habitat. Two surveys undertaken in May/June and July/August.
- ***Invasive plant species***. Inspection of all habitats for invasive plant species. Survey at the same time as habitats and botany survey.

Monitoring frequency for habitats/plants will be every year during Years 1-5 from completion of restoration, whereas breeding birds will be undertaken in Years 2 and 5 from completion of restoration. Beyond this it is likely that monitoring frequency will further reduce for the life of the LEMP/monitoring plan, for example, monitoring visits every 3-5 years.

Monitoring will be linked to clear targets which will trigger adaptive management actions as required. Intervention will generally only be undertaken if the site is not establishing as predicted/wanted or if unexpected changes have occurred to create a significant and unwanted risk. For example: failure of habitat establishment or vegetation colonisation; or presence of invasive, exotic or undesirable plant or animal species.

Monitoring targets should lead to careful management procedures which will not adversely impact upon successfully restored habitats or protected species. Monitoring targets and potential remedial management actions are presented in the table below.

Monitoring Component	Monitoring Target	Possible Remedial Action
Habitats and botany	Maintain minimum amount, diversity and quality of created target habitats based on scheme design and initial monitoring data.	Habitat creation (e.g. re-planting & re-seeding) Habitat management (e.g. altered cutting or grazing regime, installing stock-proof fencing) Weed control (e.g. pulling and/or herbicide spraying)
Breeding birds	Maintain minimum diversity and numbers of target breeding bird species (farmland specialists that do not form large breeding colonies) based on baseline survey and monitoring data	Habitat creation or management (as above)
Invasive plant species	Identify presence/absence and if required extent, numbers and density	Weed control (e.g. pulling and/or herbicide spraying)

7.2 Monitoring review and reporting

A report presenting a record of habitat after-care and management operations undertaken during the previous 12 months, a review of the monitoring results (set against targets and baseline [initial monitoring] data) for the previous 12 months, and a schedule of planned work, including a programme, for the forthcoming 12 months should be produced.

Where monitoring identifies an undesirable change or non-compliance with scheme design or targets, then the report will identify recommendations for future adaptive management/remedial action. The report could take the form of a short note/check-list, but must be consistent to allow comparative analysis from year to year.

7.3 Responsibility for implementation

The responsible organisation for funding and commissioning ecological monitoring for the life of this LEMP is the quarry operator.

The responsible organisation for undertaking any ecological surveys is a qualified ecological consultancy or person.

The responsible organisation for funding and implementing any recommended management prescriptions for the life of this LEMP is the quarry operator.

8 Work Programme

A list of management prescriptions and an initial 5 year programme of ecological management and monitoring for the proposed land restoration is provided in the tables below.

The management prescriptions and programme will be regularly reviewed as part of ongoing LEMP review process.

Table 1 Habitat Management Prescriptions

Habitat / Feature	Number	Action	Timing
Woodland	W1	Initial planting	November - March
	W2	Establishment inspection	March - November
	W3	Establishment weeding	May – July
	W4	Establishment fertiliser	March – April
	W5	Re-firming & watering	All year (as required)
	W6	Crown thinning	October - November
	W7	Replacement planting	November - March
	W8	Pollarding	October – March
	W9	Coppicing	October – March
	W10	Thinning	October – March
	W11	Weed control	May – October
Hedgerow	H1	Initial planting	November – March
	H2	Establishment inspection	March - November
	H3	Establishment weeding	May – July
	H4	Establishment fertiliser	March – April
	H5	Re-firming & watering	All year (as required)
	H6	Crown thinning	October - November
	H7	Replacement planting	November - March
	H8	Maintenance cutting	January - February
	H9	Leave uncut grass base	All year (topped every 3 years)
	H10	Weed control	May - October
Species-rich grassland	G1	Initial seeding	August – September or March - April
	G2	Initial cutting	April - September
	G3	Hay cut	August
	G4	Aftermath grazing	August - October
	G5	Leave uncut boundaries	All year (topped every 3 years)
	G6	Weed control	May - October

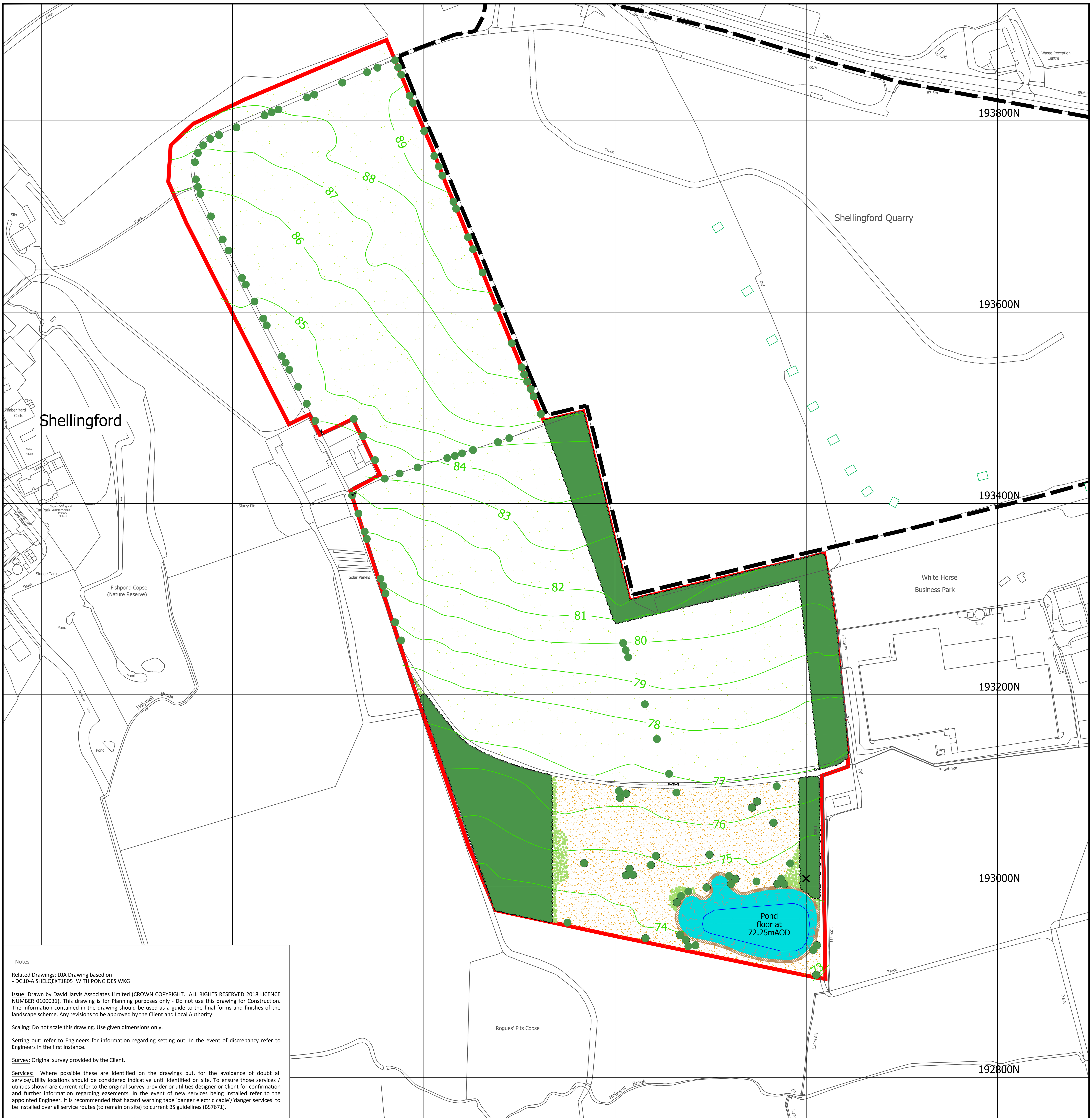
Habitat / Feature	Number	Action	Timing
Grassland trees & scrub	TS1	Initial planting	November – March
	TS2	Maintenance cutting	January – February
Waterbody	W1	Initial planting	May – June
	W2	Weed control	May - October
Monitoring	M1	Habitats & botany	May - August
	M2	Breeding birds	May - July
	M3	Invasive species	May - August

Table 2 Year 1-5 Work Programme (after initial planting/seeding)

Prescription Ref.	Year post-restoration				
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
W2	**x**	**x**	**x**	**x**	**x**
W3	**x**	**x**	**x**	**x**	**x**
W4	**x**	**x**	**x**	**x**	**x**
W5	**x**	**x**	**x**	**x**	**x**
W6				**x**	**x**
W7		**x**	**x**	**x**	**x**
W8-10	After Year 5				
W11			**x**		**x**
H2	**x**	**x**	**x**	**x**	**x**
H3	**x**	**x**	**x**	**x**	**x**
H4	**x**	**x**	**x**	**x**	**x**
H5	**x**	**x**	**x**	**x**	**x**
H6				**x**	**x**
H7		**x**	**x**	**x**	**x**
H8					**x**
H9	**x**	**x**	**x**	**x**	**x**
H10			**x**		**x**
G2	**x**	**x**			
G3		**x**	**x**	**x**	**x**
G4		**x**	**x**	**x**	**x**
G5	**x**	**x**	**x**	**x**	**x**
G6			**x**		**x**
TS2					**x**
W2			**x**		**x**
M1	**x**	**x**	**x**	**x**	**x**
M2		**x**			**x**
M3	**x**	**x**	**x**	**x**	**x**

Appendix A Aerial Photograph with Ecology Target Notes

Appendix B Restoration Plan



Notes

Related Drawings: DJA Drawing based on
- DG10-A SHELQEXT1805_WITH PONG DES WKG

Issue: Drawn by David Jarvis Associates Limited (CROWN COPYRIGHT. ALL RIGHTS RESERVED 2018 LICENCE NUMBER 0100031). This drawing is for Planning purposes only - Do not use this drawing for Construction. The information contained in the drawing should be used as a guide to the final forms and finishes of the landscape scheme. Any revisions to be approved by the Client and Local Authority

Scaling: Do not scale this drawing. Use given dimensions only.

Setting out: refer to Engineers for information regarding setting out. In the event of discrepancy refer to Engineers in the first instance.

Survey: Original survey provided by the Client.

Services: Where possible these are identified on the drawings but, for the avoidance of doubt all service/utility locations should be considered indicative until identified on site. To ensure those services / utilities shown are current refer to the original survey provider or utilities designer or Client for confirmation and further information regarding easements. In the event of new services being installed refer to the appointed Engineer. It is recommended that hazard warning tape 'danger electric cable'/'danger services' to be installed over all service routes (to remain on site) to current BS guidelines (BS7671).

Planting: Plant species are selected and located in line with consideration of the site conditions, NHBC guidelines and discussions with the Local Authority and design team. All plants and planting procedure to conform to the David Jarvis Associates Limited Landscape Specification that will accompany the Construction issue drawings. No species or plant location is to be varied without prior consent of the Landscape Architect.

Foundations: Developers / Contractors to ensure that all foundations (buildings and external walling) are designed and constructed so as to take into account, at the time of maturity, any existing or proposed trees, hedgerows or other vegetation on the application site or existing vegetation on land adjoining the site at the time of construction and any trees felled or hedgerows removed on or adjacent to the site during the previous 15 years. For this purpose the developer / contractors will submit all relevant details to the authority dealing with the Building Regulations Certificate.

Design Levels: Refer to Engineers where design levels are not shown.

CDM: Drawings to be read in conjunction with Designers risk assessment. Potential risks above that of those associated with the general construction typical to the drawing are identified below;

PLANT SCHEDULE

General Woodland Planting

To be planted on a 2m x 2m grid, in random groups of between 3 and 9 of the same species. Each plant to be mulched with an approved bark mulch to a minimum depth of 75mm for a diameter of 1.0m around each tree. Plant stock should be of local provenance wherever possible. Planted areas to be protected with rabbit proof fencing.

Species	Size (cm)	Age Pot Size	%
Acer Campertre (Field Maple)	40-60	1+1	5
Betula Pendula (Silver Birch)	40-60	1+1	5
Corylus avellana (Hazel)	40-60	1+1	20
Crataegus monogyna (Hawthorn)	40-60	1+1	25
Euonymus europaeus (Spindle)	40-60	1+1	3
Ilex aquifolium (Holly)	40-60	3L	5
Ligustrum vulgare (Wild Privit)	60-80	0/2	5
Malus sylvestris (Crab Apple)	40-60	1+1	5
Prunus spinosa (Blackthorn)	40-60	1+1	10
Quercus robur (Pedunculate Oak)	40-60	1+1	10
Sorbus torminalis (Wild Service Tree)	40-60	1+2	2
Tilia cordata (Small-leaved Linden)	40-60	1+1	3
Vibrunum lantana (Wayfaring-tree)	40-60	1+1	2
			100%

Hedgerow Planting

To be planted in two rows at 300mm centres with 500mm between rows. Plants to be provided with mulch matting and spiral rabbit proof guards fixed with a cane. A 6.0m wide headland will be retained either side of each hedgerow on land where arable cultivation is proposed.

Species	Size (cm)	Age Pot Size	%
Cornus sanguinea (Dogwood)	40-60	1+1	5
Corylus avellana (Hazel)	40-60	1+1	10
Crataegus monogyna (Hawthorn)	40-60	1+1	45
Euonymus europaeus (Spindle)	40-60	1+1	10
Prunus spinosa (Blackthorn)	40-60	1+1	25
Vibrunum lantana (Wayfaring-tree)	40-60	1+1	5
			100%

Hedgerow Tree Planting

To be planted in random groups within the hedgerow at random centres of between 3m and 30m, based on an average of 1 per 15m. Each tree to be securely staked and provided with a spiral rabbit proof guard and mulch mat.

Species	Height (cm)	Specification	%
Acer campertre (Field Maple)	150-175	2x: Feathered: 3 brks: B	42
Prunus avium (Wild Cherry)	150-175	2x: Feathered: 5 brks: B	15
Quercus robur (Pedunculate Oak)	150-175	2x: Feathered: 3 brks: B	40
Ulmus glabra (Wych Elm)	150-175	2x: Feathered: 3 brks: B	3
			100%

Proposed Areas of Scrub - Natural Regeneration

The intention is to establish areas of scrubland by creating suitable conditions that allow for the colonisation of desirable species leading to the creation of a rich and 'biodiverse' habitats. Where practical, subsoils would be replaced over topsoils or mixed with them to reduce the nutrient status of the existing soils. The areas will not be seeded or planted initially but left for indigenous species to generate naturally.

Tree Planting For Grassland

Each plant to be mulched with an approved bark mulch to a minimum depth of 75mm for a diameter of 1.0m around each tree. Plant stock should be of local provenance wherever possible. Planted areas will be protected with rabbit proof fencing.

Species	Girth (cm)	Height (cm)	Specification	%
Acer campertre (Field Maple)	8-10	250-300	2x: Standard: CSH 175-200cm: 4brks: RB	18
Betula pendula (Silver Birch)	8-10	250-300	2x: Standard: CSH 175-200cm: 3brks: RB	2
Crataegus monogyna (Hawthorn)	8-10	250-300	2x: Standard: CSH 175-200cm: 3brks: RB	8
Malus sylvestris (Crab Apple)	8-10	250-300	2x: Standard: CSH 175-200cm: 4brks: B	10
Prunus avium (Wild Cherry)	8-10	250-300	2x: Standard: CSH 175-200cm: 3brks: RB	10
Quercus robur (Pedunculate Oak)	8-10	250-300	2x: Standard: CSH 175-200cm: 3brks: RB	25
Salix alba (White willow)	8-10	250-300	2x: Standard: CSH 175-200cm: 3brks: RB	20
Salix cinerea (Grey willow)	-	125-150	0/2:Cutting: Brached: 3brks: B	5
Ulmus glabra (Wych Elm)	-	150-170	2x: Feathered: 3brks: B	2
				100%

Marginal Planting

To be planted 5 per metre squared.195CC plant sizes.

Species	%
Alisma plantago-aquatica (Water Plantain)	5
Butomus umbrellatus (Flowering Rush)	5
Caltha palustris (Marsh Marigold)	5
Carex acutiformis (Lesser Pond Sedge)	5
Filipendula ulmaria (Meadowsweet)	10
Iris pseudacorus (Yellow Flag Iris)	5
Juncus articulatus (Joined Rush)	5
Lychnis flos-cuculi (Ragged Robin)	10
Lycopus europaeus (Gipsywort)	5
Lysimachis vulgaris (Yellow Loosestrife)	10
Lythrum salicaria (Purple Loosestrife)	10
Mentha aquatica (Water Mint)	5
Myosotis scorpioides (Water Forget-me-Not)	5
Ranunculus lingua (Greater Spearwort)	5
Sagittaria sagittifolia (Arrowhead)	5
Veronica beccabunga (Brooklime)	5
	100%

The scheme should be implemented during the first available planting season (October - March inclusive) following completion of the development.

KEY

- PLANNING APPLICATION BOUNDARY
- EXISTING & RESTORED CONTOURS
- PROPOSED HEDGEROW
- PROPOSED GENERAL WOODLAND PLANTING
- PROPOSED TREES
- PROPOSED HIBERNACULA
- AREA OF PROPOSED AGRICULTURE
- PROPOSED SPECIES-RICH GRASSLAND (Emorsgate Seeds: EM6 - Meadow Mix for Chalk and Limestone Soils)
- PROPOSED POND
- PROPOSED MARGINALS
- PROPOSED AREAS OF SCRUB (Natural Regeneration)
- FIELD GATE

Drawing Revision

Rev.	Date	Description	Drawn	Checked
P4	26/10/2020	Proportion of Wych Elm reduced following OCC comments	JB	BS
P3	28/06/2018	Amended to S. Dangerfield comments recv'd 26/06/2018	JB	BS
P2	22/06/2018	Amended to S. Dangerfield comments recv'd 20/06/2018.	JB	BS/AC
P1	20/06/2018	First draft issued to client.	JB	BS

Client
EARTHLINE LTD

Project
SHELLINGFORD QUARRY WESTERN EXTENSION

Drawing Title
RESTORATION PROPOSALS

Scale	Sheet Size	Date
1:2000	A1	JUN 2018

Client Ref.	Drawing Ref.	Drawing No.	Status
-	2459-5-2	DR-0001	S5-P4

Status
PLANNING

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