Clauchrie Windfarm
EIA Report Technical Appendix 14.4: Forestry
November 2019

dga forestry
established 1972

FIGURES

FORESTRY

1 INTRODUCTION

This Technical Appendix of the Environmental Impact Assessment Report (EIA Report) evaluates the potential effects of the proposed Clauchrie Windfarm (the proposed Development) on the woodland resource. This assessment was undertaken by DGA Forestry LLP.

Forestry is not being regarded as a receptor for Environmental Impact Assessment (EIA) purposes. Commercial forests are dynamic and their structure continually undergoes change due to normal felling and restocking by the landowner; natural events, such as windblow, pests or diseases; and external factors, such as a windfarm development.

This EIA Report Technical Appendix therefore describes the plans as a result of the proposed Development for felling, restocking and forest management practices; the process by which these were derived; and the changes to the physical structure of the forest. It further discusses the issue of forestry waste arising from the proposed Development. The forestry proposals are interrelated with environmental effects, which are assessed separately. This Technical Appendix should be read in conjunction with the EIA Report chapters, in particular:

- Chapter 3 Site Selection and Design;
- Chapter 4 Development Description;
- Chapter 6 Landscape & Visual Impact Assessment;
- Chapter 7 Hydrology, Hydrogeology, Geology & Soils;
- Chapter 8 Ecology & Biodiversity; and
- Chapter 9 Ornithology

This Technical Appendix identifies areas of forest to be removed for the construction and operation of the proposed Development and outlines the proposed management practices, while identifying the likely restocking proposals and future land management of the remaining forest. The responsibility for the management of the remainder of the forest outwith the proposed Development lies with the landowner and therefore the wider felling operations, restocking, and aftercare operations do not form part of the Proposed Development for which consent is sought.

The proposed Development (as shown in EIA Report Figure 4.1 in Volume 2 of the EIA Report) lies within existing commercial forestry plantations. The forestry is owned by the Scottish Ministers and managed by Forestry and Land Scotland (See paragraph 2.1). The forestry proposals have been developed to:

- identify areas of forest to be removed for the construction and operation of the proposed Development;
- identify those areas which may or may not be replanted as part of the proposed Development; and
- propose management practices for the forestry works.

In general, throughout this Technical Appendix data labelled "baseline" refers to the current crop composition and any existing plans without any modification as a result of the proposed Development. Data labelled "windfarm" refers to the forestry plans incorporating the proposed Development.

This Technical Appendix is structured as follows:

- Legislation, Policy and Guidance;
- Forestry Study Area;
- Forest Plans;
- Development of the Windfarm Forest Plan;
- Baseline Conditions;
- Windfarm Forest Plan;
- Requirement for Compensatory Planting;
- Forestry Waste;
- Forestry Management Practices; and
- Summary.

2 LEGISLATION, POLICY AND GUIDANCE

Relevant overarching planning policies for the proposed Development are detailed within the Planning Statement that accompanies the application. A desktop study was undertaken drawing upon published National, Regional and local level publications, assessments and guidance to establish the broad planning and forestry context within which the proposed Development is located.

Forestry related policies and documents listed below have been considered within the forestry assessment. The following section provides an outline of those planning policies which are relevant to the proposed Development and in particular to forestry.

2.1 Forestry and Land Management (Scotland) Act 2018

Until 1st April 2019, the Scottish Ministers owned the National Forest Estate (NFE), provided funding and had responsibility for forestry strategy and policy, but the management of the NFE and delivery of forestry functions had been the responsibility of the Forestry Commissioners.

The Forestry Commission was a cross-border public authority and a UK non-ministerial department with a statutory Board of Commissioners. The Commission was made up of a number of parts, including in Scotland:

- Forest Enterprise Scotland (FES), which carried out forestry operations and managed the NFE on Scottish Ministers' behalf; and
- Forestry Commission Scotland (FCS), which was responsible for the other forestry functions in Scotland.

When full devolution of forestry to the Scottish Government was completed on 1 April 2019, FCS and FES became two new agencies of the Scottish Government:

- Scottish Forestry (SF) will be responsible for regulatory, policy and support functions; and
- Forestry and Land Scotland (FLS) will be responsible for the management of the NFE and any other land managed for the purposes of the Forestry and Land Management (Scotland) Act 2018.

With the introduction of the Forestry and Land Management (Scotland) Act 2018[1] and its associated Regulations on April 1st 2019, the old regulatory regime of felling control under the Forestry Act 1967[2] was repealed in Scotland. From 1 April 2019, anyone wishing to fell trees in Scotland requires a Felling Permission issued by SF, unless an exemption applies or another form of felling approval such as a felling licence (including a forest plan) has previously been issued.

Under the new Regulations felling which is authorised by planning permission consent continues to be exempt from the Regulations and does not require a Felling Permission issued by SF.

[1] The Scottish Government (2018). The Forestry and Land Management (Scotland) Act 2018, Edinburgh. Available at http://www.legislation.gov.uk/asp/2018/8/contents/enacted [accessed on 15.04.19].

[2] UK Government (1967). Forestry Act 1967 (as amended). HMSO, London. Available at https://www.legislation.gov.uk/ukpga/1967/10/contents [accessed on 15.04.19]

2.2 Scotland's Forestry Strategy 2019 - 2029

Scotland's Forestry Strategy 2019 – 2029 (SFS)[3], was published in 2019 after a consultation period. The strategy provides an overview of contemporary Scottish forestry; presents the Scottish Government's 50-year vision for Scotland's forests and woodlands; and sets out a 10-year framework for action.

The vision is that "...*in 2070, Scotland will have more forests and woodlands, sustainably managed and better integrated with other land uses. These will provide a more resilient, adaptable resource, with greater natural capital value, that supports a strong economy, a thriving environment, and healthy and flourishing communities.*"

It lists a number of objectives summarised below:

- increase the contribution of forests and woodlands to Scotland's sustainable and inclusive economic growth;
- improve the resilience of Scotland's forests and woodlands and increase their contribution to a healthy and high quality environment; and
- increase the use of Scotland's forest and woodland resources to enable more people to improve their health, well-being and life chances.

It further describes the priorities as:

- ensuring forests and woodlands are sustainably managed;
- expanding the area of forests and woodlands, recognising wider land-use objectives;
- improving efficiency and productivity, and developing markets;
- increasing the adaptability and resilience of forests and woodlands;
- enhancing the environmental benefits provided by forests and woodlands; and
- engaging more people, communities and businesses in the creation, management and use of forests and woodlands.

There are ambitious targets included within the strategy for new woodland creation:

- 10 000 ha per year in 2018;
- 12 000 ha per year from 2020/21;
- 14 000 ha per year from 2022/23; and
- 15 000 ha per year from 2024/25.

The stated objective is to increase Scotland's woodland cover from the current 18.5% to 21% by 2032.

2.3 The Land Use Strategy for Scotland 2016 - 2021

The Land Use Strategy for Scotland 2016 - 2021[4] sets out a strategic framework for getting the best out of Scotland's land resources. It looks at the potential of the land and the ways in which it is used, both now and in the future. Principles of sustainable land use are central to its vision for the future. With specific reference to forestry, the strategy acknowledges forestry's role as a key multipurpose land use and the role it has to play in terms of delivering the Vision, Objectives and Principles of the Land Use Strategy in rural and urban Scotland. It comments that the sustainable management of Scotland's woodlands and forests makes an important contribution to Scotland's economy; it delivers health and wellbeing benefits for people and a range of other critical ecosystem services including climate change mitigation and adaptation.

To increase its role in addressing the challenge Scotland faces from climate change, a target of 100,000 ha of new woodland creation between 2012-2022 has been established. Within the UK, Scotland is leading the way in terms of areas of new woodland creation, however it is recognised that more needs to be done to achieve the planting target. To support this, Scotland's Forestry Strategy 2019 – 2029 emphasises the continued protection of Scotland's forest resource.

2.4 Third National Planning Framework

Scotland's Third National Planning Framework (NPF3)[5] recognises that woodlands and forestry are an economic resource, as well as an environmental asset (NPF3 Paragraph 4.2). It further supports the continued expansion of Scotland's woodland and forestry resource (NPF3 Paragraph 4.23). A key action of NPF3 (NPF3 Paragraph 6.10) is a commitment to create on average 10,000 ha per annum of new woodland from 2015 onwards, a target which has been superseded by the Scottish Forestry Strategy.

2.5 Scottish Planning Policy

The Scottish Planning Policy (SPP)[6] includes a section on woodlands (SPP Paragraphs 216 - 218). This refers to the Scottish Government's Control of Woodland Removal Policy (Forestry Commission Scotland, 2009) which is discussed in more detail below. The SPP states that woodland removal should only be permitted where it would achieve significant and clearly defined additional public benefits. It further states that where woodland is removed in association with Development proposals, developers will generally be expected to provide compensatory planting and that the acceptability of woodland removal, in the context of the Control of Woodland Removal Policy, should be taken into account in determining applications.

2.6 Control of Woodland Removal Policy

In parallel with the SFS and other national policies on woodland expansion, there is a strong presumption against permanent deforestation unless it addresses other environmental concerns. In Scotland, such deforestation is dealt with under the Scottish Government's 'Control of Woodland Removal Policy'[7]. The guidance relating to the implementation of the policy was revised and updated in 2019[8].

The purpose of the policy is to provide direction for decisions on woodland removal in Scotland. The policy document lays out the background to the policy, places it into the current policy and regulatory context, and discusses the principles, criteria and process for managing the policy implementation. The following paragraphs summarise the policy relevant to the Development.

The principal aims of the policy include:

- to provide a strategic framework for appropriate woodland removal; and
- to support climate change mitigation and adaptation in Scotland.

The guiding principles behind the policy include:

- there is a strong presumption in favour of protecting Scotland's woodland resources; and
- woodland removal should be allowed only where it would achieve significant and clearly defined additional public benefits. In appropriate cases a proposal for compensatory planting may form part of this balance.

Woodland removal, without a requirement for compensatory planting, is most likely to be appropriate where it would contribute significantly to:

- enhancing priority habitats and their connectivity;
- enhancing populations of priority species;
- enhancing nationally important landscapes, designated historic environments and geological Sites of Special Scientific Interest (SSSI);
- improving conservation of water or soil resources; or

[3] The Scottish Government (2019). Scotland's Forestry Strategy 2019 -2029, Edinburgh.
[4] The Scottish Government (2016). A Land Use Strategy for Scotland, Edinburgh.
[5] The Scottish Government (2014). Scotland's Third National Planning Framework (NPF3). Edinburgh.
[6] The Scottish Government (2014). Scottish Planning Policy. Edinburgh.
[7] Forestry Commission Scotland (2009). The Scottish Government's Policy on Control of Woodland Removal. Edinburgh.
[8] Forestry Commission Scotland (2019): Scottish Government's policy on control of woodland removal: implementation guidance. Available at https://forestry.gov.scot/publications/349-scottish-government-s-policy-on-control-of-woodland-removal-implementation-guidance

- public safety.

Woodland removal, with compensatory planting, is most likely to be appropriate where it would contribute significantly to:

- helping Scotland mitigate and adapt to climate change;
- enhancing sustainable economic growth or rural/community development;
- supporting Scotland as a tourist destination;
- encouraging recreational activities and public enjoyment of the outdoor environment;
- reducing natural threats to forests or other land; or
- increasing the social, economic or environmental quality of Scotland's woodland cover.

The consequences of the policy are stated as:

- minimising the inappropriate loss of woodland cover in Scotland;
- enabling appropriate woodland removal to proceed with no net loss of woodland -related public benefits other than in those circumstances detailed in the policy; and
- facilitating achievement of the Scottish Government's woodland expansion ambition in a way that integrates with other policy drivers (such as increasing sustainable economic growth, tackling climate change, rural/community Development, renewable energy and biodiversity objectives).

Addressing the policy requirements can be met through changes to forest design, increasing designed open space, changing the woodland type, changing the management intensity, or completing off site compensation planting.

2.7 The Ayrshire and Arran Forestry and Woodland Strategy

The approved Ayrshire and Arran Forestry and Woodland Strategy (AAFWS)[9] was launched in October 2014 (Ayrshire Joint Planning Unit, 2014). It supports national policies whilst integrating with other Ayrshire Councils' strategies and plans. The strategy is intended to guide woodland management and expansion in Ayrshire and Arran, providing a policy and a spatial framework to maximise the contribution of woodland and forestry to the people, environment and economy of the region.

The strategy forms statutory Supplementary Guidance to the three Ayrshire Local Proposed Development Plans. It is therefore a material consideration in planning decisions involving proposed development proposals affecting woodland. The strategy supports Scottish Ministers' desire to see an expansion in woodland cover, delivering multiple benefits across the country.

In parallel with national policies, there is a presumption against woodland loss. It is recognised that there has been pressure on woodland cover in the regions due to proposed development, principally windfarms. Under the theme of "Climate Change" the strategy states that one of the key priorities is to ensure that reductions in woodland cover resulting from restructuring and proposed development are more than compensated by new woodland creation elsewhere within Ayrshire and Arran. This in turn leads to a number of Priority Key Actions including:

- CC1: Implement the woodland removal policy, with compensation planting required within Ayrshire and Arran; and
- CC5: Facilitate renewable energy proposed development.

The strategy also recognises the importance of peatlands in the region many of which were planted with conifer forests. This results in a further Priority Key Action:

- CC7: Encourage the restoration of peatlands during forest redesign and restructuring in locations with suitable hydrological and soil and vegetation conditions.

The strategy sets out regional priorities for woodland expansion and management by broad landscape zones. The proposed Development falls within the Southern Uplands and Galloway Hills zone. The zone is currently heavily wooded, with 44% of the land area currently under woodland, the vast majority of which is softwood. Within this zone one of the key issues identified is the pressure for windfarm proposed development and the importance of securing appropriate compensatory planting where net woodland removal takes place.

2.8 The Dumfries and Galloway Forestry and Woodland Strategy

The Dumfries and Galloway Forestry and Woodland Strategy (DGFWS) [10] supports national policies whilst integrating with other Dumfries and Galloway Council (DGC) strategies and plans. It provides a framework for guiding forestry and woodland practice within Dumfries and Galloway. It is intended to guide both woodland creation and the restructuring and management of existing forests and woodlands, to maximise the benefits for the local economy, communities and environment. The strategy supports Scottish Ministers' desire to see an expansion in woodland cover, delivering multiple benefits across the country.

The DGFWS forms Supplementary Guidance to the Local Development Plan. It supersedes the Dumfries and Galloway Indicative Forestry Strategy Technical Paper No. 4; the Forestry Strategy Diagram, which forms part of the Dumfries and Galloway Structure Plan (approved 1999); and the Galloway and Langholm/Lockerbie Local Forestry Framework (2000). It does not supersede the 'Landscape Design Guidance for Forests and Woodlands in D&G' (SNH/DGC 1998).

In DGFWS Paragraph 4.32, the DGFWS recognises that the region has attracted a lot of interest from wind energy developers and that many afforested areas are also potentially suitable locations for windfarms. It states that integrating wind energy developments into wooded areas can have advantages in that the visual impacts of infrastructure may be screened or softened by planting whilst contributing to overall forest design objectives.

This has resulted in a policy within the DGFWS (page 23): LAN 9 "Work with emerging guidance on integrating wind energy developments within forest landscapes."

Under the of Theme of "Woodlands, Forestry and Climate Change" one of the key policy objectives, of the DGFWS, is to encourage effective development of renewable energy from forests in the form of biomass wood fuel and the integration of appropriate renewable energy schemes within forests and woodlands.

Paragraph 6.13 of the DGFWS states that there may be potential within some of the existing forested areas for the siting of windfarms; however, this needs to be balanced against the loss of trees and carbon emissions from their construction. Both the Local Development Plan and the Wind Energy Supplementary Guidance emphasise the need for replacement planting of woodland lost as a result of development.

Paragraph 6.14 of the DGFWS identifies that the access and transportation needs of both the timber industry and windfarm construction should be planned for in a comprehensive and inclusive manner.

This has resulted in a policy within the DGFWS: DRE 2 (page 39): "Develop effective local guidance and practice to minimise woodland loss from renewable energy developments." The DGFWS goes on to state in Paragraph 8.5 that locating windfarms or turbines within woodland or productive forests can lead to a loss of woodland cover and refers specifically to the Scottish Government's policy on "The Control of Woodland Removal".

It should be noted that only the proposed access to the proposed Development lies within Dumfries and Galloway. The proposed Development lies within South Ayrshire.

3 FORESTRY STUDY AREA

The Forestry Study Area (FSA), as shown on Figure 14.4.1, extends to approximately 11,070 ha and is part of an extensive area of state owned forestry containing 6 separate forest blocks. These consist of White Clauchrie, Changue, Rowantree, Shalloch, Drumjohn and Girvan Road. The forests contain a range of woodland types and age classes due to original planting programme together with areas

[9] Ayrshire Joint Planning Unit (2014): The Ayrshire and Arran Forestry and Woodland Strategy.

[10] Dumfries and Galloway Council (2014): The Dumfries and Galloway Forestry and Woodland Strategy. Dumfries.

of unplantable land and open ground. The crops are comprised largely of commercial conifers with areas of mixed broadleaves and open ground. The woodlands are in the production phase with rotational felling and restocking underway. Further information on the composition of the woodlands in the FSA is provided in the baseline description below.

4 FOREST PLANS

One of the original key objectives of the Forestry Commission was forest expansion, in both state and private forests, to produce a strategic reserve of timber, and consequently, a limited range of species was planted. More recently, greater emphasis has been placed on developing multi-purpose forests, which require a restructuring of age and species in existing woodlands. Restructuring is achieved through the forest planning process.

A Forest Plan, termed either a Land Management Plan (LMP) or Forest Design Plan (FDP) in the State sector, relates to individual forests or groups of woodlands. The term Forest Plan will be used throughout this Technical Appendix. It describes the woodlands, places them in context with the surrounding area, and identifies issues that are relevant to the woodland or forest. Forest Plans describe how the long-term strategy would meet the management objectives of the owner, the criteria of the UK Forestry Standard (UKFS)[11] and the UK Woodland Assurance Standard 4th Edition (UKWAS)[12], under which the woodlands would be managed if certificated.

The Forest Plan involves a scoping exercise whereby the views of Statutory Consultees, neighbours and stakeholders are sought, resulting in an agreed Scoping Report. The results of the scoping exercise are incorporated into the Forest Plan. The Forest Plan covers all aspects, such as conservation, archaeology, landscape and the local community in addition to forestry and silvicultural considerations.

Restructuring of age class and species are important factors in this process to ensure proposals meet the current standards. A Windfarm Forest Plan is prepared along the same principles with the relevant information being provided by other members of the project team. A Forest Plan will typically contain felling and restocking proposals covering a 10 year period in detail, with outline proposals for the remainder of the forest. As mentioned above there are 6 forest blocks within the proposed Development area. These are contained within 4 separate Forest Plans: Upper Cree Forest Plan (including Rowantree, Drumjohn and Girvan Road forest blocks), White Clauchrie Forest Plan, Shalloch Forest Plan, and Carrick & Changue Forest Plan.

Restructuring presents forest managers with many challenges and opportunities, particularly in relation to the management of potential catastrophic windblow. The forest planning process allows forest managers to review and revise proposals in a structured way to take account of such external factors. The inclusion of a windfarm within the forest is an example of one such external factor.

The current guidelines require diversification of species and woodland types as part of the forest planning process, specifically an increase in the proportion of broadleaf woodland, other conifers, and open ground. The incorporation of the proposed Development into the forest would result in further restructuring of the crops.

5 DEVELOPMENT OF A WINDFARM FOREST PLAN

5.1 Introduction

Existing crop information is collated from the landowner and crop surveys as necessary including species, planting year and felling and restocking plans.

Details of turbine locations, new tracks, storage compounds, borrow pits, substation and other infrastructure would be provided by other disciplines within the project team. This data would then be amalgamated with the forestry data to construct the proposed Development forestry proposals.

The location of turbines and infrastructure is heavily influenced by environmental constraints and technical considerations, e.g. sensitive habitats, wind capture, ground conditions, etc. The final location of turbines and infrastructure takes the various site constraints into consideration. Land management requirements associated with the construction of the proposed Development would also be incorporated into the forestry proposals, where appropriate.

The proposed Development felling programme would largely be driven by technical constraints. Within forests and woodlands, areas of crop may require to be felled to accommodate the construction and operation of the proposed Development. In this case taking into account technical and environmental constraints a 2.5 ha (90 m radius) keyhole was adopted around each turbine location within woodland for construction, operation and environmental mitigation. There would be an area of additional disturbance at each turbine location over and above the keyhole which would be required to accommodate the infrastructure required for the erection of the proposed turbines in this case. A 10 m buffer will be applied around each item of infrastructure, in addition to the area required for the infrastructure. An indicative 30 m corridor has been applied to all roads to be used for turbine delivery and construction purposes. This would be reviewed at the detailed design stage post consent and prior to construction. Please refer to Chapter 4 Development Description which contains information on all the infrastructure elements.

5.2 Windfarm Felling Plan

Felling required for a Development can be divided into two categories. Firstly, that required during the construction phase of the proposed Development, which for the purposes of this assessment, has been anticipated as commencing in 2021; secondly, felling required during the operational period of the proposed Development. In this case there is no felling required outwith that required for the construction phase.

The crops were assessed to identify those areas which would require to be felled for a number of reasons as described above. Due to the crop growth rates and current crop height it has been assessed that the infrastructure within woodland areas could be largely keyholed into the existing crops. Where entire coupes are to be felled the infrastructure would be incorporated into the restocking plan as described below.

Additional minor felling would be required for forest management purposes, for example, to reduce the risk of subsequent windblow; to reduce coupe fragmentation; and to ensure access for future forest operations.

The resultant windfarm felling plan shows which woodlands within the FSA would be felled as a result of the proposed Development and when this felling would take place.

5.3 Windfarm Species Plan

The windfarm restocking plan shows which woodlands would be restocked and with which species. The majority of the areas to be felled for the proposed Development would be restocked except for the areas itemised below:

- land required for the proposed Development's permanent infrastructure subject to the buffer zones described above; and
- land to be left unplanted for forest management; or forest design purposes.

It has been assumed that where possible and as shown on Figure 14.4.7, some temporary infrastructure such as edges of re-profiled borrow pits would be re-instated and available for restocking post completion of construction. To ensure that the forestry establishes successfully, the soil should be restored using best practice to a minimum depth of 1m.

In preparing the restocking plan a number of points would be considered as detailed below:

[11] Forestry Commission (2017). The UK Forestry Standard: The Government's Approach to Sustainable Forestry, Forestry Commission, Edinburgh.

[12] UKWAS (2018). The UK Woodland Assurance Standard Fourth Edition, UKWAS, Edinburgh.

- fragmentation of coupes to be minimised as much as possible;
- coupe shapes would be modified to ensure that access for future forestry operations, principally harvesting, is maintained; and
- coupe shapes and edges would be modified to follow good practice.

Species composition was considered taking into account the proposed Development operational objectives, landowner objectives and forestry policies.

The forestry proposals have been assessed by each of the separate environmental disciplines / consultants as part of the EIA process and the effects are reported in individual chapters of this EIA Report and their supporting Technical Appendices.

6 BASELINE CONDITIONS

6.1 Baseline Planting Year/Age Class Structure

Many woodlands established in the mid to late 1900's, were planted in large contiguous blocks, often over a limited number of years and with a limited range of species. Such woodlands develop poor structural diversity, especially on upland sites. Restructuring the age class and species of such forests is desirable and would yield both forest management and environmental benefits.

A summary of the age class structure of the woodlands within the FSA is detailed in Figure 14.4.2 and in Table 14.4.1 below.

Please note there may be minor discrepancies in the totals within all tables contained in this Technical Appendix. This is due to rounding of the individual values for the different parameters in the database.

Table 14.4.1: Baseline Age Class Structure

Baseline Age Class		
Age (Years)	**Area (ha)**	**Area (%)**
0	3,234.2	29.2%
1 - 10	1,169.6	10.6%
11 - 20	2,185.5	19.7%
21 - 30	2,162.5	19.5%
31 - 40	1,796.5	16.2%
41 - 50	30.9	0.3%
51 - 60	365.9	3.3%
61 - 70	101.7	0.9%
70+	24.2	0.2%
Totals	**11,071.0**	**100.0%**

Due to the ongoing restructuring programme the woodlands within the FSA contain an increasing diverse age class structure.

The current guidelines contained within the UKFS is that in forests characterised by a lack of diversity due to extensive areas of even-aged trees, stands adjoining felled areas should be retained for 7 years or until the restocking of the first coupe has reached a minimum height of 2 metres (m). For planning purposes this is likely to be between 5 and 15 years depending on establishment success and growth rates. It is recognised that in large even-aged plantations, especially in the uplands, restructuring age class structure to meet this target may take more than one rotation.

6.2 Species Composition

The current baseline species composition of the woodlands within the FSA is shown in Figure 14.4.3 and illustrated in Table 14.4.2 below. The main species are commercial conifers, principally Sitka spruce, which in pure or mixed stands, accounts for approximately 63.5 % of the total FSA. Other conifer woodland and broadleaves form very small components of the woodlands. Open ground, including other land, accounts for the second largest component at 29.2 %. A proportion of this open ground is felled woodland awaiting restocking.

Table 14.4.2: Baseline Species Composition

Baseline Species Composition		
Species	**Area (ha)**	**Area (%)**
Sitka spruce	5,445.3	49.2%
Sitka spruce / Mixed conifer	1,315.3	11.9%
Mixed conifer	260.2	2.4%
Mixed broadleaves	554.0	5.0%
Mixed woodland	262.1	2.4%
Open ground	3,234.2	29.2%
Totals	**11,071.0**	**100.0%**

The species composition reflects the practice and guidance which prevailed at the time the woodlands were established, though restructuring is introducing an increasing proportion of broadleaves and other conifers into the woodland composition.

6.3 Baseline Felling Plan

The baseline felling plan forms part of the current Forest Plans prepared by the forest managers. It considers the requirement to restructure the age class of even aged forests as described above. The baseline felling plan is illustrated in Figure 14.4.4 and presented in Table 14.4.3 below. The data is summarised in 5-year bands as per standard practice.

Table 14.4.3: Baseline Felling Plan

Baseline Felling Plan		
Fell Phase	**Area (ha)**	**Area (%)**
No felling	3,684.9	33.3%
Phase 1: 2019-2023	302.3	2.7%
Phase 2: 2024-2028	382.7	3.5%
Phase 3: 2029-2033	434.5	3.9%
Phase 4: 2034-2038	543.1	4.9%
Phase 5: 2039-2043	938.2	8.5%
Phase 6: 2044-2048	1,065.2	9.6%
Long Term Retentions	46.5	0.4%
Natural Reserves	93.6	0.8%
Outside Plan Period	3,580.0	32.3%
Total	**11,071.0**	**100.0%**

A large proportion of the FSA is designated as "Outside Plan Period" due either to earlier felling and restocking as part of the Forest Plan; the age or growth rates of the crop. The prospective felling year of these areas lies outside of the current forest plan period.

Other areas within the FSA have been designated as Natural Reserves (NR). These are areas which are considered of high conservation interest or potential and are managed by minimum intervention unless alternative management has higher conservation or biodiversity value.

Other areas of crop in the baseline felling plan have been assigned a delayed felling period by the forest managers. These areas are Long Term Retentions (LTR): crops to be retained beyond their age of economic or silvicultural maturity for conservation and biodiversity purposes. These woodlands would otherwise be managed as normal and would in due course be felled and replanted. The identification of LTRs and NRs is part of the requirements of UKWAS and the UKFS.

The baseline felling programme is designed to provide the required separation between felling coupes, where possible. This may take more than one rotation to achieve, especially in the uplands where windfirm boundaries between felling coupes are limited.

6.4 Baseline Restocking Plan

The baseline restocking plan as detailed in the Forest Plan is illustrated in Figure 14.4.5 and outline in Table 14.4.4 below.

Table 14.4.4: Baseline Restocking Plan

Species	Area (ha)	Area (%)
Sitka spruce	4,937.5	44.6%
Sitka spruce / Mixed conifer	1,300.2	11.7%
Mixed conifer	473.8	4.3%
Mixed broadleaves	1,024.1	9.3%
Mixed woodland	137.9	1.2%
Open ground	3,197.5	28.9%
Total	**11,071.0**	**100.0%**

The baseline restocking proposals illustrate how the forest would be structured at the end of the Forest Plan period if the entire plan was implemented. Table 14.4.5 below compares the baseline current species composition and the baseline restocking species composition at the end of the plan period without the implementation of the Development.

Table 14.4.5: Baseline Species Comparison

Species	Baseline Current Species	Baseline Restocking Species	Variance	
	Area (ha)	Area (ha)	Area (ha)	Area (%)
Sitka Spruce	5,445.3	4,937.5	-507.8	-4.6%
Sitka Spruce / Mixed Conifer	1,315.3	1,300.2	-15.1	-0.1%
Mixed Conifer	260.2	473.8	213.7	1.9%
Mixed Broadleaves	554.0	1,024.1	470.1	4.2%
Mixed Woodland	262.1	137.9	-124.2	-1.1%
Open Ground	3,234.2	3,197.5	-36.8	-0.3%
Total	**11,071.0**	**11,071.0**	**0.0**	**0.0**

The changes between the current baseline current species composition and that contained within the baseline restocking plan are discussed below:

- the proportion of primary conifer crops (Sitka spruce and Sitka spruce/other conifers) decreases by 522.9 ha equivalent to 4.7% of the FSA;
- the area of open ground decreases slightly by 36.8 ha; and
- the area of broadleaf woodland and mixed conifer woodland increase by 470.1 ha and 213.7 ha respectively, though this is partially balanced by a reduction in the mixed woodland category.

The majority of these changes reflect the ongoing proposed restructuring of the first rotation crops to meet current guidelines resulting in a decrease in the primary conifer species, Sitka spruce, in favour of broadleaves and other conifer species.

7 WINDFARM FOREST PLAN

7.1 Introduction

The effect of the proposed Development on the structure of the woodlands within the FSA has been compared against the baseline species. This has concentrated on changes to the felling and species plans required to accommodate the proposed Development.

7.2 Felling Plan

The proposed Development windfarm felling plan is shown in Figure 14.4.6 and summarised in Table 14.4.6 below.

Table 14.4.6: Windfarm Felling Plan

Windfarm Felling Plan		
Fell Phase	**Area (ha)**	**Area (%)**
No fell	3,684.9	33.3%
Phase 1: 2019-2023	601.0	5.4%
Phase 2: 2024-2028	420.3	3.8%
Phase 3: 2029-2033	413.9	3.7%
Phase 4: 2034-2038	627.8	5.7%
Phase 5: 2039-2043	873.8	7.9%
Phase 6: 2044-2048	741.6	6.7%
Long Term Retentions	46.5	0.4%
Natural Reserves	93.6	0.8%
Outside Plan Period	3,567.5	32.2%
Total	**11,071.0**	**100.0%**

Table 14.4.7 below compares the baseline and windfarm felling plans.

Table 14.4.7 Felling Plan Comparison

Fell Phase	Baseline Felling Plan	Windfarm Felling Plan	Variance	
	Area (ha)	Area (ha)	Area (ha)	Area (%)
No fell	3,684.9	3,684.9	0.0	0.0%
Phase 1: 2019-2023	302.3	601.0	298.7	2.7%

Fell Phase	Baseline Felling Plan	Windfarm Felling Plan	Variance	
	Area (ha)	Area (ha)	Area (ha)	Area (%)
Phase 2: 2024-2028	382.7	420.3	37.5	0.3%
Phase 3: 2029-2033	434.5	413.9	-20.6	-0.2%
Phase 4: 2034-2038	543.1	627.8	84.8	0.8%
Phase 5: 2039-2043	938.2	873.8	-64.4	-0.6%
Phase 6: 2044-2048	1,065.2	741.6	-323.6	-2.9%
Long Term Retentions	46.5	46.5	0.0	0.0%
Natural Reserves	93.6	93.6	0.0	0.0%
Outside Plan Period	3,580.0	3,567.5	-12.5	-0.1%
Total	**11,071.0**	**11,071.0**		

There would be advanced felling of 298.7 ha during Phase 1: 2019 – 2023, resulting from the construction of the proposed Development. This is balanced out by reduced felling in subsequent periods. The felling phase of other coupes was amended for forest management and design purposes; at the landowner's request; or to meet current guidelines, in particular to achieve the required separation between felling coupes.

Felling is required for infrastructure and construction of the proposed Development. Where possible the proposed Development infrastructure will be "keyholed" into the crops, where only the crops required for the infrastructure and its associated buffer zones will be cleared as detailed earlier. Where this is not possible the crops will be felled back to the nearest wind firm edge or management boundary and the proposed Development infrastructure will be keyholed into the restocking.

7.3 Windfarm Restocking Plan

The baseline restocking plan has been amended to integrate the proposed Development infrastructure requirements into the forest design and to take account of the site conditions. The windfarm restocking plan is shown in Figure 14.4.7 and summarised in Table 14.4.8.

Table 14.4.8: Windfarm Restocking Plan

Species	Area (ha)	Area (%)
Sitka Spruce	4,795.0	43.3%
Sitka Spruce / Mixed Conifer	1,290.6	11.7%
Mixed Conifer	479.4	4.3%
Mixed Broadleaves	1,049.0	9.5%
Mixed Woodland	137.9	1.2%
Open Ground	3,184.8	28.8%
Windfarm Open Ground	134.3	1.2%
Totals	**11,071.0**	**100.0%**

The baseline and windfarm restocking plans have been analysed to assess the changes construction of the proposed Development would have on the species composition of the forest. These data are presented in Table 14.4.9.

Table 14.4.9: Restocking Species Plan Comparison

Species	Baseline Restocking Species	Windfarm Restocking Species	Variance	
	Area (ha)	Area (ha)	Area (ha)	Area (%)
Sitka Spruce	4,937.5	4,795.0	-142.5	-1.3%
Sitka Spruce / Mixed Conifer	1,300.2	1,290.6	-9.6	-0.1%
Mixed Conifer	473.8	479.4	5.6	0.1%
Mixed Broadleaves	1,024.1	1,049.0	24.9	0.2%
Mixed Woodland	137.9	137.9	0.0	0.0%
Open Ground	3,197.5	3,184.8	-12.6	-0.1%
Windfarm Open Ground	0.0	134.3	134.3	1.2%
Total	**11,071.0**	**11,071.0**	**0.0**	**0.0%**

The change in area of stocked woodland due to the proposed Development is shown in Table 14.4.10 below.

Table 14.4.10: Stocked Woodland Area Comparison

Woodland Type	Baseline Restocking Species	Windfarm Restocking Species	Variance	
	Area (ha)	Area (ha)	Area (ha)	Area (%)
Stocked	7,873.5	7,751.9	-121.6	-1.1%
Unstocked	3,197.5	3,319.1	121.6	1.1%
Total	**11,071.0**	**11,071.0**		

The changes in the structure of the woodlands are discussed below. The changes refer to a comparison of the windfarm restocking species plan against the baseline restocking species plan:

- there would be a net reduction in the area of conifer woodland of 146.5 ha;
- broadleaf woodland would increase by 24.9 ha;
- open ground as part of the forest design would decrease by 12.6 ha; and
- the net reduction in stocked woodland area within the FSA would be 121.6 ha equivalent to 1.1% of the FSA.

8 REQUIREMENT FOR COMPENSATORY PLANTING

As a result of the construction of the proposed Development, there would be a net loss of woodland area. The area of stocked woodland in the study area would decrease by 121.6 ha.

In order to comply with the criteria of the Scottish Government's Control of Woodland Removal Policy, off-site compensation planting would be required. The Applicant is committed to providing appropriate compensatory planting. The extent, location and composition of such planting to be agreed with SF, taking into account any revision to the felling and restocking plans prior to the commencement of operation of the windfarm.

9 FORESTRY WASTE

The Scottish Environment Protection Agency (SEPA) guidance document WST-G-027, "Management of Forestry Waste" (SEPA, 2013)[13] highlights that all waste producers have a statutory duty to adopt the waste hierarchy as per the Waste (Scotland) Regulations 2012 (the Scottish Government, 2012)[14], which amended Section 34 of the Environmental Protection Act (EPA) 1990 (duty of care) (UK Government, 1990)[15]. This places a specific duty on any person who produces, keeps or manages (controlled) waste to take all such measures available to them to apply the waste hierarchy in Article 4 (1) of the revised Waste Framework Directive[16] (rWFD), which is:

- prevention;
- preparing for re-use;
- recycling;
- other recovery, including energy recovery; and
- disposal, in a way which delivers the best overall environmental outcome.

Further guidance is contained in the document LUPS-GU27, "Use of Trees Clear Felled to Facilitate Proposed Development on Afforested Land" (SEPA, 2014)[17].

A hierarchy of uses for forestry materials is proposed, derived from the waste hierarchy contained within the Regulations, summarised as follows:

- prevention via the production of timber products and associated materials for use in timber and other markets;
- the re-use of materials on site for a valid purpose, where such a use exists e.g. road construction including floating roads;
- there is no valid re-cycling use for forestry residues;
- other recovery via collection and use as biomass for energy recovery or other markets, where not included above; and
- where no valid on or off site use can be found for the material, disposal would be in a way that is considered to deliver the best overall environmental outcome.

Where no valid on or off site use or other disposal method can be found for the material, it should be regarded as waste and handled accordingly. Disposal of timber residues as waste in or on land requires a landfill permit or a waste exemption licence and should be considered the option of last resort.

As discussed in this EIA Report Technical Appendix, the crops will be replanted except where required for infrastructure associated with the proposed Development. Brash would be left in situ to provide nutrients for the next rotation where the crops are being replanted as per standard forestry practice. Where crops are not being replanted brash would be removed and treated in line with the proposed hierarchy described above.

Stumps would be left in situ as per good practice guidance, except where excavated as part of the construction activities. Excavated stumps would be treated in line with the proposed hierarchy described above.

In areas of lower yielding crops into which the proposed Development infrastructure would be keyholed. The objective would be to recover as much merchantable timber as possible and failing that to treat them in line with the hierarchy outlined above. Where suitable, whole trees would be extracted and used in the biomass market. As a result, it is anticipated the forestry waste arising from the works will be minimal.

It is proposed that full consideration and further clarification on this issue should be included in a Forestry Waste Management Plan to form part of the Construction Environmental Management Plan (CEMP) during the detailed planning phase following receipt of planning consent and prior to commencement of construction.

10 FORESTRY MANAGEMENT PRACTICES

10.1 Crop Clearance

Areas of crops of sufficient tree size and standing volume would be harvested conventionally. Timber operations would be undertaken with conventional harvesting and forwarding equipment utilising flotation tracks as required. The flotation devices are fitted to each machine wheel which gives the machines very low ground pressure and minimises the ground disturbance during the forestry operations.

Stemwood down to 7 centimetres (cm) or below would be removed from site and sold into the timber markets. The harvester would maximise timber recovery wherever possible, this would result in the maximum timber volume being recovered to ensure the volume used in the brash mats is kept to a minimum. On wetter ground the harvester would build stronger brash mats to ensure there would be minimal damage to the peat and soil structure by the forwarder during extraction. On soft ground, the bottom layers of brash mats become embedded into the soil and removal could result in more environmental damage than leaving the material to naturally degrade.

In areas of young or lower yield class crops, where little or no merchantable timber would be recovered, a number of options could be utilised depending on the factors prevailing at the time of clearance. The methodology used would depend on tree size; site conditions; the availability of suitable equipment; and the markets prevailing at the time of the works being carried out. Where there was suitable access and ground conditions the trees could be whole tree harvested and extracted to roadside for chipping as biomass.

Where trees are very small due to age or poor growth it may be more viable to fell the crop manually using scrub cutters or chainsaws. The end use of the material would depend on the factors mentioned above, but in some cases there would be no recoverable material. Where material was recoverable it could potentially be used on site in the base of floating roads; extracted and processed for biomass; or used for ecological enhancement if applicable.

Stumps would be left in situ as per the guidance contained in the Forestry Commission Research Note "Environmental effects of stump and root harvesting" (Forestry Commission, 2011)[18] except where they would be removed for borrow pits, excavated roads, turbine bases and other infrastructure requiring excavation. Such material would be treated as described above.

10.2 Restocking / Planting Methodology

Restocking would be carried out to current standard practice, the forest manager's internal guidance and practices and in accordance with the guidelines contained in the UKFS and UKWAS as a minimum, where applicable. Methodology would vary depending on the type of restocking being carried out. The following information is provided for guidance as to the restocking methodology which may be adopted.

On commercial conifer areas the methodology would normally include:

- site preparation by machine cultivation and drainage;

[13] SEPA (2013): SEPA Guidance Notes WST-G-027 "Management of Forestry Waste". https://www.sepa.org.uk/media/28957/forestry_waste_guidance_note.pdf [accessed 20/01/2019]
[14] The Scottish Government (2012): The Waste (Scotland) Regulations 2012 No. 148 available at https://www.legislation.gov.uk/sdsi/2012/9780111016657 [accessed 20/01/2019]
[15] UK Environmental Protection Act 1990 1990 c. 43 Part II Duty of care etc. as respects waste Section 34 available at http://www.legislation.gov.uk/ukpga/1990/43/section/34 [accessed 20/01/2019]
[16] EU Waste Legislation Waste Framework Directive https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098 [accessed 20/01/2019]
[17] SEPA (2014): LUPS-GU27 "Use of Trees Cleared to Facilitate Development of Afforested Land. https://www.sepa.org.uk/media/143799/use_of_trees_cleared_to_facilitate_development_on_afforested_land_sepa_snh_fcs_guidance-_april_2014.pdf [accessed 20/01/2019]
[18] Forestry Commission Research Note "Environmental effects of stump and root harvesting" (Forestry Commission, 2011). https://www.forestry.gov.uk/pdf/FCRN009.pdf/$FILE/FCRN009.pdf [accessed 20/01/2019]

- manual planting;
- subsequent follow-up establishment operations such as the replacement of failures, weeding and protection measures until the crops are satisfactorily established; and
- replanting would be carried out with the conifer species identified in the restocking plan at the minimum density of 2,500 trees per hectare.

Restocking within the broadleaf woodland areas would be carried out to the same specification with the following changes:

- a lower planting density would be to 1,600 trees per ha; and
- the principal species would be mixed native broadleaves including , for example, downy and silver birch with small components of other species as appropriate to site such as oak, rowan, hazel, gean, grey willow, goat willow, alder and woody shrubs.

10.3 Aftercare Works

Aftercare establishment works would normally include, but are not limited to, the following:

- the woodlands would be beaten up (replacement of failures) to ensure satisfactory stocking levels by year 5, broadleaf woodlands by year 10;
- the woodlands would be weeded as necessary to ensure satisfactory establishment by year 5/year 10 for broadleaf woodlands;
- the woodlands would be protected against pine weevils by management inspections and remedial treatment as necessary;
- the woodlands would be protected against browsing damage from wild and domestic animals;
- the woodlands would be protected against fire;
- fertiliser would be applied as necessary to ensure satisfactory establishment and growth; and
- other works as reasonably required ensuring satisfactory establishment of the woodlands.

10.4 Standards and Guidelines

All forestry operations would be carried out in strict accordance with current good practice and guidelines. This would include, but not be limited to:

- UK Forestry Standard (Forestry Commission 2017);
- Forest Industry Safety Accord Guides[19] (or equivalent) (FISA, 2014); and
- current relevant legislation including, but not limited to, Health and Safety at Work Act 1974 (UK Government, 2014)[20].

11 SUMMARY

The total study area extends to 11,071.0 ha and is comprised of State owned and managed woodlands.

Felling would be advanced on 298.7 ha.

The species composition of the forest would change as a result of the proposed Development forestry proposals. In particular, the area of conifer woodland would decrease by 121.6 ha and the area of broadleaf woodland would increase by 24.9 ha.

The area of unplanted ground would increase and as a result, there would be a net loss of woodland area of 121.6 ha.

In order to comply with the Scottish Government's Control of Woodland Removal Policy, compensation planting would be required to mitigate for the loss of woodland area. The Applicant is committed to providing appropriate compensatory planting. The extent, location and composition of such planting to be agreed with SF, taking into account any revision to the felling and restocking plans prior to the commencement of operation.

[19] Forest Industry Safety Accord (2014). FISA Safety Guides (various). Edinburgh.

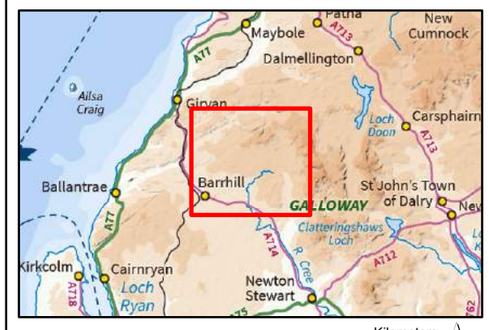
[20] UK Government (1974): Health and Safety at Work etc. Act 1974 available at http://www.legislation.gov.uk/ukpga/1974/37/contents [access 20/01/2019]

Clauchrie Wind Farm
Figure 14.4.1
Forestry Study Area

Author: T. Winter
Date: 22/11/2019
Scale 1:65,000

Legend

- Site Boundary
- Forestry Study Area



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Forest Managers & Consultants
40 Main Street
New Abbey
DG2 8BY
Tel: 01387 850497
Email: mail@dga-forestry.co.uk

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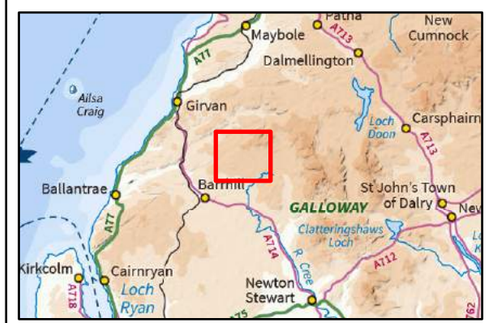
Clauchrie Wind Farm
Figure 14.4.2
Baseline Age Class

Author: T. Winter
Date: 22/11/2019
Scale 1:30,000

Legend

- Site Boundary
- 0
- 1-10
- 11-20
- 21-30
- 31-40
- 41-50
- 51-60
- 61-70
- 71-80



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Forest Managers & Consultants
40 Main Street
New Abbey
DG2 8BY
Tel: 01387 850497
Email: mail@dga-forestry.co.uk

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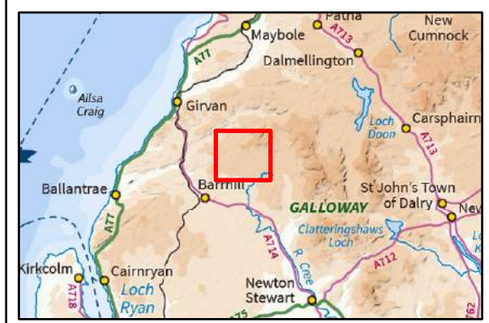
Clauchrie Wind Farm
Figure 14.4.3
Baseline Species

Author: T. WInter
Date: 22/11/2019
Scale 1:30,000

Legend

- Site Boundary
- Sitka spruce
- Sitka spruce/ Mixed conifer
- Mixed conifer
- Mixed broadleaves
- Mixed woodland
- Open ground
- Felled



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New Abbey
DG2 8BY
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Email: mail@dga-forestry.co.uk

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Figure 14.4.4
Baseline Felling

Author: T. Winter
Date: 22/11/2019
Scale 1:30,000

Legend

- Site Boundary
- Phase 0: No Felling
- Phase 1: 2019-2023
- Phase 2 : 2024-2028
- Phase 3: 2029-2033
- Phase 4: 2034-2038
- Phase 5: 2039-2043
- Phase 6: 2044-2048
- Long Term Retentions
- Natural Reserves
- Outside Plan Period

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DG2 8BY
Tel: 01387 850497
Email: mail@dga-forestry.co.uk

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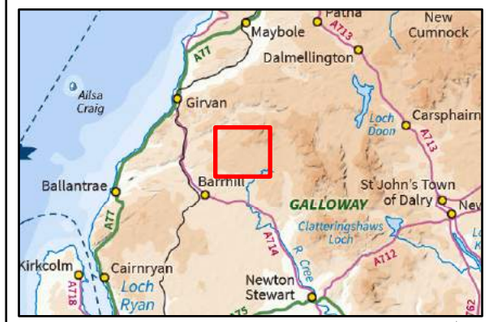
Figure 14.4.5
Baseline Restocking Plan

Author: T. Winter
Date: 22/11/2019
Scale 1:30,000

Legend

- Site Boundary
- Sitka spruce
- Sitka spruce/ Mixed conifer
- Mixed Conifer
- Mixed broadleaves
- Mixed woodland
- Open Ground



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New Abbey
DG2 8BY
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Email: mail@dga-forestry.co.uk

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Clauchrie Wind Farm
Figure 14.4.6
Development Felling Plan

Author: T. WInter
Date: 26/11/2019
Scale 1:30,000

Legend

- Site Boundary

Felling Phases

- Phase 0: No Felling
- Phase 1: 2019-2023
- Phase 2: 2024-2028
- Phase 3: 2029-2033
- Phase 4: 2034-2038
- Phase 5: 2039-2043
- Phase 6: 2044-2048
- Long Term Retentions
- Natural Reserves
- Outside Plan Period

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New Abbey
DG2 8BY
Tel: 01387 850497
Email: mail@dga-forestry.co.uk

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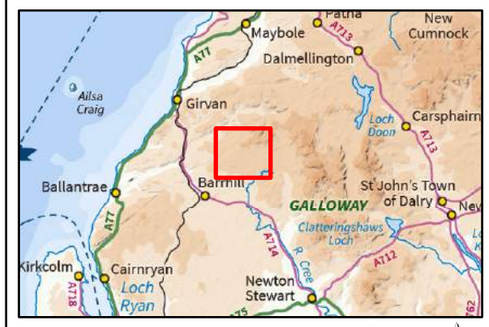
Clauchrie Wind Farm
Figure 14.4.7
Development Restocking Plan

Author: T. Winter
Date: 22/11/2019
Scale 1:30,000

Legend

- Site Boundary
- Sitka spruce
- Sitka spruce/ Mixed conifer
- Mixed Conifer
- Mixed Broadleaves
- Mixed Woodland
- Open Ground
- Wind Farm Open ground



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