Dated 17th July 2017

(1) **Natural England** of 4th Floor, Foss House, Kings Pool, 1-2 Peasholme Green, York YO1 7PX ('Natural England'); and

(2) [redacted]

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**Deed of Agreement - under sections 7 and 13 Natural Environment and Rural Communities Act 2006**

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Relating to:

*A shared vision agreed between Crag Estate and Natural England; it includes moorland restoration works and a set of agreed principles for key land management practices, and a programme of agreed infrastructure works.*

Term: 1 April 2017-30 April 2023

# Crag Estate Moorland Agreement

## (1 April 2017-30 April 2023)

[redacted] – Crag Estate

[redacted] – Crag Estate

[redacted] – Natural England

## Contents

# 1. Introduction

The [redacted] Crag Moorland Estate is the largest privately owned moor in the South West Peak and is located at the southern most fringes of the Pennine Chain. This is a varied landscape where the moors are more vulnerable to the impacts of the surrounding land use compared with the extensive moorland areas of the Dark Peak.

The Estate's Home Beat at Crag comprises approximately 860 hectares of moorland, of which the majority (810 ha) lies within the Leek Moors SSSI. This area is also designated as a Special Area of Conservation – South Pennine Moors SAC and as a Special Protection Area – Peak District Moors (South Pennine Moors Phase 1) SPA.

Blanket bog is the predominant habitat, characterised by deep, mainly wet peat supporting a mix of heather and hare's-tail cottongrass with a range of other dwarf shrubs such as bilberry and crowberry. Mosses are plentiful but *Sphagnum* is still scarce. The moors support important populations of upland breeding birds including golden plover, curlew and short-eared owl. A survey in 2013 showed stability in the curlew population in the South West Peak, and even indications of an increase. The Estate is keen to continue to contribute to successful breeding wader populations.

The South West Peak moors have suffered from the impacts of agricultural intensification and past industrial pollution from Manchester's cotton mills. Two key results are i) the loss of moorland habitat to white ground dominated by grasses and ii) the loss of *Sphagnum* mosses which are crucial to the viability of the blanket bog habitat and peat formation.

The grouse shooting is a major focus for the Estate, and driver for the management of the moor. In addition to the Home Beat the Estate leases the adjacent Goyt Valley moorland from United Utilities (approximately 1000 ha). The average grouse bag for the last 10 years from the whole area is 277 brace, and for the Home Beat only for the last 5 years is 132 brace. It is estimated that this equates to a cost of around £700 to produce a brace of grouse. The market price to rent shooting by the day is £150 a brace. One of the objectives for the Estate is to provide an additional drive on the Home Beat in the Cutthorn Common, Wood Moss and Danebower area of the Estate (approximately 300 ha) and to reduce the average cost of producing a brace of grouse, potentially to below £500. The agreement includes significant vegetation management and restoration to support this outcome.

There are two agricultural tenants on the Crag Home Beat each of which are the agreement holders for their respective Higher Level Stewardship agreements (AG00420378 – [redacted] and AG00358832 – [redacted]). There is a third agreement on the in-hand land at Cutthorn Common (AG00443075). The moorland is important for livestock production, particularly for [redacted] which covers the majority of the main moorland block. The Swaledale flock is also important for management of the moorland habitat.

The Estate have undertaken extensive grip blocking works to restore the condition of the blanket bog habitat since 2006. All the grips have been blocked using peat dams,

with the majority having been re-profiled. Investigations into the re-profiling and stabilisation of the eroding gully ends have been undertaken.

This agreement covers **site specific interventions** to restore blanket bog and create more grouse territories (Section 4.1), and **longer term management** of heather dominated areas (Section 4.2) to achieve the outcomes listed in Section 3.

### 1.1 The Agreement

This agreement is entered into under the provisions of sections 7 and 13 of the Natural Environment and Rural Communities Act 2006.

The Agreement covers the land included in the three Higher Level Stewardship agreements:

AG00420378 - [redacted]
AG00358832 - [redacted]
AG00443075 - [redacted]

## 2. The Vision

The shared vision for the Crag Estate Home Beat is:

“The Crag Estate and Natural England will work together to restore favourable, functioning blanket bog that supports a viable grouse shoot and safeguards the special environmental features of the habitat. This will be achieved through collaborative working, integrating the needs of the grouse shoot, farming and environment to provide resilient, functioning ecosystems, and shooting and farming enterprises that are flexible and able to adapt to changing situations.”

The approach will:

- Build on existing positive relationships
- Be adaptive, informed by the results of interventions
- Involve mutual understanding of key positive management principles
- Involve professional judgement by the land manager to deliver the Outcomes (see 3.1)
- Involve support from Natural England, particularly around monitoring and emerging evidence

The agreed Outcomes are described in 3.1 below.

## 3. Outcomes

**3.1** The main focus of this agreement is **to restore favourable, functioning blanket bog** across the estate that delivers the following **shared outcomes:**

A viable grouse shoot

Functioning blanket bog and moorland habitats in favourable condition

Thriving upland bird populations

**Crag Estate**


Carbon storage and sequestration

High water quality and flood alleviation

Sustainable upland sheep farming

### 3.2 What "good" looks like

The condition of the blanket bog that is being aimed for may be referred to as "What good looks like". Below is an example of some of the best quality blanket bog on Crag Estate – it has many of the characteristics of "good" – its extent is currently limited.

Hummock forming *Sphagnum* species

Mix of blanket bog species including *Sphagnum*, heather, bilberry, common and hare's tail cottongrass and crowberry (others could include cowberry, cranberry, bog rosemary, feather mosses, cloudberry)

Heather and Sphagnum growing in balance with no dominance by a single species

Vegetation growing at different heights

Other characteristics:

- High water table
- No bare peat
- No man-made drainage – all drains blocked
- Reduced susceptibility to wildfire
- Uneven vegetation structure with hummocks and hollows

### 3.3 Blanket bog states present on Crag Estate

The condition of blanket bog varies throughout the country and across individual estates, and to assist in the recognition of different blanket bog types the "Strategy for the Restoration of Blanket Bog in England" (2015) identifies six blanket bog states:

**State 1 Afforested bog (inactive)** – Bogs which have been planted with trees, usually for commercial reasons, and are not functioning as blanket bog.

**State 2 Bare peat bog** – Little or no vegetation with areas of exposed bare peat and extensive gullying and hagging. Unlikely to support representative peatland communities. Small patches of dwarf shrubs (heather) may exist.

**State 3 Dwarf-shrub dominated blanket bog with other species scarce or absent (largely inactive)** – Largely inactive, severely modified bogs where dwarf shrub cover exceed 75% of the canopy and other typical mire species such as bog mosses and even cottongrass are rare or absent. It may have moderate to severe gullying and hagging. Occurs often on 'drier' peats and the more easterly moors.

**State 4 Grass and/or sedge dominated blanket bog (potentially active)** – May be active or have potential to become so. Vegetation is dominated by graminoids such as purple moor-grass, cottongrass of deer grass with *Sphagnum* bog mosses scarce or absent. Does not include the post-burn grass or sedge dominated areas of modified bogs of State 5 below. Unlikely to be extensively drained and usually with few gullies or haggs.

**State 5 Modified blanket bog with high dwarf shrub cover but with *Sphagnum* and other mire species (active) -** Dwarf shrub cover is high, often reaching 50-75%, and *Sphagnum* cover tends to be lower. Cottongrass is abundant or frequent as an understorey and becomes dominant in the years following fire. Moderately active, with peat formation likely to be slower than in State 6. It may be drained, but usually with few gullies or haggs. Characteristic of much of the Pennines for example.

**State 6 Active hummock/hollow/ridge blanket bog (active)** – This is unmodified or little modified, *Sphagnum*-rich blanket bog, which is peat forming (active) often with hummocks and hollows. There may be basin or valley mire components. Typically neither heather nor cottongrass achieve high abundance and there is usually a good *Sphagnum* understorey. It meets, or is close to meeting favourable condition attributes.

It is important to recognise that these six states are not on a continuum i.e. there is not a stepwise improvement from State 1 to 6. Also, these descriptions are broad and local circumstances may be categorised further, in more detail.

On the Crag Estate the blanket bog is described by States 4, 5, and 6 with State 5 being the most abundant. Table 1 describes the characteristics of these three blanket bog states and the interventions appropriate to move their condition to good quality, functioning blanket bog.

Site visits with Estate representatives were done to develop a shared understanding of the blanket bog states and the appropriate actions to be taken in different areas. To assist in decision making while the "Outcomes Approach" is in its early stages Maps 1 and 2 show areas where different interventions are agreed for different blanket bog states. Map 1 covers the **site specific interventions** and Map 2 the **longer term management**.

## Table 1. Blanket bog states* present on Crag Estate and agreed actions

| ***Sphagnum* moss** | **Feather moss** | **Heather cover** | **Hare's tail cotton-grass** | **Other blanket bog species** | **Blanket bog state** | **Is action needed to move to functioning blanket bog?** | **Appropriate actions** |
|---|---|---|---|---|---|---|---|
| Very infrequent often absent | Typically less than 5% cover | Less than 10% cover, infrequent | Typically more than 75% cover and dominant, often co-dominant with Molinia | Infrequent bilberry and sometimes crowberry | **State 4.Grass and/or sedge dominated bog**<br>  <br>• Water table high<br>• Typically no bare peat<br>• Generally uniform vegetation structure<br>• Potentially active bog | Yes | • Grips all blocked – no further action<br>• Some eroding gullies – consider appropriate remedial works<br>• *Sphagnum* missing – need inoculation with *Sphagnum*<br>• Limited range of blanket bog species – may be appropriate to introduce dwarf shrub species – see Site Specific Interventions and Table 2. |
| Less than 5% cover, very infrequent | Often abundant, more wide-spread than *Sphagnum* | Usually 50% or more | Maybe just few strands if very heather dominant, or up to 50% in more open swards where heather cover is less | Bilberry & crowberry present | **State 5. Modified blanket bog**<br>  <br>• Variable water table – high in some areas<br>• May be small areas of bare peat<br>• Vegetation structure may be varied<br>• Moderately active bog | Yes | • Grips all blocked – no further action<br>• Some eroding gullies – consider appropriate remedial works<br>• *Sphagnum* missing – need site preparation and inoculation with *Sphagnum*<br>• Need to develop more diverse sward where heather is dominant<br>**Interventions**<br>• Cutting as <u>preferred</u> method to remove the heather canopy in conjunction with inoculation with *Sphagnum* (see 5.3 for methodology)<br>• Restoration burning to remove the heather canopy where cutting is not poss ble (see Figure 1 for decision tree) followed by *Sphagnum* inoculation (see 5.3 for methodology) |

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|---|---|---|---|---|---|---|---|
| More than 50% - abundant with range of wet and dry loving species – hummocks of *Sphagnum* | Tends to be less abundant than *Sphagnum* | Less than 50% - not dominant, in balance with other species | Less than 50% - not dominant, in balance with other species | Bilberry, crowberry, cranberry, common cottongrass | **State 6.Active hummock/ hollow/ridge** bog  • High water table • No areas of bare peat • Vegetation structure very variable • Active bog | No | • Grips all blocked – no further action • If gullies potentially impacting on these areas then they are a priority for remedial works • No cutting or burning interventions are required, or introduction of *Sphagnum* or other blanket bog species |

* as cited in “A Strategy for the Restoration of Blanket Bog in England” 2015

## 4. Moorland restoration (blanket bog and heath)

The main focus of this agreement is **to restore favourable, functioning blanket bog** across the estate that deliver the outcomes detailed in section 3. There are smaller areas of acid grassland where the aim is to **restore dry heath** habitat.

This section is divided into:

1) Site specific interventions
2) Longer term management

### 4.1 Site specific interventions

**Table 2** describes specific interventions in the areas shown on **Map 1**.

The following section summarises the site-specific interventions that are proposed.

**Blanket bog**

**Molinia dominant** – at least 90% of the vegetation is *Molinia*, with few other species present.

Spray with glyphosate, burn the dead litter and inoculate with *Sphagnum*, heather, cross-leaved heath and cottongrass.

Exclude grazing.

Areas 6A, 14B, 22

**Molinia-Hare's tail cottongrass** vegetation with few other species present. *Molinia* makes up at least 50% of the vegetation.

Spray with glyphosate, burn the dead litter and inoculate with *Sphagnum*, heather, cross-leaved heath and cottongrass.

Exclude grazing.

Areas 9A, 14A, 15B

**Heather-Molinia mix**, sometimes with other species e.g. feather mosses, bilberry, hare's tail cottongrass. Often where previous regeneration work has been done.

Spray with a selective graminicide e.g. Laser, no burning, inoculate with *Sphagnum*.

Exclude grazing.

Areas 1, 2, 4A, 12, 13

**Mixed vegetation with low density heather**, but range of blanket bog species e.g. hare's tail cottongrass, crowberry, bilberry and feather mosses.

Spray with a selective graminicide e.g. Laser around individual heather plants. Maximum 1m wide zone to be sprayed.

Exclude stock.

Areas 5A, 16, 19, 21B

**Species poor vegetation with "peat pockets",** tend to be dominated by hare's tail cottongrass with few other species present.

Inoculate the "peat pockets" with a mix of heather, cross-leaved heath, crowberry, bilberry and *Sphagnum*.

Exclude stock.

Areas 5C, 8, 15A, 18

**Species poor vegetation,** tends to be dominated by hare's tail cottongrass with few other species present. Denser vegetation with no "peat pockets".

Cut no more than 40% of the vegetation in a "random grid" using a power shredder. Double chop the vegetation and inoculate with a mix of heather, bilberry, crowberry, cross-leaved heath and *Sphagnum*.

Exclude stock.

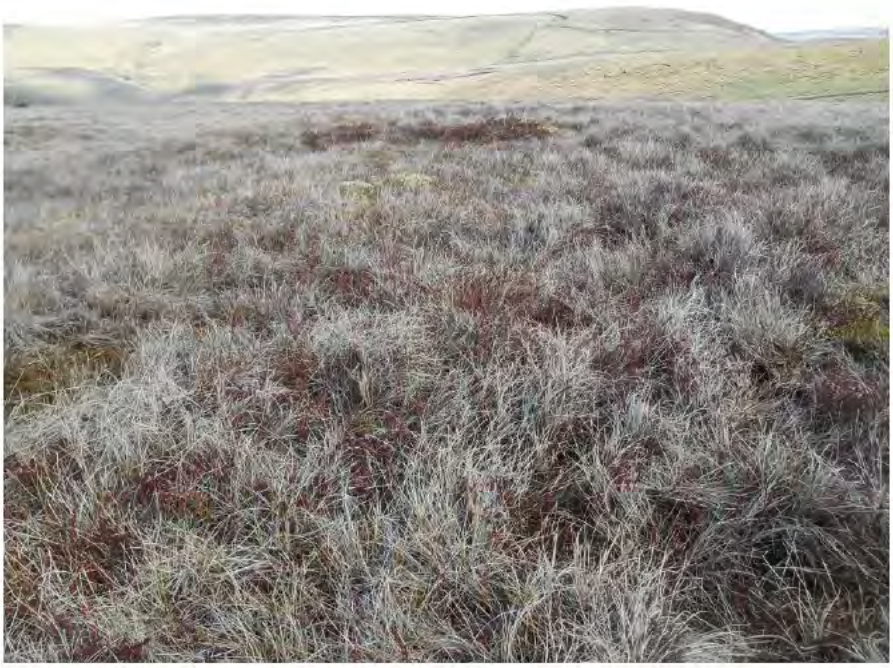
Area 5C

**Mixed vegetation with "peat pockets",** hare's tail cottongrass with frequent bilberry, crowberry and feather mosses, but low amounts of heather and *Sphagnum*.

Inoculate the "peat pockets" with a mix of heather, cross-leaved heath and *Sphagnum*.

Exclude stock.

Areas 7A, 15A



**Mixed vegetation**, taller, denser vegetation with no "peat pockets" and several blanket bog species e.g. hare's tail cottongrass, bilberry, crowberry and a good feather moss layer. Heather and *Sphagnum* are infrequent.

Cut no more than 40% of the vegetation in a "random grid" using a power shredder. Double chop the vegetation and inoculate with a mix of heather, cross-leaved heath and *Sphagnum*.

Exclude stock.

Areas 7A,7B, 8, 18

## Dry heath

**Nardus grassland,** dominated by mat grass sometimes with infrequent billberry.

Spray with glyphosate, burn the dead litter and apply heather seed.

Exclude stock.

Areas 4B, 5B, 9, 10A, 11A,B,C, 21A

**Table 1 Site Specific Interventions**

| Area (Map 1) | Agreed works | Timscale | Area (ha) | SSSI | Description of sward | Burning | Glyphosate | Laser | Cutting | Heather etc seed | Sphagnum | Rationale | Other comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Cutthorn Common Ridge | 1. Apply Laser to control Molinia using a knapsack sprayer/quad bike to he lower bank in July/August 2016 and if necessary in July/August 2017<br>2. Secure fencing and follow requirements of HLS agreement AG00443075<br>3. No burning<br>4. Stock exclusion | Works completed by September 2017 | 15.7 | No | Molinia is dominant in some areas e.g. lower slopes, heather, hare's tail cottongrass, bilberry, crowberry, common cottongrass and Hypnum moss are frequent throughout the sward with varying distributions. Heather regeneration is generally good on the upper slopes. Heather regeneration is patchy on the lower slope but reasonable number of small plants. Competition from Molinia is affecting growth of heather. Heather beetle has affected some plants. | No | No | Yes | No | No | No | Selec ive control of Molinia should allow the heather plants to grow. | There are numerous self-set conifers that need removing.<br>Grazing of he heather regeneration is evident but not as significant as in Area 2. There is a very low stile in the wall on the footpath that will allow sheep access. (Sheep have been grazing in Area 2 and 3 - see notes in these rows). The HLS grazing regime needs to be implemented. |
| 2 Cutthorn Common flat | 1. Apply Laser to control Molinia using a knapsack sprayer/quad bike in July/August 2016 avoiding wet areas and rough banks.<br>2. "Seed" with heather.<br>3. No burning.<br>4. Fencing will be secured by 15 June 2017.<br>5. Stock exclusion. | Works completed by end of 2016. | 5.97 | No | Molinia dominated sward with frequent hare's tail cottongrass and Hypnum moss. Sphagnum occurs at a very low level. Heather is ocassional. | No | No | Yes | No | Yes | No | Selec ive control of Molinia should allow the heather plants to grow. | Heather regeneration has been affected by sheep grazing. The roadside boundary is not stockproof and this area is open to the adjacent pasture (Area 3) which is being grazed by sheep. The HLS stocking regime needs to be implemented. |
| 4A Woodmoss Flat (by road) | 1. Apply Laser to control Molinia using a knapsack sprayer/quad bike in July/August 2016 avoiding wet rushy areas.<br>2. Apply Sphagnum pellets/gel in 2017.<br>3. No burning.<br>4. Stock exclusion.<br>5. Apply glyphosate to Nardus dominated areas (localised) using a knapsack sprayer/quad bike in 2017. | 2016 and 2107. | 7.04 | No | The top of the bank adjacent to Area 7 is acid grassland with Nardus on shallow soils. The lower area is a hare's tail cottongrass- bilberry sward on deep peat with some Molinia, scattered heather and good amount of Hypnum moss cover. Sphagnum occurs in small amounts. Some areas of shallower peat where Nardus is abundant in the flat. | No | No | Yes | No | No | Yes | Encouragement of the existing heather component is considered appropriate for his blanket bog sward, but the areas with no/minimal heather still have functioning bog characterisitics where it is considered important that these are not adversely impacted. Therefore the use of glyphosate will be restricted to the Nardus areas on shallow peat. | Stock will be excluded from all the areas 4A-7B. |

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| 4B | 1. Apply glyphosate to the Nardus bank only using a knapsack sprayer/quad bike in Aug/Sep 2016, burn with licence in September 2016 and apply heather seed in autumn 2016.2. Review results of 2016 spray and if necessary repeat spray in March 2017 3. Stock exclusion. | 2017 | 0.75 | No | Nardus dominated bank. | Yes | Yes | No | No | Yes | No | Development of heath is compatible with SSSI interest. | |
| 5A Woodmoss Flat (middle) | 1. Apply Laser using a knapsack sprayer around heather plants, maximum 1m width, in July/August 2016.<br>2. No burning.<br>3. Stock exclusion. | September 2016 | 7.87 | No | This area has been gripped - these are partially re-vegetated. The area has been split into three strips with different treatments from N to S. The sward typically comprises hare's tail cottongrass with Molinia in some areas. | No | No | Yes | No | No | No | From N to S in three strips i) cut with small topper and seeded, ii) just overseeded, iii) burned (spring) and seeded - all in 2015. Also it would appear grazing has continued - the plot is not stockproof. | Stock will be excluded from all the areas 4A-7B. |
| 5B Woodmoss Flat | 1. Spray with glyphosate using a knapsack sprayer/quad bike in July/August 2016, burn with a licence in September 2016, seed with heather and possibly pasture top (to be reviewed and agreed).<br>2. Review results of 2016 spray and if necessary repeat spray in March 2017.<br>3. Review need to pasture top.<br>4. Stock exclusion. | 2016 & 2017 | 3.51 | No | 5B comprises Nardus dominated acid grassland, wi h remnant heath/bilberry on shallow soils. | Yes | Yes | No | ? | Yes | No | The regeneration of heather in the Nardus grassland is considered appropriate in the restoration of a dry heath habitat. | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5C Woodmoss Flat | 1. Apply heather-cross-leaved heath-crowberry-bilberry-Sphagnum pellets/gel to the whole area (sufficient bare peat pockets and mossy areas to act as a seed bed) in 2017.2. Where the sward is species poor cottongrass use the power shredder to cut in a "random grid" such that no more than 40% of the sward is cut. Double cut/chop he cut areas to reduced the litter layer, and apply pellets as above. Cutting in 2016, pellets/gel 2017.<br>3. Stock exclusion. | 2016-17 | 2.67 | No | 5C is wet, deep peat with abundant hare's tail cottongrass, bilberry and Hypnum moss. Sphagnum is frequent. The most southerly parcel is more species poor with a less well developed moss layer and "pockets" of bare peat BUT there are also very diverse areas here with abundant Sphagnum and cranberry. | No | No | No | Yes | Yes | Yes | Aim to maintain blanket bog indicator species as well as introducing additional species and increasing the distribution and frequency. | |
| 6A Woodmoss lower slope | 1. Apply glyphosate using a knapsack sprayer/quad bike to the areas with Molinia in July/August 2016, burn with a licence in September 2016 and seed with heather-Sphagnum in autumn 2016.<br>2. Stock exclusion. | 2016 | 0.58 | Yes | The grips have been blocked in this area. There is an area where Molinia is abundant between the road and the Sparbent field. | Yes | Yes | No | No | Yes | Yes | The regeneration of blanket bog species is compatible with SSSI interest. | |

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| 7A Woodmoss Ridge | 1. Apply heather-cross-leaved heath-Sphagnum pellets/gel to the whole area (sufficient bare peat pockets and mossy areas to act as a seed bed) by February 2017.<br>2. Where the sward is a mix of bilberry, cottongrass and Hypnum mosses use the power shredder to cut in a "random grid" such that no more than 40% of the sward is cut. Double cut/chop he cut areas to reduce he litter layer in 2017, and apply pellets/gel 2017.<br>3. Localised grassy areas ( hese are limited) spray with glyphosate Aug/Sept 2016, burn with a licence in 2016 and apply pellets as above.<br>4. Stock exclusion. | 2106 and 2017 | 7.72 | Yes | Hare's tail cottongrass is abundant with frequent bilberry, crowberry and Hypnum moss layer. Heather is ocassional through the sward, but has suffered heavy grazing by sheep. There are "pockets" of bare peat throughout. Sphagnum occurs rarely. This area is still recovering from historical overgrazing, wi h acrocarpus mosses and damaged bilberry tussocks. | Yes | Yes | No | Yes | Yes | Yes | The sward has several features that are characteristic of functioning bog (high water table, 2 species of cottongrass, Hypnum moss layer and three species of dwarf shrubs). Therefore the move towards a heather dominant sward is not considered appropriate. But a modest increase in the heather frequency could be accommodated as long as the method used does not affect the current species. The introduction of Sphagnum is important as it occurs only rarely at present. | Stock will be excluded from all the areas 4A-7B. |
| 7B | 1. Use the power shredder to cut in a "random grid" such that no more than 40% of the sward is cut. Double cut/chop he cut areas to reduced the litter layer, and apply pellets/gel as above in 7A. Cut in 2017 and apply pellets/gel by February 2018.<br>2. Stock exclusion. | 2016/7 and 2018 | 7.6 | Yes | In this part of 7 (long term stock exclusion) recovery of the vegetation is more advanced with a well developed moss layer and hare's tail cottongrass and bilberry co-dominant. | No | No | No | Yes | Yes | Yes | Similar to 7A. | |

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| 8 Sparbent | 1. Apply heather-cross-leaved heath-Sphagnum pellets/gel to the whole area (sufficient bare peat pockets and mossy areas to act as a seed bed) by February 2017.<br>2. Where the sward is a mix of bilberry, cottongrass and Hypnum mosses use the power shredder to cut in a "random grid" such that no more than 40% of the sward is cut. Double cut/chop he cut areas to reduced the litter layer, and apply pellets as above. Cut in 2017 and apply pellets/gel by February 2018.<br>3. Boundary works to be completed by 15 June 2017.<br>4. Stock exclusion. | 2016/7 and 2017/8. | 9.55 | Yes | Hare's tail cottongrass dominant, remnant bilberry hummocks, small "pockets" of bare peat, Sphagnum rare, Hypnum moss, Molinia and deer grass all ocassional. Not stockproof, some areas hard grazed by sheep. | No | No | No | Yes | Yes | Yes | Glyphosate not appropriate as cottongrass is peat forming, and there are "pockets" of bare peat amongst the cottongrass where seed could take. Some increase in heather combined with inoculation with Sphagnum is considered appropriate. | Sheep have been regularly accessing this area - the fence and wall will be made stockproof by May 2017. Gulley in the north of the unit with some revegeta ion in the bottom. Consider stone blocks. |
| 9 Danethorn Hollow | 1. Apply glyphosate with a knapsack sprayer/quad bike in July/August 2017, burn with a licence September 2017 and seed with heather in autumn 2017. Repeat in 2018 if needed. Steep slopes and rushes to be avoided.<br>2. Fencing will be in place by 15 June 2017. | 2017-2018 | 5.96 | Yes | Nardus dominated bank with remnant bilberry present as small "sprigs". Some of the ground is very steep but flattens out on the top of the bank. Some areas of fescue-bent grassland with more loamy soils - close grazed. Soft rush at bottom on slope. | Yes | Yes | No | No | Yes | No | The regeneration of heather in the Nardus grassland is considered appropriate in the restoration of a dry heath habitat. | Steep ground will limit feasibilty and the soft rush flushes will be avoided. |

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| 9a Sparbent Hill | 1. Apply glyphosate with a knapsack sprayer/quad bike in July/August 2017, burn with a licence September 2017 and seed with heather-Sphagnum in autumn 2017. Repeat in 2018 if needed. Rushes to be avoided.<br>2. Fencing will be in place by 15 June 2017.<br>3. Stock exclusion. | 2017 and 2018 | 1.59 | Yes | Southern part (adjacent to Area 8) is mix of soft rush and semi-improved grasses on loamy soil. The rest of 9A is typically a mix of hare's tail cottongrass and Molinia, with remnant bilberry hummocks, Sphagnum is rare and Hypnum moss is locally frequent. Tends to be drier than Area 8. Heavily sheep grazed, feels compacted. | Yes | Yes | No | No | Yes | Yes | Shallower peat with no opportunity for re-wetting, and at this time difficult to suggest how the blanket bog status may be improved. | Imperative that a new fence is put in place as this area is currently run with the semi-improved grassland area to the SW of the exclosure in Area 8. Adjacent ground (no proposals) is cottongrass dominant but Sphagnum papillosum and fallax is spreading well and some dwarf shrubs. NB vehicle tracks developing with some associated erosion. Immediately to the west of Area 9 there is an area where Polytrichum is still abundant (past overgrazing sign). |
| 10 Correc ion Moor | 1. Apply Sphagnum - timing to be agreed (site reviewed to assess natural regeneration first).<br>2. Stock exclusion. | TBA | 10.9 | No | Hare's tail cottongrass bog with frequent heather resulting from the regeneration work. Molinia is frequent and in some areas it is dominant. Heather regeneration has been set back by grazing (the fence is just stock netting and not very high). | No | No | No | No | No | Yes | N/A | Sheep need to be kept out of the exclosure to enable heather to regenerate. |
| 10a Correc ion Moor | 1. Apply glyphosate using a knapsack sprayer/quad bike to the Nardus dominated areas in July/August 2017, burn with a licence in September 2017 and seed with heather in autumn 2017.<br>2. Sphagnum to be added to the previously treated blanket bog area - timing to be agreed (site reviewed to assess natural regeneration first).<br>3. 15 June 2017.<br>4. Stock exclusion. | 2017 | 7.56 | No | The bank to the west of the exclosure is Nardus dominated acid grassland. The top is flatter grading into steep slope and into gently sloping ground at he bottom. The area between the exclosure (Area 10) and the Nardus bank is a hare's tail cottongrass area with remnant heather that has suffered from sheep grazing. This area also supports bilberry and Hypnum moss in some areas. There are bare "pockets" of peat in between the cottongrass. The peat is generally wet with water table at the surface at time of visit. | Yes | Yes | No | No | Yes | Yes | The Nardus dominated sward is generally not on deep peat and therefore the introduction of heather is compatible with the heath habitat.<br>The cottongrass area on deep peat has bare peat "pockets" distributed throughout where heather seed could germinate and be good receptor sites for Sphagnum. | Sheep grazing has negatively affected heather regeneration in the cottongrass bog. |

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| 11A, B and C Correc ion bank below Danebower | 1. Apply glyphosate using a knapsack sprayer/quad bike to the Nardus dominated areas only in July/August 2017, burn with a licence in September 2017 and seed with heather in autumn 2017.<br>2. Repeat in 2018 if necessary (to be agreed).<br>3. Stock exclusion. | 2017 and 2018 | 13.082.70.33 | No | A mix of vegetation types. The wetter low lying ground supports a mosaic of soft rush with hare's tail cottongrass/common cottongrass-Sphagnum. This grades into Nardus dominated grassland on the edges of the mound to the west of this area. The bank that rises up to Areas 16-17 is dominated by Nardus on shallow soils. The southern end of this has soft rush flushes throughout. | Yes | Yes | No | No | Yes | No | Regeneration of heather on Nardus acid grassland with thin soils is compatible with heath restoration. This will enable a more diverse sward to develop. Soft rush areas are not appropriate for heather regeneration and the cottongrass areas are wet and have characteristics of functioning blanket bog, so heather seeding is not appropriate. | |
| 12 Danebower | 1. Apply Laser using a knapsack sprayer/quad bike in July/August 2016 where Molinia is frequent only.<br>2. Apply heather-Sphagnum pellets/gel in 2017.<br>3. No burning.<br>4. Fencing works will be done by 15 June 2017.<br>5. Stock exclusion. | 2106 and 2107 | 7.05 | Yes | Hare's tail cottongrass dominant with frequent heather, crowberry, common cottongrass and bilberry. Well developed moss layer, mainly Hypnum. Molinia becomes more abundant towards the A54. | No | No | Yes | No | Yes | Yes | Control of Molinia to favour blanket bog vegetation is appropriate. | The fence against the A54 is not stockproof (quarry area) and sheep are gaining access to Danebower from here (this is a stock excluded area in HLS). There are vehicle tracks developing across this area.<br>Area important for golden plover. |
| 13 Danebower central | 1. Apply Laser using a knapsack sprayer/quad bike in July/August 2016 where Molinia is frequent only.<br>2. Apply heather-Sphagnum pellets/gel in 2016.<br>3. Repeat in 2017 if necessary.<br>4. No burning.<br>5. Stock exclusion. | 2016-17 | 4.46 | Yes | Hare's tail cottongrass bog with crowberry, cross-leaved heath, common cottongrass and heather. Some Molinia. | No | No | Yes | No | Yes | Yes | Control of Molinia to favour blanket bog vegetation is considered appropriate. | Need to exclude sheep effectively.<br>Area important for golden plover. |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14A Danebower north | 1. Apply glyphosate using a knapsack sprayer/quad bike to the whole area where Molinia is abundant in July/August 2016, burn with a licence in September 2016 and seed with heather-Sphagnum in autumn 2016/spring 2017.<br>2. Stock exclusion. | 2016/7 | 3.49 | Yes | This is a high plateau area where vegetation is generally low growing. The northern most area, adjacent to Area 15, is drier with Molinia abundant. The area between the gullies just to the south of here is wetter with more diverse blanket bog vegetation - two species of cottongrass, crowberry, Hpynum moss, cross-leaved heath and heather. To the south of here there is an area approximately 60m wide from the Merry Road that is mainly Molinia and hare's tail cottongrass, with no moss layer. The area to the west of this strip is more diverse as above. | Yes | Yes | No | No | Yes | Yes | Please note that this is a smaller area than originally proposed to reflect the extent of the Molinia-cottongrass sward. | |
| 14B | 1. Apply glyphosate using a knapsack sprayer/quad bike to the Molinia in July/August 2016, burn with a licence in September 2016 and seed with heather-Sphagnum in autumn 2016/spring 2017.<br>2. Stock exclusion. | 2016-17 | 1.2 | Yes | Drier, more Molinia present. | Yes | Yes | No | No | Yes | Yes | | |
| 15A | 1. Apply heather-cross-leaved heath-crowberry-bilberry-Sphagnum pellets/gel to the whole area (sufficient bare peat pockets and mossy areas to act as a seed bed) in 2017.<br>2. No burning. | 2017 | 1.1 | Yes | A "thin" hare's tail cottongrass sward with frequent common cottongrass and ocassional bilberry, crowberry, Molinia and Nardus. Heather is present but at a very low level. "Pockets" of bare peat among the cottongrass. | No | No | No | No | Yes | Yes | Glyphosate not appropriate as there are several blanket bog indicators and a high water table. There are "pockets"of bare peat amongst the cottongrass where seed could take. Some increase in heather, combined with inoculation with Sphagnum is considered appropriate. | Golden plover use this area |
| 15B | 1. Apply glyphosate using a knapsack sprayer/quad bike to the areas with Molinia in July/August 2016, burn with a licence in September 2016 and seed with heather-Sphagnum in autumn 2016.<br>2. Stock exclusion. | 2016 | 0.85 | Yes | Hare's tail cottongrass abundant with frequent Molinia, crowberry, bilberry and common cottongrass. Sphagnum is rare. | Yes | Yes | No | No | Yes | Yes | The abundance of Molinia in this area justifies he use of glyphosate, burn and seed me hod. | Caution regarding the proximity to watercourses, regarding use of herbicide and burning. Care is needed to prevent damage from vehicle use in this area. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 Shallow drains at top of Merry Road | 1. Spray with Laser around heather plants - maximum 1m width in 2017.<br>2. No burning.<br>3. Stock exclusion. | 2017 | 3.6 | Yes | Hare's tail cottongrass area with frequent common cottongrass, crowberry, bilberry and Hypnum moss. Heather is present at a very low level. This is a wet area (water table high) which is very exposed where vegetation is low growing. There are 25 shallow drains (only inches deep) which have naturally revegetated and do not carry running water. | No | No | Yes | No | No | No | This area has several features that are characteristic of functioning bog (high water table, 2 species of cottongrass, good moss layer and range of dwarf shrubs). Therefore a significant increase in heather is not considered appropriate. | Also important for breeding golden plover. |
| 17 Danebower | 1. Spray glyphosate, burn and seed trial plot 50mx50m in 2016.<br>2. Apply heather, cross-leaved heath, bilberry, crowberry and Sphagnum in the pellets plus Sphagnum gel. | | 0.25 | Yes | Primarily hare's tail cottongrass-bilberry sward with ocassional heather and crowberry, abundant Hypnum moss and frequent common cottongrass, indicating he wetness of this area. Sphagnum is rare. There are small "pockets" of bare peat between the cottongrass. | Yes | Yes | No | No | Yes | Yes | The sward type represented by the trial plot areas has several features that are characteristic of functioning bog (high water table, 2 species of cottongrass, good moss layer and range of dwarf shrubs, albeit at a low level). Therefore the move towards a more heather dominant sward is not considered appropriate. But a modest increase in the heather frequency, in conjunction with an increase in Sphagnum, could be accommodated as long as the method used does not affect the current species. | Important area for golden plover. |
| 18 Adjacent to Torgate boundary | 1. Apply heather-cross-leaved heath-bilberry-crowberry-Sphagnum pellets/gel to the whole area (sufficient bare peat pockets and mossy areas to act as a seed bed) in 2017.<br>2. Where the sward is a mix of bilberry, cottongrass and Hypnum mosses use the power shredder to cut in a "random grid" such that no more than 40% of the sward is cut. Double cut/chop he cut areas to reduced the litter layer, and apply pellets as above. Cutting and pellets/gel 2017.<br>3. Boudaries will be made secure by 15 June 2017.<br>4. Stock exclusion. | 2017 | 0.57 | Yes | This area is bounded by the fence to the south and a gully to the east and comprises an open hare's tail cottongrass sward that is wet with little moss cover. | No | No | No | Yes | Yes | Yes | The introduction of Sphagnum should encourage the development of a functioning blanket bog. The high water table here is likely to limit heather regeneration and growth and therefore if it is combined with Sphagnum inoculation it is considered appropriate. | This area is important for breeding golden plover and therefore a short, open sward must be retained. Boundaries need to be stock proof to implement he stock exclusion under HLS. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 1. Spray with Laser around heather plants - maximum 1m width in 2017.<br>2. No burning.<br>3. Stock exclusion. | 2017 | 0.79 | Yes | This area is located between two gullies. This area supports a diverse sward with abundant hare's tail cottongrass and bilberry, and frequent common cottongrass and crowberry. Heather is ocassional-frequent and there is a reasonably well developed Hypnum layer. | No | No | Yes | No | No | No | A limited development of heather is compatible with functioning blanket bog. There are 6 indicator species present, ableit not evenly distributed, it would not be appopriate to expand heather at the expense of the diversity present in the sward. | |
| 20 | 1. Apply Sphagnum in 2017.<br>2. Boundaries will be made secure by 15 June 2017.<br>3. Stock exclusion. | 2017 | 1.5 | Yes | A cottograss- heather sward with >50% heather cover. Hare's tail cottongrass is low growing and does not pose much competion to the heather. | No | No | No | No | No | Yes | The cover of hea her is good and competition low. The introduction of Sphagnum is desirable to move towards functioning blanket bog. | Boundaries will be secured to exclude stock. |
| 21A Bank below Cat & Fiddle | 1. Apply glyphosate using a knapsack sprayer/quad bike to the Nardus dominated areas in July/August 2017, burn with a licence in September 2017 and seed with heather-Sphagnum in autumn 2017.<br>2. Boundaries will be secured by 15 June 2017.<br>3. Stock exclusion. | 2017 | 0.88 | Yes | The vegetation is very mixed in this area. At the N end opposite the Cat & Fiddle there is a good mix of heather, bilberry, crowberry, hare's tail cottongrass, cross-leaved heath with mounding Hypnum moss. Sphagnum and deer grass are present ocassionally. In the NW corner adjacent to the road here is a small area dominated by Nardus/soft rush (21A). | Yes | Yes | No | No | Yes | Yes | Regeneration of heather in the small Nardus area is not in conflict with the condition of the blanket bog. | This area will be made stock proof - there is currently no boundary on the NW side (Cat & Fiddle end). |
| 21B | 1. Spray with Laser around heather plants - maximum 1m width, avoiding steep banks in 2017.<br>2. No burning.<br>3. Stock exclusion. | 2017 | 1.4 | | Moving southwards in 21, heather becomes more patchy but the sward still supports typically 5 blanket bog indicator species and characteristics of functioning bog (21B). | No | No | Yes | No | No | No | Area 21b has many functioning bog characteristics e.g. the number of indicator species, wetness and moss layer and therefore is it not appropriate to encourage a significant increase in hea her cover. | |
| 21C | 1. Apply heather-cross-leaved heath-Sphagnum pellets/gel to the whole area (sufficient bare peat pockets and mossy areas to act as a seed bed) in 2017.<br>2. No burning.<br>3. Stock exclusion. | 2017 | 1.5 | | Further south the sward becomes less mossy with a thin sward of hare's tail and common cottongrass and frequent crowberry. This area has "pockets" of bare peat, and is wet and "hard" (21C). This vegetation type extends between the gulleys in the southern part of this area. | No | No | No | No | Yes | Yes | Area 21C could support more heather to create a cottongrass-dwarf shrub sward. | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 Mary road east | 1. Apply glyphosate using a knapsack sprayer/quad bike to the areas with Molinia in July/August 2017, burn with a licence in September 2017 and seed with heather-Sphagnum in autumn 2017.<br>2. Stock exclusion. | 2017 | 0.57 | Yes | Some areas Molinia dominant with sprigs of heather. Forms mosaic with hare's tail cottongrass-crowberry sward. | Yes | Yes | No | No | Yes | Yes | This con inues previous works to control Molinia. The wetness of the area is likely to determine the amount of heather regeneration. | Control will be limited to the Molinia dominated areas avoiding the cottongrass-crowberry areas. |

## 4.2 Longer term management

The aim of the long term management of the blanket bog is to restore good quality, functioning blanket bog that delivers the 5 Outcomes in 3.1. This may include works to improve hydrology and the blanket bog vegetation across the whole estate to achieved the 5 Outcomes including those for the grouse shooting interest.

This includes the management of heather dominated areas across the Estate that have traditionally been managed by rotational burning to create a varied age structure for grouse and sheep. The focus of this agreement is to consider all of the 5 Outcomes and cutting or burning will be used as a tool to enhance the blanket bog, specifically in conjunction with the introduction of *Sphagnum*. Hence the term "restoration burning". The aim in the long term (beyond the timescale of this agreement i.e. in 20+ years time) is to create conditions where routine interventions for the management of the blanket bog are no longer necessary.

There are some limited areas that are close to being active hummock/hollow blanket bog. These areas most closely resemble "what good looks like". In the main these areas do not require any management as the vegetation is varied and in balance. However, there is one area where heather appears to be increasing in its cover and 3 small trial burns are to be undertaken (Map 2).

In areas of modified bog where heather is dominant removal of the dwarf shrub canopy is needed to allow light into the sward and to provide the conditions for the introduction of other blanket bog species, particularly *Sphagnum*. Cutting is the preferred method for removing the heather canopy as it can help to reduce the competitiveness of heather, create a mulch for wet-loving species to grow in, provide some short-term structural diversity and slow down the regeneration of heather. Burning may also be used to remove the heather canopy where it is not practical to cut (see Figure 1).

There are also areas with abundant or dominant *Molinia* where restoration works to reduce the *Molinia* cover and introduce appropriate blanket bog species, including *Sphagnum*, have been agreed.

The sections below describe and consider the appropriate interventions for the different blanket bog states.

**Blanket bog State 6 Active hummock/hollow/ ridge blanket bog**

- Diverse vegetation composition and structure (more than six indicator species)
- Both dry and wet-loving species
- High cover of *Sphagnum*
- Lower cover of heather and grasses
- Abundance of hummock-forming *Sphagnum* moss
- High water table – peat surface wet and bouncy

**Interventions**

- No intervention generally required
- Where heather appears to be becoming dominant (more than 50% cover) 3 small trial burns will be done (Map 2)

## Management of heather - cutting or burning for restoration purposes

Cutting is the preferred restoration technique for removing the heather canopy – burning will only be used where cutting is not possible. The heather canopy will be removed by the most appropriate intervention method for the particular site – please refer to Figure 1. Cutting will be done using an ATV mounted flail. The type of blanket bog vegetation where cutting/burning can be undertaken is:

**Blanket bog State 5 - Modified blanket bog with high dwarf shrub cover**

- Heather makes up at least 50% of vegetation cover and is approximately 30cm tall
- Feather mosses often well developed but *Sphagnum* scarce
- Water table generally high but drier areas associated with more dwarf-shrub dominated areas

**Interventions**

- Cut in preference, burn if cutting is not practical – see Fig 1.
- Inoculate with *Sphagnum* – see 5.3.
- Introduce other blanket bog species as appropriate – see Map 2.

**Blanket bog State 5 - Modified blanket bog with high dwarf shrub cover**

- Heather makes up at least 50% of vegetation cover but is less than 30cm tall and not as dominant as in the example above.
- Feather mosses often well developed but *Sphagnum* scarce
- Water table generally high but drier areas associated with more dwarf-shrub dominated areas

**Interventions**

- Use cutting only
- Inoculate with *Sphagnu*m – see 5.3.

## *Molinia* dominated swards

Where *Molinia* has become dominant and is encroaching on the blanket bog habitat works may be done to reduce its cover and encourage blanket bog species. Two sward types occur, 1) *Molinia* is dominant with greater than 90% cover and 2) *Molinia* is abundant with a low frequency of blanket bog species present. The following section covers these two scenarios.

**Blanket bog State 4 – Grass and/or sedge dominated bog Type 1 Molinia dominant**

- *Molinia* dominant, more than 90% cover
- Feather mosses and *Sphagnum* absent
- Other blanket bog indicators absent/scarce
- Water table high

**Interventions**

- Apply glyphosate
- Burn off the litter
- Inoculate with *Sphagnum* – see 5.3.
- Apply mix of heather, cross-leaved heath and bilberry

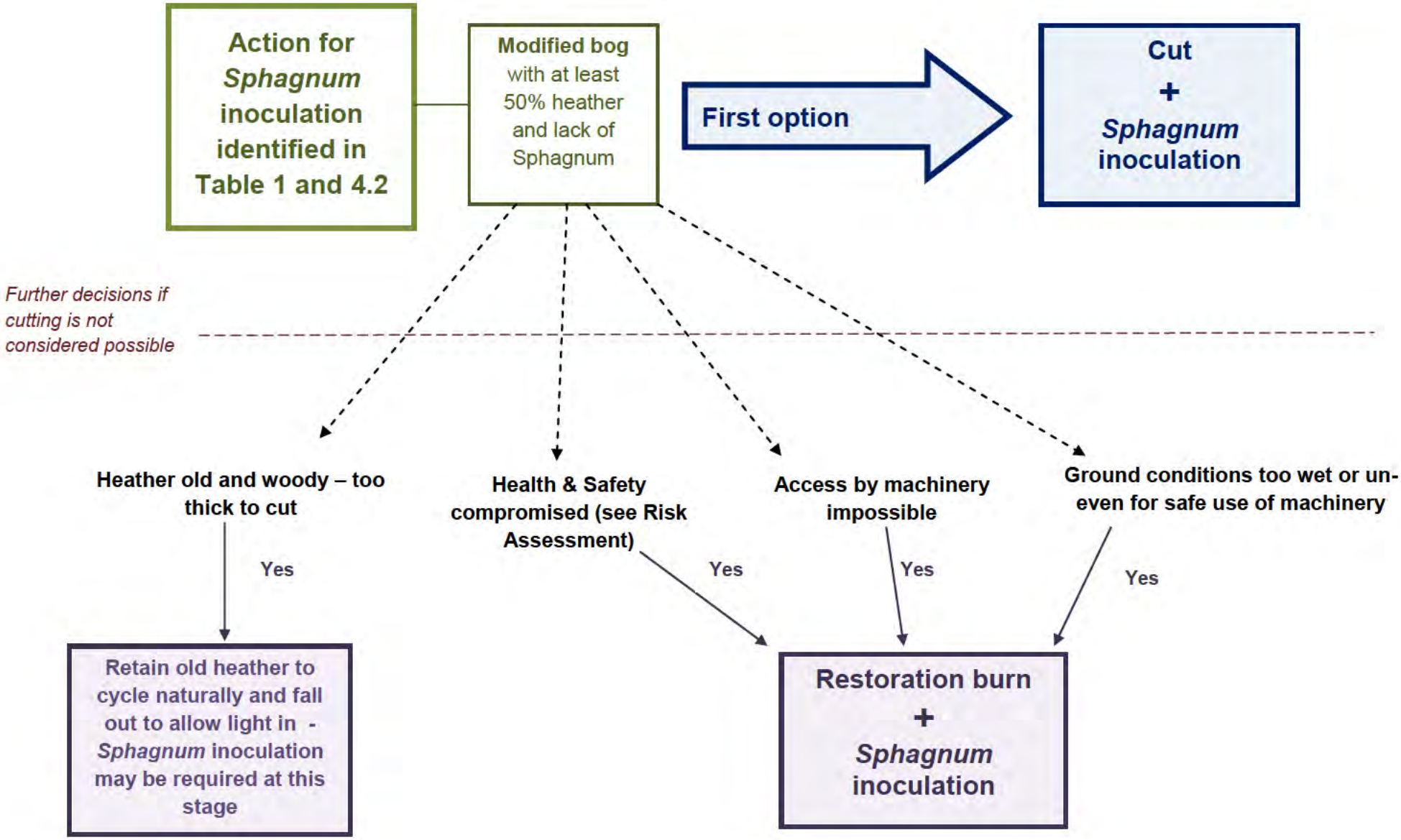
**Blanket bog State 4 – Grass and/or sedge dominated bog Type 2 Molinia abundant**

- *Molinia* abundant, more than 50% cover
- Feather mosses and *Sphagnum* absent/low frequency
- Other blanket bog indicators present
- Water table high

**Interventions**

- Apply selective herbicide to control the *Molinia* e.g. Laser
- Inoculate with *Sphagnum* – see 5.3.

**Figure 1. Management decisions – using an ATV mounted power shredder**



## 5. Heather management and blanket bog restoration principles

### 5.1 Cutting

- Cutting will take place in the areas shown on Map 2 where heather makes up at least 50% of the cover. All cutting will be followed by the application of *Sphagnum* and other species as appropriate.
- Cutting will only be carried out from 15th August to 31st March. Cutting should not be undertaken, in any case, where birds are seen to start nesting.
- In the areas cut at least 10% of heather in the late mature/degenerate stage will be retained across the moor – where possible a patch size at least 30m x 100m will be retained.
- Cutting will not scalp or damage the moss/peat surface. Cuts will be a maximum of 30m wide by 100m in length. If cutting is being used to create a fire break the location, size and management of these will be agreed with Natural England. If long cuts are made, the edges should be wavy to blend in with the landscape and contours.
- Cut material will be flailed/chopped to create a mulch on the surface of the peat.
- No cutting will occur when the ground is saturated, as this can damage the peat surface.
- All sensitive areas will be avoided including wet areas and bogs, which are sensitive to disturbance and important for wildlife.
- A low ground pressure vehicle or a tractor with dual wheels will be used, to reduce compaction and damage to the peat, disturbance to the surface and risk of bogging down. There will be no damage to the peat surface and rocks and no persistent tracks (should not be visible after 12 months).
- The location of all cuts will be recorded using a GPS.
- The Risk Assessment for the use of an ATV mounted power shredder will be available by 1 October 2017.

Each cut area will be inoculated with *Sphagnum* mosses **within one year** of the initial cut. Other blanket bog species e.g. cottongrasses, bilberry, crowberry, cross-leaved heath may be added depending on their occurrence in the vegetation.

### 5.2 Restoration Burning

- Restoration burning will only take place in areas where cutting is not possible (Fig. 1). Heather cover will be at least 50% and heather not less than 30cm/1ft in height**.**
- Restoration burning is a “one-off” operation and all burns will be followed by the application of *Sphagnum* and other species, as appropriate, to achieve the restoration of favourable blanket bog. If further intervention is required in the future to achieve the required outcomes this will be agreed as part of the review process. Evidence collected through the monitoring will be used to inform the

most appropriate follow up intervention (this may include cutting and burning, or any other novel technique) and will be agreed (in writing) with Natural England.

- Burn size will be determined by the nature of the ground i.e. where cutting is not possible. The maximum area of a burn will be no more than 0.15 hectares (30x50m) where there are larger blocks of tall heather on uneven ground. Typically, small burns (30 x 20m) will be done.
- Burning will only be carried out when conditions allow for quick cool burns. A cool burn is one which removes the dwarf-shrub canopy yet leaves behind a proportion of 'stick' and does not cause damage to the moss layer or expose the peat surface. Hotter, slower burns can kill the moss and lichen layer and plants like cowberry and bilberry and if severe it can burn into the peat surface causing erosion and affecting the integrity of the sensitive habitat. Any moss or lichen or litter layer should not be damaged by burning. When conditions do not to allow for this, fires will not be started.
- Burning is only allowed between 1 October and 15 April. Caution should be followed during periods of dry weather and burning should not be undertaken even within this period where bird nesting activity has been noted in proposed burn areas.
- Heather and Grass etc. Burning (England) Regulations 2007 / Defra 'Heather and Grass Burning Code' (2007 version). All burning will follow the Regulations (and any subsequent amendments) and should be in accordance with the Code (and any future revisions thereof) unless otherwise specified within this agreement. The Heather and Grass Burning Code and Regulations can be found on the DEFRA website www.defra.gov.uk. Further guidance, e.g. supplementary detailed guidance notes, will be available on the Natural England website www.naturalengland.org.uk.
- Sufficient personnel and equipment will be available to control burning, for example to extinguish any fires that prove to be too hot or that are in danger of getting out of control. There will be a fogger available during all burning.
- At least 10% of heather in each SSSI unit will be retained in the mature-degenerate stage.
- The agreement holder will inform Natural England as soon as possible and within a week of any accidental burns that do not follow the practices listed above.
- The location of all burns will be recorded using a GPS.

Each burn will be inoculated with *Sphagnum* mosses **within one year** of the burn. Other blanket bog species e.g. cottongrasses, bilberry, crowberry, cross-leaved heath may be added depending on their occurrence in the vegetation.

### 5.3 *Sphagnum* inoculation

Methods for establishing *Sphagnum* are being developed all the time and this section provides information on the currently available and recommended methods. Decisions around which method is most appropriate will depend on the specific situation and site characteristics, resources available and targets for *Sphagnum* establishment. Natural England welcomes the opportunity to discuss which method may be the most appropriate for specific sites. The trialling of new techniques is also welcomed, in agreement with Natural England.

**Site selection**

- Heather dominated sward (at least 50% cover) with infrequent/no *Sphagnum*
- Prioritise areas where the water table is high for a significant part of the year

**Site preparation**

Cutting

- Use cutting as the preferred method to remove the heather canopy and create a finely chopped mulch.
- Allow the brash to "weather" i.e. settle and become wet – this will be weather dependent.

Burning

- Where it is not possible to cut use burning to remove the heather canopy ensuring there is no damage to any existing bryophyte layer or the peat surface.
- Allow the burned surface to weather e.g. if burned in autumn leave over the winter before applying *Sphagnum*.

## *Sphagnum* application methods

### 1. Leca pellets and Sphagnum Gel e.g. BeadaCoat

Leca clay pellets may be impregnated with a range of blanket bog species (heather, cross-leaved heath, cottongrasses) and also fragments of dry *Sphagnum.* They are available from Geoff Eyre.

To deliver sufficient amounts of *Sphagnum* the pellets are used in conjunction with concentrated *Sphagnum* gel e.g.BeadaCoat supplied by Micropropagation Services – see below for more information and species mix.

Application rate of *Sphagnum* pellets: 45kg/ha i.e. 2.5 x 15kg bags/ha

Application rate of BeadaCoat (concentrated *Sphagnum* gel): 3L per 15kg bag of pellets i.e. 7.5L/ha

Spreading methods:

The pellets and Beadacoat are supplied separately and transported to site. The BeadaCoat is supplied with the gel and *Sphagnum* separated in sealed bags. Once on site the gel and *Sphagnum* is mixed e.g. in a bucket by hand/mixing spoon. There are then different options for applying the pellets and BeadaCoat:

a) By hand – mix the combined *Sphagnum* gel (BeadaCoat) with the pellets using 3L of gel to each 15kg bag of pellets. Mix in batches to ensure an even coating of the pellets. Distribute the coated pellets by hand to the relevant areas aiming at about 20 pellets/$m^2$.

b) Using a spinner on a quad bike (or similar). Mix the pellets and combined *Sphagnum* gel in batches into the spinner using a spade/shovel. Apply at the required rate to deliver 20 pellets/$m^2$.

**2. Sphagnum Gel e.g. BeadaGel and BeadaCoat (Micropropagation Services)**

BeadaGel is a gel that contains *Sphagnum* 'plantlets' and is available as a "normal" concentration and as a "concentrated" version called BeadaCoat. Gel needs to be applied within 5 days of being supplied.

Application of **BeadaCoat** (concentrated gel)

- In combination with Leca pellets (see above)

Application of **BeadaGel**

- Backpack application

  The *Sphagnum* BeadaGel is applied using a back pack with a lance that administers 4 x 2mm diameter "blobs". The backpack is a converted sprayer. The recommended rate is 5-10 blobs/$m^2$. Neal at BeadaMoss has 3 kits which may be borrowed.

- The "groove machine"

  This is being developed by MoorLife 2020 in collaboration with Geoff Eyre and the principle is to use a machine to create a groove in brash/moss/peat for the gel to be applied into to increase the probability of *Sphagnum* coming into contact with wetness, and not dessicating.

Rate of application: 30-35L/ha

**Species mix for BeadaGel and BeadaCoat**

Currently the recommended species mix is:

| | ***Sphagnum* species** | **% of mix** |
|---|---|---|
| 1 | S. capillifolium | ~20% |
| 2 | S. cuspidatum | ~5-10% |
| 3 | S. denticulatum | ~1% |
| 4 | S. fallax | ~30% |
| 5 | S. fimbriatum | ~10% |
| 6 | S. magellanicum | ~1%+ |
| 7 | S. palustre | 20-30% |
| 8 | S. papillosum | ~20% |
| 9 | S. squarrosum | ~1% |
| 10 | S. subnitens | ~5-10% |
| 11 | S. tenellum | ~1% |

All species except *S. magellanicum* and S. *tenellum* sourced from the Peak District

### 3. *Sphagnum* beads e.g. BeadaMoss

*Sphagnum* beads (BeadaMoss) have been developed by Mircopropagation Services and contain very small fragments of *Sphagnum* material. Consequently the establishment time is longer than other methods, something that needs to be accounted for in relation to the agreed outcomes and timescales/trajectories.

Application rate for BeadaMoss: 20 beads/$m^2$ - application by hand.

The beads can contain a mix of species as appropriate to the site. The species mix should be agreed with Natural England – this will depend on site conditions.

### 4. *Sphagnum* plugs e.g. BeadaHumok

Plugs of *Sphagnum* containing different species have been developed by Micropropagation Services. The species mix should be agreed with Natural England – this will depend on site conditions.

Application rate for BeadaHumock: 4-5000 plugs/ha

Planting method: Plant by hand by making a small hole e.g. with a dibber, or when wet pushing into the peat, and firming around by foot.

### 5. Translocation of *Sphagnum* hummocks

The methodology of translocation follows the RSPB Dovestone Guide to *Sphagnum* planting and is summarised below:

- Donor sites will be agreed with Natural England prior to works taking place.
- A maximum of 10 handfuls of *Sphagnum* will be taken from a square metre of the donor site within a 2 year period. A handful will be approximately 10 -15 cm of material.
- Harvested *Sphagnum* will be stored in sacks and used within 5 days.
- *Sphagnum* will be introduced into newly cut/burnt areas at an average of 1 handful per 8 $m^2$ with an emphasis on introduction into wetter areas to improve initial success.
- It is estimated that a newly burnt area of 20m x 30m will require 75 handfuls, a burnt area of 40m x 25m will require 125 handfuls and therefore, a burnt area of 3ha will require 3750 handfuls (500 handfuls per acre).
- To plant the *Sphagnum* a handful is made into a pseudo hummock and all the brown dead material underneath the growing top (capitula) is planted into the peat (this applies to all species except *S. cuspidatum* which should be placed on the edges of pools). It is important that the capitula are tightly packed together and the brown material is below the peat surface so that is anchors the new hummock and if the peat dries out in the summer it will wick moisture from under the surface of the peat.

- The hummock is placed in a shallow depression made by either a boot heel or bulb planter and the target diameter of the translocated hummock will be approximately 10cm.
- *Sphagnum* should be planted into a habitat that closely resembles the original habitat:
    - Flush species harvested from flush areas should be replanted into very wet places e.g. behind gully blocks, in *Sphagnum*-free vegetated gullies and into seepage lines.
    - Hummock and other “drier” *Sphagnum* species should be planted into wet vegetated peat pans and wet intact but species poor blanket bog.

### 5.4 Wildfire risk management

The moorland at Crag is surrounded by roads, the A54 is particularly busy and the Thatchmarsh road is very popular starting point for walkers. It is proposed that a detailed Wildfire Risk Management Plan is developed by 1 October 2017, and incorporated into the agreement once agreed by all parties.

# 6. Shooting butts, track and fencing

## 6.1 Shooting butts

Four lines of shooting butts are proposed – Axe Edge, Pump House, Cutthorn Common and Wood Moss, of which the first two are within the Leek Moors SSSI and the other two lie outside the SSSI. The Axe Edge butts are a re-location of an existing line to address safety issues, they are located very close to the Thatchmarsh Road and are currently poorly aligned with the road. Please refer to Map 3.

Axe Edge (SSSI)

The existing butts are to be moved forward, further onto the moor and away from the Thatchmarsh road. The traditional stone-turf butts will be dismantled and reconstructed in the new positions. The most northerly butt will remain in position with eight being re-located. The following specification will be followed:

- The new butts will be similar in size and design to the existing ones, approximately 6ft x 6ft (1.8m x1.8m) and either i) partially sunken on sloping ground (approximately 2ft/0.6m in depth at forward face), or ii) slightly raised on flat ground.
- All work will be done by hand with materials and equipment transported using an argocat.

- 8 butts will be relocated, with approximately 45 yards spacings between them.
- The existing butts will be dismantled and the stone re-used in the new butts. The turves will be used to restore the footprint of the old butt. Any drainage pipes/channels will be removed or blocked.
- For the new butts the turves covering the footprint of the butt will be removed and set aside to be used to turf the outside of the butt that sits above ground level.
- All construction works will be done between 15 July 2018 and 1 April 2019 providing there are no nesting birds in the locations of the works.

**i) Specification for semi sunken butts on sloping ground:**

- Semi sunken butts to be used for butts 1,5,6,7 and 8. In addition to the generic specification above, this type of butt will have an impermeable membrane inserted along the front face of the butt, where the cut is made, to retain water in the peat.
- Any drainage that is utilised will not be directed into gulleys or drainage channels but into adjacent hollows/low lying ground. Any drainage pipes, where used, will be as short as possible and will have drainage holes throughout to allow seepage of water into the peat. Drainage pipeswill be installed at a maximum depth of approximately 1ft. The direction of flow of water from the drainage pipes will be thoroughly considered, to avoid any sensitive areas, prior to installation.
- The base of the butt will be covered with permeable Terram, covered with approximately 2-3 inches of aggregate and topped with dark gravel.

**ii) Specification for butts on flat ground:**

- Slightly raised butts will be used for butts 2,3,4. In addition to the generic specification above, this type of butt will take off the top layer of tussocky vegetation, lay a permeable Terram layer covered with 4-6 inches of aggregate to give a firm base, topped with dark gravel.
- No drainage will be required as the floor of the butt will be above the water table.

<u>Pump House (SSSI)</u>

A new line of 9 butts is proposed, as shown on Map 3. The following specification will be followed:

- The butts will comprise wooden hurdles with a flag stone base. The dimensions will be approximately 6ft x 6ft (1.8m x1.8m) x 3ft 6 inches (1.05m) across the base.
- All work will be done by hand with materials and equipment transported using an argocat.
- There will be no disturbance or cutting into the peat. The butts will be located on *Molinia* dominated vegetation wherever possible.

- There will not be any drainage installed.
- Butts will be spaced approximately 45 yards apart.
- All construction works will be done between 15 July 2017 and 1 April 2019 providing there are no nesting birds in the locations of the works.

Cutthorn Common (non-SSSI)

A new line of 9 butts is proposed, as shown on Map 3. The Pump House specification will be followed with construction planned between 15 July 2019 and 1 April 2020.

Woodmoss (non-SSSI)

A new line of 9 butts is proposed, as shown on Map 3. The Pump House specification will be followed with construction planned between 15 July 2020 and 1 April 2021.

**6.2 Track**

Map 3 shows a track on the western edge of Cutthorn Common that has been used for several years by the Estate keepers in argocats and 4x4 vehicles. Much of the lower section of the track has a stone surface while the upper sections are not stoned. The total length of the track is approximately 710m. The track lies outside the SSSI and therefore consent under the Wildlife and Countryside Act 1981 (as amended) is not required for the following works:

Top section

Top section

Middle section

Bottom section near A54

- Repair and maintain the track to provide access onto Cutthorn Common.
- Install drainage channels/run-offs at approximately 50m intervals.
- Insert stone (gritstone) into the wheel ruts only (no increase to the height of the track surface i.e. the surface vegetation in the middle of the track will remain unsurfaced).
- Access the site from the A54 using an argocat to transport materials.
- Undertake the work between 15 July 2017 and 1 April 2018.

### 6.3 Fencing

Repairs to existing fences, and some new fences are needed to facilitate the restoration works by excluding sheep. Map 4 shows fencing (sheep netting and two strands of barbed wire) to be completed by 15 June 2017. There are additional fencing and walling works to ensure boundaries are stock proof and these will be completed by 1 September 2017.

### 6.4 Consent and other permissions

The butt and fencing works that are located within the Leek Moors SSSI are consented under the Wildlife & Countryside Act 1981 (as amended) in this agreement.

There are additional works specified that are located outside the SSSI.

It is the responsibility of the landowner to ensure that all other relevant permissions are obtained where necessary e.g. planning permission for track and butt works. This applies to works both within and outside the SSSI.

## 7. Sensitive areas

Heather management and other restoration interventions and works are not appropriate in sensitive areas as listed below:

- Flushes and mires including areas around springs, pools, wet hollows and those rich in bog mosses with abundant and or almost continuous cover of *Sphagnum* species, other mosses, liverworts and or lichens. Such areas contain species which are sensitive to cutting or burning and often occur only at a small scale.

- Haggs, erosion gullies, areas of bare peat.

- Areas with a noticeably uneven structure, at the spatial scale one metre square or less. In heathland this unevenness is most commonly found in very old heather stands, often comprising large and spreading dwarf shrub bushes. The dwarf shrub canopy will not be completely continuous and some of its upper surface may be twice as high as other parts. In blanket bog unevenness can also be characterised by *Sphagnum* hummocks, lawns and hollows or mixtures of well-developed cotton-grass tussocks and spreading bushes of dwarf shrubs.

- Areas where soils are less than 5 centimetres deep or ground made up of scree or where there is high incidence of exposed rock.

- There should be no cutting or burning within 10m either side of a watercourse, from the edge of the watercourse to protect:
    - well developed bankside structure/cover;
    - from bankside erosion;
    - watercourses, including active grips, that have a significant hydrological function taking water off the moor.

NB Cutting or burning up to the edge of these watercourses may significantly increase the runoff and securing a buffer of unburnt ground immediately around these watercourses should reduce the impact of runoff.

- Steep slopes and gullies greater than 1 in 3 on blanket bog and 1 in 2 on dry heath.
- Areas in which rare species occur.
- Features listed on the Historic Environment Record.

## 8. Trajectories and Monitoring

A trajectory for each blanket bog state will be established – this work is ongoing and this agreement will be updated as appropriate. The trajectory sets out the steps towards favourable, functioning blanket bog – the end point is the same whatever the starting state is, but the steps will be different. Milestones will be established e.g 5, 10, 20 years.

Monitoring is needed to ensure that the restoration works are successful and in line with the relevant trajectory. The results of monitoring will identify any further management requirements or amendments. Both the Estate and Natural England will have responsibilities for the monitoring, the results of which will inform the annual review (See Section 8.3). Methods for monitoring areas that are subject to cutting, restoration burning and *Sphagnum* inoculation (and any other interventions) are still being developed. This section of the agreement will be updated as methods become established.

**What the Estate will do**

- Mark all burns/cuts on blanket bog with a handheld GPS; record whether it was for restoration or firebreak and record which restoration technique was carried out in each i.e cutting or restoration burn.
- Record the restoration work done to all areas managed using cutting or burning ( i.e *Sphagnum* inoculation - type and rate of application)
- Record observations regarding the relevant attributes (see below) in 10% of cuts and burns each year – the method for this will be discussed and agreed with Natural England. Monitoring attributes:
    i) cover of *Sphagnum* moss
    ii) cover of heather
    iii) cover of other species
- Revise the monitoring programme in line with future developments, following discussions with Natural England.

**What Natural England will do**

- Implement water table monitoring on the blanket in association with restoration works.
- Undertake comparative monitoring of at least 10% of cuts and burns each year (in addition to those done by the estate) to assess changes in:
    i) cover of *Sphagnum* moss
    ii) cover of heather
    iii) cover of cottongrasses
    iv) cover of other dwarf shrub species
    v) cover of feather mosses
    vi) number of blanket bog species present

### What both parties will do

- Monitor progress of the management agreement using appropriate counts of birds, including grouse, and collecting other data from partners on short-eared owl and other notified breeding bird species counts.
- A set of base readings should be taken as soon as possible (within a year of the cut/burn and *Sphagnum* inoculation) to establish a start point from which to measure future progress and then annually from that date.

### Preliminary trajectories and milestones

This section suggests trajectories and milestones for blanket bog states 4 and 5 to provide an idea of what is meant by the terms, and what we are aiming for. Work is ongoing and the agreement will be updated when this becomes available.

**State 4 Grass and/or sedge dominated bog**

| **Attribute** | **Current condition** | **Milestone 1 (5 years)** | **Milestone 2 (10 years)** | **Milestone 3 (favourable - timescale unknown)** |
|---|---|---|---|---|
| 1. High water table | Yes | Maintain water table within 5-10 cms for 95% of the year | Maintain water table within 5-10 cms for 95% of the year | Maintain water table within 5-10 cms for 95% of the year |
| 2. No/very little bare peat | Yes | No bare peat | No bare peat | No bare peat |
| 3. *Sphagnum* present | Very little < 5% | 50% cover with a range of wet and dry loving species developing e.g. * *S.fallax, S.capillifolium, S.cuspidatum, S.papillosum, S.palustre, S.subnitens* | At least 90% cover made up of a range of wet and dry loving species * | At least 90% across the blanket bog area made up of a range of wet and dry loving species * |
| 4. Range of blanket bog species | Typically 0-2 species (heather and bilberry) present but very infrequent | At least 3 species (heather, bilberry and *Sphagnum*) making up 30% of cover | At least 4 species (heather, bilberry, hare's-tail cottongrass and *Sphagnum*) making up at least 75% of cover (heather not exceeding approximately40% cover) | At least 6 species distributed across the blanket bog (heather not exceeding approximately 40%of cover) |
| 5. *Molinia* dominance | 75%-100% of cover | Cover of *Molinia* less than 75% | Cover of *Molinia* less than 30% | Cover of *Molinia* less than 5% |
| 6. Lack of bryophyte layer | *Sphagnum* and feather mosses rare | See 3 above for *Sphagnum*<br>Feather mosses frequent | See 3 above for *Sphagnum*<br>Feather mosses frequent | See 3 above for *Sphagnum*<br>Feather mosses frequent |

**State 5 Modified bog**

| Attributes | Current condition | Milestone 1 (5 years) | Milestone 2 (10 years) | Milestone 3 (favouarable - timescale unknown) |
|---|---|---|---|---|
| 1. High water table | Variable | Restore and maintain water table within 5-10 cms for 95% of the year | Maintain water table within 5-10 cms for 95% of the year | Maintain water table within 5-10 cms for 95% of the year |
| 2. No/very little bare peat | Small localised areas | Establish *Sphagnum* and other blanket bog species in bare peat | Bare peat rare | No bare peat |
| 3. *Sphagnum* present | Very little < 5% | 50% cover in cuts and burns with a range of wet and dry loving species developing e.g. * *S.fallax, S.capillifolium, S.cuspidatum, S.papillosum, S.palustre, S.subnitens* | At least 90% cover in cuts and burns made up of wet and dry loving species * and evidence of spreading to wider areas | At least 90% across the blanket bog area made up of wet and dry loving species * |
| 4. Feather mosses present | Frequent | Maintain in balance with *Sphagnum* | Maintain in balance with *Sphagnum* | Maintain in balance with *Sphagnum* |
| 5. Range of blanket bog species | Typically 3-6 species (heather, hare's-tail cottongrass, common cottongrass, bilberry, crowberry, *Sphagnum*, feather moss) present | At least 5 species present in at least 50% of the area. Heather not exceeding 60% across the area. | At least 6 species present in least 75% of cover. Heather not exceeding 50% across the area. | At least 6 species distributed across the whole blanket bog area. Heather not exceeding approximately 40% of cover. |
| 6. Heather dominance | 75%-100% of cover | Cover of heather less than 60% | Cover of heather less than approximately 50% | Cover of heather less than approximately 40% |

## 9. Terms and Conditions

### 1. Management of the Land

1.1 The Land Owner must obtain any necessary consents and/or permissions needed in order for his obligations to be carried out under the Agreement, and ensure that such consents and/or permissions are maintained and complied with as necessary; and

1.2 Natural England and the Land Owner agree to collaborate with each other for the benefit of the Land, and provide each other with regular information and communication on all aspects of the management of the Land.

1.3 For the avoidance of doubt, no funding is being provided under the terms of this Agreement, for any of the works described in it.

### 2. Disposals

If you want to make a Disposal you must notify Natural England in writing as soon as possible, and at least one month before the proposed Disposal is to take place, giving full details of the proposed Disposal

### 3. Management Reviews

3.1 The Land Owner and Natural England must consult each other regularly about the management of the Land and will have an annual review meeting.

3.2 At any meeting, the Land Owner and Natural England must:

3.2.1 Review this Agreement and its operation;

3.2.2 consider the future management of the Land;

3.2.3 consider whether, in the light of the proposed future management of the Land, the Shared Outcomes could more appropriately and/or effectively be achieved, without them being compromised in any way, by the continuation of this Agreement and or any modification of it

3.3 If either the Land Owner or Natural England considers it is no longer possible or desirable to achieve the Shared Outcomes, and subject to clause 4.3.2, both parties will use their best endeavours to agree modifications of the Agreement, as appropriate.

### 4. Events of Default and Termination of the Agreement

4.1 The Agreement shall terminate immediately on disposal of the land by the Land Owner

4.2 If there is an event of default as described in clause 4.3, either party may end the Agreement early by giving written notice. Such notice shall state the date that the Agreement will end, which may be immediate.

4.3 An ‘event of default’ occurs for the purposes of clause 4.2 in any of the following circumstances:

4.3.1 if either party is in breach of any of its obligations under the Agreement. If the breach can be put right, each party will allow the other a reasonable time to do so before ending the Agreement, but if it cannot be put right either party may end the Agreement immediately;

4.3.2 if, in either party's opinion, it proves impossible, impractical or undesirable to achieve the Shared Outcomes;

**5 Land Owner's Confirmations**

5.1 By signing this Agreement, the Land Owner confirms to Natural England that it has full power to enter into the Agreement on the terms set out in it and without needing to obtain anyone else's consent.

5.2 The Land Owner further confirms that it has taken and will continue to take all necessary steps to ensure that all persons who have any right of management control in relation to the Land and/or any rights (including rights of access) to the Land and/or any interest in the Land will not breach the provisions of the Agreement over the entire period of the Agreement.

**6. Information**

6.1 The Land Owner consents to the disclosure by Natural England to the public of any information about the Agreement to the extent necessary to enable Natural England to comply with its statutory obligations under the Freedom of Information Act 2000 and/or the Environmental Information Regulations 2004. Details disclosed on request or proactively on the internet or in publications may include, but are not limited to, applications, agreements, your name and address, the name and address of your farm or business, grid references, the location of parcels, details of the environmental features and details of inspections and/or monitoring.

**7. Disputes**

7.1 The Land Owner and Natural England commit to resolving any disputes or differences between them in relation to the Agreement or the ending of the Agreement by amicable means.

7.2 Any dispute that cannot be resolved in the manner described in paragraph 7.1 shall be referred to and determined by an independent solicitor or barrister of at least ten years standing acting as an expert and who is experienced in drafting, negotiating and advising upon agreements similar to this agreement, such independent person to be agreed between the Parties or failing such agreement to be nominated by the President or Vice-President or other duly qualified officer of the Law Society on the application of either party.

**8. Meaning of certain words**

8.1 'the Land' means the whole or any part of the land included in Higher Level Stewardship Agreements AG00420378, AG00358832 and AG00443075 (including all buildings, fixtures and fittings on the Land and all water on or covering the Land, whether now or at any time after the date of the Agreement);

8.2 'Disposal' means the disposal of the Land by way of sale, exchange or lease, or by way of the creation of any easement, right or privilege, or by giving someone other than you the right to use the Land, or in any other way, except by way of mortgage or charge; However, 'Disposal' excludes any arrangement by which you retain the possession and/or control of the Land or by which the Land remains at your disposal: for example, most contract farming agreements and seasonal grazing and mowing licenses will not amount to a 'Disposal';

8.3 ‘**Map**’ means the map or maps attached to the Agreement

**9. Interpretation**

9.1 In the Agreement:

9.1.1 the headings are used for guidance only;

9.1.2 words suggesting the singular include the plural and vice versa;

9.1.3 words suggesting any gender include both other genders;

9.1.4 save where stated to the contrary, any reference to the Agreement or to any other document includes any permitted variation, amendment or supplement to such document;

9.1.5 words preceding ‘include’, ‘includes’, ‘including’ and ‘included’ shall be construed without limitation by the words which follow those words;

9.1.6 any reference to any enactment, order, regulation or other similar instrument shall be construed as a reference to the enactment, order, regulation or instrument as amended, replaced, consolidated or re-enacted; and

9.1.7 a reference to a person includes firms, partnerships and corporations and their successors and permitted assignees or transferees.

9.2 It is not intended that any third party should have the right to enforce a provision of the Agreement by virtue of the Contracts (Rights of Third Parties) Act 1999.

9.3 The Agreement shall be governed by and construed in all respects in accordance with the laws of England and Wales. Subject to clause 7 (Disputes), the English courts have exclusive jurisdiction to settle any disputes which may arise out of or in connection with the Agreement.

9.4 Except where expressly provided in the Agreement, the Agreement constitutes the entire agreement between the parties in connection with its subject matter and supersedes all prior representations, communications, negotiations and understandings concerning the subject matter of the Agreement.

Signed as a deed by [redacted]

[redacted]

[SIGNATURE OF WITNESS]

NAME OF WITNESS: [redacted]

ADDRESS OF WITNESS: [redacted]

OCCUPATION OF WITNESS: [redacted]

EXECUTED as a Deed by )

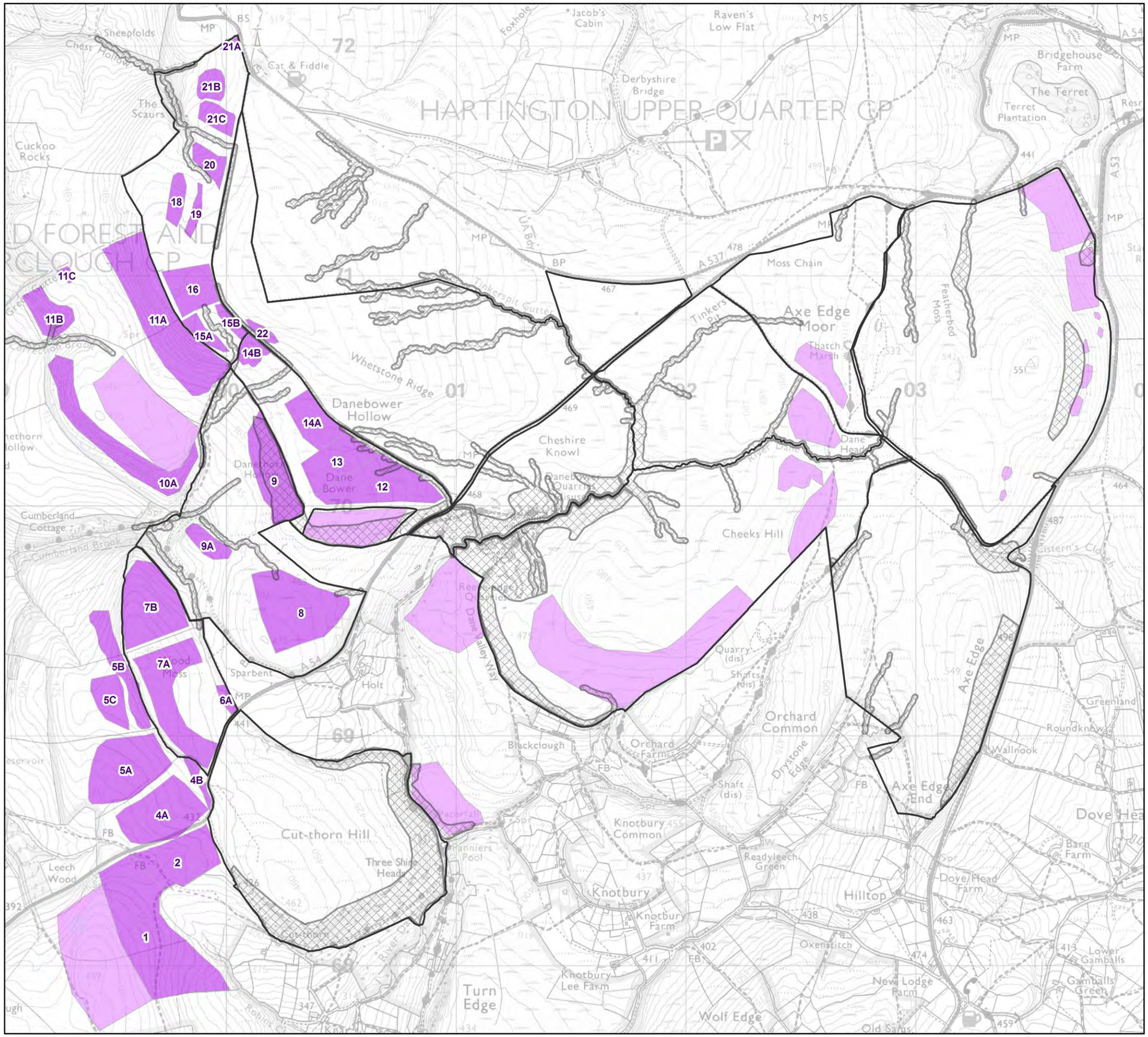
affixing the Common Seal of )

**NATURAL ENGLAND** )

in the presence of )


[redacted]

Authorised Signatory




NATURAL ENGLAND

**Map 1**
**Crag Estate Moorland Plan**
**2017-2023 - Site specific interventions**

**Legend**

- Crag Estate SSSI units
- Sensitive areas
- Blanket bog regeneration proposed
- Past blanket bog regeneration works

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NATURAL ENGLAND

**Map 2**
**Crag Estate Moorland Plan**
**2017-2023 - Longer term management**

**Legend**

- Crag Estate SSSI units
- Sensitive areas

Restoration

Action

- Cut only + Sphagnum (State 5)
- Cut/burn + Sphagnum (State 5)
- Cut/burn + Sphagnum and cross-leaved heath (State 5)
- Cut/burn or Laser + Sphagnum (State 4 & 5)
- Glyphosate, burn + Sphagnum (State 4)
- Laser + Sphagnum (State 4)
- Laser/glyphosate, burn + Sphagnum (State 4)
- 3 small trial burns (State 6)

Blanket bog states:
State 4 - Grass and/or sedge dominated bog
State 5 - Modified bog
State 6 - Active hummock/hollow/ridge bog

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**Map 3**
**Crag Estate Moorland Plan**
**2017-2023 - Shooting butts and track**

Pump House

Axe Edge

Wood Moss

Cutthorn Common

**Legend**

- Shooting butts *(see Section 6.1)*
- Track *(see Section 6.2)*
- Crag Estate SSSI units
- Sensitive areas

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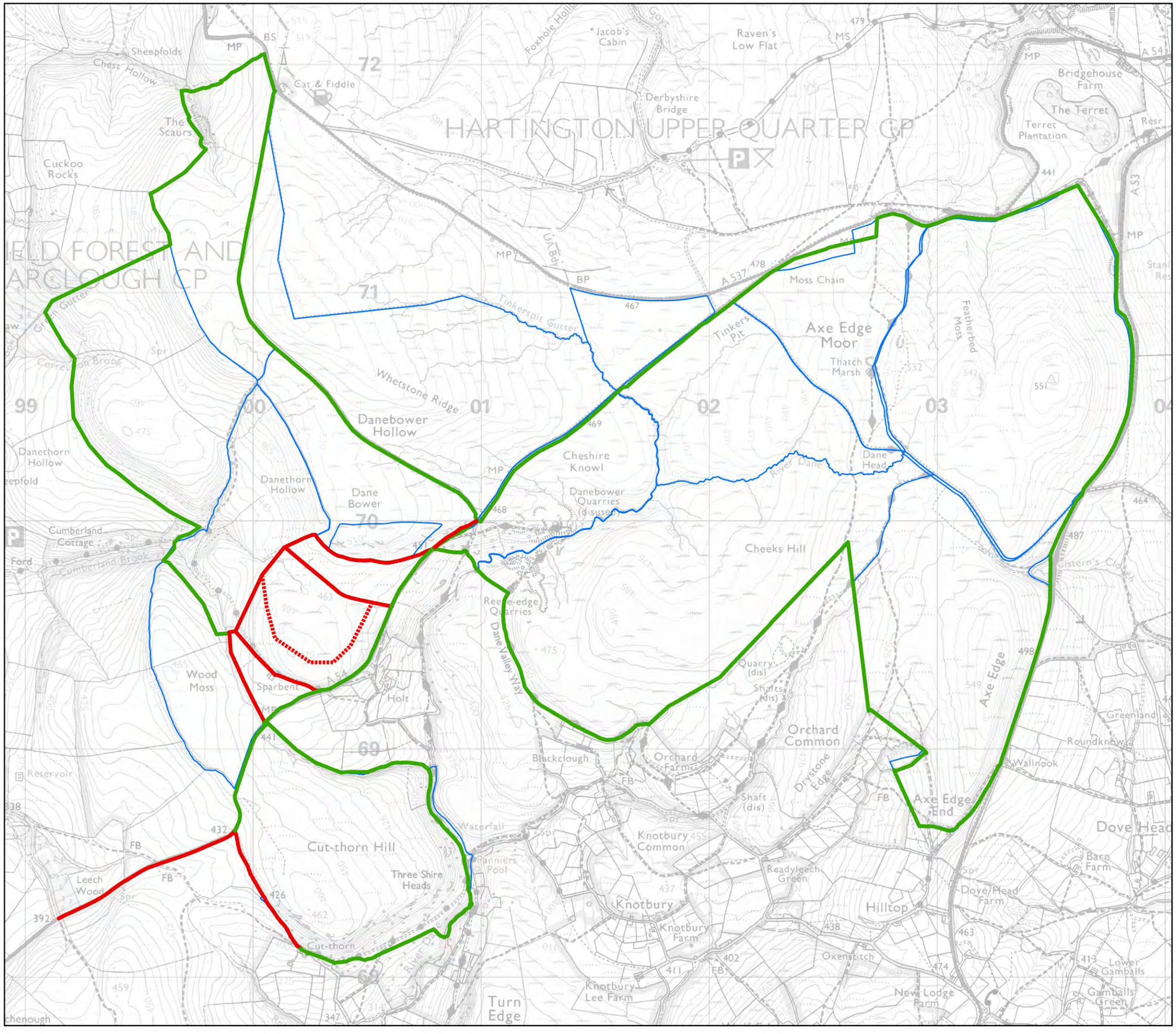


**Map 4**
**Crag Estate Moorland Plan**
**2017-2023 - Boundary works**

**Legend**

**Completion date**

- 1 Sept 2017
- 15 June 2017
- Ensure stockproof
- Crag Estate SSSI units

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