Firville Bog (SAC 000647), Co. Tipperary

Executive Summary

This survey, carried out in September 2011, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Firville Bog. Vegetation was described and mapped based on raised bog ecotope vegetation community complexes (Kelly and Schouten, 2002). The following Annex I habitats occur: Active Raised Bog, Degraded Raised Bog and Depressions on peat substrates of the Rhynchosporion.

Active Raised Bog covers 16.75ha (9.12%) of the high bog area. The highest quality example of Active Raised Bog consists of *Sphagnum* lawns, pools, hummocks and hollows. *Sphagnum* cover is >90% and is complete (100%) in certain locations.

Degraded Raised Bog covers 166.93ha (90.88%) of the high bog area. It is drier than Active Raised Bog and supports a lower density of *Sphagnum* mosses. It has a less developed micro-topography while permanent pools and *Sphagnum* lawns are generally absent. There are also four small inactive dry flushes on Firville Bog that are mostly dominated by *Betula pubescens*.

Depressions on peat substrates of the Rhynchosporion are found in both Active and Degraded Raised Bog, but tended to be best developed and most stable in the wettest areas of Active Raised Bog.

Restoration works took place at the site including blocking of some cutover drains between 1994 and 2005.

The current conservation objective for Firville Bog is to restore the area of Active Raised Bog to the area present when the Habitats Directive came into force in 1994. In the case of Active Raised Bog, the objective also includes the restoration of all of the sub-marginal ecotope present at the time as this represents the area of Degraded Raised Bog most technically

feasible to restore. The Area objective for Active Raised Bog is 136.86ha. The objective in relation to Structure and Functions (S&Fs) is that at least half of the Active Raised Bog area should be made up of the central ecotope and active flush (i.e. the wetter vegetation communities). These values have been set as Favourable Reference Values or FRVs until more site specific values can be set based on hydrological and topographical studies. The objective for Degraded Raised Bog is for the sub-marginal area to be restored to active peat forming communities as stated above and that no loss or degradation of any kind occurs. Although FRVs could not be established for the Rhynchosporion depressions, the objectives are to increase its extent and to improve its quality to values associated with a favourable conservation status of Active Raised Bog. Therefore, the habitat's objectives are indirectly associated with Active Raised Bog objectives.

The Area and quality of Active Raised Bog has remained unchanged at Firville Bog in the 2005 to 2011 period. Although several new peat forming areas have been described at the site, these are likely to be the result of more comprehensive field mapping rather than actual changes.

There are still nearly 2km of drains on the high bog that are considered to be reduced functional, even though these have continued to infill in the 2005-2011 period. Cutover drainage also continues to negatively impact on Active Raised Bog at the site, and drainage maintenance, associated with agricultural improvements was evident from the 2010 aerial photograph. Peat cutting no longer takes place at the site, but open facebanks may still be draining the high bog. A few scattered *Pinus sylvestris* trees remain on the high bog but these do not appear to pose a major threat to the high bog habitats. A recent (2008) fire damaged 7.6% (14ha) of the high bog.

Active Raised Bog has been given an overall **Unfavourable Bad-Stable** conservation status assessment as habitat Area and quality have remained the same in the reporting period with present values below the favourable reference values. Future Prospects are considered Unfavourable Bad-Stable as cutover drainage continues to hinder the restoration of peat forming communities.

Degraded Raised Bog has been given an overall **Unfavourable Bad-Stable** assessment as habitat Area and quality have remained the same in the reporting period with present values below the FRV's. Future Prospects are considered Unfavourable Bad -Stable.

Rhynchosporion depressions have been given an overall **Unfavourable Bad-Stable** conservation status assessment as habitat Area and quality have remained the same in the reporting period.

The **overall raised bog** at **Firville SAC** (part of Kilcarren and Firville SAC) has been given an **Unfavourable Bad-Stable** assessment**.**

A series of **recommendations** have been also given, these include: further hydrological and topographical studies to ascertain more accurate FRVs; further botanical surveys on the high bog and cutover to assess the efficiency of restoration works and an impact assessment of maintenance works on adjacent land drainage with a view to the potential of blocking these drains.

Site identification

SAC Site Code	000647	6" Sheet:	TY: 04 & 07
Grid Reference:	E 195000 / N 201100	1:50,000 Sheet:	53
High Bog area (ha)[1]:	183.68ha		
Dates of Visit:	23, 27, 28/09/11		
Townlands:	Kilgask, Lisduff and Ballyhaugh.		

Site location

Firville Bog is located approximately in N. Tipperary 13km SW of Birr, Co. Offaly on the east side of the Birr to Borrisokane road. The R438 road linking Birr and Borrisokane separates it from Kilcarren Bog (part of the same SAC). These two bogs are two of a group located at the mid-south of the main distribution of raised bogs in Ireland. Ballyduff and Clonfinane Bogs (both SAC 641) lie 5km to the ENE of the site and Arraghmore Bog (NHA 640) lies 1km to the east.

Description of the survey

The survey was carried out in September 2011 and involved a vegetation survey of the high bog at Firville Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2005 by Fernandez *et al*. (2005). High bog vegetation was described and mapped, based on raised bog ecotope vegetation community complexes developed by Kelly *et al*. (1995). Detailed notes were taken on each community complex and any flushed areas that were present. These included: species lists; estimation of % cover of dominant species; percentage *Sphagnum* cover; evidence of damage (due to burning, peat cutting or drainage); micro-topography; ground firmness; and presence of *Cladonia* species. A list of photographical records is given in Appendix II. The survey aimed to assess the conservation status of Habitats Directive (Council Directive 92/43/EEC) Annex I habitats on the high bog.

1 This figure is slightly smaller than the one given in 2005, as a result of improvement on mapping accuracy; based on 2010 aerial photography.

The entire high bog of Firville Bog was re re-surveyed. Sections mapped as sub-marginal, sub-central and central ecotope in 2005 were surveyed in more detail. These are the areas where changes were likely to have occurred. Quadrats, which describe the micro-topographical features and indicator species, recorded in the 2004/05 project (Fernandez *et al*. 2005) were re-surveyed and additional quadrats were recorded where necessary (see Appendix III). The size of quadrats was 4m x 4m.

The 2011 survey did not look at cutover. The survey of cutover would require a new methodology which would include assessments of cutover and lagg zone vegetation, particularly to this site as restoration took place on cutover areas and improvements within these sections are expected.

A GeoExplorer handheld GPS minicomputer (Trimble GeoXT) was used in the field to record quadrats, ecotope boundaries, location of vegetation complexes and other points of interest. The GPS positions of these features were logged and stored on Terrasync software (Trimble). Additional comments were stored as text fields in the device. Post processing of data was carried out, based on the Active GPS Network from Ordnance Survey Ireland, to obtain sub-metre accuracy of the data.

A digital vector format ecotope vegetation map was produced based on the spatial data collected during the survey using ArcGIS 9.3 and 2010 aerial photography. The Irish National Grid was used as the co-ordinate reference system. Vegetation complex and ecotope maps are given in Appendix IV.

Description of the high bog

Firville Bog has been classified as a Midlands Raised Bog (Cross, 1990) and geomorphically as a Ridge Basin Bog (Kelly *et al*. (1995). The high bog is elongated in an east/west direction and separated from Kilcarren Bog by a road. Most peat cutting was carried out in the past along the northern and southern margins of the high bog close to this road. Of particular hydrological note is the presence of infiltration zones along the margins of the site with part of the northern edge grading naturally into the adjoining mineral soil (Kelly *et al*., 1995).

Ecological information

Raised Bog Annex I (Habitats Directive (92/43/EEC)) habitats

The following Raised Bog EU Annex I habitats, are found in Firville Bog:

- Active Raised Bog (EU code 7110),
- Degraded Raised Bog (EU code 7120) and
- Depressions on peat substrates of the Rhynchosporion (EU code 7150).

Active Raised Bog (7110)

The current area of Active Raised Bog at Firville Bog is 16.75 ha (9.12% of the high bog), which is a decrease of 15.5ha since 1994.

Active Raised Bog includes central and sub-central ecotope.

Central ecotope was found in Firville Bog at four locations (**C1** to **C4**) and sub-central ecotope at twenty locations (**Sc1** to **Sc20**) (see Appendix IV, Map 1). The highest quality Active Raised Bog in Firville Bog consists of central ecotope, in particular, vegetation community complex 14, found in the east of **C1**. This is located in a depressed area featuring high hummocks, lawns and interconnecting pools. *Sphagnum* cover is >90% and is complete (100% cover) in places. *Sphagnum cuspidatum* (75-90%) dominates along with *S. magellanicum*, *S. papillosum* and *S. capillifolium* subsp. *rubellum*. Other species recorded include *Drosera anglica*, *Menyanthes trifoliata* and *Aulacomnium palustre*. The most widespread central ecotope present at Firville Bog is vegetation community complex 15 (dominates **C1**, **C2**, **C3** and **C4**. This is similar to complex 14, but there are fewer pools (34-50% compared to 51-75% cover). Most of the central ecotope, however, is confined to areas where subsidence has occurred in association with an old drainage network, **C4**, being the only area where central ecotope is found away from the drainage network.

Complex 9/7 + P is the most widespread complex within sub-central ecotope and consists of high hummocks, hollows and pools. The pools cover is 11-25% and the overall *Sphagnum* cover is 34-50% (51-75% in places) dominated by *S. cuspidatum*, *S. magellanicum*, *S. papillosum* and *S. capillifolium* subsp. *rubellum*. Sub-central ecotope becomes wetter near central ecotope and the wettest and finest quality sub-central ecotope areas feature a higher content of *Eriophorum vaginatum* and *E. angustifolium* (complexes 9/10 and 9a/10); *Sphagnum* cover varies from 50 to 75% in these complexes, where pools are very occasionally found.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Firville Bog is 166.93ha (90.88% of the high bog).

Degraded Raised Bog includes the sub-marginal, marginal and face bank ecotope, as well as inactive flushes. Although some areas of Degraded Raised Bog have a relatively well-developed raised bog flora, they are affected by water loss to varying degrees, and are usually devoid of permanent pools.

The sub-marginal ecotope features the most developed micro-topography within Degraded Raised Bog, with a higher presence of hummocks and hollows (frequently dominated by *Narthecium ossifragum* and only occasionally *Sphagnum cuspidatum* and *S. tenellum*). *Sphagnum* covers up to 40% of the ground and mostly consists of *S. capillifolium* subsp. *rubellum*. *S. papillosum*, *S. magellanicum*, *S. tenellum, S. subnitens* and *S. cuspidatum* are also present. Very occasionally *S. austinii* and *S. fuscum* hummocks are found. *Calluna vulgaris*, *Erica tetralix, Eriophorum vaginatum, E. angustifolium, Rhynchospora alb,* and *Trichophorum germanicum* are also common at various degrees of coverage across the high bog.

Marginal ecotope is slightly drier than sub-marginal ecotope and mainly occurs as a narrow band near the margins of the high bog. Micro-topography consists of *Calluna vulgaris* hummocks, low *Sphagnum* hummocks, flats and very occasionally hollows. The *Sphagnum* cover is even lower here than in the sub-marginal ecotope (<10%) and the vegetation is characterised by higher cover of *Narthecium ossifragum*, *Carex panicea*, *Trichophorum germanicum* and *C. vulgaris*.

Face bank ecotope is characterised by firm ground, tall *Calluna vulgaris*, poor *Sphagnum* cover and flat micro-topography.

There are also four small inactive flushes on Firville Bog. Three of these are dominated by *Betula pubescens* while the fourth is dominated by *Pinus sylvestris*. The overall Sphagnum cover in these flushes ranges from 11-33%.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Firville Bog. It is found in both Active and Degraded Raised Bog, but tends to be best developed and most stable in the wettest areas of Active Raised Bog. In these areas, the Rhynchosporion vegetation occurs along pool edges and on lawns underlain by deep, wet and quaking peat. Typical plant species include *Rhynchospora alba*, *Sphagnum cuspidatum, S. magellanicum, S. papillosum*, *Drosera anglica* and *Eriophorum angustifolium*.

R. alba was also found within degraded raised bog, but always associated with wet features such as hollows.

Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2011 survey of Firville Bog is given in Appendix I. Vegetation is divided into a number of community complexes, which are listed and described based on the dominant species. These community complexes are grouped into ecotope types. The distribution of the ecotopes is shown on the ecotope map (Appendix IV, Map 1). The community complexes are shown on the community complex map (Appendix IV, Map 2) and the quadrat details are given in Appendix III and their location in Appendix IV (Map 1).

Impacting activities

Table 6.1 below provides a list of activities impacting high bog vegetation at Firville Bog, according to their occurrence on the high bog or adjacent to the high bog; area or length affected, and whether they influence negatively (i.e. drainage, peat extraction) or positively (i.e. restoration works; see section 7).

Table 6.1 Impacting activities

Code	Activity	Ranking	Influence	Area (ha) /Length(km) affected	Location	Habitat affected
J02.07	Drainage	M	-1	1.909km [1]	On HB	**7110/7120/7150**
J02.07	Drainage	M	-1	n/av	Adjacent to HB	**7110/7120/7150**
J01	Fire	L	-1	14ha	On HB	**7110/7120/7150**
I02	Problematic native species	L	-1	<0.05ha	On HB	**7110/7120/7150**
B01.02	Artificial planting on open ground (non-native trees)	L	-1	Unknown	Adjacent to HB	**7110/7120/7150**

HB: High Bog; Ranking: H: High importance/impact; M: Medium importance/impact; L: Low importance/impact.

[1] This figure only includes functional and reduce-functional drains. n/a: not applicable, n/av: not available

Peat cutting

Peat cutting no longer takes place at Firville Bog. Fernandez *et al*. (2005) mentioned that there had been no cutting at the site since the 1970s. The largest area of peat cutting took place immediately east of the road that separates the site from Kilcarren Bog in the WNW of the high bog. Cutting also took place along the northeast and south high bog sections. Although cutting has ceased for over 30 years, the old face banks and cutover drainage associated with past cutting are still likely to continue to cause negative impacts on the high bog habitats.

Drainage

High bog drainage

Table 6.2 shows a slight change on high bog drainage status between 2005 and 2011 as drain bK (0.337km) is now deemed non-functional. A large proportion of drains remain reduced functional (1.906km), particularly along the eastern section of high bog (e.g. eastern section of drains bA, bD and bE). Some of these reduced functional drains are impacting on the high bog habitats and will continue to do so until they are blocked and become completely in-filled and therefore non-functional.

High bog drains are considered to have medium importance/impact on high bog habitats.

Table 6.2 High bog drainage summary

Status	**2005 (km)** [1]	**2011 (km)**	**Change**
NB: functional	n/a	n/a	n/a
NB: reduced functional	2.243	1.906	(-) 0.337
NB: non- functional	4.296	4.633	(+) 0.337
B: functional	n/a	n/a	n/a
B: reduced functional	n/a	n/a	n/a
B: non- functional	n/a	n/a	n/a

B: Blocked; NB: Not blocked n/a: not applicable

[1] High bog drainage has been revised (e.g. re-digitised in cases) and figures above may slight vary from those given by Fernandez *et al*. (2005)

Table 6.3 below provides a more detail description of the drainage present on the high bog at Firville Bog including any change in their functionality in the 2005 – 2011 reporting period (see Map 3).

Table 6.3 High bog drainage detail

Drain Name	Length (km)	2005 status	2011 status	Change	Comment
bA	0.224	NB: non-functional	NB: non- functional	No	This section of the drain is completely infilled (and difficult to see on the ground?), but further east it is still considered reduced functional
bA	0.864	NB: reduced functional	NB: reduced functional	No	This section of the drain is infilling but still considered reduced functional, further west it is non-functional
bB	0.073	NB: non-functional	NB: non- functional	No	
bC	0.456	NB: non-functional	NB: non- functional	No	
bD	0.700	NB: non-functional	NB: non- functional	No	
bD	0.458	NB: reduced functional	NB: reduced functional	No	This section of the drain is infilling but still considered reduced functional, further west it is non-functional
bE	0.704	NB: non-functional	NB: non- functional	No	
dE	0.520	NB: reduced	NB: reduced	No	This section of the

		functional	functional		drain is infilling but still considered reduced functional, further west it is non-functional
bF	0.461	NB: non-functional	NB: non- functional	No	
bG	0.521	NB: non-functional	NB: non- functional	No	
bH	0.522	NB: non-functional	NB: non- functional	No	
bJ	0.465	NB: non-functional	NB: non- functional	No	
bK	0.337	NB: reduced functional	NB: non- functional	Yes	This drain is now completely in-filled and thus now considered non-functional
bM	0.170	NB: non-functional	NB: non- functional	No	
bN	0.063	NB: reduced functional	NB: reduced functional	No	

Bog margin drainage

The cutover areas were not surveyed for drains during 2011.

Cutover drains associated with former peat cutting are present along the northwest, south and northeast cutover. These drains continue to drain the high bog and impacting high bog habitats.

The drain running parallel to the road separating Firville from Kilcarren Bogs is also likely to have some negative influence on high bog habitats.

Drainage maintenance is evident on the 2010 aerial photograph along the east margin of the high bog (to the east of Sc9), associated with agriculture improvements.

Bog margin drainage is considered to have a medium importance/impact on high bog habitats.

Fire history

Fernandez *et al*. (2005) mentioned the occurrence of regular burning at Firville Bog. However, no evidence of recent burning was noted in the 2005 survey. Nonetheless, the 2005 ortho- image shows evidence of a recent burn affecting the southern section of high bog.

During the current survey a recent burn (2008) was noted as damaging 7.6% of the high bog area (14ha). This activity is considered to have low importance/impact on high bog habitats.

Problematic native species

Fernandez *et al*. (2005) described isolated *Pinus sylvestris* trees across the high bog. Some *Ulex* and birch growing along the abandoned track leading into the site from the west (GR 194075/201215) was also reported. These trees still remain on the high bog but do not appear to be spreading.

Problematic native species are considered to have low intensity/impact on high bog habitats.

Afforestation and forestry management

A small area of conifer plantation is found within the Firville/Kilcarren SAC. This is located to the north-east of Kilcarren Bog. This is considered to have low intensity/impact on high bog habitats.

Other impacting activities

No other significant impacting activities were noted or recorded in 2011 impacting high bog habitats in the 2005-2011 reporting period.

Conservation activities

No major physical management actions such as high bog drains blocking have been carried out at the site. Fernandez *et al*. (2005) mentioned a very small amount of drain blocking carried out on the cutover on Firville Bog. No further details have been obtained in relation to this work. This activity is considered to have covered a very small area and thus its impact on the high bog habitats is likely to have been small too. Thus further restoration including blocking of drains is recommended.

Conservation status assessment

The assessment of the conservation status of Annex I Active and Degraded Raised Bog is based on the following(a more detailed description of conservation status assessment methods is given within the methods section of the project's Summary Report (Volume 1):

AREA - comparison of current habitat area with favourable reference values and its change in the reporting period to assess trends.

STRUCTURE & FUNCTION - comparison of central ecotope and active flush area (i.e. the higher quality wetter vegetation communities) for Active Raised Bog, and marginal and face bank ecotope area (i.e. the lower quality and drier vegetation communities) for Degraded Raised Bog against favourable reference values to assess their status and changes in their area in the reporting period to assess their trend. Community complex descriptions were also taken into account to evaluate changes in ecotope quality together with an analysis of the indicators recorded in the quadrats.

FUTURE PROSPECTS - an assessment of the influence of current and future activities both negative and positive (e.g. restoration works) affecting these habitats. Future Prospects for Active and Degraded Raised Bog are assessed at status and trend level based on the prospects for the habitat to reach favourable reference values in a two reporting period (12 years).

Active Raised Bog (7110)

Area

Table 8.1 indicates that there has been no change in the area of Active Raised Bog in the 2005-2011 reporting period.

Central ecotope area is considered not to have changed in the reporting period and the discrepancy (1.91ha) between the 2005 (not amended) and the 2011 figures is due a more comprehensive surveying and accurate mapping in 2011, which resulted in an improved ecotope map.

Several new areas of sub-central ecotope (**Sc10** to **Sc20**), of which the total area is 2.09ha, have been mapped in 2011. These areas are likely to be the result of more comprehensive surveying in 2011, which also resulted in considerable changes in **Sc1**, **Sc2** and **Sc6** (see Map 1). Small pockets of sub-central ecotope (too small to be mapped) have also been recorded during the 2011 survey to the east of **Sc4** and north of **Sc6**. (see Map 2). Some of these small patches of sub-central ecotope were previously (2005) mapped as part of larger sub-central ecotope areas and now are only depicted as sub-central ecotope complexes dots.

The favourable reference value (FRV) for Area is considered to be the sum of Active Raised Bog (central, sub-central ecotopes and active flush) plus sub-marginal ecotope when the Habitats Directive came into force in 1994 (see table 8.4). Therefore, the FRV Active Raised Bog Area is 136.86ha (based on 1994/5 Kelly (1995) figures amended by Fernandez *et al.* (2005), see tables 8.1 and 8.3 below). This FRV is only approximate until further hydrological and topographical studies are

carried out in order to assess the maximum potential capacity of the high bog to support Active Raised Bog. The current area value (16.75ha) is 87.76% below the FRV. A current habitat Area value of more than 15% below FRV falls into the **Unfavourable Bad** assessment category.

Active Raised Bog would not reach a favourable assessment until its Area reaches the FRV. The southern, north-eastern and north-western cutovers should be considered for the development and expansion of Active Raised Bog at the site.

A long term (1994/5-2011) trend indicates a reduction on the area of Active Raised Bog at the site (15.51ha) (see table 8.1). A more recent and short term trend analysis (6 years; 2005-2011) shows no change on its area. Therefore, the habitat Area is given a **Stable** trend assessment.

The Area of Active Raised Bog at Firville Bog is assessed as Unfavourable Bad-Stable (see table 8.5).

Structure & Functions

The FRV for S&Fs is for at least half of the active raised bog area to be made up of central and active flush, i.e. the higher quality wetter vegetation communities. This value is 8.38ha (half of 16.75ha, the current area of ARB). The current value is 4.99ha which is 40.45% below the FRV. A current value more than 25% below FRV falls into the **Unfavourable Bad** assessment category.

A long term (1994/5-2011) trend indicates a decrease of the total area of central ecotope and active flush at the site (10.41ha) (see table 8.1). A more recent and short term trend analysis (6 years; 2005-2011) shows no change. Therefore, the habitat's S&Fs are given a **Stable** trend assessment.

Quadrats analysis (**Qc1, Qc2, Qc3, Qsc1, Qsc2, Qsc3, Qsc4,** and **Qsc5**) indicates the following:

Qc1: Although the quadrats here show a dramatic difference in the pool cover (34-50% cover in 2005 compared to "absent" in 2011), the 2011 survey notes that the area immediately surrounding the quadrat was in fact dominated by pools. Thus, this difference is likely to be the result of lack of precision in relocating of the quadrat (up to 2m) between both surveys. The quadrats show an increase in the overall *Sphagnum* cover (from 51-75% in 2005 to 91-100% in 2011). However, the cover of *S. cuspidatum* has declined (from 11-25% to 4-10%) while that of *S. magellanicum* has increased (from 34-50% to 76-90%). The other major difference recorded is in the cover of *Rhynchospora alba* from 4-10% in 2005 to 34-50% in 2011. Although the quadrat differences, in particular the change of *Sphagnum* dominance from *S. cuspidatum* to *S. magellanicum*, indicate a change from wetter to drier conditions, the fact that the 2011 quadrat was surrounded by wetter

type vegetation suggests that lack of precision in relocating of the quadrat (up to 2m) rather than an actual change may be the cause.

Qc2: The total *Sphagnum* cover (91-100%) and pool cover (51-75%) has not changed from 2005-2011 and overall the quadrats appear very similar, both being dominated by *S. cuspidatum* (51-75% cover). Small differences do occur such as a slight decrease in the cover of *S. papillosum* (11-25% in 2005 compared to 4-10% in 2011) and a slight increase in cover of *S. capillifolium* subsp. *rubellum* (4-10% in 2005 to 11-25% in 2011). Further slight differences include an increase in the cover of *Rhynchospora alba* (4-10% in 2005 to 11-25% in 2011) and a decrease in *Narthecium ossifragum* (4-10% in 2005 to 1-3% in 2011) and *Cladonia portentosa* (4-10% in 2005 to "Absent" in 2011). However, overall these quadrats are very similar and any differences may merely be the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than an actual change.

Qc3: The total *Sphagnum* cover (91-100%) and pool cover (51-75%) has not changed from 2005-2011 and overall the quadrats appear very similar, both being dominated by *S. cuspidatum*. Small differences do occur such as a slight increase in cover of *S. cuspidatum* (34-50% in 2005 compared to 51-75% in 2011) and a slight decrease in *Narthecium ossifragum* (4-10% in 2005 to 1-3% in 2011) and *Cladonia portentosa* (4-10% in 2005 to 1-3%" in 2011). However, overall these quadrats are very similar and any differences may merely be the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than an actual change.

Qsc1: The total *Sphagnum* cover (34-50%) has not changed from 2005-2011 and overall the quadrats appear very similar. Small differences do occur such as a slight increase in cover of *S. cuspidatum* (4-10% in 2005 compared to 11-25% in 2011) and a slight decrease in *S. magellanicum* (4-10% in 2005 to 1-3% in 2011). In addition, *S. fuscum* was recorded in 2005 and not in 2011, while *S. austinii* was recorded in 2011 and not in 2005. Further slight differences include an increase in the cover of *Calluna vulgaris* (11-25% in 2005 to 26-33% in 2011) and a decrease in *Narthecium ossifragum* (4-10% in 2005 to 1-3% in 2011). However, overall these quadrats are very similar and any differences may merely be the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than an actual change.

Qsc2: The total *Sphagnum* cover (34-50%) has not changed from 2005-2011 and overall the quadrats appear similar. Small differences do occur such as a slight decrease in the cover of *S. austinii* (4-10% in 2005 to 1-3% in 2011). In addition, *S. fuscum* was recorded in 2005 and not in 2011. Further slight differences include an increase in the cover of *Calluna vulgaris* (4-10% in 2005 to 11-25% in 2011) and a decrease in *Cladonia portentosa* (4-10% in 2005 to 1-3% in 2011). The decrease in the cover of

Sphagnum austinii and *S. fuscum* suggest that there may have been a slight decline in the quality of the Active Raised Bog during the reporting period here. However, overall these quadrats are similar and any differences may merely be the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than an actual change.

Qsc3: The total *Sphagnum* cover (34-50%) has not changed from 2005-2011 and overall the quadrats appear very similar. Small differences do occur such as a slight increase in cover of *S. cuspidatum* (4-10% in 2005 compared to 11-25% in 2011) and a slight decrease in the cover of *S. papillosum* (11-25% in 2005 to 4-10% in 2011). Further small differences include a slight increase in the cover of *Calluna vulgaris* (11-25% in 2005 to 26-33% in 2011) and a slight decrease in *Narthecium ossifragum* (11-25% in 2005 to 4-10% in 2011) and *Trichophorum germanicum* (4-10% in 2005 to 1-3% in 2011). In addition, 'algae in pools' was recorded as 4-10% in 2005 and as 'absent' in 2011 and bare peat as 4-10% in 2005 and 1-3% in 2011. All of these differences combined suggest that there may have been a slight improvement in the quality of the Active Raised Bog during the reporting period here. However, overall these quadrats are very similar and any differences may merely be the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than an actual change.

Qsc4: The total *Sphagnum* cover has increased from 34-50% in 2005 to 51-75% in 2011, but overall the quadrats appear very similar. Other small differences do occur such as a slight increase in the cover of *S. cuspidatum* (4-10% in 2005 compared to 11-25% in 2011) and a slight decrease in the cover of *S. magellanicum* (4-10% in 2005 to 'absent' in 2011). Further small differences include a slight increase in the cover of *Calluna vulgaris* (4-10% in 2005 to 11-25% in 2011) and a slight decrease in *Narthecium ossifragum* (4-10% in 2005 to 1-3% in 2011). In addition, 'algae in pools' was recorded as 4-10% in 2005 and as 'absent' in 2011 and bare peat as 1-3% in 2005 and as 'absent' in 2011. All of these differences combined suggest that there may have been a slight improvement in the quality of the Active Raised Bog during the reporting period here. However, overall these quadrats are very similar and any differences may merely be the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than an actual change.

Qsc5 (former Qc4): The complex name given to this quadrat in 2005 was 4/14 and it was termed central ecotope. In 2011, the complex name is given as 4 + P and it is termed sub-central ecotope. However, the differences are likely to be largely due to a disparity in interpretation as well as a result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than any real change. The overall *Sphagnum* cover has actually increased from 26-33% to 51-75% in the reporting period. There has also been an increase in the cover of *S. cuspidatum* (4-10% in 2005

compared to 26-33% in 2011) and increase in the pool cover (4-10% in 2005 compared to 34-50% in 2011). Further small differences include a slight decrease in the cover of *Narthecium ossifragum* (4-10% in 2005 to 1-3% in 2011). In addition, 'algae in pools' was recorded as 4-10% in 2005 and as 'absent' in 2011 and bare peat as 4-10% in 2005 and as 1-3% in 2011. All of these differences combined suggest that there may have been a slight improvement in the quality of the Active Raised Bog during the reporting period here. However, overall these quadrats are similar and any differences may merely be the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than an actual change.

Typical good quality indicators and typical plant species are still found in sub-central and central ecotopes throughout the entire bog. No major changes of their occurrence within quadrats (**Qc1, Qc2, Qc3, Qsc1, Qsc2, Qsc3, Qsc4,** and **Qsc5**) have taken place (see Appendix III).

The structure and functions of Active Raised Bog at Firville Bog are assessed as Unfavourable Bad-Stable (see table 8.5).

Future Prospects

Impacting activities such as drainage both on the high bog and cutover, and to a lesser area past peat cutting (face banks remain open and draining the high bog) continue to negatively impact on the habitat and hinder the recovery to FRVs.

Habitat **Area** is currently 87.76% below FRV (see table 8.4) and a stable trend is foreseen. The habitat Area is expected to be more than 15% below FRV in the following two reporting periods (12 years). Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad-Stable**. Habitat's **S&Fs** are currently 40.45% below FRV (see table 8.4) and a stable trend is also foreseen. Therefore S&Fs are expected to more than 25% below FRV in the following two reporting periods. Thus, **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Stable**.

The overall habitat's Future Prospects are Unfavourable Bad-Stable (see table 8.5).

Blocking of remaining reduced-functional and functional drains both on the high bog and cutover is necessary. Cutover areas (particularly the southern, north-western and northern-eastern) should be considered for restoration of the habitat and to achieve FRVs.

The overall conservation status of Active Raised Bog at Firville Bog is assessed as Unfavourable Bad-Stable (see table 8.5).

Table 8.1 Changes in Active Raised Bog area

Active Ecotopes	1994/5 [1]	2005 [2]	2005 (amended)	2011	Change (2005-2011)	
	Area (ha)	**Area (ha)**	**Area (ha)**	**Area (ha)**	**Area (ha)**	**%**
Central	15.40	6.90	4.99	4.99	0.00	0.00
Sub-central	16.86	10.91	11.76	11.76	0.00	0.00
Total	**32.26**	**17.81**	**16.75**	**16.75**	**0.00**	**0.00**

1 These are the figures calculated from the vegetation map drawn by Kelly *et al*., (1995) that was geo-referenced and digitised as part of Fernandez *et al*. (2005) project.

2 2005 figures have been slightly modified based on a more accurately mapped high bog boundary undertaken as part of this project. This has mostly affected face bank ecotope figures.

Note: Table 8.1 includes 2005 figures and 2005 amended figures. The latter shows the ecotope area believed to be present in 2005 after surveying improvements in 2011. The comparison between 2005 (amended) and 2011 illustrates the actual changes in ecotope area in the 2005-2011 period. Any change in ecotope area between the 2005 and the 2005 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2011 (see table 8.2 for further detail).

Table 8.2 Assessment of changes in individual Active Raised Bog areas

Area	Quadrats	Trend	Comment	Quadrats analysis
C1	Qc1	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	**Qc1**: The 2005 and 2011 quadrats are similar and although the quadrat differences, in particular the change of *Sphagnum* dominance from *S. cuspidatum* to *S. magellanicum*, indicate a change from wetter to drier conditions, the fact that the 2011 quadrat was surrounded by wetter type vegetation suggests that lack of precision in relocating of the quadrat (up to 2m) rather than an actual change may be the cause. Furthermore, there has been an increase in the overall *Sphagnum* cover (from 51-75% in 2005 to 91-100% in 2011), which would indicate a more

				positive change.
C2	Qc2	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	**Qc2**: The 2005 and 2011 quadrats are very similar with the total *Sphagnum* cover and pool cover not changing from 2005-2011. Small differences do occur such as a slight decrease in the cover of *S. papillosum* and *Narthecium ossifragum* and a slight increase in cover of *Sphagnum capillifolium* subsp. *rubellum* and *Rhynchospora alba*.
C3	Qc3	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	**Qc3**: The 2005 and 2011 quadrats are very similar with the total *Sphagnum* cover and pool cover not changing from 2005-2011. Small differences do occur such as a slight increase in cover of *S. cuspidatum* and a slight decrease in *Narthecium ossifragum* and *Cladonia portentosa*.
C4	None	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	
Sc1	None	Stable	Slightly larger than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping. Some changes also due to re-allocation of previously mapped central vegetation to sub-central ecotope. Sc1 also surrounds C2.	
Sc2	None	Stable	Slightly larger than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	
Sc3	Qsc3	Stable	Slightly smaller than mapped in 2005. This change is the result of more	**Qsc3**: The 2005 and 2011 quadrats are similar with the total *Sphagnum* cover

			comprehensive surveying in 2011 which resulted in a more accurate mapping.	remaining the same. Small differences do occur such as a slight increase in cover of *S. cuspidatum* and a slight decrease in the cover of *S. papillosum*. Other small differences include a slight decrease in cover of *Narthecium ossifragum*, *Trichophorum germanicum*, 'algae in pools' and bare peat. All of these differences combined suggest that there may have been a slight improvement in the quality of the Active Raised Bog during the reporting period here. However, overall these quadrats are very similar.
Sc4	None	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping. In addition, in the 2011 survey, as well as a sub-central ecotope polygon (Map 1), there are also some scattered isolated dots of sub-central (Map 2) so that the differences between the two surveys is not as large as implied by the ecotope maps.	
Sc5	Qsc4	Stable (possibly improving)	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	**Qsc4**: The 2005 and 2011 quadrats are similar although the total *Sphagnum* cover has increased between 2005 and 2011. Other small differences include a slight increase in the cover of *S. cuspidatum* and a slight decrease in the cover of *S. magellanicum*. Further small differences include a slight decrease in the cover of *Narthecium ossifragum*, 'algae in pools' and bare peat. All of these differences

				combined suggest that there may have been a slight improvement in the quality of the Active Raised Bog during the reporting period here. However, overall these quadrats are similar.
Sc6	Qsc2,Qsc5	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	**Qsc2**: The 2005 and 2011 quadrats are similar with the total *Sphagnum* cover remaining the same. Small differences do occur such as a slight decrease in the cover of *S. austinii*. In addition, *S. fuscum* was recorded in 2005 and not in 2011. These differences suggest that there may have been a slight decline in the quality of the Active Raised Bog during the reporting period here. However, overall these quadrats are similar. Was **Qc4**, now named **Qsc5**: The difference in ecotope classification here is largely due to a disparity in interpretation and possibly also as a result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than any real change. The overall *Sphagnum* cover has actually increased in the reporting period and there has also been an increase in the cover of *S. cuspidatum* and in the pool cover. Further small differences include a slight decrease in the cover of *Narthecium ossifragum* and in the cover of 'algae in pools' and bare peat. All of these differences combined suggest that there may have been a slight improvement in the quality of the

				Active Raised Bog during the reporting period here.
Sc7	None	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	
Sc8	Qsc1	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	Qsc1: The 2005 and 2011 quadrats are very similar with the total *Sphagnum* cover remaining the same. Small differences do occur such as a slight increase in cover of *S. cuspidatum* and a slight decrease in *S. magellanicum*. In addition, *S. fuscum* was recorded in 2005 and not in 2011, while *S. austinii* was recorded in 2011 and not in 2005. Further slight differences include an increase in the cover of *Calluna vulgaris* and a decrease in *Narthecium ossifragum*. However, overall these quadrats are very similar.
Sc9	None	Stable	Slightly smaller than mapped in 2005. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	
Sc10	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	
Sc11	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	
Sc12	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of	

			more comprehensive surveying in 2011 which resulted in a more accurate mapping.
Sc13	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.
Sc14	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.
Sc15	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.
Sc16	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.
Sc17	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.
Sc18	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.
Sc19	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of

			more comprehensive surveying in 2011 which resulted in a more accurate mapping.
Sc20	None	Unknown	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.

Degraded Raised Bog (7120)

Area

The Degraded Raised Bog FRV for area is 46.82ha at Firville Bog. This value corresponds with the difference between the current high bog area (183.68ha) and Active Raised Bog FRV (136.86ha) for area. Degraded Raised Bog is a particular habitat type, for which FRV smaller than the current value, may be desirable in many sites. However any decrease in habitat area would only be considered positive, when it is the result of restoration to Active Raised Bog. Current habitat Area is 256.54% bigger than FRV and therefore the habitat Area is given an **Unfavourable Bad** assessment (see table 8.4).

Table 8.3 indicates that there has been no change on the area of Degraded Raised Bog in the 2005-2011 reporting period. Therefore the habitat Area is given a **Stable** trend.

The Area of Degraded Raised Bog at Firville Bog is assessed as Unfavourable Bad-Stable (see table 8.5).

Structure & Functions

The FRV for S&Fs is for a maximum 25% of the Degraded Raised Bog area to be made up of marginal and face bank, i.e. the lower quality and drier vegetation communities. This value is 41.73ha (25% of 166.93ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (62.38ha) is 49.48% above the FRV (in the particular case of Degraded Raised Bog a current area value equal or smaller than FRV is desirable) (see Table 8.4). A current value more than 25% above FRV falls into the **Unfavourable Bad** assessment category.

S&Fs trend is assessed based on actual changes within marginal and face banks ecotope (e.g. decreases due to rewetting processes or increases as a result of further drying out). As table 8.3

indicates, there has been no change in their area in the reporting period. Thus, the DRB's S&Fs at Firville Bog are given a **Stable** trend.

The Structure & functions of Degraded Raised Bog at Firville Bog are assessed as Unfavourable Bad- Stable (see table 8.5).

Future Prospects

Impacting activities such as drainage and past peat cutting continue to negatively impact the habitat. However, no major changes have taken place in the reporting period and are not expected to take place in the following two reporting periods (12 years). FRVs would not be reached unless restoration works are undertaken. Habitat **Area** is currently 256.54% above FRV (see table 8.4) and a Stable trend is expected in the following two reporting periods. As a result habitat Area is expected to remain more than 15% above FRV. Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad- Stable**. Habitat's **S&Fs** are currently 49.48% above FRV (see table 8.4). A Stable trend is foreseen in the following two reporting periods, **S&Fs** are expected to remain more than 25% above FRV. Thus, habitat's **S&Fs Future Prospects** are assessed as **Unfavourable Bad- Stable**.

Therefore the Future Prospects for Degraded Raised Bog are considered Unfavourable Bad-Stable (see table 8.5).

The overall conservation status of Degraded Raised Bog at Firville Bog is assessed as Unfavourable Bad-Stable (see table 8.5).

Table 8.3 Changes in Degraded Raised Bog area

Inactive Ecotopes	**1994/5** [1]	**2005** [2]	**2005 (amended)**	**2011**	**Change (2005-2011)**	
	Area (ha)	**Area (ha)**	**Area (ha)**	**Area (ha)**	**Area (ha)**	**%**
Sub-marginal	104.60	98.58	104.27	104.27	0.00	0.00
Marginal	47.29	63.10	58.83	58.83	0.00	0.00
Face bank	Na	3.56	3.55	3.55	0.00	0.00
Inactive flush	0.64	0.63	0.28	0.28	0.00	0.00
Total	**152.53**	**165.87**	**166.93**	**166.93**	**0.00**	**0.00**

[1] These are the figures calculated from the vegetation map drawn by Kelly *et al*., (1995) that was geo-referenced and digitised as part of Fernandez *et al*. (2005) project.

[2] 2005 figures have been slightly modified based on a more accurately mapped high bog boundary undertaken as part of this project. This has mostly affected face bank ecotope figures.

Note: Table 8.1 includes 2005 figures and 2005 amended figures. The latter shows the ecotope area believed to be present in 2005 after surveying improvements in 2011. The comparison between 2005 (amended) and 2011 illustrates the actual changes in ecotope area in the 2005-2011 period. Any change in ecotope area between the 2005 and the 2005 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2011.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchospora alba depressions are found across the entire bog in both Active and Degraded Raised Bog. The species is more frequently found and reaches its finest quality associated within wet features (*Sphagnum* pools, lawns and hollows) on Active Raised Bog.

The physical structure and distribution of the habitat across large sections of the high bog makes the process of calculating its area unfeasible and as a consequence makes the process of calculating realistic FRVs unfeasible. Thus, the assessment of the habitat's Area conservation status is indirectly based on the assessment of Active Raised Bog habitat Area (a favourable assessment indicates that all sub-marginal ecotope has turned Active Raised Bog). The habitat Area is given an **Unfavourable Bad** assessment.

The Area trend assessment is based on the variation on Active Raised Bog and sub-marginal ecotope within Degraded Raised Bog in the reporting period. Neither the area of Active Raised Bog nor the area of sub-marginal ecotope has varied in the reporting period. As result habitat Area is given a **Stable** trend.

The habitat's Area Future Prospects status is equally based on the Active Raised Bog Area Future Prospects status assessment and the Area Future Prospects trend is based on the trend expected for Active Raised Bog and sub-marginal ecotope in the following two reporting periods. Impacting activities (e.g. high bog and cutover drainage) continue to negatively impact high bog habitats (i.e. Active and Degraded Raised Bog). Thus, the trend is only deemed to be Stable as improvements cannot be expected until restoration works take place. Therefore, the habitat's Area Future Prospects are given an **Unfavourable Bad**-**Stable** assessment.

The S&Fs conservation assessment is also indirectly based on the Active Raised Bog S&Fs status and trend assessments, as Active Raised Bog supports the finest habitat quality type. Therefore, the habitat's S&Fs are given an **Unfavourable Bad**-**Stable** assessment.

The habitat's S&Fs Future Prospects status and trend are equally based on the Active Raised Bog S&Fs Future Prospects status and trend assessments in the following two reporting periods. Therefore, the habitat's S&Fs Future Prospects are given an **Unfavourable Bad-Stable** assessment.

The overall habitat's Future Prospects assessment is Unfavourable Bad-Stable.

The conservation status of depressions on peat substrates of the Rhynchosporion at Firville Bog is assessed as Unfavourable Bad-Stable (see table 8.5).

Table 8.4 Habitats favourable reference values

Habitat	Area Assessment			Structure & Functions Assessment		
	FRV Target (ha) [1]	2011 value (ha) [2]	% below target	FRV Target 2011 (ha)[3]	2011 value (ha) [4]	% below target
7110	136.86	16.75	87.76	8.38	4.99	40.45

[1] 1994/5 central, sub-central, active flush, bog woodland and sub-marginal ecotope area.

[2] 2011 central, sub-central ecotope, active flush and bog woodland area.

[3] Half of the current central, sub-central ecotope and active flush area. The target is that the area of the highest vegetation quality (i.e. central ecotope and active flush) should be at least this figure.

[4] 2011 central ecotope and active flush area.

	FRV Target (ha) [5]	2011 value (ha) [6]	% above target	FRV 2011 Target (ha) [7]	2011 value (ha) [8]	% above target
7120	46.82	166.93	256.54	41.73	62.38	49.48

[5] 1994/95 high bog area minus 7110 area FRV.

[6] 2011 Degraded Raised Bog area.

[7] 25% of the current Degraded Raised Bog habitat area. The target is that the extent of marginal and face bank ecotopes should not be larger than 25% of the current Degraded Raised Bog habitat area.

[8] Current marginal and face bank ecotopes area.

As table 8.5 below indicates, each individual EU habitat present on the high bog has been given the following overall conservation status assessment based on the three main parameters (Area, S&Fs and Future Prospects) individual assessments:

- **Active Raised Bog is assessed as being Unfavourable Bad-Stable.**
- **Degraded Raised Bog is assessed as being Unfavourable Bad-Stable.**
- **Rhynchosporion depressions is assessed as being Unfavourable Bad-Stable.**

Table 8.5 Habitats conservation status assessments

Habitat	Area Assessment	Structure & Functions Assessment	Future Prospects Assessment	Overall Assessment
7110	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad-Stable
7120	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad-Stable
7150	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad-Stable

Conclusions

Summary of impacting activities

There have been no major changes in the intensity or influence of impacting activities:

- Peat cutting is no longer present at the site. However, open face banks may still continue to drain the high bog.
- There are still nearly 2km of drains on the high bog that are considered to be reduced functional. Although these high bog drains continue to infill they are still somewhat functional.
- Cutover drainage (peripheral drainage) associated with former peat cutting is present along the northwest, south and northeast cutover. These drains continue to drain the high bog.
- Drainage maintenance, associated with agricultural improvements, is evident on the 2010 aerial photograph along the east margin of the high bog.
- The drain running parallel to the road separating Firville from Kilcarren Bogs is also likely to have some negative influence on the high bog habitats.
- A recent (2008) fire damaged 7.6% (14ha) of the high bog.
- *Pinus sylvestris* although present do not seem to have spread in the reporting period and are not considered a major threat.

Changes in active peat forming areas

- Several new areas of sub-central ecotope (**Sc10** to **Sc20**), of which the total area is 2.09ha, have been mapped in 2011. These areas are likely to be the result of more comprehensive surveying in 2011, which also resulted in considerable changes in **Sc1**, **Sc2** and **Sc6**.
- The Active Raised Bog appears to have remained Stable, both in Area and quality, in the reporting period.

Other changes

There have been no other major changes.

Quadrats analysis

- No major changes in vegetation have taken place within those quadrats recorded in 2005 that were re-surveyed in 2011 (see Appendix III).
- Although high accuracy GPS equipment was used during the 2005 and 2011 surveys, the devises still only allow up to 0.5m accuracy. The lack of precision in relocating of the quadrat may justify certain differences in the vegetation described. Permanent markers were inserted into quadrats recorded in 2011.

Restoration works

- A small amount of drain blocking has been carried out in the past (prior to 2005) on the cutover.

Summary of conservation status

- **Active Raised Bog** has been given an overall **Unfavourable Bad-Stable** conservation status at Firville Bog. Habitat Area and quality (S&Fs) have remained the same in the reporting period. However both values are below the FRVs. Future Prospects are considered Unfavourable Bad-Stable as cutover drainage continues to hinder the restoration of active peat forming communities.
- **Degraded Raised Bog** has been given an overall **Unfavourable Bad-Stable** conservation status at Firville Bog. Habitat Area and quality (S&Fs) have remained the same in the reporting period. Habitat Area and S&Fs are above the FRV, which is taken as a negative status for this habitat. Future Prospects are considered Unfavourable Bad-Stable as cutover drainage continues to hinder the restoration of degraded areas to active peat forming communities and improvements are not expected unless restoration works are undertaken.
- **Depressions on peat substrates of the Rhynchosporion** has been given an overall **Unfavourable Bad-Stable** conservation status at Firville Bog. Habitat Area and quality

have remained the same in the reporting period. Future Prospects are considered Unfavourable Bad-Stable.

The conservation status of the **overall raised bog** at **Firville SAC** is assessed as being **Unfavourable Bad-Stable**.

Recommendations

- **Further restoration works** including the blocking of high bog reduced functional drains, and possibly the cutover drains.
- **Further hydrological and topographical studies** to ascertain the capacity of the high bog to support Active Raised Bog and thus estimate a more accurate favourable reference value.
- **Further botanical monitoring surveys** both on the high bog and cutover in order to assess the efficiency of restoration works.
- An **Impact assessment** of maintenance works on adjacent land drainage with a view to the potential of blocking these drains.

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Appendix I Detailed vegetation description of the high bog

Active Raised Bog (7110)

Central Ecotope Complexes

COMPLEX 14

- **Location**: east of **C1**.
- **Ground**: quaking
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: absent
- **Macro-topography**: depression
- **Pools**: 51-75%
- ***Sphagnum* cover**: >90% (100% in places)
- ***Narthecium* cover**: <4%
- **Micro- topography**: High hummocks/lawns and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (4-10%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Rhynchospora alba* (4-10%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H & P; 4-10%), *S. magellanicum* (L & P; 4-10%), *S. cuspidatum* (P; 75-90%).
- **Additional comments**: Other species present include *Drosera anglica*, *Menyanthes trifoliata* and *Aulacomnium palustre*.

COMPLEX 15

- **Location**: this complex dominates **C1, C2, C3** and **C4**.
- **Ground**: quaking
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: <4

- **Macro-topography**: depression
- **Pools**: 34-50%
- ***Sphagnum* cover**: >90%
- ***Narthecium* cover**: <4%
- **Micro- topography**: High hummocks/hollows/lawns and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Rhynchospora alba* (11-25%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H & P; 4-10%), *S. magellanicum* (L & P; 4-10%), *S. tenellum* (H; <4%), *S. fuscum* (H; <4%), *S. cuspidatum* (P; 26-33%).
- **Additional comments**: Other species present include *Aulacomnium palustre*, *Vaccinium oxycoccos*, *Drosera anglica*, *Leucobryum glaucum* and *Andromeda polifolia*. In parts of this complex the *Sphagnum* cover in the pools is complete. However, towards the edges the complex grades into sub-central ecotope where open water and the cover of *Rhynchospora alba* increase.

  This complex is also found on the dome of the high bog (**C4**). Here, there is a lower *Sphagnum* cover (51-75%) and a lower coverage of pools (26-33%). Furthermore, there is a higher amount of *Narthecium ossifragum* (11-25%), which dominates the inter-pool areas. These inter-pool areas have a relatively low *Sphagnum* cover. However, this is consistent with the 2005 survey when although this area was classified as central ecotope, it was classed as complex 6/15, which had some characteristics of sub-central ecotope. Compared to the 2005 map this area of central ecotope is now mapped as two smaller areas separated by a narrow band of sub-central. A 2.5m *Betula pubescens* is present in one of the northern part of this of central ecotope and flush indicators are also present such as *Vaccinium oxycoccos* and *Dicranum scoparium*.

  This complex is also found in **C3**. Here the *Sphagnum* cover is slightly lower (75-90%) and the cover of *Eriophorum vaginatum* (11-25%) is higher. The complex grades into the sub-central complex 9/7/6 + P where the cover of *Narthecium ossifragum* increases and the pool cover decreases

Quadrats **Qc1, Qc2** and **Qc3** were recorded within this complex at **C1, C2** and **C3**.

Sub-Central Ecotope Complexes

COMPLEX 9/7 + P

- **Location**: this complex dominates **Sc1, Sc6, Sc17, Sc20**, the northeast section of **Sc2**, and sections of **Sc3, Sc4, Sc5, Sc14** and **Sc16**.
- **Ground**: very soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: 11-25%
- ***Sphagnum* cover**: 34-50% (51-75% in places)
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: Tall hummocks/hollows and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (4-10%), *Narthecium ossifragum* (4-10%), *Rhynchospora alba* (4-10%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H & P; 11-25%), *S. magellanicum* (L & P; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. cuspidatum* (P; 11-25%).
- **Additional comments**: Other species present include *Drosera anglica*, *Menyanthes trifoliata*, *Leucobryum glaucum* and *Andromeda polifolia*. *Myrica gale* also occurs in patches at a cover of ca. 11-25%.

  The complex is also recorded within **Sc2** where it consists of large (up to 15m long) tear pools in-filled by *Sphagnum cuspidatum*. *S. capillifolium subsp. rubellum, S. austinii* and *S. magellanicum* hummocks are found at the edge of the pools. Overall *Sphagnum* cover varies from 51-75%. Inter-pool area consists of tall *Calluna vulgaris* hummocks with *S. capillifolium subsp. rubellum* and *S. papillosum*.

  A 'new' area of this complex is recorded NE of **Sc2**. Here there is a patchier cover of *Sphagnum cuspidatum* (4-10%) in the pools and larger areas of open water and algae.

  This complex is also found in the eastern section of C4, within **Sc6**. Here, the complex consists of large tear pools with *S. cuspidatum, E. angustifolium, M. trifoliata*. Inter-pool area is poor in *Sphagnum* cover and mainly consists of *Narthecium ossifragum* and tall *Calluna vulgaris* hummocks. Overall *Sphagnum* cover is 35-50%.

This complex is found in a new sub-central ecotope area (**Sc20**) (GR 200997/194293) to the east of flush W. *Sphagnum cuspidatum* in-filled tear pools characterize the complex, which also contain *Eriophorum angustifolium*, *E. vaginatum* and *Rhynchospora alba*. *S. magellanicum, S. papillosum* and *S. capillifolium subsp. rubellum* hummocks are also found at the edges of the pools and in the inter-pool areas. Overall *Sphagnum* cover ranges from 50 to 75%. *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%) and *E. angustifolium* (4-10%) are also found. Sub-central ecotope quality decreases at the edges of the complex where pools area interconnecting but mainly consists of open water and algae. Overall *Sphagnum* cover is 35 to 50%. Some sections of the complex have been recently (2010) burnt. This complex 9/7+P section has an elongated shape, which is likely to indicate some sort of water flow.

Complex 9/7+P is again found in a new area (**Sc17**) in Firville bog (GR 2001007/194467). Here interconnecting pools dominated by S*phagnum cuspidatum* and *S. papillosum* characterize the complex. *S. magellanicum* and *S. capillifolium subsp. rubellum* are found at the edges of the pools. Tall *Calluna vulgaris* is found in the inter-pool areas. Overall *Sphagnum* cover varies from 50 to 75%. This other section of complex 9/7+P is found on a depression on the ground. *Rhynchospora alba* and *Narthecium ossifragum* become more frequent at the edge of the complex, where *Sphagnum* cover decreases to 35 to 50%.

Quadrat **Qsc4** was recorded within this complex at **Sc5**.

COMPLEX 9A/10

- **Location**: this complex is found within **Sc7,** north of **Sc3, Sc11** and **Sc19**.
- **Ground**: soft
- **Physical indicators**: burnt
- ***Calluna* height**: <10cm
- ***Cladonia* cover**: absent
- **Macro-topography**: depression
- **Pools**: absent
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: Low hummocks/hollows
- **Tussocks**: *Eriophorum vaginatum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (11-25%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (4-10%), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (<4%), *Andromeda*

polifolia (<1%), *Sphagnum capillifolium subsp. rubellum* (H; 11-25%), *S. papillosum* (H; 11-25%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; 11-25%).

- **Additional comments**: This complex is also in the north-western section of **Sc19** (GR 200870/194422). This complex is found in an area slightly depressed where a few drains meet. The complex is characterized by high *Sphagnum magellanicum* and *S. papillosum* hummocks, as well as *S. cuspidatum* hollows. *Eriophorum vaginatum* becomes frequent with 11 to 25% cover. *E. vaginatum* is also found (11-25%), along with *Calluna vulgaris* (11-25%) and *Erica tetralix* (4-10%). Overall the *Sphagnum* cover ranges from 75 to 90%.

COMPLEX 9/10

- **Location**: this complex is found within the northern section of **Sc3**, dominating **Sc9, Sc10, Sc15** and **Sc18**, the western section of **Sc**5, the eastern section of **Sc19** and within **Sc1** section surrounding C2.
- **Ground**: very soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 11-25%
- **Macro-topography**: gentle slope
- **Pools**: 4-10%
- ***Sphagnum* cover**: 34-50% (51-75% in places)
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: High hummocks/hollows and pools
- **Tussocks**: *Eriophorum vaginatum* (11-25%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (4-10%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H; 11-25%), *S. magellanicum* (H; <4%), *S. tenellum* (H; <4%), *S. cuspidatum* (P; 11-25%).
- **Additional comments**: *Myrica gale* also occurs in patches at a cover of ca. 11-25%.

  A 'new' area of this complex was recorded in a depression **Sc10** between two small marginal ridges to the south of C1 and C2. This area is likely not to have been surveyed in 2005. This depression is extremely w*et al*though there are no typical pools. The cover of *Cladonia portentosa* (absent), *Calluna vulgaris* (11-25%) and *Narthecium ossifragum* (4-10%) is lower in this

area while the cover of *Eriophorum angustifolium* (4-10%), *Sphagnum magellanicum* (Hl; 4-10%) and *S. cuspidatum* (Hl/P; 26-33%) is higher.

Another 'new' area of this complex was also recorded in a depression with water running off towards the northern cutover (**Sc15**). The cover of *Calluna vulgaris* (4-10%) and *Narthecium ossifragum* (<4%) is lower again in this area while the cover of *Rhynchospora alba* (11-25%) is higher. The *Cladonia portentosa* cover is <4%. The overall *Sphagnum* cover is 51-75% consisting of *S. capillifolium subsp. rubellum* (H; 11-25%), *S. papillosum* (H; 11-25%), *S. magellanicum* (H; <4%), *S. tenellum* (H;<4%) and *S. cuspidatum* (Hl; 26-33%). Hollows turn into pools in the wettest sections of the complex where *Menyanthes trifoliata* and *Drosera anglica* are found.

This complex is again found in small patches along the northern section of high bog, most are too small to be mapped and only dots were recorded indicating their location (GR 194742/201450 and 194965/201413).

This complex is also found in **Sc9**. Here it consists of large tear pools dominated by *Sphagnum cuspidatum* and *Eriophorum angustifolium* with *Sphagnum magellanicum*, *S. papillosum* and *S capillifolium* subsp. *rubellum* hummocks at the edge of the pools. Overall the *Sphagnum* cover ranges from 75-90%.

COMPLEX 9/7/6 + P

- **Location**: this complex dominates **Sc3** and **Sc13**, but is also found within **Sc4** and **Sc16**.
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: flat
- **Pools**: 11-25% (4-10% in places)
- ***Sphagnum* cover**: 34-50%
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: High hummocks/hollows and pools
- **Tussocks**: *Eriophorum vaginatum* (11-25%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (4-10%), *Menyanthes trifoliata* (<4%), *Drosera anglica* (<4%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S.*

papillosum (H; 11-25%), *S. magellanicum* (Hl; 4-10%), *S. austinii* (H; <4%), *S. cuspidatum* (P; 11-25%).

- **Additional comments**: *Rhynchospora alba* is largely confined to the pools. This complex grades into another sub-central complex 9/7 + P in places where the *Sphagnum* cover increases and the cover of *Narthecium ossifragum* decreases.

  This complex is found in a new area named **Sc16** (GR 200820/195077) located to the south of Sc3. Here, *Sphagnum cuspidatum*, *Eriophorum vaginatum* and *Rhynchospora alba* area found dominating tear pools. *S. papillosum, S. capillifolium subsp. rubellum* and *S. magellanicum* are also found at the edges of the pools forming hummocks. The inter-pool area consists of tall *Calluna vulgaris, Narthecium ossifragum* and *Carex panicea*. Overall *Sphagnum* cover ranges from 35 to 50%. *S. austinii* hummocks are also found but only very occasionally.

  Complex 9/7/6+P is also found in a newly recorded sub-central ecotope section on the south of the high bog (**Sc13**) (GR 200980/195319) *Sphagnum cuspidatum* and *Eriophorum vaginatum* dominate long tear pools. Inter-pool areas contain tall *Calluna vulgaris* and *Narthecium ossifragum*. *S. papillosum, S capillifolium subsp. rubellum* and *S. austinii* hummocks are also found. Overall *Sphagnum* cover is moderate (35-50%).

Quadrat **Qsc3** was recorded within this complex at **Sc3**.

COMPLEX 9/7/10

- **Location**: this complex dominates the eastern section of **Sc2** and **Sc18**.
- **Ground**: very soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: flat/gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 34-50% (51-75% in places)
- ***Narthecium* cover**: 4-10% (<4% in places)
- **Micro- topography**: High hummocks/hollows
- **Tussocks**: *Eriophorum vaginatum* (26-33%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (26-33%), *E. angustifolium* (<4%), *Narthecium ossifragum* (4-10%), *Rhynchospora alba* (<4%), *Sphagnum*

capillifolium subsp. rubellum (H; 4-10%), *S. papillosum* (H; 26-33%), *S. magellanicum* (H; <4%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; 4-10%).

- **Additional comments**: *Myrica gale* also occurs in patches at a cover of ca. 11-25%.

COMPLEX 4 + P

- **Location**: this complex dominates **Sc8** and **Sc12** and the western section of **Sc1, Sc6** and **Sc7**.
- **Ground**: soft to very soft
- **Physical indicators**: bare peat (<4%)
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: depression
- **Pools**: interconnecting and tear pools (11-25%)
- ***Sphagnum* cover**: 34-50%
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: High and low hummocks/pools/hollows
- **Tussocks**: *Trichophorum germanicum* (<1%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (25-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium*(<4%), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (4-10%, but up to 25% in places), *Andromeda polifolia* (<1%), *Menyanthes trifoliate* (<1%), *Sphagnum capillifolium subsp. rubellum* (H; 11-25%), *S. papillosum* (H; 4-10%), *S. magellanicum* (H; <4%), *S. subnitens* (H;<4%), *S. tenellum*(H;<4%), *S. austinii* (H<4%), S. *cuspidatum* (P & Hl;4-10%), *Pleurozia purpurea* (<1%).
- **Additional comments**: this complex is also found to the west of C4 within Sc6. Here inter-connecting pools cover 11-25% of the ground, but are poor in *Sphagnum*, which consists of *S. cuspidatum*, *S. papillosum* and *S. magellanicum*. *Rhynchospora alba* and *Menyanthes trifoliate* are also found in the pools. Edge of the pools contains *S. capillifolium subsp. rubellum*, *S. subnitens S. papillosum* and *S. austinii* hummocks. Overall *Sphagnum* cover varies from 33 to 50%. Tall *Calluna vulgaris* hummocks are found in the inter-pool area, which also contain *Narthecium ossifragum* (4-10%) and bare peat (<4%).

  Sc7 also features complex 4+P.

  This complex was also found in **Sc1**. Here *Sphagnum cuspidatum* and *S. magellanicum* dominate hollows. Hummocks consist of *S. papillosum* and *S. capillifolium subsp. rubellum*. The overall *Sphagnum* cover is 35 to 50%. The western section of Sc1 contains high cover of *Myrica gale* (11-25%).

Quadrats **Qsc1, Qsc2** and **Qsc5** (formerly Qc4) were recorded within this complex at **Sc8**, **Sc6** and **Sc5**.

Degraded Raised Bog (7120)

Sub-Marginal Ecotope Complexes

COMPLEX 6/9 + P

- **Location**: this complex is found surrounding **Sc1, Sc3, Sc4, Sc6, Sc10, Sc16, Sc19** and to the east of **Sc9**.
- **Ground**: soft to very soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: absent
- **Macro-topography**: depression (gentle slope in places)
- **Pools**: 11-25% (4-10% in places)
- ***Sphagnum* cover**: 26-33%
- ***Narthecium* cover**: 26-33%
- **Micro- topography**: Low hummocks/hollows and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (4-10%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (4-10%), *Narthecium ossifragum* (26-33%), *Rhynchospora alba* (4-10%), *Myrica gale* (11-25%), *Menyanthes trifoliata* (<4%), *Drosera rotundifolia* (<4%), *Vaccinium oxycoccos* (<4%), *Andromeda polifolia* (<4%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H & Hl; 11-25%), *S. magellanicum* (H; <4%), *S. fuscum* (H; <4%), *S. cuspidatum* (P; 4-10%).
- **Additional comments**: there is also a burnt version of this complex found on the east of Firville Bog in parts affected by the 2008 fire. Bare peat is present at 4-10% cover and *Campylopus introflexus* at <4%. *Narthecium ossifragum* (34-50%), *Calluna vulgaris* (4-10%) and *Sphagnum subnitens* (4-10%) occur at a higher cover values while *Eriophorum vaginatum* (4-10%), *Rhynchospora alba* (<4%) and *Sphagnum cuspidatum* (<4%) are found at lower cover values.

  This burned version of the complex is also found around Sc20, north of flush W. The pools are again characterised here by a patchy cover of *Sphagnum cuspidatum* (4-10%) and open water. The cover of *Rhynchospora alba* (4-10%) is slightly higher in this area as is the cover of *Erica tetralix* (11-25%) and *Carex panicea* (4-10%). Conversely, the cover of *Calluna vulgaris* (4-10%),

Eriophorum angustifolium (<4%), *Sphagnum subnitens* (H; <4%) and *S. papillosum* (H; 4-10%) is lower. Hummocks of *Leucobryum glaucum* (<4%) are also frequent in this area.

COMPLEX 6 + P

- **Location**: east of **Sc3**.
- **Ground**: firm
- **Physical indicators**: bare peat <4%
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: 4-10% (11-25% in places)
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 34-50%
- **Micro- topography**: High hummocks/hollows, flats and pools.
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (34-50%), *Rhynchospora alba* (<4), *Andromeda polifolia* (<4%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H; 4-10%), *S. cuspidatum* (P; 4-10%).
- **Additional comments**: The pools have a patchy cover of *Sphagnum cuspidatum* as well as open water and algae.

COMPLEX 4/9A + P

- **Location**: to the north of **Sc2** and **Sc8**.
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: gentle slope
- **Pools**: 11-25%
- ***Sphagnum* cover**: 26-33%
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: High hummocks/hollows and tear pools.

- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (11-25%), *Narthecium ossifragum* (4-10%), *Rhynchospora alba* (11-25%), *Myrica gale* (4-10%), *Menyanthes trifoliata* (<4%), *Drosera rotundifolia* (<4%), *Andromeda polifolia* (<4%), *Sphagnum capillifolium subsp. rubellum* (H; 11-25%), *S. papillosum* (H; 4-10%), *S. magellanicum* (P; <4%), *S. cuspidatum* (P; 4-10%).
- **Additional comments**: None.

COMPLEX 9/7

- **Location**: this complex is found across the northern, southeastern and southwestern high bog.
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: flat or depressions
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: <4%
- **Micro- topography**: Low hummocks/tussocks/hollows.
- **Tussocks**: *Eriophorum vaginatum* (4-10%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (11-25%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Rhynchospora alba* (<4%),*Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium subsp. rubellum* (H; 11-25%), *S. magellanicum* (H;<4%), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments**: None.

COMPLEX 9/7/6

- **Location**: this is the most widespread sub-marginal complex across the entire high bog.
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm

- ***Cladonia* cover**: <4%
- **Macro-topography**: flat/gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 11-25% (26-33% in places)
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: High hummocks/hollows.
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (<4%), *Trichophorum germanicum* (<4%), *Leucobryum glaucum* (<4%), *Drosera rotundifolia* (<4%), *Sphagnum capillifolium subsp. rubellum* (H; 11-25%), *S. papillosum* (H; 4-10%), *S. magellanicum* (Hl; <4%), *S. subnitens* (H; <4%), *S. fuscum* (H; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments**: Where *Myrica gale* becomes frequent the complex is named **9/7/6+My**. *Carex panicea* is also present in places and where this becomes more common than *Narthecium ossifragum*, the complex is termed **9/7/3** and **9/7/3 + *Myrica gale***.

Marginal Ecotope Complexes

COMPLEX 6/7

- **Location**: this complex was found across the entire marginal ecotope of the bog.
- **Ground**: firm to soft
- **Physical indicators**: bare peat <4%, *Campylopus introflexus* <4%
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 34-50%
- **Micro- topography**: High hummocks/hollows and flats.
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (34-50%), *Carex panicea* (4-10%), *Rhynchospora alba*

(<4%), *Trichophorum germanicum* (<4%), *Leucobryum glaucum* (H; <4%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H; <4%).

- **Additional comments**: In some areas this complex is found along with tear pools (4-10% cover) and is termed 6/7 + TP. The tear pools are mostly open water and colonised by *Eriophorum angustifolium* with a patchy cover of *Sphagnum cuspidatum*. The cover of *Rhynchospora alba* also increases in places particularly in areas where there appears to be water run-off.

  Where the *Sphagnum* cover increases to 11-25%, the vegetation is classified as complex **7/6** (sub-marginal).

COMPLEX 3/6

- **Location**: this complex was found across the south, east and west marginal sections.
- **Ground**: firm
- **Physical indicators**: burnt; bare peat 4-10%
- ***Calluna* height**: <10cm
- ***Cladonia* cover**: absent
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 26-33%
- **Micro- topography**: Flats with scattered low hummocks/hollows.
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (4-10%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (26-33%), *Carex panicea* (26-33%), *Rhynchospora alba* (<4%), *Drosera rotundifolia* (<4%), *Andromeda polifolia* (<4%), *Leucobryum glaucum* (H; <4%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H; <4%), *S. subnitens* (H; <4%).
- **Additional comments**: *Molinia caerulea* is also found in this complex particularly towards the high bog margin as is *Myrica gale*. Where *M. Gale* becomes more frequent (34-50% in patches) the complex is termed **3/6 + My**.

  This complex is also found with pools (4-10%) and is termed **3/6 + P** in these areas.

COMPLEX 7/2

- **Location**: this complex was found across the south-eastern high bog edge.
- **Ground**: firm

- **Physical indicators**: bare peat 4-10%
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: absent
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: High hummocks/hollows.
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (<4%), *Narthecium ossifragum* (11-25%), *Trichophorum germanicum* (4-10%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H; <4%).
- **Additional comments**: In some areas this complex is found along with tear pools (4-10% cover) and is termed 6/7 + TP. The tear pools are mostly open water and colonised by *Eriophorum angustifolium* with a patchy cover of *Sphagnum cuspidatum*. The cover of *Rhynchospora alba* also increases in places particularly in areas where there appears to be water run-off.

Face bank Complexes

COMPLEX 1

- **Location**: this complex was found along the bog margin
- **Ground**: firm
- **Physical indicators**: bare peat (very variable)
- ***Calluna* height**: 41-50cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: <4%
- ***Narthecium* cover**: absent
- **Micro- topography**: absent
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent

- **Species cover**: *Calluna vulgaris* (76-90%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Molinia caerulea* (<4%), *Trichophorum germanicum* (<1%), *Myrica gale* (<4%), *Hypnum jutlandicum* (<4%), *Hylocomium* splendens *(<1%).*
- **Additional comments**: none.

Inactive Flushes

FLUSH W (FW)

- **Location**: towards the south-west of the high bog, west of Sc20.
- **Ground**: soft
- **Physical indicators**: burnt; bare peat 4-10%.
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: absent
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 11-25% (26-33% in places)
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: *Calluna vulgaris* hummocks/ low hummocks.
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (26-33%), *Narthecium ossifragum* (4-10%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *S. papillosum* (H & Hl; 4-10), *S. cuspidatum* (Hl; <4%), *Polytrichum alpestre* (<4%), *Leucobryum glaucum* (4-10), *Vaccinium oxycoccos* (<4%), *Andromeda polifolia* (<4%) and *Aulacomnium palustre* (4-10%).
- **Additional comments**: flush W is essentially composed of 20-30 *Betula pubescens* of between 0.5-2m tall. There are also some patched of *Molinia caerulea* in places.

FLUSH X (FX)

- **Location**: middle of high bog, to the south of Sc2.
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 41-50cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: ridge

- **Pools**: absent
- ***Sphagnum* cover**: 26-33%
- ***Narthecium* cover**: <4%
- **Micro- topography**: na
- **Tussocks**: *Eriophorum vaginatum* (26-33%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (26-33%), *Sphagnum capillifolium subsp. rubellum* (H; 26-33%), *Polytrichum alpestre* (<4%), *P. commune* (<4%), *Vaccinium oxycoccos* (4-10%), *Anthoxanthum odaratum* (<4%) and *Aulacomnium palustre* (4-10%).
- **Additional comments**: flush X features a *Betula pubescens* tree ca. 3m tall and 3 *Betula* 2-3m tall surrounded by ca. 20 *Betula* 1-2m tall. There are several large hummocks of *Sphagnum capillifolium subsp. rubellum*.

FLUSH Y (FY)

- **Location**: slightly to the west of the middle of the high bog; north of C2.
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: ridge
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: <4%
- **Micro- topography**: na
- **Tussocks**: *Molinia caerulea* tussocks/low hummocks/hollows (11-25%).
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Myrica gale* (<4%), *Empetrum nigrum* (<4%), *Molinia caerulea* (11-25%), *Eriophorum vaginatum* (4-10%), *Sphagnum capillifolium subsp. rubellum* (H; 4-10%), *Leucobryum glaucum* (<1%).
- **Additional comments**: flush Y features a clump of 30 to 40 *Pinus sylvestris* trees up to 5m high, but most of them less than 2m high.

FLUSH Z (FZ)

- **Location**: west-northwest of the high bog close to the road.

- **Ground**: firm
- **Physical indicators**: absent
- ***Calluna* height**: 41-50cm
- ***Cladonia* cover**: 11-25%
- **Macro-topography**: ridge
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: <4%
- **Micro- topography**: *Calluna vulgaris* hummocks/ low hummocks.
- **Tussocks**: absent (11-25%).
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Betula pubescens* (50-75%), *Calluna vulgaris* (50-75%), *Myrica gale* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%),*Sphagnum capillifolium subsp. rubellum* (H; 11-25%),*S. papillosum* (H; 4-10%), *S. magellanicum* (H; 4-10%), *S. palustre* (H; <4%), *Aulacomnium palustre* (<1%), *Leucobryum glaucum* (<1%), *Vaccinium oxycoccos* (<1%),*Polytrichum strictum* (<1%), *Hylocomium splendens* (<1%).
- **Additional comments**: flush Z features a clump of birch trees less than 3m tall.

Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Firville Bog in both Active and Degraded Raised Bog, but it is only occasional found on degraded habitat. Only *Rhynchospora alba* was recorded within the 2011 survey at this site.

R. alba is found in all ecotopes except the face bank in Firville Bog, such as: central ecotope (complex 14; 15); sub-central ecotope (9/7 + P; 9/10; 9/7/6 + P; 4 + P); sub-marginal ecotope (6/9 + P; 4/9a + P) and marginal ecotope (7/2).

The species becomes very frequent within complexes 15 (central ecotope), 4 + P (sub-central) and 4/9a + P (sub-marginal).

The species is always found associated with wet features such as *Sphagnum* pools, *Sphagnum* lawns and hollows, along with *Sphagnum magellanicum*, *S. papillosum*, *S. cuspidatum*. *Rhynchospora alba* was also recorded in more degraded areas of the bog such as steep slope sections at the edge of the bog where run-off channels are found.

Appendix II Photographical records

Photograph Number	Aspect	Type	Feature	Date
102-0461	SW	Overview	Qsc4	23/09/2011
102-0462	SE	Overview	Qsc1	23/09/2011
102-0462	SE	Overview	Qsc1	23/09/2011
102-0463	S	Overview	Qc4	23/09/2011
102-0464	SE	Overview	Qsc2	23/09/2011
102-0465	SW	Overview	Qc1	27/09/2011
102-0466	N	Overview	Qc2	27/09/2011
102-0467	NW	Overview	Qsc3	28/09/2011
102-0469	NE	Overview	Qc3	28/09/2011

Appendix III Quadrats

Ecotope type	Central	Central	Central	Central
Complex Name	**15**	**15**	**14**	**15**
Quadrat Name	Qc1	Qc1	Qc2	Qc2
Easting	194267	194264	194491	194492
Northing	201255	201253	201192	201194
Firmness	Very soft	Quaking	Quaking	Quaking
Burnt		No		No
Algae in hollows %	Absent	Absent	Absent	Absent
Algae in pools %	4-10	Absent	Absent	Absent
Bare peat %	4-10	Absent	Absent	Absent
High hummocks %	Na	Absent	na	4-10
Low hummocks %	11-25	4-10	11-25	11-25
Hollows %	4-10	4-10	4-10	Absent
Lawns %	11-25	76-90	4-10	Absent
Pools %	34-50	Absent	51-75	51-75
Pool type	Interconnecting	Absent	Interconnecting	Interconnecting
S.austinii hum type	Absent	Absent	Absent	Absent
S.austinii hum %	Absent	Absent	Absent	Absent
S.austinii height(cm)	Na	Absent	na	Absent
S.fuscum hum type	Absent	Absent	Absent	Absent
S.fuscum hum %	Absent	Absent	Absent	Absent
S.fuscum height(cm)	Absent	Absent	Absent	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Absent	Absent	Absent	Absent
Trichophorum %	Absent	Absent	Absent	Absent
S.magellanicum %	34-50	76-90	4-10	4-10
S.cuspidatum %	11-25	4-10	51-75	51-75
S.papillosum %	4-10	4-10	11-25	4-10
S.denticulatum %	Absent	Absent	Absent	Absent

S.capillifolium%	4-10	1-3 (many indiv)	4-10	11-25
S.tenellum %	Na	1-3 (many indiv)	na	1-3 (many indiv)
S.subnitens %	Absent	Absent	Absent	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	4-10	34-50	4-10	11-25
N.ossifragum %	4-10	1-3 (many indiv)	4-10	1-3 (many indiv)
Sphag pools %	34-50	Absent	51-75	51-75
Dominant pool Sphag	S. cuspidatum		S. cuspidatum	S. cuspidatum
Sphag lawns %	11-25	76-90	4-10	Absent
Sphag humm %	11-25	4-10	11-25	26-33
Sphag holl %	4-10	4-10	4-10	Absent
Total Sphag %	51-75	91-100	91-100	91-100
Hummocks indicators		Absent		Absent
Cladonia portent %	4-10	1-3 (several indiv)	4-10	Absent
Other Cladonia sp				
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	4-10	11-25	11-25	11-25
Calluna height(cm)	21-30	21-30	21-30	21-30
Other NotableSpecies		A.palustre,D.rotun difolia		D.anglica; S.fallax
Other comment		Surrounding area dominated by S.cuspidatum pools		
Date	**08/03/2005**	**27/09/2011**	**08/03/2005**	**27/09/2011**

Ecotope type	**Central**	**Central**	**Sub-central**	**Sub-central**
Complex Name	**14**	**15**	**9/4 + P**	**4+P**
Quadrat Name	Qc3	Qc3	Qsc1	Qsc1
Easting	195017	195017	195685	195686
Northing	200947	200946	201564	201563
Firmness	Quaking	Quaking	Soft	Soft
Burnt		No		No
Algae in hollows %	Absent	Absent	4-10	Absent

Algae in pools %	Absent	Absent	4-10	Absent
Bare peat %	Absent	Absent	4-10	Absent
High hummocks %	Na	11-25	na	26-33
Low hummocks %	26-33	4-10	26-33	11-25
Hollows %	11-25	Absent	11-25	11-25
Lawns %	Absent	Absent	Absent	Absent
Pools %	51-75	51-75	11-25	4-10
Pool type	Interconnecting	Interconnecting	Regular	Interconnecting
S.austinii hum type	Absent	Absent	Absent	Relic
S.austinii hum %	Absent	Absent	Absent	1-3 (many indiv)
S.austinii height(cm)	Na	Absent	na	21-30
S.fuscum hum type	Absent	Absent	na	Absent
S.fuscum hum %	Absent	Absent	4-10	Absent
S.fuscum height(cm)	Absent	Absent	na	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Absent	Flats	Absent	Absent
Trichophorum %	Absent	1-3 (few indiv)	Absent	Absent
S.magellanicum %	Absent	Absent	4-10	1-3 (many indiv)
S.cuspidatum %	34-50	51-75	4-10	11-25
S.papillosum %	11-25	11-25	11-25	11-25
S.denticulatum %	Absent	Absent	Absent	Absent
S.capillifolium%	11-25	11-25	4-10	4-10
S.tenellum %	Na	1-3 (many indiv)	na	1-3 (many indiv)
S.subnitens %	Absent	Absent	Absent	1-3 (many indiv)
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	4-10	4-10	4-10	4-10
N.ossifragum %	4-10	1-3 (many indiv)	4-10	1-3 (many indiv)
Sphag pools %	51-75	51-75	11-25	4-10
Dominant pool Sphag	S. cuspidatum	S. cuspidatum	S. cuspidatum	S. cuspidatum
Sphag lawns %	Absent	Absent	Absent	Absent
Sphag humm %	26-33	26-33	26-33	26-33
Sphag holl %	11-25	Absent	11-25	4-10
Total Sphag %	91-100	91-100	34-50	34-50

Hummocks indicators		Absent	S. fuscum	S.austinii
Cladonia portent %	4-10	1-3 (many indiv)	4-10	4-10
Other Cladonia sp				
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	11-25	11-25	11-25	26-33
Calluna height(cm)	31-40	31-40	31-40	31-40
Other NotableSpecies		V. oxycoccos	V. oxycoccos	M. trifoliata
Other comment				Algae common throughout entire complex in pools; Campylopus introflexus
Date	**08/03/2005**	**28/09/2011**	**08/03/2005**	**23/09/2011**

Ecotope type	**Sub-central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**6/9 + P**	**4+P**	**6/9/2 + P**	**9/7/6+P**
Quadrat Name	Qsc2	Qsc2	Qsc3	Qsc3
Easting	195382	195377	195060	195056
Northing	201138	201137	200957	200961
Firmness	Soft	Soft	soft	Soft
Burnt		No		No
Algae in hollows %	4-10	Absent	4-10	1-3 (many indiv)
Algae in pools %	4-10	Absent	4-10	Absent
Bare peat %	4-10	1-3 (many indiv)	4-10	1-3 (few indiv)
High hummocks %	Na	11-25	na	11-25
Low hummocks %	11-25	11-25	11-25	4-10
Hollows %	11-25	11-25	11-25	11-25
Lawns %	4-10	Absent	Absent	Absent
Pools %	11-25	4-10	4-10	4-10
Pool type	Interconnecting	Interconnecting	Regular	Regular
S.austinii hum type	Na	Active	Absent	Absent
S.austinii hum %	4-10	1-3 (many indiv)	Absent	Absent
S.austinii height(cm)	Na	0-10	na	Absent
S.fuscum hum type	Na	Absent	Absent	Absent

S.fuscum hum %	4-10	Absent	Absent	Absent
S.fuscum height(cm)	Na	Absent	Absent	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Absent	Absent	Tussocks	Tussocks
Trichophorum %	Absent	Absent	4-10	1-3 (many indiv)
S.magellanicum %	4-10	4-10	Absent	Absent
S.cuspidatum %	4-10	4-10	4-10	11-25
S.papillosum %	4-10	4-10	11-25	4-10
S.denticulatum %	Absent	Absent	Absent	Absent
S.capillifolium%	4-10	4-10	4-10	4-10
S.tenellum %	Na	1-3 (many indiv)	na	1-3 (many indiv)
S.subnitens %	Absent	Absent	Absent	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	4-10	4-10	4-10	4-10
N.ossifragum %	11-25	11-25	11-25	4-10
Sphag pools %	11-25	4-10	4-10	4-10
Dominant pool Sphag	S.cuspidatum	S.cuspidatum	S.cuspidatum	S.cuspidatum
Sphag lawns %	4-10	Absent	Absent	Absent
Sphag humm %	11-25	11-25	11-25	11-25
Sphag holl %	11-25	1-3 (many indiv)	11-25	4-10
Total Sphag %	34-50	34-50	34-50	34-50
Hummocks indicators	S.austinii&S.fuscum	S.austinii		Absent
Cladonia portent %	4-10	1-3 (many indiv)	Absent	Absent
Other Cladonia sp	Cladonia floerkeana			
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	4-10	11-25	11-25	26-33
Calluna height(cm)	21-30	21-30	31-40	31-40
Other NotableSpecies		M.trifoliata;D.anglica		
Other comment				Borderline SM/SC
Date	**08/03/2005**	**23/09/2011**	**08/03/2005**	**28/09/2011**

Ecotope type	**Sub-central**	**Sub-central**	**Central**	**Sub-central**
Complex Name	**9/6/3 p**	**9/7+P**	**4/14**	**4+P**
Quadrat Name	Qsc4	Qsc4	Qc4	Qsc5
Easting	195392	195391	195619	195618.
Northing	201375	201374	201303	201304
Firmness	Very soft	Very soft	Very soft	Soft
Burnt		No	old burn damage	No
Algae in hollows %	4-10	Absent	4-10	Absent
Algae in pools %	4-10	Absent	4-10	Absent
Bare peat %	1-3 (many indiv)	Absent	4-10	1-3 (many indiv)
High hummocks %	Na	26-33	na	11-25
Low hummocks %	4-10	11-25	4-10	4-10
Hollows %	11-25	4-10	Absent	Absent
Lawns %	Absent	Absent	4-10	Absent
Pools %	4-10	11-25	4-10	34-50
Pool type	Tear	Interconnecting	Tear	Tear
S.austinii hum type	Absent	Absent	na	Absent
S.austinii hum %	Absent	Absent	4-10	Absent
S.austinii height(cm)	Na	Absent	na	Absent
S.fuscum hum type	Absent	Absent	Absent	Absent
S.fuscum hum %	Absent	Absent	Absent	Absent
S.fuscum height(cm)	Absent	Absent	Absent	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Tussocks	Absent	Absent	Absent
Trichophorum %	1-3 (many indiv)	Absent	Absent	Absent
S.magellanicum %	4-10	Absent	4-10	4-10
S.cuspidatum %	4-10	11-25	4-10	26-33
S.papillosum %	11-25	11-25	4-10	4-10
S.denticulatum %	Absent	Absent	1-3 (many indiv)	Absent
S.capillifolium%	4-10	4-10	4-10	4-10
S.tenellum %	Na	4-10	na	1-3 (many indiv)
S.subnitens %	Absent	Absent	Absent	Absent

R.fusca %	Absent	Absent	Absent	Absent
R.alba %	Na	4-10	11-25	11-25
N.ossifragum %	4-10	1-3 (many indiv)	4-10	1-3 (many indiv)
Sphag pools %	11-25	11-25	4-10	34-50
Dominant pool Sphag	S.cuspidatum	S.cuspidatum	S.cuspidatum	S.cuspidatum
Sphag lawns %	Absent	Absent	4-10	Absent
Sphag humm %	4-10	34-50	4-10	11-25
Sphag holl %	4-10	4-10	Absent	Absent
Total Sphag %	34-50	51-75	26-33	51-75
Hummocks indicators		Absent	S.austinii	Absent
Cladonia portent %	1-3 (many indiv)	Absent	4-10	4-10
Other Cladonia sp				
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	4-10	11-25	11-25	11-25
Calluna height(cm)	31-40	31-40	31-40	31-40
Other NotableSpecies				M.trifoliata,D.anglica
Other comment	Stable	surrounding pools tear pools;area was mapped as burnt in 2005, C.panicea now absent	drier	borderline ectope,edge C ecotope (Previously Qc4)
Date	**08/03/2005**	**23/09/2011**	**08/03/2005**	**23/09/2011**

Appendix IV Survey maps

193700.000000 194600.000000 195500.000000

201800.000000 201200.000000 200600.000000

Sc6 Sc9 Qsc5 Sc15 Sc14 Sc5 Qsc4 Qsc1 Sc8 Sc9 Qsc5 C4 Sc6 C4 Sc6 Sc12 Qsc2 Sc7 Sc11 Z Sc1 Qc1 C1 Qc2 Y C2 Sc1 Sc2 X Sc10 Sc17 W Sc20 Sc3 Qsc3 Qc3 C3 Sc13 Sc19 Sc18 Sc4 Sc16 Y

598 2 37 Including 10 0 19 water

KILGASK DER

Lisduff House

510 3 32

193700.000000 194600.000000 195500.000000

Raised Bog Monitoring Survey 2011

Map 1: Ecotopes Map and Quadrats

Ecologic Environmental & Ecological Consultants Ltd.

Firville Bog SAC (000647)
Co. Tipperary

1:7,500

N

0 95 190 380 570 760 Meters

Legend

Ecotope type

- Central
- Sub-central
- Bog Woodland
- Woodland
- Active Flush
- Open water
- Sub-marginal
- Inactive Flush
- Marginal
- Face bank
- Quadrat
- SAC

Raised Bog Monitoring Survey 2011

Map 2: Vegetation community complexes

Ecologic Environmental & Ecological Consultants Ltd.

Firville Bog SAC (000647)
Co.Tipperary

N

1:7,500

0 105 210 420 630 840 Meters

Legend

Ecotope type

- Central ecotope complex
- Sub-central ecotope complex
- Sub-marginal ecotope complex
- Marginal ecotope complex
- Face bank ecotope complex
- Flush

Boundary type

- SC/C
- F/C
- SM/C
- M/C
- F/SC
- SM/SC
- M/SC
- FB/SC
- F/SM
- M/SM
- SM/FB
- F/M
- M/FB
- F/FB
- Other
- SAC

Raised Bog Monitoring Survey 2011

Map 3: Impacts (High Bog drainage; Turf cutting;Fire events)

Ecologic Environmental & Ecological Consultants Ltd.

Firville Bog SAC (000647)
Co.Tipperary

1:7,500

0 100 200 400 600 800 Meters

N

Legend

High Bog drainage

- Blocked:non-functional
- Blocked:reduced functional
- Not blocked:functional
- Not blocked:non-functional
- Not blocked:reduced functional
- Recently burnt
- Ecotopes
- SAC