Garriskil Bog (SAC 000679), Co. Westmeath

Executive Summary

This survey, carried out in September2011, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Garriskil 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 50.87ha (29.88%) of the high bog area. The highest quality example of Active Raised Bog consists of *Sphagnum* lawns, pools, hummocks and hollows. *Sphagnum* cover reaches 100% in certain locations. Active Raised Bog also includes an active peat forming flush.

Degraded Raised Bog covers 119.39ha (70.12%) 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. The habitat also includes an inactive flush.

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

Restoration works took place at the site in 1998. These included the blocking of high bog drains.

The current conservation objective for Garriskil 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 124.92ha. 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.

There has been a slight increase in the area of Active Raised Bog (5.75ha) at Garriskil Bog in the 2004/5 to 2011 period. Several new peat forming areas have developed at the sites as a result of rewetting processes associated with the blocking of drains. This has been particularly significant along the north-eastern section of the high bog. In addition, some of the sub-central and central ecotope sections have expanded. There are have also been some new peat forming areas described at the site, which are the result of a more comprehensive field mapping in 2011.

Cutover drainage and reduced functional high bog drains are the highest impacting activities at the site. Peat cutting no longer takes place at the site. Invasive species *Pinus sylvestris* and *Rhododendron ponticum* are found across many sections of the high bog. However, these are not deemed a major threat to high bog habitats.

Active Raised Bog has been given an overall **Unfavourable Bad-Improving** conservation status assessment. Habitat Area has slightly increased and quality improved in the reporting period. However, both are below favourable reference values. Future Prospects are considered Unfavourable Bad-Improving.

Degraded Raised Bog has been given an overall **Unfavourable Bad-Improving** assessment as there has been some restoration to Active Raised Bog.

Rhynchosporion depressions has been given an overall **Unfavourable Bad-Improving** conservation status assessment as there has been some restoration to Active Raised Bog and no further drying of the high bog.

The **overall raised bog** at **Garriskil SAC** has been given an **Unfavourable Bad-Improving** assessment**.**

A series of **recommendations** have been also given, these include: further restoration works (e.g. blocking of cutover drains); further hydrological and topographical studies to ascertain more accurate FRVs and further botanical surveys on the high bog to assess the efficiency of restoration works.

Site identification

SAC Site Code	679	6" Sheet:	WT: 6
Grid Reference:	E 23600/ N 267400	1:50,000 Sheet:	41
High Bog area (ha)[1]:	170.26ha		
Dates of Visit:	06 to 08/09/11		
Townlands:	Garriskil, Monagead, Hospitalbank, Derradd and Clonkeen		

Site location

Garriskil Bog is located approximately 2.5km north-east of Ballinalack, 1 km southeast of the village of Street and 1km west of Lough Derravaragh in Co. Westmeath. The River Inny runs to the southeast, the River Riffey to the south and southeast and the Dublin to Sligo railway runs to the north and is adjacent to the bog at the northwest. The site can be accessed from a bog road that runs to the north of the site. The road may be accessed from beside an old church close to the village of Street and later via several railway crossings that lead to grassland and cutover along the high bog.

Description of the survey

The survey was carried out in September 2011 and involved a vegetation survey of the high bog at Garriskil Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2004/5 by Fernandez *et al*. (2005). High bog vegetation was described and mapped, based on raised bog ecotope vegetation community complexes developed by Kelly and Schouten (2002). 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 2004, as a result of improvement on mapping accuracy; based on 2010 aerial photography.

The entire high bog of Garriskil Bog was re-surveyed. Sections mapped as sub-marginal, sub-central and central ecotope in 2004/5 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 2004/5 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.

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

This bog has been classified as a Ridge River C bog (morphological type) (Kelly *et al*., 1995) and as a Midland Raised Bog (Cross 1990). The bog is roughly shaped as a rhomboid that has the longest axis orientated northwest-southeast. There are small protrusions of high bog at each of the corners.

Ecological information

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

The following Raised Bog EU Annex I habitats, are found in Garriskil 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 Garriskil Bog is 50.87ha (29.88% of the high bog), which is a decrease of 20.4ha since 1994.

Active Raised Bog includes central and sub-central ecotope as well as active flushes.

Central ecotope was found in Garriskil Bog at five locations (**C1** to **C5**) and sub-central ecotope at ten locations (**Sc1** to **Sc10**) (see Appendix IV, Map 1). The highest quality Active Raised Bog sections consist of central ecotope (vegetation community complex 15) in a small depressed area featuring hummocks, lawns and pools (25-33%). The *Sphagnum* cover ranges from 75 to 90% and consists of *Sphagnum capillifolium* and *S. papillosum* hummocks, *S. magellanicum* hummocks and lawns, and *S. cuspidatum* pools. *Drosera anglica, Menyanthes trifoliata and Rhynchospora alba* are also found in these pools. Complex 35 is the most widespread central ecotope community complex at Garriskil Bog. *Sphagnum* cover is slightly lower (50-75%), with the pools featuring lower *Sphagnum* cover and consist of open water in places. Tall hummocks with robust *Calluna vulgaris* are found, as well as flats with abundant *Narthecium ossifragum*. Where these flats replace low *Sphagnum* hummocks the overall *Sphagnum* cover decreases (34-50%) and the vegetation is classified as sub-central ecotope (complex 6/35). Both complexes (35 and 6/35) have western raised bog type features such as *Racomitrium lanuginosum* and open water pools.

Complex 9/10 is the most widespread complex within sub-central ecotope and its micro-topography consists of tall and low *Sphagnum* hummocks and hollows. The overall *Sphagnum* cover ranges from 34 to 50%, but reaches 100% in places. Some sections that are dominated by this complex have re-wetted and *S. capillifolium, S. papillosum* and *S. magellanicum* dominate the hummocks layer, but *S. subnitens* and *S. austinii* are also found; *S. cuspidatum* is found within pools along with *Drosera anglica* and *Rhynchospora alba.*

One active peat forming flush is found to the northwest of the high bog. This flush consists of large *Sphagnum* lawns (*Sphagnum magellanicum*, *S. papillosum*) and pools (*S. cuspidatum*), as well as open water. *Eriophorum angustifolium* is abundant. The flush is located in a depression where water logging takes place.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Garriskil Bog is 119.39ha (70.12% of the high bog).

Degraded Raised Bog includes the sub-marginal, marginal and face bank ecotope and inactive flush. 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 and very occasionally pools. Pools mostly consist of open water and algae is frequently found within them. *Narthecium ossifragum* flats become more abundant. Complex 9/7 and 9/7/6 are the most widespread sub-marginal ecotope complexes at the site. The micro-topography consists of hummocks (*Sphagnum capillifolium*, *S. papillosum*, *S. tenellum*, *S. subnitens* and occasionally *S. austinii)* and hollows (*S. magellanicum* and *S. cuspidatum*). *Eriophorum vaginatum* and *Calluna vulgaris* characterise complex 9/7 and *Narthecium ossifragum* becomes more frequent in complex 9/7/6. When *N. ossifragum* is replaced by *Carex panicea* the complex is named 9/7/3.

Marginal ecotope is slightly drier than sub-marginal ecotope and mainly occurs as a narrow band near the margins of the high bog (slightly wider to the south). The micro-topography consists of *C. 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 *N. ossifragum, T. germanicum* and *C. vulgaris*.

Face bank ecotope is characterised by firm ground, tall *C. vulgaris*, poor *Sphagnum* cover and flat micro-topography. This ecotope is found at the edge of the high bog.

The high bog also features scattered *Rhododendron ponticum* bushes and *Pinus sylvestris* trees.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Garriskil 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 Garriskil 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 Garriskil 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	12.158km [1]	On HB	**7110/7120/7150**
J02.07	Drainage	M	-1	n/av	Adjacent to HB	**7110/7120/7150**
I01	Invasive alien species	L	-1	<0.5ha [3]	On HB	**7110/7120/7150**
A04	Grazing	L	-1	<0.5ha	On HB	**7110/7120/7150**
4.2	Restoring/Improving the hydrological regime	H	+1	11.949km [2]	On 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 reduced-functional drains (some of them blocked).

[2] This figure includes blocked drains on high bog.

[3] This figure is estimated and represents the extent of trees across entire high bog

n/a: not applicable, n/av: not available

Peat cutting

Peat cutting no longer takes place at Garriskil Bog. Fernandez *et al*. (2005) mentioned the absence of peat cutting during the 2004/5 survey and also the lack of cutting in 1995 as reported by Kelly *et al*.,

(1995). Therefore, although this activity has not taken place at the site for a long period it is estimated that 49% of the bog has been cutaway since the 1840s (Fernandez *et al*., 2005).

Nevertheless, old face banks and cutover drainage associated with cutting along the entire southern half of the site are likely to continue to cause negative impacts on the high bog habitats.

Drainage

High bog drainage

There have been no major changes in the status of high bog drains. Infilling has continued taking place and the high bog within the blocked drain complex bA to the northeast of the high bog is very wet and Active Raised Bog has expanded here.

Overall, the majority of drains on the high bog remain reduced functional (12.158km). These reduced functional drains are impacting the high bog habitats and will continue to do so until they become completely in-filled and therefore non-functional.

High bog drainage is considered to have medium importance/impact on high bog habitats.

Table 6.2 High bog drainage summary

Status	2004/5 (km) [1]	2011 (km)	Change
NB: functional	n/a	n/a	n/a
NB: reduced functional	0.209	0.209	0.000
NB: non- functional	0.200	0.200	0.000
B: functional	n/a	n/a	n/a
B: reduced functional	11.949	11.949	0.000
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 Garriskil Bog including any change in their functionality in the 2004/5 – 2011 reporting period (see Map 3).

Table 6.3 High bog drainage detail

Drain Name	Length (km)	2004/5 status	2011 status	Change	Comment
B	0.119	B: reduced functional	B: reduced functional	No	Infilling taking place
b2B	0.055	NB: reduced functional	NB: reduced functional	No	Infilling taking place
bA	11.83	B: reduced functional	B: reduced functional	No	Infilling taking place
bC	0.154	NB: reduced functional	NB: reduced functional	No	Infilling taking place
d1	0.036	NB: non-functional	NB: non- functional	No	
d2	0.04	NB: non-functional	NB: non- functional	No	
d3	0.124	NB: non-functional	NB: non- functional	No	

Bog margin drainage

The cutover areas were not surveyed for drains during 2011.

Cutover drains associated with former peat cutting are found along most of the high bog margin being absent only from the northern perimeter.

Kelly *et al.,* (1995) noted that a drain/stream to the west of the site had recently been deepened and re-dredged. Kelly *et al.,* (1995) also noted that the River Inny and River Riffy along the southern and south-eastern boundary of the site had been dredged and postulated that the subsidence in the south of the high bog could be linked to this activity. The southern side of the Inny River was dredged by the Office of Public Works (OPW) in 1996, who have a statutory obligation to maintain the channel (Site Conservation Plan). The river had previously been dredged in the 1950s. Whether or not this activity has taken place in the new 2004/5-2011 reporting period has not been confirmed.

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

Fire history

No evidence of fire events having taken place in 2004/5 – 2011 period were noted in the 2011 survey. Fernandez *et al*. (2005) mentioned that high bog has not been affected by burning since 1997.

Invasive species

Fernandez *et al*. (2005) mentioned a single large *Rhododendron ponticum* bush (2 m high) to the west of flush Z (GR 236113/267387) surrounded by numerous seedlings and small plants (100 < 1 m high) covering a large area (50 m^2). *Rhododendron ponticum* is obviously spreading in this area. This bush and numerous seedlings were already noted by Kelly *et al*., (1995). The new 2011 survey confirmed the spreading of *Rhododendron* (100 x 25m contains up to 100 plants and many seedlings).

Individual and groups of *Pinus* sp. trees are frequently found on the southern slopes of the high bog mainly in the marginal ecotope (Fernandez *et al*., 2005).

Invasive species are considered to have low intensity impact on high bog habitats.

Other impacting activities

Fernandez *et al*. (2005) noted that trampling was occurring on the north-western margin of the high bog around the swallow hole adjacent to flush Q stating that "The high bog is badly damaged around this area and there is extensive bare peat. Cattle are encroaching onto the bog from the adjacent grassland." Severe trampling was noted at this location by Kelly *et al*., (1995) and around the margin at other locations. This activity was again noticed during the 2011 survey with the trampling described as rather intensive but very much localized with the cattle not going very far on to the high bog.

Grazing (i.e. trampling) is considered to have a low intensity impact on high bog habitats.

Conservation activities

A Restoration Project was undertaken in 1998, which included the blocking of high bog drains: particularly drain complex bA to the northeast of high bog. Evidence of improvement including infilling were already noted by Fernandez *et al*. (2005). This trend has continued, as confirmed by the 2011 survey. Active Raised Bog has expanded within this drain complex. Therefore, the blocking of drains at the site should be recorded as a very positive action.

Fernandez *et al*. (2005) also noted that NPWS have bought out some turbary rights and ownership rights of various peat-cutting plots around the bog in the past few years.

Scrub has been removed by the NPWS from the cutover areas in several locations (e.g. northern cutover) in the site in recent years (ca. 2010).

High bog drain blocking is reported as a positive management action under Restoring/Improving the hydrological regime (4.2) within table 6.1.

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 a 5.75ha increase in the area of Active Raised Bog in the 2004/5-2011 reporting period.

Central ecotope has increased by approx. 0.25ha at **C4** (former C5) to the northwest of the high bog, associated with re-wetting processes (see Map 1). Former C4 has been re-allocated to sub-central

ecotope as a result of reinterpretation of the vegetation rather than an actual change. This area (complex 6/35) currently located within the northern section of **Sc1** features large open water pools with no *Sphagnum* cover, but with *S. papillosum* and *S. magellanicum* hummocks at the edges of the pools. *Narthecium ossifragum* dominates the inter-pools areas.

The new ecotope map shows considerable changes in the sub-central ecotope. Although many of these changes are the result of a more comprehensive surveying and accurate mapping, actual changes have taken place in many other sub-central sections. The latter are the result of rewetting processes associated with the blocking of drains (see table 8.1 for more detail). Thus, sub-central has expanded due to rewetting at **Sc1** (former Sc8 section: by 1ha approx.); **Sc3** (former Sc6, Sc7&Sc11: 2.5ha approx.); **Sc5** (1ha approx.).

Rewetting and subsequent expansion of sub-central ecotope has also taken place at **Sc9** (0.5ha) and **Sc2** (former Sc2&Sc3; 0.5ha approx.). **Sc9** now stretches further into the high bog edge and some sort of water flow pattern towards this section from the surrounding high bog was noted during the 2011 survey. **Sc2** is expanding towards the east where central **C4** is located and this section of high bog is getting wetter as the presence of open water pools within **FU** illustrates. Whether this improving trend will continue or not in the future is uncertain due to the presence of a nearby swallow hole (flush to west), as sudden habitat losses could take place associated with this feature.

FU is slightly smaller than mapped in 2004. This is the result of a more comprehensive survey and therefore an improved vegetation map.

Some scattered patches of sub-central ecotope (too small to be mapped) were also recorded in 2011 (sub-central ecotope dots illustrate their location in Map 2). In the particular case of those located in the south-eastern section of high bog, they follow a linear pattern indicating some sort of water flow towards the southeast cutover.

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, Active Raised Bog Area FRV is 124.92ha (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 habitat Area value (50.87ha) is 59.28% below the FRV. A current habitat Area value 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.

A long term (1994/5-2011) trend indicates a reduction in the area of Active Raised Bog at the site (20.36ha) (see table 8.1). A more recent and short term trend analysis (7 years; 2004/5-2011) gives a more optimistic result with a 5.75ha increase of its area. Therefore, the habitat Area is given an **Increasing** trend assessment.

The Area of Active Raised Bog at Garriskil Bog is assessed as Unfavourable Bad-Increasing (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 25.44ha (half of 50.87ha, the current area of Active Raised Bog). The current value is 14.65ha which is 42.41% 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 area of central ecotope at the site (29.64ha) (see table 8.1). A more recent and short term trend analysis (7 years; 2004/5-2011) shows a slight increase (0.25ha). Therefore, S&Fs are given an **Improving** trend assessment.

Quadrats analysis (**Qc1** to **Qc5, Qsc1**to **Qsc6**) indicates the following:

Qc1: a slight variation of quadrat data: algae pools & hollows, bare peat, *Trichophorum germanicum* and *Sphagnum denticulatum* are now absent; *Sphagnum* hollows are now absent (these may have been classed as pools in 2011); a slight decrease in lawns and hollows cover, *Rhynchospora alba* and *Cladonia portentosa* cover; a slight increase in pools and *Sphagnum* pools cover, *Sphagnum cuspidatum, S. capillifolium* and overall *Sphagnum* cover. Quadrat Qc1 was classified as complex 15 in 2004, whereas it is deemed to correspond with complex 35 in 2011. This is the result of observer variation. The increase in overall *Sphagnum* cover and *Sphagnum* pools, as well as *S. cuspidatum* within pools within the quadrat indicates some re-wetting within this section of **C3**.

Qc2: a slight variation of quadrat data: algae pools & hollows now absent; a slight increase in hummocks, *Sphagnum* hummocks & lawns cover; a slight decrease in hollows, pools and *Sphagnum* pools cover as well as in *Sphagnum austinii*, *S. magellanicum, S. cuspidatum, Rhynchospora alba, Trichophorum germanicum* and *Cladonia portentosa* cover; *S. denticulatum* is now absent; *S. papillosum* now dominates the pools; an increase in overall *Sphagnum* cover.

Qc3: a slight variation of quadrat data: algae in pools and *Sphagnum subnitens* are now absent; a slight increase in pools and *Sphagnum* pools cover as well as *Sphagnum cuspidatum* cover; a slight

decrease in *Sphagnum fuscum, Narthecium ossifragum* and *Cladonia portentosa* cover; *Trichophorum germanicum* and *Sphagnum papillosum* are now present.

Qc4: a slight variation of quadrat data: algae in pools now absent; a slight decrease in hollows cover as well as *Narthecium ossifragum* cover; a slight increase in pools and *Sphagnum* pools cover; *Sphagnum* hollows are now absent (these may have been classed as pools in 2011). Quadrat Qc4 was classified as complex 15 in 2004, whereas it is deemed to correspond with complex 35 in 2011. This is the result of vegetation interpretation.

Qc5: a slight variation of quadrat data: Sphagnum fuscum, S. papillosum, *Trichophorum germanicum* are now present; a slight decrease in *S. cuspidatum*, *Rhynchospora alba*, *Narthecium ossifragum* and *Cladonia portentosa* cover; *S. magellanicum* now dominates the pools instead of *S. cuspidatum*; a slight increase in *Sphagnum* lawns& hummocks cover.

Qsc1: a slight variation of quadrat data: a slight decrease in pools and *Sphagnum* pools cover as well as in *Trichophorum germanicum* cover; *Sphagnum magellanicum* and *Sphagnum* hollows are now absent. Quadrat Qsc1 was classified as complex 9/7/6 + P in 2004, whereas it is deemed to correspond with complex 6/35 in 2011. This is the result of observer variation.

Qsc2: a slight variation of quadrat data: algae in pools and *Sphagnum fuscum* are now absent; a slight decrease in hummocks cover, pools and *Sphagnum* pools cover as well as in *S. magellanicum* and *Cladonia portentosa* cover; *Trichophorum germanicum* and *S. papillosum* are now present. Quadrat Qsc2 was classified as complex 6/4/35 in 2004, whereas it is deemed to correspond with complex 6/35 in 2011. This is likely to be the result of observer variation. However, *Rhynchospora alba* cover data for the 2004/5 quadrat is not available to compare to the 2011 data in order to assess any variation in its cover.

Qsc3: a slight variation of quadrat data: a slight increase in hollows cover but *Sphagnum* hollows are now absent; a slight decrease in *Sphagnum* lawns and pools cover as well as *Trichophorum germanicum, Sphagnum magellanicum* and *Rhynchospora alba* cover; *Leucobryum glaucum* is now absent; a slight increase in *Sphagnum* hummocks and overall *Sphagnum* cover.

Qsc4: a slight variation of quadrat data: pools and *Sphagnum* pools & hollows now absent, *Sphagnum austinii* (but recorded adjacent to quadrat) also absent*; S. papillosum* now present; a slight increase in *Sphagnum* lawns cover (these may have been classed as pools and/or hollows in 2004/5); a slight decrease in *Cladonia portentosa* cover.

Qsc5: a slight variation of quadrat data: *Sphagnum austinii, Trichophorum germanicum* now absent; a slight decrease in *Narthecium ossifragum* and *Cladonia portentosa* cover.

Qsc6: this quadrat was previously classified as sub-marginal ecotope (Qsm1; complex 9/7). Slight variation of quadrat data: a slight decrease in hollows cover as well as *Sphagnum magellanicum* and *Cladonia portentosa* cover; *Sphagnum* hollows are now absent; *S. papillosum* now present; a slight increase in *Narthecium ossifragum* cover; higher overall *Sphagnum* cover (11-25% in 2004/5 to 34-50 in 2011). This increase in *Sphagnum* cover indicates that this area may be getting wetter and thus the expansion of sub-central ecotope within **Sc9**.

Slight changes have taken place within above quadrats (see Appendix III). However, some of the changes noted may be also the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than actual changes.

Typical good quality indicators and typical plant species are still found in sub-central and central ecotopes throughout the entire bog.

The Structure & Functions of Active Raised Bog at Garriskil Bog are assessed as Unfavourable Bad-Improving (see table 8.5).

Future Prospects

Restoration works undertaken at the site have had a positive effect on the habitat as the expansion of sub-central ecotope indicates.

Habitat **Area** is currently 59.28% below FRV (see table 8.4) and an Increasing trend is expected in the following two reporting periods (12 years), as a result of the positive effects of restoration works, despite some impacting activities (both high bog and cutover drainage) still having negative influence on the high bog habitats (see table 6.1). Nevertheless the habitat Area is expected to remain more than 15% below FRV. Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad-Increasing**. Habitat's **S&Fs** are currently 42.41% below FRV (see table 8.4). An Improving trend is also foreseen, but the **S&Fs** are expected to be more than 25% below FRV in the following two reporting periods. Thus **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Improving**. **The overall habitat's Future Prospects are Unfavourable Bad-Improving** (see table 8.5). Blocking of remaining cutover functional drains is recommended. Cutover areas should be considered for restoration of the habitat in order to achieve FRVs.

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

Table 8.1 Changes in Active Raised Bog area

Active Ecotopes	**1994/5** [1]	**2004/5** [2]	**2004/5 (amended)**	**2011**	**Change (2004/5-2011)**	
	Area (ha)	**Area (ha)**	**Area (ha)**	**Area (ha)**	**Area (ha)**	**%**
Central	43.76	13.28	14.04	14.29	(+)0.25	(+)1.78
Sub-central	26.94	26.77	30.72	36.22	(+)5.50	(+)17.90
Active flush	0.53	0.53	0.36	0.36	0.00	0.00
Total	**71.23**	**40.58**	**45.12**	**50.87**	**(+)5.75**	**(+)12.74**

[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] 2004/5 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 2004/5 figures and 2004/5 amended figures. The latter shows the ecotope area believed to be present in 2004/5 after surveying improvements in 2011. The comparison between 2004/5 (amended) and 2011 illustrates the actual changes in ecotope area in the 2004-2011 period. Any change in ecotope area between the 2004/5 and the 2004/5 (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	Qc2,Qc5	Stable (possibly expanding?)	Slight changes as a result of more comprehensive surveying in 2011 which resulted in more accurate mapping.	**Qc2:** algae pools & hollows now absent; slight increase in hummocks, *Sphagnum* hummocks& lawns cover; slight decrease in hollows, pools and *Sphagnum* pools cover, *Sphagnum austinii*, *S. magellanicum*, *S. cuspidatum*, *Rhynchospora alba*, *Trichophorum germanicum*, *Cladonia portentosa* cover; *S. denticulatum* now absent; *S. papillosum* now dominate the pools; increase in overall

				Sphagnum cover. **Qc5:** *Sphagnum fuscum, S. papillosum, Trichophorum germanicum* now present; slight decrease in *S. cuspidatum*, *Rhynchospora alba, Narthecium ossifragum, Cladonia portentosa* cover; *S. magellanicum* now dominates the pools instead of *S. cuspidatum*; slight increase in *Sphagnum* lawns& hummocks cover
C2	Qc3	Stable	Slight changes as a result of more comprehensive surveying in 2011 which resulted in more accurate mapping.	**Qc3:** algae in pools and *Sphagnum subnitens* now absent; slight increase in pools and *Sphagnum* pools cover, *Sphagnum cuspidatum* cover; slight decrease in *Sphagnum fuscum, Narthecium ossifragum, Cladonia portentosa* cover; *Trichophorum germanicum* and *Sphagnum papillosum* now present.
C3	Qc1,Qc4	Stable	C3 is much larger than depicted in 2004. The western section of former C2 is now considered to be part of C3. This is the result of more comprehensive surveying in 2011 which resulted in more accurate mapping. Some changes also due to re-allocation of previously mapped sub-central vegetation to central ecotope.	**Qc1:** algae pools & hollows, bare peat, *Trichophorum germanicum, Sphagnum denticulatum* now absent; *Sphagnum* hollows now absent (this may have been identified as pools in 2011); slight decrease in lawns and hollows cover, *Rhynchospora alba* cover; slight increase in pools and *Sphagnum* pools cover, *Sphagnum cuspidatum, S. capillifolium, Cladonia*

				portentosa cover, overall *Sphagnum* cover. **Qc4:** slight decrease in hollows cover, *Narthecium ossifragum* cover; slight increase in pools and *Sphagnum* pools cover; *Sphagnum* hollows now absent (these may have been classed as pools in 2011).
C4	None	Increasing	C4 corresponds with the former (2004/5 C5). Central ecotope has expanded in this location. A much larger Sc2 and wetter FU also indicate this trend.	
C5	None	Stable	This specific area was not surveyed in 2004. Thus any ecotope map changes here are due to more comprehensive surveying in 2011, which resulted in more accurate mapping.	
Sc1	Qsc1,Qsc2,Qsc3	Increasing	This sub-central ecotope section was formerly three separated areas (Sc1, Sc4&Sc8) and currently consists of a much larger sub-central ecotope section. The 2011 survey shows that these areas are now connected. Thus any ecotope map changes here are due to more comprehensive surveying in 2011, which resulted in more accurate mapping. But in the case of Sc8 rewetting is taking place associated with blocking of	**Qsc1:** slight decrease in pools and *Sphagnum* pools cover, *Trichophorum germanicum* cover; *Sphagnum magellanicum, Sphagnum* hollows now absent. **Qsc2:** algae in pools and *Sphagnum fuscum* now absent; slight decrease in hummocks cover, pools and *Sphagnum* pools cover, *S. magellanicum, Cladonia portentosa* cover; *Trichophorum germanicum* and *S. papillosum* now present.

			drains and therefore sub-central has expanded in this location.	**Qsc3:** slight increase in hollows cover but *Sphagnum* hollows now absent; slight decrease in *Sphagnum* lawns and pools cover, *Trichophorum germanicum*, *Sphagnum magellanicum*, *Rhynchospora alba* cover; *Leucobryum glaucum* now absent; slight increase in *Sphagnum* hummocks and overall *Sphagnum* cover.
Sc2	None	Increasing	Sc2 was previously (2004) two separate sub-central ecotope sections (Sc2&Sc3). Sc2 has expanded and joined Sc3. Adjacent central ecotope C4 has also expanded and FU is wetter than described in 2004.	
Sc3	Qsc5	Increasing	This sub-central ecotope section was formerly three separated areas (Sc6, Sc7&Sc11) and currently consists of a much larger sub-central ecotope section. Active peat forming vegetation has expanded as a result of re-wetting associated with the blocking of drains.	**Qsc5:** *Sphagnum austinii*, *Trichophorum germanicum* now absent; slight decrease in *Narthecium ossifragum* and *Cladonia portentosa* cover.
Sc4	None	Unknown, possibly improving	This specific area was not surveyed in 2004. Thus any ecotope map changes here are due to more accurate mapping in the 2011 survey, which, has resulted in an improved ecotope map. This area although not comprehensively surveyed in	

			2004/5 was described as very wet.	
Sc5	None	Increasing	This sub-central ecotope section has expanded as a result of re-wetting associated with the blocking of drains.	
Sc6	None	Unknown	This specific area was not surveyed in 2004. Thus any ecotope map changes here are due to more accurate mapping in the 2011 survey, which, has resulted in an improved ecotope map.	
Sc7	None	Unknown	This specific area was not surveyed in 2004. Thus any ecotope map changes here are due to more accurate mapping in the 2011 survey, which, has resulted in an improved ecotope map.	
Sc8	None	Unknown	This specific area was not surveyed in 2004. Thus any ecotope map changes here are due to more accurate mapping in the 2011 survey, which, has resulted in an improved ecotope map.	
Sc9	Qsc4,Qsc6	Increasing	This sub-central ecotope section has expanded as a result of re-wetting.	**Qsc4:** pools and *Sphagnum* pools & hollows now absent, *Sphagnum austinii* (but recorded adjacent to quadrat) also absent; *S. papillosum* now present; slight increase in *Sphagnum* lawns cover (these may have been classed as pools and/or hollows in

				2004/5); slight decrease in *Cladonia portentosa* cover. **Qsc6 (former Qsm1):** Slight variation of quadrat data: slight decrease in hollows cover, *Sphagnum magellanicum*, *Cladonia portentosa* cover; *Sphagnum* hollows now absent; *S. papillosum* now present; slight increase in *Narthecium ossifragum* cover; higher overall *Sphagnum* cover.
Sc10	None	Stable	Sc10 now consists of two separated sub-central ecotope patches. This is likely to be the result of more comprehensive surveying in 2011, which resulted in more accurate mapping.	
FU	None	Re-wetting	FU is smaller than depicted in 2004. The southern section is now considered to be part of Sc2. This is due to re-allocation of previously mapped active flush vegetation to sub-central ecotope. In addition some changes are due to a more comprehensive surveying in 2011 which resulted in more accurate mapping. This flush is completely waterlogged which may indicate that is getting wetter. The expansion of adjacent central and sub-central areas also indicates this trend.	

Degraded Raised Bog (7120)

Area

The Degraded Raised Bog FRV for area is 45.34ha at Garriskil Bog. This value corresponds with the difference between the current high bog area (170.26ha) and Active Raised Bog FRV (124.92ha) for area. Degraded Raised Bog is a particular habitat type, for which a 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 163.32% 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 a decrease (5.75ha) in the area of Degraded Raised Bog as a result of development of Active Raised Bog (i.e. expansion of sub-central ecotope). Therefore, the habitat is given a **Decreasing** trend, which should be taken as a positive development.

The Area of Degraded Raised Bog at Garriskil Bog is assessed as Unfavourable Bad-Decreasing (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 29.85ha (25% of 119.39ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (37.1ha) is 24.30% 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 between 5 and 25% above FRV falls into the **Unfavourable Inadequate** 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).Table 8.3 shows no change in their area. Thus, the DRB's S&Fs at Garriskil Bog are given a **Stable** trend.

The mapping of boundary between marginal and sub marginal is difficult and increases or decreases are only recorded where major changes in the vegetation are evident. Therefore, where no changes are shown, more subtle positive effects in the particular case of Garriskil Bog cannot be ruled out. Furthermore, sub-marginal ecotope has decreased as a result of the expansion of sub-central ecotope associated with re-wetting processes. This indicates that the high bog is overall re-wetting and although this trend is not illustrated by any change in marginal or face bank ecotopes,

it is also likely to be affecting the habitat's S&Fs. Thus, an Improving trend in the reporting period cannot be ruled out.

Quadrat analysis (**Qsm2**) indicates the following:

Qsm2: slight variation of quadrat data: algae in pools and *Sphagnum* pools& hummocks are now absent, *Leucobryum glaucum* is now absent; slight increase in hummocks and hollows cover as well as *Narthecium ossifragum* cover; pools are now absent; *S. austinii* and *S. papillosum are* now present; slight decrease in *Trichophorum germanicum, S. magellanicum* and *Rhynchospora alba* cover as well as in *Sphagnum* hollows cover.

The lack of precision in relocating of the quadrat may justify certain differences in the vegetation described.

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

Future Prospects

Impacting activities such as high bog and cutover drainage continue to negatively impact the habitat. However, overall, restoration works are having a positive effect on the habitat and are expected to continue in the following two reporting periods (12 years). Nevertheless, further restoration works are required to the habitat to achieve FRVs.

Habitat **Area** is currently 163.32% above FRV (see table 8.4) and a Decreasing trend is expected in the following two reporting periods (12 years), as a result of expansion of Active Raised Bog associated with restoration works. Nevertheless, habitat Area is expected to remain more than 15% above FRV. Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad-Decreasing**. Habitat's **S&Fs** are currently 24.30% above FRV (see table 8.4). Although an Improving trend is foreseen in the following two reporting periods, **S&Fs** are expected to remain between 5 and 25% above FRV. Thus, habitat's **S&Fs Future Prospects** are assessed as **Unfavourable Inadequate-Improving**.

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

Table 8.3 Changes in Degraded Raised Bog area

Inactive Ecotopes	1994/5 [1]	2004/5 [2]	2004/5 (amended)	2011	Change (2004/5-2011)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Sub-marginal	53.69	85.24	87.88	82.13	(-)5.75	(-)6.54
Marginal	44.67	41.75	34.57	34.57	0.00	0.00
Face bank	na	2.53	2.53	2.53	0.00	0.00
Inactive flush	1.60	0.16	0.16	0.16[3]	0.00	0.00
Total	**99.96**	**129.68**	**125.14**	**119.39**	**(-)5.75**	**(-)4.59**

[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] 2004/5 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.

[3] Flush U corresponds with a swallow hole.

Note: Table 8.1 includes 2004/5 figures and 2004/5 amended figures. The latter shows the ecotope area believed to be present in 2004/5 after surveying improvements in 2011. The comparison between 2004/5 (amended) and 2011 illustrates the actual changes in ecotope area in the 2004/5-2011 period. Any change in ecotope area between the 2004/5 and the 2004/5 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2011.

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

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. The area of both central and sub-central ecotopes has increased in the reporting period. As result habitat Area is given an **Increasing** 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. Restoration works are likely to continue to positively affect the habitat in the future despite the occurrence of certain activities (e.g. high bog and cutover drainage) still negatively impacting the associated habitats (i.e. Active and Degraded Raised Bog). Therefore, the habitat's Area Future Prospects are given an **Unfavourable Bad-Increasing** 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-Improving** 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-Improving** assessment.

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

The conservation status of depressions on peat substrates of the Rhynchosporion at Garriskil Bog is assessed as Unfavourable Bad-Improving (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 2011 Target (ha) [3]	2011 value (ha) [4]	% above target
7110	124.92	50.87	59.28	25.44	14.65	42.41

[1] 1992 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	45.34	119.39	163.32	29.85	37.1	24.30

[5] 1992 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–Improving.**
- **Degraded Raised Bog is assessed as being Unfavourable Bad–Improving.**
- **Rhynchosporion depressions is assessed as being Unfavourable Bad–Improving**

Table 8.5 Habitats conservation status assessments

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

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 be continuing to drain the high bog.
- Only reduced functional drains remain on the high bog, including those blocked. These are, and will continue to be, still considered to have some negative influence on the high bog habitats until they become completely in-filled. Overall the high bog drains have continued infilling.
- Cutover drainage associated with former peat cutting continues having some negative influence on high bog vegetation. Maintenance work on adjacent stream and rivers Inny and Riffy along the southern and south-eastern boundary took place in the past (1990's). Whether or not this activity had taken place in the new 2005-2011 reporting period has not been confirmed.
- No fire events have damaged the high bog in the reporting period.
- *Pinus sylvestris* and *Rhododendron ponticum* are found in several locations on the high bog. *Rhododendron ponticum* seems to have continued spreading. Nevertheless invasive species are not considered a major threat to high bog habitats.
- Trampling was reported in 2011 near the swallow hole within flush Q. This activity was already reported by Kelly *et al*. (1995) and is considered to have low importance/impact.

Changes in active peat forming areas

- The new ecotope map (Map 1) shows many changes on the distribution of Active Raised Bog. Some are due to the expansion associated with re-wetting after the blocking of drains: former Sc6, Sc7&Sc11 are now part of one larger sub-central section (**Sc3**); former Sc8 has expanded and is now part of **Sc1**; re-wetting has also taken place within former Sc2 and Sc3 and these are now are part of a slightly larger section (**Sc2**). **Sc9** and **Sc5** have also expanded. The latter also associated with drainage blocking. Expansion of central ecotope has also taken place along the north-west of the high bog within **C4**. Adjacent flush **FU** is characterised by the abundance of open water pools and this confirms the re-wetting trend within this section.

Other changes

- The new ecotope map (Map 1) shows some other changes:
- New active peat forming areas not recorded in the previous 2004/5 survey which are the result of a more comprehensive surveying in 2011 rather than changes on high bog vegetation: **C5**, **Sc4** (although possibly also expanding), **Sc6**, **Sc7**, **Sc8** and **Sc10** (now two separate sections).
- Map 2 also shows some scattered sub-central ecotope dots on the south-eastern section of high bog, they follow a linear pattern indicating some sort of water flow towards the south-east cutover.

Quadrats analysis

- Quadrat analysis shows slight changes in many of the quadrats. Some of these changes confirm the re-wetting and expansion of active peat forming areas such as at quadrats Qsc6 within Sc9; Qc1 &Qc4 within C3 (see Appendix III).
- Although high accuracy GPS equipment was used during the 2004/5 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

- Restoration works (blocking of high bog drains) was undertaken in 1998. Infilling processes have continued since in the blocked drains and rewetting has triggered the expansion of Active Raised Bog at several sections: **Sc1**, **Sc2**, **Sc3**, **Sc5** and **Sc9**.

Summary of conservation status

- **Active Raised Bog** has been given an overall **Unfavourable Bad-Improving** conservation status at Garriskil Bog. Habitat Area has slightly increased and quality (S&Fs) improved in the reporting period. However both values are below the FRVs. Future Prospects are considered Unfavourable Bad-Improving as positive effects of restoration works are expected to continue in the future.
- **Degraded Raised Bog** has been given an overall **Unfavourable Bad-Improving** conservation status at Garriskil Bog. Habitat Area has slightly decreased due to an increase of Active Raised Bog. Although quality (S&Fs) has been given a Stable trend, it cannot be ruled out improvements on this habitat's attribute in the reporting period as the expansion on Active Raised Bog indicates re-wetting processes within the site. Both 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-Improving due to the restoration of degraded areas to active peat forming communities, which is also expected to continue.

- **Depressions on peat substrates of the Rhynchosporion** has been given an overall **Unfavourable Bad-Improving** conservation status at Garriskil Bog. Habitat Area and quality (S&Fs) are considered to have increased and improved in the reporting period. Future Prospects are considered Unfavourable Bad-Improving.

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

Recommendations

- **Further restoration works** including the blocking of functional cutover drains, which are mostly found along the south and south-east cutover.
- **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** on the high bog in order to assess the effectiveness of restoration works.

References

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Appendix I Detailed vegetation description of the high bog

Active Raised Bog (7110)

Central Ecotope Complexes

COMPLEX 15

- **Location:** this complex cover s small section within **C4**, to northwest of high bog (south of **FU**)
- **Ground**: quaking
- **Physical indicators**: absent
- ***Calluna* height**: <30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: depression
- **Pools**: interconnecting pools (25-33%)
- ***Sphagnum* cover**: 75-90%
- ***Narthecium* cover**: <4%
- **Micro-topography**: high hummocks and low hummocks/*Sphagnum* lawns/ pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: likely to be expanding
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%), *Narthecium ossifragum* (<4%), *Rhynchospora alba* (4-10%), *Andromeda polifolia* (<1%), *Menyanthes trifoliate* (<1%), *Drosera rotundifolia* (<1%), *D. anglica* (<1%), *Sphagnum capillifolium* (Hummocks (H); 4-10%), *S. papillosum* (H; 4-10%), *S. magellanicum* (H& Lawns (L); 11-25%), *S. cuspidatum* (Pools (P); 26-33%).
- **Additional comments**: **C4** also consists of vegetation community complex 35

COMPLEX 35

- **Location**: this complex dominates **C1, C2, C3** and **C5**, but is also fund within **C**4
- **Ground**: soft to quaking
- **Physical indicators**: absent
- ***Calluna* height**: <20cm
- ***Cladonia* cover**: <4%

- **Macro-topography**: flat
- **Pools**: interconnecting pools (11-15%)
- ***Sphagnum* cover**: 50-75%
- ***Narthecium* cover**: 4-10%
- **Micro-topography**: *Calluna vulgaris* hummocks/high hummocks and low hummocks/*Sphagnum* lawns/ pools/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (25-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%), *Narthecium ossifragum* (4-10%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Menyanthes trifoliate* (<1%), *Drosera rotundifolia* (<1%), *D. anglica* (<1%), *Racomitrium lanuginosum* (<4%), *Aulacomnium palustre* (<4%), *Sphagnum capillifolium* (H; 26-33%), *S. papillosum* (H & P; 11-25%), *S. magellanicum* (H& L; 11-25%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. fuscum* (H; <1%), *S. austinii* (H; <1%), *S. cuspidatum* (Hollows (Hl)&P; 4-10%).
- **Additional comments**: where *Narthecium ossifragum* flats replace low hummocks in the inter-pool area the vegetation becomes sub-central ecotope (complex 6/35); the *Sphagnum* cover also decreases here.

  This complex is found at **C5**. Large *Sphagnum cuspidatum* pools are found at this location and dominate the vegetation. *S. magellanicum* lawns are also present along with *S. papillosum* at the edges of the pools. *Menyanthes trifoliate* and *Rhynchospora alba* are also very common.

Quadrats **Qc1, Qc2, Qc3, Qc4** and **Qc5** were recorded within this complex at **C1, C2** and **C2**.

Sub-Central Ecotope Complexes

COMPLEX 9/10

- **Location:** this complex dominates **Sc2, Sc3, Sc4, Sc5, Sc7, Sc8 Sc9** and **Sc10**
- **Ground:** soft
- **Physical indicators:** absent
- ***Calluna* height:** 30-40cm
- ***Cladonia* cover:** 4-10%
- **Macro-topography:** flat
- **Pools:** absent, apart from where peat has been excavated to build dams
- ***Sphagnum* cover:** 34-50%

- ***Narthecium* cover:** <4%
- **Micro-topography:** tall and low hummocks/hollows
- **Tussocks:** *Eriophorum vaginatum* (11-25%), *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** evidence of regeneration after drainage blocking
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (4-10%), *Narthecium ossifragum* (<4%), *Trichophorum germanicum* (<4%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; 11-25%), *S. magellanicum* (H; 4-10%), *S. subnitens* (H;<4%), *S. austinii* (H;<1%), *S. cuspidatum* (Hl;<4%), *Vaccinium oxycoccos* (<1%).
- **Additional comments:** sub-central ecotope at Sc8 although mainly consists of sub-central ecotope (9/10) it also contains sub-marginal ecotope patches complexes 9/7/6 and 9/7. However, other sections (northeast of Sc1) contain higher *Sphagnum* cover (up to 75%) (GR 267567/236352). This complex become very patchy at Sc10; here sub-marginal vegetation complexes 9/7 and 9/7/6 are also found. Sc10 is located on a depression on the ground and has elongated shape, which is likely to indicated some sort of water running towards southeast of the high bog.

  A "new" small sub-central ecotope section (Sc8) was recorded (GR 235430/267868); this specific area was not surveyed previously; some evidences of water flow were noted.

  This complex is also found surrounding C4, within Sc2, and adjacent active flush. *Sphagnum magellanicum* becomes dominant at this location along with *Eriophorum vaginatum*. Interconnecting pools are also found (<10%). Pools contain high *S. cuspidatum* cover (91-100%), *Drosera anglica* and *Rhynchospora alba*. The overall *Sphagnum* cover is high (91-100%).

Quadrats **Qsc4, Qsc5** and **Qsc6** (previously mapped as Qsm1 (2004)) were recorded within this complex at Sc3 and Sc9.

COMPLEX 6/35

- **Location**: located to the southeast of **C3** within **Sc1**
- **Ground**: very soft to quaking near pools
- **Physical indicators**: absent
- ***Calluna* height**: 20-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: flat
- **Pools**: interconnecting (11-25%)
- ***Sphagnum* cover**: 34-50%

- ***Narthecium* cover**: 26-33%
- **Micro-topography**: tall and low hummocks/ *Narthecium ossifragum* flats/pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (26-33%), *Rhynchospora alba* (4-10%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *D. anglica* (<4%), *Menyanthes trifoliate* (<1%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; 11-25%), *S. magellanicum* (H; 11-25%), *S. subnitens* (H;<4%), *S. austinii* (H;<1%), *S. fuscum* (H;<1%), *S. cuspidatum* (P;<4%), *Racomitrium lanuginosum* (<1%), *Leucobryum glaucum* (<1%).
- **Additional comments:** some of the pools consist mainly of open water

Quadrats **Qsc1, Qsc2** and **Qsc3** were recorded within this complex at **Sc1**.

Active Flushes

FLUSH U (FU)

- **Location**: northwest
- **Ground**: very soft to quaking
- **Physical indicators**: absent
- ***Calluna* height**: 30cm
- ***Cladonia* cover**: absent
- **Macro-topography**: depression
- **Pools**: interconnecting pools and open water
- ***Sphagnum* cover**: 76-90%
- ***Narthecium* cover**: <5%
- **Micro- topography**: lawns and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: likely to be getting wetter
- **Species cover**: *Calluna vulgaris* (<4%), *Erica tetralix* (<4%), *Eriophorum angustifolium* (26-33%), *E. vaginatum* (4-10%), *Sphagnum magellanicum* (L; 34-50%), *S. papillosum* (H; 11-25%), *S. cuspidatum* (P; 11-25%).
- **Additional comments**: this flush is adjacent to C5 and open water pools are very common (photo 102-0438). The area is completely waterlogged; lots of rain was noted in the days prior and during survey.

Degraded Raised Bog (7120)

Sub-Marginal Ecotope Complexes

COMPLEX 6+P

- **Location**: this complex is found surrounding **Sc1**
- **Ground**: soft
- **Physical indicators**: algae in pools
- ***Calluna* height**: 30-40cm
- ***Cladonia* cover**: 1-4%
- **Macro-topography**: flat
- **Pools**: regular and interconnecting (4-10%)
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 34-50%
- **Micro-topography**: low hummocks/*Narthecium ossifragum* flats/pools
- **Tussocks**: *Eriophorum vaginatum* (4-10%), *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: none
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (34-50%), *Trichophorum germanicum* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. austinii* (H;<4%), *S. cuspidatum* (P; <4%), *Racomitrium lanuginosum* (<1%), *Leucobryum glaucum* (<1%), *Vaccinium oxycoccos* (<1%).
- **Additional comments:** some of the pools consist mainly of open water

COMPLEX 9/7

- **Location**: this complex is found across the entire sub-marginal ecotope but on the southwest high bog
- **Ground**: firm to soft
- **Physical indicators**: absent
- ***Calluna* height**: 30-40cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: gentle slope
- **Pools**: absent

- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: <4%
- **Micro-topography**: *Calluna vulgaris* hummocks/low hummocks/hollows
- **Tussocks**: *Eriophorum vaginatum* (4-10%)
- **Degradation or regeneration evidence**: none
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. austinii* (H;<4%).
- **Additional comments:** none

COMPLEX 9/7/6

- **Location**: this is the most widespread sub-marginal ecotope complex on the high bog, thus it is found across the entire high bog
- **Ground**: firm to soft
- **Physical indicators**: absent
- ***Calluna* height**: <40cm
- ***Cladonia* cover**: 34-50%
- **Macro-topography**: flat
- **Pools**: absent, apart from where peat has been excavated to build dams
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 4-10%
- **Micro-topography**: *Calluna vulgaris* hummocks/low hummocks/hollows
- **Tussocks**: *Eriophorum vaginatum* (<4%), *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: none
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (4-10%), *Trichophorum germanicum* (<4%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. magellanicum* (Hl;<4%), *S. cuspidatum* (Hl; <4%), *Leucobryum glaucum* (<1%).
- **Additional comments:** this complex becomes 9/7/3 where *Narthecium ossifragum* is replaced by *Carex panicea* (11-25%) along the south-eastern section of high bog.

Quadrats **Qsm2** was recorded within this complex to the west of **Sc2**.

Marginal Ecotope Complexes

COMPLEX 7/2

- **Location**: this is the only marginal ecotope complex described for the site and it is found along the high bog margin
- **Ground**: firm
- **Physical indicators**: absent
- ***Calluna* height**: <40cm
- ***Cladonia* cover**: 34-50%
- **Macro-topography**: steep slope
- **Pools**: absent, apart from where peat has been excavated to build dams
- ***Sphagnum* cover**: up to 10%
- ***Narthecium* cover**: <4%
- **Micro-topography**: *Calluna vulgaris* hummocks/low hummocks/hollows
- **Tussocks**: *Trichophorum germanicum* (4-10%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Trichophorum germanicum* (4-10%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *Hypnum jutlandicum* (11-25%).
- **Additional comments**: none

Face bank Complexes

COMPLEX 1

- **Location**: this complex was found along the bog margin
- **Ground**: firm
- **Physical indicators**: bare peat variable
- ***Calluna* height**: <50cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: generally absent but <5% in places
- ***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**: this complex was not thoroughly surveyed and it was mapped mainly based on the 2010 aerial photographs and previous 2004/5 survey map.

Inactive Flushes

FLUSH Q (FQ)

This flush occurs in the north-west margin of the high bog adjacent to the area mapped as shallow hole by Kelly *et al*., (1995). The swallow hole feature occurs at the margin of the high bog. The high bog subsides into a channel or valley leading the swallow hole and the edge of the high bog. This area is heavily poached by cattle encroaching from adjacent grassland using the swallow hole as a drinking hole. The bog surface has frequent bare peat cover and the vegetation is dominated by *Calluna vulgaris* and *Trichophorum germanicum* on the upper slopes and *Molinia caerulea* within the swallow hole/ channel. The vegetation at the high bog side of the swallow hole is flushed and is dominated by *Calluna vulgaris* (30%) (0.3-0.4 m high) and *Eriophorum vaginatum* (30%). The general *Sphagnum* cover is 20-30% and dominated by hummocks of *S. capillifolium* with less frequent *S. papillosum* and small patches of *S. cuspidatum* in small hollows (< 5%). The *Cladonia* spp. cover is less than 5%. The swallow hole feature may be linked to Flush U (description taken from Fernandez *et al*. 2005).

Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Garriskil 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 Garriskil Bog, such as: central ecotope (complex 15; 35); sub-central ecotope (9/10; 6/35) and sub-marginal ecotope (9/7; 9/7/6).

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*. It was also found within *Narthecium ossifragum* dominated hollows in sub-marginal and marginal ecotope complexes.

Appendix II Photographical records

Photograph Number	Aspect	Type	Feature	Date
102-0418	SW	Overview	Qsc5	06/09/2011
102-0419	NW	Overview	Qsc4	07/09/2011
102-0420	E	Overview	Qsc6	07/09/2011
102-0424	SE	Overview	Qsc1	07/09/2011
102-0425	S	Overview	Qc4	07/09/2011
102-0426	SW	Overview	Qc1	07/09/2011
102-0427	SE	Overview	Qc5	08/09/2011
102-0433	S	Overview	Qc2	08/09/2011
102-0435	NW	Overview	Qsc3	08/09/2011
102-0436	SW	Overview	Qc3	08/09/2011
102-0437	NW	Overview	Qsc2	08/09/2011
102-0438	N	Overview	open water within central	08/09/2011
102-0440	NW	Overview	Qsm2	08/09/2011

Appendix III Quadrats

Ecotope type	Central	Central	Central	Central
Complex Name	**15**	**35**	**35**	**35**
Quadrat Name	Qc1	Qc1	Qc2	Qc2
Easting	235322	235324	235786	235787
Northing	267594	267595	267745	267743
Firmness	Very soft	Quaking	Very soft	Quaking
Burnt	No	No	No	No
Algae in hollows %	4-10	Absent	1-3 (many indiv)	Absent
Algae in pools %	4-10	Absent	4-10	Absent
Bare peat %	1-3 (many indiv)	Absent	na	Absent
High hummocks %	na	11-25	na	1-3 (many indiv)
Low hummocks %	11-25	11-25	26-33	51-75
Hollows %	11-25	1-3 (many indiv)	11-25	1-3 (many indiv)
Lawns %	11-25	4-10	na	1-3 (many indiv)
Pools %	11-25	34-50	26-33	11-25
Pool type	Interconnecting	Interconnecting	Interconnecting	Interconnecting
S.austinii hum type	na	Active	na	Active
S.austinii hum %	4-10	4-10	4-10	1-3 (many indiv)
S.austinii height(cm)	na	11-20	na	0-10
S.fuscum hum type	Absent	Absent	na	Active
S.fuscum hum %	Absent	Absent	1-3 (many indiv)	1-3 (many indiv)
S.fuscum height(cm)	Absent	Absent	na	0-10
Leucobryum glaucum	Absent	Present	Absent	Absent
Trichophorum type	Tussocks	Absent	Tussocks	Tussocks
Trichophorum %	4-10	Absent	4-10	1-3 (few indiv)
S.magellanicum %	11-25	11-25	4-10	Absent
S.cuspidatum %	4-10	26-33	4-10	1-3 (many indiv)
S.papillosum %	4-10	4-10	11-20	26-33
S.denticulatum %	4-10	Absent	4-10	Absent

S.capillifolium%	4-10	11-25	4-10	4-10
S.tenellum %	na	1-3 (many indiv)	na	4-10
S.subnitens %	na	Absent	na	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	11-25	1-3 (many indiv)	4-10	1-3 (many indiv)
N.ossifragum %	4-10	4-10	4-10	4-10
Sphag pools %	11-25	34-50	26-33	4-10
Dominant pool Sphag	S. cuspidatum	S. cuspidatum	S. cuspidatum & S. denticulatum	S. papillosum
Sphag lawns %	11-25	11-25	na	1-3 (many indiv)
Sphag humm %	11-25	11-25	26-33	34-50
Sphag holl %	11-25	Absent	11-25	Absent
Total Sphag %	34-50	51-75	34-50	76-90
Hummocks indicators	S. austinii	S. austinii	S. austinii & S. fuscum	S. austinii & S. fuscum
Cladonia portent %	4-10	1-3 (several indiv)	4-10	1-3 (many indiv)
Other Cladonia sp				Cladonia uncialis
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	11-25	11-25	11-25	26-33
Calluna height(cm)	21-30	21-30	21-30	21-30
Other NotableSpecies		D. intermedia	Racomitrium lanuginosum	Menyanthes Drosera inter
Other comment		S. fuscum outside quadrat		Pools mostly open water
Date	**22/06/2004**	**07/09/2011**	**22/06/2004**	**08/09/2011**

Ecotope type	**Central**	**Central**	**Central**	**Central**
Complex Name	**35**	**35**	**15**	**35**
Quadrat Name	Qc3	Qc3	Qc4	Qc4
Easting	235642	235643	235374	235372
Northing	267670	267669	267524	267520
Firmness	Soft	Quaking	Soft	Quaking
Burnt	No	No	No	No
Algae in hollows %	na	Absent	na	Absent

Algae in pools %	1-3 (many indiv)	Absent	1-3 (many indiv)	Absent
Bare peat %	na	Absent	na	Absent
High hummocks %	na	11-25	na	11-25
Low hummocks %	na	11-25	na	11-25
Hollows %	na	1-3 (many indiv)	34-50	11-25
Lawns %	na	1-3 (many indiv)	Absent	Absent
Pools %	4-10	26-33	4-10	11-25
Pool type	Interconnecting	Interconnecting	Interconnecting	Interconnecting
S.austinii hum type	na	Active	na	Active
S.austinii hum %	4-10	4-10	1-3 (many indiv)	1-3 (many indiv)
S.austinii height(cm)	na	31-40	na	0-10
S.fuscum hum type	na	Active	Absent	Absent
S.fuscum hum %	4-10	1-3 (many indiv)	Absent	Absent
S.fuscum height(cm)	na	21-30	Absent	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Absent	Tussocks	Absent	Tussocks
Trichophorum %	Absent	1-3 (many indiv)	Absent	1-3 (many indiv)
S.magellanicum %	Absent	Absent	11-25	1-3 (many indiv)
S.cuspidatum %	11-25	26-33	11-25	11-25
S.papillosum %	Absent	4-10	11-25	11-25
S.denticulatum %	na	Absent	na	Absent
S.capillifolium%	11-25	11-25	11-25	11-25
S.tenellum %	na	1-3 (many indiv)	na	1-3 (many indiv)
S.subnitens %	4-10	Absent	na	1-3 (many indiv)
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	4-10	4-10	4-10	4-10
N.ossifragum %	26-33	4-10	11-25	4-10
Sphag pools %	4-10	26-33	4-10	11-25
Dominant pool Sphag	na	S. cuspidatum	S. cuspidatum	S. cuspidatum
Sphag lawns %	na	1-3 (many indiv)	Absent	Absent
Sphag humm %	na	26-33	na	26-33
Sphag holl %	na	Absent	34-50	Absent
Total Sphag %	51-75	51-75	51-75	51-75

Hummocks indicators	S. austinii & S. fuscum	S. austinii & S. fuscum	S. austinii	S. austinii
Cladonia portent %	4-10	1-3 (many indiv)	4-10	Absent
Other Cladonia sp				
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	na	11-25	na	26-33
Calluna height(cm)	na	31-40	na	31-40
Other NotableSpecies		Drosera intermedia		Drosera intermedia
Other comment		Adjacent pool to the east has poor Sphagnum cover		
Date	**22/06/2004**	**08/09/2011**	**22/06/2004**	**07/09/2011**

Ecotope type	**Central**	**Central**	**Sub-central**	**Sub-central**
Complex Name	**35**	**35**	**9/7/6 + P**	**6/35**
Quadrat Name	Qc5	Qc5	Qsc1	Qsc1
Easting	235863	235865	235482	235483
Northing	267730	267728	267462	267462
Firmness	Quaking	Quaking	Soft	Soft
Burnt	No	No	No	No
Algae in hollows %	na	Absent	1-3 (many indiv)	Absent
Algae in pools %	na	Absent	1-3 (many indiv)	Absent
Bare peat %	na	Absent	1-3 (many indiv)	1-3 (many indiv)
High hummocks %	na	Absent	na	4-10
Low hummocks %	26-33	26-33	11-25	11-25
Hollows %	na	1-3 (many indiv)	11-25	11-25
Lawns %	11-25	11-25	Absent	Absent
Pools %	26-33	26-33	11-25	4-10
Pool type	Interconnecting	Interconnecting	Regular	Interconnecting
S.austinii hum type	na	Active	na	Active
S.austinii hum %	na	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)
S.austinii height(cm)	na	0-10	na	21-30
S.fuscum hum type	Absent	Active	na	Active
S.fuscum hum %	Absent	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)

S.fuscum height(cm)	Absent	0-10	na	21-30
Leucobryum glaucum	Absent	Present	Absent	Absent
Trichophorum type	Absent	Tussocks	Tussocks	Tussocks
Trichophorum %	Absent	1-3 (few indiv)	4-10	1-3 (many indiv)
S.magellanicum %	26-33	26-33	4-10	Absent
S.cuspidatum %	4-10	1-3 (many indiv)	4-10	4-10
S.papillosum %	Absent	4-10	4-10	4-10
S.denticulatum %	na	Absent	Absent	Absent
S.capillifolium%	4-10	4-10	11-25	11-25
S.tenellum %	na	1-3 (many indiv)	na	1-3 (many indiv)
S.subnitens %	na	Absent	Absent	1-3 (many indiv)
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	11-25	1-3 (many indiv)	4-10	1-3 (many indiv)
N.ossifragum %	11-25	4-10	11-25	11-25
Sphag pools %	26-33	4-10	11-25	4-10
Dominant pool Sphag	S.cuspidatum	S.magellanicum	S.cuspidatum	S.cuspidatum
Sphag lawns %	11-25	26-33	Absent	Absent
Sphag humm %	26-33	34-50	11-25	11-25
Sphag holl %	na	Absent	11-25	Absent
Total Sphag %	51-75	51-75	26-33	26-33
Hummocks indicators	S.austinii	S.austinii&S.fuscum	S.austinii&S.fuscum	S.austinii&S.fuscum
Cladonia portent %	4-10	1-3 (many indiv)	4-10	4-10
Other Cladonia sp				
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	na	11-25	11-25	11-25
Calluna height(cm)	na	11-20	21-30	31-40
Other NotableSpecies		Sphagnum pulchrum, Aulacomnium palustre, Drosera intermedia	Racomitrium lanuginosum	Drosera intermedia
Other comment				Borderline SC
Date	**22/06/2004**	**08/09/2011**	**22/06/2004**	**07/09/2011**

Ecotope type	**Sub-central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**6/4/35**	**6/35**	**6/35**	**6/35**
Quadrat Name	Qsc2	Qsc2	Qsc3	Qsc3
Easting	235455	235449	235612	235613
Northing	267817	267809	267782	267781
Firmness	Very soft	Very soft	Very soft	Soft
Burnt	No	No	No	No
Algae in hollows %	na	Absent	na	Absent
Algae in pools %	1-3 (many indiv)	Absent	1-3 (many indiv)	1-3 (many indiv)
Bare peat %	na	Absent	na	Absent
High hummocks %	na	4-10	na	4-10
Low hummocks %	11-25	4-10	11-25	11-25
Hollows %	na	4-10	11-25	34-50
Lawns %	na	4-10	4-10	1-3 (many indiv)
Pools %	11-25	4-10	4-10	4-10
Pool type	Regular	Regular	Interconnecting	Interconnecting
S.austinii hum type	na	Active	na	Relic
S.austinii hum %	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)
S.austinii height(cm)	na	11-20	na	11-20
S.fuscum hum type	na	Absent	na	Relic
S.fuscum hum %	1-3 (many indiv)	Absent	1-3 (many indiv)	1-3 (many indiv)
S.fuscum height(cm)	na	Absent	na	11-20
Leucobryum glaucum	Absent	Absent	1-3 (many indiv)	Absent
Trichophorum type	Absent	Tussocks	Tussocks	Tussocks
Trichophorum %	Absent	1-3 (many indiv)	4-10	1-3 (many indiv)
S.magellanicum %	11-25	4-10	4-10	1-3 (many indiv)
S.cuspidatum %	na	1-3 (many indiv)	na	1-3 (many indiv)
S.papillosum %	Absent	4-10	4-10	4-10
S.denticulatum %	na	Absent	na	Absent
S.capillifolium%	4-10	4-10	11-25	11-25
S.tenellum %	na	1-3 (many indiv)	na	4-10
S.subnitens %	na	1-3 (many indiv)	na	1-3 (many indiv)

R.fusca %	Absent	Absent	Absent	Absent
R.alba %	na	1-3 (many indiv)	4-10	1-3 (many indiv)
N.ossifragum %	na	34-50	34-50	34-50
Sphag pools %	11-25	4-10	4-10	1-3 (many indiv)
Dominant pool Sphag	S.cuspidatum	S.cuspidatum	na	S.cuspidatum
Sphag lawns %	na	4-10	4-10	1-3 (many indiv)
Sphag humm %	11-25	11-25	11-25	26-33
Sphag holl %	na	Absent	11-25	Absent
Total Sphag %	26-33	26-33	26-33	34-50
Hummocks indicators	S.austinii&S.fuscum	S.austinii	S.austinii&S.fuscum	S.austinii&S.fuscum
Cladonia portent %	4-10	1-3 (many indiv)	4-10	4-10
Other Cladonia sp		Cladonia uncialis		
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	na	26-33	na	11-25
Calluna height(cm)	na	31-40	na	21-30
Other NotableSpecies		Drosera intermedia		Pleurozia purpurea
Other comment		Adjacent to SM		Borderline SC/SM
Date	**22/06/2004**	**08/09/2011**	**22/06/2004**	**08/09/2011**

Ecotope type	**Sub-central**	**Sub-central**	**Sub-central**	**Sub-marginal**
Complex Name	**9/10**	**9/10**	**9/10**	**9/10**
Quadrat Name	Qsc4	Qsc4	Qsc5	Qsc5
Easting	236113	236111	236546	236546
Northing	266935	266937	267417	267415
Firmness	Soft	Very soft	Soft	Very soft
Burnt	No	No	No	No
Algae in hollows %	na	Absent	na	Absent
Algae in pools %	na	Absent	na	Absent
Bare peat %	na	Absent	na	Absent
High hummocks %	na	Absent	na	Absent
Low hummocks %	34-50	34-50	51-75	51-75
Hollows %	11-25	11-25	na	1-3 (many indiv)

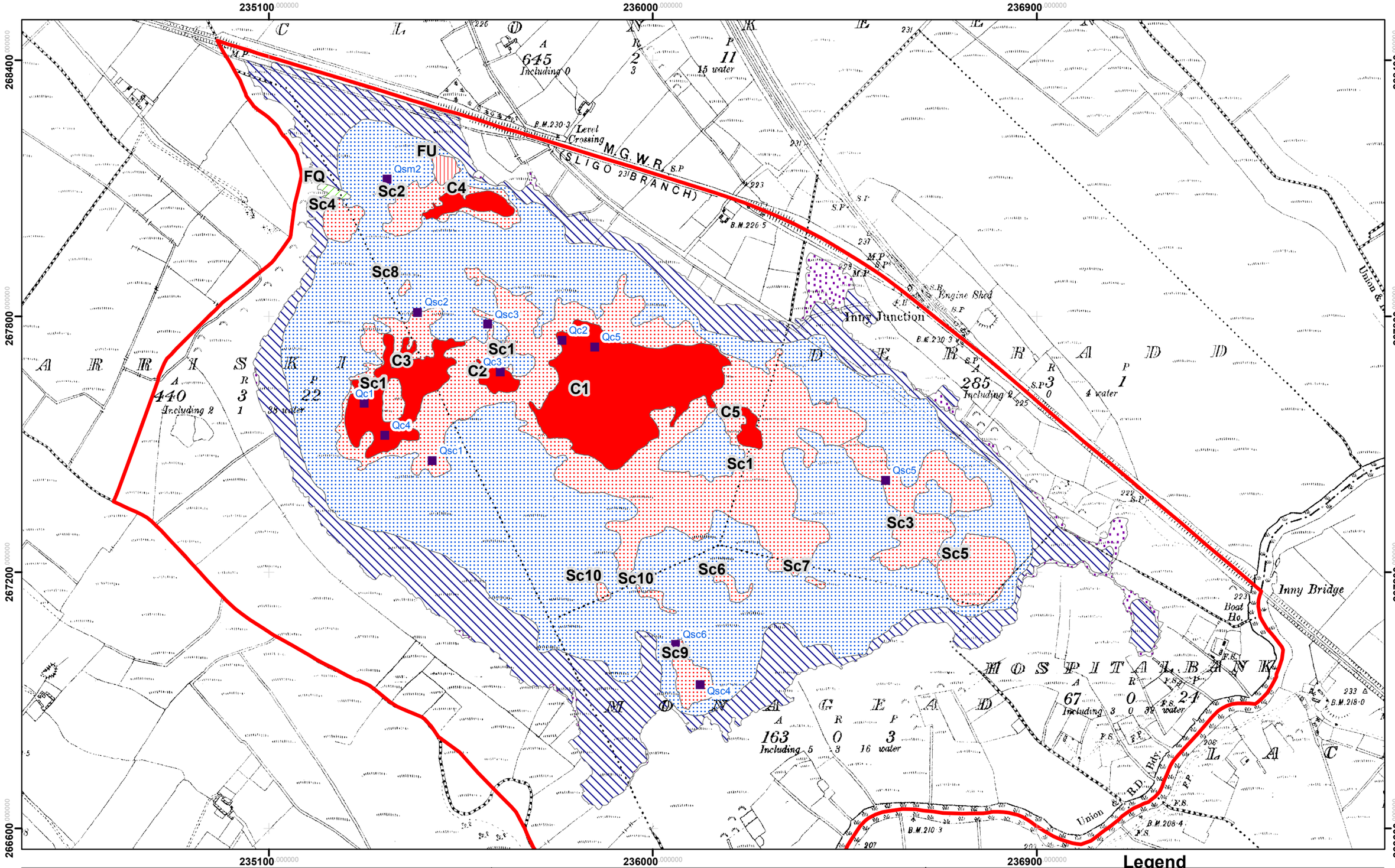
Lawns %	4-10	11-25	na	4-10
Pools %	4-10	Absent	Absent	Absent
Pool type	Absent	Absent	Absent	Absent
S.austinii hum type	na	Absent	na	Absent
S.austinii hum %	4-10	Absent	1-3 (many indiv)	Absent
S.austinii height(cm)	na	Absent	na	Absent
S.fuscum hum type	Absent	Absent	Absent	Absent
S.fuscum hum %	Absent	Absent	Absent	Absent
S.fuscum height(cm)	Absent	Absent	Absent	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Absent	Absent	Tussocks	Absent
Trichophorum %	Absent	Absent	4-10	Absent
S.magellanicum %	34-50	34-50	11-25	11-25
S.cuspidatum %	na	Absent	na	Absent
S.papillosum %	Absent	11-25	11-25	11-25
S.denticulatum %	na	Absent	na	Absent
S.capillifolium%	11-25	11-25	11-25	11-25
S.tenellum %	na	Absent	na	11-25
S.subnitens %	na	Absent	na	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	Absent	Absent	Absent	Absent
N.ossifragum %	na	1-3 (many indiv)	4-10	1-3 (many indiv)
Sphag pools %	4-10	Absent	Absent	Absent
Dominant pool Sphag	na		na	
Sphag lawns %	4-10	11-25	na	4-10
Sphag humm %	34-50	34-50	51-75	34-50
Sphag holl %	11-25	Absent	na	Absent
Total Sphag %	51-75	51-75	51-75	51-75
Hummocks indicators	S. austinii	Absent	S.austinii	Absent
Cladonia portent %	4-10	1-3 (many indiv)	4-10	1-3 (many indiv)
Other Cladonia sp				
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	na	34-50	na	26-33

Calluna height(cm)	na	21-30	na	31-40
Other NotableSpecies		Waterlogged		
Other comment		Active Sphagnum austinii just outside quadrat	re-wetting	
Date	**22/06/2004**	**07/09/2011**	**22/06/2004**	**06/09/2011**

Ecotope type	**Sub-marginal**	**Sub-central**	**Sub-marginal**	**Sub-marginal**
Complex Name	**9/7**	**9/10**	**9/7/6**	**9/7/6**
Quadrat Name	Qsm1	Qsc6	Qsm2	Qsm2
Easting	236053	236054	235375	235377
Northing	267026	267031	268125	268121
Firmness	Soft	Very soft	Soft	Soft
Burnt	No	No	No	No
Algae in hollows %	na	Absent	na	Absent
Algae in pools %	na	Absent	1-3 (many indiv)	Absent
Bare peat %	1-3 (many indiv)	Absent	na	1-3 (many indiv)
High hummocks %	na	Absent	na	4-10
Low hummocks %	na	11-25	4-10	11-25
Hollows %	26-33	11-25	26-33	34-50
Lawns %	na	4-10	Absent	Absent
Pools %	na	4-10	4-10	Absent
Pool type	na	Regular	Absent	Absent
S.austinii hum type	na	Active	Absent	Relic
S.austinii hum %	1-3 (many indiv)	1-3 (many indiv)	Absent	1-3 (many indiv)
S.austinii height(cm)	na	11-20	Absent	21-30
S.fuscum hum type	Absent	Absent	na	Absent
S.fuscum hum %	Absent	Absent	1-3 (many indiv)	Absent
S.fuscum height(cm)	Absent	Absent	na	Absent
Leucobryum glaucum	Absent	Absent	4-10	Absent
Trichophorum type	Absent	Absent	Tussocks	Tussocks
Trichophorum %	Absent	Absent	4-10	1-3 (many indiv)
S.magellanicum %	11-25	4-10	4-10	1-3 (many indiv)

S.cuspidatum %	na	1-3 (many indiv)	na	Absent
S.papillosum %	Absent	4-10	Absent	1-3 (many indiv)
S.denticulatum %	na	Absent	na	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 %	na	Absent	na	1-3 (many indiv)
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	4-10	4-10	11-25	1-3 (many indiv)
N.ossifragum %	4-10	11-25	11-25	26-33
Sphag pools %	na	4-10	4-10	Absent
Dominant pool Sphag	na	S.cuspidatum	S.cuspidatum	
Sphag lawns %	na	4-10	Absent	Absent
Sphag humm %	na	11-25	4-10	Absent
Sphag holl %	26-33	Absent	26-33	11-25
Total Sphag %	11-25	34-50	11-25	11-25
Hummocks indicators	S.austinii	S.austinii	S. fuscum	S.austinii&S.fuscum
Cladonia portent %	4-10	1-3 (many indiv)	4-10	4-10
Other Cladonia sp				
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	na	26-33	na	34-50
Calluna height(cm)	na	21-30	na	31-40
Other NotableSpecies		Drosera intermedia		
Other comment		Appears to be improving (previously Qsm1)		
Date	**22/06/2004**	**07/09/2011**	**22/06/2004**	**08/09/2011**

Appendix IV Survey map



Raised Bog Monitoring Survey 2011

Map 1: Ecotopes Map and Quadrats

Ecologic Environmental & Ecological Consultants Ltd.

Garriskil Bog SAC (000679)
Co. Westmeath

1:8,500

N

0 100 200 400 600 800 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.

Garriskil Bog SAC (000679)
Co. Westmeath

N

1:8,500

0 110 220 440 660 880 Meters

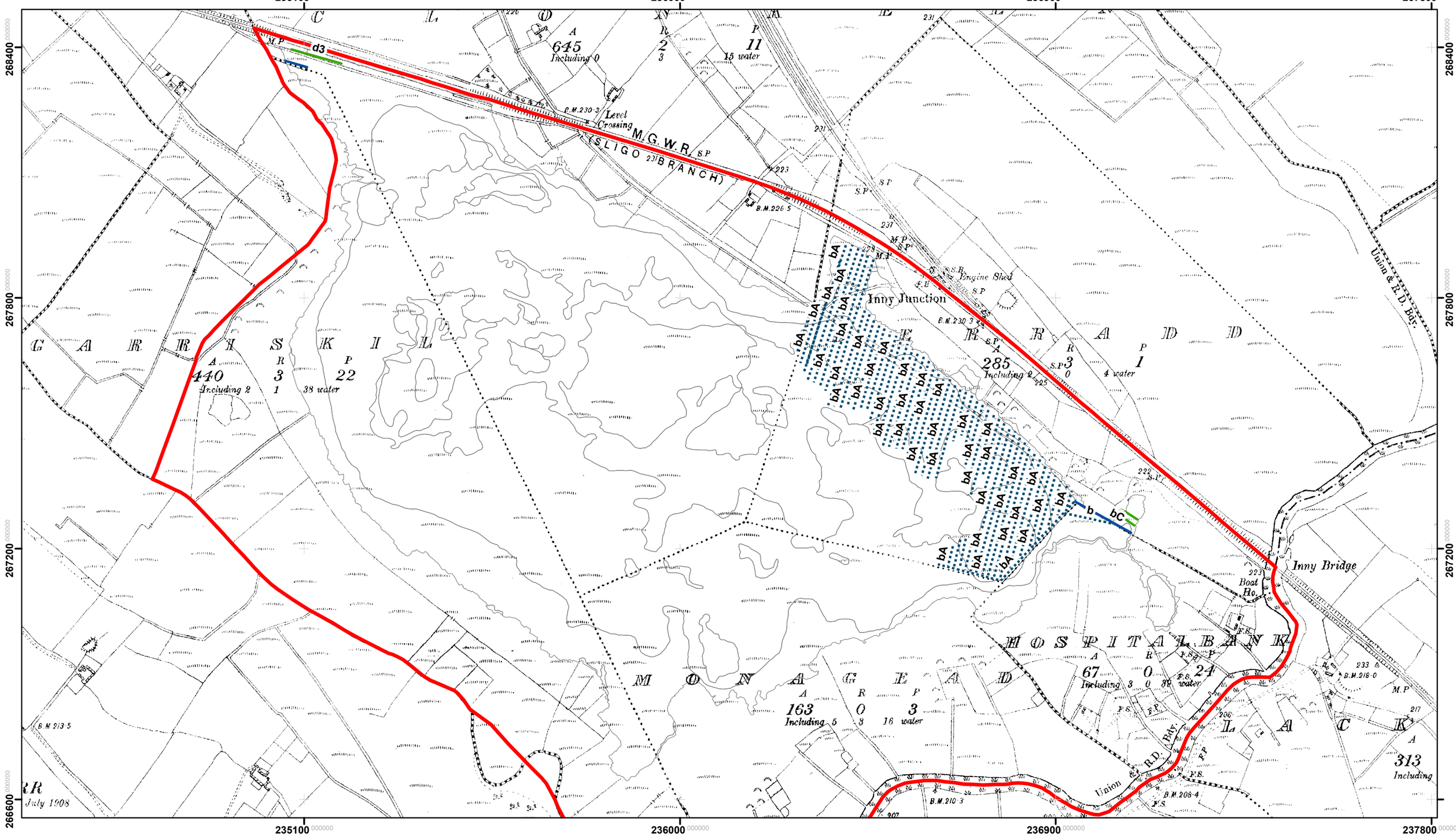
Legend

Ecotope type

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

Boundary type

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



Raised Bog Monitoring Survey 2011

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

Ecologic Environmental & Ecological Consultants Ltd.

Garriskil Bog SAC (000679)
Co. Westmeath

N

1:8,500

0 112.5 225 450 675 900 Meters

Legend

High Bog drainage

- Blocked:non-functional
- Blocked:reduced functional
- Not blocked:functional
- Not blocked:non-functional
- Not blocked:reduced functional

- Ecotopes
- SAC