Crosswood Bog (SAC 002337), Co. Westmeath

Executive Summary

This survey, carried out in September 2012, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Crosswood 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 4.64 ha (4.73%) of the high bog area. Central ecotope is absent from the site, and only a small area (0.14ha) of active flush is present. This flush supports *Pinus sylvestris* and *Betula pubescens*, as well as *Sphagnum fallax* and *S. palustre*, but there is no closed canopy and hence, it is not classed as Bog Woodland. A particularly notable feature of the sub-central ecotope is the abundance of *S. pulchrum*.

Degraded Raised Bog covers 93.47 ha (95.27%) 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 includes sub-marginal, marginal and facebank ecotope as well as inactive flushes.

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. On Crosswood Bog it was found to be most common within the sub-central ecotope.

No restoration works have taken place on the high bog, but the cutover to the south of the high bog was included as part of the he Coillte Life project (LIFE04 NAT/IE/000121) to restore raised bogs. Restoration work took place from 2005-07, and although 39.1ha of conifer plantations were removed, the project met with limited success as restrictions were placed on drain blocking due to the concerns of adjacent turbary plot holders.

The current conservation objective for Crosswood 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 56.67ha. 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 decrease in the area of Active Raised Bog (1.00ha) at Crosswood Bog in the 2004 to 2012 period. This loss has taken place from sub-central ecotope towards the west of the high bog. In addition to the small loss of ARB, there have been a number of changes to the mapped distribution of the habitat at the site, although these are attributed to the more comprehensive field mapping that took place during this survey.

The 2012 survey has also noted further drying out processes in the southwest of the high bog, illustrated by the spread of pine in this intensively drained area.

Peat cutting and drainage are the most threatening activities at the site. 3.13ha of high bog have been lost in the reporting period due to peat cutting and this activity is considered to be one of the reasons for the decline in Active Raised Bog along the western section of high bog. Over 8km of high bog drains remain functional and significant water losses via these drains were recorded during the 2012 survey. There is also an extensive network of drains on the cutover, particularly in the north-west and south of the high bog. A recent fire in the east of the site severely burnt 6ha of the high bog vegetation.

Active Raised Bog has been given an overall **Unfavourable Bad–Declining** conservation status assessment. Habitat Area has slightly decreased while habitat quality (S&Fs) remained unchanged in the reporting period. However, the current Area value as well as the S&Fs are below favourable reference values. Future Prospects are considered Unfavourable Bad-Declining as impacting activities (peat cutting and drainage) continue to threaten the habitat.

Degraded Raised Bog has been given an overall **Unfavourable Bad-Declining** conservation assessment and **Rhynchosporion depressions** has been given an **Unfavourable Bad-Declining** conservation status assessment.

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

A series of **recommendations** have been also given, these include: cessation of peat cutting; restoration works on the high bog particularly the blocking of high bog functional drains, further hydrological and topographical studies to ascertain more accurate FRVs; an impact assessment of the affect of drain blocking in the cutover on adjacent land with a view to the restoration of the cutover; further botanical surveys on the high bog and cutover in order to assess the efficiency of restoration works and ongoing monitoring and management of restoration works such as the monitoring of water table levels and the removal of regenerating conifers.

Site identification

SAC Site Code	002337	**6" Sheet:**	WT 29
Grid Reference:	E208367 / N240406	**1:50,000 Sheet:**	47
High Bog area (ha):	98.11ha [1]		
Dates of Visit:	27 & 28/09/12		
Townlands:	Crosswood, Creggan Upper, Creggan Lower, Moydrum & Glenaghanvoneen		

[1] The current extent of the high bog is 98.11ha, while that reported in 2004 was 101.38ha (Fernandez *et al*., 2005). This discrepancy is partially the result of more accurate mapping of the high bog edge by using the higher resolution 2010 aerial images compared to those used in 2004. High bog area has also decreased by 3.13 in the 2004/05-2010 period due to peat cutting. The actual high bog extent in 2004 was 101.24ha (see tables 8.1 and 8.3 2004 (amended) figures).

Site location

This bog is located approximately 3km east of Athlone in Co. Westmeath. It is immediately south of a disused branch of the Dublin–Galway railway line (Athlone–Mullingar) line and immediately north-east of the Dublin/Galway motorway (M6). It is a relatively isolated bog and is the most northerly of the central midland group. It can be accessed from local roads off the N62 and R446. During the 2012 survey, it was accessed from the south-east of the site via a turn-off from the R446 at Ballydonagh, which goes under the M6 after which there is a left hand turn onto a bog road from which the site can be accessed.

Description of the survey

The survey was carried out in September 2012 and involved a vegetation survey of the high bog at Crosswood Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2004 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.

The entire high bog of Crosswood Bog was re-surveyed. Sections mapped as sub-marginal, sub-central and central ecotope in 2004 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 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 for Active Raised Bog.

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 Basin Bog (geomorphology) (Kelly *et al*., (1995) and as a Midland (northern) type raised bog (Cross 1990). The high bog is an irregularly shaped rectangle with the longest axis orientated in an east-west direction. Originally it had an oval shape. It reaches its maximum length of 1600 m in an ENE-WSW direction. It is narrowest in a north-south direction where it has an average width of 580 m. The presence of notable amounts of *Sphagnum pulchrum* makes this an unusual site.

Ecological Information

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

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

- Active Raised Bog (EU code 7110),

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

Active Raised Bog (7110)

The current area of Active Raised Bog at Crosswood Bog is 4.64ha (4.73% of the high bog), which is a decrease of 21.10ha since 1994.

Active Raised Bog includes sub-central ecotope and active flush.

Sub-central ecotope (4.5ha) was found at three locations (**Sc1, Sc2** and **Sc4**) (see Appendix IV, Map 1). Only one community complex type was recorded, complex 15-. This consisted of hummocks, hollows and pool-like depressions. The pools were often not clearly defined and were sometimes more like *Sphagnum*-filled depressions dominated by *Rhynchospora alba*. The overall *Sphagnum* cover ranged from 51 to 75% and was unusual in that there were areas where *S. pulchrum* dominated in the pools. However, there were also areas where *S. cuspidatum* dominated and *S. denticulatum* was also present along with *Menyanthes trifoliata* and *Drosera anglica*. Hummocks of *Sphagnum capillifolium* dominated the *Sphagnum* layer although hummocks of *S. austinii* and *S. fuscum* as well as *S. papillosum* were also present. The cover of *S. magellanicum* was high in places. *Calluna vulgaris*, *Erica tetralix*, *Narthecium ossifragum* and *Eriophorum angustifolium* dominated the vegetation with flush indicators such as *Aulacomnium palustre*, *Dicranum scoparium* and *Vaccinium oxycoccos* present in places.

One active peat forming flush (0.14ha) was also recorded at Crosswood Bog (flush **Z**). Although this flush was wooded (*Betula pubescens* and *Pinus sylvestris* dominated) there wasn't a closed canopy so it was not classed as Bog Woodland. Most of the flush was also considered inactive even though a high *Sphagnum* cover (51-75%) was recorded. This is due to the fact that it was dry and dominated almost entirely by hummocks of *S. capillifolium*. However, an active area was recorded towards the north-west of the flush as it was slightly wet with a more diverse *Sphagnum* cover including *S. fallax*, and *S. palustre*. *Calluna vulgaris* (26-33%) and *Eriophorum vaginatum* (34-50%) dominated the vegetation and other species recorded in the active flush area included *Molinia caerulea*, *Juncus effusus*, *Hylocomium splendens*, *Empetrum nigrum*, *Vaccinium myrtillus*, *Polytrichum strictum*, *P. commune* and *Aulacomnium palustre*.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Crosswood Bog is 93.47ha (95.27% 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 (40.64ha) featured the most developed micro-topography within Degraded Raised Bog. However, pools were absent. Three community complexes (with additional variants) were recorded within the sub-marginal ecotope: 9/7, 9/7/6 and 6/3/9 (B). Complex 9/7 was the best quality sub-marginal complex and thus had some sub-central characteristics. Only small amounts of this complex were recorded at Crosswood Bog, mostly immediately north of flush **Z**. *Calluna vulgaris* and *Eriophorum vaginatum* dominated the vegetation and the *Sphagnum* cover, which ranged from 26 to 50%, was composed almost entirely of hummocks of *S. capillifolium*. However, small amounts of *S. papillosum* and *S. austinii* were also present. The cover of *Cladonia portentosa* was relatively high and the flush indicators *Dicranum scoparium* and *Vaccinium oxycoccos* were also present. Complex 9/7/6 was far more common on the site covering large areas particularly in the middle section of the high bog. The *Sphagnum* cover, which ranged from 11 to 33%, again was composed largely of hummocks of *S. capillifolium* and *S. papillosum*, though *S. subnitens*, *S. magellanicum* and *S. cuspidatum* were also present. *Calluna vulgaris* dominated the vegetation along with *Eriophorum vaginatum* and *Narthecium ossifragum*. Very occasionally, pools were found within this complex, but these were mostly open water or algal with a very poor cover of *Sphagnum cuspidatum* though they did support *Menyanthes trifoliata* and *Drosera anglica*. The western indicator *Pleurozia purpurea* was also recorded as well as some tall hummocks of *Leucobryum glaucum*. In some areas *Carex panicea* was of a higher cover value than *Narthecium ossifragum*, and in these areas the variant complex 9/7/3 was instead used to describe the vegetation. Although very similar to complex 9/7/6, these areas often have a slightly lower *Sphagnum* cover. Part of the sub-marginal ecotope towards the east of the high big was burnt in 2012 and in this area complex 6/3/9 (B) was used to describe the vegetation. *Narthecium ossifragum* dominated large areas though *Carex panicea* and *Eriophorum angustifolium* were also common. The *Sphagnum* cover was low, but the cover of burnt *Sphagnum* hummocks was much higher (26-33%).

Marginal ecotope (45.10ha) is slightly drier than sub-marginal ecotope and was mainly recorded as a narrow band near the margin of the high bog although there was a wider band in the north-east and the south-west, the two most intensively drained areas. Three community complexes (with

additional variants) were recorded within the marginal ecotope: 6/7/3, which dominated the marginal ecotope, 2/7, which was restricted to a very narrow band close to high bog margin and 6/3 (B), which was found towards the east of the site in an area that had been burnt in 2012. *Calluna vulgaris*, *Narthecium ossifragum* and *Carex panicea* dominated complex 6/7/3, which had a *Sphagnum* cover of 4-10%. A variety of this complex was found in the south of the site where the cover of *Carex panicea* was lower and the complex was termed 6/7. Where scattered *Pinus* was recorded in the south-west of the site, the complex was termed 6/7 + Pine. Complex 2/7 was dominated by tussocks of *Trichophorum germanicum* and *Calluna vulgaris* and there was usually a steep slope down to the high bog margin. The *Sphagnum* cover was even lower within this complex. Complex 3/6 (B) was dominated almost exclusively by *Narthecium ossifragum* and *Carex panicea* and though the *Sphagnum* cover was low, there were also some burnt *Sphagnum* hummocks. Small areas of face-bank (3.6ha) vegetation were recorded in places at the very edge of the high bog in areas where robust *Calluna vulgaris* dominated the vegetation.

Two inactive flushes (3.83ha) were also recorded on the high bog at Crosswood Bog; flush **B** and flush **Z**. Flush **B** was recorded in the north-east of the high bog and was dominated by *Molinia caerulea* and had been burnt in 2012. It was classed as an inactive flush despite having a relatively high *Sphagnum* cover, due to the fact that it was dry and dominated almost entirely by hummocks of *S. capillifolium*. However, there were small patches (too small and scattered to map) that were wet with *S. magellanicum* and *S. cuspidatum* that could have been classed as active flush. Flush **Z** was recorded just west of the centre of the high bog and was largely inactive although a small area towards its northern extent was classed as active. The inactive area also had a high *Sphagnum* cover, which was almost entirely dominated by hummocks of *S. capillifolium*. *Calluna vulgaris* and *Eriophorum vaginatum* dominated the vegetation along with scattered *Betula pubescens* and *Pinus sylvestris* that are mainly 2-4m in height though with some individuals of 6-8m.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Crosswood 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 within *Sphagnum* hollows and along *Sphagnum* pool edges and on lawns. On Crosswood Bog it was found to be most common within the sub-central complex 15-. 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 and run off channels.

Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2012 survey of Crosswood 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 Crosswood 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):

Table 6.1 Impacting activities

Code	Activity	Ranking	Influence	Area (ha) /Length(km)	Location	Habitat affected
C01.03	Peat extraction	H	-1	3.13ha of the high bog cut away	Inside High Bog: 44 different locations along the north-western & south-eastern high bog margin	**7110/7120/7150**
J02.07	Drainage	H	-1	8.010km [1]	Inside High Bog	**7110/7120/7150**
J02.07	Drainage	H	-1	n/av	Outside High Bog	**7110/7120/7150**
J01	Fire	L	-1	6ha	Inside High Bog	**7120/7150**
I01	Invasive alien species	L	-1	<0.5ha [3]	Inside High Bog	**7110/7150**
I01	Invasive alien species	M	-1	<0.5ha [3]	Inside High Bog	**7120**
I02	Problematic native species	L	-1	<0.5ha [4]	Inside High Bog	**7110/7150**
I02	Problematic native species	M	-1	<0.5ha [4]	Inside High Bog	**7120**

B02.02	Forestry clearance	M	+1	39.1ha	Outside High Bog	**7110/7120/7150**
4.2	Restoring/Improving the hydrological regime	M	+1	n/av	Outside High Bog	**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.

[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

This activity has taken place at 44 locations (plots) along the north-western (21 plots) and south-eastern (23 plots) margins of the high bog in the 2004/5-2010 period. This has reduced the area of high bog by 3.13ha. The loss of high bog from peat cutting is calculated using GIS techniques on aerial photography from 2004/5 and 2010. Information from the NPWS indicates that 44 plots were cut on the high bog at Crosswood Bog in 2010/2011; 20 plots were cut in 2012 and 6 in 2013. Thus the area of high bog lost on Crosswood Bog during the reporting period is in excess of 3.13ha, but since there is no aerial photography available post 2010, the area lost from 2010 to 2012 cannot be estimated.

Peat cutting was also reported from 44 plots in 2004 (Fernandez *et al*., 2005). The plots in the north-west were described as being intensively cut in 2004 with slumping, subsidence and cracking reported along the high bog margin and with the drains on the cutover being actively maintained. The cutting in this area was considered (because of its intense nature and proximity to Active Raised Bog) to be the largest threat to ARB on Crosswood Bog, and since 2004, 1ha of ARB has been lost from Sc1 most likely as a direct consequence of this cutting. The cutting in the south-east was described as being of a similar nature to the cutting in the north-west and was only classed as a being of a slightly lower threat because of its greater distance from ARB.

In 2012, the peat cutting on Crosswood Bog appeared to be still of an intensive nature as indicated by the loss of 3.13ha (3.09% of the total high bog present) during the reporting period and by the severe slumping, cracking and subsidence recorded along the high bog margin where cutting was taking place.

This activity is considered to have a high importance/impact on high bog habitats. In addition, old face banks and high bog and cutover drainage associated with cutting continue to cause negative impacts on the high bog habitats.

Drainage

High bog drainage

Table 6.2 shows that there has been a slight decrease (96m) in the length of functional drains on the high bog. However, this is simply because part of the high bog where drains d1, d2 and bF occur has been cut and thus their lengths reduced. Hence, this is not a positive development. All the drains on the high bog remain functional (8.01km). Significant water losses from the high bog, via drains, were noted during the 2012 survey with flowing water recorded in drains bA, bD, bE, bF and bJ.

Drain bF alone accounts for 2.265km of the high bog drains and crosses the length of the high bog in a west/east direction, occurring as a double drain towards its western extent. Peat cutting has reached and crossed drain bF to the east of its mid section and fast flowing water was recorded running off the high bog via this drain, at this point, during the 2012 survey.

Drain bJ is a complex of drains (excavated sometime between 1973 and 1993) in the south west of the site, which are linked with drain bF. This drainage complex has resulted in the surrounding area being very dry and is thus the reason why marginal ecotope vegetation dominates in the south-west of the high bog and is also likely to be the reason why *Pinus* trees are spreading in the area.

Water flow has been recorded in the five parallel drains in the north of the site (bA, bB, bC, bD & bE) during each of the three surveys (1994, 2004 & 2012). These drains (0.5-1.0m wide and 0.5-1.0m deep) were excavated in 1993/1994, just prior to the 1994 site visit and it was noted that they were draining "the wettest part of the bog" with "considerable water flow" recorded at the time. Thus, these drains are likely to have played a significant role in the loss of the 22ha of central ecotope at Crosswood Bog since 1994 (17.5ha of this has degraded to sub-marginal ecotope and the remaining 4.5ha to sub-central ecotope).

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

No blockage of drains has occurred to date.

Table 6.2 High bog drainage summary

Status	2004 (km) [1]	2012 (km)	Change
NB: functional	8.106	8.010	(-)0.096
NB: reduced functional	0.000	0.000	0.000
NB: non- functional	0.000	0.000	0.000
B: functional	0.000	0.000	0.000

B: reduced functional	0.000	0.000	0.000
B: non- functional	0.000	0.000	0.000

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 vary slightly 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 Crosswood Bog including any change in their functionality in the 2004 – 2012 reporting period (see Map 3).

Table 6.3 High bog drainage detail

Drain Name	Length (km)	2004 status	2012 status	Change	Comment
bA	0.158	NB: functional	NB: functional	No	Drainage maintenance within this drain recently took place; water flowing recorded during visit
bB	0.130	NB: functional	NB: functional	No	
bC	0.138	NB: functional	NB: functional	No	
bD	0.156	NB: functional	NB: functional	No	Water flowing recorded during visit
bE	0.323	NB: functional	NB: functional	No	Water flowing recorded during visit. This drain was re-mapped in 2012 to show that it extends in a WNW direction beyond drain bG. This is a mapping improvement rather than an actual change on the ground.
bF	2.265	NB: functional	NB: functional	No	Double drain; water flowing towards E recorded during visit
bG	0.553	NB: functional	NB: functional	No	Drain complex. Some of the drains towards the east of this complex are infilling.
bH	0.405	NB: functional	NB: functional	No	
bJ	3.234	NB: functional	NB: functional	No	Drain complex; water flowing recorded during visit
bK	0.577	NB: functional	NB: functional	No	
d1	0.038	NB: functional	NB: functional	No	This drain was wrongly classified as reduced functional in 2004
d2	0.033	NB: functional	NB: functional	No	This drain was wrongly

	classified as reduced functional in 2004

Bog margin drainage

The cutover areas were not surveyed for drains during 2012, but were described in detail by Kelly *et al*. (1995).

There are numerous drains associated with active peat cutting in the north-west and south-east of the site. These drains appear to be well maintained and are over 1.0m deep and impacting on high bog habitats. The drains in the north-west coalesce and discharge into a westerly flowing stream to the north of the site while the drains in the south-east coalesce and discharge into a westerly flowing stream to the south of the site.

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

Fire history

There has been a recent fire (2012) in the east of the site that severely burnt 6ha of the high bog (6.1%) vegetation. Fernandez *et al*. (2005) noted that a very small area (0.2ha) of the high bog (as well as some of the cutover) had been recently burnt prior to the 2004 site visit. A second older fire was also noted at the time as having affected ca. 20ha in the east of the high bog. This burn line is still evident on the aerial photo of 2010, extending south from drain bC, and thus must have been a severe burn. Kelly *et. al* (1995) reported evidence of recent burns in the east and south-east of the site while Douglas and Grogan (1986) described the central area and the wooded flush as having been recently burnt. Thus, fire events appear to be relatively frequent at Crosswood Bog, and are considered to have a low importance/impact on high bog habitats.

Invasive species

Two mature *Rhododendron ponticum* bushes were reported from the high bog in 2004 (Fernandez *et al*., 2005). No further seedlings or younger plants were recorded in 2012.

Fernandez *et al*. (2005) also reported the spread of *Pinus* spp. on the high bog, particularly in the south-west within the area of drainage complex bJ. *Picea* saplings and trees were also recorded, but only occasionally. In 2012, *Pinus* spp. were again recorded as spreading in the south-west of the site with young pines (1-2m tall and <8 years old) scattered, but frequent. Interestingly there is no mention of pines by Kelly *et al.* (1995) in their description of Complex 2/3 from this area of the high bog in 1994 although they did note in their vegetation summary that scattered *Pinus sylvestris* trees

were encroaching onto the high bog. The spread of *Pinus* spp. is indicative of the high bog drying out and their presence is likely to result in the further drying out of the site.

Campylopus introflexus has been recorded from many areas of the high bog, particularly towards the margins and areas that have suffered more from fires and drainage.

Invasive species are considered to have a low importance/impact on ARB and Rhynchosporion depressions and a medium importance/impact on DRB.

Problematic native species

Kelly *et al.* (1995) noted that scattered *Pinus sylvestris* trees were encroaching onto the high bog and this encroachment appears to have continued in the last 18 years.

Problematic native species are considered to have low importance/impact on ARB and Rhynchosporion depressions and a medium importance/impact on DRB.

Afforestation and forestry management

In 2004, 39.1ha of conifer plantations lay to the south of the high bog. The plantations were composed mostly of *Pinus contorta* or *Picea sitchensis* and were immediately adjacent to the high bog in its south-western extent and elsewhere were only separated from the high bog by areas of cutover with ongoing active peat-cutting. These plantations along with 3.6ha of *Betula pubescens* woodland formed the 42.7ha project area for part of the Coillte Life project (LIFE04 NAT/IE/000121) to restore raised bogs. Restoration activities undertaken (from 2005-07) as part of the Coillte Life project included the clear-felling and removal of the mature conifer crop, wind-rowing of the remaining brash, and the blocking, where possible, of associated drains with peat dams. Follow-up work included the control of the natural regeneration of conifer seedlings. Much of the Coillte Life project site has thus now been cleared of conifers and any brash remaining has been wind-rowed to allow bog vegetation re-colonise the exposed peat surface. However, as the surface is very dry and drain-blocking has been restricted due to the concerns of turbary holders, the re-colonisation of bog species has been very slow (Derwin, 2008).

The project ecological monitoring report notes that before conifer felling and drain blocking was carried out, the water levels were found to be 70cm below the surface and that with the removal of the conifers and the blocking of the associated drains, there was a distinct rise in the water table within the project site. However, with the restrictions on drain blocking brought about by the concerns of turbary plot holders working adjacent to the project site, the main drains were re-opened and the water levels dropped sharply.

Overall, the success of the project at Crosswood Bog was considered limited largely due to the nature of the restoration area and the proximity of active turbary. The water table of the project area cannot be raised without the further blocking of drains, which is unlikely while active peat cutting continues. Thus, the conclusion of the projects report was that the site should be re-assessed once peat cutting has ceased with the intention of further drain blocking.

Conifer removal and drain blocking are reported as positive management actions in Table 6.1.

Other impacting activities

There are paths with associated drains adjacent to the high bog along the northern and southern margins and an old disused railway lines crosses along the northern margin.

Conservation activities

No physical restoration management actions have been carried out on the high bog at Crosswood Bog and negotiations with turf cutters have so far failed to stop or even reduce the extent of peat cutting at the site. Thus, over 3ha of high bog has been lost to peat cutting during the reporting period and over 8km of high bog drains as well as an extensive series of cutover drains continue to drain it.

However, on a positive note, the site was part of the Coillte Life project (LIFE04 NAT/IE/000121) to restore raised bogs (*http://www.raisedbogrestoration.ie/life04/raised-bog-project-sites/crosswood-bog-athlone-westmeath-ireland.html*). Under this project, 39.1ha of conifer plantations (composed mostly of *Pinus contorta* and/or *Picea sitchensis*) that lay on the cutover to the south of the high bog were removed with a view to developing birch woodland with local patches of marsh vegetation or wet woodland along the blocked drains.

Derwin (2008) stated that restoration activities carried out from 2005-07 as part of this project included the clear-felling and removal of the mature conifer crop, wind-rowing of the remaining brash, and the blocking, where possible, of associated drains with peat dams. Follow-up work included the control of the natural regeneration of conifer seedlings. Derwin (2008) reported that much of the Coillte Life project site has thus now been cleared of conifers and that any brash remaining has been wind-rowed to allow bog vegetation re-colonise the exposed peat surface. However, as the surface is very dry and drain-blocking has been restricted due to the concerns of turbary holders, the re-colonisation of bog species has been very slow.

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Overall, the success of the project at Crosswood Bog was considered limited largely due to the nature of the restoration area and the proximity of active turbary. The water table of the project area cannot be raised without the further blocking of drains, which is unlikely while active peat cutting continues. Thus, the conclusion of the projects report was that the site should be re-assessed once peat cutting has ceased with the intention of further drain blocking.

Both forestry removal and cutover drain blocking are reported as positive management actions under Forestry Clearance and 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 and Bog Woodland 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 decrease (1.00ha) in the extent of Active Raised Bog habitat on Crosswood Bog.

The area of sub-central ecotope is considered to have declined by 1.0ha with all of the loss being recorded from **Sc1**. Most of this loss occurred from the south-western extent of **Sc1** and can be attributed to the ongoing peat cutting to the west of this area and to high bog drainage.

Small differences in the boundary of **Sc2** and **Sc4** have also been recorded, but these are attributed to being the result of a more comprehensive survey and increased mapping accuracy in 2012.

Sc5 and **Sc6** are no longer present in 2012. However, these areas were extremely small in 2004 with only one sub-central point recorded within each of the two areas. A number of sub-central points were recorded from each of the two areas again in 2012. However, the extent of sub-central was considered too small to map and it is likely that their 'loss' can be attributed to the increased mapping accuracy of the 2012 survey.

Sc3 is also no longer present. This sub-central area was composed entirely of complex 9/7/10 + Cl in 2004, which was described at the time as having a *Sphagnum* cover of 40%, composed mostly of *S. capillifolium* with no lawns or pools present. This complex would be considered as sub-marginal complex 9/7 using 2012 criteria and thus the 'loss' of sub-central ecotope here can be attributed to vegetation re-interpretation. Indeed the description of the area in 2012 estimates the *Sphagnum* cover to be mainly 26-33%, but up to 50% in places.

The area of active flush (0.14ha) has remained the same during the reporting period. All of the active flush occurs towards the north of flush **Z** and although the boundary has changed slightly, the changes are attributed to being the result of a more comprehensive survey and increased mapping accuracy in 2012.

Although flush **B** is mapped as inactive, it was recorded as having a high *Sphagnum* cover dominated almost entirely by hummocks of *S. capillifolium*. There were also small wet patches that supported *S. magellanicum* and *S. cuspidatum* that could be classed as Active Raised Bog. However, these were too small and scattered to map. This flush was burnt in 2012. The 2004 survey also recorded some "potentially active areas" within flush **B**.

The favourable reference value (FRV) for Area is considered to be the sum of Active Raised Bog (central and sub-central ecotopes) plus sub-marginal ecotope when the Habitats Directive came into force in 1994 (see table 8.4). Therefore, Active Raised Bog Area FRV is 56.67ha (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 (4.64ha) is 91.81% below the FRV. A current Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category.

A long term (1994-2012) trend indicates a reduction in the area of Active Raised Bog at the site (20.10ha) (see table 8.1). A more recent and short term trend analysis (8 years; 2004-2012) also indicates a decrease in the area (1.00ha) of Active Raised Bog. Therefore, the habitat Area is given a **Decreasing** trend assessment.

The Area of Active Raised Bog at Crosswood Bog is assessed as Unfavourable Bad-Decreasing (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 2.32ha (half of 4.64ha, the current area of Active Raised Bog). However, the current area of active flush is 0.14ha which is 93.97% below the FRV. Therefore S&Fs are given an **Unfavourable Bad** assessment.

No central ecotope has been recorded at Crosswood Bog since 1994 when 22ha of it were recorded. The loss of this area is, at least partially, explained by the excavation of the five parallel drains bA, bB, bC, bD and bE just prior to the 1994 survey as Kelly *et al*. (1995) noted that they were draining "the wettest part of the bog" with "considerable water flow" recorded in them at the time.

Although the long term (1994-2012) trend indicates a decrease in the extent of central ecotope, the short term (8 years; 2004-2012) trend indicates that the extent of active flush has been stable and therefore the S&Fs are given a **Stable** trend.

No quadrat analysis can be carried out on this site as no quadrats were recorded in 2004. However, quadrats **Qsc1, Qsc2, Qsc3** and **Qsc4** were recorded in 2012 for future monitoring surveys.

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

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

Future Prospects

A dramatic decrease in the area (20.10ha) of Active Raised Bog on Crosswood Bog was recorded from 1994 to 2004, with only a slight decrease (1.00ha) recorded from 2004 to 2012. The dramatic loss from 1994 to 2004 is partially explained by the fact that the series of five drains (bA – bE) in the north of the site were inserted in the months before the 1994 survey and thus their impact had not yet been felt. Indeed, as well as noting that these drains were draining "the wettest part of the bog", Kelly *et al*. (1995) also concluded that the drains "will undoubtedly affect the quality of the central area".

The continued loss of Active Raised Bog habitat can be explained by the fact that impacting activities most notably peat cutting, and high bog drainage continue to negatively impact on the ARB habitat. As well as losing over 3ha to peat cutting during the reporting period, this activity continues to cause slumping and subsidence further and further into the high bog in the north-west and south-east of the site. The fact that there has been no reduction in the intensity of the cutting during the reporting period (44 plots have been cut) is enough alone to result in the Future Prospects of Active Raised Bog to be considered Unfavourable. However, the outlook for ARB on Crosswood Bog looks even bleaker when considering the fact that all the 8km of drains on the high bog are still functional with no immediate plans to block them. As noted above high bog drains are likely to be responsible for the loss of central ecotope on the site and they are also responsible for a large area in the south-west of the site being dominated by dry marginal ecotope. The 2004 & 2012 survey also noted the spread of *Pinus* spp. particularly within drainage complex bJ in the south-west of the site. The abundance of pines is another indication of further drying out of the high bog.

Cutover drainage is also intensive at Crosswood Bog, but on a positive note, there is potential for restoration of the cutover along large areas to the south and west of the high bog. Indeed, this site was chosen as part of the Coillte Life project (LIFE04 NAT/IE/000121) to restore raised bogs. Under this project, 39.1ha of conifer plantations (composed mostly of *Pinus contorta* and/or *Picea sitchensis*) that lay on the cutover to the south of the high bog were removed from 2005-07. However, large restrictions were placed on the drain blocking proposed as part of the project due to the concerns of turbary plot holders working adjacent to the project site. Thus the project's success was considered limited and it was concluded that the site should be re-assessed once peat cutting has ceased with the intention of further drain blocking (Derwin, 2008).

Habitat **Area** is currently 91.81% below FRV (see table 8.4) and a Decreasing 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-Decreasing**.

Habitat's **S&Fs** are currently 93.97% below FRV (see table 8.4) and a Declining trend is also foreseen. Therefore S&Fs are expected to be more than 25% below FRV in the following two reporting periods. **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Declining**. **The overall habitat's Future Prospects are Unfavourable Bad-Declining** (see table 8.5)**.** Blocking of the high bog drains and the cessation of peat cutting is essential. The blocking of cutover drains is also likely to be necessary in order to attain the FRVs and it will also be important to reduce the frequency and intensity of fire events.

Cutover areas (particularly the western and southern) could play a major role in the restoration of the ARB habitat at Crosswood Bog as the current characteristics of the high bog (i.e. small size, steep slopes caused by cutting and drainage) may make it difficult to regenerate previous Active Raised Bog values on the high bog.

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

Table 8.1 Changes in Active Raised Bog area

Active Ecotopes	1994/5[1]	2004	2004 (amended)	2012	Change (2004-2012)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Central	22.00	0.00	0.00	0.00	0.00	0.00
Sub-central	3.57	6.12	5.50	4.50	(-)1.00	(-)18.18
Active flush	0.17	0.17	0.14	0.14	0.00	0.00
Total	**25.74**	**6.29**	**5.64**	**4.64**	**(-)1.00**	**(-)17.73**

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

Note: Table 8.1 includes 2004 figures and 2004 amended figures. The latter shows the ecotope area believed to be present in 2004 after surveying improvements in 2012. The comparison between 2004 (amended) and 2012 illustrates the actual changes in ecotope area in the 2004-2012 period. Any change in ecotope area between the 2004 and the 2004 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2012 (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
Sc1	Qsc1 & Qsc2	Decreasing	A decrease in area with most of the loss having occurred from the south-western extent. This decrease is attributed to the continued peat cutting to the west of Sc1 and the	Qsc1 & Qsc2 – New 2012 quadrats

Area	Quadrats	Trend	Comment	Quadrats analysis
			continued presence of high bog drains.	
Sc2	Qsc3 & Qsc4	Stable	Slight changes along the entire boundary, but these changes are as a result of more comprehensive surveying and increased mapping accuracy in 2012.	Qsc3 & Qsc4 – New 2012 quadrats
Sc3	None	No longer present (but stable)	Sc3 was composed entirely of Complex 9/7/10 + Cl in 2004, which was described at the time as having a *Sphagnum* cover of 40%, composed mostly of *S. capillifolium* with no lawns or pools present. This complex would be considered as sub-marginal complex 9/7 using 2012 criteria and thus the 'loss' of sub-central ecotope here can be attributed to vegetation re-interpretation.	
Sc4	None	Stable	Slight changes along the entire boundary, but these changes are as a result of more comprehensive surveying and increased mapping accuracy in 2012.	
Sc5	None	No longer present (but stable)	Sc5 was extremely small in 2004 with only one sub-central point recorded within it. A number of sub-central points were recorded from here in 2012, but the extent was considered too small to map. It is likely that the 'loss' of Sc5 can be attributed to the increased mapping accuracy of the 2012 survey.	
Sc6	None	No longer present (but stable)	Sc6 was extremely small in 2004 with only one sub-central point recorded within it. A number of sub-central points were recorded from here in 2012, but the extent was considered too small to map. It is likely that the 'loss' of Sc6 can be attributed to the increased mapping accuracy of the 2012 survey.	
Z	None	Stable	The area of active flush within Flush Z has remained the same during the reporting period. There have been small changes in the boundary, but these are attributed to being the result of a more comprehensive survey and increased mapping accuracy in 2012.	
B	None	Stable	Although Flush B is mapped as inactive, there were small wet patches within it that supported *Sphagnum magellanicum* and *S. cuspidatum* that could be classed as ARB. However,	

Area	Quadrats	Trend	Comment	Quadrats analysis
			these were too small and scattered to map. The 2004 also recorded some "potentially active areas" within Flush B.	

Degraded Raised Bog (7120)

Area

The Degraded Raised Bog FRV for Area is 41.44ha at Crosswood Bog. This value corresponds with the difference between the current high bog area (98.11ha) and the Active Raised Bog FRV (56.67ha) 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 125.56% 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 (2.13ha) in the area of Degraded Raised Bog. The decrease is the result of the loss of Active Raised Bog (1.00ha) and a high bog loss of 3.13ha caused by peat cutting. As a result the habitat is given a **Decreasing** trend.

The Area of Degraded Raised Bog at Crosswood 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 23.37ha (25% of 93.47ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (49.00ha) is 109.69% 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). Table 8.3 shows a decrease in the area of marginal ecotope of 0.91ha and a decrease in the area of face-bank ecotope of 2.22ha. However, these decreases are due to the loss of high bog to peat cutting and therefore are a negative development. The increase of 1.00ha of sub-marginal ecotope is also a negative

development as this increase has come about as a result of the degradation of ARB. Nevertheless, increases in marginal or face bank ecotope due to further drying out have not been recorded. Thus, the DRB's S&Fs at Crosswood Bog are given a **Stable** trend.

The mapping of boundary between marginal and sub marginal is difficult and decreases are only recorded where major changes in the vegetation are evident. Therefore, where no changes are shown, more subtle negative effects cannot be ruled out, and therefore negative changes may have been underestimated. The basic assumption is that were peat cutting has taken place subsidence will occur and will continue for some decades and this will dry out the adjacent areas of the bog.

Typical good quality indicators and typical plant species are still found throughout the entire bog on sub-marginal ecotope.

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

Future Prospects

Degraded Raised Bog has decreased in area as a result of peat cutting. This activity continues at the site and will continue to reduce the habitat's extent unless is phased out. Furthermore, drainage on the high bog continues to damage the habitat and hindering its recovery to FRVs, as well as minimising the chances to convert face bank and marginal ecotope into sub-marginal ecotope and/or Active Raised Bog. In addition further restoration works to counteract negative effects of impacting activities are necessary.

The 2012 survey noted the spread of *Pinus* spp. across many sections of the entire high bog, but particularly the south-west. The spread of pines is likely to an indication of further high bog drying out.

Habitat **Area** is currently 125.56% above FRV (see table 8.4) and a Decreasing trend is expected in the following two reporting periods (12 years). 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-Decreasing**. Habitat's **S&Fs** are currently 109.69% above FRV (see table 8.4). A Declining trend is foreseen in the following two reporting periods and thus **S&Fs** are expected to remain more than 25% above FRV. As a result, habitat's **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Declining**.

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

Table 8.3 Changes in Degraded Raised Bog area

Inactive Ecotopes	1994/5[1]	2004	2004 (amended)	2012	Change (2004-2012)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Sub-marginal	30.93	37.62	39.64	40.64	(+)1.00	(+)2.52
Marginal[2]	41.18	50.38	46.01	45.10	(-)0.91	(-)1.98
Face bank[2]	n/a	2.41	6.12	3.90	(-)2.22	(-)36.27
Inactive flush	5.57	4.68	3.83	3.83	0.00	0.00
Total	**77.68**	**95.09**	**95.60**	**93.47**	**(-)2.13**	**(-)2.23**

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

[2] Any 2012 marginal and face bank ecotope value given within the report should be taken as a maximum value. Their extent is based on the 2012 habitat survey and 2010 aerial photographs. It cannot be ruled out that further marginal and/or face bank ecotope losses may have taken place at the margin of the high bog in the 2011-2012 period associated with peat cutting.

Note: Table 8.3 includes 2004 figures and 2004 amended figures. The latter shows the ecotope area believed to be present in 2004 after surveying improvements in 2012. The comparison between 2004 (amended) and 2012 illustrates the actual changes in ecotope area in the 2004-2012 period. Any change in ecotope area between the 2004 and the 2004 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2012.

The overall conservation status of Degraded Raised Bog at Crosswood Bog is assessed as Unfavourable Bad-Declining (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 Active Raised Bog has

slightly decreased (by 1.00ha) in the reporting period. However, this decrease has resulted in a similar sized increase in the extent of sub-marginal ecotope. 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 such as peat cutting and drainage continue to threaten Active and Degraded Raised Bog. Logically this has to have a long term negative effect on Rhynchosporion depressions. Therefore, the habitat's Area Future Prospects are given an **Unfavourable Bad-Decreasing** 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-Declining** assessment.

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

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

Table 8.4 Habitats favourable reference values

Habitat	Area Assessment			Structure & Functions Assessment		
	FRV Target (ha) [1]	2012 value (ha) [2]	% below target	FRV 2012 Target (ha) [3]	2012 value (ha) [4]	% below target
7110	56.67	4.64	91.81	2.32	0.14	93.97

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

[2] 2012 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] 2012 central ecotope and active flush area.

	FRV Target (ha) [5]	2012 value (ha) [6]	% above target	FRV 2012 Target (ha) [7]	2012 value (ha) [8]	% above target
7120	41.44	93.47	125.56	23.37	49.00	109.69

[5] Current high bog area minus 7110 area FRV.

[6] 2012 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–Declining.**
- **Degraded Raised Bog is assessed as being Unfavourable Bad–Declining.**
- **Rhynchosporion depressions is assessed as being Unfavourable Bad–Declining.**

Table 8.5 Habitats conservation status assessments

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

Conclusions

Summary of impacting activities

- Peat cutting still continues at the site and has taken place at 44 locations in the 2004-2012 reporting period. The activity has continued in 2013. At least 3.13ha of high bog have been lost in this period due to peat cutting and this activity is considered to be one of the reasons for the decline in Active Raised Bog along the western section of high bog.
- Over 8km of drains on the high bog remain functional and significant water losses via these drains were recorded during the 2012 survey. Some of these drains were inserted onto the high bog in 1993/94 and are likely to have played a significant role in the loss of the 22ha of central ecotope at Crosswood Bog in 1994, while other are the reason why the south-west is dominated by dry marginal ecotope.
- An extensive network of drains on the cutover, particularly in the north-west and south of the high bog is also impacting on the high bog habitats.

- A recent fire in the east of the site severely burnt 6ha of the high bog vegetation.

Changes in active peat forming areas

- There has been a slight decrease in the area of Active Raised Bog (1.00ha) at Crosswood Bog in the 2004 to 2012 period. This loss has taken place from sub-central ecotope towards the west of the high bog (**Sc1**). In addition to the small loss of ARB, there have been a number of changes to the mapped distribution of the habitat at the site, although these are attributed to the more comprehensive field mapping that took place during this survey. This has resulted in the former sub-central areas **Sc3**, **Sc5** and **Sc6** no longer being mapped as ARB.

Other changes

- The 2012 survey has also noted further drying out processes in the southwest of the high bog, illustrated by the spread of pine in this intensively drained area.

Quadrats analysis

No quadrat analysis can be carried out on this site as no quadrats were recorded in 2004. However, quadrats **Qsc1, Qsc2, Qsc3** and **Qsc4** were recorded in 2012 for future monitoring surveys.

Restoration works

- No restoration works have taken place on the high bog, but the cutover to the south of the high bog was included as part of the he Coillte Life project (LIFE04 NAT/IE/000121) to restore raised bogs. Restoration work took place from 2005-07, and although 39.1ha of conifer plantations were removed, the project met with limited success as restrictions were placed on drain blocking due to the concerns of adjacent turbary plot holders.
- NPWS has engaged in negotiation with landowners in relation to the cessation of peat cutting at the site. Despite negotiations peat cutting continues at Crosswood Bog.

Summary of conservation status

- **Active Raised Bog** has been given an **Unfavourable Bad–Declining** conservation status at Crosswood Bog. Habitat Area has slightly decreased while habitat quality (S&Fs) remained unchanged in the reporting period. However both values are below the FRVs. Future Prospects are considered Unfavourable Bad-Declining as impacting activities (peat cutting and drainage) continue to threaten the habitat.
- **Degraded Raised Bog** has been given an **Unfavourable Bad-Declining** conservation status at Crosswood Bog. Habitat Area has decreased as a result of peat cutting. S&Fs have

remained Stable. Habitat Area and S&Fs are above the FRV. Future Prospects are considered Unfavourable Bad-Declining due to threatening impacting activities.

- **Depressions on peat substrates of the Rhynchosporion** has been given an **Unfavourable Bad-Declining** conservation status at Crosswood Bog. Habitat Area and quality are considered to have not changed in the reporting period. However, Future Prospects are considered Unfavourable Bad-Declining as a result of threatening impacting activities.

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

Recommendations

- **Cessation of peat cutting.**
- **Restoration works** particularly the blocking of high bog functional drains.
- There appears to be good potential for the **restoration of cutover areas**. However, an impact assessment of the affect that drain blocking in the cutover may have on adjacent land may be necessary prior to the any such restoration project on the 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 and cutover in order to assess change in habitat's conservation status and the success of the restoration works.
- **Ongoing monitoring and management of restoration works** such as the monitoring of water table levels and the removal of regenerating conifers.

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Appendix I Detailed vegetation description of the high bog

Active Raised Bog (7110)

Central Ecotope Complex

No central complexes recorded on Crosswood Bog.

Sub-Central Ecotope Complexes

COMPLEX 15-

- **Location**: this is the only sub-central community complex recorded at Crosswood Bog and characterizes **Sc1**; **Sc2** and **Sc4**
- **Ground**: soft to very soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: depression
- **Pools**: 11-25% (these are not clearly defined pools and in places are more like *Sphagnum*-filled depressions dominated by *Rhynchospora alba*)
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: hummocks/hollows and pool-like depressions
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Rhynchospora alba* (11-25%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (4-10%), *Carex panicea* (<4%), *Drosera anglica* (<4%), *Menyanthes trifoliata* (<4%), *Andromeda polifolia* (<4%), *Vaccinium oxycoccos* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. austinii* (H; <4%), *S. fuscum* (H; <4%), *S. papillosum* (H & P; 4-10%), *S. magellanicum* (L & P; 11-25%), *S. cuspidatum* (P; 4-10%).
- **Additional comments**: *Sphagnum pulchrum* dominates some of the pools in the north of **Sc1** and in **Sc4**. In the north of **Sc1** there is also a lower cover of *S. austinii* (which is 4-10% in places in the south of **Sc1**), *S. fuscum* and *Rhynchospora alba* (4-10%) while there is a higher cover of

Eriophorum vaginatum (11-25%), *E. angustifolium* (4-10%) and *Carex panicea* (4-10%). In the western lobe of **Sc1**, complex 15- may be dryer than in 2004 as the pools have very little *Sphagnum cuspidatum* (<4%) in places and *Rhynchospora alba* cover is high (11-25%).

This complex also dominates **Sc2**. Here the inter-pool areas have a poorer *Sphagnum* cover and there is an increase in the cover of *Narthecium ossifragum* (11-25%) and *Carex panicea* (11-25% in places). However, in parts of this area, the pools are better defined and there is a higher cover of *Sphagnum denticulatum* and *S. capillifolium* and a lower cover of *S. magellanicum* and *Rhynchospora alba* (4-10%). Towards the east of this area the pools are dominated by *Sphagnum pulchrum* while *Aulacomnium palustre* was recorded in the south.

This complex also dominates the area formerly mapped as **Sc5**, but the area is now considered too small to map. Pools cover ca. 25% of this small area and are dominated by *Sphagnum cuspidatum* (4-10%), *S. magellanicum* (4-10%) and *S. papillosum* (4-10%). Hummocks of *S. capillifolium* (26-33%) dominate the inter-pool area along with *Calluna vulgaris* (34-50%). *Rhynchospora alba* also occurs in the pools (11-25%).

The area formerly mapped as **Sc6** is considered too small to map as it is essentially composed of 3-4 *Sphagnum cuspidatum/S. magellanicum* pools. Hummocks of *S. austinii* and *S. fuscum* are also present here as well as *Drosera anglica*, *Menyanthes trifoliata* and *Dicranum scoparium*.

The loss of **Sc5** and **Sc6** is considered to be an improvement in mapping accuracy rather than an actual change.

Quadrats **Qsc1, Qsc2, Qsc3 and Qsc4** were recorded within this complex.

Active flushes

FLUSH Z

- **Location**: found on the western section of high bog
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 41-50cm
- ***Cladonia* cover**: 11-25%
- **Macro-topography**: flat
- **Pools**: absent
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: absent
- **Micro- topography**: high hummocks/hollows

- **Tussocks**: *Eriophorum vaginatum* (11-25%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *Vaccinium oxycoccos* (<4%), *Andromeda polifolia* (<4%), *Sphagnum capillifolium* (H; 51-75%), *S. papillosum* (H; <4%), *S. magellanicum* (H; <4%).
- **Additional comments:** Although this flush is wooded (*Pinus sylvestris* and *Betula pubescens* dominated) there isn't a closed canopy so it is not classed as bog woodland. The trees are mainly 2-4m in height though some individuals are 6-8m. Most of this flush is considered inactive even though there is a relatively high *Sphagnum* cover (51-75%). This is due to the fact that it is dry and dominated almost entirely by hummocks of *S. capillifolium*. However, there is a small area considered active towards the north-west of the flush as it is slightly wet and there is a more diverse *Sphagnum* cover including *S. fallax*, and *S. palustre*. The cover of *Calluna vulgaris* (26-33%) is lower here while the cover of *Eriophorum vaginatum* (34-50%) is higher. Other species recorded in this area include *Molinia caerulea*, *Juncus effusus*, *Hylocomium splendens*, *Empetrum nigrum*, *Vaccinium myrtillus*, *Polytrichum strictum*, *P. commune* and *Aulacomnium palustre*.

  Sc3 was recorded as complex 9/7/10 to the north-east of this flush in the 2004/05. However, this area is now mapped as sub-marginal complex 9/7. This is an interpretation difference rather than an actual change.

Degraded Raised Bog (7120)

Sub-Marginal Ecotope Complexes

COMPLEX 9/7

- **Location**: this complex is found north of flush Z
- **Ground**: soft to very soft (wet)
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 11-25%
- **Macro-topography**: flat
- **Pools**: absent
- ***Sphagnum* cover**: 26-33% (34-50% in places)
- ***Narthecium* cover**: <4%
- **Micro- topography**: hummocks/hollows

- **Tussocks**: *Eriophorum vaginatum* (11-25%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (11-25%; 26-33% in places), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Trichophorum germanicum* (<4%), *Carex panicea* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; 4-10%), *S. austinii* (H; <4%), *Dicranum scoparium* (<4%); *Vaccinium oxycoccos* (<4%).
- **Additional comments:** this complex has a high *Sphagnum* cover (50% in places) for a sub-marginal ecotope, but this is composed almost entirely of hummocks of *S. capillifolium* and thus is not considered as active raised bog. However, part of this was mapped as sub-central complex 9/7/10 in 2004/05. This is likely to be due to vegetation interpretation difference rather than any real change.

COMPLEX 9/7/6

- **Location**: this is the most widespread sub-marginal ecotope community complex at the site and it is found across the entire middle section of the high bog
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: <4% (4-10% in places)
- ***Sphagnum* cover**: 11-25% (26-33% in places)
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: hummocks/hollows/flats and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Trichophorum germanicum* (<4%), *Carex panicea* (4-10%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H & P; <4%), *S. subnitens* (H; <4%), *S. tenellum* (H; <4%), *S. magellanicum* (P; <4%), *S. cuspidatum* (P; <4%), *Menyanthes trifoliata* (<4%); *Drosera anglica* (<4%); *Vaccinium oxycoccos* (<4%); *Leucobryum glaucum* (<4%).
- **Additional comments:** where pools occur within this complex, they generally have a patchy *Sphagnum* cover and are mostly open water or algal.

Where *Carex panicea* is of a higher cover value than *Narthecium ossifragum*, the complex is termed complex 9/7/3. In these areas the surface is generally firm to soft underfoot and the *Sphagnum* cover is 11-25%.

Where this complex occurs to the west of **Sc2**, the *Sphagnum* cover is lower (11-25%) and the cover of *Narthecium ossifragum* is higher (34-50%). There are tall *Leucobryum glaucum* hummocks in this area and the cover of *Trichophorum germanicum* is 4-10%. *Pleurozia purpurea* is also present. There are patches here where there is a low *Sphagnum* cover (4-10%) so that marginal ecotope forms a mosaic with sub-marginal in places.

To the north of the flush between **Sc1** and **Sc2**, the complex grades into 9/7/6 + *Pinus sylvestris* and also into an area of complex 9/7 where the *Sphagnum* carpet is very soft under *Calluna* and *Cladonia* and *Eriophorum vaginatum* is 26-33%.

- At the eastern side of the site in the 9/7/6 complex, the *Eriophorum* spp. cover can be low (<10%), but the *Sphagnum* cover remains high (>20%). There are occasional *S. fuscum* hummocks, but *Narthecium ossifragum* is locally high (34-50%) in small patches.

COMPLEX 6/3/9 (B)

- **Location**: east of **Sc2**
- **Ground**: soft
- **Physical indicators**: burnt in 2012; burnt *Sphagnum* hummocks 26-33%
- ***Calluna* height**: <10cm
- ***Cladonia* cover**: absent
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 4-10% (burnt *Sphagnum* 26-33%)
- ***Narthecium* cover**: 51-75%
- **Micro- topography**: low hummocks/hollows but flats dominate
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%; 4-10% in places), *E. angustifolium* (<4%; 4-10% in places), *Narthecium ossifragum* (51-75%), *Trichophorum germanicum* (<4%), *Carex panicea* (11-25%; 4-10% in places), *Rhynchospora alba* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H <4%), *S. austinii* (H; <4%), *S. tenellum* (H; <4%), *S. magellanicum* (H; <4%), *S. cuspidatum* (Hl; <4%).

- **Additional comments:** Parts of this burnt area has a good soft deep *Sphagnum* cover (26-33%) with *Narthecium* flats in possible former pool areas. There are relic high hummocks of *Leucobryum glaucum* >40cm high and *Sphagnum fuscum* >15cm high. Although there are no pools it is sometimes squelchy under-foot and in places could have been a sub-central complex in the past.

Marginal Ecotope Complexes

COMPLEX 6/7/3

- **Location**:
- **Ground**: firm to soft
- **Physical indicators**: bare peat (<4%)
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 11-25%
- **Macro-topography**: steep slope (gentle in places)
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: hummocks/hollows/*Narthecium ossifragum* flats
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (34-50%), *Carex panicea* (11-25%; 26-33% in places), *Rhynchospora alba* (<4%; 4-10% in places), *Trichophorum germanicum* (<4%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. papillosum* (H; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments**: A variant of this complex also occurs with less *Carex panicea* (4-10%) and more *Calluna vulgaris* (34-50%), in which the complex is called 6/7. Where this complex occurs in the south-west of the high bog (in the area with drains running through it), *Pinus sylvestris* is present (6/7 + Pines) and appears to be spreading with young pines (1-2m tall and <8 years old) scattered but frequent.

COMPLEX 3/6 (B)

- **Location**: east of high bog

- **Ground**: firm
- **Physical indicators**: burnt in 2012; burnt *Sphagnum* hummocks 11-25%
- ***Calluna* height**: <10cm
- ***Cladonia* cover**: absent
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 76-90%
- **Micro- topography**: hummocks/hollows/*Narthecium ossifragum* flats
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Narthecium ossifragum* (76-90%), *Carex panicea* (11-25%; 4-10% in places), *Rhynchospora alba* (<4%), *Trichophorum germanicum* (<4%), *Leucobryum glaucum* (<4%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. papillosum* (H; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments**: Although this complex has got a higher cover of *Narthecium ossifragum* than *Carex panicea.* The complex is named 3/6 (B) rather 6/3 (B), which is a frequently found sub-marginal ecotope community complex on Irish raised bogs.

COMPLEX 2/7

- **Location**: east and south of high bog edge
- **Ground**: firm
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 11-25%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: hummocks/hollows
- **Tussocks**: *Trichophorum germanicum* (4-10%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (51-75%), *Narthecium ossifragum* (4-10%), *Carex panicea* (4-10%), *Trichophorum germanicum* (4-10%), *Sphagnum capillifolium* (H; 4-10%).

- **Additional comments**: none.

Inactive flushes

FLUSH A

This 'flush' was described in 2004 as occurring around "a mature *Pinus sylvestris* tree (4-5 m high) along drain bF". The tree was described as being surrounded by a patch of *Molinia caerulea* and scattered *Pinus* saplings as well as several *Betula pubescens* and *Sorbus aucuparia* saplings and *Vaccinium myrtillus* bushes. This 'flush' was not re-visited in 2012 and is thus not mapped.

FLUSH B

- **Location**: in the north-east of the high bog
- **Ground**: firm to soft
- **Physical indicators**: burnt in 2012; burnt *Sphagnum* hummocks 51-75%
- ***Calluna* height**: <10cm
- ***Cladonia* cover**: absent
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 4-10% with 51-75% (burnt hummocks)
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: Low hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Molinia caerulea* (34-50%), *Calluna vulgaris* (4-10%), *Potentilla erecta* (<4%), *Succisa pratensis* (<4%), *Aulacomnium palustre* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; <4%), *S. subnitens* (H; <4%), *S. magellanicum* (H; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments:** This flush is considered inactive even though there is a relatively high *Sphagnum* cover (51-75%). This is due to the fact that it is dry and dominated almost entirely by hummocks of *S. capillifolium*. However, there are small patches that are wet with some *S. magellanicum* and *S. cuspidatum* that could be considered as active raised bog. These areas are too small and scattered to map.

  Kelly *et al*. (1995) described this area as Marginal Ecotope and classed it as complex 2 + *Molinia*. They noted that land to the south, west and north-west of it slope down to the area suggesting possible water run-off. They also noted that its presence may be associated with underlying

mineral soil as the peat may only form a thin layer in this area (the area was shown as being on mineral soil on the 1840s sheet). Some of the drains west of this flush (the eastern-most drains of bG) appear to be infilling and the area may be re-wetting as a result. This area was not surveyed in great detail in 2012. However, it is recommended that any future survey would assess this area, in particular, more comprehensively.

Face bank Complexes

COMPLEX 1

- **Location**: along the edge of high bog
- **Ground**: firm
- **Physical indicators**: cracking
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: generally absent but <4% in places
- ***Narthecium* cover**: <4%
- **Micro- topography:** tall robust *Calluna vulgaris*/low hummocks
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (76-90%), *Erica tetralix* (4-10%), *Trichophorum germanicum* (<1%), *Narthecium ossifragum* (<4%), *Sphagnum subnitens* (H; <4%).
- **Additional comments**: the face-bank is ca 3m high in the north-west of the site.

Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Crosswood Bog in both Active and Degraded Raised Bog, but it is only occasional found on degraded habitat. Only *Rhynchospora alba* was recorded within the 2012 survey at this site.

R. alba is found in all ecotopes in Crosswood Bog, such as: sub-central ecotope (15-); sub-marginal ecotope (6/3/9 (B)) and marginal ecotope (6/7/3;3/6 (B)).

The species becomes very frequent within complexes 15- (sub-central).

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* and *S. pulchrum*. 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
P0396	NE	Overview	Qsc1	26/09/2012
P0401	NE	Overview	Qsc2	26/09/2012
P0413	NE	Overview	Qsc3	27/09/2012
P0414	NE	Overview	Qsc4	27/09/2012

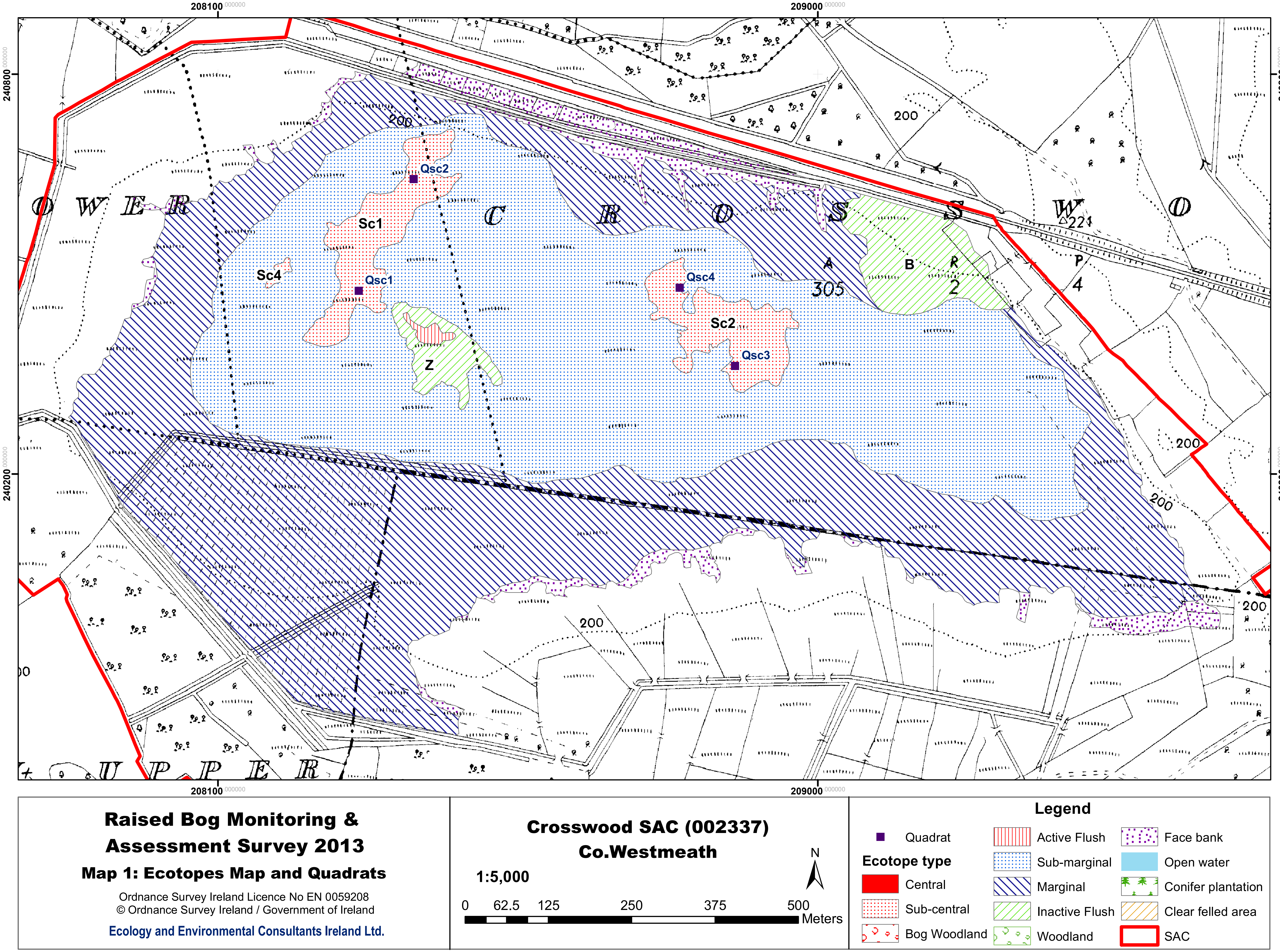
Appendix III Quadrats

Ecotope type	**Sub-central**	**Sub-marginal**	**Sub-central**	**Sub-central**
Complex Name	**15-**	**15-**	**15-**	**15-**
Quadrat Name	Qsc1	Qsc2	Qsc3	Qsc4
Easting	208311.01	208393.82	208876.04	208793.14
Northing	240474.63	240642.06	240362.16	240479.42
Date	26/09/2012	26/09/2012	27/09/2012	27/09/2012
Firmness	Soft	Soft	Very soft	Soft
Burnt	No	No	No	No
Algae in hollows %	1-3 (several indiv)	Absent	Absent	Absent
Algae in pools %	1-3 (few indiv)	Absent	Absent	1-3 (many indiv)
Bare peat %	1-3 (many indiv)	Absent	Absent	Absent
High hummocks %	Absent	Absent	Absent	Absent
Low hummocks %	34-50	34-50	51-75	51-75
Hollows %	11-25	Absent	Absent	4-10
Lawns %	4-10	Absent	Absent	Absent
Pools %	4-10	26-33	34-50	26-33
Pool type	Interconnecting	Interconnecting	Interconnecting	Regular
S.austinii hum type	Active	Active	Active	Active
S.austinii hum %	4-10	1-3 (several indiv)	1-3 (many indiv)	1-3 (many indiv)
S.austinii height(cm)	0-10	11-20	11-20	0-10
S.fuscum hum type	Active	Absent	Absent	Active
S.fuscum hum %	1-3 (many indiv)	Absent	Absent	1-3 (many indiv)
S.fuscum height(cm)	0-10	Absent	Absent	0-10
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Flats	Tussocks	Tussocks	Tussocks
Trichophorum %	1-3 (few indiv)	1-3 (few indiv)	1-3 (few indiv)	1-3 (few indiv)
S.magellanicum %	11-25	4-10	1-3 (many indiv)	1-3 (many indiv)
S.cuspidatum %	1-3 (few indiv)	1-3 (several indiv)	4-10	4-10
S.papillosum %	4-10	11-25	4-10	4-10
S.denticulatum %	Absent	11-25	1-3 (several indiv)	1-3 (many indiv)
S.capillifolium%	11-25	4-10	34-50	26-33
S.tenellum %	1-3 (many indiv)	Absent	1-3 (many indiv)	4-10

Ecotope type	**Sub-central**	**Sub-marginal**	**Sub-central**	**Sub-central**
Complex Name	**15-**	**15-**	**15-**	**15-**
S.subnitens %	Absent	Absent	Absent	1-3 (many indiv)
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	11-25	1-3 (many indiv)	4-10	4-10
N.ossifragum %	4-10	1-3 (several indiv)	1-3 (many indiv)	4-10
Sphag pools %	1-3 (few indiv)	26-33	11-25	11-25
Dominant pool Sphag	S.magellanicum	S.pulchrum	S.cuspidatum	S.cuspidatum
Sphag lawns %	4-10	Absent	Absent	Absent
Sphag humm %	26-33	11-25	51-75	34-50
Sphag holl %	4-10	Absent	Absent	Absent
Total Sphag %	51-75	Absent	51-75	51-75
Hummocks indicators	S.austinii & S.fuscum	Absent	S.austinii	S.austinii&S.fuscum
Cladonia portent %	11-25	11-25	1-3 (many indiv)	11-25
Other Cladonia sp	C. uncialis			
C. panicea %	Absent	1-3 (few indiv)	1-3 (many indiv)	4-10
Calluna cover %	11-25	11-25	26-33	34-50
Calluna height(cm)	11-20	11-20	11-20	21-30
Other NotableSpecies	Dicranum scoparium & Menyanthes trifoliata	Drosera anglica & Menyanthes trifoliata	Aulacomnium palustre, Drosera anglica, Menyanthes trifoliata, Odontoschisma sphagnii & Mylia taylorii	Drosera anglica, Menyanthes trifoliata, Dicranum scoparium &Vaccinium oxycoccos
Other comment	Rhynchospora alba dominates in depressions that are likely to have formerly been pools.	Sphagnum pulchrum 11-25% cover		

Note: Data for those 2004 quadrats re-surveyed in 2012 is given to the right of the original 2004 quadrat data in table above. Not all quadrats reported in 2004 were re-surveyed in 2012. Nonetheless, all 2004 quadrat data is given above. Additional quadrats were recorded where necessary. Some 2004 quadrats may have been classified under a different ecotope category in 2012; further detail is given within the report.

Appendix IV Survey maps



Raised Bog Monitoring & Assessment Survey 2013

Map 1: Ecotopes Map and Quadrats

Ecology and Environmental Consultants Ireland Ltd.

Crosswood SAC (002337)
Co.Westmeath

208100 000000

209000 000000

240800 000000

240200 000000

LOWER CROSSWOOD

UPPER

Not available

Not available

9/7+Pines

6/7+Pines

Raised Bog Monitoring & Assessment Survey 2013

Map 2: Vegetation community complexes

Ecology and Environmental Consultants Ireland Ltd.

Crosswood SAC (002337)
Co.Westmeath

1:5,000

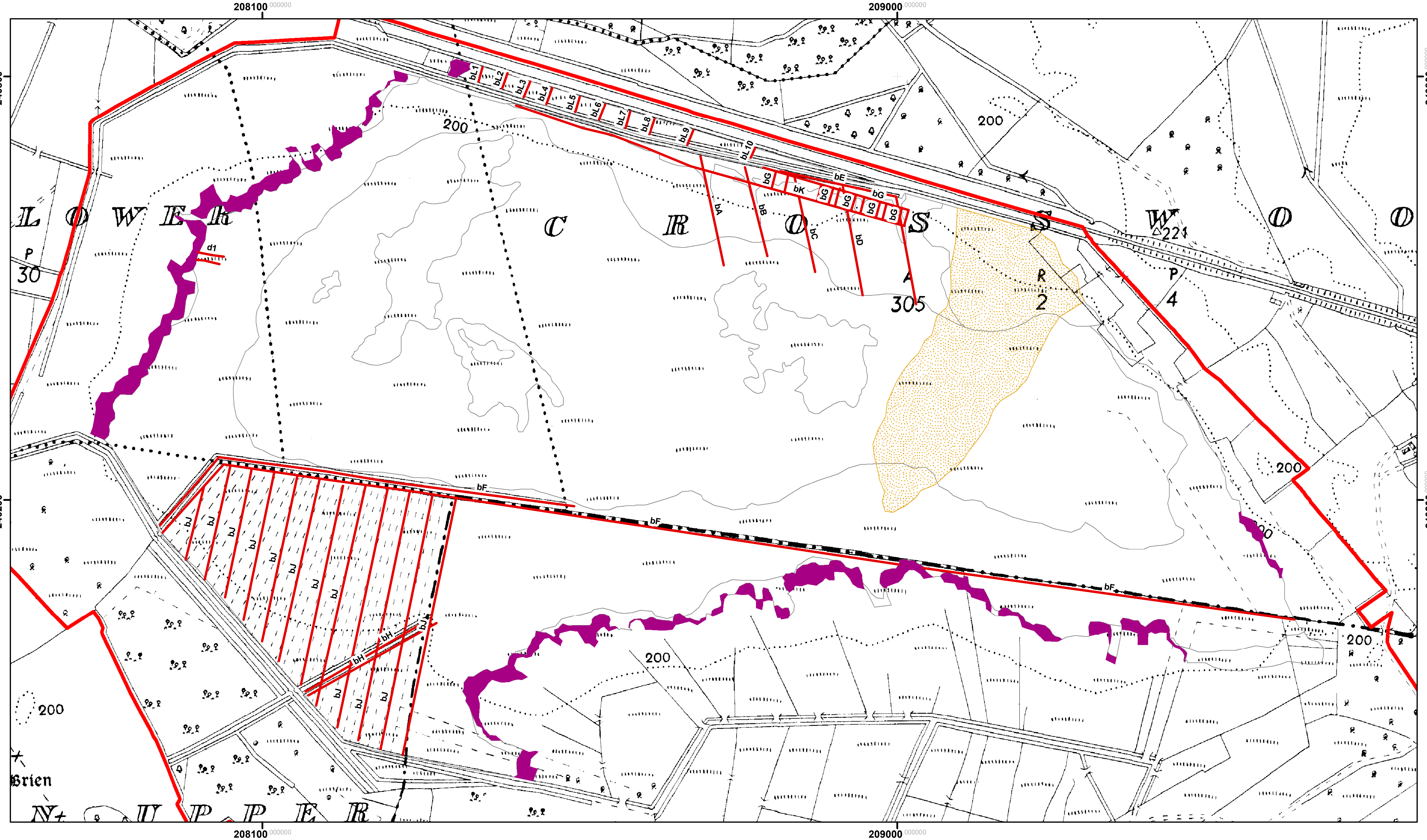
N

0 70 140 280 420 560 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
- 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 & Assessment Survey 2013

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

Ecology and Environmental Consultants Ireland Ltd.

Crosswood SAC (002337)

Co.Westmeath

1:5,000

0 70 140 280 420 560 Meters

N

Legend

High Bog drainage

- Blocked:non-functional
- Blocked:reduced functional
- Not blocked:functional
- Not blocked:non-functional
- Not blocked:reduced functional
- SAC
- Burnt high bog (2004/05-12/13)
- High bog cutaway (2004/05-10)