RAISED BOG RESTORATION PROJECT

AN INVESTIGATION INTO THE CONSERVATION AND RESTORATION OF SELECTED RAISED BOG SITES IN IRELAND

PART 3
SITE REPORTS (A3 Format)

A REPORT TO THE NATIONAL PARKS AND WILDLIFE SERVICE, DUBLIN.

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SUMMARY OF CONTENTS

This section of the report contains the detailed site reports for the sites for which the maps are drawn in A4 format. A paper copy of the Drains and Hydrochemistry Map, Vegetation Map, Ecotope Map, Landuse Map and Slopes Map accompany the site report. Transparent copies of these maps are contained in Appendix I.

Also contained in Appendix I are the 1840s geological maps (1:10,560) for each site and a copy of the site boundary map (1:10,560). For the sites which were combined when filling in the Special Areas of Conservation forms there is only one site map. This is contained in the envelope of the first site name. The sites to which this applies are:

Corliskea/Trien

Kilcarren/Firville

Ballykenny/Fisherstown

Ballyduff/Clonfinane

LIST OF FIGURES

ALL SAINT'S BOG, CO. OFFALY

1. SUMMARY OF SITE DETAILS

NHA No.	566	1/2" Sheet:	15
Grid Ref:	N 01 11	6" Sheet:	OY 29
GSI Aerial Photo:	N 163	1:25,000 Sheet:	17/19 NE
Other Photo:	SC 34062	Area (ha):	234 (total), 184 (intact)
NHA Photo:	685:1-11		

Date(s) of Visit: 14 and 15-6-94 (Ecology)
14 and 15-6-94 (Geohydrology)

Townlands: Glaster, Ballynasrah, Kilnaglinny, Coolaghansglaster and Macnamanny or Fulough.

2. INTRODUCTION

2.1 BACKGROUND

The site was identified as being of major importance by the Forest and Wildlife Service in 1985. A note on file describes it as an extremely wet bog with well developed hummock/hollow systems. Much of the N and W sides had been burnt 2-3 years previously. However *Sphagnum* species were regenerating well in these areas. It was given A status and included in the list of potential raised bog NNRs (Cross, 1990). Cross (*op cit*.) describes it as the only known example of a raised bog in Ireland with an extensive wet *Betula* woodland.

Cross (1987) describes the *Betula* flush in detail from information gathered from releve data. These findings are outlined in Section 6.2.2.

Corings (0-4m) were taken by Bord na Mona in 1986 to assess the suitability of the site for moss peat production. Humification degree and peat stratigraphy were not detailed.

A SW/NE transect across the site was levelled by the Hydrometric section of the O.P.W in September, 1988.

All Saint's was also visited by The International Mires Group in 1988 (Fojt, 1988). Their report includes a description of the site and some of the results of detailed investigations they undertook. These included:

1. Peat depths using a Hiller borer along the transect levelled by the O.P.W.
2. Water table depths (below surface) from holes in the peat.
3. pH and electrical conductivity of water from water table holes was sampled.
4. Vegetation was surveyed using $2m^2$ quadrats (20 in total).
5. A stratigraphic profile was examined.

Using the O.P.W. levelling transect and the information obtained using the Hiller bore an illustration of sub-soil and surface topography is shown. This is re-produced in this report (Fig. X).

O'Connor and Speight (1987), in a paper on insects new to Ireland, describe the occurrence of *Dictenidia bimaculata* in the *Betula* flush on All Saint's bog (hatching from the rotten wood of a dead *Betula* stump). This is a species associated with ancient European woodlands and is considered to be threatened in a European context.

Coneycarn pit a quarry in the esker which runs to the S of All Saint's bog is a site with a number of rare plant species; *Galeopsis angustifolium, Erigeron acer* and *Orchis morio*.

There is a note on file from Cross (1989) expressing concern that part of the esker ridge to the S hadbeen bought by Banagher concrete. He felt that the removal of gravel: could affect the hydrological system operating beneath the flush on the high bog; and/or cause drying out of the S side of the bog.

All Saint's bog is also a refuge for the Little Brosna flock of Greenland Whitefronted Geese (Annex 1 species: Birds Directive). 1984/85 numbers are given in a note on file from Cross (1985).

The NPWS own 112ha of the site which they purchased from Bord na Mona. Erin Peats own a large section (50ha) to the NE which they are currently exploiting for moss peat.

2.2 LOCATION AND ACCESS

The bog is located 8km NNW of Birr and 6km S of Banagher. The Rapemills River borders the northern edge. A gravel ridge runs to the south, south of which the Little Brosna River flows.

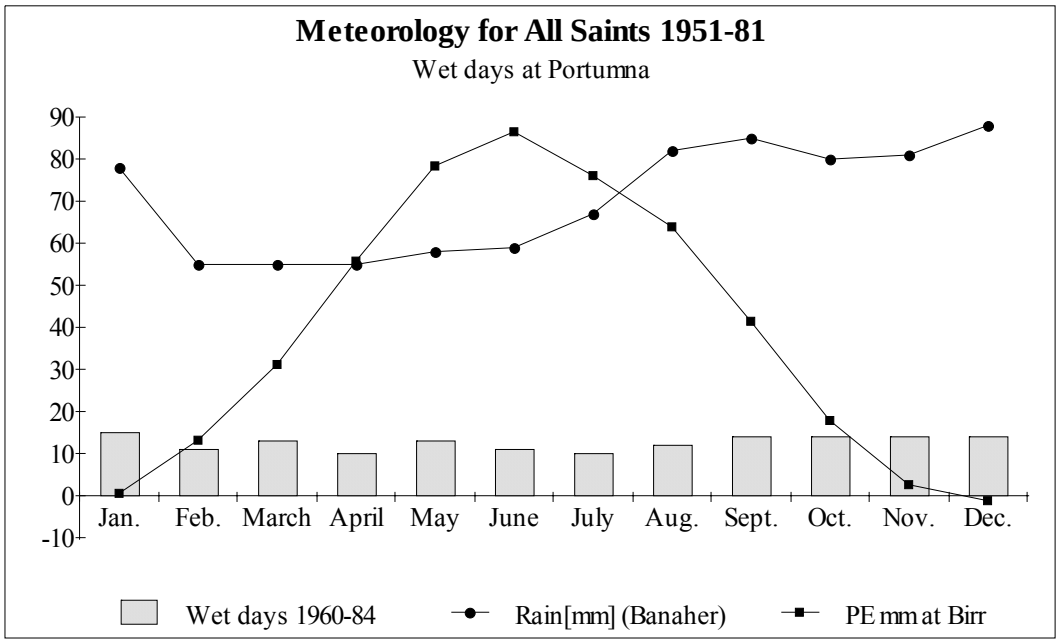
The site may be accessed from a small road which runs beside the gravel pit at its southern side. This small road is to the west off the Banagher to Nenagh road (L 113), just N of the Little Brosna River. A grassy track from beside an old house leads onto the southern side of the bog.

3. METEOROLOGY

No meteorological measurements have been made on All Saint's bog. Rainfall data from the nearby Banaher rainfall station for the years 1951-80 indicate that the area receives approximately 844mm of precipitation annually (Figure X).

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

Figure X:



The above factors suggest that the year round actual evapotranspiration (AE) from All Saint's bog is greater than PE at Birr, site of the nearest synoptic station which had an average PE of 466.5mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at All Saint's would therefore be greater than 466.5mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 377mm/yr.

Meteorological data for All Saint's Bog (1951-1981) are summarised below:

Rainfall (P)	844mm/yr
Actual Evapotranspiration, (AE)	>466.5mm/yr
Potential recharge, (PR)	<377.5mm/yr
Raindays > 0.2 mm (annual {1951-1980})	207 days

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

The whole bog is generally rather flat in the central part with slopes towards the edges particularly to the north. In some places the slopes may be steeper due to subsidence caused by drainage and/or peat cutting.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

This bog is about 42m O.D. in height and lies 1km north-east of the Little Brosna River. High ridges of sands and gravels lie between the SW section of the bog and Little Brosna.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

Recent geological maps by Hitzman (Chevron/GSI,1993) show that the area is directly underlain by calcareous shales. Waulsortian limestones (fossiliferous mudmounds) lie to the NE where there is higher ground.

The calcareous shales have a low permeability and are classed as a poor aquifer. The Waulsortian limestone also has a low permeability.

5.1.2 Subsoils (See 6" 1840s Map)

Data Availability

No subsoils data were available for All Saint's bog apart from the initial 1840s GSI geology field sheets and recent fieldwork carried out for this study.

Geology of Inorganic Subsoils

The subsoil geology of this bog and surrounding area are dominated by sands and gravels. Sections in drains in the cut-away areas and gravel pit to the south indicate that the southern section of the bog is underlain by foresets which dip north (Slide X). Sections in the northern drains beside the Rapemills River show that calcareous shell marl and clays underlies the peat. Clay is also exposed in drain mB to the SW.

An illustration of the sub-soil topography is shown in Figure X from data discussed in Section 2.1. A high permeability subsoil ridge runs E/W under the bog coincident with the linear *Betula* dominated flush.

Peat
Geological maps produced in the 1840s show that peat once covered large expanses of low lying ground along the banks of both the Little Brosna and Rapemills rivers.

5.1.3 Depth to Bedrock
Depth to rock on the bog is unknown.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology
The site has relatively few drains on the high bog apart from the development in the NE corner and some short drains on the western edge. Despite this the site was very dry at the time of the survey (approx. two weeks without rain) and no proper pools were seen. The long linear flush which runs across the centre of the site was damp in places. This flush may be part of an internal drainage system. Some old drains were noted in the field which were not evident on the aerial photography. They were all infilled and non-functional although they may have affected the surrounding vegetation in the past. A description of the drains is seen below and their positions are illustrated on the Drains and Hydrochemistry Map.

Drain bA at the W of the site is old and infilled but there is evidence of some water flow at times of high rainfall. It is 1m wide by 0.25m deep and supports *Narthecium, Calluna, Sphagnum papillosum* and *S. cuspidatum*. *Huperzia selago* was noted close to this drain.

Drain bB is at the northern side of the site close to the mound with *Phragmite*s at the west end of the main flush. It is very old, infilled and not easily seen in the field. It appears to be non-functional.

Drain Complex bC is a series of 12 new short drains associated with active peat cutting on the western bog edge. They are all bare of vegetation apart from some algae. Drains bC 2-5 and 10-12 all had flow to the west at the time of the survey but there was evidence of flow in all the other drains, at times of high rainfall. Erosion channels leading into some of the drains were seen.

Drain bD (0.5 deep by 1m wide with 30cm of water) is part of the Erin Peat cutting and is infilled with *Sphagnum cuspidatum*. It also marks a townland boundary on the 6" sheet. Along the edge of this drain flush species were noted, such as *Empetrum, Betula, Pleurozium schreberi, Vaccinium oxycoccus, Potentilla erecta, Andromeda, Polytrichum, Aulacomnium* and *Eriophorum vaginatum*.

Drain bE is a new drain which runs NW/SE across Drain bD. It is 0.25m wide by 0.5m deep and is mostly bare of vegetation with just some *S. cuspidatum*. There was no flow at the W side.

Drain Complex bF consists of 19 drains which are part of the Erin Peat development. They have been cut for some time and have some *Sphagnum* growth. They extend into the eastern section of the soak and have flow towards the N. *Calluna, Empetrum, Betula, Pleurozium schreberi, Vaccinium oxycoccus, Potentilla erecta, Andromeda, Polytrichum* and *Eriophorum vaginatum* are seen along the edges of the drains. A number of small drains also run E/W in this area. They are 0.25 deep and wide and contain stagnant water. This area is not harvested at present.

Drain bG runs along the southern edge of the Erin Peat area. It is 2m deep by 2m wide, decreasing to 0.5m wide at the base. It is bare of vegetation and there is flow of water to the east (EC 96 μS/cm). *Betula* twigs and bark may be seen in the peat profile of this drain. The spoil from this drain is dominated by *Campylopus introflexus*.

5.2.2 Bog Margin Hydrology
South West
This side mainly consists of old faces but with much slumping. There is some hopper-cutting in the vicinity of drains mA, mB and mZ where stoney till, calcareous rich is exposed. The peat is dry and pale brown and faces are 2-3m high. The cut-aways are generally overgrown in the south and drains are dry.

West
There is hopper-cutting in the west at drains mC where faces are 1.5m to 2m high. The cut-away drains lie in till.
North West
There is widespread hopper-cutting ongoing in the vicinity of drains mD. Faces are 2-3m high and drains are 2m deep and 1m wide.
North
The drains at Erin Peats are widespread and much peat has been removed. All their drains now hit till/shell marl. Drain mG, although 3m deep only has an EC of 90µS/cm.
East
There is an extensive lobe of hopper-cutting immediately east of Erin peats and in the vicinity of drains mF. Faces are 2-3m high with slumping. The cut-away drains are 2.5m deep and 1.5m wide. South of mF the faces are old and <1m high. Most of the drains here had no flow and lie at the break in slope of a gravel ridge. There is a good local lagg zone restoration potential at the very SE corner.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry

Values are shown on the Drains and Hydrochemistry Map.

Transect of pH and EC values from Fojt (1988) and also see Flush Y (Section 6.2.2).
South West
The ECs along the SW were in the range of 90-150µS/cm indicating recharge is ongoing.
West
The ECs in the cut-away drains range 370-390µS/cm.
North
The Rapemills River has an electrical conductivity of 750µS/cm. The drains at Erin Peats have ECs in excess of 400µS/cm.
East
The ECs in drains mF were >500µS/cm.

5.3.2 Laboratory Hydrochemistry

Samples were taken for hyrochemical analyses by M. Proctor during the visit by the International Mires Conservation Group in 1988.

During this survey 3 x 500ml samples were taken for laboratory analysis in order to determine the origin of the upwelling groundwater. Two were taken in the cut-away to the SW (A) and (B), and one was taken at the hopper-cutting to the east at drain mF (C).

3 x 500ml samples were taken for laboratory analysis as part of this study. Two were taken near drains mA (marked S, on the drains and hydrochemistry map) in the cut-away to the NW (A,B) and the other in a cut-away drain to the east (B), at drain mF.

There are small amounts of all the major ions.

A

Electrical conductivity:	85µS/cm
pH:	4.54
Calcium:	1.61 mg/l Ca

Magnesium:	1.45 mg/l Mg
Total Hardness:	9.99 mg/l CaCO3
Alkalinity:	-0.576 mg/l HCO3
Sodium:	9.99 mg/l SO4
Potassium:	1.05 mg/l K
Chloride:	- mg/l Cl
Sulphate:	- mg/l SO4
Aluminium:	- µg/l Al
Iron:	216 µg/l Fe

B

Electrical conductivity:	234µS/cm
pH:	7.62
Calcium:	27.93 mg/l Ca
Magnesium:	4.0 mg/l Mg
Total Hardness:	86.21mg/l CaCO3
Alkalinity:	115.16 mg/l HCO3
Sodium:	9.59 mg/l SO4
Potassium:	0.74 mg/l K
Chloride:	- mg/l Cl
Sulphate:	- mg/l SO4
Aluminium:	- µg/l Al
Iron:	267 µg/l Fe

C

Electrical conductivity:	375µS/cm
pH:	8.25
Calcium:	73.43 mg/l Ca
Magnesium:	3.14 mg/l Mg
Total Hardness:	196.28 mg/l CaCO3
Alkalinity:	198.22 mg/l HCO3
Sodium:	9.39 mg/l SO4
Potassium:	0.58 mg/l K
Chloride:	- mg/l Cl
Sulphate:	- mg/l SO4
Aluminium:	- µg/l Al
Iron:	1673 µg/l Fe

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation

This bog is situated predominantly in an area of low permeability shales which are overlain by relatively high ridges of high permeability gravels. The bog consists of two basins, the main basin is south west of the *Betula* flush. A gravel ridge runs E/W under the flush and a smaller basin lies to its north coincident with the Erin Peats operation.

Bog Regime

There are few drains on the high bog and in the cut-away apart from the Erin Peats area in the N which tears out a large part of the bog which would be impossible to regenerate, since so much peat has been stripped from here.

ECs are generally < 150µS/cm except in the west and east where deep drains intercept the water-table.

Inter-relationship

At the macro scale, All Saint's bog lies in a groundwater discharge zone. Groundwater flow is thought to mirror topography, recharging in the NE at Clongawny More and flowing SW under the

shallow Rapemills river and this bog, discharging to the Little Brosna River. Any of the deep marginal drains intercept the regional water-table. There may be some leakage of groundwater under the bog at the the gravel ridge underlying the *Betula* flush.

At the meso scale the relatively high gravel ridges recharge the groundwater locally and this is why the ECs are generally low since run-off from the bog particularly in the S, will infiltrate to the water-table vis the high oermeability gravels.

6. VEGETATION

6.1 VEGETATION SUMMARY

Overall this site has rather dry high bog vegetation complexes. However the *Sphagnum* cover is high in the central vegetation complexes and an acrotelm layer is well developed but there are few permanent pools. *S. imbricatum* hummocks are frequently seen over most of the site with some large ones to the east. *S. fuscum* is also seen.

A large linear *Betula* dominated flush is the main feature of this site. It is also colonised by *Pinus sylvestris* with an understorey of *Betula* and *Pinus* scrub with scattered herbs such as *Osmunda, Molinia, Carex rostrata* and *Carex nigra*. The bryophyte layer is dominated by *Sphagnum fimbriatum*. There are suggestions that it may be part of an ancient woodland (Cross, 1987; O'Connor and Speight, 1987).

An unusual feature of this site is the occurrence of *Dactylorhiza maculata* on a number of areas of the high bog including wetter central complexes (See Vegetation Map where the approximate locations of colonies of *Dactylorhiza* are indicated by DM). It may seen in complexes 10/6, 10/6-, 2/6/3 and 6RB. It is especially noticeable on the south-eastern section of the bog.

The old cut-away areas all around the site support mostly *Eriophorum vaginatum* and *Calluna* (PM7:35). At the southern side there are some areas of regenerating peat where a *Sphagnum* layer has developed. A list of species for a typical area of regeneration was taken at the east side of the site. This includes *Molinia, Sphagnum* sp., *Anthoxanthum, Carex nigra, Salix, Polytrichum, Calluna* and *Ulex*. At the wetter facebank edge *Carex rostrata, Juncus effusus* and *Sphagnum recurvum* were noted. *Betula pubescens* scrub and trees and *Ulex* scrub may also be seen in many areas of cut-away around the site (See Landuse Map).

Two areas of mesotrophic vegetation were noted on the southern side of the site in the old cut-away. The first of these is close to Slope 1. Here in the water filled pit next to the facebank edge *Typha, Lemna, Potamogeton polygonifolius, Carex diandra, C. rostrata, Equisetum fluviatile* and *Riccardia* sp. were recorded. In the slightly drier sections the following were noted, *C. echinata, Juncus effusus, Lycopus europaeus, Osmunda regalis* and *Holcus lanatus* (PM7:22). The EC of the water in this area was 165 μS/cm.

The second area is associated with Slope 2. Again it is a water filled pit (EC 218 μS/cm) with *Lemna, Nasturtium officinale, Typha, Carex rostrata, Cardamine pratensis, Lythrum salicaria, Potamogeton polygonifolius* and *Salix sp.* Beyond this the vegetation indicates drier conditions with *Ulex* dominating.

There are two areas of cut-away which are dominated by *Juncus effusus* at the southern and northern sides of the bog.

At the southern side of the site N of the gravel pit there is a hedge on the edge of the high bog. This is a rather messed up area. The tree layer is dominated by *Salix, Corylus, Sambucus, Acer* and *Fraxinus*. *Pteridium, Rubus* and *Urtica* colonise the clearings with *Molinia, Ulex, Holcus lanatus, Anthoxanthum, Festuca rubra, Briza media, Carex pulicharis, Epilobium angustifolium, Senecio jacobaea, Cirsium palustre, Potentilla erecta, Geranium robertianum, Veronica chamaedrys,*

Glechoma hederacea, Succisa pratensis, Hyperichum sp. and *Lotus corniculatus*. Leading from this area onto the high bog, the bog surface appears heathified with a lot of *Molinia* with the addition of *Pedicularis sylvatica, Polygala vulgaris* and *Potentilla erecta* with *Luzula, Holcus lanatus, Anthoxanthum, Stellaria media, Plantanthera bifolia, Dactylorhiza maculata* and *Poa trivialis*.

6.2 DETAILED VEGETATION

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types which are illustrated on the Ecotope Map.

6.2.1 Complexes

Marginal Complexes

Complex 1

The facebank complex, dominated by *Calluna*, occurs in places around the edge of the site. *Pteridium* encroaches into it in places along the eastern and southern boundaries. An enriched variant occurs along the edges of the Drain bF complex, where *Empetrum nigrum* and *Eriophorum vaginatum* are also seen. At Drain bC the following species are seen in this complex: *Holcus lanatus*, *Anthoxanthum*, *Poa trivialis* and *Stellaria media*. Close to Slope 2 *Potentilla erecta* and *Molinia* encroach into this complex.

Complex 1 + Enrichment (1+Enr)

This is the area between Drains bD and the Erin Peat production site to the N of the bog. *Calluna* is tall and enrichment indicators such as *Empetrum, Vaccinium oxycoccus* and *Polytrichum alpestre* were seen.

Complex 2

Two small areas dominated by *Trichophorum* occur on the western edge of the bog between Slopes 1 and 2 and close to Slope 3 and at the S of the site associated with Slope 12. These areas are very dry, with bare peat and a lot of *Campylopus introflexus* at the western side. Some *C. paradoxus* was also noted. The western area had suffered burning. The bog edge here grades into the cut-away and the facebanks are absent or very shallow. There is no acrotelm layer in this complex. There is a small area of this complex at the SW of the bog with the addition of *Molinia* (2+Mo).

Complex 2/3

This occurs in small patches along the northern edge associated with steep Slopes 5 and 7 into active peat cutting. It is dominated by *Trichophorum* and *Carex panicea*. The *Sphagnum* cover is very low and there is no acrotelm layer.

Complex 2/6/3

This is a marginal complex which is seen in a broad band to the W of the site and in a narrow band to the S. It is dominated by *Trichophorum* (20%), *Narthecium* (20%) and 10% *Carex panicea*. Algal hollows are also common (20%). These occasionally contain *S. cuspidatum* and *S. auriculatum*. Typical hummocks make up 10% and are dominated by *Calluna* (30cm tall). The total *Sphagnum* cover is low and most occurs on hummocks. *S. papillosum* and *S. magellanicum* were the dominant *Sphagnum* types seen. At the NW some large *Calluna* topped hummocks with *Leucobryum* and *S. imbricatum* occur colonised by *Betula* seedlings. *Dactylorhiza maculata* is also seen in this area. Along the NW edge this complex is at its widest and the *Sphagnum* cover is slightly better than at the S. However the acrotelm layer is generally poor throughout the complex. A small *Calluna* dominated mound with the addition of *Pteridium, E. vaginatum, Vaccinium oxycoccus, Andromeda* and *Leucobryum* occurs in this complex close to Slope 5. Along the south-east *Huperzia selago* was noted in this complex.

Complex 6/2
This covers a small area at the extreme NNW of the site. It is dominated by *Narthecium* and *Trichophorum* and is very dry with a very poor *Sphagnum* cover and thus no acrotelm layer. It has been burnt in the past and *Trichophorum* increases towards the bog edge at the northern side.
Complex 9
This is a small area at the E of the site. It is dominated by *Eriophorum vaginatum* and *Calluna* (30cm tall). Some *Empetrum* was noted. No *Carex panicea* was seen. The *Cladonia portentosa* cover was high. The *Sphagnum* cover was low and the bog surface hard under foot.

Sub-Marginal Complexes
Complex 6/3+*Cladonia* (Cl)
This is a small area of vegetation along Drain bG which is dominated by *Narthecium* hollows (20-30%) and *Carex panicea* (20-30%). There is 20% cover of *Cladonia portentosa* and a low *Trichophorum* presence indicating that the complex has not been burnt for some time. It is associated with peat subsidence and Slope 9. The *Sphagnum* cover is low (10%) with some *S. imbricatum*. *Calluna* covers 45% of the area and it reaches 30cm in height. The acrotelm layer is poor.

Complex 6
A small area dominated by *Narthecium* and *Calluna* may be seen at the north of the site associated with Slope 6.

Complex 6 RB
This is a band of recently burnt (last 2-3 years) running NW/SE along the southern side of the site (PM7:20, PL9:13 and 36 and PL9:34 shows boundary with 10/6). It extends approximately 150-200m into the site. It is dominated by *Narthecium* hollows (50%). *Carex panicea* (10%), *Rhynchospora alba* (5%) and *Trichophorum* (5%) are also present and algal hollows are quite common (10%). The latter are mostly small and dry and the entire area was crispy underfoot. They are possibly tears as they are mainly aligned E/W. There is a concentration of tear pools/hollows around the active peat cutting at the east side of the quarry (+TP). There is very little *Calluna* and there is evidence of burning. The overall *Sphagnum* cover was 15% and is dominated by *S. subnitens* and *S. imbricatum*. At the northern side *S. imbricatum* becomes more common and the area is a little wetter with *S. cuspidatum* and *S. auriculatum* in some of the hollows. *Leucobryum* hummocks were also noted. This burnt area grades into Complex 10/6 at the northern side where *Sphagnum magellanicum* lawns with *Drosera anglica* occur (PM8:0-2). A few isolated large hummocks dominated by *Calluna, Hypnum* and *Vaccinium oxycoccus*, with *S. magellanicum* and *S. imbricatum* at the base, occur. *Aulacomnium palustre* was seen in small amounts in this complex. An acrotelm layer was mostly absent.

At the NW edge of this complex, in association with Slope 1, there is an area which has been burnt more recently with 60% bare peat. The vegetation is dominated by *Trichophorum* and *Calluna, Carex panicea* and some *C. binervis* (PL8: and PM7:22)

A zone of *Dactylorhiza maculata* occurs at the eastern side of this complex

Complex 6/10
This is a transitional complex which occurs at the east edge of Complex 10/6. It is very similar to that complex but is drier and the frequency of the *Narthecium* hollows is increased. This probably due to the drying out effects of the bog margin. *Huperzia selago* occurs in this complex. *Cladonia portentosa* cover reaches 20% in places.

Complex 6/2+Pools (P)
This complex occurs at the NW side of the main flush. It is dominated by *Trichophorum* (20%) and *Narthecium* (40%) but has some well developed pools (10%). These are mainly filled with *S. cuspidatum* with *Menyanthes, Rhynchospora fusca* and *S. auriculatum*. In the inter-pool areas the *Sphagnum* cover is very low and the surface is hard underfoot. *Carex panicea* and *R. alba* were noted in the inter-pool areas. The overall *Sphagnum* cover is 15%, 10% of this is in the pool/lawns. Some of the pools are rounded rather than linear and the water table level was very low at the time of

the survey. *Sphagnum papillosum* was invading some pools which are drying out (PL9:16). There is virtually no acrotelm layer.

Sub-Central Complexes

Complex 10/6/2

This complex lies to the N of the main flush and has a very uniform appearance. The total *Sphagnum* cover is moderate (25%), composed of *S. capillifolium* hummocks (5%), *S. papillosum* (8%) and *S. magellanicum* (10%). *Narthecium* hollows cover 20%, while *Trichophorum* tussocks have 25% cover. Typical hummocks make up 12% , *Eriophorum vaginatum* (10%) and algal hollows (10%). No *Carex panicea* was seen. At the interface with Complex 2/6/3 at the north side surface water was evident. The acrotelm layer is poor.

Complex 10/6-

This is a drier version of Complex 10/6 which is described below. The main differences are that the cover of *S. imbricatum* is lower while that of *Trichophorum* is higher (15%). It is possible that the area has been more recently burnt than 10/6 and 10/6 +Cl but it may also be being affected more by marginal drainage. *Dactylorhiza maculata* was seen in the S of this complex.

Complex 10/6

This central complex covers a large portion of the site. It is dominated by *Narthecium* hollows (35%). In The total *Sphagnum* cover is 30% and consists of *S. imbricatum* hummocks (10%), *S. magellanicum* (10%), *S. papillosum* (5%) and *S. capillifolium* (5%). Some *S. imbricatum* growth is in low lax hummocks. *Rhynchospora alba* hollows are also common (10%) and *S. cuspidatum* pools make up 5%. Some pools contain *Menyanthes, Drosera anglica* and *S. auriculatum*. However most of the pools were dry at the time of the survey. The pools are linear and are aligned in two directions. The flats and hollows had a crispy algal layer over much of their surface. Scattered *Dactylorhiza maculata* were seen in this complex at SW and SE of the site (PL9:28). *Racomitrium* and *Pleurozia purpurea* were noted in the southern part of this complex. The latter was very dry, crisped and difficult to see so it may have been more widespread. To the S of the main flush patches of *Carex nigra* were recorded.

A section of this complex at the east of the site has very well developed *Sphagnum imbricatum* hummocks reaching 25% cover in places (PL9:30 and PM7:33). They are up to 1-3m in diameter and 0.5-0.75m high. *Vaccinium oxycoccus, Pleurozium schreberi* and *Calluna* (0.5m tall) top the hummocks. Surrounding the large hummocks there are smaller *S. imbricatum*, *S. magellanicum* and *S. fucum* hummocks. There were no pools but *Sphagnum* lawns had *Menyanthes* and *Drosera anglica* in places. *Carex panicea* cover is very low in this area and the *Narthecium* cover is increased to 45% forming large lawns. The acrotelm layer is good and the crispy algal layer was absent (PM7:34). *Pinus* and *Betula* encroach onto the SE of this complex and *Betula* is occasionally seen on hummocks.

Complex 10/6+ *Cladonia* (Cl)

This denotes an area of this complex at the east of the site which has a high *Cladonia portentosa* cover (30-60%) (PM7:32 towards flush). There are fewer *Sphagnum* hummocks and the *Calluna* cover is higher (typical hummocks 20%). *Eriophorum vaginatum* (10%) and *E. angustifolium* are present. The main difference apart from the *Cladonia* cover is the occurrence of *S. magellanicum* hollows (15%) and the *Narthecium* hollow cover is slightly lower (25%). Close to the eastern side of the flush *Empetrum nigrum* in notable amounts was seen. *Dactylorhiza maculata* was also noted. One large *Pinus sylvestris* tree may be seen in this complex some way from the main soak. It is surrounded by numerous seedlings (PL9:29). There are occasional large hummocks with *Leucobryum, Pleurozium schreberi* and *Empetrum* with epiphytic lichens on the *Calluna* 3 (3).

Complex 10/9

This complex occurs in the vicinity of the flush, between the flush and the typical high bog complexes. It has some enrichment features for example *Vaccinium oxycoccus* on the hummocks, patches of *Carex nigra* and *Molinia*. It is generally dominated by *Eriophorum vaginatum* (20%), some tall *Calluna* hummocks (50cm tall) and a total *Sphagnum* cover of 55%. *Sphagnum magellanicum* lawns are frequent (20%). Large *S. imbricatum* hummocks, *S. magellanicum* and *S. papillosum*

hummocks occur. In areas of this complex, namely to the west of the flush, pools with *S. auriculatum, S. cuspidatum* and *E. angustifolium* occur. Algal hollows are also present. There is a moderate lichen cover 10-15%, particularly on the hummocks. There is a noticeable absence of *Carex panicea* and *D. anglica*. At the N of the flush this complex is much drier and there are fewer pools.

6.2.2 Flushes

Flush Z is a small feature at the western end of the main flush. It consists of a raised mound (150m N/S and 60m E/W) (PL8:15 and PM7:) which is dominated by *Calluna* (up to 70cm tall) and thriving *Phragmites*. There is also scattered *Betula* with a bryophyte layer of *Hypnum jutlandicum*. To the south there is a drier L-shaped mound which is dominated by *Calluna* and *Vaccinium myrtillus*. It is hard and dry underfoot.

Flush Y

The main feature of this site is a long linear flush running E/W with arms to the north and south. It occupies approximately 30ha of the intact high bog. The tree cover is not uniform throughout this flush and there are some partial clearings, areas of scrub and areas of dense tall trees. The tree layer is mainly dominated by *Betula* with some areas dominated by *Pinus sylvestris* and some areas with a mixture.

Cross (1987) describes the woodland of the flush using data from 4x4m releves. The trees were mostly *Betula pubescens* with some *B. pendula*. These were mostly 6-8m high but reached 10m in places. The shrub layer was dominated by *Betula, Salix* and *Pinus sylvestris*. The dwarf shrub layer consisted of *Calluna, Empetrum* and *Vaccinium oxycoccus*. The bryophyte layer was dominated by *S. fimbriatum, S. palustre, Aulacomnium palustre* and *Polytrichum commune*. The water table was more or less at surface level at the time of his survey and the pH of the peat around 4.0. He concludes that drying out or a burning event are not satisfactory explanations for the presence of the woodland.

During this survey the woodland was also described:

The areas of dense woodland, which are seen in four places (See Vegetation Map, D1-4) are dominated by *Betula* (6m tall) with *Pinus sylvestris* (6-7m tall). The shrub layer consists of *Betula* (0.5-2m tall) with *Calluna* (0.5m tall which appears to be dying in places) and *Salix* sp.. The understorey in D1 is dominated by *Molinia* with *Juncus effusus* and *Anthoxanthum*. In the remainder of the dense woodland areas *Molinia* is not as common. In the four areas *Osmunda, Dryopteris dilatata* and scattered *Carex rostrata* occur and the bryophyte layer (90%) is dominated by *Sphagnum fimbriatum* hummocks with *Polytrichum commune* and *P. alpestre* between them. *S. recurvum*, *S. palustre*, *S. papillosum, Aulacomnium palustre* and *Pleurozium schreberi* were also seen. Wefts of *Vaccinium oxycoccus* occurred over the hummocks and *Andromeda* was common. In the northern area patches of *S. squarrosum* were present. *Rhytidiadelphus squarrosus* was also seen.

The northern arm of the soak is similar to the densely wooded areas with patchy *Molinia* (PL9:17 and 18). The southern arm is dominated by *Pinus sylvestris* (PL9:32). The southernmost section of the southern arm has evidence of some burning but is regenerating well.

The five partial clearings (C1-C5) are characterised by scattered *Betula* scrub (1 m), occasional *Pinus sylvestris* (Pl9:23 (C2)) with the dwarf scrub layer dominated by *Calluna* (60-80% and 0.6 m tall) and *Eriophorum vaginatum* dominating the herb layer (PL9:21-22 (C1). *Osmunda* (PM7:26 (C2)) and *Empetrum* occur frequently with *Pteridium* (PL9:24 (C2)) along the northern edges. *Carex nigra, C. rostrata, Potentilla erecta, Juncus effusus, Molinia, Vaccinium myrtillus*, *Rubus fruiticosa* agg. and *Salix* sp. The *Salix* is not thriving. Bryophyte cover is high but overall cover is lower than in the dense woodland. The *S. fimbriatum* cover is lower but *S. capillifolium* was more common. *Blechnum spicant* was seen. Clearing C3 has been partially drained and is dominated by scrub *Betula* (PM7:28 to NE and PL9:25 to SE). Clearing C5 is part of the southern arm of the soak and is similar to the other clearings but has more scrub *Pinus* (PL9:33). The *Betula* trees and scrub in all areas are colonised by copious epiphytic lichens.

The findings of the International Mires Group (Fojt, 1988) back up the conclusions of Cross (1987). They found that the occurrence of the areas of *Betula* woodland were coincident with ridges of underlying mineral material. (4.5-5m below the peat surface). The pH values of water (from pits) ranged from 3.9-4.3. The EC values for the open bog were 121.4 μS/cm while those in the woodland were 139.9 μS/cm . It is suggested that mineral rich waters are upwelling under the *Betula* flush.

Water samples were also collected during the IMCG visit and analysed by M. Proctor. He found that the Ca levels were similar in ombrotophic bog pools and from with the flush. This may be due to the gravel workings at the S of the site. However Mg and K values were slightly higher from within the flush. The higher EC values suggest that some other ion/anion, which was not measured, is of importance in the flush.

The stratigraphical investigations showed a continuity of *Betula* through the profile with changes in associated species. *Phragmites* was recorded at the base. This ties in with the discovery of *Dictenidia bimaculata* in the woodland by O'Connor and Speight (1987). The species was also seen on Clara Bog flying in the *Betula* woodland. They are both examples of undisturbed woodland with little human interference. It is considered to be a threatened species in Europe and is part of the ancient forest fauna.

7. BOG TYPE

This bog has been classified as a Ridge River A bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes (Map)

A number of slopes were estimated in the field. Their locations are shown on the Slopes Map of the site in Appendix II.

Slope 1 At the west of the site the slope from a recently burnt area into old peat cutting is 1m over 50m.

Slope 2 To the N of Slope 1, into old cutting with a tall face bank (2m high), the slope is 0.5m over 40m with cracking and slumping of the bog surface.

Slope 3 At the NW from an area of recent drainage (Drain complex bC) into active peat cutting the slope is 0.25m over 30m. The bog surface has suffered severe cracking in this area.

Slope 4 At the N, into agricultural land, the slope is 0.5m over 40m.

Slope 5 Along the northern edge, into active peat cutting, a slump has occurred and the slope is 1m over 30m.

Slope 6 This is also along the northern edge and is associated with active peat cutting which has caused a deep depression (PM7:25 to E) and the slope is 2.5m over 30m. This slope leads from an arm of the main flush with *Betula* on the high bog in this area.

Slope 7 Along the northern edge, with slumping and cracking into active peat cutting, the slope is steep, 1m over 30m and the slope extends further into the high bog.

Slope 8 The slope in this area is 2m over 50m into active peat cutting.

Slope 9 This is located at the northern side into the large area of peat exploitation being carried out by Erin Peat Products. The slope into Drain mG is 1.5m over 70m. Subsidence of a large section of the bog is apparent in this area.

Slope 10 At the east side of the site into active peat cutting the slope is 0.5m over 30m, with severe deep cracking of the bog. The facebank in this area is 2.5m high. *Pteridium* is encroaching from the cut-away onto the high bog in this area.

Slope 11 Along the east also into old peat cutting the slope is more gentle, 0.5m over 50m. The bog adjoins rising mineral soil in this area.

Slope 12 At the southern point of the site through Complex 2 and into some old peat cutting and agricultural land the slope is gentle at 0.25m over 100m.

Slope 13 Along the southern edge the slope into a small area of active peat cutting is 1m over 50m with cracking and slumping. There is *Pteridium* encroaching into the bog here (PM7:35 to W along S edge).

8.2 RECENT HUMAN IMPACT (Landuse Map)

8.2.1 Peat Cutting

Active peat cutting is being carried out most extensively along the northern edge. This includes a large commercial development by Erin Peat Products for moss peat in the NE corner (PL9:26 and 27 and PM7: 29and 30). This has being carried out for some time and is severely affecting the site due to the insertion of long drains leading from the main flush and resulting peat subsidence. The rest of the northern edge is being cut using the hopper method but, on comparison with the 1970s aerial photograph, the rate of cutting appears to be slow and not on a commercial basis. Peat cutting is also being carried out on the NW side and the insertion of new drains (Drain Complex bC) is associated with this. Small scale cutting is also occurring at the north side of the eastern edge and at the east side of the southern edge. More extensive cutting is being carried out on both sides of the gravel pit at the southern edge. Recent marginal drainage works are associated with the cutting to the west of the gravel pit.

8.2.2 Fire History

A large band of recently burnt vegetation runs along the southern edge of the site. This was burnt approximately 2-3 years ago with one area to the west which appears to have been burnt more recently or which was more severely affected by the fire event. At the NW corner there is a small area of disturbed vegetation with a large percentage of bare peat. This may be due to burning and/or drainage. The western side of the site appears to have experienced more recent burning than most of the eastern side. This is apparent from the low *Cladonia portentosa* cover on the western and south-eastern sections with an increase in the cover of *Trichophorum* and *Carex panicea*. There is no evidence of burning in the flush apart from the very southern part of the southern arm, close to vegetation Complex 6 RB.

8.2.3 Gravel Extraction

This is being carried out in Coneycarn pit at the S of the site. The pit is located in an esker deposit.

8.2.4 Arterial Drainage

The Rapemills River to the N of the site has been deepened and straightened.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. A mineral ridge runs E/W under the site coincident with the main flush. The peat layer is shallower in this area.

2. Hydrochemical analysis shows that the EC of the surface water within the flush is higher than on the ombrotrophic bog. This suggests that there is a mesotrophic effect.

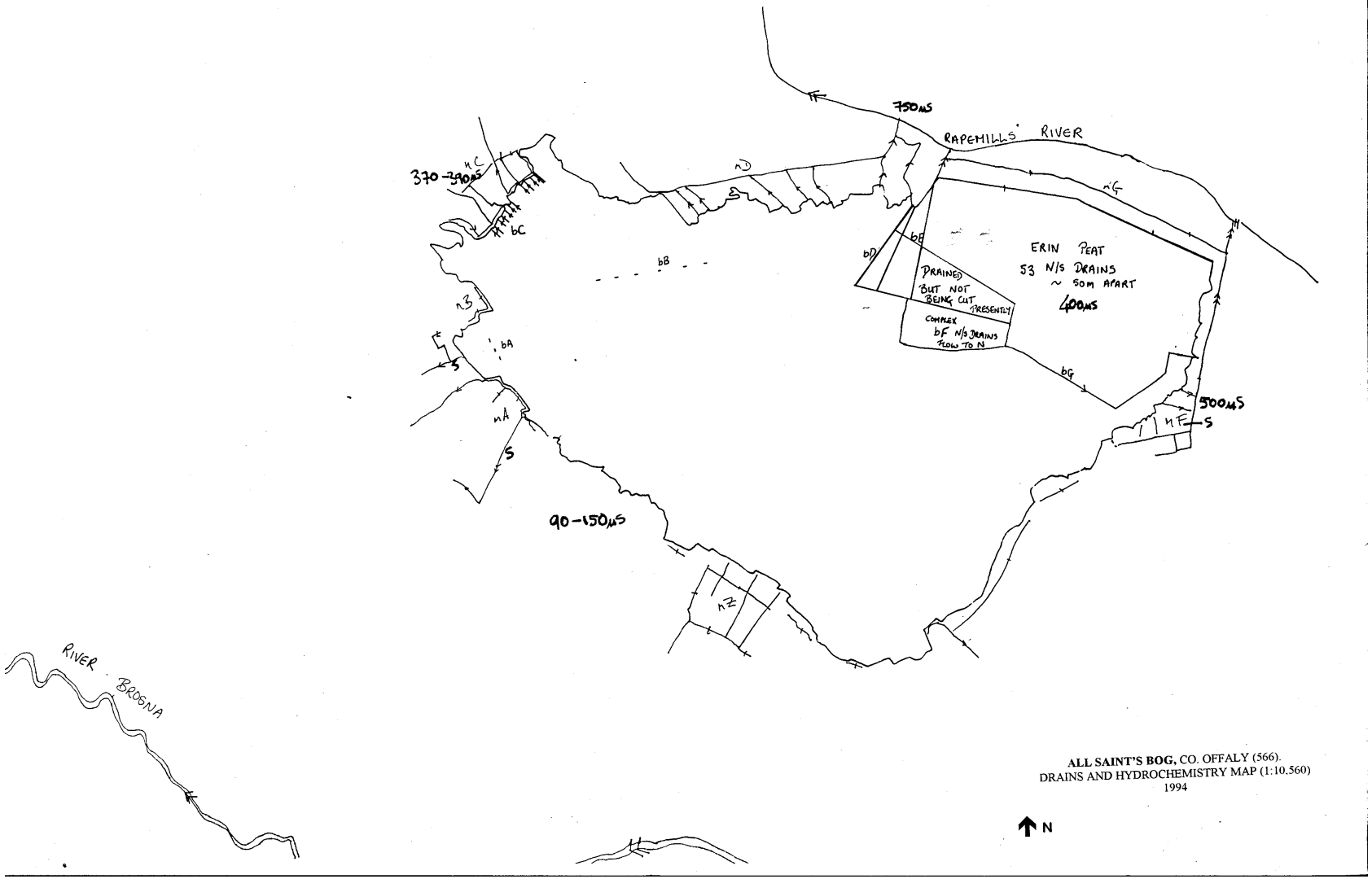
3. No central complex with permanent pools is seeen on this site. However the site is quite flat and there is a large area of sub-central vegetation. This suggests that marginal drainage effects have been significant.

4. Calcium levels are relatively high in the bog water at this site. This may be due to aerial deposition from the quarrying activities at the S of the site.

5. Two *Phragmites* mounds are seen on the site. This are probably associated with underlying mineral deposits.

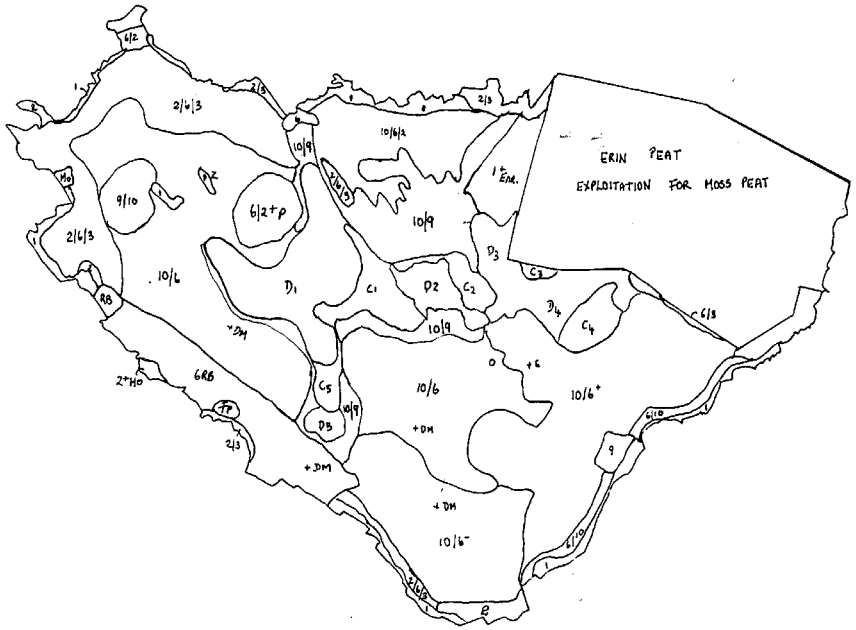
Lara Kelly
Marie Dromey
Malcolm Doak

Raised Bog Restoration Project (1995).



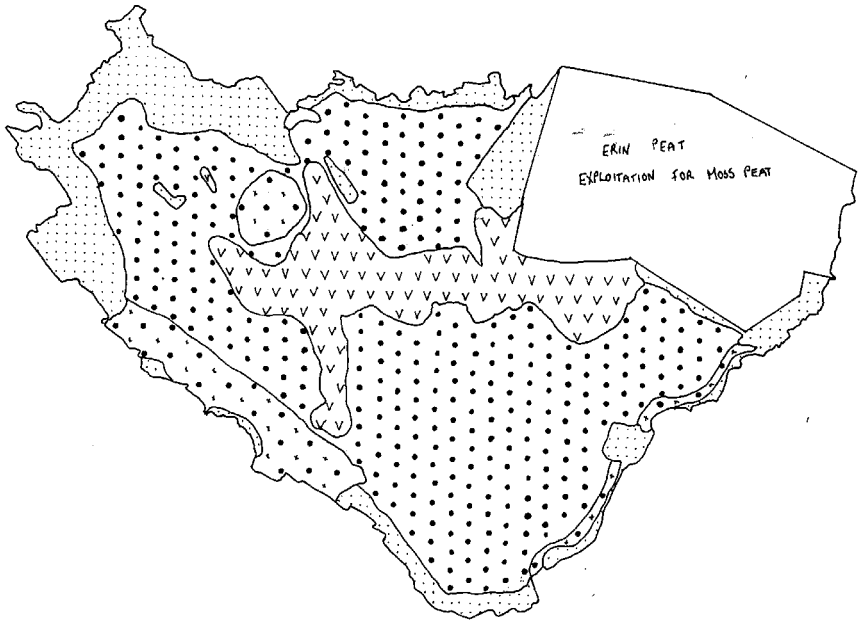
ALL SAINT'S BOG, CO. OFFALY (566).
DRAINS AND HYDROCHEMISTRY MAP (1:10.560)
1994

N



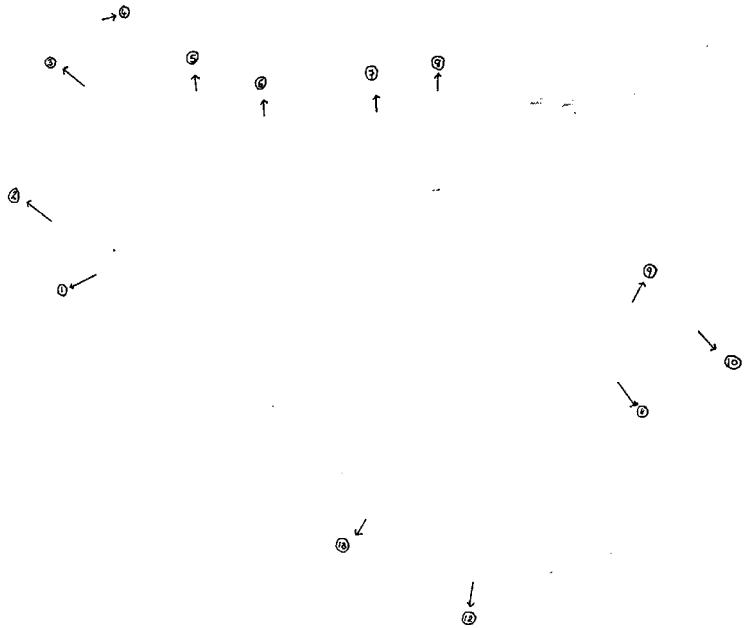
ALL SAINT'S BOG, CO. OFFALY (566).
VEGETATION MAP (1:10.560)
1994

N



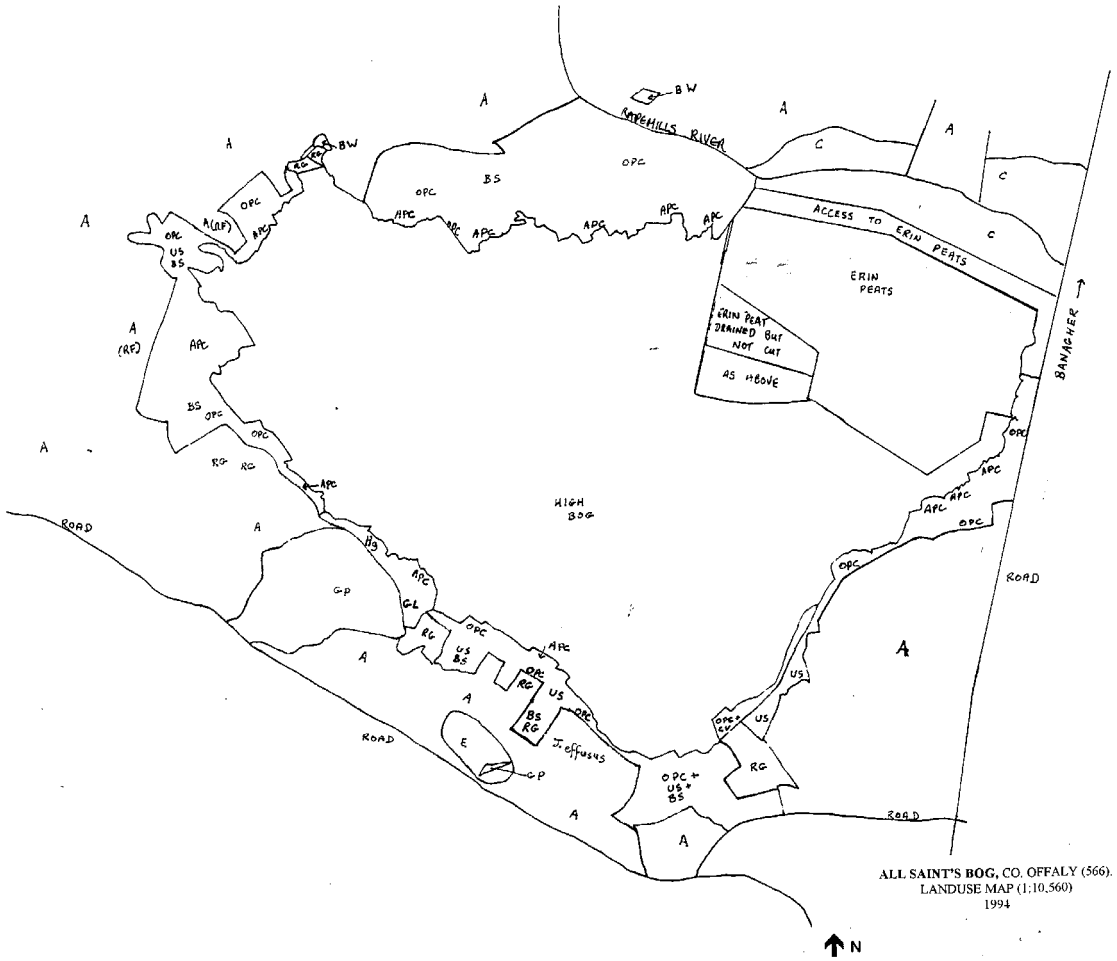
ALL SAINT'S BOG, CO. OFFALY (566).
ECOTOPE MAP (1:10,560)
1994

N



ALL SAINT'S BOG, CO. OFFALY (566).
SLOPES MAP (1:10,560)
1994

N



ALL SAINT'S BOG, CO. OFFALY (566).
LANDUSE MAP (1:10,560)
1994

BELLANAGARE, CO. ROSCOMMON

1. SUMMARY OF SITE DETAILS

NHA No.	592	1/2" Sheet:	12
Grid Ref:	M 72 87	6" Sheet:	RN 15/21
/GSI Aerial Photo:	M544 etc.	1:25,000 Sheet:	17/27 NW
Other Photo:	OS 8152/53/71	Area (ha):	878 (High Bog)
NHA Photo:	667:1-24 668:5-17		
Date(s) of Visit:	24-27/10/94 (Ecology) 24-26/10/94 (Geohydrology)		

Townlands: Mullen, Derreen, Cornamucklagh and Falmore, Arraghan, Lugakeeran, Tully, Brackloon, Cloonsheever, Cloonfinglas and Leitrim.

2. INTRODUCTION

2.1 BACKGROUND

Bellanagare is the largest Western or Intermediate raised bog remaining in Ireland. A large section of the site was owned by Bord na Mona and could be purchased easily. The NPWS now own approximately 588 ha of the site.

Bellanagare was visited by M. Schouten (Appendix II (Douglas and Grogan, 1985)) sometime in the period 1979-1981. It was described as the most extensive raised bog he had seen. However a large part had been burnt some years previously. He describes the vegetation as being rather uniform with a homogenous cover of *Erica tetralix/Narthecium/Trichophorum* type. Parts of the N were locally good with occasional hollow complexes and some *Campylopus atrovirens* was seen at pool edges. *Pleurozia purpurea, Vaccinium oxycoccus* and *Andromeda* are described as occurring frequently.

The site was also visited by Douglas and Grogan (1985) and was assigned an A status. However it was not included in the list of possible NNR sites drawn up by Cross (1990). Douglas and Grogan (*op cit*.) describe the bog as a large undulating area with a number of streams and associated *Molinia* flushes. The bog surface to the S of the Frances River was described as soft with extensive *Sphagnum* lawns as was an area to the N. The wettest area was seen to the NE (East Lobe). *Sphagnum pulchrum* (a rare Sphagna) was noted here and *Carex limosa* was seen in a small flush.

2.2 LOCATION AND ACCESS

Bellanagare is located between the towns of Frenchpark, Bellanagare and Castlerea in Co. Roscommon. It is an elongate site, approximately 7km long and 1.5km wide at the S. The road between Frenchpark and Castlerea runs to the W of the bog. Another road runs to the S and there are various roads to the E and N.

Access may be obtained at a number of points. The N section and E Lobe may be accessed from a road which extends into the W of the bog off the Frenchpark to Castlerea road. The W Lobe, Central section and SW Lobe may be entered from another road, which runs alongside the Frances River, off the Frenchpark to Castlerea road. The W Lobe could also be accessed directly from the Frenchpark to Castlerea road. The SE and SW lobes can be visited from the southern road. A bog road runs N from this into the S of the site.

3. METEOROLOGY

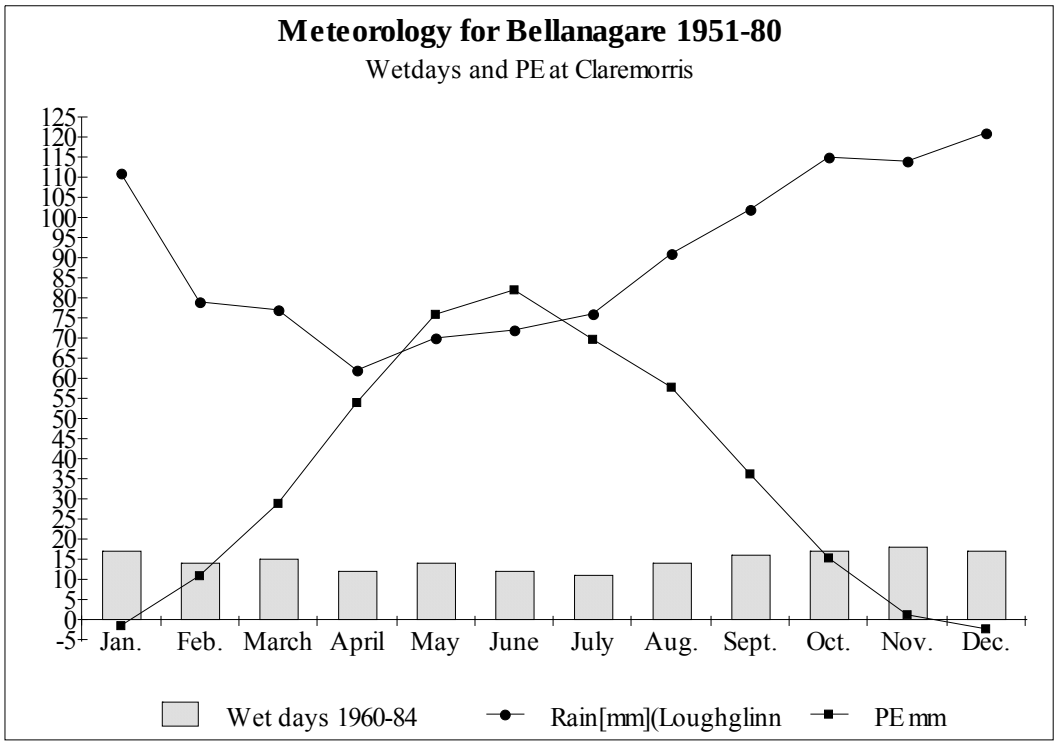
No meteorological measurements have been made on Bellanagare bog. Rainfall data from the Loughglinn rainfall station for the years 1951-80 indicate that the area receives an average 1090mm of precipitation annually (Figure X).

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

The above factors suggest that the year round actual evapotranspiration (AE) from Bellanagare Bog is greater than PE at Claremorris, site of the nearest synoptic station which had an average PE of 428.1mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Bellanagare would therefore be greater than 428.1mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 662mm/yr.

Figure X



Meteorological data for Bellanagare Bog (1951-1981) are summarised below:

Rainfall (P)	1090mm/yr
Actual Evapotranspiration, (AE)	>428.1mm/yr
Potential recharge, (PR)	<662mm/yr

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

This bog has a very different topography to any of the other bogs under study. The bog is often flat and appears to mirror the underlying mineral surface topography. The bog consists of several lobes of peat which radiate downslope along ridge appexes from a central high point which is coincident with the Frances River (River Suck) and Bredoge River (Lough Gara) surface catchment divide. There are several small streams between the peat ridges. In most cases the streams flow on clayey tills and the sidewalls are grass covered indicating that peat is thin or cannot grow on the relatively steep slopes.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

The bog is situated in an upland area where the height range is 90-120 m OD.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

The bog is underlain by muddy Carboniferous limestones. Yellow Sandstone (Devonian) lies immediately east of the bog.

The muddy limestones have a low permeability and are classed as a poor aquifer.

5.1.2 Subsoils (See 6" 1840s Map)

Generally this bog is underlain by clayey limestone till often with a stoney matrix. Sandstone till lies along the east side of the bog.

5.1.3 Depth to Bedrock

Depth to rock on the bog is unknown, but it is believed to be <3m considering that the bog lies on a bedrock upland and that there is both limestone and sandstone outcrop to the east. as marked on the 1840's geology map.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology

The extensive nature of this site means that drainage activities are seen in many places. The North Lobe has been almost completely covered with surface drains in the last ten years and some recent drains are also seen to the NW of the E Lobe and the SW of the West Lobe. A long old drain follows a townland boundary which runs the entire length of the site. The middle section of the site has also suffered drainage due to the construction of bog roads and associated drains to facilitate peat cutting. A similarly affected area is seen to the S of the site.

Natural internal drainage channels are also seen. These are discussed in Section 6.2.2. under flushes but water flow directions in these natural drainage features (where applicable) are indicated on the Drains and Hydrochemistry Map.

Despite the large number of drains described in the field some large expanses of undrained high bog remain. No blocking of drains has yet been carried out at this site.

The drains of the high bog are described in detail below. They are illustrated on the Drains and Hydrochemistry Map and flow directions are indicated.

North Lobe

Drain Complex bA is a series of seven drains, to the west of this lobe, which run NW/SE with a cross drain at the NW end. These drains are not apparent on the 1970s aerial photographs. The

drains are 0.75m deep and 1.5m wide narrowing to 0.3m at the base. There is approximately 5cm of water which flows northwards over most of the drain length with a small amount of flow to the S close to Road 1. They are mostly bare of vegetation with some colonisation by *E. angustifolium*. *Myrica* grows along the road side to the S and partly along the drains. Drain bA6 which runs through Flush Z is slightly deeper than the others (1m). The spoil from the drains has been left in mounds. It is mostly bare with some colonisation by *Campylopus introflexus*.

Drain Complex bB is a series of drains which run NNW/SSE to the E of Drain Complex bA. Broad drains (5) and narrow drains (7) alternate. The drains of this complex are older than those of Drain complex bA and were present on the 1970s aerial photograph. Reflecting their older age there is more colonisation by *E. angustifolium* and *E. vaginatum* with some *Utricularia minor*. The dark ridges beside the drains are lines of spoil. The broad drains are 2-2.5m wide and 0.75m deep. The narrow drains have similar dimensions to the bA drains. All drains flow northwestwards into a NE/SW drain which runs along their northern end, except for Drain bB1 which extends N to the bog edge. The NE/SW drain flows into Drain bB1 which has rapid water flow to the N. The N section of Drain bB1 is 2.5m deep by 3m wide narrowing to 1m at the base. It is mostly un-vegetated with some *Juncus bulbosus* and *Molinia* (EC 139 μS/cm). There is some flow SSE into Road 1 drain over the last 30 m of the southern part of these drains.

Where Drain bB1 extends through Flush Z *Carex rostrata, Potamogeton polygonifolius, Juncus bulbosus, Ranunculus flammula* and *Sphagnum auriculatum* v. *inundatum* are seen (EC 159-177 μS/cm with some Fe staining). *Molinia* grows along the drain edges and on the spoil heaps.

Drain bB3 has a patch of *Myrica* along its edge with *E. angustifolium* and *Calluna* along the W edge with *Molinia* on the spoil. The spoil of Drain bB9 is colonised by *Potentilla palustris, Molinia, Angelica, Myrica, Juncus effusus, Salix, Anthoxanthum odoratum* and *Osmunda* although the mound is quite dry. The drain itself has very rapid flow to the N. It contains species similar to the other drains with the addition of *Angelica, Dryopteris dilatata, Marchantia polymorpha* and abundant *Potamogeton polygonifolius* (EC 200 μS/cm). Drains bB10-12 are all narrow drains.

Between drains bB5 and bB7 *R. alba* cover is high. Patches of *Myrica* are also seen. The diagonal lines on the aerial photograph may correspond to patches of *Myrica.*

Drain Complex bC consists of 36 drains which have been dug some time since the 1970s apart from bC24 which is shown on the 1910 6" sheet (townland boundary) and on the 1970s aerial photograph. The drains are approximately 40m apart and run NE/SW at the W of this lobe with cross drains at both ends of the complex. The most westerly drain is the only drain which is not connected by a cross drain at its NE end. The drains are generally 0.3m wide at the base by 0.75m deep by 1.5m wide at the top and bare except for algae. There is up to 10cm of water in most and in the drains at the W of the complex there is flow in two directions while in those to the E the flow is to the NE. There is little evidence of flow at the summit of those drains which flow in two directions and this section of these drains is also more shallow with a higher water table and some infilling by vegetation. This vegetation is made up of *Menyanthes* and *E. angustifolium.* The NE end of the most westerly drain ends abruptly and is 0.75m wide at this point with a high and deep water table and infilling mainly with *E. angustifolium.* At some of the drain edges in the non flush areas there is a concentration of *Narthecium* and *E. angustifolium*. Where the drains cut through Flush Y they are lined mainly with *Molinia* and *E. vaginatum* with *Empetrum*, *Vaccinium myrtillus*, *V. oxycoccus* and *J. effusus* and are infilling with *J. bulbosus, Phragmites, Carex rostrata, E. angustifolium*, *Polytrichum commune, S. capillifolium, S. subnitens* and *Aulacomnium palustre* with *Utricularia* in the deeper sections. *Sphagnum subnitens* and *S. papillosum* were recorded along some of the sides of these drains. *Potamogeton polygonifolius* was seen in bC15 where an EC of 136 μS/cm was recorded (bC1 is at the W side of the complex). Drain bC24 is older than the other drains of this complex and extends the length of the entire site (See under Drain bC24).

At the N end of Drain bC32, close to the junction with the E/W drain is a *Rhododendron* bush (1m high). The E/W drain here has significant flow to the W. It then angles N/S and flows rapidly to the N. Some *Empetrum* was seen along the drain edges. Drain bC36 is deeper than the other drains

(0.75m deep by 1.5m wide) with rapid water flow (25cm) to the N. The drain is bare apart from some filamentous green algae (EC 64 μS/cm).

The cross drain to the NE of the complex which takes the flow from 15 of the most westerly NE/SW running drains is a double drain along an old track and there are link drains which cross the track. Part of the most northerly of these two drains has been re-dredged this year and is up to 3m wide at the top by 0.3m wide at the base by 1.5m deep. The more southerly drain is 0.75m wide with deep water. There is rapid flow in both drains and the flow is as indicated on Fig X.

Drain bC24 extends the length of the entire site and follows a townland boundary shown on the 1910 6" sheet. It is older than the other drains of Drain Complex bC. Where it forms part of Drain complex bC it is deeper than the rest of the drains with rapid flow to the NNE (EC 82 μS/cm). It is lined with *Molinia, Succisa, Betula* and *P. erecta* and infilling with *Molinia, J. bulbosus, S. palustre, S. auriculatum* var. *inundatum, S. cuspidatum, Potamogeton polygonifolius* and *E. angustifolium.* At the junction with Drain bO, Drain bC24 is up to 3m wide at the top and up to 2m deep with deep water and rapid flow to the NE. Drain bO, carrying water from the eastern section of Drain Complex bC, flows into Drain bC24 at this point.

Drains Complex bD separates the Northern Lobe from the East Lobe and consists of up to six drains which run E/W. It is shown on the 1910 6" sheet of the bog. It is possible that the drains were a preparatory step in forming a link with the tracks at either end of them. All these drains are not well defined in the field as there are collapsed features along them and some join up with each other. The most northerly drain is 2m deep with 10cm of water flowing to the E. The more southerly drain is also well defined and is more shallow but with a much more rapid flow to the E. The sides of the drains are lined with *Molinia, Narthecium, S. papillosum, E. tetralix* with some algae and *J. bulbosus* nearer the base. Between the drains are spoil ridges dominated by very tall *Calluna, Molinia* and *E. vaginatum*. Further E there is some *Phragmites* with *Myrica* and *Polytrichum alpestre* and bands of *Molinia* with *J. effusus.* West along these drains the flow changes to the WSW.

Drain Complex bP is a series of five drains (0.75m deep by 1m wide) which run N/S to the NW of the northern section of the site. Four drains flow N into an E/W drain which flows W into the drain running alongside Road 3. The fifth drain flows directly into the roadside drain. They are all relatively new and are mostly bare of vegetation.

Road 2 runs E/W at the E side of the N Lobe. Deep drains run along either side. They are 2m wide by 1.5m deep. No flow was evident but it is probably to the E.

The drains on either side of Road 3 are 2m deep by 1.5m wide with water flow to the N.

Drain bQ is to the West of drain bC24. It is 1.5m deep by 0.25m wide at the base and bare. It flows to an area of active peat cutting to the WNW.

Drain bR runs NNW/SSE through Flush X. It is located in a depression and is surrounded by flush vegetation. The drain is mostly infilled by *Molinia, Phragmites* and some *Juncus effusus* (EC 106 μS/cm). At its S end it has been recently deepened (0.5-1m deep by 1.5m wide). There is significant flow to the N in the deepened section.

Drain bS is a very new drain just to the N of Drain Complex bP. It is not shown on the 1993 aerial photograph. It is 1m deep by 2m wide and was dug by a hymac machine which is now working further to the N.

Drain b2A is an old drain seen at the NW side of the N Lobe. It is 0.5m deep by 0.25m wide and is infilled *with S. cuspidatum, Trichophorum, Calluna* and *Narthecium*. It contains some water and although flow is not apparent it may still be functional. There are a few old drains in this area which can not be seen on the aerial photograph. They are all infilled, mainly by *S. cuspidatum*.

On either side of Road 1, 1m deep by 2m wide (narrowing to base) drains occur. Flow to the W is seen. *Ulex* and *Molinia* grow along either side of the track and have overgrown it to the E so that the road is no longer passable. *Myrica* and *Molinia* encroach from the road onto the bog on either side.

NE Arm
Drain bE at the S of this section is also an area of old peat cutting. There is water flow to the S. It is approximately 2-3m wide and mostly bare with tussocks of *E. angustifolium* and *E. vaginatum* and *J. effusus, Molinia* and some *Betula.*

Drain bF is a long old double drain which runs ENE/WSW at the SE of this arm. It is shown on the 1910 6" sheet. It leaves the bog and cuts through some of the old cut-away (where it is mostly infilled with *E. angustifolium*, *S. papillosum* and some water) and then continues up on to the high bog further ENE. It is about 2m wide, non-functional and dominated by *Calluna*. It is about 2m wide.

Drains bG, bH, bJ, bK and bL are old infilled drains to the E of this arm. Most appear to be non-functional. Drains bH, bJ and bK correspond to lines on the 1910 6" sheet. Drain bG is infilled with *Narthecium* and bits of Sphagna. bH is similar with the addition of *E. angustifolium*. bJ is slightly wetter with *S. cuspidatum* and *S. magellanicum* and *S. papillosum* along the edges. The S end is dominated by *E. angustifolium*. Drain bL has some water flow at its northern end.

Drain bM at the N of this lobe is associated with active peat cutting and is almost infilled. There is flow to the N at the N end.

Drain bN is an old peat cutting channel on the N edge of this arm. It is 1.5m deep by 1.5m wide with partly collapsed edges. It runs N/S close to Drain bC36 with water flow to the N (EC 77 μS/cm). It is infilling with *E. vaginatum*.

Drain bO is a double drain at the W end of Road 2 which has had a small area re-dredged this year and flow is to the E. In the section closer to bC24 the more southerly drain is 0.3m wide at the base by 0.75m deep with rapid flow to the W into bC24. Some of the drains from Drain Complex bC feed into it. The more northerly of the bO drains is 0.5m deep by 1.25m wide at the top. It is lined with *Molinia*.

East Lobe
Drain Complex b2B consists of four drains 0.7m deep and wide with 5-10cm of water flowing WNW into the southern drain along Road 1 which at this point is flowing WSW. The drains are bare of vegetation.

Drain b2C is an old drain at the W of the lobe which curves at its S end. There is a continuation of this drain into old peat cutting as a stream or small river. The drain on the high bog is 1m deep by 0.5m wide and at the western end is 2m deep by 2.5m wide at the top. The sides are colonised by Sphagna, *Molinia, Juncus bulbosus* and *Potentilla palustris*. There is rapid flow to the W bog edge (EC 69 μS/cm recent rain). *Molinia, Calluna, Juncus effusus, Potentilla erecta* and *Myrica* occur along the drain edges with *Myrica* spreading out from the drain in both directions.

Drain bC24 at the E of Drain Complex b2B does not actually connect with them. This drain is 1m deep by 0.25m wide at the base with deep water which is flowing NE. The drain at this point is lined with *Molinia* and *J. effusus* with a *Calluna* ridge along the western edge of the drain. Further S the drain is 0.75m deep by 0.5m wide with 10cm of water flowing to the SSW (EC 87 μS/cm). *Potamogeton polygonifolius* and *E. angustifolium* colonise parts of the drain but there is virtually no *Sphagnum* growth. Patches of *Molinia* are seen along the drain.

Drain b2D near the E edge is old, infilled and non-functional. At the NNW end it is lined with *Calluna* and there is some flow to the NNW into an area of active peat cutting. The middle sections are soft and dominated by *S. magellanicum, S. capillifolium, E. angustifolium* and *Calluna.*

Drain b2E runs NW/SE across the S side of this lobe and is located in a depression. It is seen on the 1970s aerial photograph. There is rapid flow to the W all along the drain. At the E end it is partly infilled by *S. cuspidatum, Narthecium, Trichophorum* and *Calluna*. At the W end *Molinia* and *Juncus effusus* infill the drain with tall *Calluna* and *Molinia* along both edges. On the N side at the W end an old peat cutting bank 1 m deep by 2 m wide is seen. This is colonised by *E. angustifolium* and *E. vaginatum* with some *Juncus effusus* and *Typha* (EC 132 µS/cm). *Myrica* spreads from this area northwards.

b2F is also seen on the 1970s aerial photograph. It links drains b2E and b2C. It is 0.25 m wide by 1m deep. It is overgrown by tall *Calluna* and *Myrica*. *Molinia* is seen in the drain close to Drain b2C. There is flow to the NW.

Drain Complex b2G is a series of five drains which run NW/SE across the NW section of the E lobe. They cut through Drains bC24 and b2C. They are 0.5m deep by 1m wide narrowing to 0.5m at their bases. There is generally 5cm of water in the drains. There is some algal growth but apart from that they are un-vegetated. At their SE ends there is partial water flow into Drain bC24. The flow changes to the N into Drain bC24 about a third of the way between the drains. To the W of Drain bC24 the drains flow N into the drain running alongside Road 1 and E into bC24. There is very little spoil spread out beside these drains.

Mid Lobe

Drains b2H to the N of Road 6 consists of two drains which are old and almost completely infilled. They are 0.25m wide and infilling with *Narthecium, S. papillosum, S. capillifolium* and *Calluna* with *S. cuspidatum, S. auriculatum* and *Menyanthes* in the wetter sections. Further S the drains widen as some old peat cutting was carried out along them.

West Lobe

Part of Drain bC24 separates this lobe from the southern section of the Mid Lobe. Along this stretch there is significant flow in two directions as the course of the drain is influenced by depressions at both ends. This section of the drain has not been re-dredged and it is lined with tall *Calluna* along both sides. There are some old drains along both sides of the drain which run at 45^{o} angle to it. Where the drain flows through Flush T2 *Salix* and *Betula* were seen growing. Further S towards the drain summit there are areas of *E. angustifolium* dominated vegetation beside the drain in areas where it is over-flowing. Further S on the down slope the drain is lined with tall *Ulex*. At the S end of the W Lobe there is a road/track (R7) along bC24. Here it becomes a double drain with flow to the N (S of Road 8) and S (N of Road 8) towards a depression caused by Road 8. There may also be flow from this depression W towards the Frances River.

Drain Complex b3A is a series of 7 drains and some forestry drains associated with a small Lodgepole pine plantation. The drains run NNE/SSW at the SW side of the lobe and a further drain runs NW/SE along their northern ends. The NNE/SSW drains flow to the SSW towards the cut-away. Beside the forestry the drain is double. The drains are 0.5m deep and 0.25-1m wide. The NW/SE drain flows in both directions and does not link with the drains of/in the forestry plantation. The drain complex has caused subsidence as the whole area is lower than its surroundings.

Drain b3B is an old drain with significant flow WNW along the edge of the bog in the vicinity where Flush Y3 exits the bog. It is collapsed in places and there are very large perpendicular erosion channels which run into it from the high bog and then beyond it to the bog edge. At the ESE end of the drain, where the erosion channels are not as frequent or as large, pools have formed along the drain some deep and others infilling with *S. cuspidatum.* Further E another series of perpendicular drains run NNW/SSE into either side of the flush, generally leading into a swallow hole. They are more easily seen on the 1970s aerial photograph. The S drains are partly infilled by *S. cuspidatum, Narthecium*, *E. angustifolium* and in places *S. magellanicum* but are water filled. They flow N into the flush. The drains to the N are really just lines of *Calluna* dominated vegetation apart from b3D which has been deepened. The majority appear to be non-functional.

Drains b3C consist of two drains which run N into Drain b3B and then to the bog edge. These two drains appear to have been re-dredged. They are 0.25m deep and wide with rapid flow to the N.
Drain b3D flows SW down a significant slope (Slope 41) into Flush Y3. Near the flush the drain is 1.5m deep by 0.25m wide at the base with rapid flow. The drain at this point is bare. Further N the drain is more shallow with clumps of *Molinia* and *J. effusus* along it. At the junction with Drain b3E Drain b3D is 0.75m wide with a high and deep water table. Flow was not detected. Species growing in the train at this point include *S. cuspidatum* and *E. angustifolium.* In the depression associated with the junction of the two drains there is abundant *E. angustifolium*, *E. vaginatum* and pools. Drain b3D continues NE of Drain b3E where it is visible in the field as a narrow band of *Calluna* which is wet underneath. It is associated with a gentle slope (Slope 36). The drain fizzles out after a short distance.

Drain b3E is an old drain which runs SE/NW and crosses Drain b3D. It is a double drain NW of Drain b3D. The drains are approximately 0.75m wide and infilling with tall *E. angustifolium*, *J. effusus*, *S. papillosum, S. magellanicum, S. capillifolium* and *Calluna.* There are some water ponding areas infilled with *S. cuspidatum* and *Utricularia.* At the NW end the more N drain supports *Salix* and *Agrostis.* There is a slight flow to the NW. The vegetation between the drains is dominated by *Eriophorum* species and *Calluna.* In the depression associated with the junction of the these two drains there is abundant *E. angustifolium*, *E. vaginatum* and pools. To the E the drains are infilled with *S. cuspidatum, S. auriculatum* and *E. angustifolium* with *S. papillosum* and *S. magellanicum* along the edges. S. pulchrum was seen along the edge of the more N drain. The water level is high in both drains. Small drains lead from the more southerly drain to the SE in a more or less herring bone pattern. The drains run through the N arm of Flush Y3 and *Molinia* is seen along them from this point to the bog edge. There may have been a road between the double drains to the E.

Drain b3F at the NE of the this lobe is aligned NNW/SSE with some slight flow to the NNW. It is 0.25m deep and wide and infilled mainly with *Calluna* with some wet patches.

Drains associated with Peat Cutting to the North and South East of this Lobe.
Many of these carry water to the bog edge. Where hand cutting has occurred the remaining ridges are dominated by *Calluna*, while *E. angustifolium* dominates the lower areas.

South West Lobe
Part of Drain bC24 separates this lobe from the South East Lobe. The drain at the N end of this stretch is double along an old Road 7 with flow to the NE. The more westerly drain is 0.75m deep and wide with deep water flowing to the NE. It is lined with *Calluna, Molinia, Rubus, V. myrtillus* and *Salix.* The more easterly drain has collapsed. The mid section of this stretch of the drain flows through Flush X3 and is lined with *Molinia* with tall Calluna at the edges with no water flow. The S end of this section of the drain is partially infilled with *E. angustifolium* and *Calluna* and flow is very slight to the SW.

Drains b3G is an old double drain which runs NNE/SSW with slight flow to the NNE. The drains are infilled mainly with *Calluna* and *S. papillosum.* The more westerly drain supports some *Molinia, Phragmites* and *Betula* with a *Calluna* ridge beyond it. This drain is 0.75m wide and the east drain is 0.5m wide with a partial channel between them which is approximately 8m wide. The vegetation between the drains consists mainly of *Calluna* and *Eriophorum*.

Drain b3J is an old drain which runs N/S across the W side of this lobe. It is infilled and appears to be non-functional. A line of *Calluna* (60cm tall) dominated mounds mark the drain. The mounds are up to 1m high and 2 m across and appear as double mounds.

Drain b3H runs E/W across the lobe and is also marked by mounds which are a litter smaller and not as regular as those along Drain b3J. The drain is old and infilled by *S. papillosum, S. magellanicum*, *E. vaginatum* and *Calluna*.

Drain b3H1 is an old drain running parallel to Drain b3H to the W of the line of mounds. It is infilled by *S. cuspidatum, Narthecium* and *Calluna*.

Some water loss may be occurring through this drain as it is quite wet.

Drain b3K marks two drains which run E/W at the SW corner of this lobe. The S drain is double. All drains flow westwards and there is *Calluna* along their edges.

Drain b3L is associated with a recent forestry plantation and has rapid flow to the west. It is 0.75m deep by 0.25m wide at the base by 1m wide at the top. There is 10cm of flowing water and the drain is bare. The high bog on both sides of this drain is disturbed and there is up to 50% bare peat.

South East Lobe
Drain b4A runs N/S at the S of this lobe parallel to two bog roads. It is a double drain. The drains are 0.6 wide by 0.2m deep and are infilled mainly by *Calluna* with some *S. papillosum, S. capillifolium, S. tenellum* and *E. angustifolium*. The drains contain some water. No flow was discernible but is probably northwards. The western drain contains more water. *E. angustifolium* and *Calluna* dominate between the drains. This drain joins with b4E to the N.

Drain b4B to the SW of this lobe is aligned WNW/ESE and is associated with old forestry at its ESE end and a more recent Lodgepole Pine plantation at the WNW end. The ESE end is similar to Drain b4A except that the more southerly drain is lined with tall *Calluna.* The drain is double at this end and the vegetation between them is dominated by *C. panicea, Trichophorum* and *Narthecium.* At the WNW end there is only one drain and it has recently been re-dredged. It is 2m wide at the top narrowing to 0.3m wide at the base. It is 1.5m deep with 5cm of water flowing significantly to the NW.

Drain b4D in the SW corner of this lobe is associated with forestry plantations. It is aligned NE/SW with slight flow to the NE into Drain b4E. The drain is 1.25m wide at the base by 0.5m deep with 5cm of water and some *S. cuspidatum* and *E. angustifolium.* Flow increases near the junction with Drain b4E.

Drain b4E is aligned NW/SE on the SW of this lobe stretching from the forestry plantation on the SW corner to Drain b4A and the tracks associated with peat cutting. It is infilled by *S. cuspidatum, S. papillosum* and *E. angustifolium* in its central section. The drain is old but the NW end has been re-dredged and is similar to the new part of Drain b4B and there is rapid flow to the NW. It also takes the flow from Drain b4D. The E/W section of this drain is 1m deep by 0.5m wide with 10cm of water. The drain is bare of vegetation and there is rapid water flow to the E. Tall *Calluna* grows along its edges.

Drain b4H is a double drain at the N of this lobe and aligned NNE/SSW with some flow to the NNE at that end. The drains are approximately 1m wide with deep stagnant water. It is infilling with *S. cuspidatum, S. auriculatum, E. angustifolium, Drosera, Menyanthes, Narthecium* and *Calluna*. The more easterly drain is the deeper of the two. The vegetation between the drains is dominated by *Calluna, E. vaginatum, Trichophorum* and *Cladonia.* There are some old infilled drains at 45^{o} angles to the main drain.

Drain b4J is associated with old peat cutting at the SE edge of this lobe. The drain (EC 95µS/cm) is 3m wide by 1m deep with *Betula, J. effusus, Agrostis, Molinia*, *Salix, Polytrichum commune, Calluna, S. papillosum, S. capillifolium, S. magellanicum*, *Aulacomnium* and *Lemna.* There is slight flow to the S off the high bog.

5.2.2 Bog Margin Hydrology (See Drains and Hydrochemistry Map)
North Lobe - West
Drains mA1 to the south side of track R1 are relatively new and probably for forestry; no peat cutting is occurring here. They are 1.5m deep and 2m wide with shows of iron. The cut-away is relatively wet and surface drainage is via drain mA which is 0.5m deep and lies in in sandy till. The faces north of track R1 to drain mA5 are old and ~1m high. The faces are old with smoe turf banks but cut-away drainage is more active at drains mA5, 6, and 7. These drains lie in clayey till and are >1.5m deep.

North Lobe - North
Drain mR1 (0.75m wide, 2m deep) is marked by large amounts of *phragmities* on a shallow slope to the north. There are many old turf banks alongside track R3. One drain lies on each side of the track and are <1m deep.

Eastern Arm
Some localised hopper-cutting occurs on the N side of this arm. Small minor drains occur in the cut-away at mJ and flow to two drains that flow north from track R2. These drains are >3m deep. Several sets of drains (mF and mE) occur to the south of this arm, but there is little peat-cutting; reclaimation of land is ongoing here.

East Lobe
There is very little drainage or peat-cutting activity occurring here since this part is owned by NPWS. Face heights in part are a maximum of 2m but generally faces have subsided to the level of the cut-away.

West Lobe
The northern part of this lobe is marked by preparation for forestry. Many small drains occur in the vicinty of drains mA3 and mA2. There is local hopper-cutting at drain mb3F with faces 3m high. The boundary for the western side of this lobe is a main road. Drains are stagnant at this point.

Drain mb3D to the exit of Flush Y3 is aligned NNW/SSE with flow to the SSE. Species seen along the drain include *Molinia, J. effusus, Succisa, Agrostis* and *J. conglomeratus.* The flush initiates at the apex of the bog on the surface catchment divide and flows in a relatively steep clay lined channel with gravels at the bottom. There is a lack of peat in the channel.

To the south of this lobe there is a small area of hopper-cutting at b3A; faces are 2m high.

South West Lobe
This lobe is dominated by hand cutting and the remaining ridges are overgrown with *Calluna*, while *E. angustifolium* dominates the lower areas. generally there is little active peat-cutting. The peat at drain b3H1 is relatively thin with patches of *phragmities*. Further south at drains b3K there is a slump marking a former bog burst.

Drain mb4D to the SE of this lobe is new and associated with a Sitka Spruce forestry plantation which is dominant in the cut-away. The flow is in various directions. The drain is 1.5m deep by 0.75m wide at the base. Species seen growing along it include *Molinia, Rubus, J. bulbosus, Agrostis, Anthoxanthum, Heracleum* and *Salix.*

Drains b4G at the SE of this lobe are associated with active peat cutting (both Hopper and Difco methods). The drains are approximately 0.75m deep and 1.5m deep narrowing to 0.3m at the base. Flow is as shown on Fig X. The most NW section of the drain is very close to Flush W3 and is lined with *Molinia.* It continues in through the flush.

South East Lobe
Drain b4C is a new drain also associated with the Lodgepole Pine plantation on the high bog and separating it from the main body of the bog. It is aligned more or less N/S and flow is to the N. The drain is similar to the more recent section of Drain b4B and supports a facebank complex of tall *Calluna* with some *Molinia* along its edges.

To the S of this lobe two bog roads have been constructed (near b4E). Drains have been dug on either side of these roads which carry water off the bog and from drains associated with peat cutting. Within the old peat cutting the drains are colonised by *E. angustifolium*, *J. effusus, Molinia* and *Salix*. Some water flow is seen. Drain m4J has an EC of 65µS/cm and is 1m deep.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map)

North Lobe - West

Drains mA1 have electrical conductivities >260µS/cm. Drains mA5, 6, and 7 have ECs of <120µS/cm.

North Lobe - North

Drain mR1 is has an EC of 80µS/cm. The drains at track R3 are 82µS/cm.

Eastern Arm

Drains mF and mE have ECs of ~150µS/cm.

West Lobe

The ECs in the vicinty of drains mA3 and mA2 were 65µS/cm. The EC at Drain mb3D is ~ 80µS/cm. To the south the ECs are ~156µS/cm in the area of hopper-cutting. Drain mb3A had an EC of 88µS/cm at its exit.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation

This bog lies in an upland area at the top of a surface catchment divide where rainfall is relatively high. Bedrock is muddy impermeable limestone and the soils are clayey but stoney. The bog and upland is the nain recharge zone for groundwater but since the limestone and soils have such low perneabilities little potential recharge is thought to enter the aquifer.

Bog Regime

The peat is concentrated on ridges. Several large streams/flushes lie between the ridges where there is a lack of peat due to strong slopes which peat cannot form on due to fast flows of water. There are many drains on the bog and in the cut-away particularly in the NW parts.

Inter-relationship of topography hydrology and hydrogeology

In the geohydrologist's opinion Bellanagare is a blanket bog which developed directly on the mineral ground up to a considerable angle of slope. A blanket bog is the reponse to a wetter pluvic climate.

6. VEGETATION

6.1 VEGETATION SUMMARY

The vegetation of this site is characterised by an abundance of *Trichophorum, Narthecium* and *Carex panicea* with varying dominances. The *Sphagnum* cover is generally low (< 10%). There are some localised wetter areas with pools where *Sphagnum* cover is higher, such as on the W Lobe (6/3+P+Cl) and on the E Lobe (2/6/4+P). Around Flush Y4 there is a very soft wet are where the *Sphagnum* cover is not high. This area is probably associated with the flush.

The importance of *Trichophorum* at this site may be related to frequent fire events but may also be related to the sloping nature of the bog. *Campylopus introflexus* and *Cladonia floerkeana* occur indicating past disturbance events, most probably fire.

Marginal and sub-marginal complexes are widespread and again, in some cases, this may be due to the number and degree on internal sloping. In addition tear pools and erosion channels are frequently seen.

Western indicator species are commonly see. These include *Racomitrium, Pleurozia purpurea, Pedicularis sylvatica* and *Campylopus introflexus*. Despite this *Andromeda* occurs often as does *Vaccinium oxycoccus*. *S. fuscum* and *S. imbricatum* are also noted on a regular basis.

Flushes are frequent on this site are usually located in depressions, although some are associated with the effects of marginal drainage. At a number of the flushes indicated on the vegetation map, springs, rises and/or streams are shown on the 1910 6" sheet and, in some cases, also on the 1848 6" sheet. One flush (W3) is coincident with a bog burst.

Sphagnum pulchrum is seen in notable amounts in the wetter areas (Complexes 6/3/2+P and 2/6/4+P). *Carex limosa* was noted in some bog pools.

Overall the vegetation of this site is more typical of blanket bog than raised bog.

Due to the on-going localised peat extraction around much of the site (except around the SW lobe) the vegetation of the cut-aways is dominated by species typical of such areas i.e. *Juncus effusus* and *Molinia*. To the W of the N Lobe there is some localised hand cut turf and the cut-aways are dominated by regenerating peat, *J. effusus* and patches of *Phragmites* with *Calluna* and *Pteridium* on old turf banks and along some of the bog edge. There are very few bushes or scrub development. To the NNW there is a forestry plantation of Sitka Spruce. To the NNE of this lobe there is an area of intensive peat cutting facilitated by Roads 2 and 3. The vegetation where the peat is hand cut consists of *J. effusus, Molinia, Calluna* and some old pits with standing water and some *E. angustifolium.* Areas where deep new drains are being dug and where the Hopper method of extraction is used are bare of vegetation. To the S of the N lobe and separating it from the mid eastern lobe is an area of old peat cutting dominated by *Phragmites* with *Molinia*, tall *Calluna* and wet areas with *Agrostis, Potamogeton polygonifolius, Ranunculus flammula, Sphagnum papillosum, Menyanthes, E. angustifolium* and *Aulacomnium.*

To the N of the NE arm is an area where a combination of Hopper and hand cut extraction is carried out and there are some areas of old peat cutting. The vegetation is again dominated by *J. effusus, Molinia* and *E. angustifolium* with some *Salix* along old drains. Close to Road 2 are areas with more concentrated scrub growth of *Ulex, Alnus* and *Salix.* There is a strip of coniferous woodland at the eastern side of the northern edge. To the east of this lobe there is an area of mineral soil next to the bog. Field walls are made of stone and there are some large rocks present. At the bog edge in this area is *Rubus, Agrostis, Anthoxanthum* and *Salix.* To the S of the NE arm the bog grades into mineral soil. The area seems to have been used for peat cutting in the past and much of it is dominated by *J. effusus, Pteridium* and *Calluna.* To the W of this edge is a patch of *Phragmites.* There is now also some rough grazing in the area. Close to a house in the area is a clump of deciduous trees. There is agricultural land to the E of the S edge.

To the NE of the East Lobe there are some new deep drains in the cut-away and peat extraction close to the bog edge is by Hopper method. In the older cut-away areas further out from the bog there is regenerating peat, *J. effusus* and some grazed areas. Along the E and ESE of this lobe there is old cut-away dominated by *J. effusus* and *Molinia* with regenerating peat and *Betula* and *Salix* scrub in the ESE corner. There is also some agricultural land close to the bog edge and some forestry. To the N of Road 4 the cut-away is dominated by *E. angustifolium, Myrica* and *Calluna.* To the W of this lobe is an area of cut-away mainly forested with a young plantation. Between the forestry and the high bog are some areas of old and active peat cutting - mostly by hand.

To the S of Road 4 in the Mid Lobe the cut-away and a small area of the high bog has been recently burnt and *Molinia* is the dominant vegetation. To the W of this road there is a tall mound approximately 2m higher than the northern section of the mid east lobe which is dominated by *Pteridium, Salix* and *Molinia*. The area where parts of roads 5-8 are in close proximity to each other is not owned by NPWS and there is extensive peat cutting being carried out close to the high bog. Large tract areas of old peat cutting are seen between the roads and the more recent cutting at the high bog edge which are dominated by turf banks of tall *Calluna*.

There is a forestry plantation on the high bog to the S of the W Lobe and it extends into the cut-away close to the Frances River. There is an area of active peat cutting along the bog edge to the E of it. In the cut-away at the very WSW corner is an area of mineral soil overgrown with *Molinia, Pteridium, Fraxinus, Crataegus, Ulex, Salix* with similar species at the bog edge. There are ruins of an old house and this area appears to have once been a field. Further N the old cut-away is dominated by *J. effusus* and *Calluna* with some areas dominated by *Molinia* and *Calluna. Salix*, *Ulex* and *Betula* are scattered throughout. Where Flush Y3 exits the bog from this lobe the cut-away is dominated by *Pteridium* and *Molinia* with some *J. effusus.* Where this lobe is very close to the road which links Castlerea and Frenchpark (L11) there are some isolated *Salix* bushes with *Rubus* and much *Molinia.* Here the bog grades into the cut-away. There is mainly old cut-away to the N of this lobe with *J. effusus* and *Ulex* dominating. There is one small patch of very recent forestry on the high bog at the N of this lobe.

To the S of the W Lobe and separating it from the SW lobe is the Frances River the banks of which are grazed.

There is little active peat cutting around the sides of the SW lobe. To the N of this lobe the vegetation on the steep banks to the R. Frances is dominated by *Pteridium* with *Calluna* and *Salix*, *Ulex* and *Betula* scrub. Cattle have access to this vegetation. Lower down the slopes, grasses dominate. To the NNW of this lobe there is some mineral soil and a deep swallow-hole like depression. Along the NNW and W edges *Calluna, J. effusus* and isolated *Ulex, Betula* and *Salix* are seen. To the S there is a coniferous forestry plantation towards the W and further E are grazed fields which are much lower than the high bog (up to 3-4m below it). There is much *Betula* and tall *Calluna* with *Pteridium* along the bog edge in this area. Vegetation similar to that of Flush W3 is seen at the edge of this flush. There is old cut-away to the E of the flush which is dominated by tall *Calluna.* There is a small forestry plantation at the exit of Flush X3 but this does not appear to be doing very well. There is much *Molinia* in the ground layer. On rising ground in the cut-away is a large area of forestry and areas of rough grassland with scattered scrub.

Flush X3 separates the SW from the SE Lobes. The vegetation is dominated by *Molinia.* There are forestry plantations around the S and SW of the SE Lobe with a small area where rough grazing is carried out. There is much old and active peat cutting carried out around the SE of this lobe and there are patches bare of vegetation and areas of *Calluna* dominated turf banks. *Salix, Betula*, *Pteridium* and *Ulex* are seen along old drains. At the ESE of this lobe and probably associated with Flush X4 there is mineral soil and the high bog grades into it. There are patches dominated by *Molinia*, by *Molinia* and *Ulex* and further N by moorland type vegetation. At the N of this lobe there is intense peat cutting at the edge of the bog and between this and Road 8 and the S end of Road 5 there are old turf banks dominated by *Calluna.*

The vegetation of the tracks/roads which criss cross the site is dominated by *Ulex* and *Salix* with some calcareous species on the track surfaces.

6.2 DETAILED VEGETATION OF THE HIGH BOG

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

This vegetation complexes are also grouped into ecotopes (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1

Calluna dominated vegetation is seen on facebank edges in several palaces around the site and growing along the edges of drains. To the NE of the N Lobe *Calluna* reaches 70cm in height. Along the ditch beside Road 5 in the Mid Lobe *Calluna* is 60-70cm high. To the SW of the W Lobe *Calluna* in this complex is approximately 50cm high and to the NW there is up to 60% *Cladonia* and the *Calluna* is 80cm tall. To the SW of the W lobe *Pteridium* is encroaching along the bog edge in the

complex. At the S of the SW lobe there is 50% *Cladonia* and the *Calluna* is up to 70cm tall. To the E of Flush X4 in the SE Lobe is an area of heathland vegetation dominated by *Calluna.*

Complex 1+*Molinia* (Mo)
This is associated with Flush X4 to the E of the SE Lobe. The *Calluna* is up to 1m tall and there is much *Molinia* and some *Ulex.* The ground is rising slightly.

Complex 1 + *Myrica* (*My*)
To the S of the E lobe and close to Road 4 there is abundant *Myrica* in the facebank complex and the *Calluna* is up to 60cm. There is some active peat cutting being carried out with associated drainage, bare peat and some *Cladonia floerkeana*.

This complex is also seen in association with old peat cutting which was carried out at the junction of the W end of Drain b2E and the S end of Drain b2C.

Complex 2
This complex is seen at the SE of the E lobe and it has up to 80% *Trichophorum*, some bare peat, a lot of surface water, uneven topography and short *Calluna.* Other areas of the complex are seen in the following parts of the site.
A small patch is seen at the SW of the E Lobe.
To the S of the Mid Lobe E and W of Road 5.
To the W of the W lobe there is an area on the high bog with old Difco drills now dominated by *Trichophorum.*
At the E of the SE Lobe where there is an increase in the *R. alba* cover.
To the SE and NW edges of the exit of Flush X3 between the SW and SE Lobes where there are erosion channels leading into the flush.

Complex 2/3
This dry complex is dominated by *Trichophorum* (35%) and *Carex panicea* (20%) with *Narthecium* (5-10%). The *Sphagnum* cover is low and the surface is not soft. It is seen in the following areas:
to the W of the N Lobe;
to the SE of the E lobe;
close to the northern end of Road 5 at the E of the Mid Lobe;
at the NW corner of the Mid Lobe;
at the top of the ridge in the centre of the W Lobe (past burning suggested by patches of bare peat and an abundance of *E. tetralix*. The remains of old hummocks are seen. *Sphagnum* regeneration is not good);
along the E of the S edge of the W Lobe where there is a lot of surface water, a frequent occurrence of *Pleurozia purpurea* and some erosion channels;
along the SW of the SE Lobe;
in patches to the S of the site where peat cutting has occurred.

Complex 2/3 + Tear Pools (TP)
A small area of this complex, similar to above with the addition of tear pools is seen to the SW of the N Lobe.

Complex 2/3 + *Cladonia* (*Cl*)
This is similar to the above complex with the addition of a high *Cladonia* cover (30%). This is seen in a band to the N of the E/W line of mounds (man-made dominated by *Calluna* with some *Molinia*) on the SE Lobe. Tall *Calluna* (60cm) is seen and *R. alba* occurs in shallow partial erosion channels. This complex appears to be on a ridge which slopes to the S, hence the erosion channels.

Complex 2/3 + Erosion Channels (ER)
This complex is seen to the W of the main channel of Flush X3. The surface is very hard and slippy underfoot. *Trichophorum* and *Carex panicea* dominate with *R. alba* (10%) in erosion channels, *E. vaginatum* (10%) and only small amounts of *Narthecium*. Water run-off is seen in the channels which deepen towards the flush channel to form erosion gullies.

Complex 2/3/4 + Erosion Channels (ER)
This marginal complex is seen at the W edge of the W lobe in association with the exit of Flush Y3 and a line of tall hummocks which forms part of a townland boundary. It is characterised by very deep erosion channels carrying water N towards the edge. The *Trichophorum* tussocks are up to 0.75m deep with much bare peat and *R. alba.*
The complex is also seen to the S of the NE arm where there is an increase in *R. alba* cover and to the S of SE of the Mid Lobe.

Complex 2/3/6
This complex dominated by *Trichophorum* (up to 40%), *Carex panicea* (30%) and *Narthecium* (10-20%). This complex is seen in a few places around the site:
to the N of the Mid Lobe *E. angustifolium* is scattered throughout and some small *S. cuspidatum* pools occur;
between the drains of b2G complex in the E Lobe where the surface is hard underfoot and patches of *Molinia* and *Myrica* occur;
further S of drain Complex b2G where it is associated with Slopes 28, 29 and 30 and the % cover of *Trichophorum* increases to 55%. The ground is hard and tussocky and there is some bare peat and algal hollows;
to the S of the E of the Mid Lobe where *Calluna* is short (5-10cm);
to the NW of the W lobe where the ground is moderately soft and a lot of *S. imbricatum* and *Racomitrium* were seen;
on the SW Lobe this complex is seen in close association with Complex 2/6/3. The micro-topography is very uniform and the area was probably burnt recently (*Calluna* 5-10cm). Some *Cladonia portentosa* and *C. uncialis* occurs but only in very small patches. The bog surface is a bit softer here but there is little *Sphagnum* cover. Some *Calluna* dominated mounds are seen. These are probably man-made shooting butts;
to the N of the SW lobe in association with Slope 44 there is 40% *Trichophorum,* 30% *Calluna* and 15-20% each of *Narthecium* and *C. panicea.* The ground is hard and the topography uneven. *Racomitrium* was seen;
around the N, NE and S edges of the SE lobe.

Complex 2/3/6 + *Myrica* (My)
This is similar to above and is seen to the SW of the E Lobe.

Complex 2/3/6 + Tear Pools + *Cladonia* (TP + *Cl*)
This is seen to the NW of the W lobe and is dominated by *Trichophorum, C. panicea, Narthecium, Calluna, E. angustifolium* and *Cladonia* up to 70%. The ground is uneven. The pools are small and there is *Campylopus atrovirens* at the edges.

Complex 2/7
This marginal complex is dominated by *Trichophorum* (40-55%) and *Calluna* (40-50%), 20-30cm tall) with *Carex panicea* (5-10%), *Erica tetralix, Narthecium* (5%), *E. vaginatum* (10%) and *E. angustifolium* and occasional patches of *R. alba*. The *Sphagnum* cover is generally low (+-10%) and the bog surface is mostly hard. Small algal hollows are frequently seen. This complex is seen in several places around the site:
To the S of Drain Complex bA in the N Lobe;
between Drains bA and bB1 also on the N Lobe where there is an increase in *Calluna* cover at the W edge (Complex 7/2);
to the N of the Mid Lobe;
between drains b3B (bog surface is a little soft in this area) on the W Lobe;
on the ridge to the N and within Drain Complex b3A on the W Lobe (*Sphagnum* cover up to 20% in parts of this area);
to the S of Drain bA3 to the SW of W Lobe where it is associated with Slope 33;
at the W edge of the W lobe where there is 60% *Trichophorum* with much surface water, algal hollows and scattered *E. angustifolium*. In some of the hollows there is *S. cuspidatum, S. papillosum* and *Menyanthes.* There is abundant *Racomitrium;* to the SW of the SW Lobe where the surface is hard and tussocky and to the SSE of the SE lobe where there is 10% bare peat, a lot of surface water and erosion channels associated with peat cutting activities. The *Trichophorum* is up to 60% cover with 30%

E. tetralix and some *Narthecium* and *R. alba* in hollows. The ground is very hard, tussocky and slippy and machinery drives across it;
to the NNE of the SE Lobe where there is an increase in *Carex panicea.*

Complex 2/7 + Erosion Channels (ER)
This is similar to the above complex as *Calluna* and *Trichophorum* dominate with the addition of shallow erosion channels. It is seen close to the SW side of Flush X3.

Complex 3/2
Carex panicea (25%) and *Trichophorum* (20%) dominate. The *Sphagnum* cover is low and the surface is hard.
It is seen to the E of Flush Z in the N Lobe and within Complex 2/7 (E of Drain bB9 some patches of *Myrica* are seen);
to the NW of the N Lobe;
in association with Slope 8 at the NE corner of the NE arm;
close to the bog edge at the W of the W Lobe (with much associated surface water);
at the W side of the SW Lobe on an area of partly cut-over peat and associated with Slope 48;
on the W slopes of Flush W3 on the SW Lobe.

Complex 3/2 + *Cladonia* (Cl)
A small area similar to above but with the addition of up to 40% *Cladonia* is seen on the E slopes of Flush W3 at the SW of the site and also to the NNW of the SE Lobe where the *Cladonia* cover is less.

Complex 3/2 + *Myrica* (*My)*
A complex similar to the above but with the addition of *Myrica* is seen S of the curved Drain b2C in a sloping area.

Complex 3/2/7
This is seen at the W edge of the W lobe where it is associated with active peat cutting. It is dominated by *C. panicea* (35%), *Calluna* (35%) which is < 20cm and *Trichophorum* (20%). There is much bare peat and the terrain is uneven underfoot. There is abundant *Racomitrium* and patches of *R. alba*.

Complex 3/2/7 + Tear Pools (TP)
To the N of complex 3/2/7 in association with Slope 34 there are some tear pools with a SW/NE orientation. They are infilling and not deep. There is another area of this complex N of Flush Y3 at the W of the W lobe. The *Narthecium* cover is up to 10% and the ground is not as tussocky and there is no bare peat.

Complex 3/2/6
This complex with *Carex panicea* (30%), *Trichophorum* (20%) and *Narthecium* (15%) occurs:
to the E of Road 5 in the Mid Lobe where there is also abundant *E. angustifolium*. There is evidence of burning from some time ago as patches of bare peat and *Cladonia floerkeana* occur. Some pools are present these are mainly algal but some occur with *S. cuspidatum*, *R. alba* and *D. anglica* with *Campylopus atrovirens* at the pool edges. *Sphagnum* cover is approximately 10%, mainly *S. capillifolium* and *S. tenellum*. The bog surface is mostly hard with some localised soft spots;
at the E of the Mid Lobe between Road 5 and Drain b2H;
to the S of the SE Lobe where the bog surface is very slippy and hard. Some small algal hollows occur. The *Sphagnum* cover is low < 10%, mainly *S. tenellum, S. capillifolium* and bits of *S. papillosum*. Towards the west the quality of the complex improves. The Sphagnum cover increases to about 15% and both *S. magellanicum* and *S. fuscum* are seen. The surface is softer;
close to Drain b4E (N/S section) at the S of the SE Lobe;
the complex is also seen along the SE edge of the SE Lobe where it is associated with active peat cutting and Slopes 69 and 71.

Complex 3/2/6 + Tear Pools (TP)
To the S of the SE Lobe a similar complex to above is seen with the addition of tear pools. These pools are due to stresses created by peat cutting and draining.

Complex 3/2/6 + *Cladonia* (Cl)
This is similar to the above complex with the addition of 30% *Cladonia portentosa* cover. It is seen to the SE of the Mid Lobe. The area has obviously not been burnt recently.

Complex 3/6/2
This is seen at the centre of the Mid Lobe. *Carex panicea* (25%) dominates with *Narthecium* (20%) and *Trichophorum* (15%) also abundant. *Calluna* is also frequent but is very short (5-10cm). There is very little *Sphagnum* and the bog surface is hard. Occasional small *S. cuspidatum* and algal pools occur. A similar complex occurs to the W of the W lobe N of Flush Y3.

Complex 2/7/6 + *Myrica* (My)
This is seen to the S of Drain b2E in the E Lobe. *Trichophorum* cover is high (50%) and *Calluna* (25%, 30-35cm tall) and *Narthecium* (10%) are important elements. Some algal pools occur. *Myrica* is scattered throughout the complex.

Complex 2/7/9
Trichophorum, Calluna and *E. vaginatum* are dominant. Erosion channels occur and the surface is hard and tussocky. *S. capillifolium* hummocks occur. It is also seen on the sloping ground (Slope 33) at the SW of the W lobe and in association with Slope 43 at the S of the W Lobe.

Complex 2/7/9 + *Cladonia* + Tear Pools (*Cl* + TP)
This is seen at the edge to the S of the Mid Lobe between Drains bC24 and b2H. It seems as though there may have been a small bog burst in the area at one time. There are similar dominants as above. There is also 60% *Cladonia* and some very tall tussocks with scattered *Molinia,* very small *Betula* and *Empetrum* throughout. There are some pools at the base of the tussocks and these support abundant *R. alba, Drosera, Menyanthes, S. papillosum, S. cuspidatum* and *S. auriculatum.*

Complex 2/9/7
This complex where *Trichophorum* (35%), *E. vaginatum* (25%), *Calluna* (20%, 20cm tall) and *E. angustifolium* (10%) dominate is seen in a few parts of the SE Lobe*:*
to the SW of the SE lobe S of Drain b4B where there is poaching and as a result the ground is very tussocky and there are degraded *Sphagnum* hummocks;
to the SW of the SE Lobe there is very little *Sphagnum* cover and the bog surface is hard. There are some soft patches where *Sphagnum* cover is higher;
on the lobe to the NE of the SE Lobe there is no *Cladonia* cover in this area and the bog surface is hard. *Carex panicea* also has a cover (15%);
to the NNW of the SE Lobe:
at the mid E edge of the SE lobe.
The complex is also seen to the N of the SW lobe where the bog surface is very wet and the *Calluna* is dying. Some patches of *Phragmites* occur. A line of mounds runs E/W across this area along Drain b3H. These are colonised by *Calluna* (with lichen epiphytes), *Vaccinium myrtillus, Hypnum, Aulacomnium palustre, Cladonia floerkeana* and *Campylopus introflexus*. The complex extends S of this line of mounds to a depressed area with some pools and soft ground. There is a lot of *Racomitrium* also.
Another area of the complex is seen to the N of the NW arm of Flush X3 in the W Lobe

Complex 2/9/7 + *Cladonia* (*Cl*)
There is a small area of this complex with 25% *Cladonia* cover N of Drain b4B in the SE Lobe. A larger area of the complex is seen to the N of the SE lobe N of Complex 9/7+ *Cl* and the *Cladonia* cover is 15%. There is 20% *Trichophorum* and the *Calluna* is very tall - up to 60cm with a lot of *Hypnum*. There are patches of Complex 9/7 + *Cl* in this complex indicating that the area may have been burnt some time ago but some patches escaped.

Complex 2/6/3
This complex is dominated by *Trichophorum* (30-35%), *Narthecium* (15-25%), *Carex panicea* (10%) and *Calluna* (30cm tall). There is very little *Sphagnum* cover. The complex is the most widespread complex at this site and is seen:

N. Lobe
. to the SW of the N lobe where there are some small algal hollows some with *S. cuspidatum* and *S. papillosum.* The *Sphagnum* cover is 10% including *S. imbricatum, S. magellanicum, S. capillifolium* and *S. tenellum.* The ground is soft but there is a lot of surface water. There is some *R. alba* in hollows and shallow erosion channels associated with the slopes around the edges of this area of the complex and there are some tear pools to the N of the site with *S. auriculatum, R. alba, S. cuspidatum* and *E. angustifolium*. *Narthecium* cover increases further into the bog. There is evidence of past burning - bare peat and *Cladonia floerkeana*;

NE Arm
. around the edge of the NE arm where there is an increase in the amount of *C. panicea*. The bog surface is hard in contrast to the adjoining Complex 6/9A. Some *Racomitrium* and *S. fuscum* hummocks are seen and there are patches of *Cladonia portentosa* in places - reaching 40% at the very SSE corner of this lobe. Part of this area is poached;

East Lobe
. in two areas to the S of Road 1 on the E Lobe this complex has many small algal pools and much surface water. The surface is quite slippy. Occasional small *S. capillifolium* hummocks occur and bits of *S. magellanicum* and *S. papillosum* are seen. Very infrequent small *S. cuspidatum* pools which are linear (0.5 -1m long) with a more or less NNE/SSW orientation. There is an increase in % *R. alba* towards the edges of the complex in this area and this is particularly true to the E of the area in association with Slope 11 W into Drain bC24. The microtopography of the complex over this area is very uniform;
. in a small area of Flush X2 within Complex 9/7+My
. to the N of Flush Y2 where low ridges of *Calluna* and *E. vaginatum* may be seen;
. to the NE of this lobe the *Calluna* is up to 40cm, the ground is tussocky with some bare peat patches and there is very little *E. angustifolium*. *S. fuscum, Pleurozia purpurea* and a lot of small *S. imbricatum* hummocks are seen;
. on the SE side of the E Lobe this complex is similar with many small algal hollows, a slippy surface and occasional *S. imbricatum* hummocks. Surface water is also a characteristic;
. to the S of Drain b2E at the SE of the E Lobe there is a small area of the complex;

Mid Lobe
. in a small area to the E;
. to the N of the Mid Lobe where occasional *S. cuspidatum* pools are seen. The bog surface is quite soft in this area;

West Lobe
. to the S of Flush T2 in the W Lobe where there is sloping ground towards the flush and Drain bC24. There is a lot of *E. angustifolium* and *E. vaginatum* and the *Calluna* is up to 45cm.
. to the N and S of Flush Z3 in the W Lobe *E. vaginatum, E. angustifolium* and *Calluna* are frequent and some small algal hollows occur. The micro-topography is very uniform. *Campylopus atrovirens* is seen at some pool edges.
. to the N side of Flush Y3 in the W Lobe. The pattern on the aerial photograph corresponds to dead *Calluna* and *Cladonia portentosa* cover (10%);

South West Lobe
. to the N of the SW lobe an area of this complex is poached and there is a high % cover of *Trichophorum* and *Calluna.* The complex is associated with the slope into the Frances River (Slope 44) and there are some small tear pools. Patches of Complex 9/7 are also seen. Part of the complex extends eastwards across Drain bC24;
. to the W of the SW Lobe the surface is quite soft in this complex. *Calluna* is dying and E. angustifolium is seen frequently. Water ponding may be occurring in this area as it is at the base of a

low ridge. *Phragmites* and *Molinia* patches are seen in places at the base of the ridge. *Trichophorum* cover increases on the approach to the cut-away to the W;
. to the SE of the SW Lobe there is up to 5% *Racomitrium* and 10% *Cladonia* in the complex;

South East Lobe
. to the N of Flush Z4 in the SE Lobe this complex covers a large area. There are some shallow erosion channels on the slope into the flush. There is an increase in the amount of *Narthecium* and very little *E. angustifolium* is present. On the flat the surface is quite soft, *Calluna* is short (5-10cm) and a small *Betula* tree was seen (1 m tall). To the S of the line of mounds which runs E/W across the SE Lobe the surface is wet and soft with some poorly developed pools with *S. cuspidatum* and *S. papillosum*. *E. vaginatum, E. angustifolium* and *Calluna* are also important. A patch of *E. vaginatum* dominated vegetation may be linked to Flush X3. To the SE of this large area in association with Slopes 70 and 71 there is very little *E. angustifolium* and *Narthecium* but an increase in *Trichophorum* (55%) and *Calluna* (40%). Further S *Narthecium* cover increases, the *Calluna* is shorter and there is abundant *E. tetralix* with a lot of *R. alba* towards the W edge ;
. between the two arms of Flush X3 E of Drain bC24;
. close to the exit of Flush X3;
. to the NE of the SE Lobe this complex is seen with some pools. *E. angustifolium* is very frequent and dominates some patches. *Racomitrium* occurs. The surface is soft in this area. On the arm to the E, *Calluna*, *E. vaginatum* and *E. angustifolium* increase.

Complex 2/6/3 + *Cladonia* (Cl)
A small area of the above complex with the addition of some *Cladonia* cover is seen on the arm of the SE Lobe.

Complex 2/6/3 + *Myrica* (*My*)
This complex is seen to the NW of the E lobe between two areas of Complex 2/6/3 and has abundant short *Myrica* throughout. The complex is similar to the above and there is *Ulex* encroaching near Road 1. The complex is also seen at the SE of the E Lobe and between the two areas of Flush X2 in the E Lobe.

Complex 2/6/3 + Tear Pools (TP)
This is seen to the SE of the elbow of Flush Y3 close to the bog edge in the W Lobe. The slumping has probably occurred due to peat cutting as there is a definite slope into an area of old cut-away. Linear (N/S orientated) pools occur (40%). Most are algal but some contain unhealthy *S. cuspidatum, R. alba* and *Menyanthes*. *Cladonia portentosa* cover is about 15% but disappears close to the bog edge where burning is indicated. Another similar area of this complex is seen to the E of Drain b2H in the Mid Lobe.

Complex 2/6/3 + Algal Pools (AP)
A small area of this complex is seen to the SW of the SE Lobe and is similar to Complex 2/6/3 with the addition of many algal pools.

Complex 6 Recently Burnt (RB)
This is a recently burnt small area which is dominated by *Narthecium.* It can be seen to the W of the W lobe SW of the NW end of Drain b3E. The burning event appears to be recent as it was not shown on the 1993 aerial photograph.

Complex 6/7
This is seen in the N lobe at the W of Drain Complex bC and it is dominated by *Narthecium* and *Calluna.* The amounts of each is variable with the % cover off *Calluna* increasing towards Drain Complex bB. In some places the *Calluna* cover is up to 60% and it is 35cm tall. The *Sphagnum* cover is poor mainly *S. tenellum* and *S. capillifolium* though the ground is not very hard. Scattered throughout the complex are *E. angustifolium* and *Trichophorum* in moderate amounts, *E. vaginatum, C. panicea, S. imbricatum* and hummocks of *Empetrum* with *V. oxycoccus.*

Complex 7/3
This complex is dominated by *Calluna* and *Carex panicea* with *Trichophorum* and *E. vaginatum* also present in notable amounts. Some low *S. capillifolium* hummocks occur. It is seen to the NE of the N Lobe at the junction of the NE arm. It is a marginal complex and the bog surface is hard.

Complex 7/9/2
This complex is seen to the NE of the SE Lobe. *Calluna* is tall (30-40cm) with *E. vaginatum* and *Trichophorum*. *Cladonia portentosa* cover is 5-10%. *Empetrum* occurs and some *Betula* seedlings. It is also seen at the SE edge of the SE lobe.

Complex 7/9/2 + Tear Pools
This is seen to the W of the W lobe and is associated with Slope 34. It is dominated by *Calluna* (30% and 35cm tall), *E. vaginatum* with come *E. angustifolium* (30%) and *Trichophorum* 10%. There are some degraded *S. capillifolium* hummocks in the inter-pool areas with some *Narthecium* and *C. panicea*. *Racomitrium* and *S. fuscum* hummocks were recorded. Some of the tear pools are up to 5m long with much *R. alba* the cover of which reduces higher up the slope. There is *Sphagnum* at the down slope side of the pools - mainly *S. capillifolium* and *S. magellanicum* and in the pools are *S. cuspidatum, S. auriculatum, Drosera* and *Menyanthes.* Some tall hummocks which form part of a townland boundary are seen at the N edge of this complex.

Complex 7/9/3
This complex dominated by *Calluna, E. vaginatum* and *Carex panicea* is seen to the NE of the SE lobe. Some algal tear pools occur in this area probably due to the stress caused by peat cutting close by. *Menyanthes* and *R. alba* occurs in a few of these pools. *Calluna* dominated mounds are seen within this complex. These appear to be man-made.

Complex 7/9
Dominated by *Calluna* (45-65%) and *E. vaginatum* (30-40%) this complex is seen in a number of places around the site. It is quite often associated with flush features. Other important community types are *Narthecium* (10%) and *E. angustifolium* (15%) with *S imbricatum* but overall the *Sphagnum* cover is low. Very little *Andromeda* occurs. The complex is seen:
between the *Molinia* dominated areas in Flush Y in the N Lobe with occasional small clumps of *Molinia*;
to the E and W of Drain bC24 (N section);
to the SW of the W lobe and associated with Slope 33 where there is a patch of *Phragmites* with *Aulacomnium, Pleurozium schreberi, S. capillifolium* hummocks and some *Cladonia portentosa* (5%);
forming an E/W ridge at the NE side of the SW Lobe with *Empetrum* also (may be an internal drainage feature). Dark spots on the aerial photograph in this are correspond to *Calluna* mounds and old degraded hummocks;
to the SW of the SW lobe, close to the recently excavated Drains b3L associated with forestry, the terrain is very tussocky and there is much bare peat;

An area of the complex with *Myrica* is seen at the SW corner of the SW Lobe close to the Sitka spruce forestry (Complex 7/9 +My (*Myrica*)). *Calluna* is 40-50cm high and *Myrica* is scattered through the complex with some patches of *Molinia*.

A similar complex to 7/9 but with the addition of *Molinia* (Complex 7/9+Mo) is associated with Flush X4 and heath to the E of the SE Lobe.

Complex 7/9 + *Cladonia* (Cl)
Complex 7/9 also occurs with a high cover of *Cladonia portentosa* (20-50%). It is seen:
on the NE arm with some *Aulacomnium palustre* and *Empetrum* noted;
close to Flush W3 in SW Lobe with *Calluna* (40cm high), *S. capillifolium, Pleurozium schreberi, Aulacomnium palustre* and *Polytrichum alpestre*;
N of Flush Y4 to the N of the SE Lobe;

in two areas close to the E edge of the SE lobe where the *Calluna* (65%) is up to 1m tall with patches of *Molinia,* enrichment indicators and tall *S. capillifolium* hummocks. Further S the *Calluna* reduces in height, there is less *Cladonia* and *Trichophorum* and *Narthecium* are present;
close to Drain b4E on the SE Lobe where *Cladonia portentosa* cover is 15%.

Complex 9A/3/2
This complex is dominated by *E. angustifolium* with *Carex panicea* and is seen to the NW of the N Lobe. *Trichophorum* and *Calluna* are also important elements with small amounts of *Narthecium*. Surface water is present but the ground is hard underfoot. Two NE/SW lines of vegetation are seen in this area. *E. vaginatum* and *Calluna* dominate with patches of *Molinia* with tall *Calluna*, *Empetrum, Aulacomnium palustre, S. capillifolium* and *Vaccinium oxycoccus*. The cover of *E. vaginatum* and *E. angustifolium* increases close to these lines. It is possible that they mark old drains.

Complex 9A/6 + *Phragmites* (Ph)
This area of vegetation is really an extension of the West arm of Flush Y to the NNW of the N Lobe. *Narthecium* and *E. angustifolium* dominate with *Calluna* and *Phragmites*. *Calluna* and *Carex panicea* cover increase close to the bog edge.

Complex 9A/7
This complex dominated by *E. angustifolium* and *Calluna* is seen:
to the E of the N Lobe and more associated with the S edge and some poaching this complex is also seen with *Calluna* 40-45cm tall. The *Sphagnum* cover is moderate (25%), mostly *S. capillifolium* but some *S. magellanicum* is seen. The surface is hard however and there is some surface water;
to the NE of Road 4 and close to Flush V2, *E. angustifolium* and *Calluna* dominate an area with large patches of bare peat. This is associated with peat cutting.

Complex 9/7/2
This complex is by *E. vaginatum, Calluna* and *Trichophorum* with *Trichophorum* increasing close to the bog edge. There is also an increase in surface water at the edges and some algal hollows with *S. cuspidatum.* The ground is hard and *Molinia* is scattered throughout the complex. It is seen in the following locations:
to the N of Flush X3 in the SE Lobe;
in the SE Lobe close to its eastern edge;
in a small area to the SW of the SE Lobe;
to the NW of the SW Lobe.

Complex 9/7/2+Cl
Cladonia portentosa cover is also seen in parts of Complex 9/7/2. It is seen E of Complex 9/7 on the NE arm where there is 20% *Cladonia portentosa* cover with tall *S. capillifolium* hummocks, *Pleurozium schreberi, Aulacomnium, Andromeda* and *V. oxycoccus*. The bog surface is a little wetter and softer underfoot. There is poaching at the S edge of this complex. This complex is also seen to the N of the SE lobe which is very soft and quaking and almost entirely dominated by *E. vaginatum*. The *Cladonia* cover is 70% There is another patch to the E of the SE lobe. The ground is very tussocky and there is 20% *Cladonia.*

Complex 9/7/3
This complex is similar to Complex 9/7/2 except that *C. panicea* is more important than Trichophorum. The % cover of this plant increases further towards the edge in association with Slope 13 in an area of active peat cutting. It is seen S of Flush Z2 at the NE of the E Lobe.

Complex 9/7/6 + *Myrica* (*My*)
This is seen to the S of the SW lobe and is dominated by *Eriophorum* sp., *Calluna* and *Narthecium* (increasing towards the edge) with *Myrica.* The complex is associated with Slope 49. *S. fuscum* is seen.

Sub-Marginal Complexes

Complex 3/6/9A+ Pools (P)

This is seen to the W of the Complex 6/3+P+Cl area N of Flush Y3 on the W Lobe. *Carex panicea, Narthecium* and *E. angustifolium* dominate. The *Calluna* is short and burning has probably occurred. The pools are small and mostly algal. Some larger, linear ones contain *S. cuspidatum*. *R. alba* is seen around the pool edges. The bog surface is a little soft.

Complex 3/6/9A

This is similar to the above but without the addition of pools and is seen beside the complex mentioned above.

Complex 3/9/7

This complex occurs to the W of the W lobe and is dominated by *C. panicea* (35%), *Eriophorum* sp. 20%, *Calluna* up to 35% mainly 20cm tall but sometimes reaching 35cm and *Trichophorum* 10% with scattered *Narthecium*. The *Sphagnum* cover is 15% mainly *S. capillifolium, S. papillosum* and *S. tenellum. Racomitrium* and *Andromeda* are present and there are some hollows with *R. alba.* Another small area of this complex can be seen in association with Slope 51 to the N of Flush W3 on the SW Lobe.

Complex 6/2/3

This complex is dominated by *Narthecium* (35%) with *Trichophorum* and *Carex panicea* also important. The micro-topography is generally very uniform. Some *Racomitrium* hummocks occur and occasionally *S. cuspidatum* pools with *S. auriculatum* and *Menyanthes*. *S. magellanicum* may be seen infilling some pools. It is seen at the NE of the Mid Lobe (east of Road 5) in association with Slopes 19, 20 and 22. The *Sphagnum* cover tends to be low and the bog surface not very soft but there may be localised wet patches. It is also seen at the centre of the SE Lobe where the surface is quite soft and *E. vaginatum* is also important (15%). Here it is on a flat area which may explain its wetter nature.

Complex 6/2/3 + Tear Pools

This is a marginal complex at the E edge of the Mid Lobe and is associated with Slope 19. It is similar to the above but with the addition of pools and an increase in *Trichophorum.* The pools are steep sided. There is little *Calluna*

Complex 6/3/2

This complex is dominated by *Narthecium* (30-35%), *Carex panicea* (20-25%) and *Trichophorum* (5-15%) with dwarf shrubs (*Calluna* and *Erica tetralix*) ranging from 20 -30% (*Calluna* 10 -35cm high). *E. angustifolium* is also frequent. The *Sphagnum* cover is low (5-10%) and the bog surface varies from being hard to a little soft depending on distance from the bog edge. The micro-topography is generally quite uniform with no large hummocks. The complex is seen:

to the NW of Drain Complex bC on the N Lobe where the areas colonised by *Narthecium* are a little soft; to the SW of the site where occasional *S. cuspidatum* pools occur. This area has not been burnt as recently and there is some micro-topographical variation. *Cladonia portentosa* cover is approximately 5%;

to the N of the W Lobe. Here the surface is not soft and patches of *Myrica* and *Molinia* are seen with enrichment indicators such as *Aulacomnium, Pleurozium schreberi, V. oxycoccus, Empetrum, P. erecta,* tall *S. capillifolium* hummocks and much *Pedicularis sylvatica* scattered throughout. On the approach to Flush T2 from the W of the W Lobe there is an increase in *Trichophorum* and *C.* panicea with some algal hollows and tear pools. This area of the complex is associated with Slope 38;

in two area at the W of the SW Lobe;

to the N of Flush W3 in the SW Lobe.

Complex 6/3/2 + Pools (P)

This is similar to Complex 6/3/2 with the addition of pools. To the N of the W Lobe this complex occurs with 10% pools. The structure is quite uniform, in common with Complex 6/3/2 in this area. However the bog surface is wetter and softer.

To the NE of Flush Y2 in the E Lobe is an area of 6/3/2+P where the pools are more or less linear and at right angles to the slope into the flush. *S. pulchrum* is seen in some of the lawns and infilling pools. Ridges of *Calluna, E. angustifolium* and *Myrica* occur. *Racomitrium* is quite plentiful.

The complex is also seen in a small area at the SW of the SW Lobe.

Complex 6/9A
This complex is seen towards the E end of the NE arm in a central position. It is dominated by *Narthecium* (35%), *E. angustifolium* (20%) and *Calluna* (20%). The *Narthecium* flats are soft although *Sphagnum* cover is low. *S. imbricatum* is seen forming low hummocks (appears to be regenerating) and small amounts of *S. papillosum* and *S. magellanicum* also occur. Some wetter *Narthecium* lawns are seen with *R. alba* and *S. auriculatum*. Bits of *Cladonia portentosa* and *C. uncialis* occur. *E. vaginatum* has significant cover in places. Towards the E, *Trichophorum* cover increases to between 15-20% but the bog surface remains wet. This is the wettest area seen on the N Lobe.

Complex 7/9A
This complex is seen to the NW of the N Lobe close to the W arm of Flush Y. *Calluna* (60% and 30cm tall) and *E. angustifolium* (35%) dominate with *E. vaginatum* (15%) and *Carex panicea* (+-5%). *Sphagnum* cover is moderate with *S. papillosum, S. capillifolium, S. tenellum* and *S. imbricatum* (5%). Little bits of *Cladonia portentosa* and *Aulacomnium palustre* are seen.

Complex 9/3/2
This complex is seen to the S of the Mid Lobe between Drains bC24 and b2H. It is dominated by *Eriophorum* (35%), *C. panicea* (35% and increasing towards the edges), *Trichophorum* (10%) and much short *Calluna* (< 25cm) throughout. There is also some *Narthecium.* The ground is soft and there are some wet hollows with *S. papillosum.* The complex merges into 2/6/3/ + P+ *Cl.*

Complex 9/7
This complex is also dominated by *Calluna* (25-45%) and *E. vaginatum* (40-50%) but the latter is more frequent. Other communities of note are *Trichophorum* (15%), *Narthecium* (10%) and *Carex panicea* (5%). The *Sphagnum* cover is usually about 15%, mostly *S. capillifolium* and *S. tenellum* but can reach 30%. The bog surface is generally not very soft and can be hard. The complex is seen:
. to the N and W of Drain Complex bC in the N Lobe where the *Calluna* has up to 50% cover and is 40cm tall and there is up to 20% *Narthecium* and some algal hollows;
. to the E of Drain Complex bC on the N Lobe - no large hummocks are seen in this area and there are indications of past burning such as patches of bare peat and the occurrence of *Cladonia floerkeana*;
. around Drain Complex bP to the NNE of the N Lobe *Calluna* is up to 50cm high and *Carex panicea* and *Trichophorum* are also plentiful and the *S. capillifolium* cover reaches about 15% but the surface is dry and not soft;
. to the N of the NE arm *Betula* is invading this complex;
associated with Drain Complex b2G in the E Lobe where the *E. vaginatum* and *Calluna* cover is high throughout but the distribution of this complex is difficult to map due to small scale changes;
. to the N of Flush Z2 in the E lobe where it is associated with Slope 12 and there are some areas with a lot of surface water and there are enrichment indicators such as *Aulacomnium* and *Empetrum* with *Betula* and *Phragmites* scattered about;
. to the N of Road 6, which extends into the centre of the Mid Lobe. *E. vaginatum, Carex panicea* and *Narthecium* also occur with occasional *S. cuspidatum* pools. These pools can contain *Menyanthes*, *R. alba* and *Drosera anglica*. Low ridges of *Calluna* are seen which may be slump features associated with the road. They are orientated more or less E/W. They may also be the result of a burning pattern as there is a very sudden boundary with Complex 2/3/6 (*Calluna* much shorter) to the N. The *Sphagnum* layer is dominated by *S. capillifolium*;
to the S of Flush T2 where it is present in the Mid Lobe
. to the NW of Drain Complex b3A at the S of the W Lobe the *Sphagnum* cover is quite high (30%) though there are some degraded hummocks and a lot of *C. panicea.* Where it occurs at the base of the ridge before the slope towards the cut-away the bog surface is a little soft;

. just to the S of Flush Z3 on the W Lobe this complex is seen with small patches dominated by *E. angustifolium* and *Calluna* in this area is short (5-10cm) so recent burning may have occurred;
. close to Drain b3Hand N of Flush W3 on the SW Lobe this complex is seen with patches of *Phragmites*;
. to the N of Drain b3H on the SW lobe there is a large patch of this complex which is very tough going as there are abundant tall *E. vaginatum* tussocks, associated wet hollows with *S. cuspidatum* and *Calluna* up to 40cm tall;
. around the NW arm of Flush X3, between the SE and SW Lobes, where there is a high proportion of *C. panicea;*
. to the SE of the SW lobe where it is soft and wet and probably associated with the SW arm of Flush X3;
. to the SW of the SW Lobe;
. to the N of Flush X3 (SE Lobe) there is a linear N/S feature which is dominated by tall *Calluna, E. vaginatum* and *E. angustifolium;*
. to the SW of Flush Y4 in the SE Lobe, the *Calluna* is in bad shape but *Empetrum* (10%) is doing well.
. towards the S of the SE Lobe where it is probably slightly enriched as patches of *Molinia* and *Pteridium* occur with *Pteridium* also scattered through the area. Other species noted in this area were *Empetrum, Potentilla erecta*, a few scrub *Betula*, *Polytrichum commune* and *Aulacomnium palustre*. Patches of bare peat and the presence of *Cladonia floerkeana* indicate a burning event.

Sub-Central Complexes

Complex 2/6/3 + Pools (P)

This is seen to the E of the E Lobe and is similar to Complex 2/6/3 with the addition of small linear pools (15-20%), many of which are algal. Some contain *S. cuspidatum*, *Menyanthes, Drosera anglica*, *R. alba* with *S. papillosum* at the edges. *S. imbricatum* is also seen at pool edges. Some larger pools are seen on flatter sections, which are filled with *S. cuspidatum*. *Sphagnum* cover ranges from 25-40%, occurring mostly in the *S. cuspidatum* pools but *S. auriculatum*, *S. capillifolium, S. papillosum, S. magellanicum, S. fuscum* and *S. imbricatum* were noted. *R. alba* is generally more frequent in this complex than in Complex 2/6/3 and *Carex panicea* is not as abundant. *E. angustifolium* is plentiful scattered throughout. The surface is soft but the *Sphagnum* cover is only 10%. *Racomitrium* is seen forming small hummocks and *Pleurozia purpurea* is also seen. In one area the pools are very frequent and are all *S. cuspidatum* infilled and *Campylopus atrovirens* was seen at the pool edges. Some pools are larger and partially interconnecting especially further W. The bog surface is soft in this area. There is some evidence of past burning and no large hummocks are seen.

Approaching Lake/Flush W2 from the W of the E Lobe shallow *S. cuspidatum* pools occur which are infilling with *S. papillosum* and *S. magellanicum* with some *R. alba* and *Menyanthes*. *S. pulchrum* was also seen here as were some *Racomitrium* hummocks. South of the lake at W2 and in association with Slopes 16 into a depressed area, pools are seen. They have various orientations depending on which side of the depression they are on.

The complex occurs in a few areas on the W lobe. It is seen in separate locations to the N and E of Flush Y3 on the W Lobe. *Trichophorum, Narthecium* and *Carex panicea* dominate with small *S. cuspidatum* pools. It has been affected by fire as *Calluna* is much shorter here than in the adjoining complexes. A patch of *Molinia* is seen on the boundary with Complex 9/7+Pools.

To the NE of the W lobe and joining with an area to the E of Drain bC24 there are large pools and the area is very wet. There is a high water table in the area and some of the pools are deep. The pools vary in size and shape and some inter connect. In some pools there are lawns of *S. papillosum*, *S. cuspidatum* and *S. auriculatum* with *Menyanthes, Drosera* and *E. angustifolium* growing up through them. In others there is infilling and others are empty. There is *C. atrovirens* and *S. papillosum* around some of the more healthy pools. Closer to the edges of the complex the pools may be tear pools. There are more pools to the W than E of Drain bC24 but those to the W are longer. In the inter-pool areas are *Narthecium* lawns with *Calluna* hummocks some with *Aulacomnium.* There are also some low wide *S. imbricatum* and *S. capillifolium* hummocks. *Racomitrium* was seen. At the W edge of the complex *E. vaginatum, Calluna* and *E. angustifolium* are common. Pools are mostly linear with an E/W

orientation. A large proportion of the pools are algal but some contain *S. cuspidatum* with *Campylopus atrovirens* at the pool edges. *Sphagnum* cover is low, mainly *S. capillifolium* and *S. tenellum*.

There is a small area of the complex to the E of the north western arm of Flush X3 in the SW Lobe but W of Drain bC24. The pools are small, deep and unhealthy.

A small area of the complex is seen to the SW of the SW lobe in a depressed area. The pools are circular and almost completely infilled with *S. cuspidatum, S. magellanicum, S. auriculatum* and *S. papillosum* with abundant *Racomitrium* in the area.

There is a further small area of the complex to the SE of the SW Lobe and is associated with subsidence close to a forestry plantation at the bog edge.

Complex 2/6/3+P+*Cladonia* (Cl)

To the N of Flush Y3 and to the SE of Complex 2/6/3 + P in the W Lobe and close to Drain bC24 the pools become larger and increase in frequency (30%) and more contain *S. cuspidatum*. Sometimes the pools are interconnecting. *Cladonia portentosa* cover occurs and reaches 70% E of Drain bC24. *S. fuscum* is seen and *S. papillosum* occurs at pool edges. *Pleurozia purpurea* is frequently seen. The surface is soft and there is some micro-topographical variation.

Complex 2/6/4 +Pools (P)

This complex is sen close to Complex 2/6/3 +Pools on the E Lobe. *Carex panicea* cover falls to 5% or less. *Trichophorum, Narthecium* and *R. alba* dominate. The pools are typical except that *S. pulchrum* occurs and becomes frequent towards the E. *Racomitrium* is also seen. The micro-topography is quite uniform as there are no large hummocks or deep pools. This complex occurs on a plateau area with only a very gentle slope to the S. *Sphagnum* cover is high and the bog surface is very soft

Complex 6/3 + Pools + *Cladonia* (+P+Cl)

This complex is seen to the N of Flush Y3 on the W Lobe. *Narthecium* (20%), *Carex panicea* (20%), *Calluna* and *E. vaginatum* are also abundant. *Cladonia portentosa* cover ranges from 20-60 %. There has been no burn for some time but *Calluna* is dying in places. Pools are frequent (20%) and are linear (E/W orientation). The pools are similar to those describes for Complex 9/7+Pools but are larger and *Carex limosa* was seen in a few pools. The surface is soft but *Sphagnum* cover is low. *S. papillosum* and *Campylopus atrovirens* are seen at pool edges and *S. capillifolium* between. Some *Racomitrium* is seen and *Polypodium vulgare* was noted.

Complex 9/7 +En +*Cladonia* (Cl)

This is seen around the S and E of Flush Y4 on the SE Lobe. It covers quite a large area and the whole area is obviously flushed to some extent. It appears to be in a slightly depressed area *Calluna* (45%, up to 40cm tall) and *E. vaginatum* (35%). *Trichophorum* cover increases to the S of Flush Y4. The bryophyte cover is 40% with a lot of *Hypnum* but also *S. capillifolium*, *S. tenellum, Aulacomnium palustre* and *Polytrichum alpestre*. *Cladonia* cover is about 40% increasing eastwards through the complex to 70% with some *C. uncialis* also present. The *Calluna* is dying in places and *Empetrum* is very frequent. Patches of *Molinia* occur and occasionally *Betula* is seen. Other species noted were *Vaccinium myrtillus, V. oxycoccus, Andromeda Potentilla erecta, Pleurozium schreberi, Hylocomium* and *Dicranum*. Close to the patches of *Molinia, Dryopteris dilatata* and *Pteridium* occur. The bog surface is very wet and soft and difficult to walk through.

Complex 9/7 + *Myrica* (My)

In the area between Flushes X2 and Y2 on the E Lobe *Calluna, E. vaginatum* and *E. angustifolium* dominate with patches of *Molinia* and *Myrica* (clumps) and *Myrica* also scattered through the complex. *Narthecium* is also frequently seen. The *Sphagnum* cover reaches 25% in places and the surface can be quite wet and soft. *S. papillosum* and *S. cuspidatum* occur.

Complex 9/7 + Pools (P)
This is seen on the W Lobe, S of Flush Y3. *E. vaginatum, Calluna* and *E. angustifolium* dominate with 5-10% pools between. The pools are mostly small and infilled with *S. cuspidatum, R. alba, E. angustifolium, Menyanthes, Drosera anglica* and *S. auriculatum*. *Narthecium* (15%) is seen around the pool edges with *S. papillosum* at the waters edge. Some pools are linear (E/W orientation) and may be tear pools. The main *Sphagnum* is *S. capillifolium* but *S. imbricatum* and well developed *S. fuscum* hummocks are seen. *Racomitrium* is also present in small patches. The surface is soft within this complex. It is also seen in a depressed area around the junction of Drains b3D and b3E in the middle of the W Lobe. It is dominated mostly by *E. vaginatum* with *E. angustifolium* in the wetter areas, *Calluna*, 10% *Trichophorum* and 5% each of *C. panicea* and *Narthecium.* The pools are large and isolated some with the appearance of tear pools. Some pools are deep and empty and others support *S. cuspidatum, S. auriculatum, Menyanthes, Drosera, E. angustifolium* and small amounts of *R. alba.* The ground is very wet and soft but not quaking.

6.2.2 Flushes
Flush Z is a linear *Molinia* dominated feature to the W of the N Lobe. It extends N from Road 1 towards the cut-away at the NW edge of the N Lobe. A deep drain bB1 (Drain Complex bB) runs right through the flush. One of Drain Complex bA drains (Drain bA7) also runs through part of this flush. A lake is shown in this area on the 1910 and 1848 6" sheets (Loughannabollbeg) and swallow-holes are also indicated (Pollnamaddy). Around a remaining swallow-hole there is some *Betula* scrub, *Molinia, Calluna* up to 50cm, *J. effusus, P. commune, J. articulatus, V. myrtillus, P. vulgaris* and *P. erecta*. In another beside it the EC is 83 µS/cm and *S. recurvum* was recorded. Where Drain bB1 runs through the flush there is iron staining and it is colonised by species such as *Potamogeton polygonifolius*, *Carex rostrata, C. echinata, Juncus bulbosus, J. effusus, J. articulatus, Menyanthes* and *S. auriculatum* v. *inundatum* (EC 159-177 µS/cm). At the very NW edge of the flush there is a very large and deep swallow hole (20m by 6m) and it is dominated by *Pteridium* with *J. effusus, Molinia* and *Agrostis*. It appears dry and this may be because the deepened Drain bB has diverted the water.

Flush Y is a large expanse of *Molinia* and scattered *Betula* scrub seen in the centre of the N Lobe. Drain Complex bC runs through the flush. To the S of the flush there is a concentration of *Betula* scrub (1-1.5m tall) with some *Salix*. In addition to *Molinia* and *Betula* the other frequently seen species are *Myrica, Calluna* (60cm), *Potentilla erecta, Erica tetralix*, *Empetrum, Polygala vulgaris* and *Vaccinium oxycoccus*. *Phragmites* is also seen on the mid-west and N of the *Betula* scrub and also scattered in among the trees. The centre of the flush appears to be in a depression. Some soft spots with *S. capillifolium* are seen but overall the flush is quite dry due to the effects of drainage. Where the drains of bC complex run through the flush *Potamogeton polygonifolius* is seen (EC 136 µS/cm). Patches between the *Molinia* are dominated by *Calluna* and *E. vaginatum* with some *Narthecium*.

A patch of *Phragmites* extends from the S side of the flush eastwards along Drain bD and in an area of old peat cutting to the N of it. There are similar species as in the flush but there are also wet pits with *Potamogeton polygonifolius, Ranunculus flammula*, *Aulacomnium, Menyanthes* and *S. papillosum.* The facebanks are < 1m. There is flow from this area through Drain Complex bC. The drains of Drain Complex bC do not connect with Drain Complex bD. In addition to the N of this flush, W of Drain Complex bC there is an area of *Phragmites* and *Molinia* with frequent low *S. imbricatum* hummocks.

Flush X is seen to the N of the North Lobe. It is a large expanse of *Molinia* dominated vegetation. Other species noted were *Myrica, Luzula, Potentilla erecta, Polygala vulgaris, Erica tetralix, Pedicularis sylvatica, Empetrum, Polypodium vulgare, Vaccinium oxycoccus, Succisa, S. capillifolium, S. papillosum, S. tenellum* and *Polytrichum alpestre* with other typical bog species. Much of this area was burnt approximately 3-5 years ago and burnt *Myrica* stems can be seen. Parts of this area are quite soft underfoot. Patches of *Narthecium, Carex panicea* and *E. vaginatum* dominated vegetation occur with some *Myrica*. The *Sphagnum* cover in these areas is moderate. There is a depression associated with Drain bR which runs through this flush. Here *Phragmites* and *Betula* are frequent.

This flush is really an extension of Flush Y as they join at the E/W drain of Drain Complex bC.

Flush Z2 is seen on the northern slopes of the E Lobe and is dominated by *Molinia* with scattered *Betula* (up to 1.5m tall) and *Phragmites*. It is associated with Slope 12 and there is much surface water. *Calluna* is scattered throughout and it is up to 50cm tall. Other species seen include tall *S. capillifolium* hummocks, *Aulacomnium, Polytrichum alpestre, P. commune, Pleurozium schreberi, V. myrtillus, V. oxycoccus, P. erecta, Empetrum* and *C. panicea.*

Flush Y2 is seen to the centre of the E Lobe close to Drain b2C. It consists mainly of *Salix* trees up to 2.5m in height (with abundant epiphytic lichens) with *Myrica, E. vaginatum, Empetrum, J. effusus* and *Calluna* common. Other species noted were *Agrostis, Anthoxanthum, Dryopteris dilatata, Galium, Succisa, Rumex, Mentha* and *Rhytidiadelphus*. A small wet section in the centre of the flush is colonised by *S. capillifolium, Aulacomnium palustre, Potentilla palustre* and *S. papillosum*. It appears that this area is sometimes flooded. It may be a swallow-hole. A line of *Myrica, Calluna* and *Juncus effusus* extends to the NE and *Myrica* extends to the SW. is also scattered through the vegetation on the slope to the S.

To the NE of Flush Y2 the slope has a series of lines of *Calluna, E. angustifolium* and *E. vaginatum* dominated vegetation which are at right angles to the slope. These may be slumps as some linear pools (tear pools) containing *S. cuspidatum* occur in this area.

Flush X2 lies to the S of Flush Y2. In fact the two flushes may be linked (hydrologically), suggested by patterns on the aerial photographs. This area appears to be an internal drainage channel with a swallow-hole to the W side. *Salix* (3m tall) dominates with species such as *J. effusus, Dryopteris dilatata, Potentilla erecta, Calluna, Empetrum, E. vaginatum, Molinia, Luzula, Potentilla palustris, Vaccinium oxycoccus, Andromeda, S. cuspidatum, Aulacomnium palustre* and *Hylocomium splendens*. A line of *Molinia, J. effusus* and *Myrica* extends to the E with a large patch of *E. angustifolium* at the end.

This flush is located in a depression with a slope to the W. On this slope *E. vaginatum* and *Calluna* dominate with a 90% *Sphagnum* cover (mostly *S. capillifolium*) in places with patches of *Molinia* and *Myrica*. There is probably lateral water flow through this area to the W. Lines of *Myrica, Calluna, E. angustifolium* and some *Molinia* patches lead towards the cut-away suggesting some water movement.

Flush W2 is to the ESE of the E Lobe and can be defined as an infilling lake area (PM 19:3+4). The area is in a slight depression with gentle rising ground to the N of it. S of the lake area there is a further gentle down slope to the S. The lake (EC 82 μS/cm) is approximately 40m NW/SE by 25m. The lake is mainly infilled with *Sphagnum* lawns with some *Narthecium* islands and clumps of *J. effusus* with *Aulacomnium palustre.* At the time of the survey it was possible to walk across the area though care was required. The lawns consist of *Sphagnum cuspidatum* and *S. recurvum* with *Carex limosa, Menyanthes, E. angustifolium* and *V. oxycoccus* growing up through them. Surrounding the lake area are *Sphagnum* lawns of *S. cuspidatum, S. pulchrum, S. auriculatum, S. magellanicum* and *S. papillosum* with small amounts of *Drosera, Menyanthes, Narthecium* and *R. alba* growing up through them. The lawns are separated from each other by dry *Calluna* hummocks with *V. oxycoccus, Aulacomnium, Andromeda* and *S. capillifolium* with *S. magellanicum* at the lower parts of the hummocks.

Flush V2 is situated at the SE corner of the East Lobe and is an enriched area which was once old cut-away. The facebanks are < 0.5m high and there are some wet pit areas. The flush is dominated by *Molinia, Pteridium* and tall *Calluna* with a linear patch of *J. effusus.* Growing in association with the *Calluna* is *Hypnum, Aulacomnium* and tall *S. capillifolium* hummocks. Other species seen include *Potentilla erecta, Polygala vulgaris, Luzula, V. myrtillus, Polytrichum commune* and a clump of *Betula* scrub up to 2m tall. In the wet pit areas *E. angustifolium* and *S. cuspidatum* were seen. There is a very small patch of *Phragmites* to the E of the flush.

Flush U2 runs E/W parallel to Drain b2E to the N of the Mid Lobe. It consists mainly of erosion channels which carry water towards the drain. Some channels are colonised by *Molinia* and *Myrica*. The sections between the gullies are dominated by *Trichophorum* with lumps of bare peat. Sometimes *Myrica*, *Molinia* and *Calluna* also occur on the higher sections but they are mostly confined to the gullies. The whole area is very tussocky and was probably burnt recently.

Flush T2 is seen at the NE of the West Lobe. It is associated with Slope 26 to the N and another slope into it (Slope 38). Drain bC24 runs through this flush. To the W of the drain the area is *Molinia* dominated with *Betula* scrub (up to 2m tall), *Calluna, P. erecta, V. oxycoccus* and abundant *S. capillifolium.* Closer to Drain bC24 there is an increase in the amount of *Calluna* and it is up to 70cm tall. *V. myrtillus* was also seen in association with it. To the E of the drain *Molinia* with *Calluna, Potentilla erecta* and *Empetrum* dominates. Betula is seen along the drain. On the slope northwards, just N of the *Molinia* area, *E. angustifolium* dominates. To the S of the flush (Complex 9/7 on the map) *E. angustifolium* dominates with short *Calluna* and abundant *Empetrum.*

Flush Z3 is seen on the Western Lobe to the S in the central area. It consists of a *Molinia* patch with bits of *Molinia* extending around it. *Potentilla erecta* was present in notable amounts and some *Phragmites* was also noted. This flush is located on a high point and may be associated with an underlying mineral ridge. The bog surface is quite hard around the flush and E. vaginatum cover increase in the immediate vicinity of the *Molinia* area. *Vaccinium oxycoccus, V. myrtillus, Polytrichum alpestre, Hylocomium splendens* and *Aulacomnium palustre* were noted here. The black spots on the aerial photograph correspond to *Calluna* dominated hummocks with some *Leucobryum*.

Flush Y3 is a long linear feature which runs E/W across the centre of the W Lobe. It has a short arm to the N also at its E end. It is located in a depression and is *Molinia* (*Potentilla erecta* and *Vaccinium oxycoccus* common) dominated with a number of large swallow holes along its length. These are colonised by species such as *Juncus effusus, Rubus, Salix, Rumex, Lonicera, Galium, Ranunculus repens, Succisa, Angelica, Dryopteris dilatata, Potentilla erecta, Agrostis* and *Pteridium* (EC 71 μS/cm). Some of the swallow-holes are very large (2-2.5m deep by 10m wide by 30-40m long). A number of old drains lead into the swallow-holes of this flush from the S. On the slopes leading into the flush some *R. alba* erosion channels occur. A stream is shown on the 6" sheet at the W end of this flush. Towards the W on the S of this flush some pools are seen on the slope into the flush. These appear to be associated with slumping. Most of the pools are algal but some contain *S. cuspidatum*. The NE arm of this flush is also dominated by *Molinia* with some *Empetrum* and small *S. cuspidatum* pools. The double drain b3E runs through this arm. S of the drain *Molinia, Calluna, Erica tetralix* and *Potentilla erecta* dominate with a wet *Sphagnum* layer. *Dactylorhiza maculata* was recorded also.

Flush X3 is made up of two sections divided by the S section of Drain bC24 with a section in both the SE and SW Lobes. To the W of the drain on the E side of the SW Lobe the flush is *Molinia* dominated with tall *Calluna* bushes, *Vaccinium oxycoccus*, *Potentilla erecta*, *Polygala vulgaris*, *Hylocomium splendens* and *Pleurozium schreberi*. A *Betula* tree (2.5m tall) with many lichen epiphytes is surrounded by a circle of *Molinia* and tall *Calluna*. East of this tree is a depression with a deep swallow-hole. The top of the hole is 2m below the bog surface and the water (EC 62 μS/cm) a further 1m below that. Species associated with the swallow-hole include *J. effusus, Rumex, Agrostis,* and G*alium palustre.*

To the E of Drain bC24 this flush (Flush X3) forms a Y-shaped line of *Molinia* with swallow holes and channels. It has the appearance of a river channel. Running water can be heard but there was no surface water flow. Some swallow-holes/channels are very large. At the exit of this flush at the southern junction between the SE and SW Lobes there is a deep channel with tall *Calluna* along the edges. Species noted in the channel included *Molinia, Juncus effusus, Potentilla erecta, Potentilla palustris, Rumex, Agrostis, Carex rostrata, Galium* and *Plagiomnium* sp. (EC 72 μS/cm). The exit of the flush corresponds to the start of a tributary of the Cloonard River. A rise (spring) is shown on the 1910 6" sheet. The swallow holes are surrounded by *Molinia* with the *Calluna* at the edges (80cm -1m). Some of the species seen growing in the swallow-holes are *Vaccinium myrtillus, J. effusus, Potentilla palustris, Rumex, Succisa* and *Carex rostrata*. The long channel in the centre of the flush is infilled

with *Molinia* and *Pteridium* with some *Juncus effusus*. Tall *Calluna* is seen along the edges. Small *Molinia* channels leading into the main channel are seen. *Molinia* also spreads up onto the bog out of the main channel and side channels. A *Rhododendron* bush is seen to the N of this main channel. The E arm of the Y shape is similar to the W arm. The channel is not as deep and separate swallow-holes are seen to the N rather than a long channel. *Molinia, J. effusus, Pteridium* and *Calluna* dominate. To the N of the Y shape of Flush X there is a row of black dots on the aerial photograph. These are *Calluna* (80cm) and *E. angustifolium* dominated mounds (natural) with lines of *E. angustifolium, Juncus effusus* and shorter *Calluna* running between them. This area is possibly linked to Flush X3 as patterns between them are visible and the line of mounds are on the crest of the slope to the S.

Flush W3 is a large pear shaped depression at the S of the SW Lobe. It is probably the result of a bog burst. *Betula* clumps to the N connect by a line of *Myrica* to a large wooded area close to the bog edge. A spring is shown in this area on the 1910 6" sheet. The wooded area consists of *Betula* (up to 5m tall but mostly in the range 1-3 m) and *Salix* bushes (2-3 m). *Molinia*, *Calluna* and *Juncus effusus* dominate beneath. Other species noted were *Vaccinium oxycoccus, Potentilla erecta, Succisa, Rubus, Cirsium palustre, Galium palustre, Crataegus monogyna, Hedera, Heracleum, Geum urbanum, Hypericum tetrapterum, Valerian, Ranunculus acris, R. repens, Dryopteris dilatata, Lonicera, Angelica, Polytrichum alpestre, P. commune, Aulacomnium palustre, Hylocomium splendens* and *Rhytidiadelphus*. A wet patch is seen in the centre which is dominated by *Equisetum, Cardamine, E. angustifolium, Carex rostrata, Anthoxanthum odoratum* and unknown (EC 77-80 μS/cm).

The smaller wooded area to the N is also dominated by *Salix* and *Betula* with additional species such as *Epilobium, Dactylorhiza maculata, Stellaria media, Juncus effusus, Rubus, Dryopteris dilatata, Agrostis, Anthoxanthum odoratum, Potentilla erecta* and *Angelica*. N again there is an E/W line of *Salix, Calluna, Juncus effusus* and *Betula*.

Linear slump features occur on the slopes into the flush (patterning obvious on the aerial photograph). This is Vegetation Complex 3/2+ Erosion channels. Occasionally *S. cuspidatum* is seen in some pools. There is a lot of bare peat, some *R. alba* and up to 40% *Cladonia* at the E side. *Betula* seedlings encroach from the flush into the surrounding bog vegetation.

Flush Z4 is a linear *Molinia* flush on the W side of the SE Lobe. It is situated in a shallow depression with a slope towards the bog edge. Other species recorded were scrub *Betula*, *Calluna* (dying), *Erica tetralix, Potentilla erecta, Polygala vulgaris, Narthecium, E. vaginatum, E. angustifolium, Trichophorum, Vaccinium oxycoccus, Hylocomium splendens* and *S. imbricatum*. Parts are wet underfoot and S. cuspidatum is seen. At the more western end where the flush flattens out *Juncus effusus* and *Phragmites* are seen.

Flush Y4 is a crescent shaped feature to the NE of the SE Lobe. It is located in an area of Complex 9/7 (*Calluna* and *E. vaginatum* dominated) that has not been burnt for some time. The whole area appears to be flushed with *Empetrum, E. vaginatum* and *Molinia* with a patch of *Juncus effusus* and *Pteridium*. A *Rhododendron* bush is also seen close by. The centre is soft, wet and very difficult to walk through. *Vaccinium oxycoccus* overgrows the Sphagna and there is much *Polytrichum alpestre*. Other species noted were *Dryopteris dilatata* and *Vaccinium myrtillus*.

Flush X4 is a small flush at the E edge of the SE lobe. It is linear and dominated by *Molinia* with patches of *J. effusus* and *Ulex.* At its N end there are clumps of *Betula, Salix, Ulex* and *Agrostis.* To the E of it is an area of heath/moorland peat.

7. BOG TYPE

This bog has been classified as a Blanket Bog.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes

This is an undulating site with the peat surface following the underlying topography to a certain extent. Streams and flushes are located in depressions and the construction of roads, digging of drains and peat cutting has caused some slumping and subsidence. The bog occurs on different levels and there are many sloping areas within the site. Some of these slopes were estimated in the field. They are described below and are illustrated on the Slopes Map.

North Lobe with NE Arm (Slopes 1 - 10)
North Lobe (Slopes 1-6)

Slope 1 This slope in the SW corner is 0.75m over 50m to the SE to Road 1.

Slope 2 This slope is from a similar position on the high bog as Slope 1 but is to the W edge and is 1.5m over 50m to an area of old peat cutting.

Slope 3 This lobe at the NW of this lobe is to the NW edge and is 0.75m over 100m to an area of old peat cutting. The steepest section of this slope is at the edge where it is 0.5m over 30m.

Slope 4 At the NW corner of the site the slope north towards a forestry plantation in the cut-away is 2.5 m over 100 m. This slope runs through an area of *Phragmites*.

Slope 5 The slope to the N along Drain bR, running through Flush X is 3m over 600m. Slopes are also seen from the SW and SE into this area.

Slope 6 The slope from the N side of Road 1, northwards through Drain Complex bC is 2m over 300m.

NE Arm (Slopes 7-10)

Slope 7 This slope at the N edge is o.5m over 10m to an area of active peat cutting - Hopper method.

Slope 8 This slope at the N edge is 1m over 40m to an area of active peat cutting (Hopper). There is much cracking and slumping resulting in a reduced height facebank < 1m tall. Complex 3/2 is associated with this.

Slope 9 At the S of the NE Arm the slope southwards into an area of old peat cutting is m over 50m. The facebank is 1.5m high in this area and there is some slumping of the high bog surface.

Slope 10 This slope is at the S edge and is 0.3m over 50m with a graded edge to *Molinia* and *J. effusus.*

East Lobe(Slopes 11-18 and 27-30))

Slope 11 This is at the N end and is NW towards Drain bC24. The slope is associated with the drain and there is much *R. alba* present. The slope is 0.3m over 20m

Slope 12 This is to Drain bD to the N at the N edge and is 1.5m over 150m from Flush ZZ.

Slope 13 This is to the E at the NE of the lobe and is 0.75m over 50m to an area where there is hand cut peat. There is cracking and slumping ands the facebank < 1m.

Slope 14 This is at the NE edge and is to the NE. It is 0.5m over 30m to an area of active peat cutting.

Slope 15 From the plateau at the E side of this lobe, the slope to the SSW towards the central depression is about 4 m over 500 m.

Slopes 16 These slopes are at the SE of this lobe into a depressed area on the high bog S of the lake at W2. The slopes are from the N, W and S and are 0.5m over 50m. Complex 2/6/3 with abundant *E. angustifolium* and pools.

Slope 17 The slope from Drain b2E N towards Flush X2 (S arm) is 2m over 100m.

Slope 18 From the high ground at the SE side of this lobe the slope N towards Drain b2E is 0.5m over 40m.

Slope 27 The slope from Drain b2C S towards the central depression associated with Drain b2T is approximately 3.5m over 400m.

Slope 28 From the *Myrica* patch to the S of Road 1, south towards the exit of bC24 and b2C (W end), the slope is 4 m over 300 m.

Slope 29 This slope is at the SW of this lobe from Drain Complex b2G south west to an area of old peat cutting and is 1.5m over 150m through Complex 6/3/2 with abundant *Trichophorum.*

Slope 30 The slope to the SW parallel to the S side of Road 1 is approximately 3m over 700m.

Mid Lobe (Slopes 19-26)

Slope 19 This is at the NNE of this lobe and is 0.75m over 100m to an area of old peat cutting with collapsed facebanks. Complex 6/2/3 + tear pools is associated with the slope with an increase in *Trichophorum* towards the edge.

Slope 20 On the W side of Road 5 and parallel to it, the slope to the S (from till mound) is 3.5m over 200 m. The slope steepens at the bog edge to give a fall of 2 m over 50 m.

Slope 21 This slope is at the SE of this lobe and is 0.75m over 50m to an area of old peat cutting dominated by *Molinia*. The slope is associated with Complex 2/6/3 and there are greater amounts of *Trichophorum* in the sloping area.

Slope 22 This slope is at the SE of this lobe and is 0.5m over 50m to the SE towards Road 5.

Slope 23 The slope from the mid-section of this lobe SE towards active peat cutting is 1.5 m over 75 m.

Slope 24 This slope is SSW into an area of active peat cutting in the eastern section of this lobe and is 1m over 50m. The facebanks are up to 2m tall.

Slope 25 The slope from the central section of the lobe, E towards Road 5 is gentle at 0.25m over 75m. Very little subsidence is associated with this road.

Slope 26 At the N side of the lobe the slope N towards Drain b2E is 5m over 600m.

Western Lobe (Slopes 31-43 and Slope 54)

Slope 31 At the SW of the W Lobe the slope southwards through drained section (b3A) from the ridge into active peat cutting is 2.5m over 100m.

Slope 32 This slope at the SSW of the lobe is to the SW where there is active peat cutting by the Hopper method and the slope is very steep. It is 0.75m over 25m and the facebank has collapsed in places. It is < 1m tall.

Slope 33 This slope is to the SW from the NW corner of the forestry plantation at the SSE of this lobe and is 3m over 350m towards the valley of the Frances River.

Slope 34 This slope at the SW of the lobe is 0.2m over 50m to the W into an area of old peat cutting.

Slope 35 This is at the NW of this lobe and is 0.5m over 300m to the W towards an old track, dominated by *Molinia,* and drains.

Slope 36 This is a gentle slope at the NW of this lobe and is to the SSW along Drain b3D N of where it joins with Drain b3G. The slope is 0.5m over 100m to the junction.

Slope 37 At the N edge of the W Lobe the slope to the N edge and old peat cutting is 1.5m over 75m. The facebank is < 1.5m

Slope 38 This slope is at the N of this lobe and is associated with Flush T2. There is a slight slope from the W in towards the flush. It is 0.3m over 50m and there is an increase in *Trichophorum* and *C. panicea* in complex 6/3/2 in the area.

Slope 39 The slope southwards through the N arm of Flush Y 3 is 0.5 m over 50 m.

Slope 40 At the mid-east of the W Lobe the slope through Complex 2/6/3+tear pools SE towards old peat cutting is 0.75m over 40m.

Slope 41 From Flush Z3 at the centre of this lobe, the slope N towards Flush Y3 is 1.5 m over 50m.

Slope 42 Towards the SW of the W Lobe the slope southwards into Drain complex b3A and active peat cutting (hopper) is 1.5m over 75m. The facebanks here are up to 3m high with some slumping of the high bog.

Slope 43 The slope to the S on the south edge of the W Lobe towards old peat cutting (through Complex 2/3) is 1m over 30m. The slope for the remainder of this edge to the E is similar.

Slope 54 This slope is at the S of this lobe E of Drain bC24 and is 0.5m over 50m east to an area of active peat cutting. The facebanks are up to 1m tall.

SW Lobe (Slopes 44-53)

Slope 44 On the N edge of this lobe, the slope to the N is 1.5 m over 50 m.

Slope 45 This is at the N of this lobe N into an area of old peat cutting with the Frances River valley to the N beyond it. The slope is 0.5m over 50m and the facebanks are < 1m tall.

Slope 46 This slope to the NW is at the NW of this lobe and is 0.75m over 30m to the bog edge. There is a small circular depressed area or swallow hole which is a further 4-5m below the bog in the field immediately to the W of the slope. There is mineral soil at the bog edge and no facebank.

Slope 47 The slope from the second mound (row of mounds running N/S) W into a shallow dip is 0.75m over 50m.

Slope 48 From the N/S row of mounds the slope to the W edge is 2m over 500m.

Slope 49 This is at the S of the lobe and is 1m over 75m to an area of old peat cutting. The facebank is up to 1.5m tall and there is a further drop - up to 4m - to the fields immediately beyond.

Slope 50 The slope from the W side of Flush W3 eastwards into the flush is 1.5m over 40m.

Slope 51 The slope from the N side of Flush W3 towards the S is 2.5m over 75m.

Slope 52 The slope to the SE through Flush X 3 is 2m over 250m.

Slope 53 This is at the N of this lobe and is 2m over 150m to an area of old and active peat cutting and the head of the Frances River valley.

SE Lobe (Slopes 55-71)

Slope 55 The slope to the N edge of this lobe towards the road is 2m over 75m.

Slope 56 At the N of this lobe the slope E towards the road and active peat cutting is 0.5m over 50m.

Slope 57 Just E of Flush X4 the slope southwards along the flush is 2.5 -3m over 500m.

Slope 58 The slope from the centre of the lobe southwestwards into Flush X3 (E arm) is 2m over 400m with a drop of another metre into the flush channel.

Slope 59 The slope from the E/W line of mounds, on the N side of this lobe, towards the Y shape of Flush X3 (E arm) is 2m over 75m.

Slope 60 The slope from the N end of Flush X3 (E arm) to its exit is approximately 3.5m over 700m. This slope was difficult to estimate but certainly was not less.

Slope 61 The slope southwards, on the E side of bC24 and parallel to it, into Flush X3 (E arm) is 2.5m over 50m.

Slope 62 From the NW the slope into the SE into the W end of Flush X3 (E arm) is 1.5m over 10m.

Slope 63 The slope from the SE into the W end of Flush X3 (E arm) is 1.5m over 40m.

Slope 64 From the N, southwards into Flush Z4 the slope is 1.5m over 40m.

Slope 65 At the SW of this lobe the slope westwards through Flush Z4 to the bog edge is 2m over 100m.

Slope 66 From the S the slope northwards into Flush Z4 is 1 m over 50m.

Slope 67 The slope from Drain b4A to the NE into Drain b4E is 1m over 50m with associated slump features (tear pools).

Slope 68 The slope from the NW into Drain b4E and old and active peat cutting is 1.5m over 60m.

Slope 69 This is at the SE of this lobe and is 0.5m over 30m N through Complex 3/2/6 to an area of old peat cutting dominated by *Molinia, Calluna* and scattered *Ulex.*

Slope 70 This slope at the SE of this lobe is E to an area of active peat cutting and is 0.75m over 100m.

Slope 71 This slope is from the same source as Slope 70 but is to the W into an area of active peat cutting and old bog track. The slope is 1.5m over 100m and the facebanks are up to 2m tall.

8.2 RECENT HUMAN IMPACT (Land use Map)

8.2.1 Peat Cutting

Much of the site (588 ha, 67%) is owned by NPWS (though they do not own all of the turbary rights) and active peat cutting, for the most part, has been confined to those edges not owned by NPWS.

The most extensive peat cutting is carried on to the N of the site and along Roads 4-8 to the east centre of the site.

There are a series of 36 long, new, deep drains (Drain Complex bC) as well as those of Drain Complexes bA and bB in the N Lobe which appear to have been associated with commercial peat extraction. However, this area is now owned by NPWS and these drains require blocking. (Drain Complexes bA, bB and bC are described under Section 5.2.1 of this report). Also on the N lobe and at the W edge is some active peat cutting (by hand) and the facebanks are < 1m. There is also Hopper cut turf close by where the facebanks are up to 2m. Separating the N Lobe from the NNW Lobe is an area where an old drain was being re-dredged and there is significant flow to the E and also to the W which then flows N to a re-dredged section of Drain bR. There is extensive active peat cutting to the E of the NNW Lobe (mainly using the hopper method) and the excavations are probably associated with this. Some of the facebanks along Road 3 are up to 3m tall. This area is not owned by NPWS.

Along the N edge of the NE arm (not owned by NPWS) there is quite extensive Hopper cut peat (turbary plots are shown on the 1910 6" sheet). Facebanks to the W of this edge are 2-3m tall and 1m high at the E side. Some of the drains in the cut-away have recently been re-dredged. To the S of this lobe there is mineral soil and the high bog grades into it. There is no active peat cutting at this edge.

To the NE of the E Lobe there is a small amount of peat cutting (hand cut) and the facebanks are < 1m high. To the S of this lobe there are some turbary plots, which are not owned by NPWS, where there is a combination of hand and Hopper cut turf in an area of old and active peat cutting. facebanks are low. There is also active peat cutting in the SW corner of this lobe and the facebanks are up to 1.5m tall. A combination of hand and Hopper method of extraction is used.

Much of the Mid Lobe is not owned by NPWS and there is extensive peat cutting along turbary plots. There are also area of old peat cutting with collapsed turf banks and stagnant water filled pits. Access is facilitated by Roads 5-8. The Hopper method of extraction is mainly carried out and the facebank heights vary from 2.5m close to the mound NE of the lobe, 1m in the vicinity of Slope 21, up to 2m at the E and W of Road 5 and up to 1.5m along Drain bC24. There are some large areas of bare peat in the area between Roads 5 and 6 (Close to the edge associated with Slope 24) and this is due to machines travelling it.

There is little active peat cutting around the W Lobe even though the edges are not owned by NPWS. There is mineral soil to the W of the lobe and access to the bog edge is not easy as the main road (L11) is close by. Old facebanks at the SW are up to 3.5m deep. There is some active peat cutting at the S of the lobe (Hopper method) close to a forestry plantation and the facebanks are up to 1m. There are also small areas of active peat cutting to the SW and NW of the lobe. Facebanks are up to 2m tall and hand cut at the SW of the lobe and up to 1.5m to the NW. There is a small area of Difco cut turf on the high bog to the SW of the lobe. West of Drain bC24 there is an area where extensive peat cutting has been carried out in the past. This area is now owned by NPWS (clear title) and peat cutting at the time of the survey was in small, localised areas.

There is little active peat cutting around the SW Lobe as there is mineral soil to the S and W and the main road (L11) is very close to the bog edge. There is a steep drop to an area of rough grazing to the S of the site. The fields are approximately 3-4m below the high bog.

Active peat cutting around the SE Lobe is confined to the SSE and in an extensive area along the N edge which can be accessed by Roads 5, 7 and 8. Both areas are not owned by NPWS. A combination of mainly hand and some Hopper methods of extraction are used in both areas and there are areas of old *Calluna* dominated turf banks present. The facebanks are up to 1.5m tall. There is a small area of active peat cutting to the east in an area close to a mineral mound. The facebanks are < 1m tall.

8.2.2 Forestry

Small patches of forestry are seen on the high bog but the majority of plantations are on cut-away peat around the site.

The most mature plantation is seen to the S of the site at the SW of the SE lobe. This is approximately 20 years old with Sitka spruce planted in the cut-away and Lodgepole pine on the high bog. A Lodgepole pine plantation which has partly failed is seen to the NW of the Northern lobe on the high bog.

Younger plantations are seen in various places around the site:
To the NW of the N lobe in the cut-away beside the partly failed plantation on the high bog there is a large area of forestry (Sitka spruce 6-8 years old).

To the E of E Lobe.

To the SW of the W Lobe - Lodgepole pine with some Sitka spruce associated with Drain complex b3A also in the cut-away to the SW of the mid west lobe beside the plantation on the high bog (Sitka spruce). There is also a small patch of forestry on the high bog to the N of the W Lobe and a large area of the cut-away to the N of the W Lobe is also planted.

To the W of the SW Lobe - Sitka spruce. There is a large area of the cut-away to the S of the SW Lobe with recent forestry. There is also some forestry in a small area of high bog at the SSE of this lobe.

As well as the mature plantation already mentioned which grows to the S of the SE Lobe there are 3-4 small plots of Lodgepole pine (approximately 5 years old). Some of these are part in the cut-away and on the high bog.

8.2.3 Fire History

Schouten, in survey work carried out during 1979-1981 (Appendix II (Douglas and Grogan, 1985)), noted that a great part of the bog had been burnt a number of years previously and that much of the vegetation was dominated by *Erica tetralix, Narthecium* and *Trichophorum.* He also noted that the vegetation in localised areas in the N part of the overall bog was not damaged. Douglas and Grogan (1985) note that much of the bog surface had been burnt in 1984 that there were various burning events through the years. Today, evidence of recent burning events can be seen in small areas, one to the NNW of the W Lobe (Complex 6RB) and the other to the NNE of the Mid Lobe where the fire was mainly confined to an area of active peat cutting.

Some areas of the bog appear to have escaped burning in the past 10-20 years as the *Cladonia* cover is high. This can be seen in the following areas;
to the S of the NE arm where the % cover is 20% (Complexes 7/9+Cl and 9/7+Cl);
there are a few areas in the W lobe: Complex 2/3/6+TP+Cl at the NW edge with a 70% cover; separate from that just mentioned is a large area, some of which is in the Mid Lobe, with a number of linked complexes with a high *Cladonia* cover: Complex 6/3+P+Cl N of Flush Y3 with 20-60% *Cladonia* cover and abundant *Calluna* though it is dying; Complex 2/6/3+P+Cl both E and W of Drain bC24 with up to 70% *Cladonia* cover and Complexes 2/6/3+TP and 2/6/3 immediately W of Drain bC24 support up to 15% *Cladonia* cover.
to the S of the Mid Lobe and isolated is Complex 2/7/9+Cl with a 60% *Cladonia* cover and at the edge of this lobe and also isolated is Complex 3/2/6+Cl with a 30% cover.
to the S of the SW lobe and on either side of Flush W3 are two Complexes with up to 50% *Cladonia* cover - Complex 7/9+Cl to the W and Complex 3/2+Cl to the E.
there are two areas in the SE Lobe supporting high amounts of *Cladonia*. Almost the entire N half of the Lobe has escaped burning. The complexes support a good cover of *Cladonia* (figure in brackets). These include Complexes 3/2+Cl at the NW edge, 2/9/7+Cl (15%), 9/7+Cl (70%), 7/9+Cl (50%), 9/7/2+Cl (40-70%), 7/9/2+Cl, Complex 7/9+Cl close to Flush X4 (15-50%) and Complex 2/3+CL at the S of the area (30%). In the S half of the lobe are two small separate areas which have escaped burning. Complex 2/9/7+Cl (25%) and Complex 7/9+Cl (15%).

8.2.4 Poaching

There is little poaching around this large site possibly due to the fact that peat cutting is carried out around much of the bog and the land is not conducive to grazing. In some areas where there is mineral

soil adjacent to the bog, cattle gain access. This is seen to the S of the NE arm (Complexes 9/7 and 2/4/3). There is a mineral mound in the area and grazing is carried out quite close to the bog. The facebanks in the area are low and <1m. Damage to the bog is not severe. Similarly at the E of the NE arm cattle gain access though in this instance the facebanks are high and it is not known where the access point is (Complex 2/6/3).

Cattle graze the banks of the Frances River during the summer months. At the E end the southern river bank is quite steep and invades by scrub and *Pteridium*. Tracks weave through the undergrowth to the high bog at the N of the SW Lobe. Damage is not severe (Complex 2/3/6) though the area is associated with a steep slope (Slope 44) and this can increase the damaging effects.

To the SW of the SE Lobe is an area where rough grazing is again carried out close to the bog edge. A small part of the high bog appears to be poached quite frequently and the ground is very tussocky.

8.2.5 Dumping
Household and farm refuse is seen dumped in places along the bog roads which lead into the site.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. Flush W3 on the SW Lobe is associated with a small bog burst.

2. Flush Y2 is associated with local discharge of groundwater whichoccurs on a natural slope within the site.

3. Numerous other flushes occur, mostly lines of swallowholes making internal drainage systems.

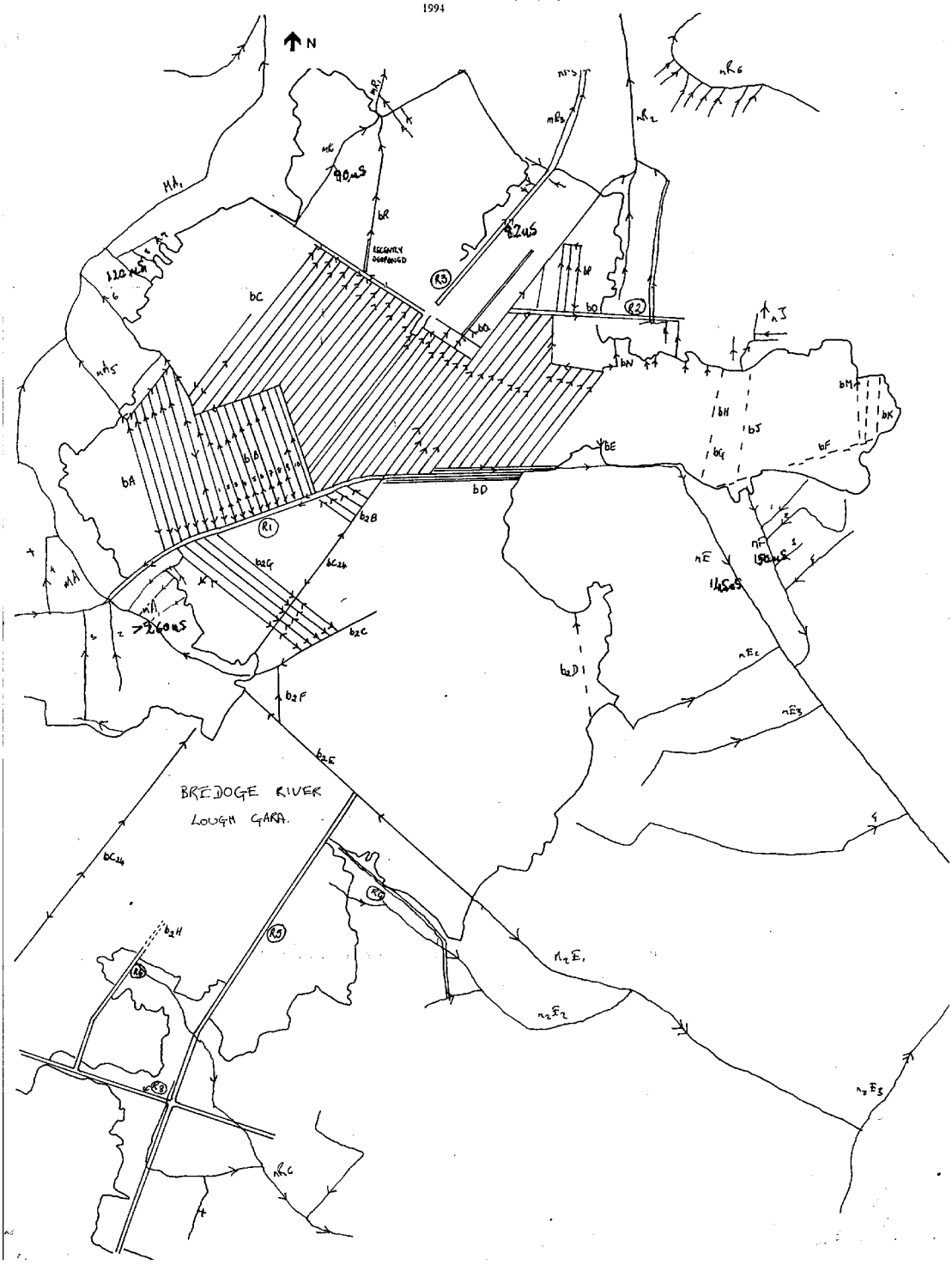
4. The surface topography of this site follows that of the underlying mineral soil so that many various slopes occur within the site. Vegetation cover more typical of dry marginal areas occurs on these slopes, whereas wet pool areas are confined to the flatter sections of the site.

5. Extensive peat cutting and the construction of bog roads has led to drying out of the site.

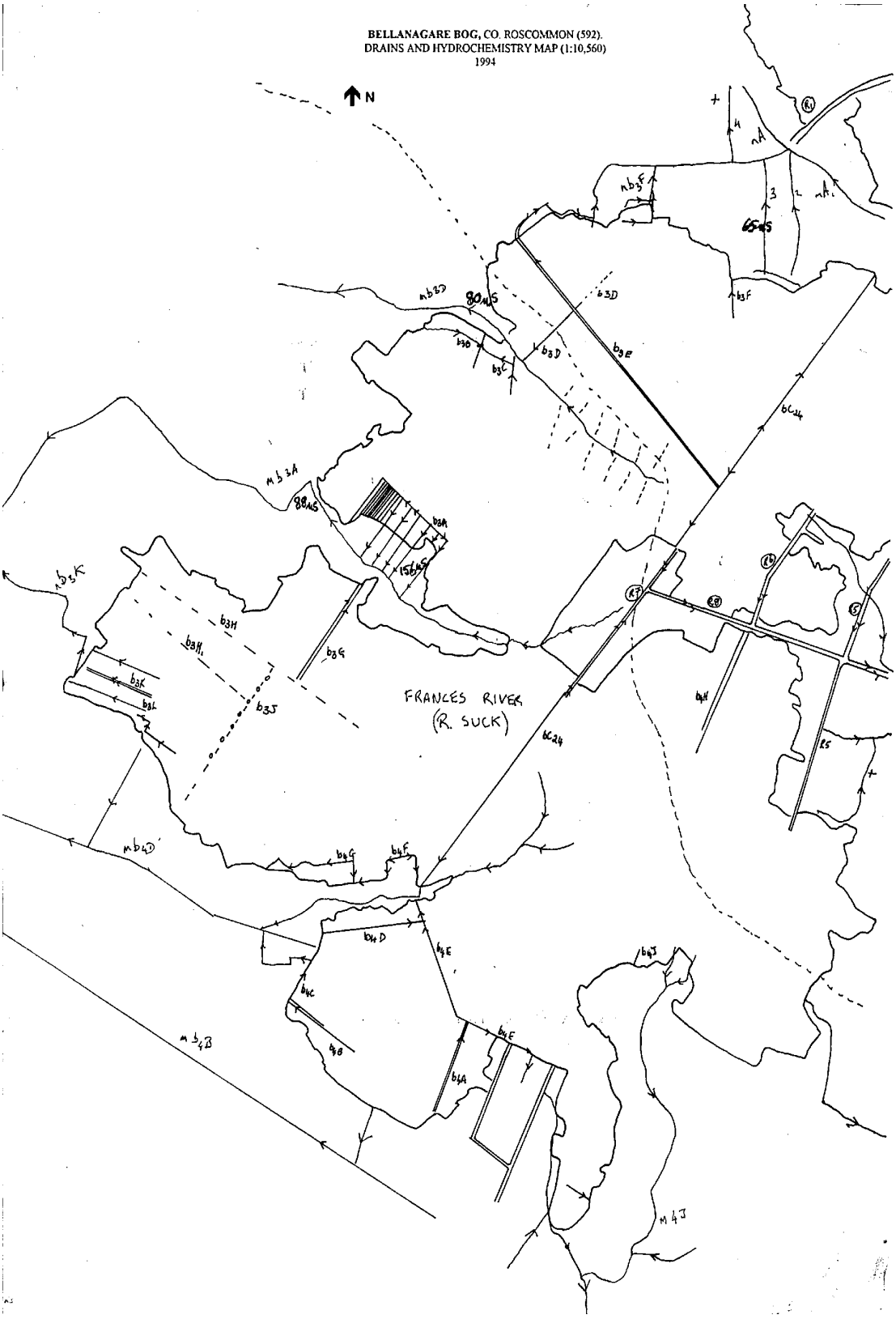
Lara Kelly
Marie Dromey
Malcolm Doak

Raised Bog Restoration Project (1995).

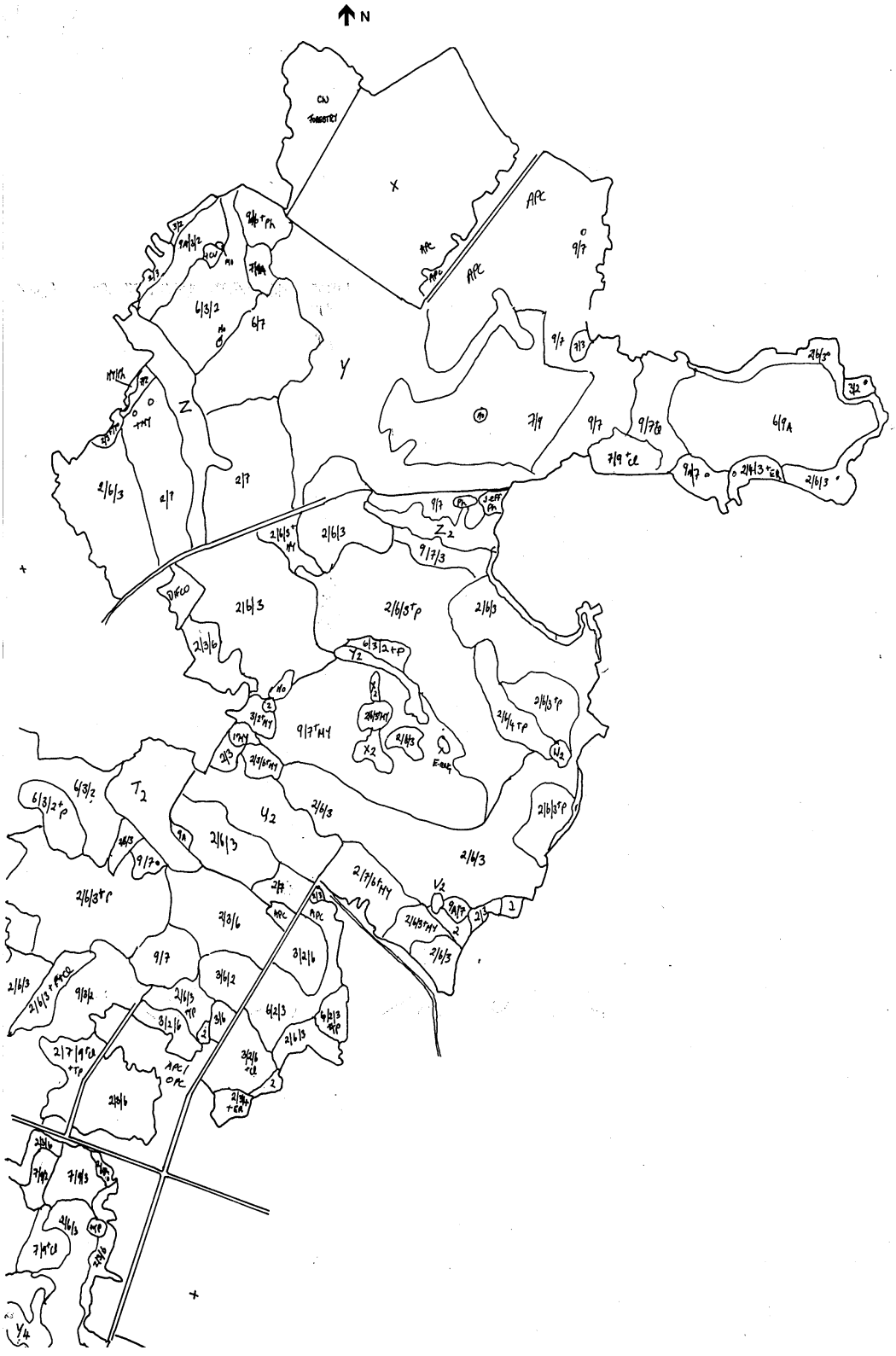
BELLANAGARE BOG, CO. ROSCOMMON (592).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994



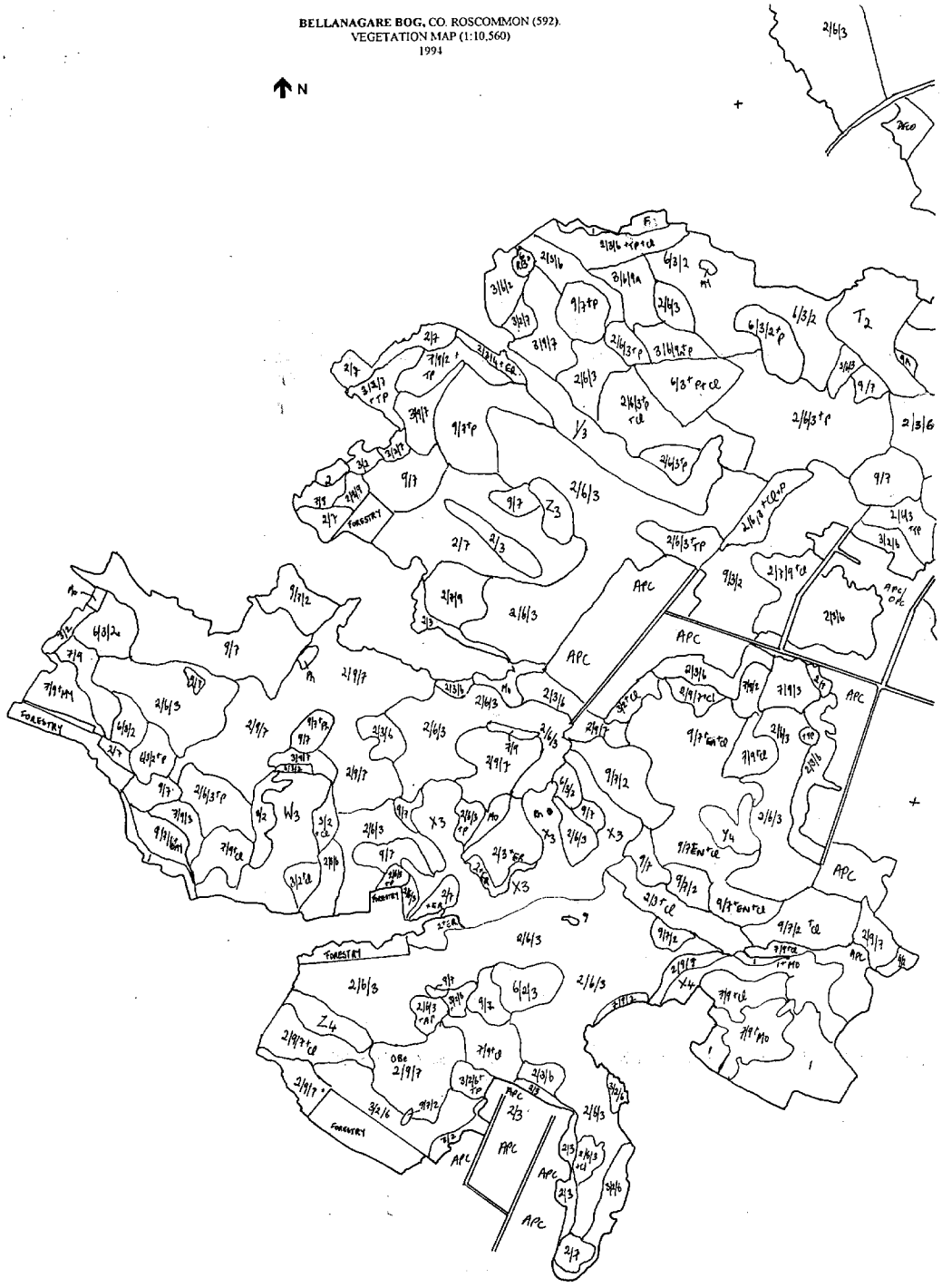
BELLANAGARE BOG, CO. ROSCOMMON (592).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994



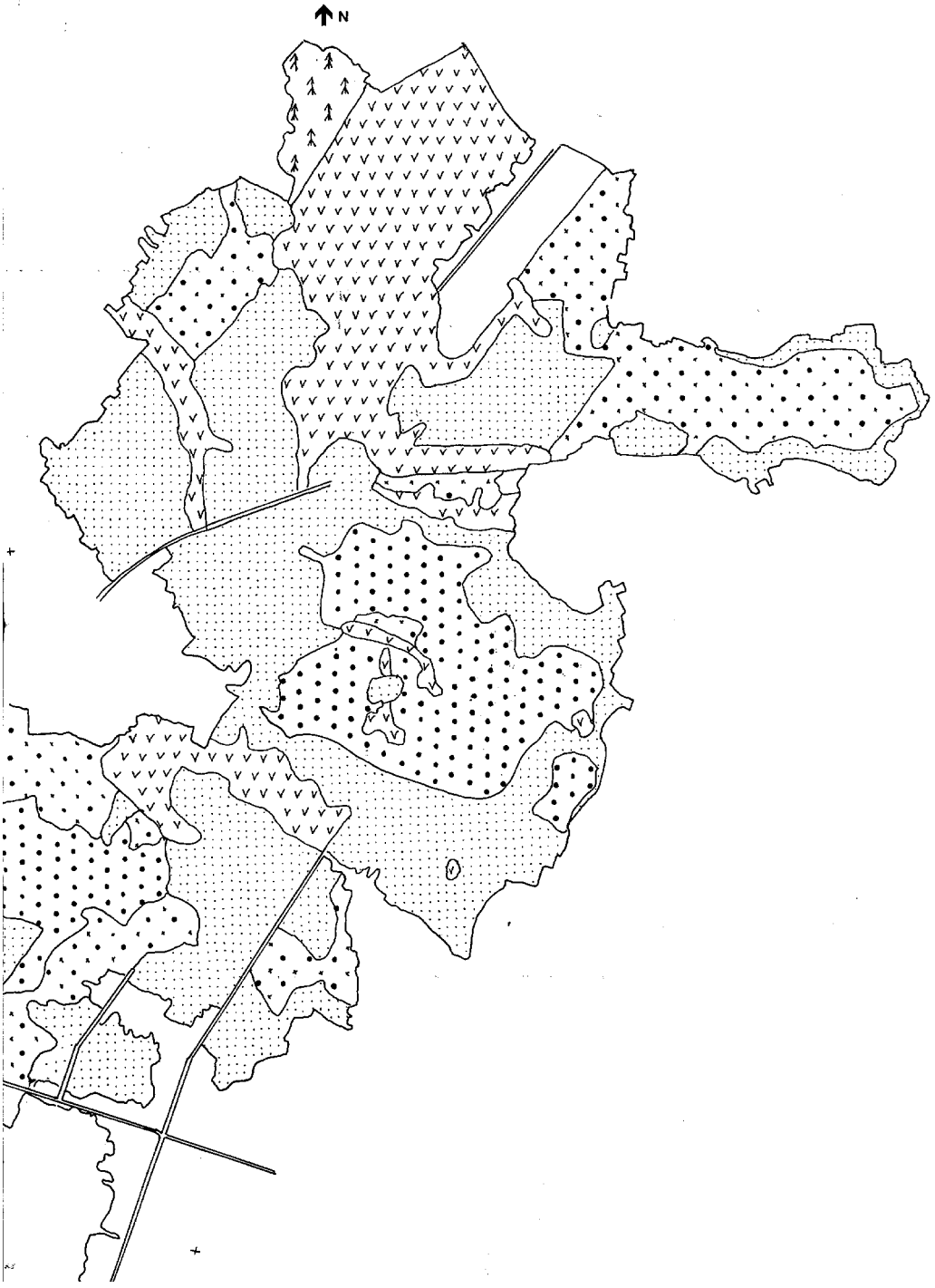
BELLANAGARE BOG, CO. ROSCOMMON (592).
VEGETATION MAP (1:10,560)
1994



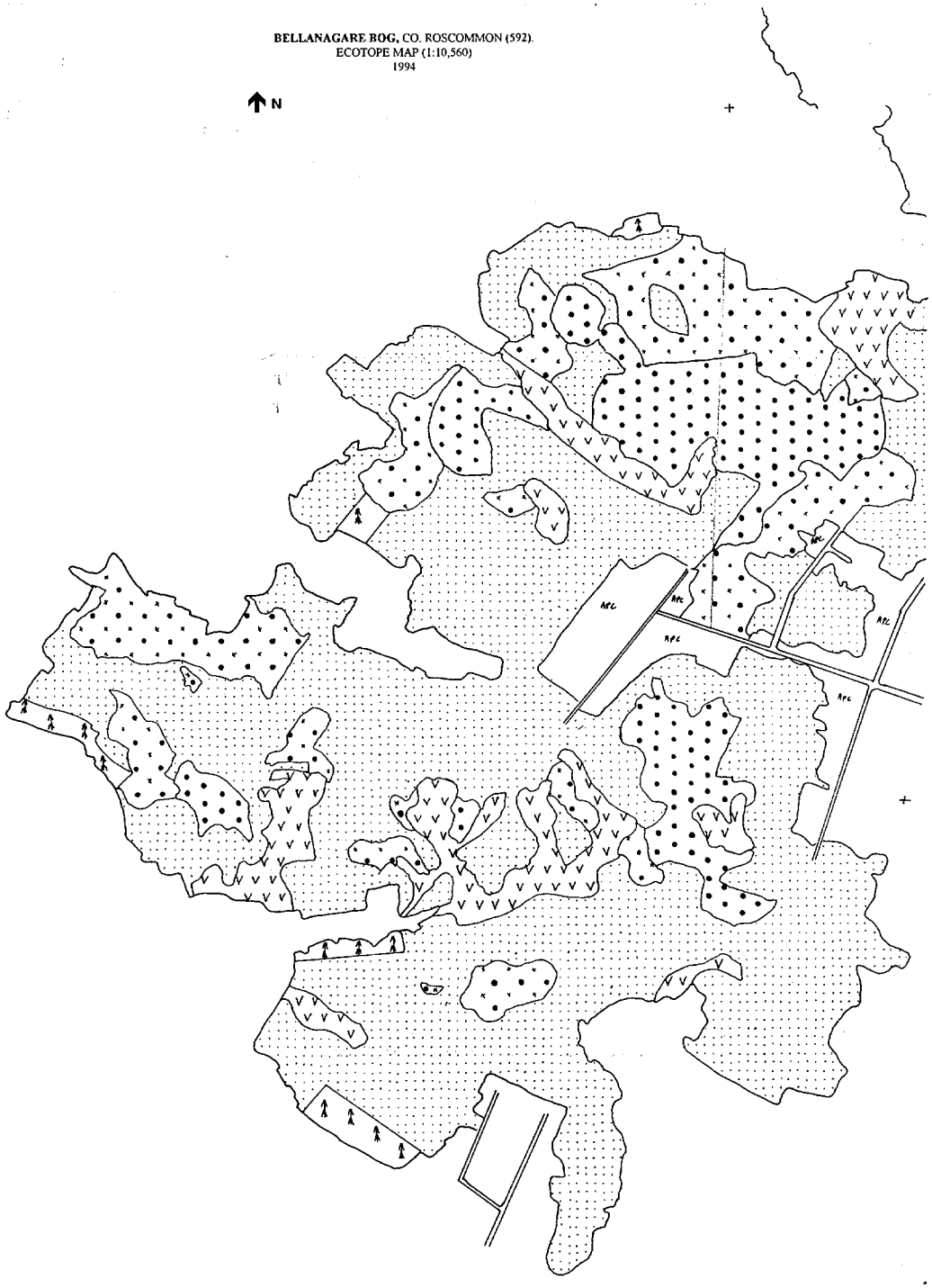
BELLANAGARE BOG, CO. ROSCOMMON (592).
VEGETATION MAP (1:10,560)
1994



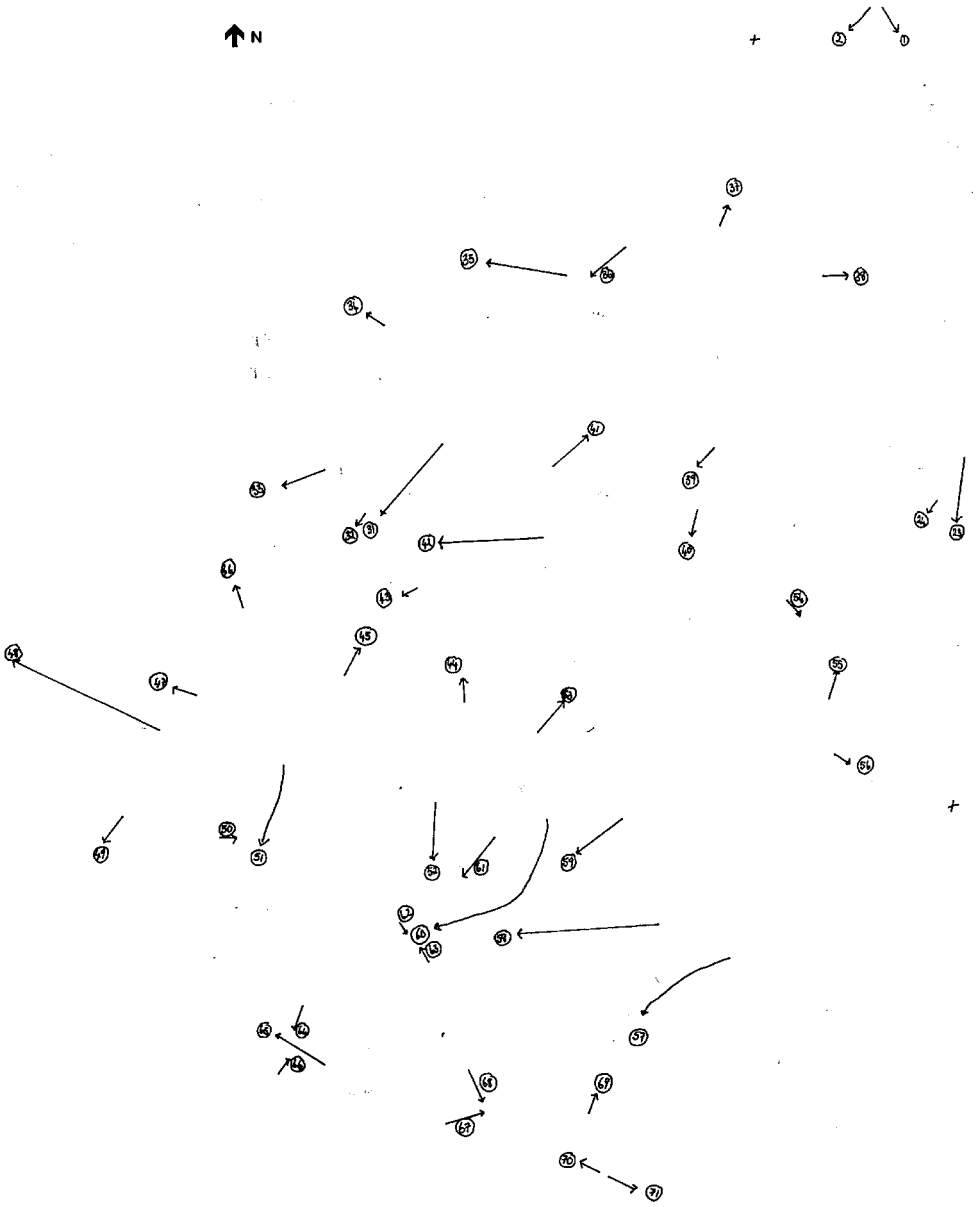
BELLANAGARE BOG, CO. ROSCOMMON (592).
ECOTOPE MAP (1:10,560)
1994



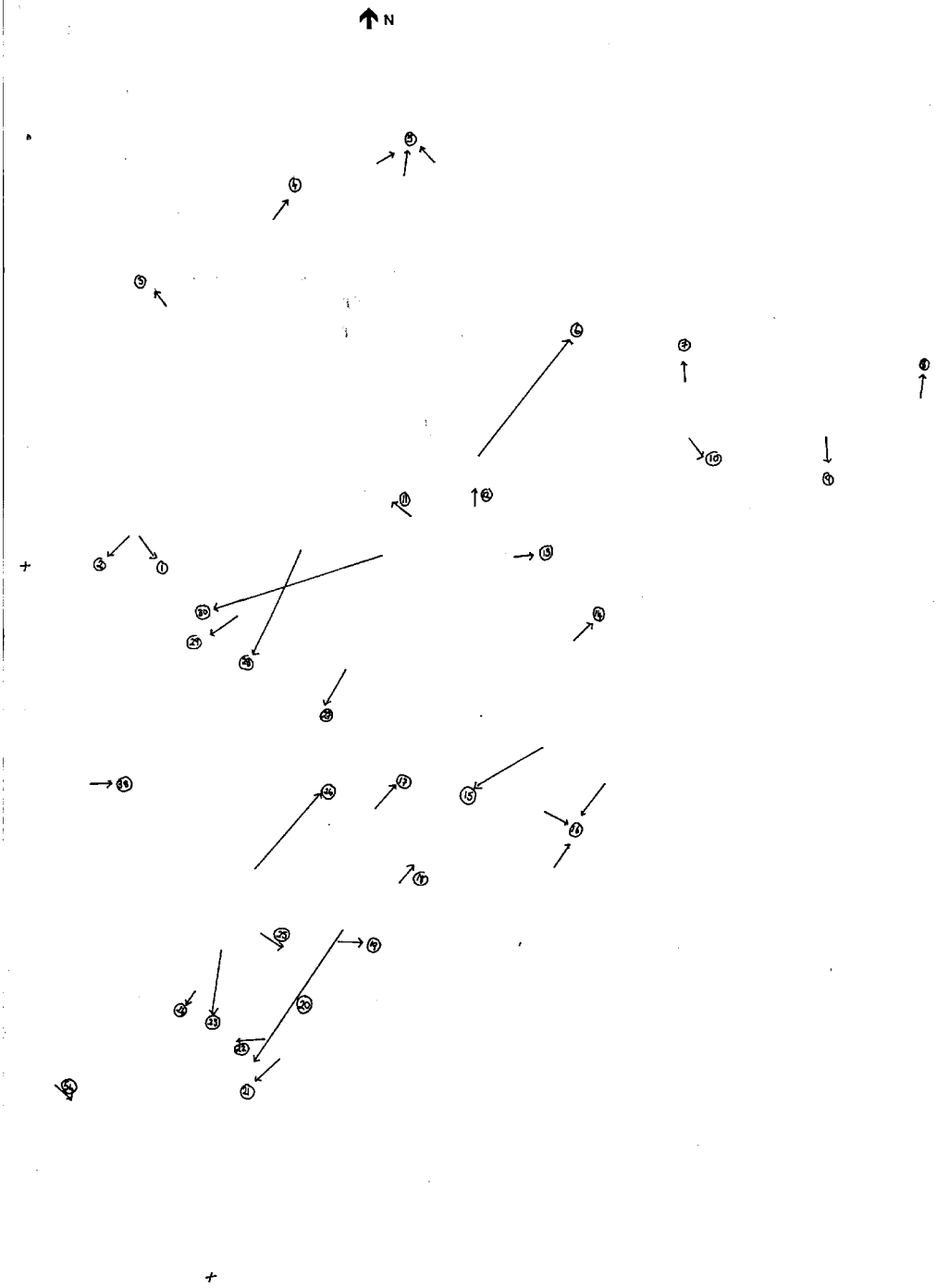
BELLANAGARE BOG, CO. ROSCOMMON (592).
ECOTOPE MAP (1:10,560)
1994



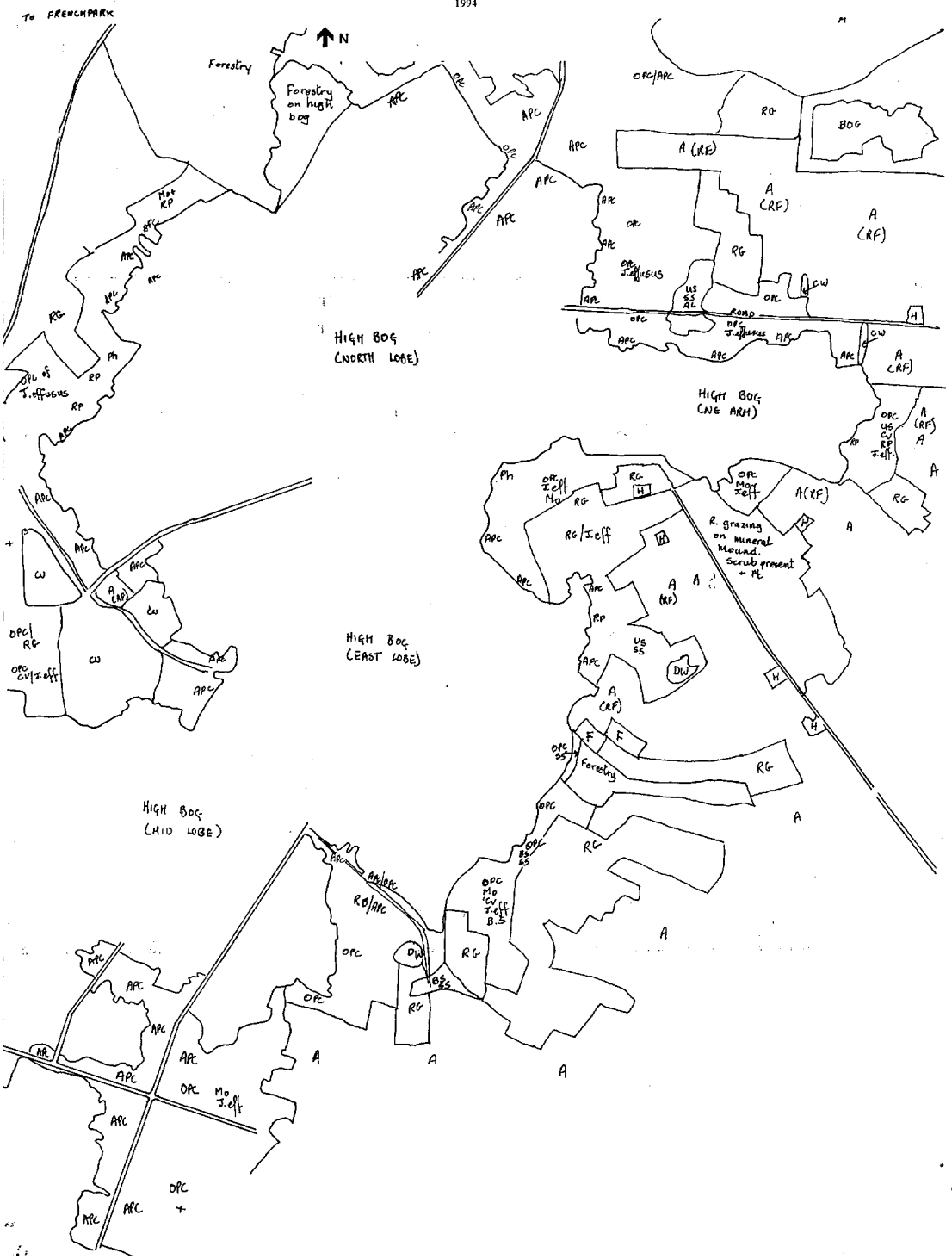
BELLANAGARE BOG, CO. ROSCOMMON (592).
SLOPES MAP (1:10,560)
1994



BELLANAGARE BOG, CO. ROSCOMMON (592).
SLOPES MAP (1:10,560)
1994



BELLANAGARE BOG, CO. ROSCOMMON (592).
LANDUSE MAP (1:10,560)
1994



CAMDERRY, CO. GALWAY.

1. SUMMARY OF SITE DETAILS

NHA No.	240	1/2" Sheet:	12
Grid Ref:	M 70 57	6" Sheet:	GY 19/32
GSI Aerial Photo:	M 161	1:25,000 Sheet:	14/25 SE
NHA Photo:	649:28-36	Area (ha):	197.0 (High Bog)
Date(s) of Visit:	25/5/94 & 10/11/94 (Ecology) 25/5/94 & 10/11/94 (Geohydrology)		

Townlands: Boggauns, Camderry, Corracullin, Cloonshivna and Cialsallagh.

2. INTRODUCTION

2.1 BACKGROUND

This relatively large site is one of a group of bogs to the mid-west of the country and was assigned a Bii status during the National Raised Bog Survey (Cross, 1990). When the site was surveyed by Douglas and Grogan, 1985, as part of the National Raised Bog Survey, a large portion had recently been burnt but *Sphagnum* regeneration was taking place. The site was quite dry though there were some wet, soft areas. A system of large pools and hummocks was recorded in the centre of the main lobe and some open water flushes were also seen. Wet quaking ground was recorded on the smaller lobe to the S. However, the authors noted that turf cutting was extensive along the margins of the site and that conifer planting had taken place at the W of the high bog. Nonetheless the site was still considered to have conservation potential.

Recent colour oblique aerial photography (NHA survey 1993) revealed that no new drains had been inserted but that peat cutting was on-going especially along the margins of the smaller lobe and to the east of the main body of the bog. As the NPWS are in the process of acquiring a large section of this bog from BNM it is necessary to assess its present conservation potential and to compare its status with other similar bogs in the area.

2.2 LOCATION AND ACCESS

This bog is located approximately 12km NNE of Mount Bellew in east Co. Galway. Clooncullaun Bog (one of the sites surveyed during this project) lies to the NNW. It is also 2.5km SW of Lough Lurgeen. Camderry is surrounded at the N, NW and SW by a tributary of the Shiven River. The bog may be accessed from a trackway which leads from a road running NE/SW at the southern side of the site.

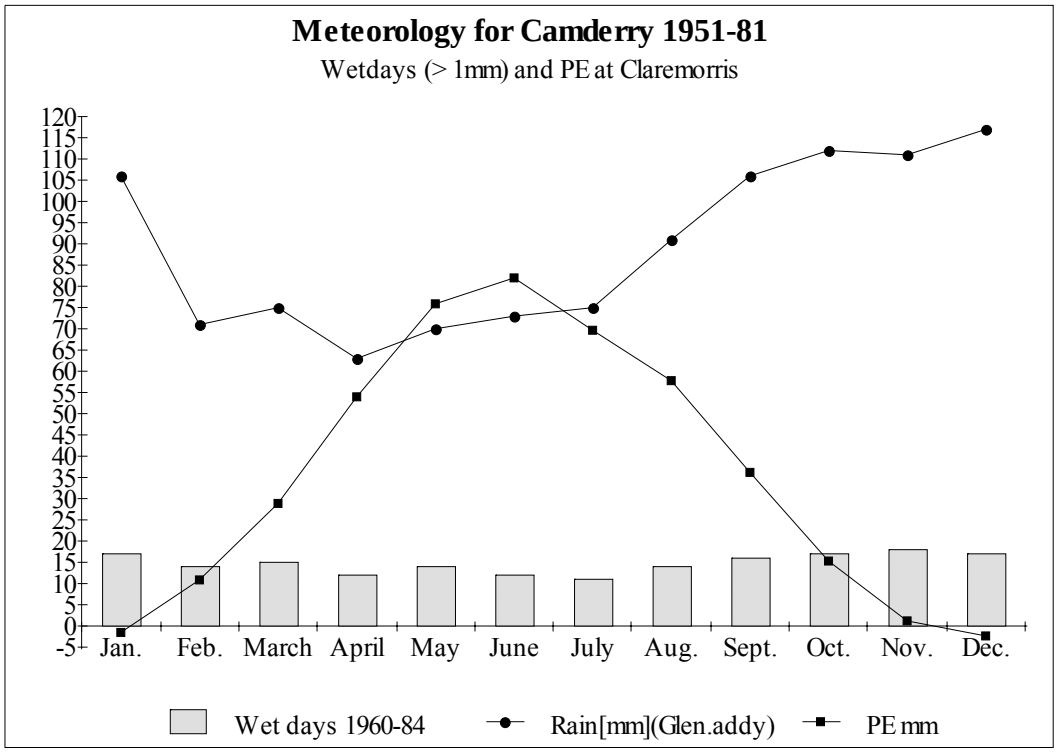
3. METEOROLOGY

No meteorological measurements have been made on Camderry bog. Rainfall data from the nearby Glennamaddy rainfall station for the years 1951-80 indicate that the area receives an average 1069 mm of precipitation annually (Figure X). The nearest Meteorological Service synoptic station at Claremorris suggests that the site could have up to 234 rain days and up to 177 wet days annually.

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual

evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

Figure X



The above factors suggest that the year round actual evapotranspiration (AE) from Camderry bog is greater than PE at Claremorris, site of the nearest synoptic station which had an average PE of 428.1mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Camderry would therfore be greater than 428.1mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 641mm/yr.

Meteorological data for Camderry Bog (1951-1981) are summarised below:

Rainfall (P)	1069mm/yr
Actual Evapotranspiration, (AE)	>428.1mm/yr
Potential recharge, (PR)	<641mm/yr
Raindays > 0.2mm (annual {1951-80})	234 days
Wetdays > 1mm (annual {1960-1984})	177 days.

Rainfall analyses up to 1991 for the Glennamaddy area show that late winters (January, February, March) have become progressively wetter over the past 20 years and those of the last years have been wettest of all (D. Drew, *Pers. Comm.*).

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE BOG

In plan the site reaches a maximum length of 2680m in a NE to SW direction. It is thinnest in an WNW/ESE direction where it has an average width of 1600m. The bog's highest point is ~92mOD.

There are not very many significant marginal slopes on this bog. There is a general slope to the south over the whole site, and the southern lobe is at a lower level to the main lobe. The bog probably follows the under-lying topography to some extent. Camderry is similarly situated to the Lough Lurgeen and Clooncullaun bogs, in that it straddles several drumlin ridges. The S lobe of this bog is nearly separated from the main lobe since a NW/SE trending drumlin ridge divides the two. The two lobes are joined at a narrow point, coincident with the break in slope of the NW tip of the drumlin.

The bog appears quite dry and the whole site may have subsided due to water loss from drainage in the past.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

At the macro scale Camderry is a relatively large bog which is situated in a drumlin filled valley. The Mount Mary mountain (164m OD) lies 3km to the east of the site.

At the meso scale, this bog developed in interdrumlin depressions.

5. HYDROLOGY

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

Recent geological maps by Smith, show that the area is probably underlain by cherty argillaceous bioclastic Carboniferous limestones (known as ABL). The Old Red Sandstone Mount Mary inlier lies 3km to the east of the site.

The ABL fossiliferous limestones generally have a low permeability and are classed as a poor aquifer.

5.1.2 Subsoils (See 6" 1840s Map)

Data Availability

No subsoils data were available for Camderry bog apart from the initial 1840s GSI geology field sheets, and recent fieldwork carried out for this study.

Geology of Inorganic Subsoils

The subsoil geology of this bog and surrounding area is dominated by a clayey/stoney limestone till with some sandstone clasts. Certain edges of the bog are underlain by a silty sandstone till. The Shiven River to the SW of the smaller lobe is in till which has a variable clay to silt matrix.

Peat

The black line on the enclosed photocopy of the Geological Survey map produced in the 1840s indicates the original extent of the bog.

5.1.3 Depth to Bedrock

There is Yellow sandstone outcrop to the E, coincident with the high ground of the Mt. Mary ORS inlier. Depth to rock on the bog is unknown.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology

There are many drains in this bog many of which are old and infilled and may be non-functional. However, the bog is dry and has suffered drainage in the past. The drains are illustrated on the Drains and Hydrochemistry Map.

South
Drain bA at the S of the main body of the bog is new. It is 3m wide by 2m deep with 10cm of water flowing rapidly to the N into the bog. This drain also flows out of the bog into the cut-away area at a point 1m into the bog face. The drain is bare of vegetation. There is spoil along it and *Myrica* grows on this.

Drain bB extends along the S of the site. It is an old drain which is apparent on the 1973 AP. To the E of the junction with Drain bA there is rapid flow to the E (EC 89 μS/cm). The drain in this area is 1m deep by 1m wide with 10cm of water. The indications are that the water level is often much higher. Along the drain E of the junction with Drain bA and *Calluna* grows with *Myrica, Juncus effusus, Rubus, Salix* sp., *Potentilla erecta, Rumex* and *Dryopteris.*

Drain bP is a double drain extending along the SW of the main body of the bog along both sides of the access road. Between the outer and inner drains along each side of the road, there is a series of short perpendicular drains. Between some of these *Carex panicea* dominates. The drains were stagnant at the time of the survey. They support some *S. cuspidatum*. The outer drains are stagnant and are 0.25m wide overhung with tall *Calluna*. They widen at the western end to approximately 1.5m. The inner drains are 0.75m wide and are full of stagnant water. The inner drain, at a point between the N and NW arms of the access road, supports *Molinia, Betula, Salix* sp. and *Vaccinium myrtillus*.

East
Drain bC at the SE of the site is 2m wide by 0.75m deep with 20cm of water flowing to the NE (EC 70 μS/cm). It is an old drain and supports *Sphagnum cuspidatum, Juncus bulbosus* and algae.

Drain bD is seen at the edge of the E of the site, between the bog edge and old cut-away. It is 0.5m wide by 1m deep with 40cm of stagnant water. The regenerating bog is higher than the drain and islands consisting of *S. magellanicum, S. capillifolium* and *S. papillosum* and others of *Molinia* have broken away from the regenerating area and are floating in the drain. Other species found included *Potamogeton polygonifolius, Lemna* sp., *Juncus bulbosus* and *S. cuspidatum.*

Drain bE is also at the E of the site and is parallel to Drain bD. It is 0.75m deep by 0.5m wide with a very small amount of water. There was no flow. The drain is overhung by *Calluna* with some *Salix* sp. and *J. effusus.*

Drain bF is also to the E of the site and runs parallel to Drains bD and bE. It is partly collapsed with *S. cuspidatum, Eriophorum angustifolium* growing in 20cm of stagnant water.

Drain bG is found to the E of the site. Water in the drain flows towards a flush area. The drain is up to 3m wide and is infilled with *Rhynchospora alba, Sphagnum cuspidatum, Juncus bulbosus, Carex panicea, Eriophorum angustifolium* and *Calluna.*

North
Drains bH1 and bH2 are situated in a flush area at the NE of the site and water flows NE to the bog edge. There was no flow at the time of the survey but evidence in the lie of the *Molinia* indicates that there is flow at times of heavy rainfall. Drain bH1 is 2-3m wide narrowing to 1.5m at the edge. It is 1m deep. Drain bH2 is 1.5m wide by 1m deep with *Myrica* and *Salix sp*. along it.

Drain bL runs E/W along the northern edge of the bog. It is old and completely infilled with *E. vaginatum* and tall *Calluna* with *Polytrichum commune* and *Molinia.* There is evidence of flow to the west at times of high rainfall.

West
Drain bM is a long drain which runs N/S through the western part of the site. It borders the Lodgepole Pine plantation at the west of the site. It is infilled with *Calluna, Narthecium, E. angustifolium, E. vaginatum* and nearer the forestry, *Aulacomnium* and *S. cuspidatum* occur.
Western Lobe
Drain bN seen at the northern side of the northern section of the lobe. It is 0.75m wide by 0.5m deep with 70cm of stagnant water. It is overhung by tall *Calluna*.

Drain/Ridge bO occurs at the junction between the main body of the site and the western lobe. It is infilled with tall *Calluna*.

Southern Lobe
Drain bQ is an old drain which runs parallel to the SSE edge. Parts to the E are infilled and non-functional. Further W the drain is up to 1m wide with a high water table. There is infilling with *E. angustifolium, Calluna* and *Narthecium* and there are ponding areas with *S. auriculatum, S. cuspidatum, Menyanthes* and *Drosera* with *S. papillosum.* There is no flow.

5.2.2 Bog Margin Hydrology
The Shiven River lies close to the edges of Camderry bog and surrounds three sides of it.

South
The cut-away area is not structured and is largely regenerating, certain cut-away drains have infilled with *sphagnum*, generally there is little organised drainage. At certain faces drains are 1.5m wide and flow to drains at the track as marked; faces are old.

East
There has been new hopper-cutting in the cut-away to the SE since the 1970s. 1m deep drains flow to a small stream which flows south. There is a small spring in this area, as marked; it is a local feature and sits at the break in slope of the drumlin to the E. The slumping of faces here is common. To the NE the faces are much older and merge with the old cut-away which is regenerating with *sphagnum* and grass. Faces here are a maximum of 0.5m high. The main mH drains are relatively wide.

North
The Shiven River lies immediately alongside the most northerly part of this bog. There is a steep gradational slope from the bog to the river. Natural erosion channels leave the bog and enter the narrow river which is only 15cm deep and 0.65m wide.

West
The NW side has relatively new cutting with 2m high hopper faces and 2x3m deep drains (mM). These drains lie in till. The faces in the SW are older and covered in forestry, certain drains mN, are 2x3m.

Western Lobe
The western side of this lobe has very high faces 3-4m high with shows of sandstone till. Drains mJ are 1x1m.

Southern Lobe
To the SW the bog edge is 5m from the river separated by flush vegetation. The peat is very thin along all the edges in the S Lobe. The drumlin that separates this lobe from the main bog consists of silt till and is overgrown with *Ulex*. The faces here are a product of hand-cutting and are overgrown with *calluna.* Few drains run along this side since generally the bog recharges groundwater here.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map)
Water flowing from the bog and the adjacent inorganic subsoil was sampled on the 25/5/94 & 10/11/94. There had been several heavy rain spells over these days and the previous days. Water flowing off the bog had low ECs, typically less than 100 μS/cm. These values are similar to that of rainfall reflecting the largely inert nature of the peat. Generally relatively moderate electrical conductivities (μS/cm) were noted in the cut-away drains around the bog margins.

South
The electrical conductivities to the south in the cut-away were 90-110μS/cm.

East
The electrical conductivities to the E in the cut-away were 60-120μS/cm. The small spring had an EC of 247μS/cm.

North
The Shiven River which lies immediately alongside the most northerly part of this bog has an EC of 324μS/cm.

West
The drains in the NW, nearest the river are entirely in silty till with shows of iron and ECs ranging 146- 406μS/cm.

Western Lobe
Drains mJ have ECs of ~ 90μS/cm.

Southern Lobe
To the SW of the bog at drain mK, the river has an EC of 378μS/cm.

5.3.2 Laboratory Hydrochemistry
No samples were taken for analysis at the Coillte laboratory.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
Camderry bog lies in a groundwater recharge zone and is situated in a drumlin filled valley.

Groundwater flow is thought to mirror topography, recharging at the drumlins and flowing west/south to the Shiven River. Only a low proportion of rainfall is thought to recharge to groundwater since there are high levels of runoff from the widespread clay tills. There are several streams and rivers in the area.

Bog Regime
There are many drains on this bog but they are old and infilled and may be non-functional. Overall high bog hydrology will have been considerably affected by drainage.

This bog has a high density of marginal drains where there is hopper cutting in the S, E and NW of the main lobe, and to the west sides of the western and southern lobes where peat is thickest.

Inter-relationship
Only some of the cut-away drains at Camderry intercept the groundwater-table since EC values were relatively low. Generally ECs averaged 110μS/cm, indicating that the cut-away drains recharge local groundwater. The bog lies in interdrumlin depressions and part of the apex of a drumlin where original boundaries part remain. Where part of the bog lies on the drumlin there is the potential for infiltration lag zones.

6. VEGETATION

6.1 VEGETATION SUMMARY

This is a relatively dry site which has no well developed wet hummock hollow areas. The wettest areas have *S. cuspidatum* lawns with *Menyanthes* rather than well developed pools and are confined to depressed sections of the site. Peat cutting and drainage have affected the southern side of the site with

a long extension of high bog to the S. Some *Molinia* flushes occur at the edges of the bog and there are three small flushes on the high bog. One of these is associated with the drain leading from the forestry on the high bog while the other two are associated with under ground drainage in a subsidence area at the eastern side of the site. Western indicator species were noted, *Racomitrium* being the most common and forming hummocks in the centre of the site. *Pleurozia purpurea*, *S. auriculatum* and the occurrence of *Carex panicea* over most of the site also indicates more westerly conditions. *S. magellanicum, S. imbricatum* and *S. fuscum* were all recorded.

The old cut-aways are mainly colonised by *Ulex* and *Betula* with areas of *Molinia*. At the S edge of the southern lobe there is a *Crataegus* hedgerow very close to the bog. Some of the drains in the vicinity of Flush X contain enrichment species such as *Potamogeton polygonifolius* and *Carex rostrata*. At the N of the site along the banks of the river, *Crataegus*, *Salix* sp. and *Calluna* grow as well as typical river bank species such as *Filipendula, Urtica* and *Rumex* sp. (PL8:36).

To the W of the Southern Lobe old cut-aways are dominated by *Calluna* with *Juncus effusus, E. angustifolium* and *Molinia*. *Betula* and *Salix* also occur, mainly concentrated along the drains. Along the river to the SW, *Calluna* and *Juncus effusus* dominate. To the S there is some *Sphagnum* re-generation in the cut-away.

6.2 DETAILED VEGETATION

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1

This complex dominated by *Calluna* is found in places along the N edge and most of the W edge. Along the N edge patches of *Molinia* and *Myrica* and *Vaccinium myrtillus* are present and the *Calluna* is approximately 1m tall with an abundance of *Cladonia portentosa* indicating that this area has not been burnt for some time. To the W of the Southern Lobe the *Calluna* is up to 1.5m tall in this complex.

Complex 3/2

This is a marginal complex which occurs in small patches at the edge of the site where slopes are steep. It is dominated by *Carex panicea* and *Trichophorum*. N of Drain bB is a small area of this vegetation with the addition of many algal tear pools. The bog surface under this complex is hard. This complex with 10-15% *Cladonia*, 40-55% *C. panicea,* 15-20% *Trichophorum*, little *Calluna* and poor *Sphagnum* cover occurs to the south of Drain bQ and at the edge of the southern lobe in association with an area of active peat cutting. There is much *E. angustifolium* and surface water and some abandoned peat.

Complex 3/2+*Cladonia*

This is similar to the above complex but with a higher *C. portentosa* cover (40%). It is seen at the W side of the southern Lobe. Some *R. alba* and bare peat erosion channels are seen in this complex close to the bog edge.

Complex 3/2 Recently Burnt (RB)

This is seen in association with an unburnt version of the complex to the W of the southern lobe and is made up of 25% bare peat, 20% each of *C. panicea* and *Trichophorum* and 10% of young *Calluna.* There is some *Sphagnum* regenerating.

Complex 3/2/4

This complex is dominated by *Carex panicea* flats (25%) with 15% *Trichophorum* and 8% *R. alba* hollows. It is found at the SE corner and in a small area to the NNW in association with Slope 7.

In both areas towards the edge of the bog the *R. alba* grows in erosion channels through which there is surface water flow. The erosion channels along the N edge extend to up to 30m into the bog and are in rough terrain with tussocks of *Calluna vulgaris* and *Trichophorum*. (PL8:34 to E and 35 to W). Algal hollows are also common in this complex (15%) some of which are inter-connecting with associated surface water and water logging. The *Sphagnum* cover is low at 10% though there are some small *S. subnitens, S. magellanicum* and *S. imbricatum* hummocks. In some of the pools there is a small amount of *S. auriculatum* and *S. cuspidatum.* To the NNW *Huperzia selago* was noted in this complex.

Complex 6/2/3
This complex occurs to the N and S of Drain bP and is dominated by *Narthecium* (10-25%), *Carex panicea* (10-15%) and *Trichophorum* (10%) with algal hollows and erosion channels. There is a very low *Sphagnum* cover and the bog surface is hard.

Complex 6/2/3 + *Cladonia* (*Cl*)
This is seen around the S edge of the southern lobe. It is dominated by *Narthecium* (30%), *Trichophorum* (20%), *C. panicea* (10%), *E. angustifolium* 10-15%, *Calluna* (35% up to 35cm tall) and *Cladonia portentosa* (25%). There are some algal/tear pools which are mostly unhealthy though some support *S. cuspidatum* and *S. auriculatum* with *Menyanthes* and *R. fusca. Sphagnum* cover throughout is low and consists mainly of *S. capillifolium* and *S. tenellum. Andromeda* and *Racomitrium* are present. The *Cladonia* cover decreases further into the bog.

Complex 6/2/3 Recently Burnt (RB)
This is a small area to the S of the southern lobe which has been recently burnt though not severely. *Sphagnum* species are regenerating. *Huperzia* was seen.

Complex 3+ *Cladonia*
This complex which covers the majority of the site is dominated by *Carex panicea* and is very dry. There are some algal pools, small amounts of *Racomitrium* and *Pleurozia purpurea.* Occasional tall *S. capillifolium* hummocks (0.5m tall by 1m diameter) topped with *Calluna* occur. In the NNE of the site *Cladonia portentosa* cover reaches 50% cover. In the NE corner there are scattered *Myrica* bushes in this complex (3+*Cl*+*My*). There are some slumping features in this area, close to Complex 3/10+Cl, which have formed cracks aligned NNE/SSW (slumps). Some of these are wet with *S. cuspidatum* and *Menyanthes* with tall *Calluna* at the edges. *Huperzia* was noted in this area.

To the N of the W lobe this complex has not been burnt for some time and has a high cover of *E. vaginatum* and *Calluna* 30-40cm high. Close to the facebank *Ulex* is encroaching on to the high bog. Where the lobe narrows to the S, a band of *Myrica* extends across the neck of the two portions of the lobe. *S. imbricatum* and *S. fuscum* were seen in the area.

At the S of the site N of Drain bP there is a very flat area of this complex where there is an abundance of algal tear pools some containing *S. cuspidatum* and *Menyanthes*. The acrotelm is poor. The vegetation is dominated by *Carex panicea, Trichophorum* and *Eriophorum vaginatum.*

There is an area of recently burnt vegetation at the very SE of the lobe.

Complex 2/9A/7 *Cladonia* (*Cl*)
This complex is seen in the southern lobe where there is a drop on the high bog (Slope 15). There are erosion channels and the vegetation is dominated by 25% *Trichophorum*, 25% *E. angustifolium* and 20% *Calluna.* Some of the deep erosion channels are now filled with *S. papillosum, S. magellanicum, S. capillifolium, S. tenellum* and *S. subnitens* with some *Cladonia*. The topography is very uneven and the ground slippy.

Sub-Marginal Complexes
Complex 3 + *Racomitrium*
There are two areas where this complex occurs - the central part of the main lobe and a small area to the S of the forestry on the W side of the bog. The *Sphagnum* cover is low at 10%. The dominant vegetation types are *Carex panicea* (20%), *Narthecium* hollows at 10% and algal hollows 10%.

Some algal tear pools aligned NNW/SSE containing *Menyanthes* with *Campylopus atrovirens* around the edges were seen. The unusual characteristic of this complex is the occurrence of many low *Racomitrium* hummocks (15%) (10-20cm) (PL8:33 to the NW). *Pleurozia purpurea* was also seen.

Complex 2/6/3
This complex is seen to the W side of the Southern Lobe. *Trichophorum* dominates (45%) with 30% *Narthecium* and 10% *Carex panicea*. The *Calluna* is 5% (40cm tall). The *Narthecium* lawns are quite soft but the *Sphagnum* cover is low. *Racomitrium* is present and there are some small amounts of *Cladonia portentosa* and *C. uncialis*.

Complex 9A/7 + *Cladonia* (*Cl*)
This complex is seen along the S of the southern lobe with *E. angustifolium* (55%) and *Calluna* (up to 60cm tall) with *Trichophorum, C. panicea* and up to 10% *Cladonia increasing* to 50% further west. The *Sphagnum* cover is 15% consisting mainly of *S. capillifolium* with *S. papillosum*, *S. cuspidatum* and *S. auriculatum* in hollows between tussocks.

Complex 9/7/6 + *Cladonia* (*Cl*)
This complex is seen to the S of the southern lobe and is dominated by *Narthecium* 10%), *Eriophorum* sp. ((35%) mostly *E. vaginatum*), *Calluna* (20% up to 45cm tall), *Trichophorum* ((20%) increasing at the edge of the complex) and a *Sphagnum* cover of 15-20%. The latter consists of *S. fuscum, S. subnitens* and degraded *Sphagnum* hummocks. The ground is wet and slushy owing to algal development. There are some small, mostly unhealthy, pools. These occasionally contain *Drosera, R. alba, S. papillosum* and *S. auriculatum. Cladonia portentosa* cover is 10%.

Complex 3/10 + *Cladonia* (Cl)
This is a very uniform complex seen at the mid N of the site. It is very similar to Complex 3+*Cl* except that the *Calluna* is much taller and the *Cladonia* cover is high at 70% indicating that burning has not occurred for some time. In addition, the total *Sphagnum* cover is higher (20%). There are algal pools (8%) some with *S. cuspidatum* and *Menyanthes.* There is 15% cover by *Carex panicea* flats and 35% typical hummocks with 20% *S. capillifolium* hummocks. There is a section of this complex towards the S which has been more recently burnt as it has a lower *Cladonia* cover and shorter *Calluna* (Complex 3/10).

Sub-Central Complexes
Complex 6/9A
This is seen in the southern lobe and is in a slightly depressed area which is probably associated with Complex 15^{-}. The complex is dominated by *E. angustifolium* (55%) with *Narthecium* (15%), *Calluna* 25% up to 50cm tall and a *Sphagnum* cover of 10-15%. The ground is soft and the *Sphagnum* cover consists of *S. capillifolium* hummocks, *S. papillosum, S. tenellum, S. magellanicum* and *S. fuscum.* There are a few pools but they are mostly algal and there is some algal development on the bog surface. *Racomitrium*, which occurs quite frequently and *Andromeda* were seen. *Cladonia portentosa* cover is low at 10%.

Complex 10
This is a very small vegetation complex situated immediately to the N of the forestry on the bog (PM6:37). It is dominated by *Eriophorum vaginatum* with 70% *Sphagnum* cover, mainly *S. capillifolium*. There are only small amounts of *Carex panicea.* Close to the forestry *Pinus contorta* and *Betula* are encroaching on to this complex.

Central Complex
Complex 15^{-}
This was the wettest vegetation complex recorded at the site and it was found at three locations - the largest was in the western lobe and the other two at the mid N of the site. It is characterised by extensive *S. cuspidatum* and *S. papillosum* lawns with *Menyanthes* and tear pools aligned NNE/SSW at the edge of the complex. There are *Narthecium* hollows (20%) but the dominant vegetation type is typical hummocks (50%) and 10% *S. capillifolium* hummocks. The total *Sphagnum* cover is 30% and there is a well developed acrotelm layer. In the lobe there is a flushed area which is very quaking

consisting of many *Narthecium* lawns with *Aulacomnium* and *Vaccinium oxycoccus* surrounding them. Low hummocks of *S. capillifolium* and *S. imbricatum* also occurred. On the Southern Lobe *Campylopus atrovirens* was seen at some pool edges. *E. angustifolium* is plentiful and *S. fuscum* was noted.
Where this complex occurs at the N of the site it is similar but with some tall hummocks of *Calluna* and *S. capillifolium* with *Vaccinium oxycoccus, Aulacomnium* and *Pleurozium schreberi.* There are also a series of *Molinia* patches which are in a slightly depressed area. *Potentilla erecta* was also recorded.

6.2.2 Flushes

There are dry flushes around the edge of the bog and three small wet flushes on the high bog which are associated with subsidence.

Flush Z is seen at the SE of the site. Drain bB runs through it and the area has also been affected by digging operations associated with the erection of ESB power lines (double). No flowing water was seen. The flush is dominated by *Molinia, Calluna* and *Myrica*. Other species include *Juncus effusus, Potentilla erecta, Dryopteris, Luzula multiflora, Hylocomium splendens, Pleurozium schreberi, Sphagnum capillifolium, S. papillosum, Aulacomnium* and *Cladonia portentosa.*

Flush Y is a very small flush which is wet underfoot but no surface or running water was seen. It may be associated with the larger Flush X to the N of it. There were liverworts present and it seems that at times of high rainfall water lodges between the *Molinia* tussocks. Species found include *Molinia, Juncus effusus, Hypnum* with tall *Calluna, Potentilla erecta* and *Aulacomnium palustre.* No *Sphagna* were recorded though *S. capillifolium* was seen beyond the tall *Calluna*.

Flush X consists of a circular flush (PL8:30 and 31) in a depression with an associated band of vegetation which grows between it and the SE edge of the bog. The circular part of the flush is approximately 4m by 5m with some water. At the time of the survey this water was contained in a large tear pool in the circular depression. The *Sphagnum cuspidatum* layer around the edge of the depression had dried indicating that water level had been higher. Other species found in the depression were *J. effusus, J. bulbosus, Menyanthes, Eriophorum angustifolium* and *E. vaginatum.* Around this depressed circular area the bog surface is very spongy with a deep *Sphagnum* layer with *Aulacomnium, Polytrichum commune* and *Plagiomnium* sp.. Species also recorded in this area were *Potentilla erecta, Vaccinium oxycoccus, Pleurozium schreberi* and *Andromeda.*

The band of vegetation which runs SE from the flush is dominated by *E. vaginatum* with *Calluna* which is mostly dead (PL8: 33 to SW). Other species recorded in this area were *Blechnum spicant, Potentilla erecta, Pleurozium schreberi,* abundant *Andromeda, Vaccinium oxycoccus, Polytrichum alpestre* and patches of *Molinia.* Throughout this band of vegetation there was a lot of surface water and algal growth suggesting that flooding occurs in this area which may account for the dead *Calluna*.

Flush W is a *Molinia* dominated dry flush at the NE of the site. Other species recorded include *Myrica, Calluna, E. vaginatum, Potentilla erecta, Erica tetralix, Polygala vulgaris, Aulacomnium palustre, S. capillifolium, S. papillosum, S. subnitens* and some *Leucobryum.* There is evidence of surface water flow through the flush.

Flush V is a dry *Molinia* dominated flush at the NW of the site. Channels which carry surface water at times of heavy rainfall run through it.

Flush U is a wet area at the SE corner of the forestry. It is dominated by *Eriophorum vaginatum* and *E. angustifolium* with clumps of *Juncus effusus* and some *Betula* and *Pinus* species which are encroaching. *Polytrichum commune* and *Aulacomnium palustre* dominate the moss layer. Other species include *Andromeda, Erica tetralix, Luzula multiflora, Trichophorum. Anthoxanthum* and *Dryopteris.* This flush is probably associated with the subsidence and disturbance caused by forestry operations.

7. BOG TYPE

RIDGE BASIN. Camderry bog occupies two basins with ridges in between.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes

Slopes were estimated in the field and they are described below. Their locations are shown on the Slopes Map.

Slope 1 This is a very gentle slope, 0.2m over 50m, to the S towards drain bB. The bog is very dry in this area.

Slope 2+ 3 These are seen at the mid-east of the site and are associated with Flush X, which is in a depressed area. Slope 2 from the west is 0.5m over 30m and slope 3 from the NNE is 1m over 30.

Slope 4 This steep slope, at the east of the site, is associated with Drain bF. It is 2m over 50m.

Slope 5 This very gentle slope at the NE of the site is associated with the very dry Flush W and is 0.5m over 300m to old cut away.

Slope 6 This is a steep slope from the N of the bog to the river edge. The area has a rough tussocky terrain with a slope of 3.5m over 30m.

Slope 7 This is at the NW of the site in an area with deep and large erosion channels and surface water pools. In places some of the water flows underground. The slope is 2m over 60m.

Slope 8 This slope is at the very SW of the main lobe of the bog in an area subjected to severe cracking and slumping possibly associated with the drop of the bog level in the SW lobe. The slope is 0.5m over 20m.

Slope 9 This long slope to the NW across the neck of the SW Lobe is 3m over 300m with extensive sloping of 1m over 20m at the NW edge in an area of severe cracking and slumping to the W and NW. Some of these cracks form erosion channels 0.5m deep and up to 50m long with *Rhynchospora alba* and *Trichophorum*. There is a mineral mound in the area to the SE. The longer slope across the bog emanates from this area.

Slope 10 This slope is to the NW along the NW edge of the western lobe into an area of old regenerating cut-away. The height of the facebanks vary from 1-2m. The slope is 1.5m over 30m.

Slope 11 This slope is associated with a drop in height from the mineral mound, N towards Drain bP. It is 1.5m over 200m.

Slope 12 This is seen at the junction between the western and southern lobes and is 3m over 300m from a till ridge to an area of active peat cutting at the W edge.

Slope 13 At the W side of the Southern Lobe the slope to the W is 1.5m over 30m. The face bank is 2-3m deep here.

Slope 14 The slope at the SW of the Southern Lobe southwestwards towards the river is 0.75m over 20m to the bog edge with a further drop of about 1m to the river bank.

Slope 15 This is seen to the S of the southern lobe where there is a steep drop on the high bog and is 0.4m over 10m.

Slope 16 This slope is seen to the SSE of the southern Lobe and is 0.75m over 150m to an area of recently burnt ground. The facebanks are low 0.75m.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

Peat cutting has been carried out around most of the site. Active peat cutting is carried out along parts of the E and S edges and in the NW corner of the main body of the bog and at the W edge of the W lobe and around the S and W of the southern lobe. Some of the older, abandoned cut-away areas are regenerating: at the edge of Flush X; where Drains bE and bF exit the bog, at the SW corner, in the vicinity of Drain bN and around the E of the southern lobe. Other old peat cutting areas are dominated by *Ulex* and *Betula*. The facebanks around the site are mainly 1-1.5m but less in the older cut-aways.

Tall facebanks are seen in an area of active peat cutting at the junction of the western and southern lobes where they are up to 3.5m tall. To the W of the Southern Lobe there is a small actively cut are (hopper) where the face bank is 2-3m deep. The face bank drain is cut into the underlying mineral material and deep drains run through the cut-away to the W.

8.2.2 Fire History

The indications from this site are that it has been subjected to frequent burning. The cover of both *Cladonia* and *Calluna* are low over most of the site except in places on the Southern lobe and the *Calluna* is not very tall. There is a section of the site where *Racomitrium* hummocks account for 15% of the cover and where other typical hummock formers are absent. There was a small area to the S of the W lobe and isolated patches in the southern lobe which had recently been burnt. Areas least affected by burning are in the vegetation Complex 3/10+ *Cladonia* at the mid N of the site, Complex 15^{-} and Complex 9/7+ *Cl* in the Southern lobe and at the N of this lobe.

8.2.3 Forestry

There is a large (approx. 20 ha) Coillte Teo. plantation of Lodgepole Pine on the west of the Main Lobe on the high bog. The trees are approximately 15 years old. Drains have been inserted around the plantation and there appears to be some localised subsidence associated with these. Volunteers are spreading onto the high bog around the plantation.

8.2.4 Arterial Drainage

The river which runs close to the bog at its N, NW and SW edges is a tributary of the Shiven River and forms part of the Suck Catchment. It appears to have been drained in the recent past. There are spoil heaps along the N bank and the sides of the river are very straight.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. Complex 15- on the S section of the site is associated with subsidence and water ponding.

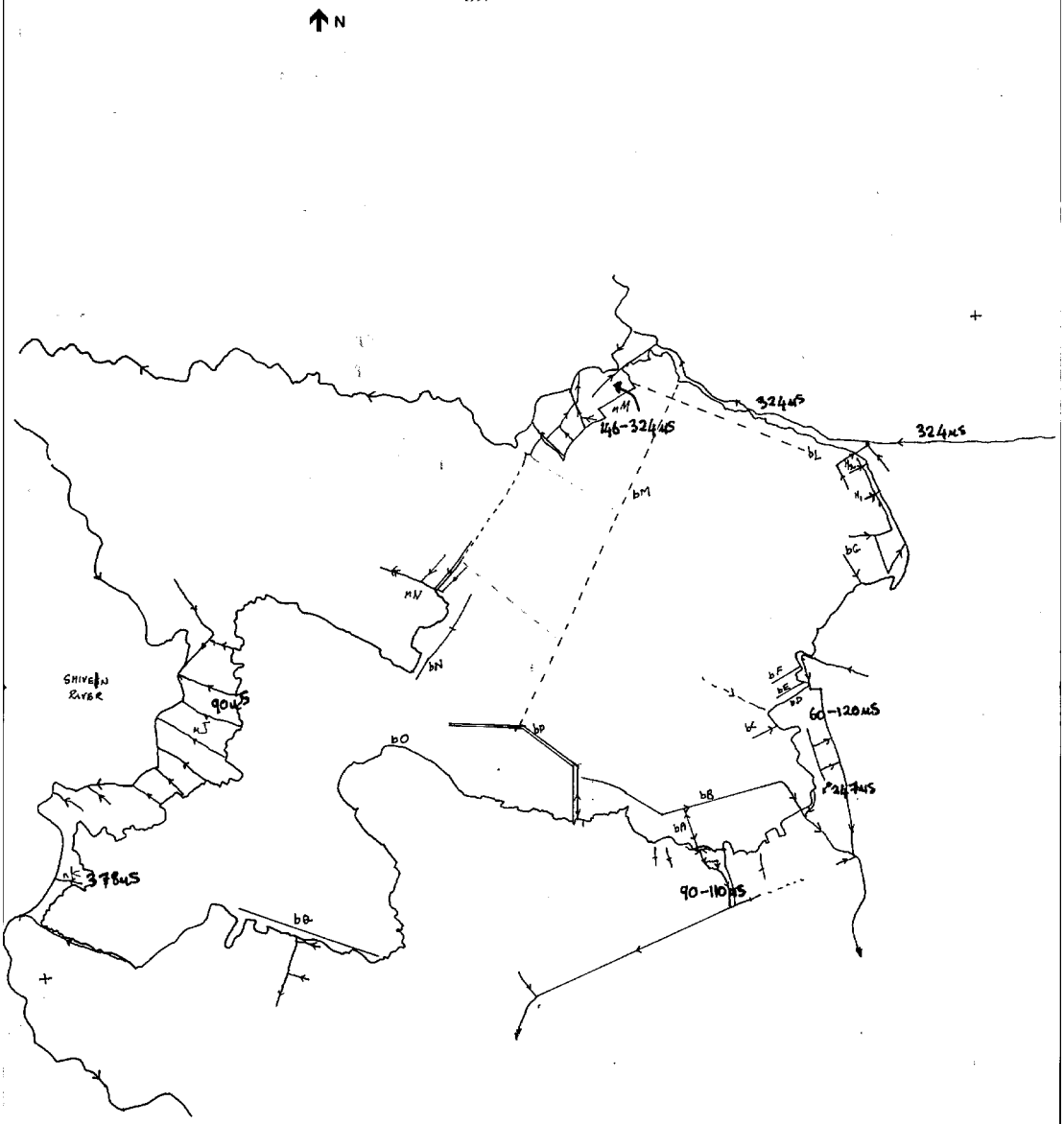
2. A drumlin runs through a section of the site separating the Main Lobe from the S Lobe. Myrica is associated with this. Tearing patterns have also developed around the ridge which also suggests subsidence may have occurred.

3. Small flushes are seen in places, these are associated with internal drainage patterns.

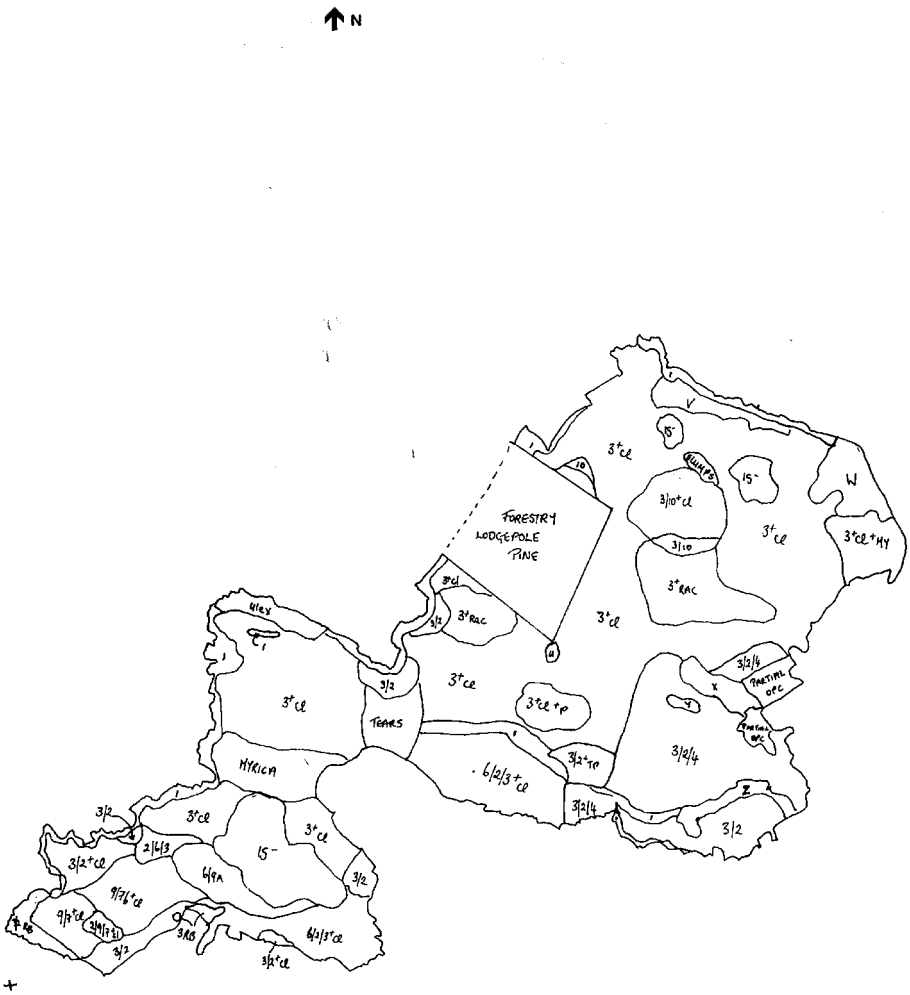
Lara Kelly
Malcolm Doak
Marie Dromey

Raised Bog Restoration Project (1995).

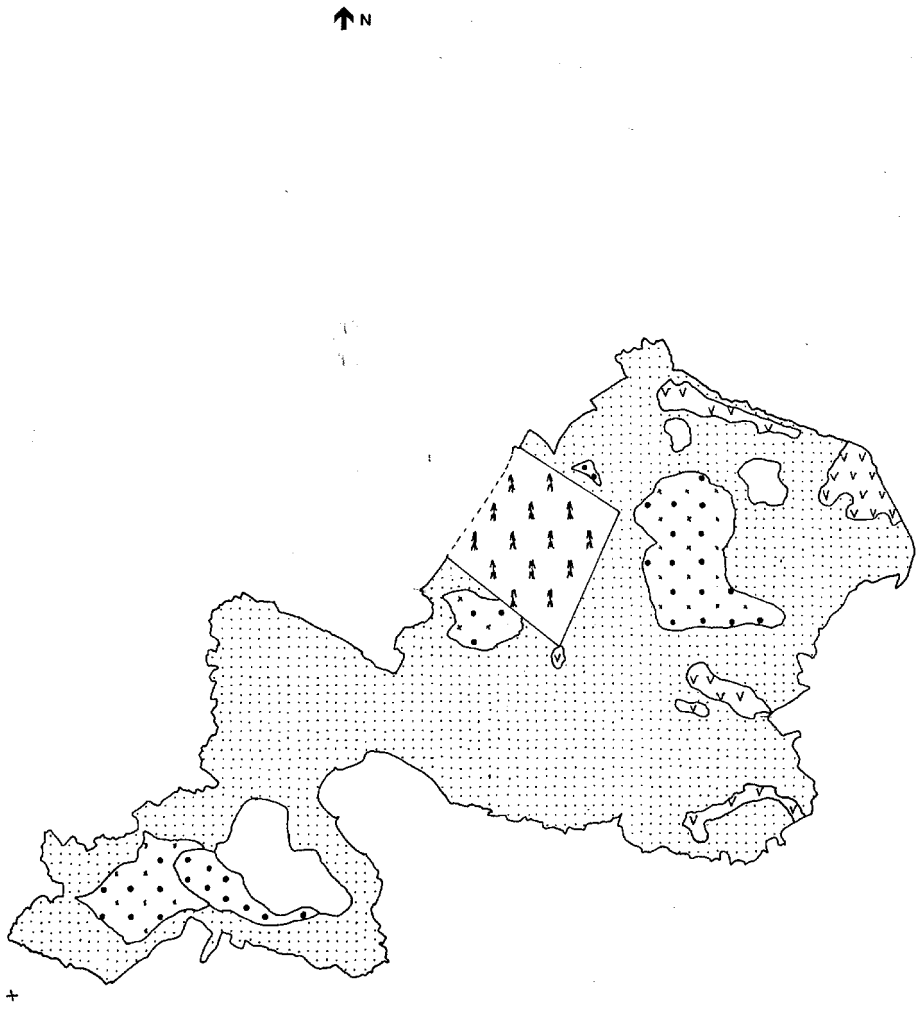
CAMDERRY BOG, CO. GALWAY (240).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994



CAMDERRY BOG, CO. GALWAY (240).
VEGETATION MAP (1:10,560)
1994

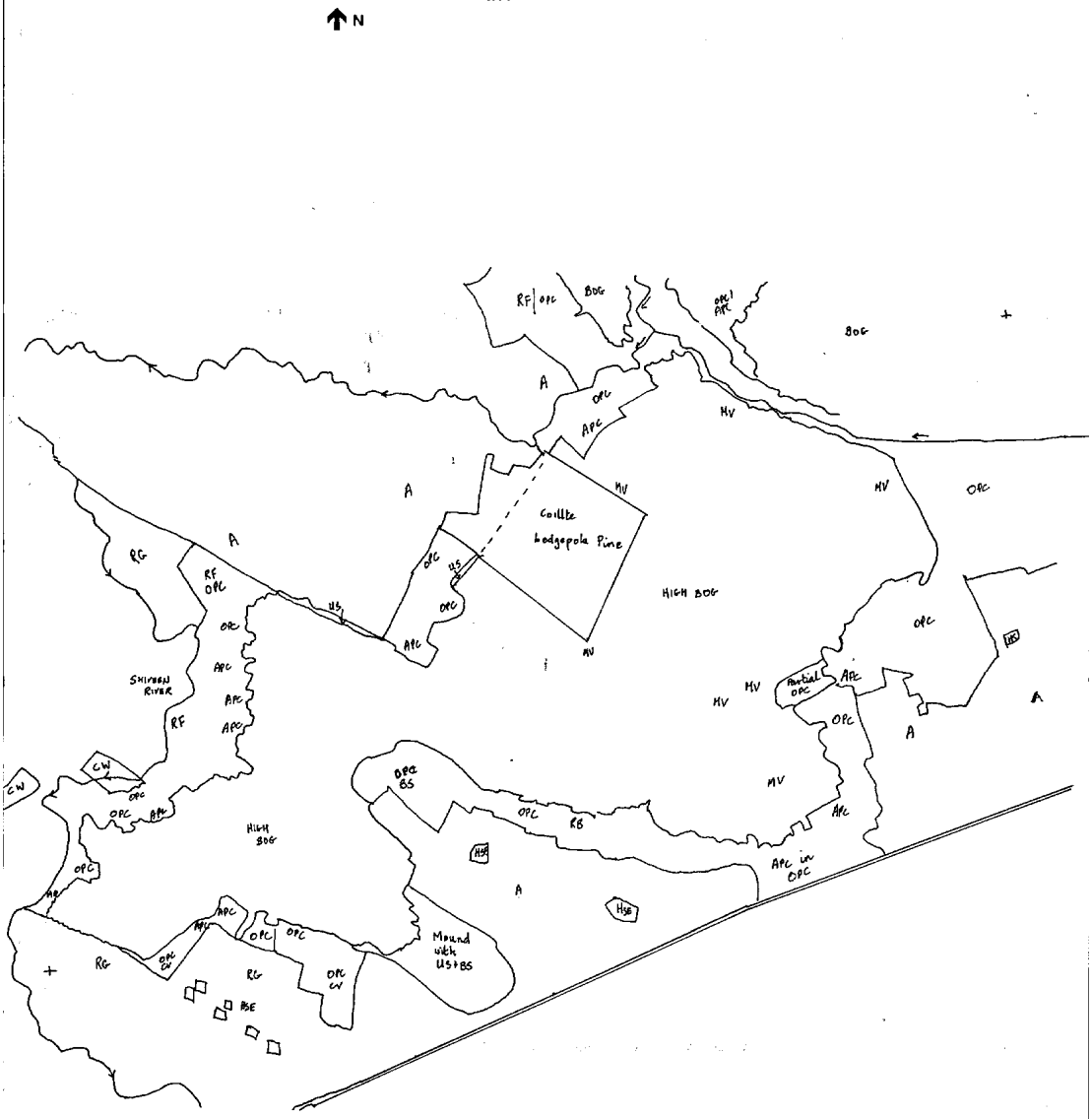


CAMDERRY BOG, CO. GALWAY (240).
ECOTOPE MAP (1:10,560)
1994



CAMDERRY BOG, CO. GALWAY (240).
SLOPES MAP (1:10,560)
1994

CAMDERRY BOG, CO. GALWAY (240).
LANDUSE MAP (1:10,560)
1994



CARROWNAGAPPUL, CO. GALWAY

1. SUMMARY OF SITE DETAILS

NHA No.	1242	1/2" Sheet:	12
Grid Ref:	M 67 50	6" Sheet:	GY 45 and 46
GSI Aerial Photo:	M 479	1:25,000 Sheet:	14/25
Other Photo:	OS (1993 B+W) 1233/1258	Area (ha):	320.0 (High Bog)
NHA Photo:			
Date(s) of Visit:	6/7-9-94 (Ecology) 6/7-9-94 (Geohydrology)		

Townlands: Carrownagappul, Gunnode, Carrownagannive, Speinglawn and Ballynallahy.

2. INTRODUCTION

2.1 BACKGROUND

This site was visited by Douglas and Mooney (1984) as part of The National Raised Bog Survey. They describe it as an extensive bog traversed by tacks. The SW of the site had been burnt in 1984 but *Sphagnum* regeneration was occurring. In general the bog was quite wet with some pool areas although the pools tended to be algal. The bog was given Bii status and was not included in the list of possible raised bog NNRs by Cross (1990).

Carrownagappul was also visited during the NHA survey. Approximately 20% of the site was considered to be of medium or good quality. *Carex panicea* and *Narthecium* were noted as being in abundance.

A large portion of the site is on offer for sale to NPWS by Bord na Mona and so the site was incorporated into this survey.

2.2 LOCATION AND ACCESS

The bog is located 1km NNW of Mount Bellew, Co. Galway. It lies just to the S of Shankill West and Curraghlehannagh bogs.

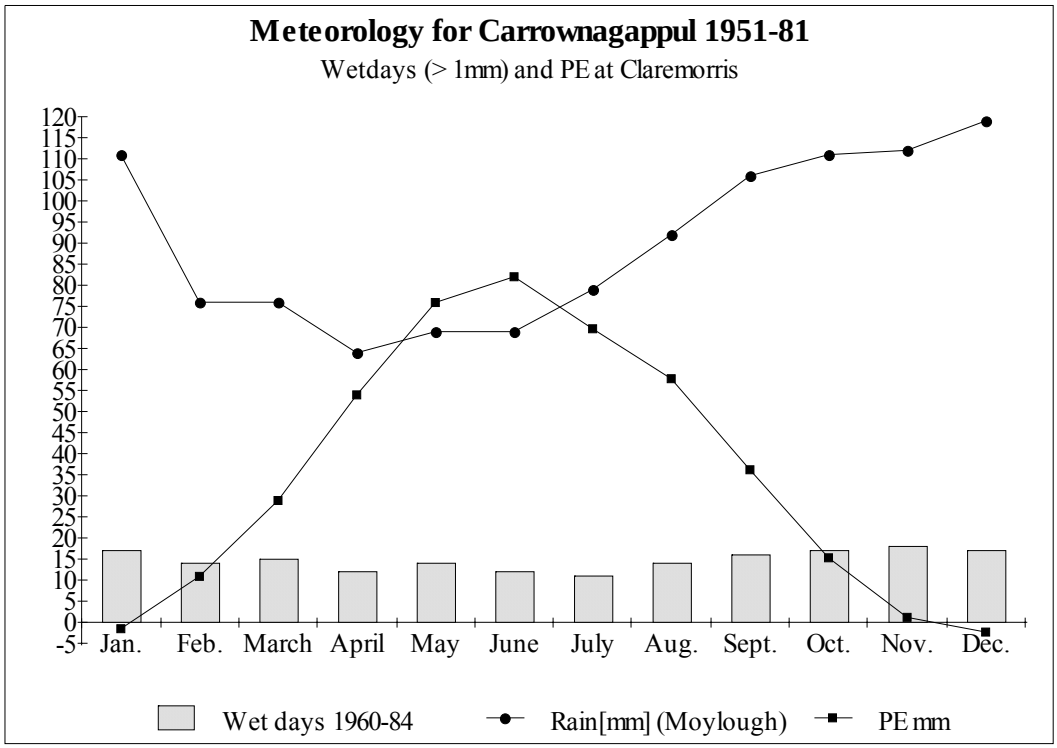
Access may be obtained at many points as bog roads run right through the site.

3. METEOROLOGY

No meteorological measurements have been made on Carrownagappul bog. Rainfall data from the nearby Moylough rainfall station for the years 1951-81 indicate that the area receives approximately 1084mm of precipitation annually (Figure X). The nearest Meteorological Service synoptic station at Claremorris suggests that the site could have up to 234 rain days and up to 177 wet days annually.

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

Figure X



The above factors suggest that the year round actual evapotranspiration (AE) from Carrownagappul bog is greater than PE at Claremorris, site of the nearest synoptic station which had an average PE of 428.1mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Carrownagappul would therfore be greater than 428.1mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 656mm/yr.

The meteorological data for Carrownagappul Bog (1951-1981) are summarised below:

Precipitation	1084mm/yr
Actual Evapotranspiration, (AE)	>428.1mm/yr
Potential recharge, (PR)	<656 mm/yr
Raindays > 0.2mm (annual {1951-80})	234 days
Wetdays > 1mm (annual {1960-1984})	177 days

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

The general slope of the site is to the S and SE, with significant internal slopes associated with Flush W. Slopes are also seen in connection with other flushes to the N and S. Short marginal slopes occur where peat cutting activities and drainage are ongoing (PM16:35A), such as at the SE lobe where there is higher ground to the N.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

This bog is situated in a wide drumlin filled valley.

At the meso scale the bog lies on a flat plateau which is between two rivers.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

Recent geological maps by Hitzman (Chevron/GSI,1993) show that the area is directly underlain by shallow water Carboniferous limestones (SHL). These limestones are pure and susceptible to karstification as is indicated by a swallow hole which occurs 400m to the east of the bog.

The SHL limestones would generally have a moderate to high permeability, depending on their degree of karstification and amount of fissures. These limestones are generally classed as a local moderately productive aquifer.

5.1.2 Subsoils (See 6" 1840s Map)

Data Availability

No subsoils data were available for Carrownagappul Bog apart from the initial 1840s GSI geology field sheets and recent fieldwork carried out for this study.

Geology of Inorganic Subsoils

Silty limestone till is dominant, particularly in the SW. Clayey till is found at the deeper cut-away drains in the east. Some very low relief eskers run NE/SW under the bog. A till island lies in the middle of the bog (NE), where it stands proud at 76m.O.D. The 'island' has always been clear of peat, since it was not covered in the 1840s. Overall subsoils are calcareous.

5.1.3 Depth to Bedrock

There are limestone outcrops directly west, and south-east of the bog. Depth to rock on the bog is unknown.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology (See drains and Hydrochemistry Map).

This site has been extensively drained. The central triangle of drains were inserted by The Sugar Co. before the site was purchased by Bord na Mona (S. Canny BnM (did not have date of insertion)). Much peat cutting has also been carried out resulting in a high density of marginal drains.

Main Bog

Drain bA corresponds to a townland boundary shown on the 1910 6" sheet and has been dug since the 1970s aerial photograph was taken. It is a very long drain which runs N/S through the middle of the main bog linking Flushes Z and X. At the its southern end it is 90cm deep by 60cm wide narrowing to 25cm at the base with 17cm water flowing rapidly to the S (EC of 68 μS/cm). The drain is mostly bare except for some filamentous green algae. It is overhung by *Calluna* with *Molinia* in the vicinity of Flush Z. The spoil from the drain is colonised by *Campylopus introflexus*. The drain is narrower to the N. At the N end in the vicinity of Flush X the drain widens. Species seen include *Rumex, J. effusus, Succisa, Myrica, Salix, Rubus, Cirsium palustre, Agrostis, Empetrum, Calluna, Potentilla palustris, Anthoxanthum*, *Molinia* and *Dryopteris.* There is rapid flow to the north off the bog.

Drain bB has also been dug since the 1970s aerial photograph and is located in the centre of the main bog. It joins with the S end of Drain bA. Drain bB is 0.75m wide by 0.5m deep with 20cm of water, is aligned NE/SW and has flow to the NE. The SW end is in flush Z where there is a clump of *Betula* and the drain is lined with *V. oxycoccus, Molinia* and *Phragmites*. Close to the NE end the drain ends abruptly. Approximately 150m further along the same line there is a similar drain. The break in the drain appears to be where a machine got stuck as the area is messed up. At this point there may have been a flush as the surface is very wet and soft and *Juncus effusus, Betula, Molinia, Rubus, Dryopteris dilatata* and *Aulacomnium palustre* are seen in a clump. Another patch with *Ulex, Betula, Luzula* and *Anthoxanthum* is seen close by.

Both drains bA and bB appear as double drains on the 1993 aerial photograph but these lines are shallow depressions with a lot of *C. introflexus* with tall *Calluna* along the edges.

Drain bC has been dug since the 1970s aerial photograph, is in the centre of the main bog and is shorter than Drains bA and bB. It is close to the S end of Drain bA and is parallel to it with a link to it at the N end. The S end flows rapidly into Drain bB. It is similar to both drains depending on which it is closest to. North of Flush Z the drain narrows and is not deep (0.5m deep by 0.1m wide). There are two strips up to 1.5m wide of *Narthecium* dominated vegetation with *E. tetralix, C. introflexus* and patches of *E. angustifolium* on either side. These are possibly machine tracks. The N link with Drain bA is almost infilled with *R. alba.*

Drain Complex bD consists of a series of 15 drains in the centre of the main Lobe. All drains flow into Drain bE, either directly or indirectly. Drains bD1-bD4 flow SE into bD5, which flows very rapidly northwards into Drain bE where it crosses Flush W. They are all approximately 0.5 m by 0.5 m and are bare of vegetation, apart from some algae and *E. angustifolium*. The spoil from the drains is thrown up as a slurry and is colonised by *Narthecium*. Drains bD7-bD9 flow northwards into bD6 which carries water (very rapidly) NNE into Drain bE. bD7 also flows over ground into bD5. Drains bD10-bD13 flow northwards directly into Drain bE.

Drain bE consists of two sections and forms part of the complex of drains seen in the centre of the site. The western side runs NNW/SSE between Drain bA and Flush W while the eastern section runs W/E from Flush W to a complex of drains at the NE of the Main Lobe. These are associated with active peat cutting. At its western side it is 0.5m by 0.5m and is mostly bare of vegetation. There is a break in the drain which is visible on the aerial photograph. On the S side of this drain erosion channels carry surface water into it. The break in the drain is probably because the area was too wet for machinery as there are a lot of pools in this area. Some of these are dried out. Where the drain runs through Flush W there is a large *Molinia* dominated depression. The drain then angles ENE and is 1m deep by 0.25m wide with very rapid water flow to ENE. Drains bD1-bD13 flow into this section of the drain.

Drain Complex bF is a series of six drains associated with peat cutting to the NE of the main bog. They have been dug some time since the 1970s aerial photograph was taken. Five of these drains are quite wide and have been used for peat cutting. *Calluna* dominated turf banks with some *Campylopus introflexus* and wet pits usually dominated by *E. angustifolium* are seen. There is flow in most of the drains towards Track 2 and Drain bH1 which then flows to the NNW. Erosion channels are at the head of the drains. The facebanks are generally 1-1.5m tall.
bF1 is narrow and extends to the NW edge. It is 0.75m wide and is infilled with *Calluna,* and *Sphagnum* species.
bF2 is up to 12m wide with old peat cutting. A patch of *Typha* was seen and the EC is 225 μS/cm. *Salix, Juncus effusus* and *Pinus sylvestris* were seen. There is a narrower drain which extends from the wide section to the NW edge.
bF3 is similar to bF2 except there is no *Typha* patch and no extension to the NW edge. There is Difco cutting along the SE side.
bF4 is up to 40m wide with active peat cutting along both edges and *Molinia, J. effusus* and, *Pteridium*.
bF5 is similar to bF4 but not as wide.
bF6 is narrow and there are patches of *Myrica* to the SE. It seems to be carrying more water off the bog than the other drains. It is quite close to Flush X.

Drain Complex bG consists of four drains at the SE of Flush X which have been excavated since the 1970s aerial photograph. They have been used for peat cutting and they may also be draining the SE arm of Flush X. The drains flow towards Drain bH1 which then flows to the NNW. bG1 is narrow. bG2 is 0.75m wide with a high water table. Species include *S. cuspidatum, S. papillosum, S. magellanicum* and *E. angustifolium.* This drain widens out to 2-3m at the NE end where peat has been cut. Drains bG3 and bG4 are similar though shorter.

Drains bH1 and bH2 are the drains on either side of Track 1 which runs NW/SE and separates the main bog from the Northern Lobe. Both drains have flow in two directions - to the NW towards Flush X and to the SE towards Flush W and active peat cutting where it has recently been deepened. Both are overhung by tall *Calluna* and there is facebank complex along the bog side of the drains except in the vicinity of Flush W and where there is active peat cutting. Drain bH1 to the SW of the track flows significantly to the NW. It is 1.5m deep by 1.25m wide at the top narrowing to 0.25 at the base and has 5cm of water. At the SE end there is *Potamogeton polygonifolius.* Drain bH2 has been deepened at its SE end and a river like channel extends under Track 2 and off the bog.

Drain Complex bJ to the N of the main bog is close to Flush W. The drains are aligned NE/SW, are associated with a slope 0.5m over 50m and there is a lot of surface water near Drain bH1. Some of the drains are narrow and were possibly inserted for the purposes of marking turbary boundaries. These are almost totally infilled. A few of the drains are up to 0.5m wide and two have had peat cutting carried out along them. Flow to the NE towards bH1 and then SE was evident in these.

Drain Complex bL is a series of drains to the E of the main bog which are visible on the 1970s aerial photograph. They are aligned NW/SE. The drains are about 25m apart and every second drain is up to 1m wide with some *Salix* and *Betula* scrub along it. There is peat cutting along the SE end of these drains where they are much wider. There is significant flow to the SE. Within this area is a series of very narrow drains which are perpendicular to the NW/SE drains and which possibly define turbary plots. They have a high water table and are infilling with *Sphagna*. The vegetation between all drains of bL complex is 3/2/6 + *Cladonia* with increasing amounts of *R. alba* and bare peat (complex 3/2/4) towards the SE edge in the vicinity of peat cutting.

The wide drain bL1 supports mesotrophic species including *Salix, J. effusus, Typha, Succisa, Holcus lanatus, Agrostis* sp., *Rubus, Ranunculus flammula, Potentilla palustris, Calluna*, *Pteridium* and *Polytrichum commune.* There is a patch of *Molinia* with some *Salix* to the N of it. Immediately to the N of this patch the drain is much more shallow with *Narthecium* along the edges.

Drains bL2 and bL3 have little or no mesotrophic vegetation.

Drain bM to the E of the main bog is aligned NW/SE with flow to the SE. It is 0.5m deep and wide with facebank complex along the edge. At the SE end it widens where peat cutting has been carried out.

Drain bM1 is a short drain to the E with a significant flow to the SE into drain bN1. It is associated with a small *Calluna* mound and has been widened as a result of peat cutting. There is *Typha*, *Betula* and *Phragmites* in the cut-away area and active peat cutting along the SW side. The *Betula* and *Phragmites* are encroaching on to the bog.

Drain bN1 is along the NW of Track 2 is 1.5m deep with 10cm of water flowing in both directions. There is facebank complex along the drain with *Phragmites, Salix, J. effusus, Angelica, Succisa, Ulex* and *Pteridium.*

Drains associated with Peat Cutting on the Main Lobe
A series of very narrow drains which are aligned NW/SE. They appear to be turbary markers and are shown on the 1919 6" sheet. Some have been widened as a result of peat cutting and now flow SE into Drain bN1. Drains bM, bO and bP are examples and these drains extend NW to Drain bB. Some of the peat cutting is active. Where the drains have been widened in association with peat cutting there are extensive erosion channels into them with increased surface water, run-off. *R. alba* and *E. angustifolium.* In the peat cutting areas there is some mesotrophic vegetation including *Agrostis* sp., *J. effusus, Molinia, Typha, Salix* and *Phragmites*.

Drain bO is 0.5 m deep by 0.5 m wide. It is bare of vegetation and has rapid flow to the SE. It extends from Drain bB, SW to Drain bN and Track 2.
Drain bP is similar. It is 0.75 m deep by 0.5 m wide with some colonisation by *E. angustifolium*. Flush Z extends southwards along this drain with *Molinia, Phragmites* and *Betula* seen.

Northern Lobe
Drains bH1 and bH2 are the drains on either side of Track 1 which runs NW/SE and separates the main bog from the Northern Lobe. Both drains have flow in two directions - to the NW towards Flush X and to the SE towards Flush W and active peat cutting where it has recently been deepened. Both are overhung by tall *Calluna* and there is facebank complex along the bog side of the drains except in the vicinity of Flush W and where there is active peat cutting. At the SE end of Drain bH2 (to the NE of the track) there is active peat cutting perpendicular to this drain. The drains associated with the active peat cutting flow into bH2 which has been deepened considerably (up to 4m in places) and is down to till. There is significant flow to the SE along this deepened drain. The dredging extends beyond Track 2 where Drain bH2 has the appearance of a river (EC 310-390 μS/cm).

Drains associated with Peat Cutting on the Northern Lobe
Small narrow drains have been used to mark out turbary plots. These are not always well defined in the field but are 0.15m wide towards the edges of the lobe with a high water table. Peat cutting has been carried out along some of these and is extensive to the NW of this lobe. On the western section of the Northern Lobe there is an area of a whole series of peat banks and drains (2 m deep in places). These are sometimes infilled with vegetation but all act as water run-off points. Bare erosion channels on the slopes carry water into the drains/peat cuttings and the sections between consist of dry, hard peat. To the NNE of this lobe many peat cutting banks and associated drains are seen. Some are up to 4m wide with *Calluna* ridges in the centre. *R. alba* and *E. angustifolium* and sometimes *S. cuspidatum* are seen in wet sections. There is evidence of flow to the SW in some drains. The bog surface has been badly messed up with machine tracks resulting in areas of bare peat. *Trichophorum*, patches of bare peat and *R. alba* dominate between the peat cutting banks. To the SE of the lobe the area of peat cutting has not been greatly extended since the 1970s aerial photograph though active peat cutting mainly by the hopper method is on-going. The facebanks are 2-3m high and there is cracking and slumping of the bog surface. In the areas of older peat cutting the drains are infilling and some support mesotrophic species including *Typha.* All new drains and most of the old drains flow towards Drain bH2 which has recently been deepened in this area.

Drain b2J at the SE of the lobe runs NW/SE, is up to 2m wide and is old. It seems to mark the edge of the peat cutting area. It is infilling with *C. panicea, Typha* and *Salix* with *Sphagna* at the edges. No flow was seen.

Drain b2K runs along the W side of Track 3 which separates the North and North Eastern lobes. The Drain is 0.75m wide with flow in two directions. It is lined with *Ulex* and *Salix.*

Drains of the North East Lobe
Drain b2L runs NW/SE and is apparent on the 1970s aerial photograph. It is 2m wide and completely infilled. There are patches with *S. cuspidatum* and *E. angustifolium* and other patches dominated by *Narthecium. S. papillosum* grows along extensive sections at the edges. There is a *Calluna* dominated ridge along the SW. There is one small *Betula* and a separate clump of *J. effusus* along the drain. A recent burnt patch extends across the drain.

Drain b2M along Track 5 marks a townland boundary. Tall *Calluna* is seen all along this drain and *Phragmites* extends onto the high bog in places.

Drain b2N at the ESE edge is associated with a recent conifer plantation. It surrounds the plantation and is 1m deep by 1.5m wide and is mostly bare of vegetation.

Drains associated with Peat Cutting to the SW of the NE Lobe
No new drains have been inserted in this area since the 1970s. However active peat cutting is on-going along most of its length - mainly by hopper method at the facebanks - and the drains have been shortened. This has increased the slope factor and there is increased run-off and erosion channels at the head of these drains. There is flow in all of them.

South Eastern Lobe
Drain b2A runs NW/SE on the SE Lobe. It is an old drain associated with peat cutting. It is colonised by *Phragmites* (EC 118 μS/cm) with tall *Calluna* along its edges. *Phragmites* is seen on the high bog between this drain and Drain b2B.

Drain b2B is seen in the same area as b2A. It is 2.5m deep by 1m wide (at its SE end). It supports species such as *Phragmites, Betula, Typha, Juncus effusus, Rubus, Angelica, Molinia, Dryopteris dilatata, Ranunculus flammula, Succisa* and *Senecio aquaticus*. It has been cut into the underlying till and there is rapid water flow to the S. The EC is only 56 μS/cm in the drain on the high bog but down slope where it approaches the cut-away, the EC increases to 221 μS/cm. *Hydrocotyle* and *Cardamine* are seen here.

Drain b2D runs NE/SSW across the SE of this lobe. It is 2 m wide and 0.2 m deep. It is infilled with *Trichophorum, Calluna* and *Eriophorum angustifolium* and is dry. It separates the high bog vegetation from an area which has been partly cutover and has been poached by cattle.

Drain b2G is a double drain which runs NE/SW across the centre of the SE Lobe. They are both 1m wide and 0.5m deep and are mostly bare of vegetation. There is water flow north-eastwards towards the bog road. The more NE drain extends across the Lobe while the more SW drain is shorter.

Drains Associated with Peat Cutting on the South Eastern Lobe
These drains run SE/NW with flow in two directions. There is greater flow to the SE of the bog and active peat cutting in the vicinity. There is also some flow northwestwards towards Drain bN2.

5.2.2 Bog Margin Hydrology
Main Bog
South-west/South
Remains of the original bog lie close to the stream mA, and faces here are less than 0.25m high. The cut-away is overgrown and regenerating, drains have infilled and so there is little drainage. There are relatively new deepened drains at mB, which lie in silty/clayey till and are 2m wide, 1m deep. Generally water is trapped in the cut-away and infiltrates to the local water-table at this point, discharging to stream mA.

Road 1
There are pockets of hand-cutting along each side of the track, some faces are quite deep 1.5m. There are large pools of stagnant water. An old drain 2m deep and 1.5m wide runs parallel to the track. Till is close to surface along the track since *phragmities* occur along the old hand-cutting area and at the track. There is hopper-cutting at the area marked APC; it occurs where there is a break in slope and peat is thickest. Near the junction with Road 2 there is a deep stream which sits in till and flows west to road 4.

Road 3
Heavy hopper-cutting along faces NW of road 3. Flow from cut-away drains is directed east to the swallow hole 300m east. Widespread till east of road 3; this road marks boundary for thick peat.

Till Island
Relatively higher ground in the centre of bog where roads 1, 2 and 6 meet where some peat cutting has occurred. Old fields are on this island and the 1840s map show no peat occurred on the till apex. There is a 2m deep drain entirely in silt till with large sub-angular limestone clasts 10-15cm.

North West
Localised hopper-cutting here associated with the flush.

West
To the W of the main bog there is a wide drain between the bog and the forestry plantation. It is 2.5m wide by 0.75m deep and peat cutting has been carried out along it. There are erosion channels running from the high bog into it. The vegetation consists of *Calluna* and *E. angustifolium* with *Betula* and Pine seedlings. There are some wet pits with regenerating *Sphagna.*

North Eastern Lobe
Overgrown faces and cut-away in NE. Birch trees up to faces which are < 1.5m high. Faces are 2m high with hopper-cutting to N of this lobe with relatively lare cut-away extent. Cut-away drains are 1.5m deep and partly in silty till. Water moves N.

Northern Lobe
There are large extents of old cut-away to the N along road 5. An esker ridge occurs N of here. To the SW and along road 2 there are 2-3m deepened drains with till at bottom. Mid-way along road 2 there are small pools of water with high ECs.

South Eastern Lobe
To the S of this lobe there is an old marginal drain 2m below the bog with ombrotrophic species and *Molinia.*

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See drains and Hydrochemistry Map).
Water flowing from the bog and the adjacent inorganic subsoil was sampled on the 6/7 September 1994. The previous few days were a rain day.

Main Bog
South-west/South
The shortlived stream mA, which rises immediately west of the bog, had an electrical conductivity of 613µS/cm. The ECs in the cut-away were 120-196µS/cm in parts and 67-76µS/cm at the old faces. Stream mC has an EC of 163µS/cm.

Road 1
The electrical conductivity along this track is ~ 120µS/cm.

Road 3
The ECs around this area of hopper-cutting are 315-450µS/cm.

North West
Localised hopper-cutting drains shows ECs of 280µS/cm.

Till Island
Relatively low ECs at 198µS/cm considering the drains are in till; groundwater recharge area.

North Eastern Lobe
ECs in N are 170µS/cm.

Northern Lobe
There are pools along road 2 with high ECs of 520µS/cm.

5.3.2 Laboratory Hydrochemistry
No samples were taken for analysis at the Coillte laboratory.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
This bog and its surroundings lie within the Shiven River catchment which is a tributary of the River Suck.

Bog Regime
The low permeability of the catotelm means that the water can only flow through it very slowly and so the bog water table is present in the acrotelm. Most of the available rainfall would therefore flow in the acrotelm to the bog margins or the tracks in the middle of the bog.

In the middle of the bog there is a zone of high permeability silty till.

There has been a major change to the surface drainage in the northern half of the bog caused by new ditches, and around the till 'island' caused by peat cutting. Flow is now dominantly NE/E to the Shiven River.

Inter-relationship of topography hydrology and hydrogeology
Overall there were little incidences of high ECs in the cut away drains along the tracks. EC values were higher at the bog edges in areas of hopper-cutting where drains would have intercepted the water-table. Most of the runoff water from the bog is believed to infiltrate into the relatively permeable till and enter the watertable as recharge. Recharge occurs at the till mound and ground-water discharges around this 'island' where there is heavy peat cutting. Springs occur mid-way along the two NW bog tracks.

Flow to the E side of the bog sinks at a karstic swallow hole 200m away.

At the stream in the SW, regional groundwater is discharging. Immediately adjacent,is a recharge area between the stream and the bog, coincident with mesotrophic wet meadows. Here the peat is very thin and overlies permeable gravelly subsoils. Potential lagg zone to the SW connected to local recharge to the stream.

As a whole the bog is located on a plateau which acts as a recharge zone to the surrounding rivers.

6. VEGETATION

6.1 VEGETATION SUMMARY

Narthecium is the dominant species over much of this site. *Carex panicea* and *Trichophorum* are also important. The effects of peat cutting and drainage are apparent to the NNW of the bog where *Trichophorum* is the dominant species. The wettest area of this site is Complex 6/15 which is seen on two areas on the Main Lobe covering approximately 4ha. Inter-connecting *S. cuspidatum* pools have 25% cover and the bog surface is very soft within this complex. Complex 6/2/10 covers a small area to the W of the Main Lobe (3ha) where the *Sphagnum* cover is 50%. A moderate *Sphagnum* cover is seen in Complexes 6/2/3 and 9/7+*Cladonia*. Complex 6/3/2 has a low *Sphagnum* cover (10-15%) but the bog surface is soft. The remainder of the complexes at this site have a low *Sphagnum* cover which is typical of these intermediate or western raised bogs.

The western indicators *Pleurozia purpurea* and *Racomitrium* are seen frequently over the site.

There are a number of flushes on the bog. One of these is extensive. It is a *Molinia* dominated linear feature with a number of swallow holes and a channel along its length. To the N of the Main Lobe there is a smaller, similar feature. Patches of *Phragmites* are seen in various places around the remainder of the bog.

To the SW of the Main Lobe there is a depression which runs NW/SE close to the bog edge. It appears to be a water movement track which is colonised by *Molinia* and *Myrica* with typical bog species. It may also be an area where peat cutting occurred in the past. Close to the bog side of the depression there are some *S. papillosum* and *S. magellanicum* lawns with *S. cuspidatum, Menyanthes, Vaccinium oxycoccus* and *Polytrichum alpestre* (EC 69 μS/cm). Along the bog edge *Calluna, Myrica* and *Ulex* dominate with patches of *Molinia* and *Betula*. The facebanks are very low 0.25m. The cut-away here is very uneven, probably reflecting the underlying topography. *Molinia, Calluna, Juncus effusus* and *J. conglomeratus* are common with patches of *Myrica* and *Ulex* and some *Betula, Pteridium, Succisa, Potentilla erecta, Cirsium dissectum, Dactylorhiza maculata* and *Carex binervis*. There is some *Sphagnum* re-generation, mainly *S. capillifolium* but the area is quite dry overall. There are no indications of up-welling water. Just to the NW of this area *J. effusus* dominates fields which provide rough grazing. There is an old peat cutting area close by and the following species were noted in the face bank drain: *Carex rostrata, Menyanthes, Potamogeton polygonifolius* and *S. recurvum* (EC 72-102 μS/cm).

At the mid-west side of the site the cut-away areas are *Juncus effusus* dominated fields with species such as *Mentha* in the wetter sections. Close to the bog edge there is a grassy area with *Calluna*. Species noted here were *Potentilla erecta, Succisa, Pedicularis sylvatica, Carex binervis, Dactylorhiza maculata* and various grass species. It may have been partly cut-over in the past. The facebanks in this area are less than 0.5m high. There is a small Pine forestry plantation at the bog edge

To the NNE of the Main Lobe there is a semi-circle shaped old peat cutting area where the following species were noted: *Ranunculus flammula, Juncus effusus, J. bulbosus, Typha, Utricularia, Potamogeton polygonifolius* and *Hydrocotyle vulgaris* (EC 66 μS/cm).

To the NE of the Northern Lobe the cut-away is mostly colonised by *Juncus effusus, E. angustifolium, Ulex* and *Calluna*. In the drains at the S of this lobe there are mesotrophic species such as *Typha* and *Salix.*

To the S of the SE Lobe there is an area of partly cut-over peat where wet pits with *S. cuspidatum* and *E. angustifolium* occur. To the S of this the old peat cutting is colonised by *Juncus effusus, E. angustifolium, Molinia, Ulex* and *Pteridium* with *Typha* in some drains (PL16:23).

6.2 DETAILED VEGETATION OF THE HIGH BOG

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1

To the west of the site *Calluna* dominates in a thin band along the face bank edge. The *Calluna* is short (10-20cm high). North of the forestry plantation there are some erosion channels with pine seedlings and abandoned turf in the complex (PM16:32A - too narrow to map).

Along the southern side of the Track at the N of the Northern Lobe *Calluna* with *Ulex* is seen.

To the N of the NE Lobe *Phragmites* is seen in the *Calluna* dominated complex along the Track 5.

Complex 2

This marginal complex occurs at some bog edges and to the W and N of the site in the area of drains and peat cutting banks. It is dominated by *Trichophorum* (up to 80%) and often has large areas of bare peat or erosion channels. The surface is generally very hard and tussocky.

A recently burnt area of this complex is seen at the NW end of the Northern Lobe (Complex 2RB).

An area close to the recently burnt section on the Northern Lobe is also dominated by *Trichophorum* with the addition of *Calluna* (Complex 2/7). There is practically no *Sphagnum* cover and the ground is hard.

Complex 2/3
This marginal complex is also seen on the partially cut-away areas and on the SW Lobe. It is dominated by *Trichophorum* and *Carex panicea*. At the SW Lobe the bog surface is very hard and has been poached by cattle. However there is 20% cover by *Sphagnum*, nearly all *S. capillifolium* and some *Racomitrium* occurs. Wet parts are also seen which may correspond to old peat pits. Here the *E. vaginatum* and *Sphagnum* covers are higher. There are areas of this complex where there is a very high % cover of bare peat. On peat cutting areas at the W of the site erosion channels are common and there is practically no *Sphagnum* cover.

The complex is also seen to the NW of the main lobe in an area where there is much machine damage due to the intensity of the active peat cutting and there is much bare peat. The bog surface is hard.

Complex 3/2
This is seen as a small area to the N of the main bog in association with Drains bG and is dominated by *C. panicea* and *Trichophorum*. There is some cracking of the bog surface and bare peat. *Huperzia* was seen.

Complex 3/2 + *Cladonia* (*Cl*)
There is a very small area of this complex to the NW of the main lobe. It is dominated by *C. panicea* and *Trichophorum* and is poached. There is 15% cover of *Cladonia portentosa* and much bare peat.

Complex 2/3/7+ *Cladonia*
Trichophorum dominates but the area has not been burnt for some time so that the *Calluna* is tall and abundant. The *Cladonia portentosa* cover is moderate. This complex is seen in a very small area to the N of the centre of Drain bB.

Complex 2/3/6
This is a marginal complex dominated by *Trichophorum* with notable amounts of *Carex panicea* and *Narthecium*. The *Sphagnum* cover is low (5-10%) and the surface is generally hard. It is seen to the NW, S and SE of the Main Lobe. To the S it is seen to the S of the *Molinia/Myrica* depression (Section 6.1). The surface is hard although the *Sphagnum* cover is 20%. Where it occurs to the NW of the main lobe there are some small algal pools and some *Racomitrium* was recorded. Where the complex occurs to the SE of the main bog it is associated with Slope 11. The ground is soft and there are small isolated pools with *S. cuspidatum* and some algal hollows. *Racomitrium* is present.

Complex 4/2/3
This is seen on the SE Lobe close to an area of active peat cutting (PM17:1-2). *R. alba* dominates (30-35%) with *Trichophorum* (30%) and *Carex panicea* (10-15%). Small algal hollows are also seen (10%). There is some bare peat, a lot of surface water, erosion channels and there are occasional small hollows/pools which are colonised by *S. cuspidatum, Menyanthes* and *Drosera anglica*. The overall *Sphagnum* cover is low (5-10%), consisting mainly of *S. capillifolium, S. tenellum* and *S. papillosum*. The bog surface is not soft. Areas of the complex may have been burnt as there is up to 10% bare peat and some *Campylopus introflexus.*

Complex 3
Carex panicea dominates this complex close to Track 3 on the Northern Lobe. *Dactylorhiza maculata* is seen. The surface is hard and slippery.

Complex 3RB (Recently Burnt)
This is seen at the S of the SE Lobe. It is dominated by *Carex panicea* and has been recently burnt. *Molinia* is encroaching and *Dactylorhiza maculata* was seen within this. *Phragmites* and *Menyanthes* also occur. This complex is fenced off from the old peat cutting but cattle poaching is occurring.

Complex 3/6/4
This is seen close to the water track feature at the S of the Main Lobe. *Carex panicea* and *Narthecium* dominate with notable amoounts of *R. alba*. The *Sphagnum* cover is low and the ground is hard. There is some evidence for surface water run-off.

Complex 3/6/2
This is seen on the SE end of the NE Lobe. *Pinus sylvestris* and *P. contorta* trees are encroaching. Mature *P. sylvestris* are seen at the bog edge and there is a small *P. contorta* plantation at the edge of the high bog. *Dactylorhiza maculata* was noted in this area.

Complex 3/2/6
Carex panicea, Trichophorum and *Narthecium* dominate this marginal complex. It is seen to the SW, on the SE Lobe, the Northern Lobe and the NE Lobe (PM17:4 on the NE lobe). To the SW of the site the % cover of vegetation is *Trichophorum* 25%, *C. panicea* 30%, *Narthecium* 10%, low *Calluna* 5-10%, *R. alba* 5% and 20% *Sphagnum* mainly hummocks of *S. magellanicum, S. papillosum*, *S. capillifolium* and *S. tenellum.* Further into the complex the *Sphagnum* cover is better though patchy with *S. magellanicum* up to 15% and the cover of *Narthecium* increases and *C. panicea* reduces. The topography of the bog is flat in the area and the ground soft. It seems that the *Sphagnum* is growing where surface water is lodging. There is an increase in *Trichophorum* cover towards the edge. Further N along this area of the complex there is a reduction is *Sphagnum* and many algal hollows present.

On the small lobe of the SE Lobe the *Sphagnum* cover is 25%, mainly *S. capillifolium* and *S. tenellum* with some *S. fuscum*. The *Calluna* is 30cm tall. The top surface layer is a little soft but underneath is hard. There is a moderate cover of *Eriophorum* sp. On the main lobe there is little *Sphagnum* but there is a lot of surface water and some algal hollows. *R. alba* is scattered throughout. *Pleurozia purpurea* was noted. The bog surface is hard and slippery.

In one place on the Northern Lobe *Phragmites* invades this complex from a peat cutting drain. The *Calluna* is tall along the north side of this Lobe and up to 15% *Cladonia portentosa* was seen (3/2/6+Cl). The bog surface was a little soft in places. A Lodgepole pine (0.5 m) was also seen on the high bog in this area.

This complex is seen in other places around the site with a significant cover of *Cladonia portentosa* (3/2/6+Cl).

To the N of the NE Lobe *Myrica* is seen in this complex in large amounts (Complex 3/2/6 + *Myrica*) and further east *Pinus sylvestris* trees are frequent (+ Pines).

A burnt version of this complex (3/2/6 B) is seen on the SW Lobe. It was probably burnt some time ago. The *Calluna* is short (5-10cm) and there are some burnt stems remaining. Patches of bare peat occur but the *Sphagnum* species are re-generating. This area is poached by cattle.

Another recently burnt area of this complex is seen to the S of the NE lobe (3/2/6RB). *C. panicea* is short and up to 80% and there are some algal hollows, *Trichophorum*, patches of *Narthecium* and regenerating *Sphagnum* including *S. subnitens* and *S. capillifolium.*

Complex 3/2/6 + Algal Pools+*Cladonia* (AP+*Cl*)
This is seen on the SE Lobe. It is similar to Complex 3/2/6 with the addition of algal pools. The *Calluna* is tall (30cm). The surface is hard and tussocky. The *Cladonia portentosa* cover is 5-10%. There is some *R. alba* and *Menyanthes* in the algal pools. Another area of this complex is seen close to the NW edge of the main lobe.

In the NE corner of the main lobe and associated with Drain Complex bL the ground is very hard and there is much surface water with some algal hollows. The *Calluna* cover is 25% and tall (30-40cm) and there is 10% *Cladonia* and *Narthecium* with 20% *Sphagnum* including *S. imbricatum, S. magellanicum* and *S. papillosum* though the ground is hard. The terrain slopes towards the drains. Towards the edges there is an increase in *R. alba* cover and much bare peat.
In the N lobe this complex with up to 20% *Cladonia* and no algal pools is seen around the edges. The cover of *C. panicea* increases up to 60% at the east of the lobe and *Trichophorum* increases at the edges. There are some erosion channels and cracking at the edges in the vicinity of active peat cutting and there is an increase in the amount of *R. alba*.

On the E Lobe this complex is seen with little to no *Cladonia portentosa* cover (3/2/6+AP).

Complex 3/2/6 + Pools (P)
This is similar to Complex 3/2/6 with the addition of *S. cuspidatum* and algal pools (15%). The pools also can contain *Menyanthes, Drosera anglica* and *R. alba*. In between the pools *Trichophorum, Narthecium* and *Carex panicea* dominate with *S. capillifolium* and *S. subnitens* and some *S. Papillosum* and *S. magellanicum*. The bog surface is a little soft.

An area of this complex is seen to the NNE of the main lobe and is associated with the slope NNE towards Road 1. The *Sphagnum* cover is very good though the pools are small and most are unhealthy. Some support *S. cuspidatum* and *Menyanthes.*

Another area of the complex is seen to the S of the N lobe where it is associated with a slight slope towards Road 1. Some of the pools inter-connect and are deep and large with *Menyanthes, S. cuspidatum, S. auriculatum* and degraded hummocks in their centre. Other pools are algal and are infilling with *R. alba* at the edges. *Calluna* in the complex is tall (30-40cm). Large *Leucobryum* hummocks and low wide *S. fuscum* hummocks were seen.

Complex 3/2/9
This complex is seen at the centre of the site to the W of Flush Z and unlike the surrounding Complex 6/2/3 is hard underfoot with algal hollows and the *Sphagnum* cover is much lower. *Calluna* is tall (30-40cm). The complex is on a slight slope and this may be as a result of subsidence caused by Drain bA.

Complex 3/2/9 + *Cladonia* (*Cl*)
This is seen between the two arms of Flush W. *Carex panicea* cover is 35% with 30% *Trichophorum* and 5-10% *E. vaginatum*. The *Cladonia* cover is 75%. The *Sphagnum* cover is low and the ground is hard with some surface water logging. The complex is also seen to the NNE of the flush where *Racomitrium* and low wide hummocks of *S. imbricatum*, *S. capillifolium* and *S. subnitens* are seen.

Sub-Marginal Complexes
Complex 3/7/9
This is seen in a small area at the centre of the northern edge of the Northern Lobe. *Carex panicea, Calluna* and *E. vaginatum* dominate. A patch of *Phragmites* and *Betula* occurs within the complex. The complex is also seen between Drains bB and bC at the S end of the main lobe and is dominated by tall *Calluna* and 45% *C. panicea.* Bryophyte cover including *Hypnum* is 40%. Other species seen include *V. oxycoccus, S. imbricatum, S. magellanicum, Andromeda* and *P. erecta.* The ground is hard and the complex is probably influenced by the close proximity of Drains and Flush Z. There is moderate cover by *Eriophorum* species.

Complex 3/7/9 + *Cladonia* (+*Cl*)
An area of this complex with 15% *Cladonia* is seen to the S of the SE lobe and in the N lobe where there is up to 50% *C. panicea* and up to 50% *Cladonia*. The ground is soft and the *Sphagnum* cover up to 40%.

Complex 6/3/2
This complex, dominated by *Narthecium, Carex panicea* and *Trichophorum*, covers a large portion of the sub-marginal sections of this site. The *Sphagnum* cover is generally low (10-15%) but despite this the surface is quite soft.

To the W of the N end of Drain bA, *Racomitrium* is seen in small clumps on the *Narthecium* lawns and occasionally forms small hummocks. Its occurrence may be associated with that of *Cladonia portentosa.*
To the NE of Drain bE, the complex is soft underfoot and the *Sphagnum* cover reaches 20% with some small algal pools with bits of *S. cuspidatum* at their edges.

Complex 6/3/2 + Pools (P)
Seen at the NE side of Drain bA, it is similar to the above complex as regards dominant community types with the addition of *S. cuspidatum* tear pools. These are aligned at right angles to the slope to the NW into Drain bA and the bog edge and some are aligned parallel to Road 1.Some pools are bare or algal and *D. anglica, Menyanthes* and *Cladipodiella* are seen too. Close to Drain bA the pools act as focus points for surface water flow into the drain.

Complex 7/9
This vegetation type, with an abundance of *Calluna* (40cm high) and *E. vaginatum* is seen close to Drains bD1-4. *Empetrum, Myrica, Betula* and *Aulacomnium* also occur suggesting some enrichment. A dry version is seen in a small area at the S edge of the Main Lobe with *Molinia* encroaching.

Complex 7/9 + *Cladonia* (*Cl*)
Between Drains bD1 and bD2 *Calluna* and *E. vaginatum* dominate and the *Cladonia portentosa* cover is 25%. *Empetrum* is common with *Pleurozium schreberi* also occurring. *Racomitrium* hummocks occur too. The *Cladonia* cover reaches 60% between Drains bD7-13 and the *Sphagnum* cover is 30%. Just N of Drain bD2 a bush of *Myrica* and a patch of *Molinia* is seen.

Complex 9/7
This is seen at the very S of the Main Lobe. *E. vaginatum* tussocks dominate (50%) with *Calluna* (25%, 10 -15cm), *E. angustifolium* (15%) and some *Narthecium* (5%). The *Sphagnum* cover is 30%, mainly *S. capillifolium* and *S. tenellum* but the surface is only a little soft. The structure is very uniform and the area may have suffered burning in the past. This is also indicated by some bare tussocks colonised by *Campylopus introflexus*. The area may be under the influence of flushed conditions seen at Flush Z, as *Vaccinium oxycoccus* is seen frequently and a small group of scrub *Betula* occurs.

Complex 9/7 + *Cladonia* (*Cl*)
This is similar to the above complex. *E. vaginatum* cover is 40%, *Calluna* (20%, 25-30cm tall), *Narthecium* (10%), *Trichophorum* (10%) and *Carex panicea* (5%). *Cladonia portentosa* cover is 30% and the *Sphagnum* cover is moderate (20%), mainly *S. capillifolium* and *S. papillosum*. The surface is soft and some small algal hollows occur. It is seen on the Northern Lobe.

Complex 3/9 + *Cladonia* (*Cl*)
This is a small area of vegetation associated with the NW end of Flush W. The *Sphagnum* cover is high, mostly *S. capillifolium* with up to 70% *Cladonia portentosa* cover. The surface is very soft. Many *Dactylorhiza maculata* plants were seen close to where the *Molinia* starts.

Complex 6 +*Calluna* (CV)
This complex, dominated by *Narthecium* flats and *Calluna* (30%, 40cm in height), is seen to the W of Drain bC, S of the junction with Drain bA. *Menyanthes* and *E. angustifolium* grow up through the *Narthecium* lawns in places. The total *Sphagnum* cover is approximately 35%, mainly *S. capillifolium* and *S. papillosum* with some *S. imbricatum*. *Aulacomnium* is also seen (influence of Flush Z?). The surface is soft and wet. The complex is also seen between Complex 15 and Drains bD and bE.

Complex 6/2/3-
This is similar to Complex 6/2/3 except that the *Sphagnum* cover is lower (10%). The bog surface is harder also but still a little soft in places. Some algal hollows occur (10%) and patches of *Cladonia portentosa* are seen. *E. vaginatum* cover increases where *C. portentosa* cover is higher. This may be in slightly wetter patches. Bits of *Racomitrium* were noted. This complex is seen to the WNWof Flush X.

Complex 7+Pools (P)
This complex has large inter-connecting pools and hummocks. It is dominated by *Calluna* (50%) which is up to 40-50cm tall, 20% pools, 15% *Narthecium* and some *Cladonia* (10%). The *Sphagnum* cover is poor on the inter-pool areas and the ground is hard. The pools support *Menyanthes, E. angustifolium, Drosera, R. alba, Narthecium* and *S. cuspidatum*. There are also some algal pools. There are hummocks in the inter-pool areas some of which are low and wide with *V. oxycoccus, Empetrum* and *S. magellanicum* at the lower edge. Other hummocks of *S. fuscum* and *S. imbricatum* and some tall *Leucobryum* hummocks occur. *Pleurozia purpurea* and *Racomitrium* were recorded. The complex is seen to the N of the main lobe close to the summit of Road 1 (PM16:33A).

This complex is also seen on the N lobe close to the summit of Road 1. Both areas are probably associated. This area is drier, has no open water pools and the *Sphagnum* cover is lower and confined to pool areas. *Menyanthes* grows up through the *Sphagnum* lawns which are infilling the pools. No *Racomitrium* or *Pleurozia purpurea* were seen here.

Sub-Central Complexes
Complex 6/2/3
Narthecium flats dominate this complex with *Trichophorum* and *Carex panicea* also important. The *Sphagnum* cover is generally moderate and the surface is often wet and soft. Occasionally *S. cuspidatum/Menyanthes* pools occur. The *E. vaginatum* cover can be high at times. Patches where *E. angustifolium* cover is high are seen just to the E of the Lodgepole Pine plantation at the W of the bog. To the N of Drain bD3 and around Drain bD4, *Racomitrium* is seen in this complex.

To the W of the main lobe (PM16:28A-30A) the vegetation is dominated by 25% *Narthecium*, 25% *Trichophorum* and 10% *C. panicea*. There is a high *Sphagnum* cover - up to 50% - and the ground is quite soft. The area is quite uniform though there are some large low hummocks some with *Empetrum, V. oxycoccus, Aulacomnium, Dicranum, Calluna* and epiphytic lichens; some with *S. fuscum* and *S. imbricatum* and some low hummocks of *S. magellanicum* and *S. papillosum. Andromeda* is present. Near Flush Y and a *Rhododendron* bush the ground is wetter and softer. Where Complex 6+P is seen at the W edge of the main bog there is an increase in *Narthecium* cover in Complex 6/2/3. At the very NW edge of this area of the complex there is a depression where the *Sphagnum* cover increases to 80%, mainly *S. cuspidatum, S. magellanicum* and *S. papillosum.*

On the N Lobe there are some patches where *E. vaginatum* cover was high. *Narthecium* flats are quite large in places. Some tall *Leucobryum* topped by *Calluna* (with epiphytic lichens). The *Cladonia portentosa* cover is low 5-10%. Apart from the large hummocks the surface is quite uniform. *S fuscum* and *S. imbricatum* were seen frequently as was *Pleurozia purpurea*. Occasional algal pools were also noted.

S of Drain bP the *Sphagnum* cover reaches 60% in this complex and some *Empetrum* was noted. The *Sphagnum* layer is dominated by *S. magellanicum* and *S. papillosum* with *S. tenellum* also present and the bog surface is soft. *Menyanthes* is scattered through the *Sphagnum* lawns in places and there is some *Aulacomnium palustre*. *Calluna* is tall here (30-45cm). *Phragmites* and *Betula* encroach onto the high bog from cut sections. The presence of *Empetrum* may be due to the influence of Flush Z which lies just to the N. *Vaccinium oxycoccus* and *Andromeda* are seen throughout.

To the S of Drain bE, this complex is a littler drier. Some pools occur but are probably tear pools as they are aligned parallel to the road.

Complex 6/2/3 + *Cladonia*
This is similar to the above with the addition of *C. portentosa* cover indicating that burning has not occurred for some time. It is seen at the SE of the Main Lobe where there is 30% *C. portentosa* cover. On the Northern Lobe the *C. portentosa* cover is 40%. The *Calluna* (25%) is 30cm tall. *S. capillifolium* and *S. subnitens* are frequent and a well developed *S. fuscum* hummock was noted. There is one large hummock topped by *Calluna* (with epiphytic lichens) and *Empetrum*. In addition there are some small patches of *Racomitrium* and *Pleurozia purpurea*.

Complex 6/2/3 + Pools (P)
This complex is seen at the centre of the Main Lobe and covering a large section of the N Lobe, where it extends almost as far N as the Track. It is similar to 6/2/3 but wetter with *S. cuspidatum* pools (10-20%). The pools tend to be linear and may be tear features (on the N Lobe they are aligned SW/NE). Some of the open water pools inter-connect and can be deep. The pools are also colonised by *Menyanthes, Drosera anglica* and *E. angustifolium* with *S. papillosum* around some pool edges. *Narthecium* is seen on the flats between the pools with *Trichophorum, Carex panicea*, *Calluna* (30cm) and *E. vaginatum* (10%). The surface is soft and wet within this complex. On the N Lobe *S. magellanicum* lawns also occur and there are some large *S. imbricatum* and *Leucobryum* hummocks (0.75 m high). *Cladonia* cover on the hummocks is high. A patch of *Myrica* is also seen with *Racomitrium* hummocks around it. Towards the NW of this complex on the N Lobe the cover of *Carex panicea* increases to about 20%, but it tends to occur in patches. In this area too there are a few *Betula* up to 2m tall and a patch of *Molinia*. Under the trees are *Empetrum, P. erecta, Pleurozium schreberi, V. oxycoccus* and *Dryopteris.*

Where this complex approaches the Track to the N of the Northern Lobe the pools act as focus points for water run-off. They are quite deep and inter-connecting.

Complex 6 + Pools (P)
This is a small area to the W of the site close to the forestry plantation and is in a depression possibly associated with the plantation. The complex is dominated by *Narthecium* lawns with moderately sized pools most of which are almost completely infilled with *S. cuspidatum* and *S. magellanicum* lawns. *Drosera* and *Menyanthes* are growing up through the lawns and the ground is soft and wet. Closer to the plantation the pools are deeper and linear with steep edges. These are possibly tear pools and are aligned ENE/WSW. There are some tall isolated *Calluna* hummocks in the complex (PM16:31A).

Complex 6/2/10
This is a small wet area to the W of Drain bA which is dominated by *Narthecium* flats (30%) with lawns of *S. cuspidatum* (10%) and a high abundance of *Trichophorum* (15%). The lawns/pools support *Menyanthes, R. alba* and *D. anglica*. Some of the larger pools have *S. magellanicum* and *S. papillosum* around their edges. The total *Sphagnum* cover is 50%, but the distribution is patchy. *S. imbricatum* occurs quite frequently (5%). The bog surface is very soft.

Central Complex
Complex 6/15
This is the wettest area seen on this site. It covers an area which spreads across Drain bA. Large, partially inter-connecting *S. cuspidatum* pools occur (25%) which are colonised by *Menyanthes, E. angustifolium* and *Drosera anglica*. Some pools are rounded but most are linear. *Campylopus atrovirens* is seen at the edges of some. The inter-pool areas are dominated by *Narthecium* (45%) and *Calluna* (15%) with *S. capillifolium, S. papillosum, S. magellanicum* and *S. imbricatum*. The surface is very soft. The micro-topography is more structured than in the other complexes at this site.

6.2.2 Flushes
Flush Z is to the South Centre of the site where Drains bA, bB, and bC converge. It is *Molinia* and *Phragmites* dominated with scrub *Betula* 1-1.5m tall and one Pine concentrated at a point N of the junction of Drains bB and bC. Other species include an abundance of *Empetrum,* tall *Calluna* (50-60cm), *V. oxycoccus, E. vaginatum* tussocks, *Andromeda, P. erecta, Polygala vulgaris,* small amounts of *Cladonia, Pleurozium schreberi*, *Aulacomnium palustre, Dicranum, Hypnum, S. capillifolium, S. magellanicum, S. auriculatum, Polytrichum alpestre* and *Blechnum.*

Flush Y is seen to the W of the site just W of Drain bA. It consists of scattered clumps of *Phragmites* with other species noted such as *Empetrum, Dactylorhiza maculata* and *Aulacomnium palustre*. There are many low *S. imbricatum* hummocks in this area and the total *Sphagnum* cover is 80%. The surface is very soft. A patch of *Myrica* is seen close by and a *Rhododendron* bush was recorded to the W between Flush Y and the small forestry plantation.

Flush X is seen at the NNW of the Main Lobe. It is made up of a line of swallow holes which run SW/NE into the northern end of Drain bA. The swallow holes are surrounded by tall *Calluna* (1 m) with *Molinia* and tussocks of *E. vaginatum* in the centre. The white patch on the aerial photograph corresponds to a long strip of *Molinia* dominated vegetation (running water heard). Around the line of swallow holes the covers of *E. vaginatum* and *Calluna* are high with some scattered *Molinia*. The bog surface is rather hard.

Where this flush joins up with the N end of Drain bA, there is an area of old peat cutting. *Molinia* dominates with *Calluna* (1m), *Myrica, Rumex, Salix, Rubus, Cirsium palustre, Agrostis, Juncus effusus, Anthoxanthum, Potentilla erecta, P. palustris, Dryopteris dilatata, Succisa, Polygala vulgaris, Vaccinium oxycoccus* and *Polytrichum alpestre*.

In the area of old cutting a very luxuriant stand of *Typha* occurs. The EC here is high (595 μS/cm) and there is some iron iridescence. This is probably due to the effects of slope and deep cutting, which combined are allowing ground water to upwell.

Another line of swallow holes runs NE/SW on the SE side of Drain bA. These are similar to those on the NW side.

Flush W is a Y-shaped feature seen to the NE of the Main Lobe of the bog. It consists of a series of swallow holes (subterranean flow) along the N and S arms with a longer river/stream and swallow-holes to the ESE (PL16:21). It crosses under Track 2 to bog on the other side and exits the bog where the facebanks are up to 4m tall. There is quite a drop in height over this stretch (See slopes 7 and 22). The stream/river is 2-3m deep with up to 50cm of water with considerable flow to the SE. The vegetation of the sides is dominated by *Molinia* and tall *Calluna* in the facebank complex. There is an abundance of *Rubus*, *Ulex* and *Pteridium*. Other species seen include *Succisa, J. effusus, P. erecta, V. myrtillus, Luzula, Galium palustre, Sphagnum palustre, Agrostis* sp. and *Dactylorhiza maculata*. *Betula* and *Salix* dominated clumps occur along this section of the flush in the vicinity of swallow holes. The southern arm has a large *Molinia* dominated depression (see slopes 8 -10). Drain bE runs through this section of the flush. There is a small patch of *Molinia* near Drain bL1 which is probably associated with this flush.

Flush Z1
This is seen on the NE Lobe of the site. It is a small feature, associated with Road 5 and Drain b2M. It is dominated by *Molinia* with *Potentilla erecta*, *Menyanthes* and *Pleurozium schreberi*.

6.2.3 Tracks/Roads
There are five tracks/roads which cut through this bog. They exert an influence on both the vegetation and hydrology of the bog and track and these are not necessarily positive influences. Drains are an essential requirement when building a track through bog. These drains then act as channel courses for taking water off the bog, in turn causing sloping and the lowering of the bog topography. This has a direct influence on the bog vegetation as not all species can tolerate a slope factor and disturbance. Permanent pools and hummock hollow topography cannot form on the slopes. Another effect on vegetation and hydrology arises from the presence of a track in that they are built of imported calcareous material. The terrestrial vegetation of the track reflects this and the alkaline material may affect the conductivity of the drains along the tracks - though if the drains are deep enough and on till the same effects can be seen.

Track 1 which runs NW/SE has very little scrub vegetation along it and not very much mesotrophic vegetation in the drain alongside. The vegetation of Track 2 which runs NE/SW is dominated by tall *Ulex* along most of its length with *Salix* and *Phragmites* is also quite common. At its SW end *Crataegus,* a variety of *Salix* and tall *Betula* were recorded. Track 3 is short and runs N/S. It is lined with *Ulex* which is not too tall. Track 4 runs across the N of the Northern lobe. It is dominated by *Ulex* along its edges. Track 5 is to the NE of the NE lobe and is colonised by *Ulex, Salix, Betula* and *Ilex*. A drain runs along either side.

7. BOG TYPE

This bog has been classified as a Ridge Basin bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes (See Slopes Map)

Slope 1 This is at the W of the main bog through complex 6 and 3/2/6 at the edge to a new drain separating the bog from an agricultural field and is 1.5m over 20m The facebank is 1.5m deep. The spoil was deposited on the bog.

Slope 2 This slope is also at the W of the main bog and is from the S into the forestry plantation. It is 1m over 30m through Complex 1 with bare peat and erosion channels (PM16:32A). *Betula* and Pine are encroaching.

Slope 3 This slope is at the W of the site in a N direction through complexes 3/2/6 and 1 to an area of active peat cutting and is 1m over 10m with cracking and slumping. The facebanks are up to 4m tall and the hopper method is used. Till was not seen though the presence of *Agrostis* and *Potamogeton polygonifolius* indicate some enrichment.

Slope 4 This slope from the high bog near the small forestry plantation to the W of the site is NNW towards another plantation at the N of the site and is 2-3m over 500-600m.

Slope 5 At the N of the site, SW of Road 1, the slope to the NW into the northern end of Drain bA is 2m over 100m.

Slope 6 The slope to the SE along the northern arm of Flush W is 1m over 150m. The general slope of the bog in this area is to the SE.

Slope 7 This slope from the NW end of Flush W, south-east toward the bog roads and till mound, is 2.5m over 500m.

Slope 8 From the N into the western end of the southern arm of Flush W, the slope is 0.5m over 50m.

Slope 9 From the W into the same area the slope is 0.5m over 75m.

Slope 10 And from the S into the same area the slope is 0.5m over 20m.

Slope 11 This is at the E of the main bog in a NE direction from Drain bM to Flush W and is 0.5m over 50m through complex 2/3/6 + *Cladonia.*

Slope 12 This is at the E of the main bog in a SE direction towards peat cutting and is 1m over 40m.

Slope 13 This slope is seen at the S of the site, from Flush Z (at the S junction of Drains bA and bB) SSE towards bog road 2. It is 1.25m over 100m.

Slope 14 This is seen at the S of the site. The slope from the high bog into an area of old peat cutting and infilled facebank drain (mesotrophic vegetation) is 0.75m over 150m.

Slope 15 This is on the SE Lobe on the SE side, south-eastwards from the high bog through Complex 3RB and into old peat cutting and pastures. The slope is 0.75m over 30m.

Slope 16 This is in the middle of the SE lobe and is SW into an area of active peat cutting where the slope is 1.5m over 40m and the facebanks are up to 2m. The vegetation has been burnt and there is much bare peat, *R. alba* and erosion channels.

Slope 17 This slope is also in the middle of the SE lobe, SE into an area of old peat cutting which has been grazed. It is 1.5m over 50m and the facebanks are m tall.

Slope 18 This slope is 2m over 20 at the edge of the bog into an area of old peat cutting which is grazed. The bog grades into the grazed area. There is no facebank.

Slope 19 The slope to the NE on the SE lobe into an area of old peat cutting is 0.5m over 75m. There is associated surface water run-off.

Slope 20 This is seen on the SE side of the SE Lobe. The slope into active peat cutting is 1m over 40m. The facebanks vary from 2-4 m in height and there is associated cracking and slumping of the high bog surface.

Slope 21 This is seen on the SE Lobe. The slope from the top of the dome into the SE end of Flush W is 2.5m over 250m.

Slope 22 This is at the NE of the SE lobe in the vicinity of the exit of Flush W from the bog and is 0.75m over 20m. There is active peat cutting in this area and the facebanks are up to 4m high. There is cracking and slumping of the bog surface.

Slope 23 On the Northern Lobe the slope at the northern edge, northwards into active peat cutting is 1.5m over 30m. The facebank at this point is approximately 2.5m high. On average the slope along this edge where there is active peat cutting (hopper) is 1m over 30m.

Slope 24 For a distance of a few hundred metres along the northern boundary of the Northern Lobe, partially uncut high bog adjoins Road 4. The slope here is more gentle, 0.5m over 100m.

Slope 25 At the NE side of the N Lobe where there is active peat cutting the slope to the bog edge is 1.5m over 30m. The facebanks range from 1-2m in height and there is cracking and slumping of the bog surface. There are bare peat erosion channels on the bog edge in this area.

Slope 26 This slope is at the SW of the NE lobe and is 1.5m over 50m to an area of active peat cutting. The facebanks are up to 4m tall and there are erosion channels and bare peat at the edge of the high bog.

Slope 27 This slope is to the S of the NE lobe and is 0.5m over 10m into an area of active peat cutting. The facebanks are 2-3m high and there is severe slumping of the bog surface.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

Much of this site is presently owned by Bord na Mona and peat cutting is not carried on in these areas. However, much of the site (N, NE and SE lobes and the SE and NE of the main lobe) has turbary boundaries defined by a series of narrow drains (shown on the 1910 6" sheet). In many places along these stretches areas are and have been cut away for peat. The peat cutting is along the side of the drains and not at their edges with the result that there are patches where peat cutting is eating into the bog. Areas to the NW and SE of the N lobe (PM17:3 at the SE of the N lobe), to the ENE of the main lobe and to the NE and SW of the SE lobe (PM17:1) have been extensively cut away in this manner. Most of the peat cutting is by hand and hopper method. In addition the drains along the access tracks are being deepened in the vicinity of active peat cutting. This is especially the case to the SE of the N lobe where the drain is on till. There is also peat cutting to the NW of the main bog in an area where narrow turbary plots do not exist and along the SW edge of the NE lobe.

The height of the facebanks around the site varies: 3-4m to the W of the N lobe, to the SW of the NE lobe and to the E of the SE lobe; 2-3m to the SW of the SE lobe and S of the NE lobe; 1-2m in the areas where the narrow turbary plots are close to the tracks which cut through the site and < 1m in the older cut-aways to the S and W of the main bog and to the E of the SE lobe. At the NE side of the SE Lobe cutting is both by hand and using the hopper method. The facebank has collapsed in places and machinery comes up onto the bog. At the exit of Flush W to the E of the SE lobe the facebanks are up to 4m tall.

Difco harvesting is carried out in some cut-away areas (PM16:36A at the E of the SE lobe).

8.2.2 Forestry

To the W of the site there is a small mature coniferous plantation (*Pinus contorta*) (PM16:30A+32A) and to the NW there is a coniferous plantation on cut-away peat. Around the NE lobe there is some old coniferous forestry in the cut-away. Some of this has been felled and more recent saplings planted. These newer trees are approximately 5 years old. Volunteers are starting to spread out onto the surrounding bog from this plantation.

8.2.3 Fire History

Much of this site has been bunt in the past. According to Douglas and Mooney (1984) the SW of the site was burnt in 1984. The SE of the Main Lobe appears to have escaped recent burning as the *Cladonia portentosa* cover is quite high. This is also the case on parts of the Northern Lobe. At the edges of the SE Lobe some recent burning was noted.

8.2.4 Poaching

Much of the older cut-away around the W, S and E of the site is grazed. In places these areas are not fenced off from the bog and so poaching occurs. This is particularly true of the S and E of the SE lobe.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. The areas of *Phragmites* which occur on this site are probably associated with thinner peat on sub-soil mounds.

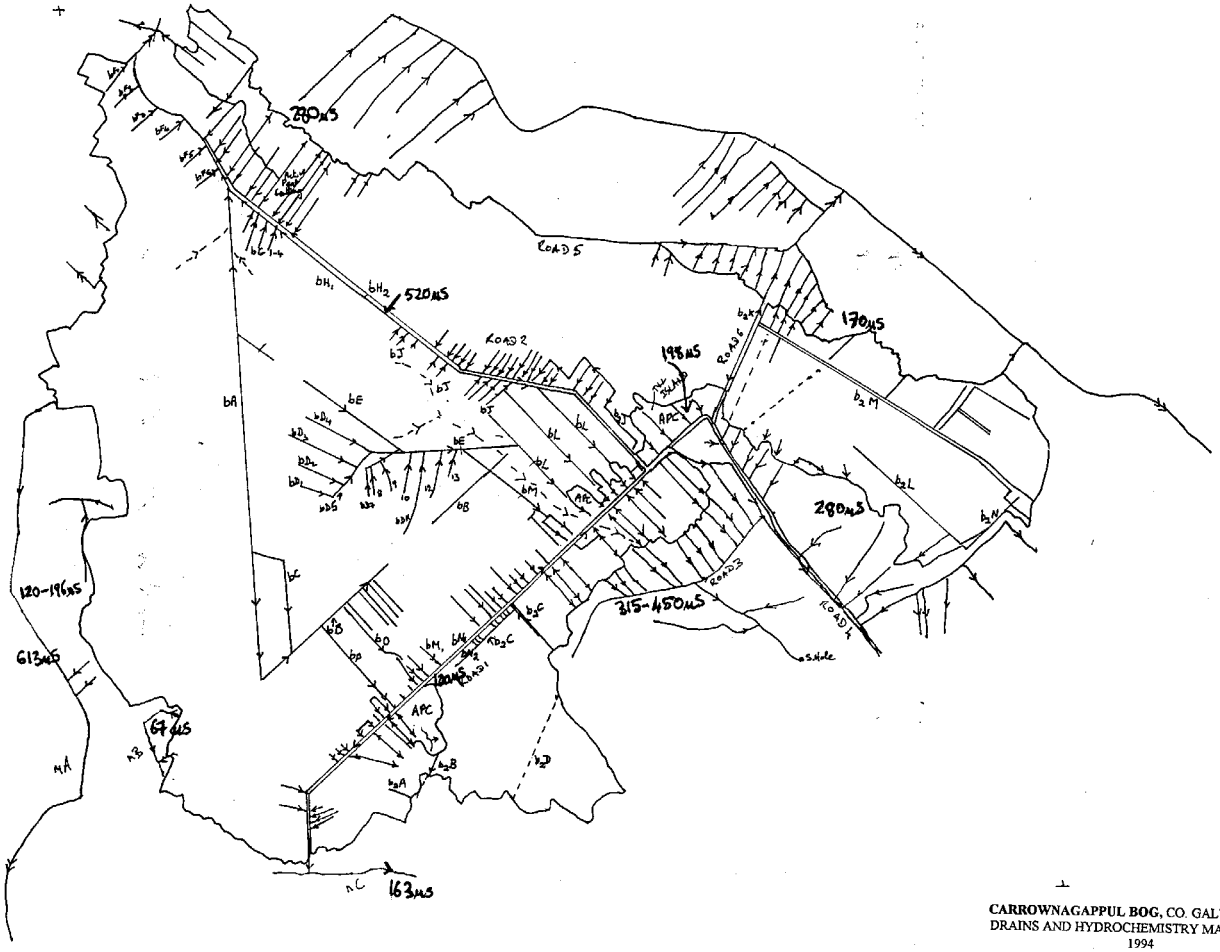
2. Extensive flushes within the site are associated with internal drainage systems. This often incorparate swallowholes.

3. Permanent pool areas are associatd with the flattest sections of the site.

4. At the SW of the site mesotrophic wet meadows may indicate local ground water discharge.

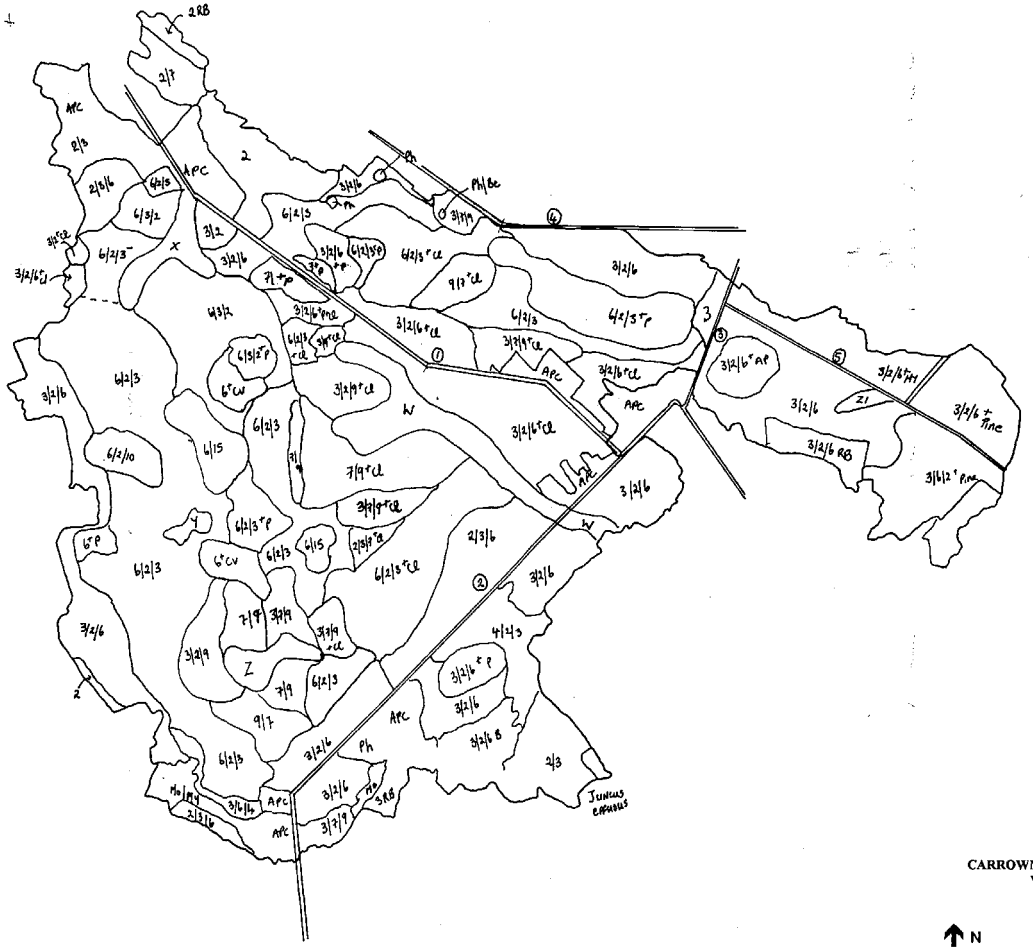
Lara Kelly
Malcolm Doak
Marie Dromey

Raised Bog Restoration Project (1995).



CARROWNAGAPPUL BOG, CO. GALWAY (1242).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994

N



CARROWNAGAPPUL BOG, CO. GALWAY (1242).
VEGETATION MAP (1:10,560)
1994

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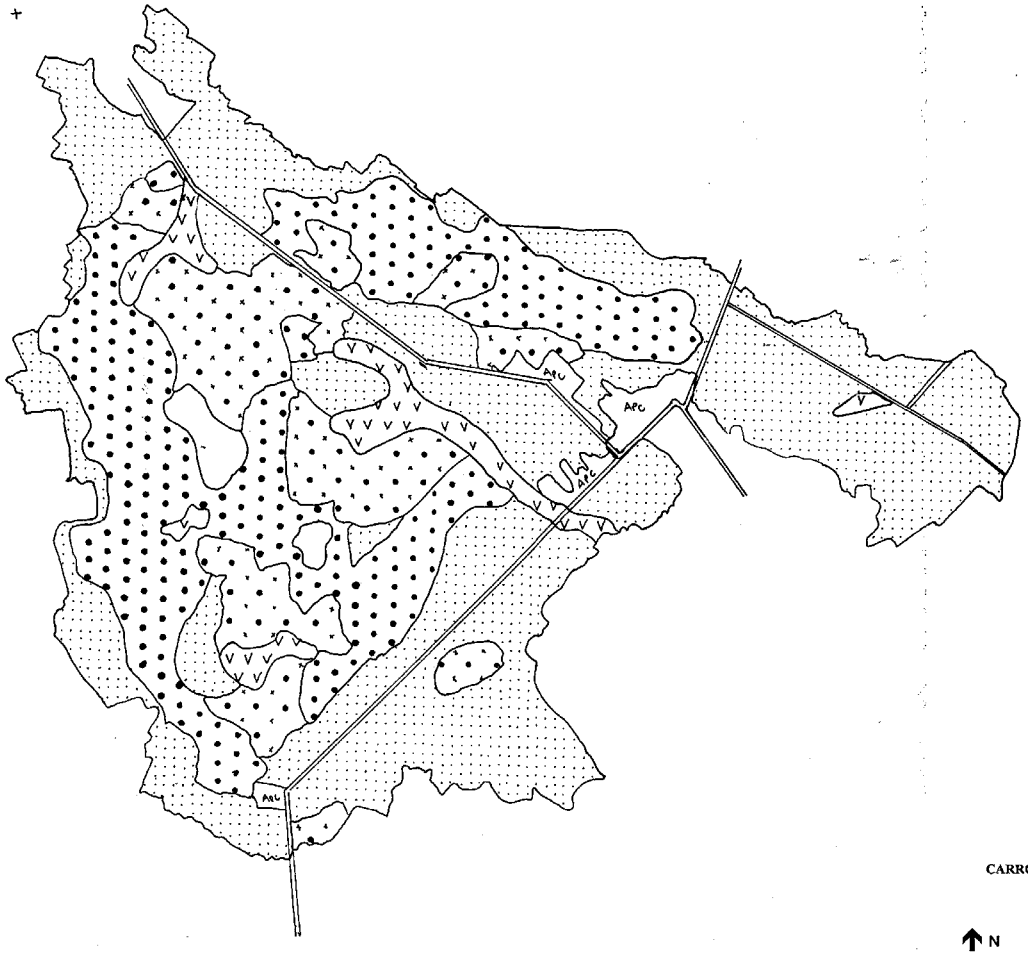

CARROWNAGAPPUL BOG, CO. GALWAY (1242).
ECOTOPE MAP (1:10,560)
1994

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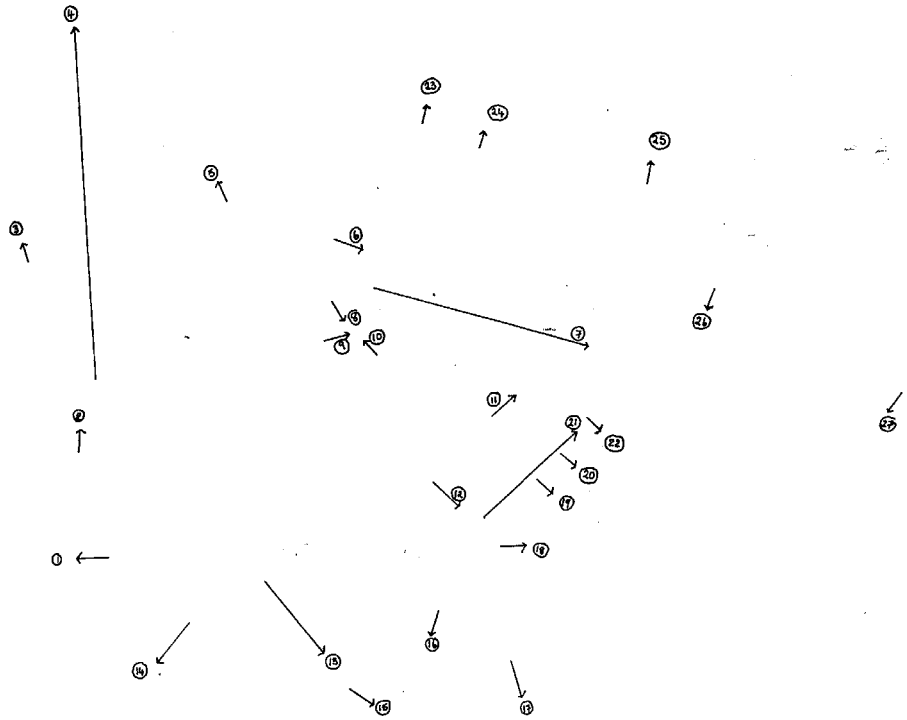

CARROWNAGAPPUL BOG, CO. GALWAY (1242).
SLOPES MAP (1:10,560)
1994

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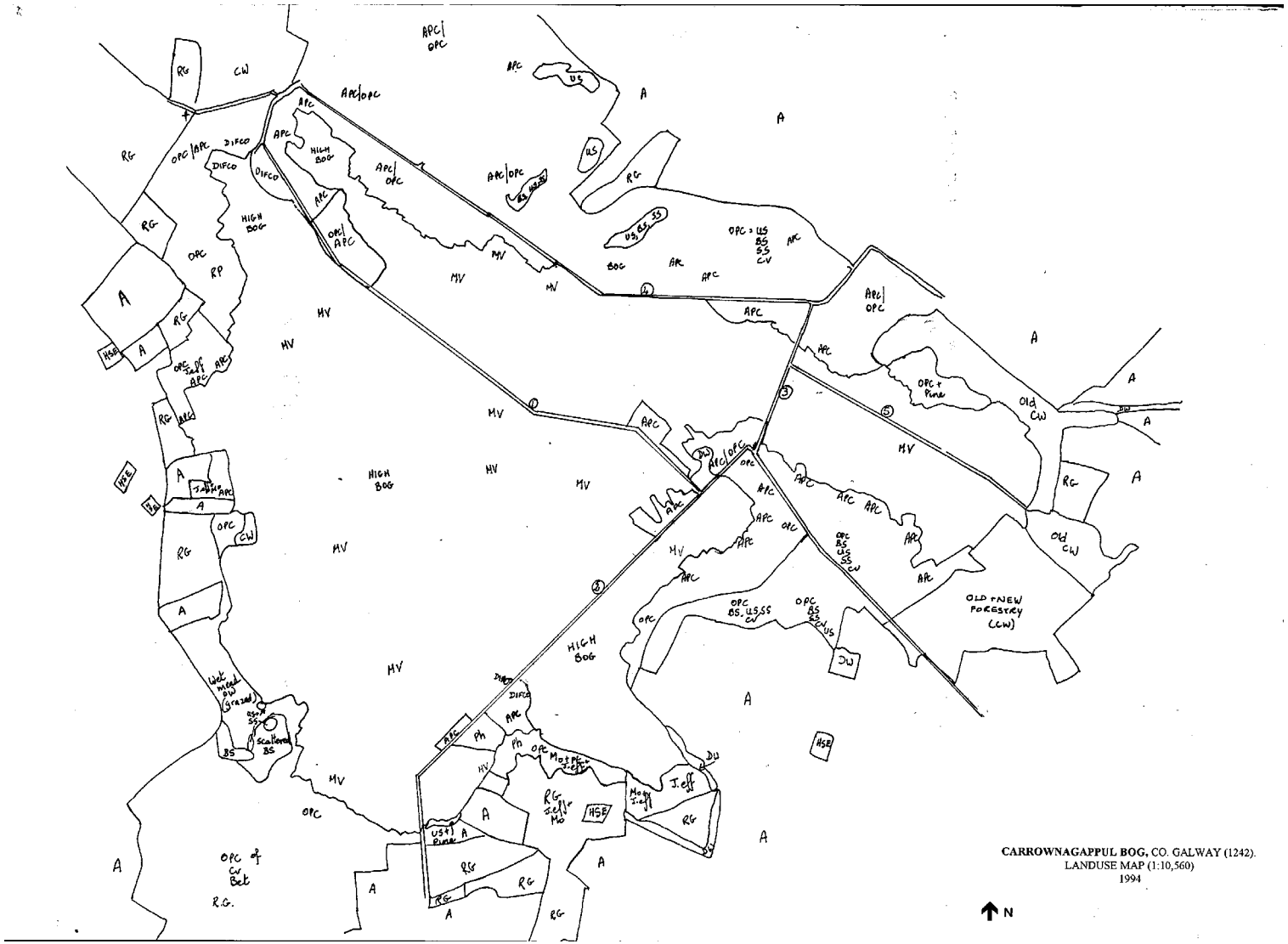


CARROWNAGAPPUL BOG, CO. GALWAY (1242).
LANDUSE MAP (1:10,560)
1994

CLOONCHAMBERS, CO. ROSCOMMON

1. SUMMARY OF SITE DETAILS

NHA No.	600	1/2" Sheet:	11/12
Grid Ref:	M 63 80	6" Sheet:	RN 26
GSI Aerial Photo:	M 88	1:25,000 Sheet:	14/27 NE
Other Photo:	OS 8182/83	Area (ha):	193.5 (High Bog)
NHA Photo:	664:12-23 & 665:1-7		
Date(s) of Visit:	3/4-10-1994 (Ecology)		
	3/4-10-1994 (Geohydrology)		

Townlands: Cloonchambers, Cloonconra, Leveelick and Cloonkeen.

2. INTRODUCTION

2.1 BACKGROUND

This site was visited in 1984 by Douglas and Mooney (1984) during the National Raised Bog Survey. They described it as a very variable site with some very wet areas and other very degraded sections. The main feature of interest was the large *Molinia* dominated flush which runs through the centre of the bog. The site was given a Bi rating. It was not included in the list of sites to form a raised bog NNR net-work compiled by Cross (1990).

This bog was also visited by the NHA survey team in 1993. They noted that the most significant peat cutting was occurring at the eastern side. Local people told them that the bog had not been burnt for about ten years (However recent burning was seen at the time of this survey). In addition they were told that part of the bog is owned by the Land Commission (no maps at HQ).

2.2 LOCATION AND ACCESS

Cloonchambers lies approximately 2km west of Castlerea, Co. Roscommon. The River Suck runs to the N of the bog and approaches close to the bog edge on the SW side. The Athlone to Westport railway line runs by the E and SE of the SE Lobe.

The site may be accessed from a bog road which runs along the northern edge.

3. METEOROLOGY

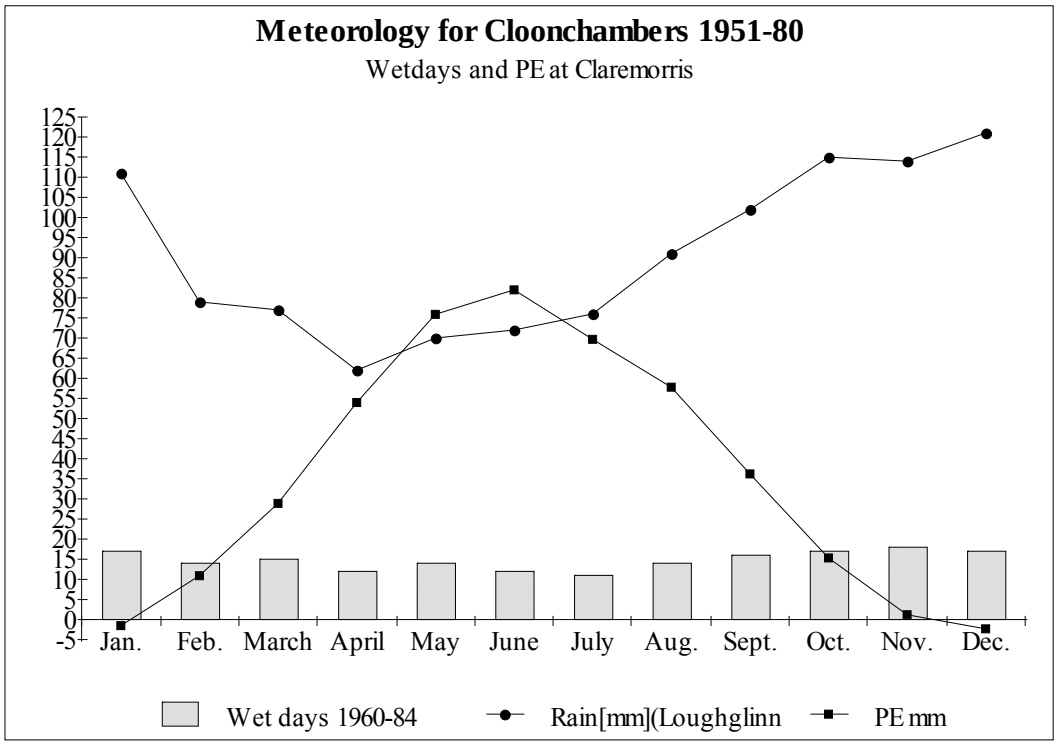
No meteorological measurements have been made on Cloonchambers bog. Rainfall data from the Loughglinn rainfall station for the years 1951-80 indicate that the area receives an average 1090mm of precipitation annually (Figure X).

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

The above factors suggest that the year round actual evapotranspiration (AE) from Cloonchambers Bog is greater than PE at Claremorris, site of the nearest synoptic station which had an average PE of 428.1mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Cloonchambers would therfore be greater than 428.1mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 662mm/yr.

Figure X



Meteorological data for Cloonchambers Bog (1951-1981) are summarised below:

Rainfall (P)	1090mm/yr
Actual Evapotranspiration, (AE)	>428.1mm/yr
Potential recharge, (PR)	<662mm/yr

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

This elongate bog consists of three lobes. The main section lies to the N along the crest of a drumlin. It is E/W trending and is approximately 3km long and 1.25km wide at its widest point. Two smaller lobes to the south are separated from the main lobe by an extensive flush in a central depression. The two southern lobes are separated from each other by a deep drain and another depression.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

At the macro scale this bog lies in a drumlin filled valley adjacent to the upper reaches of the River Suck.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

This area is probably underlain by cherty argillaceous bioclastic Carboniferous limestones (known as ABL). Yellow sandstone lies S/SE of the bog.

The ABL fossiliferous limestones generally have a low permeability and are classed as a poor aquifer.

5.1.2 Subsoils (See 6" 1840s Map)
No subsoils data were available for Cloonchambers bog apart from the initial 1840s GSI geology field sheets, and recent fieldwork.

Geology of Inorganic Subsoils
The Quaternary subsoil geology of this bog and surrounding area is dominated by stoney till with a silty matrix. Clayey tills lie in sections in drains to the north near the river.

5.1.3 Depth to Bedrock
Depth to rock on the bog is unknown.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology (See Drains and Hydrochemistry Map)
Very few high bog drains are seen at this site. However as this is a very elongate bog it suffers from marginal drainage effects over a large area. On the Main Lobe an old infilled drain is seen at the western edge and there is some small scale drainage to the E on the high bog.

The main drains are seen dividing the three lobes. These drains are shown on the 1910 6" sheet of the area. Some have been recently deepened. They carry water from the bog and from agricultural land (to the S and NW of the bog), towards the River Suck.

The drains at this site are described in more detail below.

Drain bA runs E/W at the W side of the Main Lobe. It is an extension of an old field boundary seen in the cut-away. It is old and infilled, mainly with *Sphagnum papillosum*.

Drain bB is a large drain which runs E/W between the Main Lobe and the two southern lobes, through Flush Y. It is 1m deep by 0.5m wide with a rapid flow of water to the W. It is surrounded by the vegetation of Flush Y (Section 6.2.2). The EC was 58 μS/cm at the time of the survey.

At the central section of the drain a luxuriant growth of *Molinia* occurs. Species noted in the drain included *Angelica, Juncus effusus, Sparganium erectum, Menyanthes, Equisetum fluviatile, Ranunculus flammula* and *Carex diandra* (EC 67 μS/cm). A rapid flow towards the W was still evident in this section. Towards the E end this drain is mainly infilled with tall *Calluna* and *Myrica* with some *Vaccinium myrtillus, Molinia, Potentilla palustris, Caltha, Cardamine* and *Succisa* (EC 63-104 μS/cm). Water was present in the drain at this point but no flow was detectable. Some small *Betula* are also seen and there are mounds of peat along the drain.

Drain bC runs N/S between the two southern lobes. It is 1.5m deep by 2m wide with rapid flow to the N into Drain bC1. It is mostly bare of vegetation. At the S side it is 2m deep by 3m wide on a peat base (EC 273 μS/cm). Where it runs through the fields at the south of the site *Glyceria* and *Sparganium erectum* are seen growing in it. Drain bC1 is the E/W section of this drain and looks like an extension of drain bB. It is 2m deep by 3m wide and till has been exposed in places (EC 146 μS/cm). *Glyceria* and *Ranunculus flammula* are seen growing in this drain but it is mostly bare of vegetation. It drains agricultural land to the S of the site. Water flows rapidly to the west and eventually reaches the River Suck. These two drains are shown as a double drains on the 1910 6" sheet of the site.

Drain bC2 is a short drain which runs N/S, N of drain bB and is 1m deep by 0.5m wide. It is old and *Potamogeton polygonifolius* is seen growing on the bottom. *Calluna* and *Molinia* grow along its edges. There is rapid water flow to the S into the junction of Drains bB, bC and bC1 (EC 88 μS/cm).

Drain bC3 is similar to bC2 but with less water flow.

Drain bD runs NNW/SSE on the northern edge of the SW Lobe. It has significant flow northwards into Drain bC1.

Drain bE runs E/W close to the northern edge of the SW Lobe. It divides the high bog vegetation from Complex 3/2 which has been recently burnt. The drain is old and infilled with *Narthecium, Calluna, Eriophorum angustifolium, Sphagnum cuspidatum, S. papillosum* and *S. magellanicum*. It is 0.5 m wide. At its western end it widens to 1.5m and *Molinia, Myrica* and *Betula* occur close by.

Drain bF runs SW/NE along the northern edge of the fields which have been partially developed on the mineral mound at the E end of Flush Y. It is shown on the 1910 6" sheet of the area. It is approximately 2m wide by 0.5m deep and is infilled with species such as *Juncus effusus, Molinia, Carex rostrata, Salix, Betula, Agrostis* sp.*, Sphagnum cuspidatum*, *Polytrichum alpestre*, *P. commune, Salix, Betula* and *Blechnum spicant*. No water flow was evident in the drain but water from the bog surface was flowing into the drain in places (EC 61 μS/cm).

Drain bG runs NNW/SSE across the narrowest section of the site between the mineral ridge at the E end of Flush Y and Mound 1. It is old, dry and infilled with *Eriophorum vaginatum, E. angustifolium* and *Calluna*.

Drain bH is a peat cutting bank and drain which extends right across the SE of the Main Lobe. Old difco peat cutting channels are evident on its northern bank.

Drain bJ is a short recent drain which runs parallel to the northern bog edge at the SE of the Main Lobe. It is 0.25m wide and 0.5m deep. It is un-vegetated and there is flow towards the N where it angles towards the bog edge. It is associated with active peat cutting.

Drain bK is another small drain in the same area as Drain bJ. It is 0.5m deep and 0.75m wide narrowing to 0.25m at its base. There is some flow to the ESE associated with the steep slope towards the active peat cutting.

Drain bM is seen at the east of the site running N/S along the edge of Flush YY. It is up to 1m wide in places and there is some flow towards the S. *Salix* and *Cardamine* were noted in the drain.

Drain bN runs parallel to Drain bM on the W side of Flush YY. Flow is seen to the S and N in this drain. At the S it flows into Drain bM.

Drain bO at the north of the Main Lobe, E of Mound 1, is 0.5m wide. It runs parallel to the bog edge with three arms to the N towards the bog edge. Water flow is seen in these arms. The remainder of the drain is mostly infilled with vegetation.

Drain bP runs N/S alongside an area of old peat cutting at the centre of the N of the Main Lobe. It is old and partly infilled with tall *Calluna* and *Myrica*. There is some flow northwards towards the bog edge.

5.2.2 Bog Margin Hydrology (See Drains and Hydrochemistry Map)

Main Lobe

West

The peat is thin to the west and there is no active peat cutting since the peat lies on a relatively permeable ridge that has been paludified. Generally the cut-away is wet but with no drains.

North/North West

This side is marked by flushes which run from the crest of the ridge to the road and drain mP. There is a gradation from the peat to flush to the edge of the bog. There are five small ridges of till which stand proud along the edge of the bog; one ridge is high and has *Quercus* growing on it. Flushes initiate at the ridges. Drain mG is 1x1m. Generally the faces are old and peat is thin; peat margins are partly original.

South East

There is extensive hopper-cutting here with deep cut-away drains as marked (mK). Drains bH move water into a swallow hole and drains have been deepened in their vicinity.

South West Lobe
North
Drain bC1 (bB) is 3m deep and 2.5m wide with good flows, and it lies in stoney till. The width of the drain increases westwards to the R. Suck. Peat along this N face is 0.5m high and poached in part particularly along the banks of the R. Suck, which is 1.5m blow the peat surface. There is some difco cutting to the west.

South
The boundary drain is deep and separates the steep sharp hill from the high bog. It is 1.75m deep and 2m wide, water was 15cm deep. Drain mD1 is an area of localised hopper-cutting but other than this there is limited cutting.

South West Lobe
South
This is the main area of active hopper-cutting and the main drain mE, moves water north via drain mC which cuts the two southern lobes in two. The faces in the south are up to 3.5m high and there was some exposure of sandstone till. Drain mE is 2m wide and 1.75m deep. At the very SE the faces are 4m high with substantial exposures of till.

East
This side has old faces no more than 1m high.

North
Drain bB marks the northern boundary of this lobe which runs E/W between the main lobe and the two southern lobes, through Flush Y.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map).

Main Lobe
West
The ECs of the cut-away are ~120µS/cm.
North/North West
Drain mG has an EC of 185µS/cm. Drains mK have ECs of ~165µS/cm.
South West Lobe
North
Drain bC1 had an EC of 150µS/cm at the intersection of drain bC3 and 282µS/cm nearer the R. Suck. The Suck had an EC of 315µS/cm.
South
The boundary drain mD, had relatively high ECs of ~350µS/cm with iron probably sourced from local groundwater and runoff from the mineral soil slopes. Drain mD1 had ECs ranging 128-270µS/cm.
South West Lobe
South
Drain mE has an EC of 120-280µS/cm.
East
This side has a stagnant drain with an EC of 211µS/cm.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
This bog lies on and between drumlins alongside the River Suck. This bog and surrounding uplands are the main regional recharge zone for groundwater.

Bog Regime
There are relatively few drains on the high bog but there are many drains in the cut-away particularly in the east and south.

Inter-relationship of topography hydrology and hydrogeology
Generally the ECs are ~150μS/cm along the margins of this bog apart from the south where local groundwater is upwelling at the break in slope of the drumlin. Most of the runoff water from the bog is believed to flow to the marginal drains and middle flush since the subsoils although of moderate permeability are believed to be paludified. Curious till ridges lie alongside the northern boundary of the bog. In most cases they are covered by thin peats. More investigation (coring) is needed to to understand their makeup and permeability.

6. VEGETATION

6.1 VEGETATION SUMMARY

Overall this site is rather dry and features only two areas of well developed hummocks and hollows/pools. The best example occurs in a depression on the SW Lobe (Complex 15) and covers an area of about 1.5ha. The other area occurs on the W of the Main Lobe (Complex 4/6/10 + Pools) where it covers approximately 2.5ha. The remainder of the site is covered by *Carex panicea* or *Narthecium* dominated communities. Localised wet patches occur but there are no other areas of well developed pools. Parts of the SE Lobe, where extensive *Narthecium* flats occur, are very soft underfoot but the *Sphagnum* cover is low.

The main features of interest of the site are the extensive flush which divides the Main Lobe from the southern lobes and the mineral mounds to the N of the Main Lobe.

The main flush (Flush Y) is dominated by *Molinia* with significant stands of *Phragmites* and *Juncus subnodulosus*. Close to the drain which runs through the flush species such as *Sparganium*, *Ranunculus flammula* and *Equisetum fluviatile* occur.

The mounds towards the W of the northern edge are mainly *Calluna* dominated with *Molinia* and in some cases *Phragmites* around their bases. The more easterly mound occurs in the centre of the bog and is wooded by *Quercus*. This mound is approximately 3m high. Other species noted were *Pteridium, Molinia, Vaccinium myrtillus, V. vitis-idaea* and *Lonicera*. All these mounds are probably associated with underlying till deposits.

The vegetation of the cut-away along the NNW of the main lobe is dominated by *Molinia* with regenerating peat and has been burnt. There are clumps of *Pteridium, Ulex* and *Calluna.* The facebank is quite shallow and there are some *Salix* and a *Crataegus* along it. To the WSW of this lobe there are some small plots dominated by *E. angustifolium* and *J. effusus* with facebanks up to 1.5m high. There is agricultural land beyond the track. Around the N of the SE lobe there is vegetation of the river flood plain, to the W the vegetation is dominated by *Calluna* and *Myrica* and to the S fields, used as rough grassland, and other fields dominated by *J. effusus* are seen. The river vegetation consists of *Nuphar, Potamogeton natans, Sparganium emersum, Hippuris, C. rostrata* and *Myosotis* (EC 313 μS/cm).

Between the SW and S Lobe and at the NE corner of the SW Lobe there is an area of grassland with species such as *Anthoxanthum odoratum*, *Poa* sp., *Filipendula*, *Rumex*, *Trifolium*, *Agrostis*, *Juncus effusus, Potentilla erecta, Galium, Plantago*, *Cirsium palustre*, *C. vulgare, Taraxacum, Hypochaeris, Ranunculus repens* and many others. There is also a tractor track through this area and growing on it are *Rumex, Anthoxanthum, Agrostis, Stellaria, P. erecta, Molinia, Festuca* and *J. effusus.* The ground is very hard. To the SE of the SE lobe there is an area dominated by *Phragmites.*

To the S of the S lobe there is active peat cutting close to the bog and there are some *Betula* and *Salix* with some rough grassland and agricultural land beyond. There is some Difco cutting also and the facebanks are up to 4m high. To the S of the main lobe NE of Flush Y there are some very old reclaimed fields now dominated by *E. vaginatum*, patches of *Agrostis, J. effusus, Calluna* and *Polytrichum commune.* Close to this area and to the S of the main lobe there are some very old areas of peat cutting with regenerating peat dominated by *E. angustifolium* with some large pools and very shallow facebanks (PM18:7).

The cut-away to the SW of the SE lobe is dominated by *Molinia* and to the SE of the SE Lobe it is dominated by *Molinia* and *Myrica* with *Juncus effusus*. *Salix* and *Calluna* grow along old drains. *Calluna* and *Ulex* dominate the old peat cutting banks.

To the NE of the main lobe the cut-away seems old and is dominated by regenerating peat and much *Calluna*.

6.2 DETAILED VEGETATION OF THE HIGH BOG

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (see Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1 + Erosion Channels (ER)

This complex is seen to the N of Flush Y and close to Complex 2/3+ EG. The *Calluna* dominates low ridges and is up to 50cm tall. Species recorded with it include *Agrostis, Anthoxanthum, Cerastium, Cynosurus* and *C. binervis.* There are wet patches between and at the base of the ridges dominated by *J. effusus* and *Molinia*. Complex 1 is also seen around the S edge of the S lobe.

Complex 1 is also seen in places around the site and Complex 1+*Myrica* occurs at the SE of the SE lobe.

Complex 2 + *Myrica*

This is at the W of the site W of Drain bC3 and is dominated by tall *Trichophorum* tussocks with some patches of *C. panicea* and *E. vaginatum.* There are pools between the tussocks and they are dominated by *E. angustifolium.* This complex is also seen to the N edge of the main lobe, E of a large area of old peat cutting.

Complex 2/3 RB (Recently Burnt)

This complex is seen at the NW edge of the Main Lobe. It has been recently burnt resulting in 60% bare peat with 25% tussocks of *Trichophorum* and 10% *Carex panicea* cover. The *Sphagnum* layer has been almost completely destroyed. The bog surface is hard. Some short re-growth of *Calluna* is occurring and *Huperzia selago* was seen. A small area of this complex is seen to the NW of the SW Lobe.

Complex 2/3

This marginal complex is seen to the W of the site N of Drain bC1 and is made up of 25% *Trichophorum* and *C. panicea* with some *Narthecium, Calluna* and *E. tetralix.* The *Calluna* cover is 35% and it is 20cm tall. The area is poached and there are surface water pools. There is up to 10% cover of *R. alba.* The *Sphagnum* cover is very low and consists mainly of *S. capillifolium* and *S. tenellum.* There is scattered *E. vaginatum* throughout the complex. The complex is also seen along the S edge of the main lobe where the surface is very slippy and also to the N of the main lobe.

Complex 2/3 with Erosion Gullies (+EG)

This is seen on the slope towards the S from the N side of Flush Y. Towards the east of the slope into Flush Y *Trichophorum* and *Carex panicea* dominate with erosion gullies leading into the flush. The surface is hard and slippy. Erosion channels with *Molinia* and 5-10% *Cladonia* cover are associated with this complex at the S of the main lobe.

Complex 2/3 + Erosion Channels (ER) is seen to the S of the Main Lobe where the channela are not as pronounced as in Complex 2/3 + EG.

Complex 2/3/6 + *Myrica*
This is seen to the N of the main lobe and is dominated by *Trichophorum,* C. panicea and *Narthecium* with *Myrica.* The complex is associated with Slopes 22 and 23 in an area where the peat is very shallow and there are mineral mounds around. The ground is harder than in Complex 2/6/3 + *Myrica* further E. There is a small area of Complex 2/3/6 without *Myrica*.

Complex 2/6
This complex is seen to the N of Flush Z at the W of the Main Lobe. The cover of *Trichophorum* is high with some *Narthecium* also present. Its occurrence is probably associated with the drainage effects of Drain bA.

Complex 2/7 +*Myrica* +Erosion Gullies (My+EG)
On the slope towards the S at the NW side of Flush Y is an area of much *Trichophorum*, *E. tetralix* and *Calluna* with *Myrica* occurs. These species dominate mounds between erosion gullies which lead into the flush. The mounds are hard, slippery and tussocky with a high algal cover. In the gullies *Narthecium* and *Carex panicea* dominate and *Molinia* is seen in some. Bare peat accounts for about 15% cover and *Cladonia floerkeana* is seen frequently.

Complex 2/6/3
This covers a small area of the SW Lobe. *Trichophorum* (35%), *Narthecium* (20%) and *Carex panicea* (5%) dominate with medium sized algal pools (occasionally with *S. cuspidatum*) and a lot of surface water. No large hummocks are seen but the area has not been burnt recently. The slope eastwards to the depression associated with Complex 15 may account for the occurrence of this complex in the centre of the lobe.

Complex 2/6/3 + *Myrica*
This is similar to the above with the addition of *Myrica*. It is found to the N of the main lobe and is associated with Slope 21.

Complexes 2/9/7 and 2/3/7
These are seen close to the N of Mound 2. *Molinia* leads out from the mound to the N forming two arms. The area is rather messed up due to peat cutting and burning and is generally of poor quality. *Trichophorum* is the dominant species and the surface is mostly hard.

Complex 3 Recently Burnt (RB)
This complex is seen at the W edge S of Drain bA. It consists of approximately 15% bare peat and is dominated by 80% *C. panicea* with 5% *Trichophorum*.

Complex 3/2
This marginal complex is seen to the N of the SW lobe N of Drain bE and is dominated by *C. panicea* and *Trichophorum*. The ground is very hard with little *Sphagnum* and there is encroaching *Molinia* along the N and W edges. The complex is also seen at the S edge of the SE lobe and to the S of the main lobe. *Huperzia* was seen in this complex to the N of the main lobe.

Complex 3/2 EC (Erosion Channels)
This marginal complex is seen at the NE corner of the SW Lobe. *Carex panicea* and *Trichophorum* dominate mounds between deep erosion channels which are colonised by *Rhynchospora alba*. *Sphagnum* species are mostly absent apart from around the edges of erosion channels. The surface is hard, tussocky and slippy. Some *Racomitrium* occurs and *Myrica* is seen close to the bog edge. Water from the depression in which Complex 15 is located may exit through this area and then into Drain bC1.

Complex 3/2 + Myrica (*My*)
An area dominated by *Carex panicea* and *Trichophorum* with *Myrica* is seen at the west side of the SW Lobe. It is a marginal complex with a low *Sphagnum* cover and hard surface. There are some erosion channels/gullies at the edge lined with *Molinia* and *Myrica* and there is much surface water run-off. There are some small pools with *S. cuspidatum, S. capillifolium* and *S. tenellum.*

The *Calluna* cover is 30% and it is up to 20cm tall. *Huperzia* and *Racomitrium* area seen.
This complex is also seen to the N of the main lobe.

Complex 3/2 Recently Burnt (RB)
A section of the SE of the SW lobe and SW of the SE lobe has recently been burnt and is dominated by *Carex panicea* and *Trichophorum* with bare peat. There is active peat cutting in the vicinity and the fire originated there. There is some *Phragmites* encroaching on to the bog in this area.

Complex 3/4/2
This is a marginal complex seen to the SW of the SW lobe and is dominated by *C. panicea, R. alba* erosion channels and tussocks of *Trichophorum* which increase at the edge of the complex. *Molinia* is encroaching into the complex from the cut-away.

Complex 3/2/7
Between Mound 2 and the mineral ridge to the S of the mid-section of the Main Lobe there is an area dominated by *Carex panicea* (40%), *Trichophorum* (30%) and *Calluna* (20%, 25cm tall) with occasional patches of *Narthecium*. The whole area is very hard, tussocky and slippery (algal cover 60%) with a lot of surface water. Some *Sphagnum* is seen in wet hollows (5%). Where this complex occurs at the S edge of this lobe there is a high cover of *E. angustifolium.*

A pattern is apparent on the aerial photograph within this complex. It appears that slumping or cracking of the bog surface has occurred associated with Slope 14. This has resulted in a series of shallow (10cm deep) E/W trending hollows and ridges. *Trichophorum* and *Calluna* dominate the ridges with *Carex panicea* between.

Complex 3/2/6
This is seen on the E side of the SW Lobe. *Carex panicea* (30%), *Trichophorum* (20%) and *Narthecium* (10%) are dominant with *Calluna* (15%) also important. The area has a very uniform micro-topography. The *Sphagnum* cover is low (10%) consisting mainly of *S. tenellum* and *S. capillifolium*. The ground is hard and there is a lot of water lying on the surface.

Complex 3/2/6+*Myrica* is seen N of Drain M2.

Complex 3/2/9
This is seen in the same general area as Complex 3/2/7, slightly to the E, where *E. vaginatum* cover increases (20%) and the *Calluna* cover drops to about 10%. Otherwise it is very similar. The increase in *E. vaginatum* cover may be associated with the closeness to mineral soil as peat in this area is probably only forming a thin layer. *Aulacomnium palustre* also occurs suggesting some enrichment. The complex is also seen at the S edge of the main lobe between two areas of old cut-away. The surface is very uneven with small, old cut-away banks scattered throughout. *E. angustifolium* is growing in pit areas and there is some *Sphagnum* regeneration.

Complex 3/2/9 + *Myrica* (My)
This is similar to Complex 3/2/9 with the addition of *Myrica* (40% cover and approximately 50cm high).
Complex 3/6
This is seen along the N bog edge at the E of the Main Lobe. *Carex panicea* and *Narthecium* dominate with some tear pools (occasionally containing *S. cuspidatum* and *Menyanthes*). These are orientated parallel to the bog edge. There is an increase in *C. panicea* and erosion channels nearer the bog edge.

Complex 3/6RB can be seen close to the W side of Drain M2 along the N bog edge.

Complex 3/6 + *Myrica* (*My*)
This is similar to the above complex with the addition of surface water and abundant *Myrica*. It occurs to the N of the main lobe.

Complex 3/9/6 RB + *My* (Recently burnt + *Myrica*)
To the N of Mound 2 an area of *Carex panicea, E. angustifolium* and *Narthecium* vegetation occurs which has been recently burnt. The *Sphagnum* cover was moderate but has now been more or less destroyed. Regeneration may be possible in places. *Myrica* occurs in this complex.

Complex 7/9/2
This complex is seen to the S of the main lobe and is dominated by *Calluna* and *E. angustifolium*, especially near Drain bF, with *Trichophorum* tussocks. The *Calluna* is up to 25cm tall. There is little *Sphagnum* and the ground is hard and slippy. there is a lot of surface water and some *Cladonia.*

Complex 6/3/2
Narthecium, Carex panicea and *Trichophorum* (15%) dominated vegetation is seen between Flush Y and its southern arm (Y1). *Eriophorum angustifolium* is common and scattered throughout. It is also seen on the N slope into the E end of Flush Y. The bog surface is quite hard in this area and the *Sphagnum* cover is very low (5%). The complex is also seen to the S of the main lobe where there is bare peat and erosion channels. Close to complex 4/6 + Pools at the N edge of the main bog Complex 6/3/2 with pools occurs. The pools are steep sided and bare with *C. atrovirens* at the edges. This complex is also seen further W along the N edge of the main lobe where *Racomitrium* occurs.

Complex 6/3/2 + *Myrica* (My)
This is similar to the above complex. It is seen to the N of the Main Lobe, just E of a large area of old peat cutting. Small amounts of *Sphagnum* occur and water is lying on the top layer but the surface is not soft. *Calluna* (40cm) and *Myrica* (50cm tall) are common. This complex occurs on a slope to the SE which may explain the presence of *Myrica*. The complex also occurs at the N edge to the E of this.

Complex 6/3
This complex, which is dominated by *Narthecium* and *Carex panicea* communities, is seen in a number of places on this site. At the NW side of the Main Lobe the total *Sphagnum* cover is quite low and the bog surface is mostly not very soft. The microtopography is fairly uniform with very little *Calluna* and very few hummocks. Occasionally linear pools occur which are possibly present as a result of tearing. These sometimes support *Sphagnum cuspidatum, Menyanthes* and *Eriophorum angustifolium*. On the slope towards Flush Y the frequency of pools reaches about 10%. Some surface water is seen lying in algal hollows. Towards the NW corner *Rhynchospora alba* cover is high. To the SE of the Main Lobe patches where *Carex panicea* dominates occur. Tall *Calluna* and the occurrence of *Cladonia portentosa* suggest no recent burning history in this area.

Where this complex occurs on the SW Lobe there are few pools (*R. fusca* seen in some) but the surface is a little soft in places. Two *Calluna* and *Phragmites* mounds are seen in this complex on the SW Lobe. They are approximately 0.75-1m high. The *Phragmites* is short and spindly but has flowered. *Hypnum jutlandicum* dominates the bryophyte layer with *Aulacomnium palustre* also present. *Carex panicea* cover increase close to these mounds and to the N in this area where the complex is associated with Drain bE. Bare peat erosion channels and some *C. introflexus* are also present. *Racomitrium* was seen.

On the W side of the SE Lobe frequent small algal pools occur. Towards the NW these algal pools are lager and more linear (E/W orientation). Some contain *S. cuspidatum*. The *Calluna* in this area reaches 40cm in height. There is a very small amount of *Cladonia* present. At the E of this lobe *Racomitrium* and *S. imbricatum* were recorded.

On the plateau of the SE Lobe the *Narthecium* lawns are large and soft and *Menyanthes* is seen scattered through some lawns. Occasional shallow *S. cuspidatum* pools/lawns occur and *S. imbricatum* hummocks with *Aulacomnium palustre* and *Empetrum* were noted. This area is the highest quality example of this complex on the site.

Complex 6/3 +*Myrica* (*My*)
This is seen to the S of Flush Z. It is similar to Complex 6/3 with the addition of 25% *Myrica* (short bushes). This area is on a slope towards Flush Y and the occurrence of *Myrica* may be related to enhanced lateral water flow. This complex also occurs around Flush Y, in a N/S band on its eastern side (not mapped), at the centre of the northern edge of the Main Lobe and at the W margin of the SW Lobe. The latter area had a high cover of *Erica tetralix* and very little *Calluna* suggesting recent burning. The *Sphagnum* cover is generally low in this complex and the surface is not soft. It is also seen to the SE of Flush ZZ at the E of the site. *Myrica* cover is approximately 10% with a patchy distribution. In places it could be considered to be a marginal community.

Sub-Marginal Complexes
Complex 6/3/9
This is seen at the centre of the SE Lobe. *Narthecium* and *Carex panicea* dominate with abundant *E. vaginatum* (15%). The total *Sphagnum* cover is approximately 15%, consisting mainly of S. capillifolium. There are no pools in this complex. The *Cladonia portentosa* cover ranges from 5-10%. The bog surface is not soft within this complex. Where the complex occurs close to the SE corner of this lobe the *Calluna* is up to 60cm tall and there is some *Myrica* present. Where the complex occurs to the N of the SE lobe near the junction of Flush X and Drain bB, *Empetrum, Aulacomnium* and *S. imbricatum* are seen. Another small patch occurs to the S of the main lobe.

Complex 6/2/7
This is seen to the SW side of Mound 1 to the E of the Main Lobe. On the slope towards the mound *Narthecium* cover is approximately 25% with some small algal hollows. It is similar to Complex 3/2/7 except that the *Carex panicea* cover is low and is replaced by *Narthecium*. It is also wetter but the *Sphagnum* cover is still low.

Complex 4/6
This is sen in the vicinity of the wooded Mound 1 at the E of the Main Lobe. Soft *R. alba* lawns (40%) and *Narthecium* flats (25%) dominate with *Calluna* and *Carex panicea* on hummocks between. and some algal hollows (15%). The *Sphagnum* cover is low and there is a lot of algal cover and surface water. *S. cuspidatum* is seen in some hollows. Close to the mound the cover of *Carex panicea* increases forming patches. 4/6 + *Myrica* is very similar with the addition of *Myrica*. The distribution of *Myrica* in this area is generally patchy.

Complex 4/6 + Pools
This is seen to the NE of Mound 1. *Rhynchospora alba* and *Narthecium* dominate with tear pools which have a NNW/SSE orientation. There is a slope to the SE. The pools contain *S. cuspidatum* and *Menyanthes* with some totally algal pools. *Campylopus atrovirens* is seen at some pool edges. Bits of *Carex panicea* also occur. The area was probably burnt in the past as patches of bare peat are seen and *Campylopus introflexus* occurs. The *Sphagnum* cover is low on the inter-pool areas and there is a lot of water lying on the bog surface.

Complex 6/2 Recently Burnt (RB)
This is seen at the W of the N edge of the Main Lobe, close to the bog edge. *Narthecium* cover is high (50%) with 15% *Trichophorum*. The surface is soft with a moderate *Sphagnum* cover but most of the Sphagna have been badly burnt. Some bits of healthy *S. capillifolium* remain. *Leucobryum* and *Andromeda* were noted. Small algal hollows make up approximately 5% of the community cover. Some of these hollows are colonised by *Menyanthes*.
Complex 6/3 + Pools (P)
This complex is seen to the W of Complex 15/6 on the SW Lobe and to the SE of Flush Y1. It is dominated by *Narthecium* and *Carex panicea*. On the SW Lobe 15% *S. cuspidatum* pools occur with some algal pools. The surface is soft although the *Sphagnum* cover is low in the inter-pool areas (10-15%). Some *S. imbricatum* is seen and *Dicranum scoparium* was noted on a few hummocks.

The area to the SE of Flush Y1 is similar. The surface is soft and some large *S. imbricatum* hummocks occur. The *Calluna* is 30cm high and bits of *Cladonia portentosa* occur indicating that the area has probably not been burnt recently. *E. vaginatum* cover is quite high here.

Complex 6/3 B
This is similar to complex 6/3. It is seen to the SE of Mound 1 (wooded). *Erica tetralix* is abundant, *Calluna* is short and *Campylopus introflexus* occurs frequently indicating a recent fire history. However this burn occurred at least 4 years ago. The bog surface is soft and there is much water lying on the surface. Occasional shallow *S. cuspidatum* pools occur. There is very little microtopographical variation.

Complex 6/3 RB
In the vicinity of Flush Z and in a wide band to the east a section of Complex 6/3 occurs which has been recently burnt. Close to Flush Z the bog surface is soft with a high *Sphagnum* cover (25%). However much of the *Sphagnum* layer appears to have been destroyed although it may regenerate. Some *Menyanthes* is seen scattered through the *Sphagnum* lawns. *Calluna* growth is very short reflecting the recent burn. To the E the appearance of this complex is similar. The fire appears to have caused an increase in the cover of *Carex panicea* and *Eriophorum angustifolium*. Due to the short *Calluna* the whole area has a very uniform appearance and as there are no real hummocks there is little micro-topographical variation (PM18:6).

Complex 6+*Myrica* (My)
This is seen along the S side of the SW Lobe. It is dominated by *Narthecium* lawns (35%) with tall *Calluna* (40cm) and abundant *Myrica* (40%). The bog surface is soft but there is only a low *Sphagnum* cover. The area has not been burnt for some time. Occasional algal pools occur and a patch of *Molinia* was noted. There is generally very little *Carex panicea* in this complex. A number of *Calluna* (Complex 1) dominated mounds and patches of encroaching *Molinia* are seen to the SW of this complex.

Complex 6
This is seen at the junction of Drain bB and Flush Y and is very soft and wet. It is dominated by *Narthecium* lawns (up to 70%). Water from the mound lodges in the area and is prevented from escaping as there is a mound along the N side of Drain bB. Pools with *Potamogeton polygonifolius* were seen.

Complex 6 Recently Burnt (RB)
This is seen in the same area as Complex 6/2 RB but not in such marginal positions. The *Trichophorum* cover is lower and shallow pools with *S. cuspidatum* and *Menyanthes* occur. The *Narthecium* lawns are very soft and quaking. The Sphagna are in poor shape due to burning. *S. fuscum* was seen in this complex.

Complex 9 Recently Burnt (RB) and Complex 9
This is an area dominated by *E. angustifolium* and *E. vaginatum* with *Aulacomnium* which has been recently burnt. It is seen to the S of the Main Lobe on the W side close to Flush Y. It occurs on the slope into Flush Y on a line with the *Phragmites* mound to the W and a ridge slightly to the SE. A lot of surface water flows through it. It appears as though there was a good *Sphagnum* layer present but this has been burnt. There is some *C. panicea* and abundant young *Calluna* now growing. There may have been Complex 9/7 present before the burning event. *Andromeda* and *Polytrichum alpestre* were recorded.

A small area dominated by *E. angustifolium* which has not been recently burnt (Complex 9) is also seen, slightly to the E of Complex 9RB.

Complex 7/9/3 +Cladonia (Cl)
This is seen to the E (PM18:2) and N of the SE Lobe. *Calluna* (50cm tall in places), *E. vaginatum, E. angustifolium* and *Carex panicea* dominate with 20% *Cladonia portentosa* cover. *Cladonia* cover increases closer to Drain bB. Patches of *Racomitrium* occur. *Empetrum* and *Aulacomnium palustre* are seen to the N. This complex is possibly associated with Flush Y. The *Sphagnum* cover is 20% with tall *S. capillifolium* hummocks, *S. papillosum, S. subnitens* and *S. tenellum.* Another patch of this complex occurs to the SW of Flush ZZ and is probably associated with it. There is less *Cladonia* (5%) and the *Calluna* cover is 30% reaching 40-50cm tall.

Complex 7/9/3 + *Myrica* (*My*)
This complex is similar to above and a small area of it is seen at the S bog edge of the main lobe. It is associated with the slope where Flush ZZ exits the bog.

Complex 9/7
This complex, dominated by *E. angustifolium, E. vaginatum* and *Calluna*, is seen in a line leading from the N side of Mound 1 and is associated with a small *Calluna* ridge attached to the mound. The *Sphagnum* cover is moderate and includes *S. cuspidatum* and *S. capillifolium*. Some past burning has occurred as old *Calluna* stems are present. *Juncus effusus* and *Aulacomnium* occur suggesting some enrichment.

Sub-Central Complex
Complex 6/4/10 + Pools (P)
This complex is very wet with extensive soft and quaking *Narthecium* flats (50%) (PM18:5). *R. alba* is frequent (15%) and shallow pools (15%) with *S. cuspidatum, Drosera anglica, Menyanthes* and *S. auriculatum* occur. Low wide hummocks with *S. imbricatum, Polytrichum alpestre, Dicranum, Vaccinium oxycoccus* and *Cladonia portentosa* occur. Some *Campylopus introflexus* also occurs suggesting a fire history. The total *Sphagnum* cover is 25%, mostly *S. cuspidatum* in the pools with 10% *S. papillosum* and 5% *S. capillifolium*. *Aulacomnium palustre* was also noted. The surface is very soft in this complex.

Central Complex
Complex 15/6
This is the wettest complex seen at this site. It covers an area of about 1.5ha to the NE of the SW Lobe. It is located in a depression which is approximately 0.5m lower than the surrounding area. *Sphagnum cuspidatum* pools predominate (40%) with very healthy growth. *Menyanthes, E. angustifolium* and *Drosera anglica* occur in the pools with *S. papillosum* around the edges. The pools are more or less linear and E/W trending. The total *Sphagnum* cover is high (50%) but is mostly *S. cuspidatum* with *S. capillifolium* (10%) and *S. papillosum* (10%).

The inter-pool areas are dominated by *Calluna, Narthecium* (15%), *E. vaginatum, Carex panicea* (5%) and *S. capillifolium* and are not very soft.

6.2.2 Flushes
Flush Z is an area of *Phragmites* and *Myrica* which is seen at the west of the Main Lobe, just S of Drain bA. The area had been recently burnt and the *Sphagnum* layer was damaged. The flush occurs on the top of the ridge which slopes southwards towards Flush Y. The peat layer may be shallow at this point.

Flush Y is the main feature of the site. It is a large, mainly *Molinia* dominated, flush which separates the Main Lobe from the two southern lobes. Most of the flush is located in a depression with steep slopes to the N. At its eastern end a mineral ridge juts into the bog and there is field development with *Ulex* hedges in this area (PM18:2-4). A drain (Drain bB) runs right through the flush and there is rapid water flow in this to the W, flowing eventually into the River Suck. Before reaching the river Drain bB has a recently deepened section which is now Drain bC. Complex 2+ *Molinia/Myrica* and erosion gullies and Complex 2/3 +erosion gullies are seen along the slopes to the N edge of the flush with surface water flow to the S into the main flush channel.

At the base of the mound and close to Complex 1+ Erosion Channels to the N of the flush there is a wet area with *C. nigra, C. echinata, C. pulicharis, J. effusus, J. bulbosus, Succisa, S. recurvum, P. alpestre, Cirsium palustre, Schoenus, P. commune* and *Pleurozium schreberi.*

As the depression flattens out *Molinia* dominates with *Myrica* and *Potentilla erecta*. Close to Drain bB other species such as *Rubus, Salix, Juncus effusus, Succisa, Pteridium, Hypochaeris, Equisetum fluviatile* and *Carex echinata* are seen.

In the central section of Drain bB, where Fe staining is noticeable (EC 67 µS/cm), *Sparganium, Angelica, Mentha, Ranunculus flammula, Carex rostrata* and *C. diandra* were also noted. To the N of the drain in this area, *Carex rostrata* and *Menyanthes* are seen scattered through the *Molinia* in small Fe stained pits. *Carex echinata* is very common here and *Dactylorhiza* was also noted. Surface water appears to be flowing through the area.

South of the drain a line of *Calluna, E. vaginatum* and *E. angustifolium* leads into the *Molinia* dominated area.

At the E side of the flush N of Drain bB, *Phragmites* is seen at the base of the slope and extends northwards up the slope in places. The ground is very wet and soft with tall *Molinia* tussocks and abundant *Juncus subnodulosus*. Additional species seen at the E end of Flush Y are *Polygala vulgaris, Cirsium dissectum, C. palustre, Carex pulicharis, C. echinata, J. conglomeratus, Schoenus nigricans, Triglochin, R. flammula, Plantago, Menyanthes, Polytrichum commune* and *Sphagnum recurvum* var. *tenue*. These species all occur close to where the mineral ridge juts into the bog and where fields have been partly developed.

Carex paniculata was recorded both by Douglas and Mooney (1984) and the NHA Survey team in 1993. It was not seen during this survey although looked for particularly.

The southern arm of Flush Y (Y1) extends NW/SE close to the west side of the SE Lobe. It is dominated by *Molinia* and *Myrica* with some *Betula* scrub, *P. erecta* and *P. vulgaris.*

Flush X is a small area at the SE side of the SW Lobe. *Phragmites* and *Molinia* dominate with *Narthecium, Calluna, Erica tetralix, Polygala vulgaris* and *S. capillifolium*. *Phragmites* and *Molinia* are also seen in the cut-away close to the high bog edge (facebank 0.75m). Close to the bog edge recent burning has occurred approximately 3 years ago. An arm of the flush, dominated by *Molinia* and *Myrica* extends northeastwards.

Flush ZZ is a linear feature seen running NE/SW across the bog to the E. It is dominated by *Molinia* and *Myrica* with *Potentilla erecta*, *Calluna* and *Erica tetralix*.

Flush YY is close to Flush ZZ and is parallel to it. It separates the SSE end of the main bog from the main bog and active peat cutting is carried out along it. It is dominated by tall *Molinia* tussocks with *P. erecta* and is drained. There is an old drain running through it which is up to 1m wide with *J. effusus, J. conglomeratus, Succisa, Cardamine* and *Salix*.

6.2.3 Mounds

Mound 1 is a wooded mound (probably till) seen in the centre of the high bog towards the east of the site. It is approximately 3m high with the flanks dominated by *Calluna* (20cm) with much *Campylopus introflexus* indicating burning. *Pteridium, Molinia* and *Quercus* (burnt stems) are seen closer to the top. One *Quercus* is approximately 4m high and has a spreading bushy form. Epiphytic lichens, both crustose and foliose are seen on this tree indicating that it escaped recent burning. Other species noted on this mineral mound included *Vaccinium vitis-idaea, V. myrtillus, Hedera helix, Rubus, Lonicera, Brachypodium sylvaticum, Succisa, Galium* sp., *Potentilla erecta, Sorbus, Quercus* seedlings (several), *Calliergon cuspidatum, Aulacomnium palustre* and *Polytrichum alpestre*.

Mound 2 is seen to the N of the site at the centre of the northern edge of the Main Lobe. Around the edges of the mound *Myrica, Molinia, Juncus effusus, Calluna, Potentilla erecta, Succisa* and *Polygala vulgaris* are seen. At the NW side a patch of *Phragmites* occurs with other species such as *Myrica, Molinia, Succisa, Cirsium dissectum* and *Schoenus nigricans*. On the mound itself *Calluna* is abundant (20cm tall) with scattered *Molinia, Salix* and *Quercus* saplings.

Mound 3 has been very recently burnt and is mostly covered by bare peat with some *Calluna* and *Molinia* re-growth.

Mound 4 has also been burnt and there is much bare peat.

Mound 5 is the smallest mound and is partly surrounded by recently burnt *Molinia* and some *J. effusus.* Close to the NNE side of the mound there is a small pit with *P. palustris*, deep *Molinia* tussocks and 30cm of water. The mound itself has been burnt. There is an old roadway/track through the mound which is lined with a wall at the N edge. The roadway/track is an extension of a marginal drain. It is shown as a small field on the 1910 6" sheet (PM18:8).

7. BOG TYPE

This bog has been classified as a Ridge Basin bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes (See Slopes Map)

A number of slopes were estimated in the field. These were noted in marginal areas and also internally. The slopes are described below.

Slope 1 This slope at the NW of the site is to the W into an area of old peat cutting which is dominated by *E. angustifolium* and is 0.5m over 100m. The facebanks are up to 1.5m tall.

Slope 2 At the western side of the Main Lobe, the slope southwards from Flush Z towards Flush Y (central depression) is 2.5 m over 200 m.

Slope 3 On the SW Lobe, the slope from the west into the depression where Complex 15 occurs, is 0.5 m over 100 m.

Slope 4 This slope at the N of the SW lobe is to the N and is 0.5m over 30m to an area of old peat cutting. The facebanks are up to 1m tall.

Slope 5 This slope is to the N of the SW lobe to the bog edge and is 1m over 50m to old cut-away dominated by *J. effusus*. There are very shallow facebanks < 0.5m with erosion channels in Complex 3/2 + *Myrica*.

Slope 6 At the W side of the SW Lobe, the slope westwards into cut-away and active difco cutting, is 0.75m over 50m.

Slope 7 This slope is to the S of the SW lobe and is 0.5m over 50m to old cut-away dominated by *Molinia* with patches of *Myrica* and *Agrostis.*

Slope 8 At the centre of the SE Lobe there is a crescent shaped ridge which runs roughly N/S. At the base of the slope to the W, Complex 6/3 with pools occurs. The slope is 1m over 50m.

Slope 9 From the same ridge, the slope to the NNW towards the confluence of Drains bB and bC complex, is 2.5m over 500m.

Slope 10 This slope at the S of the site is 0.5m over 50m into an area of old peat cutting dominated by *J. effusus*. The facebanks are up 1.5m tall.

Slope 11 This slope is also at the S of the site and is 0.5m over 20m into an area of active peat cutting with cracking and slumping. Complex 3/2 is associated with the slope. The facebanks are up to 3.5m tall.

Slope 12 At the SE of the SE Lobe the slope at the margin, southeast towards old cut-away is 0.25m over 30m.

Slope 13 This is at the centre of the site and is SW from a ridge into Flush Y and is 1.5m over 100m. There are erosion channels at the base of the ridge which are associated with the slope.

Slope 14 At the centre of the Main Lobe, the slope to the NNW towards Mound 1 is 0.25m over 50m.

Slope 15 From the same point at the centre of the Main Lobe, the slope to the NNE edge is 3m over 500m.

Slope 16 The slope towards the railway line at the extreme SE of the Main Lobe is 0.5m over 40m.

Slope 17 Also at the SE of the Main Lobe, the slope eastwards into active peat cutting (facebanks 3-4m high) is 1m over 30m.

Slope 18 North of the wooded mound on the east of the Main Lobe, the slope to the SE into the S end of Drain bH is 2.5m over 300m.

Slope 19 This is at the NE edge of the bog and is 0.5m over 50m to an area of active peat cutting (Difco). The facebanks are < 1m.

Slope 20 This slope is to the N at the N edge of the bog and is 0.5m over 20m into a marginal drain. Complex 6/3 + *Myrica* is associated with this.

Slope 21 This slope is also to the N at the N edge of the site and is 1m over 100m through Complex 2/6/3. There is no facebank complex.

Slope 22 This slope is also at the N edge of the bog. It is 1m over 30m to the E through Complex 1 + *Myrica.*

Slope 23 The slope to the NNW, in the area N of Mound 1, towards the bog edge is 4m over 300m.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

There are not very many drains around this site except the substantial Drains bC and Drain bB which have significant flow off the bog. Peat cutting is mainly concentrated where these drains exit the bog at the W and SW and along the ENE of the site.

There is much Difco cutting around this site mostly on the high bog; on the high bog to the W of the northern edge where the facebank is up to 1.5m high; along the W of the main lobe; at the junction of Drain bB and bC2; in the SW corner of the SW lobe; to the S of Drain bC1; to the SE of the SW lobe where facebank height varies from 1.5m to 4m as there is also Hopper cutting in the area; to the S of the S lobe in association with Slope 11 where there is severe slumping; on the ENE of the SE lobe and along the E side of the N edge where it is extensive in places.

Hopper cutting is carried out between the SW and S lobes where Difco cutting is also carried out and the facebanks are up to 4m; in association with Slope 11 where they are a similar height but are more shallow at the E of this edge; to the S of the main lobe old hand cutting was carried out and the facebanks are <1m; to the ENE of the SE lobe it is up to 4m tall reducing to the N and there is stacked turf; the facebanks along the E of the northern edge are fairly shallow increasing to 2m in the vicinity of Slope 20.

8.2.2 Dumping

Some cars are dumped along the west and north western edges.

8.2.3 Poaching

There is some poaching by cattle along the west of the northern edge though it is not severe.

8.2.4 Fire History

Douglas and Mooney (1984) state that the eastern section of the site was burnt in 1983 and part of the southern section in 1984. The western end had not been burnt for approximately 15 years. The NHA report (November, 1993) mentions that local information was that the bog had not been burnt for about 10 years.

However when the site was visited during this survey recent burning was seen at the NW edge of the Main Lobe (Complexes 2/3RB, 6/2RB and 6RB) and a large strip across the NW section (Complex 6/3RB). Damage to the *Sphagnum* layer was severe in places. There were also small areas of recent burning to the SE of the SW Lobe and at the E of the Main Lobe. In all cases it appears that burning spread from the adjacent cut-away.

8.2.5 Agricultural Improvements

Fields have been developed on the mineral ridge at the east end of Flush Y in the past. These appear to have been abandoned now and *Ulex* is spreading.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. The Main Lobe of this bog lies on a drumlin ridge and therefore the peat layer is quite thin. This is reflected in the vegetation which is more typical of marginal dry situations.

2. The large flush which separates the Main Lobe from the two southern lobes lies at the base of the drumlin ridge. Mineral richer waters are asociated with the flush. This originate from the drumlin.

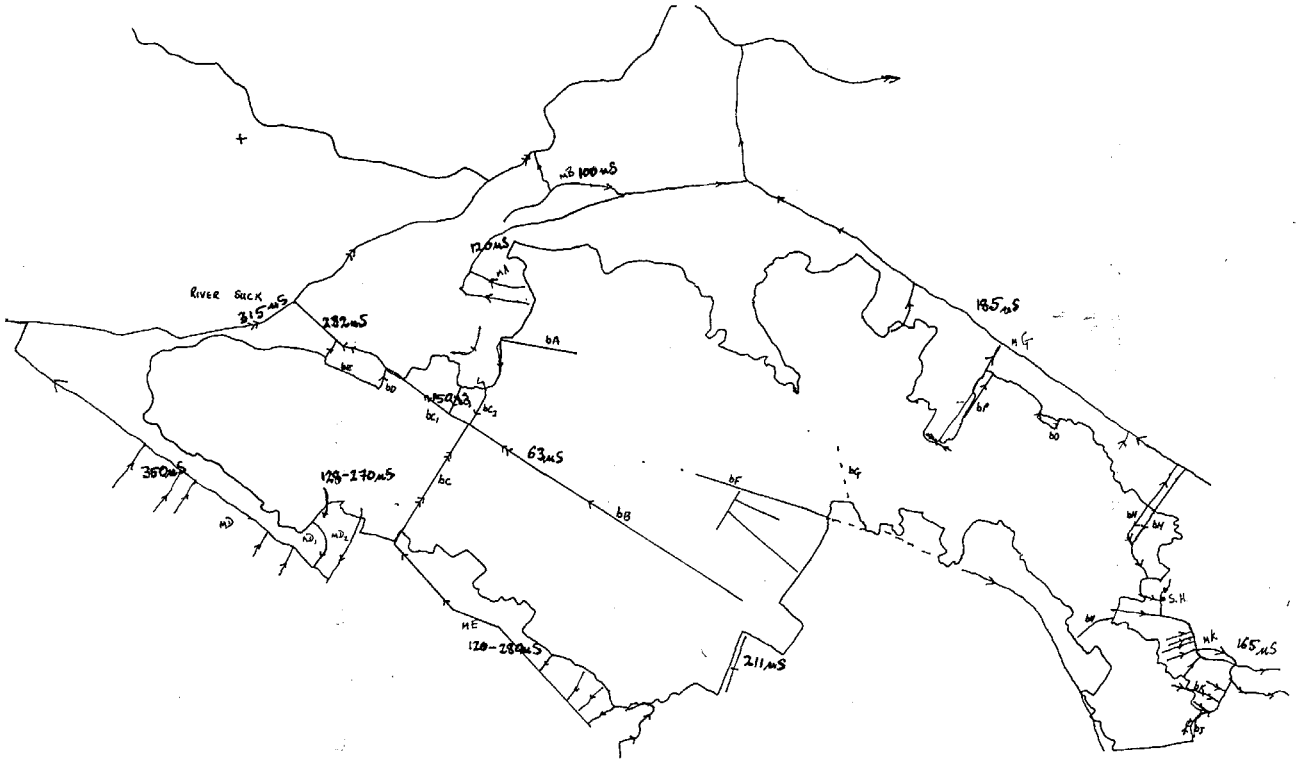
3. The two southern lobes are located in small basins. A wet central complex on the SW Lobe is located in a depression associated with subsidence.

4. T o the N of the site some till mounds occur. One which is wooded occurs in the middle of the site.

5. Recent fire has damaged parts of the vegetation and may also have been important in the past as few well developed *Sphagnum* hummocks are seen.

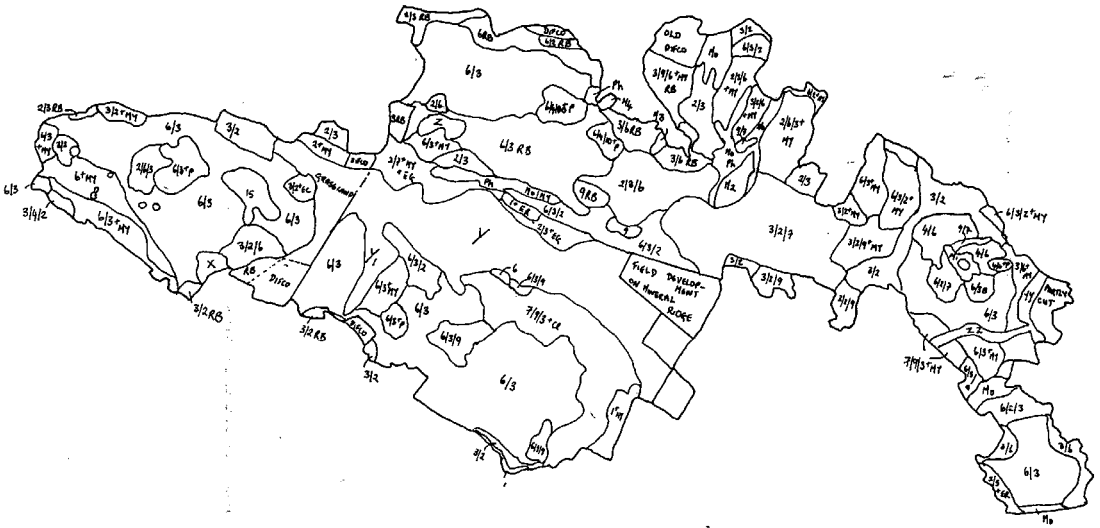
Lara Kelly
Malcolm Doak
Marie Dromey

Raised Bog Restoration Project (1995).



CLOONCHAMBERS BOG, CO. ROSCOMMON (600).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994

N



CLOONCHAMBERS BOG, CO. ROSCOMMON (600).
VEGETATION MAP (1:10,560)
1994

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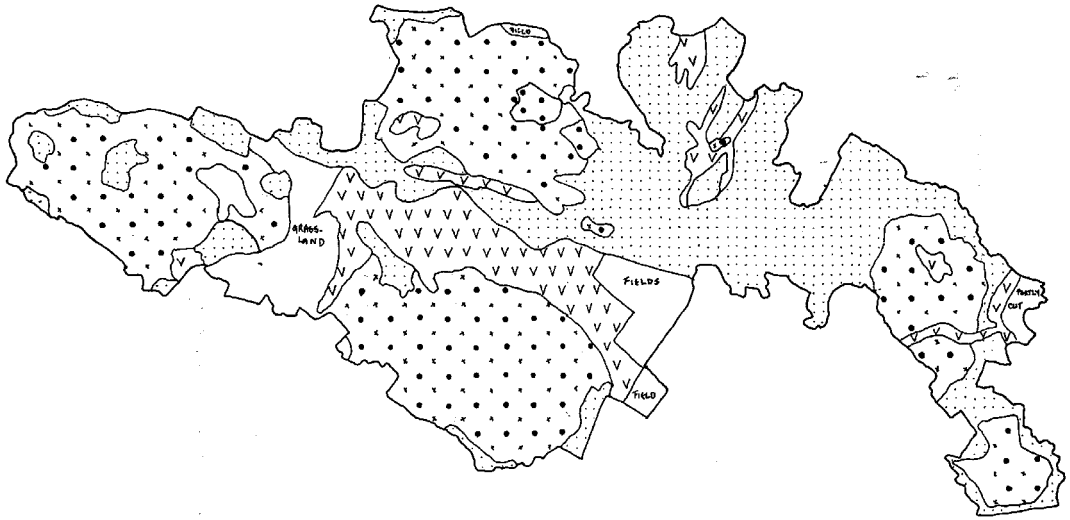

CLOONCHAMBERS BOG, CO. ROSCOMMON (600).
ECOTOPE MAP (1:10,560)
1994

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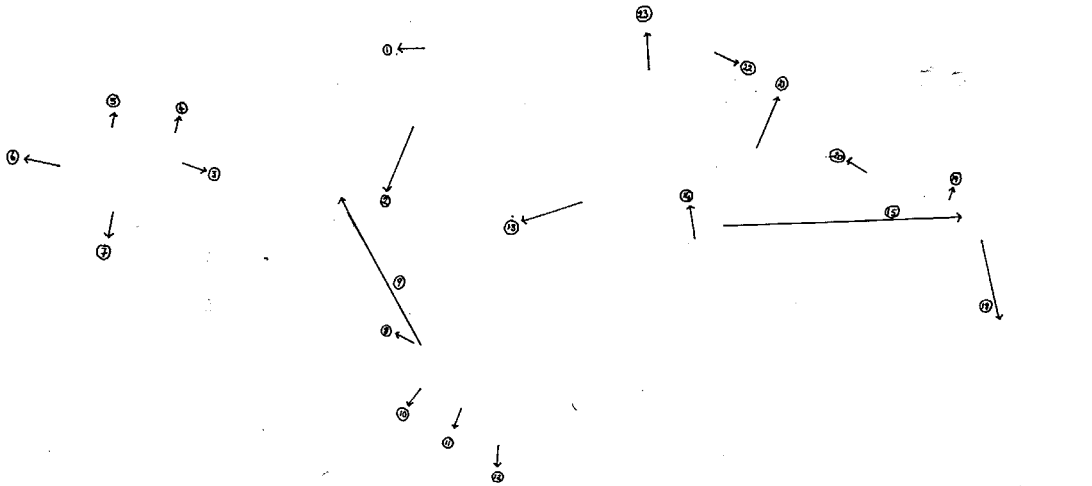

CLOONCHAMBERS BOG, CO. ROSCOMMON (600).
SLOPES MAP (1:10,560)
1994

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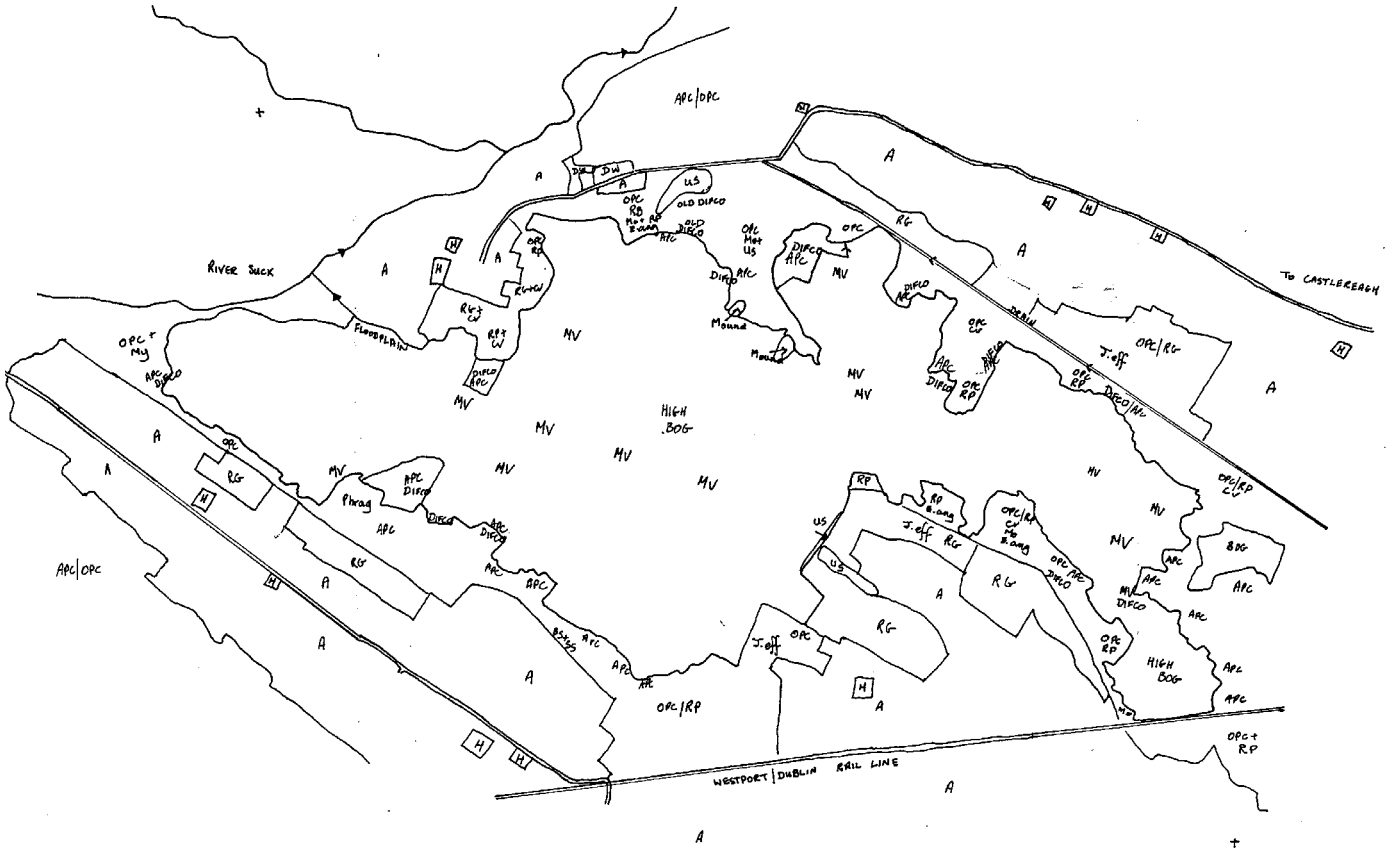


CLOONCHAMBERS BOG, CO. ROSCOMMON (600).
LANDUSE MAP (1:10,560)
1994

N

CLOONMOYLAN, CO. GALWAY

1. SUMMARY OF SITE DETAILS

NHA No.	248		1/2" Sheet:	15
Grid Ref:	M 78 00		6" Sheet:	GY 126/132
GSI Aerial Photo:	M 454		1:25,000 Sheet:	17/19
NHA Photo:	657:9-34		Area (ha):	440.0 (High Bog)
Date(s) of Visit:	9-11/4/94	(Ecology)		
	9-11/4/94	(Geohydrology)		

Townlands: Cloonmoylan, Derryvunlam, Drumminnamuckla South, Rosturra, Clonco, Rossmore, Cloonoon, Srah and Baunia.

2. INTRODUCTION

2.1 BACKGROUND

This site was chosen as part of the survey for a number of reasons. It was assigned an A rating following the survey on the ecology, status and conservation of raised bogs (Cross, 1990). This indicates that it is a good quality site with a relatively intact hydrology. It is one of the largest sites of the SW midlands and its conservation would ensure the preservation in the variation of raised bogs along the N/S and E/W gradients. A study of recent aerial photography revealed that the site had not sustained major damages since the last survey.

A survey in 1983 carried out on behalf of the Forest and Wildlife Service to locate midland raised bogs of scientific interest revealed that at least 20% of the bog surface on the W side was very wet with excellent *Sphagnum* growth pattern including *Sphagnum pulchrum*, a very uncommon species (O' Connell and Mooney, 1983). The bog was again assessed in 1993 as part of the NHA survey. Similar findings to those of ten years earlier resulted.

Part of the site to the NW is currently being transferred from Coillte to NPWS.

2.2 LOCATION AND ACCESS

This bog is located near the NE shores of Lough Derg approximately 1km NE of Woodford. The western side of the site may be accessed from the Portumna to Woodford road which runs alongside most of the western boundary. The eastern side may also be accessed from this road by a left turn at Turners Cross and a number of bog roads which lead into the site.

3. METEOROLOGY

No meteorological measurements have been made on Cloonmoylan bog. Rainfall data from the nearby Portumna and Woodford weather stations for the years 1951-80 indicate that the area receives approximately 957mm of precipitation annually (Figure X). The nearest synoptic station at Birr suggests that the site could have up to 207 rain days annually.

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

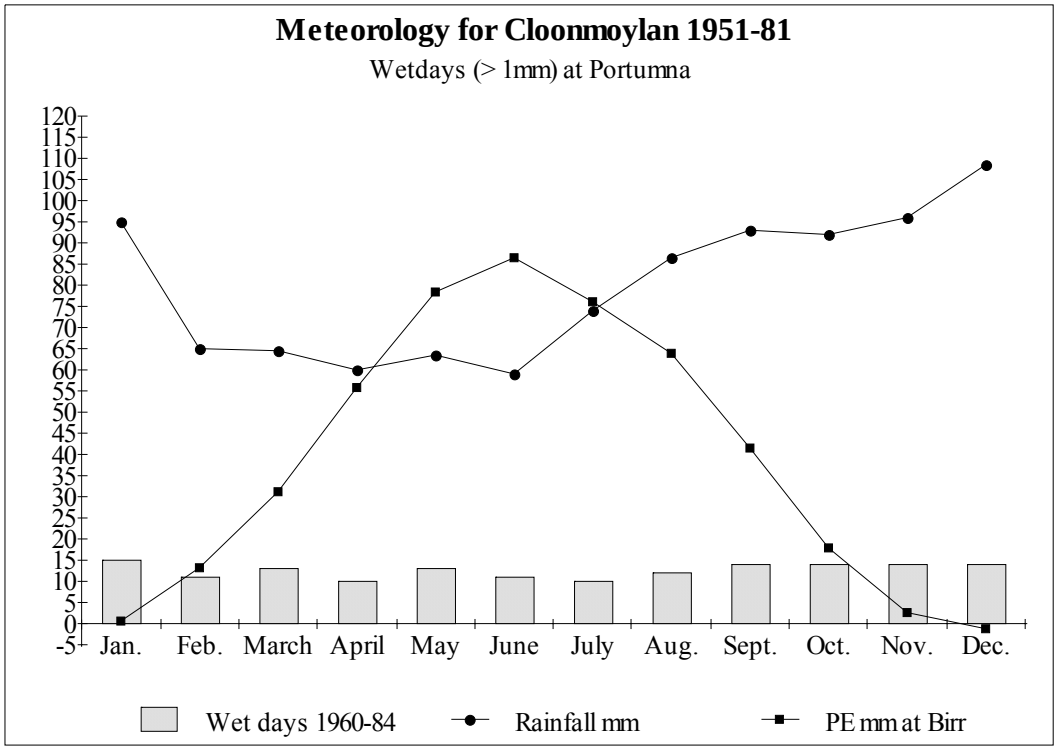
The above factors suggest that the year round actual evapotranspiration (AE) from Cloonmoylan bog is greater than PE at Birr, site of the nearest synoptic station which had an average PE of 466.5mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Cloonmoylan would therfore be greater than 466.5mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 490mm/yr.

Meteorological data for Cloonmoylan Bog (1951-1981) are summarised below:

Rainfall (P)	957mm/yr
Actual Evapotranspiration, (AE)	>466.5mm/yr
Potential recharge, (PR)	<490mm/yr
Raindays > 0.2 mm (annual {1951-1980})	207 days
Wetdays > 1mm at Portumna (annual {1960-1984})	150 days

Figure X:



4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

Cloonmoylan is a raised bog which remains in its original basin. In plan the site reaches a maximum length of 2810m in a NE to SW direction. It is thinnest in an east-west direction where it has an average width of 2150m. The bog's highest point is 44.8mOD.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

This bog is situated in a lowland plateau beside Lough Derg. The Slieve Aughty mountains lie 3km to the west of the site.

At a meso scale the bog is surrounded by low relief bedrock cored ridges with height ranges of 37-45m O.D.. A N/S trending limestone ridge lies separates the eastern section of the bog from the shores of Lough Derg which are 700m east.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock Geology

Recent geological maps by Hitzman (Chevron/GSI,1993) show that the area is dominantly underlain by dark grey muddy fossiliferous Carboniferous (Courceyan) limestones, interbedded with thin calcareous shales (shown as ABL, on map enclosed with the Barroughter report). The eastern section of the bog is directly underlain by Waulsortian Carboniferous limestones, where there is outcrop (fossiliferous mudmounds, WA, on map). A SW/NE trending fault runs underneath the bog coincident with flush Z, in the west and Y, in the east. On the south side of the fault there are the ABL limestones and on the north side of the fault there are Limestone Shales (Courceyan) and Old Red Sandstones (Devonian)

The muddy fossiliferous ABL limestones generally have a low permeability and are classed as a poor aquifer. The Waulsortian limestones and Limestone Shales also has a low permeability. The ORS may have a moderate permeability.

5.1.2 Subsoils (See 6" 1840s Map)

Data Availability

No subsoils data were available for Cloonmoylan bog apart from the initial 1840s GSI geology field sheets, and recent fieldwork carried out for this study.

Geology of Inorganic Subsoils

The subsoil geology of this bog and surrounding area is dominated by two types of till. Sections in drains in the westerly cut-away areas indicate that the outer limits of the bog are underlain by poorly sorted clayey tills with relatively large clasts of limestone and sandstone (Photo X). Cut-away drains to the north show the till here to have a silty matrix with sub-angular clasts of sandstone.

It is understood that Cloonmoylan bog is predominantly underlain by the clay rich tills. The high proportion of fines in the tills suggest that it has a low permeability.

5.1.3 Depth to Bedrock

There is a limestone outcrop directly south-west and east of the bog along the low relief ridges. Outcrop of shaley/muddy limestone occurs in the cut-away drains to the south-west which are 0.7m deep (Photo X). Depth to rock on the bog is unknown; although it is thought to be close to the surface given its proximity to the lake and local outcrop.

5.2 HYDROLOGY

5.2.1 Bog Hydrology

There are numerous drains seen on this bog. A large portion of the NE of the site has been extensively drained with active peat cutting at the bog edge. Bog roads have also extended into this area. A double drain crosses the entire site running E/W towards the N. Large drains are also seen to the SE and S of the site. Bog roads have been constructed here as well to facilitate peat cutting. Deep drains are associated with these. The drains are described in more detail below and are illustrated on the Drains Map.

West

Drains bA and bA3 are at the N and S sides of Flush Z respectively and both extend the full length of the flush. Drain bA is quite deep but with no flow. The mid-eastern section of Drain bA (EC 87 µS/cm) becomes a double drain, each of which are about 1m wide. The more northerly drain supports *Phragmites* and *Sphagnum cuspidatum*. Further east the drain become one and *Phragmites, Potamogeton polygonifolius, Eriophorum angustifolium, Narthecium, S. capillifolium* and *S. papillosum* hummocks were found there. The west end of bA runs through a depressed area.

Drain bA3 (EC 140 - 210 μS/cm) supports a similar list of species with an abundance of *Phragmites*, which also extends on to the bog. There is sandy till evident near the drain (PL7:x and PM4: 15 and 16).

Drain bB3 runs at right angles to Drain bA3. It is 0.75m wide and approximately 60m long and water flow is to the N (EC 82μS/cm). It supports *S. cuspidatum, S. papillosum, S. pulchrum, Narthecium, Eriophorum angustifolium*, *E. vaginatum* with *Phragmites* at the northern end.
Drain bC3 runs E/W just south of Drain bA3 at the west of the site. It is 0.5m wide with 15cm of water. It supports *Eriophorum angustifolium, E. vaginatum, Narthecium, S. papillosum, S. pulchrum* and *S. cuspidatum.*

North
The following series of drains all run NNW/SSE across the NE lobe of this site. At the SE ends of some of these drains there are short drains running at approximately a 45 ^{0} angle.

Drain bJ is old and infilled and difficult to see in the field.

Drain bK is old and infilled though there is flow to the SE. The drain narrows as it gets further into the bog. It is infilled with *S. cuspidatum, Eriophorum angustifolium, E. vaginatum* and *Calluna.* At the northern end the flow direction changes to the north-west.

Drain bL is 1.5m deep by 0.5m wide with a flow to the SE at its SE end and flow to the NW at its NW end. It is bare apart from short *Calluna* along the sides and edges.

Drain bM1 is a short old infilled drain with *E. vaginatum, E. angustifolium* and *Erica tetralix*. It runs out of drain bM and flows to the S. Drain bM is 0.5m deep by 1m wide.

Drain bN is 4m wide with a small channel 0.25 wide in the centre containing stagnant water. Growing in it are *E. angustifolium, Carex paniculata, Potamogeton polygonifolius* and *Betula*. It contains evidence of iron staining and the EC was 325 μS/cm. It flows to the SE. At its NW end it has a small bend containing stagnant water.

Drain bO is 1m deep with 5cm of water flowing slowly to the SE. *Calluna* is seen along the sides. It is not clearly seen at the NW end.

Drain bP (EC 133 μS/cm) is 6m wide with a 0.25m channel in the centre with 5-10cm of water and evidence of iron staining and flow to the SE. It is infilled with *E. angustifolium* and some *Betula*.

Drain bQ runs alongside the western edge of the bog road at the NE corner of the site is 2 metres deep with stagnant water 10-20cm deep (EC 88 μS/cm) (PM4: 5 looking W along road and Drain bQ. It contains species such as *Juncus bulbosus, J. effusus, Potamogeton polygonifolius* and *Myosotis*. Drain bQ1 runs along the eastern side of the same road and contains *Typha* and *Triglochin palustris* with evidence of iron staining (EC 196 μS/cm). Drain bQ2 runs N/S and is similar to Drain bO.

Drain bR runs from the NW into Drain bQ with a significant flow of water. At the northern end it flows northwards and is infilled with *E. angustifolium* and *E. vaginatum*.

Drain bS also runs into drain bQ but is dry and infilled with *Narthecium, Sphagnum capillifolium, S. papillosum* and some *Betula*.

The remainder of the drains in this area are all similar to Drain bO.

East
Drain bB at the east of the site is 4m wide, is old and infilled with *Carex paniculata, C. acutiformis, Salix, Betula, Molinia, Eriophorum angustifolium, E. vaginatum, Potamogeton polygonifolius, Calliergon cuspidatum* and *Typha latifolia.* There was evidence of iron in the water.

Drains bC, bD and bE are old and for the most part are found in the cut-away. There are some stagnant pools in them. The drains are infilled with *Eriophorum angustifolium, E. vaginatum, Salix, Narthecium* and *Calluna.* Drain bC supports *Carex rostrata.*

Drain bF (EC 87μS/cm) with a flow to the E. It is infilled with *Sphagnum cuspidatum, S. capillifolium, S papillosum, S. X collected - possibly recurvum,* and *Narthecium.* There is *Myrica* to the N of it between it and Flush X.

Drains bG1 and bG2 form a double drain which extends east-west across the northern section of the site. At the eastern end these drains carry 0.5m of water with a significant flow eastwards (EC 80 μS/cm). *Carex acutiformis* was recorded at this end with some *Succisa* and *Pteridium*. The mid section of bG2 (EC 114 μS/cm) contains an abundance of *Carex paniculata* with *Myrica, Aulacomnium, Menyanthes, Eriophorum vaginatum* tussocks, *Salix* sp. *Betula, Rubus* and *Lonicera.* bG1 has less *C. paniculata* and more *Molinia.* At the western end bG2 is totally infilled mostly by *Sphagnum magellanicum* whereas bG1 is less so.

A number of drains may be seen at the eastern side of the site to the south of the area where peat cutting has encroached into the site.

Drain bA2, at the east of the site, runs parallel to and N of the access road. Water flow is to the east. It is infilled but not fully blocked and the edges have collapsed. *Sphagnum cuspidatum, Rhynchospora alba* and *Eriophorum angustifolium* were recorded.

Drain bB2 is a large drain which runs E/W north of Drain bA2. At the eastern end it is infilled and difficult to see in the field with *Myrica* colonising the edges. The mid-west end is 2m wide containing *S. cuspidatum*, and *E. angustifolium*. At its western end it has been recently excavated with spoil at the edges and there is significant flow to the W into Drain bJ2.

Drain bC2 is a small infilled drain to the north of Drain bA2 running E/W.

Drain bD2 runs at right angles to Drain bB2 towards the N. It is collapsed with old peat cutting around it. It contains *E. angustifolium, Calluna, Molinia* and *Betula*.

Drain bE2 runs northwards from the access road into the bog with stagnant water (EC 86 μS/cm) containing *S. cuspidatum*.

Drain bF2 is a double drain which is similar to Drain bE2 but extends further into the site.

Drain bG2 is a short drain (3.5m wide) which flows to the N and joins Drain bB2. Growing in it are *R. alba, E. angustifolium and E. vaginatum* and *Calluna.*

Drain bJ2 runs N/S and joins bB2 and has a significant flow to the N (EC 82 μS/cm). There is tall *Betula* along its northern end. Some of the other species recorded at drain edges were *Potentilla erecta, Rubus, Molinia* and *Pteridium*. Between this drain and track which leads to the N from the access road there are a series of narrow perpendicular drains, some of which are deep while others are infilled with *Molinia*. Between Drains bJ2 and bK2 the vegetation has been disturbed and supports the species *Molinia, Juncus effusus, Betula* and *Polytrichum alpestre* indicating some peat mineralisation.

Drain bK2 is a double drain with deeper channels at the edges seen close to the N/S Road 2. *Potamogeton polygonifolius* and *E. vaginatum*. In between the channels *Pedicularis sylvatica, Polygala vulgaris, Calluna, Narthecium, Molinia, Ulex* and *Salix* were noted. At its northern end it has been recently deepened (1.5m deep by 2m wide) with 25cm of water flowing to the N (PL7:9 to N and PL7:10 looking to Drain bH2). Between Drains bK2 and bL2 is a dried out area with *Molinia, Myrica* and *Betula* (1m high). Road 2 extends N/S and links to Roads 1 and 3 (Drains bY2 and bQ2) and Drain bS2.

Drain bL2 is a newly excavated drain (1m wide by 1.5m deep) with 5-10cm of water flowing to the N.

bM2 is an old infilled drain (2m wide) supporting *Juncus effusus, E. angustifolium* and *E. vaginatum* with *Betula* and *Salix* sp.
bN2 (1m deep by 1m wide) has a varying EC due to iron concentrations (121-202 µS/cm). It contains the following species, *Lemna minor, Potamogeton polygonifolius, Calliergon cuspidatum, Sphagnum recurvum, S. capillifolium, S. cuspidatum, Juncus bulbosus, Myrica, E. angustifolium, E. vaginatum, Dryopteris, Andromeda* and *Salix* sp.

Drain bO2 is an old infilled drain with an EC of 134 µS/cm and supports *Typha, Carex paniculata, Potamogeton polygonifolius, Myrica, Juncus effusus, Calluna, E. angustifolium, E. vaginatum, Rubus* and *Betula.*

Drain bP2 (EC 85 µS/cm) is infilled with *Sphagnum recurvum and S. papillosum, Aulacomnium, Molinia, Myrica, Pteridium, E. vaginatum, Calluna* and *Betula.*

Drain bQ2 is a double drain which is an extension of the access Road 3 running towards the west. The northern drain is 1.5m deep by 0.75m wide and is infilled with *E. vaginatum, Salix, Betula, Pteridium* and *Dryopteris* with a flow of water to the east (EC 81 µS/cm). The southern drain (EC 85 µS/cm) with significant flow to the east. Between the two parts of the double drain there are a series of short drains.

Drain bR2 is an old drain which merges with Drain bQ2. It is 0.75m wide with *S. cuspidatum* and *E. angustifolium*.

South
Drain bS2 is a double drain with water flow to the east. The northern section is 1.5m deep by 0.5m wide and contains 30cm of water (EC 75 µS/cm rising to 109µs/cm at the east end). The southern drain is similar with tall *Calluna* over -hanging both. Between the two parts of the double drain there are a series of short drains which are 5m apart (PL7:13 of Drain bS2 and 15 of bS2 with Lough Derg in the background). The west end of this drain has been recently burnt with *Cladonia subservicornis* var. *verticillata, C. floerkeana* and *Campylopus introflexus*.

Drain bT2 is also a double drain which runs parallel to Drain bS2 at the southern side of the site, south of Flush ZZ. A ridge runs alongside the northern drain which is infilled at the NW edge with *S. capillifolium, S. papillosum, Narthecium* and *E. vaginatum.* There is also some algae in the drain. The southern drain is partially infilled by *Myrica* and *E. vaginatum*, *E. angustifolium, Betula, Salix* and *Aulacomnium palustre.* Between the two drains are algal hollows, surface water and *Trichophorum.*

Drain bU2 is a small drain south of Drain bS2. Recorded within it were *S. auriculatum, S. cuspidatum* and *E. vaginatum*.

Drain bV2 is another double drain. The western drain is 0.5m wide and has a flow to the SE (EC 76 µS/cm). It is colonised by *S. cuspidatum, S. pulchrum, S. auriculatum, E. angustifolium* with *Myrica* at the SE end. Between the two drains *Calluna* dominates with *Ulex, Betula, Empetrum, Campylopus introflexus, Cladonia floerkeana* and *Pleurozia purpurea*. At the southern end of this drain *Ulex* and *Betula* are encroaching onto the high bog and between the double drain.

Drain bW2 is a triple drain which runs NE/SW with flow into Drain bV2. The drains are filled with water and contain *S. cuspidatum, E. angustifolium* and *E. vaginatum*.

Drain bX2 is a bare drain 0.5m wide at the SE section of the site. Also in this area there are a number of old short drains which lead into the cut-away. They are associated with cracking and slumping of the peat.

Drain bY2 at the south-east of the site runs parallel to the access Road 1. It is 1.5m wide by 1m deep with 60cm of water with no significant flow. The drain has collapsed in places. There is a similar drain running beside the road to the south (EC 78µS/cm).

Drain bD3 is an old drain infilled with *E. angustifolium, S. imbricatum, S. papillosum, Calluna, Empetrum nigrum* and *Vaccinium oxycoccus.*

Drain bE3 is a double drain at the SW of the site. The most northerly drain is 1.5m deep with 25cm of water and no flow. It is overhung by tall *Calluna.*

Drain bF3 is a double drain with the most north westerly one 1m wide and infilled with *Eriophorum angustifolium, E. vaginatum, S. magellanicum, Calluna* and *Narthecium.* The other part of the drain, with an EC of 80 μS/cm, supports *Molinia, Betula, Myrica* and tall *Calluna.* There is significant flow to the SW at the SW of both drains.

Drain bG3 is found at the SW of the site east of Drain bF3. It is a maze of drains rather like a delta. There is low flow to the SW.

Drain bH3 at the SW of the site west of drain bF3 is 0.25m wide, is deep and bare with overhanging *Calluna*. There is a flow to the SW.

Drain bJ3 is also found at the SW of the site and is further west of Drain bF3. There is 15cm of water with a significant flow to the SW. It widens to 3m at the edge of the bog and becomes river-like. It supports *Potamogeton polygonifolius, Carex rostrata, Narthecium* and *Betula.*

5.2.2 Bog Margin Hydrology

The principal drains have been labelled on the Drains Map and are discussed separately below.

West

South of the NPWS owned plot of bog there is intensive cutting and drainage along the west side of the bog since it is so near to the main road and easily accessable. All drains intercept till mostly clayey but stoney, and certain drains lie in shaley bedrock. One or two lie in pockets of pure sands which probably overlie clays.

North

There are a high density of cut-away drains (>2m deep) to the north of the bog since there is much hopper-cutting with faces up to 3m high. There are several collapse faces. All the drains to the N lie in silty till and one or two lie in bedrock.

Flow is northwards to a main drain (2m deep x 2m wide) which flows E to Lough Derg. This drain also collects water from the southwestern/western cut-away drains of Barroughter Bog.

East/North-east

There has been recent excavation of peat and digging of drains in this area particurlarly north of tracks R1 and R2. There were relatively strong flows in all these drains and several areas of collapsed face banks. Certain of the main collector drains mD1,2 have been recently cut, knocking down scrub forestry, and were a maximum of 3m deep and 2m wide in till with strong flows.

South

There is heavy peat hopper-cutting along the entire S side of this bog. Drains run perpendicular from the faces every 30m but are shallower than the drains to the N and NE of the bog with an average depth of 1m. These cut-away drains lie predominantly in peat except for drains mT that cut through a silty till mound. The faces at mV are older and inactive with slumping. NE of drain bV2 the drains are older and overgrown.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Hydrochemistry Map)

Water flowing from the bog and the adjacent inorganic subsoil was sampled over the 9-11th April 1994 period. There had been several heavy rain spells over these days and the previous days. Water flowing off the bog had low ECs, typically less than 100 µS/cm. These values are similar to that of rainfall reflecting the largely inert nature of the peat. Generally relatively moderate electrical conductivities (84-467µS/cm) were noted in the cut-away drains around the bog margins.

West

There is intensive drainage along the west side of the bog. Drains bA lie alongside Flush Z and both extend the full length of the flush; they lie partly in till. They have relatively high ECs, ~ 180µS/cm, and show large amounts of iron showing the possible infleunce of local groundwater discharge.

North

EC values to the north of the bog in the cut-away drains were a maximum of 140µS/cm. There were local incidences of relatively high ECs ~ 230µS/cm where the drains are deep enough to intercept the water-table (see electrical conductivity overlay). The main outlet drains which flow N to Barroughter Bog have ECs of 226µS/cm.

East/North-east

Drains in this part of the cut-away had relatively moderate ECs reaching a maximum of 220µS/cm with shows of Iron. Drain mQ is far out into the cut-away and has an EC of 330µS/cm

South

Generally the drains in the southerly cut-away have a wide range of ECs, 86-467µS/cm with several shows of iron since groundwater is upwelling in the drains.

5.3.2 Laboratory Hydrochemistry

A sample was taken for analysis from Flush X through which a stream flows. This flush appears to have an external water source. Hydrochemical analyses showed a eutrophic influence rather than a minerotrophic influence. NO3-N (0.59 mg/l), NH4-N (0.22mg/l) and PO4-P (0.14 mg/l) are all much higher than seen in typical bog water. The Ca and Mg levels were similar to those of bog water. The higher level of the former three may be due to the aerating effects of flowing water.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation

Cloonmoylan bog lies in a regional groundwater discharge zone and is situated on a lowland plateau beside Lough Derg.

Groundwater flow is thought to mirror topography, recharging at the foothills of Slieve Aughty and flowing east under the bog discharging to Lough Derg, the hydraulic low point for the region.

Only a low proportion of rainfall is thought to recharge to groundwater since there are high levels of runoff from the widespread clay tills. There are several streams and rivers in the area.

Bog Regime

There are many active drains on the high bog discharging considerable amounts of water to the cut-away areas particularly in the NE. All the drains are relatively long on the high bog. Overall high bog hydrology will have been considerably affected by drainage.

Generally the bog has a high density of marginal drains due to extensive hopper cutting. Peat cutting and associated drainage occurs in nearly all parts of the bog and so there are practically no possibilities for lagg zone potential.

Inter-relationship
Only some of the cut-away drains at Cloonmoylan intercept the groundwater table since EC values were relatively low. Generally ECs averaged 180µS/cm, indicating that they recharge groundwater and are less likely to be sites for groundwater discharge than the drains at Barroughter Bog. The regional water-table must be deeper in the vicinity of Cloonmoylan than at Barroughter. Barroughter bog lies only 1km NE but is much nearer to Lough Derg and lies in its former floodplain.

6. VEGETATION

6.1 VEGETATION SUMMARY

This site possesses a large central area of wet vegetation which is quaking underfoot. There are extensive *Sphagnum* lawns, including lawns of *Sphagnum pulchrum*. A number of flushes are also seen. These are dominated, for the most part, by *Molinia* and *Betula* with *Myrica, Potentilla erecta* and *Polygala vulgaris*. The bog has been regularly burnt in the past and thus the vegetation is not as well developed as could be expected on a site of this size. The lichen cover is generally low but there is a diverse lichen cover on unburnt areas, especially at the east of the site. *Frangula alnus, Carex paniculata* and *Carex rostrata* were recorded in some marginal areas of the bog, associated either with drains or flushes.

The western indicator species, *Racomitrium* and *Pleurozia purpurea* were recorded but only in small amounts in the wetter complexes. *Andromeda* was present over the whole site but was not common. *Sphagnum magellanicum* was also rather uncommon. *S. imbricatum* hummocks were quite frequent, forming large hummocks in places. *S. fuscum* was also present but in small amounts.

On the western side of the site some small *Betula* and *Pinus* trees are encroaching.

The cut-away at the eastern side of the site is colonised by *Betula* and *Ulex* behind the areas of active cutting, with *Juncus effusus* and *Calluna* dominating close to the face bank edge.

There are a number of gravel bog roads on the E and NE of the site associated with access for drainage and peat cutting (PM4: 6+7). This limestone gravel contributes to higher base status and thus the species found there are anomalous with the vegetation of the high bog. Species found include *Fraxinus excelsior, Viburnum opulus, Sorbus aucuparia, Salix* sp., *Betula, Rubus, Rosa* sp., *Viola* sp., *Sesleria albicans, Primula veris, P. vulgaris, Lotus corniculatus, Hieracium pilosella, Carex flacca, Plantago lanceolata, Centaurea nigra, Holcus lanatus, Festuca rubra, Rhinanthus minor, Achillea millefolium, Orchis mascula, Fragraria vesca, Potentilla erecta, P. reptans, Taraxacum*, *Equisetum arvense*, *Blechnum spicant, Pteridium, Ulex* and *Molinia.*

6.2 DETAILED VEGETATION OF THE HIGH BOG (Vegetation Map)

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes
Complex 1
The face bank complex dominated by *Calluna* is seen in various places around the edges of the site. It forms a distinct band at the SW edge.

Complex 2
At the SE of the site there is an area close to the bog edge where *Trichophorum* dominates. The bog surface is hard and there is no acrotelm layer.

Complex 2/3
This complex is associated with the drained NE lobe of the bog and also occurs at the eastern edge between Flush X and Flush Y. It is dominated by *Trichophorum* and *Carex panicea* and had been recently burnt (PM4:4 and 5). Within the drained area erosion channels, surface water hollows, *Erica tetralix*, bare peat and *Campylopus introflexus* cover increases. This appears to be typical for areas which have been burnt (PL7:8 to W between drains bN and bO).

Complex 4/2
This complex occurs to the south of Drain bE3 and west of Flush YY at the east of the site. The *Sphagnum* cover is low and the vegetation is dominated by *R. alba* flats (40%) and *Trichophorum* (15%). There was surface water. *Campylopus introflexus* and *Cladonia floerkeana* were noted suggesting disturbance.

Complex combining varying amounts of complexes 2, 3, 4 and 6. (Complexes 2/3/6 and 2/3/4/6)
These are mostly marginal complexes and the relative proportions of each complex vary according to the wetness of the area - 2 and 3 usually indicating drier conditions. Accordingly they are dominated by *Trichophorum, Carex panicea, R. alba* and *Narthecium*. They are most evident at the SE of the site where drainage and peat cutting have resulted in small scale variations in vegetation cover caused by disturbance.

Complex 6/2
This complex is dominated by *Narthecium* hollows (35%) with the addition of *Trichophorum* tussocks (10%). It is seen on the undulating area at the east side of the site south of the area of extensive cutting (PM4:13). The *Sphagnum* cover is moderate (20%) composed mainly of *S. capillifolium* hummocks, some of the larger ones are topped by *Empetrum.* The lichen cover is moderate at 15%. Some *Pinus sylvestris* was seen on the high bog in this complex. West of Drain bM2 this complex occurs with the addition of *Carex panicea*, scattered *Myrica* and clumps of *Betula.* The complex is also seen close to the N side of Drain bS2.

There is a recently burnt version of this complex 6/2 RB which has less *Narthecium* hollows (15%), with some algal pools (5%) and a high cover of *Campylopus introflexus* (40%) and bare peat (15%). Some *Carex panicea* also occurs. The *Calluna* is very short and the *Sphagnum* layer has been destroyed. Some *Salix* scrub is encroaching into this area.

Close to the facebank edges in this area *Trichophorum* cover increases and *Narthecium* hollow cover decreases. The complex is indicated by 2/6.

Complex 6/3
This complex is dominated by *Narthecium* hollows (35%) with *Carex panicea* (15%) and burnt hummocks, dominated by *Eriophorum vaginatum* (40%). The *Sphagnum* cover lies between 5 to 10%. In places where there had been no burning *Cladonia* cover was 20%. Throughout this complex there are patches dominated by *Narthecium* hollows with little *Carex panicea*. It is seen to the N of the site, N of Flush X.

Sub-Marginal Complexes
Complex 6
This is an area of *Narthecium* (45%) hollows where the hummocks have been burnt recently but there is still an acrotelm layer which is very variable in depth. It is found at the mid-west edge of the site. There was a high algal cover in this complex probably due to past burning effects (50%). *Racomitrium* was recorded in this complex with some *Betula* encroaching from the bog edge.

Close to the S side of Flush X, *Myrica* and *Betula* are seen in Complex 6 (6+My and 6+My/Be). In addition there is another area close to Flush X which was burnt more recently or more severely (6RB).

Complex 6 + *Cladonia*
This is similar to Complex 6 as it is dominated by *Narthecium* hollows (35%), however it has been unburnt for some time and the *Cladonia* cover is moderate (15%). The *Sphagnum* cover is still low but the structure of the area is good with taller hummocks (5% *S. imbricatum* (2m diameter by 0.25 tall (PM4:7 &8)). On the taller hummocks, *Empetrum* and *Aulacomnium* were noted. The *Calluna* is tall (30cm) and there are some scattered *Betula* scrub. There are also some infilled pools which are aligned NE/SW (5%) with *S. cuspidatum*, *R. alba, S. pulchrum* and *Menyanthes*. These are possibly tear pools due to their linear orientation.

To the S of the site, south of Drain bT2 and north of Drain bE3 a variation of this complex occurs. There are fewer pools and *S. pulchrum* was not seen. *Racomitrium* and *Pleurozia purpurea* were recorded.

Complex 6/4
This complex occurs in two areas at the NW of the site. It is dominated by *Narthecium* and *R. alba.* Just north of the western end of Drain bG there is an area of Complex 6/4 with the addition of tear pools, which are algal filled (6/4+TP). *Myrica* also occurs here.

Complex 4/6
This is an area to the west of Flush ZZ with extensive *R. alba* lawns with some *Narthecium* hollows and scattered *Myrica*. Pools occur which are intermediate between round and tear pools. Some of these contained *S. cuspidatum*, some are algae and some contain *S. auriculatum* and *Eleocharis multicaulis*.

Complex 6/10 Recently Burnt (RB)
This complex is dominated by *Narthecium* hollows (45%) with a burnt *Sphagnum* layer. The burning appears to have occurred at least 3 years ago and some of the *Sphagnum* species are regenerating giving a live *Sphagnum* cover of 20% including *S. papillosum* (10%), *S. capillifolium* (5%) and *S. imbricatum* (5%) with an occasional *S. pulchrum* lawn. The structure is poor due to burning but there is an acrotelm layer in places, however it is very variable in depth. *Eriophorum angustifolium* is very common probably due to the colonising of bare peat after the fire event.

A small area of complex 6/10 which is unburnt occurs to the S of Flush Z. The *Sphagnum* cover was moderate with *Narthecium* growing up through the lawns. *Erica tetralix* is abundant with some *Carex panicea*. The *Calluna* is tall (0.4m) with a higher lichen (5%) and *Sphagnum* cover. Some young *Betula* are also encroaching.

Sub-Central Complexes
Complexes 4/10 and 4/10/6
Within Complex 2/3/6 at the SE of the bog there are some small wet areas dominated by *Sphagnum* lawns and *R. alba* and in the case of 4/10/6, *Narthecium* is quite important also. The bog surface is soft in these areas.

Complex 4/6/15
This is a small area to the SW of the site. It is dominated by *R. alba* flats (35%), *Narthecium* hollows (20%) and *S. cuspidatum/S. pulchrum* pools (10%). The *Sphagnum* cover is quite low (15%) but there is an acrotelm layer and the surface is quaking.

Complex 10/6RB
This is seen forming a band across the centre of the site. It is similar to Complex 10/6 but has been recently burnt so that much of the *Sphagnum* layer has been destroyed. At the eastern side of this complex the vegetation is dominated by *E. vaginatum* tussocks.

In the centre of the complex in the centre of the site west of Flush Y there are a few small areas which appear to have been unburnt with *Betula* and *Molinia.*

Complex 10/6
South east of Drain bR2 there is a slightly depressed area. The total *Sphagnum* cover is high (50%) composed of *S. capillifolium* hummocks (15%), *S. imbricatum* (5%) and *S. papillosum* (10%) with 15% *S. cuspidatum* infilled large rounded pools with 10% *S. pulchrum* lawns. It very wet with a good acrotelm. There is some scattered *Myrica* in this complex. The *Calluna* is 30cm tall. Around the edges of some of the pools *Aulacomnium palustre* and *Empetrum* occur (PL7: 11 of pool with those species). Further south on rising ground the *Calluna* height and cover increases.

North of Drain bS2 this complex also occurs with well developed *Sphagnum* hummocks. South of this complex patches of *Carex panicea* are seen. The lichen cover is high here (50%) and the cover of *Narthecium* is reduced (10%). An acrotelm is present with *S. pulchrum* lawns. In places *Betula, Myrica* and *Pinus* were recorded. *Racomitrium* was recorded in this complex south of Drain bW2.

At the southern side of Flush YY this complex contains a notable amount of *Myrica* (Complex 10/6+My).

Complex 10 Recently Burnt (RB).
This covers quite an extensive area in the centre of the site in an area which appears to be slightly depressed. The total *Sphagnum* cover is low due to burning and burnt *S. imbricatum*, *S. papillosum* and *S. capillifolium* hummocks were noted as well as low amounts of *S. magellanicum*, S. subnitens, *S. fuscum* and *Leucobryum*. It is dominated by *Calluna*, *Eriophorum vaginatum* and *Erica tetralix* with 35% cover of typical hummocks (PM4:2). *Narthecium* cover is low (5%) and there are patches of *Carex panicea*. The indications are that this was a very wet area but suffered severe fire damage approximately 2 years ago. *Sphagnum* species appear to be regenerating. *Campylopus introflexus* was common indicating the disturbance caused by burning. The central part of this complex shows an increase in *Narthecium* hollows (20%) and a increase in *Sphagnum* cover (10%). At the western edge of Flush Y, *S. magellanicum* becomes more common in this complex with *Myrica* and *Betula* encroaching from the flush. Occasional patches of *Molinia* with *Potentilla erecta* occur in the vicinity of Flush Y. At the very eastern edge of this complex the *Sphagnum* cover is very low possibly due to more recent or more frequent burning. A small area of this complex occurs to the NW of Flush X, it is wetter than that described above.

At the NW of Drain bS2 and N of Drain bE3 there is a small area of this complex which appears to be flushed with *Betula* and tall *E. vaginatum* tussocks (10 RB+). The area has been burnt and there was much surface water but no real pools. There were stumps of *Calluna* remaining with an increase in the amount of *R. alba* lawns (15%). There was no *Narthecium* and very little *Calluna*. There were tall *S. capillifolium* hummocks with some *S. imbricatum*. Other species recorded in this area included *Empetrum, Vaccinium oxycoccus, Aulacomnium* and *Polytrichum alpestre.*

Close to the W end of Drain bG1 this complex is seen with higher amounts of *Carex panicea* (10/3RB).

Complex 10
This complex is seen along the N of Drain bS2 and at the S side of Complex 15 to the E of Road 2. The total *Sphagnum* cover is high (80%) composed of *S. magellanicum* hummocks and lawns with small amounts of *S. imbricatum* and *S. capillifolium*. An acrotelm layer is present.

Complex 10+TP
To the E of Flush Y there is a section of Complex 10 with the addition of some tear pools. These may be associated with the effects of drains in this area.
Central Complexes
Complex 4/15
This forms part of the central quaking area of the flat high bog with a high *Sphagnum* cover (60%). *S. cuspidatum/S. pulchrum* pools form 20% and *R. alba* flats make up 35% of the cover. The pools are very shallow and are rounded and are mostly infilled with *Sphagnum* and contain *Menyanthes, Drosera anglica, Eriophorum angustifolium* and *R. alba* (PM4:17).

A few large *Racomitrium* hummocks were seen. *Empetrum, Andromeda* and *Dicranum* were recorded on some of the larger hummocks with the dominant species usually *S. imbricatum* (PL7: 20 and 21 of *Racomitrium*). Closer to the N section of Flush ZZ the pools are longer and are curvilinear (PM4: 20 pool with *Menyanthes* and *S. auriculatum*)

Complex 15
This complex is most extensive at the south central part of the site. It has a high *Sphagnum* cover (55%) consisting of *S. capillifolium* (5%). *S. magellanicum* (5%), *S. pulchrum* lawns (5%) with 25% *S. cuspidatum* pools. Some pools contain *Carex limosa* and *R. fusca* and are large and rounded. The inter-pool areas are not very quaking. *Myrica* is present in places suggesting lateral water movement. The area has been unburnt for some time as the *Calluna* is 0.4m tall with some epiphytic lichens (1/1). The total *Cladonia* cover is 20%. A small patch of this complex is seen close to Drain bW2 where it is associated with localised subsidence.

6.2.2 Flushes
Flush Z is a rather dry *Betula* flush on the western side of the site close to the first access point. Two deep drains run along either side of it. It may be situated on a till mound as *Phragmites* is present in the flush and out onto the high bog indicating a higher nutrient status. Other species which were recorded in this area include *Juncus effusus, Salix* sp., *Pinus sylvestris, Ulex, Molinia, Eriophorum vaginatum, Sorbus aucuparia, Pteridium, Rubus, Vaccinium myrtillus, Lonicera, Potentilla erecta, Pedicularis sylvatica, Carex nigra, J. bulbosus* and *Epilobium* (PL7:1-2 and PM4:1) There was evidence of recent burning in this flush.

Flush Y is a small linear flush in a depressed area on the eastern side of the bog (EC 81μS/cm). It appears to be associated with an internal drainage course as subterranean water could be seen and there was evidence of surface water flowing rapidly from the W and emerging further E. Evidence of a recent burning history was seen in the charred remains of *Betula* stumps. Plants growing along the flush include *Ilex aquifolium, Salix, Betula, Frangula alnus* (with Brimstone Butterfly*), Dryopteris, Polygala vulgaris, Potentilla erecta, Rubus, Carex paniculata, Juncus effusus, Vaccinium myrtillus* and 3 mosses collected (PL7: 3 looking E).

A SW/NE trending fault runs underneath the bog coincident with flush Z, in the west and Y, in the east (as detailed in Section 5.1.1). It may be that the flushes formed within the margins of the fault zone. Such a zone would have a high permeability, allowing a preferential zone of flow to form underneath the bog in the SW/NE direction.

Flush X is a large linear *Betula* dominated area which transverses the northern section of the site. It follows the course of a small stream which is subterranean for much of its length. Much running water was seen at the E end where an EC of 187 μS/cm was recorded, whereas in the mid-west an EC of 78 μS/cm was recorded. A water sample was taken from this stream for analyses. This showed a slight eutrophication effect (see Section 5.3.2 for details). Vegetation recorded along its length includes *Betula, Salix, Ilex aquifolium, Lonicera, Rubus, Dryopteris, Pteridium, Blechnum spicant, Potentilla erecta, Polygala vulgaris, Succisa pratensis, Molinia, Juncus effusus, Carex paniculata, Vaccinium oxycoccus, V. myrtillus, Sphagnum palustre, S. X, ve*ry tall *Myrica, Calluna, Anemone nemorosa* and *Sorbus aucuparia.* At its eastern end *Carex acutiformis* was found. The band of *Molinia* with scattered *Myrica* extends for quite a distance to both N and S at the W end and to the S at the E end of this flush (PM4: 2 SW to Flush X, the gap in it and the west of it PM4: 3 SSE to cut-away and flush X). At the eastern end of this flush, in the cut-away, an area of 'drift' is indicated on the GSI 1848 6" field sheet. It is possible that a ridge of mineral material underlies the bog close to this flush area.

Flush ZZ, at the SSW of the site, is linear and extends approximately 500m into the bog. There are mature *Pinus* sp. (10m) at the end of the flush (furthermost from the edge). Other species found include *Sphagnum palustre, S. capillifolium, S. papillosum, Aulacomnium palustre, Rhytidiadelphus squarrosus, Polytrichum alpestre, Pleurozium schreberi, Eriophorum vaginatum, Vaccinium oxycoccus, Empetrum nigrum, Andromeda polifolia, Molinia, Dryopteris, Blechnum spicant, Myrica* (1.5m tall) *Rubus, Salix* sp., and *Betula.*

Further south along the flush there is *Carex paniculata*, large *S. capillifolium* hummocks, *Leucobryum, Polygala vulgaris, Potentilla erecta* and *Pedicularis sylvatica.* The band of *Molinia* dominated vegetation and tall *S. capillifolium* hummocks extends for up to 50m to the east of the flush. The vegetation to the east of the flush is dominated by *R. alba* and *Narthecium* lawns with *Myrica* (PL7: x looking NW into the flush). There is a drain and ridge along part of the flush (EC 82 μS/cm).

At the SE edge of the flush there are 2 mounds dominated by facebank complex with *Molinia* between them. There are a series of mounds to the NW of Flush ZZ with *Pleurozium schreberi, Myrica,* young *Betula* and *Calluna* (1m tall). They perhaps form a link with Flush Y3.

Flush Z3 is at the mid-west of the site. The vegetation includes young *Betula* and *Pinus* sp., tall *Sphagnum capillifolium* hummocks, *Empetrum nigrum, Eriophorum vaginatum* and *Calluna* tussocks. Under the *Pinus* are *Rhytidiadelphus squarrosus, Hypnum, Vaccinium myrtillus* and a lichen cover of 4/3 on the *Calluna.*

Flush YY at the east of the site is very dry and the area shows evidence of recent burning - burnt *Myrica, Betula* stumps and *Epilobium angustifolium*. This area is shown on the 1910 6" sheet as a pool on the high bog with scrub woodland to the N. The vegetation includes tall *Betula* (up to 7m), *Eriophorum vaginatum,* extensive *Aulacomnium* and *Polytrichum alpestre* lawns with *Hylocomium splendens, Sphagnum capillifolium, S. palustre, Empetrum nigrum, Myrica, Molinia* and *Dryopteris.*

Flush Y3 at the SW of the site (EC 136 μS/cm) may be associated with Flush ZZ as there are a sequence of mounds/small flush areas between the two of them. Plants found include *Betula, Rubus, Salix* sp., *Dryopteris, Agrostis* sp., *Juncus effusus, Empetrum, Andromeda, Vaccinium oxycoccus, Polytrichum commune, Aulacomnium palustre, Pleurozium schreberi* and *Eurhynchium* sp. There is also algae developing in hollows.

There is another little mound in a curved line SSE of flush Y3. There is a young *Betula* on it with a band of *Myrica* running towards flush ZZ (PL7: 22 looking NW at the flushes). The two little flushes seem in a depression.

Flush X3 is small and very close to the west edge of the bog. Plants found include *Aulacomnium palustre, Empetrum, Molinia, Calluna* and *Betula.*

7. BOG TYPE

This bog has been classified as a Raised bog type since it is surrounded on all side by low relief bedrock ridges.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes

This is a relatively flat site with some depressions which are associated with flushes and internal drainage systems. Steep sided drains at the edges which are related to peat cutting have resulted in cracking and slumping of the edges (PM4:12). Where noticeable slopes were seen in the field estimates were made. Their location is shown on the Slopes Map.

Slope 1 At the mid-eastern edge of the site the slope along drain bD to the cut-away is 0.25m over 100m.

Slope 2 At right angles to the above slope in a northerly direction the slope is steep 0.25m over 20m with cracking and slumping of the peat.

Slope 3 Also in this area the slope towards drain bE is 0.5m over 100m.

Slope 4 At the south-eastern side of the drained NE lobe the slope from Drain bK into the cut-away is 1m over 100m.

Slope 5 At the northern edge of the NE lobe the slope is 0.25m over 50m.

Slope 6 At the NW corner of the site into an area of old cut-away which has been colonised by Betula the slope is 1.5m over 50m.

Slope 7 At the NW side close to the western end of Drain bG the slope is very gentle 1m over 150 metres.

Slope 9 At the eastern side of the site where a large area of cut-away extends into the site there is an area of undulating bog. At the north-eastern corner of this the slope is steep into the cut-away, 0.5 metres over 25m. Between this slope and slope 10 the *Calluna* is 0.5m tall with cracking and slumping of the peat towards the cut-away.

Slope 10 Further west along this edge the slope increases to 1m over 25m.

Slope 11 This section of the bog also slopes westwards towards a small road which has been built onto the bog. Here the slope is about 2m over 300m.

Slope 12 The slope from the access road at the eastern side of the site towards the northern edge is 0.5m over 50m.

Slope 13 The slope from Drain bB2 towards the cut-away is very steep 1m over 25 with severe cracking and slumping of the peat adjacent to the face bank.

Slope 14 At the eastern side of the site the steep slope from Drain bH2 west to the old access road which runs N/S is 2.5m over 30m.

Slope 15 This gentle slope of 0.25m over 100m in a NE. direction to the access road is found in the vegetation complex 10/6 which is just south of the most westerly road which runs E/W.

Slope 16 This slope is found at the S end of Flush ZZ into the cut-away. It is 1.5m over 50m. There is considerable cracking in this area and the drains have been deepened at the bog edge.

Slope 17 The slope from the SW of Drain bV2 to the cut-away is 2m over 50m.

Slope 18 A depression of 0.25m in a NE direction was recorded at the south end of Drain bW2.

Slope 19 This slope at the S. boundary of the site is 1.5m over 50m. There is severe cracking and slumping in the area.

Slope 20 This slope is at the SE corner of the site and is 2m over 30m to the NW and the access road. Severe cracking and slumping is associated with it.

Slope 21 This slope is at the west of the site immediately S of Flush Z. It is in a NW direction towards the dense *Betula* stand and is a gentle slope of 1m over 300m.

Slope 22 This is also a gentle slope to the west of 1.5m over 300m and is taken from the 2nd Pine tree.

Slope 23 This is at the SW of the site where there is severe cracking and slumping and active peat cutting resulting in a very tall face bank. The slope is 1.5m over 40m.

Slope 24 This slope was also recorded from the SW of the site where again there is severe cracking and slumping. The slope is 1.5m over 50m.

Slope 25 This slope at the SW boundary is very steep nearing the edge - 1m over 15m (PL7: 23 to the W).

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

Peat cutting has been carried out extensively around approximately 95% of the site. The hopper method is used most frequently (PM4:14). There are only two areas where active peat cutting does not occur - a small area at the mid east edge at the N of Drain bW2 and a second area at the NW side of the site. At the NNE of the NW section *Betula* scrub has developed in the cut-away and this abandoned area corresponds to the portion now owned by NPWS. The Portumna to Woodford road borders the remainder of this inactive section. Patches of *Betula, Juncus effusus, Molinia* and *Ulex* grow in the active cut-away areas (PM4:11).

8.2.2 Machinery

The presence of digger could be seen in three areas on the high bog - opposite Drain bK at the west, SE of drain bW2 and N of Drain bL2. Caterpillar tracks across bog in SW and NW.

8.2.3 Fire History

Most of this site has experienced recent and frequent burning. The area just to the south of Drain bG has been burnt fairly recently. The *Calluna* cover is low and the bushes are short and the *Sphagnum* layer has been badly damaged. At the NW of the site there is an area which has not been burnt for some time and the *Cladonia portentosa* cover is 15%. The *Cladonia* cover is 25% over most of the central vegetation complex.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY AND TOPOGRAPHY

1. The main flush to the N of the site is coincident with a fault which runs E/W under the site. Water from mineral ground outside the site flows through this flush.

2. An extensive network of drains and a large number of bog roads has caused considerable drying out of the bog surface and a deterioration in vegetation cover, particularly to the NE.

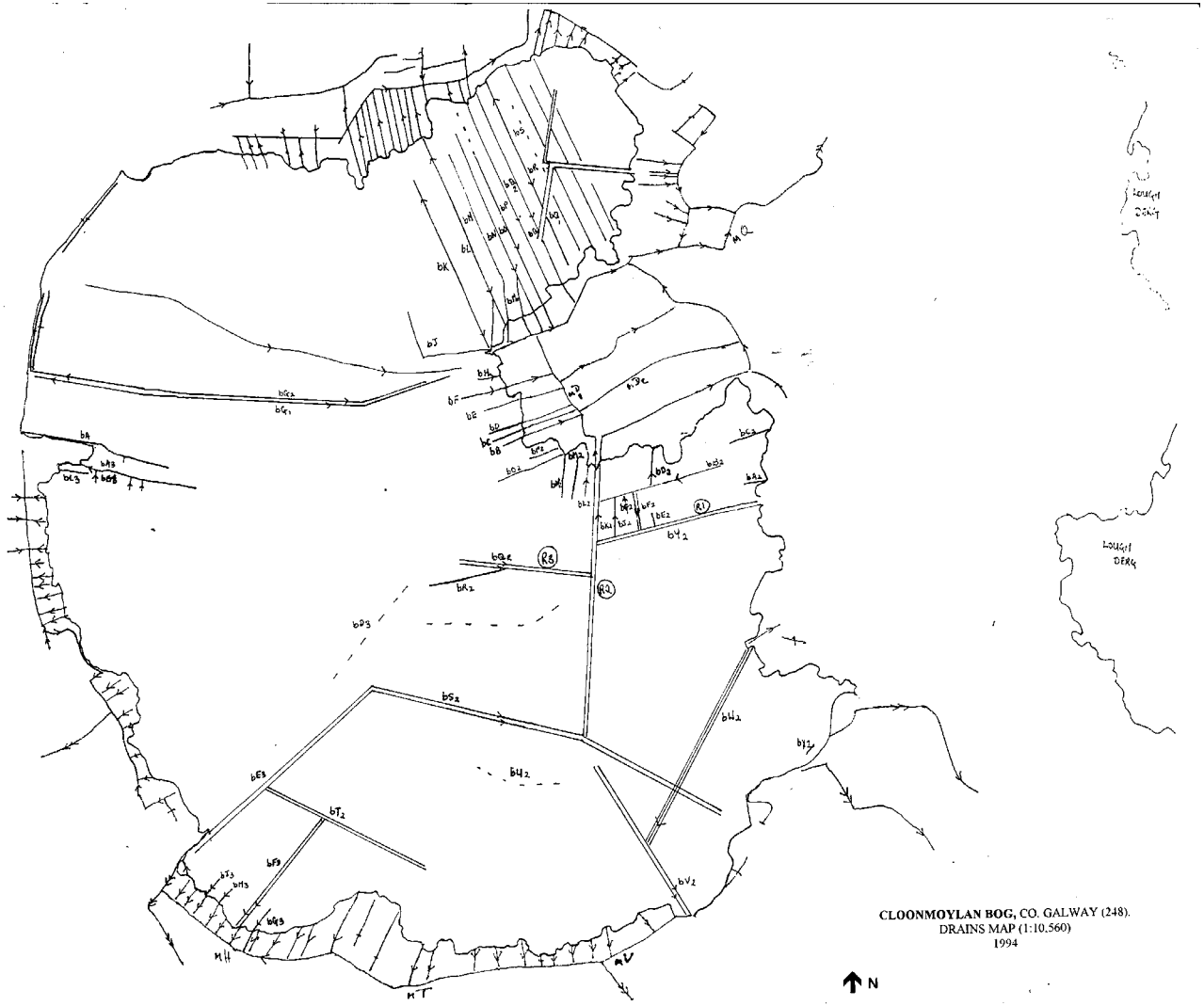
3. The wettest sections of the site are associated with the flattest areas. These are quite extensive.

4. The linear flush at the S of the site appears to be related to an internal drainage system.

5. Recent fire has affected parts of the high bog resulting in a deterioration in *Sphagnum* cover.

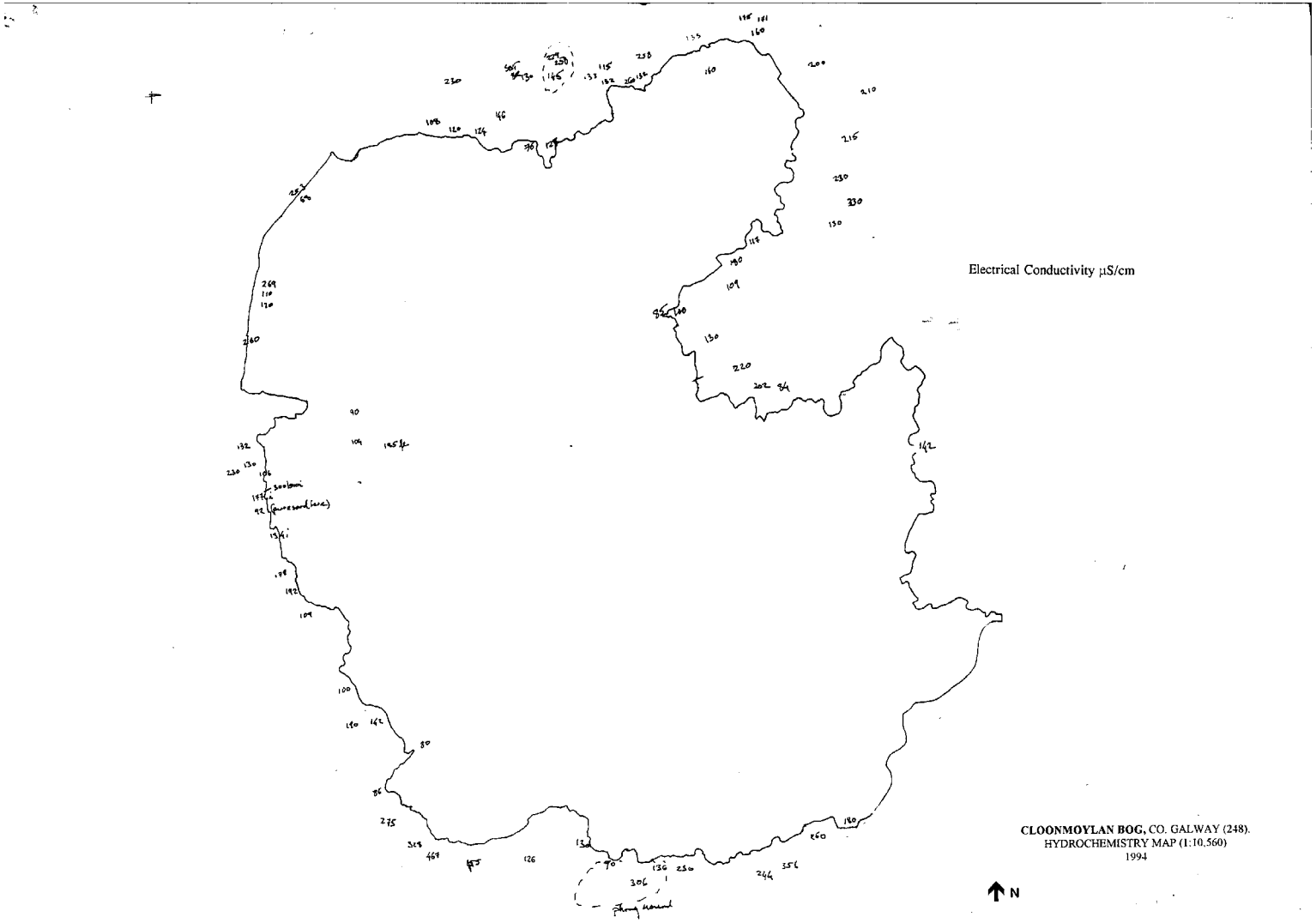
Lara Kelly
Malcolm Doak
Marie Dromey

Raised Bog Restoration Project (1995).

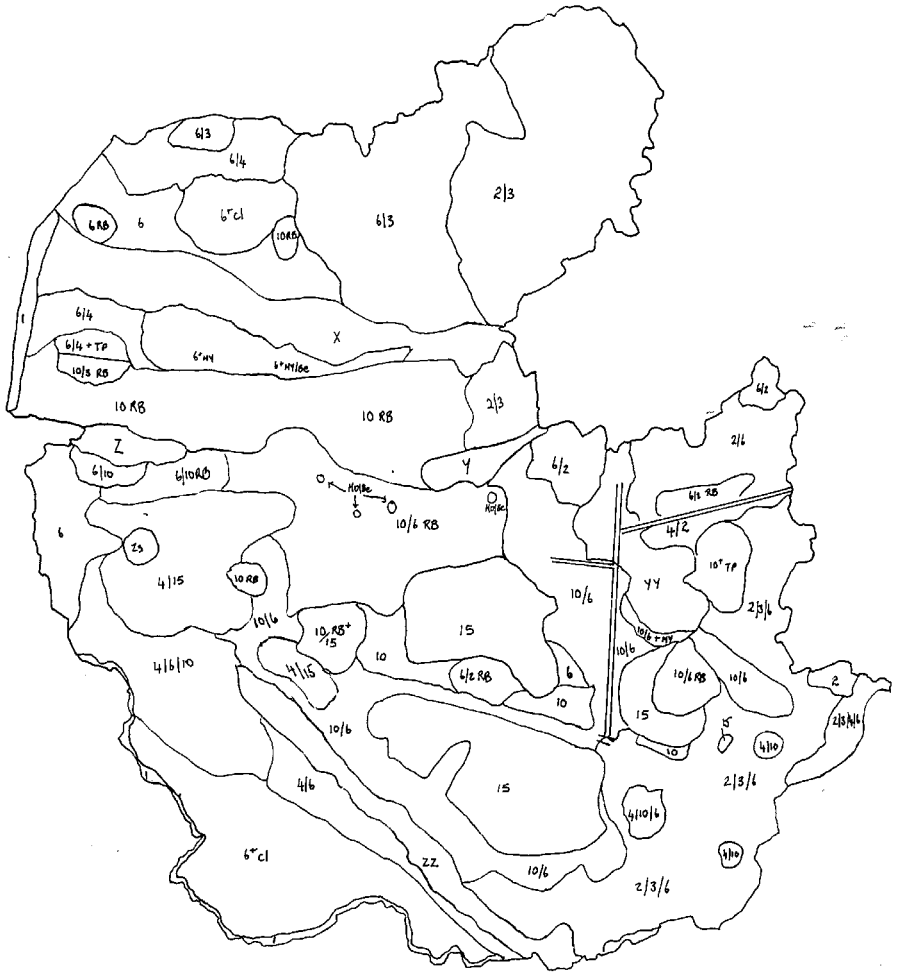


CLOONMOYLAN BOG, CO. GALWAY (248).
DRAINS MAP (1:10.560)
1994

N



CLOONMOYLAN BOG, CO. GALWAY (248).
HYDROCHEMISTRY MAP (1:10,560)
1994



CLOONMOYLAN BOG, CO. GALWAY (248).
VEGETATION MAP (1:10.560)
1994

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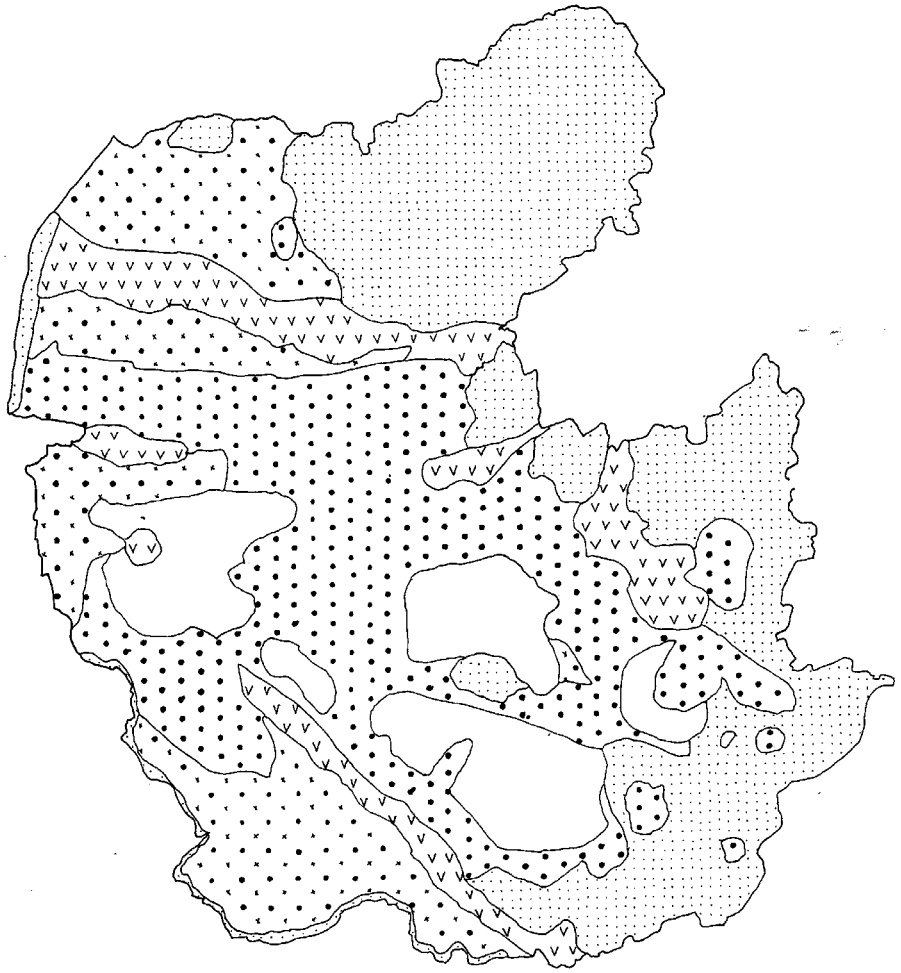

CLOONMOYLAN BOG, CO. GALWAY (248).
ECOTOPE MAP (1:10,560)
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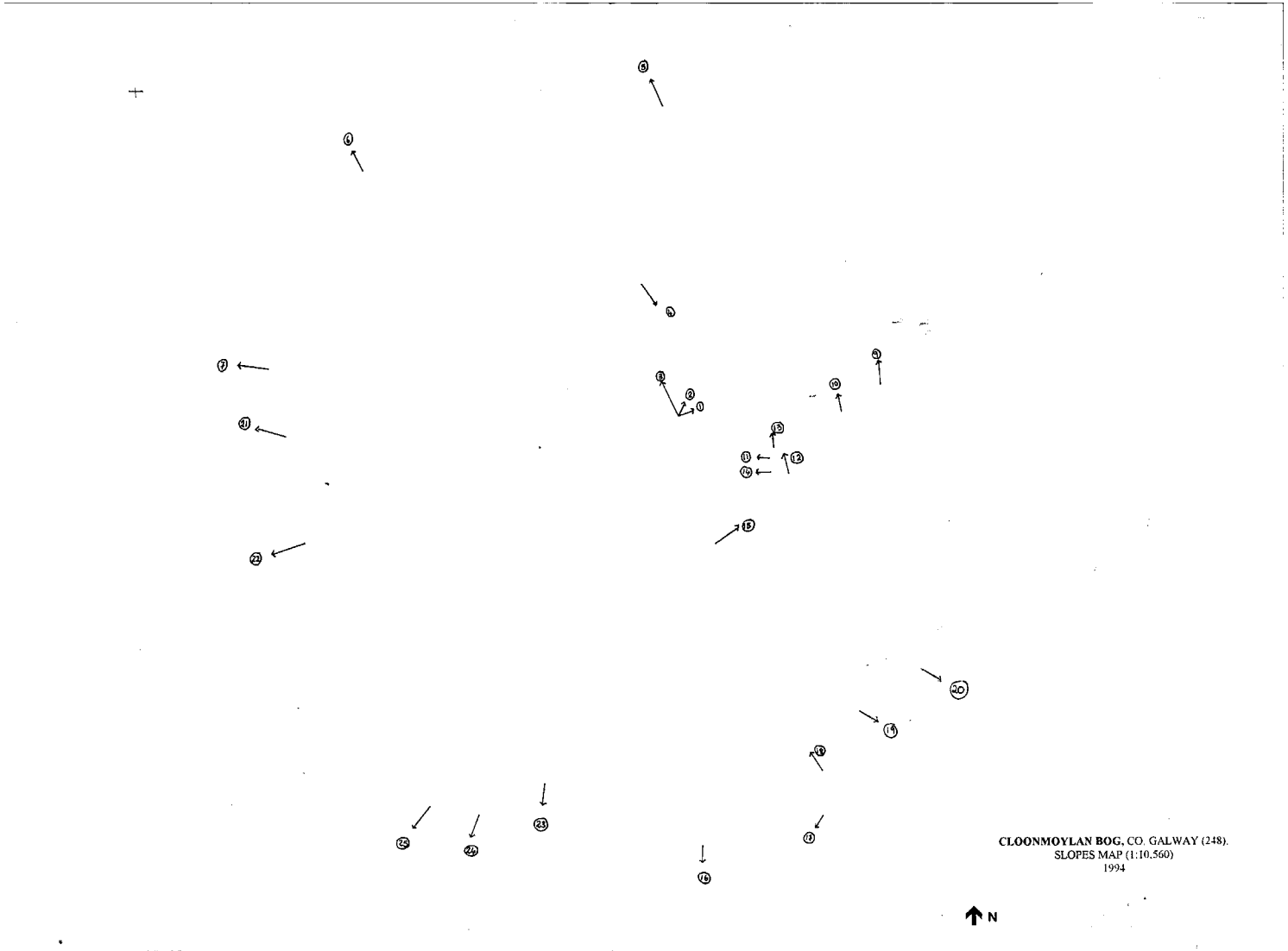
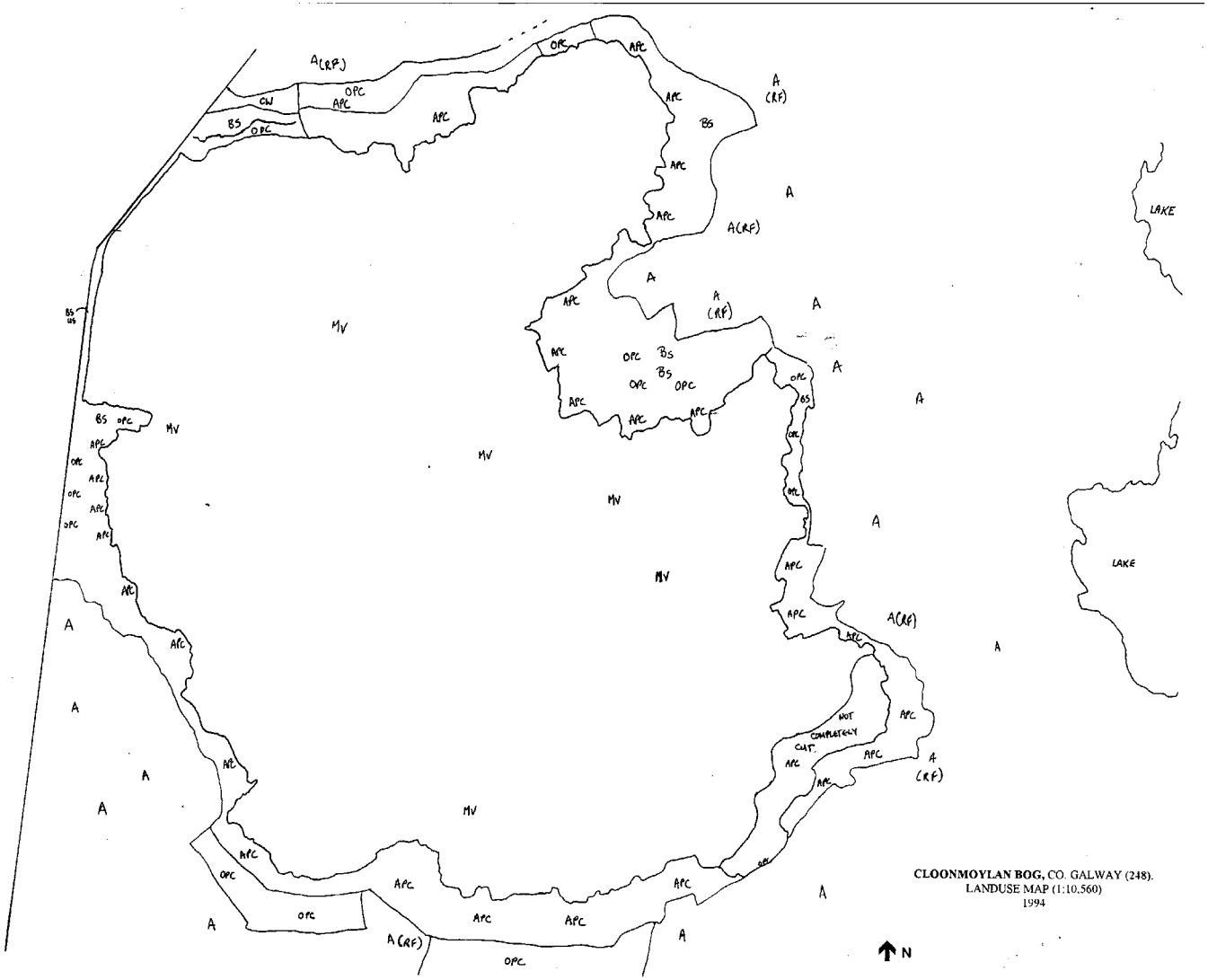


CLOONMOYLAN BOG, CO. GALWAY (248).
SLOPES MAP (1:10,560)
1994



CLOONMOYLAN BOG, CO. GALWAY (248).
LANDUSE MAP (1:10,560)
1994

CORLISKEA, CO. GALWAY/ROSCOMMON.

1. SUMMARY OF SITE DETAILS

NHA No.	(219) 2110	1/2" Sheet:	12
Grid Ref:	M 67 74	6" Sheet:	GY 1/2 & RN 26/33
GSI Aerial Photo:	M 63	1:25,000 Sheet:	14/27 SE
Other Photo:	OS (1993) 8219/8228	Area (ha):	234 (Main Lobe)
NHA Photo:	652:26-36A and 653: 1-5		60 (East Lobe)
Date(s) of Visit:	4 -5/8/94 (Ecology)		
	4 -5/8/94 (Geohydrology)		

Townlands: Corliskea, Bookalagh, Cloonfelliv, Annagh and Cloonfad.

2. INTRODUCTION

2.1 BACKGROUND

This site was visited by Douglas and Grogan (1985) as part of the survey to locate raised bogs of scientific interest carried out by the Wildlife Service between 1983 and 1987. They describe the bog as being large and wet with good pool systems and a number of flushes including a small lake. One of the flushes was wooded, mainly by *Betula* with well developed *Sphagnum* hummocks beneath. Lines of swallow holes are also mentioned. Intensive peat cutting was noted at the northern and eastern edges.

Corliskea was given A status and included in the list of potential NNRs compiled by Cross (1990). For these reasons this site was included in this survey.

During the final part of this project this site was combined with two adjacent sites Trien and Cloonfelliv. These were treated as one site when filling in the Natura 2000 forms.

2.2 LOCATION AND ACCESS

This site is located approximately 6km south of Castlerea, Co. Roscommon and 3km NW of Ballymoe, Co. Galway. The Galway/Roscommon border runs through the site. The road between Ballymoe and Dunmore runs by the S of the bog while the road from Ballymoe N towards Castlerea runs to the E. Access is easiest from the latter as a bog road off it runs the entire length of the northern edge. A small road also divides this site from Trien (NHA 616) which lies immediately to the NW.

3. METEOROLOGY

No meteorological measurements have been made on Corliskea bog. Rainfall data from the nearby Ballymoe rainfall station for the years 1951-80 indicate that the area receives an average 1026mm of precipitation annually (Figure X).

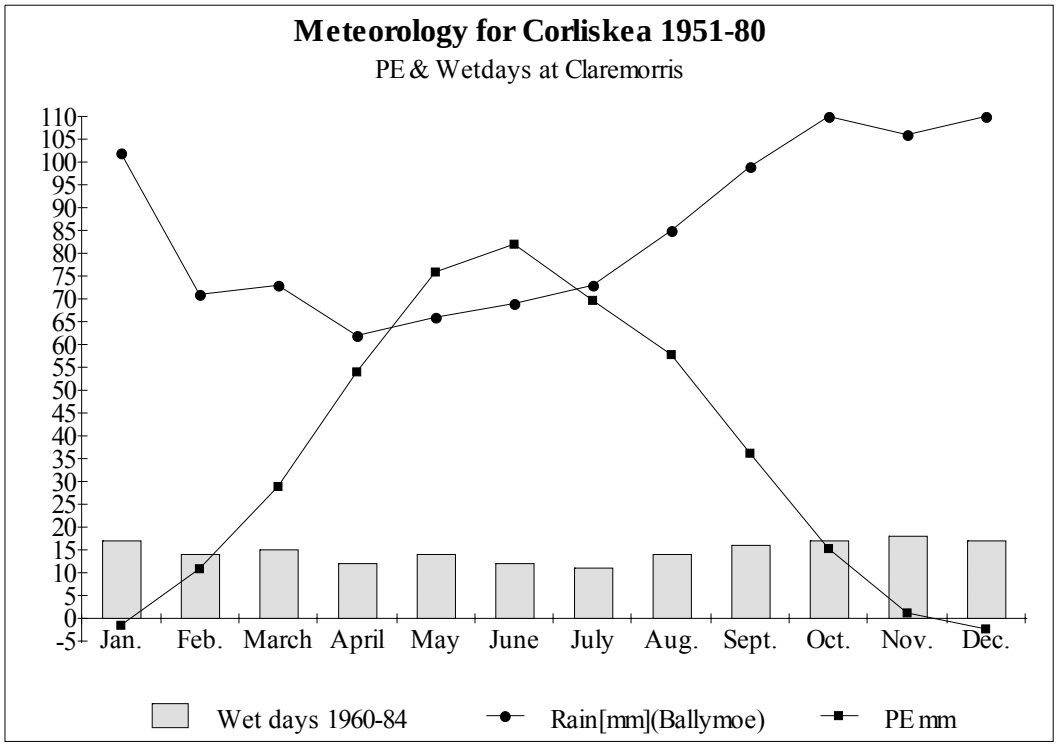
Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

The above factors suggest that the year round actual evapotranspiration (AE) from Corliskea Bog is greater than PE at Claremorris, site of the nearest synoptic station which had an average PE of 428.1mm/yr (1951-81) calculated by the Penman method.

Annual evapotranspiration losses from the bog surface at Corliskea would therefore be greater than 428.1mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 598mm/yr.

Figure X



Meteorological data for Corliskea Bog (1951-1981) are summarised below:

Rainfall (P)	1026mm/yr
Actual Evapotranspiration, (AE)	>428.1mm/yr
Potential recharge, (PR)	<598mm/yr

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

This is an intermediate raised bog indicating that it shares features with blanket bogs. The most noticeable of these are the absence of a definite dome and the undulating nature of the site. The most significant slopes are into the centre of the site at the E end of Flush W with slopes of up to 3m over 300-500m from the N, S and E. The bog also slopes to the west from Flush W and along River 1. Slopes associated with peat cutting are also seen at the margins of the site.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

Corliskea bog covers a large inter-drumlin area between the River Suck and the Island River.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

Recent geological maps by Smith, show that the area is probably underlain by cherty argillaceous bioclastic Carboniferous limestones (known as ABL).

The ABL fossiliferous limestones generally have a low permeability and are classed as a poor aquifer.

5.1.2 Subsoils (See 6" 1840s Map)

No subsoils data were available for Corliskea bog apart from the initial 1840s GSI geology field sheets, and recent fieldwork.

Geology of Inorganic Subsoils

The Quaternary subsoil geology of this bog and surrounding area is dominated by clayey tills. Sections in drains near the drumlins show that till is stoney within a coarse matrix.

Lake clays were recorded to the south of the bog where peat faces are 1.5m-4m high.

5.1.3 Depth to Bedrock

Depth to rock on the bog is unknown.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology (See Drains and Hydrochemistry Map)

West

Rivers (See notes on Rivers 1 and 2 in Section 8.2.1).

Drains complex bA have been dug since the 1970s but appear quite old. There is cracking and slumping along and towards the three drains which go to make up this complex. There is significant flow to the SE in the most S drain. The drain is partially infilled and is 0.25m deep by 0.5m wide.

Drain bB is old and not easily seen in the field. It extends SW of Flush Z towards and through the new forestry plantation on the high bog. There are erosion channels along this drain.

Drain complex bC is associated with a *Pinus contorta* plantation - planted recently. The drains run NNE/SSW and the numerous drains within the forestry are 0.25m deep by 0.5m wide with no flow at the time of the survey. The most easterly drain at the edge of the plantation is deeper with rapid flow to the SSW towards R2. The EC of the water in this drain is 250 μS/cm and species such as *Lemna, Callitriche, Filipendula, Galium palustre, Epilobium palustre, Juncus bulbosus* and *Menyanthes* were recorded though most of the drain was bare. The most westerly drain is also deeper with flow to the SSW but the EC is only 91 μS/cm and no minerotrophic species were recorded.

Drain bD is a short, old, partially infilled drain which flows NNW into R2. Species seen include *S. cuspidatum, S. auriculatum, R. alba* and *E. angustifolium.*

Drain bE is also old and infilled with a similar list of species but this drain is longer. Flow is also to the NNW.

Drain bF runs NW/SE parallel to R1. At the NW end this drain has partially collapsed and is up to 2.5m wide in places. It is 0.25m deep with 0.1m of water at its edges. There is rapid flow is to the NW. The central ridge is colonised by *Molinia, Calluna* and *E. angustifolium.* At the SE end there is a significant slope where there are many erosion channels. At this point the drain is 1m wide by 0.5m deep and partially infilled from the edges.

Drain bG is an old drain forming the county boundary between Cos. Roscommon and Galway and runs E/W across much of the site. It is not always easily seen in the field. West of Drain bF Drain bG is 0.4m wide with a high water table which is up to 40cm deep. There does not appear to be a flow. The drain supports *S. cuspidatum, S. auriculatum, E. angustifolium,* and *Drosera anglica.* Where the drain cuts across R1 it is infilled with *Molinia* on the slopes in towards the river.

Drain bJ is at the NW with significant flow SW in towards a series of swallow holes and WSW into R2. It is 0.25m wide by 2.5m deep. Facebank vegetation complex and *Myrica* dominate along the edges with *Salix, Molinia, Agrostis, Succisa, Melampyrum, Potentilla erecta, Arrhenatherum* and *Sorbus aucuparia.*

North
The east of Drain bG where it borders an area of active peat cutting has been re-dredged and widened to 1m. It is shallow and infilled with *Narthecium* mainly with patches of *R. alba*. Flow is seen to the NE.

Drain bG1 runs N and perpendicular to Drain bG and has significant flow to the N. It is partially collapsed and supports *E. angustifolium* and *Myrica*. There are some open water pools with *S. cuspidatum* and *S. auriculatum.*

South
Drain bH flows N into the lake and at this point it widens to 2m. Indications are that water levels in the drain can be 0.25m higher than at the time of this visit. Parts of the drain are infilling due to collapse. The facebank complex occurs along this drain.

Drain Complex b2H is a series of drains very close together which flow SW. They seem to be old but were not present on the 1970s aerial photograph. It appears as though they are the result of peat cutting. The facebank vegetation complex is seen along the intact sections of the drains. There are also some pits of water. *Betula* is encroaching from the S end.

Drain b2J is parallel to an area of intense active peat cutting. The drain is old and infilled mainly with *Calluna* and *Cladonia*. The facebanks are up to 3m tall.

Drain b2K has significant flow to the SSW. There is a depressed area around the head of the drain which is dominated by *E. angustifolium* with much surface water and erosion channels. The drain seems to be a focus point for this erosion. The drain itself is short and narrow with *Myrica* and *Molinia* along it.

Drain b2L, aligned NW/SE, is old and infilled with *Myrica, E. vaginatum* and patches of *Molinia.*

Drains b2M and b2N are new drains which are 0.5m deep by 1.5m wide narrowing to 0.5m at the base. There is 10cm of water with flow to the S (EC 81 μS/cm). Some algal growth is present but otherwise the drain is bare (PL15:21 to N).

East of the Main Bog
A series of drains associated with active peat cutting are seen at the east of the main section of the bog at the base of the till mound. All of these are old and partially collapsed and carry water from the bog. Most have associated Difco cutting on the high bog beside them with hand and hopper cutting at the bog edge. In places bare peat erosion channels are seen running towards the drains.

East Lobe
Drain complexes b2A and b2B are new drains (not on aerial photographs taken in 1993). They seem to be preparatory to the harvesting of turf. Complex b2A are three drains which flow W in towards the shorter of the two tracks to the E of the site and one drain which extends S from the old drain at the E of the track. The drains are 0.25m deep and wide. Drain complex b2B consists of two long drains about 8m apart which link the shorter track with another track to the S of the site. There is flow in both directions (there is a slight rise nearer the N track). There is a cross drain near the N track but flow was not seen.

These three drains are 0.75m deep by 1m wide narrowing to 0.25m at the base. Vegetation complex 6/3 occurs between the two longer drains.

Drain b2C is aligned E/W, is old, in an area of old peat cutting, up to 5m wide and collapsed in places. There are some pools/wet areas with ombrotrophic vegetation. *J. effusus* and *Betula* were also recorded.

Drain b2D on the high bog flows ENE and down the steep slope (Slope 20). It is 3m wide and appears as though it may have been used for peat cutting in the past.

Drain b2E is an old drain aligned NW/SE. It was lined with *Molinia* at the SE end with *Ulex* and a large clump of *Rhododendron* at the SE end. The remainder of the drain was not easily seen in the field.

5.2.2 Bog Margin Hydrology (See Drains and Hydrochemistry Map)

North

There is APC along the whole of this side and along the tracks. Many peat banks have been left behind.

North West

Drains bC flow north to the main drain, mC. These drains are >2m deep and 2.5m wide. Drain mD drains the NW side and part of the main road. This drain acts as the boundary between peat and agricultural land. It is >3m deep.

West

There is a deep drop with steep slopes to the flush/river (drain mE) which lies in till in parts. Further SW, the faces are on a high plateau where there is a drop of more than 12m to stream mE.

South

There is active hopper-cutting at drains mH where faces are >3m high. The cut-away consists of a ridge of till in parts.

South East

There is new hopper-cutting just east of drains b2J. Several new deep drains mJ, are 3m wide and 2m deep and have probably been inserted for forestry. The drains lie in till which is clayey at depth.

Centre

This area consists of a lobe of clayey till surrounded by peat which is a large area of former hand-cutting and hopper-cutting.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map)

North West

Drains bC have ECs of ~300µS/cm. Drain mD has an EC of 212µS/cm.

West

The stream mE, had an EC of 90µS/cm.

South

The ECs at the hopper faces mH, are 100µS/cm and the main drain is 108µS/cm.

South East

The ECs of drains mJ were in the range of ~230µS/cm with shows of iron.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
Corliskea bog is an intermediate raised bog and shares features with blanket bogs. The bog and surrounding inter-drumlin area act as a regional recharge zone for groundwater, lying between the River Suck and the Island River. This bog was joined to Trien bog in the 1840's but a road and drains now run between the two.

Bog Regime
There are relatively few drains on the high bog but there are many drains in the cut-away particularly to the east and north. Generally the ECs were ~150μS/cm in the cut-away drains apart from those in the south and north-east where ECs were >270μS/cm in drains along drumlins. Little runoff from the bog is believed to infiltrate to the watertable since subsoils are generally of low permeability at depth.

Inter-relationship of topography hydrology and hydrogeology
Since Corliskea is an intermediate raised bog the peat in parts is shallow and lies upslope or near the apex of drumlin ridges, particularly where the subsoils are believed to be paludified. The till ridge at the centre of the bog may at one time have stood proud of the bog; it separates the western part of the bog from the eastern part. In fact the eastern side of the bog formed within its own individual basin.

6. VEGETATION

6.1 VEGETATION SUMMARY

The wettest complex at this site is 6/3/35 which covers approximately 5ha. Inter-connecting *S. cuspidatum/S. auriculatum* pools occur with some *Racomitrium* islands and the *Sphagnum* cover is high. The other main pool complex is 6/3+Pools (P). The pools are mainly algal but the bog surface is soft. The driest section of the site is to the SE.

The sloping nature of the site means that certain areas where water flow is focussed or where water ponding may occur are wetter. The wettest areas are mostly seen around the flushes to the west of the bog.

A *Betula* flush is seen to the NW of the site and there are two *Molinia* dominated lines of swallow holes with partly subterranean streams. A small lake is seen at the head of one of these streams.

There is a *Phragmites* (0.75m tall) and *Calluna* (60cm tall) dominated mound to the SE of the main bog. Other species recorded on this mound include *E. vaginatum, E. tetralix, V. myrtillus* and *Cladonia.* The bryophyte layer consists of *Pleurozium schreberi, Hylocomium, Hypnum, S. capillifolium, Polytrichum alpestre* and large hummocks of *S. subnitens*. There is a very narrow band of complex 3/6 all around it. This mound may be associated with the mineral mound to the SSE.

Because of the intensity of the active peat cutting around much of the site, especially to the N, the vegetation is dominated by *Calluna* turf banks with *Molinia, Myrica* and *E. angustifolium* between. To the W there is wet meadow and reclaimed fields close to he bog edge. At the WSW edge there are patches of *Ulex, Pteridium* and *Rubus*. Further E on the southern edge there is active peat cutting with old peat cutting beyond on rising ground towards a mineral ridge. *Molinia* and *Calluna* dominate with *Salix, Betula* and *Pteridium* along the drains. There is some grazing by cattle. In the vicinity of Slope 13 there is a, partially cut, very wet area dominated by *E. vaginatum* with *Sphagnum* regeneration and some *Phragmites, Molinia, P. erecta, S. recurvum* and *V. oxycoccus.* The area is close to the mineral ridge and is poached. East of Slope 13 the old cut-away is dominated by fields of *J. effusus* with areas of regenerating peat. In the vicinity of Drain b2H the areas of old peat cutting are dominated by *Molinia* with scattered *Pteridium, Betula* and *J. effusus*. At the SSE edge of the main bog there is old and active peat cutting with fields dominated by *J. effusus* with some *Alnus, Betula* and *Pinus sylvestris* encroaching. On the more recently active areas is *Calluna* and regenerating peat with some *Molinia.* At the E of the site there is mainly *Ulex* with tall *Calluna, Betula, Salix*, *Pteridium* and some *Rhododendron* along the tracks/roads which lead into the bog.

There is an old mixed deciduous woodland at the extreme east of the site and there is some encroaching by *Betula* and *Pinus sylvestris.* A band of *Ulex* and *Pteridium* grows between the forestry/woodland and the bog. At the S of the E lobe an area of old peat cutting is dominated by *Molinia* and encroaching *Betula* with mature *Betula* beyond (PM15:23).

6.2 DETAILED VEGETATION OF THE HIGH BOG

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1

This *Calluna* dominated marginal complex is seen in places around the edges of the site and along drains, rivers and flushes. At the W end of River 2, *Calluna* reaches 1.5m in height. The complex is also seen along the N and S edges of the W of the bog where the *Calluna* is approximately 30-50cm high. At the western edge the *Calluna* is only 10-15cm tall and there is other evidence of past burning. This complex is particularly well developed at the S end of Flush Y and is also seen along the bog roads on the eastern lobe of the site. Along the eastern edge of the site close to the till mound, *Ulex* and *Pteridium* are seen in this complex. Along the SE edge of the site there are tall facebanks and *Betula* and *Myrica* are invading the high bog through this complex.

Complex 2+ *Cladonia* (Cl)

This *Trichophorum* dominated area is seen in the area between Flush Y and Drain Complex bC and to the W and S of Flush Y. Many deep inter-connecting erosion channels occur and the whole area is tussocky and hard underfoot. However it has not been recently burnt as the *Calluna* is tall and there is a *Cladonia portentosa* cover of 20%.

Complex 2

This is similar to the above complex but with only a very low or no *Cladonia portentosa* cover. It is seen at the NNW of the site close to the south end of the forestry plantation on the high bog.

Complex 2/3 and 2/3+EC

This is a marginal complex on the E lobe and is surrounded by drains. There is much surface water, algal hollows, small pools and bare peat. There is very little *Calluna.* This complex is also seen with erosion channels on the NNE of the Main Lobe (2/3+EC).

Complex 3/2 and 3/2+EC

This marginal complex occurs on slopes at the edges of the site, particularly along the southern side. It is also seen on the eastern lobe, where a lot of surface water is seen and shallow erosion channels some bare and some colonised by *R. alba* occur. The complex is dominated by *Trichophorum* and *Carex panicea* communities.

In places the frequency of deep mostly bare erosion channels is high, especially on the slopes into River 2 (PL15:9) which are associated with Slope 1. There is some *Cladonia* and *Leucobryum* and the *Calluna* is 30cm tall. These areas are denoted by 3/2+ EC (Erosion Channels). It is also seen at the N side of the W end of Flush X and at the W side of River 1 where *Huperzia* is very common and *Racomitrium* is present. *Huperzia* is also present near the swallow-holes at the NW end of Flush W.

A small area of this complex occurs at the S side of the W of the bog, where the *Cladonia portentosa* cover reaches 25% and the *Calluna* is 50m tall on mounds. It obviously has not been burnt for some time but the ground is still hard and tussocky and there is no acrotelm layer.

Complex 4/3 + *Myrica* (My)
This complex is seen between the two bands of *Molinia* dominated vegetation which form Flush Z. *Carex panicea* dominates the higher areas with *R. alba* dominating the erosion channels between with some *Narthecium*. The surface is hard with surface water lying throughout. *Myrica* and *Melampyrum* are scattered throughout.

Complex 4/2
This complex, dominated by *R. alba* and *Trichophorum*, occurs in small patches at the bog margins. *Carex panicea* and *Narthecium* also occur. Surface water was present and the top layer was hard and slippery, indicating the presence of an algal layer. Erosion channels are extensive in places. This is especially true at the eastern bog edge close to the till mound.

Complex 9/7
This small area of vegetation is seen just E of Drain bN at the S of the site. *E. vaginatum* and *Calluna* dominate with some *S. capillifolium* and *S. papillosum* cover. The bog surface is dry and hard. Here the bog is close to the adjoining mineral soil and the peat layer is probably quite thin.

Complex 6/3/2
This complex, which covers a large portion of the site, particularly on the eastern side, is dominated by *Narthecium* with abundant *Carex panicea, Trichophorum* and small algal hollows. *Calluna* and *Sphagnum* cover is low and the surface is generally not soft. Surface water logging is apparent (PM15:24).

On slopes into Flush Y1 *Huperzia* and *Dactylorhiza maculata* were seen. On the SE lobe of the bog this complex dominates with many erosion channels, some containing *R. alba*. The surface is very hard and tussocky. The *Cladonia* cover is up to 20% in places here indicating that burning has not occurred for some time. A *Pinus sylvestris* was seen in this complex on the SE lobe. At the SW of the site some small *Racomitrium* hummocks were seen in this complex.

Complex 6/3/2 + *Myrica*
This is similar to above with the addition of up to 40% *Myrica.* The complex is seen along the NW edge and is associated with Drain complex bA. The *Sphagnum* cover is poor at 5-10% and consists of *S. capillifolium* and *S. papillosum.* The *Calluna* is short. There are small algal hollows and surface water logging. Some of the hollows contain *R. alba* and other contain *Menyanthes* and *D. anglica. Melampyrum* is present throughout the complex and there are patches of *Molinia.*

Complex 6
This complex is found on the E lobe with up to 75% *Narthecium* and overall the complex is dry. There are some dry algal hollows. *Rhododendron ponticum*, *Molinia* and *V. myrtillus* are encroaching. The *Calluna* is very short with a low cover. *E. tetralix* cover is quite high at 10-15%. The area was possibly burnt in the past.

Complex 6/3 + *Myrica*
This complex occurs to the S of the site in the vicinity of Drains b2K and b2L. The area is poached and the ground very hard. There are patches of *R. alba* and *E. vaginatum. Andromeda* is also present. The *Calluna* is 15-20cm.

Sub-Marginal Complexes
Complex 3/6 +*Calluna* (CV)
This complex, seen just to the E of Flush WN, is dominated by *Carex panicea* with *Narthecium* and abundant *Calluna* (20cm tall). The *Sphagnum* cover is poor but the bog surface is soft. There is evidence that surface water flow occurs in places. *Pedicularis sylvatica* was seen here.

Complex 3/6+ Pools (P)
This is similar to the above complex with the addition of pools and is seen to the N of Flush V close to the bog edge. However the pools are mainly algal and dried out. *Pedicularis sylvatica* was also noted here.

Complex 3/6 + *Cladonia* and 3/6
This small complex is seen slightly to the east of the centre of the site. The *Cladonia* cover is moderate at 15-20% and the *Sphagnum* cover, including *S. fuscum, S. imbricatum* and *S. subnitens* hummocks is also moderate. The *Calluna* is 40cm tall. There is a small clump of *Betula* with *J. effusus, E. vaginatum, Anthoxanthum, D. maculata, Pedicularis sylvatica, P. erecta*, *Aulacomnium* and *Polytrichum alpestre*. A patch of this complex is seen within Flush W witout a *Cladonia portentosa* cover.

Complex 6/3/2 + Pools (P)
This is similar to the complex 6/3/2 with the addition of pools. It is wetter and has a higher Sphagnum cover (20%), which consists mainly of *S. capillifolium* and *S. papillosum*. It is seen between Flush W and Flush WN where the pools are aligned SW/NE and are colonised by *S. cuspidatum, Menyanthes, S. auriculatum* and *Drosera anglica*. The bog surface here is soft and a high water table appears to be maintained as it is in a sunken section. *Huperzia selago* was noted here. It is also seen on the slopes into Flush Y1. The pools are similar and the water table is high possibly due to continued water flow through the area. *D. maculata* was seen here. The *Calluna* cover is approximately 15% and there is some *Cladonia portentosa* cover. A *Racomitrium lanuginosum* hummock was seen.

Where this complex occurs on sloping ground to the SW of the lake the pools are very small and are mostly algal. There is much surface water present.

Complex 6/3
This complex covers a large portion of the site, particularly towards the bog edges. it is dominated by *Narthecium* (40-50%) with *Carex panicea* (10-15%). Small algal hollows are common *and R. alba* is sometimes seen. *Sphagnum* cover is generally low (5-10%). The complex is seen between Drains bE and bF (close to Drain bF bare erosion channels occur). It is also seen on the Eastern Lobe where, in the central section, burning has not occurred for some time as the Calluna is of intermediate height (20cm) and the *Sphagnum* cover (mainly *S. capillifolium*) reaches 20% in places. The surface is soft and spongy where this occurs and very occasional small pools containing *S. cuspidatum* and *Menyanthes* are seen. In the SE of the lobe *Betula, Rhododendron ponticum* and Pines are encroaching

To the SE of the main section of the site this complex has been burnt more recently as the *Calluna* is only 5-10cm and *Campylopus introflexus* is seen throughout. Surface water is common and the surface is soft in places although the *Sphagnum* cover is low. *Eriophorum angustifolium* is scattered throughout. Close to Drains bM and bN the cover of *E. vaginatum* increases and there are some small clumps of *Molinia*. Between the drains there is a high cover of *Erica tetralix* and *Calluna*. Cattle poaching is evident in this area.

There is a small patch of *Molinia/Myrica* dominated vegetation associated with Drain bJ at the S edge of this area of this complex and there is active peat cutting carried out (PM15:25).

Complex 6/3 +Tear Pools (TP)
This is seen at the centre of the N edge of the site. It is similar to Complex 6/3 except that a series of tear pools have developed probably due to the effects of peat cutting. These tear pools are mostly algal and are aligned at right angles to the slope to the N.

Complex 6/3 + Pools (P)
This is similar to the above complex but is wetter with the addition of pools and it occurs in more central sections of the site. The pools are mostly linear, aligned at right angles to slopes associated with flushes, rivers and margins. The pools are mostly algal but sometimes contain *Menyanthes* and/or *E. angustifolium*. They are generally not inter-connecting. In places the pools are very long and deep and have been formed due to slumping caused by peat cutting. This is seen along the southern edge of the bog and on the Eastern Lobe. In the latter area *S. cuspidatum, S. auriculatum* and *R. alba* are seen in some pools. Between Flush W (N section) and Flush V, *Dactylorhiza maculata* was seen scattered in this complex.

In the W of the site between the lake and Flush X this complex is associated with sloping ground towards River 1, towards River 2 and towards Drain bE and Flush X. The area is soft and there is up to 60% *Narthecium* cover. The linear pools are aligned WNW/ESE and are up to 4m long. Some pools support *E. angustifolium* and dead *S. cuspidatum* and some are deep.

South of Flush X the pools are aligned E/W and some are up to 6m long. The pools support *S. magellanicum, S. imbricatum* and *Drosera* at their edges with *S. auriculatum, S. cuspidatum, Menyanthes* and *R. alba* in them. The inter-pool areas are soft. Between Drain bG and Flush X the pools have decreased in size, there is less *Narthecium* and up to 2 5% *Calluna.*

To the E of the lake and River 1 there is a large area of this complex associated with the slope down in a northerly direction to Flush W. At the top of the slope there are very large tear pools aligned NE/SW. There is little *Calluna* and the pools are mainly infilled with *E. angustifolium* with *S. cuspidatum* and *S. papillosum* at the edges. The inter-pool areas are variable in softness with *Narthecium* dominated areas hard and *Carex panicea* areas hard. *Further down the slope there is an area with large pools* with *Cladonia* topped hummocks in them. In the inter-pool areas there is some bare peat *Campylopus introflexus* and abundant *Carex panicea.* The area was possibly burnt with just the tall hummocks in the pools escaping damage. The ground is very hard. Nearing Flush W on the lower slopes the topography is very uniform with *Calluna* hummocks (20%) only 20cm tall. There is an increase in *Sphagnum* cover to 15% and includes *S. fuscum.* The pools are smaller and are infilled with *S. cuspidatum* with *S. papillosum* at the edges. The ground is soft.

To the E of Flush WN, pools are very frequent and appear to be tears but are infilled with *S. cuspidatum, S. auriculatum, Menyanthes, Drosera anglica* and *E. angustifolium*. Surface water flow channels are evident between the pools. This complex extends northwards right up to the bog edge. However close to the bog edge the pools become algal and are deep with a definite NW/SE alignment. *Campylopus atrovirens* was noted around the pools edges.

Just NW of the *Phragmites*/*Calluna* mound at the E of the site an area of this complex occurs where the *Cladonia portentosa* cover is high. The *Calluna* (15cm tall) and *E. angustifolium* cover is high with *R. alba* abundant in depressions. The bog surface is wet and soft and the *Sphagnum* cover is approximately 20% including *S. imbricatum* and *S. fuscum.* Algal and *S. cuspidatum* colonised pools occur. This area is indicated by 6/3+P+Cl (with pools and *Cladonia*).

In the E lobe there are burnt and unburnt examples of this complex. The lighter coloured areas on the aerial photograph have been burnt some time in the past. In these areas the pools are infilled with *S. papillosum, S. cuspidatum, S. auriculatum, Menyanthes, Drosera* and *R. alba.* The area is soft and the *Sphagnum* cover 15-29%. There is no *Cladonia.* Higher up the bog the *Calluna* is tall, there are large *S. capillifolium, S. imbricatum* and *S. fuscum* hummocks topped wit *Cladonia*, the *Sphagnum* cover increases to 25%, the area is quite wet and squelching and *E. angustifolium* cover increases. The area is on level ground and the pools are not linear.

Complex 6/3 + *Myrica* + Pools
This is similar to above as pools are mostly algal although some contain *S. cuspidatum* and occasionally *Menyanthes.* This complex is found to the NW of the site close to the new forestry plantation. There are erosion channels leading westwards towards the new Drain bC associated with the plantation and the pools appear to be emptying into this. There are also small patches of bare peat. *Racomitrium, Pleurozia purpurea* and *Melampyrum* are present in the complex.

Central Complex
Complex 6/3/35
This is the wettest complex at this site and is seen in a few locations. One occurs between River 1 and Flush X. The complex is similar to Complex 6/3 but the pools have a more permanent appearance and are inter-connecting. The pools are colonised by *S. cuspidatum, S. auriculatum, Menyanthes, R. alba, Drosera anglica* and *E. angustifolium*. Some *Racomitrium* islands occur but they are degraded. The *Sphagnum* cover is high in places between the pools consisting mainly of *S. capillifolium, S. papillosum* and *S. imbricatum* with bits of *S. fuscum, S. tenellum* and *S. subnitens*. The *Cladonia portentosa* is 20%. The bog surface is soft within this complex (PM15:17).

A second area is located just to the SW of this on a level plateau where some of the pools are aligned parallel to the S edge of the bog. There are islands and tall hummocks (30-40cm) of *Racomitrium, Dicranum, Pleurozium schreberi* and *S. fuscum. Cladonia* is found only on hummocks. Pools are similar to above. In the inter-pool areas there is 25% *Calluna* cover with much *Narthecium* and the ground is hard (PM15:18).

To the SW of the lake some of the pools are rounded and some are long, linear and deep with little *Sphagnum* at the edges. In the pools are *R. alba, Menyanthes* and *Drosera* while the deeper pools are bare or with *Menyanthes. Racomitrium* islands are present and *Cladonia portentosa* is growing on the hummocks and islands.

In another area SW of the *Phragmites/Calluna* dominated mound at the E of the site there are also inter-connecting pools which support a similar range of species with the addition of *Utricularia minor* and *Campylopus atrovirens* (at the pool edges).

6.2.2 Flushes

There are a number of flushes on this site, concentrated to the W of the bog, which are associated with internal drainage systems both subterranean and over ground. Flushes Z and W converge and form River 2 and River 1 meets River 2 at the centre of the western edge of the site.

Flush Z is a an area of vegetation at the NW of the site with associated bands of *Molinia* and swallow holes (no running water heard). At the N side there is an area with *Sorbus aucuparia* and *Frangula alnus* (five) with other species such as *Pteridium, Lonicera, Dryopteris dilatata, Agrostis* sp., *Juncus effusus, Rumex* sp., *Myrica, Vaccinium myrtillus, Succisa pratensis, Dicranum scoparium* and *Leucobryum glaucum*. The *Molinia* dominated area surrounding these trees also has scattered *Myrica* with *Potentilla erecta* and *Polygala vulgaris*. This *Molinia* area extends southwards and eastwards to Drain bJ.

Flush Y lies to the W of Drain complex bC. It runs NNE/SSW and is dominated by *Molinia* with tall *Calluna* and some *Vaccinium myrtillus* along its edges. *Molinia* dominated channels lead into both sides of the main channel. Other species recorded included *Juncus effusus, Anthoxanthum, Myrica* and *Potentilla erecta*. It appears to have been a water trackway in the past which has been by-passed due to recent drainage although it may carry water during periods of high rainfall. The flush becomes waterlogged towards the bog edge where *Pteridium* encroaches and a large *Salix* tree is seen.

Flush X is a linear feature seen at the SW of the bog made up of a series of swallow-holes. These are surrounded by tall *Calluna* with *Salix* and *Juncus effusus* in some. Towards the W, *Molinia, Potentilla erecta*, *Succisa*, *Pteridium, Vaccinium myrtillus*, and *Osmunda* are seen around the swallow holes (PL15:10 to the SE) with *Viburnum opulus* recorded in one. Water was seen in some swallow holes but did not appear to be flowing. At the east end of the flush a *Pinus sylvestris* seedling (1 m tall) was noted. At the west end of the flush, close to the bog edge, *Juncus effusus, Lonicera, Anthoxanthum, Hypochaeris, Ilex, Rubus* and *Salix* were noted.

Flush W is a long linear area of vegetation which runs from the centre of the site westwards to the bog edge. It is located in a central depression (approximately 3 m lower than the rest of the bog) and joins with Drain bJ and Flush Z. There is a clump of swallow-holes in this location. The flush continues to the W as River 2. An arm of the flush extends northwards and is denoted WN. The eastern end of the main section consists of a series of swallow-holes (with running water) with *Calluna* (50cm) around the edges and some *Molinia*. Some *Calluna* and *Eriophorum vaginatum* dominated ridges occur also. Westwards the line of swallow holes continues some of which had water at the surface and were filled with *S. cuspidatum*. The central part is dominated by *Betula, Juncus effusus, Pteridium, Succisa, Melampyrum, Molinia* and *Calluna*. A band of *Molinia* extending along it to the N and S. *Potentilla erecta* and *Polygala vulgaris* are commonly seen in this band (PM15:20). A *Rhododendron* bush was noted here. Directly S of Flush V, *Myrica* comes into the Flush vegetation. The Flush then becomes very wet and difficult to walk through with *Menyanthes* and *S. papillosum* lawns.

The northern arm (WN), which is separated from the main section of the flush by a pool area, is also made up of a series of swallow-holes (running water heard in most).

Some are just in typical bog vegetation while others are surrounded by tall *Calluna* or *Molinia*, with other species such as *Potentilla erecta, Blechnum spicant, Vaccinium myrtillus, Betula, Succisa, Juncus effusus, Vaccinium oxycoccus, Rubus fruiticosus, D. maculata, Salix, Anthoxanthum, Aulacomnium palustre* and *Polytrichum alpestre*. *Pedicularis sylvatica* was recorded between the swallow holes in this area. Complex 6/3/2 with tear pools occurs in places between the swallow holes and the bog surface is soft in places with a moderate *Sphagnum* cover. This may be due to water movement into the area as it is sunken.

Flush V to the N of the site consists of a wood dominated by *Betula* which are up to 8m tall with epiphytic lichens and an area dominated by *Molinia* with abundant *V. myrtillus* (PM15:20+21). There are some *S. cuspidatum* filled pools with *Aulacomnium* and *P. alpestre* around them. There is scattered *Myrica* and *Pteridium* near the wood. Trees in the centre of the wood are 5m tall. Under the trees is *Calluna* up to 80cm tall, *Molinia* tussocks, *P. erecta, J. effusus, V. myrtillus, Dryopteris, Luzula, E. vaginatum* tussock and *Cladonia* with a concentration of tall *V. myrtillus* around the woodland. In the bryophyte layer *Pleurozium schreberi, Polytrichum alpestre, P. commune, Aulacomnium, Hylocomium, S. capillifolium, S. papillosum, S. fimbriatum, S. recurvum, S. palustre, S. squarrosum, Leucobryum* and *Peltigera membranacea* were seen.

Flush U is a small area of swallow-holes near the NE of River 2 at the W of the site. There was no sound of running water. The holes are lined with *Calluna* 1m tall and are surrounded by *J. effusus, Molinia, V. myrtillus* and *Blechnum.*

Flush T is seen to the SW of Flush W and consists of a small clump of *Betula* and a large patch of dry *E. vaginatum* dominated vegetation with *Calluna* and *Molinia.* Nearing Flush W the % *Molinia* increases. Found in association with the *E. vaginatum* dominated vegetation is 40% *Sphagnum* cover - mostly *S. capillifolium* and degraded hummocks with *Menyanthes* growing up through some of the better ones. *Aulacomnium, Polytrichum alpestre, Osmunda, P. erecta*, tall *Calluna* and some bare peat were also recorded.

The clump of *Betula* trees shows evidence of burning as most are less than 1m (PM15:19). The area is very dry and the under storey is dominated by *Molinia* with *J. effusus, V. oxycoccus, V. myrtillus, P. erecta, Aulacomnium, P. alpestre, S. palustre, Dryopteris, Hylocomium, Pleurozium schreberi, Leucobryum, E. vaginatum* and *Anthoxanthum*. There is a high epiphytic lichen cover on the new trees.

Flush S is seen to the S of the site and is associated with both R2 and the lake. It is in a depression with the ground to the SW rising. The vegetation is dominated by *Molinia* with abundant *Pleurozium schreberi, S. capillifolium, S. recurvum, S. subnitens, S. papillosum, Polytrichum commune, Rhytidiadelphus, Aulacomnium, Dryopteris, V. oxycoccus, V. myrtillus, P. erecta, Succisa, Luzula, J. effusus, Andromeda* and a clump of *Myrica.*

Flush Z1 is seen on the eastern lobe to the west of the more easterly road. It consists of two concentrations of *Betula* trees with flushed vegetation between. The *Betula* in the westerly group is up to 4 m high with scrub and seedlings 0.5 - 2m tall. Other species present include *Molinia, Calluna, Pteridium, Vaccinium myrtillus, Rhododendron, Eriophorum angustifolium, Juncus effusus, Anthoxanthum odoratum, Dryopteris dilatata, S. capillifolium, Aulacomnium palustre, S. papillosum, Polytrichum alpestre, P. commune* with *Rhytidiadelphus triquestris* dominating the bryophyte layer. The more easterly group of trees is similar but without *the Rhytidiadelphus triquestris* and with the addition of *Empetrum, Lonicera, Blechnum spicant* and *Hylocomium splendens*. Epiphytic lichens are abundant on the *Betula*. Between the two groups of trees *Eriophorum vaginatum* cover is high and the *Cladonia portentosa* cover reaches 15%. There is scattered *Pteridium* with *Vaccinium oxycoccus, Salix, Galium palustre, Andromeda, Carex nigra* and *Potentilla erecta*. *S. capillifolium, Pleurozium schreberi* and *Aulacomnium palustre* dominate the bryophyte layer with some *Dicranum scoparium*.

Flush Y1 is a small line of swallow holes running NW/SE at the east side of the main bog. They occur in a slightly depressed area and may mark an underground stream. However running water could not be heard. Tall *Calluna* dominates with *Molinia* around some of the holes.

6.2.3 Vegetation of the Rivers

There are two rivers draining this site. They join up with each other near the edge and flow to the W. River 1 (R1) is the larger of the two and flows NNW from the lake. The river is in a depression with steep slopes into it. There are erosion channels along both sides but these appear more abundant on the W side where the slope is steeper. The vegetation along the route is dominated by *Molinia* with *P. erecta,* clumps of *Pteridium,* a large *Sorbus aucuparia*, some *Lonicera, V. myrtillus, Succisa, Rubus* and small amounts of *Calluna.* The river is not continuous but evidence suggests it may be subterranean. At Point 1 it is dry, at Point 2 there is a swallow-hole with the sound of flowing water, at Point 3 there are clumps of *Pteridium* and the sound of running water, at Point 4 the vegetation is dominated by *J. effusus* and *Molinia* with rapid flow to the NW and at Point 5 at the turn to the SW there is a clump of *Betula* 2m tall and *V. myrtillus.*

River 2 flows to the W of the site. Most of the flow appears to be subterranean but there is some water evident (EC 71 μS/cm). The river bed is stepped down towards the W and the sides are about 1.25m deep (PM15:14). The vegetation above the river is dominated by tall *Calluna* with *Molinia, Pteridium, Succisa, V. myrtillus, Rumex, Cirsium palustre, Rubus, Lonicera, Salix, Sorbus* and *Hedera*. Lower down is *Stachys palustris, Potentilla anserina, P. erecta, P. palustris, Anthoxanthum, Agrostis, Galium palustre, J. effusus, Arrhenatherum, Plantago, Senecio aquaticus, Hypochaeris, Epilobium angustifolium, Angelica, Ranunculus repens, Hypericum* and *Filipendula.*

6.2.4 Vegetation of the Lake

The lake to the S of the site is surrounded to the N by a band of *Molinia* dominated vegetation (Flush S). The water at the W side of the lake (EC is 66 μS/cm) is dominated by *Menyanthes* with some *Hydrocotyle*, *Sphagnum recurvum* and *E. angustifolium* (PM15:16). The remainder of the lake seems bare. Around the lake edges are tall *Molinia* tussocks with *J. effusus, Anthoxanthum, Agrostis*, *Sphagnum palustre, S. fimbriatum* and *S. recurvum* with young *Salix* to the NW side. This lake is shown on the 1910 6" sheet, although it is slightly smaller now.

7. BOG TYPE

This bog has been classified as a Ridge Basin bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes

A number of marginal and internal slopes were estimated in the field and are described below. Their positions are shown on the Slopes Map.

West

Slope 1	This slope at the W of the site from the high bog S into River 2 is 0.5m over 50m.
Slope 2	This slope is also from the W of the site from the high bog NNW into River 2. It is quite steep at 2m over 50m.
Slopes 3 & 4	These are the slopes along both sides of River 1 to the SW of the site. Slope 3 from the W towards the river is 0.75m over 70m. Slope 4 from the E is slightly less. There are also less erosion channels on the E side of the river.
Slope 5	This is the slope from the higher ground to the SW of the lake at the SW of the site towards the lake and is 0.75m over 50m.
Slope 6	This slope is at the W of the site in a NW direction along Drain bF. The slope is 0.5m over 100m with erosion channels, bare peat and vegetation complex 4/2.
Slope 7	This slope is at the W of the site N of Flush X in a westerly direction into an area of active peat cutting (hopper and hand cutting) near the clump of Lodgepole Pine. The fresh facebank edge is 2.5m tall. The slope/big slump is 0.5m over 30m.
Slope 8	This slope is also at the W of the site in a northerly direction towards the end of Flush X. There is severe slumping of the bog surface in the vicinity where the flush exits the bog. The slope is 3m over 50m.

Slope 9 This slope is in a westerly direction at the SW of the site into an area of active peat cutting where the facebank edge is 2.5m high and there is a deep marginal drain with *Utricularia*. The slope is 0.5m over 25m with cracking of the bog surface.

Slopes 10 & 11 These slopes are to the S of the site towards an area of old peat cutting and recent forestry. Slope 10 to the SW is 0.75m over 30m and Slope 11 to the W is 0.5m over 20m.

Slope 12 This slope to the S of the site into an area of active peat cutting, with a facebank edge up to 3m tall in places (Pine trunks exposed in it), is 0.25m over 15m. There is severe slumping and cracking of the bog surface.

Slope 13 This slope, down in a northerly direction from the ridge at the S of the site towards the SE of Flush W, is in the middle of the site. It is 3m over 200m.

Slope 14 This is at the N of the site where there is a gentle slope towards the road and an area of active peat cutting. The slope is 0.5m over 30m.

Central Area and East of Main Bog

Slope 22 This slope is from the ridge around the N of the bog S towards an E/W line of swallow holes and pools in a depression. The slope is 0.3m over 30m.

Slope 23 There is a till mound to the east of the central section of the bog with active peat cutting all along the western side of it. The slope from the high bog east through this area of peat cutting is 1m over 150m.

Slope 24 To the S of the till mound there is a ridge along the S edge of the bog. The slope from this ridge NNE to a low-lying area to the SE of the till mound with active peat cutting on-going is 2.5m over 350m.

Slope 25 This slope towards the edge at the S of the site is very steep at 1.5m over 50m to active peat cutting (hopper) with the facebank edge up to 4m deep in places. There is severe cracking and slumping of bog surface with erosion channels running perpendicular to the edge.

Slope 26 This slope is also to the S of the site and is associated with Drain bH which runs SSW. The slope is 1m over 50m with severe cracking and slumping of the bog surface to an area of old cut-away dominated by *Molinia* with scattered tall *Betula*. The facebank edge is up to 3-4m in places.

Slope 27 This is a slope to the NW from the *Phragmites* mound towards the SE of Flush W and is 3m over 250m.

Slopes 28 & 29 These slopes are from the same point at the top of an incline along the N of the bog. Slope 28 is 3m over 500m in a SSW direction towards the SE of Flush W and Slope 29 is NE into an area of active peat cutting and the road and is 0.5m over 30m. There slumping features associated with this latter slope and large bare erosion channels.

East Lobe

Slope 15 This slope is at the S into an area of active peat cutting where the facebank edge is 3m tall. The slope is 1m over 25m with severe cracking and slumping.

Slope 16 This slope is westwards towards the longer of the two tracks and is 0.5m over 50m.

Slopes 17 & 18 These slopes are from the high bog N through cut-away towards the road. The entire cut-away all along the N edge slopes to the road. Slope 17 is 3m over 200m and Slope 18 is 3.5m over 300m.

Slope 19 This slope is at the NE of the site where Difco peat cutting is being carried out on a very steep section of bog. The slope is 2m over 70m in an NE direction (PM15:22).

Slope 20 This steep slope is ESE at the E of site from the side of mature woodland to the main road and is 2-4m over 200m. The road is higher than the surrounding cut-away bog.

Slope 21 This is a gentle slope to the SE of the site into old cut-away dominated by *Juncus effusus* and is 0.5m over 50m.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

Peat cutting is being carried out extensively along the northern edge of the site, where a road extends right along this edge of the bog. This cutting is being carried out both by hand and machine. Turbary rights appear to be numerous as there are many different banks and many groups of people were seen. Peat cutting is also widespread around the till mound to the E of the site, around which a road runs. Peat cutting is also occurring along the southern side of the bog but to a lesser extent (PM15:18). New drains have been inserted in the cut-away to the south of the lake. The facebanks in the vicinity of Drains b2J are up to 3m tall (PM15:25). The Eastern Lobe of the bog is cut off from the main lobe by peat cutting and the till mound. Roads run N/S into the eastern lobe from the northern road allowing easy access for peat exploitation. There is also active peat cutting to the N of this lobe and old peat cutting with some Difco harvesting to the NNE (PM15:22). At the SSE of this lobe there is another area of old peat cutting where scrub is invading (PM15:23). Peat cutting appears to be the main problem affecting the conservation potential of the site at present.

8.2.2 Forestry/Woodland

There is a recent Lodgepole pine (*Pinus contorta*) plantation on the high bog to the W of the site where a series of drains (drain complex bC) with flow to the SW have been inserted. The trees are approximately 2 years old and there is *Myrica* scattered throughout the plantation (Pl15:7+9 and PM15:15). Another small Lodgepole Pine plantation with some Sitka spruce is seen at the W of the southern edge of the site in the cut-away close to slope 10. It is approximately 5 years old. A deep drain has been inserted on the bog side of the forestry which is 1 m deep by 2m wide (EC 104 μS/cm). It is colonised by species such as *Lemna, Potamogeton polygonifolius, Epilobium palustre, Juncus effusus, Anthoxanthum odoratum, Salix* and *Carex echinata.* A very small clump of Lodgepole Pine (5 m tall) may be seen on the W side of the bog close to the exit point of Flush X. At the extreme ESE of the site there is a mixed woodland mainly of *Betula* with some Scots Pine which was shown on the 1910 6" sheet.

8.2.3 Fire History

Douglas and Grogan (1985) state that the SE section of the bog had been damaged by fire some years previous to their visit. Bare patches of peat were evident and the *Sphagnum* layer was discontinuous. However some *Sphagnum* regeneration was occurring.

Towards the western edge of the site there was evidence of recent burning in Complex 1. On the East Lobe within Complex 6 there was very short *Calluna* and a high cover of *Erica tetralix* suggesting a recent fire history. To the E of the small lake *Campylopus introflexus* was seen frequently also indicating past disturbance most probably fire.

8.2.4 Dumping

Dumping of household and farm refuse is occurring in places along the road at the N of the site.

8.2.5 Cattle Poaching

Cattle can gain access to the high bog at the centre of the southern edge of the site where the adjoining mineral soil is at the same level as the bog. Parts of the high bog have been fenced in this area and poaching by cattle is severe in places.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. In a small area at the mid-south of the site the bog adjoins the mineral soil and over a small area there is only a thin layer of peat. Some indications of mineral enrichment are seen.

2. The sloping nature of the site means that certain areas where water flow is focussed or where water ponding may occur are wetter. The wettest areas are mostly seen around the flushes to the west of the bog.

3. There are two rivers on this site which are partly subterrranean. The vegetation on the banks of the rivers is dominated by tall *Calluna* while some more mesotrophic species occur in the river depression.

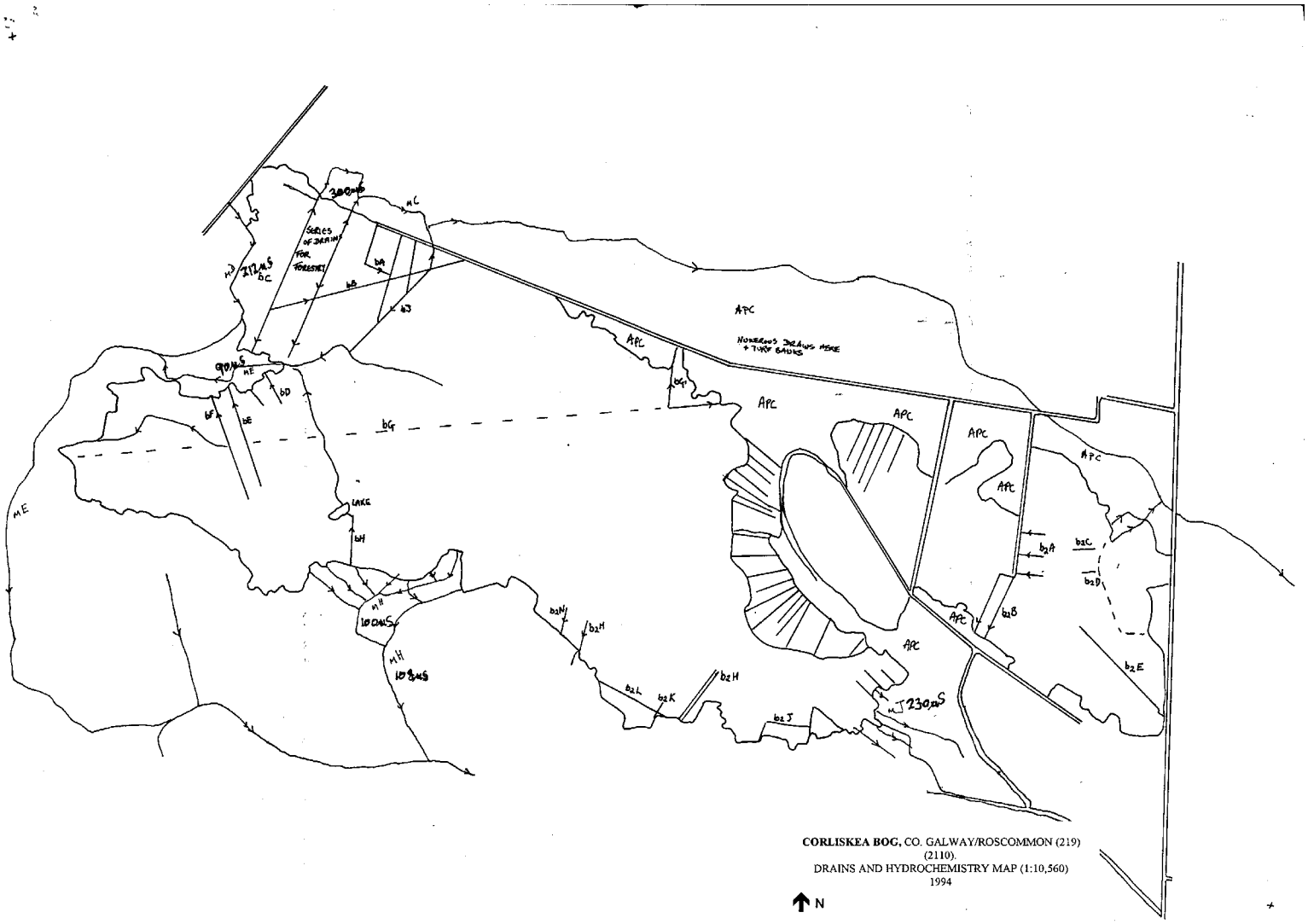
4. A till mound separates the main lobe from the E Lobe. A small till mound, dominated by *Phragmites* and *Calluna*, is seen on the main lobe.

5. It is thought due to the presence of till mounds and the sloping nature of the site that the peat layer is quite thin in places.

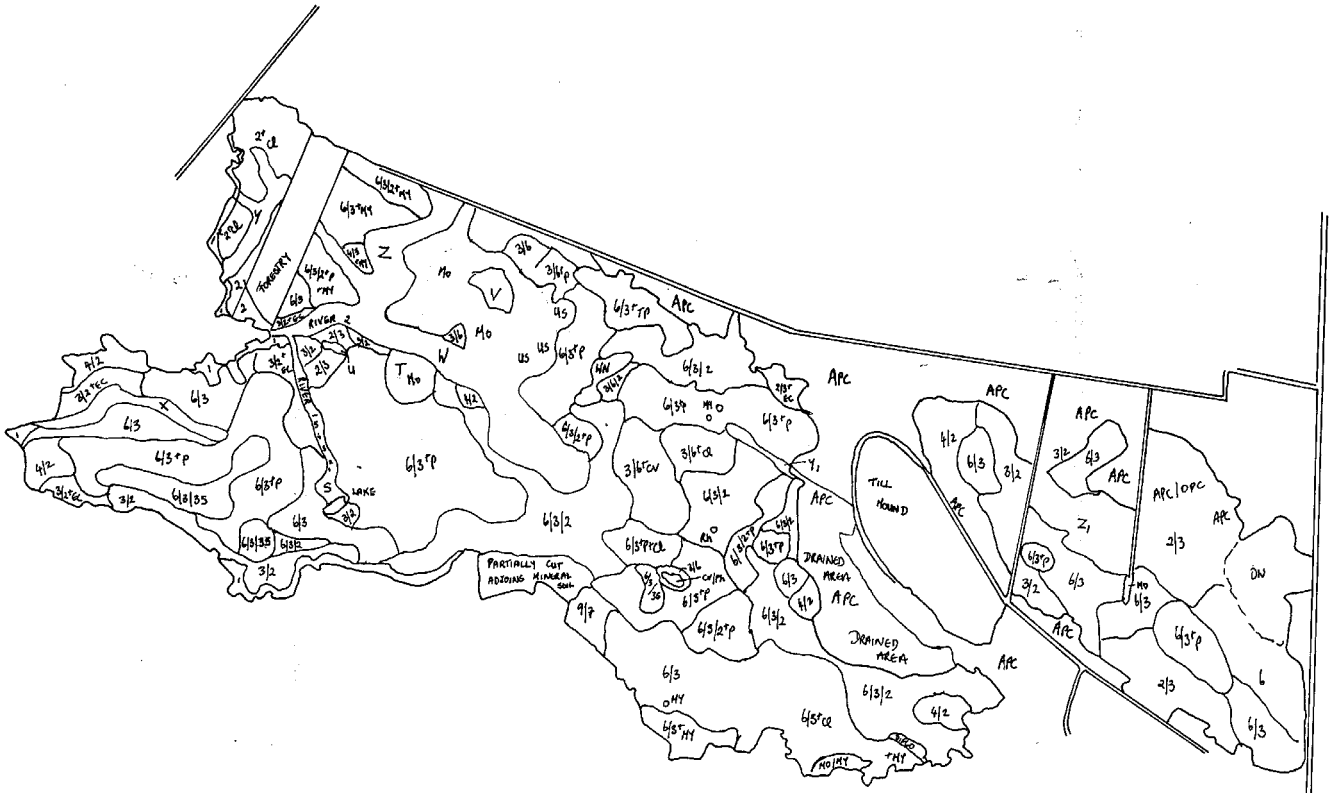
6. Apart from the rivers other internal drainage systems occur mostly with swallowholes. Around one of these *Frangula alnus* was recorded.

Lara Kelly
Marie Dromey
Malcolm Doak

Raised Bog Restoration Project (1995).



CORLISKEA BOG, CO. GALWAY/ROSCOMMON (219) (2110).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994



CORLISKEA BOG, CO. GALWAY/ROSCOMMON (219)
(2110).
VEGETATION MAP (1:10,560)
1994

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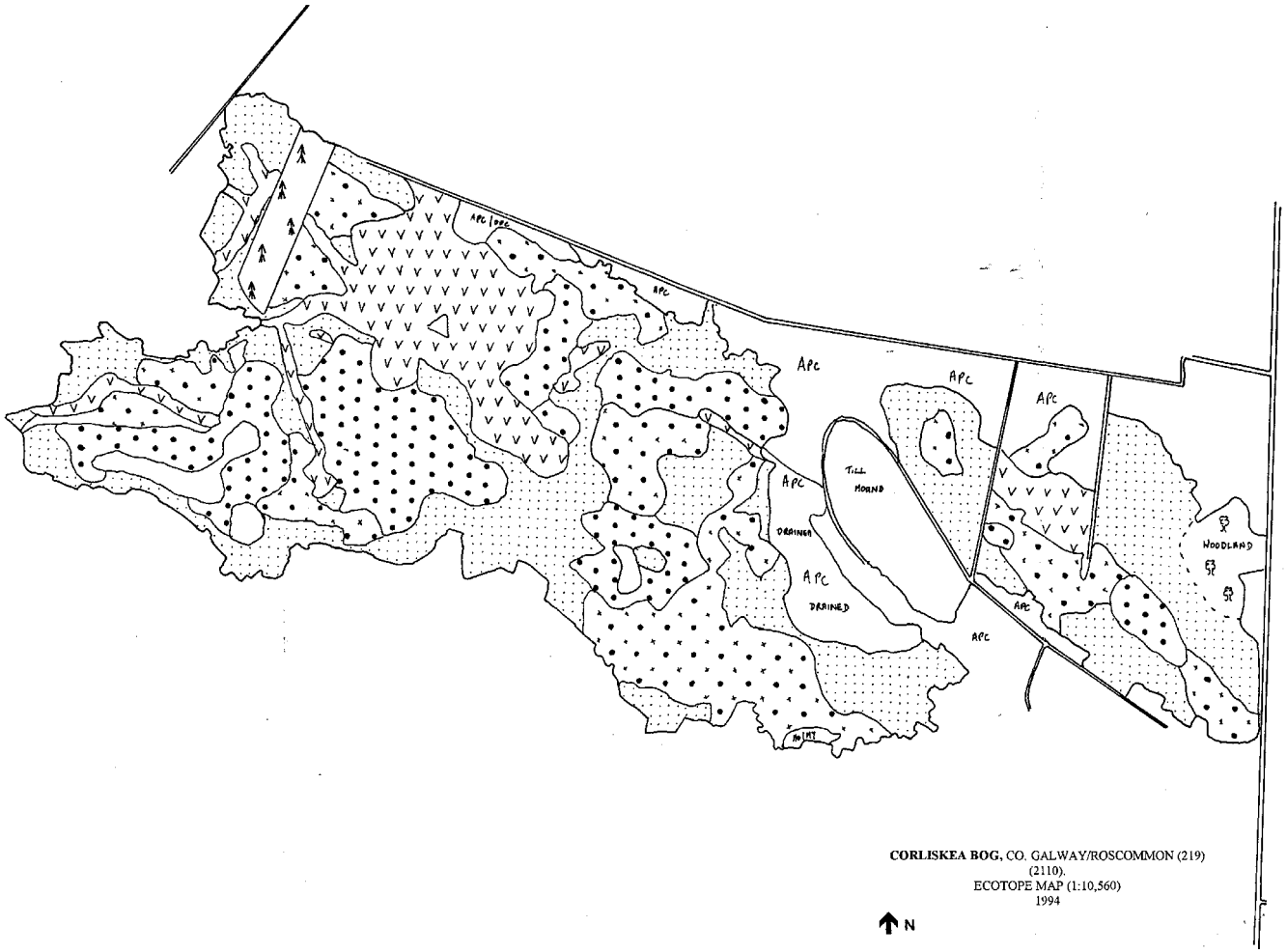

CORLISKEA BOG, CO. GALWAY/ROSCOMMON (219)
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ECOTOPE MAP (1:10,560)
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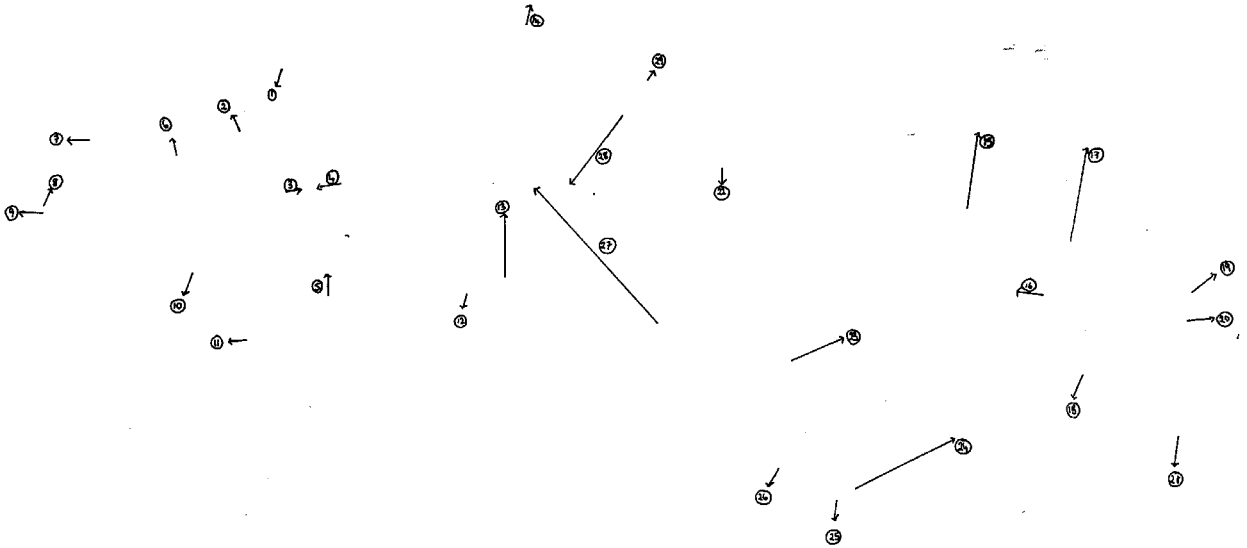

CORLISKEA BOG, CO. GALWAY/ROSCOMMON (219)
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SLOPES MAP (1:10,560)
1994

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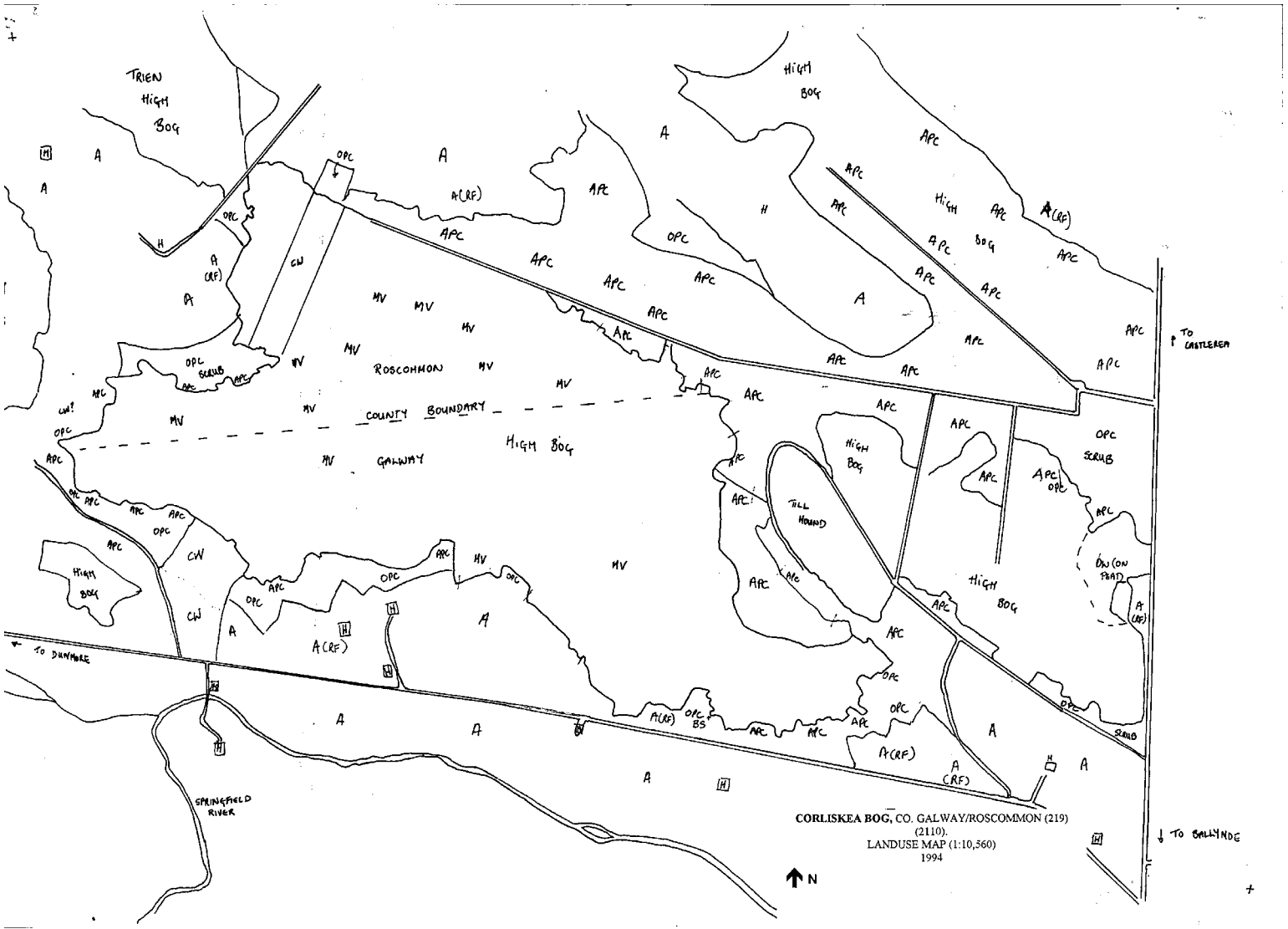


CORLISKEA BOG, CO. GALWAY/ROSCOMMON (219) (2110).
LANDUSE MAP (1:10,560)
1994

FIRVILLE, CO TIPPERARY

1. SUMMARY OF SITE DETAILS

NHA No.	(645) 647	1/2" Sheet:	15
Grid Ref:	M 95 01	6" Sheet:	TY 4 and 7
GSI Aerial Photo:	M448		
Other Photo:	SC 34028/31 (1993)	Area (ha):	188.0 (High Bog)
Date(s) of Visit:	29-30/6/94 (Ecology)		
	28-29/6/94 (Geohydrology)		

Townlands: Kilgask, Lisduff and Ballyhaugh.

2. INTRODUCTION

2.1 BACKGROUND

This is one of two bogs in N. Tipperary separated from each other by L113 road linking Birr and Borrisokane (Kilcarren is the other bog). The bogs are two of a group located at the mid-south of the main distribution of raised bogs in Ireland. Firville was assigned an A rating following the National Raised Bog Survey and was classified as a True Midland Raised Bog (Cross, 1990). This rating indicates that is a very good quality site. However it was not included in the list of potential raised bog NNRs.

The site was visited by O'Connell and Mooney in 1983 and was described as having a wet soft surface over most of its extent. This was despite the fact that *Sphagnum* cover was generally low. The drainage pattern at the south of the site was described as being old and infilled at that stage.

Due to its size, high rating and intactness (determined from recent aerial photography) this site was visited as part of this survey.

This site was combined with adjacent Kilcarren when filling out the SAC forms.

2.2. LOCATION AND ACCESS

This bog is located approximately 13km SW of Birr, Co. Offaly on the east side of the Birr to Borrisokane road (L113). Access to the bog from the road is easy and a car may be parked in the cut-away area to the NE of Kilcarren Bog on the other side of the road.

3. METEOROLOGY

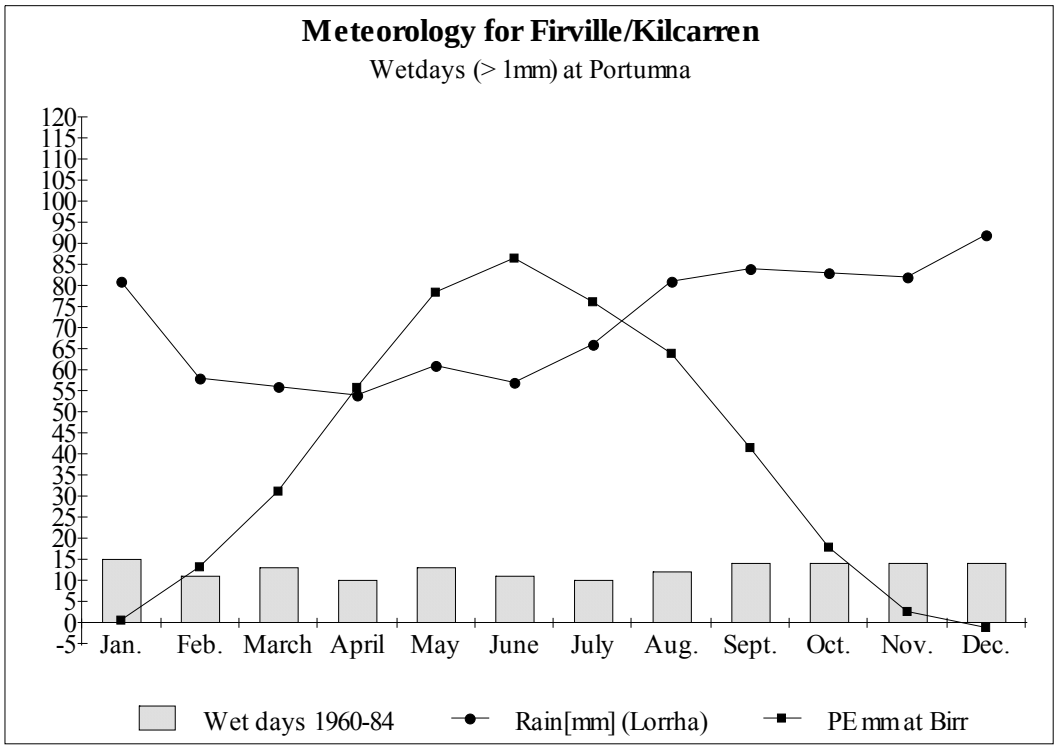
No meteorological measurements have been made on Firville bog. Rainfall data from the nearby Lorrha weather station for the years 1951-80 indicate that the area receives approximately 855 mm of precipitation annually (Figure X). The nearest synoptic station at Birr suggests that the site could have up to 207 rain days annually.

Evapotranspiration in Ireland is usually estimated by using values of potential evapotranspiration (PE) from conventionally sited Meteorological Service stations. PE can be regarded as the amount of water transpired by a green crop which completely covers the ground and is never short of water (Keane, 1986). Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994).

The recent Irish and Dutch work at Clara and Raheenmore bogs suggest that evapotranspiration is significantly more on site than might be estimated using potential evapotranspiration (Daly and Johnston, *op. cit.*).

The above factors suggest that actual evapotranspiration (AE) from bog is greater than PE at Birr, site of the nearest synoptic station which had an average PE of 466.5mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Firville would therefore be greater than 466.5mm/yr.

Figure X



Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore 408.5mm/yr.

Meteorological data for Firville Bog (1951-1981) is summarised below:

Rainfall (P)	855mm/yr
Actual Evapotranspiration, (AE)	446.5mm/yr
Potential recharge, (PR)	408.5mm/yr
Raindays > 0.2 mm (annual {1951-1980})	207 days
Wetdays > 1mm at Portumna (annual {1960-1984})	150 days

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

Firville is a relatively flat bog with a very shallow dome. Slopes to the bog edge are gentle over much of the site with some steep slopes associated with cut-away peat. A section of vegetation Complex 14 is associated with a shallow depression in the mid-east part of the site.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

There is rising ground to the north and mid south of the site.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock
Recent geological maps by Hitzman (Chevron/GSI,1993) show that the area is directly underlain by Waulsortian Carboniferous limestones (fossiliferous mudmounds).

The Waulsortian limestones generally have a low permeability and are classed as a poor aquifer.

5.1.2 Subsoils (See 6" 1840s Map)
Data Availability
No subsoils data were available for Firville bog apart from the initial 1840s GSI geology field sheets and recent fieldwork.

Geology of Inorganic Subsoils
The subsoil geology of this bog and surrounding area is dominated by limestone till. Sections in drains in the cut-away areas indicate that the outer limits of the bog are underlain by poorly sorted clayey tills with relatively large sub-angular clasts composed of limestone (Slide X). There is believed to be some stony till underneath the north east lobe of the bog.

It is believed that Firville bog is predominantly underlain by the clay rich tills. The high proportion of fines in the tills suggest that it has a low permeability.

Peat
The present boundaries of peat are much the same as they were in the geological maps produced in the 1840s. Peat cutting has removed peat from the north east.

5.1.3 Depth to Bedrock
There is limestone outcrop directly north and south-east of the bog. Depth to rock on the bog is unknown; although it is thought to be close to the surface given its proximity to local outcrop.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology (See Drains and Hydrochemistry Map)
The S half of the site is criss-crossed by a network of old large drains (shown on the 1910 6" sheet). These are mostly non-functional and are infilled. Much of the remainder of the high bog is unaffected by high bog drains.

Drain bA is the most northerly of the drains in the drainage network and runs E/W. At its W end it is infilled with *Calluna* and *Narthecium* and *Myrica*. It is approximately 2m wide by 10cm deep. The E section of this drain is infilled with *Sphagnum magellanicum, S. cuspidatum, Eriophorum angustifolium, Rhynchospora alba, Menyanthes* and *Drosera anglica* (PL11:21 to W). The drain in this section is full of water to just under the *S. cuspidatum* layer. *Calluna* and *E. vaginatum* colonise the edges. Where this drain crosses vegetation Complex 14 the drain edges have broken down and the drain vegetation links up with that of the pools.

Drain bD and bE, which run E/W, are similar to each other. There is a track parallel to the W end of drain bD. West of Drain bF the two drains (bD and bE) are not easily seen in the field.

They are non-functional and infilled with *Narthecium.* East of Drain bG they are 1-1.5m wide with evidence of some water flow. They are infilled with *S. cuspidatum, Drosera, E. angustifolium, R. fusca* and *Narthecium.* The E end of Drain bD is infilled with *E. angustifolium* whereas the E of Drain bE, which is quite close to the edge of the site, is infilled with *Narthecium, Calluna* and dry algal hollows. This section has been burnt during the past year.

Drain bF at the W of the sits runs N/S. At its N end it is similar to the wetter section of Drain bA. At its S end close to the bog edge it is infilled with *Molinia, Phragmites, Potentilla erecta* and *Betula* with a *Calluna* dominated ridge to the E. An old fence runs along the ridge. Between these two sections of the drain it is infilled with some dry algal hollows.

Drain bG runs N/S. At its N end it is infilled with *Narthecium, Calluna* and algae. There is no standing water and tall *Calluna* (50cm) dominates the W edge. In the middle section the drain is 1m wide with 10cm of water and supports *S. cuspidatum, R. fusca* and *E. angustifolium.* At its S edge, close to the bog margin it is infilled with *Molinia, E. vaginatum, Juncus effusus* and *Carex echinata.*

Drain bH runs N/S. At its N end this drain is infilled with *Narthecium, E. angustifolium, Calluna* and dried out *S. cuspidatum.* The mid section of the drain is 1m wide by 10cm deep and is infilled mainly with *Narthecium* with some *R. alba, E. angustifolium*, *S. cuspidatum* and *R. fusca.* At the S end *Molinia* and *Calluna* dominate.

Drain bM west of Drain bH also runs N/S from Drain bE. It is 0.5m wide at Drain bE where it supports *E. angustifolium,* and *S. cuspidatum*. The S end, towards rising ground, is infilled with *Calluna* and *Molinia* with tall *Calluna* along its edges.

Drain bJ runs N/S. At its N end it is wetter than the previous two drains and is infilled with *Narthecium, R. alba, Drosera anglica* and *S. cuspidatum* with some *S. magellanicum.* Further S it becomes drier and is infilled with *Narthecium* and *Calluna*. The southern most end is difficult to see in the field.

Drain bK runs N/S and is the most easterly of this network of drains. Its N end is similar to the wetter sections of Drain bA. At the S side it runs through a recently burnt area and is infilled with *Narthecium.* Where Drains bD and bK meet the area is wet and quaking with *E. angustifolium* dominating.

Drain bB is a short drain which runs N/S at the N edge of the site. It is overgrown and contains *Carex rostrata, Molinia, Myrica, S. auriculatum* and *S. cuspidatum* with tall *Calluna* (1m) and *Betula* encroaching along the edges. In places the drain contains stagnant water (EC 97 µS/cm). A barbed wire fence extends along this drain into the bog and *Dactylorhiza maculata* may be seen along this fence.

Drains bC1 and bC2 run SE/NW along the NE of the site (Drain bC2 is nearer the edge). The drains are old and infilled with *Myrica, Calluna, Narthecium* and *S. cuspidatum.* There are some pools of stagnant water and evidence of flow. There is *Molinia* along bC2. This drain has collapsed into the edge in places. Between both drains there is short *Calluna* and some bare peat.

5.2.2 Bog Margin Hydrology (See Drains and Hydrochemistry Map)

South

There are no drains to the very SW since the bog grades into the cut-away, cattle poaching is ongoing. Faces are old and have subsided to <1m high. There is a deep drain mM, in the cut-away 100m south of the faces which lies in clayey till. It is 2m wide and 2.5m deep and recently dredged which has left mounds of stoney till along its sides.

South East

There are large areas of old cut-away with *phragmities* and shallow faces. There are some recently dredged drains mK, that feed drain mM. Parts of the high bog have grass growing on it and the cut-away gets narrower where it is confined by drain mM.

East
There are old faces with no cutting and *Phragmities*. There is also *Typha* along here and peat faces are < 2m.

North
There is an old extensive cut-away section to the north with turf banks and pools and *Typha*. Flow is directed to the north via drain mH, new and relatively deep. There is a high ridge of till between drain mH and mG which runs under the bog in an E/W direction. Stony till lies along the edge of the bog at the start of drain mH.

North West
The cut-away here is very overgrown with old turf banks and pools. Most fo the cut-away drains are overgrown.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map)

South
The electrical conductivity of the main drain mM is 730µS/cm. ECs at the old faces are ~300µS/cm.

South East
Drain mM at this point is 705µS/cm.

East
The ECs are 240µS/cm at faces with upwelling groundwater from the local high to the east.

North
Drain mH has an EC of 150µS/cm at the faces and an EC of 470µS/cm in the cut-away.

North West
The ECs here are a maximum of 100µS/cm.

5.3.2 Laboratory Hydrochemistry

No samples were taken for analysis at the Coillte laboratory.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
Firville bog lies in a groundwater recharge zone and is situated between NW/SE trending drumlins which are bedrock cored. Generally the bog is not domed.

Bog Regime
This bog has a low density of marginal drains with little peat cutting.

Inter-relationship
This bog developed in a basin and extended onto one of the ridges in the north-east where it joined with a smaller basin. There is artificial groundwater discharge in the N, E and S where recently deepened drains intercept the water-table.

6. VEGETATION

6.1 VEGETATION SUMMARY

This is a very diverse site with some wet areas displaying good examples of permanent pools. Approximately 32 ha of the site is covered by wet central or sub-central complexes with pools of *Menyanthes, S. cuspidatum, Drosera anglica* and some *S. auriculatum* with hollows and hummocks.

The wettest area (Complex 14) covers approximately 7.5ha, Complex 15 (9ha), Complex 6/15 (6ha) and Complex 10 (4ha). Most of the remainder of the site is dominated by *Narthecium* flats (Complex 6). Despite the low *Sphagnum* cover in the latter complex the surface is soft and spongy, indicating the presence of an acrotelm layer,

Myrica and *Melampyrum* are commonly seen on this site, particularly at the NW, along the northern edge and on the Northern Lobe. *Plantanthera bifolia* is seen in complex 2+*My*rica at the N of the site.

An interesting feature is the recording of *Dactylorhiza maculata* throughout the site in both dry and semi-dry areas. Its presence is indicative of mineralisation and on this bog the plant is found in the vicinity of rising ground at the N of the site in Complexes 9/6/3, 6+*Myrica*, Complex 6 and at the S of the site in Complex 2 +*Cladonia*. Its frequent occurrence may be related to the thin peat layer that occurs in places (see Section 5.1.2 on Soils).

There are some small flush areas around the site. The largest, at the centre of the site, is dominated by *Pinus sylvestris* with a scrub layer of *Betula*. *Empetrum nigrum* was recorded from beneath an old *Betula* tree near Flush Z at the W of the site.

In areas to the SW of the site, which are poached, non-ombrotrophic species such as *Anthoxanthum odoratum, Festuca rubra, Holcus lanatus, Luzula, Juncus effusus, Trifolium pratense, Rumex acetosa, Potentilla erecta* and *Hypochaeris radicata* are encroaching onto the high bog.

There is a band of *Molinia* dominated vegetation around the SW edge of the N lobe. *Betula* and *Pteridium* encroaching along the bog edge at the N and SW of the site.

Many areas of old cut-away are dominated by *Calluna, Eriophorum angustifolium* and *Juncus effusus* with *Molinia* occurring close to the bog edge with *Betula* and *Ulex* behind and *Pteridium* in the clearings. *Myrica gale* is also found in the cut-away to the NW and SE and *Osmunda* also occurs at the SE. The drop to the cut-away in this area is 1.5m. In places, particularly along the N edge, the *Ulex* and *Betula* scrub forms a boundary (PM11:13). There is mature *Betula* wood beyond the area of old peat cutting along the N edge (PM10: 34+35) and at the NE of the N lobe with tall coniferous trees at the outer edge of the cut-away to the NW of the main site. To the N of the N lobe there are areas of regenerating *Sphagnum* pools with *Menyanthes* close to the old drains (PM11: 9+10). *Schoenus nigricans* was also growing near one of these pools. *Phragmites* occurs in some areas of old peat cutting around the site and is associated with areas where there is rising ground off the bog to the N (PM10: 35+36) and near where Drain bF exits the bog at the S .

An extensive area to the SE of the site was burnt in the recent past and is dominated by *Narthecium*. The burning event seems to have originated off the bog and there is much damage to areas of old peat cutting. Other smaller fire events have recently occurred to the SW of the site.

The vegetation of the marginal drains to the S, SE and E and W of N lobe are indicative of mesotrophic conditions with iron staining and high conductivities (200-460 μS/cm). These drains support species such as *Potentilla palustris, Typha*, *Carex rostrata*, *C. diandra, C. binervis, C. echinata, Succisa, Hydrocotyle, Galium saxatile, G. palustre, Cardamine pratensis, Menyanthes, Valeriana officinalis*, *Glyceria fluitans, Sparganium erectum*, *Mentha*, *Dryopteris dilatata* and *Equisetum fluviatile* (PL11-10 Drain mH). Drains mJ along the E of the N lobe and Drain mG along the N of the main body of the site are marginal drains which have been deepened and in addition to the species above support *Sphagnum squarrosum, S. palustre, Calliergon cuspidatum, Phragmites, Lemna minor, Filipendula ulmaria, Juncus articulatus, C. lepidocarpa, C. demissa, Ranunculus flammula, Potentilla erecta, Lythrum salicaria, Rumex acetosa, Urtica dioica, Cirsium palustris, Juncus effusus, Rubus* and *Salix.* Drains at the NW (flowing towards the main road and forming large ponds), the SW and W of the site are more acidic with lower conductivities (80 -100 μS/cm). They support, *Menyanthes, Potamogeton polygonifolius,* and *E. angustifolium* in the wetter areas and *S. cuspidatum, S. auriculatum, S. magellanicum, S. papillosum, S. recurvum* and *Drosera anglica* in drier parts.

Some fields around the bog have been reclaimed since the 1970s and a field on a mineral ridge to the N of the bog is very close to it (PM11:5).

A vegetated track runs E/W on to the bog from the road and extends for approximately 150m. It supports many calcicole species and is quite dry. There are wetter patches dominated by *J. inflexus* along the track with small pools at the edges further into the bog. The list of species found is similar to those of the track on Kilcarren Bog across the road but the abundance varies as this track is drier. A list of the species found on the tracks is given in Appendix X.

The vegetation along the main road which separates the site from Kilcarren Bog is typical of midland hedgerows.

6.2 DETAILED VEGETATION OF THE HIGH BOG

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1

The *Calluna* dominated facebank complex is seen around much of the site. It is particularly well developed along the northern and southern edges and along old turf banks which extend out from the NW of the Main Lobe and the N of N lobe. At the NW corner and in places along the northern edge *Myrica* is also present (1+My). *Betula* and *Phragmites* with tall hummocks of *S. capillifolium* occur in this complex at the northern edge where the *Calluna* is particularly tall (80cm) and the *Cladonia* cover reaches 20% (PM10:36). For the remainder of the northern edge the band of face bank complex narrows with *Ulex, Myrica* and patches of *Molinia* occurring. At the NW corner of the N Lobe the *Calluna* reaches 1.5m in height with encroaching *Betula* (PM11:8). At the SW *Pteridium*, *Molinia*, *Myrica* and *Phragmites* encroach in places. Along the western edge next to the road *Molinia* encroaches approximately 15m into the site with *Myrica*, *Potentilla erecta, Polygala* and *Dactylorhiza maculata*. At the south-east of the site where recent burning has occurred this complex is mostly absent. To the E of the southern end of Drain bH a small *Molinia* dominated drain extends into an area with tall *Calluna* (70cm) with a considerable amount of *Carex binervis*. Two short drains extend into this complex at the south side of the site, E of Drain bF. These are colonised by *Molinia, Phragmites, Potentilla palustris, P. erecta, Rubus, Salix* and *Betula* (PL11:32 to E).

This complex may also be seen along the edges of some high bog drains particularly the southern ends of Drains bF-bK.

Complex 2

There is a small area of this marginal complex around the steeply sloping W edge of the N lobe. It is dominated by *Trichophorum* (50%) with *Campylopus introflexus* and bare peat. Surface water runoff has resulted in erosion channels. There is 10% cover of *Calluna* which is 20cm tall. Also present are *Carex panicea* and *Narthecium.* This complex also occurs at the N of the Main Lobe, where it is bordered at the edge by a band of *Molinia*, and in two small areas at the S and SE of the bog. The overall area is very flat (PM10:37). The mineral land immediately to the N of the site is level with this complex on the high bog. The complex is dominated by *Trichophorum* (60%) with 10% cover by small algal hollows which are infilled with *Narthecium* or are bare. *Eriophorum vaginatum* tussocks make up 5% of the area and *Hypnum jutlandicum* occurs throughout. Total *Sphagnum* cover is low (5%) mainly low hummocks of *S. magellanicum* and *S. tenellum.* An acrotelm layer is absent. The area is wet due to the presence of surface water. There is little *Calluna* in the complex and it is short. *Plantanthera bifolia* was recorded in the complex. To the E of this Complex is a small patch of *Myrica gale*. Along the N edge there is a small section of this complex with the addition of *Myrica* (2+My). There is also part of this complex at the SE of the site which has been recently burnt (2RB).

Complex 2 +*Cladonia* (Cl)
This marginal complex is seen at the SE and S edges of the site. It is dominated by *Trichophorum* with abundant *Erica tetralix, Eriophorum vaginatum* and *E. angustifolium.* It has been unburnt for some time (*Cladonia portentosa* cover 25%) but there is no acrotelm layer. There are intermittent *S. capillifolium* hummocks but the remainder is hard underfoot. In many places it has been badly poached by cattle making it tussocky and difficult to walk through. There is some surface water in places and an algal layer was evident.

Complex 2/6/3
This marginal complex is seen at the NW of the site behind the *Calluna* dominated facebank. It consists of *Trichophorum* with *Narthecium* and *Carex panicea*. The *Sphagnum* cover is low and there is no acrotelm. Erosion channels with bare patches of peat, short *Calluna* and *Campylopus introflexus* are seen to the W of the complex into an area of old peat cutting (PM10:34).

Complex 2/6 RB (Recently Burnt)
This occurs closer to the bog margin at the SE of the site than the complex below and has also been recently burnt. *Trichophorum* cover is high (PM11:11) with the addition of *Narthecium*. There has been very severe poaching (PL11:19) of the bog surface by cattle due to easy access from the adjoining fields that are only 0.5m lower than the high bog (PL11:20 and 31 and PM11:12). The surface is very rough underfoot and some vegetation more indicative of pastures and meadows is encroaching. The facebanks have been broken down in places and the peat is very dry.

Complex 2/6
This is seen at the SE and S of the site. It is dominated by *Trichophorum* (20%) and *Narthecium* (20%) with *Rhynchospora alba* (5-10%) and dry algal hollows (15%) (PL11:11 to E). The *Sphagnum* cover is low with only small amounts of *S. tenellum*, *S. magellanicum, C. capillifolium* and *S. papillosum*. There is no acrotelm layer. *R. fusca* is seen in some hollows.

Complex 4
To the NW and NE of Flush Y towards the northern margin of the site there are two small area dominated by *R. alba*. The *Narthecium* cover drops and the bog surface is very tussocky with a poorly developed acrotelm layer.

Complex 6/4/2
This is seen around the edges of the N Lobe where the slopes to the bog edge are steep. *Narthecium* and *R. alba* dominate. The latter is mostly confined to erosion channels which lead to the bog edge. These are quite extensive in places and would be focus points for surface water run-off (PM11: to NE). On the NE side of the N Lobe this complex is seen with extensive erosion channels and *Myrica* (6/4/2 +EC+My).

Complex 6/2
This is seen to the N of the Northern Lobe. *Trichophorum* (20%) and *Narthecium* (20%) are co-dominant with *R. alba* ranging from 5-10% and dry algal hollows (15%). There is some *R. fusca* seen in the algal hollows. Some *Sphagnum* cover occurs with species such as *S. tenellum, S. magellanicum, S. capillifolium* and *S. papillosum* the most frequent. However the surface is not soft and there is no acrotelm layer.

Complex 6/7
An area of vegetation occurs at the SW side of the N lobe where *Narthecium* and *Calluna* dominate. The *Sphagnum* cover is very low and the area is dry with no evident acrotelm.

Complex 7
An area dominated by tall *Calluna* (50%) occurs on the N edge of the site where the N lobe juts off. There is rising ground in the area and the field immediately beyond the marginal drain is at a lower level than the bog (PM11:4, 6+7). *Phragmites* encroaches onto high bog (PL11:6 to the N). The *Sphagnum* cover is moderate but the peat surface is very hard. *Trichophorum, E. vaginatum* and *E. angustifolium* are also present.

Sub-Marginal Complexes

Complex 6 RB (Recently Burnt)

This is a large recently burnt area which extends all along the eastern and south-eastern edge of the bog. The *Calluna* has all been severely burnt though there is some regrowth from the bases. It is thought that this was probably burnt last winter. *Narthecium* is the dominant species with up to 70% cover in places, 20% bare peat and some *E. angustifolium*. Some *Leucobryum* remains but there is very little *Sphagnum* cover left at the eastern side (PL11:6 to S, PL11:7 to SW and PM11:14 to N show burnt and non-burnt areas). Further south the cover of *Sphagnum* remaining increases but it is all very dried out (PL11:18 to S). A crispy algal layer covers much of the surface. At the SE of the site part of the high bog has been fenced off.

There is another burnt patch at the west of the site though the burning is not as extensive or as recent. There are hummocks of *S. imbricatum, S. capillifolium* and *S. papillosum* and a moderate acrotelm layer present.

Complex 6/4

There is an area on the SW of the N Lobe where *R. alba* is common but forms flats rather than erosion channels. The *Sphagnum* layer is well developed here (30%) consisting mainly of *S. papillosum, S. magellanicum, S. tenellum* and *S. capillifolium*. The *Calluna* is short (10cm) and *Erica tetralix* is abundant with *Eriophorum angustifolium* scattered throughout. This area may have been burnt in the recent past but an acrotelm layer is present and some *S. imbricatum* hummocks occur.

Complex 6

This complex covers a large percentage of the site. It consists mainly of *Narthecium* flats interspersed by *Calluna* dominated hummocks with a high occurrence of algal hollows many of which contain *R. fusca* with an occasional *Sphagnum cuspidatum* pool or hollow. The hollows are larger towards the edges of the complex where slope to the edge of the bog becomes a factor. *Calluna* cover reaches 55% in places and heights of 30-40cm. *Sphagnum* cover is low throughout this complex but the surface over most of the area is soft and spongy indicating the presence of an acrotelm layer. *S. imbricatum* and *Leucobryum* are present to the E and W of the complex and where it occurs on the W of the N lobe.

Eriophorum vaginatum becomes frequent in this complex in some areas particularly at the N central part of the site and close to Flush Y (Complex 6 with *Calluna* and *E. vaginatum*: 6+*Cv*/*E. vag*.) This appears to be associated with areas which have not been burnt for some time (*Cladonia portentosa* and *C. uncialis* cover 5%) and tall *Calluna* (50cm).

A crispy algal layer was evident over much of the *Narthecium* hollows.

On the SE side of the site this complex is drier and harder underfoot than elsewhere with a higher occurrence of algal and *R. fusca* hollows. The algal hollows are deep in places and there is evidence that they are full of water at times but they were dry at the time of the survey. The *Calluna* is short in this area (10-20cm) and *Erica tetralix* was abundant. This may suggest a fire history (PM11:23).

In one area at the north of the site, N of Flush X, this complex occurs with up to 15% *R. alba* (Complex 6+4).

Just to the N of Flush Y a very large tear pool (TP) occurs in this complex. It is approximately 13m long in an E/W direction and 1.5m wide and is infilled with *Sphagnum cuspidatum* with a little *Menyanthes* and *Drosera anglica*. Also there is a small area where E. angustifolium cover increase close to Flush Y (6/9A).

Close to the N edge the frequency of algal hollows increases (15%). These may be tear pools as they are aligned NE/SW, more or less parallel to the bog margin.

At the W of the site, south of Drain bA and W of Drain bF algal hollows are very frequent with some dried out *S. cuspidatum* pools and occasional *S. magellanicum* hummocks.

Occasionally in small spots between the drain complex at the S of the site the *Sphagnum* cover increases to 20% in this complex. The algal pool cover appears to increase towards the drain junctions. Occasionally they contain *S. cuspidatum* or *R. fusca*.

East of Drain bH and N of Drain bD scattered *Dactylorhiza maculata* was noted in this complex.

Complex 6-
An area of complex 6 with a lower cover of *Narthecium* and shorter *Calluna* occurs to the W of Drain bJ between Drains bH and bK. *Cladonia portentosa* is absent which may suggest a fire history. However the bog surface is still very soft and spongy within this complex.

Complex 6+ *Myrica gale* (MY)
This is similar to complex 6 as it is dominated by *Narthecium* flats but with the addition of *Myrica*. It is seen at the NW of the site (PM10:35) and in the middle section of the Northern Lobe. At the NW of the site the *Myrica* is sometimes clumped, especially between Flush Y and the northern edge, and is up to 1m tall but is mostly scattered and shorter (50cm). Scattered *Dactylorhiza maculata* may be seen in many places in this complex even at some distance from the bog margin.

On the N Lobe this complex has a high percentage of algal hollows some of which still contained water at the time of the survey. Patches of this complex have a moderate acrotelm cover but overall on the Northern Lobe it is fairly poor. Close to the bog edge *Melampyrum* may be seen scattered around this complex. The *Narthecium* is growing very luxuriantly in this area and will flower abundantly.

Sub-Central Complexes
Complex 9/6
This complex occurs near the N edge of the site and is somewhat similar to complex 9/6/3. However there is no *Carex panicea* in this complex and the *Narthecium* occurs in hollow areas where *Cladonia* is absent. *Cladonia* cover throughout is 20%. There is 30% *Sphagnum* and a good acrotelm layer.

Complex 9/6/3 + Tear pools (TP)
Close to the northern edge of the site W of the northern Lobe, a small area of vegetation dominated by *Eriophorum vaginatum, E. angustifolium* and *Calluna* occurs with *Narthecium* and *Carex panicea* with large tear pools some of which contain *S. cuspidatum, S. auriculatum, Menyanthes, R. alba* and *Drosera anglica* (PM11:1-7). The water table is low in these pools but the *S. cuspidatum* looks healthy although there are a number of tear pools which are algal. Some of the tear pools are up to 20m long with a more or less NE/SW orientation. Some are also infilled with lawns of *S. magellanicum* and *S. papillosum*. Total *Sphagnum* cover is about 50% including *S. imbricatum* hummocks. The acrotelm layer is well developed in this area. This may be due to waterlogging as the bog rises towards the northern edge and water may pond in this area. Some of the hummocks/tussocks are 30cm tall and *Dactylorhiza maculata* occurs in the complex. Towards the edge of this complex the % of *Trichophorum* increases.

There is a *Betula* tree with *Betula* seedlings and hummocks of *S. capillifolium, S. magellanicum* and *S. papillosum* with *Vaccinium oxycoccus* around it. The *Calluna* is 50cm tall.

Complex 10/6
Just to the N of Flush X there is a small area of vegetation with *S. cuspidatum* pools. Many are dried out but some still have approximately 5cm of water. There is evidence that the water table is up to 15cm deep at times and floods the *Narthecium* lawns. The *Sphagnum* cover is high (60%) consisting mainly of *S. papillosum* and *S. magellanicum* with dried out *S. cuspidatum* in the pools and an acrotelm layer is present. Many of the pools are algal or just contain *Eriophorum angustifolium*. This probably reflects the drying out that occurs in the summer period as seen at the time of the survey.

Complex 10 B (Burnt)
This is similar to Complex 10 below but was burnt approximately 6-7 years ago. The *Calluna* is shorter and *Eriophorum angustifolium* is more frequent. The *Sphagnum* cover is moderate and there are some dried out linear pools containing *S. cuspidatum, R. alba,* Algae and *R. fusca* (PL11:8).

Complex 10 +*Cladonia*
This is an area at the S end of the N lobe, at the junctions of Drains bH and bD and in the vicinity of Drains bE, bG and bH (PM11:19). It consists of linear *Sphagnum cuspidatum* pools and *S. magellanicum* lawns with a total *Sphagnum* cover of 50%. Some of the pools have a permanent appearance and contain *Menyanthes* and *Drosera anglica*. Many are infilled with *R. alba*. Where this complex occurs at the S of the site *S. auriculatum* is also found. *Eriophorum vaginatum* and *Calluna* (40-50cm) dominate the inter-pool areas with some *Cladonia portentosa* and *Narthecium*. The surface is soft and spongy and an acrotelm layer is present. *Leucobryum* hummocks and *S. auriculatum* are present in the complex at the S of the site.

Where this complex occurs at the junction of Drains bD and bK *S. imbricatum* is also present (PM11:21+22).

To the S of the southern section of complex 10+*Cladonia* there is an area dominated by *E. angustifolium* with some *E. vaginatum.* The area is in a depression with rising ground at the edge of the bog and is probably water logged during the winter. Immediately to the W of it *E. vaginatum* dominates. Both areas also contain 10% *Calluna* which is 40cm tall, 10% *S. papillosum* and 5% *S. magellanicum* though this increases in the *E. vaginatum* section. The area is very soft but not quaking.

Central Complexes
Complex 15
To the E of flush X and at the E end of Drain bA and the N ends of Drains bJ and bK there is an area with *S. cuspidatum* pools. These are smaller than those seen in Complexes 14 and 6/14 but still have a permanent appearance although the water table was very low. There is also a higher occurrence of algal pools. The *S. cuspidatum* pools also contain *Menyanthes*, *R. alba*, *E. angustifolium* and *Drosera anglica*. *Narthecium*, tall *Calluna, E. vaginatum* and *E. angustifolium* dominate the inter-pool areas with approximately 10% *Cladonia portentosa* cover. Some pools contain *S. auriculatum* and one possibly contained *Drosera intermedia*.

Complex 6/14
This is a central pool area at the SE of the site with many *S. cuspidatum* pools (20%) which contain *R. alba, Drosera anglica, Menyanthes* and *Eriophorum angustifolium*. The water table was low (approximately 5cm) in the pools at the time of the survey. The pools are interconnecting with a more or less E/W orientation and can be as long as 50m. *S. magellanicum* lawns are seen at the edges of the pools (PL11:15) and *S. auriculatum* occurs in some. Other pools are almost completely infilled.

The total *Sphagnum* cover is 40% and there is a well developed acrotelm layer. *Cladonia portentosa* cover is high on the inter-pool areas which are dominated by *Calluna* (typical hummocks 25%), *Eriophorum* species and *Narthecium* (15%). There are occasional large *Leucobryum glaucum* hummocks (0.75m). At the edges of this complex the pools have very low water levels and the *S. cuspidatum* appears unhealthy. *Dactylorhiza maculata* was seen at the southern side of this complex.

Complex 14 (PM11: 17 to S from Drain bA + 18 to N from Drain bA)
This central complex is seen at the west of the site in the region of Drain bA. It is the wettest complex seen at this site and covers approximately 7.5ha. *S. cuspidatum* lawns/pools cover 70% of this complex in places to the N of Drain bA. To the south they decrease to about 50%. In both cases they also contain *Menyanthes*, *Drosera anglica* and *Rhynchospora alba. R. alba* tends to occur at the edges of the pools. *S. magellanicum* lawns occur with greater frequency to the S of Drain bA, perhaps indicating a drier version of the complex. In places at the edges of this complex the *S. cuspidatum* pools are dried out (PL11: 24).

This complex would be extremely wet during the winter months as there is evidence that the water level is at least 15cm higher than the present *Sphagnum* lawn surface.

The inter-pool areas are dominated by *Narthecium* (10%), *Calluna*, *Erica tetralix*, *Eriophorum angustifolium, E. vaginatum* and *S. magellanicum*. Total dwarf shrub cover is approximately 30% and the total Sphagnum cover is high (90%) consisting of *S. cuspidatum*, *S. magellanicum, S. capillifolium* and *S. papillosum* (Pl11:26 and 27). The acrotelm layer is deep within this complex.

There are some drier hummocks along Drain bA of *Polytrichum commune* and *Vaccinium oxycoccus. Juncus effusus* and *Carex rostrata* occur in Drain bA where it runs through this complex.

The more easterly section of this complex lies in a sunken area of the bog with rising ground to the E and NE. At the southern side of this area some linear algal pools occur a few containing *R. fusca*.

6.2.2 Flushes

Flush Z at the W of the site is small and dominated by *Betula* with dense *Calluna* and *Myrica* up to 1m tall. The bryophyte layer consists of *Aulacomnium palustre, Sphagnum palustre, S. capillifolium, S. papillosum, Dicranum* and *Polytrichum alpestre*. Also found were *Vaccinium myrtillus, V. oxycoccus, Andromeda* and tussocks of *E. vaginatum.*

Flush Y is a small dry flush located just to the N of the central section of Drain bA and an area of Complex 14 vegetation (PM11:18 to N). It is dominated by approximately 20 *Pinus sylvestris* trees with a number of seedlings. The tallest of the trees is approximately 8m. *Betula* scrub (2m tall) also occurs with tall *Calluna* (1m). Epiphytic lichens may be seen on the *Calluna*. Under the trees the herb layer is dominated by *Molinia* with some *Anthoxanthum odoratum*. The bryophyte layer consists mainly of *S. palustre, Hypnum jutlandicum* and *Pleurozium schreberi*. *Molinia* extends about 30m to the west into a point and *Molinia* and *Betula* with *Calluna* and some *Pinus* seedlings extend northeastwards (PL11:4 to NW).

Flush X lies just to the E of Flush Y. It is dominated by *Betula* and *E. vaginatum*, the largest *Betula* reaching 3.5m tall though most range from 0.5m to 1.0m (PL11:5 to the W). Other higher plant species noted were *Luzula* and *Vaccinium oxycoccus*. Hummocks dominated by *Polytrichum alpestre* with *Hylocomium splendans*, *Aulacomnium palustre*, *S. capillifolium, S. papillosum, Pleurozium schreberi* and *Polytrichum commune* occur. Lichen epiphytes are abundant on the *Betula.*

Flush W approximately 10m by 6m lies near the junction of Drains bG and bE and consists of a clump of *Betula* (1m tall) and *Calluna* (0.75m tall). The bryophyte layer consists of *Aulacomnium palustre, Sphagnum capillifolium, S. papillosum, Polytrichum alpestre*, *P. commune*, *Leucobryum* and *Hypnum*. Also found were *Vaccinium oxycoccus,* a large amount of *Andromeda, Molinia* and *Cladonia.* Fox scent was very strong in the area.

7. BOG TYPE

This bog has been classified as a Ridge Basin bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes

A number of slopes were estimated in the field. They are described below and their position is illustrated on the Slopes Map.

Slope 1 This is at the W of the site N of Drain bA and sloping westwards towards the road and associated marginal drain. It is 0.3m over 30m.

Slope 2 This is also at the W of the site to an area of old peat cutting. The slope is 1m over 70m with severe slumping of the peat surface.

Slope 3 This is located at the NW of the site into an area of old peat cutting. The slope is steep over a short distance - 0.75m over 30m - with severe slumping and cracking.

Slope 4 This slope is at the W side of the N lobe into an area of old peat cutting and reclaimed land and is 0.5m over 50m.

Slope 5 This slope is also at the W side of the N lobe slightly N of slope 4. The slope is steep 1m over 30m.

Slope 6 This is a slope N into old peat cutting (PM 11:9 to NE) on the N edge of the N lobe and is 1.5m over 50m and is associated with erosion channels and surface water runoff of Complex 6/4/2. The facebanks are 1-1.5m tall.

Slope 7 This is a slope NE into reclaimed land across Drains bC1 and bC2 from the E side of the N lobe. It is 0.5m over 50m.
Slope 8 Further S into an area of old peat cutting the slope is steeper at 0.5m over 30m.
Slope 9 Further S again the slope from the high bog towards recently cultivated land and marginal drain is 0.3m over 50m.
Slope 10 This is at the S side of the site into an area of old peat cutting which is colonised by *Phragmites*. The slope is very gentle at 0.25m over 100m. The facebank in this area is very shallow ranging from 0.25m to 0.5m.
Slope 11 This is slightly westwards along the S edge where the facebank is higher. The slope into old peat cutting is 0.5m over 50m with some slumping of the peat surface.
Slope 12 This is at the S side of the site along Drain bH towards old peat cutting and rough grazing and is gentle at 0.25m over 100m
Slope 13 This is at the S side of the W edge west towards the main road. The slope is gentle 0.5m over 150m.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

There is no active peat cutting on/around this site since 1970s though peat cutting has been carried out in the past. The largest area of old peat cutting is to the NW of the site with further areas to the NNE, to the N of the Northern Lobe (PL11:12) and along most of the S of the site. At the SW of the site there are a series of ridges which mark an area of abandoned difco peat cutting (PL11:33 to E).

8.2.2 Fire History,

The site has suffered from regular burning events and the vegetation throughout reflects this. Small pockets have escaped recent burning. The most recent event affected the SE of the site - both the area of old peat cutting (PM11: 12+13) and the margin of the high bog (PM11:11) - and is not evident on the 1993 aerial photograph. The wet Drains bD, bK and bE may have prevented the fire extending further into the bog. There is no active peat cutting in this area though field reclamation is evident and cattle graze the land right up to the bog edge. A further burning event, though smaller, occurred 1 to 2 years ago at the SW of the site along an old track.

8.2.3 Cattle Poaching

Cattle graze right up to the edge of the site along the SE and in small sections along the N edge. There are tracks on to the bog between the *Ulex* at the N of the site. There is evidence that the cattle gain access to the SE of the main bog where the marginal drain is no longer effective. The facebank is less than 1m high along most of its length. Where the bog is poached the ground is very rough and hard with surface water lodging in the tracks left by the cattle.

8.2.4 Dumping

There is evidence of dumping of household refuse along the main road at the W of the site and in the area of old peat cutting to the NW.

8.2.5 Agricultural Improvements

A comparative study of the 1970s and 1993 aerial photographs reveals that field development is ongoing around the site. Areas to the NW, mid-N, W and E of the N lobe, along the SE and in the SW corner have been incorporated as agricultural land and are used for silage, hay making and for grazing. One field at the SE is still covered in peat but shows signs of being prepared for field development (new deep drains around it). A new deep drain has been inserted at the W of the N lobe (PM11:8) and the drain at the E side (mJ) has been deepened. At its N end Drain mJ is 3-4m below the bog decreasing to 1.5m below the bog at its SE end. On the NW side of the N Lobe recently reclaimed fields are almost at the same level as the high bog with a deep drain separating them from the marginal bog drain. There is slumping and cracking of the high bog surface towards the drains.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. The wettest section of the site is associated with subsidence caused by an old drainage network which extends into the centre of the site.

2. The presence of *Myrica*, *Melampyrum* and *Dactylorhiza maculata* in many of the vegetation complexes indicates that there is some mineral enrichment. It is thought that the peat layer is quite thin over parts of the site.

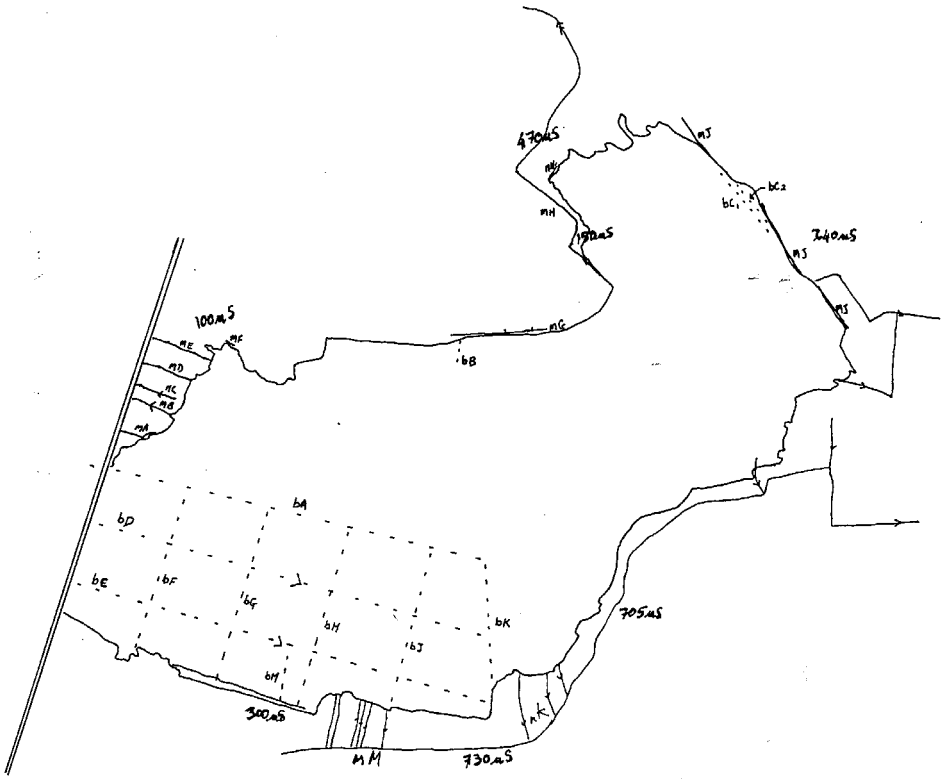
3. Much of the site is dominated by *Narthecium* lawns. However in contrast to sites such as Clara and Raheenmore this vegetation appears not to indicate dried out conditions. The bog surface is generally soft and quaking in parts indicating the presence of an acrotelm layer.

4. At the W of the N Lobe deep marginal drains have caused cracking and slumping of the bog surface.

5. For part of the northern edge the bog grades naturally into the adjoining mineral soil forming an infiltration lagg.

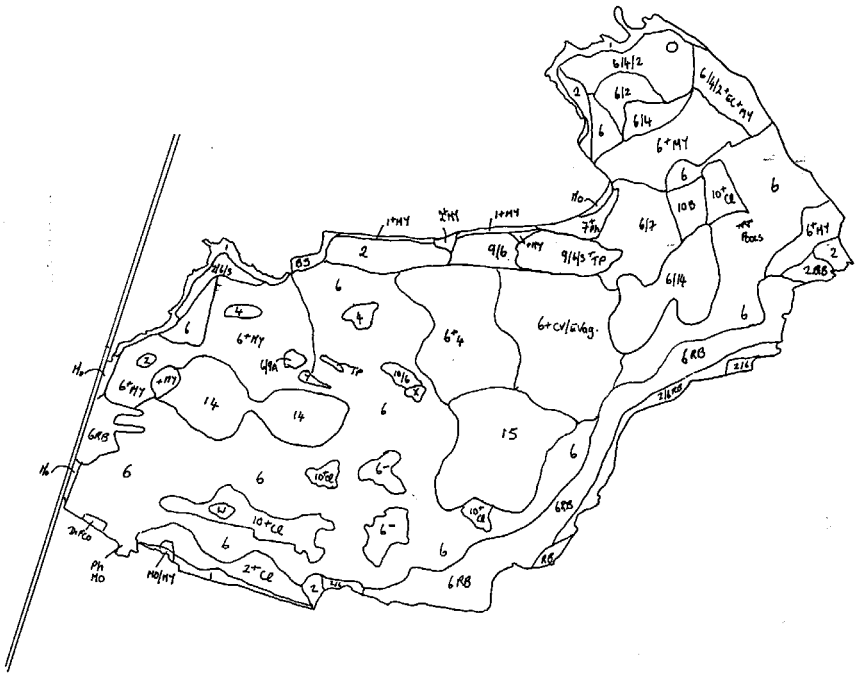
Lara Kelly
Marie Dromey
Malcolm Doak

Raised Bog Restoration Project (1005).



FIRVILLE BOG, CO. TIPPERARY (645).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994

N



FIRVILLE BOG, CO. TIPPERARY (645).
VEGETATION MAP (1:10,560)
1994

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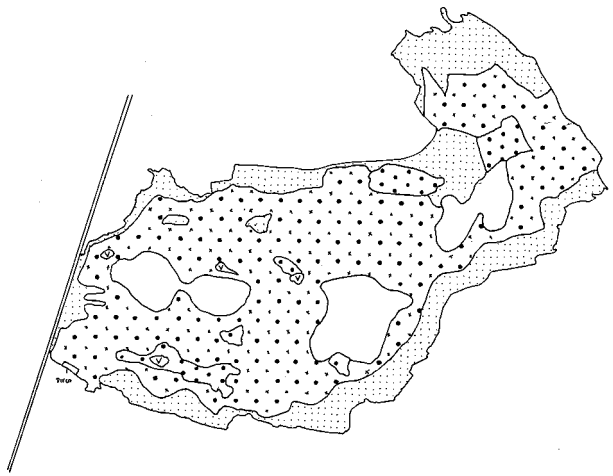

FIRVILLE BOG, CO. TIPPERARY (645).
ECOTOPE MAP (1:10,560)
1994

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FIRVILLE BOG, CO. TIPPERARY (645).
SLOPES MAP (1:10,560)
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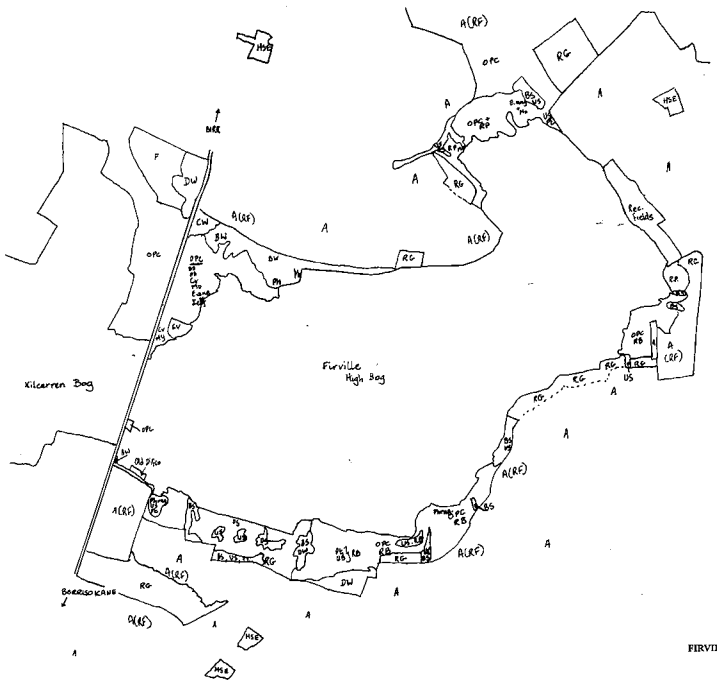


FIRVILLE BOG, CO. TIPPERARY (645).
LANDUSE MAP (1:10,560)
1994

KILCARREN, CO. TIPPERARY

1. SUMMARY OF SITE DETAILS

NHA No.	647		1/2" Sheet:	15
Grid Ref:	M 93 02		6" Sheet:	TY 4/7
GSI Aerial Photo:	M 448			
Other Photo:	SC 34028/31 (1993)		Area (ha):	185.0 (High Bog)
Date(s) of Visit:	26-27/4/94	(Ecology)		
	26/4/94	(Geohydrology)		

Townlands Kilregane, Drumkilfadda, Dary and Kilcarren.

2. INTRODUCTION

2.1 BACKGROUND

This is one of two bogs in N. Tipperary separated from each other by L113 road linking Birr and Borrisokane (Firville is the other bog). The bogs are two of a group located at the mid-south of the country and in the area of the main distribution of Raised Bogs. Kilcarren, the smaller of the two by 40ha, was assigned a Bi status and classified as a True Midland Raised Bog during the survey to establish a network of raised bogs worthy of conservation (Cross, 1990). This is a high status indicating that the site is wet with quaking areas though its hydrology has been somewhat damaged (Firville was assigned A status).

The site was visited in 1983 (O'Connell and Mooney, 1983) on behalf of FWS who noted that most of the bog was quite wet. Vegetation indicating surface water movement and nutrient enrichment was noted throughout the site: separate *Betula*, *Pinus* and *Molinia* flushes and numerous patches of *Myrica*. A very wet area of open water corresponding to a small lake on the 6" sheet was also noted. Active peat cutting was confined to small areas at the NE, SE and SW of the site though large drains had been inserted at the NW of the site.

A large section of this bog is owned by the Land Commission and could easily be acquired if conservation/restoration is recommended. A ownership map from the Land Commision file was sent to NPWS approximately 7 years ago (P. Keane, Regional Wildlife Officer). There is no record of this map now.

A comparative study of the 1970s and 1993 aerial photography revealed that drains on the bog have infilled somewhat and that areas of old peat cutting were regenerating and that active peat cutting was confined to small sections at the SW and NE of the site.

It was decided to include this site as part of the present survey for comparative purposes with Firville; because it is large and as it appears that no major damaging changes have taken place since 1970s.

This site was combined with adjacent Firville when filling out the SAC forms.

2.2 LOCATION AND ACCESS

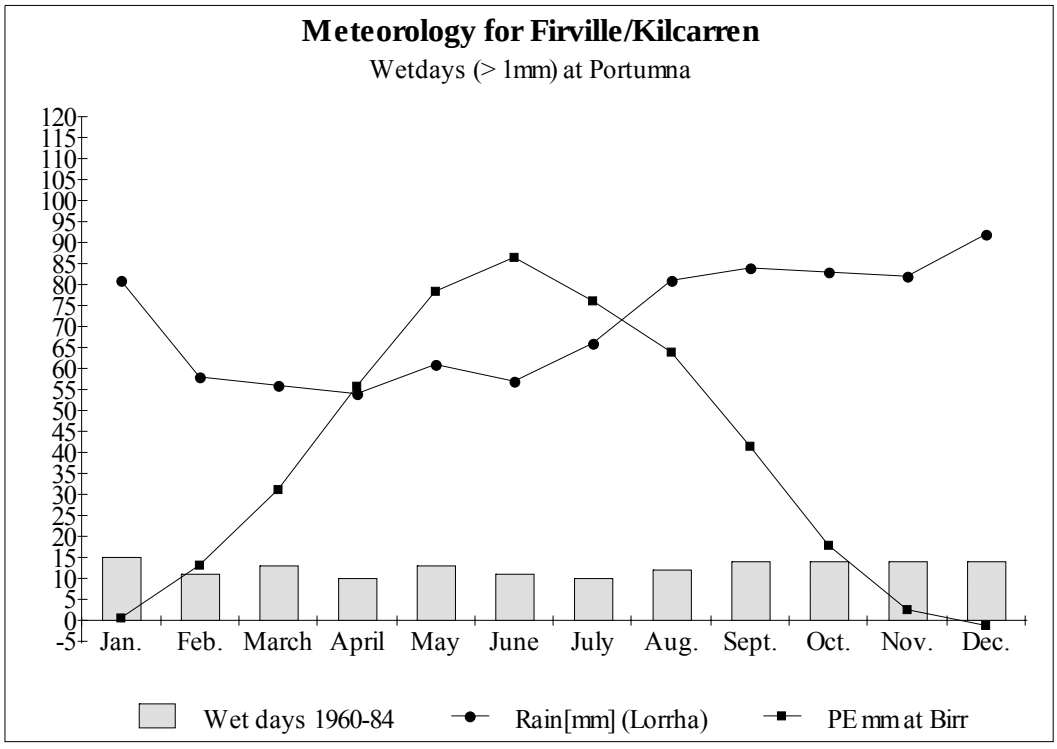
This bog is located approximately 13km SW of Birr, Co. Offaly on the west side of the Birr to Borrisokane road (L113). Access to the bog from the road is easy and a car may be parked in the cut-away area to the NE of the site.

3. METEOROLOGY

No meteorological measurements have been made on Kilcarren bog. Rainfall data from the nearby Lorrha weather station for the years 1951-80 indicate that the area receives approximately 855mm of precipitation annually (Fig. X). The nearest synoptic station at Birr suggests that the site could have up to 207 rain days annually.

Evapotranspiration in Ireland is usually estimated by using values of potential evapotranspiration (PE) from conventionally sited Meteorological Service stations. PE can be regarded as the amount of water transpired by a green crop which completely covers the ground and is never short of water (Keane, 1986). Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore bogs suggest that evapotranspiration is significantly more on site than might be estimated using potential evapotranspiration (Daly and Johnston, *op. cit.*).

Figure X



The above factors suggest that actual evapotranspiration (AE) from bog is greater than PE at Birr, site of the nearest synoptic station which had an average PE of 466.5mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Kilcarren would therefore be greater than 466.5mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore 408.5mm/yr.

Meteorological data for Kilcarren Bog (1951-1981) is summarised below:

Rainfall (P)	855mm/yr
Actual Evapotranspiration, (AE)	446.5mm/yr
Potential recharge, (PR)	408.5mm/yr
Raindays > 0.2 mm (annual {1951-1980})	207 days
Wetdays > 1mm at Portumna (annual {1960-1984})	150 days

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

This is a level bog with a shallow dome. Slopes are steepest towards the road, in the vicinity of old peat cutting at the east of the site, and towards the SW where Flush V exits the bog at another area of old cut-away. There are also slopes associated with drainage.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

A north west/south east low relief drumlin lies directly north of Kilcarren.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

Recent geological maps by Hitzman (Chevron/GSI,1993) show that the area is directly underlain by Waulsortian Carboniferous limestones (fossiliferous mudmounds).

The Waulsortian limestones generally have a low permeability and are classed as a poor aquifer.

5.1.2 Subsoils (See 6" 1840s Map)

Data Availability

No subsoils data were available for Kilcarren bog apart from the initial 1840s GSI geology field sheets and recent fieldwork.

Geology of Inorganic Subsoils

The subsoil geology of this bog and surrounding area is dominated by limestone till. Sections in drains on the cut-away areas indicate that the outer limits of the bog are underlain by poorly sorted clayey tills with relatively large sub-angular clasts composed of limestone (Slide X).

Till is close to surface along a north west axis from the carpark to agricultural fields in the north.

It is believed that Kilcarren bog is predominantly underlain by the clay rich tills. The high proportion of fines in the tills suggest that the till has a low permeability.

Peat

The present boundaries of peat are much the same as they were in the geological maps produced in the 1840s. Peat cutting has removed peat from the north east.

5.1.3 Depth to Bedrock

There is limestone outcrop directly north and west of the bog. Depth to rock on the bog is unknown; although it is thought to be close to the surface given its proximity to local outcrop.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology (See Drains and Hydrochemistry Map)

Most of the drains on this bog have been inserted before the 1970s and are now infilled. There is one short new drain to the N of the site.

North East

Drain bA is at the N of the N lobe and runs NW/SE. It is 0.75m wide and is old and infilled. There are some stagnant pools along it supporting *S. cuspidatum* and *R. fusca.*

Drain bB is a long drain which runs NE/SW through the E of the site. Where it exits the bog to the N, there is a change of direction to E/W. The drain corresponds to a townland boundary. The E/W section is approximately 1.5m wide by 0.5m deep.

Parts are bare and parts vegetated mainly by *E. angustifolium.* There is *Calluna* along the edges.

The NE/SW section is infilled with *Narthecium, S. papillosum, S. capillifolium, S. magellanicum* with *Menyanthes, Myrica* and *Potamogeton polygonifolius* at the NE end. The EC in this area was 235 μS/cm. South of Flush W *Myrica* grows along the drain.

Drain bJ which runs E/W is old, infilled with *Myrica*, *S. magellanicum, S. cuspidatum* and *Narthecium* and is 1.5m wide by 10cm deep. A ridge runs along the N side which is dominated by *Calluna.*

Drain bK runs SSW/NNE at the E of the site. It is old, infilled with *Myrica, S. papillosum, S. magellanicum* and *Calluna* and is non-functional.

Drain bL also runs E/W. At the E end the drain splits into two on either side of a vegetated track and the W end leads from Flush W. The drains either side of the track are infilled with *S. magellanicum, S. subnitens, S. papillosum, Narthecium* and *Calluna*.

West
Drain bH is an old short drain at the NW corner of the site. It is 0.5m by 0.5m and is infilled with *Narthecium, Calluna, S. magellanicum* and *S. cuspidatum. Betula* grows along it and there is a patch of *Myrica* to the SE along it. There is flow to the NW.

South East
Drain bM runs NW/SE at the SE corner of the site just N of an abandoned peat cutting area. It is a relatively new drain 0.75m wide by 0.5m deep. It contains 20cm of water (EC 100 μS/cm) colonised by some *E. angustifolium* and *E. vaginatum.* There is flow to the W into Drain bN.

Drain bN runs N/S and is infilled in the middle section *with S. magellanicum, S. papillosum, Narthecium* and *Calluna.* At the S end there is flow to the S.

Drain bO is short and infilled. It is difficult to see at the NE end but it is possible that it leads from Drain bM. The drain is 0.25m wide and there is evidence of flow to the S.
Drain bP is E of Drain bB and well defined in the field and contains 18cm water at its S end. There is flow to the S. The drain in this area is 0.5m by 0.5m and bare of vegetation. There are patches of *Myrica* along the edge ogf the drain as it approaches the S edge. The drain becomes more difficult to see in the field further N. It appears as though it may be a branch from Drain bB.

North
Drain bC complex is a large drain at the NW of the site. Drain bC at the N end is 0.5m wide by 0.5m deep. It is mostly bare with some algae and *S. capillifolium* and *S. papillosum* growing down the edges. There is evidence of flow to the NE. At the N edge where it adjoins the marginal drain *Phragmites* occurs and the drain is overhung by tall *Calluna.* The central part of this drain contains 40cm of water (EC 107 μS/cm) and is infilled with *S. cuspidatum, E. angustifolium* and *Drosera anglica.*

Drain bC1 runs SE/NW from the S end of Drain bC. It is 0.25m by 0.25m and is infilled with *S. cuspidatum* (unhealthy), *E. angustifolium* and *Drosera anglica.* It contains 50cm of water. Drain bC2 is similar but with low *Calluna* on its N side. Between these two drains the vegetation is dominated by *Trichophorum* and *E. angustifolium.* These two drains continue to the N through a depressed area where there is *Betula* and *Calluna* between them. They widen to 0.5m and support *S. papillosum, S. magellanicum* and *Narthecium* with *Betula* along them. There is some stagnant water with *S. cuspidatum.* There is evidence of burning to the N between the drains.

Drain bD is a recent short drain which runs N/S at the N of the site. It is 1.5m deep by 2m wide and almost bare. It supports small amounts of *Drosera* and *Narthecium*. *Phragmites* and *E. vaginatum* grow at the N end. There is flow to the N (PM10: 7 to N). The spoil to the E of this drain is colonised by *Molinia.*

Drain bE is at a 45^{o} angle to the N end of drain bC1. It is infilled with *S. cuspidatum, E. angustifolium* and *Drosera anglica.* There is evidence of flow into bC1 at times of heavy rainfall.

5.2.2 Bog Margin Hydrology (See Drains and Hydrochemistry Map)

North East

The drain beside the road (mB) is 2.5m wide and >2m deep with *Typha* and *phragmities* in places. The bog faces here form one wall of the drain mA which is up to 2m deep. There are small amounts of hopper-cutting. Part of drain mA lies in clayey till which is part of a lobe of till that runs NW under the bog to drain mG. The cut-away has one main drain mC, some distance from the faces. The cut-away is dominantly till.

There are old faces 2m high beside drains mA, mD1,2, at the northern lobe; *Typha*, *phragmities* and trees grow beside the drain. Flow is north to the main outlet drain mD3 which flows west.

North

The peat along the north at drains mG to mB merges to the till ridge and forms a natural gradation to grass. There is a *molinea* flush on the bog at this point. Animals can move onto the bog at mG. Drain mG is 1.5m deep with spring water emanating and iron. Limestone blocks are used to raise the level of the water for cattle in this drain. Generally the bog is level with the fields and there is no dome here. The bog moves off the till ridge after drain mB where old cutting has taken place.

North West

There are large parts of old cut-away which is overgrown and wet in places. There is much *phragmities*. Faces are relatively high near drain bH.

South

There are many old cut faces along the south with some hopper-cutting and difco on the high bog. Drains in the cut-away are overgrown and infilled.

East-road

There are trees and *Typha* along the edge of the road. The bog slopes to the road, there are many ponds along the break in slope. Drains along here range 155-300μS/cm.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map)

North East

The electrical conductivity of drain mB was 350-390μS/cm and of drain mA was 230μS/cm and 560μS/cm to the north. All cases showed iron. Drains mD showed ECs of 366-614μS/cm.

North

Drain mG had an EC of 610μS/cm. There are high values of EC along the north with high levels of iron. ECs range ~565μS/cm.

South

ECs range 100-530μS/cm along the old cut-away to the south.

East-road

The ECs along the road range 100-300μS/cm.

5.3.2 Laboratory Hydrochemistry

No samples were taken for analysis at the Coillte laboratory.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
Kilcarren bog lies in a groundwater recharge zone and is situated between NW/SE trending drumlins which are bedrock cored. Generally the bog is not domed.

Bog Regime
This bog has a low density of marginal drains with little peat cutting.

Inter-relationship
This bog developed in a basin and extended onto one of the ridges in the north/north-east forming a natural onlap of peat onto till. Drains here are few but some intercept the water-table (mG) causing springs to form within what is normally an infiltration zone. There is a natural infiltration lag zone along the entire north side particularly between drains bC and mG. Some meadow/pasture vegetation species are colonising the edge and *Phragmites* is encroaching in places. Peat to the north is probably very thin.

6. VEGETATION

6.1 VEGETATION SUMMARY

The vegetation of this site is characterised by *Narthecium* flats, which are the dominant community type over much of the bog. *Calluna* is also abundant. The sub-marginal Complex 6 has a low *Sphagnum* cover but the surface is still quite wet and soft. The sub-central or central complexes 6/10 and 10/9 (associated with Flush V) have a moderate to high *Sphagnum* cover and have a well developed acrotelm layer. The latter complex occurs in a depression. *S. imbricatum* is seen in most complexes and to the west of the site there is an area with large *S. imbricatum* hummocks.

It is a shallow domed bog with a number of flush areas which appear to be interconnected and are located in depressions. On the 1910 6" sheet open water bodies are shown where Flushes V and W occur now. There are some wet soft areas associated with the flushes which may be remnants of these open water bodies. *Myrica gale* with *Melampyrum pratense* dominates in the sloping areas associated with the flushes. *Frangula alnus* was recorded in one of these areas.

Betula, Pinus and *Pteridium* are encroaching in the NW corner and to the W of the site and there are scattered *Pinus* and *Betula* throughout the site. *Betula* seedlings are also colonising the area N of Drain bD. *Molinia* and *Potentilla erecta* are colonising the edge of the bog in the vicinity of Drains bC and bD at the N of the site and along the edge near the road at the E of the site.

In common with Firville, *Dactylorhiza maculata* is seen on the high bog in several places. This suggests that the underlying mineral material may be only overlain by a thin layer of peat.

There are some recently burnt areas where there is a high % of bare peat with *Carex panicea* and low growing *Calluna* (PM10:28 to S of site).

There is a section along the N edge where the mineral soil is adjacent to the bog. There are no facebanks in this area and there is a sudden tranistion from the high bog to the mineral soil. In this area the mineral soil is separated from the high bog by an electric fence. Cattle have gained access to the high bog and have poached along the edge. Some meadow/pasture vegetation species are colonising the edge and *Phragmites* is encroaching in places. In the drain between this section of mineral soil and the adjoining fields there are deep drains. *Chara globularis* was recorded in these.

Some of the old cut-away areas, usually where there is rising ground off the bog, are dominated by *Phragmites* (PM10:5, 7+8 along N edge) with a range of other species including *Lychnis flos-cuculi, Potentilla erecta, Molinia, Rubus, Salix, Betula* seedlings, *Ulex, Dactylorhiza maculata, J. conglomeratus, Succisa, Carex demissa, C. nigra, Anthoxanthum, Erica tertralix,* and a bryophyte layer of *Aulacomnium palustre, Sphagnum capillifolium, S. magellanicum, S. capillifolium, S. sibnitens,* and *Polytrichum alpestre*.

These areas were dry at the time of the survey. The drop from the high bog into them is generally quite low (less than 1m).

Other old cut-away areas, particularly to the W of the site, are dominated by mature *Betula* woodland with *Calluna* and *Pteridium* in the clearings. Parts of this cut-away have been recently burnt. There are extensive areas of old cut-away to the S of the site in the vicinity of the flush area V. The vegetation was not recorded in detail but the area is dominated by *Calluna* near the bog with *Molinia, E. angustifolium, J. effusus,* clumps of *Betula* and *Salix* with *Pteridium* and *Osmunda* further out behind this. The facebanks are 2-3m tall.

In areas of active peat cutting, particularly at the NE of the site, a wide range of species were recorded. The vegetation of the marginal drains is dictated by the water chemistry. Most of the wetter drains around this bog are quite deep, with exposed till and iron staining (EC 150-743 μS/cm) (PM10:6). The older marginal drains are infilled (PM10:9). Species found in the wetter drains and usually influenced by till include *Veronica anagallis aquatica, Lythrum salicaria, Juncus effusus, Cardamine, Typha latifolia, Lemna, Potamogeton polygonifolius, P. berchtoldi, Carex echinata, C. rostrata, Eleocharis palustris, Mentha, Hydrocotyle, Sparganium* sp, *Menyanthes, Equisetum fluviatile* and *E. angustifolium*.

A vegetated track runs E/W on to the bog from the main road at the E of the site and extends for approximately 150m. It supports many calcicole species and there are some wet patches along it and at the W end where it meets ombrotrophic vegetation. The wetter patches support *Schoenus nigricans.* The extensive list of species along the track is similar to those of the track on Firville Bog across the road but the abundance varies as this track is wetter. A list of the species found on the tracks is given in Appendix X.

A typical midland woodland/hedgerow is seen along most of the main road to the E of the bog. This road is level with the bog in places and it separates this bog from Firville Bog (PM10:25). Trees recorded include *Salix, Betula, Corylus* and *Ilex*.

6.2 DETAILED VEGETATION OF THE HIGH BOG

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1

This complex can be seen around most of the site except in areas of active peat cutting and in areas that have been recently burnt. Tall *Calluna* with *Myrica*, *Molinia* and *Potentilla erecta* can be seen along the E of the site next to the road. The *Calluna* of the facebank complex is very short at the SE of the site immediately to the W of Drain bB and along the NW of the N lobe where there is *Carex panicea* also present. Both areas have a burning history. *Phragmites* is encroaching onto the this complex N of Drain bC.

Complex Recently Burnt (RB)

There are a few areas around the edges of the site which have been recently burnt. To the S, west of Flush V, the burn is very recent with 80% bare peat and some *Carex panicea* regrowth (PM10:28). Further W along the southern edge another recently burnt area (approx. 4 years ago) occurs. *S. papillosum* is regenerating here but there is still 35% bare peat with young *Calluna, Erica tetralix* and *Betula* seedlings. Another area at the NW of the site has been recently burnt with 80% bare peat and regrowth of *Calluna, Carex panicea* and *Trichophorum*.

Complex 2
This is a marginal complex which is seen along the northern edge of the site where cattle have access to the high bog. It is dominated by *Trichophorum* with *Eriophorum angustifolium* throughout. The surface is hard and tussocky due to poaching. The Sphagna are drying out and there are crispy algal hollows. Patches of *R. alba, Narthecium* and *Carex panicea* are seen in this complex. Some non-ombrotrophic plants such as *Holcus lanatus, Anthoxanthum, Luzula, Stellaria media, Trifolium repens* and patches of *Molinia* were noted. The adjoining mineral soil is at the same level as the bog. It is possible that reclamation may have been attempted in this area. Much of this area is electrically fenced but cattle still gain access during the year.

Complex 2/3
This is seen at the extreme N of the N lobe, N of Drain bA where *Trichophorum* and *Carex panicea* dominate on a very dry hard area with a signifiicant slope to the bog edge. There are frequent dry *R. alba* hollows and *R. fusca* is also present. *Betula* scrub is invading from the N. There is no acrotelm layer.

Complex 2/3/6
This is seen on the northern lobe and in the marginal sloping areas around most of the bog (Pm10:5 to the N of the site). It is dominated by *Trichophorum*, *Carex panicea* and *Narthecium*. Algal hollows are common, many of which contain *R. fusca*. The acrotem layer is poor over most of this complex and the Sphagna which are present are dry. *Campylopus introflexus* was seen which probably indicates disturbance and/or a fire history. Close to the N end of Drain bB the *Trichophorum* cover falls. At the NW there is some acrotelm where burning does not appear to have been so recent. Along the S of the site *Betula* is invading this complex.

Complex 6/3
This is seen at the NE edge of the site close to the area where active peat cutting is occurring. *Narthecium* (25%) and *Carex panicea* (20%) dominate. Otherwise the complex is quite similar to Complex 6 except that the bog surface is not as soft and the *Sphagnum* cover is even lower.

Sub-Marginal Complexes
Complex 6
This occurs at the E of the Northern Lobe, at the SE of the site, covering much of the northern half of the main body of the bog and in a sub-central zone along the southern edge. It is dominated by *Narthecium* flats (20-35%) with *Carex panicea* (10%) and *Trichophorum* (10%). The *Sphagnum* cover is low (10%), *S. magellanicum* and *S. papillosum* both at 5% cover with *S. imbricatum* and *S. capillifolium*. *Leucobryum* hummocks are also present. In places the *Sphagnum* cover increases to 20%. Despite the low *Sphagnum* cover in most of this complex the bog surface is soft and wet underfoot indicating the presence of an acrotelm layer (PM10:3). *Calluna* cover is high at 40% reaching 40cm in height (PM10:4). Patches of *Cladonia portentosa* occur but the overall lichen cover is low. Algal pools, sometimes linear, are common throughout this complex (10%) and are large in places. *Rhynchospora alba* and *R. fusca* may be seen colonising some of these hollows. Towards the western edge *R. alba* hollows become quite frequent To the north and west of Drains bC and bC1 some *S. cuspidatum* pools/hollows occur and there is evidence that there is surface water lying for a major part of the year. At the SE this complex includes abundant *E. vaginatum* and *Cladonia*. At the extreme SE of the site this complex is drier and harder with many algal hollows. *Dactylorhiza maculata* was seen in this complex on the N. Lobe. Close to Drain mD, at the SW of the site, a *Sorbus* tree was seen.

Complex 6+ *Myrica* (My)
At the E of the site and between Flushes V and W, on sloping ground, the *Narthecium* (20%) dominated complex occurs with the addition of *Myrica* attaining 50% cover in places. For a description of the area between the two flushes see Flush W below. At the E of the site this complex is drier and the slopes are steeper where active peat cutting is being carried out. *Carex panicea* occurs in these drier areas. *Dactylorhiza maculata* is encroaching into this complex at the SE of the site. S of the track there are erosion channels and evidence of burning - abundant *Campylopus introflexus.*

Complex 6B
An area of Complex 6 at the SE, W of Drain bN was burnt about 3-4 years ago. *Narthecium* still dominates with low *Calluna* (10cm) and abundant *Erica tetralix*, 15% bare peat and some *Carex panicea*. Machine tracks were evident on the bog in this area. The *Sphagnum* cover is low but some regeneration is occuring of *S. capillifolium* and *S. imbricatum*. The acrotelm layer is mostly absent.

Sub-Central Complexes
Complex 6/10
This sub-central complex is found in the central part of both the N. Lobe and the main body of the bog. It is dominated by extensive lawns of *Narthecium* (20%) but the *Sphagnum* cover is greater than in Complex 6 (25%), 15% of which forms hummocks. *S. magellanicum* makes up 10% and *S. papillosum* 5%. Other significant bryophytes recorded were *S. subnitens*, *S. imbricatum* and *S. fuscum*. *Eriophorum vaginatum* is common in this complex. Some large *Leucobryum* hummocks are present and typical hummocks make up 15%. *S. cuspidatum* lawns/pools cover 10% with *S. magellanicum* around the edges. These also contain *Menyanthes, E. angustifolium, Drosera anglica* and in places *R. fusca* (PM10:19 at E of site). On the N. Lobe the larger pools/hollows are aligned E/W. *R. alba* hollows cover 10% and *Carex panicea* patches occur (5%). *Racomitrium* is seen in this complex in small amounts.

At the NW of the site in the vicinity of Drain bH an area of this complex with large *S. imbricatum* hummocks occurs (6/10+*S.imb*). These reach about 0.5 m in height and 1-2m wide.

A number of *Pinus sylvestris* and *Betula* trees are seen scattered in this complex. *Betula* B1 is 3m high and is surrounded by tall *Calluna* with *Anthoxanthum, Eriophorum vaginatum, Vaccinium oxycoccus, Dryopteris dilatata, Aulacomnium palustre* and *S. imbricatum*. It is possible that this feature started out as a *S. imbricatum* hummock which was colonised by the other species as it grew above the water table. *Betula* seedlings extend N from this tree towards Drain bC2. SW of Complex 10/9 the cover of pools declines in this complex but the *Sphagnum* cover is still high. An acrotelm layer is present throughout this complex.

6/10+ *Myrica*
This is similar to the above complex with the addition of *Myrica* (60%) and is seen to the E of the site. *Leucobryum* hummocks occur (10%) and the total *Sphagnum* cover is 30%. *S. capillifolium* and *S. magellanicum* cover 5% each (PM10:20 at E of site). There are some small *S. cuspidatum* pools (10%), patches of *R. alba* and algal tear pools with an E/W orientation. Hummocks covered by *Cladonia portentosa* occur with some epiphytic lichens on *Calluna.*

Complex 9/10
This complex may be seen to the E of Drain bB at the E of the site. It is dominated by *Sphagnum magellanicum* and *S. papillosum* with abundant *Eriophorum angustifolium* and *E. vaginatum*. It may have been burnt some time ago as the *Calluna* is short and although the *Sphagnum* layer is well developed the layer underneath is hard. In addition *Cladonia floerkeana* is seen. This may be due to the mineral ridge which projects under the bog in this area. The whole complex has a very uniform appearance (PM10:3+33).

This complex also occurs, to the E of the bog, with the addition of *Myrica* (9/10 + *Myrica*), *Melampyrum, Dactylorhiza maculata* and *Osmunda*. The *Cladonia portentosa* cover is 10% in this area, the tussocks of *E. vaginatum* are large and *Calluna* reaches 30cm in height suggesting that this area has not been bunt so recently.

Central Complex
Complex 10/9
This complex occurs at the head of Flush V in a depressed area with rising ground to the N and E with a slight rise to the W and exiting to the S through Flush V. The total *Sphagnum* cover is 80-90 % (PM10:15 and is made up of *S. magellanicum, S. papillosum* with some *S. capillifolium* and *S. cuspidatum* lawns which cover approximately 10% and contain *Menyanthes* and *Drosera anglica* (They are aligned more or less NW/SE and may have been created by slumping to the SE. There is no open water. *E. vaginatum* and *E. angustifolium* are abundant with *R. alba* in hollows.

The *Calluna* is 40cm tall and there is some *Cladonia portentosa* cover. There are some indications of flushing such as the presence of *Aulacomnium palustre*. The whole area is very wet, quaking with a deep acrotelm and is difficult to walk through (PM10:14). It probably forms part of the catchment for Flush V. *Myrica* is present in the eastern part of this complex.

At the NW of this complex close to the pines discussed below the surface is very wet and quaking with a dominance of *S. cuspidatum* lawns.

At the NW of this area some *Pinus sylvestris* trees and *Myrica* clumps may be seen. Pine 1 (P1) is two mature *Pinus sylvestris* trees with *Molinia, Holcus, Anthoxanthum, Luzula, Juncus effusus, Vaccinium oxycoccus* and *Andromeda* with a bryophyte layer of *Aulacomnium* and *S. papillosum*. Pine 2 (P2) is surrounded by *Calluna*. A third pine was also seen in this area. Two clumps of *Myrica* may be seen in this complex close to where the three pines grow. They may be associated with Flush V to the SE and the occurence of Complex 10/15. Between the clumps of *Myrica* there is 90% *Sphagnum* cover with a significant amount of *R. alba* and is very quaking underfoot.

6.2.2 Flushes

Flush Z at the N of the site in the vicinity of Drain bC is an area of large *S. cuspidatum* tear pools which are aligned E/W parallel to the bog edge and are probably associated with slumping in this area.

Flush Y is in a slightly depressed area where water ponding occurs to the W of the site. It consists of 50% *S. cuspidatum* pools with *Eriophorum angustifolium* and *E. vaginatum* which are fruiting well. *S. magellanicum* and *R. alba* dominate the inter-pool areas. A patch of *Myrica* occurs to the NNW.

Flush W is a linear feature associated with Drain bB. An open water body is indicated on the 1910 6" sheet in the area where this flush now occurs. All that now remains is a large pool/lawn of *S. magellanicum, S. cuspidatum, Menyanthes*, *Aulacomnium palustre* and *Vaccinium oxycoccus* (PM10: 15 and 16). A small clump of *Betula* which attain 4m in height occur beside the infilling pool and there is a group of *Pinus* about 70m further to the N. *Dactylorhiza maculata* extends northwards from the *Betula* towards the area of Pine. *Molinia* dominates the herb layer in this area with *Melampyrum pratense, Potentilla erecta, Vaccinium oxycoccus*, *Polytrichum alpestre* with some *Sphagnum papillosum and S. capillifolium* hummocks *and S. palustre and S. recurvum*. A band of *Molinia* and *Myrica* extends to the S towards Flush V with *Osmunda* (clumped), *Melampyrum, Potentilla erecta, Juncus effusus, Dactylorhiza maculata, Andromeda, Polygala, Dryopteris dilatata, Lonicera, Carex rostrata, Ulex* and scrub *Betula* and *Salix* (PM10:26+27). The *Molinia, Myrica* (10-20% cover), *Melampyrum* and *Dactylorhiza maculata* extend westwards all the way to Flush V (120m away) and southwards where burning of the high bog has occurred.

Flush V extends over a large portion of the S central area of the site (approximately 20ha). It may be associated with an open water body/pool indicated on the 1910 6" sheet of this area. No open water body now exists although a small area of open water was present in 1983 (O'Connell and Mooney). This area is now dominated by *Sphagnum* lawns mainly of *S. magellanicum* and *S. recurvum* with *Menyanthes. Aulacomnium palustre, Polytrichum alpestre, Vaccinium oxycoccus, Molinia, Myrica* and *Melampyrum* also occur indicating flush conditions. This whole flush area links up with the vegetation of Flush W indicating some enrichment over much of the SE of the site. It is wet and supports a very good *Sphagnum* layer with a deep acrotelm. The S edge of this flush is sunken due to peat cutting at the bog edge. Here there is a clump of tall *Betula* trees (7m) and the following species were recorded beneath them: *Myrica, Molinia, Melampyrum, Potentilla erecta, Anthoxanthum, Carex panicea, C. binervis, C. pilulifera, Dryopteris dilatata, Juncus effusus* and *Frangula alnus* (low and bushy). There is evidence of burning as some burnt *Betula* stumps remain.

7. BOG TYPE

This bog has been classified as a Ridge Basin bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes

Most of this site slopes to the S and this slope is pronounced in the vicinity of Flush V. To the N, especially the NE of the Main Lobe there is a sudden tranistion from the bog to the mineral soil. There is practically no slope to the bog edge in this area. A number of slopes were estimated in the field and are described below. Their postions are shown on the Slopes Map.

Slope 1 This slope is at the NE of the N lobe to an area of old peat cutting. It is 0.5m over 50m.

Slope 2 This slope is at the NW of the N lobe into an area of old peat cutting and is 1m over 20m.

Slope 3 This slope along the N of the site towards an area of old cut-away, now dominated by *Phragmites*, is 0.25m over 30m. The facebank edge is very shallow.

Slope 4 This slope further W along the N edge of the site is associated with Drain bC and is 0.5m over 20m.

Slope 5 This slope further W along the N edge is associated with the newly deepened Drain bD, which flows north, and is 0.75m over 50m.

Slope 6 This slope is at the NW corner of the site into an area of old peat cutting and Difco cutting. The slope at the edge is very steep at 0.5m over 5m. The facebank edge is 2m tall with encroaching *Betula* and *Salix.* There is severe cracking of the high bog surface.

Slope 7 This slope is at the W of the site into an area of old peat cutting now dominated by *Pteridium* with *Betula* both of which are encroaching onto the bog. The slope is 0.5m over 30m.

Slope 8 This is at the SW of the site into an area of old peat cutting where *Betula* are encroaching on to the bog. The slope is 0.5m over 50m.

Slope 9 This slope is in the same area as Slope 8 but is NW/SE into the depression associated with the old peat cutting. It is steep at 1m over 30m.

Slope 10 This slope is located at the N edge near the road at the E of the site into an area of active peat cutting. The slope is 0.75m over 30m and there is severe cracking and slumping.

Slope 11 This is found along the SE edge into an area of old peat cutting and is 0.3m over 10m.

Slope 12 This is at the S edge of the site at the end of Drain bB into an area of old peat cutting now dominated by *Betula*. The slope is 0.5m over 10m and there is severe cracking and slumping.

Slope 13 This is further W along the S edge of the site in the vicinity of Flush V where the slope is steep at 1m over 20m.

Slope 14 This slope is also near Flush V into an area of old peat cutting. There are machine tracks on the bog and associated severe cracking and slumping of the high bog. The slope is 1m over 50m.

Slope 15 This is also on the S edge of the bog and is associated with old peat cutting now dominated by *Betula, Phragmites* and *Calluna.* The slope is 1.5m over 50m across burnt peat and an area where hopper cut turf is laid out. There is serious cracking and slumping of the peat surface. The facebank edge varies in height and reaches up to 2m tall (PM10:30).

Slope 16 This slope is also on the S edge of the bog and is associated with old peat cutting. It is 1.5 m over 75 m.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

Small areas of active peat cutting are found to the SW, SE, one small area to the NW and one at the NE of the site. The marginal drains in these areas are deep and wide and the facebanks up to 3m tall especially to the S of the site. Both Difco and hopper methods are used. Some hopper cut turf is laid out at the SW on the high bog (PM10:29+30) and is stacked in small hummocks (PM10:31+32) and there is Difco cut peat at the SE in the vicinity of drain bO.

Abandoned Difco cut peat is found between Drains bP and bO at the edge of the high bog. There are old turf banks along the mid N of the site off the bog. Only one new drain at the N of the site has been inserted since the 1970s.

8.2.2 Fire History

There has been a recent burning event on the S edge of the site, W of Flush V, with 35-80% bare peat. A small area to the W of Drain bN at the SE of the site was burnt about 3-4 years ago. *Narthecium* now dominates. Another area which has suffered recent burning is to the WNW of the site where there is 80% bare peat on a small portion of the high bog. The area of old peat cutting nearby has been more extensively damaged. A patch along the N section of Drain bE and bC1 to the N of the site has also recently been burnt.

8.2.3 Catle Poaching

Cattle poach this bog along the N edge where the mineral soil juts into the bog and is at the same level. There is no facebank. An electric wire fence restricts the cattle to a small strip of high bog. The vegetation in this area is dominated by *Trichophorum* with some species more typically associated with meadows occurring, such as *Anthoxanthum, Luzula, Stellaria* and *Trifolium*.

8.2.4 Agricultural Improvements

Small areas between the N of the main bog and the N lobe have been reclaimed and are now used for grazing. The marginal drain along the E side of the N edge has been deepened and the field immediately beyond the high bog is lower than the bog. Many field boundaries of the 1970s map have been removed.

8.2.5 Forestry

A young forestry plantation was seen on the old cut-away to the NE of the site.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. The wettest section of this site is located in a depression which has probably been formed due to subsidence caused by the extensive peat cutting which has occurred to the S in the past.

2. In common with Firville Bog, *Dactylorhiza maculata* is common. This is probably associated with a thin peat layer ant the influence of the under lying mineral soil.

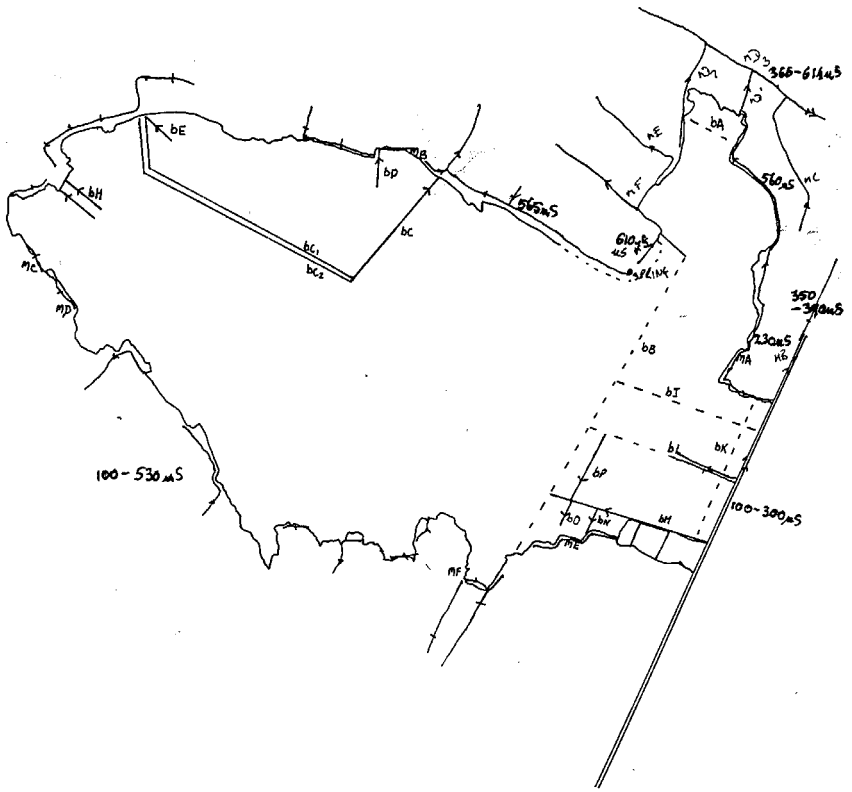
3. Between fluhes V and W *Myrica* is common, indicating lateral water movement.

4. *Frangula alnus* is seen at the exit of Flush V.

5. Along part of the N edge the bog grades naturally into adjoining mineral soil forming an infiltration lagg.

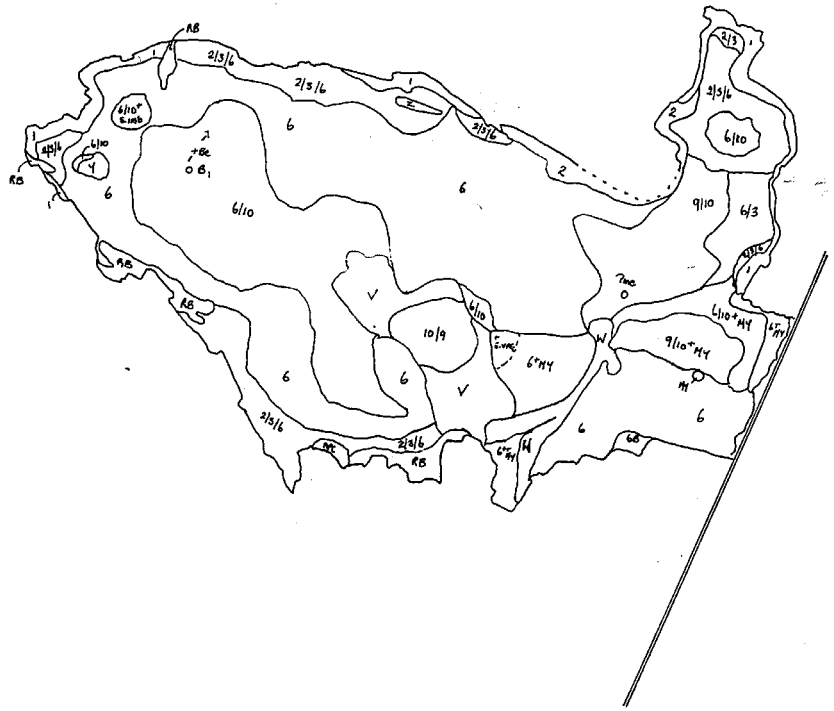
Lara Kelly
Malcolm Doak
Marie Dromey

Raised Bog Restoration Project (1995).



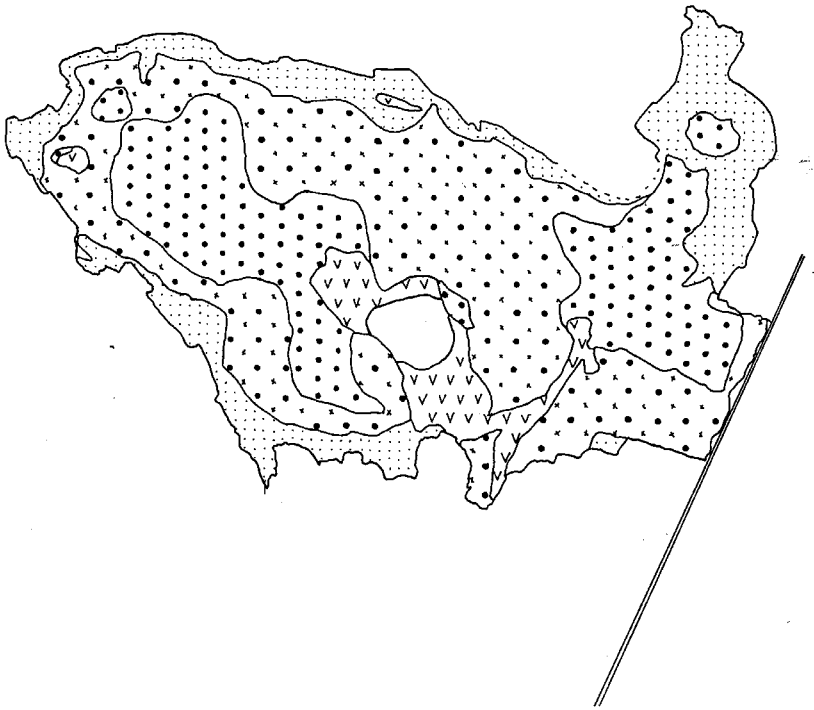
KILCARREN BOG, CO. TIPPERARY (647).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994

N



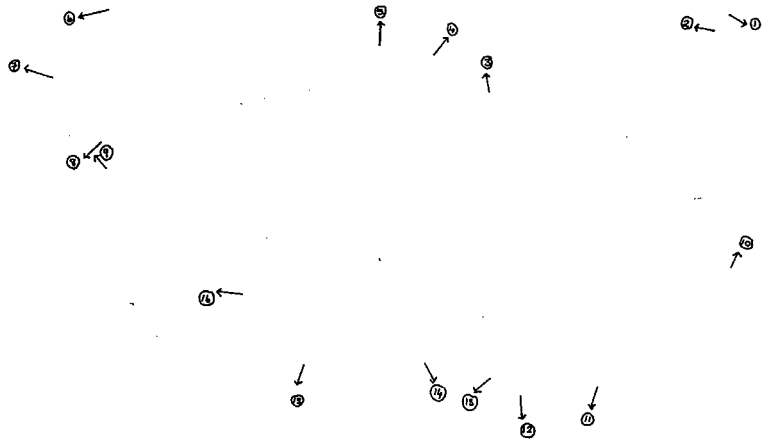
KILCARREN BOG, CO. TIPPERARY (647).
VEGETATION MAP (1:10,560)
1994

N



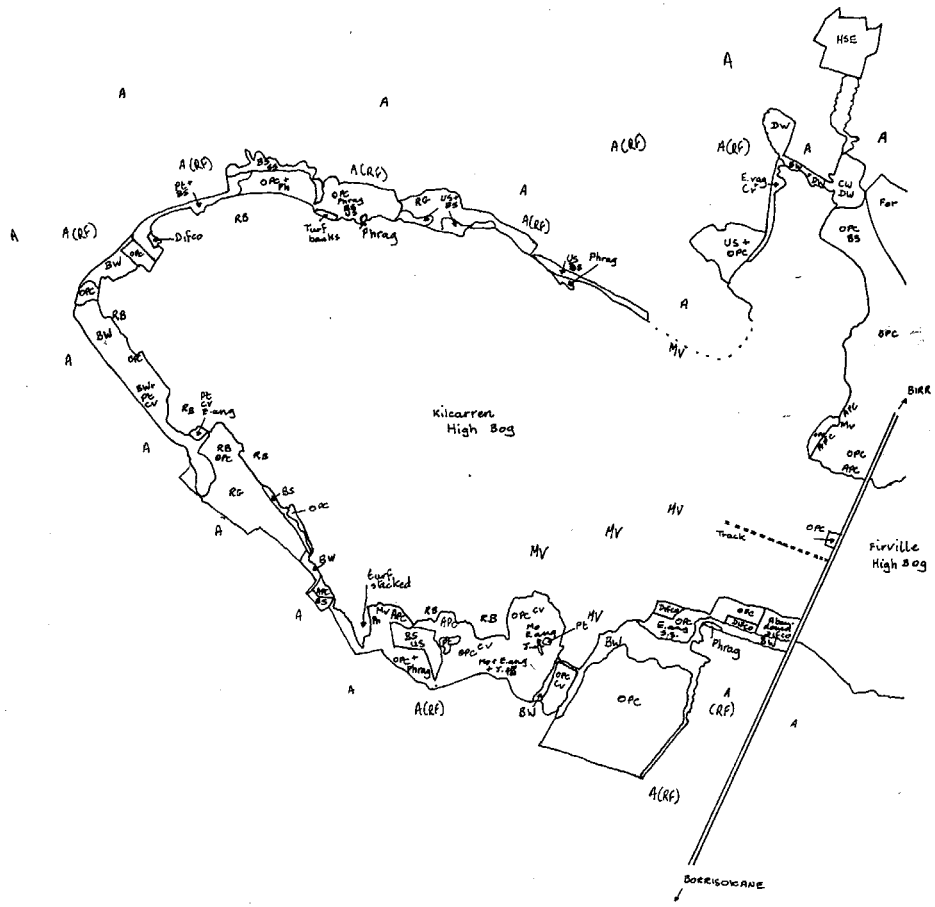
KILCARREN BOG, CO. TIPPERARY (647).
ECOTOPE MAP (1:10,560)
1994

N



KILCARREN BOG, CO. TIPPERARY (647).
SLOPES MAP (1:10,560)
1994

N



KILCARREN BOG, CO. TIPPERARY (647).
LANDUSE MAP (1:10,560)
1994

N

LISNAGEERAGH, CO. GALWAY

1. SUMMARY OF SITE DETAILS

NHA No.	296	1/2" Sheet:	12
Grid Ref:	M 662 630	6" Sheet:	GY 6/7/18/19
GSI Aerial Photo:	M 137	1:25,000 Sheet:	14/25NE
Other Photo:	OS (B+W1993) 8263	Area (ha):	285
NHA Photo:	650:30-34 & 651:1-17		
Date(s) of Visit:	13/14-9-94 (Ecology)		
	13/14-9-94 (Geohydrology)		

Townlands Lisnageeragh, Frass, Curraghmulmurry and Clooncon East.

2. INTRODUCTION

2.1 BACKGROUND

This site was surveyed during the National Raised Bog Survey. It was classified as a western or intermediate raised bog and assigned a Bii rating (Douglas and Grogan, 1985). They described it as an extensive bog which was scarred by peat cutting and trackways. It featured well developed inter-connecting pool areas and some flushes. However due to the extent of peat cutting and drainage its conservation value/priority was deemed to be low.

Lisnageeragh bog was also visited during the Natural Heritage Area Survey (1994). It was described as a large area of intact dome with approximately 50% of the site consisting of high quality raised bog habitat. The adjacent Ballinastack Turlough, at the north of the bog, was considered to add to the importance of this area due to its use by wildfowl.

Despite its low rating and the fact that it was not included in the list of sites to form a network of raised bog Nature Reserves, this site was included in the Raised Restoration Project survey. This was primarily because most of the site is presently owned by Bord na Mona (freehold) (see Fig. X) and a large portion of the site could be purchased readily and restoration works undertaken. The large size of the site was also a consideration.

2.2 LOCATION AND ACCESS

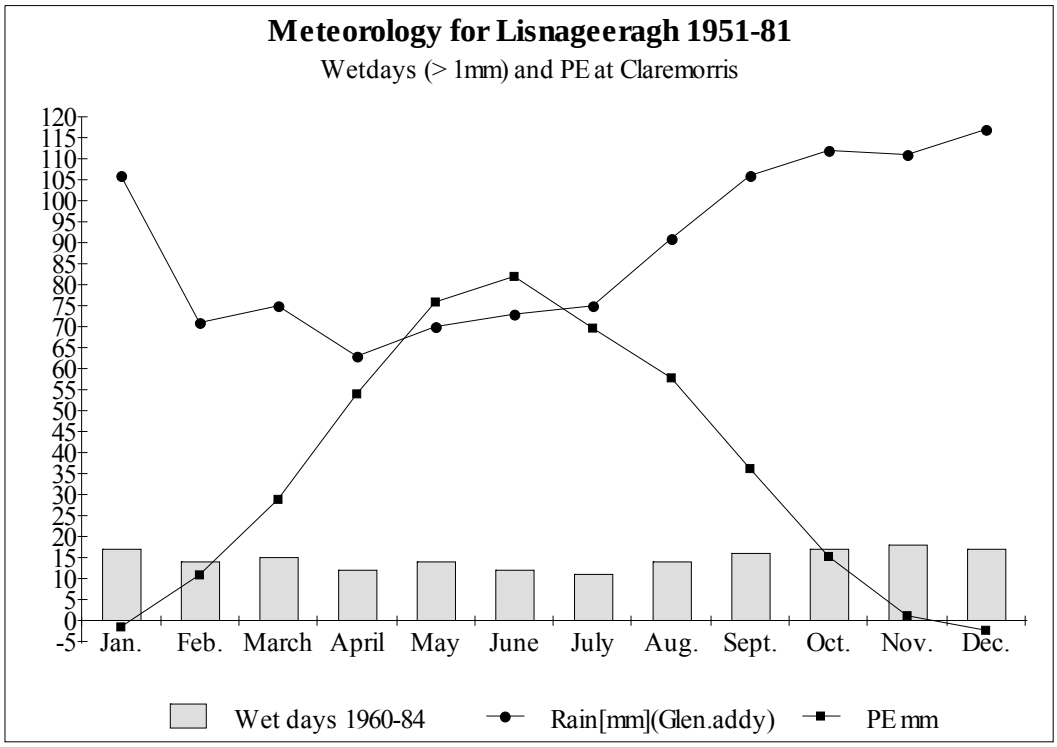
This bog is located approximately 2.5km east of Glennamaddy, Co. Galway. Access may be obtained from a number of bog roads which lead eastwards from the road between Glennamaddy and Ballymoe.

3. METEOROLOGY

No meteorological measurements have been made on Lisnageeragh bog. Rainfall data from the nearby Glennamaddy rainfall station for the years 1951-80 indicate that the area receives an average 1069 mm of precipitation annually (Figure X). The nearest Meteorological Service synoptic station at Claremorris suggests that the site could have up to 234 rain days and up to 177 wet days annually.

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

Figure X



The above factors suggest that the year round actual evapotranspiration (AE) from Lisnageeragh Bog is greater than PE at Claremorris, site of the nearest synoptic station which had an average PE of 428.1mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Lisnageeragh would therfore be greater than 428.1mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 641mm/yr.

Meteorological data for Lisnageeragh Bog (1951-1981) are summarised below:

Rainfall (P)	1069 mm/yr
Actual Evapotranspiration, (AE)	>428.1mm/yr
Potential recharge, (PR)	<641mm/yr
Raindays > 0.2mm (annual {1951-80})	234 days
Wetdays > 1mm (annual {1960-1984})	177 days

Rainfall analyses up to 1991 for the Glennamaddy area show that late winters (January, February, March) have become progressively wetter over the past 20 years and those of the last years have been wettest of all.

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

The topography of Lisnageeragh bog follows that of the underlying subsoils to a certain extent. Faces in the south and southwest of the bog are less than 0.75m high where blanket type peat overlies parts of three drumlins that trend NW/SE. Thicker *Sphagnum* peat occurs in parts of the east and south of the bog where peat overlies depressions or lower ground between drumlin ridges. Faces here have heights of up to 4m. In other words this bog is not a raised bog, but a western or an intermediate raised bog that forms an irregular plateau blanketing drumlin hummocks and hollows.

In plan, the site reaches a maximum length of 3200m in a SE-NW direction. It is thinnest in an east-west direction where it has a width of 1500m.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

The bog is situated in an upland area (> 100m OD) where there are low relief drumlins. Esker gravels and associated glacio-fluvial deposits lie directly west of Lisnageeragh bog. Ballinastack turlough lies in a depression to the NW of the bog.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

Recent geological maps by Smith (GSI) show that the area is directly underlain by dark limestone (wackestone). There is a large collapse feature/swallow hole 7m deep to the immediate west of the bog with a sinking stream. This indicates that parts of the bedrock are karstified. Overall the dark limestones generally have a low permeability but may have higher permeability zones where there is karstification. The Old Red Sandstone Mount Mary inlier lies 9km to the south east.

5.1.2 Subsoils (See 6" 1840s Map)

No subsoils data were available for Lisnageeragh bog apart from the initial 1840s GSI geology field sheets, and recent fieldwork.

Geology of Inorganic Subsoils

The Quaternary subsoil geology of this bog and surrounding area are dominated by tills and gravels. Sections in drains (mA) to the west at a low point between two drumlins that trend NW/SE, indicate that the outer limits of the bog (apart from the NW) are underlain by poorly sorted silty limestone/old red sandstone tills with relatively small sub-rounded clasts (Slide 4). In exposed till sections the sandstone has been weathered and eroded to give the till a silty to sandy matrix. A second more permeable subsoil deposit is found in the higher ground which lies directly northwest of Lisnageeragh bog at drains mJ, where there are several local extraction pits. Aerial photography shows that these pits are part of a low relief esker ridge which runs north/south along the very western edge of the bog. Peat has grown up along parts of the west side of the esker. The (mL) drains that cut across the esker show it to be composed of dirty gravels with an assortment of clast sizes (Slides 11-16).

Lake clay beside drain mB4 was recorded to the south of the bog where peat faces are 1.5m-4m high (slide 6).

Peat

The line on the aerial photo overlay indicates the original extent of the bog. It is reproduced from Geological Survey maps produced in the 1840s.

5.1.3 Depth to Bedrock

There are three limestone outcrops at Glennamaddy town 3km SW. There are also two limestone outcrops 1km east of the bog. Depth to rock on the bog is unknown.

5.2 HYDROLOGY (See Drains and Hydrochemistry Map)

5.2.1 High Bog Hydrology

South

Drain bA is an old, long drain which runs almost E/W across the lower portion of the site. It forms a townland boundary and there is a track along the western section. Immediately to the E of R4 Drain bA is 1m wide in places with a high water table and some flow to the W. There are places where the water is deep and there is 10cm of water throughout.

There is some infilling with *S. papillosum* and *S. magellanicum* at the edges and *S. auriculatum* and *S. cuspidatum* occur in the drain. Tall *Calluna* is seen along the edges. There are deep erosion channels perpendicular to the drain along both sides. Along the mid-section of the drain there is a high water table and infilling with *E. angustifolium, S. cuspidatum* and *Menyanthes.* The eastern section of the drain is almost infilled. It flows into the forestry plantation and is lined with *Molinia.*

Drain bB is a long, old, double drain which runs E/W across the site. There is a surfaced track at the E end, tractor tracks with *Calluna* and *V. myrtillus* along the mid section and no track to the W. The more southerly drain is 1m wide and infilling with *S. cuspidatum, S. auriculatum, E. angustifolium* and patches of *R. alba* at the edge. There is slight flow in both directions and this increases towards the edges of the bog. There are very deep erosion channels on either side of the drains and it appears that the tops of the drains are 0.75m below the surface. The more northerly drain is wider than 1m in places. The southerly drain widens to 2m and is 1m deep east of R1 (EC 59 μS/cm). It is infilling with *Potamogeton polygonifolius, Molinia, Menyanthes, Salix, J. effusus* and *Betula* with *Ulex* and *Pteridium* along the edges. West of R1 the northerly drain is 1m deep by 0.5m wide (EC 63 μS/cm) with *Molinia* and *P. polygonifolius* with *Ulex, Calluna, Salix* and *Pteridium* along the edges. There is slight flow to both the E and W. At the E end there are areas of old peat cutting along both drains and they are dominated by *Pteridium, Salix, Rubus, Sonchus, Succisa* and *Ulex*. There is considerable flow to the E along the more southerly drain (EC 53 μS/cm).

Drain bC also runs E/W and has flow in various directions depending on the slopes caused by tracks and Flush Z. In the mid section the drain is level with the bog and there are some pools forming along it with patches of *E. angustifolium* dominated vegetation. To the E near Flush Z the drain is 0.75m deep and wide widening to 3m at the flush. There is significant flow and there was peat cutting carried out in the past. There is no flow into the flush as the drain is blocked but reforms further E where it is 0.5m deep by 3m wide with flow to the E off the bog. West of R1 the drain is 0.5m wide and infilling with *R. alba.* It is collapsing into an area of old peat cutting at the very W end.

Drain bJ at the SE of the site is an old drain which runs in two directions. The NNW/SSE section is the shorter of the two. At the junction of this and the NNE/SSW section the drain is 0.75m wide by 0.5m deep with 5cm of water. It is infilling with *E. angustifolium, S. papillosum* and *S. magellanicum.* Spoil along both edges is colonised by *Calluna.* No flow was seen. Where the drain approaches the E of Drain bD it widens and is deep with a high water table. There is flow to the W into bD. West of Drain bD, Drain bJ is up to 2m wide by 1m deep and infilling. It is collapsing in places due to peat cutting along the bog edge.

Drain bK at the very S of the site flows to the SE and has been inserted since the 1970s. It is 1.5m wide by 0.25m deep with flow at the edge.

Drains bL are two drains at the S of the site which have been dug some time since the 1970s. They are 0.1m deep and wide with significant flow ESE to both sides of a plot with active peat cutting.

Drain bM in the same location as Drains bL and has also been inserted since the 1970s. It is 1m wide by 0.5m deep with 5cm of water flowing to the ESE. The drain is associated with active peat cutting.

Drains bN are old drains at the SW of the site W of Drain bD2 and are associated with old peat cutting. They are up to 2m wide, collapsed in places but with some flow to the E and there is facebank complex along them. Between both drains Complex 2/3/4 with a lot of bare peat was recorded.

West

Drain bD is the longest drain on the bog. It runs N/S and forms a townland boundary. There is flow in various directions depending on the slopes associated with Flush Z1 and the tracks. There is some infilling with *R. alba, Narthecium, S. papillosum* and *E. angustifolium.* At the very S end of drain bD1 there is *Betula* scrub with *Angelica, Osmunda, Blechnum, Ulex, Salix, J. effusus* and *Potentilla erecta.* It is up to 2m deep with 50cm of water which flows significantly to the S. There is a series of old, short drains which are at a 45^{o} angle to Drain bD1 and which flow into it. Between the drains bA and bC there is considerable flow to the S and the drain is 0.5m deep with 10cm of water. North of Drain b2B the drain is associated with slopes 20, 21 and 22. There is flow to the N towards Flush Z1.

There are some open patches of water and there is infilling with *S. cuspidatum, R. alba, D. anglica* and some *Molinia*. There are patches of *Myrica* along infilled sections of the drain and there is a long strip of *Myrica* along a channel leading NNE to the flush. (There is no further *Myrica* present along Drain bD north of the channel branching off). There are channels flowing from bD into Flush Z1. Further N the flow of Drain bD is influenced by a patch of actively cut peat through which it flows. Where bD flows through Flush Z1 it is 1.5m deep by 2m wide and there is evidence of flow to the N. It is colonised by *Molinia* with *Calluna* and a bush of *Ulex* along the edge. At the very N edge the drain is 1m wide and mostly infilled. There are patches of *S. cuspidatum* and *S. auriculatum* and slight flow to the NW into an area of old peat cutting.

Drain bO is associated with R3. The more easterly drain is 1m wide by 0.5m deep and infilled with *Molinia, E. angustifolium* and *J. effusus.* Further N beyond Drain bC this drain has been recently deepened to 1.5m. It is 3m wide at the top narrowing to 0.5m at the base and there is considerable flow to the S. West of R3 the drain is 0.5m deep and wide and is infilling with *E. angustifolium.* It too has been deepened further N. Road 3 is composed of calcareous material and is dominated by *Molinia* with *Ulex, Pteridium, Calluna* and *Salix* along its edges.

Drain b2A is an old, double drain which is aligned NW/SE and is an extension of R3. The drain is 1m wide by 0.1m deep with some flow to the S. It is infilling with *R. alba* and *Narthecium* with *S. cuspidatum* further N.

Drain b2B is an old drain aligned WNW/ESE. The mid section is 1m wide by 0.25m deep and is infilled with patches of *S. cuspidatum* and *Narthecium* with *Calluna*.

Drain b2C has been excavated since the 1970s and runs E/W with flow to the E. It is a short drain 0.25m wide by 0.1m deep with 5cm of water. The drain is associated with active peat cutting which is carried on to the S of it.

Drain b2D runs NE/SW very close to the bog edge. It is 1m wide by 0.5m deep with flow to the NE. It is infilling with *S. cuspidatum, S. auriculatum, E. angustifolium, S. papillosum. S. capillifolium* and *Utricularia*. There is *Molinia* on the high bog beside it with *Molinia* dominated vegetation to the W of it.

North

Drain b2E is an old drain (EC 102 µS/cm) which runs NNE/SSW and is associated with the N of Flush Z1. It is deep and narrow with rapid flow W into the bog and the flush. It is connected to a spring (EC 200 µS/cm) at the base of a ridge in the area of old peat cutting. The drain is lined with *Molinia, Myrica, Ulex, Pteridium, Succisa, Sparganium erectum, Potentilla erecta, Rubus, Caltha palustris, Filipendula* and *Salix.*

Drain b2F runs NNW/SSE through Flush Z1 and is 2m deep by 1m wide. It acts as an artificially deepened channel for the flush.

Drain b2G is an old ridge which runs NNE/SSW with wet soft vegetation on the N side. The ridge is dominated by *Calluna* with *E. vaginatum, Trichophorum* and some *C. introflexus.* There is some *Molinia* along the SSW end.

Drain b2H is at the NE edge and it runs NW/SE. It is 2.5m wide by 0.75m deep. The drain is old, infilled and collapsing at the edges.

Drain b2J is associated with Flush X1 and also forms part of a townland boundary. The drain is 1-2m wide and is *Molinia* dominated with clumps of *J. effusus, Myrica* and *Ulex.* There is *Pteridium* at the bog edge and *Phragmites* along the line of the old drain in an area of old peat cutting.

Drain b2K appears to be a large crack/channel up to 20cm wide with 15cm of water flowing rapidly to E. *Molinia* and *Myrica* line the channel and there is also some *Melampyrum* present.

East
Drain bE is an old, narrow drain which flows NE from Drain bC at the N of Flush Z. It is 0.25m deep by 0.2m wide.

Drain bF is a wide, old drain which runs NW/SE at the NE of Flush Z. It is 1.5m wide at the NW end widening to 2.5m at the SE end. There is significant flow to the NW and SE. There are *Calluna*, *Cladonia* and *E. vaginatum* dominated ridges along both sides. In places the drain is almost completely infilled with *R. alba* and there are patches of *Myrica* to the SE.

Drain bG is an old drain which runs NE/SW at the NE of Flush Z. It is not visible on the 1993 aerial photograph. The drain is 1m wide with 20cm of water and there is flow to the NE. There is some infilling with *S. cuspidatum, S. auriculatum, S. papillosum,* and *S. magellanicum* and some *R. alba* at the edges. The facebank complex is seen at the NE end.

Drain bH is old, narrow and almost completely infilled. It is parallel to Drain bG and to the E of it.

5.2.2 Bog Margin Hydrology with Face Bank Details (See Drains and Hydrochemistry Map)
South West/West
All high bog drains and cut-away drains in this part of the bog direct their water west to the main outlet mA3. Drain mA3 is 2m wide and 0.5m deep in till. Its ultimate destination is Mill Lough a turlough just NE of Glennamaddy town. The tracks (R1 - R4) are the main arteries for drainage on the high bog.

There is a relatively large area of old turf banks where small drains interconnect to flow to R4. There are two drains on either side of R4. They are 1.3m wide and 0.25m deep. Peat cutting has caused a semicircular depression to form south and north of R4. There is heavy hand cutting north of mR4 with many turf banks. Several of the marginal drains here flow directly to the main outlet mA3.

There are many old turf banks with an extensive new drainage system to the west of R3. The drains at R3 are up to 1.5m deep and 30cm wide. Drain mR4 is 2m deep, 1.3m wide and overgrown. Drain mA1, is a newly deepened drain up to 5m deep with till at the bottom. This drain becomes less deep further south. This drain has the effect of becoming the boundary for the SW of the bog since it is so deep and is entirely in old turf banks (slide 4). Drain mA2 is the older peripheral drain for the bog which once separated the bog from the agricultural fields (slide 3). There is a 5m drop from the abandoned turf banks to the field.

To the south of drain mA1, the peat becomes thinner since it overlies a till drumlin at 'Whiskey Hill'. The faces here are very old and no more than 1m high. The drains at the faces are 1.5m wide and over 1m deep. The cut-away is relatively overgrown and wet here.

South
The peat here is much thicker where hopper cutting is practised; face heights are a maximum of 4m. Cutting is concentrated west of R1, where face drains (mB) are 1-2m wide and up to 2m deep. There is evidence of some slumping. Several macropores, 10cm diameter, were recorded in these faces. Several new 0.5-1m wide drains (slide 7) have been dug in the corresponding cut-away where they move water south via drain mR1.

South East
Moving eastwards along the south of the bog, faces become thinner since the peat encroaches another NW/SE trending drumlin. Drains mC1-4 dug some time since the 1970s, drain an older overgrown cut-away here. A spring initiates at the head of drain mC5 at the break in slope of the drumlin, where its outflow moves south west to drain mR. Generally there are no drains in the margins immediately east of bK/mC5 since they lie on the free draining drumlin composed of silty till. The peat here has blanket properties and is very thin and poached (slide 8). The high bog at this point is thought to be at the same level of the agricultural fields.

Forestry is the main boundary for the south east. There is a 6m wide very old overgrown drain (mD) adjacent to the forestry running NE/SW. It is dry in parts where some poaching has occurred (slide 9).

East
There are thick peat faces up to 4m high with extensive areas of cut-away (*Phragmities*) where several 0.5m-1m drains lead to a main stream (mE). Stream mE which flows north is 1m wide and 2m deep in peat with relatively high flow. Drain bE which drains a flush flows north east into face drains with till at the bottom where the faces are 2m high (slide 10).

North East
North of drain bE the peat margins are sloped and thin out where the surface is blanket like and poached. The faces immediately north of bE are 1.5m high but old and overgrown with bushes and shrubs. *Phragmities* is present in the old face drains where their substrate is probably till since the old cut-away is elevated where it slopes east, into the main stream mE.

There is a large flush X1 with several swallow holes where water moves through an overgrown flush vegetation in the old cut-away to stream mE (slide 25). *Phragmities* abounds here. Till is believed to be near the surface here, faces are not higher than 0.5m.

The faces beside drain mF are about 0.5m. The corresponding cut-away is very wet and overgrown where several flushes flow from a poached bog surface to drain mF and stream mE.

Drains mG are a series of overgrown grass covered drains which move water from the cut-away into a depression at b2E which runs NNE/SSW associated with Flush Z1. These drains are 1.5m deep where there is rapid flow to the flush. There is thought to be a spring (EC 200μS/cm) where drains mG meet b2E.

North
The flush Z1 and associated depression separate a small north western lobe from the main bog. Faces beside drains mH are 2m high where the corresponding cut-away has been prepared for forestry. The face pools are overgrown with mesotrophic rich vegetation.

The faces along the north west of this lobe are less than 1m high where the peat is blanket like with poaching. Drains mJ and bD flow to a turlough immediately north west of the bog (Slides 23,24).

West
Drains mJ are coincident with old faces that are less than 1m high where *Typha* occurs. Drain mJ4 which is 0.25m wide and 1m deep moves water into a large swallow hole. The swallow hole is steep sided and up to 7m deep. Water at the bottom is about 2m deep with an EC of only 83μS/cm. The walls of the swallow hole are believed to be composed of black limestone. It is thought that the swallow formed from a karstic collapse feature and acts as a recharge feature for local groundwater.

Drains mK direct their water to the turlough north west of the bog via drain mL1.

Aerial photography shows that a low relief esker ridge runs north/south along the very edge of the bog (Slides 11-16). This area lacks surface drains suggesting that the subsoils here are relatively free draining. Two very minor springs issue at the break in slope of the west side of the esker where their limited outflows leave via drains mL1 and mL2. The EC of the two springs are 480μS/cm and 540μS/cm respectively. Drains mL1,2 were recently deepened to 1.5m depth and sit in stony dirty gravels.
The drains at R5 are up to 1.5m deep and 30cm wide. The water in drain R5 moves west to drain mL which falls within the Springfield River catchment.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map)
Water flowing from the bog and the adjacent inorganic subsoil was sampled on the 13/14th September 1994. Each of the previous four days was a rain day.

South West
The Electrical Conductivity (EC) at R4 was 55µS/cm. Drains at R3 and R5 had an EC of 68-85µS/cm with *Phragmities* in the corresponding cut-away. Drain mA1 had an EC of 83µS/cm. The EC south of drain mA1 was 72µS/cm.

South
The new drains (mB) west of R1 have an EC of 93 - 125µS/cm.

South East
The spring at the head of drain mC5 has an EC of 288µS/cm. There was little outflow; the spring is a discharge point for the localised groundwater mound of the drumlin. The groundwater of the drumlin is not thought to be part of the regional groundwater body.

East
Drains mE3-7 have ECs of 90-144µS/cm. Face drains (with till at the bottom) where drain bE flows north east into the cut-away have an EC of 78µS/cm. There is no groundwater upwelling here since the till is thought to be above the watertable. It is likely that the drains here recharge groundwater since they are sited in permeable till.

At point mE 14, stream mE lies in till where it has a higher EC of 200µS/cm. At this point stream mE is believed to be the main discharge point for groundwater. There is a good break in slope to stream mE and *Phragmities* is present in the old face drains (200µS/cm) between mE 13/14

North East
There is a spring (EC 250µS/cm) where drains mG meet b2E; groundwater emerges at a break in slope of till ridge to NE. The face pools near drains mH with mesotrophic rich vegetation have an EC of 255µS/cm.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
Most of the bog and its surroundings lie within Springfield River catchment which is a tributary of the Island River that ultimately flows north into the upper reaches of the River Suck. A regional surface water/groundwater catchment divide runs along the south west portion of the bog since the peat overlies parts of three drumlins which lie in a regional upland area. All water in the SW area flows to the turloughs of Glennamaddy.

Surface water/groundwater in the peat and underlying subsoils flows out in all directions from the catchment divide. This bog and surrounding uplands are the main regional recharge zone for groundwater.

Bog Regime
The low permeability of the catotelm means that the water can only flow through it very slowly and so the bog water table is present in the acrotelm. Most of the available rainfall would therefore flow in the acrotelm to the bog margins. Five main marginal drains move water away from the bog. Drains mL, bD and mE fall within the Springfield River catchment where drains mL and bD flow to Ballinapeaka turlough immediately north west of the bog, and Drain mE directs its flow to the Springfield River. Drains mA3 and mR1 direct their flow to the two turloughs east of Glennamaddy.

To the west of the bog there are few surface streams/drains since there is a zone of high permeability esker sands and gravels and associated glacio-fluvial deposits.

Inter-relationship of topography hydrology and hydrogeology
Overall there were little incidences of high ECs in the cut away drains. EC values were never more than 150µS/cm apart from those in the north east. Most of the runoff water from the bog is believed to infiltrate into the relatively permeable till and enter the watertable as recharge.

Local groundwater upwells in the drains north east of the bog near drains mH since there is a mesotrophic rich vegetation where the EC is 255μS/cm and there is a spring (EC 250μS/cm) beside drains mG.
These sites are situated in a depression west of a drumlin and are believed to intercept the local groundwater-table.

6. VEGETATION

6.1 VEGETATION SUMMARY

Drainage, peat cutting and fire have had a major role in forming the present vegetation cover seen at this site. Extensive peat cutting and the insertion of associated bog roads has caused sloping of the bog so that erosion channels are commonly seen around the main drains and at the bog edge. Fire has resulted in a fairly uniform microtopography over the site due to the degradation of hummocks and burning of *Calluna*. Two areas remain which appear to have escaped burning for some time and have the highest *Sphagnum* cover (35%). These two areas are Complex 35 seen at the SW and SE of the site and covering between them approximately 5ha. Complex 6/2/35 (moderate *Sphagnum* cover with soft surface) is seen at the centre of the site and covers approximately 7ha. If the latter area were to remain unburnt for some time it could revert to Complex 35 as it appears to be a degraded form of that complex. Over the remainder of the site *Sphagnum* cover is low but, despite this, the surface is soft in many places. This is the usual situation for Western or Intermediate raised bogs.

There are a number of flushes which are mostly *Molinia* dominated. Swallow holes are generally a feature of the flushes. Flush Z at the east of the site is more mesotrophic than the others with indicators of mineral enrichment such as *Typha, Potentilla palustris* and *Carex paniculata* (EC 397 μS/cm measured at one point in the central section). Flush W1, seen on a high point to the north of the bog, is dominated by *Phragmites* and appears to be situated on an underlying mineral ridge.

There are extensive cut-away areas around this site and tracks built to facilitate access for peat cutting on the high bog. The older cut-aways around the site are colonised by *Betula, Salix* and *Ulex* and clumps of this vegetation may be seen to the very SSW of the site and in isolated small areas in along the E of the site. More recent cut-away areas are dominated by *J. effusus* with patches of *Molinia* along the E of the site in the areas where Flushes X1, Y1, Z and X exit the bog and to the W where Flush Z1 exits. There is another patch to the W in an area where a mineral ridge is very close to the bog and is also in a similar location to the S. In the latter area there is a narrow band of *Ulex* dominated vegetation with *Betula* and *Salix. Phragmites* is seen in an area to the NE of the site which is associated with a mineral ridge and in an area of peat cutting along the mid-west which extends quite a distance on to the high bog. *Typha* occurs in the cut-away to the mid-west of the site. To the very NNE of the site there are deep pits (EC 255 μS/cm) which support species such as *Caltha palustris, Hydrocotyle, Mentha, Sparganium erectum, Angelica, Filipendula*, *Rumex, Rubus, J. effusus, Potentilla palustris, Callitriche* and *Alnus Glutinosa.* There are some areas of regenerating peat to the E of the site. In an area tot the NW of the site near the large swallow hole the cut-away is dominated by *E. angustifolium and the old mar*ginal drain supports *Typha, C. rostrata, C. diandra, J. effusus, Holcus, Molinia, Lemna, Potamogeton polygonifolius, Galium palustre, Potentilla palustris, Epilobium palustre, Hydrocotyle, Cardamine* and *Nasturtium* (EC95 μS/cm). There are some remaining uncut but dry ridges in the cut-aways and these and old drains are colonised by tall *Calluna, Pteridium* and *Salix*. To the W of the site SE of the swallow-hole, the cut-away area is perpendicular to the bog and harvested by hand. There are many ridges of tall *Calluna* dominated vegetation which are collapsing. Between the cut-away and the better agricultural land is an area of rough grassland which is grazed during part of the year. However, scrub vegetation seems to be encroaching.

There is a spring to the NNE of the site where there the ground off the bog is rising (EC 250 μS/cm). The water flows into the bog through Flush Z1. The vegetation is dominated by *Molinia* with clumps of *Myrica*, *Ulex* and *Salix* with *Angelica* in the channel flowing towards the bog. There are some swallow-holes in the vicinity.

A large swallow hole is seen to the NW of the site in a field just beside the bog. Species recorded in this included *Polygonum hydropiper, Carex vesicaria, C. rostrata, Sparganium emersum* and *Equisetum fluviatile*.

6.2 DETAILED VEGETATION OF THE HIGH BOG

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1

This complex is seen along most of the older drains and tracks, along the areas of old cut-away and to the S and ESE of the site (the extent is too small to map in places). Where it occurs to the ESE of the site there is abundant tall *Myrica* and *Calluna* reaches up to 1m in height (1 +*Myrica*). There are pine *Betula* and *Ulex* encroaching on to the bog in this area. Along the S edge *Molinia* is encroaching into the complex and *V. myrtillus*, *Ulex* and *Agrostis* were also recorded (1 +*Molinia*). Where the complex is seen along the older drains, tracks and cut-away the *Calluna* is quite tall and can extend quite a distance onto the high bog. The complex is seen along Drain bB2 where it extends up to 8m into the high bog and is growing on the spoil from the drains. *Ulex and Betula* are growing among the *Calluna.*
from the actual drain

Complex 2/1

This complex is seen to the E of the site between Drain bG and the NE of Flush Z and is associated with Slope 3 and an area of old peat cutting. The complex consists of 30% *Trichophorum* tussocks with up to 50% bare peat and 20% *Calluna* (40cm tall). There is a sparse growth of *E. angustifolium* and some *C. introflexus* with *Molinia* patches throughout.

Complex 2

This complex dominated by *Trichophorum* is seen to the W of the N arm of Flush Z1. The ground in this area is hard with large tussocks, deep erosion channels and tall *Calluna*. The tops of the larger hummocks are degraded. *Molinia* is encroaching into the complex from the flush and the bog edge. There are also patches of *C. panicea.*

Close to the NE arm of Flush Z1, Complex 2+ Erosion Channels and *Myrica* occurs with *R. alba* in the channels (2+ER+My).

Complex 2+*Myrica* is found in two small patches along the East of the site. In both instances the facebanks are very shallow. The more northerly area is poached. The more southerly area is associated with Slope 34 and the topography of the complex is very uneven. There is another area of this complex W of the two arms of Flush Z1

Complex 2/3+Erosion Channels (ER)

This marginal complex is seen to the east of the N end of R1 close to active peat cutting and is also seen along the west edge of the N Lobe (PM17:18). In the N lobe the topography is very uneven as the large hard tussocks are up to 30cm tall. Bare peat areas and erosion channels with much surface water are common. Small algal pools are frequent on the N lobe with *R. fusca* and *R. alba* in some (PM17:19). In some instances the pools are inter-connected and form surface water run-off points. The *Sphagnum* cover is very poor and consists mainly of *S. capillifolium* on the tussocks with some *S. papillosum* and *S. magellanicum* at the base. *Huperzia*, *Pleurozia purpurea, C. introflexus* and patches of *Racomitrium* occur in this complex. A small patch of this complex is seen to the SSE of the site.

Complex 2/3+Erosion Channels +*Cladonia* (ER+Cl)
A small patch of this complex with 20% *Cladonia* cover occurs at the east of the site in the corner between Drains bG and bF and along the E of Drain bF. There is active peat cutting along both edges of this complex and the facebanks are 2-3m tall. This complex is also seen to the W of R1 in an area of old and active peat cutting. The tussocks are up to 40cm tall and there is 20% *Calluna* cover (30-40cm tall) (PM17:26).

Complex 2/3+*Myrica* (*My*)
This is a much wetter and softer version of Complex 2/3 which is found to the E of the site, SE of drain bA. It is associated with Slope 10. The *Sphagnum* cover is low and consists of *S. capillifolium* and *S. tenellum*. *Molinia* is encroaching from the bog edge. There are areas where the complex is tussocky and the hollows are dominated by *R. alba*.

Complex 2/3/4
This marginal complex is found between Drains bF and bG in the same area of the bog as Complex 2/1, it is also seen between the double Drains bN to the SW of the site and at the SSW edge in an area of active peat cutting. The complex is dominated by *Trichophorum* and *C. panicea* with many erosion channels and surface water pools containing *R. alba*. There is a high cover of *Erica tetralix* in the complex at the E of the site and much bare peat in that to the SW and SSW.

Complex 3/4/2
This marginal complex to the W of the site S of Flush Z1 is associated with Slope 20 and is dominated by *C. panicea, R. alba* and *Trichophorum*. There is a lot of surface water and algal hollows. The *Sphagnum* cover is low at 10% although the area is soft. This may be associated with the large amount of surface water.

Complex 3/2
This is the most frequent marginal complex seen at this site. It has some sub-marginal charateristics. *C. panicea* (40%) and *Trichophorum* (30%) dominate. The nature of this complex is very variable depending on closeness to drains or the bog edge. In the sub-marginal areas, such as at the NE of the bog, the surface is quite soft and wet with some patches of *R. alba* and occasional *S. cuspidatum* pools with *Menyanthes* growing between (PM17:20). The *Sphagnum* cover here is approximately 20%. At the SW of the main lobe a small area of this complex occurs where the *Sphagnum* cover is low and the surface is hard. This may be due to the slope to the S.

Complex 3/2+*Cladonia* (*Cl*)
A small area of this complex is seen to the W of R3 and appears to have escaped recent burning.

Complex 3/2 + Erosion Channels (ER)
In the more marginal areas, erosion channels occur frequently, particularly in the vicinity of drains and roads/tracks where run-off is increased due to slopes. In this complex *C. panicea* and *Trichophorum* dominate the areas between the erosion channels and *R. alba* and *Narthecium* occur in the erosion channels. These channels are deep and inter-connecting and can carry considerable amounts of water into drains leading off the bog (eg. Drain bA). Where this complex is seen between the two arms of Flush Z1 the erosion channels become more shallow further away from the main channel leading into the flush. The *Sphagnum* cover is generally low (5%) and is confined to the edges of the erosion channels. The bog surface is hard and there is no acrotelm layer. On the E side of R1 this complex has been severely burnt in the past. *Pleurozia purpurea* was noted in this area. S of the NE arm of Flush Z1 *Myrica* is seen in this complex (3/2+ER+My)

Complex 3/2+*Myrica* (*My*)
This is seen in four locations at the N and E of the site and covers an area of approximately 20ha. *Myrica* is scattered throughout the entire area and has a 50% cover. The surface is soft and the *Sphagnum* cover is 30% consisting mainly of *S. capillifolium, S. magellanicum* and *S. cuspidatum*. The ground is also wet with patches of *Narthecium* and *R. alba* in hollows. Where the complex occurs N of Flush Y1 there are areas near the edge with no *Myrica.* Near the edge SE of Flush Z1 patches of *Molinia* occur. The most southerly area (10ha) is associated with Slopes 33 and 34.

There are patches of *Phragmites* on the higher slopes in this vicinity. The structure of this complex in the four areas is very different to the other versions of Complex 3/2.

Complex 3/2+ Tear Pools (TP)
This complex is similar to Complex 3/2 with the addition of pools. E of the central section of Drain bD some very long tear pools (at least 75m long) are seen. These are infilled with *S. cuspidatum, Menyanthes, D. anglica* and *E. angustifolium. S. papillosum* is seen at the edges of some. Another area of this complex occurs to the W of the central section of Drain bD but the pools are much smaller and shorter. In this small area of the complex there are slopes to the E and W to Drain bD and R3 respectively. South of Flush Z1 smaller and fewer pools are seen in this complex. The *Sphagnum* cover is approximately 30%, including *S. magellanicum* but the bog surface is not very soft. The pools are probably associated with the slope into Flush Z1. The higher *Sphagnum* cover is probably associated with surface water flow through the complex.

Complex 4/2+*Myrica* (*My*)
This complex is seen at the NE of the site N of Flush X1 and it is associated with Slope 28 - NE to Flush Y1 and Slope 30 SE to the bog edge. It covers a small area which is dominated by *R. alba* (35%) and *Trichophorum* with patches of *C. panicea. Myrica* occurs in patches. There is much surface water and the surface is quite hard. There is another small area of this complex to the NE of Flush Z1.

Complex 4/2/3
This is seen in a strip which runs N/S just S of Flush W1 and N of Drain bC. *R. alba* (35%), *Trichophorum* (25%), *C. panicea* (20%) and small shallow algal pools (15%) are the main components. There is much surface water but the *Sphagnum* cover is very low (5%, mainly *S. papillosum*). The peat layer here may be thin as *Dactylorhiza maculata* was noted.

Complex 4/3/6
This complex is seen N of Flush Z and is associated with Slope 35. It is dominated by *R. alba, C. panicea* and *Narthecium.* There is very little *Sphagnum* present but the ground is soft under foot due to surface water.

Complex 7/9A + *Myrica* (*My*)
This complex occurs to the SE of the site and is associated with Slopes 8, 10 and 11. Parts of the area show evidence of burning and the ground is hard. There is some *Sphagnum* regeneration including *S. magellanicum, S. capillifolium* and *S. papillosum.* C*ladonia portentosa* and abundant *Hypnum* is present in other areas and the *Calluna* is 40cm tall. There is a ridge along the W and NW of the complex. Nearer the edge of the complex there is an increase in *C. panicea* and surface water and there is no *Cladonia. Aulacomnium* and *Polytrichum alpestre* are present. This complex is seen to the N of the site, E of Flush W. There is up to 60% *Calluna* which is 20cm tall with *E. angustifolium* and some *Trichophorum* and *C. panicea.* The *Sphagnum* cover is up to 15% and there is surface water present. There are three patches of *Phragmites* seen in the complex.

Complex 2/9A + *Myrica* (*My*)
This is a small area of vegetation in the centre of Complex 7/9 +*Myrica* and is dominated by *E. angustifolium* and *Trichophorum* with *Calluna* up to 40cm tall. There is 15-20% *C. panicea.*

Complex 7/9A + *Molinia* (*Mo*)
This complex is seen to the SE of the site and is similar to 7/9 + *Myrica* except that there are scattered patches of *Molinia* with *Potentilla erecta.* There is a mineral ridge at the bog edge and this may account for the presence of the *Molinia.* There is 5-10% *Cladonia* present and 15% *Sphagnum* including *S. magellanicum, S. tenellum* and *S. capillifolium.* The area is poached and the ground hard under foot despite the *Sphagnum* cover.

Complex 2/3/6
This covers two small areas at the SSE of the site at the base of the southern ridge. The *Trichophorum* cover is approximately 40% with lots of small algal pools. Some small, shallow, linear pools occur which contain *S. cuspidatum*. The *Sphagnum* cover is approximately 20%.

Complex 3/2/6
This occurs in a strip to the W and E of Flush Z, between drains bA and bC, near the SE edge of the site and in many places around the bog edges. *C. panicea* (50%) and *Trichophorum* (25%) dominate with patches of *Narthecium* (15%) and *R. alba* (PM17:21 at E of site). A lot of surface water occurs with shallow algal hollows. In the more marginal areas, erosion channels sometimes occur. The *Sphagnum* cover is generally low (+ to 5%) and the bog surface is hard. At the SE of the site the *Calluna* cover is low in this complex and the microtopographical variation is small. This may be due to burning. In this area the surface is a little soft in places due to water logging. At the WNW edge of the site there is a mineral ridge next to the bog where this complex occurs and the slope off the bog is very gentle (Slope 18). The complex is severely poached and there is an increase in the amount of *R. alba* and a reduction in *Narthecium. Pleurozia purpurea* and *Huperzia* are seen. Where the complex occurs to the S of the site in the vicinity of Drain bJ there is a small amount of *Cladonia* present and the ground is wet and soft. There is 15% *Calluna* which is 30-40cm tall. At the E of the site N of Flush Z there are patches with up to 70% *C. panicea* and the *Calluna* (20%) is very short. *E. angustifolium* and *Trichophorum* are scattered throughout. The ground is soft but there is very little *Sphagnum.*

Complex 3/2/6 +*Cladonia* (*Cl*)
This is similar to Complex 3/2/6 and is seen in a small area at the edge of the site to the W of Flush Z1. There is up to 20% *Cladonia* suggesting that this area has not been burnt in the recent past.

Complex 3/6/2
This is seen mainly to the WNW of the of the site and at the ESE edge. *C. panicea* dominates with *Narthecium* and *Trichophorum* also important. Some small algal pools occur and low *S. capillifolium* and *S. papillosum* hummocks. There is little variation in microtopography. *Calluna* cover is low and some degraded hummocks occur. These are topped by *Cladonia floerkeana* and *Campylopus introflexus* which suggest a fire history. The bog surface is hard.

A small area of this complex with the addition of *Myrica* is seen to the S of Flush W1 and to the NE of Flush Z1 (3/6/2+My).

Complex 3/6/2 + Algal Pools (AP)
This complex is similar to Complex 3/6/2 and is seen at the E of the site between Drain bA and Drain bB where the pools are much smaller than in Complex 3/6/2 + P and they are mostly algal. The ground is still very hard and the *Sphagnum* cover < 10%. This consists mainly of *S. papillosum* at the edges of some pools with some of the healthier pools also supporting *S. cuspidatum* and *S. auriculatum.* The complex is dominated by *C. panicea* (35%), with *Narthecium* and *Trichophorum* both at 15-20%. This complex is also seen to the W of the site where the *Sphagnum* cover is higher and there is a lot of *R. alba* in the pools. There are also some *S. imbricatum* hummocks present (up to 15cm tall).

Complex 2/9/7
This occurs at the SW of the main lobe where it narrows close to R1. *Trichophorum, E. vaginatum* and *Calluna* dominate with some *C. panicea*. There is very little *Narthecium.* Mounds dominated by *Calluna* occur and small algal pools are seen. The bog surface is mostly hard with evidence for past burning disturbance such as *Campylopus introflexus*. Around some algal pools the surface is a little softer with bits of *S. cuspidatum* and *S. auriculatum.*

Sub-Marginal Complexes
Complex 3/6/2 + Pools (P)
This complex is similar to Complex 3/6/2 and is seen to the N of Drain b2B where linear pools occur over a small area. These pools are orientated NNW/SSE. Many are algal but a number are infilled with *S. cuspidatum, Menyanthes* and *D. anglica. R. fusca* was also noted. The *Sphagnum* cover is higher (20%) in the inter-pool areas than in Complex 3/6/2. However, the surface is still hard in places with a lot of surface water. In places *Cladonia portentosa* is seen but taller hummocks still have evidence of past burning.

Complex 6/3 Recently Burnt (RB)
This is seen to the W of end of the N section of R3. *Narthecium* and *C. panicea* dominate with a short *Calluna* re-growth. It was probably burnt early last season and the burning may have originated in the cut-away area. Some *Sphagnum* cover remains but it is very dry despite wet weather.

Complex 6/3 with enrichment indicators (Mv)
Close to the N and W sides of Flush W1 there is an area dominated by *Narthecium* and *C. panicea* with enrichment indicators such as *Aulacomnium palustre* and *V. oxycoccus* (over-growing *S. capillifolium* hummocks) and *Myrica*. A very lush growth of large *E. angustifolium* occurs. An animal track runs through this area and has been marked by *Salix* sticks some of which have rooted. This area is not mapped separtely to Flush W1.

Complex 6/2/3 + Pools (P)
Directly SE and SW of Flush Z a *Narthecium* and *Trichophorum* dominated area with patches of *C. panicea* and *S. cuspidatum* pools occur. The *Sphagnum* cover is moderate and the bog surface is soft.

This complex is also seen with few pools to the centre of the E of the site. *Sphagnum* cover is a little lower but the bog surface is still soft.

Complex 6/3/2
This complex is dominated by *Narthecium* hollows with notable amounts of *C. panicea* and *Trichophorum* which can reach 20%. It is seen around the site to the W and E of Flush Z1, at the S of the site and at the NW between Drains b2A and bD (N section). Generally there is very little microtopographical variation with very few or no hummocks. Also the *Calluna* cover is low and plants are short. This may suggest a burning history. The *Sphagnum* cover is low (5-10%) but the bog surface is quite soft overall. Between Drains b2A and the northern section of Drain bD *R. alba* cover was quite high (10%). *S. imbricatum* was also seen. Sometimes small, shallow non-interconnecting algal and *S. cuspidatum* pools occur. Where the complex occurs to the NW there is a clump of scrub *Betula* in the complex.

Complex 6/3/2 + Algal Pools (AP)
Narthecium, C. panicea and *Trichophorum* and algal pools are important components of this complex. It is seen mainly around the southern section of the site around Flush Z. The pools are all linear with a NW/SE orientation and are 15-20m long in places and interconnecting. They are deep and narrow and are mostly algal with *Menyanthes* and *E. angustifolium*. Some contain *S. cuspidatum* and *S. auriculatum* but it is not a healthy growth. *S. magellanicum* and *S. papillosum* occur at the edges of some pools. *R. alba* is seen in more shallow pools. Between drains bA and bB hummocks of *Leucobryum* and *S. imbricatum* occur (PM17:12 to E).

Between Drains bC and bB this complex has been quite recently burnt. Patches of bare peat, the occurrence of *Campylopus introflexus*, *Huperzia* and *Cladonia floerkeana* and the very uniform structure all suggest this. Further in from the bog edge the surface is softer which is more typical for this complex. At the SE of the site there is a lot of surface water seen in this complex and the bog is soft and squelching. However the soft layer does not appear to be very deep.
Complex 6/3/2 + Algal Pools + Erosion Channels (AP+ER)
N of Drain bB close to the drain, erosion channels are also present and the algal pools appear to be inter-connected by over-land flow. Some *Racomitrium* islands occur in the algal pools in this area.

Complex 6/3/2 + Pools (P)
This complex occurs at the mid to S section of the site in the vicinity of Drain bC (PM17:23+24) and at the SW of the site W of Drain bD. It is a slightly wetter example of 6/3/2+AP and the pools have a more permanent appearance. Some are still linear and winding and some inter-connect with a more or less N/S orientation. They cover approximately 30% of the complex. Many are still algal but a greater percentage (PM17:23+24) are colonised by *S. cuspidatum, S. auriculatum, D. anglica, Menyanthes*, *E. angustifolium* and some support *R. fusca.* There is *S. magellanicum* and *S. papillosum* around the edges of most of the pools especially N of Drain bC and some support *Campylopus atrovirens.* The inter-pool areas are dominated by *Narthecium* and, despite the low *Sphagnum* cover, are quite soft. Some low *S. magellanicum* hummocks occur and *Pleurozia purpurea* is quite common.

Close to the SW side of Drain bC the surface is very soft due to leakage from the drain and *E. angustifolium* cover is increased. *V. oxycoccus* is seen over-growing some very soft *Sphagnum* lawns but there are hard sections in between which are old degraded hummocks.

Sub-Central Complexes

Complex 6/4/35

This complex occurs to the E of Complex 6/2/35 and is rather similar except that the amount of *R. alba* increases. The cover of pools is high and they are large and deep. However most are algal. *Cladopodiella fluitans* was seen in some of the pools.

Complex 6/2/35

This covers the central section of the site N of Drain bC. Long narrow pools cover approximately 30-35% of the surface. They have a N/S orientation and are inter-connecting in places. They are infilled with *S. cuspidatum, S. auriculatum, Menyanthes, D. anglica* and *E. angustifolium* with some *Utricularia*. *S. papillosum* and some *C. atrovirens* are seen at the pool edges. Some pools are bare or algal. Parts of the complex which appear to have escaped burning support *Racomitrium* and *Cladonia* islands (this is probably Complex 35 but the area is too small to map). The inter-pool areas are dominated by *Narthecium* and *Trichophorum* with patches of *C. panicea.* The *Sphagnum* cover is moderate and the area is quite soft. *S. capillifolium, S. magellanicum* and *S. subnitens* are the most frequently seen *Sphagna* between pools. Some clumps of *Myrica* occur in the complex. At the W edge of this complex the cover of *R. alba* increases as the complex grades into Complex 6/4/35.

Central Complex

Complex 35

This is the central complex at this site and is seen in two locations. In both the bog surface is soft and quaking. The total *Sphagnum* cover is 35% with 10% *S. papillosum,* 5% *S. capillifolium* and 5% *S. magellanicum*. Pools cover approximately 40% and are long, sinuous, inter-connecting and mostly linear. *S. cuspidatum, Utricularia, S. auriculatum, Menyanthes, E. angustifolium* and *D. anglica* are present in most though some pools are algal or bare. *R. fusca* is seen in some pools in this complex to the SW of the site (PL16:36). Some *Racomitrium* islands occur (PL16:33+34). The inter-pool areas are dominated by *E. vaginatum* (15%), *Calluna* and some large *S. imbricatum* hummocks. The *C. panicea* and *Narthecium* cover is very low. *Cladonia* cover is approximately 10% and *Pleurozia purpurea* is common. This vegetation type is seen in as small area to the E of the S section of the bog and at the SW of the site where the *Narthecium* cover increases as the complex gradually grades into complex 6/3/2 + pools

6.2.2 Flushes

Flush Z is a long flush at the ESE of the site with flow in a NE direction at its northern and southern ends. It also influences the flow of Drains bA, bB and bC. Flow in the mid-section of the flush, between drains bC and bB is to the S, into Drain bB. Most of the flush looks like an old river channel and there is some old peat cutting on the W side. There are tall *Calluna* (0.8-1.5m) dominated ridges on either side with *Vaccinium myrtillus, Rubus* and *P. erecta*. In the channel between, *Typha, Rubus, Rumex, Lemna, Potentilla palustris, Carex paniculata, J. effusus, Osmunda, Molinia, Succisa, Blechnum, Dryopteris dilatata, Calliergon cuspidatum* and *S. cuspidatum* were recorded (EC 397 μS/cm) (dumped cars are seen at the end of Road 2 in the flush) (PL16:32 to SW). At the junction with Drain bC the channel widens and is dominated by *Molinia* with a shrub layer of *Salix* and *Ulex*. To the S there is sloping ground into the flush from the E, W and S. The flush consists of a series of swallow-holes and tracks/channels of *Molinia* and *J. effusus* with tall *Calluna* around the edges. There are a few small *Betula* (1.5m tall). It appears that this area may have been drained so that the natural drainage channel has been by-passed. The *Molinia* spreads out into the surrounding bog vegetation and *Calluna* with *P. erecta* are common throughout. Other species found in the area include *V. oxycoccus, V. myrtillus, Pedicularis sylvatica, Dactylorhiza maculata, Succisa, Sphagnum capillifolium, S. magellanicum, Aulacomnium palustre, Polytrichum alpestre, Pleurozium schreberi* and *Dryopteris dilatata*. There is also the remains of a large pool in the area most of which is infilled with *Molinia* along the N side. A small open water section remains with *S. cuspidatum, J. effusus, Menyanthes, Carex nigra, D. anglica and E. angustifolium.* The bog surface is very wet and soft in this area. It seems that the area may be used by wildfowl as duck feathers occur.

There was old peat cutting near the N end of the flush and there are old turf banks up to 1m tall. Active peat cutting is carried on to the E of the flush exit and the facebanks are up to 2.5m tall.

Flush Y consists of a large, deep swallow hole near the ESE edge of the bog south of Drain bB. It is dominated by *Molinia* and *J. effusus* with *Rubus, Agrostis, P. erecta, Myrica* and *Pteridium.* High levels of water sound were heard but not seen. There is significant flow through the active facebank beside the swallow-hole.

Flush X is in a depression caused by the mineral ridges to the S and E of the site. It is dominated by patches of *Molinia* and *Myrica* with linear patches of *J. effusus* and tall *Calluna* patches. There are also smaller areas of *C. panicea, Trichophorum* and *E. angustifolium*. Other species seen include *Succisa, P. erecta* and *Hypnum.* Old drains run through the area possibly indicating that peat cutting was carried out some time in the past. An EC of 60 µS/cm was recorded in one of them. The SSW arm consists of three swallow holes and is *Molinia, J. effusus* and *Myrica* dominated. The surface throughout varies in that there are areas where there is much surface water and other areas which are solid and hard. The are has been burnt.

Flush Z1 to the N of the site is quite extensive and has resulted in much sloping of the bog surface. From the S, channels flow N off Drain bD. One is lined with *Myrica* and is the main channel with a significant flow NNE. It is 0.25m deep by 0.5m wide and appears to be natural. The other is lined with *R. alba* and there are many similarly lined shallow erosion channels leading into the main channel. The flush itself is dominated by *Molinia* including large tussocks with a lot of water between them. Other species seen are *Myrica, P. erecta* and *Calluna.* There is a swallow-hole at the NNW end of the *Molinia* dominated area with rapid flow NNW. A series of swallow-holes and channels extend to the N with *Calluna, Myrica* and *Molinia* marking them. *Dryopteris dilatata* and *Blechnum* are seen. The NE arm of the flush is dominated by *Molinia* which is less tussocky and there is no *Myrica* or *Calluna.* There appears to be flow westwards. Species seen in the main channel of this section include *J. effusus, Succisa* and *Galium palustre, E. tetralix* with *S. papillosum, Aulacomnium palustre, Polytrichum alpestre, Plagiomnium, S. cuspidatum* and *Dryopteris* in the wetter sections. To the E of the S end of the flush there are some N/S long tear pools colonised by *S. cuspidatum* and *Menyanthes* with *S. magellanicum* at the edges. The pools are probably associated with the sloping (see Slope 26).

Flush Y1 at the NE of the site is in a depression at the bog edge which is associated with slopes 27 and 28. It consists of a series of swallow-holes to the NW which are lined with tall *Calluna, Myrica* and clumps of *J. effusus.* There was no sound of water. The surrounding vegetation is dominated by *Molinia* with *Polygala vulgaris, Potentilla erecta* and *Myrica.*

Flush X1 is to the S of Flush Y1 and is drained by Drain bJ. It consists of a series of swallow-holes almost parallel to the drain and there is subterranean flow to the E from one hole to the other. The vegetation in between and on the slopes into this area is dominated by *Molinia* with some *Polytrichum alpestre* and *Potentilla erecta.* At the W end of this flush the vegetation consists of *Phragmites, Molinia* and *Myrica* with more swallow-holes further west.

Flush W1 in the centre of the site is *Molinia* and *Phragmites* dominated with *Myrica* around the edges. *Myrica* and *Phragmites* extend northwards towards Flush X1 and may even connect with it. There are also patches of *Phragmites* on the slopes to the E of this flush. Other species seen include *Calluna, E. tetralix, Potentilla. erecta, Menyanthes, V. oxycoccus, Andromeda, S. magellanicum, Aulacomnium* and *Polytrichum alpestre.* This flush may be associated with a mineral ridge underlying the bog.

7. BOG TYPE

This bog has been classified as a Ridge Basin bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes

Approximate slopes are described below and are illustrated on the Slopes Map.

Slope 1 This is seen at the SW of the site. The slope from the high bog westwards towards Road 1 and active peat cutting is 0.4m over 50m.

Slope 2 The slope southwards along Flush Z towards Drain bB is 0.5m over 50m.

Slope 3 This is from the NW side of flush Z into it. The slope is 1m over 15m with a 1m high facebank (PM17:13)

Slope 4 From the SE side, the slope in to the N end of Flush Z is 0.5m over 30m. The facebank here is 1.5m high.

Slope 5 This is at the mid section of the E edge. The slope NE into active peat cutting is 0.75m/20m. The facebanks range from 2-3m in height.

Slope 6 The slope eastwards at the east end of Drain bC is 1.5m over 20m into active peat cutting. The facebanks are up to 4m high and there is slumping of the bog surface

Slope 7 The slope northwards into the east side of Drain bB is 0.25m over 30m.

Slope 8 The slope from the W into the central section of Flush X is 0.5m over 30m.

Slope 9 The slope from the SE edge northwards into the depressed area at the S side of Flush X is 0.25m over 75m.

Slope 10 The slope NNE along the depression in which Flush X lies is 2.5m over 500m.

Slope 11 At the SE of the site the slope NE into the bog is 0.5m over 50m. This is from a mineral ridge which extends under the bog in this area.

Slope 12 From the SW of the site towards the NNE along Flush Z and towards Drain bA the slope is 2m over 300m.

Slope 13 At the SW edge of the main lobe the slope from Drain bJ to the S into an area of old cut-away with regeneration is 1m over 30m. The old facebank is 2m high with slumping of the bog surface.

Slope 14 This slope at the SW of the site is to the west into the mid-section of R1 and is 0.75m over 50m.

Slope 15 In the same area the slope eastwards from the SW lobe towards R1 is 0.75m over 50m.

Slope 16 The slope to the S from the SW lobe into an area of active peat cutting is 1m over 30m. The facebanks are 3-4m high and there is some slumping.

Slope 17 The slope north from the SW lobe through an area of old cut-away towards R4 is 2m over 250m.

Slope 18 N of R5 the slope westwards is only 0.5m over 100m. There are no facebanks in this area and mineral soil is adjacent. The bog is poached there (PM17:16).

Slope 19 A little further N of Slope 18 the slope northwards into an area of old peat cutting is 1m over 50m. The facebank is 1m high.

Slope 20 The slope from the west side of the N end of Drain bD towards the SE is 0.25m over 50m.

Slope 21 From the NNW side of Drain bD the slope SE into the channel leading towards Flush Z is 1m over 30m

Slope 22 The slope from the N end of bD NNE into Flush Z1 is 1.5m over 100m.

Slope 23 This slope from the west edge E, along an area of active peat cutting, towards Flush Z1 is 1m over 50m.

Slope 24 This slope at the W of the site, northwards into an area of active peat cutting is 0.5m over 15m. The facebanks are 1m tall.

Slope 25 This is at the very NNW edge of the site along the N arm of Drain bD and is 1m over 75m into an area of old peat cutting. Ballinastack Turlough lies to the N from the bog (PM 17:20 to N).

Slope 26 This is a slope of 0.25m over 50m to the SW into the S end of Flush Z1.
Slope 27 This slope is at the E of the site in a SE direction into the depression associated with Flush Y1 is 0.2m over 20m.
Slope 28 This slope is in the same area as Slope 27 but is in a NE direction. It is 2.5m over 300m.
Slope 29 This is a slope to the SW into Flush X1 and is 2m over 500m.
Slope 30 This slope is at the E of the site in a SE direction between Flushes X1 and Y1 and is 0.75m over 50m.
Slope 31 At the E of the site the slope from the SSE into the depression associated with Flush X1is 1.5m over 30m.
Slope 32 This is the slope NE towards Flush X1 from Drain bD and is 3m over 350m.
Slope 33 This slope from the S northwards into the centre of Flush X1 is 1.5m over 75m.
Slope 34 This slope at the E of the site S of Drain b2K is 1m over 100m through Complex 3/2 + *Myrica*.
Slope 35 Immediately N of Flush Z at the E of the site the slope to the NNE is 2m over 15m into an area of old peat cutting. The facebanks are up to 2m deep and there is cracking and slumping.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

Peat cutting has been carried out on a large scale on and around this site. At the mid-east this bog has been separated from what was once a large peat complex. Road construction on the western and south-west side of the site has resulted in large areas of cut-away and partly cut-away bog. Most peat cutting has been carried out by hand with long banks and associated drains extending into the site. Hand cutting is still ongoing but hopper cutting is now also used especially on the eastern edge. Patches of Difco cut peat are seen as well.

West/South West

This area is connected by a network of man-made gravel tracks where there is extensive hand cutting with many turf banks. This cutting has extended 800m onto the bog. Parts of the area are now inaccessible by foot due to wet hollows between 'walls of peat'. At the mid-west the facebanks range from 1-2 m in height. East of Road 5 *Phragmites* is extending onto the high bog from hand cut peat banks (PM17:17).

At the SW of the site, west of Road 3, actively cut facebanks are 2-2.5 m high (hopper). Hand cut banks are also seen in this area. West of the northern section of Road 3 the facebanks are shallow and *Sphagnum* regeneration is occurring in the cut-away. *Typha* is seen in the facebank drains in this area.

South

There are thick hopper faces for 800m along the southern side of the bog where maximum face heights are 4m. At the S of the site in the vicinity of Drain bJ and west of the mineral ridge the facebanks are 3-4m tall and the hopper method of extraction is in use.

East

There is hopper cutting for 700m along the middle-east side of the bog. Faces are often up to 4m high here. Just east of Flush Z and S of Road 2 there is a small area of Difco cutting on the high bog. This has been abandoned and *Molinia* is encroaching in to the area from the flush. All along the mid-east of the site there is active peat cutting - mainly by hopper extraction - and the facebanks vary in height from 2-3m at the N end to 4-5m at the S end near the forestry.

8.2.2 Forestry

A large mixed coniferous plantation (approx. 30 years old) lies to the SE of the site. *Pinus contorta* and *Picea sitchensis* predominate. This forestry is partly planted on a mineral ridge, which juts into the bog at this point, and partly on cut-away peat. Another small coniferous plantation occurs at the western edge of the bog just north of Road 1. At the extreme NE a very recent coniferous plantation is seen on mineral soil and cut-away adjacent to the bog.

8.2.3 Fire History

This bog has been extensively burnt in the past and much of the high bog shows very little microtopographical variation. This is primarily due to the effects of fire where hummocks have been destroyed and *Calluna* growth is short. However it may also be related to the fact that *Sphagnum* species play a smaller role in the vegetation cover of intermediate raised bogs such as this although large *Sphagnum* dominated hummocks are seen in some areas where there are indications that burning has not occurred for some time. The two areas of well developed hummocks and pools which were seen on this site were also areas which had not suffered burning for some time. Inter-connecting pools, many filled with *S. cuspidatum* and *S. auriculatum* with *Racomitrium* hummock islands are, generally, the highest quality areas on intermediate raised bogs. The large pool area in the centre of this site may have been one of these areas in the past but, due to burning as well as drainage, is now degraded.

One recently burnt area was seen at the west of the site (Complex 6/3RB). This burning probably occurred late last year or early this year and spread from the adjoining cut-away. The *Sphagnum* layer was badly affected by the fire but not completely destroyed.

Part of the forestry to the SE of the site has been burnt in the past and has been replanted.

Douglas and Grogan (1985) state in their report that most of the bog had suffered fire damage 3-4 years prior to their survey. It would appear that large areas have been burnt since then.

8.2.4 Cattle Poaching

Cattle poach this bog in two areas one of which is to the SSE of the bog where a mineral ridge is next to the high bog and the other is at the mid west of the site in a similar situation. To the SSE the cattle have created a path across an old marginal drain and broken through *Ulex.* At the W of the site there is no fence or drain separating the bog from the grazed area.

An animal track runs across the bog just north of Flush W1. This has been marked by pieces of stick and is used on a regular basis, possibly by sheep or deer.

Horses gain access onto the edge of the high bog at the E of the site, to the N of Road 5. Here the mineral soil adjoins the high bog with no definite face bank.

8.2.5 Dumping

Dumping is carried out in the cut-away in many places around this site. At the east end of Road 2 a number of cars have been dumped in Flush Z.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. Due to the western location of this site the high bog topography follows that of the underlying mineral soil to a certain extent. The vegetationj cover reflects this with the wettest areeas on the flatter sections of the site and drier communities on the slopes.

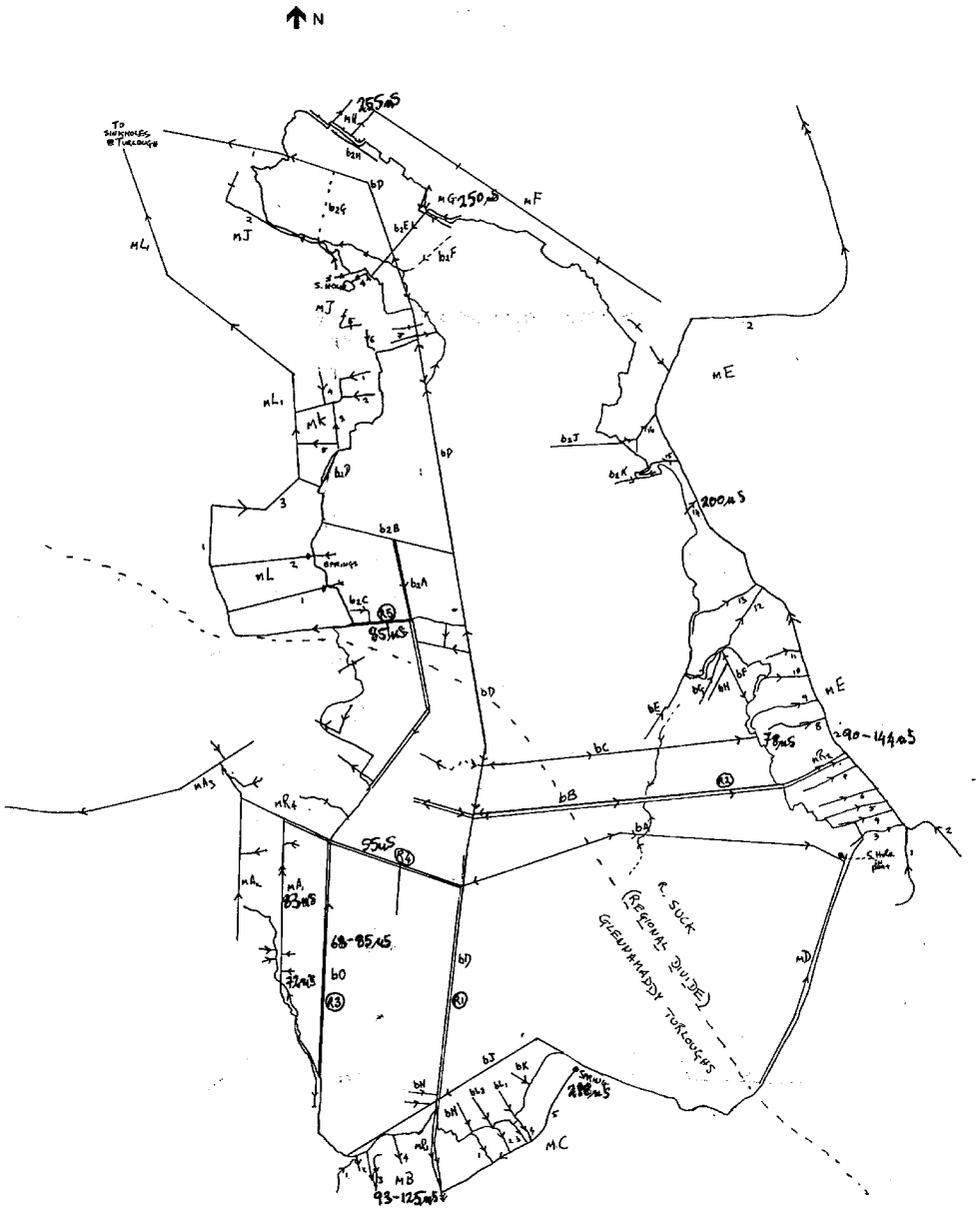
2. Some *Molinia* flushes occur on the top of the ridges within the site probably because the peat layer is thinner in these areas.

3. Extensive swallowhole flushes occur which are associated with internal drainage systems.

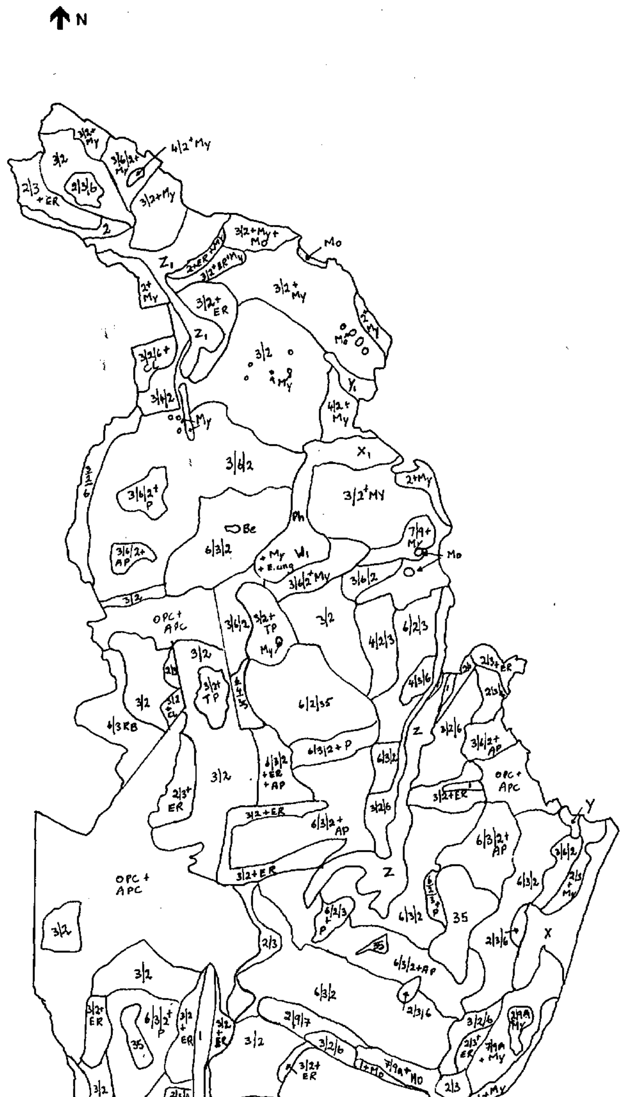
4. There is a small fen area associated with local ground water discharge at the NNE edge of the site.

Lara Kelly
Malcolm Doak
Marie Dromey

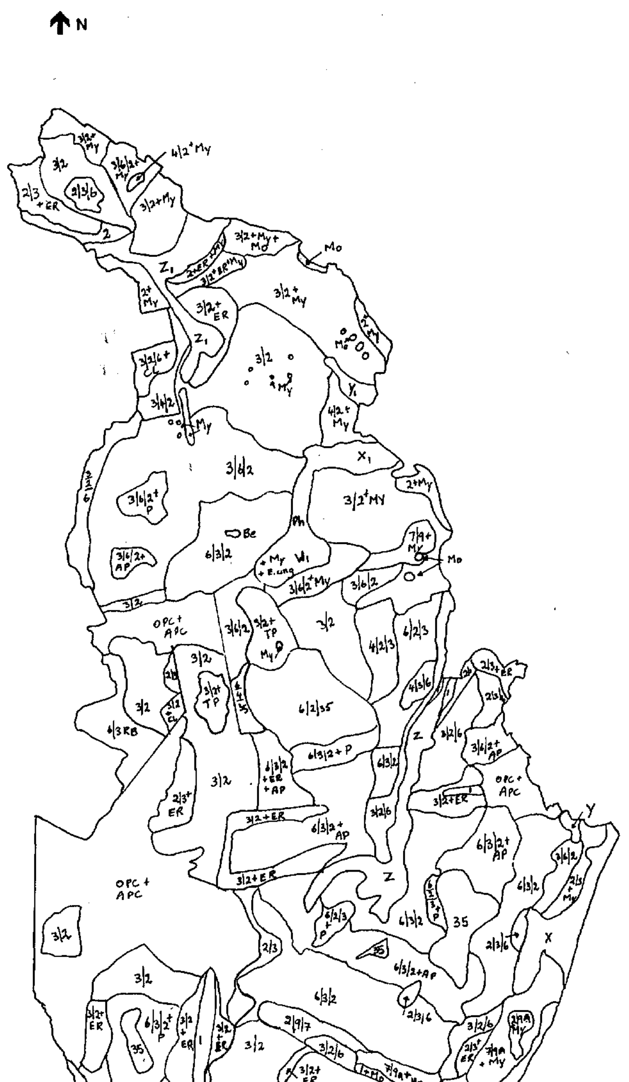
LISNAGEERAGH BOG, CO. GALWAY (296).
DRAINS AND HYDROCHEMISTRY MAP (1:10.560)
1994



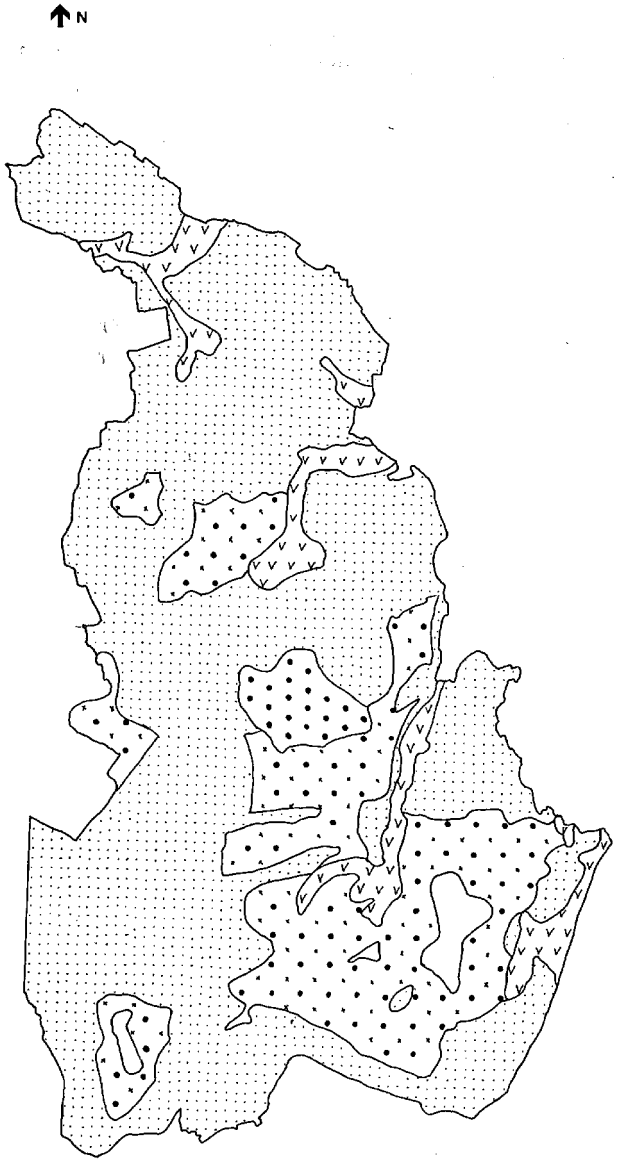
LISNAGEERAGH BOG, CO. GALWAY (296).
VEGETATION MAP (1:10,560)
1994



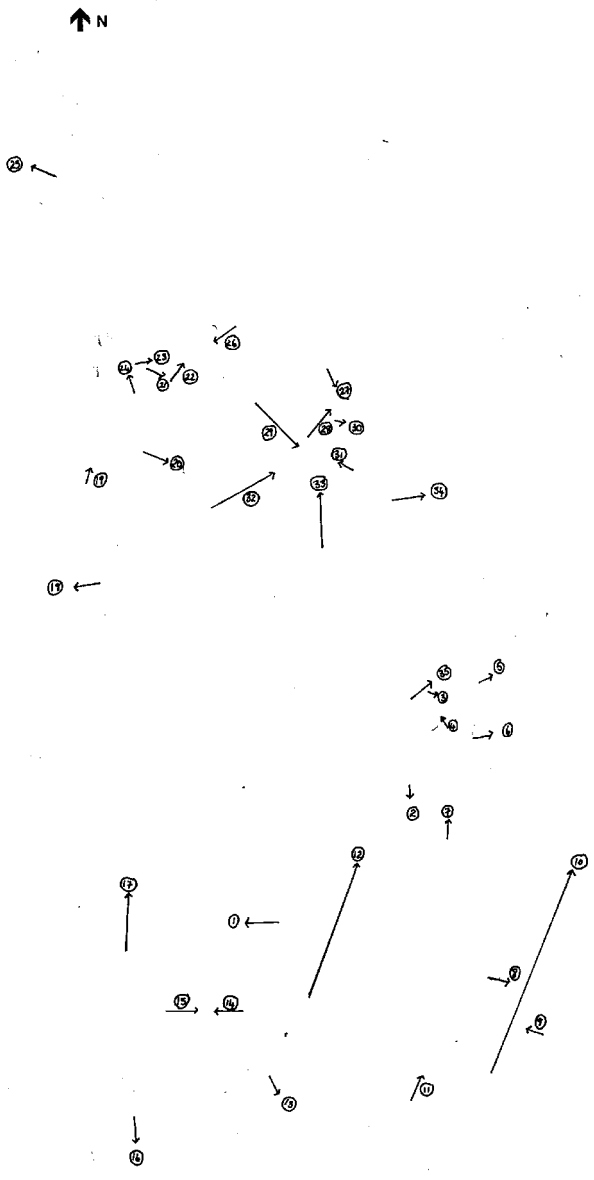
LISNAGEERAGH BOG, CO. GALWAY (296).
VEGETATION MAP (1:10,560)
1994



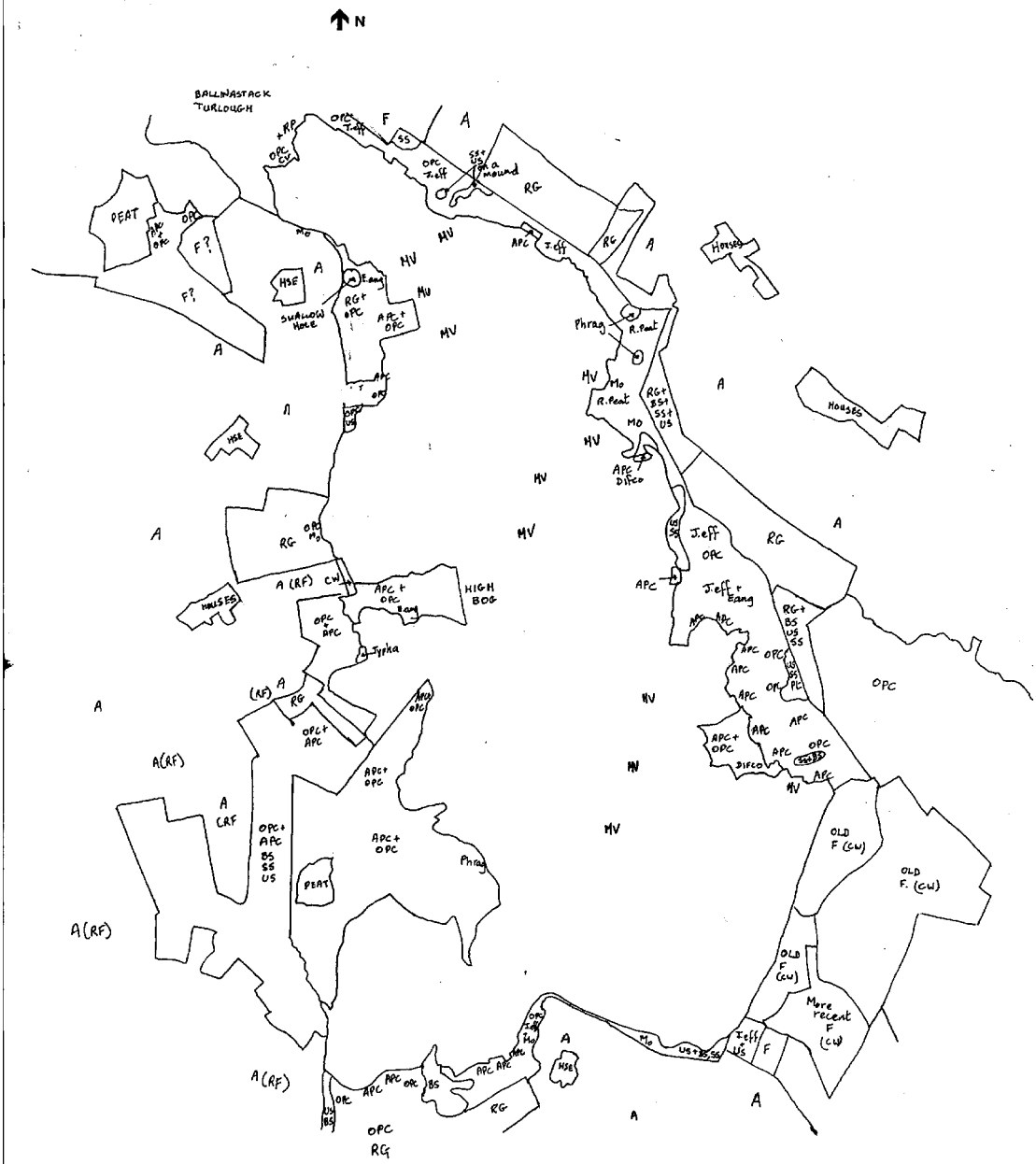
LISNAGEERAGH BOG, CO. GALWAY (296).
ECOTOPE MAP (1:10,560)
1994



LISNAGEERAGH BOG, CO. GALWAY (296).
SLOPES MAP (1:10,560)
1994



LISNAGEERAGH BOG, CO. GALWAY (296).
LANDUSE MAP (1:10,560)
1994



LOUGH LURGEEN, CO. GALWAY

1. SUMMARY OF SITE DETAILS

NHA No.	301	1/2" Sheet:	12
Grid Ref:	M 675 590	6" Sheet:	18/19/32
GSI Aerial Photo:	M 163/164	1:25,000 Sheet:	14/25 SE, 14/25NE
NHA Photo:	649:1-16 & 648:25-34	Area (ha):	487
Date(s) of Visit:	25/28-7-94 (Ecology) 25/27-7-94 (Geohydrology)		

Townlands: Ashfield, Ardoslough, Corramaeeagh, Cappagh, Carrowntober East and Derroogh South.

2. INTRODUCTION

2.1 BACKGROUND

This site was included as part of this survey to ascertain its present status. A synopsis of the findings of previous surveyors is given below:

Douglas and Grogan (1985) note that this was a remarkably extensive and virtually intact bog featuring a number of habitats including a spring fed lake, small stream, *Molinia* flushes, small fen and pool complexes. This diverse habitat is connected by a stream to Glennamaddy turlough. The authors also note that although the site had suffered fire damage, regeneration was occurring. Cross (1990) selected this bog for inclusion in a network of Nature Reserves. It was classified as a Western Raised Bog and assigned an A status i.e. as very good quality or unique site. A site also merits this classification if it is of exceptional interest even though it may be damaged.

Sheppard (1992), in a survey of Ireland's Winter Wetlands for Bird Life notes that both the bog and turlough are feeding and roosting sites for a range of birds and that the Greenland White-fronted Geese and Mallard use the bog. The bog and turlough are regionally and locally important sites for this purpose.

The site was also visited by The International Mires Group in 1988 (Fojt, 1988). An investigation of the vegetation, water table heights and hydrochemistry was undertaken. Their data is discussed in more detail in a later section.

38ha of this bog is owned by NPWS.

The Glennamaddy Turlough is hydrologically connected to this site (see Section 5.4). A vegetation survey of the turlough was carried out by Goodwillie (1992).

2.2 LOCATION AND ACCESS

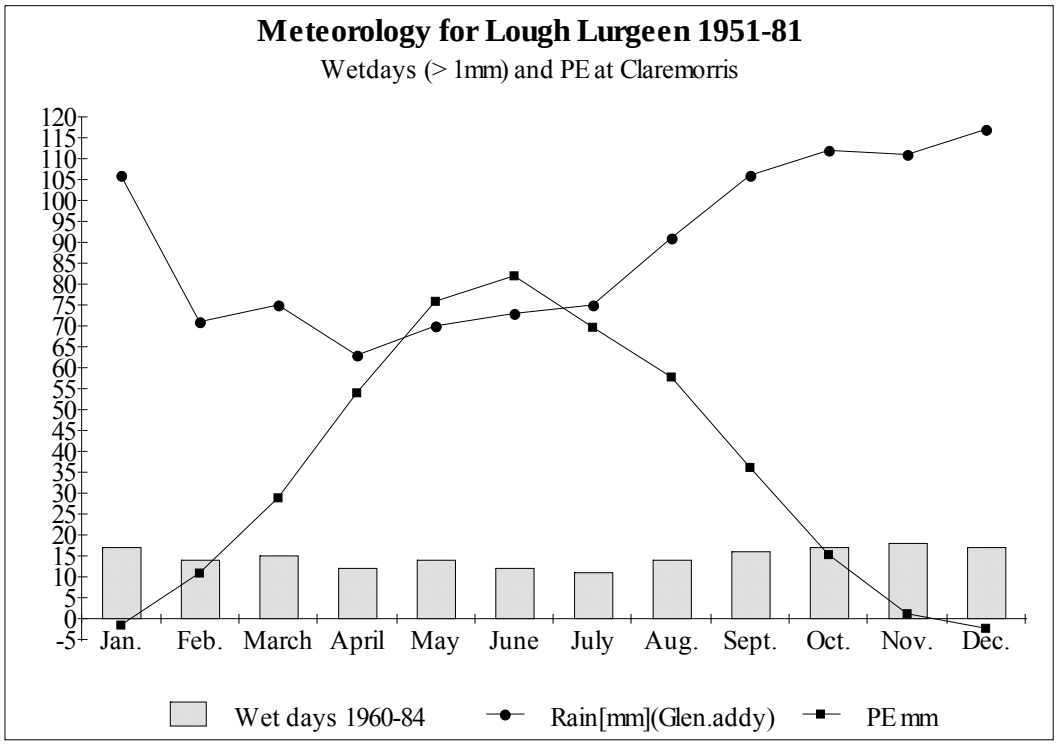
This bog is situated just to the SE of Glennamaddy, Co. Galway. Roads run to the S, E and N of the site. Several bog roads run off these into the bog. Access may be obtained from a number of these roads.

3. METEOROLOGY

No meteorological measurements have been made on Lough Lurgeen bog. Rainfall data from the nearby Glennamaddy rainfall station for the years 1951-80 indicate that the area receives an average 1069 mm of precipitation annually (Figure X). The nearest Meteorological Service synoptic station at Claremorris suggests that the site could have up to 234 rain days and up to 177 wet days annually.

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994). The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

Figure X



The above factors suggest that the year round actual evapotranspiration (AE) from Lough Lurgeen Bog is greater than PE at Claremorris, site of the nearest synoptic station which had an average PE of 428.1mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at Lough Lurgeen would therfore be greater than 428.1mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 641mm/yr.

Meteorological data for Lough Lurgeen Bog (1951-1981) are summarised below:

Rainfall (P)	1069 mm/yr
Actual Evapotranspiration, (AE)	>428.1mm/yr
Potential recharge, (PR)	<641mm/yr
Raindays > 0.2mm (annual {1951-80})	234 days
Wetdays > 1mm (annual {1960-1984})	177 days

Rainfall analyses up to 1991 for the Glennamaddy area show that late winters (January, February, March) have become progressively wetter over the past 20 years and those of the last years have been wettest of all. This is thought to be the underlying cause of the increase in flooding of the turlough south east of Glennamaddy town (D. Drew, *Pers. Comm.*).

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

(see 'Top Contours' 6" sheet and aerial photo)
The 'top contours' map shows the topography of the peat surface (Bord na Mona c. 1940s). Two rivers separate the bog into three lobes. Outfall V, separates the main bog (containing the lough) from a large cutover and widely drained bog to the west. Outfall D, separates the main bog from a smaller 'SE lobe'.

The main bog with Lough Lurgeen and associated stream is the main lobe of interest. The lake and stream lie in a linear NW/SE depression (85-87 m OD), surrounded by three peat ridges at a level of 90 m OD. There are significant slopes perpendicular to the stream and the lake. In the SE there are significant slopes towards Outfall D. Generally the main bog appears to be rather flat with only slight slopes. It does not have a dome like watchglass topography.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA (see aerial photograph M163)

The bog lies in a drumlin filled valley where the height ranges of the drumlins are about 80-104m O.D. The bog lies to the immediate east of a low karstic depression host to a seasonal lake (turlough) which has a maximum depth of 74m O.D. at the lower swallow hole. There is rising ground to the S beyond the bog (PM13:33).

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock
Recent geological maps by Smith, show that the area is probably underlain by cherty argillaceous bioclastic Carboniferous limestones (known as ABL). The Old Red Sandstone Slieve Dart inlier lies 16 km to the north west.

The ABL fossiliferous limestones generally have a low permeability and are classed as a poor aquifer.

5.1.2 Subsoils (See 6" 1840s Map)
Data Availability
No subsoils data were available for Lough Lurgeen bog apart from the initial 1840s GSI geology field sheets, and recent fieldwork.

Geology of Inorganic Subsoils
The subsoil geology of this bog and surrounding area is dominated by a limestone/sandstone till. In exposed till sections the sandstone parent material has been weathered and eroded to give the surface of the till a silty to sandy matrix. However, sections in drains in the easterly cut-away areas of the main bog, indicate that the outer limits of the bog are underlain by poorly sorted clayey/stony tills with relatively small sub-rounded clasts composed of limestone and degraded friable sandstone clasts (Slide 19,20,21,30). The entire river to the SW of the main bog (Outfall V) is in till which has a variable clay to silt to stony matrix (slide 7).

Peat
The black line on the aerial photo overlay indicates the original extent of the bog. It is reproduced from Geological Survey maps produced in the 1840s.

5.1.3 Depth to Bedrock
There is limestone outcrop directly SE of Glennamaddy town at the two swallow holes nearest to the town. There is also an outcrop SW of the bog as marked on the air photo. Depth to rock on the bog is unknown.

Results of drilling adjacent to the swallow holes, carried out by the GSI drill rig in early November 1994, are being awaited.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology (See Drains and Hydrochemistry Map)

Apart from the drains on this bog, Outfalls D and L also carry water off the bog; the former to the ESE and the latter to the WSW.

South East Lobe

Along the N edge is a series of old short drains leading towards the river (Outfall D) with facebank complex along them.

Drain bA at the slope N runs N into the river and there is evidence of flow. Species found include *S. capillifolium, S. papillosum, S. subnitens, S. cuspidatum, S. auriculatum* and *Calluna* with *Molinia, Carex lepidocarpa, C. paniculata, Myrica, Osmunda, Succisa, Potentilla erecta* and *Rubus* nearer the river. Facebank complex extends along it.

Drain bB is similar in location and vegetation as Drain bA. It is 0.5m wide by 1m deep, widening to 2m near the river.

Drain bC at the NE edge runs NW/SE and is old and infilled.

Drain bD also at the NE runs NE/SW is a double drain about 2.5m wide though collapsed in places. It is in the vicinity of an old peat cutting area. There are some large deep pools at the edges with *E. angustifolium* and *Utricularia minor*. The central section is drier and also vegetated with *E. angustifolium.*

Drain bF is at the NE and runs NNE/SSW into an area of regenerating peat. It is 0.5m wide by 0.3m deep, is old and bare with flow.

Drain bG runs NE/SW at the E of the SE lobe and is old and infilled with vegetation.

Drain bH at the S of the SE lobe is 2m wide by 0.5m deep and runs NNE/SSW. It is old and infilled with *Sphagnum. papillosum, Eriophorum angustifolium, Calluna* and *Erica tetralix* with some *Salix, Juncus effusus* and *Polytrichum commune*. Tall *Calluna* grows along the edges which are collapsed in places.

Drain bJ is parallel to Drain bH and exits into an area of old peat cutting. The drain is 1m deep by 0.3m wide with water. There was no flow at the time of the survey. Tall *Calluna* overhangs the drain.

Drain bK is similar to Drain bH.

Main Bog : South and East

Drain bA1 at the SW of the main bog is a recent drain which is 0.5m deep by 0.25 wide. It is un-vegetated with some water flow. It appears to have been inserted in connection with the small forestry plantation seen at the bog edge here. Machine tracks are seen on the bog surface in this area.

Drain bB1to the S runs SE/NW and is 0.25m deep and wide widening to 1m at the edge. There is flow to the SE. *E. angustifolium* was recorded in the drain.

Drain bC1 at the SW runs ESE/WNW through Flush Z1 into Drain bE1 and has a partial ridge along it. It is infilled with *Molinia, Myrica, Menyanthes* and *Calluna* and is 1.25m wide. It ends abruptly on the high bog.

Drain bD1 at the SW runs E/W and joins with Drain bC1. It is old, infilled and 0.5m wide. There is a bend at the W end towards the edge.

Drain bE1 at the SW runs ENE/WSW towards/part of the river (Outfall D) that separates the SE lobe from the main bog. This drain/river forms part of a townland boundary. The drain is associated with peat cutting and its presence may have diverted the flow of water from Flush Z1 towards the river through this drain instead. There are some erosion channels leading into it. The drain is 1.5m deep in places by 0.5m wide with 10cm of water flowing significantly to the NNE towards the river. The bottom was peat based. *Myrica, Salix, Ulex* and tall *Calluna* dominated the high edges. There is a right angled turn towards Outfall D and this is *Pteridium* dominated. Species found nearer the end were similar to those found along the river to the ENE (Appendix X).

Drain bZ1 (See Flush Z1)

Drain bF1 runs E/W at the SE of the site. It is 0.25m wide with *S. cuspidatum, E. angustifolium, R. alba*, some *Calluna* and *S. capillifolium.* There is 10cm of water.

Drain bG1 at the SE of the site is probably associated with peat cutting in the area which is extensive. The drain is collapsed and infilled.

Drain bH1 at the SE is runs N/S is 1.5m wide and is associated with Flush U of 8 swallow holes. The drain flows N into the largest swallow hole where the vegetation at the end of the drain is dominated by *Molinia.* The remainder of the drain is almost infilled and supports *Trichophorum, E. vaginatum, E. angustifolium* and *R. alba* with S. *papillosum* along the edges.

Drains bK1 complex are associated with old peat cutting at the E of the site. The slope off the bog towards the peat cutting is quite gentle in this area. Some of the drains show evidence of partial flow, there are stagnant water pools with no vegetation in others, there are some pools filled with *Sphagna*, some are collapsed and some drains are completely infilled with *E. angustifolium* and *Calluna*.

Main Bog: North and North West
Drains bM1 run NW/SE along both sides of an old track at the E of the site. The drains are 1m deep by 0.5m wide with *Potamogeton polygonifolius, Utricularia, S. cuspidatum, S. auriculatum, S. capillifolium, S. papillosum, S. magellanicum* and *Carex panicea*. There was no water flow at the time of the survey. The track continues SE along a till ridge. Species found on it are listed in Appendix X.

Drain bN1 is an old infilled drain which runs SW/NE at the N end of the lake and the NW end of track/Drain bM1. It is shown on the 1910 6" sheet as a townland/barony boundary and is now marked with stakes as it delimits the area presently owned by the NPWS. *Calluna, Trichophorum, S. magellanicum, S. papillosum* and *S. cuspidatum* dominate with a patch of *Molinia* at the end closest to the lake.

Drain bA2 at the E of the site runs NNW/SSE parallel to the edge and is 1m wide (PM14:19). It is infilled with *Menyanthes*, *Anthoxanthum, Narthecium, Potentilla erecta, Molinia,* with *Calluna, Myrica, S. capillifolium* and *S. papillosum* at the SSE end.

Drain bB2 at the SE edge of Flush X at the E of the site is part of a townland boundary and runs ENE with rapid flow. The drain is 1.5m deep. It is dominated by tall *Molinia* tussocks with *Ulex, Calluna, Myrica* and *Potentilla erecta, Anthoxanthum* and *Juncus effusus.* The drain ends abruptly at a stake on the high bog.

Drain bC2 is seen at the NE of the site NE of Drain/track bM1. It forms a townland/barony boundary on the 1910 6" sheet and also marks the boundary of the OPW ownership (shown by a line of stakes in the field). It is old and infilled with *S. cuspidatum,* and *Menyanthes* with open water in places. *Myrica* is seen along its E end. There may be localised subsidence associated with this drain.
Drain complex bD2 are a series of four short old drains which run NE/SW at the E of the site into an

area of old peat cutting. They are old, infilled with *Pteridium, Myrica, J. effusus, S. capillifolium, S. papillosum, S. magellanicum, E. angustifolium* with facebank complex. There are some stagnant pools.

Drain bE2 runs along two sides of the older forestry plantation to the NE of the site. It is 0.5m wide, quite shallow, with water and infilled with *Sphagnum cuspidatum, S. auriculatum, S. papillosum, R. alba* and *E. angustifolium.* There is a short space between the drain and the forestry and this is being colonised by pines.

Drain bF2 at the NE of the site is aligned NW/SE. At its NW end it is 1m wide and infilled with *Molinia, Narthecium, S. capillifolium, S. papillosum* with *Vaccinium myrtillus* along the edge. The SE end is not easily seen in the field.

Drain bG2 at the NE of the site is between the old and more recent forestry plantations on the high bog and is aligned NE/SW. It is 1m wide and infilled with *S. capillifolium, S. papillosum, S. magellanicum, Vaccinium oxycoccus, Menyanthes* and *Narthecium.* Flow was not detected.

Drain bH2 is similar to bG2 and is next to the more recent forestry. There is a mound with *Calluna, Cladonia portentosa* and *Potentilla erecta* along it.

Drain bJ2, similar to Drains bG2 and bH2 is to the NE of the more recent forestry plantation and is also infilled, mainly with *Molinia.* Beside it is another *Molinia* lined old drain.

Drain bK2 at the NW of the site now marks this edge of the bog. It is lined with *Betula, Sorbus aucuparia, Rubus*, tall *Calluna, Vaccinium myrtillus, Molinia, Pteridium, Blechnum, Ulex, Potentilla erecta, Agrostis* sp., and *Sphagnum palustre.* There are dry erosion channels, dominated by *Molinia,* which run towards Drain bK2.

Drain bM2 at the S of the NE lobe is old and not very well defined in the field. It is lined with *Molinia* and *Potentilla erecta.* The bog to the S of it grades into an area of old peat cutting/field reclamation on mineral soil.

Drain bN2 at the E of the mineral mound to the NW of the site is aligned SE/NW and leads from a patch of *Phragmites* at its SE end to the mineral mound. It is lined with *Phragmites* and *Molinia* and is part of Flush V.

Drain bO2 is similar and similarly located to bP2 but is aligned E/W. It has flow W towards the mineral mound and is 0.5m deep and wide. Additional species found along it include *Succisa, Salix, Calluna, Potentilla erecta, Luzula, Sphagnum capillifolium* and *S. papillosum.*

Drain bP2 is parallel to Drain bN2 and is lined with *Molinia.* There is a patch of *Myrica* at the edge near the mineral mound.

Drains bQ2 and bS2 to the S of the mineral mound at the NW of the site are aligned SE/NW and are old, quite long, not easily seen in the field and are infilled with patches of *Molinia, Myrica* and *Ulex*. The bog this side of the mound seems to be drying out and there is abundant *Ulex* encroaching.

South West of the Main Bog
Drain bA3 at the W of the site has significant flow to the S into an area of active peat cutting. The drain is overhung by *Calluna*.

Drain bB3 is 0.75m deep by 0.25-0.75m wide. There is evidence of water flow to the edge of the bog and there are erosion channels leading into the S side of the drain. There is facebank vegetation along the edges although the drain has collapsed in places. *E. angustifolium* and *E vaginatum* are infilling in places.

Drains bC3 is similar to Drain bB3 though it is up to 2.5m wide.

Drain bD3 is also similar to Drain bB3 but is 3m wide.

Drain bE3 is similar to Drain bD3.

Drain bF3 is at the edge of Flush S and its EC is 187 μS/cm. It flows towards the river and *P. polygonifolius* was seen in it.

Drain bG3 is old and collapsed and up to 5m wide and 0.75m deep. Peat cutting was carried out along it in the past and there are extensive bare erosion channels with water flow towards the river. There is some infilling with *Calluna* on the ridges and *E. angustifolium* between them.

5.2.2 Bog Margin Hydrology and details on subsoil exposures
(See Drains and Hydrochemistry Map)
South East Lobe
South
There is an inefficient drainage system along the main road, where there are pockets of water in pools/drains. The slope of a drumlin is coincident with the ESB cables. There are tear pools downslope from the drumlin apeax to the road, where the peat is at the same level as the road. To the SE there is a relatively new drain in the old cut-away which lies in stony till.

West
Drain bE to the NE runs SSW/NNE and is overhung with *Calluna*. It is 0.75m wide with good flows of water. In dry areas at the edge *Lemna, Epilobium palustre, E. angustifolium* were recorded.

Main Bog
North/North-east
Moving SE along the NE side there are large areas of old regenerating cut-away which are very wet; flow is to drain mD. There is a depression on the high bog at drain bB2, where a flush originates. There are reclaimed fields just east of drain bM1. Part of this area is poached Downslope the stream to the N lies in stoney till with shows of iron; it is 1m wide and 10cm deep. There are old peat islands and pools along the track.

East
There is active hopper-cutting along here with extensive faces 2.5-3m high. Peat is thick here since it is situated in an inter-drumlin low. The drains are 2.5m wide beside the track with silty till on clayey till at bottom.

South-west
There are old cut-away faces to the S of drains mA, with a relatively new drain for forestry in the SW. Face heights to south of mA are 1.5m. There is hopper-cutting to the N of drains mA, with 2-3m high faces. Sand occurs at some of the face drains. Drains flow south which are 1m deep. There is slumping of bog at these faces.

South-west/West
The faces are old and gradational along the margins of Outfall V. Hand-cutting has left turf-banks and stagnant pools along here. The floodplain of Outfall V reaches the faces forming an important linear flush. There is a small area of hopper-cutting at the very SW tip near drain bA3, where faces are 3m high.

West
Faces here are right alongside the floodplain. The river was at a high level and recently flooded the floodplain since there was algal paper. Drain mR2 at the W edge of the site is associated with old peat cutting and is up to 2.5m wide. There are some open water pools with iron staining which support *Lemna* and *E. palustre.* Other plants found include *Calluna, Trichophorum, Eriophorum vaginatum, Salix, Holcus, Juncus effusus* and *Molinia. Betula* is encroaching from the edge.

Lake
The lake is 8 ha in size and up to 2m deep. It is located in a depression between two peat lobes. A stream Outfall L, exits from the NW side. Most of the lake is open water but at the Outfall L exit there is a small mesotrophic fen with iron on the water. The lake's edges consist of hard, dark well humified peat. Wind and water have eroded the N side of the peat, forming a 'wall'. Erosion channels and flushes feed the lake with surface water; a spring also feeds the lake.

Bog Stream (Outfall L)
Outfall L has a relatively deep channel along its entire stretch to the NW exit point near the turlough. The gradient from the lake exit to turlough exit is 0.0018 (5.5m over 3018m). At the lake exit the bottom of Outfall L is 0.3m above till. Downstream in the last quarter, Outfall L flows entirely in till.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map)
Water flowing from the bog and the adjacent inorganic subsoil was sampled on the 25-27th July 1994. There had been several heavy rain spells over these three days. The electrical conductivities are marked on the drains overlay.

South East Lobe
South
The electrical conductivity along the bog/road boundary was 90µS/cm.

West
The electrical conductivity at drain bE was 568µS/cm in the SE and 324µS/cm to the NE as bog-water mixes with the high EC water.

Main Bog

North
Generally ECs at mD in cut-away are 180-220µS/cm.

North-east
The stream mD to the N which lies in stoney till has an electrical conductivity of 480µS/cm. The ponds along the bog track have an EC of 90µS/cm.

East
The ECs at the active hopper-cutting ranges 190-320µS/cm, but 90µS/cm at the faces.

South-west
The new drain for forestry in the SW, S of drains mA, has an EC of 371µS/cm. To the N of drains mA the ECs are 105-208µS/cm. Where drain mA meets Outfall V the electrical conductivity is 569µS/cm.

The electrical conductivity of outfall V, was not less than 560 µS/cm. It originates about 900m south of the road, and flows entirely in till. Vegetation here shows a higher base status. It is thought that this river intercepts the water-table of regional groundwater.

South-west/West
Outfall V has an EC of 600µS/cm along here. ECs are 140µS/cm along the sides of the stream. ECs at hopper-cutting to SW tip are 228µS/cm.

West
The EC here was 543µS/cm at Outfall V.
Lake
The lake has an EC of 176µS/cm.

Bog Stream (Outfall L)
This stream had the same electrical conductivity as that of the lake (176μS/cm).

5.3.2 Laboratory Hydrochemistry
A sample for hydrochemical analysis was taken at the on bog lake, Lough Lurgeen (1/9/94).

There are small amounts of all the major ions.

Electrical conductivity:	104μS/cm
Calcium:	11.4 mg/l Ca
Magnesium:	1.62 mg/l Mg
Total Hardness:	35.14 mg/l CaCO3
Alkalinity:	34.04 mg/l HCO3
Sodium:	7.92 mg/l SO4
Potassium:	0.35 mg/l K
Chloride:	13.33 mg/l Cl
Sulphate:	1.47 mg/l SO4
Aluminium:	11 μg/l Al
Iron:	131 μg/l Fe

Samples were also taken by M. Proctor during the IMCG field trip. He collected samples from bog pools and from the lake. These show that, as the above sample also does, that there is a ground water influence in the lake. The pH of all lake samples was > 6.0 while the Ca values were > 6.5 mg/l. Typical bog water usually has Ca values of less than 1.0 mg/l.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
Lough Lurgeen Bog plays an important role in the hydrology of the Glennamaddy area. A surface water catchment for the area based on the original Bord na Mona material and recent fieldwork is marked on the aerial photo overlay. The highest point in the east of the catchment is coincident with the 295/300ft O.D. (91m) contour on the peat surface just east of Lough Lurgeen. All surface water (including outfalls V and L) within this catchment is directed towards the turlough SE of Glennamaddy town, which has a maximum low point of 74m O.D.. The only outlet for the turlough is via two sets of swallow holes.

The flooding of the turlough this year caused the back-up of the two main rivers (outfalls V and L). Flooding occurred up to points (i) and (ii) on outfalls V and L, respectively (July 1994). At outfall V, the river had recently flooded the entire floodplain, up to 40m wide, just downstream of (i) [Slide 10]. At the time of survey the river had receded into its channel (Slide 8). At outfall L, on the main bog, flooding at the turlough caused back-up to point (ii). A dried out algal layer was seen up to 1m above the level of the water, along the channel banks.

Bog Regime
The SE lobe of the bog falls outside the Glennamaddy catchment, causing this lobe to be hydrologically separate from the main bog.

The Bord na Mona 'bottom contours' map indicates that the lake (Lough Lurgeen) and its stream (outfall L) on the main bog lie in a low point (260-265ft O.D. [79.5m]) between the break in slope of two till ridges or drumlins which have maximum heights of 290ft O.D. (88.4m). Section 4 West (see aerial photo or transect sheet), shows that the surface of the lake at point 2, just at the eastern shore, is coincident with till at 265ft O.D. (79.5m), one pine stump and *Phragmites.* A spring is known to occur here (J. Ryan *Pers. Comm.*). At the lake exit to the west, where outfall L initiates, the water level of the lough is about 0.25 m above peat. This point is coincident with a fen 10m wide, iron on the water, and an EC of 175 μS/cm. The fen at the lough exit forms a narrow shallow restricted outlet. Water may only leave the lough and flow into outfall L if it is at a higher level than this outlet.

Inter-relationship of topography hydrology and hydrogeology
(See 'Bottom Contours' 6" map)
400m to the north of the lake a till ridge runs NW/SE underneath the bog for 2 km from Ashfield (1) house at 300ft O.D. (91.5m) to the path at (2), which has a till height of 290ft O.D. (88.4m). To the SW of the lough a till ridge runs SW/NE at 280ft O.D. (85.4m) for 1.5 km from the main road at (3) to (4) on the high bog. To the west of line AB, underlying till heights are less than 265ft O.D. (81m).

When the top contours (peat surface) map is overlain onto the bottom contours (subsoil surface) map it is clear that peat is no more than 3m deep along the northern till ridge (point 1 to 2), 4.5m from point 3 to 4, and 4.5m to 6m at point 5. However, the peat is substantially thicker to the west of AB, coincident with the lower heights of underlying till. The two contour maps suggest that peat cover is thin on the drumlin ridges and thicker in the hollows (6-8m), west of AB. In other words this bog is not a raised bog, but an intermediate blanket bog that grows to form a plateau blanketing drumlin hummocks and hollows, in an area where there is thought to be surplus rainfall year round.

Up to 70%, of the proposed catchment for the Glennamaddy turlough, as marked on the air photo overlay, is covered in bog (several areas are burnt) or former bog that is now cut-away. These 'soils' have a very low permeability. If the bog is at field capacity (f. c. occurs over most of the year, from Fig. X) rainfall would immediately runoff to the principle streams Outfall V and L, and hence the turlough. In other words the turlough's catchment has a flashy response to recharge.

If the turlough were to be completely drained all rivers in the catchment would flow more easily since the head to the turlough's swallow holes would increase. This could cause outfall L on the bog to flow more freely year round causing water levels in the lake to drop. A lower water level at the lake could cause it to infill with vegetation and dry out the mesotrophic fen at the lake's narrow restricted outlet.

The Glennamaddy catchment is a rare example of an integrated bog-turlough system, that has a fast response time to recharge events.

6. VEGETATION

6.1 VEGETATION SUMMARY

The vegetation of the site is characterised by the abundance of *Narthecium, Carex panicea, Trichophorum* and *Calluna*. The relative abundance of those species varies over the site depending on the proximity to the edge of the bog and the effect of slope. Complexes 2/6/3 and 2/3/6, where *Trichophorum* communities are the dominant type, tend to occur closest to the bog edge or on the steeper slopes. Complexes 6/3/2 and 3/6/2, where either *Narthecium* or *Carex panicea* is more dominant, tend to be found in the more central or flatter areas of the site. Occasionally *Sphagnum cuspidatum* pools are seen in these complexes - the pools sometimes containing *Drosera anglica, Menyanthes*, and other aquatic species - but overall algal hollows are more common.

Central hummock/hollow/pool complexes are very limited with the most well developed area (Complex 35 +*Cladonia*) covering approximately 3ha at the N of the site. This complex consists of a series of inter-connecting *S. cuspidatum* pools with a relatively high *Sphagnum* cover and *Racomitrium* islands in some pools. This area has escaped recent burning. South of the lake another wet area covering approximately 2.5ha occurs. Overall the wet central complexes only cover 8ha of this site with a further small area, probably associated with subsidence, close to the trackway/drain bM1 (Complex 4/6/35 covering 2ha).

The main feature of the site is the lake (Lough Lurgeen, 8ha) - which is seen to the SE of the main body of the bog - and its stream (Outfall L) which exits to the NW bog edge. The E side of the lake is colonised by a band of *Phragmites* with an inner band of *Scirpus lacustris* (PM14:10) while the vegetation of the SW side of the lake is completely different (see more comprehensive notes on the lake in Section 8.2). A small mesotrophic fen, dominated in two separate areas by *Carex rostrata* and *Cladium mariscus,* occurs at the NW end of the lake.

Other flush species occur along this peat based stream such as *Phragmites, Filipendula* and *Angelica*. Here the average EC is 175 μS/cm (PM14:30+31). A series of flushes supporting *Molinia* (PM14:29), *Phragmites, Betula* and *Myrica* are seen on the N slope into this stream. These are dry flushes and are probably associated with lateral water movement and enhanced aeration due to the sloping gradient. Species lists are given in Appendix B.

Another river (Outfall V) which is much wider runs along the SW and W of the of the site and joins up with the stream coming from Lough Lurgeen. The EC of this larger river is much higher (average 560 μS/cm) which is reflected in the vegetation it supports (Appendix B). Levelling sections from Bord na Mona show that this stream runs on till (see Hydrology). Eutrophication is also suspected as a film is seen on the water surface and it is known that sewage from Glennamaddy is discharged into the adjoining turlough and may back up along this stream at times of high rainfall and water levels. There are extensive flood plains along this river and the flooding waters exert an influence on the bog edge vegetation.

A third river (Outfall D) separates the SE lobe from the rest of the site. This river/stream is very narrow but has significant flow to the ENE. It is up to 1.5m deep with 25cm of water and is on sandy soil. The edges are peat based. Water feeds into this river from Drain bE1 which appears not to have been part of the system in the past. Both the river and Drain bE1 are fed from the Flush to the N of bE1. The vegetation along this outfall is more diverse than along the other two (Appendix B) and *Pteridium* is more important.

To the SSW of the site in the vicinity of Drain bB1 *Myrica, Molinia* and *Melampyrum* are encroaching. *Myrica* (PM14:7 to the E), *Molinia* and a small patch of *Phragmites* encroach to the ENE of the site. This may be associated with the mineral mound in the vicinity. At the NW of the site S of the mineral mound, *Molinia*, *Myrica* and *Ulex* are encroaching for quite a distance all along the edge and Drains bS2 and bQ2 are also dominated by them. The woodland behind, mainly *Alnus* with *Salix, Sorbus, Ulex* and occasional *Pinus sylvestris*, has extended since the time of 1970s aerial photograph. At the W of the site along by Outfall V, *C. binervis* and *Molinia* are encroaching.

There has been quite extensive peat cutting carried on around this site - most of it in the past. The vegetation of the older cut-aways - which have not been reclaimed or afforested - is generally quite similar and is dominated by *Molinia, Calluna* and *E. angustifolium* with some regeneration of peat species with *Sphagna* in the wetter areas. On steeply sloping cut-aways *Myrica* cover increases e.g. to the S of SE lobe and to SSW of main bog. *Ulex* dominates the old turf banks. There is much *Salix, Betula* and *Ulex* scrub at the SSW in the vicinity of the end of Drain bE1 and *Ulex* and *Salix* dominate along the road to the SSW of the site. *Ulex* also dominates the track and drain (Drain bM1) on a mineral ridge to the E of the site. *Alnus* grows at the edge of the site to the WNW. *Betula, Ulex* and *Salix* grow at the SW edge.

Deep wide drains can be seen in the areas where active peat cutting is on-going. Species of these more acidic marginal drains include *Utricularia, E. angustifolium, Menyanthes* and *Sphagna* - to E of SE lobe; to the W of the site N of Outfall L where the facebank is 1m deep. At the confluence of the rivers to the WNW of the site, the areas of old peat cutting are subjected to flooding. The facebanks are slumping and cracking towards the river and ombrotrophic and mesotrophic vegetation is found. The vegetation of the cut-aways to the SW of the site is influenced by the higher conductivities of the river and by Flush S. There are many erosion channels and old drains on the high bog which act as a focus point for run-off from the bog. Further S along the SW edge the area of peat cutting enlarges and there is much bare peat. Rapid, active peat cutting is ongoing and the facebanks are up to 2.5m tall.

In the cut-away areas closely associated with mineral soils i.e. to the E, NE, NW, S and SSW of the site and in drains close to roads or tracks, the vegetation reflects the increased mineralisation and may consist of *Molinia, J. effusus, Phragmites, Typha, Potentilla palustris, Succisa* and *Filipendula* (PM14:20 to E of site). Drains separating agricultural land from the bog are also usually mesotrophic e.g. that to the SE of SE lobe.

In the drain to the E of the SE lobe which is very close to river/Outfall *D, Typha, C. rostrata, C. paniculata, P. palustris, P. polygonifolius, Chara sp, Cardamine, R. flammula, Schoenus* and *Rhytidiadelphus squarrosus* were seen. To the SSW along by the road *Lychnis, C. diandra, C. nigra* and *R. flammula* are also found in addition to above. In wet pits to the SSW near the forestry *C. rostrata, Drepanocladus fluitans, C. echinata, Potamogeton polygonifolius, Typha, C. paniculata* were seen and the EC was 156-314 μS/cm (iron staining). In the old drains at the SSW edge near Drain bE1 both ombrotrophic and mesotrophic species occur and the vegetation is dominated by *Molinia* and *Myrica.* At the E of the site along an old track on a till mound there are patches of *Phragmites* in the abandoned drains with further reed sites in the old cut-away on the other side of the track. These patches of *Phragmites* are on rising ground. Along the ENE edge, between the bog and a river, *Ulex* dominates with wet meadow species, including *Phragmites,* in the clearings. Further N in the old cut-aways between bog and forestry *Succisa, Anthoxanthum, Holcus, Epilobium palustre, P. erecta, Molinia* and *Salix* were seen (vicinity of Flush X). The presence of these mesotrophic species may be due to the mineral ridge in the vicinity. Further examples of mesotrophic vegetation can be seen at the N of the site all around the edge of the bog. To the NW of the site the mineral mound is being dominated by *Betula, Alnus, Ulex* and *Molinia* with mainly mesotrophic species and some bog species in the old cut-away. Some of these are spreading on to the bog especially along Drain bK2. To the SE of this mound *Phragmites* occurs both on the mound and on the high bog (Flush V).

The vegetation in and around the Glennamaddy turlough, which lies to the NW of the site, was described and mapped by Goodwillie (1992).

6.2 DETAILED VEGETATION

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Vegetation Complexes

Marginal Complexes

Complex 1

This complex occurs rather infrequently around the site. It is seen along some of the older drains and along the river banks. In the case of the latter, plants more associated with the river are often seen growing in it. The facebank is quite extensive to the WSW of the site and *Molinia* and *C. binervis* are encroaching. At the E end of Outfall D some digging has been taking place and there is an abundance of *Trichophorum.*

Complex 2

This complex in the vicinity of Drains bF and bG at the S of the SE lobe is very tussocky and also on uneven ground. The area appears burnt as there is bare peat, *Campylopus introflexus* and *Cladonia floerkeana* and it also appears to have been grazed. There is some *S. capillifolium, S. imbricatum* and *S. papillosum* at the base of the burnt/disturbed hummocks. *C. panicea* occurs in patches. To the N of the site in the N lobe, this complex occurs on what seems to be a till ridge. *Molinia* is encroaching and the surface is very dry and hard (2+*Molinia* (Mo)). There is 20% *Cladonia* present (PM14:25).

Complex 2 + Erosion Channels (ER)

This is seen on the SE side of the SE lobe. *Trichophorum* dominates with deep and extensive erosion channels which lead to the bog edge. The *Sphagnum* cover is low and the surface is hard and slippery underfoot. Patches of *Myrica* occur and there is one large *S. cuspidatum* filled pool (this is probably of artificial origin).

Complex 2/3+Erosion Channels (ER)

This complex is seen in a wide band all along the S side of Outfall L adjacent to Complex 3/2. *Trichophorum* and *Carex panicea* dominate with extensive erosion channels. Many of the erosion channels are bare or colonised by *R. alba*.

Some of the deeper ones contain *Molinia* which extends from the river edge. The surface is very hard and slippy under foot. There is practically no *Sphagnum* cover.

Complex 2/3
Small patches of vegetation dominated by *Trichophorum* and *Carex panicea* without erosion channels are seen at the W and N edges of the site.

Complex 2/4+*Myrica* (My)
This is seen close to Complex 4/2 to the N side of the river which runs through the site (Outfall L). It is similar to Complex 4/2 except that *Trichophorum* is more frequent than *R. alba*. In addition *Myrica* is seen scattered through this complex. Also, in common with Complex 4/2 the bog surface is hard and there is little to no *Sphagnum* cover.

Complex 2/6/3
Trichophorum dominates with some *Narthecium* and *Carex panicea.* To the N of Flush W4 patches of *Molinia* occur (2/6/3+*Mo*). In the N lobe 15% *E. angustifolium* is seen with 10% *Cladonia* (PM14:23).

Complex 3RB (Recently Burnt)
This is a very small area at the W edge south of Outfall L which has been burnt in the recent past. *C. panicea* cover is 70% and the *Calluna* is very short. There is a lot of bare peat.

Complex 3/2
This marginal complex is dominated by *Carex panicea, Trichophorum* and mainly short *Calluna* (25% cover and up to 20cm tall in places). Algal hollows, bare peat, erosion channels and surface water were common. The *Sphagnum* cover is low with only a little *S. papillosum* and *S. tenellum* and the bog surface is hard and tussocky. There are some disturbance indications namely the presence of *Campylopus introflexus* which may suggest a fire history.

This marginal complex is also seen on the steep slopes along the N side of the lake and along the river exiting from it. There is a lot of surface water and the algal cover is high. The surface was hard and slippery. Patches of *R. alba* are seen in some algal hollows and occasional *Leucobryum* hummocks and *Huperzia selago* occur.

Complex 3/2 + Erosion Channels (ER)
A similar complex with extensive erosion channels leading to the bog edge is seen all along the SW edge of the main bog. These are mostly bare but are sometimes colonised by *R. alba.* To the E of the site large dry erosion channels run ESE towards a grazed area on mineral soil and further E in the vicinity of Drain bA2 *Myrica* is found.

3/2 +*Cladonia* was recorded also at the SW of the main bog. *Cladonia* cover was 70% and there was 30% *Calluna* 4(0cm tall).

Complex 3/2/6 and 2/3/6
These are marginal vegetation complexes dominated by *Carex panicea* and *Trichophorum* - the latter being more abundant at the very edges. The surface is hard and there is often much surface water present. *Huperzia selago, Leucobryum, Pleurozia purpurea, Racomitrium lanuginosum* and *Cladonia* (10%) were recorded in 3/2/6 to the SSE of the site.

On the SW lobe between the central complex 6/3/2 and the marginal complex at the edge, complex 3/2/6 with patches of *R. alba* and a lot of surface water was recorded. This complex is also seen immediately to the NE of a patch of *Phragmites* on the same lobe.

To the W of the site near the confluence of the two rivers there are patches of *R. alba* in complex 2/3/6.

To the W of the site 15% *E. vaginatum* tussocks, degraded *S. imbricatum* hummocks and *D. maculata* were seen in complex 2/3/6.

Beside it, to the S of the mineral mound at the WNW of the site the *Calluna* is 25%, the *Trichophorum* 20%, the *C. panicea* 15% and the *Narthecium* 10%. There are also some algal pools. This complex here then grades into 3/6/2 further into the bog (PM14:28).

There is a patch of 2/3/6 + *Cladonia* at the SW edge of the site. The *Cladonia* cover is 15% and the *Sphagnum* layer is better at 15% mainly *S. capillifolium* with some *S. imbricatum*. There are no erosion channels in it.

Complex 4/2
This complex which is dominated by *R. alba* (25-30%), *Trichophorum* (20%), *Narthecium* (10%), *C. panicea* (10%) and *Calluna* (5%) is seen over a large area of the SE lobe and is also associated with slopes on the main bog. On the SE lobe the *R. alba* and *E. angustifolium* are mainly confined to erosion channels. Extensive bare erosion channels are also seen. *R. fusca* dominated hollows also occur. The surface of this complex tends to be hard and slippy underfoot and the *Sphagnum* cover is low at 10% mainly *S. capillifolium, S. tenellum* and *S. papillosum*. SSW of the lake this complex occurs on a more gentle slope with 10% *E. angustifolium* and surface water pools, some with *Menyanthes* (PM14:18). The *Calluna* is 30cm tall. To the SW of the lake near the outfall there are pools with *Menyanthes*, *E. angustifolium* and *R. alba* with *S. cuspidatum* at the edges. the complex is also seen on the N slopes towards Outfall D (PM14:3+4).

Complex 4/3/2
This is seen to the SW and SE of the lake. It is similar to 4/2 with some tear pools which are all algal. Shallow dried out algal pools are also seen with some erosion channels on sloping areas. *Carex panicea* is more frequent.

Complex 3/6/2
This complex covers a large part of the central section of both the SE lobe and the main bog expanse. *Carex panicea* dominates with abundant *Narthecium* hollows and *Trichophorum* tussocks. The total *Sphagnum* cover is low - generally around 10% - consisting mainly of *S. cuspidatum* and *S. papillosum* with smaller amounts of *S. subnitens, S. tenellum,* and occasional *S. magellanicum, S. fuscum* and *S. imbricatum.* Surface water is a feature of this complex with many shallow algal pools and a hard slippy surface. The complex tends to be associated with slightly sloping areas of the central and sub-marginal sections of the site (PM13:30).

To the NE of Flush Z1N this complex occurs with patches of 4/2 and low ridges dominated by *Carex panicea, Calluna* and *E. angustifolium.* These linear ridges appear to lead into the river and possibly follow the course of a subterranean stream (PL13:29). In all probability the ridges are slumping features.

This complex may be seen on the slopes into Flush T where the algal hollows at the top of the slope are dry and the bog surface very hard. There is some evidence of fire damage in the past with the occurrence of *Campylopus introflexus* and patches of bare peat. Occasional *R. alba* is seen in the algal hollows.

The complex also occurs E of Flush W1 near Drain bN1 where the *Sphagnum* cover increases to 40% with *E. vaginatum* throughout. It is also found between Flushes 1/ 2 and 3/ 4. South of Flush W1 there is a well developed *Sphagnum* layer (30% total cover) dominated by *S. papillosum,* with frequent *S. imbricatum. E. vaginatum* is common. It is possible that this section escaped the burning mentioned by Douglas and Grogan (1985).

East of Complex 35 +*Cladonia* a patch of *Betula* scrub with *E. vaginatum, Aulacomnium palustre, S. capillifolium,* and *V. oxycoccus* occurs in this complex.

S of the mineral ridge to the WNW of the site there is 25% *Calluna* in the complex with 5% *E. vaginatum* and some *Leucobryum* hummocks, *Aulacomnium* and *Empetrum.*

The presence of the latter two may be associated with the drying out E towards the mineral soil.

Close to Flush X this complex appears not to have been burnt for some time as the *Calluna* cover is high (20%) and *E. vaginatum* and *E. angustifolium* are frequent. The total *Sphagnum* cover is approximately 15% and surface water and an algal film were evident.

On the SE lobe, N of the telegraph poles the *Sphagnum* cover increases including 5% *S. imbricatum.*

Complex 3/6/2 + Pools (P)
This complex with the addition of pools (25%) is seen to the SE of Lough Lurgeen. The inter-pool areas are similar with a comparable *Sphagnum* cover and the occurrence of some *S. imbricatum* and *S. fuscum.* The pools are both rounded and linear. Many are algal or containing unhealthy *S. cuspidatum*. However, some pools contain healthy *S. cuspidatum* with *S. auriculatum, Menyanthes, Drosera anglica* and *E. angustifolium*. In most pools the water level is between 10-15cm although some *Sphagna* were a bit dried out at the time of the survey. *S. papillosum* and *R. alba* occur around the edges. *E. angustifolium* is also common between the pools and *Leucobryum* was seen but there are no tall hummocks. The bog surface between the pools is hard and there is no acrotelm layer. There is evidence of past fire occurrence - namely degraded hummocks.

Complex 3/7
This complex to the WNW edge of the bog is dominated by 20% *C. panicea*, 25% *Calluna,* 20% *Sphagnum* namely *S. capillifolium, S. papillosum* and *S. imbricatum*, 10% *Trichophorum* and 5% each of *Narthecium, Eriophorum* species and algal hollows. The ground is dry and hard underfoot.

Complex 7/3
This complex occurs to the NE of the site very close to a till ridge. The vegetation is dominated by *Calluna* (50%) which is up to 40cm tall, 10% *C. panicea* and 5-10% *E. angustifolium*. The *Sphagnum* cover is moderate but it appears to be drying out. there are no pools or algal hollows and the ground is hard underfoot. *Narthecium* and *Trichophorum* are also present and these increase towards the edge of the complex. To the W of this complex there is scattered *E. vaginatum* and *Phragmites* throughout.

Complex 7/3 + *Cladonia* (*Cl*)
This complex is further N on the ridge and is similar to Complex 7/3 except that the *Calluna* cover decreases and there is 20% *Cladonia* and up to 15% *E. vaginatum*. At the very N of the site the *Cladonia* cover increases to 40%Neither complexes appear to have suffered recent burning.

Complex 7/9
This covers a small area to the WNW of the site, N of stream (Outfall L) and is on a ridge parallel to it. The vegetation is dominated by *Calluna, E. vaginatum* and *E. angustifolium* (PM14:26) with patches of *Phragmites, Molinia* and scattered *Betula.* The *Sphagnum* cover is up to 60% mainly *S. capillifolium* but it is somewhat dried out. *V. oxycoccus* and *Empetrum* are growing over the *Sphagna. Polytrichum alpestre, S. imbricatum, Pleurozium schreberi*, *Aulacomnium palustre* and *Leucobryum* hummocks also occur. Some *Narthecium* and *C. panicea* also occur. No pools were seen though *Menyanthes* does grow up through the *Sphagna*. The top few cm of the surface are soft. A small *Rhododendron* bush was seen.

There is also a small linear patch dominated by *Calluna* and *E. vaginatum* with *Cladonia* on the SE lobe parallel to the marginal drain to the SE. *Leucobryum* and *C. panicea* are also present and the surface is hard.

Sub-Marginal Complexes
Complex 4/2 + Pools (P)
This complex occurs close to Lough Lurgeen (S and SE of it) and at the W side of the SE lobe where it is associated with Slope 1. The *R. alba* in this complex is seen forming flats rather than erosion channels (PM13:28). The dominant plant species are similar to those in vegetation Complex 4/2 (marginal complex) but the structure is quite different. Shallow linear pools occur which are mainly algal but some contain *S. cuspidatum* and *Drosera anglica* and some *Menyanthes.*

These are generally orientated at right angles to the slope. The surface is wet and quaking. There is a lot of surface water. Occasional hummocks of *Calluna* and *E. vaginatum* tussocks are seen and *Aulacomnium palustre* was recorded. Where this complex occurs to the W of the SE lobe it is in a depression and there are large tear pools at the edges in association with Slope 1. To the SW of the lake *R. fusca* was seen in some hollows of this complex.

Complex 6/2
This is to the SW of the new forestry to the NE of the site and the complex appears to be as a result of the drainage for the forestry. The vegetation consists of 40% *Narthecium,* 20% *Calluna* which is 40cm tall, 10% *Trichophorum* and 5% *Eriophorum* species. The *Sphagnum* cover is poor and there are some pools with *S. cuspidatum.* There is *Cladonia* (5%) present in the complex. Overall the area is soft.

Complex 6/2 + Algal Pools (AP)
Narthecium and *Trichophorum* dominate in this complex near the NW edge of the main bog. There is much surface water. There are some dry *S. cuspidatum* pools. Patches of *C. panicea* and circles of *Molinia* are scattered throughout.

Complex 6/2/3
This complex is on sloping ground along the NW side of the old forestry plantation to the NE of the site. The *Narthecium* is more abundant higher up the slope as is *Cladonia* and *E. angustifolium.* The *Calluna* (15%) is 20cm tall. The *Sphagnum* cover throughout is poor (10%) including *S. imbricatum* and *S. fuscum* and there are patches of *R. alba* and bare peat. There are some pools with small amounts of *Menyanthes, D. anglica* and *S. papillosum* at the edges. There are also some algal pools (PM14:24).

Complex 6/3/2
This *Narthecium* dominated (40%) vegetation complex covers a large part of the central sections of the main bog. In addition there is 10% each of *C. panicea*, *Trichophorum* and *Calluna* - which is usually short. The *Sphagnum* cover is for a central complex is low at 10% and this is confined to small hummocks, mainly *S. capillifolium* (5%) with small amounts of *S. imbricatum, S. fuscum* and *S. papillosum.* there is some *Cladonia* on the hummocks. Algal hollows cover 5% with small amounts of *R. alba* in them. *Pleurozia purpurea, Racomitrium lanuginosum* and *Andromeda* were also recorded in this complex. *R. fusca* was seen in this complex at the edge to the SSW.

Where this complex occurs near the edge at the SSE of the main bog there are patches of *E. angustifolium* in slightly sunken sections with an increase in algal hollows and *R. alba* (5%).

In the WSW lobe this complex is softer than in other parts of the bog and the *Sphagnum* cover increases to 20% - mainly *S. capillifolium, S. papillosum* and some *S. subnitens*. The *Calluna* (15-20%*)* is short and there is an abundance of *E. tetralix*. This may suggest a burning history. Near the *Phragmites* in this section of the bog there are scattered low wide hummocks with taller *Calluna, Cladonia* and some *S. imbricatum* though they are degraded. There are indications that there may be increased mineralisation in the area as *V. oxycoccus, Aulacomnium palustre* and *Polytrichum alpestre* occur. At the NW of the S section of the site, just S of River L the *Sphagnum* cover increases - tall *S. imbricatum* and *S. fuscum* hummocks. No pools were recorded (PM14:37).

To the NW of the lake, near the mineral mound, there are patches of *Phragmites* in this complex and there are some degraded hummocks - evidence of burning.

In the N lobe of the site there is also 30% *Calluna* which is tall at up to 40cm and there are *S. magellanicum* hummocks suggesting this area has escaped recent burning (PM14:21).

E of Track bM1 there is an increase in *Calluna* (30%) with an increase in *C. panicea* and *R. alba* towards the edges. There is *E. vaginatum* present throughout.

To the E of the site the *Calluna* cover is much lower than in 6/3/2 + *Cladonia* beside it (PM14:6+7).

SE of the lake complex 6/3/2 grades into 6/3/2 + pools.
In the SW lobe there are small pools, some with *S. cuspidatum, Menyanthes, D. anglica* with *S. papillosum* at the edges in this complex. Nearing the level area of the bog the pools are bigger and more frequent but not inter-connecting. *S. auriculatum* is also found in them. They are not tear pools.

Complex 6/3/2 + *Cladonia* (*Cl*)
This is similar to the above complex but appears not to have been burnt so recently. To the SSE of the main lobe the *Cladonia portentosa* cover is approximately 10% although the *Calluna* cover is low (10%) and is approximately only 15cm tall. The topography is fairly uniform formed by *Trichophorum* tussocks and occasional algal hollows. The total *Sphagnum* cover is low (5-10%) mainly *S. capillifolium*. The surface is generally hard underfoot but somewhat softer in places. Small amounts of *S. imbricatum* and *R. alba* also occur. *Pleurozia purpurea* was seen in significant amounts and *Campylopus paradoxus* was noted (PM13:33).

In some areas of this complex the *Cladonia* cover increases to 20% and the bog surface is softer.

In the SW lobe this complex has been unburnt for longer. There is up to 20% cover of *Cladonia* and the 30% cover of *Calluna* is 30-40cm tall. Both the cover of *Sphagnum* including *S. imbricatum* and *S. fuscum* and *Narthecium* also increases. The surface is soft underfoot.

In this complex to the E of the site the % *Calluna* increases to 25% (20-30cm tall) and there is less *C. panicea* (PM14:5).

Complex 6/3/2 + Tear Pools (TP)
This is seen at the E of the main bog in the vicinity of Drain bM1 at the edges of Complex 4/6/35. It has a similar species composition to complex 6/3/2 with the addition of 5% cover by pools. These are shallow and infilled with *S. cuspidatum*. The total *Sphagnum* cover is 10% consisting mainly of *S. papillosum* and *S. capillifolium* with some *S. fuscum*. *Racomitrium lanuginosum* was also noted. *R. alba* occurs (5%) and the bog surface in this area is wet and soft. This may be related to possible local subsidence. Where this complex occurs SW of this track the total *Sphagnum* cover reaches 20%.

Another example of this complex occurs to the SE of the lake where the linear pools are aligned N/S. The pools are infilled with *S. cuspidatum*, *S. auriculatum*, *Menyanthes* and *Drosera anglica.* The complex is on a gentle slope to the W. *Leucobryum* hummocks were also present.

Where this complex occurs to the SW of the lake the pools also contain *Menyanthes* and there is scattered *E. angustifolium* throughout with very little *Calluna*. The surface is soft and quaking in places.

To the N of the lake there are many algal hollows in this complex.

Complex 6/3/4 + Pools (P)
This area corresponds to an area of tear pools at the SW of the site as defined by Douglas and Grogan (1985). This is a wet complex to the SW of Outfall L and the pools are parallel to it. There are tear pools on the lower slopes, some up to 10m long with *S. cuspidatum, S. auriculatum, D. anglica, Menyanthes* with *S. papillosum* at the edges. *Narthecium* flats are around and between the pools with *R. alba* in the algal hollows (PM14:32+34). Part of the complex is in a slight depression and the pools inter-connect. There are some tall *Calluna* hummocks with *Cladonia*. Towards the W of the complex on more level ground *E. angustifolium* increases to 10% (PM14:33).

Complex 6/4/2 + Pools (P)
This complex N of Flush W2 has pools which are slightly better than those of 6/3/2 + pools. However many are still algal. All pools are shallow and do not appear to be tear pools. On the SW side of this complex patches of *C. panicea* occur and there is much *Molinia* litter even in the pools. This may be adding nutrients.

The pools are larger and linear and are parallel to the stream (Outfall L) and perpendicular to the slope.

Sub-Central Complexes

Complex 6/10/2

This is a small area of vegetation seen at the S of the main bog. The total *Sphagnum* cover is high at 60% with shallow pools infilled with *S. cuspidatum* and some *S. auriculatum. S. papillosum* is the dominant *Sphagna* in the inter-pool areas. *Menyanthes* and *Drosera anglica* are seen in some pools. *Narthecium* (15%) and *Trichophorum* (10%) are also frequent. The *Calluna* is short (10cm) on low wide hummocks which also support *E. vaginatum, Aulacomnium palustre, S. capillifolium* and some *S. imbricatum*. *R. alba* occurs around some pools and *Andromeda* and *R. lanuginosum* were noted. This complex appears to be in a slightly depressed area and may be present due to water ponding. The surface is wet and soft.

Complex 6/10

The vegetation between the *Betula* clumps to the NE of Flush S is dominated by *Narthecium* and *Sphagna* with other species such as *V. oxycoccus* and *Polytrichum alpestre* indicating increased mineralisation occurring nearer the flush. The total *Sphagnum* cover is 50% mainly consisting of *S. papillosum, S. capillifolium, S. magellanicum, S. fuscum* and *S. imbricatum.* There are extensive *Narthecium* lawns. The area is soft with a good acrotelm layer. This complex is also seen to the NW of Flush X.

Complex 10

This complex occurs to the SSW of Flush X and there is up to 50% *Sphagnum* cover, mainly *S. capillifolium* with occasional *S. cuspidatum* pools with *D. anglica, Menyanthes* and *R. alba.* The surface is soft. There are scattered *Betula* throughout and some *Empetrum nigrum.*

Complex 4/6/35

This is a small area of vegetation which is probably associated with local subsidence around Drain/Track bM1. The vegetation consists of *R. alba* (30%), *Narthecium* (20%), *C. panicea* and *Trichophorum* both at 5%, *Calluna* (10%) and a total *Sphagnum* cover of 35% mainly *S. capillifolium* and *S. papillosum* with *S. imbricatum* and *S. fuscum.* There is evidence that the hummocks have suffered burning in the past as *Campylopus introflexus* and *Cladonia floerkeana* were present on them. Pools (20%), some of which are inter-connecting, occur. Most are algal but some contain *Menyanthes, D. anglica* others *R. fusca* and others *S. cuspidatum* and *S. auriculatum* but they are unhealthy. The inter-pool areas are not very soft. At the NW of the complex the surface is wetter, more quaking and *E. angustifolium* cover increases. *R. lanuginosum* islands were seen.

Central Complexes

Complex 35

This is seen on the plateau of the ridge to the S of Lough Lurgeen. *S. cuspidatum* pool cover is high (20%) forming an inter-connecting pool pattern. The pools also contain *S. auriculatum, Menyanthes, D. anglica, E. angustifolium, Utricularia* and *Cladipodiella fluitans* with some *S. papillosum, R. alba* and *D. rotundifolia* around the edges. The pools are aligned N/S and are up to 20m long in places. They run at right angles to the slope into Lough Lurgeen. *Racomitrium* and *Cladonia portentosa* dominated islands occur in some pools. The total *Sphagnum* cover is 40% consisting of *S. capillifolium* (10%) and *S. papillosum* (10%) and *S. cuspidatum/S. auriculatum* in the pools. The surface between the pools is soft and there is an acrotelm. *Pleurozia purpurea* was seen here.

Complex 35 +*Cladonia* (*Cl*)

This is the wettest complex seen at this site and it is found to the NW of the lake at the S extreme of the high ground to the NE of the site. It is similar to Complex 35 as it consists of an inter-connecting pool pattern. However, the cover by pools is higher in this complex (40%) and the area has not been burnt for some time as the *Cladonia portentosa* cover is approximately 10% and the *Calluna* is tall (PL14:8-10). The total *Sphagnum* cover is also higher at 60% consisting of *S. cuspidatum* and *S. auriculatum* in the pools and *S. magellanicum* (5%) and *S. papillosum* (5%) around the pools.

Some *S. cuspidatum* (5%) and small amounts of *S. imbricatum* and *S. fuscum* also occur between the pools. Large *Racomitrium lanuginosum* islands are seen in some pools and *Menyanthes, D. anglica* and *R. alba* are frequent. The bog surface is soft and quaking.

6.2.2 Vegetation of the Flushes

A species list for each separate flush is given in Appendix B.

Flush Z

This is a small flushed area on the NW of the SE lobe immediately N of the telegraph poles. It is somewhat circular in shape and is dominated by *Molinia* bounded by tall *Calluna* and a drain which supports *Menyanthes, C. rostrata, S. recurvum* and *Calliergon.* There is a depression in the centre of the *Molinia* dominated vegetation which supports mesotrophic species (PM13:31) (See Appendix B).

Flush Z1

This is a large flushed area to the SSE of the main bog and is described under three separate flush areas. Drain bE1 to the E appears to be associated with the E of this Flush and with an area of active peat cutting (PM13:35).

Flush Z1N is the northern arm of the flush and it consists of a series of *Molinia* dominated swallow-holes with mounds dominated by *Pteridium* with *Calluna* beside them. A *Calluna* dominated line is seen connecting the swallow-holes. *Salix, Rubus, Dryopteris dilatata* and *J. effusus* were also noted in these swallow-holes. NE from the S end of the *Calluna* dominated ridge of swallow-holes is another swallow-hole 2-3m deep with stagnant water at the base.

Flush Z1S is the southern arm of the flush and is *Molinia* dominated. It runs along the base of a ridge which sweeps around to the S and SE of Flush Z1N. *Myrica, Calluna* (80cm tall) and *Potentilla erecta* make up most of the remainder of the vegetation cover with some patches of *Carex panicea. Melampyrum* and *D. maculata* were also noted. Within this flush there are a number of swallow-holes which support species such as *Carex paniculata, J. effusus, Potentilla palustris, Menyanthes, Succisa, Salix, Rumex, Dryopteris dilatata* and *Festuca rubra* (PL13:26-27). Some swallow-holes were shallow and no water could be seen but water was seen flowing in a deeper hole. A swallow-hole close to the river/stream which separates the two lobes of this site also contained *Rubus fruticosus*, *R. idaeus* and *Anthoxanthum odoratum* (PL13:28) and another contained *Filipendula* and *Deschampsia caespitosa.* An area to the W of this flush was harvested for peat in the past.

Flush Z1W

This is the western arm of the flush and consists of a concentration of *Molinia* in one area to the W with a swallow-hole (dry at time of visit) in the centre of it. Species found within the swallow-hole include *P. palustris, P. erecta, Succisa, J. effusus* and *Menyanthes.* The area surrounding this concentration of *Molinia* is dominated by *Molinia, Myrica, Melampyrum, P. erecta, E. tetralix* and small patches of *Phragmites* throughout. There are dry, shallow depressions with *Menyanthes* and *Succisa*. Drains bC and bD are within this section of the flush area. To the ENE of these drains is a patch of vegetation dominated by tall *Salix* and *Myrica* with, *Filipendula, J. effusus, P. palustris* and *Molinia,* (PM13:34). There is water under the *Salix* flowing S into bE1. The area to the S and W of this flush was harvested for peat in the past.

Flush Y

This flush at the base of a sloping ridge to the S of the lake, consists of two bands of *Molinia* concentrated vegetation with flushed vegetation between. At the E end there is tall *Myrica* and some *Betula* present suggesting lateral water movement in this area.

Flush T

This consists of a line of swallow-holes leading into the SE end of the lake. Swallow-holes are also seen to the E and W of the main concentration. A band of *Calluna* links the swallow-holes which are dominated by *Molinia* with other species (see Appendix B). A badger sett was seen in one of the swallow-holes (PL13:31-32).

Vegetation complex 4/2 with bare peat erosion channels is seen around the swallow-holes.

Flush U
This is to the SE of the main bog at the foot of a slope ENE to till mound. The flush is short and consists of eight swallow-holes the vegetation of which is linked together by a ridge of tall *Calluna*. The swallow-holes themselves are up to 3m deep and are mainly dominated by *Pteridium*. No running water was heard.

Flush X
This is a small area seen at the ENE of the bog edge. It is dominated by *Molinia* tussocks with patches of *E. vaginatum* and *E. angustifolium* dominated vegetation. The surface is soft with 90% bryophyte cover. This consists mainly of *S. papillosum, S. capillifolium, S. magellanicum, Aulacomnium palustre* and *Polytrichum alpestre. Betula scrub* 1m tall , *E. tetralix, V. oxycoccus, Andromeda, Luzula, Potentilla erecta, Myrica, Menyanthes* and *Melampyrum* were also recorded. Drain bB2 exits the bog from the flush. There is significant flow to the ENE.

To the SW is another patch of *Molinia* with *Betula* scrub. Part of this area is soft and quaking. Water may collect or come to the surface from an underground stream. To the NE close to Complex 10 scattered *Betula* is growing on slightly sloping ground and this appears to be related to lateral water movement. The flushed vegetation around this flush (complex 6/10) appears to be on a mineral ridge. The *Sphagnum* cover is 40% including *S. imbricatum* with *V. oxycoccus* growing over it in places and there is also *Polytrichum alpestre* and *Aulacomnium palustre* present. *E. angustifolium* is abundant 20% and scattered throughout. The surface is soft.

Flushes W
This is a series of flushes to the NNW of the lake which are on sloping ground towards the stream/river which exits the lake (PM14:29 shows Flush W4). They may be associated with an underlying mineral ridge. *Molinia* tussocks and *Phragmites* (1m tall) dominate with some scrub *Betula*. *Myrica* occurs in each and is situated on the sloping edge towards the stream (Outfall L). Four concentrations of flushed vegetation are seen W1-W4. (PL14:5 of W2 to SW and No.6).

Flush V
This flush is seen to the NW of the site at the S end of the N lobe and is on a till mound. There is old peat cutting associated with the peat at the edge of this mound and there are some old drains which run into the flush. There are also two curvilinear drains/mounds dominated by *Molinia*, *Menyanthes* and *Phragmites.* In one of the drains there was iron staining and such species as *P. polygonifolius, Drepanocladus fluitans, P. palustre* and *C. echinata* were recorded. The vegetation of the flushed area between the drains is dominated by moderately sized patches of *Phragmites* and *Molinia* with hummocks of *Polytrichum alpestre* with *V. oxycoccus* and *Andromeda. Succisa, P. erecta* and *Pleurozium schreberi* are seen throughout the area.

Flush S
This is seen to the SW of the site leading to the bog edge and the river which bounds the site to the SW. At the eastern end it is dominated by *Molinia* with drier parts supporting *Potentilla erecta, E. tetralix, P. alpestre, S. capillifolium, S. magellanicum* and *Cladonia portentosa* cover (35%). Wetter parts nearer the bog edge support patches of *Carex rostrata* and *J. effusus, Menyanthes* and *V. oxycoccus.* There is a large *S. recurvum* infilled pool which also supports *Carex rostrata, E. angustifolium, Menyanthes* and *C. nigra.*

To the NE of this flush and probably associated with it are two clumps of *Betula*. Growing with them is *J. effusus, Anthoxanthum, D. maculata, V. myrtillus, V. oxycoccus, Salix* seedlings, *Polytrichum commune, P. alpestre, Aulacomnium palustre* and *Pleurozium schreberi.* There was no *Molinia* present in association with the *Betula*.

6.2.3 Vegetation of the Lake Area

Lough Lurgeen

This is an 8.4ha lake which is seen at the SE of the main bog in a depression between two peat lobes. The lobe to the SSW is not as steep into the lake as that to the NNE. A stream exits from the NW side and runs along the valley between the two peat lobes towards the WNW edge of the site. Most of the lake is open water but at the exit point a small mesotrophic fen is seen (PM14:9, 10, 11, 14). Beside this to the NE there is an area dominated by *Phragmites* and *Molinia* (PM14:8). Along the initial stages of the outflow a fen/wet meadow habitat exists.

In the lake close to the fen area *Nuphar lutea, Nymphaea alba* and *C. rostrata* are common in the shallow water (PL13:35-36 and PM14:10+11). *Cladium* is dominant in an area to the NW of the lake (PM14:14). A band of *Phragmites* (2m tall) occurs along the NE edge of the lake with a band of *Scirpus lacustris* further into the lake (PL14:1 and PM14:10). At the E of the site a Pine stump was seen on the lake bed among the *Phragmites.* It appeared to be in situ. At the ESE small amounts of *Typha* and *E. angustifolium* occur with some *Nuphar, Carex rostrata, Potamogeton natans, P. polygonifolius, Drepanocladus fluitans* and *Mentha* with *Hydrocotyle, Ranunculus flammula, Caltha palustris, Angelica, Veronica scutellata, Carex serotina, Osmunda, Salix* and *Sphagnum palustre* on the slightly drier areas. *Salix* grows along the SW edge of the lake with a narrow band of wet meadow vegetation between the lake and Flush Y.

The lake bed around the edges consists of hard, dark, very well humified peat. Wave and wind action appear to be eroding the N bank and lake bottom as there are cave like structures along the banks at this edge (PL14:2). At the time of the survey the banks around the N edge of the lake were approximately 2-3m higher than the water level but it was apparent that the lake level could be at least a metre higher at times.

The outflow from the lake has an EC of 115 µS/cm with significant flow. Plants found in and along it include *Typha, P. palustris, C. rostrata, Angelica, J. effusus, Equisetum fluviatile, Mentha* and *Menyanthes.*

The hydrochemistry of the lake is described in more detail in Section 5.3.2.

On the bog surface to the N of the lake edge tall *Calluna* (60cm-1m) was recorded with *Pteridium, Molinia, Rubus, V. myrtillus* and *Succisa pratensis.* All along the N edge a series of channels or depressions occur running into the lake. They probably carry water at times of high rainfall. *Molinia* and *Salix* are seen in them with *Phragmites* in the deeper among them. A narrow band of wet meadow type habitat and Flush Y occur along the SW edge of the lake. There are tussocks of *Molinia* with bands of *Filipendula*, *Valerian, J. effusus*, *Rumex acetosa, P. palustris*, *Epilobium palustre* and *C. paniculata.*

Fen Area

The small fen area is dominated by *Carex rostrata* close to or at water level with other species such as *Cladium, Molinia, Mentha, Equisetum fluviatile* in the slightly drier areas (see Appendix X). On the slopes from the bog into this small fen *Molinia* tussocks and *Phragmites* dominate.

Stream (Outfall L)

The NE bank of the stream/river which exits from Lough Lurgeen is dominated by tall *Calluna* (60-80cm) with *Myrica* and patches of *Molinia* (see Appendix X for complete list). A series of channels 10-15m long occur at right angles to this stream along both banks. These are usually dominated by *Molinia* with some *Myrica* and occasionally *Phragmites*. The vegetation of the SW bank is similar to that of the NE but *Pteridium* is much more abundant. There are also many deep inter-connecting erosion channels which run into the river (PL14:18) and some were still carrying water at the time of the survey. Vegetation Complex 2/3 dominates between the erosion channels with *Trichophorum, Carex panicea* and *Calluna* the dominant species.

The vegetation of the stream was noted at eight different points along it and the EC of the water measured (see Section 5.3.1). The average EC upstream close to the lake was 176 μS/cm and closer to the confluence of this stream and the river to the SW of the site the conductivity is 196 μS/cm. *Filipendula* and *Valerian* dominate close to the lake (PL14:16 and PM14:30+31). The river/stream floods as far as sample point 7 (see Drains and Hydrochemistry Map) and this is indicated by the presence of algal mats. *Phragmites*, *Myrica, Filipendula, Salix, Dryopteris dilatata, Potentilla palustris* and *Lysimachia nemorum* were recorded along a meander in the stream. At sample point 8 (PM14:35) *Potentilla anserina* was seen on the bank (this usually indicates fluctuating water levels) and *Nuphar, Menyanthes,* and *Angelica* were noted in the river. There was evidence of iron staining. *Cladium* was growing in the floodplain at this point. The *Salix* along this stream appears to be dying (PM14:36).

6.2.4 Vegetation of the river which bounds the SSW and W of the main bog (Outfall V).
This river flows to the NW and joins with the river coming from the lake in the bog (Outfall L) before continuing NW into Glennamaddy turlough. At the confluence of the rivers there is a floodplain covered with algal mats with a number of mesotrophic species such as *Lemna, Eleocharis palustris*, *Typha, Iris, Callitriche* and *Myosotis* in the river with *Alnus glutinosa* and *Molinia* tussocks on the flood plain (PM14:36). (For a more comprehensive species list see Appendix B). This river has conductivities ranging from 563-588 μS/cm and is probably suffering from eutrophication due to the flooding of Glennamaddy turlough into which untreated sewage is pumped (PL13:20 and 21).

6.2.5 Vegetation of the River separating main bog from SE lobe (Outfall D).
This river flows in an ENE direction. The SW end has been realigned and is described under Drain bE1. Water is fed to the river from Flush Z1 and Drain bE1. The river section is 1.5m deep with 25cm of water on a sandy base (check levelling transects). The banks are dominated by the facebank complex with *Myrica, Pteridium, Molinia* and some *Salix* along the edge. This vegetation with the addition of *V. myrtillus* extends along erosion channels and old drains beyond the banks. There are clumps of *Osmunda* along the river. A detailed vegetation list is given in Appendix B.

7. BOG TYPE

This bog has been classified as a Ridge Basin bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes (see 'Top Contours' 6" map (Appendix II) and aerial photo)
The 'top contours' map shows the topography of the peat surface (Bord na Mona c. 1940s). Two rivers separate the bog into three lobes. Outfall V, separates the large main bog (containing the lough) from a large cut-over area and widely drained bog to the west. Outfall D, separates the main bog from a smaller 'SE lobe'. The main bog with Lough Lurgeen and its river (Outfall L) is the principal area of interest. The lough and river lie in a linear NW/SE depression (85-87m OD), surrounded by three peat ridges at a level of 90m OD. There are significant slopes at right angles to Outfall L and the lake.

On the SE lobe there are significant slopes towards the river.

Overall, apart from the lake and streams, the main bog appears to be rather flat with only slight slopes. It does not have a dome-like watchglass topography.

A number of slopes were estimated in the field and these are described below (See Slopes Map).

Slope 1. This slope is at the S of the SE lobe and is 0.5m over 50m into Complex 4/2 + pools.
Slope 2. This slope is along the N of the SE lobe N towards the river (Outfall D) and old erosion channels and is 1m over 150m.

Slope 3. This slope is long and extends along the NNE of the SE lobe to the river (Outfall D) and area of peat cutting. It is 3m over 400m. The facebank edge along the river at this point is low with a shallow gradient.

Slope 4. This is at the NE of the SE lobe and is 0.5m over 30m to a marginal drain and old peat cutting. There are many erosion channels in the vicinity with bare peat and the vegetation is dominated by *Trichophorum* and *R. alba*.

Slope 5. This slope is along the S edge of the main bog in an area where there is extensive peat cutting and some forestry. The slope is 0.5m over 30m to the W. The facebank edges are 0.5-0.75m tall.

Slope 6. This is at the most S section of the main lobe and is 0.2m over 30m S along Drain bB1 into *Molinia* dominated old peat cutting area.

Slope 7. This slope at the SE of the main bog is 1.5m over 50m from the W towards Flush Z1N.

Slope 8. This is a slope from the SW of the high bog towards the lake between the *Molinia* dominated sections of Flush Y and is 2-3m over 400m.

Slope 9. This is at the E of the main bog NE towards a river along the bog edge and is 1.75m over 200m.

Slope 10. This slope on the main bog in an area near the forestry plantation is 0.3m over 50m (PM14:22). It slopes downward parallel to the forestry - which is new since the 1970s.

Slope 11. This slope is at the N of the site and is 0.5m over 50m NE towards a clump of pine at the edge of the site.

Slope 12. This slope is at the N of the site NW into Drain bK1 and is 0.5m over 50m.

Slope 13. This slope is towards the NE to Flush T and is 2.5m over 75m.

Slope 14. There are two slopes at a point SE of the lake; one to the N is 1.5m over 60m through complex 4/2 +Pools, that to the S is 1.5m over 30m to an area with extensive peat cutting.

Slope 15. This slope to the E of the lake towards Flush T is 2m over 70m.

Slope 16. This slope from the NE into the lake edge is 2m over 100m. The water level in the lake is about 1.5m below the peat banks of the lake edge.

Slope 17. This is the slope SE towards the edge of Flush X and is 1.75m over 100m.

Slope 18. This is a slope to the ENE of the site from the level high bog towards old peat cutting with forestry beyond - new since 1970s. The slope is 2m over 300m.

Slope 19. This slope between Flushes W2 and W3 is from the NE towards the river (Outfall L) and is 1.5m over 75m (PM14:29).

Slope 20. This is a gentle slope along the SW of the site into forestry and peat cutting and is 0.2m over 75m.

Slope 21. Slope 21 is from the SW of the site NE towards the river (Outfall L) and is 4-5m over 500m. It is gentle for most of its length and rather steep near the river.

Slope 22. This slope is further W along the river and is a measure of how steep the slope is into the river - 1.75m over 30m. The bog this side of the river is very badly eroded.

Slope 23. This slope to the W of the main bog towards a river (Outfall V) is 2m over 100m with the steepest section near the river.

Slope 24. This slope is along the W of the site into an area of old peat cutting and is 0.75m over 30m with some cracking and slumping. There is facebank complex in the area.

Slope 25. This slope is on the high bog parallel to the SW edge and is and is 0.3m over 50m towards Flush S. There is a lot of surface water in the area (Complex 4/2).

8.1.2 Levelling Transects and Vegetation Complexes (Transects)

Levelling
There are several levelling transects showing peat heights and underlying subsoil heights. They are part of the Bord na Mona (c. 1940s) suite of maps, enclosed in Appendix II.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting
Overall, given the size, of the site there is relatively little active peat cutting at the Lough Lurgeen bog. The presence of rivers around most edges prevents access. Active peat cutting occurs to a limited extent to the S, SW and SE of the bog and these areas are marked APC on the Landuse map. The peat cutting is often carried out in isolated small plots among abandoned plots. There is a mixture of hand cutting, hopper and difco extraction. Difco is carried on at the NE of the SE lobe; the hopper method is usually used along the N bank of Outfall D and in some areas to the SW of the site. The facebanks on the areas close to mineral mounds (E and NE) are quite shallow. Facebanks around the remainder of the site reach 2-3m in height with the tallest banks to the SSW. Previous widespread cutting has occurred to the SW of the main bog beside the main river (outfall V), resulting in extensive cut-away to the main road; and also to the S and SE along Outfall D; to the S and SSW along an old access road and to the ENE along a track on a till mound. There is abandoned peat on the high bog in the vicinity of Drain bB1 to the S of the main bog.

8.2.2 Forestry
There is some forestry to the N, NE, SSW and S of the site, most occurring in the cut-away though one of the more recent plantations has been on the high bog to the N of the site. Plantations to the NE (privately owned: see Douglas and Grogan, 1985) and SSW are approximately 15-20 years old. Sitka spruce occurs to the S, SSW and SE of the SE lobe. A small afforested area to the SSW (1993 aerial photograph) appears to have been burnt or harvested since then.

8.2.3 Fire History
There are indications that the site has suffered frequent burning in the past. The frequency of *C. panicea* and *Narthecium,* the short *Calluna* growth overall and the presence of *Campylopus introflexus* and C*ladonia floerkeana* in many of the complexes points to this fact. The presence of so much surface water throughout this site may indicate that compaction of the top layer has occurred due to burning. The International Mires research group carried out vegetation and water analysis of the site in 1988 and also noted that there was much burning (Fojt, 1988). The banks of the stream from the lake (Outfall L) have suffered fire damage. The surface is very hard and tussocky with some *Epilobium angustifolium* and *Cladonia floerkeana* present. Areas in the cut-away to the SSW of the site and the forestry in the same area appear to have been burnt recently. A part of the bog, by the mature forestry to the N of the site, has not been burnt recently and supports up to 40% *Cladonia portentosa* with tall *Calluna.* Douglas and Grogan (1985) note that this area had not been burnt in the recent past. Another area to the SE of the main bog in Complex 6/3/2 + *Cladonia* supports up to 25% *Calluna* with *Cladonia* and there is less *C. panicea* than in other 6/3/2 vegetation complexes. There is up to 20% *Cladonia* in a similar complex in the SW lobe. There are no signs that the high bog has been burnt during the past two years.

8.2.4 Poaching
There is no poaching of the high bog surface at present. A section of the bog to the ENE has been fenced off and is grazed by cattle. The peat in the grazed area appears to be on mineral soil. It is very shallow and is dominated by *Ulex* and *Myrica.*

8.2.5 ESB poles
A series of ESB poles have been erected across the southern end of the SE lobe and the SSW of the main bog. There is increased surface runoff and bare peat in the vicinity of the poles.

8.2.6 Agricultural Improvements
Low intensity livestock farming is practised on the mineral soils surrounding the bog. The more poorly drained areas adjacent to the cutover bog are used as poor pasture or have developed into scrub land.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. 400 m to the NE of the lough a till ridge runs NW/SE underneath the bog for 2 km from Ashfield (1) house at 300ft O.D. (91.5m) to the path at 2, which has a till height of 290ft O.D. (88.4m). To the SW of the lough a till ridge runs SW/NE at 280ft O.D. (85.4m) for 1.5km from the main road at 3 to 4 on the high bog. To the west of line AB underlying till heights are less than 265ft O.D. (81m). This ridge is associated with several *Molinia* dominated flushes which are seen on the N side of the stream running from Lough Lurgeen..

2. When the top contours (peat surface) map is overlain onto the bottom contours (subsoil surface) map it is clear that peat is no more than 3 m deep along the northern till ridge (line 1 to 2), 4.5 m along line 3-4, and 4.5m to 6m at point 5. However, the peat is substantially thicker to the west of AB coincident with the lower heights of underlying till. The two contour maps suggest that the peat mirrors topography. Peat cover is thin on the drumlin ridges and thicker in the hollows (6-8m), west of AB. In other words this bog is not a raised bog, but an intermediate blanket bog that grows to form a plateau blanketing drumlin hummocks and hollows, in an area where there is thought to be surplus rainfall year round.

3. Permanent pool areas are only seen on the flatter sections of this site. On the sloping areas vegetation complexes more typical of marginal areas are seen.

4. Lough Lurgeen is present in a low point of the site with ridges on all sides. It is fed by springs and the higher EC and base status is reflected in the vegetation which is seen in the lake and along the exit stream.

5. If the Glennamaddy turlough is drained all rivers in the catchment will flow more easily since the head to the turlough low point will increase. This would cause outfall L on the bog to flow more freely year round. The river is unlikely to run dry since water from the lake and runoff from the bog would still feed it year round due to surplus rainfall. However, it would be important not to drain the turlough since the Glennamaddy catchment is a rare example of a bog that is adjacent to such a large karstic feature, and turlough vegetation.

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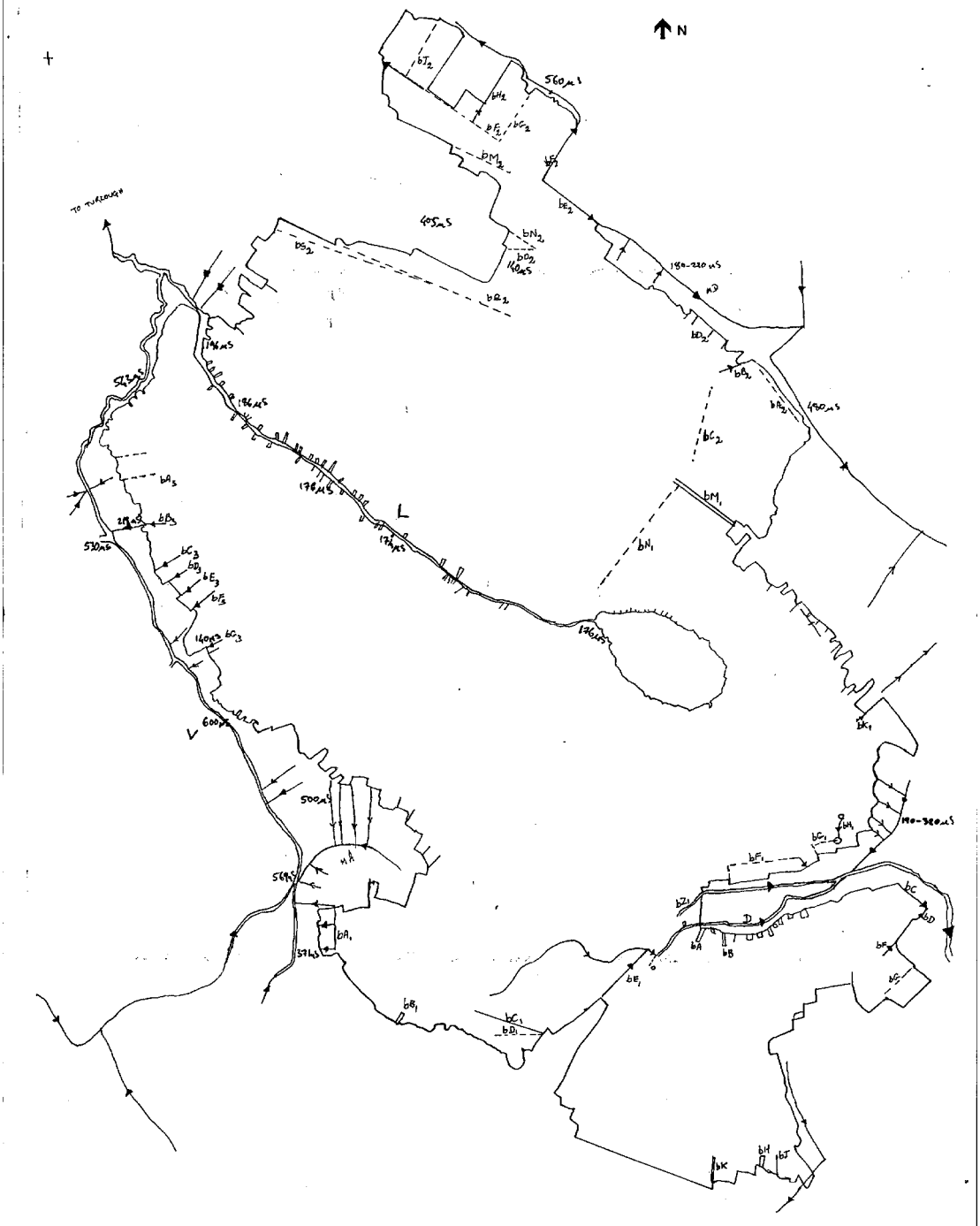
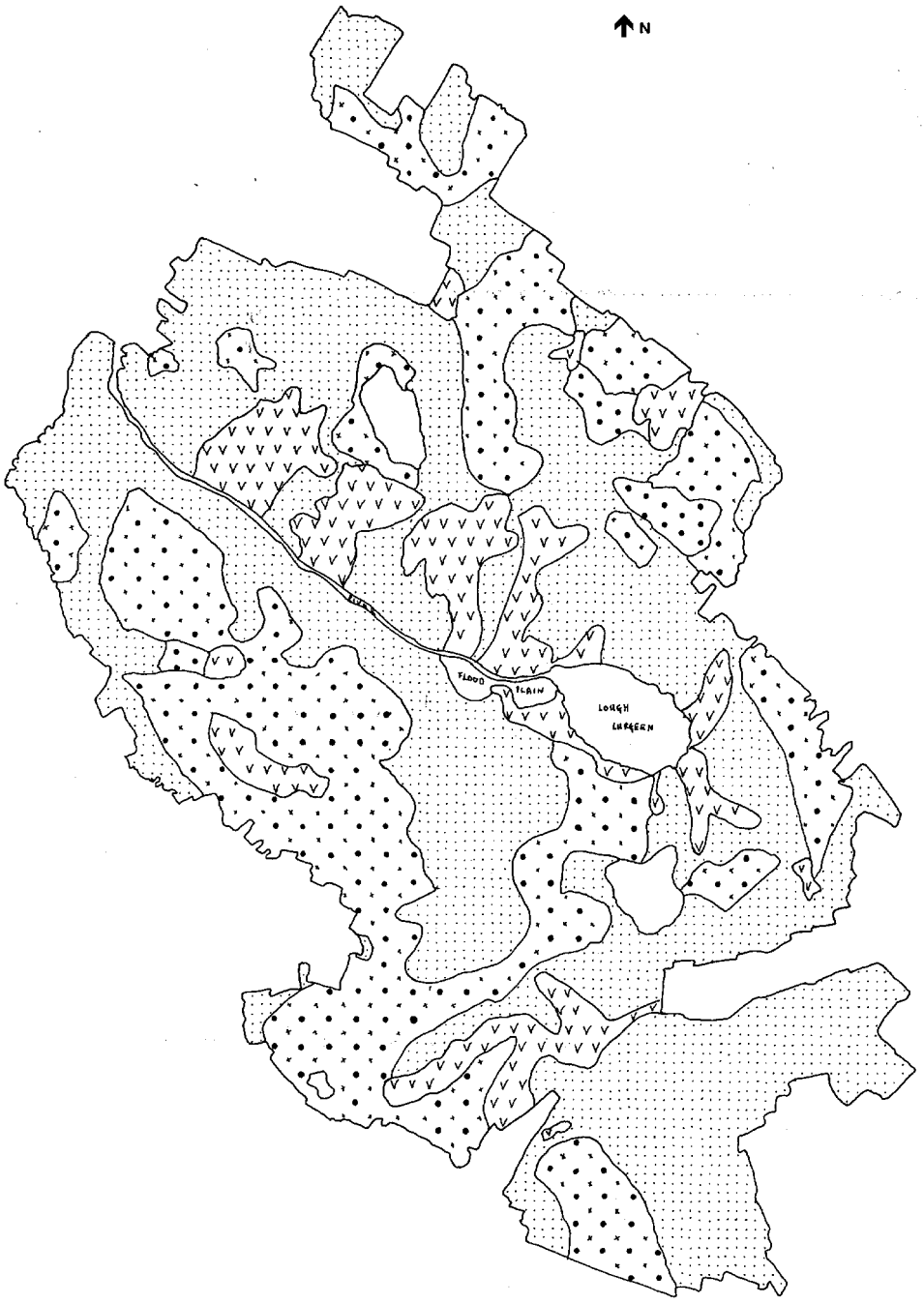
Raised Bog Restoration Project (1995).

LOUGH LURGEEN BOG, CO. GALWAY (301).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994

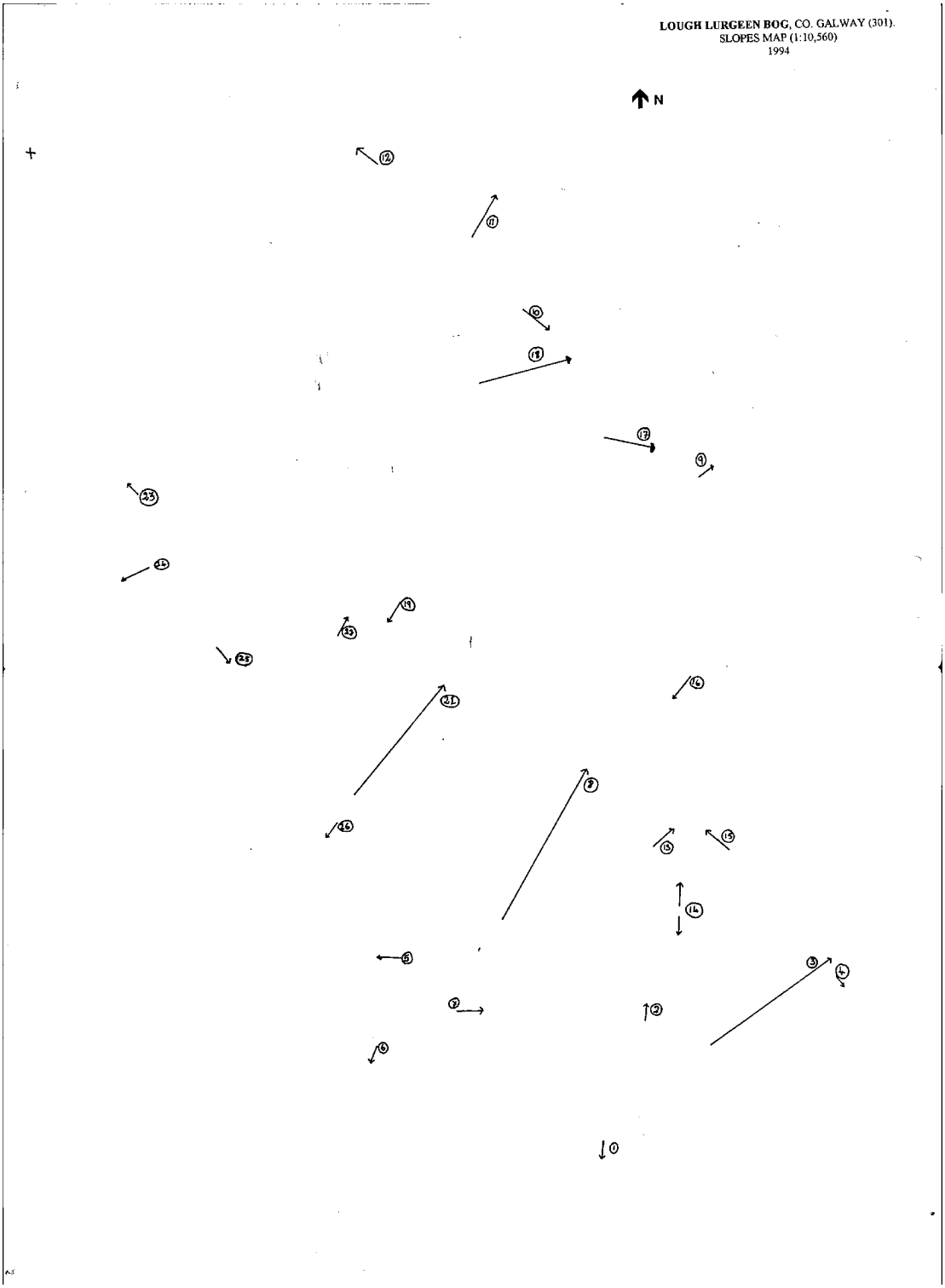


LOUGH LURGEEN BOG, CO. GALWAY (301).
VEGETATION MAP (1:10,560)
1994

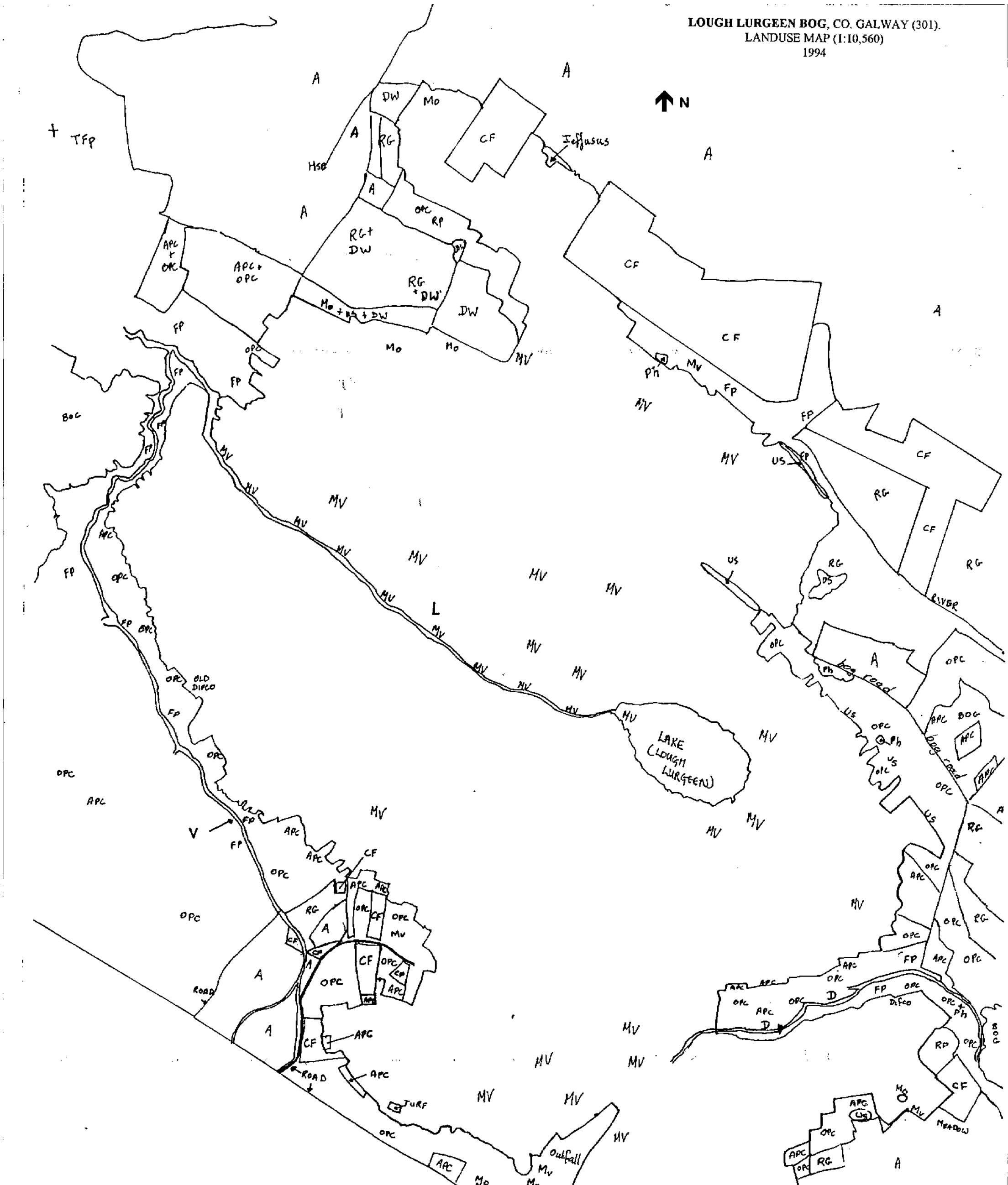
LOUGH LURGEEN BOG, CO. GALWAY (301).
ECOTOPE MAP (1:10,560)
1994



LOUGH LURGEEN BOG, CO. GALWAY (301).
SLOPES MAP (1:10,560)
1994



LOUGH LURGEEN BOG, CO. GALWAY (301).
LANDUSE MAP (1:10,560)
1994



REDWOOD BOG, CO. TIPPERARY

NHA No.	654	1/2" Sheet:	15
Grid Ref:	S 31 91	6" Sheet:	TY
GSI Aerial Photo:	S 528		
Other Photo:	SC (1993) 38025	Area (ha):	223.0 (Total)
Date of Visit:	20-4-94 (Ecologists)		181.5 (Intact)
	(Geohydrology)		

Townland: Redwood.

2. INTRODUCTION

2.1 BACKGROUND

This is one of the most westerly of the southern group of Midland raised bogs. Floodplains (callows) of both the Little Brosna and the Shannon rivers adjoin the bog cut-away all along its northern edge. The site is bordered to the east by a small stream which has been deepened and straightened; the stream separates Redwood from Ballyea Bog, which has been drained. To the west the road through the bog and another stream separate Redwood from peat which has been largely cut-away.

The site was surveyed by FWS in 1983 and was classified as a Bi site in Cross (1990). It was not included in the list of sites to form a network of raised bog nature reserves (Cross, *op cit.*).

However the site was designated as a National Nature Reserve in 1991 (Nature Reserve (Redwood Bog) Establishment Order, 1991). This designation was based mainly on its importance as a Greenland Whitefronted Goose (*Anser albifrons*) site, though this use appears to have declined in recent years (J. Wilson, note on file). *Anser albifrons* is an Annex I species listed in the Birds Directive. Wilson suggests that the bog may become more important as a roosting site in the future as other bogs in the area are cut-away.

Commercial peat cutting has seriously threatened the conservation potential of this site (see Section 5.1.1).

2.2 LOCATION AND ACCESS

The bog is situated N of the road L116 approximately 16km NNW of Birr. Entry is from L116 heading W from Birr to Portumna, turn right at Ballinacor cross roads where there is a signpost for Redwood Castle. Follow this road until it forks to the left, take the right hand turn and the next left. This accesses the bog along the road through the site.

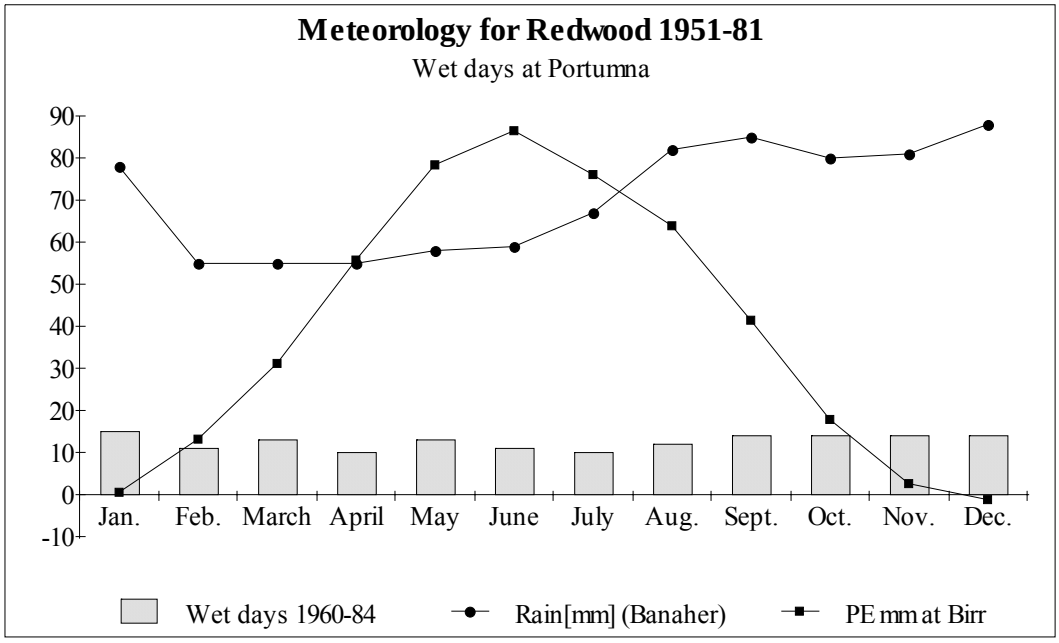
3. METEOROLOGY

No meteorological measurements have been made on Redwood bog. Rainfall data from the nearby Banaher rainfall station for the years 1951-80 indicate that the area receives approximately 844mm of precipitation annually (Figure X).

Evapotranspiration from a wetland is most difficult to determine in practice. On a large exposed Midland bog such as Clara, wind fetches are long, and evaporation may occur at near open water rates when levels are close to surface and evapotranspiration occurs from the vegetation itself (Daly and Johnston, 1994).

The recent Irish and Dutch work at Clara and Raheenmore suggests that actual evapotranspiration losses from the bog surface were found to be significantly more than estimated using potential evapotranspiration data from a regional, conventionally sited Meteorological Service station (Daly and Johnston, *op. cit.*).

Figure X:



The above factors suggest that the year round actual evapotranspiration (AE) from Redwood bog is greater than PE at Birr, site of the nearest synoptic station which had an average PE of 466.5mm/yr (1951-81) calculated by the Penman method. Annual evapotranspiration losses from the bog surface at All Saint's would therefore be greater than 466.5mm/yr.

Potential recharge (PR) is the amount of water available for recharge after actual evapotranspiration has been accounted for, i.e. PR = P - AE. PR for this bog is therefore less than 377mm/yr.

Meteorological data for Redwood Bog (1951-1981) are summarised below:

Rainfall (P)	844mm/yr
Actual Evapotranspiration, (AE)	>466.5mm/yr
Potential recharge, (PR)	<377.5mm/yr
Raindays > 0.2 mm (annual {1951-1980})	207 days

4. GEOMORPHOLOGY

4.1 TOPOGRAPHY OF THE HIGH BOG

The site lies at approximately 41m O.D. and is heart-shaped with the broadest section to the N and narrowing towards the S. The site appears to consist of two basins which are separated, to some extent, by a stream running south to north, which is partially underground (Flush Y). Marginal slopes associated with drainage and peat cutting are seen in places around the site.

4.2 TOPOGRAPHY OF THE SURROUNDING AREA

Redwood Bog lies ~300m from the River Shannon within parts of its former floodplain. Callows lie to the immediate north of the bog. A high bedrock ridge lies south of the bog.

5. HYDROLOGICAL SYSTEM

5.1 GEOLOGY/GEOHYDROLOGY

5.1.1 Bedrock

Recent geological maps by Hitzman (Chevron/GSI,1993) show that the area is directly underlain by Waulsortian Carboniferous limestones (fossiliferous mudmounds). Calcareous shales lie to the south of the bog and form the high ridge.

The Waulsortian limestones generally have a low permeability and are classed as a poor aquifer.

5.1.2 Subsoils (See 6" 1840s Map)

Data Availability

No subsoils data were available for Redwood bog apart from the 1840s GSI geology field sheets and recent fieldwork.

Geology of Inorganic Subsoils

The subsoil geology of this bog and surrounding area is dominated by limestone till. Sections in drains on the cutaway areas indicate that the outer limits of the bog are underlain by poorly sorted clayey tills and clays which are overlain by shell marl of up tp 0.5m thickness (Slide X).

It is believed that Redwood bog is predominantly underlain by the clays which have a low permeability.

5.1.3 Depth to Bedrock

There is outcrop of calcareous shales directly south of the bog on the ridge. Depth to rock on the bog is unknown.

5.2 HYDROLOGY

5.2.1 High Bog Hydrology (See Drains and Hydrochemistry Map)

This site has been extensively drained along its western edge. This is associated with the peat exploitation being carried out by The Inch Turf Co. Flow off the high bog is seen in most of these drains. Although practically all of these drains do not extend into the NNR they are draining the area of high bog owned by NPWS. A deep drain is seen all along the east edge of the bog and there is much cracking and slumping of the high bog associated with this drain, thus increasing the drainage effects.

Drains bA and bB to the SW of the site are approximately 3m wide by 1m deep with low water flow to the west. Both extend from Flush Z. These drains are typical of those associated with the peat cutting all along the western boundary. Two such drains appear to extend on to the NNR.

Drains bD and bE to the NNE of the site are infilled with *Molinia, S. magellanicum*, *Calluna, Eriophorum angustifolium* and some *Betula*. Drain bD is a double drain. These drains are not clearly visible on the aerial photograph or in the field.

Drain bF at the western tip of the NW lobe is also completely infilled.

Drain bG in the same area runs NW/SE and forms the border between the NNR and the active peat cutting area. It is 1m wide by 1m deep with a large crack in the bottom. There is little flow. Just NE of this drain and perpendicular to it is a linear feature colonised by *Betula*, *Pinus* and *Salix* sp. Water is running underground towards the south and Drain bG (EC 127 μS/cm) through the feature.

Drain bH at the southern end of Flush Y is approximately 2m wide running towards the cut-away peat. Flow is in two directions towards the cut-away and towards Flush Y. This drain appears to extend onto the NNR.

Drain bJ (outside the NNR on Ballyea Bog) is covered over with *Myrica, Betula, Ulex* and *Calluna.*

Drain complex bK (about 22 drains on Ballyea Bog) are approximately 1m wide by 0.5m deep and 20m apart flowing NE. On the spoil from the drains *Campylopus introflexus, Erica tetralix, Myrica* and tall *Calluna* may be seen.

5.2.2 Bog Margin Hydrology (See Drains and Hydrochemistry Map)
Drain mA is 7m deep in the vicinity of drain bG.

Drain mC is the deepened stream along the eastern boundary and mineral soil is exposed in the south and north. mC is approximately 4m deep and has been recently dredged in places. There is rapid flow to the NE. Species noted in the drain include *Typha latifolia*, *Myosotis scorpioides*, *Mentha aquatica*, *Agrostis stolonifera*, and *Myriophyllum* sp.

5.3 HYDROCHEMISTRY

5.3.1 Field Hydrochemistry (See Drains and Hydrochemistry Map)
Drain mA has ECs ranging 370-640 μS/cm.

Drain mC has ECs ranging 102-213 μS/cm.

5.3.2 Laboratory Hydrochemistry
No samples were taken for analysis at the Coillte laboratory.

5.4 GEOHYDROLOGICAL OVERVIEW

Regional Situation
Redwood bog lies in a regional groundwater discharge zone and is situated between a NE/SW trending bedrock cored ridge and the River Shannon. The underlying limestone aquifer has a low permeabilty and hence the water-table in this area would be relatively close to the surface.

Bog Regime
The two main drains on the east (mC) and west (mA) side of the bog are relatively deep and intercept the water-table of a shallow aquifer. The northern side of the bog is relatively undisturbed, old peat-cutting has occurred here.

Inter-relationship
This bog developed in a basin which may have in the past been partly flooded by the River Shannon. Any natural lag zone have been cut-away.

6. VEGETATION

6.1 VEGETATION SUMMARY

Overall the bog is dry with an abundance of *Rhynchospora alba* erosion hollows in the marginal areas and *Narthecium* hollows on the higher slopes or sub-marginal areas. The marginal areas have a low *Sphagnum* cover (0-15% total cover). Approximately 40ha have a moderate to high *Sphagnum* cover (18% of the site). The main lobe has a central wet area which corresponds to the area with the highest *Sphagnum* cover (up to 50%) and permanent *S. cuspidatum* pools with a cover of 15%. There is a higher *Sphagnum* cover on the central section of the NW lobe than on the main bog. In the central area of the NW lobe the permanent pools had a cover of approximately 5%. In both central areas many of the pools were linear up to 5m in length in places suggesting tearing and slumping of the bog surface due to peat cutting.

The whole bog has indications of burning and disturbance. The *Sphagnum* species have been burnt in many areas and have not regenerated to any great extent. *S. papillosum* is the main *Sphagnum* species

seen. *S. magellanicum* was only recorded in very small amounts and the areas where it did occur appear to have escaped recent burning. This may suggest that *S. magellanicum* is susceptible to fire or that *S. papillosum* is the first species to regenerate after fire. *S. imbricatum* was only recorded in the central area of both lobes. Small amounts of *Carex panicea* were seen, mainly associated with the flushes or peat cutting. *Pleurozia purpurea* and *Racomitrium lanuginosum* were recorded on the NW lobe and associated with peat cutting to the south-west. *Pedicularis sylvatica* was noted at the NE of the site on a recently burnt and desiccated marginal area.

The *Cladonia portentosa* cover was limited, probably due to frequent burning. The only area with a significant cover was on the NW lobe in both Complexes 10^{-} and 15^{-}+*Cladonia* (Cl). Epiphytic lichen cover on *Calluna* was recorded in two areas which had not been recently burnt.

The cut-away area to the north is colonised by mixed deciduous woodland with copious amounts of *Ulex*. The callows of the River Shannon and The Little Brosna river adjoin the woodland areas.

South-east of Drain mC to the north of Ballyea bog there is an area of old cut-away which supports *Molinia, Betula, Ulex* and *Calluna*.

6.2 DETAILED VEGETATION OF THE HIGH BOG

The present vegetation cover of the bog is divided into a number of community complexes, which are described according to the community types they contain. The distribution of the community complexes is shown on the Vegetation Map.

These community complexes are also divided into ecotope types (See Ecotope Map).

6.2.1 Complexes

Marginal Complexes

Complex 1

The *Calluna* dominated face bank complex occurs in small amounts on the north-eastern and north-western edges of the site and in places along Drain mC (Too small to map). There is usually very little or no *Sphagnum* cover in this complex and the bog surface is hard.

Complex 2

Much of the edge of the bog is desiccated and there is up to 30% bare peat with relatively high amounts of *Trichophorum cespitosum*, algal hollows and burnt flats. There is much *Campylopus introflexus* and *Cladonia floerkeana* - evidence of past disturbance/burning. Up to 25% cover of *Erica tetralix* is recorded from this complex. A high cover of *E. tetralix* is also an indication of a disturbance event.

At the NE of the main lobe close by Drain mC *Pedicularis sylvatica* was recorded in large amounts in this complex.

Complex 4/2

This is found near the edge of the bog where there is a recent history of burning and/or where severe slumping and cracking of the bog surface is taking place. It is also found on both sides of Flush Y where there is much water logging and the ground is sloping. *R. alba* and *Trichophorum* dominate. *Sphagnum* cover is almost absent except at the N of the NW lobe where it reaches a cover of 10% possibly because it does not appear to have been burnt as recently. *Pleurozia purpurea* was seen in the same area. Erosion channels and algal hollows are the principal features of the complex. The terrain is slippery and rough with disturbed and bare peat.

Complex 4

A very small area to the E and W of Flush Y is dominated by *R. alba* and the surface is water logged. There are occasional patches of *Sphagnum* species but overall the bog surface is quite hard. Patches of *Carex panicea* occur within this complex to the W of Flush Y (3).

Complex 4/2/6
This complex is found where there is severe cracking, slumping and sloping of the bog. It is seen along Drain mC and on the sub-marginal slopes at the NE of the main lobe. *Sphagnum* cover is extremely low. There are many patches of bare peat, algal (30%) and *R. alba* hollows with 40% cover. There is not very much *Narthecium*. Evidence that the area has been burnt include the presence of *Campylopus introflexus*, *Cladonia floerkeana* and plenty of *T. cespitosum.* There are clumps of *Myrica* in the complex near Drain mC. Small amounts of *Carex panicea* were recorded close to Drain mC.

Complex 4/6
This is a marginal complex which is characterised by *Rhynchospora alba* erosion channels (20%) with *Narthecium* and algal hollows. The *Sphagnum* cover is low (10%). The intervening areas are dominated by *Calluna*. *Pleurozia purpurea* was noted in this complex.

Complex 6
This is dominated by *Narthecium* hollows with some algal hollows and *Carex panicea*. Occasionally there are small pools with *Sphagnum cuspidatum*. This complex is located on the slopes leading down to Flush Y and on the northern edge of the NW lobe. The *Sphagnum* cover is mostly low and the bog surface is hard under foot.

Sub-Marginal Complex
Complex 6/4
This is found between Complex 4/6 and the central complexes 10^{-} and 15. It is dominated by *Narthecium* hollows (20%) and *Rhynchospora alba* hollows (20%). The total *Sphagnum* cover is low (10%) but higher than in the above complex. On the NW lobe the epiphytic lichen cover on *Calluna* on hummocks in this complex is 4 (2).

Sub-Central Complex
Complex 10^{-}
This complex is found on the NW lobe (PL5: 34 looking east along the NW lobe) and in a small patch near the cut-away at the W of the main lobe. It is a transition complex and in this case the dominant moss is *S. papillosum.* There are a few small pools with *S. cuspidatum* and *Drosera anglica* present. To the west of the complex where the bog surface seems to be stressed there are linear tear pools aligned in an E/W direction. *Sphagnum* cover is approximately 60% with small amounts of *S. imbricatum, S. magellanicum* and *Leucobryum* hummocks though there are still indications of burning - short *Calluna* and burnt woody stems. It appears that *S. papillosum* is one of the earlier mosses to regenerate after burning. There is moderate cover of *Eriophorum vaginatum*. The *Cladonia* cover improves to the W of the complex (40%) and includes *C. portentosa*, *C. uncialis* and *C. subcervicornis* ssp. *verticillata. Calluna* epiphytic lichens are 4 (2).

Where the complex occurs on the main lobe there are many algal pools and the *Sphagnum* cover in the inter-pool area varies.

Central Complex
Complex 15^{-}
This is found on the central section of the main lobe and its distribution corresponds to the shape of the lobe. There is also a small area of the complex found on the NW lobe (Complex 15^{-}+Cl), possibly associated with slumping and water ponding. The bryophyte cover in comparison to the other areas on the main lobe improves (total *Sphagnum* cover approximately 50%) but many clumps are dead as a result of burning. The *Sphagnum* cover is lower on the Main Lobe than in the central complex of the NW lobe. This is probably due to the effects of burning. *Calluna* growth throughout the complex is low. This is not a very good example of the complex because in addition to the above all the pools are not filled with a healthy growth of *S. cuspidatum*. Also the pools are not rounded but rather are linear (NE/SW direction) and some are up to 7m long. A few pools support healthy *S. cuspidatum, Menyanthes, Drosera anglica* and *R. alba.* The inter-pool areas have a varying acrotelm depth according to the amount of burning. Some of the hummocks support *S. imbricatum* with *Vaccinium myrtillus* on the taller ones. They may have been taller/bigger prior to damage as a result of burning. No lichen epiphytes were recorded on the *Calluna.*

In this complex there is a circular patch of *Myrica.* It too had been burnt.

The other area of this complex on the NW lobe is drier and supports a *Cladonia portentosa* cover of 30-40% (15^{-}+Cl). On one clump of tall *Calluna* the epiphytic lichen cover was 4/2.

6.2.2 Flushes

Flush Z is situated to the south of the main bog lobe, is quite long towards the south and extends in an arc over towards the east in its northern part. It is a dry feature colonised mainly by *Molinia, Betula, Myrica, Calluna, Ulex, Pteridium* and *Cladium* with *Succisa pratensis, Erica tetralix* and *Dryopteris* sp. There were no areas of open water but the EC probe pushed down into the surface vegetation gave a reading of 106 μS/cm (recent rainfall). A linear band (3m wide) of vegetation mainly colonised by *Phragmites* and *Cladium* leads towards the NNW with a solitary pine tree with *Molinia* and *Myrica* growing under it (PL5:36). The northern section of this flush corresponds to an area on the 1910 6" sheet which indicates an area of *Ulex* scrub. (PL5:30 and PL5:31 towards west). The presence of *Cladium* suggests that this may be an area of fen but the EC measurements do not support this. Samples at depth or a peat chemistry analysis may be required to examine this. It may be associated with a ridge of under lying mineral material. This flush had been burnt in the past as it contained dead burnt pine trees.

Flush Y is another linear feature running south to north in the northern part of the site. It follows the path of a mostly subterranean stream which flows to the north and into the Little Brosna River. (EC 86 μS/cm). This flow is significant. This area also had indications of past fires as some of the *Betula* trees were burnt. Other species recorded were *Molinia, Ulex, Myrica, Carex panicea, Vaccinium myrtillus, Calluna, Erica tetralix, Potentilla erecta, Rubus* and *Lonicera.*

In the central section of this flush there is a *Sphagnum cuspidatum* dominated pool (EC 94 μS/cm) surrounded by *Molinia* and *Eriophorum vaginatum* with some *Leucobryum* hummocks. The remainder of the southern section of this flush consists mainly of clumps of *Molinia* and *Ulex* (PL5:35 looking SE). Patches of *Carex panicea* were recorded along the western edge of this flush. This may indicate increased peat mineralisation in the area. Patches of flushed vegetation extend southwards from the main body of this flush.

7. BOG TYPE

This bog has been classified as a Ridge River C bog type.

8. HUMAN IMPACT

8.1 SLOPES AND RELATIONSHIP TO VEGETATION

8.1.1 Slopes

A number of slopes were estimated in the field. They are described below and illustrated on the Slopes Map.

Slope 1 In the NE corner of the site there is a slope of 3m over 100m with severe cracking and slumping of the bog surface.

Slope 2 Just south of this the slope is more gradual 2m over 200m (PL5:33 toward L. Brosna).

Slope 3 The north central edge, where Flush Y exits the bog, the slope is steep with a fall of 4m over 100m.

Slope 4 The northern boundary of the NW lobe has a slope of 3m over 60m close to a small area of active turbary.

Slope 5 All along the eastern boundary (Drain C) the terrain is very rough with slippery bare peat and a lot of cracking running at all angles. Some of these are filled with water and are acting as drainage channels. On the approach from the NW the slope is 2m over 75m.

Slope 6 The southern boundary of the NW lobe slopes steeply towards the cut-way, approximately 4m over 100m with severe cracking and slumping of the high bog surface.

8.2 RECENT HUMAN IMPACT (See Landuse Map)

8.2.1 Peat Cutting

There is extensive peat cutting along the west of the main lobe with resulting drainage of the high bog. This is being carried out by The Inch Turf Development Co. (Mr. T. Ryan). There are many notes on file concerning this development. Two of the drains associated with the peat cutting appear to extend on to the NNR. Access around the remainder of the site is not easy. There is a small patch of active turbary to the N of the NW lobe.

8.2.2 Fire History

There are many indications that this site has been burnt on a regular basis, even the wettest sections of the site. Short *Calluna*, damaged *Sphagnum* and the occurrence of the disturbance indicators *Cladonia floerkeana* and *Campylopus introflexus* all point towards fire events.

9. INTER-RELATIONSHIPS OF VEGETATION, HYDROLOGY, TOPOGRAPHY AND LOCATION

1. Drain m C at the E of the site is very deep and has caused severe slumping. There is also slumping to the NE

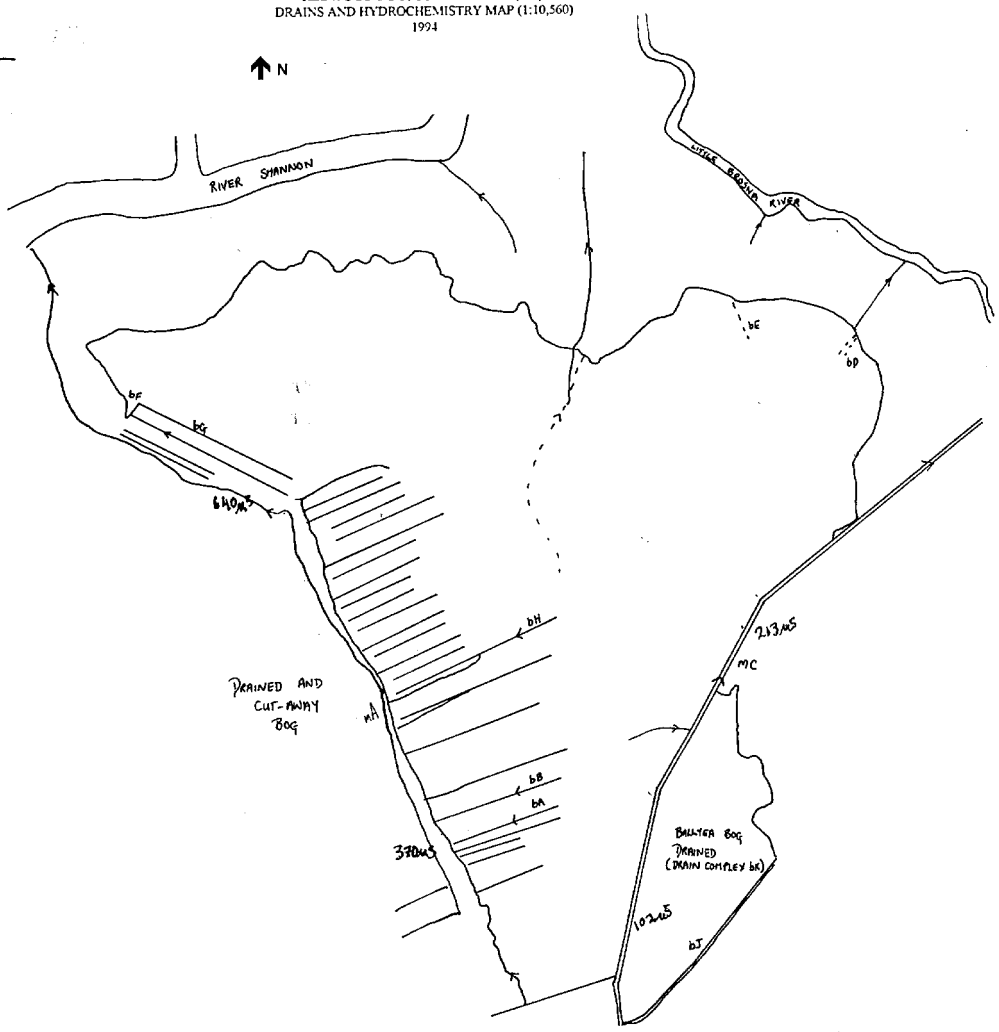
2. The pools in the central section of this site are elongate in places and open water is quite common. This suggests that tearing of the bog surface has occurred.

3. Frequent burning has occurred on the main lobe and the *Sphagnum* species have suffered so that there are few well developed hummocks.

Lara Kelly
Marie Dromey
Malcolm Doak

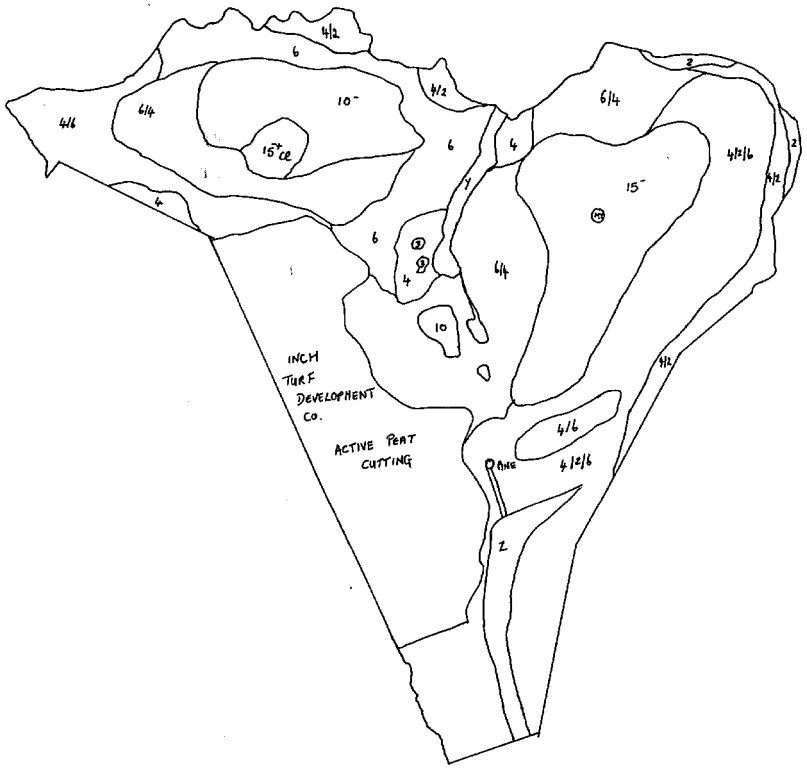
Raised Bog Restoration Project (1995).

REDWOOD BOG, CO. TIPPERARY (654).
DRAINS AND HYDROCHEMISTRY MAP (1:10,560)
1994



REDWOOD BOG, CO. TIPPERARY (654).
VEGETATION MAP (1:10,560)
1994

N



REDWOOD BOG, CO. TIPPERARY (654).
ECOTOPE MAP (1:10,560)
1994

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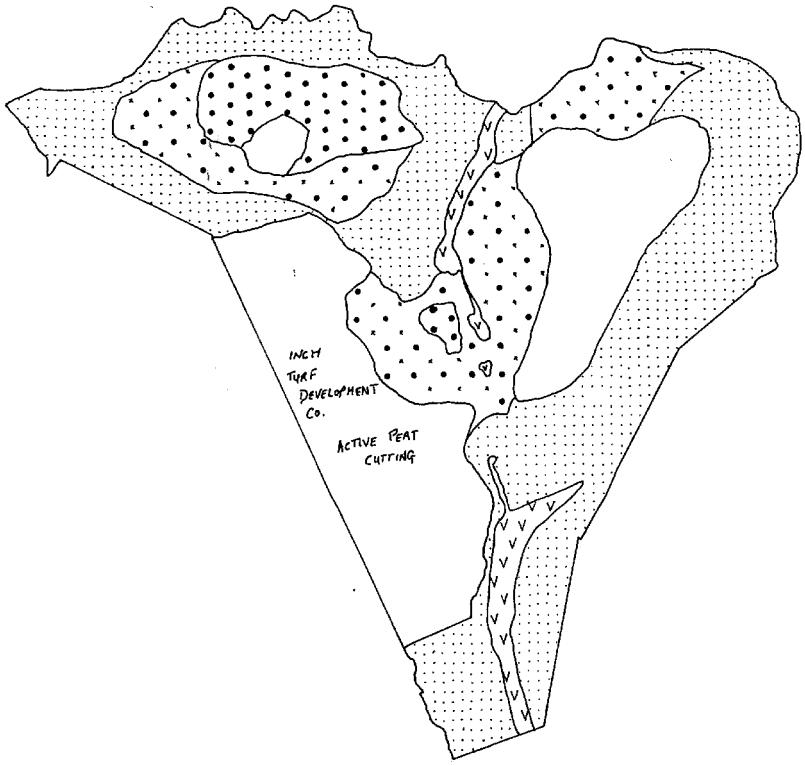
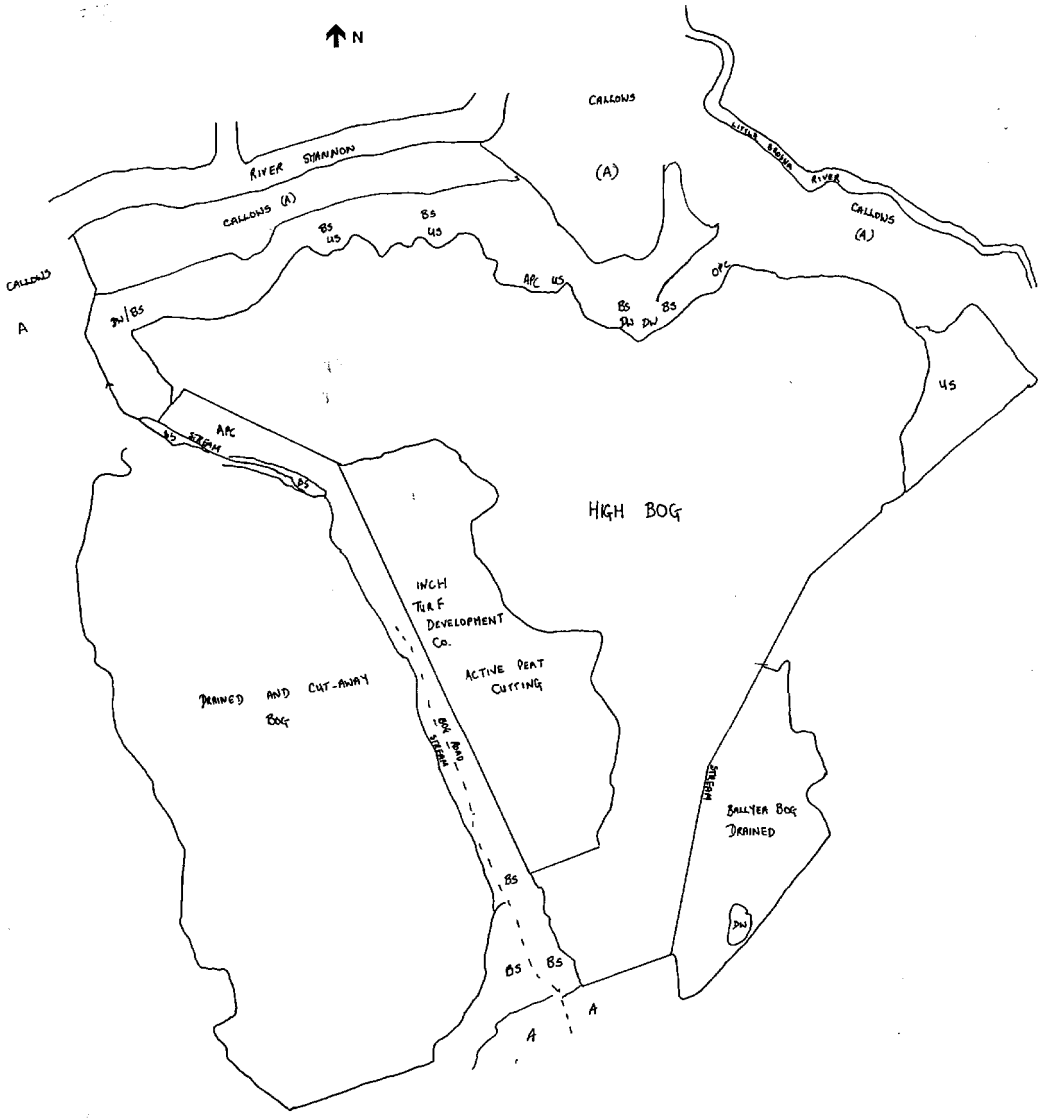


REDWOOD BOG, CO. TIPPERARY (654).
LANDUSE MAP (1:10,560)
1994



APPENDIX A

LIST OF PLANT SPECIES ON TRACKS ON FIRVILLE AND KILCARREN BOGS, CO. TIPPERARY

Species	Kilcarren	Firville
Anthoxanthum odoratum	+	+
Betula pubescens		+
Blackstonia perfoliata		+
Brizia media	+	+
Carex demissa	+	
C. echinata	+	
C. flacca	+	+
C. lepidocarpa	+	+
C. nigra	+	+
C. pulicaris	+	+
C. rostrata	+	+
Centaurea nigra	+	+
Cirsium dissectum		+
Dactylorhiza incarnata	+	
D. maculata	+	+
Equisetum fluviatile	+	+
E. palustre	+	+
Epipactis palustris		+
Filipendula ulmaria	+	+
Galium palustre	+	+
G. verum		+
Holcus lanatus	+	+
Hydrocotyle vulgaris		+
Juncus articulatus		+
J. bulbosus	+	+
J. conglomeratus	+	+
J. effusus	+	+
J. inflexus	+	+
Leucanthemum vulgare		+
Listera ovata	+	+
Lotus corniculatus	+	+
Luzula multiflora	+	+
Melampyrum pratense	+	
Mentha aquatica	+	+
Menyanthes trifoliata	+	
Molinia caerulea	+	+
Polygala vulgaris	+	+
Potamogeton polygonifolius	+	+
Potentilla erecta	+	+
Pteridium aquilinum		+
Ranunculus flammula	+	+
Rhinanthus minor		+
Salix sp.		+
Schoenus nigricans	+	
Scirpus fluitans	+	+
Trifolium pratensis		+
Triglochin palustris	+	+
Ulex europaeus	+	+
Valeriana officinalis	+	+
Vicia cracca		+
Calliergon cuspidatum	+	+
S. auriculatum var. inundatum	+	
Aulacomnium palustre	+	
Drepanocladus fluitans	+	
S. cuspidatum	+	

APPENDIX B: LIST OF PLANT SPECIES IN THE VARIOUS FLUSH AND RIVER SYSTEMS ON LOUGH LURGEEN

FLUSH	Flush Z	Flush Z1S	Flush Z1N	Flush Z1W	Flush X	Flush Y	Flush W1	Flush W2	Flush W3	Flush W4	Flush U	Flush V	Flush T	Flush S	River L	River V	River D	Track
SPECIES																		
Achillea millefolium																		+
Agrostis sp.	+	+	+	+							+				+	+		+
Alnus glutinosa																	+	
Anagallis tenella																		
Andromeda polifolia					+	+				+		+						+
Angelica sylvestris															+	+		+
Anthoxanthum odoratum	+			+	+			+				+	+		+			+
Arrhenatherum elatius																		+
Betula pubescens					+	+	+	+	+	+								
Blackstonia perfoliata																		+
Blechnum spicant								+										
Brizia media																		+
Callitriche																		+
Calluna vulgaris	+	+	+	+	+	+		+			+	+	+		+			+
Caltha palustris																		
Carex demissa																		
Carex echinata				+								+					+	
Carex flacca																		+
Carex lepidocarpa																		
Carex nigra															+		+	

Carex ovalis																	+	
Carex panicea						+												+
Carex paniculata				+											+		+	
Carex pulicaris															+			+
Carex rostrata	+																+	
Centaurea nigra															+			+
Centaurium erythraea																		+
Cirsium dissectum																		
Cirsium palustre															+			
Cladium mariscus																+		
Cynosurus cristatus																		+
Dactylis glomerata																		+
Dactylorhiza incarnata																		
Dactylorhiza maculata				+		+				+								+
Daucus carota																		+
Deschampsia caespitosa				+							+							
Deschampsia flexuousa																		+
Digitalis purpurea													+					
Dryopteris dilatata		+	+	+				+					+		+	+		
Eleocharis palustris																	+	
Empetrum nigrum										+								
Epilobium angustifolium															+	+		+
Epilobium palustre																+		
Epipactis palustris																		
Equisetum arvense																		+

Equisetum fluviatile																+		
Equisetum palustre																	+	
Erica tetralix				+	+													+
Eriophorum angustifolium					+	+											+	+
Eriophorum vaginatum				+	+	+		+										
Euphrasia sp.																		+
Festuca rubra				+											+			
Filipendula ulmaria		+		+											+	+	+	+
Galium aparine															+			
Galium palustre			+												+	+	+	
Galium verum																		
Glyceria sp.																	+	
Gymnodenia conopsea																		+
Hedera helix															+			
Heracleum sphondylium																		+
Hieracium pilosella																		+
Holcus lanatus	+										+				+			
Hydrochaeris radicata															+			+
Hydrocotyle vulgaris																	+	
Hypericum sp.																		+
Iris pseudacorus																	+	
Juncus articulatus																		+
Juncus bulbosus																	+	
Juncus conglomeratus																		
Juncus effusus	+	+	+	+	+	+	+	+			+	+			+		+	

Juncus inflexus																		
Lemna																	+	
Leontodon autumnalis															+			
Leucanthemum vulgare																		+
Linum catharticum																		+
Listera ovata																		+
Lonicera pericylamen															+			
Lotus corniculatus																		+
Luzula multiflora					+	+		+							+			+
Lysimachia vulgaris																+		
Lythrum salicaria																	+	
Medicago lupulina																		+
Melampyrum pratense																		
Mentha aquatica																	+	
Menyanthes trifoliata	+			+	+			+				+			+	+	+	
Molinia caerulea	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+
Myosotis scorpioides																	+	
Myrica gale	+	+		+	+	+									+	+	+	
Nasturtium officinalis																	+	
Nuphar lutea																+	+	
Nymphaea alba																+		
Osmunda regalis	+	+											+		+			
Pedicularis sylvatica						+				+								
Phragmites australis				+	+		+	+	+	+		+			+	+	+	
Pinus contorta								+										

Plantago lanceolata															+		+	+
Polygala vulgaris				+	+	+	+			+	+	+						+
Potamogeton natans																		
Potamogeton polygonifolius												+						
Potentilla erecta	+	+	+	+	+	+		+			+	+	+		+			+
Potentilla palustris	+	+		+											+	+	+	
Potentilla anserina															+	+	+	+
Prunella vulgaris																		+
Pteridium aquilinum	+		+								+		+		+			
Ranunculus acris															+			+
Ranunculus flammula																		
Ranunculus repens															+		+	+
Rhinanthus minor																		+
Rhododendron ponticum						+												
Rubus fruticosus	+	+	+	+		+					+		+		+	+		+
Rubus ideaus				+											+		+	
Rumex acetosa				+							+		+		+	+	+	
Salix sp.	+	+	+	+							+		+		+	+		+
Schoenus nigricans																		
Scirpus fluitans																		
Senecio aquaticus															+			
Senecio jacobaea																		+
Sorbus aucuparia															+			
Sparganium emersum																	+	
Stachys palustris																	+	

Succisa pratensis				+	+	+						+	+		+			+
Taraxacum sp																		
Trifolium pratense																		+
Trifolium repens																		+
Triglochin palustris																		
Typha latifolia	+																+	
Ulex europaeus												+			+			+
Utricularia												+						
Vaccinium myrtillus	+										+		+		+			
Vaccinium oxycoccus				+	+	+		+		+		+						
Valeriana officinalis																+	+	
Veronica chamaedrys															+			
Veronica scutellata																+	+	
Viola sp.															+		+	
Aulacomnium palustre	+				+	+						+						
Calliergon	+																	
Chara sp.																		
Drepanocladus fluitans												+						
Hypnum cupressiforme	+																	
Hypnum jutlandicum	+																	
Leucobryum										+								
Pleurozia schreiberi						+						+						
Polytriche commune			+															
Polytrichum alpestre					+	+		+				+			+			

Rytidialphus squarrosus																		
S. auriculatum var. inundatum																		
S. capillifolium				+	+	+		+										
S. cuspidatum																		
S. imbricatum					+	+				+								
S. magellanicum					+	+												
S. palustre																		
S. papillosum				+	+	+												
S. recurvum	+																	

Appendix C: Key to Ecotope Map

Symbol	Key
ν	Flush
●	Sub-Central
● X	Sub-Marginal
‘	Marginal