



**DESK STUDY:
HYDRO-ECOLOGICAL APPRAISAL OF
EMER BOG cSAC, NORTH BADDESLEY, HAMPSHIRE**

For

Test Valley Borough Council: Planning Service

In partnership with

**Environment Agency: Hampshire and Isle of Wight Area
English Nature: Hampshire and Isle of Wight Team**

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SUMMARY

This desk study provides an account of the current state of knowledge of the relationship between Emer Bog (a candidate Special Area of Conservation cSAC) and the adjoining countryside. This is the first part of a wider study intended to ensure that planning and other statutory processes, projects and plans, fully respect the hydro-ecological integrity of the site's European interest. Emer Bog cSAC comprises a wetland area (Emer Bog), adjacent wet woodlands and heathland and a smaller area of acid grassland to the southwest. The cSAC is part of a wider biodiverse cultural landscape and which holds other local ecological designations as well as providing a buffer to the surrounding managed agricultural land and the urban areas of Romsey, Chandler's Ford and North Baddesley.

The open wetlands at Emer are transition mires and fens, of types threatened in a European context and considered to be one of the best such areas in the UK. The vegetation comprises plant communities typical of basin mires, seepage mires and valley mires that have developed in an area of high groundwater located within a shallow basin like structure set into the flanks of a ridge, the water ultimately draining to the river Test. The wetland area may have developed from one time open water. In contrast, are acid grasslands on seasonally waterlogged soils at Baddesley Common and which include a flowing stream arising from springs outside of the site.

Land within and around Emer Bog is underlain by clays, and clayey sands, of the Tertiary Wittering Formation and which strata dip gently 1-2 degrees to the south. These deposits give rise to heavy seasonally waterlogged soils that are difficult to work for agriculture. Sandier deposits occur on higher land and give rise to springs feeding the wetlands. Springs in the east tend to be acidic and those to the south, neutral or slightly alkaline. The main wetland area of Emer Bog, is underlain by peat and which attains up to 1.6m thickness. Water levels in the wetlands vary and this creates flooding in winter and drier conditions in the summer.

The water in the wetlands varies from strongly acidic to mildly alkaline and is generally rich in plant nutrients, the cause of which remains unknown. Water is sourced from a wide surface and subsurface catchment and passes into the site from both surface streams and springs, and from rising groundwater. Water is lost from the site by surface flow towards a stream in the north, and possibly, also from summer percolation into underlying strata.

The water relations of Emer Bog cSAC are closely related to their surroundings and it is recommended that a substantial discharge constraint zone be identified on land within the surface and groundwater catchment of the Emer Bog and Baddesley Common wetlands and streams. Developments requiring abstraction and/or discharges to streams or soakways within the surface catchment of the upper Tadburn Lake stream should also be given careful examination to ensure that adverse effects are avoided.

DESK STUDY

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1.0 INTRODUCTION AND ACKNOWLEDGEMENTS AND PLANNING AND LEGISLATIVE BACKGROUND

1.1 INTRODUCTION AND ACKNOWLEDGEMENTS

Emer Bog is part of Baddesley Common Site of Special Scientific Interest (SSSI) and is a candidate Special Area of Conservation (cSAC) (**Appendix 1**). It is, in major part, a nature reserve of the Hampshire Wildlife Trust.

Test Valley Borough Council are undertaking an assessment of possible housing allocations as part of their local plan review of sites in Southern Test Valley and which includes land at Emer Bog and its environs (**Dwg.1**). In order to help ensure that the ecological interest of Emer Bog is fully considered within the development plan process, the Council (in partnership with the Environment Agency, English Nature and the Hampshire Wildlife Trust) have commissioned this desk study, with the following general objectives.

1. undertake a scoping study of all available data, regarding the ecology and hydrology of Emer Bog cSAC and its surroundings.
2. develop an understanding of the relationship between Emer Bog and the adjoining countryside, in particular with regard to the flow and quality of water into and out of the Bog and its habitat relationships;
3. identify areas of further technical work which may need to be undertaken and the format of such work; and
4. identify interim measures if needed, to maintain and enhance the ecological interest of Emer Bog and adjoining habitats.

As part of the scoping study, The Environmental Project Consulting Group has undertaken a desk study of available ecological information for the defined area, together with further information on topography, soils, geology, hydrology and hydrogeology as available. English Nature, the Environment Agency and the Hampshire and Isle of Wight Naturalists' Trust have collaborated with the study and close liaison has been maintained with:

- Test Valley Borough Council, Steve Lees and Trevor Warrick
- Hampshire Wildlife Trust, Ian Stone
- English Nature, Amanda Newsome
- Environment Agency, Tim Sykes and Emma Devonshire

Hampshire County Council have provided information from the county Biological Records Office that has been very helpful to this study and their assistance is acknowledged here.

Test Valley Borough Council also particularly acknowledge the financial support of English Nature and the Environment Agency and the input from Hampshire Wildlife Trust.

1.2 ROLE OF ENGLISH NATURE AND THE ENVIRONMENT AGENCY

English Nature are the Government's statutory advisors on nature conservation issues. They have a responsibility to ensure that Special Areas of Conservation, such as Emer Bog, are maintained at a favourable conservation status and to advise public bodies such as Test Valley Borough Council and the Environment Agency regarding the implications of their activities on the conservation status of cSAC sites. This study will inform English Nature's advice to these bodies and the future management of the site by the Hampshire and Isle of Wight Naturalists' Trust.

The Environment Agency has a role under Regulation 50 of the Habitats Regulations to review extant consents and permissions (Review of Consents – RoC) that are likely to have a significant adverse effect on a European site. As a result of that process, the Agency must affirm, modify or revoke licences/permissions accordingly. This process is part of a pan-European effort to maintain at (or restore to) favourable condition natural habitats and wild flora and fauna. This study will inform the Environment Agency's decisions as part of their Review of Consents.

1.3 PLANNING AND LEGISLATIVE BACKGROUND

Planning Policy Guidance on Nature Conservation (PPG9) indicates that Local Plans should identify nature conservation issues and that plans are based on fully adequate information about local species, habitats, geology and landform. Plans should be concerned with not only designated areas but also with other land of conservation value. PPG9 also indicates that authorities should take account of nature conservation considerations in assessing sites for development in the plan.

Section 48 of the Conservation (Natural Habitats, &c.) Regulations 1994 requires, in respect of a plan or project likely to affect a European site, that an appropriate assessment be undertaken of the implications for the site in view of that site's conservation objectives. That plan or project should only be agreed where it will not adversely affect the integrity of the European site. Section 50 of the Conservation Regulations also requires a review of existing decisions that may affect a European site.

The explanatory notes to the Countryside and Rights of Way Act explains that Section 28G of Schedule 9:

'imposes a duty on "public bodies" in exercising their functions to take reasonable steps, consistent with the proper exercise of those functions, to further conservation and enhancement of special features on a SSSI. This applies where the public body is exercising its statutory function on a SSSI or on land outside of the SSSI where those functions might affect a SSSI.'

Further discussion on nature conservation issues in local plans is provided in *Planning for Biodiversity – A good practice guide* (RTPI 1999). Information on key habitats can be found in *Biodiversity: The UK Action Plan* and in the *Biodiversity Action Plan for Hampshire*.

2.0 INFORMATION SOURCES

2.1 ECOLOGICAL SOURCES

The extent of the study area is shown in **Dwg.1** and sites for which information is held in the Hampshire Biological Records Office are shown on **Dwg.2**.

Information gathered includes that for:

- Candidate Special Areas of Conservation (cSACs)
- Sites of Special Scientific Importance (SSSIs)
- Sites of Importance for Nature Conservation (SINCs);
- Sites for which Test Valley Council holds information arising from previous planning applications;
- Botanical surveys commissioned by Hampshire Wildlife Trust

Citations for the cSAC and SSSI are in **Appendix 1** and outline descriptions of the Sites of Importance for Nature Conservation are in **Appendix 2**.

2.2 PHYSICAL BACKGROUND SOURCES

In addition, information on physical land features has been obtained from:

- Geological maps
- Soil Maps
- Ordnance Survey Plans
- Aerial photographs
- Hydro-ecological surveys commissioned by Hampshire Wildlife Trust
- Environment Agency Catchment Map

A full list of documents referred to is provided in Section 8.0.

3.0 REGIONAL SETTING

3.1 LANDSCAPE, LANDUSE AND LANDFORM

3.1.1 Landscape

Examination of the 1:50 000 scale Ordnance Survey map reveals that Emer Bog lies within a wide area of undulating countryside between the south trending valleys of the river Test to the west and of the Itchen valley to the east. However, the more detailed form of this land also reflects the major topographic distinctions between the higher **Chaiklands** north of an west-east line between Micheimersh and Shawford about four miles north of Emer Bog and the **Lowland Mosaic** to the south, of which the land within and around Emer Bog is part.

Emer Bog is midway between the developed areas of Romsey in the west and Chandler's Ford/Eastleigh in the east. The City of Southampton is to the south while land to the north is more open and less developed. The Hampshire Landscape (HCC 1993) indicates that this area of countryside is divided into an eastern area of mixed farmland and woodland and a western 'ancient' landscape area (which includes

Emer Bog) of heath associated pasture and woodland. This latter landscape is similar to the marginal areas of the New Forest and, together with other small areas between Portsmouth and Southampton, represents remnants of a one time much wider heathland landscape.

3.1.2 Landuse

Dwg.3 is a provisional land use map based on aerial photographs and other information and refines the broad landscape types. It can be seen that the study area is divisible into three land use types:

A. Mostly cultivated land, down to cereals or ley grassland

Cultivated land with often straight-sided hedged or fenced fields occurs in a large block of land in the west of the site at Halterworth and Warren Farm between Baddesley Common and Romsey. Smaller areas occur north of the railway line near Gosport and Broadgate and there is a further area northeast of Nutburn.

B. Pasture and Woodland: heath associated

This is the area of the former Baddesley Common and includes land at Emer Bog cSAC and Baddesley Common SSSI together with other land to the south, partly identified as SINCs and comprising a mixture of acid grassland, heathland and agriculturally unimproved neutral grasslands with scattered ancient woodlands and more recent secondary woodland and scrub. The land forms a large single area between Pound Lane in the east and Warren Farm in the west.

C. Mixed farmland and woodland

This land occurs most widely in the east of the study area between Flexford Road and the railway line and between the cultivated areas north of the railway line. The land comprises mainly improved pasture and ley grassland in an irregular landscape between blocks of ancient woodland and plantation. Land at Knightwood Farm, south of the Flexford Road and adjacent to the urban area of Chandler's Ford, has recently been developed for housing indicating the pressure for development in this part of Hampshire. This landscape includes a golf course south of the church at Ampfield.

3.1.3 Landform

Examined more closely, the land around Emer Bog occupies a lower landscape area at 35-40m AOD between significant higher land to the north around Ampfield, and to the dissected higher lands around Toothill and Chilworth to the south, which rise to about 55-60m AOD. The topographic relationships are shown in **Dwgs. 4 and 5**.

A topographically minor, but very significant, dissected ridge of higher land extends south from the higher land at Ampfield to the south of Bucket Corner on Pound Lane (here called the Pound Lane ridge). Land to the east of the Pound Lane ridge (within the mixed farmland area) falls to the Itchen valley, and land to the west (including Emer Bog, within the heath associated landscape) falls to the Test valley. This ridge extends south to join a further ridge of higher land (Castle Hill ridge) between Flexford and the southern part of Baddesley Common (including Castle Hill).

Sources:

Ordnance Survey 1:50 000 scale Landranger Sheet 185 Winchester and Basingstoke.
Ordnance Survey 1:50 000 scale Landranger Sheet 196 Solent and Isle of Wight.

Ordnance Survey 1:25 000 scale Explorer Sheet 131 Romsey, Andover and Test Valley.
Ordnance Survey 1:25 000 scale Explorer Sheet 132 Winchester.
Hampshire Landscape, Hampshire County Council 1993.

3.2 ECOLOGY

Much of the land in the study area is of ecological significance and this probably extends to about 40-50 percent of the area. The following sites have been identified (by English Nature, Hampshire County Council and the Hampshire Wildlife Trust), as being of special significance. Copies of the citations for the cSAC and SSSI are in **Appendix 1** and summaries of the SINC's are provided in **Appendix 2**.

3.2.1 Sites of European and UK Significance

Emer Bog candidate Special Area of Conservation (cSAC)

This area (the subject of this report) has been recommended as a Special Area of Conservation (SAC) because it contains transition mires and quaking bogs that are rare or threatened within a European context.

Baddesley Common SSSI

The SSSI citation explains that this is an extensive valley bog with associated damp acidic grassland, heathland, and developing woodland. Emer Bog is an excellent example of an ungrazed valley bog with a rich flora and fauna. To the south and west of Emer Bog the site includes remnants of former common land, now acidic grassland.

Trodds Copse SSSI

An area of ancient woodland in the east of the study area.

3.2.2 Sites of County Importance

There are many **Sites of Importance for Nature Conservation** (SINC's) within the study area, often in clusters of contiguous or closely spaced sites (cross-hatched on **Dwg.2**). Brief descriptions of those sites close to Emer Bog are provided below. Other sites are listed in **Appendix 2**. Numbers in the descriptions refer to those on the drawing.

The cluster of sites 11, 12, 13, 52, 53, 94, 96, 97, 98 and 99 adjoin Emer Bog on the south side and are important to the overall ecology of Emer Bog cSAC, providing an ecologically diverse important buffer zone between the site and urban North Baddesley. These are as follows.

11 – Baddesley Common South

Area: 10.46 ha

Criteria: 2B Semi-improved grasslands which retain a significant element of unimproved grassland.

1 Ralphs' Grassland Survey of 4/8/98 indicates gently sloping semi-improved and improved pasture, locally unimproved, summer horse grazing, locally heathy with occasional bell heather.

12 – Baddesley Common Meadow

Area: 6.39 ha

Criteria: 2A Agriculturally unimproved grassland and 3A Heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub.

1 Ralphs' Grassland Survey of 15/10/98 indicates a moderately sized, semi-improved, improved and unimproved hillside meadow on southern edge of Baddesley Common SSSI with some fen meadow and rush pasture.

13 – Lights Copse Meadow

Area: 4.51 ha

Criteria: 2A Agriculturally unimproved grassland.

Ian Ralphs' grassland survey of 15/10/98 indicates a permanently grazed predominantly unimproved and semi-improved meadow and including patches of scrub woodland, fen meadow and mire, the mire being exceptionally species rich.

51 – Scragg Hill Copse

Area: 4.38 ha

Criteria: 1Cii Woodland that comprise important community types of restricted distribution in the County, such as yew woods and alder swamp woods.

52 - Scragg Hill

Area: 4.56ha

Criteria: 1Cii Woodland that comprise important community types of restricted distribution in the County, such as yew woods and alder swamp woods.

53 – Warren Farm Copse

Area: 3.52 ha

Criteria: 1Cii Woodland that comprise important community types of restricted distribution in the County, such as yew woods and alder swamp woods.

94 - Baddesley Common West

Area: 16.76 ha

Criteria: 2A Agriculturally unimproved grassland and 3A Heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub.

96 – Baddesley Close Green

Area: 0.19 ha

Criteria: 2A Agriculturally unimproved grassland.

97 – Baddesley Common Old Play Ground

Area: 2.01 ha

Criteria: 2A Agriculturally unimproved grassland and 3A Heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub.

98 – Lights Copse

Area: 6.51 ha

Criteria: 1A Ancient semi-natural woodland.

99 – Nutburn Meadow

Area: 9.54 ha

Criteria: 2A Agriculturally unimproved grassland.

I Ralphs' Grassland Survey of 29.9.98 indicates a large and complex unimproved and semi-improved fen meadow crossed by recently deepened drains. Species rich with a notable 16 old meadow indicators reported. Site includes woodland and scrub, scrub woodland and a variety of open grassland habitats and a possible seasonal pond. See also letter and report of Hampshire Wildlife Trust 18.11.1993 indicating agriculturally unimproved rush pasture and fen meadows with some drier horse pasture.

Sources:

CSAC and SSSI Citations.

Hampshire County Council Biological Record.

Criteria for selecting Sites of Importance for Nature Conservation in Hampshire, Hampshire.

County Structure Plan 1996-2011 (Review) November 2000.

Site reports provided by Test Valley Borough Council.

3.3 HYDROLOGY

Surface stream patterns closely reflect the local topography described above. The main streams are shown in **Dwg.4** and which also shows surface catchment boundaries. A topographic cross section is provided in **Dwg.5**. A plan provided by the Environment Agency, and showing the main catchment divisions in the vicinity of Emer Bog cSAC, is reproduced in **Dwg.6**.

The Pound Lane ridge, extending north to high land at Ampfield, forms the divide between the catchments of the Test and Itchen rivers, while the higher land to the south at Chilworth and Toothill divides these catchments from that which drains south through Southampton to the Solent.

The main watercourses in this broad area are the Tadburn Lake stream that flows east to the Test, the Monks Brook that flows east and northeast to the Itchen, and the Tanners Brook that flows south through Southampton.

The Tadburn Lake stream has a wide catchment extending from Ampfield Wood in the north to Baddesley Common in the south. Emer Bog occurs at the head of part of this system on the west facing slope of the Pound Lane ridge near Bucket Corner.

Sources:

Ordnance Survey 1:50 000 scale Landranger Sheet 185 Winchester and Basingstoke.
Ordnance Survey 1:50 000 scale Landranger Sheet 196 Solent and Isle of Wight.
Ordnance Survey 1:25 000 scale Explorer Sheet 131 Romsey, Andover and Test Valley.
Ordnance Survey 1:25 000 scale Explorer Sheet 132 Winchester.

3.4 GEOLOGY

3.4.1 Solid Geology

Solid geology refers to deposits laid down prior to the start of the Quaternary ice ages, about two million years ago.

The area of lowland, south of the chalklands, comprises part of the northern area of the Hampshire Tertiary Basin and which extends from east Dorset across to Portsmouth and south to the northern part of the Isle of Wight.

The geology of the Tertiary Basin is exceedingly complex and individual formations have complex sequences of different lithologies and which vary both laterally and with depth and thickness.

Dwg.7 provides a compilation of geological information from published 1:10 000 and 1:50 000 scale geological maps (see references). The presentation of information on the published maps is inconsistent, partly because the stratigraphy is subject to recent revision. **Dwg.7** provides a best fit interpretation of the distribution of the main strata, but differs in detail from individual maps from which it is compiled.

The legends to these maps indicate the stratigraphy within the study area and this information is compiled in **Table 1**: A highly schematic cross-section drawn from southeast to northwest across Emer Bog is provided in **Dwg.5**. The cross-section has considerable vertical exaggeration meaning that the dip of the strata appears very much steeper than in reality. The real angle of dip is likely to be between 1 and 2 degrees to the south.

From **Dwgs.5 and 7** and **Table 1**, it can be seen that the strata dip to the south. This means that successively older strata crop out from south to north.

The youngest strata, are greenish sands (containing the mineral glauconite) of the Earnley Sand Formation (part of the Bracklesham Group). These strata crop out south of the Flexford Road.

Cropping out from under the Earnley Sands are sands and clayey sands of the Wittering Formation (also part of the Bracklesham Group) and which form the surface in a broad swathe of land across the centre of the site, either side and to the south of the railway line.

Table 1. Stratigraphy within Study Area

Bracklesham Group	Earnley Sand Formation About 10m thick		Glauconitic sands
	Wittering Formation About 34m thick		Mainly brownish-grey laminated clays; sands with clay bands; clayey sands; beds of glauconitic sands
London Clay Formation	London Clay 53-114m thick	Pebble Beds 1-2m thick	Pebble beds
		Whitecliff Sand Member 0-14m thick	Yellowish brown medium to fine-grained sands
		Nursling Sand Member 0-20m thick	Very fine-grained sands to extremely silty and clayey very fine-grained sands
		London Clay 53-114m	Olive-grey sandy and silty clays
Reading Formation About 24m thick (not exposed at surface)			Mainly mottled clays with some sand beds
Upper Chalk Over 60m thick (not exposed at surface)			Chalk with flints

The northern part of the study area is underlain by the London Clay Formation. Most of the London Clay comprises sandy or silty clays, but towards the top of the succession there are a number of locally occurring sandy deposits that are sometimes included within the Bracklesham Group. These deposits vary in thickness and tend to be thicker to the east and overlap in depth in different parts of the district. The relationships are shown on the source maps.

The Whitecliff Sand member has medium to fine-grained sands and crops out at the surface widely in the north of the site, much overlain by a thin pebble bed (not distinguished on **Dwg.7**). The underlying Nursling Sand Member is finer grained with very fine sands passing to silty and clayey very fine sands in places. In places, these sand layers are separated by typical clayey London Clay.

3.4.2 Drift Geology

Drift geology refers to deposits that have been laid down since the start of the Ice Ages and up until the present time. **Dwg.7** shows the distribution of these deposits but does not distinguish between different terraces and areas of Head Gravel and which are all shown in the same colour.

The main drift deposits shown on the published geological maps are:

River Alluvium

Clayey material on river floodplains (also containing peat and tufa in Test and Itchen floodplains).

Head Gravel

Flinty loamy material infilling lower land locally, probably much more extensive than shown on the published maps.

River Terrace Deposits, mainly gravel

Mainly sandy and flinty deposits occurring on level land along the Test and Itchen valleys and on the Solent coastal strip. Higher and older inland terraces tend to be more clayey.

River Terrace Deposits, mainly loam and clay

Loamy and clayey deposits overlying gravelly terrace deposits.

River Terrace Deposits, undifferentiated

Isolated older terrace remnants on higher land and hill tops.

Sources

Geological Survey of Great Britain 1:10 000 scale Sheet SU32 SE.
Geological Survey of Great Britain 1:10 000 scale Sheet SU42SW.
British Geological Survey 1:50 000 scale Sheet 315 Southampton.
Geological Survey of Great Britain 1:50 000 scale Sheet 299 Winchester.

3.5 SOILS

Soil is that material in which plants root and which provides support, nutrients and moisture. It is conventionally considered to be about 1.5m deep and has been derived from underlying geological substrates by various soil forming processes including leaching, waterlogging, aeration, biochemical reactions and the accumulation and incorporation of organic matter. Soil forming processes act differently at different depths and this means that soils occur as a vertical sequence (or profile) of layers (or horizons). Soils are classified according to the sequence of their different layers.

Soil mapping information is available at a scale of 1:250 000 and on which maps it is not possible to show individual areas of different soils, but rather areas within which commonly occurring groupings of different soil types occur known as 'soil associations'. Individual soil types (soil series) are usually named after the location from where they were first described. Soil associations are named after the most commonly soil series occurring within that association and given a notation code that reflects soil classification.

The distribution of the soil associations is broadly related to their geological substrates from which they have often been formed but the character of individual soils varies considerably.

Soils associations within the study area are:

631d Shirrell Heath 2 Soil Association

Well drained sandy soils with a bleached subsurface horizon, sometimes over soft rock, mainly on heaths and often very acid. Well drained sandy and coarse loamy soils on farmland.

Within the study area, these podzolic soils occur mostly on the Whitecliff and Nursling Sand Members of the London Clay Formation and on the higher undifferentiated terrace deposits where heathland occurs today or has occurred in the past prior to cultivation.

711g Wickham 3 Soil Association

Slowly permeable seasonally waterlogged fine loamy over clayey and coarse loamy over clayey soils, and similar more permeable soils with slight waterlogging. Some deep coarse loamy soils affected by groundwater. Landslips with irregular terrain locally.

Within the study area these soils, which mostly remain waterlogged at the surface for much of the winter and spring, are developed on the Earnley Sand and Wittering Formations. The component soils within this area are extremely varied but seasonal

surface waterlogging, with areas of lesser and greater waterlogging, are characteristic.

Soils at Emer Bog are included within this soil association and show a considerable variation in characteristics from moderately well drained conditions below humid heathland to permanently waterlogged peaty soils in the wetland area.

712c Windsor Soil Association

Slowly permeable seasonally waterlogged clayey soils mostly with brown subsoils. Some fine loamy over clayey and fine silty over clayey soils and, locally on slopes, clayey soils with only slight seasonal waterlogging.

Within the study area, these soils occur on the clays of the London Clay Formation. Topsoils tend to be heavy and clayey and under semi-natural vegetation, they can remain wet for prolonged periods of time. In summer, the soils often form vertical surface cracks as surface layers become drier.

Sources:

1:25,000 Soils of England and Wales, Sheet 6, South East England, Ordnance Survey for Soil Survey of England and Wales 1983.
Legend to the 1:250,000 Soil Map of England and Wales, Soil Survey of England and Wales 1983.

3.6 Landuse

Dwg.3 shows the main land uses in the area identified from a study of aerial photographs, OS 1:25000 scale plans and SSSI/SINC citations. [NB. It is not always easy to distinguish managed grassland from arable land on the aerial photographs and so this drawing must be considered provisional].

Woodland, much of it ancient, is well distributed across the study area and much of the remaining area is grassland of various types including permanent and ley grassland. There are also significant blocks of cultivated land, mostly down to cereals or managed grassland. The former common land at Baddesley Common contains a mixture of improved rough grassland, agriculturally unimproved grassland with small areas of fen, and tracts of acid grassland, *Molinia* grassland and heathland. Mire habitats occur within Emer Bog nature reserve. There is a golf course at Ampfield.

Sources:

TVBC Aerial Photographs.
EN 1982 SSSI Citation Baddesley common.
OS 1:25 000 scale maps.

3.7 Climate

Emer Bog cSAC is within about 25km of the south coast of the UK and is affected by proximity to the sea similar to a broad belt of land extending from Bournemouth in the west to Hastings in the east.

The site falls into **Bioclimatic Area E4N** meaning that this is part of an area of unexposed moderately warm and slightly moist climate (Bendelow and Hartnup 1980) with the following parameters:

- Moderately warm (with between 1650 and 1925 accumulated temperature (increments day degrees C above base 5.6 degrees C)
- Slightly moist, with an average maximum potential cumulative soil moisture deficit between 140 and 180 mm
- Unexposed to moderately exposed, with average wind speeds of between 3.0 and 4.8m/s.

Emer Bog is within **Agroclimatic Area 31 South** (MAFF Tech Bull 35) and which includes the northern and central Hampshire area between Romsey, Andover and Alton. This area has:

- Average annual rainfall of 798mm with rainfall well-distributed throughout the year peaking in November and December and with least rainfall in March, April and June.
- Effective transpiration of 377mm.
- Grass drought factor of 33 days.
- Median excess winter rain of 315mm.

Sources:

Bendelow V C and Hartnup R, Climatic Classification of England and Wales, Soil Survey Technical Monograph No 15, Harpenden 1980.

MAFF Reference Book 435, The Agricultural Climate of England and Wales, HMSO.

4.0 EMER BOG cSAC

4.1 ECOLOGY

4.1.1 Site designations

Emer Bog candidate Special Area of Conservation

Emer Bog was recommended initially as a possible Special Area of Conservation (EN 18/05/00) and later as a candidate Special Area of Conservation (EN 02/03/01) because: **'it contains transition mires and quaking bogs which are rare or threatened within a European context and which are considered to be one of the best areas in the United Kingdom'**.

The 02/03/01 citation states that:

Very wet mires often identified by an unstable 'quaking' surface. These are mires or fens that occur in waterlogged situations where they receive nutrients from the surrounding catchment as well as from rainfall. The vegetation is typically dominated by tall sedges *Carex* species and rushes *Juncus* species mixed with herbs over a ground layer of bog-mosses *Sphagnum* species or feather mosses such as *Calliergon* species.

The area is 37.5ha coincident with Baddesley Common SSSI but excludes a spur of woodland.

The reasons for recommendation are set out in **Appendix 2**.

Baddesley Common Site of Special Scientific Interest

The site was notified under the 1981 Act in 1982 because it contains an extensive valley bog together with associated damp acidic grassland, heathland and developing woodland over Bracklesham Beds in the Hampshire Basin supporting a

rich flora and fauna with most typical bog species with stands of reed, and a shorter mixed association of sedges and herbs.

The bog grades downstream into mature alder carr and upstream into heathland, heavily invaded (and partly planted) with pine, birch and scrub. The invertebrate fauna of the bog and heath is of considerable interest.

To the south and west of Emer Bog, the site includes remnants of former common land, now acidic grassland dominated by Purple Moor-grass but with a rich flora of heathland species.

The citation is in **Appendix 2**.

4.1.2 Vegetation

Neil Sanderson's 1998 report provides a boundary to the wetland habitats (shown on **Dwg. 8**) and describes the vegetation of the northern wetland and wet woodland part of the SSSI as seen on 28th October that year. His report should be referred to for detailed discussion of the plant communities present.

The open part of Emer Bog comprises a swathe of wetland passing east-west across the site and bounded by woodland variously derived by invasion of trees and shrubs into one time open areas.

Sanderson considers this to be an unusual mire system, which includes:

- A sizeable basin mire in the middle
- Seepage mires in the east; and a
- Valley mire to the west.

The occurrence of *Carex rostrata*-*Sphagnum squarrosum* Mire (NVC=M5) and *Carex-Potentilla* Tall Herb Fen (NVC=S27) are regarded by JNCC as forming part of the Habitats Directive Annex 1 54.5 **Transition Mires and Quaking Bogs**.

Neil Sanderson provides an interpretation of how the wooded areas have been derived and the open habitats they would convert to if felled.

Dwg.8 provides an interpretation of the information provided in Sanderson 1998 and indicates both the main open communities and those open communities from which the woodland may have been derived and to which it could revert given clearance and suited management (indicated in brackets ()).

A. Open Swamp and Mire Communities

Western Open Area

The western part has a large area of open *Carex rostrata* – *Potentilla palustris* Tall Herb Fen (NVC=S27) with *Carex rostrata*, *Eriophorum angustifolia* and *Menyanthes trifoliata* with an understorey of grasses, mosses, sedges and some herbs including *Lycopus*, *Hydrocotyle*, *Epilobium palustre* and *Lotus pedunculatus*. This plant community includes species typical of more base-rich conditions as well as those of more acidic conditions, and the inclusion of areas of *Sparganium erectum* Swamp (NVC=S14) further indicate a tendency to more mesotrophic or eutrophic conditions. Some areas are *Juncus* dominated (NVC=S27j). Sanderson suggests that this community is typical of the early stages of the development of peat from open water

and that there is historic evidence for open water, perhaps originating from peat cutting of a former mire.

Eastern Open Area

This area includes poor fen in the western part, passing to rush-dominated poor fen and then *Molinia* grassland and represents a transition from more base-rich to more base-poor conditions.

The western area of wetland comprises at first Poor Fen (*Carex rostratum*-*Sphagnum* Mire NVC=M5) as the tall herb fen community becomes increasingly rich in *Sphagnum* bog-mosses. Sanderson indicates that this M5 community is very rare in lowland England. The most common bog-mosses here are typical of less strongly acidic conditions. Sanderson suggests that the community is typical of Basin Mires developing infilling ponds and lakes and usually develops in succession to S27 Tall Herb Fen. It appears that Poor Fen Habitat is typical of moderately acidic peats with fairly low calcium levels, low levels of toxic ions (such as aluminium and iron) but with a high fertility with high phosphate levels being very typical.

Passing eastwards, the Poor Fen community becomes more rush dominated (*Carex echinata* – *Sphagnum* Mire *Juncus effusus* sub-community NVC=M6ci) where birch scrub has been cleared and lacks many species typical of the Poor Fen communities to the west but includes the more acid loving *Sphagnum recurvum*. There is perhaps a tendency towards a more calcifuge community here.

The easternmost area of the mire complex has *Molinia* grassland with *Calluna vulgaris*, *Erica tetralix* and with *Sphagnum palustre* and *S.recurvum*. Sanderson suggests that this *Molinia-Potentilla erecta* Mire *Erica tetralix* community (NVC=M25a) may have developed from wet heath by lack of grazing.

Mire edge communities

At a few locations around the edges are fen meadow communities typical of acidic soils on shallow peats referable to *Juncus effusus/acutiflorus*-*Galium palustre* Rush Pasture (NVC=M23).

Near the two ponds are patches of Reed Bed (*Phragmites* swamp S4) that Sanderson suggests may have developed due to nutrient rich groundwater brought to the surface by the ponds.

To the south-east of the open mire is an area of Wet Heath (*Erica tetralix*-*Sphagnum compactum* wet heath NVC = M16) and which may represent the one time typical surrounding vegetation to the site where the land is subject to seasonal rather than permanent waterlogging.

B. Woodland Mire Communities

The wooded areas have developed from the invasion of former wet open habitats and are divisible into those dominated by Alder and those with Sallow and Birch.

Alder Woods

Alder woods occur to the north and south of the open swamp and mire communities along the in and out flow axes.

The main outflow area in the north of the site has very swampy Alder over *Carex paniculata* tussocks (*Alnus-Carex paniculata* Wood NVC=W5). The inflowing flushed area in the northeast has Alder over *Carex remota* (*Alnus-Fraxinus-Lysimachia* Woodland NVC=W7). Somewhat similar woodland but with more Sallow occurs in the southern flushed mire margins.

Sallow and Sallow-Birch Woods

Historically, only the woodland stands on the most base-rich seepages were mapped in 1870.

Of the one-time large area of Sallow woodland, much has been cleared to restore areas of Tall Herb Fen and leaving only small remnants of *Salix cinerea-Galium palustre* Woodland (NVC=W1).

Around the edges of the wetland are other woodland communities developed from the more marginal poor fen and wet heathland communities.

Two areas of Downy Birch over *Molinia*, *Sphagnum palustre* and *S. recurvum* (*Betula pubescens-Molinia* woodland (NVC=W4)) occur on the eastern margins and (from the *Sphagnum* and *Juncus* species present) were probably derived from colonisation of rushy poor fen (M6), *Molinia* heath (M25a) or wet heath (M16). Thus these represent communities of more acidic conditions.

Where the Downy Birch over *Molinia* and *Sphagnum* woodland reaches the basin mire communities (M5 Poor Fen) it appears to have been derived from them and is less acidic in character.

In the south is an area of Sallow woodland transitional to *Alnus-Fraxinus-Lysimachia* Woodland (NVC=W7) and resulted from colonisation of Rush Pasture (NVC=M23). The central part of this area is transitional to *Alnus-Carex paniculata* Woodland (NVC=W5) and may have resulted from colonisation of a species-rich poor fen related to Poor Fen (M5).

Sources:

English Nature, 18/05/00, Reasons for recommendation as a possible Special Area of Conservation.
English Nature 02/03/01, Reasons for recommendation as a candidate Special Area of Conservation.
English Nature 1982, SSSI Citation.
Sanderson NA December 1998, Vegetation Survey of Emer Bog, Hampshire, for Hampshire Wildlife Trust.

4.2 TOPOGRAPHY

Dwg.4 illustrates the topographic setting of Emer Bog and **Dwg.10** emphasises the local streams, surface flows within the wetlands, and local catchment boundaries. The two parts of Emer Bog cSAC (Emer bog and Baddesley Common) have different topographic conditions.

Emer Bog

It can be seen that Emer Bog and the adjacent woodland occurs on the north to northwest facing slopes of the Pound Lane ridge and which fall appreciably at first and then more gently to the Tadburn Lake stream.

The overall topographic difference (relief) across Emer Bog from the highest to the lowest point is a little over 10m with the more gentle (and almost imperceptible) slopes across the central area of the open mire and towards the Tadburn Lake in the north.

Baddesley Common

Baddesley Common lies on almost level land either side of a tributary of the Tadburn Lake and is separated from Emer Bog by a minor western extension of the Pound Lane ridge. The land falls very gently from north and south towards a central stream with a total change in relief of only about 5m

Sources:

OS 1:25, 000 Explorer 131 Romsey and Andover.

4.3 GEOLOGY

The general geological setting is shown in **Dwg.7** taken from the 1:10 000 scale and 1:50 000 scale geological maps and in **Dwg.5** which is a cross section.

Emer Bog

The wetland area of Emer Bog is shown on the published geological maps as containing alluvium and which is not further described but which is often taken to include other floodplain deposits such as peat. Auger borings undertaken by Ron Allen (1996) showed that much of this area is underlain by up to 1.6m of peat overlying head. The nature and location of the deposit however, suggests that the wetlands are not formed on a floodplain, but have developed within an area of seepage and accumulation of small surface flows held above slowly permeable substrates.

Acid Grasslands

The surrounding area of land within the cSAC and including Baddesley Common is shown as being underlain by the Wittering Formation with the overlying Earnley Sand occurring to the south. This same material underlies the peaty deposits.

The Wittering Formation is described on the 1:10 000 scale Geological Map for the location as containing:

- mainly brownish grey laminated clays;
- sands with clay bands;
- clayey sands; and
- beds of glauconitic sands.

There are three boreholes near to the site and their locations are shown on **Dwg.7**.

Borehole SU42 SW 39

This borehole is located on high ground to the south of the Bog near Body Farm at GR 4003 2098 at about 51mAOD and on the Junction of the Earnley Sand and the Wittering Beds. The borehole was 12.85m deep and extended to 38m AOD and so the lower part is equivalent to the strata near the highest land at Emer Bog.

At this depth the different horizons in Wittering beds are described variously as medium-grained sand with a few thin ((2-3mm) bands of extremely sandy clay, very sandy clay with lenticles and partings of very fine-grained sand, very sandy clay with thin lenses and partings of fine-grained sand, and sand with a few thin (2 to 3mm) bands and thicker bands sandy clay.

Borehole SU32 SE 15

This borehole, located at the southern-most tip of Emer Bog near the northern tip of Lights Copse at GR 3976 2122 at about 40.5m AOD, penetrated 3m of Wittering Beds described as clean sand with a few clayey sand bands.

Borehole SU32 SE 16

This borehole, located at about 7.5km west of the centre of Emer Bog at GR3898 2178 at 28m AOD revealed extremely clayey fine-grained sand over sandy clay and clayey sand.

Overall, the Wittering Beds appear to be of variable layers of sandy clay and clayey sand with bands of sandy and clayey material.

Sources:

Geological Survey of Great Britain 1:10 000 scale Sheet SU32 SE.
Geological Survey of Great Britain 1:10 000 scale Sheet SU42SW.

4.4 MINERAL AND PEAT SOILS

4.4.1 Mineral Soils

The land at Emer Bog cSAC is included with the Wickham 3 Soil Association described in outline in Section 3.4 above and which also includes much land in the New Forest. This land has a varied suite of soils, which in this area are developed over generally poorly drained substrates on thin loamy drift over Wittering Formation.

These soils (which were mapped for the Soil Survey of England and Wales by Ron Allen (Ordnance Survey 1983) and are described in Jarvis *et al* 1984, occur where thin loamy drift covers Tertiary clays and loams on gently undulating land. Fine loamy or fine silty over clayey poorly drained Wickham soils on slowly permeable substrates are the most widespread soil type, but similar coarse loamy over clayey Kings Newton soils occur widely where there is a source of superficial coarse loamy material. Footslopes and low-ways often have deeper loamy Curdridge soils that are affected by high groundwater. Similar deep loamy soils on upper valley slopes have better drained Bursledon soils that are affected by only slight seasonal waterlogging.

Most of these soils have slowly permeable subsoils and, after prolonged periods of heavy rain in winter, excess water is disposed of by lateral flow. Where undrained, such as on older pastures and unimproved grasslands, the loamy over clayey soils are waterlogged for long periods in winter. This waterlogging limits cultivations to the autumn and on the heavier areas, the land can be difficult to manage and is naturally acid ensuring that much of the land is down to permanent or long term ley grassland or remains as unimproved grassland or woodland.

4.4.2 Peat Soils

The peat soils within the fen and mire areas at Emer Bog occupy too small an area to be separately depicted on the 1:250 000 scale soil map, but were examined by Ron Allen in 1996 when 13 auger borings were made in the wetland area.

Within the open mire, peat depths were typically 40-60cm from the surface. An area about 100m east of the boardwalk had 1m of peat and just to the north of this the deepest peat located was 1.6m thick.

The peat tended to be thinnest around the edges of the mire, deepening towards the centre and the north. There was a relationship between peat depth and mire communities identified by Sanderson (1998). Within the area of *Carex-Potentilla* Tall Herb Fen (S27), peat depth varied from less than 20cm at the edges to 100cm in the northern part. Within the *Carex rostrata-Sphagnum* Mire (M5) with Poor Fen, the peat was of intermediate depth at 60cm. At the small area of *Juncus* dominated *Carex echinata-Sphagnum* Mire (M6) the peat had further thinned to between 18 and 39cm. Passing east out of the wetter land onto the *Molinia-Potentilla* Mire (M25a) the peat depth had reduced from 13cm to 3cm.

In the open tall herb and poor fen area (S27 and M5), surface peat layers tend to be rich in fibrous *Sphagnum* or *Molinia* fragments, but with depth the peat is always well humified sometimes with the soft remains of grasses or sedges and sometimes with *Phragmites* leaves. Woody peat with twigs occurs occasionally. Within the *Juncus* dominated poor fen (M6), the shallow peats tended to be composed of fibrous *Sphagnum* remains throughout but the profiles are disturbed by scrub clearance and layers become mixed in places.

Within the birch, willow and alder woodland to the north of the open area, peat depths reached their maximum at 73-160cm and the peat was well humified throughout.

Below the peat there is usually a layer of dark silty clay loam that is often rich in organic matter or has peaty layers, otherwise the peat usually passes to sandy clay loam, sometimes with flints. In places, the mineral substrate contained unidentified pale cream clayey material. The peat was typically strongly acidic (pH 4-5) in the surface but became neutral at depth.

Sources:

- Ron Allen (1996) Reconnaissance Hydro-ecological Study for Hampshire Wildlife Trust.
- 1:25,000 Soils of England and Wales, Sheet 6, South East England, Ordnance Survey for Soil Survey of England and Wales 1983.
- Legend to the 1:250,000 Soil Map of England and Wales, Soil Survey of England and Wales 1983.
- Jarvis M G, Allen R H, Fordham S J, Hazleden J, Moffat A J and Sturdy R G, Soils and their use in South East England, Soil survey of England and Wales Bulletin No 15, Harpenden 1984.

4.5 HYDROLOGY

4.5.1 Catchments and streams

The surface hydrology of land within the cSAC is complex. Information is provided in Allen (1996) and Sanderson (1998), summarised below and represented schematically in **Dwg.9**.

The cSAC is sourced from streams and seepages off the eastern side of the major divide separating the catchments of the Itchen and the Test. Emer Bog itself is supplied by a relatively small surface catchment, but the upper catchment of the Tadburn Lake, a small portion of which is included in the cSAC boundary, is very large. The catchment of the small stream flowing through the southern part of the cSAC is very small while that serving a stream system flowing north through the area SINC is moderately large

The area of Emer Bog cSAC is supplied from four catchments.

- A. Northern Catchment
This is the extensive catchment of the north-eastern Tadburn Lake tributaries.
- B. Emer Bog Catchment
This is the area of land immediately surrounding the wetland area and contained by ridges of higher land.
- C. Baddesley Common Eastern Catchment
This area serves the small west stream flowing through the southern part of the cSAC.
- D. Baddesley Common Southern Catchment
This area serves the north flowing streams passing through the southern and western part of the Baddesley Common SINC.

4.5.2 Seepages and springs

The northern area of Emer Bog including the wetter open and wooded habitats appear to be fed by seasonally rising groundwater augmented by seepage and spring flows off the surrounding higher ground.

In winter much of the open mire is flooded to perhaps 50cm depending on season. Around the edges where the water is shallow in winter and the land drier in summer, active springs can be seen and occur in defined areas. The main known seepage and flow lines are shown in **Dwgs.8 and 9**.

4.5.3 Historical aspects

Neil Sanderson (1998) indicates that the area of Emer Bog is shown on the 1588 Hursley Estate map as open water and called Enmoore Ponde, but that the name Emer relates to the former Enmoor indicating a bog and which could have predated the pond.

Careful examination of the 1870 Ordnance Survey Plan (which shows the land from Lights Copse to the Tadburn Lake as almost completely open) provides a clue that the wetland area then was in two tracts. One tract was to the west and the other to the east. Both tracts converged before shedding water north into a small drain feeding the Tadburn Lake.

4.5.4 Hydrochemistry

Ron Allen (1996) reports on some water pH and nutrient determinations undertaken as part of his reconnaissance survey.

4.5.4.1 Emer Bog

Acidity

This study showed a marked acidity gradient from neutral conditions in wooded seepages in the south of the site through moderately acidic water values in the central open area to very acidic/pH values in the north wooded area and in the eastern seepage area. The overall pH range was from 7.0 in the southern seepages down to 3.8 in the northern woodland. The two southern ponds had slightly acidic

levels of pH 6. The woodland samples may have been affected by acidic leaf accumulation.

There thus appears to be a neutral southern seepage source and an acidic eastern seepage source acting on only slightly acidic ground waters (as seen in the ponds) and with a central mixing zone where pH values can vary quite widely.

Other field pH measures made from time to time have indicated that parts of the central area of the *Carex-Potentilla* tall herb fen can even be slightly alkaline giving an upward limit of perhaps about pH 7.5. One laboratory determination in 1996 indicated a pH value near to this same location of 4.1.

This remarkable range is thought to relate to different source seepage waters acting on groundwaters, all of different chemistry and varying winter and summer as water levels rise and fall and so may be seasonally affected by soil chemistry as well as water level.

Nutrient levels

Seven water samples from Emer Bog were determined in 1996 for a range of macro and micro nutrients.

Water in the two ponds was found to be mesotrophic with high conductivity, nitrogen and phosphorus values.

Water in the open mire in contrast was found to be oligotrophic to mesotrophic with low pH, moderate conductivity, high phosphorus and moderate to high nitrogen levels.

Seepage water was generally found to be high in phosphorus but the southern seepage was markedly higher in pH, bicarbonate and alkalinity compared to the eastern seepage.

Just why the southern and eastern seepages should vary in their pH values and carbonate chemistry remains unknown. The variation could be a matter of variable calcium levels in the Wittering Formation, or could relate to pollution, although the sources are not at all obvious, unless they arise from known soakaways.

4.5.4.2 Baddesley Common

Three water samples were taken from two streams and a wetland area in 1996. All three samples were chemically similar with pH values from 7.0 to 7.3 and with high levels of calcium, phosphorus and nitrogen, possibly reflecting the urban catchment at North Baddesley to the south. The urban catchment could also be reflected in slightly higher sodium chloride levels on the common, possibly derived from road salt applications that year.

4.5.5 Soil water Levels

Two perforated plastic dipwells (standpipe piezometers) have been installed at Emer Bog to about 1m deep. The locations are shown on **Dwg.9**.

Dipwell 1 is at the upper edge of the *Molinia-Potentilla* Mire close to the boundary with the *Agrostis Curtisii* grassland upslope in the east of the site.

Dipwell 2 is in the *Carex-Potentilla* Tall Herb Fen near the boardwalk in the west of the site.

Water levels at each site were recorded, at about two weekly intervals, during 2001 by the Hampshire Wildlife Trust and the results are plotted in **Dwg.10**. This period was atypically wet and the recording should be continued through a number of years to ascertain the more usually occurring water levels.

From the data plot it can be seen that:

- The groundwater table in the *Molinia-Potentilla* mire was at about ground level until the end of April, when water levels began to drop to a maximum depth of 65cm below ground level in August. By early October, water levels had recovered remained at about ground level to the end of the year.
- The groundwater table in the *Carex Potentilla* tall herb fen was above ground level (ie.the site was flooded) to a height of 5-15cm above ground level until the end of June, after which the water table dropped to about 25cm below ground level during August after which levels again rose and the site became flooded from October Onwards.
- Groundwater fluctuations mirrored each other in both sites, but the *Molinia* mire site, which seldom flooded, was dry for about 4.5 months of the year and was considerably drier than the tall herb fen site which was dry for about 2.5 months in that year and flooded for the remaining period.

Sources:

Sanderson N A (1998), Vegetation Survey of Emer Bog, Hampshire, for Hampshire Wildlife Trust..
Ron Allen (1996), Emer Bog and Baddesley Common: Reconnaissance Hydro-ecological Study, for Hampshire Wildlife Trust.
Hampshire Wildlife Trust Water Level Records 2001.

4.6 HYDROGEOLOGY

Hydrogeology is about how water behaves below ground and how it is stored and flows within geological strata. Little is known of the hydrogeology of the vicinity of Emer Bog.

The legend to the 1:50 000 scale geological map indicates that the strata in this area generally dip gently southwards at between 1 and 2 degrees. This would suggest that any flow of groundwater in the subsurface strata would be to the south, that is, away from Emer Bog.

The presence of springs around the eastern and southern edges of the wetland area suggests that the groundwater flow is indeed into the bog from the south. However, the general dip of the strata indicates that flow should be generally away from the wetlands in a southerly direction. This apparent conflict requires resolution.

The seasonal rise and fall of the water within the bog indicates that there is likely to a groundwater component to the source water. This suggests that in winter, groundwater effectively rises by upward seepage out of the Wittering Formation into the peat layers below the bog and causing seasonal flooding. This flood water is supplemented by spring flows off higher land in the south and east.

The Wittering Formation, which underlies the site, is mainly of sandy clays and clayey sands and is likely to have a low hydraulic conductivity. This means that water will pass through them only slowly. However, sandier seams occur within the Wittering Formation and these could provide conduits for locally enhanced rates of subsurface flow. Borehole evidence indicates that the higher land at the south of the Emer Bog wetlands comprises a layer of sands.

Borden Chemical Site Investigation, North Baddesley

An investigation for Borden Chemical UK Ltd at North Baddesley (Dames and Moor November 2000) about 1.8km south of the centre of Emer Bog, indicated that the site was underlain by relatively flat lying interbedded clays and sands known as the Wittering Formation and expected to be up to 57m thick. Boreholes showed that the upper part of the stratum below the site was firm to stiff, grey laminated silty clay with lenses of fine grey sand over medium dense, grey silty sand with clay laminae and with clay below. Groundwater strikes were reported in association with the silty sand unit.

It is indicated that the Paleogene deposits here are classified by the EA as a minor aquifer of variable permeability having limited or local potential for water supply only. The report indicated that based upon topography, shallow groundwater beneath the area would be expected to flow in a broadly south-south-westerly direction. However, groundwater in the deeper confined silty sand layer between clayey strata, was thought to flow west.

In relation to Emer Bog, given that the dip is very gentle, it is likely that the detailed disposition of sandier seams within the Wittering Formation is more important in determining the direction of local confined groundwater flows. This is something we know very little about.

Sources:

Geological Survey of Great Britain 1:10 000 scale Sheet SU32 SE.
Geological Survey of Great Britain 1:10 000 scale Sheet SU42SW.
British Geological Survey 1:50 000 scale Sheet 315 Southampton.
Geological Survey of Great Britain 1:50 000 scale Sheet 299 Winchester.
Dames and Moor (December 2000) Phase I/II Assessment Works, Borden Chemical UK Ltd.

4.7 DISCHARGES

The Environment Agency plan in **Dwg.6** indicates six soakway discharges at Bucket Corner and one at the north of Lights Copse, all of which are in the catchment of the Emer Bog wetlands.

In addition, are four discharges to stream or river which appear to discharge to a tributary of the Tadburn Lake about 1km north of Emer Bog.

It is understood from the Environment Agency that there are no abstractions within 1km of Emer Bog.

4.8 SUMMARY OF HYDRO-ECOLOGY

Wetlands within Emer Bog cSAC comprise an unusual ecological system with elements of fen and mire vegetation established upon peat deposits. The peats have accumulated on a gentle lower valley side as the result of the accumulation of organic matter within an area of high groundwater and seasonal seepage.

The origin of the wetland vegetation is uncertain but appears to post-date 1588 when historical evidence suggests this may have been an area of open water.

Sandy clays and clayey sands of the Tertiary Wittering Formation underlie the peat. This formation is generally of slow permeability but does contain sandier layers forming very minor confined aquifers. While seepages occur at upper layers in the valley side just above the main peat body, these are likely to be winter features created as upper sandy layers become surcharged. In summer, the slow flows are likely to follow the dip of the strata south and away from the site.

The two main seepages are of contrasted chemistry, the reason for which remains unknown. This could be due to natural conditions within the substrate geology, or could be related to fertiliser applications or to domestic discharges to soakaways.

However, the varied chemistry of the water, both in the seepages and across the flooded ground in winter, has led to the development of a suite of plant communities that are dependent both upon ground water conditions and on soil conditions. The soils are naturally acidic and so it is only when the site becomes flooded with less acidic groundwater, that the complex water relations of the site become apparent.

5.0 RELATIONSHIP OF EMER BOG WETLANDS TO WATER FLOWS IN THE SURROUNDING AREA

From the analysis of available data above it appears that Emer Bog sits within a shallow basinal structure re-entrant into a ridge of higher land separating the catchments of the Test and Itchen valleys and the wider part of the site forms a separate but closely adjacent system that is more dependent upon rainfall and stream flow.

The detailed sources of water remain uncertain, but water levels in the wetlands rise and fall seasonally suggesting a fluctuating groundwater source. There are also clear seepages and springs feeding into the higher parts of the mire from the south and from the east. These two sources appear to be acidic and more neutral respectively. Also, the flooded mire itself has considerable variation in pH and chemical characteristics that become apparent as water levels rise in winter. The reason for this remains unknown. It is clear that what was once thought of as a strongly acidic environment has water sources that may in part be neutral if not partly alkaline.

These characteristics indicate that there is likely to be contrasted groundwater, perched water and surface water components to the hydrological system, as well as direct wetting from rainfall.

The wetlands outfall to a stream known as the Tadburn Lake to the north and a short section of the stream is included within the cSAC. This stream has an extensive catchment to the northeast.

A smaller stream flowing through the southern acidic grasslands has a nearby source in Lights Copse and adjacent fields to the east.

The surrounding land-use is likely to be crucial to the hydrological system and the more intensively drained and fertilised the land, or the more heavily built up in the

source areas, the greater will be the affect on the hydro-ecological integrity of the wetlands and watercourses. There are no known groundwater abstractions in the vicinity of the site, but there are a number of domestic discharges to soakaways from dwellings along the nearby Pound Lane and also to the source waters of the Tadburn Lake.

The soils in the cSAC and surrounding land are naturally acidic and so the high values of calcium, nitrogen and phosphorus recorded most probably arise from the substrates or from agricultural, urban or highway drainage. The potential for these to affect Emer Bog and its component watercourses and flows remains unknown. It is important that the next stage of the investigation identifies any contribution from these component sources so that any adverse effects can be addressed and minimised

To summarise, Emer Bog cSAC is dependent upon the following physical and chemical support factors:

1. Topographic position;
2. Rainfall drainage within surface catchment;
3. Rainfall infiltration within the groundwater catchments;
4. Soil and substrate permeability;
5. Extent of waterlogged and flooded soils;
6. Extent of organic soils;
7. Stream flows;
8. Any surface drainage off highways and urban areas;
9. Outfall characteristics;
10. Fluctuating high groundwater conditions;
11. pH variation; and
12. Macro and micro-nutrient level variation.

The short stretch of Tadburn Lake will be affected by:

1. Catchment conditions;
2. Discharges to soakways and watercourses; and
3. Outflows from the Emer wetlands.

6.0 FURTHER SURVEY WORK

There remain a number of uncertainties about the hydro-ecology of Emer Bog cSAC, and especially of the relationship of the sensitive areas to the surrounding land. The studies necessary to resolve the issues include:

1. Determining the target habitat conditions

1. Topographic and surface features survey to ascertain the true extent of the wetland area and its relationship to adjacent land (this should be the first survey undertaken);
2. Soil and peat auger survey to determine the extent of groundwater and surface water affected waterlogged and seasonally waterlogged soils and peat, and peat depths, that would be affected by any hydrological changes to water regimes;
3. Hydrological survey to determine the depths of surface water and location of perimeter springs and seepages, including surface water flow measurements;
4. Hydrochemistry survey to determine the range of pH and nutrient concentrations across the open water and wetland areas in order to ascertain change across the site and any possible influence from consented discharges;

5. Installation of further dip wells (standpipe piezometers) to further characterise the wetland hydrology and variations in depths to groundwater across the site;
6. Botanical and NVC study of parts of the land surrounding Emer Bog (and not previously surveyed) in order to assess the plant community characteristics of the surrounding land;
7. Determination of plant species sensitive to hydro-chemical and water level change to provide base line data for monitoring;
8. Aquatic macro-invertebrate survey of flowing and standing open waters to characterise the wetland fauna and enable monitoring;
9. Study of recent and sub-fossil molluscs from within peat cores to ascertain any change in conditions during the development of the site, particular any changes in acidity and alkalinity;
10. Study of recent and sub-fossil plant remains from within peat cores to ascertain changes in the flora of the mire during its development and correlate with mollusc study to better understand recent changes in mire vegetation and hydrology; and
11. Desk study of historic sources (such as at the Hampshire Records Office) to establish past land-use and history of the wetland area and so determine trends in the development of the site.

2. Determining the surrounding conditions

1. Transect soil surveys of surrounding areas within and around the reserve to determine the critical soil zones affected by groundwater;
2. Transect boreholes to determine geological and hydrogeological conditions in critical areas including substrate lithology and permeability (hydraulic conductivity) and assessment of the angle of dip of critical strata in order to determine hydro-geological conditions and likely direction of groundwater flow;
3. Installation of lined boreholes from which to determine flow direction and to allow sampling of groundwaters in critical areas;
4. Ascertain consented discharges within 1km and consented abstractions within 5-10km of the site; and
5. Land-use survey of surrounding area to confirm results of aerial photograph study and so detect land practices that could adversely affect the special interests of the site.

3. Monitoring

1. Regular monitoring of soil water and floodwater levels within the wetlands from dip wells;
2. Regular monitoring of groundwater levels from boreholes;
3. Monitoring of critical species of fauna (especially aquatic macro-invertebrates) and flora (especially strongly calcifuge or calcicole species) to ascertain changes in hydro-ecological conditions with time;
4. Sampling and determination of pH and macro and micro-nutrient levels from open waters, dip wells and boreholes.
5. Photography of key features from which to compare any future change.

These recommendations will be developed and revised through the project partnership and taken forward into the next stage of the project.

7.0 INTERIM AND LONG TERM MEASURES TO MAINTAIN EMER BOG

In order to maintain the hydro-ecological integrity of the wetlands within Emer Bog cSAC, it is important that the conservation objectives are defined, management is put in place to ensure that those objectives are met and that there are no external processes, which will prevent those measures being upset. It is thus very important that water supplies, and the quality of the water supplied, are suited to maintaining the wetlands according to conservation objectives.

Interim measures involve:

1. Ensuring that the programme of work discussed above is undertaken; and
2. Ensuring that current planning permissions and discharges under the Water Acts are reviewed to so that indirect effects on Emer Bog are prevented.

Long-term measures involve:

1. Ensuring that planning policies fully respect the legal requirement to maintain the quality of Emer Bog cSAC so that all future planning applications include measures to avoid damage to the site, or are otherwise refused; and
2. Ensuring an appropriate scheme of monitoring, review and action such that surface water flows, ground water levels, springs and seepages, and water chemistry remain in optimum condition.

8.0 AREA OF DISCHARGE CONSTRAINT

Drawing 11 provides a provisional assessment of the surface water catchment of Emer Bog and includes both known watercourses and those areas where nearby infiltration of surface water could contribute to seepage and spring flows. At this stage, it is not possible to assess the remote sources that could affect groundwater flow, an issue to be addressed during the next phase of the study.

The red line on Drawing 11 is based on landform and drainage features that, on the basis of this study, are crucial to the hydrological integrity of Emer Bog.

The northern boundary of the area has been taken along the line of the railway in order to incorporate the nearest section of the Tadburn Lake stream which flows along the northern edge of Emer Bog and which could contribute water to the lowermost part of the site.

The southern boundary has been taken along the A27 where it abuts the urban area of North Baddesley from Scrag Hill in the west to Nutburn in the east.

The western boundary has been taken along the ridge of higher land that extends from west of Emer Farm and south through Warren Farm towards the A27. This ridge encompasses the catchment of the north flowing streams in the western part of Baddesley Common.

The eastern boundary broadly follows the Pound Lane ridge and is taken slightly east of the summit to allow for seepages through the upper part of the higher land here. This ridge encompasses the catchment of the west flowing streams and seepages.

9.0 REFERENCES

1. Allen R(1996), Emer Bog and Baddesley Common: Reconnaissance Hydro-ecological Study, for Hampshire Wildlife Trust.
2. Bendelow V C and Hartnup R, Climatic Classification of England and Wales, Soil Survey Technical Monograph No 15, Harpenden 1980.
3. Biodiversity: The UK Action Plan.
4. Biodiversity Action Plan for Hampshire.
5. British Geological Survey 1:50 000 scale Sheet 315 Southampton.
6. Conservation (Natural Habitats, &c.) Regulations 1994.
7. Countryside and Rights of Way Act 2000
8. Countryside and Rights of Way Act 2000 – Explanatory Notes.
9. Criteria for selecting Sites of Importance for Nature Conservation in Hampshire, Hampshire County Structure Plan 1996-2011 (Review) November 2000.
10. Dames and Moor (December 2000) Phase I/II Assessment Works, Borden Chemical UK Ltd.
11. English Nature, 1982 SSSI Citation Baddesley common.
12. English Nature, 18/05/00, Reasons for recommendation as a possible Special Area of Conservation.
13. English Nature, 02/03/01, Reasons for recommendation as a candidate Special Area of Conservation.
14. Geological Survey of Great Britain 1:10 000 scale Sheet SU32 SE.
15. Geological Survey of Great Britain 1:10 000 scale Sheet SU42SW.
16. Geological Survey of Great Britain 1:50 000 scale Sheet 299 Winchester.
17. Hampshire County Council, Biological Record.
18. Hampshire Landscape, Hampshire County Council 1993.
19. Hampshire Wildlife Trust, Water Level Records 200.
20. Jarvis M G, Allen R H, Fordham S J, Hazleden J, Moffat A J and Sturdy R G, Soils and their use in South East England, Soil survey of England and Wales Bulletin No 15, Harpenden 1984.
21. Legend to the 1:250,000 Soil Map of England and Wales, Soil Survey of England and Wales 1983.
22. MAFF Reference Book 435, The Agricultural Climate of England and Wales, HMSO.
23. Ordnance Survey 1:25 000 scale Explorer Sheet 131 Romsey, Andover and Test Valley.
24. Ordnance Survey 1:25 000 scale Explorer Sheet 132 Winchester.
25. Ordnance Survey 1:50 000 scale Landranger Sheet 185 Winchester and Basingstoke.
26. Ordnance Survey 1:50 000 scale Landranger Sheet 196 Solent and Isle of Wight.
27. Planning for Biodiversity – A good practice guide RTP1 1999.
28. Planning Policy Guidance 9 Nature Conservation (PPG9).
29. Sanderson NA December 1998, Vegetation Survey of Emer Bog, Hampshire, for Hampshire Wildlife Trust.
30. Various site reports provided by Test Valley Borough Council.
31. Test Valley Borough Council Aerial Photographs
32. 1:25,000 Soils of England and Wales, Sheet 6, South East England, Ordnance Survey for Soil Survey of England and Wales 1983.

APPENDICES

- 1. cSAC and SSSI Citations**
- 2. SINC's within study area**

Appendix 1.

cSAC and SSSI Citations

Reasons for recommendation as a candidate Special Area of Conservation

Area name: **Emer Bog**

Administrative area: **Hampshire**

Component SSSI: **Baddesley Common**

This area has been recommended as a candidate Special Area of Conservation (SAC) because it contains habitat types and/or species which are rare or threatened within a European context. The SSSI citation describes the special interests for which the site was notified in the British context. [NB: not for marine interests below mean low water mark]. The interests for which the site was selected as SSSI may differ from the interests selected in a European context.

Interest(s) submitted to the European Commission

European interest(s):

1. Transition mires and quaking bogs

- for which this is considered to be one of the best areas in the United Kingdom.

Very wet mires often identified by an unstable quaking surface. These are mires or fens which occur in waterlogged situations where they receive nutrients from the surrounding catchment as well as from rainfall. The vegetation is typically dominated by tall sedges *Carex* species and rushes *Juncus* species mixed with herbs, over a ground layer of bog-mosses *Sphagnum* species or feather-mosses such as *Calliergon* species.

For agency use only:

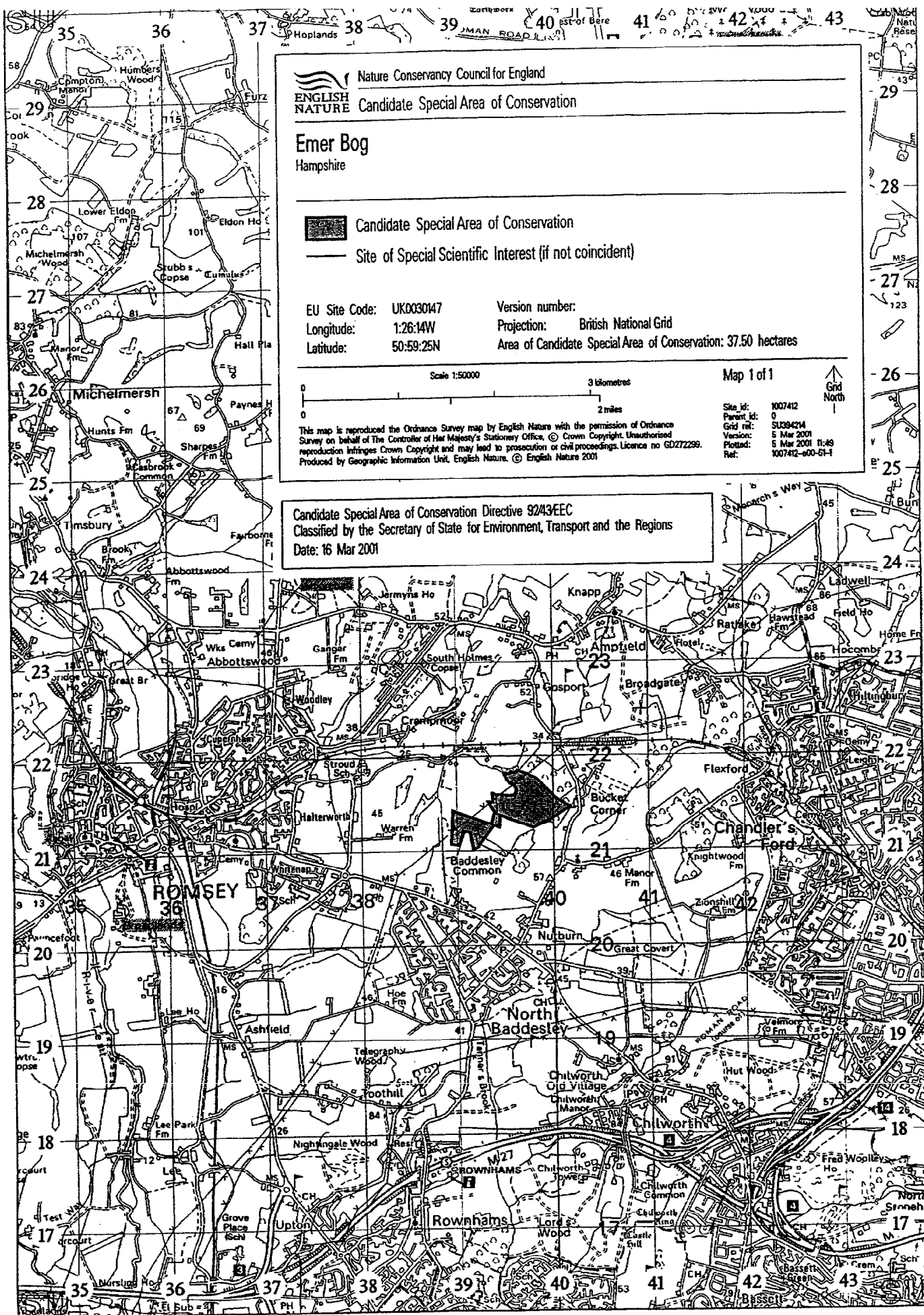
Date issued: _____

Reference number or date of map: _____

Emer Bog

Date compiled: **02/03/01**

Page 1 of 1



Reasons for recommendation as a possible Special Area of Conservation

Area name: Emer Bog

Administrative area: Hampshire

Component SSSI: Baddesley Common

This area has been recommended as a possible Special Area of Conservation (SAC) because it contains habitat types and/or species which are rare or threatened within a European context. The SSSI citation describes the special interests for which the site was notified in the British context. [NB: not for marine interests below mean low water mark]. The interests for which the site was selected as SSSI may differ from the interests selected in a European context.

The habitats and/or species for which this area has been recommended as a possible SAC are listed below. The reasons for their selection are listed, together with a brief description of the habitats and species as they typically occur across the UK. This area contains the interests described although it may not contain all the typical features.

European interest(s):

1. Transition mires and quaking bogs

- for which this is considered to be one of the best areas in the United Kingdom.

Very wet mires often identified by an unstable 'quaking' surface. These are mires or fens which occur in waterlogged situations where they receive nutrients from the surrounding catchment as well as from rainfall. The vegetation is typically dominated by tall sedges *Carex* species and rushes *Juncus* species mixed with herbs, over a ground layer of bog-mosses *Sphagnum* species or feather-mosses such as *Calliergon* species.

For agency use only:

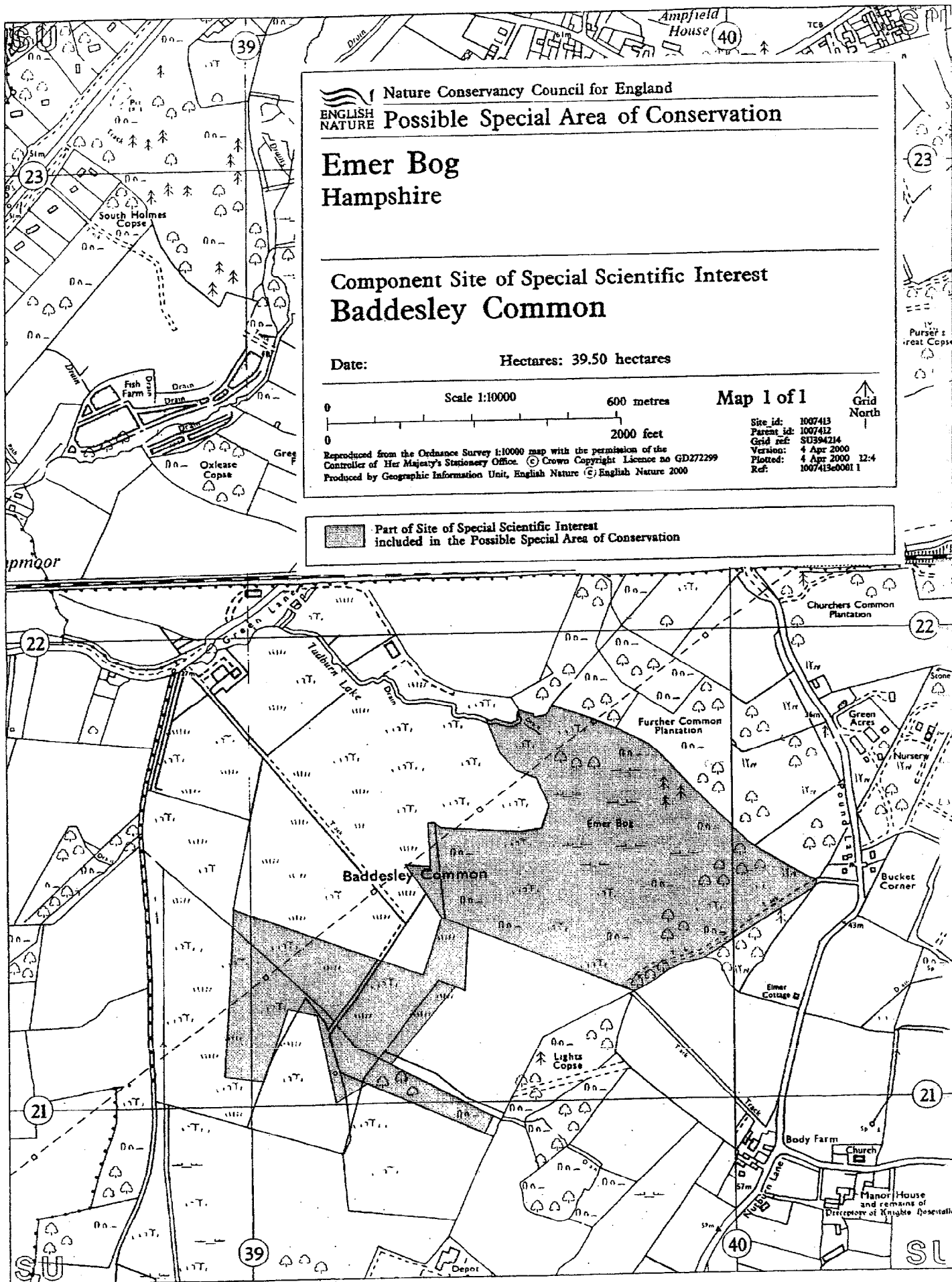
Date issued: _____

Reference number or date of map: _____

Emer Bog

Date compiled: 18/05/00

Page 1 of 1



Nature Conservancy Council for England
ENGLISH NATURE Possible Special Area of Conservation

Emer Bog Hampshire

Component Site of Special Scientific Interest
Baddesley Common

Date: Hectares: 39.50 hectares

Scale 1:10000 600 metres 2000 feet

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Produced by Geographic Information Unit, English Nature © English Nature 2000

Map 1 of 1

Grid
North

Site id: 1007413
Parent id: 1007412
Grid ref: SU394214
Version: 4 Apr 2000
Plotted: 4 Apr 2000 12:4
Ref: 1007413-0001.1

Part of Site of Special Scientific Interest
included in the Possible Special Area of Conservation

LOCAL PLANNING AUTHORITIES: Hampshire County Council
Test Valley Borough Council

NATIONAL GRID REFERENCE : SU 396215

ORDNANCE SURVEY SHEETS : 1:50 000: 185 1:25 000: SU 32

HECTARES/ACRES : 38.30/94.64

DATE NOTIFIED (1949 ACT) : 1979

DATE OF LAST REVISION:

DATE NOTIFIED (1981 ACT) : 1982

DATE OF LAST REVISION: 1982

OTHER INFORMATION : Not registered as common land. Areas of improved or species-poor grassland have been deleted from the SSSI. The greater part of the SSSI is now owned and managed by the Hampshire and Isle of Wight Naturalists' Trust as a nature reserve.

REASONS FOR NOTIFICATION:

The site comprises an extensive valley bog together with associated damp acidic grassland, heathland and developing woodland over Bracklesham Beds in the Hampshire Basin.

Emer Bog is an excellent example of an ungrazed valley bog with a rich flora and fauna which includes most typical bog species. The main elements of the bog vegetation include tall stands of Reed Phragmites australis and a shorter mixed association of sedges (especially White Sedge Carex curta, Bottle Sedge C. rostrata and Star Sedge C. echinata), with notable quantities of Marsh Cinquefoil Potentilla palustris and Bog Bean Menyanthes trifoliata, together with Marsh Violet Viola palustris and Southern Marsh Orchid Dactylorhiza praetermissa. The bog grades downstream into mature alder carr and upstream into heathland, heavily invaded, and partly planted, with pine, birch and scrub.

The invertebrate fauna of the bog and heath is of considerable interest and very large numbers of moths have been recorded.

To the south and west of Emer Bog, the site includes remnants of former common land, now acidic grassland dominated by Purple Moor-grass Molinia caerulea, but with a rich flora, including Petty Whin Genista anglica, Dwarf Gorse Ulex minor, Meadow Thistle Cirsium dissectum and Cross-leaved Heath Erica tetralix.

STATUS: SITE OF SPECIAL SCIENTIFIC INTEREST (SSSI) NOTIFIED UNDER SECTION 28
OF THE WILDLIFE AND COUNTRYSIDE ACT 1981

This map illustrates the location of Baddesley Common, a large area of common land in Hampshire. The common is outlined in a thick black line and is situated between the towns of Gosport to the north and North B. to the south. Key features include:

- Boundaries:** The common is bounded by a thick black line. To the north, it is separated from Gosport by a railway line and a road. To the south, it is bordered by the town of North B.
- Settlements and Landmarks:**
 - Gosport:** Located to the north, featuring buildings like Bramble Cottages and Green Lane Farm.
 - North B.:** Located to the south, featuring buildings like Body Farm, Vicarage, and Manor House and remains of the Precinct of Knights.
 - Blackwater Pond:** A large pond located to the west of the common.
 - Emer Bog:** A bog located to the east of the common.
 - Further Common Plantation:** A plantation located to the east of the common.
 - Lights Copse:** A copse located to the south of the common.
 - Neolithic Axe found:** A site marked on the western edge of the common.
- Infrastructure:**
 - Roads:** Several roads are shown, including Pound Lane, Green Lane, and Nuthorn Lane.
 - Railway:** A railway line runs horizontally across the middle of the map, separating Gosport from North B.
 - Drains:** Several drains are shown, including Oxlease Copse and Green Lane Drain.
- Other Features:**
 - Bucket Corner:** A location marked on the eastern edge of the common.
 - Manor House and remains of the Precinct of Knights:** A site marked on the southern edge of the common.
 - Algonquin:** A location marked on the southern edge of the common.
 - Nuthorn Cottage:** A location marked on the southern edge of the common.

The map also shows various other features such as fields, woods, and a track. The overall layout is a detailed topographical representation of the area.

Appendix 2.

SINCs within study area

The sites often fall into clusters. Sites in different clusters are grouped together in this list and separated by a blank line.

Sites north of Emer Bog (north of railway line)

10 – Oxlease Copse

Area: 1.85 ha

Criteria: 1A Ancient semi-natural woodland.

127 - Ampfield Wood

Area: 202.72 ha

Criteria: 1A Ancient semi-natural woodland and 1B Other woodland where there is a significant element of ancient semi-natural woodland surviving.

54 – Tadburn Meadows

Area: 8.10 ha

Criteria: 5B Agriculturally unimproved grassland and 5B Fens, flushes, seepages, springs, inundation grassland etc. that support a flora and fauna characteristic of unimproved and waterlogged (seasonal or permanent) conditions.

101 – Grosvenor Farm, Small Copse

Area: 0.52 ha

Criteria: 1A Ancient semi-natural woodland.

102 – Gosport Wood

Area: 1.96 ha

Criteria: 1A Ancient semi-natural woodland.

112 – South Holmes Copse

Area: 19.37 ha

Criteria: 1A Ancient semi-natural woodland.

113 – Grosvenor Farm, Wooded Meadow

Area: 2.29 ha

Criteria: 1Cii Woodland that comprise important community types of a restricted distribution in the County, such as yew woods and alder swamp woods and 5B Fens, flushes, seepages, springs, inundation grassland etc. that support a flora and fauna characteristic of unimproved and waterlogged (seasonal or permanent) conditions.

33 – Gosport Farm Meadow 1

Area: 3.88 ha

Criteria: 2A Agriculturally unimproved grassland.

34 – Gosport Farm Poplars

Area: 0.19 ha

Criteria: 1A Ancient semi-natural woodland.

35 – Purser's Great Copse

Area: 4.23 ha

Criteria: 1A Ancient semi-natural woodland.

50 - Street Shaw

Area: 2.32 ha

Criteria: 1B Woodland where there is a significant element of ancient semi-natural woodland surviving.

129 – Monks Brook Meadow

Area: 1.19 ha

Criteria: 2A Agriculturally unimproved grassland.

I Ralphs' Grassland Survey of 22/7/98 indicates a small valley bottom meadow with several meadow indicators partly disturbed by construction of large flight pond with spoil heaps. Includes species rich grassland, rush pasture, lake with introduced plants stocked with fish.

130 – Thornhill Pond and Surrounds

Area: 0.33

Criteria: 2A Agriculturally unimproved grassland

I Ralphs' Grassland Survey of 22/7/98 indicates a small area of rank grassland, fen meadow with recently dug pond, and rank fen with several meadow indicators.

139 – Great High Trees

Area: 2.44 ha

Criteria: 1B Woodland where there is a significant element of ancient semi-natural woodland surviving.

Sites south, east and west of Emer Bog (south of railway line)

9 – Cramp Moor

Area: 3.04 ha

Criteria: 2A Agriculturally unimproved grassland.

93 – Crampmoor Glebe

Area: 3.41 ha

Criteria: 2A Agriculturally unimproved grassland.

111 – Gipsy's Copse

Area: 3.55 ha

Criteria: 1Cii Woodland that comprise important community types of a restricted distribution in the County, such as yew woods and alder swamp woods.

11 – Baddesley Common South

Area: 10.46 ha

Criteria: 2B Semi-improved grassland which retain a significant element of unimproved grassland.

I Ralphs' Grassland Survey of 4/8/98 indicates gently sloping semi-improved and improved pasture, locally unimproved, summer horse grazing, locally heathy with occasional bell heather.

12 – Baddesley Common Meadow

Area: 6.39 ha

Criteria: 2A Agriculturally unimproved grassland and 3A Heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub.

I Ralphs' Grassland Survey of 15/10/98 indicates a moderately sized, semi-improved, improved and unimproved hillside meadow on southern edge of Baddesley Common SSSI with some fen meadow and rush pasture.

13 – Lights Copse Meadow

Area: 4.51 ha

Criteria: 2A Agriculturally unimproved grassland

Ian Ralphs grassland survey of 15/10/98 indicates a permanently grazed predominantly unimproved and semi-improved meadow and including patches of scrub woodland, fen meadow and mire, the mire being exceptionally species rich.

51 – Scragg Hill Copse

Area: 4.38 ha

Criteria: 1Cii Woodland that comprise important community types of a restricted distribution in the County, such as yew woods and alder swamp woods.

52 – Scragg Hill

Area: 4.56ha

Criteria: 1Cii Woodland that comprise important community types of a restricted distribution in the County, such as yew woods and alder swamp woods.

53 – Warren Farm Copse

Area: 3.52 ha

Criteria: 1Cii Woodland that comprise important community types of a restricted distribution in the County, such as yew woods and alder swamp woods.

94 - Baddesley Common West.

Area: 16.76 ha

Criteria: 2A Agriculturally unimproved grassland and 3A Heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub.

96 - Baddesley Close Green

Area: 0.19 ha

Criteria: 2A Agriculturally unimproved grassland.

97 - Baddesley Common Old Play Ground

Area: 2.01 ha

Criteria: 2A Agriculturally unimproved grassland and 3A Heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub.

98 - Lights Copse

Area: 6.51 ha

Criteria: 1A Ancient semi-natural woodland.

99 - Nutburn Meadow

Area: 9.54 ha

Criteria: 2A Agriculturally unimproved grassland.

I Ralphs' Grassland Survey of 29.9.98 indicates a large and complex unimproved and semi-improved fen meadow crossed by recently deepened drains. Species rich with a notable 16 old meadow indicators reported. Site includes woodland and scrub, scrub woodland and a variety of open grassland habitats and a possible seasonal pond. See also letter and report of Hampshire Wildlife Trust 18.11.1993 indicating agriculturally unimproved rush pasture and fen meadows with some drier horse pasture.

30 - South of Great Covert

Area: 3.28 ha

Criteria: 2A Agriculturally unimproved grassland.

40 - Great Covert

Area: 82.47 HA

Criteria: 1B Woodland where there is a significant element of ancient semi-natural woodland surviving.

100 - Sandy Lane Heath

Area: 1.97 ha

Criteria: 3A Heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub, 2A Agriculturally unimproved grassland and 5B Fens, flushes, seepages, springs, inundation grassland etc. that support a flora and fauna characteristic of unimproved and waterlogged (seasonal or permanent) conditions.

119 - Castle Lane Meadow

Area: 1.16 ha

Criteria: 2A Agriculturally unimproved grassland and 3A Heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub.

138 - East of Great Covert

Area: 1.81 ha

Criteria: 1Cii Woodland that comprise important community types of a restricted distribution in the County, such as yew woods and alder swamp woods.

37 - Sky's Wood

Area: 6.12 ha

Criteria: 1A Ancient semi-natural woodland.

38 - Tredgould Copse

Area: 5.02 ha

Criteria: 1A Ancient semi-natural woodland.

49 - Castle Hill

Area: 3.20 ha

Criteria: 1B Woodland where there is a significant element of ancient semi-natural woodland surviving.

I Ralphs' Woodland Survey of 28/7/98 indicates that this is an area of mixed woodland of a number of different types reflecting a complicated site history and including ancient secondary and recent woodland both of plantation and semi-natural origin, 50% of which has at some time been cleared for pheasant rearing and shooting.

131 – Sky's Wood Meadow

Area: 0.71 ha

Criteria: 2A Agriculturally unimproved grassland.

132 – Ramalley Piece/Badger's Copse

Area: 16.86 ha

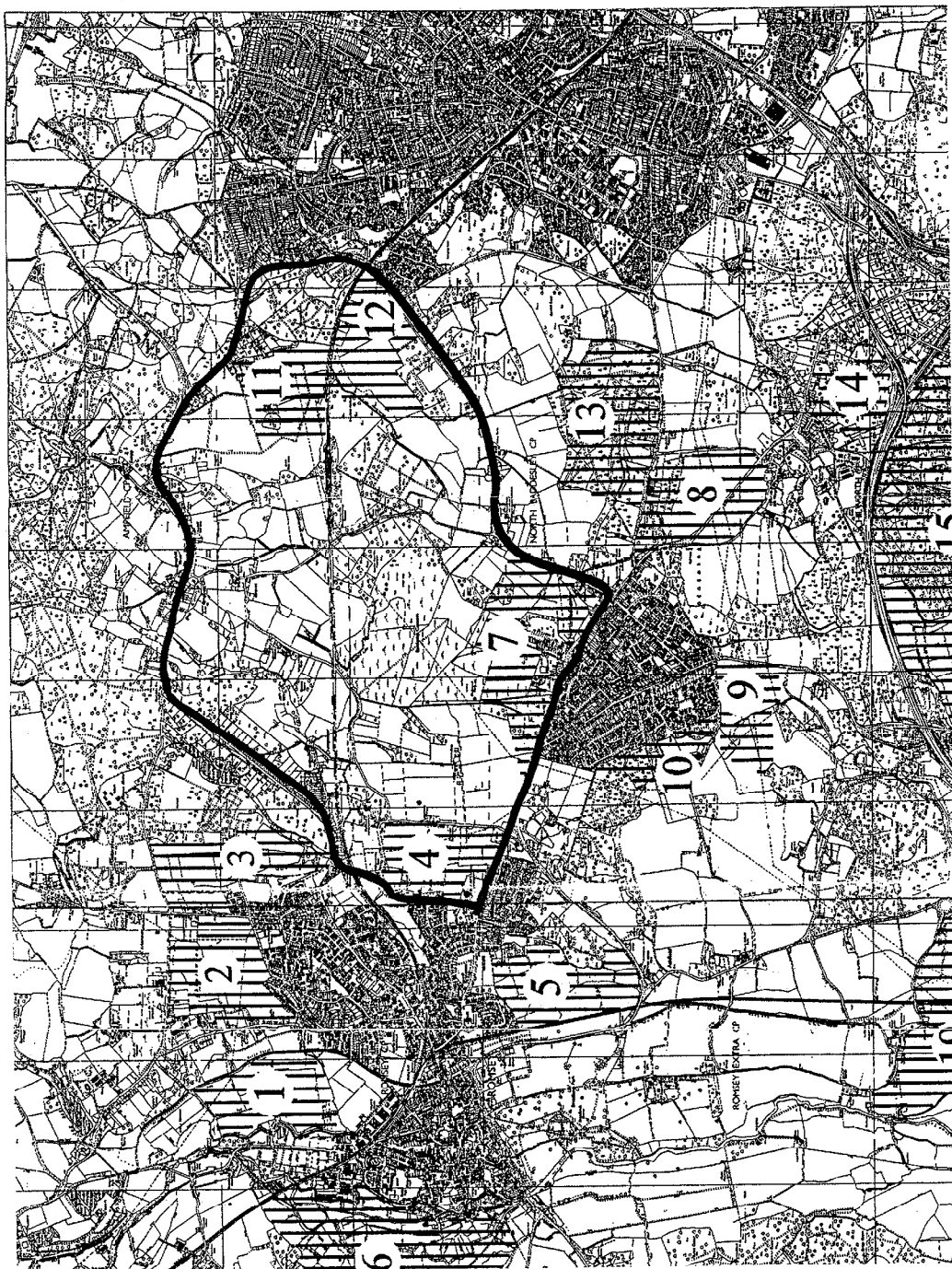
Criteria: 1A Ancient semi-natural woodland and 1B Woodland where there is a significant element of ancient semi-natural woodland surviving.

137 – Knight Wood/Clothier's Copse

Area: 11.01 ha

Criteria: 1A Ancient semi-natural woodland and 1D Pasture Woodland and wooded commons which are of considerable biological and historical interest.

DRAWINGS



Dwg 1: STUDY AREA

Project: Emer Bog cSAC

Client: Test Valley Borough Council

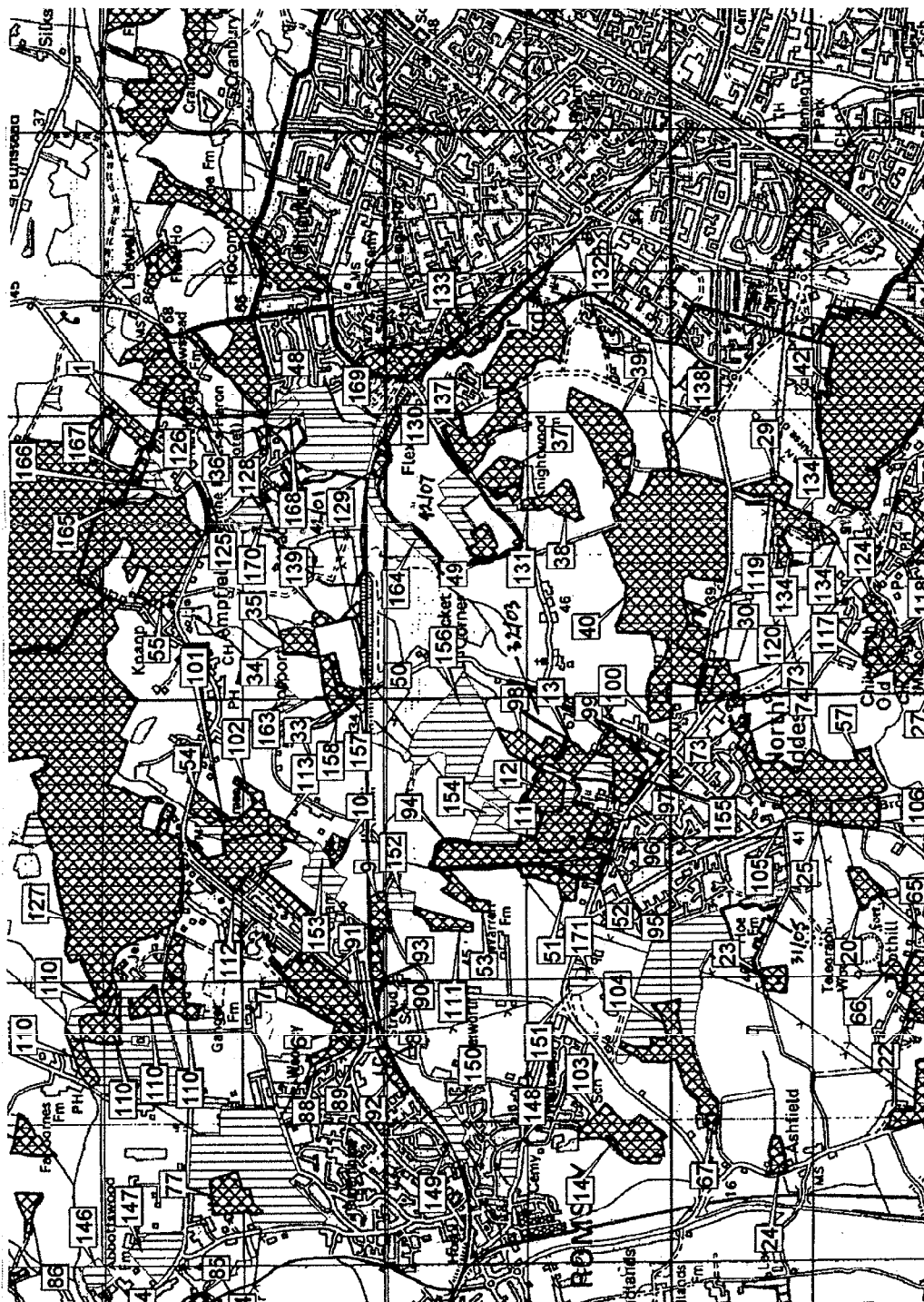
Scale: Not to scale

Drawn: R.H.A. 24th January 2002

The Environmental Project Consulting Group
44A Winchester Road, Petersfield, Hampshire GU32 3PG
Tel. 01730 231019 Fax. 01730 231021
Email: ra@epcg.co.uk Web: www.epcg.co.uk

Drawing provided by Test Valley
Borough Council.
Hatched areas are Local Plan Review
Sites.

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Dwg 2: SITES OF IMPORTANCE FOR NATURE
CONSERVATION

Project: Emer Bog cSAC

Client: Test Valley Borough Council

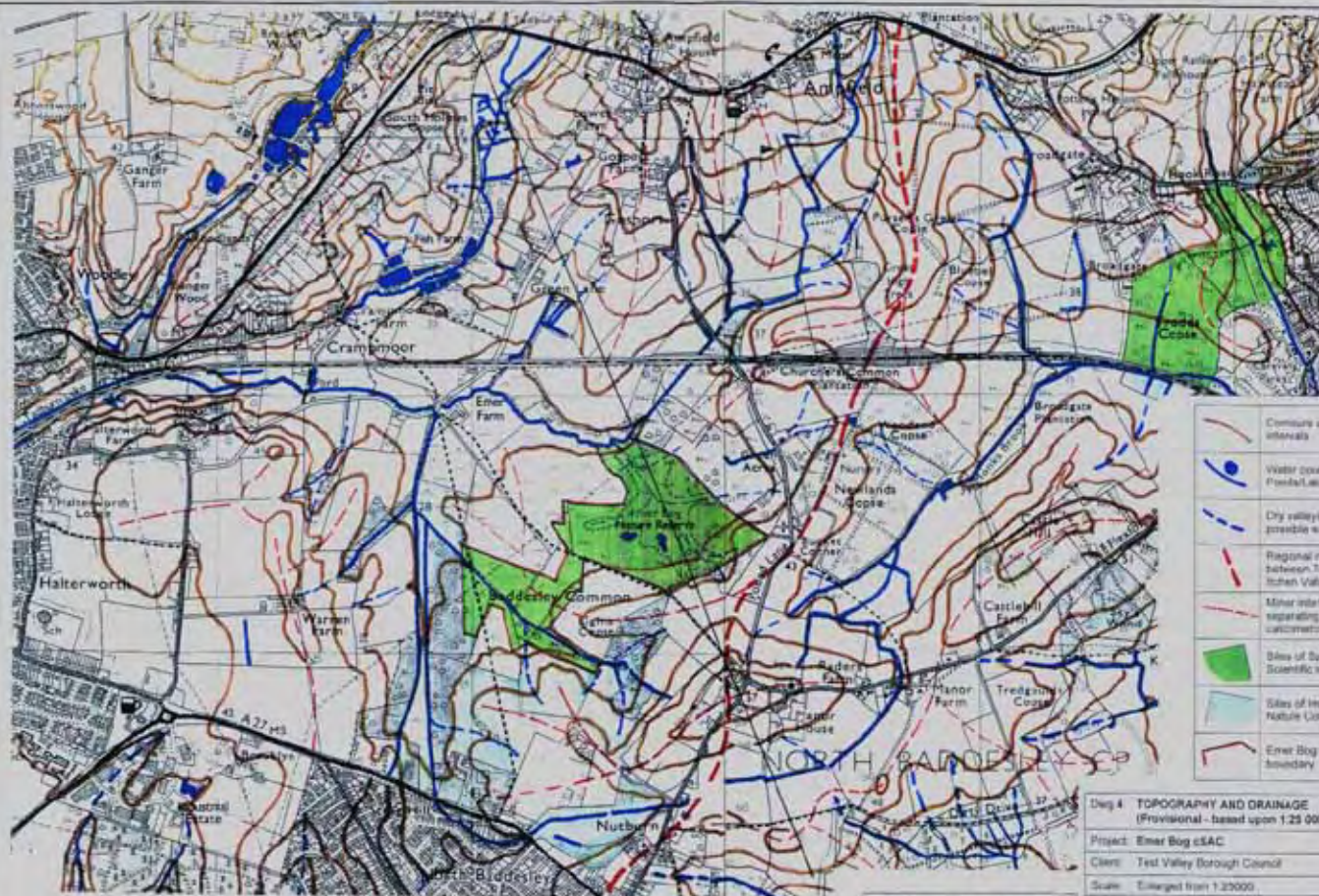
Scale: Not to scale

Drawn: R H A 24th January 2002

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Tel. 01730 231019 Fax. 01730 231021
Email. re@epcg.co.uk Web. www.epcg.co.uk

Cross-hatched areas = Sites of importance for Nature Conservation.
Vertically-hatched areas = Other sites for which information is available.
Numbers refer to outline descriptions appended to Report.
Site 156 approximates to the area of Emer Bog cSAC.
Map provided by Hampshire County Council.

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- Contours at 5m intervals
- Water courses Ponds/Lakes
- Dry valleys with possible water runs
- Regional interfluve between Test and Itchen Valleys
- Minor interfluves separating local catchments
- Sites of Special Scientific Interest
- Sites of Importance for Nature Conservation
- Emer Bog SAC boundary

Map 4 TOPOGRAPHY AND DRAINAGE
(Provisional - based upon 1:25 000 OS maps)

Project: Emer Bog SAC

Clients: Test Valley Borough Council

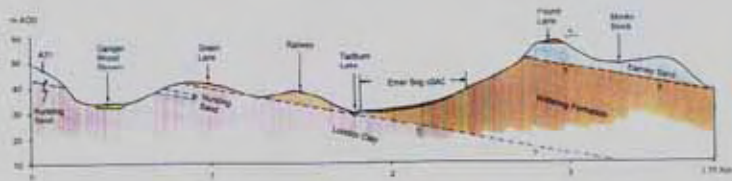
Scale: Enlarged from 1:25000

Date: RHA 24th January 2002

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Note: Some catchment boundaries and stream course alignments are provisional and require checking or more detailed mapping or on the ground.

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Dwg 5. TOPOGRAPHIC AND GEOLOGICAL CROSS SECTION
(along line shown on Dwg 4 and T)

Project: Emer Bag c5AC

Client: Test Valley Borough Council

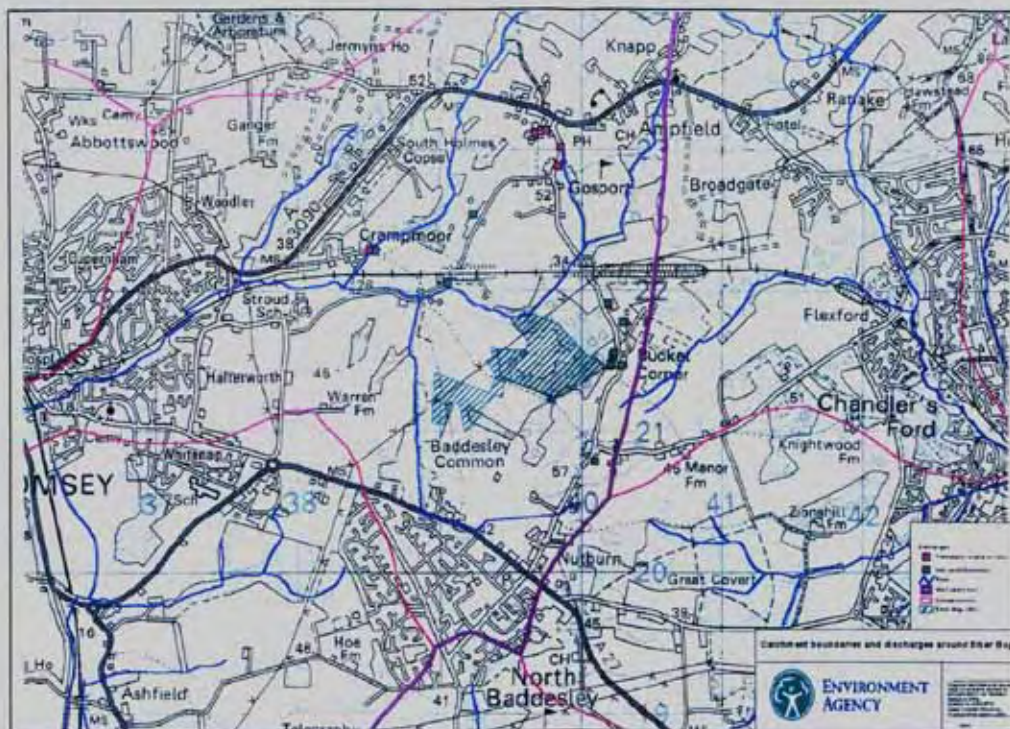
Scale: See scale bars on diagram, page 1.

Drawn: MHA 24th January 2002

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Note: This section has considerable vertical exaggeration leading to an apparent increase in angle of dip.

Real angle of disc is likely to be in order of $1-2^\circ$



Step 6: CATCHMENT BOUNDARIES AND DISCHARGES
(provided by Environment Agency)

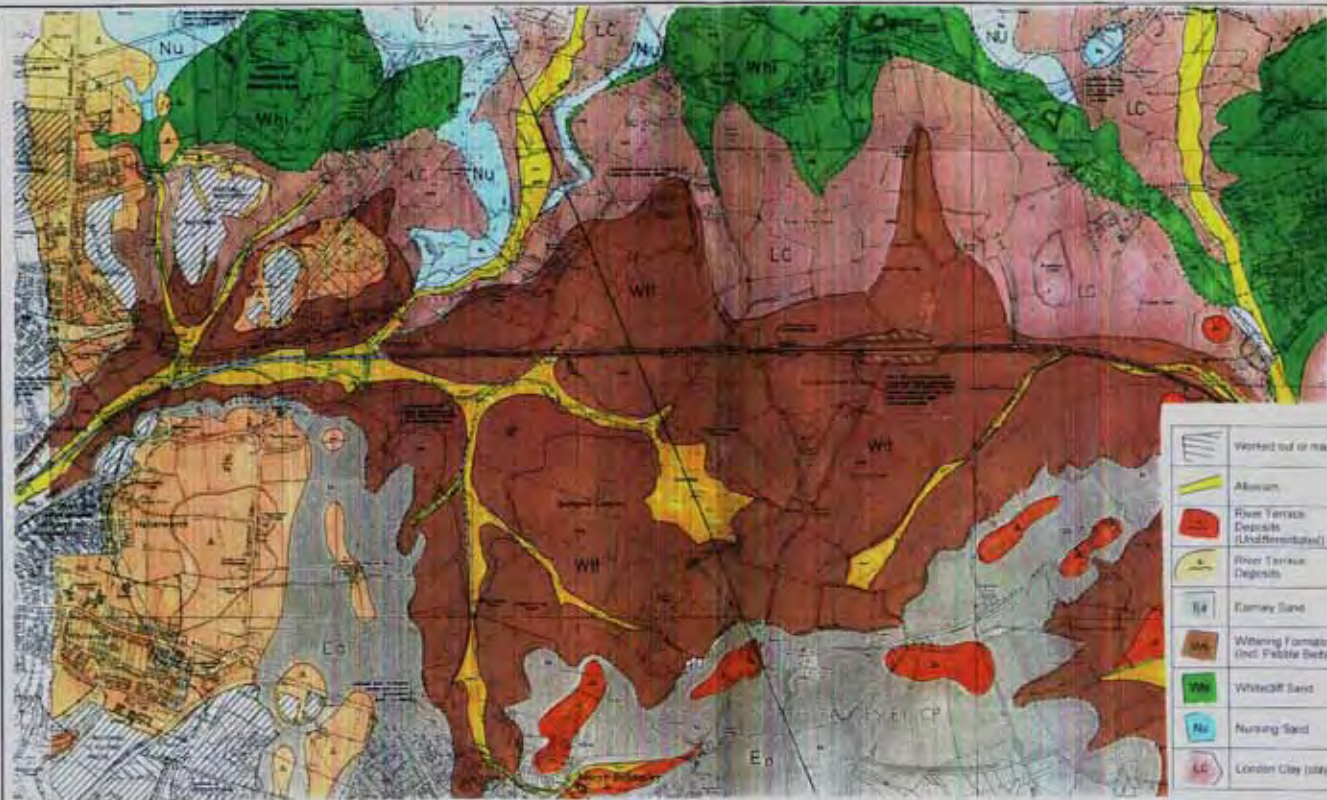
Project: Enter Blog c3AC

Client: Test Valley RiteLight Church

Scale Enlarged from 1:50,000

Drawn: R H A 24th January 2002

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	Working out or made ground	
	Alluvium	
	River Terrace Deposits (Undifferentiated)	River deposits
	River Terrace Deposits	
	Fluvial Sand	Buckingham Gravel
	Weaving Formation (and Fabbie Beds)	
	Whitecliff Sand	London Clay Formation
	Nursing Sand	
	London Clay (day)	

Day T. GEOLOGY
(Compilation map)

Project: Emer Bay cSAC

Client: Tost Valley Borough Council

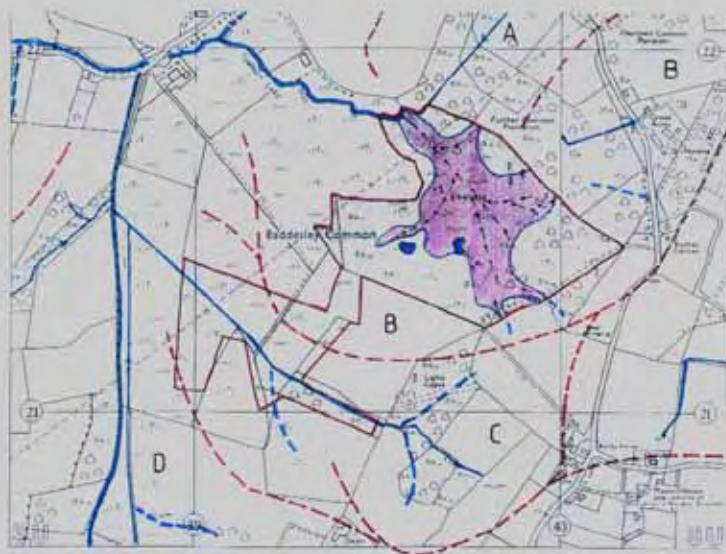
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Date: 11th April 24th January 2002

The Environmental Project Consulting Group
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Note: This map has been compiled from published 1:10 000 sheets SU32SE and SU42SW and from 1:50 000 sheets 296 and 315. Because these sheets have been revised at different times, adjustments have had to be made to produce this drawing. This means that some boundaries and stratigraphic distinctions on this drawing may differ from those on individual source maps.

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	Streams and drains
	Topographic low-ways (interpreted from contours)
	Assumed extent of wetland area
	Interpreted flow directions within wetland
	Probable catchment boundaries (interpreted from contours)
	Catchment
	Drain locations

Dwg #: EMER BOG, LOCAL HYDROLOGY AND CATCHMENTS

Project: Emer Bog sSAC

Client: Test Valley Borough Council

Scale: 1:10,000

Dwn: R H A 24th January 2002

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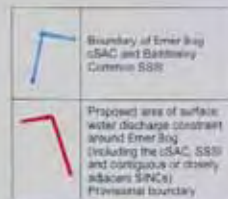


Fig 11: AREA OF DISCHARGE CONSTRAINT TO PROTECT KEY HABITATS WITHIN EMER BOG

Project: Emer Bog cSAC
 Client: Test Valley Borough Council
 Scale: Enlarged from 1:25,000
 Drawn: R.H.A. 24th January 2002

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