

Thorne, Crowle and Goole Moors SSSI WLMP Implementation Environmental Impact Assessment

Scoping Report

June 2011

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This report has been prepared for Tween Bridge Internal Drainage Board (IDB) by JBA Consulting and will form part of the formal Environmental Impact Assessment for the implementation of the Thorne, Crowle and Goole Moors Water Level Management Plan.

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Purpose

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Executive Summary

Tween Bridge Internal Drainage Board is the lead authority for a number of IDBs surrounding Thorne, Crowle and Goole Moors and has been tasked with implementing the Thorne, Crowle and Goole Moors Water Level Management Plan for the site.

The proposed works consist of the installation of a new pumping station and numerous control structures, scrub clearance, peat reprofiling and the creation of an area of lagg fen around sensitive parts of the moss. These water level management works aim to restore the Thorne Moors Special Protection Area, Special Area for Conservation, Site of Special Scientific Interest, Ramsar Site and Water Framework Directive Protected Area to Favourable (or Unfavourable Recovering) Status or Good Ecological Condition by 2015.

Due to the nature and location of these proposed works an Environmental Impact Assessment (EIA), and subsequent production of an Environmental Statement (ES), is required under the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (as amended). This Scoping Report is the initial stage of the EIA process.

The main aim of this Scoping Report is to identify the environmental factors that will be assessed for potential effects arising from the proposed scheme. A summary of the proposed assessments is presented in Table i below.

Table i Summary of Environmental Factors to be considered as part of the EIA

Environmental factor	Scoped in/out	Brief justification for scoped-out factors
Population and material assets	In	N/A
Ecology	In	N/A
Hydrology, geology and soils	In	N/A
Air and climate	Out	Any impacts on air quality are likely to occur during the construction phase through emissions and dust. However, given the agricultural nature of the surrounding area it is likely that the local community are tolerant of the existing levels of exposure associated with agricultural practices
Landscape	In	N/A
Archaeology and cultural heritage	In	N/A

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Abbreviations

ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
ASLV	Area of Special Landscape Value
BAP	Biodiversity Action Plan
DMBC	Doncaster Metropolitan Borough Council
EA	Environment Agency
EC	European Community
EclA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
ES	Environmental Statement
GQA	General Quality Assessment
HPZ	Hydrological Protection Zone
IEEM	Institute of Ecology and Environmental Management
IDB	Internal Drainage Board
LBAP	Local Biodiversity Action Plan
LCA	Landscape Character Area
LNR.....	Local Nature Reserve
LWS	Local Wildlife Sites
MAGIC	Multi-Agency Geographic Information for the Countryside

NBN	National Biodiversity Network
NCA	National Character Areas
NE	Natural England
NGR	National Grid Reference
NNR	National Nature Reserve
NVC	National Vegetation Classification
OS	Ordnance Survey
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SINC	Sites of Interest for Nature Conservation
SPA	Special Protection Areas
SSI	Site of Special Interest
SSSI	Site of Special Scientific Interest
UK	United Kingdom
WFD	Water Framework Directive
WLMP	Water Level Management Plan

1. The Scoping Process

1.1 Introduction

Thorne, Crowle and Goole Moors are multi-designatory wildlife areas situated to the north of the town of Thorne in the Doncaster District, west of Crowle in North Lincolnshire and South of Goole in the East Riding of Yorkshire (see Figure 1). The moors as a whole form part of England's largest area of peatland and have suffered from industrial peat extraction, particularly during the latter half of the 20th Century.

Peat extraction on the moors has now almost ceased but it has left a legacy of large areas of bare peat, birch woodland and environmental damage. The implementation of the Thorne Crowle and Goole Moors WLMP (May, 2010) aims to restore the moors to a favourable ecological condition and permit the recolonisation of the site by peat-forming vegetation, building on the work already carried out by Natural England and others. The implementation of this plan will permit finer control over the water levels on the moors and in the drains across the agricultural land surrounding the site. This will be achieved by the installation of a new pumping station, numerous control structures, scrub clearance, peat reprofiling and the creation of an area of lagg fen around sensitive parts of the moss.

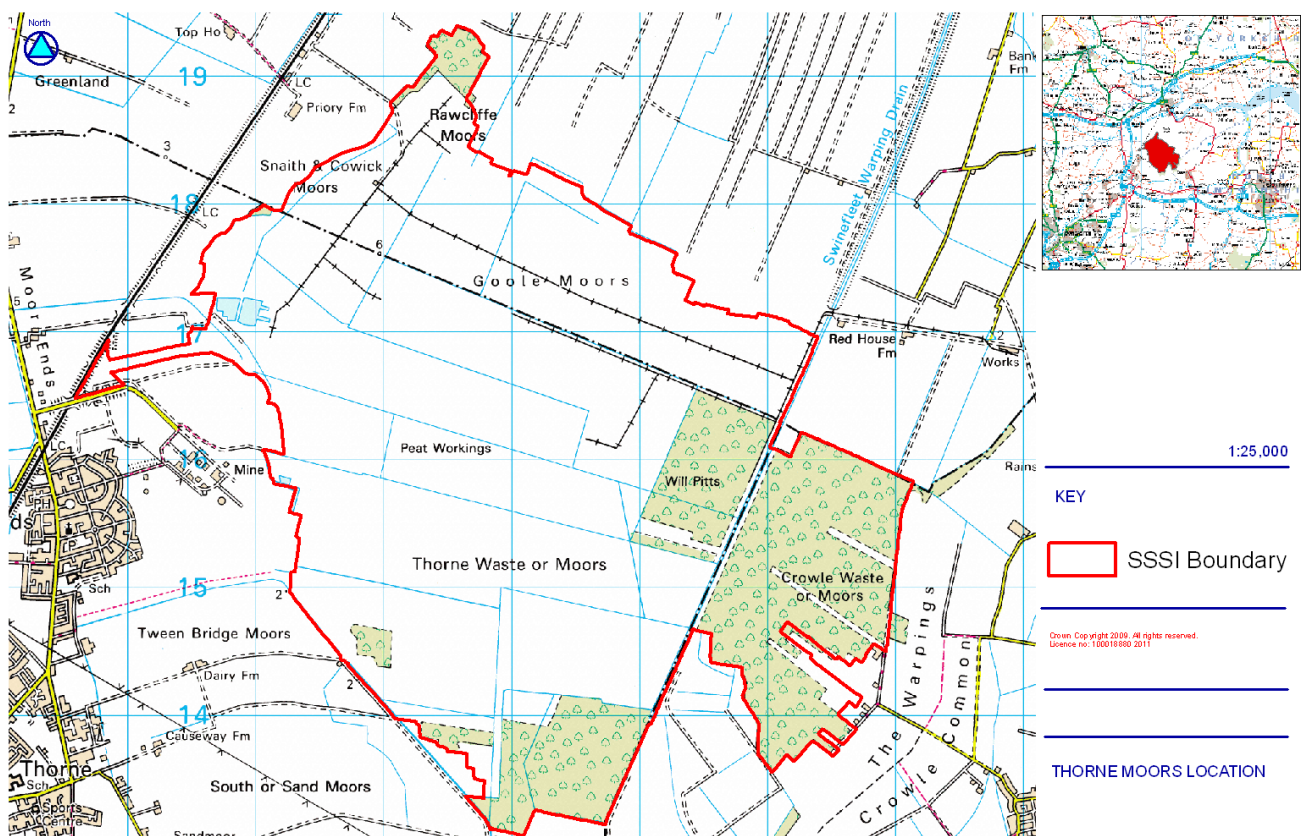


Figure 1 Location of Thorne, Crowle and Goole Moors

Tween Bridge IDB is the lead authority for a number of IDBs adjoining the moors that have been tasked with implementing the WLMP for the site. The other IDB members of the implementation group are:

- Reedness and Swinefleet Drainage Board;
- Dempster Internal Drainage Board;
- Thorntree Internal Drainage Board;
- Goole Fields Internal Drainage Board;

- Black Drain Internal Drainage Board.

It is anticipated that the works will take five years to implement in full and it has been determined by Tween Bridge IDB that the improvement works are likely to have a significant effects on the environment. Therefore, due to the nature and location of these proposed works, an Environmental Impact Assessment (EIA), and subsequent production of an Environmental Statement (ES), is required under the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (as amended). This Scoping Report is the initial stage in the EIA process.

1.2 Purpose of Scoping

The primary aim of this Scoping Report is to establish the scope and extent of the EIA and ensure that all potentially significant environmental impacts are adequately addressed, as far as is reasonably possible. The issues identified in this Scoping Report will then be subject to formal assessment, resulting in the preparation of an ES.

This Scoping Report also forms the basis for consultation with statutory authorities, elected bodies, relevant organisations and all other interested parties. The EIA process will be refined as the consultation process continues.

1.3 Scoping Objectives

The overall objectives of EIA Scoping are to:

- Describe the approach to the EIA;
- Identify the issues that will be assessed;
- Identify issues that can be eliminated (i.e. "scoped out") of the EIA process;
- Define the methodology for undertaking the assessment and evaluation stage of the EIA;
- Determine any potential site-specific environmental impacts, mitigation measures and enhancement opportunities;
- Provide a means for consultation with statutory consultees and interested parties to agree the scope and approach to the EIA.

1.4 Environmental Impact Assessment

EIA is a process which identifies the environmental impacts (both adverse and beneficial) of a proposed development. It ensures that the importance of these impacts, and the opportunity for reducing any adverse impacts, are properly considered as part of the design development process and are understood by the public, statutory authorities and other interested parties. EIA helps developers to prevent, reduce and offset adverse environmental impacts and ensures that environmental issues can be taken into account during the design of the scheme.

The requirements for EIA are defined by EC Directive 85/337/EEC, as amended. The requirements of the EIA Directive have been applied to drainage bodies through the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (as amended). The required content of an ES is set out in Schedule 4 of the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (as amended).

2. Proposed Works

2.1 WLMP Implementation Objectives

Tween Bridge IDB, in accordance with their duties under the Water Framework Directive (WFD) and the Habitats Directive, must restore the Thorne Moors SPA, SAC, SSSI, Ramsar Site and WFD Protected Area to Favourable (or Unfavourable Recovering) Status or Good Ecological Condition; in the case of the latter legislation by 2015. The area that will be affected by the proposed remedial works in the plan is shown in Figure 2. A plan showing the most up to date condition assessments, undertaken by Natural England, of the SSSI is located on Figure A10 of Appendix A.

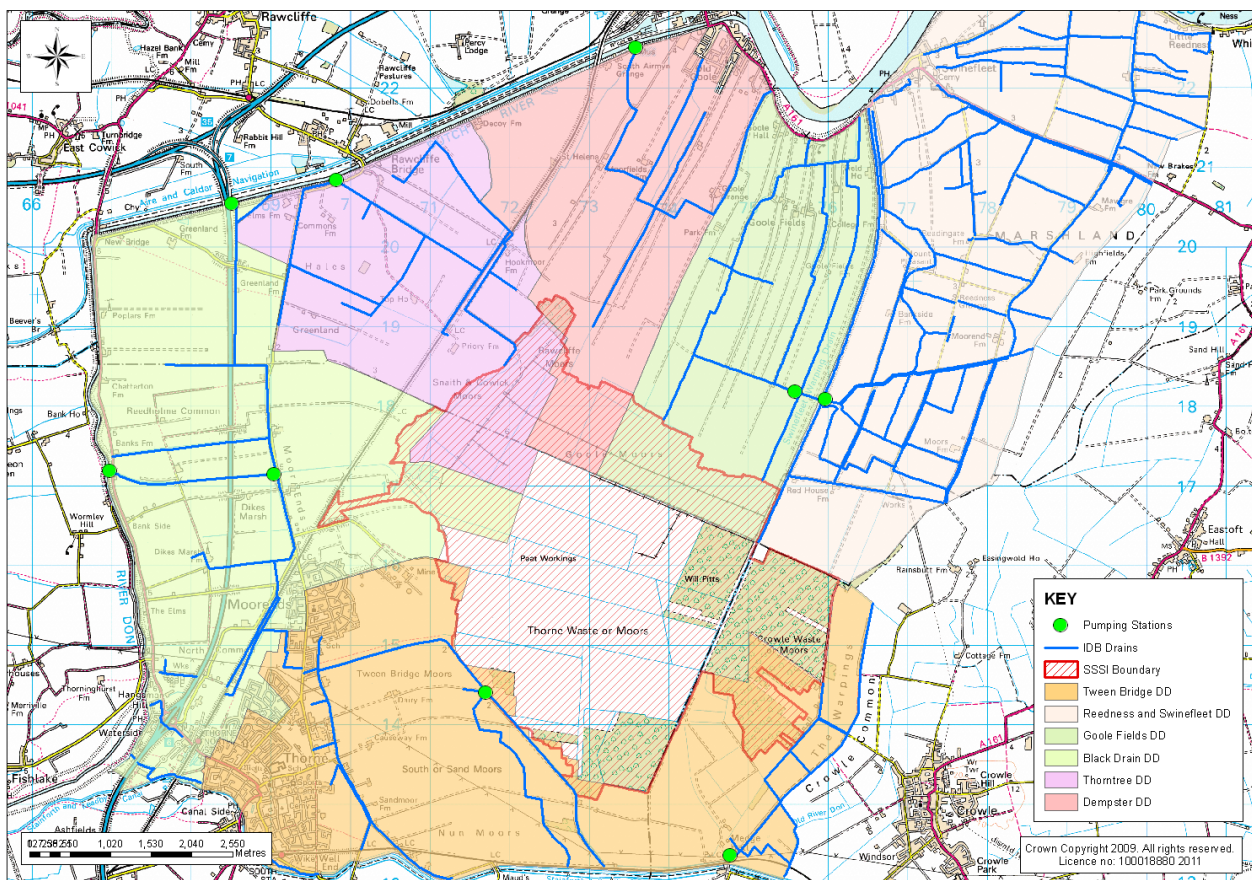


Figure 2 Thorne Moors, IDB Districts, Drains and Pumping Stations

2.2 Site History

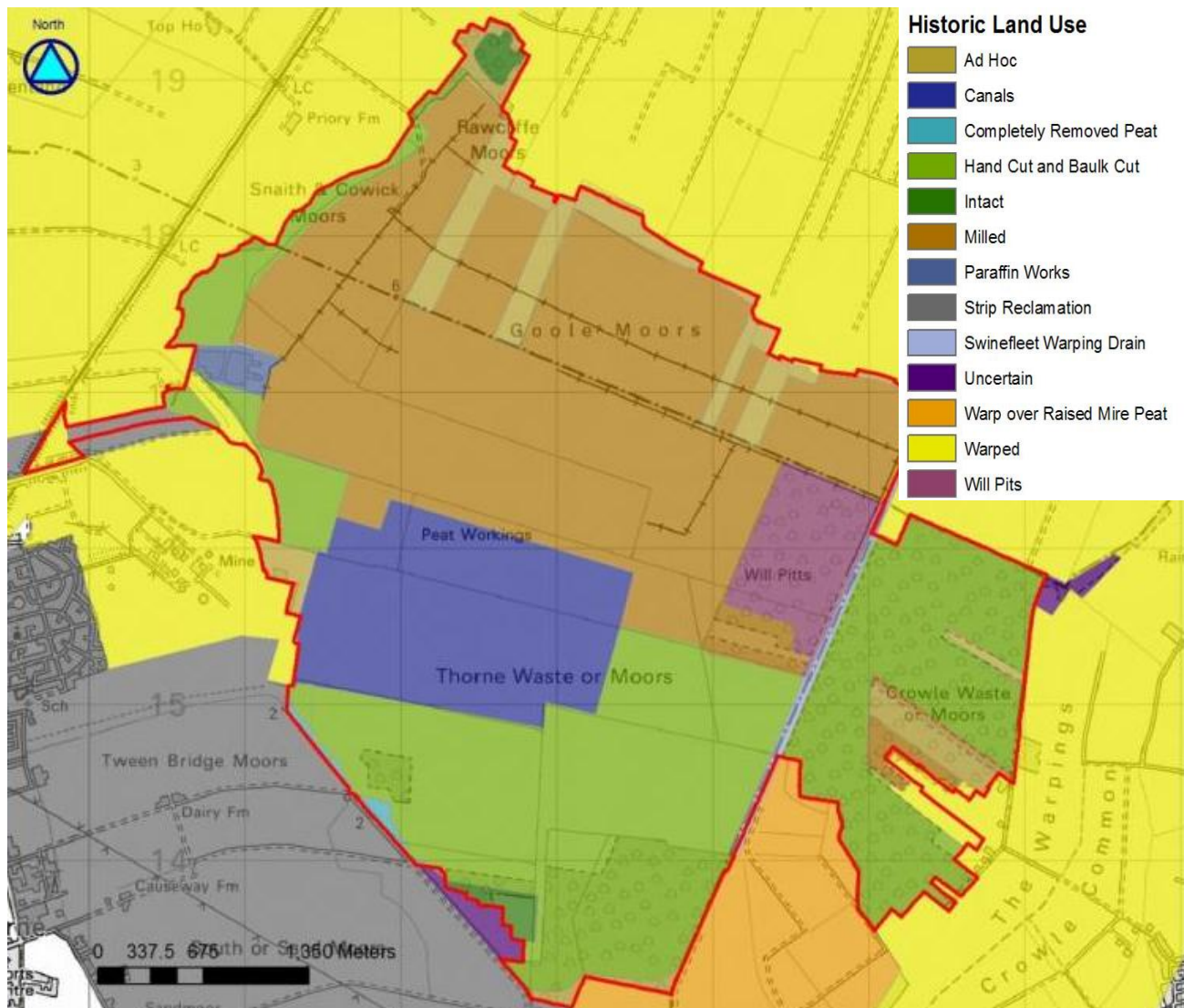
Thorne, Crowle and Goole Moors is a damaged lowland raised bog. Peat began to form on the low permeability 25 Foot Drift Clay Deposits around 3,000 to 4,000 years BP. Waterlogging created anaerobic conditions which slowed down the rate of decomposition of plant material and allowed peat to build up. As the peat accumulated and formed a dome, it became isolated from the surrounding catchment and so the primary source of water for the site became rainfall.

There have been a number of phases of peat cutting works on the site and a number of extraction techniques employed upon it (see Figure 3):

- Dutch Hand Graving – i.e. the canals area of Thorne (1890s -1940s);
- English Hand Graving – this produced the ridge and furrow topography seen on much of the south of Thorne Moors and Crowle Moors (19th and early 20th Century);

- Paraffin Works – circa 1880 deep pools to provide dense black peat for fuel were cut at the Paraffin Works;
- Mechanical Block Cutting – this produced a similar topography to the English Hand Graving Method but the cuttings were longer and denser in their cover. This appears to be limited to some areas in the south of Thorne Moors (1970-80s);
- Peat Milling – as seen on Goole Moors and other areas (1980s-90s).

As a result of these phases of extraction and the associated drainage works, the site no longer acts as an intact raised mire system.



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Figure 3 Thorne Moors Historic Land Use

2.3 Description of Proposed Works

2.3.1 Restoration Options

Over the whole site similar restoration techniques are recommended to aid restoration. These include:

- Scrub clearance;
- Bund systems, including contour bunding of hand-cut areas;
- Ditch blocking;

- Piling and re-profiling;
- Lagg creation;
- New ditches outside of the mire;
- Levees;
- Pumping and modification of the drainage regime.

Table 2-1 outlines the management options for the site by management compartment as shown on Figure A2 in Appendix A. Up to three options have been given for each area. Option 1 is currently the preferred option as it is believed that this is most likely to achieve the water level targets for the site.

Table 2-1: Summary of Management Options

Hydro-geological Sub-region	Management Compartments	Options 1 – Preferred Option	Option 2	Option 3
Milled area	2,6,7,9,11,14,15,21,27,34,43 (Bunded Mill Area)	Adjusting the heights of the outflows from the bunded cells to produce a mean water table elevation at, or just below, the ground surface. These adjustments should be informed by survey work on species colonisation in each bunded cell and through analysing data from a monitoring array.		
	2,6,7,8,9,10,11,13,14,15,16,18,19,20,21,26,27,34,35,40,43 (The whole milled area)	Creating a pumping system based on automated telemetry to maintain relatively high water levels within the main ditches all year round whilst still maintaining the capacity to deal with large rainfall events. Increasing the number of discharge points from the system by reopening ditches that breach the North West Rand at NGR 472057, 418769 (Creykes Gate) and 470476, 417290 (Durham's Warping Drain). At the detailed design stage the impact of the downstream catchment and pumping stations will be assessed. This will include an assessment of suitable maximum consented discharge rates.	Increase the number of discharge points from the system (as option 1).	Maintain the current system of weirs and pump.
	8,16,18,19,20,21,26,35 (The milled area without bunding)	Extending the bunding system across the whole of the milled area, to include Natural England land not included in the original plans, and also land not currently owned by Natural England.	Delay extending the bund system and give time for vegetation communities to develop before assessing the need to extend the bund system further (i.e. allow time to see whether desirable communities develop naturally without intervention.	
	10, 12, 13, 18, 20 (The Wooded Strips)	Removing scrub and blocking the minor drains that surround these compartments.	Scrub removal.	
	10, 12 and the northern	Bunding or re-profiling the edges of these units where	Scrub removal and raising the water	

Hydro-geological Sub-region	Management Compartments	Options 1 – Preferred Option	Option 2	Option 3
	halves of 13 and 14	higher ground is surrounded by main drains or lower milled ground, e.g. the boundary between units 10 and 11. Options for the type of bunding (sheet piling, etc.) or re-profiling have not been appraised.	level in the surrounding drains through control structures.	
	12	Blocking of the hand cut ridge-and-furrow topography with peat bunds. Scrub removal. Bunding boundary ditch.	Scrub removal. Bunding boundary ditch.	Scrub removal and watching brief.
Northern Goole Moors	1 and 3	Removing scrub – possibly using an ‘aerial runway’ method in areas of intact raised mire hummock topography. Creating an HPZ – infilling the current boundary drain and instating a new drain 60 m away from the current one so as to create a lagg habitat in the natural topographical depression that surrounds the compartment. Blocking internal drains that run through the peat.	Scrub removal and control structures within the internal and surrounding boundary drains.	Scrub removal and block internal ditches.
Inkle Moor, Durham’s Warping Drain and Paraffin Works	33	Removing scrub and instating a regular grazing management program.	Remove scrub and instate a mowing regime.	
	32	Lagg creation – blocking the ditches that drain the edge of the raised mire (Unit 31), thereby encouraging wet woodland and lagg fen habitat which already occurs over much of the site.	Watching brief.	
	31	Removing scrub. Blocking of the hand cut ridge-and-furrow topography with peat bunds. Maintaining grazing of the warped area.	Scrub removal and review effectiveness of ditch blocking in the area. Maintaining grazing of the warped area.	
	29, 30	Removing scrub in areas where it is apparent that the raised water levels are not causing the scrub to die back.	Watching brief.	
North West Rand	4 and 5	Removing the birch scrubland, leaving the established alder wet woodland on the edge of Compartment 5.	Removing the birch scrubland, leaving the established alder wet woodland on the edge of	

Hydro-geological Sub-region	Management Compartments	Options 1 – Preferred Option	Option 2	Option 3
		Defining an HPZ in the northern part of the area by blocking the external ditches and creating a habitat like the Alder Thicket found in the southern part of the North West Rand.	Compartment 5.	
Will Pitts Wood	28, 36	Watching brief		
South Thorne	37,38,39,44,45,49,50,51,52,53,54,55,56,60,61,63,66,68	Removing scrub in areas where it is apparent that the raised water levels are not causing the scrub to die back.	Removing the denser areas of scrub and monitoring areas of scatter trees to ensure that they do not become denser.	
	37,39,52,53,54,55,56,57,60,61,65,66,68	Contour bunding or other method – in dry areas, blocking the ridge-and-furrow topography with peat bunds along contours in order to reduce runoff. These would aim to aid in rewetting whole fields (at present the lowest parts of the fields are wet but the higher parts are too dry).	Scrub removal then assess the need of contour bunding based on continued monitoring of the watertable and of scrub encroachment i.e. bund where scrub removal by itself has proved to be ineffective.	
	67, 68	Maintaining the areas of wet woodland in Pony Bridge and Limberlost Woods.		
	58	Replace fixed weir on Angle Drain near Bailey Bridge with an adjustable control structure.	Maintain existing Bailey Bridge structure.	
	63	There are several possible options for Cassons Gardens: Filling in the small external boundary ditch and creating an HPZ which could be bounded by a clay levee to create an area suitable for colonisation by lagg vegetation. Improving the external peat 'cliff' through: Re-profiling (engineering the 1 – 3 m tall 'cliff'). Sheet piling. Clearing rhododendrons – this should only be done in conjunction with engineering works to raise the water table. This is because the current depth of the water table is such that scrub would be likely	Assess the potential for the area to support a raised mire habitat after rhododendron removal.	Abandon area as a having the potential to be a raised mire in the future, given the prohibitive topographical and rhododendron constraints.

Hydro-geological Sub-region	Management Compartments	Options 1 – Preferred Option	Option 2	Option 3
		to recolonise the area following clearance.		
	51	Piling along the edge of the peat to re-wet this high area.	Assess the need for piling after the effects of scrub removal on the watertable have been assessed.	
	37	Adjustable control structure on the New Mill Drain at NGR 473515, 415928.	Fixed control structure on the New Mill Drain at NGR 473515, 415928.	
	37, 39, 44, 45, 51	Lagg habitat creation: Blocking boundary ditches and instating a new ditch up to 175 m away from the current boundary. The area between the site and Thorne Colliery's pit heap could be flooded with no provision for extra ditches, thereby defining the edge of the HPZ.	Lagg habitat creation along the boundaries of compartment 37, 39 and 44 (i.e. land owned by Natural England or is not land used for agriculture)	Maintain and review the effectiveness of the control structures within the boundary ditches.
North, South and West Crowle.	69,70,71,72,73,74,75,76,83,84,85	Clearing scrub – all dense woodland in this area should be cleared except the established woodland in Compartment 70.	Scrub clearance only in areas where it is likely to result in the restoration aims being achieved solely through scrub clearance or where accompanied in tandem by engineering works to raise the watertable. e.g. Scrub clearance in Compartment 76 should be accompanied by reprofiling of the peat cliff on its southern boundary at 475432, 414934.	Removing the denser areas of scrub and monitoring areas of scattered trees to ensure that they do not become denser.
	69, 70, 84, 85	HPZ – a topographic low lies around most of the edge of the south of Crowle, including some of the arable fields that bound the site. In order to re-wet this area an HPZ similar to that proposed on the North West Rand would help. This would entail ditch blocking and the creation of lagg habitat. Some reprofiling will be required on the peat cliff edge	Assess raising the water level in the boundary ditch through a series of control structures which aid in limiting the drainage from the peat mass and maintain the drainage of the agricultural land adjacent to the bog.	

Hydro-geological Sub-region	Management Compartments	Options 1 – Preferred Option	Option 2	Option 3
		along part of boundary of Unit 85. The peat from this reprofiling can be used to infill the drain that runs along the base of the cliff.		
	71	The topography is such that the agricultural land lies approximately 0.5 to 1.5 m above the site therefore it would be difficult to establish a lagg habitat in this area. The current boundary ditch should be blocked (which lies lower than the site) and a new higher ditch dug that will be approximately 10 m into the agricultural land. Lagg creation may be suitable in one low lying corner of the field in the north western corner which currently requires significant drainage in order to maintain it.	Block the current on-site boundary ditch and install monitoring equipment to ensure this does not cause a detrimental effect upon the bordering agricultural land.	
	72	A number of small peat bunds are required to block ditches in this part of the site.		
	76	The peat cliff that bounds Compartments 76 and 77 could be improved through: Re-profiling (engineering the 1 – 3 m tall 'cliff'). Sheet piling.	Interventional restoration attempts are abandoned in this area and the peat mass is allowed to degrade/subside. The processes can be reviewed periodically to ensure that the degree of scrub encroachment is acceptable and a sustainable peat profile is forming.	
Ribbon Row	77	Options for Compartment 77 are dependent on the method adopted to deal with the peat 'cliff' between Compartments 77 and 78. Blocking the ditch that runs along the base of the northern cliff. Creating a bunded system like that implemented on the milled areas of Thorne.	Block ditch at the base of the northern cliff.	
	78, 79, 80	The topography in this area will inhibit any attempt to		

Hydro-geological Sub-region	Management Compartments	Options 1 – Preferred Option	Option 2	Option 3
		restore the area to lowland raised mire in the short term. It is suggested that some peat in this area be used in restoration activities elsewhere on site, including for the creation of bunds in Compartments 77 and 81. The final surface topography in this area should be more subdued (and so easier to re-wet) than at present. After these works, targeted scrub clearance could aid in the creation of Nightjar habitat in these areas.		
	81	Creating a bunded system like that implemented on the milled areas of Thorne. The boundaries with Units 69 and 82 may require re-profiling, although the need for this could be assessed after other implementation measures have been put in place.	The boundaries with Unit 69 and 82 may require re-profiling, although the need for this could be assessed after other implementation measures have been put in place. Monitor the natural succession in the area and intervene if this is proved to be unacceptable.	Monitor the natural succession in the area and intervene if this is proved to be unacceptable .

Figure A12 in Appendix A shows the water level classifications for each part of the site and Figures A13 and A14 also in Appendix A show the implementation plans for engineering and scrub clearance to restore the site to favourable condition.

3. The EIA Methodology

3.1 Scope of the EIA

The scope outlines the environmental factors that will be addressed in the EIA which according to Schedule 4 of the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (as amended) are:

- (a) human beings, fauna and flora;
- (b) soil, water, air, climate and the landscape;
- (c) material assets and the cultural heritage; and
- (d) the interaction between the factors mentioned in sub-paragraphs (a) to (c) above.

For the purpose of this scheme it is proposed that the following aspects and any relevant inter-relationships will be considered as part of the EIA:

- Population and material assets;
- Ecology;
- Hydrology, geology and soils;
- Landscape;
- Archaeology and cultural heritage.

These environmental factors were reviewed on the basis of EIA best practice, the requirements of the EIA Directives as they apply to land drainage authorities, professional judgement, stakeholder consensus, knowledge of the area from previous schemes and review of the baseline environment, including the environmental assessments undertaken previously.

The proposed scheme is not considered to have any likely significant effects on the following receptors and therefore these have been scoped out of the EIA process:

- Air and climate

There is no requirement under the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (as amended) for inclusion of a planning section within the ES, and therefore it is not intended to prepare a separate planning and policy chapter. However, as the policy context is an important consideration for the assessment of the various environmental aspects, planning and policy matters will be addressed within each technical assessment where appropriate.

The ES will address impacts arising from all aspects of the implementation of the Water Level Management Plan.

The geographical area that will be covered by the EIA will be determined by considering:

- The boundary of the SSSI
- The nature of the existing baseline environment
- The manner in which impacts are likely to be propagated.

The study area will be defined within each chapter of the Environmental Statement on a receptor by receptor basis and may vary depending on the receptor under consideration.

3.2 Baseline

Environmental effects will be described in terms of the extent of change to the baseline environment. This baseline is generally taken to mean the environmental conditions that are prevalent at the time of the assessment.

Baseline environmental conditions will be identified through the use of existing available data and through undertaking additional surveys, studies and modelling.

During the EIA process, relevant resources and receptors will be identified for each environmental topic and an appropriate baseline determined in respect of these.

The ES will clearly set out the following aspects for the baseline:

- Sources of information used;
- Methodology used for any additional survey or modelling work;
- Extent of consultation with external bodies;
- Any limitations pertaining to the baseline information or to the collation process;
- The spatial extent of the search area.

3.3 Assessment of Effect

The ES will report the likely significant environmental effects (whether positive or negative) that will result from the proposed scheme. The significance of an effect is assessed by looking at the change against existing baseline conditions as a result of the implementation of the planned actions. The way that the significance of an effect is determined varies for each topic, but in broad terms it is the product of the degree of change (or the magnitude of the effect) and the sensitivity or value of the receptor or resource that is affected.

3.3.1 Magnitude

The magnitude of the potential impact is defined in terms of the predicted change to the baseline environment, attributable to the proposed works. The determination of the magnitude of the potential impact is based on the level of impact from the works, the current condition of the receptor and the sensitivity or vulnerability of a receptor to the identified impact. When assessing the magnitude of the impact, the type and timescale of the effect will also be considered. The main types and timescales of impact are summarised below.

- Permanent impacts - impacts that result from an irreversible change to the existing environmental baseline, or which persist for the foreseeable future;
- Temporary impacts - impacts that persist for a limited period only; for example, during the construction period, or effects that may disappear due to the natural recovery of the environment or their assimilation into it;
- Direct impacts - impacts that arise from activities that form an integral part of the project;
- Indirect impacts - impacts that arise from activities that do not form part of the project, but which are a consequence;
- Primary impacts - the first or only impact that arises from activity;
- Secondary impacts - impacts that arise as a consequence of a primary impact;
- Cumulative impacts - impacts that result from multiple different types of impact on a particular receptor that arise as a result of the project.

3.3.2 Value

The determination of the environmental value of a receptor (i.e. importance) is difficult to assess and quantify, but can be derived from a range of factors, including designated status, the number of individual receptors, the size of a receptor, an empirical assessment of characteristics such as rarity, quality, substitutability or condition, and the sensitivity of the receptor to change. This assessment method allows for professional judgement where significant features are found, which do not have any quantifiable attribute, such as a formal designation.

Table 3-1 below provides examples of how the environmental value of different receptors can be assessed. This table is not exhaustive.

Table 3-1 Environmental Value of Receptors

Value	Aspect	Equivalent to
Very High (International Importance)	Population and Material Assets	Internationally important transport link (Airport, Ports)
	Ecology	Internationally important nature conservation sites (Ramsar Site, SPA, SAC) Species protected under Schedules II or IV of The Conservation of Habitats and Species Regulations 2010

Value	Aspect	Equivalent to
		Sustainable area of a habitat listed in Annex I of the Habitats Directive
	Water	Aquifer providing potable water to a large population EC designated Salmonid fishery
	Landscape	World Heritage Site
	Archaeology and Cultural Heritage	World Heritage Site
High (National Importance)	Population and Material Assets	Nationally important transport link (Motorway)
	Ecology	Nationally important nature conservation sites (SSSI, NNR) Species on Schedules 5 or 8 of the Wildlife and Countryside Act 1981 (as amended) Sustainable area/population of a UK BAP priority habitat/species UK Red Data Book species
	Water	Rivers classed as Grade A by the Environment Agency's General Quality Assessment (GQA) EC Designated cyprinid rivers
	Landscape	National Parks Areas of Outstanding Natural Beauty (AONB)
	Archaeology and Cultural Heritage	Scheduled Ancient Monument, listed buildings, historic parks and garden, registered historic battlefields, Undesignated features of national importance
Medium (Regional Importance)	Population and Material Assets	Regionally important transport link (A Road)
	Ecology	Viable area/population of a regionally important habitat/species
	Water	Rivers classed as Grade B or C by the Environment Agency's General Quality Assessment (GQA)
	Landscape	Area of Great/High Landscape Value
	Archaeology and Cultural Heritage	Conservation areas, undesignated features of regional importance
Low (County/District Importance)	Population	Important transport links at a county/district level (B Roads) Public rights of way
	Ecology	Important nature conservation sites within County/District Viable area/population of a Local BAP habitat/species County Red Data Book species
	Water	Aquifer providing water for agricultural/local use
	Landscape	Undesignated landscapes of county importance
	Archaeology and Cultural Heritage	Undesignated features of county importance
Very Low (Local/Site Specific Importance)	Population and Material Assets	Local roads, un-adopted highways and private roads
	Ecology	Sites with limited ecological value, but possibly with habitats/populations appreciably rich on a local level
	Water	Small aquifer providing water for agricultural use
	Landscape	Undesignated landscapes of local importance
	Archaeology and Cultural Heritage	Undesignated features of local importance Sites that are so badly damaged or altered that too little remains to justify their inclusion in a higher category
Uncertain	N/A	Sites/receptors for which there is limited existing information. For this it is not possible to determine the importance of the site based on current knowledge

3.4 Mitigation

The ES will include a description of the measures envisaged to avoid, reduce and where possible remedy any significant adverse effects on the environment. Mitigation measures will be incorporated into the design of the development through avoidance and/or reduction and at a later stage through compensation, remediation and/or enhancement.

4. Scope and Methodologies for Assessment

4.1 Introduction

This chapter of the report provides information about the scope and methodologies for the impact assessments which will form the EIA and be presented within the ES. Each environmental factor is presented in a separate section which provides the discipline-specific approach to the following:

- Overview of baseline conditions;
- Potential impacts of the works;
- Approach and methodology.

4.2 Population and Material Assets

4.2.1 Overview of Baseline Conditions

Population

The works will affect an area of low-lying arable and pastoral land surrounding the moors. This area is sparsely populated with the main concentration of housing occurring in Thorne to the south west and Crowle to the south east of the moors, with a few isolated farm properties scattered throughout the study area.

Agricultural Land

Agricultural Land Classification (ALC) separates agricultural land into five quality grades, from Grade 1 (excellent) to Grade 5 (poor), where Grades 1-3a are considered as 'best and most versatile'. A number of criteria are used for the assessment of agricultural soil, including climate (temperature, rainfall, aspect, exposure, frost risk), site (gradient, micro-relief, flood risk) and soil (depth, structure, texture, chemicals, stoniness). The majority of the land within the boundary of the SSSI site is of grade 5 with small area of non agricultural land and grade 4 to the south east of the site. The land surrounding the SSSI is mostly grade 2 however some area of grades 1 and 3 are present to the south west and north west respectively.

Recreational and Amenity Assets

There are a number of public rights of way bordering and dissecting the SSSI.

4.2.2 Potential Impacts of the Works

Potential impacts of the implementation include:

- Temporary disturbance to local population due to increased noise during implementation;
- Permanent loss of small areas of agricultural land;
- Temporary loss of small areas of agricultural land during the implementation phase;
- Temporary impacts to pedestrians, cyclists and road vehicle users during the implementation phase and scrub clearance;
- Temporary impacts to users of the public rights of way during the implementation phase;
- Increase water levels in watercourses;
- Increased flood risk to a small number of properties as a result of increased water levels;
- Periodic disturbance to public rights of way in periods of high waters.

4.2.3 Approach and Methodology

The assessment will comprise the following:

- An identification of potentially sensitive receptor locations, such as existing and proposed residential properties that could be affected by the WLMP implementation;
- A consideration of pertinent local, regional and national planning policy;
- An assessment of likely scale, scope, permanence and significance of identified impacts;
- The preparation of mitigation measures where appropriate.

Baseline data on receptors will be sourced from Ordnance Survey (OS) maps, site visits and local, regional and national planning policies and strategies.

4.3 Ecology

4.3.1 Overview of Baseline Conditions

Statutory Designated Nature Conservation Sites

Table 4-1 summarises the sites located within 5km of the study area.

Table 4-1 Statutory Designated Nature Conservation Sites

Site Name	Designation	Distance from Study Area	Reason for Designation
International Designations			
Thorne Moor	Special Area of Conservation (SAC)	Plan implementation area	Active and degraded raised bog
Humber Estuary	SAC	3.5 km to the north	Estuaries and Mud and sandflats not covered by the sea at low tide
Hatfield Moor	SAC	4.7 km to the north	Degraded raised bogs still capable of natural regeneration
Thorne and Hatfield Moors	Special Protection Area (SPA)	Plan implementation area	Important Nightjar population
Humber Estuary	SPA	3.5 km to the north	Significant populations of breeding and wintering birds
Humber Estuary	Ramsar	3.5 km to the north	Representative example of estuarine habitat type supporting representative populations of birds, seals and fish
National Designations			
Thorne, Crowle and Goole Moors	Site of Special Scientific Interest (SSSI)	Plan implementation area	Lowland raised mire and fen vegetation, invertebrates, breeding and wintering birds
Eastoft Meadow	SSSI	2.6 km to the north	Herb rich hay meadow
Hatfield Chase Ditches	SSSI	3.5 km to the south east	Species rich ditch network
Humber Estuary	SSSI	3.5 km to the north	Estuary with component habitats of intertidal mudflats, sandflats and coastal saltmarsh and the associated saline lagoons, sand dunes and standing waters.
Crowle Borrow Pits	SSSI	4.4 km to the south east	Disused railway line and a variety of habitats including alder carr, scrub, fen and open water.
Went Ings Meadows	SSSI	4.4 km to the west	Wet neutral grassland
Hatfield Moor	SSSI	4.7 km to the south	Remnant lowland raised bog
Humberhead Peatlands (comprises Thorne, Goole and Crowle)	National Nature Reserve (NNR)	Plan implementation area	Lowland raised mire and fen vegetation, invertebrates, breeding and wintering birds, Adder, Nightjar

Moors and Hatfield Moors)			
Local Designations			
Sugar Mill Ponds	Local Nature Reserve (LNR)	3.2 km to the north	Clay ponds

Non-statutory Designated Nature Conservation Sites

No non-statutory nature conservation sites are located within the site boundary however some do border Thorne Moors SSSI. These are designated by Doncaster Metropolitan Borough Council (DMBC), East Riding of Yorkshire Council or North Lincolnshire Council and are known as Sites of Scientific Interest (SSI), Sites of Interest for Nature Conservation (SINC) or Local Wildlife Sites (LWS). There are a further 27 SSIs/LWSs/SINCs within 5km of the SSSI boundary. Further details about these sites are given in Table 4-2 below.

Table 4-2 Non-statutory Designated Nature Conservation Sites

Site Name	Distance from Study Area	Reason for Designation
DMBC (SSI)		
Oak Moor and Chadwick Dike	Bordering the site	Supporting wetland diversity
Thorne Railway Delves	100m to the west	Supporting wetland diversity
Jones' Cable	150m to the west	Natural and Wet grassland
Whitaker's Plantation	280m to the south	Lowland Raised Mire
North Soak Dike	950m to the south	Supporting wetland diversity
Old Godnow Drain	1km to the south	Supporting wetland diversity
Bletcher's Drain	1.7km to the south	Supporting wetland diversity
Sandhill Farm Drain	2.1km to the south	Supporting wetland diversity
Low Ings Lane Meadows	2.8km to the west	Neutral grassland meadows
Cowick Road Pasture and Pond	2.8km to the west	Small unimproved pasture and pond
Redhouse Farm Drain	2.85km to the south	Supporting wetland diversity
Claybank Drain	3km to the south	Supporting wetland diversity
Steward's Ings Lane Meadows	3.1km to the west	Neutral grassland meadows
Hassock's Drain	3.3km to the south	Supporting wetland diversity
Thorne Ashfield	3.5km to the south west	Neutral grassland meadows
Thorne Railway Kirton Lane	3.75km to the south west	Supporting wetland diversity
Fen Carr	3.8km to the west	Marshy, semi-improved neutral grassland
Geeseness Lane Meadows	3.9km to the west	Semi-improved meadows
Thorne Watersides, Oxbows and Ings	3.9km to the south west	River Don and associated flood banks, marshy pastures and ponds, and nearby hay meadows
M180 North Drain	4.2km to the south	Supporting wetland diversity
Askern's Drain	4.3km to the south	Supporting wetland diversity
Little Fen Fields/Fen Carr	4.8km to the west	Marshy, semi-improved neutral grassland
East Riding of Yorkshire (SINC redesignated as LWS)		
Name Unknown	3.9km to the north west	Unknown
Name Unknown	4.5km to the north west	Unknown
Name Unknown	4.85km to the north west	Unknown
North Lincolnshire (SINC redesignated as LWS)		
Name Unknown	1.8km to the south east	Unknown
Name Unknown	2.6km to the south east	Unknown

Habitats

A summary of the UK Biodiversity Action Plan (BAP) priority habitats, the Doncaster Local BAP (LBAP) and the North Lincolnshire LBAP habitats within the study area is given below in Table 4-3.

Table 4-3 Habitats of Biodiversity Value within the Study Area

Habitat	Biodiversity Value	Example within Study Area
Coastal and floodplain grazing marsh	UK BAP habitat North Lincolnshire LBAP habitat	Patches located adjacent to the western site of the SSSI boundary.
Fens	UK BAP habitat Doncaster LBAP habitat North Lincolnshire LBAP habitat	Throughout the SSSI
Arable Field Margins	UK BAP habitat Doncaster LBAP habitat North Lincolnshire LBAP habitat	Some small areas on farmland bordering the SSSI
Reedbeds	UK BAP habitat Doncaster LBAP habitat North Lincolnshire LBAP habitat	Some small patches of reedbed through the SSSI
Hedgerows Ancient and species-rich hedgerows	UK BAP habitat Doncaster LBAP habitat North Lincolnshire LBAP habitat	Some scattered on farmland bordering the SSSI
Ponds Marshes and swamps, lakes and ponds, ditches and drains	UK BAP habitat Doncaster LBAP habitat North Lincolnshire LBAP habitat	Numerous ditches and drains flowing through the SSSI. Some ponds are present on the land bordering the SSSI.
Lowland Heathland	UK BAP habitat Doncaster LBAP habitat North Lincolnshire LBAP habitat	Throughout the SSSI
Lowland Raised Bog	UK BAP habitat Doncaster LBAP habitat North Lincolnshire LBAP habitat	Throughout the SSSI
Parkland, Wood Pasture and Veteran Trees	Doncaster LBAP habitat	Patches of woodland are scattered throughout the SSSI
Wet Woodland	UK BAP habitat Doncaster LBAP habitat North Lincolnshire LBAP habitat	Throughout the SSSI

Tween Bridge, Black Drain, Reedness and Swinefleet and Goole Fields IDBs all have a BAP for their drainage district which includes the following habitats relevant to the study area; Farmland, arable field margins, hedgerow and scrub, lowland raised mire, marsh, swamp, ponds, ditches and drains, wetlands and floodplain grazing marsh.

Protected and Notable Species

The information in Table 4-4 has been compiled from records from surveys undertaken for the previous schemes in the area.

Table 4-4 Protected and Notable Species within the Study Area

Species	Legal Protection and Biodiversity Value
Bats	Protected under the Conservation of Habitats and Species Regulations 2010 and the Wildlife and Countryside Act 1981 (as amended) UK BAP, North Lincolnshire LBAP species and Doncaster LBAP species
Birds	All breeding birds are protected under the Wildlife and Countryside Act 1981 (as amended)

	Species protected under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010 UKBAP, North Lincolnshire LBAP species and Doncaster LBAP species
Night Jar	All breeding birds are protected under the Wildlife and Countryside Act 1981 (as amended) Species protected under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010 UK BAP and Doncaster LBAP species
Water Vole	Protected under the Wildlife and Countryside Act 1981 (as amended) UKBAP, North Lincolnshire LBAP species and Doncaster LBAP species
Badger	Protected under the Protection of Badgers Act 1992 (as amended)
Brown Hare	UK BAP, North Lincolnshire LBAP species and Doncaster LBAP species
Great Crested Newt	Protected under the Conservation of Habitats and Species Regulations 2010 and the Wildlife and Countryside Act 1981 (as amended) UK BAP, North Lincolnshire LBAP species and Doncaster LBAP species
Grass Snake	Protected under the Wildlife and Countryside Act 1981 (as amended) UK BAP and Doncaster LBAP species
Invertebrates	Some UK BAP and Doncaster LBAP species
Vascular Plants	Some UK BAP, North Lincolnshire LBAP species and Doncaster LBAP species

Tween Bridge, Black Drain, Reedness and Swinefleet and Goole Fields IDBs all have a BAP for their drainage district which includes the following species relevant to the study area; dragon flies and damsel flies, Water Vole, Lapwing, Reed Bunting, Adder, Grass Snake and Great Crested Newt.

4.3.2 Potential Impacts of the Works

Potential impacts on ecology include:

- Loss of habitats and temporary disturbance for protected species such as Water Vole, birds and bats, through vegetation clearance, hedgerow/tree removal, and during excavation and construction works;
- Improvements to degraded wetland habitats;
- Potential damage to farmland as a result of increased wetland around the boundary of the SSSI;
- Permanent loss of some habitat types as a result of vegetation clearance;
- Disturbance to species as a result of vegetation clearance works;
- Accidental pollution of watercourses during works from spillages;
- Loss of existing field drains in HPZ.

4.3.3 Approach and Methodology

An ecological impact assessment (EclA) will be undertaken in accordance with the methodology set out in the Institute of Ecology and Environmental Management's (IEEM) *Guidelines for Ecological Impact Assessment in the UK* (IEEM 2006). The assessment will comprise the following:

Desk Study

Further information on nature conservation sites, habitats and species will be collected from a number of sources including DMBC Biological Records Centre, Lincolnshire Environmental Records Centre, Lincolnshire and Yorkshire Wildlife Trust, Thorne and Hatfield Moors Conservation Forum, Doncaster Naturalists Society and websites such as the Multi-Agency Geographic Information for the Countryside (MAGIC) and National Biodiversity Network (NBN) Gateway.

Surveys

The following ecological surveys will be undertaken:

- An extended Phase I Habitat Survey;
- National Vegetation Classification (NVC) surveys of SSI/LWS/SINC and other grassland fields which may be affected by the works;
- Hedgerow and tree surveys along watercourse to be affected by the works;
- Protected species surveys (including Water Vole, bats, Badger, Great Crested Newt, wintering and breeding birds);
- Surveys for locally important invertebrate species.

Assessment of Impacts

The potential impacts of the works on habitats and species of nature conservation importance will be assessed taking into account the findings of the above surveys and existing baseline information.

Identification of Mitigation Measures and Enhancements

Appropriate mitigation measures will be identified to eliminate, minimise or manage identified potential significant environmental impacts. The assessment of the significance of the impacts will subsequently be carried out on the residual impacts, i.e. those remaining after mitigation. Any opportunities for environmental enhancement will be identified.

4.4 Hydrology, geology and soils

4.4.1 Overview of Baseline Conditions

The majority of the site is a degraded ombrotrophic (rainfall-fed) raised mire underlain by thick lacustrine clays and silts; this isolates it from the influence of the surrounding agricultural land except in some small areas around the boundary. Due to its size, the ombrotrophic and isolated nature of many of the areas, and the complexity of the site, the conceptualisation (the process through which all that is known about the site is brought together in a working model) divides the site into a number of sub-regions which are shown in Figure 4 and discussed in more detail below.

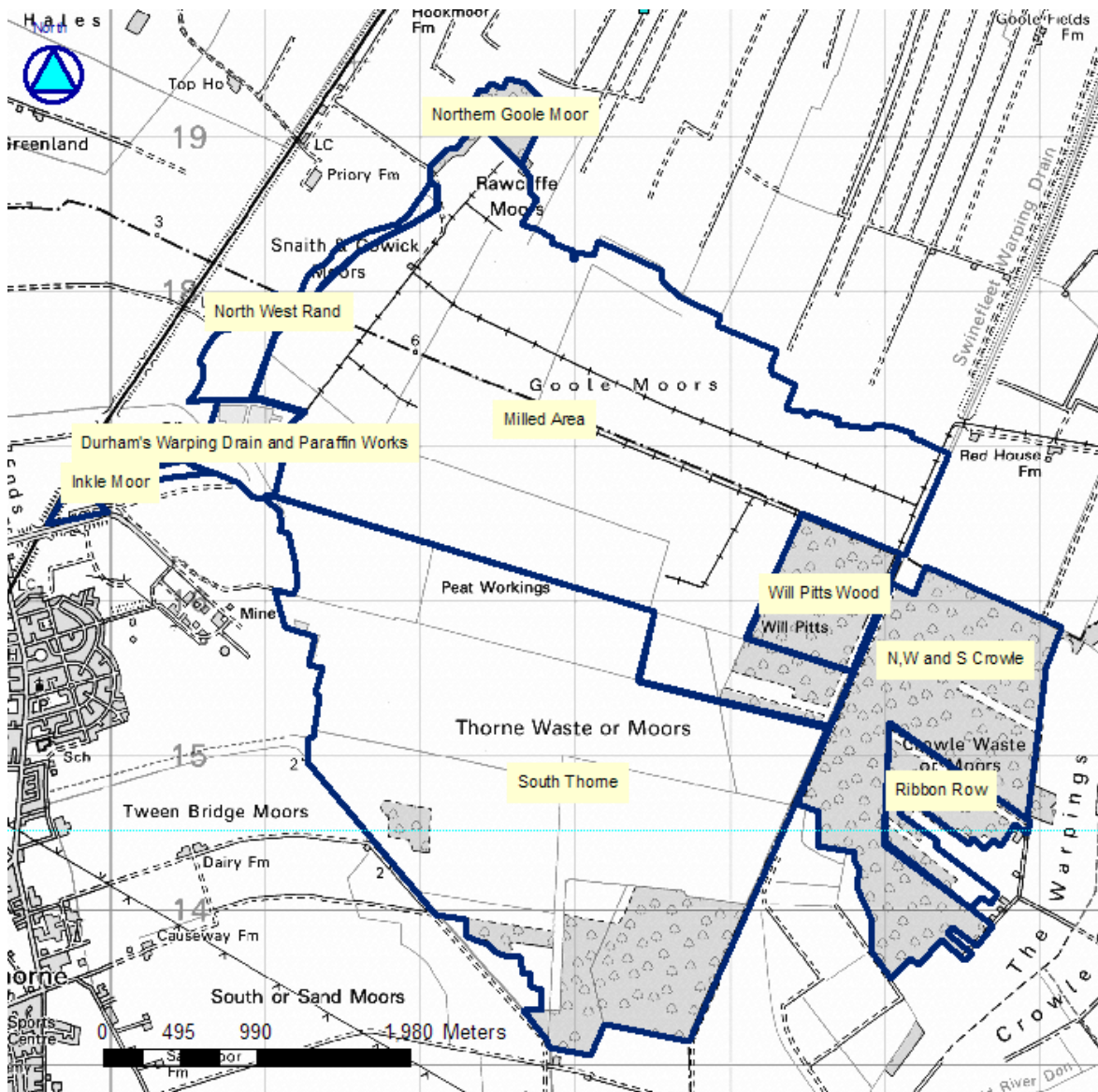


Figure 4: Sub-regions of the SSSI

4.4.2 Northern Goole Moors

Northern Goole Moors is an isolated area of intact raised mire. The area is bordered by ditches on all sides which drain the mire, leading to the establishment of bracken and birch woodland around the edges. In the centre, the watertable is near or at the surface during the winter and some *Sphagnum* is present.

4.4.3 The milled area

This area covers much of Goole Moors, Snaith and Cowick Moors and the northern half of Thorne Moors. It has been subject to mechanical milling peat extraction which has produced large, flat, bare fields of peat surrounded by deep drains. This whole area forms a depression in the centre of the mire. Therefore, to ensure that this area does not become what would in effect be a lake, the standing water is pumped out by Natural England into the Swinefleet Warping Drain and discharged into the Ouse. This area has been subject to a restoration programme by Natural England, who have installed an extensive series of bunds over much of the area to aid rewetting, stabilise groundwater fluctuations and thereby produce conditions that allow the appropriate bog vegetation to colonise.

4.4.4 The North West Rand

This area lies on the western boundary of the milled areas and stands proud of both the milled area and the agricultural land to the west. In the past it has been subject to peat extraction using English hand graving, producing the current ridge-furrow topography. On the edge of the site, a lagg alder thicket exists, which is subject to regular inundation.

4.4.5 The Paraffin Works

In this area peat was historically extracted to produce paraffin. The area is covered by small, deep regularly spaced pools.

4.4.6 Inkle Moor

Inkle Moor has never been part of the ombrotrophic peat mass, though its western end would have formed part of the lagg around the raised mire, and has been subject to several phases of agricultural reclamation. This unit of the SSSI has been designated for its neutral grassland, interest rather than lowland raised bog.

4.4.7 Will Pitts Wood

This is an area of wet woodland which was subject to extraction before it was unsuccessfully warped. This led to the abandonment of this area for agricultural production and the subsequent establishment of wet woodland.

4.4.8 South Thorne

This area has a complicated history and includes areas subject to Dutch hand graving (the canals), English hand graving and mechanical bulk extraction, Rhododendron cultivation and agricultural improvement. This has created a complex topography and microtopography which has changed how water moves through the system. The area is made more complex by the floated roads which divide and isolate areas by acting as low permeability bunds. This has led to a very heterogeneous landscape, with areas of suitable high stable watertables lying very close to drier areas colonised by thick birch scrub.

4.4.9 North, West and South Crowle

This area is bounded to the west by the Swinefleet Warping Drain which isolates Crowle Moors from Thorne Moors. The area has been subject to English hand graving, which has increased the drainage of the surface of the bog. Like the South Thorne area, this area is quite heterogeneous. On its southern boundary an area of woodland has colonised due to the efficient drainage of the agricultural land that borders the site.

4.4.10 Ribbon Row

This is an area in the centre-east of Crowle Moors. Here the land was historically owned in long narrow strips. These strips have been subject to different degrees of peat extraction, which has left some narrow extant strips, bordered by areas where the majority of the peat has been extracted, separated by tall peat cliffs. This has left the high areas drained and colonised by birch scrub and the low areas subject to rapidly fluctuating watertables and colonisation by *Juncus spp.*

Soils

According to the 1:250,000 Soil Map of England and Wales (1983) the study area contains soils of the associations 1011a Longmoss, 712i Foggathorpe2, 811b Conway and 532a Blacktoft types. A soil association is a group of soils that commonly occur together and which represent a certain type of history of accumulation. Within an association, there can be large variations in soil series and their physical attributes.

The physical characteristics of the four associations are given below in Table 4-5.

Table 4-5 Soils Associations and General Properties (Soil Survey of England and Wales 1984)

Association	Soil Survey No.	Type	Description
Longmoss	1011a	Raised peat bog	Thick very acid peat soils. Largely undrained and perennially wet. Many areas cut over or partially burnt.
Foggathorpe 2	712i	Glaciolacustrine clay	Slowly permeable seasonally waterlogged stoneless clayey and fine loamy over clayey soils. Some similar coarse loamy over clayey soils
Conway	811b	River alluvium	Deep stoneless fine silty and clayey soils variably affected by groundwater. Flat land. Risk of flooding
Blacktoft	532a	Marine alluvium	Deep stoneless permeable calcareous coarse silty soils. Some calcareous clayey soils. Flat land. Ground water controlled by ditches and pumps.

The Longmoss series covers all of the SSSI itself.

Figures A6 and A7 of Appendix A shows the drift and solid geology present within the SSSI. Figure A8 of Appendix A shows the surface water features and control structures present on and surrounding Throne, Crowle and Goole Moors.

4.4.11 Potential Impacts of the Works

The potential impacts to hydrology, geology and soils include:

- Soil compaction through the use of heavy machinery;
- Mobilisation of silt during the earthworks;
- Mobilisation of existing contaminants or creation of new pathways for contaminants (e.g. through the use of piles);
- Changes in the water table levels.

4.4.12 Approach and Methodology

The EIA methodology that will be employed in order to make an assessment of the potential impacts to hydrology, geology and soils will be as follows:

Data Collection

- Ongoing logging of water level data;
- A thorough review of publicly available maps and literature relating to soils, geology and hydrology in the study area;
- A review of existing site investigation/geotechnical reports in order to establish more site-specific ground and groundwater conditions;
- Information relating to the site's environmental setting and any records of potential sources of ground contamination or sensitive receptors such as abstractions will be requested from the local authority and Environment Agency;
- Information relating to ecologically and geologically sensitive receptors.

Assessment of Impacts

A detailed review of the proposed works will be undertaken to assess the potential associated impacts to the existing soils, geology and hydrology. Mitigation measures and design considerations will be identified to offset or reduce identified impacts.

4.5 Landscape

4.5.1 Overview of Baseline Conditions

Landscape Designations

Thorne, Crowle and Goole Moors lies within an Area of Special Landscape Value (ASLV) as designated by DMBC. These ASLVs are areas considered to be Doncaster's most outstanding areas of high quality landscape.

Landscape Character

England has been divided into areas with similar landscape characteristics, these are called National Character Areas (NCAs) (previously known as Joint Character Areas). The study area is located within the Humberhead Levels Character Area, the key characteristics of which are:

- A flat landscape occupying the area of the former pro-glacial Lake Humber;
- Very low-lying, commonly at or below mean high-water mark;
- Surface geology of drift deposits, including glacial tills, clays, peat, sand and gravel and wind-blown sand, giving local variations in character;
- Broad floodplains of major navigable rivers draining to the Humber Estuary with extensive areas of washlands and some alluvial flood meadows;
- Rich high-quality land which is intensively farmed and includes substantial areas of warped land;
- Essentially flat, very open character with occasional rising ground formed by ridges of sand and outcrops of Mercia Mudstone;
- Very large open fields divided by dykes, with relatively few hedgerows or field trees;
- Peat bogs of international ecological and historical importance which are widely exploited for commercial peat extraction;
- Widespread evidence of drainage history in rivers, old river courses, ditches, dykes and canals;
- Important areas of historic landscape such as the more enclosed agricultural landscape at Fishlake, the remnant open fields of the Isle of Axholme and the unique 'cable' landscape of Thorne;
- Areas of remnant heath and large, isolated conifer plantations on poor sandy soils;
- Modern motorways on embankments and large installations, notably power stations, which are often prominent in the flat landscape.

A Landscape Character and Capacity Assessment carried out in 2006 (ECUS Ltd 2007) categorised the rural landscape around Doncaster into eight distinct character types, which were further divided into Landscape Character Areas. A large part of the SSSI is located within the Thorne and Hatfield Peat Moorlands Character Area. The key characteristics of this Character Area are:

- Large scale, open, flat and low-lying;
- Areas of dark peat exposed on Thorne and Hatfield Moors where there has been former peat extraction along with regenerating heathland;
- Empty and remote feeling landscape on the Moors;
- Moors surrounded by areas of scrubby woodland and blocks of more mature deciduous trees which restrict views from the landscape beyond;
- Limited access with no roads and few public footpaths into the Moors;
- Areas beyond the Moors are mainly arable farming with turf grown as a crop in some fields and occasional pasture;
- Large geometric fields in a regular grid pattern bounded by straight ditches and occasional hedges and mature trees;
- Scattered farmsteads surrounded by large sheds and shelter belt trees;
- Single built up area in the north west of the LCA at Thorne and Moorends;

- Intrusive motorways, straight roads and a railway line on elevated embankments and a canal cut across the landscape beyond the Moors.

The Landscape Character and Capacity Assessment considers both the landscape quality and value of this character area to be high and the landscape strategy for this character area is to "Conserve".

A Landscape Character Assessment carried out by North Lincolnshire Council in 1999 (Estell Warren Landscape Architects, 1999) categorised the rural landscape in North Lincolnshire into six distinct character types, which were further divided into Landscape Character Areas. Part of the SSSI is located within the Flat Open Remote Farmland - Crowle Common, Dirtiness Levels, Eastoft Carr Character Area. The key characteristics of this Character Area are:

- An open area of mostly large arable fields, offering expansive views across a low-lying, level landscape with tree and hedge cover almost completely absent over much of the landscape;
- The woodland of Crowle Waste or Moors turbary landscape to the west and the settlement of Crowle in the south east offer some enclosure to views in these directions.
- The landscape has a distinct feeling of remoteness. Only in the peripheral areas of Crowle does the landscape begin to become more enclosed and intimate;
- Areas of the medieval strip farming system, forming part of the moorland allotments (Ribbon Row) can be seen in areas surrounding Crowle and Crowle Common. The farming system in areas of former peat extraction were converted to strip farming in associated with the edge of raise mire and resulted in a characteristic landscape;
- Elsewhere the landscape has been subject to early and recent enclosure, but has suffered from hedgerow removal, mainly due to the intensification of agricultural practice with the result that fields lack boundary definition;
- In the south of the landscape area tree cover is limited to small fragmented copses with associated unmanaged hedgerows and intermittent tree cover;
- Characteristic well-maintained drainage ditches follow the lines of roads and form intricate networks throughout the fields, but do not have a strong visual presence;
- There are very few roads crossing the area, adding to the remote character; only a few tracks cross the open fields offering limited access;
- A water treatment works and large prefabricated agro-industrial barns are found in the areas surrounding Crowle. Some tree planting (often pine) has been used to screen these structures, however, they still combine with the backdrop of the predominantly modern settlement to create visually intrusive features;
- Telegraph poles and farmsteads with associated tree planting add height to the low-lying landscape in which horizontal elements tend to dominate.

The Landscape Character Assessment considers both the landscape quality and value of this character area to be of significant conservation value.

4.5.2 Potential Impacts of the Works

Potential impacts on the landscape include:

- Direct impacts on the landscape fabric i.e. specific landscape elements within and adjacent to the proposed works, e.g. grasslands, hedgerows, trees and watercourses;
- Visual impacts of new permanent drainage infrastructure e.g. pumping stations.

4.5.3 Approach and Methodology

A landscape assessment will be undertaken which will comprise the following:

- Data collection and desk-based review of planning policies, landscape designations and landscape character information;
- Identification of key landscape and visual receptors by desk-based study and field survey;
- Assessment of impacts on landscape and visual baseline;

- Identification of mitigation measures and design considerations to offset or reduce identified impacts.

4.6 Archaeology and Cultural Heritage

4.6.1 Overview of Baseline Conditions

Scheduled Ancient Monuments

There are no Scheduled Ancient Monument (SAM) within 2 km of the SSSI boundary. The closest SAM to the SSSI is located 2.7km to the south west.

Listed Buildings

There are 18 listed buildings within 2km of the study area. The nearest listed building is 400m outside of the SSSI boundary to the west and is the farm house of Micklethwaite Farm. The remaining listed buildings are all situated between 1.5 and 2km away from the SSSI boundary, in the main situated within the villages of Crowle and Ealand. There are no listed buildings within the study area.

Conservation Areas

The Thorne Conservation Area is located 2.5km to the south west of the SSSI boundary and the Crowle Conservation Area is located 1.5km to the south east of the SSSI boundary. No conservation areas are located with the SSSI itself.

Other Archaeological and Cultural Heritage Resources

This information has been taken from a report produced by North Lincolnshire Council (2010).

Thorne, Crowle and Hatfield Moors are the largest remaining area of raised mire in England. Mire development began with the drowning of extensive forests in the late Bronze Age, sealing the pre-Middle Bronze Age drying land surface beneath over 6m of peat. Extensive peat cuttings since the Medieval period has much reduced the area of the Moor, whilst the latter practice of warping to create a layer of fertile soil has masked the margin of the moor and sealed the underlying peat.

These moors are recognised as an area of major archaeological and palaeo-environmental importance. Recorded finds, which include two prehistoric timber trackways, wooden artefacts and human 'bog bodies', have demonstrated the high potential for the excellent preservation of organic remains within the waterlogged, anaerobic conditions of the mire landscape.

The archaeological and palaeo-environmental potential of the moors has been confirmed by surveys carried out over the past decade by the Humber Wetlands Survey under the auspices of English Heritage. In the vicinity of the proposed restoration site, the survey recorded a Late Mesolithic/Neolithic flint scatter on a raised ridge of blown sand, and a scatter of Roman pottery from the warped land on Crowle Common to the east. The former channel of the River Don is close to the east side of the SSSI, and activity is likely to be more concentrated here.

Peat cutting, drainage and other such disturbances have resulted in the destruction of the upper part of the peat archive across the majority of Thorne and Hatfield Moors. It is likely that deposits, spanning much of the historic and later prehistoric period, have been damaged over a large part of these two peatlands. But at Crowle Moors, research suggests that some areas have never been cut for peat (Smith, 2002): radiocarbon dates obtained from the upper peat levels in the centre of the Moor are of late Medieval date. This indicates that relatively intact sequences survive here.

The archaeological and palaeo-environmental significance and potential of the restoration area is thus heightened by the presence of the warp, which has effectively sealed and protected the full sequence of underlying peat. This peat resource has particular potential to contain well-preserved remains, spanning a date range from the Bronze Age through to the Medieval period and beyond, and includes the potential; for sites of national significance. The archaeo-environmental peat archive spanning the Medieval and later periods is of particular importance. The pre-peat surface and earlier prehistoric activity will also be well preserved beneath the peat.

Any further excavation of the peat in this area of Crowle Moor may, therefore, uncover well-preserved remains within the peat, including the possibility of human remains, and expose the early land surface, which may contain evidence of prehistoric human occupation.

4.6.2 Potential Impacts of the Works

It is unlikely that the implementation of the WLMP will directly impact upon any of the known cultural heritage resources identified within and adjacent to the study area. However, there is the potential for the works to lead to the discovery of sites and finds as well as the possible de-saturation of archaeological deposits.

4.6.3 Approach and Methodology

An archaeological desk-based assessment will be undertaken and used to inform the EIA.

Information on archaeological and cultural heritage resources will be obtained from:

- South Yorkshire Sites and Monuments Record;
- English Heritage;
- Doncaster Metropolitan Borough Council;
- North Lincolnshire Council;
- East Riding or Yorkshire Council;
- Doncaster Archives;
- Doncaster Central Library (Local Studies Library).

The assessment will consist of the evaluation of the significance of known and potential sites within and surrounding the SSSI, consideration of the likely impact of the implementation of the WLMP on them, and the formulation of appropriate mitigation strategies, where required.

5. Consultation

5.1 The Consultation Process

As detailed in Section 1.2, this Scoping Report forms the basis for consultation with statutory authorities, relevant organisations and all other interested parties. In particular, this Scoping Report invites consultees to:

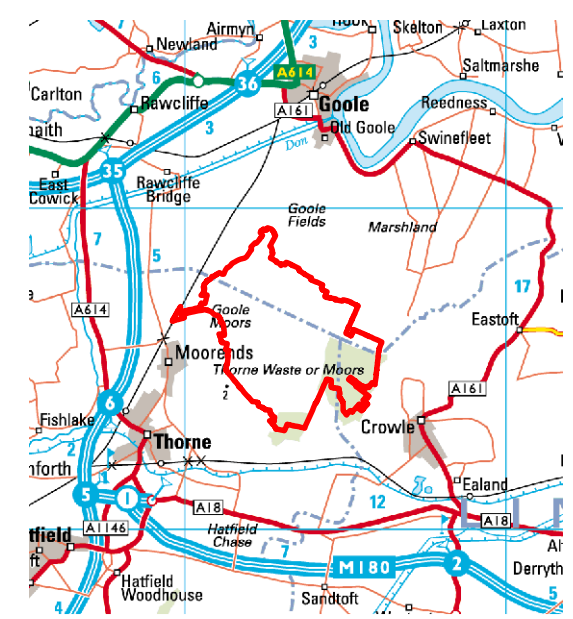
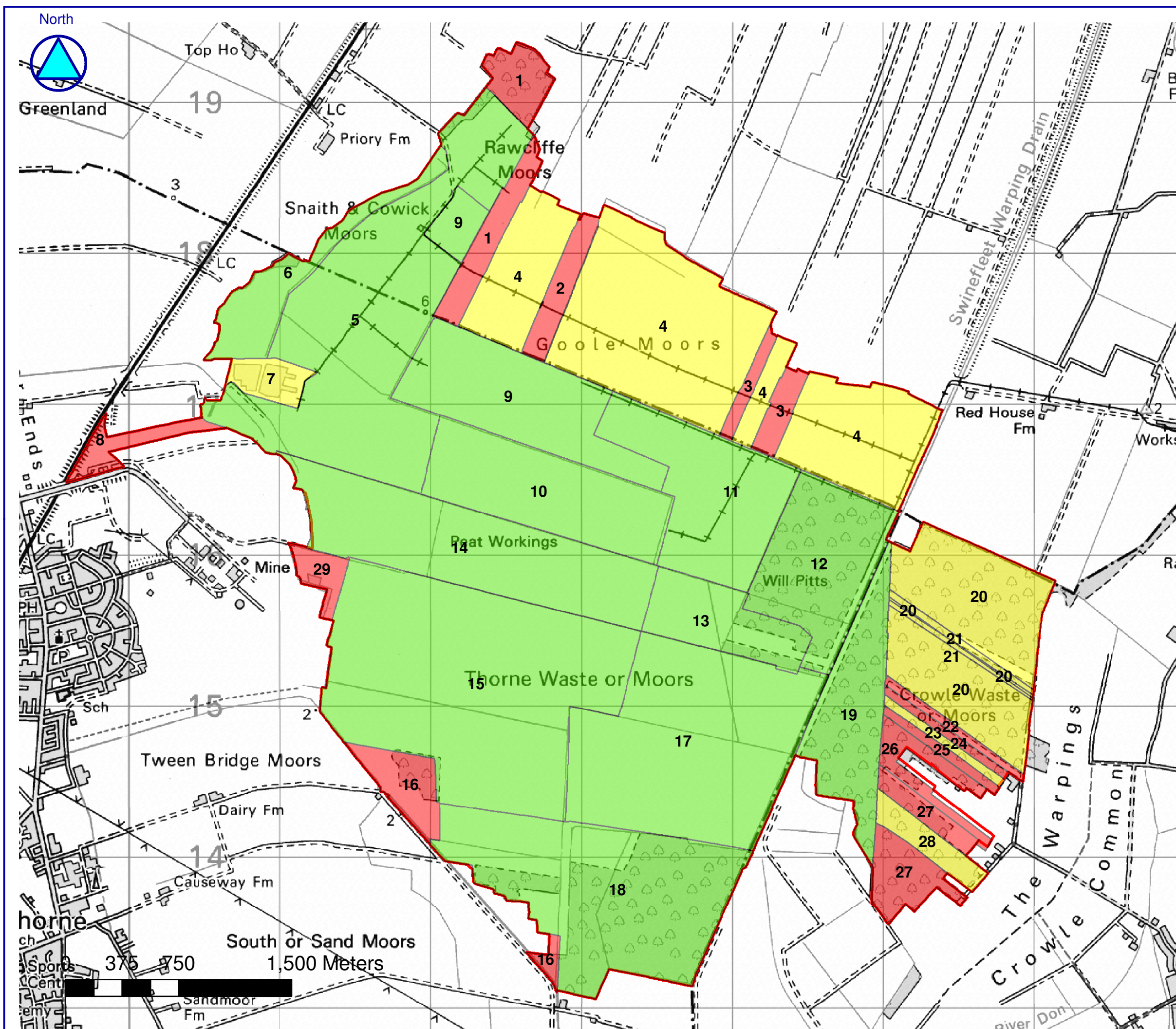
- Comment on the proposed approach to the EIA;
- Comment on the various EIA topics proposed to be addressed within the EIA;
- Comment on or recommend, where appropriate, assessment methodologies; and
- Highlight other relevant bodies or organisations that may have a vested interest in the scheme or be able to provide relevant information.

The consultation responses received on the Scoping Report will inform the EIA process as well as the on-going implementation programme.

Appendices

A. Appendix - Figures

- Figure A 10: SSSI Units
- Figure A 2: Management Compartments
- Figure A 5: Vegetation Survey
- Figure A 6: Drift Geology
- Figure A 7: Solid Geology
- Figure A 8: Surface Drainage Features
- Figure A 12: Water Level Classification
- Figure A 13: Implementation Works - Engineering Works
- Figure A 14: Implementation Works - Scrub Clearance



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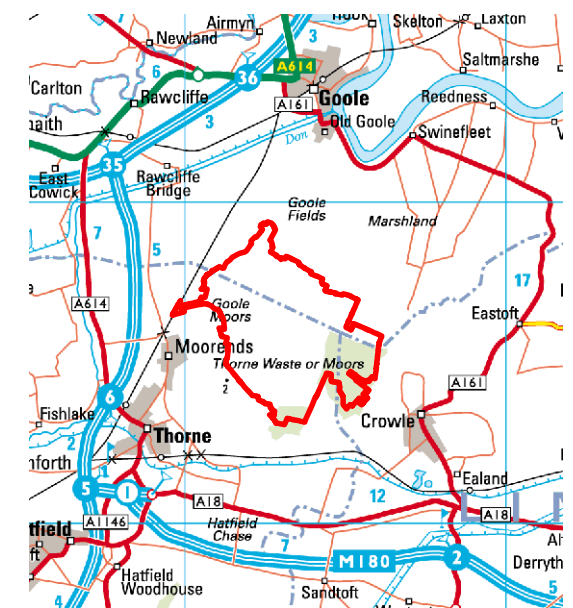
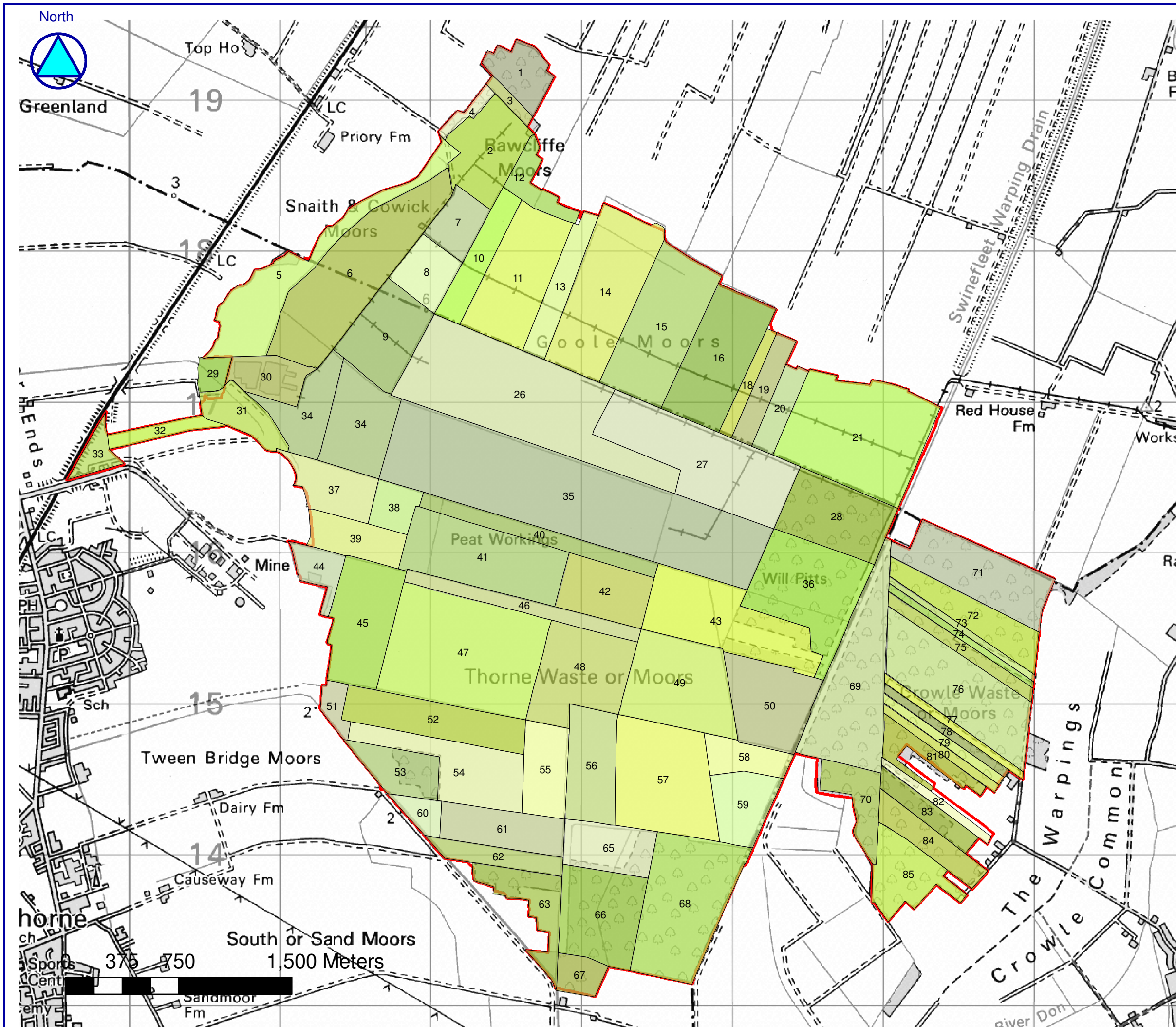
SSSI Unit Classification

- Unfavourable Decline
- Unfavourable No Change
- Unfavourable Recovery
- Thorne Moor Boundary

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FIGURE A 10
SSSI Unit Classification



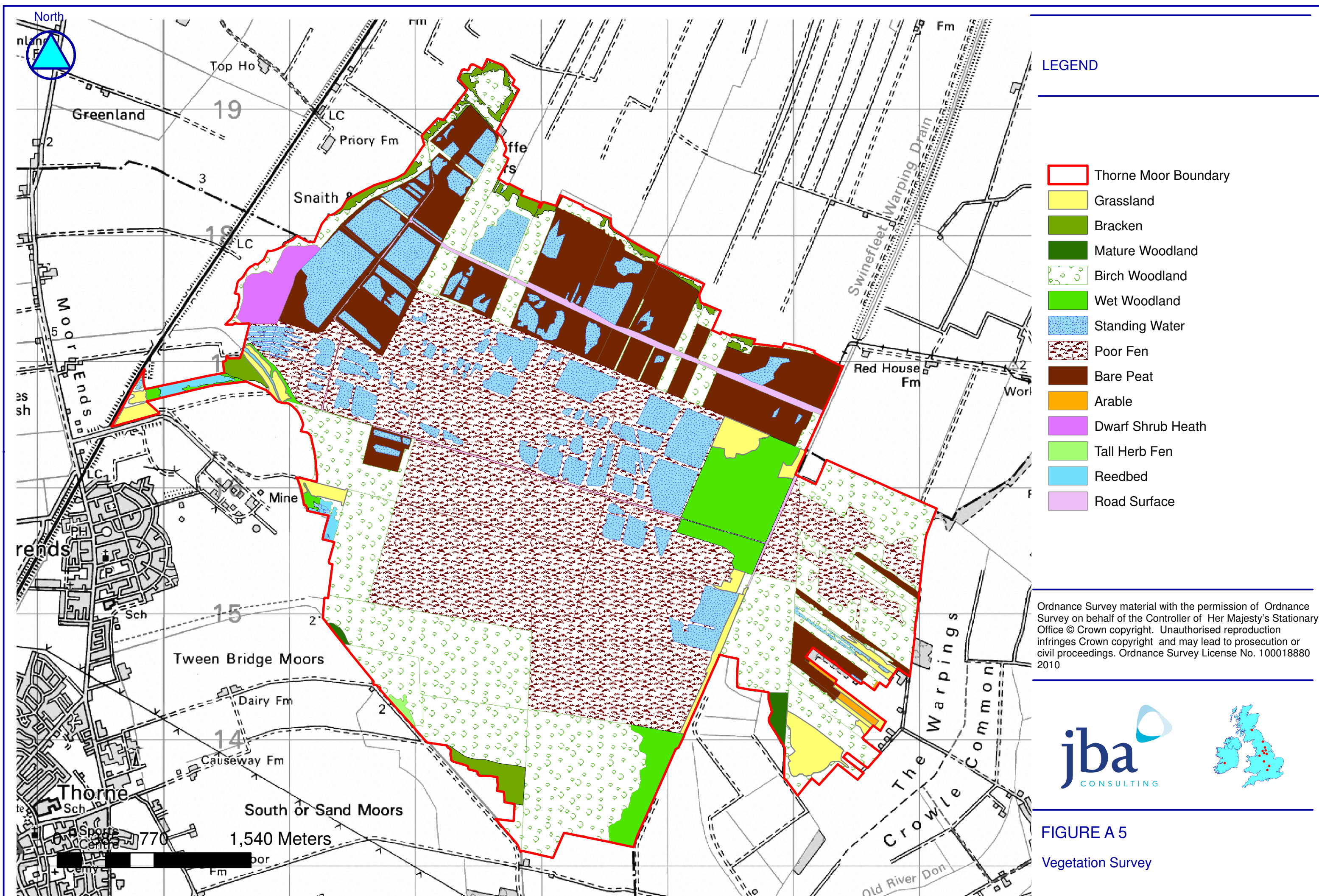
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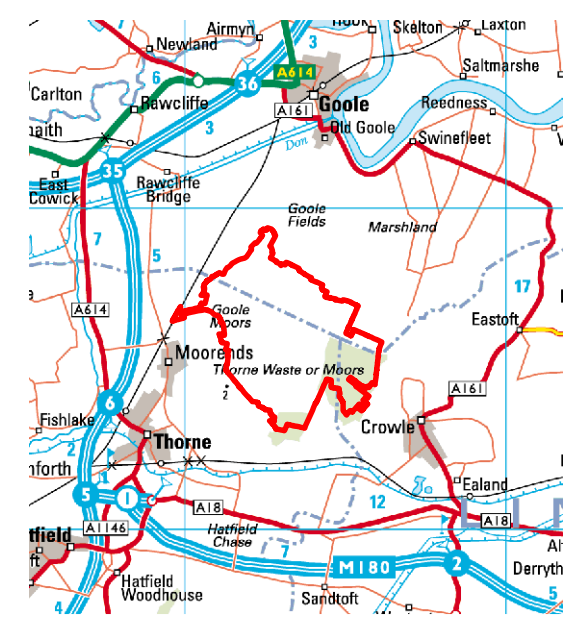
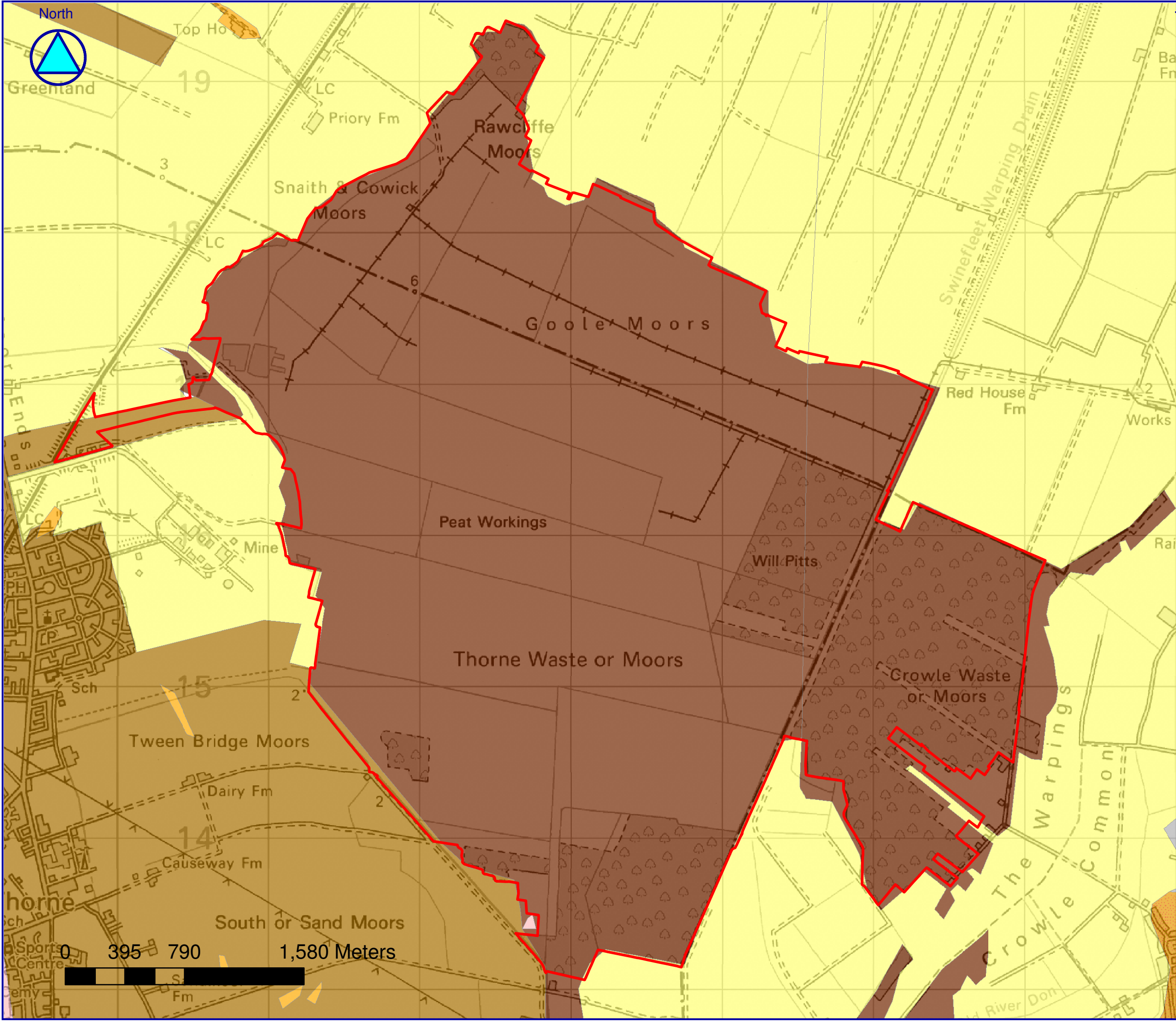
- Management Compartments
- Thorne Moor Boundary

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FIGURE A 2
Management Compartments





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Thorne Moor Boundary

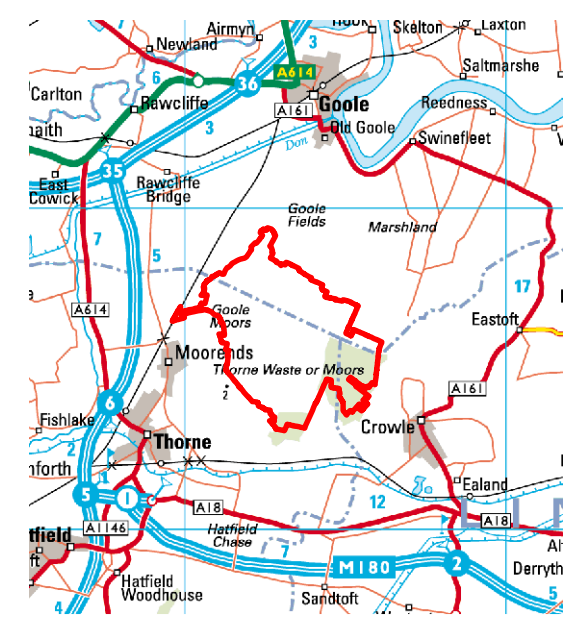
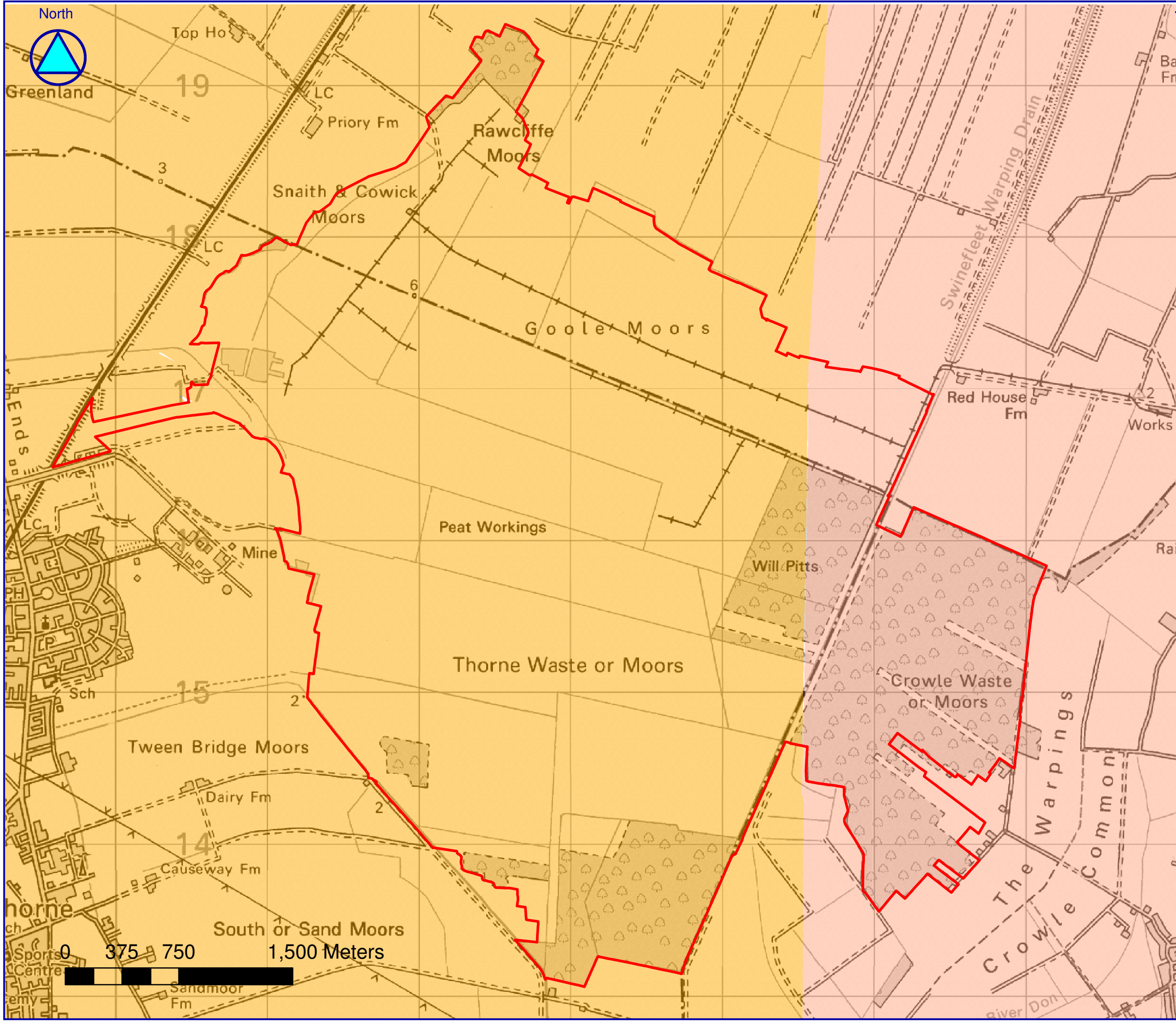
Drift Geology

- Alluvium or Warp
- Peat
- Blown Sand, Older
- Sand
- Silt and Clay
- Glacial Sand and Gravel
- Drift Absent

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Geology Data Based on BGS 1971



FIGURE A 6
Drift Geology



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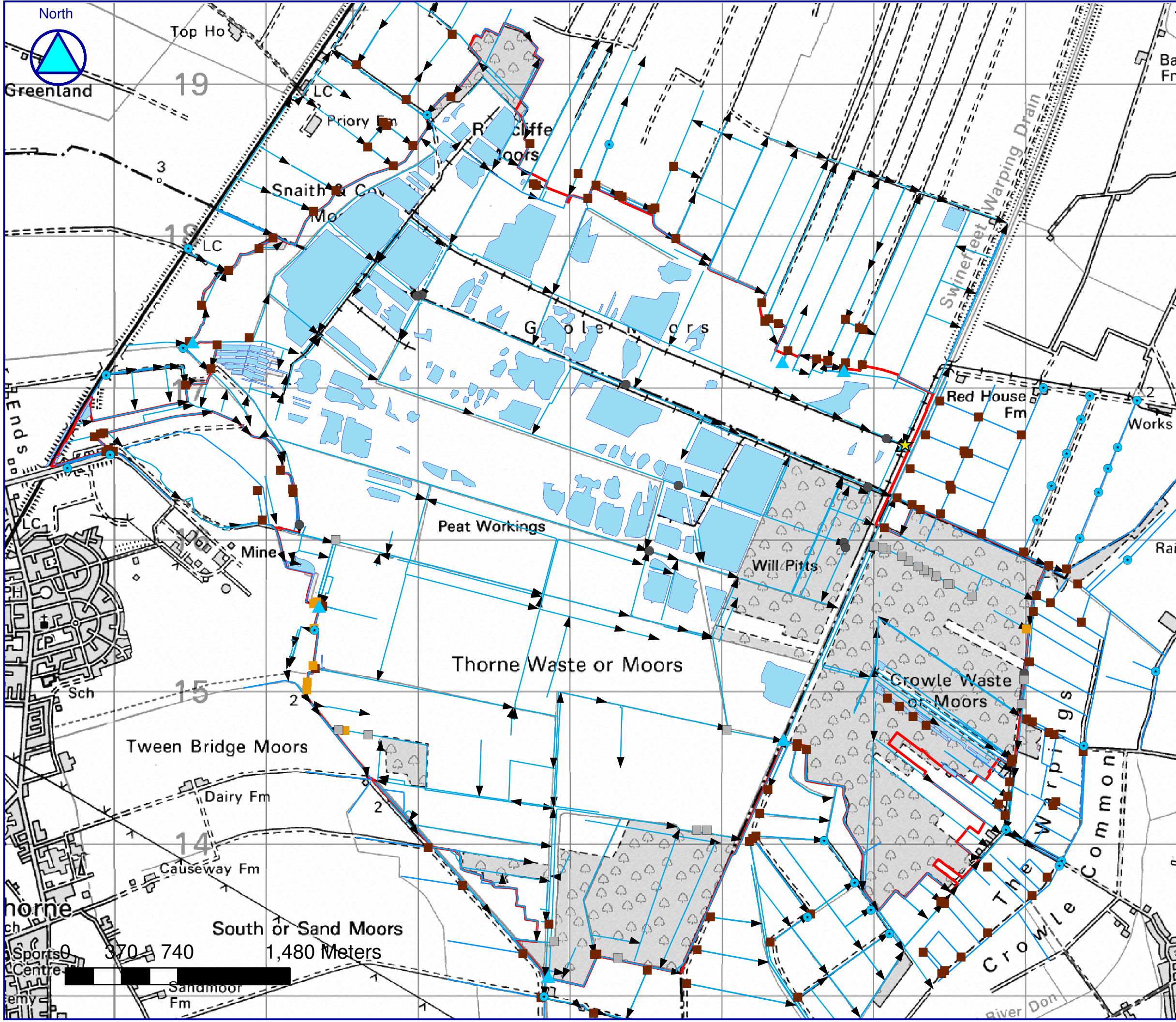
- Thorne Moor Boundary
- Bunter Sandstone
- Merica Mudstone

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Geology Based on BGS 1971



FIGURE A7

Solid Geology



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- ★ Swinefleet Pump
- ▲ Major Discharge Points
- Drains
- Areas of standing water
- Thorne Moor Boundary

Control Structures

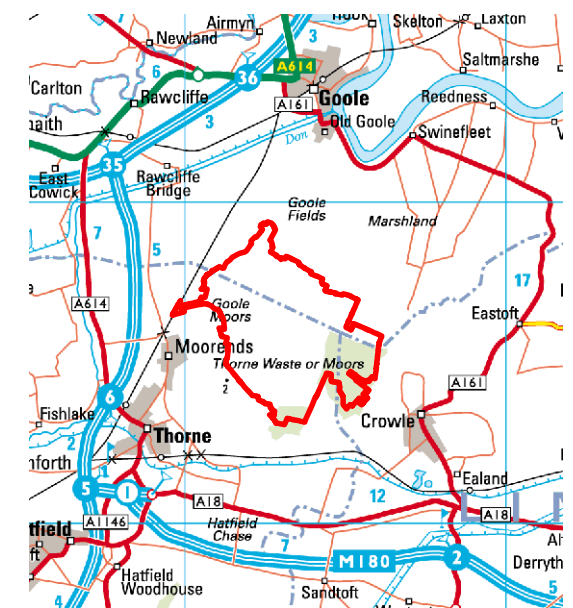
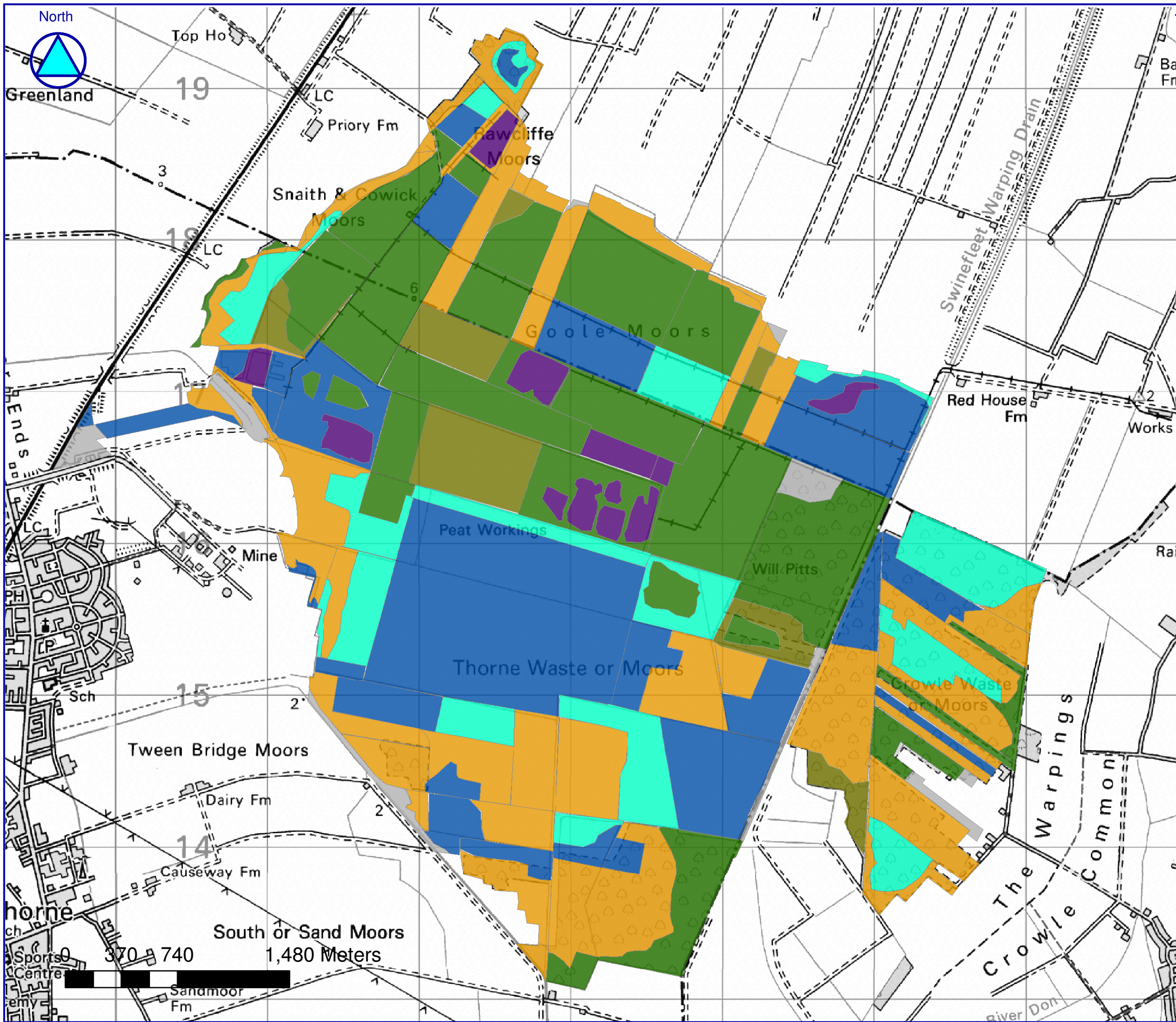
- Culverts
- Earth Bund
- Pile Dam
- Plastic Pile
- Steel Pile

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FIGURE A 8

Surface Water Features and Control Structures



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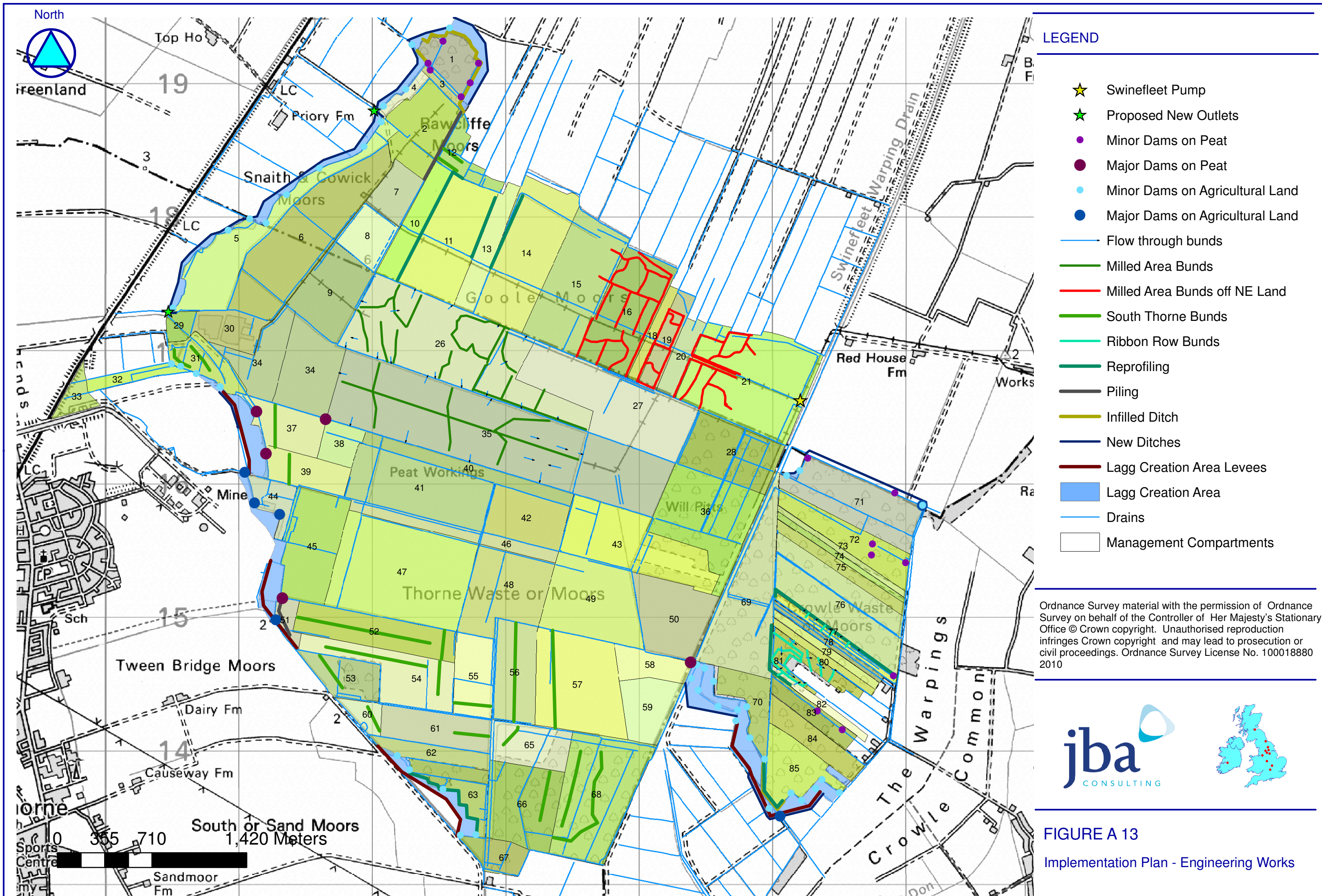
Water Level Classification

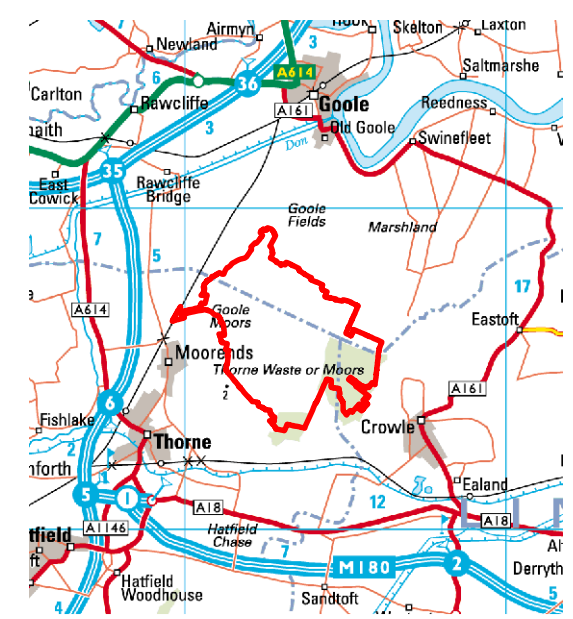
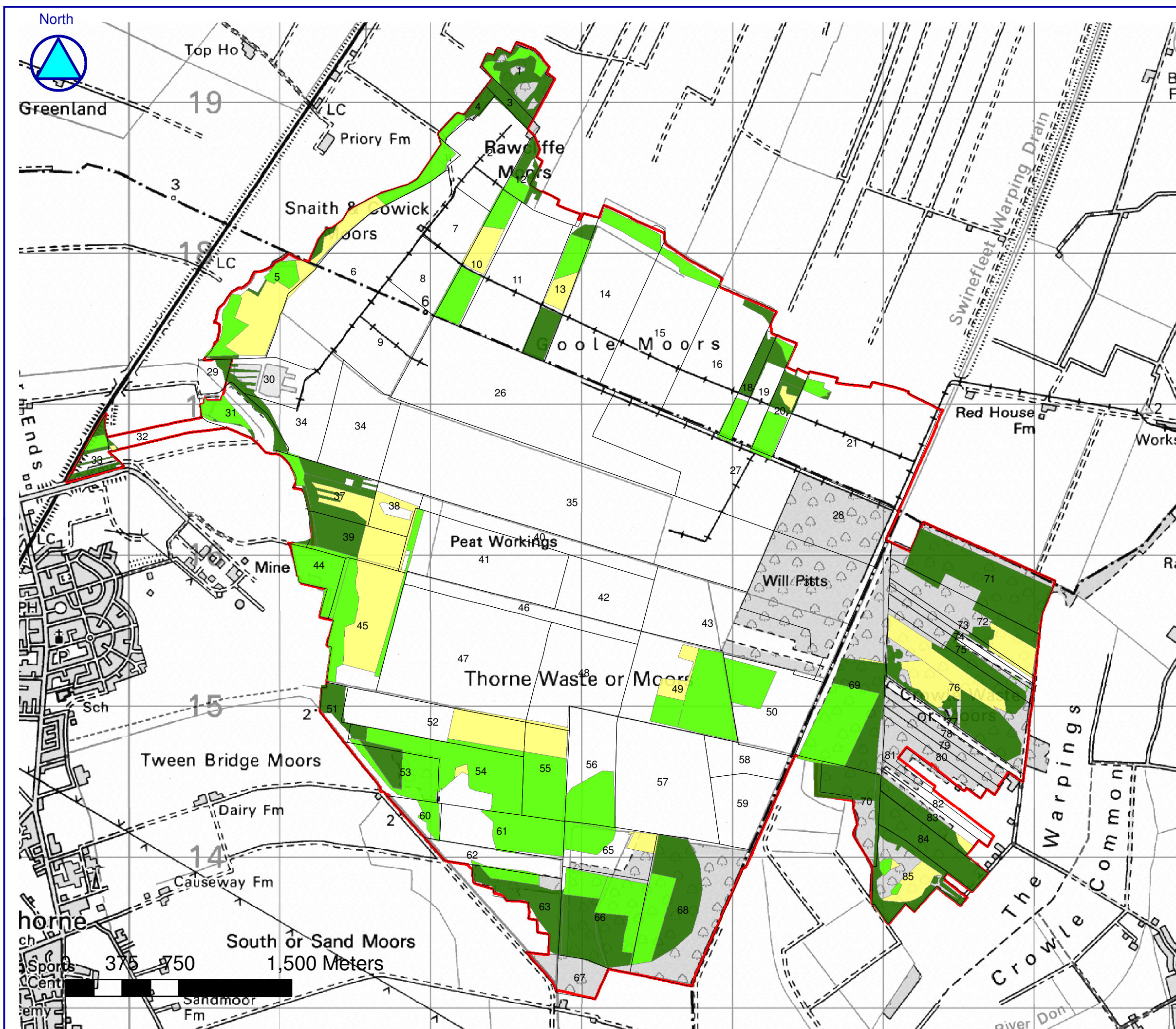
- Sufficiently Wet
- Slightly Dry
- Fluctuates - wet
- Fluctuates - dry
- Too Dry
- Too Wet
- Not Applicable

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FIGURE A 12
Water Level Classifications





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- Scrub Clearance**
- Wood Type**
- Dense
 - Less dense
 - Scattered trees
 - Management Compartments
 - Thorne Moor Boundary

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FIGURE A 14
Implementation Plan - Scrub Clearance

References

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