

# SPR EA1N and EA2 PROJECTS



## DEADLINE 9 – SUBSTATION DESIGN PRINCIPLES STATEMENT

**Interested Party:** SASES    **PINS Refs:** 20024106 & 20024110

**Date:** 15 April 2021

**Issue:** 4

### 1. Introduction

The Applicant's latest version of the Substations Design Principles Statement was submitted at Deadline 8. However much of the additional language is not about good design or design principles but simply a narrative setting out the very limited design evolution which has been achieved with the EA1N and EA2 substations. There has been no design evolution with the National Grid infrastructure other than an unverified proposal to reduce the finished ground level of the NG substation by 70cm.

It is noted that the Examining Authorities have indicated that design will be an area of primary focus during the extended examination period. Accordingly SASES has prepared Sections 1 to 4 of this submission which summarises SASES current position with regard to some of the 'Good Design' issues which have been raised during the Examinations. These opinions are in relation only to onshore works, and more specifically the works at the proposed substation site at Friston.

EN-1 Section 4.5 is very clear as to the importance of 'Good Design' with regard to new energy infrastructure, but in SASES opinion it is not evident that such 'Good Design' has been achieved in a significant number of important areas, which are described in some detail below.

Section 5 of this submission sets out some additional comments from Michelle Bolger – Expert Landscape Consultancy.

### 2. Design Oversight

The recent National Infrastructure Design Principles document from the National Infrastructure Commission ([Ref. 2](#)) is highly relevant and authoritative and the Applicant makes enthusiastic reference to it ([Ref.3](#) page 4). The Principles (page 5) recommend the appointment of a board-level Design Champion to ensure constant emphasis on the need for 'Good Design' and SASES notes the Applicants agreement to appoint a suitable senior member of the Iberdrola management.

However, SASES maintains that there is also a clear need for independent Power Engineering review of the projects, especially with regard to the design of the substations works. The NIC 'Principles' document supports this by recommending the establishment of a Design Review Panel for all NSIPs, and SASES strongly requests agreement to such an approach, to include independent participants with relevant Power Engineering expertise.

It is noted that the Applicants has objected to similar proposals made previously by SASES, and has instead reiterated their intent of allowing only limited aesthetic design

review by the Design Council, rather than a Design Review Panel including Engineering expertise capable of addressing all project issues. SASES notes that the Applicants have repeated in a number of documents their intent of reusing the substation design developed for the East Anglia 1 substation at Bramford, rather than investing in an optimal design for the much more sensitive Friston site, which in SASES opinion makes the need for independent oversight to achieve “Good Design” all the more critical. SASES notes that the Rampion substation went through a number of major design iterations before construction and would be looking to a similarly critical approach to any substations to be built at Friston.

### 3. SPR Substations Rochdale Envelope

#### 3.1 Substation Footprint

SASES maintains that the current footprint and height of the proposed SPR EA1N and EA2 substations are excessive. With regard to footprint SASES has analysed the substation footprint against rated power for a number of relevant projects and the results are shown in the Table 1 below. Efficient design with regard to substation footprint is indicated by a low ‘Spatial Usage’ value.

**Table 1**

Project	System Voltage (kV)	Rated Power (MW)	Footprint (m <sup>2</sup> )	Spatial Usage m <sup>2</sup> per MW
EA1 as built	220	714	28,500	<b>39.91</b>
EA1N as per PEIR and ES	275	800	36,100	<b>45.12</b>
EA2 as per PEIR and ES	275	900	36,100	<b>40.11</b>
EA1N after reduction	275	800	32,300	<b>40.37</b>
EA2 after reduction	273	900	32,300	<b>35.89</b>
EA1N AFRY recommendation	275	800	28,500	<b>35.62</b>
EA2 AFRY recommendation	275	900	28,500	<b>31.67</b>
Hornsea One/NGESO metric	220	1,200	32,200	<b>26.83</b>

In his statement at ISH2 Session 4 on 2 December 2020 [EV-034o] (at 28min approx.) ■■■■■, speaking on behalf of the Applicant, stated in response to questioning about the use of 275kV as the system voltage “*it means we can get more power through the cable corridor and **have a much reduced footprint per megawatt at the onshore substation***” (SASES emphasis).

But the Table 1 results indicate otherwise. The originally proposed ES footprints for EA1N and EA2 were both less efficient than EA1 despite the use of 275kV, and even after the recently announced reduction the EA1N footprint is still less efficient than that for EA1. Has SASES misunderstood ■■■■■ statement, or has the Applicant failed to implement the footprint reduction referred to?

Further, AFRY, in their report for Suffolk County Council, (REP2-037, page 11) stated that “*For planning purposes, the adoption of an identical plot size to EA1 seems reasonable.*” (that being 190m x 150m or 28,500 m<sup>2</sup>). This leads to potential Spatial Usage metrics much improved over those currently proposed, but still substantially worse than Hornsea One as Table 1 above shows.

The Spatial Usage metric currently proposed for EA1N and EA2 is far greater than that achieved by the Hornsea One project, which has been referenced as a benchmark for HVAC substation design by NGENSO in their study of Offshore Coordination for the OTNR ([Ref. 4](#), page 38).

Based on the above SASES believe the current footprints for EA1N and EA2 are excessive and invites the Applicant to propose significant improvements.

### 3.2 Height

The height of the capacitor banks associated with the Harmonic Filters remains a cause of considerable concern. Figure 1 below shows an image of what are understood to be representative capacitor banks installed at another substation project, except that rough scaling suggests that the units shown are about 8m high, when 14m high units are proposed for Friston. It is clear from the image, that sited as the Applicant proposes on the south side of the SPR substations, the capacitor banks will be highly visible from Friston village even after many years of screening growth, assuming the optimistic growth are achieved.

Figure 1



SASES acknowledges that the Applicant has announced some reduction in the height of the proposed capacitor banks, but other projects (e.g. Rampion) have demonstrated their ability to produce substation designs that avoid the need for individual items of electrical

infrastructure to be unacceptably prominent and SASES is not convinced that further improvement cannot be achieved. Enquiries are being made of other projects.

### 3.3 Substation Design

At ISH 12 ([[EV124i](#)] 32.46m) ██████████, for the Applicant, explained that in the event that additional noise reduction of the substations was required to meet the agreed noise rating levels then this would probably be achieved by the provision of additional sound insulation and/or enclosures to the electrical apparatus and that such a provision could apply to the highly visible Harmonic Filters. But the current visualisations appear to make no reference to such additional sound enclosures and do not, therefore, represent the worst case for the visual impact of the substations.

The Applicant is requested to clarify their position regarding additional sound insulation where it would affect the visual impact of the substations, and provide such additional visualisations as may be required to illustrate their effect. SASES also refers to its Deadline 9 noise submission which refers to the potential difficulty of implementing effective noise insulation measures.

## 4. National Grid Substation Design Issues

### 4.1 Rochdale Envelope

SASES notes that in September 2008 NGET applied for planning approval for a change to GIS switchgear for the substantial expansion of its Bramford substation site (Ref. 5 below), which had previously been approved as a AIS expansion in January 2007 (Ref. 6 below).

Apart from SASES concerns that NGET made use of Permitted Rights to avoid the need for a further full planning application, and that it did not relinquish any land that might not now be required as operational land, it is stated in Ref. 5 para 3 that the GIS building would be **12m** high and that sealing end gantries **12.5m** high. Why, therefore does the latest dDCO for EA1N and EA2, with regard to the GIS NGET option, provide for buildings **up to 16m** high?

SASES also notes from the NGET letter of 24 November 2020 to Save Our Sandlings ([Ref. 7](#)) that *“the design parameters for the sub-station have been provided to the Promoter by NGET. These are standard size requirements for the sub-station required to connect EA1N and EA2 projects”*. But based on the Bramford information above extracted from Ref. 5 that would seem to be incorrect. The Applicant is requested to provide a full explanation for the disparity. It should also be recalled that at CAH2 ██████████ ██████████ QC on behalf of National Grid stated that the National Grid infrastructure would not be reduced in size if only one of EA1N and EA2 was developed.

### 4.2 Good Design

NPS EN-1 is clear as to the Applicant's obligations to achieve 'Good Design' in its application. However the NGET letter ([Ref. 7](#) page 2) explains that the design of NGET substation did not represent the best design that could reasonably be achieved for the Friston site, as the design requirements were for a '*standard size*' of substation. Further the Ref. 5 information referred to in section 4.1 above demonstrates that considerable improvement on these 'standard size requirements' was proposed for the far less visually sensitive site at Bramford.

This position is clearly unsatisfactory and the Applicants are requested to provide full justification, including scaled engineering diagrams with cross-sections, of the proposed design of Friston NGET GIS substation, including justification for its greater height than that at Bramford. Equivalent information for the AIS version of the NGET substation is also requested, together with drawings showing the impact of expansion of both types of substation, should this be required for the NGV and other projects.

## 5. Landscape Briefing Note 9

<i>Project:</i>	1080 East Anglia One North and East Anglia Two
<i>Date:</i>	1 <sup>st</sup> April 2021
<i>Purpose:</i>	Notes responding to SPR's Deadline 8 submission on Substations Design Principles
<i>Reference:</i>	1080 BN09 Responses to Deadline 8 submissions.docx

### Submission Reviewed

#### ***Substations Design Principles Statement March 2021***

***ExA.AS-28. D8.V2 (No examination references for D8 documents have been issued yet)***

1. It is noted that the landscape proposals within the OLMP presented in Plate 4.2 of the Substations Design Principles Statement do not show the larger infiltration ponds proposed within Outline Operational Drainage Management Plan - Version 03 24/02/21 **REP6-017**.
2. The Substations Design Principles Statement includes for options for the colours which is says will be '*explored with the local community during the post consent engagement strategy, in order to arrive at an acceptable colour solution for the substation buildings.*' The choice or colour(s) for the buildings is an element of the detailed design that would benefit from a significant input by the Design Council or other independent review body.
3. The way in which the possible options are currently presented in the Substations Design Principles Statement does not assist in the choice of colours and a much more detailed and comprehensive presentation to local community will be required. The best colours will depend in large part on the backdrop against which they will be seen. An understanding of prevailing climatic conditions and the variations in light conditions will be essential as this will often be the sky. A variety of visualisations that show different sky/light conditions will be required. A decision will also need to be taken as to whether all the buildings should be the same colour or

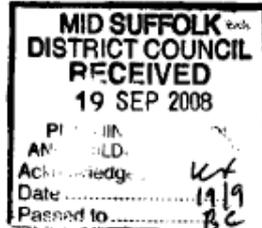
whether there should be a mix of colours that reflects their size, orientation etc., as Dame Sylvia Crowe designed at Wylva Nuclear Power Station.

nationalgrid

Scan pls.

National Grid House  
Warwick Technology Park  
Gallows Hill  
Warwick CV34 6D

██████████  
Planning – Development Control  
Mid Suffolk District Council  
Council Offices  
131 High Street  
Needham Market  
Ipswich  
Suffolk IP6 8DL



██████████  
Consultant Consents Officer

██████████@cgms.co.uk  
██████████

www.nationalgrid.com

19 September 2008

Our Ref :  
bramford/letter180908msdc

Dear ██████████

**Planning application 0076/07/FUL**  
**National Grid proposed substation extension, Bramford**

Further to our recent conversation, I enclose an A3 version of drawing 240608/01E/005/P1 which shows (in red) a revised proposal for Bramford substation. I write to seek your opinion on the permitted development status of this proposal.

Due to changing demands on the national transmission system, the scheme which was granted permission 0076/07/FUL would no longer meet our operational requirements, although National Grid has acquired all the land which would have been needed to construct this scheme. The original proposal would have involved constructing an air-insulated switchgear substation which would have extended to the west of the tree belt which runs along the western boundary of the existing substation. A new access road was proposed to run along the northern boundary of the site.

The revised proposal is for a gas insulated switchgear substation, which means that the switchgear will be located in a building, the dimensions of which will be 10m by 21m by 12m high. This building will be connected to the sealing end gantries by gas insulated busbars which will stand 2-5m above ground level. The sealing end gantries will be up to 12.5m in height. Related plant and equipment will be below this height. In order to accommodate modifications to the security fence, a new access road will be constructed along the northern boundary of the site. This will however be less extensive than that previously proposed. A minor diversion of the bridleway will be required.

As I see it, the key factors are the definition of operational land and the permitted development rights enshrined in the General Permitted Development Order.

Operational land is defined, in section 263 of the Town and Country Planning Act 1990, as land which is used by statutory undertakers for the purpose of carrying on their undertaking and land in which an interest is held for that purpose. The great majority of the proposed development would affect land in the former category. The exception would be works on the northern part of the site, including the access road, the sealing end gantry at the termination of the Bramford - Norwich overhead line and the boundary fence, which would be sited on

National Grid plc  
Registered Office: 1-3 Strand, London WC2N 5EH  
Registered in England and Wales, No 4031152

Is 'op land' as per GPDO G.15 +  
TLPA 264 (3) (a) + (b)  
PP 76/07

land recently acquired for the purpose of carrying on the undertaking – the latter category. Section 264 refers to the situation where land was acquired after 6<sup>th</sup> December 1968. Under subsection 3, land is defined as operational if there is (or has been) a planning permission in force which relates to the purpose of carrying on the undertaking. This clearly applies in the current case. All the works now proposed are contained within the boundaries of permission 0076/07/FUL.

Class G of Part 17 of the General Permitted Development Order 1995 covers work by electricity undertakings. The building housing the gas insulated switchgear would fall within Class G(e). As the building would be less than 15m in height it would not be caught by the restriction in G1(d). All the other elements of the works would fall within Class G(f). None of the plant and equipment would be over 15m in height, so it would not be caught by the restriction in G1(e).

Modifications to the overhead lines would be the subject of an application to the Department for Business under section 37 of the Electricity Act 1989, which, if approved, would include for deemed planning permission.

I would be grateful if you could confirm that the works shown in red on drawing 240608/01E/005/P1 may be considered permitted development. We will seek your approval of the design and appearance of the building in accordance with Class G2(d) once this has been finalised.

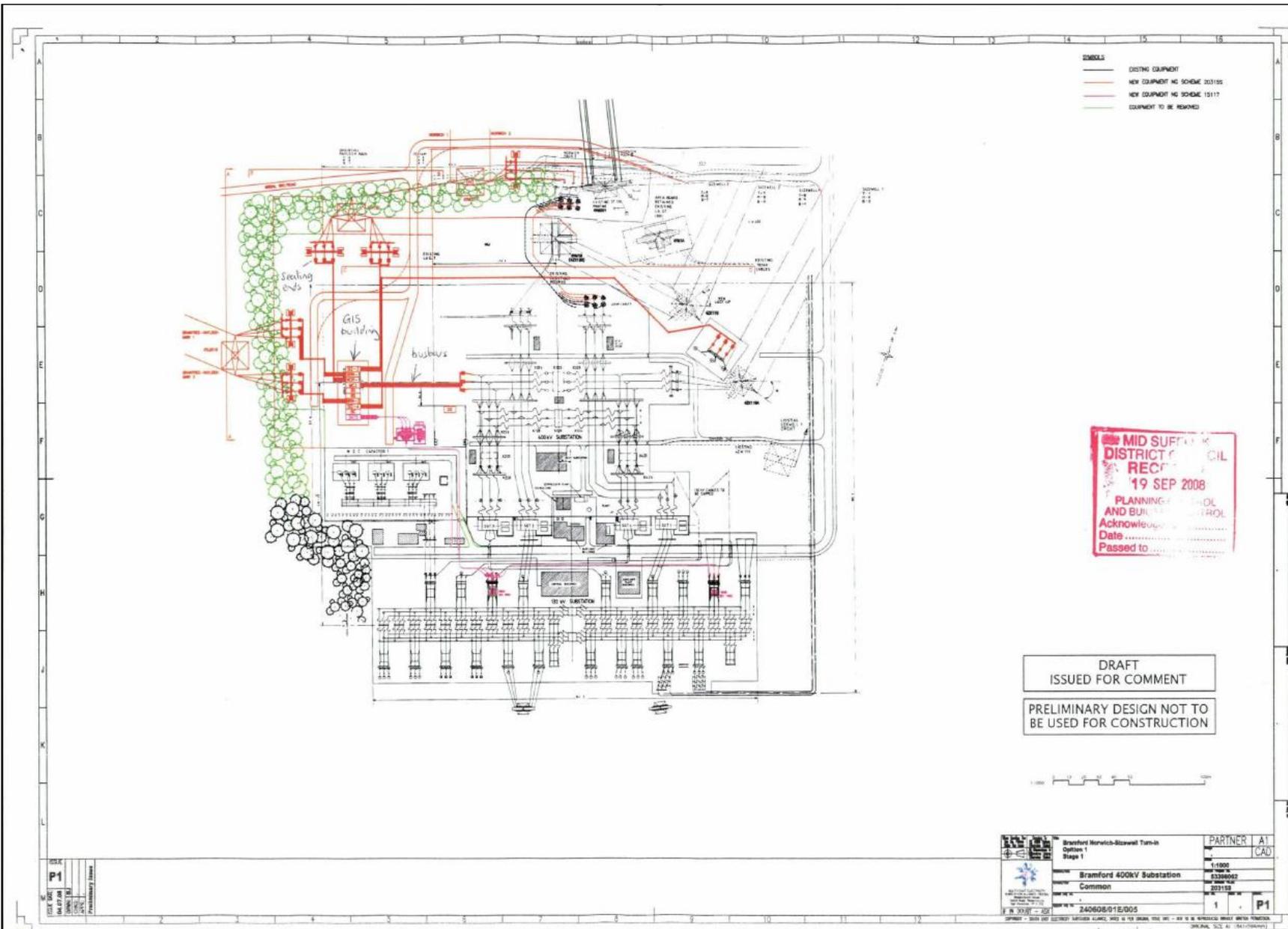
Please do not hesitate to contact me should you have any queries. I would be happy to meet you in your office or on site should you deem this necessary. **Please reply to the address below :**

c/o CgMs Consulting  
Newark Beacon  
Beacon Hill Office Park  
Cafferata Way  
Newark NG24 2TN

Yours sincerely



**BA DMS MRTPI**  
Director  
CgMs  
(Consultant Consents Officer – National Grid)



- SYMBOLS**
- EXISTING EQUIPMENT
  - NEW EQUIPMENT NO SCHEME 203105
  - - - NEW EQUIPMENT NO SCHEME 15117
  - EQUIPMENT TO BE REMOVED

**MID SUFFOLK DISTRICT COUNCIL**  
**RECEIVED**  
**19 SEP 2008**  
 PLANNING AND BUILDING CONTROL  
 Acknowledged  
 Date  
 Passed to

**DRAFT**  
**ISSUED FOR COMMENT**

**PRELIMINARY DESIGN NOT TO**  
**BE USED FOR CONSTRUCTION**

	Bramford Norwich-Stowell Turn-in	PARTNER	A1
	Options 1		CAD
	Bramford 400kV Substation	1-1000	
	Common	03/06/07	
242608/01E/005		1	P1

## Reference 6

### Mid Suffolk District Council Planning Control Department 131 High Street Needham Market IP6 8DL

#### PLANNING PERMISSION

Town and Country Planning Act 1990

Town and Country Planning (General Development Procedure) Order 1995

Date of Application: January 12, 2007

REFERENCE: 0076 / 07

Date Registered: January 15, 2007

FORM P2

Documents to which this decision relates: Drawings numbered 18217-L55e, -L70 and L54e , environmental report, figures and appendices and badger report received 12th January 2007, arboricultural assessment and drawing number 12.06.1222 A received 24th January 2007, drawing number 18217-L52f received 27th February 2007.

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#### CORRESPONDENCE ADDRESS:

██████████  
C/o Cheffins  
1/2 Clifton Road  
Cambridge  
CB1 7EA

#### NAME AND ADDRESS OF APPLICANT:

National Grid Electricity Transmission plc  
1100 Century Way  
Thorpe Park  
Leeds  
LS15 8TU

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#### PROPOSED DEVELOPMENT AND LOCATION OF THE LAND:

Construction of extension to 400KV electricity substation and associated access road.  
- Bramford Sub Station, Bullen Lane, Bramford

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The Council, as local planning authority, hereby gives notice that **PLANNING PERMISSION HAS BEEN GRANTED** in accordance with the application particulars and plans submitted subject to the following conditions:

1. The development hereby permitted must be begun not later than the expiration of three years from the date of this permission.

*Reason – To comply with the requirements of Section 91 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004*

2. Notwithstanding the details for the removal of hedgerows shown on drawing number 12.06.1222 received 24th January 2007 no development shall commence until there has been submitted to, and approved in writing by, the Local Planning Authority a scheme for the treatment of hedgerows within the site. The scheme shall clearly identify all sections of hedging proposed for removal, retention or enhancement. The scheme shall be carried out as approved unless otherwise agreed, in writing, by the Local Planning Authority.

*Reason - In order to achieve optimum hedgerow retention on site in the interests of visual amenity and historical value.*

3. No development shall take place until there has been submitted to and approved, in writing, by the Local Planning Authority a scheme of hard and soft landscaping works for the site, which shall include details of the proposed surfacing and landscaping of the diverted bridleway, any proposed changes in ground levels and also accurately identify spread, girth and species of all existing trees, shrubs and hedgerows on the site and indicate any to be retained, together with measures for their protection which shall comply with the recommendations set out in the British Standards Institute publication "BS 5837: 1991 - Trees in Relation to Construction."

the highway authority (Suffolk County Council).

3. The development may be affected by the Control of Pollution (Oil Storage) (England) regulations 2001 and the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 and as amended 1997. For further information please contact the Environment Agency.

This permission relates only to that required under the Town and Country Planning Acts and does not include any consent or approval under any other enactment or under the Building Regulations. Any other consent or approval which is necessary must be obtained from the appropriate authority.

This relates to document reference: 0076 / 07

Signed:



Dated: April 11, 2007

Professional Lead Officer  
Planning Services

MID SUFFOLK DISTRICT COUNCIL, 131 HIGH STREET, NEEDHAM MARKET, IPSWICH IP6  
8DL

**END OF DOCUMENT**