



**SCOTTISHPOWER
RENEWABLES**

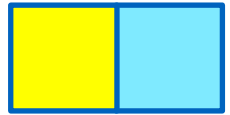
East Anglia ONE North and East Anglia TWO Offshore Windfarms

Applicants' Response to Rule 17 Questions of 13 May – Design and Layout of the Substations

Applicants: East Anglia ONE North Limited and East Anglia TWO Limited
Document Reference: ExA.R17QE-1.D11.V1
SPR Reference: EA1N_EA2-DWF-ENV-REP-IBR-001096

Date: 21st May 2021
Revision: Version 01
Author: Royal HaskoningDHV

Applicable to East Anglia ONE North and East Anglia TWO



Revision Summary				
Rev	Date	Prepared by	Checked by	Approved by
01	21/05/21	Paolo Pizzolla	Lesly Jamieson / Ian MacKay	Rich Morris

Description of Revisions			
Rev	Page	Section	Description
01	N/A	N/A	Final for submission

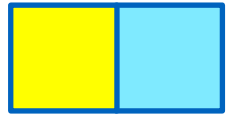
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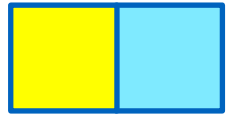
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Glossary of Acronyms

AIS	Air Insulated Switchgear
DCO	Development Consent Order
EA1N	East Anglia ONE North Offshore Wind Farm
EA2	East Anglia TWO Offshore Wind Farm
GIS	Gas Insulated Switchgear
NG	National Grid
OLMP	Outline Landscape Mitigation Plan
SuDS	Sustainable Drainage System

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Glossary of Terminology

Applicant	East Anglia TWO Limited / East Anglia ONE North Limited
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia TWO project	The proposed project consisting of up to 75 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia TWO / East Anglia ONE North project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia TWO / East Anglia ONE North project Development Consent Order.
National Grid substation location	The proposed location of the National Grid substation.
Onshore substation	The East Anglia TWO / East Anglia ONE North substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia TWO / East Anglia ONE North project.



1 Introduction

1. This document has been prepared by East Anglia TWO Limited and East Anglia ONE North Limited (the Applicants) in response to a question issued by the Examining Authority on 13th May 2021 under Rule 17 of the Infrastructure Planning (Examination Procedure) Rules 2010 (R17QE). In particular, this document addresses R17QE.1 on the 'overall design and layout of the Friston substations site under various scenarios'.
2. This document is applicable to both the East Anglia ONE North and East Anglia TWO Development Consent Order (DCO) applications, and therefore is endorsed with the yellow and blue icon used to identify materially identical documentation in accordance with the Examining Authority's procedural decisions on document management of 23rd December 2019 (PD-004). Whilst this document has been submitted to both Examinations, if it is read for one project submission there is no need to read it for the other project submission.



2 Substation Layout and Location

3. R17QE.1 requests a number of drawings showing different possible layout scenarios for the onshore substations and National Grid (NG) substation proposed for the East Anglia ONE North Offshore Wind Farm (EA1N) and East Anglia TWO Offshore Wind Farm (EA2) projects (see **Section 3** and **Appendix 1**).
4. Some of the scenarios requested involve excluding either the EA1N or EA2 onshore substation. It should be noted that in the event of only one project being consented, the relevant onshore substation would be developed in the eastern onshore substation location.
5. While both onshore substation locations are considered acceptable by the Applicants and have been fully assessed, due to the reductions in building and external electrical equipment heights of the onshore substations as presented in the **Deadline 3 Project Update Note** (REP3-052), the eastern onshore substation location offers some advantages compared to the western onshore substation location. Such advantages include improved screening from surrounding viewpoints (relevant to landscape, visual and cultural heritage setting impacts); additional benefit from the existing screening at Laurel Covert; and increased separation distance from the village of Friston to the south-west.
6. The position and orientation of the NG substation (air insulated switchgear (AIS) or gas insulated switchgear (GIS)) relative to the onshore substations and overhead lines is key to optimising its layout. The orientation of the NG substation presented within the Applications and the enclosed figures ensures the required 400 kilovolts (kV) connections from the onshore substations, and to the overhead lines, are minimised.
7. In the event that the NG substation being developed using GIS technology, centralising it to the onshore substations is the optimal location as this again ensures that the required 400kV connections from the onshore substations, and to the overhead lines, are minimised.



3 Appraisal of Mitigation Measures for Each Scenario

1. The following drawings are provided in **Appendix 1** (as requested in R17QE.1):
 - Drawing A (EA1N developed alone with the National Grid (NG) substation using air insulated switchgear (AIS));
 - Drawing B Drawing D (EA1N developed alone with the NG substation using gas insulated switchgear (GIS));
 - Drawing C (EA2 developed alone with the NG substation using AIS);
 - Drawing D (EA2 developed alone with NG substation using GIS);
 - Drawing E (both EA1N and EA2 developed together with the NG substation using AIS); and
 - Drawing F (both EA1N and EA2 developed together with the NG substation using GIS).
2. It should be noted that two versions of Drawing E are included in **Appendix 1**, one showing sustainable drainage system (SuDS) basin options that accommodates a Factor of Safety of 10 and another that accommodates a Factor of Safety of 5.
3. Brief commentaries appraising the likely effectiveness, or otherwise, of the proposed mitigation measures presented in each of the above drawings are set out in **section 3.1** to **section 3.6**.

3.1 EA1N with AIS NG Substation (Drawing A)

4. Drawing A shows that the EA1N alone onshore substation SuDS basin will be smaller than that required for both the EA2 and EA1N onshore substations developed together and that it could be accommodated for all three operational drainage scheme options (i.e. infiltration only; hybrid; and attenuation only). None of the three operational drainage scheme options would compromise the planting proposed within the Outline Landscape Management Plan (OLMP).
5. In the EA1N alone scenario the OLMP mitigation measures would include the following amendments (as shown on Drawing A):
 1. Existing field boundary between the copse woodland and Grove Road has been retained (since it is no longer within the footprint of western substation);



2. Additional woodland planting is proposed to further connect the retained copse woodland with Grove Wood to the east, following areas the existing field boundaries and located on slightly higher areas of ground;
 3. A new screen woodland belt (W3) is proposed to be accommodated along the western side of the EA2 (eastern) substation to afford further screening of this substation;
 4. A new woodland belt has also been accommodated along the southern side of the AIS NG substation along the access road, connecting to the existing copse woodland, in order to afford further screening of the NG substation; and
 5. The remaining land within the area to the west of the EA2 substation is proposed to be established with species-rich grassland.
6. The proposed mitigation measures shown in Drawing A with would improve the effectiveness of visual mitigation screening in views from Friston to the south. This is due to the retention of the existing high hedged/tree lined field boundary running west-east across the western footprint, further woodland planting being on higher ground, closer to the substations, and the addition of new screen planting on the available eastern substation boundary.
 7. Potential early woodland planting areas would be retained with no changes to the south along field boundaries closer to Friston, in order to retain this potential early screening as presented within the current OLMP. The main woodland planting belt would also be likely to improve habitat connectivity and linkages between the copse woodland, existing field boundaries and Grove Wood.

3.2 EA1N with GIS NG Substation (Drawing B)

8. Drawing B shows the same proposed EA1N alone OLMP mitigation measures as described in **section 3.1**, with the only difference being that the GIS NG substation has a smaller footprint than that for the AIS option. Therefore, land to the immediate east and west may be available for further landscape mitigation planting, however the landscape planting proposed in the OLMP to the west of the GIS substation (near the NG SuDS basin) and to the east (near Laurel Covert) provides effective landscape framework screening in views from both the east and west of the NG GIS substation.

3.3 EA2 with AIS NG Substation (Drawing C)

9. Drawing C is identical to Drawing A as it is assumed that in the project alone scenario, the onshore substation would be developed on the eastern location. There is no scenario whereby the western onshore substation would be developed alone. Please see **section 3.1** for further information.



3.4 EA2 with GIS NG Substation (Drawing D)

10. Drawing D is identical to Drawing B as it is assumed that in the project alone scenario, the onshore substation would be developed on the eastern location. There is no scenario whereby the western onshore substation would be developed alone. Please see **section 3.2** for further information.

3.5 EA1N and EA2 with AIS NG Substation (Drawing E)

11. Drawing E shows that any of the three drainage scheme options (i.e. infiltration only; hybrid; and attenuation only) could be accommodated within the SuDS basin areas proposed for both the onshore substations and the AIS NG substation. None of the three drainage scheme options would require the planting proposed within the OLMP to be compromised.
12. Fundamentally, all of the drainage proposals under consideration will have limited influence on the design of the OLMP as there would be no change required to the currently proposed planting areas, and therefore no change to the likely effectiveness of mitigation proposals.
13. The proposals for landscape mitigation shown in Drawings A-F do not materially alter, therefore the landscape and visual effects are as set out in the **Chapter 29 Landscape and Visual Impact Assessment** (LVIA) (APP-077) and the **LVIA Addendum** (REP4-031).

3.6 EA1N and EA2 with GIS NG Substation (Drawing F)

14. As per Drawing E, Drawing F again shows that any of the three drainage scheme options (i.e. infiltration only; hybrid; and attenuation only) could be accommodated within the SuDS basin areas proposed for both the onshore substations and the AIS NG substation. None of the three drainage scheme options would require the planting proposed within the OLMP to be compromised.
15. Landscape planting proposed in the OLMP to the west of the GIS substation (near the NG SuDS basin) and to the east (near Laurel Covert) provides effective landscape framework screening in views from both the east and west of the NG GIS substation.

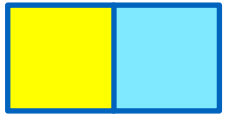
3.7 Summary

16. Drawings A to F demonstrate that the OLMP would not be compromised as a result of the drainage schemes under consideration. The different SuDS proposals would not influence the proposed landscape strategy for the Projects and there is sufficient land to deliver an infiltration only drainage scheme and the OLMP landscape planting within the Order limits.
17. The OLMP will remain fundamentally unchanged with the exception of the EA1N or EA2 alone scenario. In this 'single project' scenario (shown in Drawing C and



- D) the proposed mitigation measures would improve the effectiveness of landscape and visual mitigation measures and contribute to a reduced effect of the single project scenario in views particularly from the south-west, such as from Friston, compared to the cumulative EA2 and EA1N effect scenario.
18. Fundamentally, the proposals for landscape mitigation shown in Drawings A to F do not materially alter as a result of the drainage proposals, therefore the landscape and visual effects remain as set out in the **Chapter 29 LVIA** (APP-077) and the **LVIA Addendum** (REP4-031).

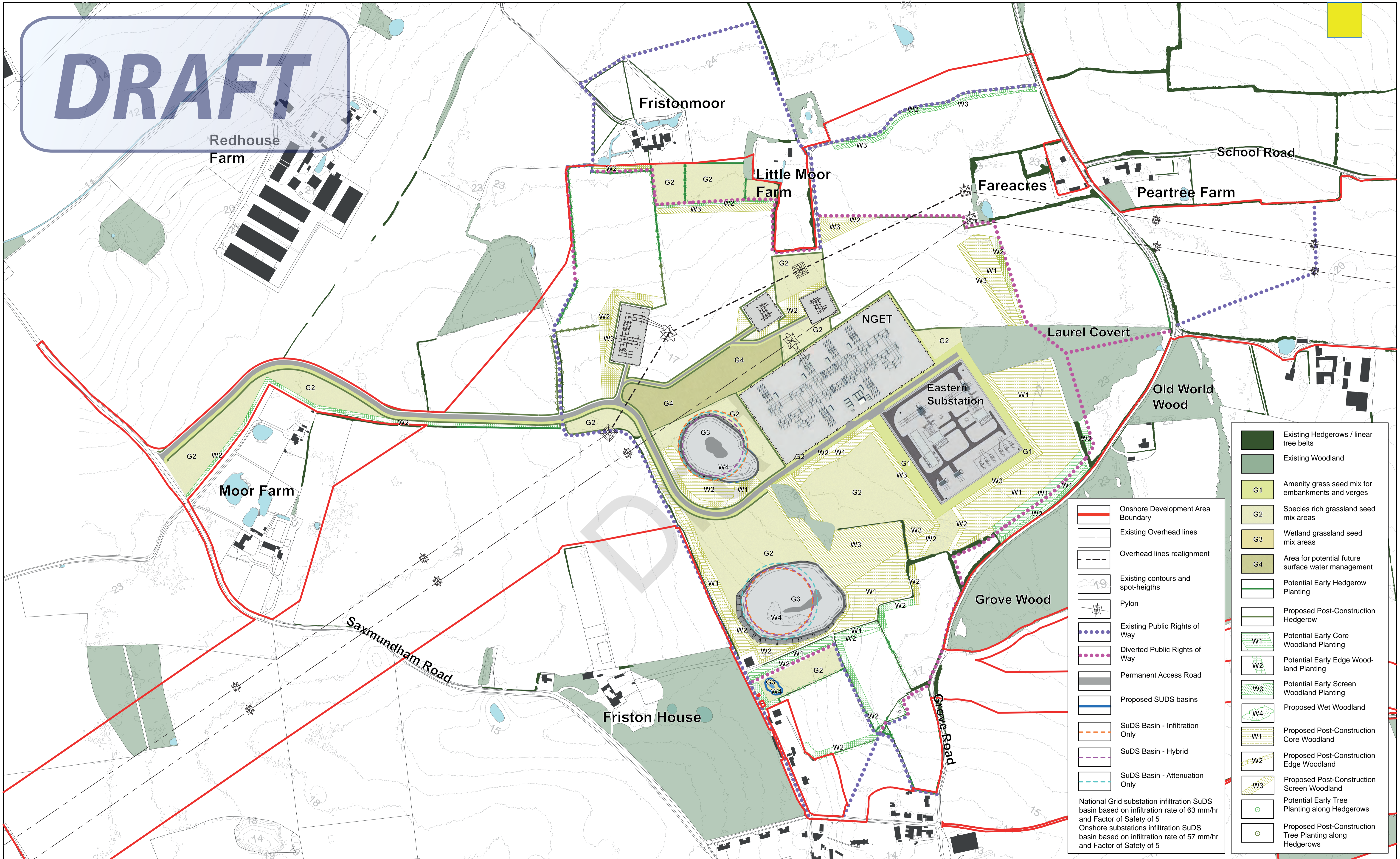
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Appendix 1 Drawings

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- Existing Hedgerows / linear tree belts
 - Existing Woodland
 - G1 Amenity grass seed mix for embankments and verges
 - G2 Species rich grassland seed mix areas
 - G3 Wetland grassland seed mix areas
 - G4 Area for potential future surface water management
 - Potential Early Hedgerow Planting
 - Proposed Post-Construction Hedgerow
 - W1 Potential Early Core Woodland Planting
 - W2 Potential Early Edge Woodland Planting
 - W3 Potential Early Screen Woodland Planting
 - W4 Proposed Wet Woodland
 - W1 Proposed Post-Construction Core Woodland
 - W2 Proposed Post-Construction Edge Woodland
 - W3 Proposed Post-Construction Screen Woodland
 - Potential Early Tree Planting along Hedgerows
 - Proposed Post-Construction Tree Planting along Hedgerows
- Onshore Development Area Boundary
 - Existing Overhead lines
 - Overhead lines realignment
 - Existing contours and spot-heights
 - Pylon
 - Existing Public Rights of Way
 - Diverted Public Rights of Way
 - Permanent Access Road
 - Proposed SUDS basins
 - SuDS Basin - Infiltration Only
 - SuDS Basin - Hybrid
 - SuDS Basin - Attenuation Only
- National Grid substation infiltration SuDS basin based on infiltration rate of 63 mm/hr and Factor of Safety of 5
 Onshore substations infiltration SuDS basin based on infiltration rate of 57 mm/hr and Factor of Safety of 5

Rev	Date	By	Comment
-	21/05/2021	st	First Issue.

Prepared: st
 Checked: sm
 Approved: lt

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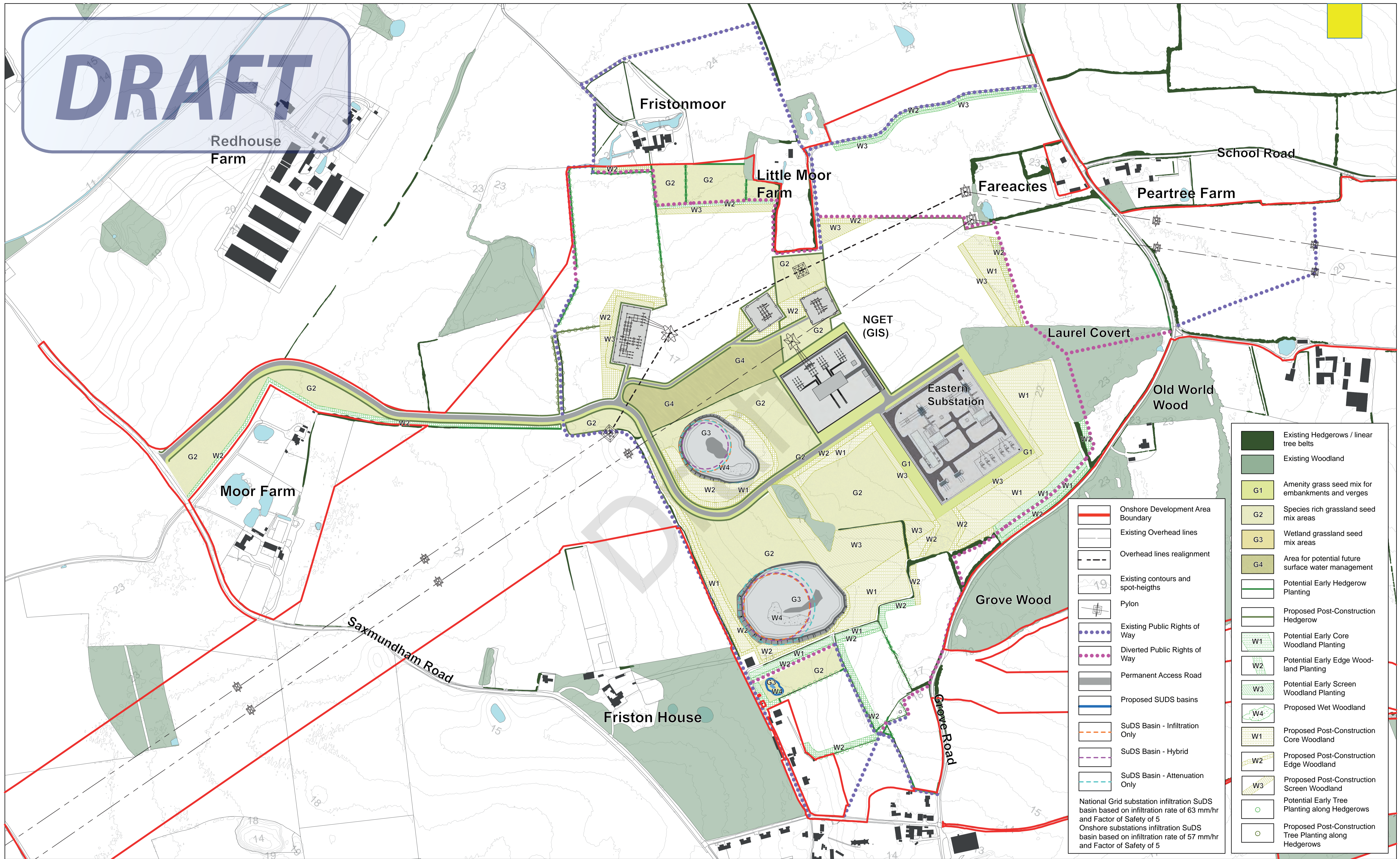
East Anglia ONE North

DRAWING A - FACTOR OF SAFETY 5: East Anglia ONE North

Offshore Windfarm developed along with National Grid Substation using AIS

Doc Ref	DRAWING A - FoS5	
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Date	21/05/21	Datum: OSGB36
Figure	A_FoS5	

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- Existing Hedgerows / linear tree belts
 - Existing Woodland
 - G1 Amenity grass seed mix for embankments and verges
 - G2 Species rich grassland seed mix areas
 - G3 Wetland grassland seed mix areas
 - G4 Area for potential future surface water management
 - Potential Early Hedgerow Planting
 - Proposed Post-Construction Hedgerow
 - Potential Early Core Woodland Planting
 - Potential Early Edge Woodland Planting
 - Potential Early Screen Woodland Planting
 - Proposed Wet Woodland
 - Proposed Post-Construction Core Woodland
 - Proposed Post-Construction Edge Woodland
 - Proposed Post-Construction Screen Woodland
 - Potential Early Tree Planting along Hedgerows
 - Proposed Post-Construction Tree Planting along Hedgerows
- Onshore Development Area Boundary
 - Existing Overhead lines
 - Overhead lines realignment
 - Existing contours and spot-heights
 - Pylon
 - Existing Public Rights of Way
 - Diverted Public Rights of Way
 - Permanent Access Road
 - Proposed SUDS basins
 - SuDS Basin - Infiltration Only
 - SuDS Basin - Hybrid
 - SuDS Basin - Attenuation Only
- National Grid substation infiltration SuDS basin based on infiltration rate of 63 mm/hr and Factor of Safety of 5
Onshore substations infiltration SuDS basin based on infiltration rate of 57 mm/hr and Factor of Safety of 5

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-	21/05/2021	st	First Issue.

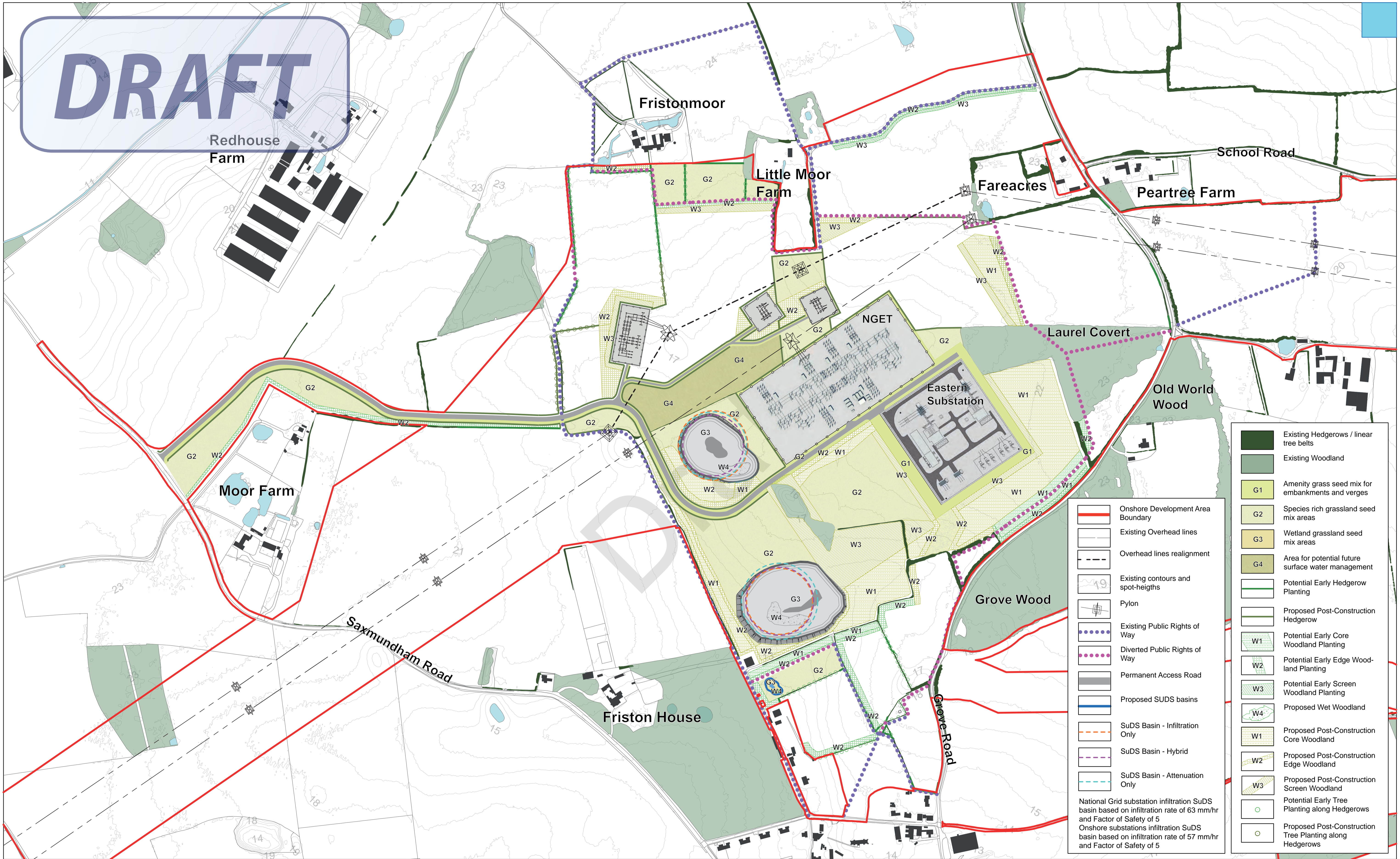
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East Anglia ONE North
DRAWING B - FACTOR OF SAFETY 5: East Anglia ONE North
 Offshore Windfarm developed along with National Grid Substation using GIS

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Rev	-	Coordinate System: BNG
Date	21/05/21	Datum: OSGB36
Figure	B_FoS5	

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	Onshore Development Area Boundary		Existing Hedgerows / linear tree belts
	Existing Overhead lines		Existing Woodland
	Overhead lines realignment		G1 Amenity grass seed mix for embankments and verges
	Existing contours and spot-heights		G2 Species rich grassland seed mix areas
	Pylon		G3 Wetland grassland seed mix areas
	Existing Public Rights of Way		G4 Area for potential future surface water management
	Diverted Public Rights of Way		Potential Early Hedgerow Planting
	Permanent Access Road		Proposed Post-Construction Hedgerow
	Proposed SUDS basins		Proposed Post-Construction Core Woodland Planting
	SuDS Basin - Infiltration Only		W1 Potential Early Core Woodland Planting
	SuDS Basin - Hybrid		W2 Potential Early Edge Woodland Planting
	SuDS Basin - Attenuation Only		W3 Potential Early Screen Woodland Planting
	National Grid substation infiltration SuDS basin based on infiltration rate of 63 mm/hr and Factor of Safety of 5		W4 Proposed Wet Woodland
	Onshore substations infiltration SuDS basin based on infiltration rate of 57 mm/hr and Factor of Safety of 5		W1 Proposed Post-Construction Core Woodland
			W2 Proposed Post-Construction Edge Woodland
			W3 Proposed Post-Construction Screen Woodland
			Potential Early Tree Planting along Hedgerows
			Proposed Post-Construction Tree Planting along Hedgerows

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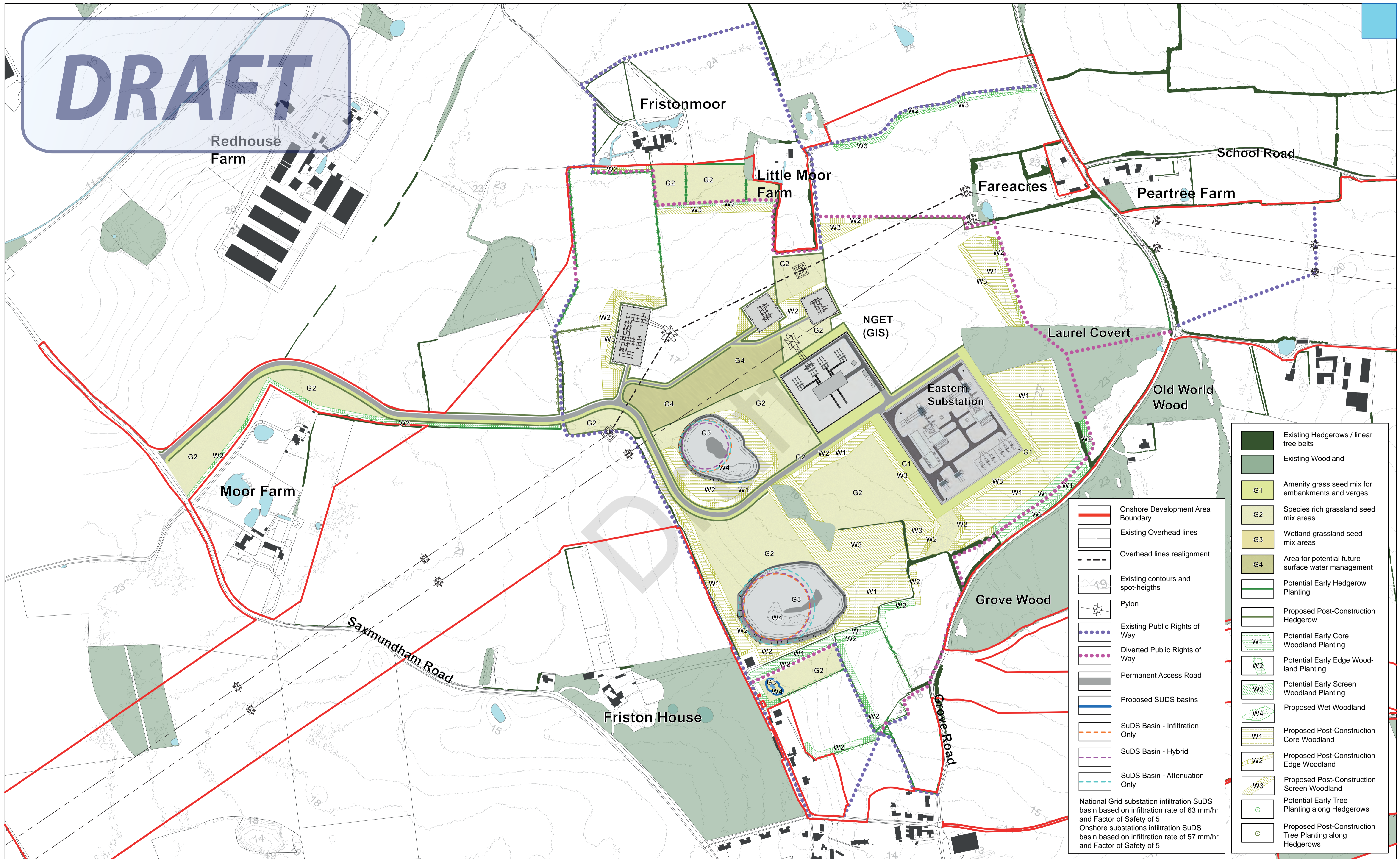
East Anglia TWO

DRAWING C - FACTOR OF SAFETY 5: East Anglia TWO

Offshore Windfarm developed along with National Grid Substation using AIS

Doc Ref	DRAWING C - FoS5	
Rev	01	Coordinate System: BNG
Date	21/05/21	Datum: OSGB36
Figure	C_FoS5	

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- Existing Hedgerows / linear tree belts
 - Existing Woodland
 - G1 Amenity grass seed mix for embankments and verges
 - G2 Species rich grassland seed mix areas
 - G3 Wetland grassland seed mix areas
 - G4 Area for potential future surface water management
 - Potential Early Hedgerow Planting
 - Proposed Post-Construction Hedgerow
 - W1 Potential Early Core Woodland Planting
 - W2 Potential Early Edge Woodland Planting
 - W3 Potential Early Screen Woodland Planting
 - W4 Proposed Wet Woodland
 - W1 Proposed Post-Construction Core Woodland
 - W2 Proposed Post-Construction Edge Woodland
 - W3 Proposed Post-Construction Screen Woodland
 - Potential Early Tree Planting along Hedgerows
 - Proposed Post-Construction Tree Planting along Hedgerows
- Onshore Development Area Boundary
 - Existing Overhead lines
 - Overhead lines realignment
 - Existing contours and spot-heights
 - Pylon
 - Existing Public Rights of Way
 - Diverted Public Rights of Way
 - Permanent Access Road
 - Proposed SUDS basins
 - SuDS Basin - Infiltration Only
 - SuDS Basin - Hybrid
 - SuDS Basin - Attenuation Only
- National Grid substation infiltration SuDS basin based on infiltration rate of 63 mm/hr and Factor of Safety of 5
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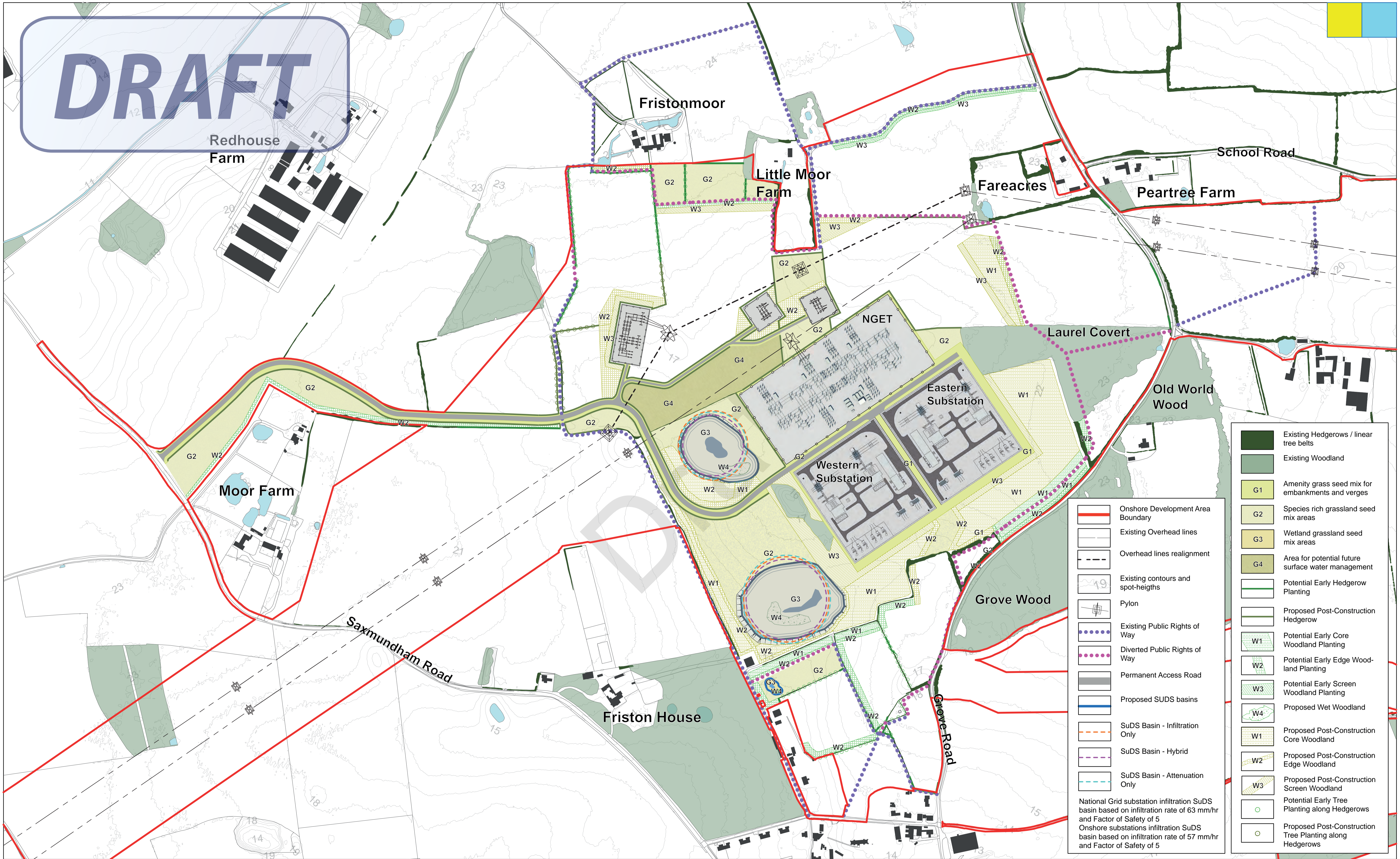
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East Anglia TWO
DRAWING D - FACTOR OF SAFETY 5: East Anglia TWO
 Offshore Windfarm developed along with National Grid Substation using GIS

Doc Ref	DRAWING D - FoS5	
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Date	21/05/21	Datum: OSGB36
Figure	D_FoS5	

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- Existing Hedgerows / linear tree belts
 - Existing Woodland
 - G1 Amenity grass seed mix for embankments and verges
 - G2 Species rich grassland seed mix areas
 - G3 Wetland grassland seed mix areas
 - G4 Area for potential future surface water management
 - Potential Early Hedgerow Planting
 - Proposed Post-Construction Hedgerow
 - Potential Early Core Woodland Planting
 - Potential Early Edge Woodland Planting
 - Potential Early Screen Woodland Planting
 - Proposed Wet Woodland
 - Proposed Post-Construction Core Woodland
 - Proposed Post-Construction Edge Woodland
 - Proposed Post-Construction Screen Woodland
 - Potential Early Tree Planting along Hedgerows
 - Proposed Post-Construction Tree Planting along Hedgerows
- Onshore Development Area Boundary
 - Existing Overhead lines
 - Overhead lines realignment
 - Existing contours and spot-heights
 - Pylon
 - Existing Public Rights of Way
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 - Proposed SUDS basins
 - SuDS Basin - Infiltration Only
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- National Grid substation infiltration SuDS basin based on infiltration rate of 63 mm/hr and Factor of Safety of 5
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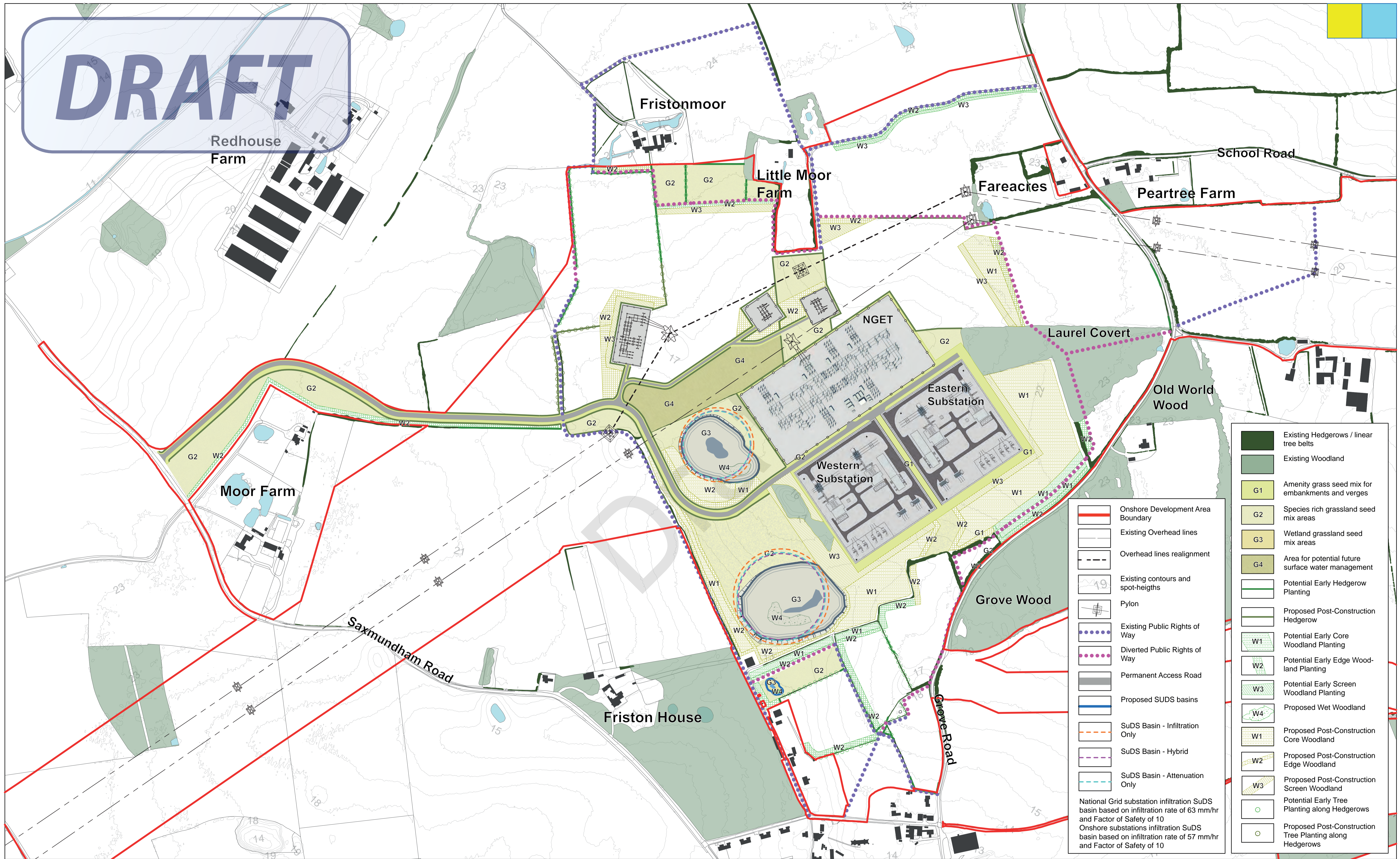
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East Anglia ONE North and East Anglia TWO Offshore Wind Farm
DRAWING E - FACTOR OF SAFETY 5: Both East Anglia ONE North and East Anglia TWO Offshore Windfarms developed together with National Grid Substation using AIS

Doc Ref	DRAWING E - FoS5	
Rev	01	Coordinate System: BNG
Date	21/05/21	Datum: OSGB36
Figure	E_FoS5	

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- Existing Hedgerows / linear tree belts
 - Existing Woodland
 - G1 Amenity grass seed mix for embankments and verges
 - G2 Species rich grassland seed mix areas
 - G3 Wetland grassland seed mix areas
 - G4 Area for potential future surface water management
 - Potential Early Hedgerow Planting
 - Proposed Post-Construction Hedgerow
 - W1 Potential Early Core Woodland Planting
 - W2 Potential Early Edge Woodland Planting
 - W3 Potential Early Screen Woodland Planting
 - W4 Proposed Wet Woodland
 - W1 Proposed Post-Construction Core Woodland
 - W2 Proposed Post-Construction Edge Woodland
 - W3 Proposed Post-Construction Screen Woodland
 - Potential Early Tree Planting along Hedgerows
 - Proposed Post-Construction Tree Planting along Hedgerows
- Onshore Development Area Boundary
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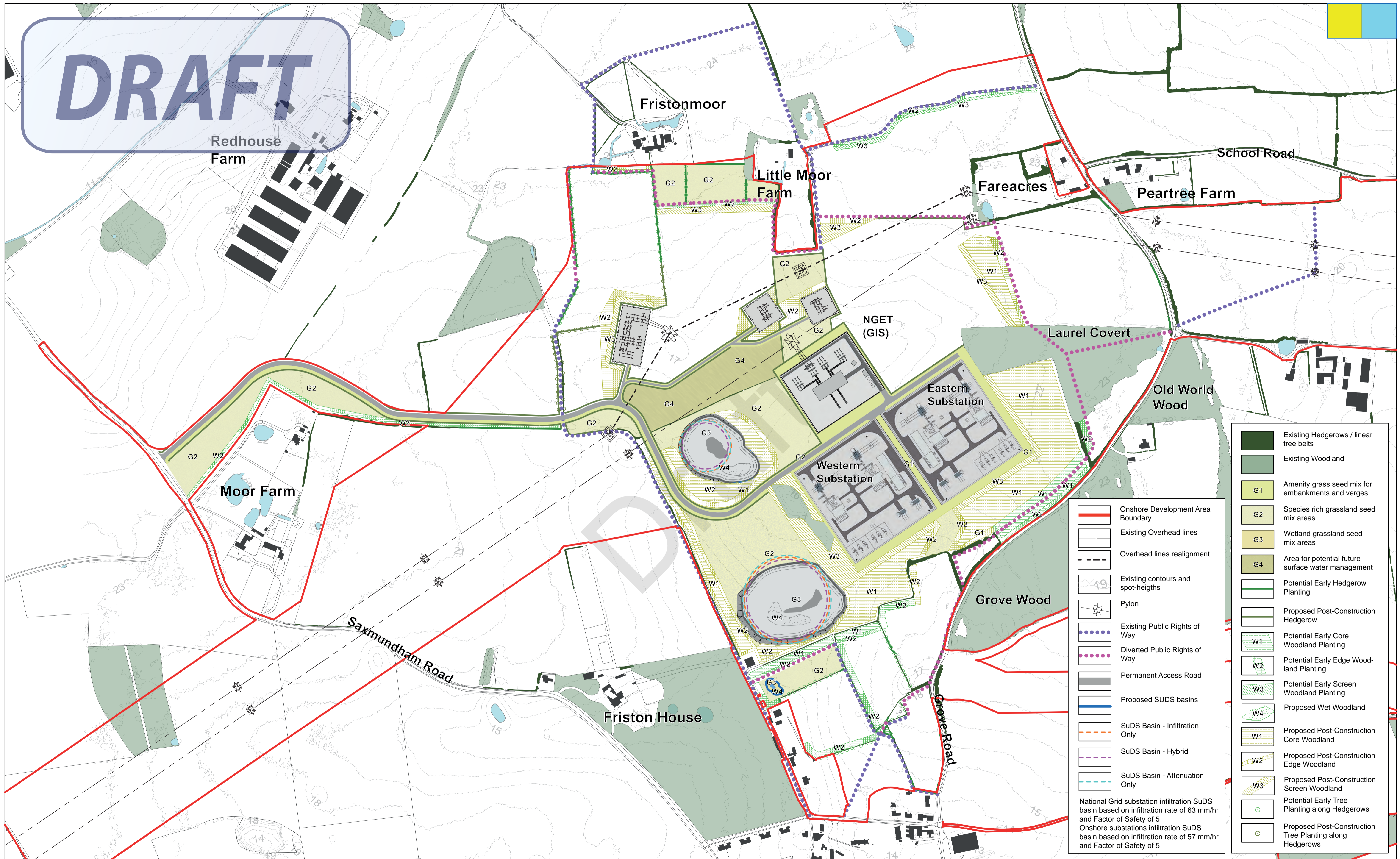
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East Anglia ONE North and East Anglia TWO Offshore Wind Farm
DRAWING E - FACTOR OF SAFETY 10: Both East Anglia ONE North and East Anglia TWO Offshore Windfarms developed together with National Grid Substation using AIS

Doc Ref	DRAWING E - FoS10	
Rev	01	Coordinate System: BNG
Date	21/05/21	Datum: OSGB36
Figure	E_FoS10	

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- Existing Hedgerows / linear tree belts
- Existing Woodland
- G1 Amenity grass seed mix for embankments and verges
- G2 Species rich grassland seed mix areas
- G3 Wetland grassland seed mix areas
- G4 Area for potential future surface water management
- Potential Early Hedgerow Planting
- Proposed Post-Construction Hedgerow
- W1 Potential Early Core Woodland Planting
- W2 Potential Early Edge Woodland Planting
- W3 Potential Early Screen Woodland Planting
- W4 Proposed Wet Woodland
- W1 Proposed Post-Construction Core Woodland
- W2 Proposed Post-Construction Edge Woodland
- W3 Proposed Post-Construction Screen Woodland
- Potential Early Tree Planting along Hedgerows
- Proposed Post-Construction Tree Planting along Hedgerows

- Onshore Development Area Boundary
 - Existing Overhead lines
 - Overhead lines realignment
 - Existing contours and spot-heights
 - Pylon
 - Existing Public Rights of Way
 - Diverted Public Rights of Way
 - Permanent Access Road
 - Proposed SUDS basins
 - SuDS Basin - Infiltration Only
 - SuDS Basin - Hybrid
 - SuDS Basin - Attenuation Only
- National Grid substation infiltration SuDS basin based on infiltration rate of 63 mm/hr and Factor of Safety of 5
Onshore substations infiltration SuDS basin based on infiltration rate of 57 mm/hr and Factor of Safety of 5

Rev	Date	By	Comment	Approved:	Initials
-	21/05/2021	st	First Issue.	Checked:	sm
				Approved:	lt

1:3,000
Scale @ A1

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Onshore Substations, National Grid Infrastructure and Cable Sealing End Compound is illustrated without shadow effects.

East Anglia ONE North and East Anglia TWO Offshore Wind Farm
DRAWING F - FACTOR OF SAFETY 5: Both East Anglia ONE North and East Anglia TWO Offshore Windfarms developed together with National Grid Substation using GIS

Doc Ref	DRAWING F - FoS5	
Rev	-	Coordinate System: BNG
Date	21/05/21	Datum: OSGB36
Figure	F_FoS5	