East Anglia ONE
Offshore Windfarm

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Surface Water and Drainage Management Plan
DCO Requirement 16 Work No 38 to 41
Final for Discharge

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SCOTTISHPOWER RENEWABLES

REVISION CONTROL

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Abbreviations

AC – Alternating Current
BS – British Standard
CfD – Contract for Difference
CIRIA – Construction Industry Research and Information Association
DC – Direct Current
DCO – Development Consent Order
DECC – Department for Energy and Climate Change
DMRB – Design Manual for Roads and Bridges
EA – Environment Agency
EAOL – East Anglia One Limited
GIS – Gas Insulated Switchgear
GRP – Glass Reinforced Plastic
MW – Megawatts
PPG - Pollution Prevention Guidelines
SPR – ScottishPower Renewables
SuDS – Sustainable Drainage System

1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State; Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE). The DCO granted consent for the development of a 1200MW offshore windfarm and associated infrastructure.

2. In February 2015 EAOL secured a Contract for Difference (CfD) award to build a 714MW project and Scottish Power Renewables announced its role in leading East Anglia ONE towards construction. In April 2015 EAOL submitted a non-material change application to DECC to amend the consent from direct current (DC) technology to alternating current (AC). In March 2016 DECC authorised the proposed change application and issued a Corrections and Amendments Order.

3. The onshore construction works associated with East Anglia ONE comprise the following, based on AC technology, with an installed capacity of 714MW and a transmission connection of 680MW;

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, each approx. 37km in length.
- Up to four cable ducts for use by the future East Anglia THREE project.
- An onshore Substation located at Bramford adjacent to existing National Grid infrastructure.

4. This document relates to the surface water and drainage management associated with the onshore substation at Bramford, referred to as Work No. 38 to 41 (Stage j) in the DCO.

1.2 Purpose and Scope

5. This document details the surface water and drainage treatment associated with the EA ONE onshore substation, herein referred to as 'the substation'. This document has been produced to fulfil DCO Requirement 16 in respect of Stage j. Requirement 16 states:

16 – *(1) No stage of the connection works shall be commenced until for that stage written details of the surface and (if any) foul water drainage system (including means of pollution control) have, after consultation with the relevant drainage authorities, Suffolk County Council and the Environment Agency, been submitted to and approved by the relevant planning authority.*

(2)The details agreed in sub-paragraph (1) must include a surface water drainage scheme for Work No. 39, which is based on an assessment of the hydrological and hydrogeological context of the development.

6. The purpose of the document is to describe the basis of the drainage scheme and management of water during construction and operation of the substation. It also includes information on the Sustainable Drainage System (SuDS) measures adopted for the attenuation, conveying and treatment of surface water, waste water and foul water arising from the development.

2 Existing conditions

2.1 Hydrological and hydrogeological context

7. The substation drainage strategy takes into account the existing hydrological and hydrogeological conditions of the site, as confirmed through site ground investigation undertaken in February 2016.

8. The superficial deposit beneath the whole of the substation is boulder clay. The bedrock unit under the majority of the substation is London Clay with the northernmost extent of the substation underlain by units from the Lambeth Group and Thanet Sands Formation.

9. The substation is to be constructed on an area of open arable fields, which have no formal surface water drainage system. All runoff from the existing, undeveloped, site will currently naturally infiltrate the ground, pond on the surface and evaporate, or eventually run into adjacent field drainage ditches.

2.2 Risk of Flooding

10. A Flood Risk Assesssment was conducted in 2012 by RSK and the findings of this were included in the Environmental Statement (Vol 3 Chapter 22). Reference was made to the Environment Agency (EA) Flood Zone Map, which was used to identifity the flood risk potential for the location of the substation.

11. The EA Flood Map identifies three categories of Flood Zones, which reflects the risk of an area being affected by flooding from either rivers or the sea, where there are no flood defences. The zones are described as follows:

- Flood Zone 1: land defined as having less than a 1 in 1000 annual probability of flooding from rivers or the sea)
- Flood Zone 2: land having between a1 in 1000 and a 1 in 100 annual probability of flooding from river or the sea
- Flood Zone 3: land having greater than a 1 in 100 annual probability of flooding

12. Based on the EA Flood Zone Map, the report confirmed that the substation is fully located within Flood Zone 1 (i.e. a less than 1 in 1000 year annual probability of flooding from rivers or the sea) and therefore (according to EA criteria) is considered to have a ‘Very Low’ risk of flooding (equivalent to <0.1%).

3 Relevant Standards and Legislation

13. The substation drainage strategy has been developed in accordance with the following relevant standards and guidance.

3.1 British Standards / Eurocodes

- BS 752-4:1998 Design of Drainage and Sewer Systems outside Buildings
- BS EN 858-1:2002 Separator Systems for Light Liquids (eg Oil & Petrol)
- BC EN 12056-3:2000 Gravity Drainage Systems Inside Buildings

3.2 Legislation and Planning Policy

- Water Framework Directive (2000/60/EC)
- The Groundwater Regulations 1998
- The Environment Act 1995
- Control of Pollution (Oil Storage) (England) Regulations 2001
- Environmental Permitting (England and Wales) Regulations 2010
- Planning Act 2008

3.3 CIRIA Guidance

- CIRIA C753 SuDS Manual (Dec 2015)
- CIRIA C762 Environmental Good Practice on Site (4th Edition 2016)

3.4 Design Manual for Roads & Bridges

- DMRB: Vol 4 Section 2 Part 7 HA 107/04 Design of Outfall and Culvert Details
- DMRB: Vol 4 Section 2 Part 1 HA 106/04 Drainage of Runoff from Natural Catchments

3.5 Environment Agency Guidance Notes*

- Pollution Prevention Guidelines (PPG)1 General Guide to the Prevention of Water Pollution
- PPG3 Use and Design of Oil Separators in Surface Water Systems
- PPG4 Disposal of Sewage where no Mains Drainage is Available
- PPG5 Works in, or liable to affect Watercourses

*The Environment Agency no longer provides 'good practice' guidance in the form of PPG and these documents were withdrawn in December 2015. The Environment Agency will be reviewing the validity of the archived documents as part of the government 'smarter guidance' project. While this process is concluded, the archived PPG documents are found at: https://www.gov.uk/government/collections/pollution-prevention-guidance-ppg

4 Sustainable Drainage Principles

14. Whilst conventional drainage methods have often been used for draining substations, for this location an appropriately designed, constructed and maintained SuDS is considered to be more suitable. The installation of SuDS will mitigate many of the potential adverse effects on the environment that may be caused by uncontrolled storm water run-off from a new development. This will be achieved through a combination of the following :

- Reduced run-off rates, which reduces the risk of downstream flooding.
- Encouraging natural groundwater recharge (where appropriate) to minimise the impacts on aquifers and river base flows in the receiving catchment.
- Reducing pollutant concentrations in storm water, to protect the quality of the receiving water body.
- Acting as a buffer for accidental spills by containing and preventing a direct discharge of high concentrations of contaminants to the receiving water body.
- Contributing to the enhanced amenity and aesthetic value of developed areas.
- Providing additional habitats for wildlife and opportunities for biodiversity enhancement.

15. There are four key elements of the SuDS that have been considered in the planning and design of the substation these are:

- Attenuation.
- Infiltration.
- Conveyance.
- Pollutant removal.

16. A brief description of each of these is provided below.

4.1 Attenuation

17. Attenuation storage controls the rate of runoff by limiting the peak flow from the development into the receiving watercourse or drainage system. This is typically achieved through the use of a temporary storage facility, with a restricted outlet. The attenuation will be sufficiently sized to detain the runoff for a given return period, but will then allow the water to discharge, at a controlled rate, back to the receiving watercourse, over an extended period. For the substation the storage has been designed to accommodate runoff from a 1 in 100 year storm even plus a 20% additional allowance for climate change. These measures will significantly reduce any peak flow rate and limit the run-off to the equivalent of the pre-existing greenfield (undeveloped) runoff and, minimising the increased risk of flooding downstream of the discharge.

4.2 Infiltration

18. Infiltration refers to allowing or encouraging water to soak into the ground, through the natural hydrologic processes. This is normally the most desirable solution for disposal of surface water from rainfall as it does not create any additional runoff and contributes directly to the recharge of the underlying groundwater. However the ground investigation of the substation ground conditions undertaken in early 2016, which included percolation tests, confirmed that much of the ground under the substation comprised of a glacial till of a low permeability. This low permeability will effectively preclude the disposal of the surface water, or foul water, directly to ground, through the installation of soakaways, or other engineered infiltration systems.

19. The substation platform itself has however been designed to be free-draining and the impermeable areas have been limited, as far as practicable. Surface water percolating through the permeable platform construction, although unable to permeate directly into the natural formation below, will instead be collected by a series of perforated pipes, laid below formation level and connected to the surface water drainage system, to outfall through the Wet Woodland SuDS facility (see Section 5.6.2) The surface water from this area will receive an initial stage of attenuation and some treatment in its passage through the granular platform construction and twin pipe filter drains, then a second stage of treatment and full attenuation within the Wet Woodland SuDS facility.

4.3 Conveyance

20. Conveyance is the process of transferring surface runoff from one place to another to manage the flow and to link the various SuDS components together. Rainfall collected in impermeable areas such as the access roads, the transformer bunds or the building roof, will be carried via underground pipes within the drainage system to the various elements of the SuDS system to allow treatment and attenuation to take place. Similarly perforated filter drains will collect water percolating through permeable areas and convey the same to the downstream SuDS facilities described later.

4.4 Pollutant Removal

21. Pollutants that may be present in any surface water, associated with the substation, will either be removed or suitably treated prior to discharge, to ensure there is no wider adverse environmental impact. The approach adopted will identify and consider the source and types of pollutants that may occur in the surface and waste waters from the substation and show how these will be managed to prevent pollution of the receiving watercourses.

22. The normal surface water drainage is unlikely to contain elevated suspended solids, or other pollutants, in the operational phase but the drainage design includes the provision to detain and so aid settlement of solids in the SuDS basins, and the requirements for the management of foul or waste water is further described in Section 6 below.

23. During construction, additional silt and other pollution control measures will be in place on site, prior to the SuDS facilities, in compliance with the requirements set out in the Code of Construction Practice (CoCP). The details of the control measures adopted will then be included and confirmed in the environmental documentation, submitted by the appointed Contractor, which will be reviewed and approved before work commences. Any fuel storage and refuelling areas will be suitably protected to prevent discharge of oil contamination, all sewage will be contained and removed from site for disposal.

24. In the operational phase, surface water collected from within the transformer bunds, or other oil-filled plant, has the potential to be contaminated with oil. Water from these areas will be discharged to the surface water drainage system, only after passing through a Class 1 full retention oil interceptor, provided with an oil detection and automatic device which will prevent any discharge in the case of a sudden unexpected influx of oil.

5 Surface Water Drainage Strategy

5.1 Introduction

25. The existing topography of the substation is located on a natural watershed, with gentle gradients falling away to both the west and the north east of the site, so the natural surface water flows in one of two directions. The surface water drainage system is designed to utilise and support this natural watershed. This results in a requirement for two separate surface water drainage systems, both incorporating SuDS controls. The SuDS will consist of either a suitably sized detention basin or, to the south west of the substation, a Wet Woodland Basin (see Section 5.6.2). All of these are designed to include a restricted outlet, providing the appropriate attenuation and treatment of surface water, prior to its discharge to the various receiving watercourses around the substation.

26. During the construction phase of the works a temporary contractor's compound is to be installed (see Appendix 1). This compound will drain to a separate detention basin (Basin 2 on Appendix 1). All drainage from this area will be the direct responsibility of the contractor and measures will be included to prevent any contamination of the surface water drainage from the compound.

27. All surface water runoff from the operational substation (platform, facilities and roads) will be collected and will receive at least two consecutive stages of treatment in its conveyance across the site, including attenuation through temporary storage basins, before its controlled release. The Overall Drainage Layout for the substation is shown in Appendix 1; the key components of this are described below.

28.

5.2 Drainage from Contractors Compound and Substation Construction

29. The construction of the substation will require the installation of a stone compound to the east of the substation to provide accommodation and welfare facilities for the contractor, storage of materials, plant and equipment. All construction activities will be controlled so as not to impact on the water quality in the local watercourses, with the introduction of all necessary control measures. These requirements are already defined in the CoCP, and will be further detailed in the Contractor's environmental documentation.

30. The drainage from this compound will be directed to a SuDS detention basin (Basin 2 on Appendix 1) installed at the north eastern corner of the compound. This will attenuate the flow and maintain any runoff at pre-development levels. Any additional water treatment required, before draining to the detention basin, will be in place for the duration of the construction activities. The compound itself will be removed at the end of the construction works to allow for reinstatement and final landscaping.

31. When ground works commence, any potential for silt laden runoff will be identified and suitable pollution control measures put in place to ensure all discharges are considered to be uncontaminated. Any rainfall influenced runoff, after any appropriate pre-treatment on site (e.g. Siltbuster or similar water treatment units), will ultimately discharge through the SuDS facilities as these are to be installed at the construction phase. As stated earlier, the CoCP clearly states the requirements and the control measures to be used.

5.3 Main Access Road Surface Water

32. If required, during the construction phase, the main access road may have a wheel wash facility installed to prevent vehicles and plant carrying mud off site onto public roads. This will be a closed loop recycled facility so will not discharge and its use, operation and maintenance will be monitored on site.

33. Surface water from the eastern section of the constructed main access road will shed to the south verge, running over the slab edge into a filter drain incorporating a perforated pipe at its base. The filter drain installed in the southern road verge provides a first stage of treatment and a degree of attenuation. The filter drain runs eastwards into a SuDS detention basin 1 (Appendix 1), installed on the north side of the access road, adjacent to the site entrance. The SuDS basin, with a controlled outlet, provides a second stage of treatment and full attenuation limiting the rate of discharge to the equivalent of the pre-

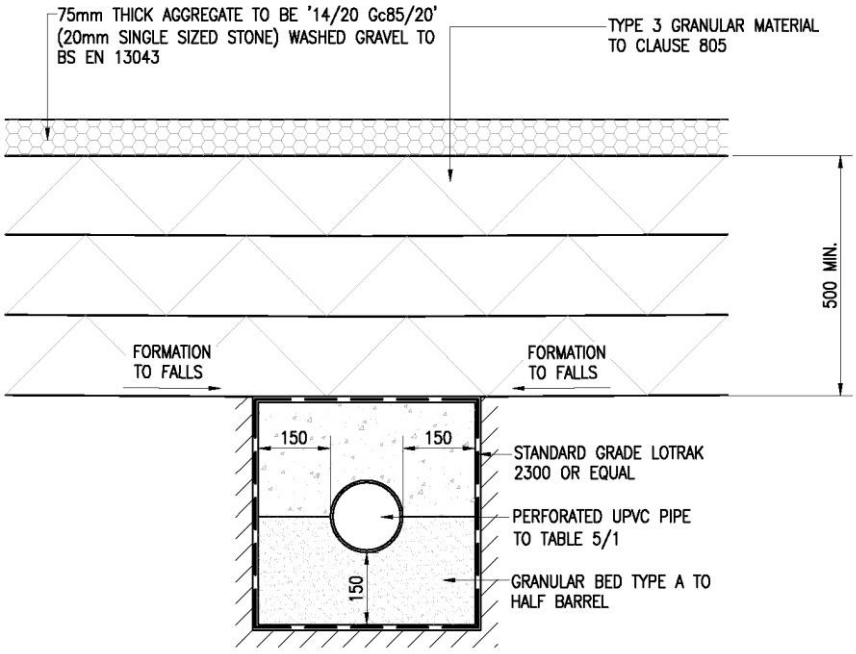
existing greenfield rates. The outlet from detention basin 1 runs northwards to an outfall into the existing drainage ditch, running north east away from the development.

34. The western section of the main access road will be drained in a similar manner, with surface water shedding toward the southern road edge with flow into a piped filter drain. The filter drain runs to the west, then north towards the substation, diverting along the outer southern earthworks bund and into the Wet Woodland SuDS facility, to the west of the substation. This drain joins with the main drainage outlet from the substation platform upstream of the Wet Woodland SuDS area. Here again the filter drain provides the first stage of treatment and partial attenuation and the Wet Woodland provides the second stage of treatment and full attenuation.

5.4 Internal Access Roads and Substation Platform Run-off

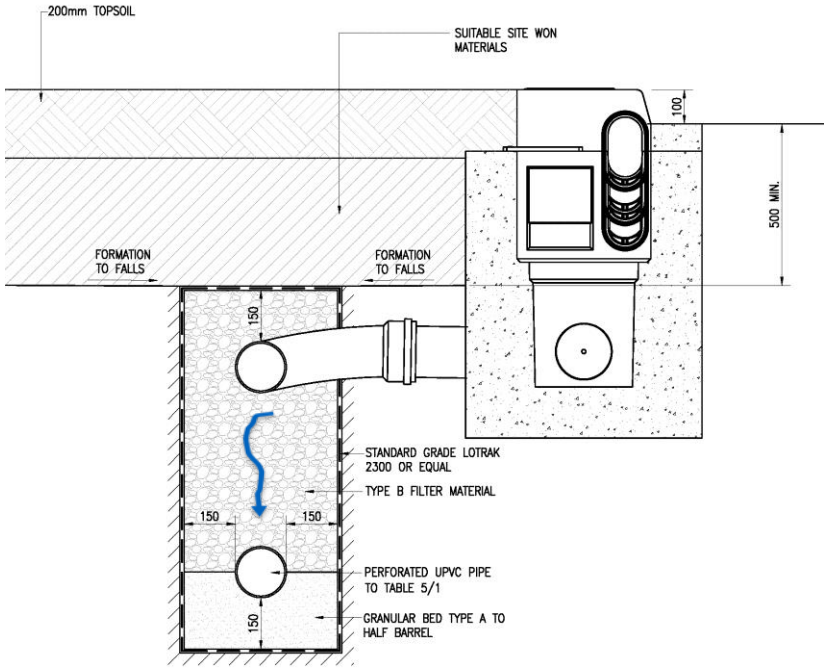
35. The level substation platform is constructed from suitably graded stone (Type 3) and surfaced in 20mm single sized stone chippings, and is designed to be free-draining. A typical section of the construction is shown in Figure 1 below. The impermeable natural formation below the platform construction will be profiled to incorporate a sloping interface with the permeable construction above, with surface water collected in a system of perforated underdrains. The surface water percolating down through the granular material of the platform to formation level, is provided with an initial stage of treatment and some attenuation, prior to its collection by the underdrains and conveyance in the drainage system to the Wet Woodland SuDS, to the south west of the substation.

Figure 1 – Typical Substation Platform Make-Up



36. The surface runoff from the internal access roads and parking area will be collected via a kerb drainage system and discharged to a twin pipe filter drain (see Figure 2 and locations in Appendix 1) in the adjacent road verge, providing a first stage of treatment and a degree of attenuation. The filter drain links with the substation platform drainage network and runs under the landscape embankments to the south western corner of the substation. Outside the substation platform, the pipe links with the filter drain from the west end of the main access road, to discharge through the Wet Woodland SuDS.

Figure 2 – Kerb Drain and Twin Pipe Filter Trench



5.5 Buildings Surface Water

37. The uncontaminated surface water from the roofs of buildings within the substation will be collected via a network of sub-surface drainage pipes and will join the drainage network, to outfall through the Wet Woodland SuDS facility where, after combining with other surface drainage, it will receive appropriate attenuation and treatment prior to discharge.

5.6 Sustainable Drainage System Components

5.6.1 Platform Construction

38. The platform construction is described above (Section 5.4). The depth and grade of stone used to form the platform and surrounding permeable areas will provide an initial slowing and limited attenuation of rain fall as it filters through the stone to be collected in the perforated drains below to then run into the piped filter drains around the substation. From here the water flows to the Wet Woodland SuDS facility, as described in Section 5.6.2. In smaller rainfall events, the surface water may be absorbed in the stone layers and evaporate, without reaching the underdrainage system.

5.6.2 Wet Woodland SuDS

39. The Wet Woodland SuDS facility is a modified detention basin, with shallow sloping sides (between 1 in 10 and 1 in 20) which will feature a permanently retained pool of water at the outlet end, giving it a more natural appearance. The area will be landscaped, with planting of suitable tree and plant species, which can tolerate the occasional inundation and to provide a habitat for bird life. The basin will be appropriately sized to contain the runoff from the access road and from the substation internal drainage, providing a second stage of treatment and fully attenuating the discharge flows to satisfy the long term storage requirements stipulated by the SuDS manual, and ensuring they do not exceed pre-existing greenfield rates. The basin outfalls to the existing brook at the south west corner of the development area, via a short length of swale (see Appendix 1).

Figure 3 – Wet Woodland SuDS- illustrative sketch

5.6.3 SuDs Detention Basins

40. There are two further detention basins, both located to the east of the substation (shown in Appendix 1), both sized to receive and attenuate the drainage flows from up to a 1 in 100 year return period storm plus an allowance for climate change of 20%.

41. Basin 1 will receive only the surface water from the main access road running eastward to the main entrance, after fully attenuating the flow, the controlled outlet from the basin is piped to an existing ditch to the north east of the substation. Any outfalls required will be agreed with the Internal Drainage Board prior to installation.

42. Basin 2 is a temporary basin which will receive the surface water runoff from the temporary contractors compound, immediately adjacent to the eastern edge of the substation, which will be constructed from suitable type 1 stone. The runoff from the compound will be collected by filter drains or peripheral swales and conducted to the SuDS basin. This stone compound and associated drain is to be removed at the end of the construction of the substation.

5.7 Maintenance

43. The SuDS facilities will be included in a routine maintenance schedule carried out around the substation, along with the landscape maintenance as described in the Substation Landscape Management Plan, to ensure they remain in effective operation. This will include checking of the various inlets and outfalls and the occasional cutting and removal of the vegetative growth on the inner slopes of the basins and any swales and appropriate maintenance of the trees in the Wet Woodland.

44. The maintenance schedule for the various surface water features is attached as Appendix 2.

6 Waste Water Drainage Strategy

6.1 Introduction

45. The waste waters produced by the substation in its operational phase comprise the foul water from the welfare facilities in the substation buildings and the water collecting in the sealed bunds around oil containing equipment, which has the potential to be contaminated by oil from the equipment. A sustainable approach has been adopted, which is considered appropriate for each type of waste water and so is in line with the overall drainage strategy.

46. Potential pollutants within the waste water will be removed or treated prior to discharge, to ensure there are no wider adverse environmental impacts, with the level of treatment being dependent on the level of pollutant risk. The treatment proposals for the different areas (identified on the Overall Drainage Layout in Appendix 1) of the substation are presented in Table 6-1.

Table 6-1 Foul Water Treatment Solutions

Site Area	Sources of pollution	Level of potential pollution	Treatment
F1	Transformer Bund*	Possible contamination of surface water collecting in the bund by leak or spillage of coolant oil	Treatment via Class 1 oil interceptor, followed by passage through twin pipe filter trench and subsequently end of pipe SuDS wet woodland facility
F2	Transformer Bund*	Possible contamination of surface water collecting in the bund by leak or spillage of coolant oil	Treatment via Class 1 oil interceptor followed by passage through twin pipe filter trench and subsequently end of pipe SuDS wet woodland facility
F3	Shunt Reactor	Possible contamination of surface water collecting in the bund by leak or spillage of coolant oil	Treatment via Class 1 oil interceptor followed by passage through twin pipe filter trench and subsequently end of pipe SuDS wet woodland facility
F4	Shunt Reactor	Possible contamination of surface water collected in the bund by leak or spillage of coolant oil	Treatment via Class 1 oil interceptor followed by passage through twin pipe filter trench and subsequently end of pipe SuDS wet woodland facility
F5	Welfare facilities at GIS Building	Domestic level foul water / sewage	No on-site treatment provided. Waste water stored within a sealed Cess Tank and periodically removed by tanker to off-site wastewater treatment facility

*Transformer Bund volume is 115% of total oil and 150 mm free height over 100% volume level.

6.2 Buildings Foul Water

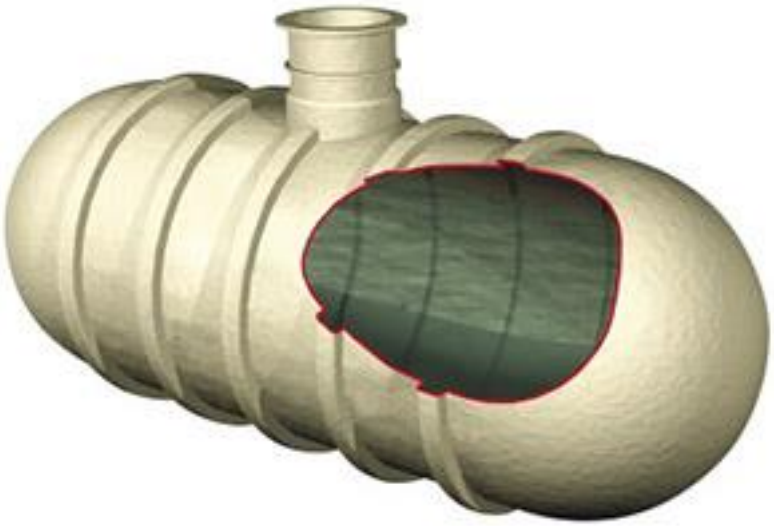
47. The foul water from the welfare facilities within the buildings will be collected via a piped drainage system and conveyed to be held in a sealed cess tank. The location of the building drainage system and cess tank is shown on the Overall Drainage Layout in Appendix 1.

48. During normal operation of the substation, there will be insufficient foul water discharged from the on-site welfare facilities to sustain the biological treatment processes within a normal small waste water treatment package plant (e.g. Biodisc Unit). In addition, as there is not sufficient ground permeability to consider installing a septic tank and soak away, foul water from welfare facilities will instead be collected and conveyed to a sealed cess tank, of the type shown in Figure 4.

49. The cess tank will be designed to have sufficient storage capacity to contain the wastewater generated by the welfare facilities, for a minimum period of three months, sized to minimise the frequency of emptying required. A tank with a capacity to accommodate 8300 litres would be sufficient for this period, allowing for a 20% factor of safety. The cess tank will also be fitted with a monitoring device and high level alarm system to alert maintenance staff to the need for emptying. The cess tank

will be situated adjacent to the access road near the substation entrance to provide ease of access for a tanker for the routine emptying of contents and their disposal to a suitably licenced waste water treatment and disposal facility.

Figure 4 - Sewage Cess Tank



6.3 Surface Water from Equipment Bunds

50. Surface water collecting inside the bunds surrounding the electrical equipment may come into contact with oil. This waste water cannot be treated in the same way as the foul drainage from the welfare facilities in the building. Any oil contamination needs to be separated from the water to enable the water to be discharged as uncontaminated, along with the general surface water runoff into the platform drainage network. This will allow it to receive further stages of treatment and attenuation within the downstream SuDS system.

51. The water in the bunds is collected in a sump, from where automatic pumps will discharge it into the “oily water” drainage pipes as shown in the substation drainage layout (Appendix 1). The potentially oily contaminated drainage from equipment bunds is conveyed to a Class 1 oil interceptor where the oil is removed and the treated surface water then runs through a catchpit downstream of the interceptor, into the substation perimeter filter drain, as shown in Figure 5.

52. The Class 1 oil interceptor will be a Glass Reinforced Plastic (GRP) full retention oil interceptor with a low maintenance coalescer unit (filter), which further improves the discharge and is designed to achieve a discharge concentration of less than 5 mg/ litre of oil. A sensor linked to the pumps will prevent the pumps from operating, should oil be detected on the surface of the water in the bund e.g. following a spillage or leakage of oils, which will prevent any oils reaching the drainage system downstream.

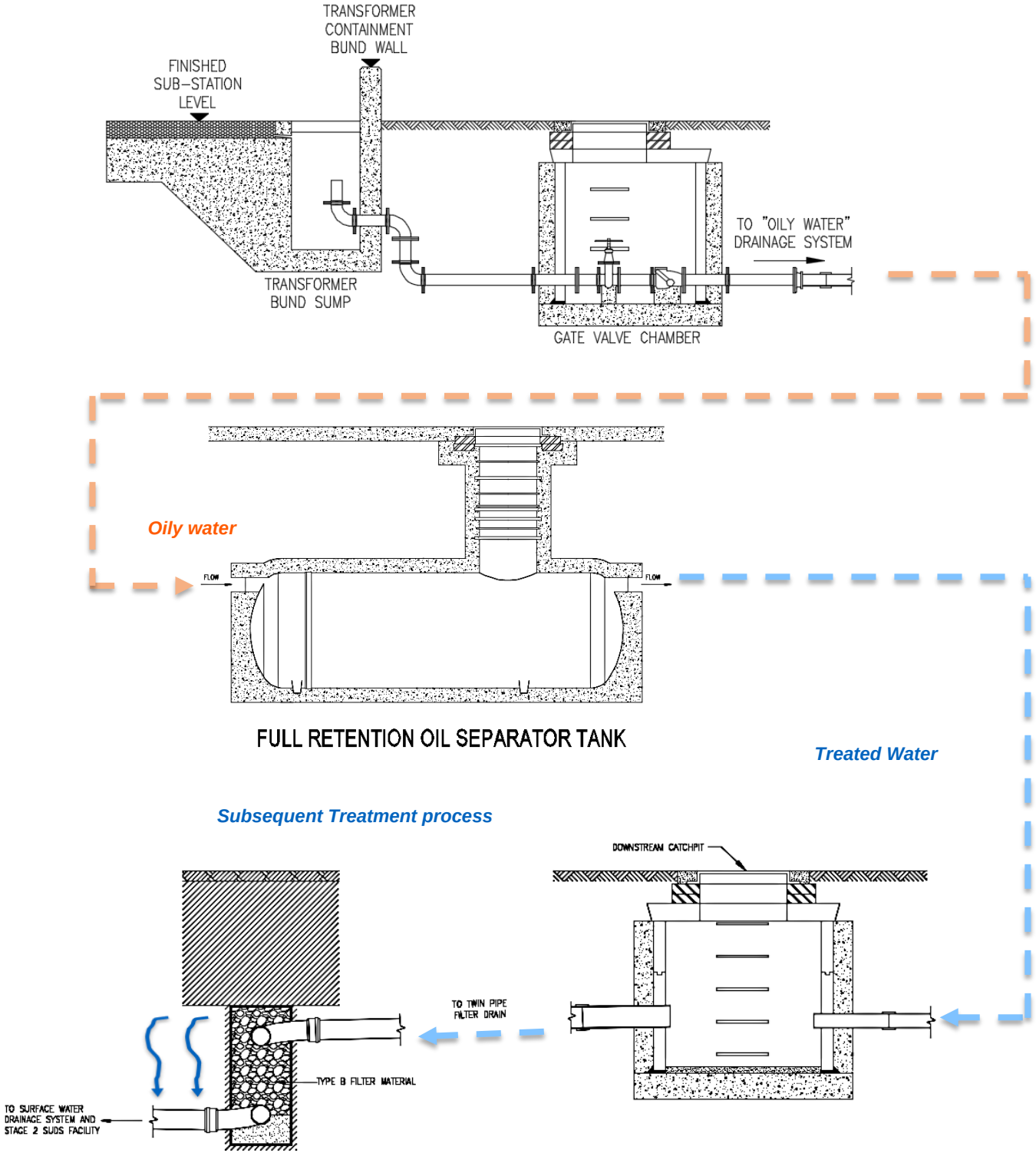
53. Chambers with a manual shut off valve will also be incorporated within the “oily water” drainage pipe network to allow each section of bunded equipment to be isolated from the drainage system downstream, either during maintenance works or following any oil leakage.

54. Downstream of the oil interceptor the treated waste water is conveyed into a twin pipe filter drain, similar to the road drainage first stage treatment described in Section 5.3. This provides the water with a second stage of treatment, prior to its conveyance through the main surface water drainage system to the Wet Woodland SuDS facility, which then provides further treatment and attenuation before discharging to the watercourse.

6.4 Maintenance of Waste Water Facilities

55. The equipment provided to treat the foul and waste water from the substation will be included in routine maintenance schedules to ensure they remain fully effective. This will include the routine emptying and maintenance of the cess tank to remove sewage from site and regular checks on the oil interceptors, valves, sensors and alarms to ensure they are all functioning correctly. All maintenance activities shall also be recorded.

Figure 5- Typical Oily Water Drainage Arrangement



7 Summary

56. This plan identifies the different elements of the surface and waste waters arising from the construction and operation of the EA ONE onshore substation. In considering and outlining how these will be managed and controlled, it addresses the location of the development, the hydrology and hydrogeological setting and considers the ways in which the potential impacts of water from the substation construction and operation will be minimised. The overall strategy adopted must therefore be able to ensure that, through the introduction and implementation of suitable control measures, there will be no measurable impacts on the receiving water catchment.

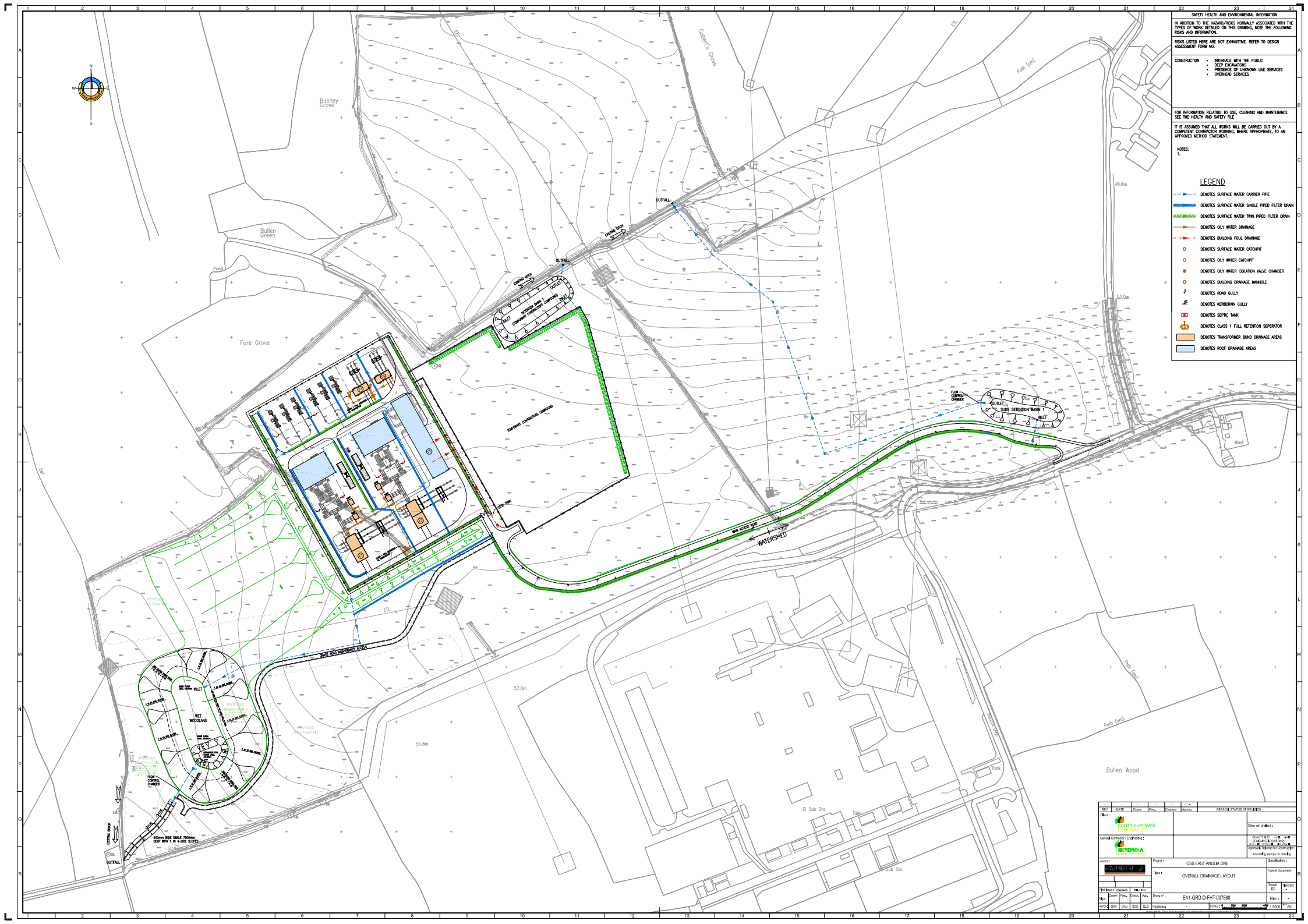
57. A drainage scheme has been developed, using a combination of conventional and sustainable drainage to handle the various waters. The uncontaminated waters from building roofs, hard standing including access roads and water percolating through permeable construction (platform) will be collected and routed to one of three detention basins, during construction and reduce to two during operation. These basins are designed to provide attenuation and a controlled onward flow, holding the initial storm flush and then limiting the outfall discharge rates to that of the pre-existing green fields. This is designed to ensure there is no detrimental impact on the small receiving watercourses as a result of increased storm related flows from the development of the substation and the introduction of an increased area of impermeable drainage.

58. Finally, the treatment and management of the waste waters are considered and outlined. Foul sewage will be contained in a sealed cess tank and tankered off site for disposal. Any oil containing equipment will be surrounded by an impermeable bund and any water drainage collecting inside the bunds that could become contaminated with oils, will only be discharged through the oil interceptors and filters installed to remove the risk of water contamination, in the event of any loss of oil.

59. Additional sensors, auto shut valves and alarms will also be added to the drainage equipment installed, to provide operators with a warning of any potential problem with pollution control equipment installed, to ensure they can take appropriate action. All equipment and the SuDS elements will be included in routine maintenance to ensure they remain fully effective.

Appendix 1

Overall Drainage Layout (Drg. No. EA1-GRD-D-FHT-007860)


SAFETY HEALTH AND ENVIRONMENTAL INFORMATION
IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.
RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DESIGN ASSESSMENT FORM NO.
CONSTRUCTION
• INTERFACE WITH THE PUBLIC
• DEEP EXCAVATIONS
• PRESENCE OF UNKNOWN LIVE SERVICES
• OVERHEAD SERVICES
FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE SEE THE HEALTH AND SAFETY FILE
IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.
NOTES:
1.
LEGEND
DENOTES SURFACE WATER CARRIER PIPE
DENOTES SURFACE WATER SINGLE PIPED FILTER DRAIN
DENOTES SURFACE WATER TWIN PIPED FILTER DRAIN
DENOTES OILY WATER DRAINAGE
DENOTES BUILDING FOUL DRAINAGE
DENOTES SURFACE WATER CATCHPIT
DENOTES OILY WATER CATCHPIT
DENOTES OILY WATER ISOLATION VALVE CHAMBER
DENOTES BUILDING DRAINAGE MANHOLE
DENOTES ROAD GULLY
DENOTES KERBDRAIN GULLY
DENOTES SEPTIC TANK
DENOTES CLASS 1 FULL RETENTION SEPERATOR
DENOTES TRANSFORMER BUND DRAINAGE AREAS
DENOTES ROOF DRAINAGE AREAS
Bushey Grove
Bullen Green
Fore Grove
Gobert's Grove
Pond
Path (um)
48.8m
53.0m
57.0m
55.8m
OUTFALL
EXISTING DITCH
RETENTION BASIN 2 (TEMPORARY CONTRACTORS COMPOUND)
INLET
OUTLET
TEMPORARY CONTRACTORS COMPOUND
SUDS DETENTION BASIN 1
FLOW CONTROL CHAMBER
MAIN ACCESS ROAD
WATERSHED
CROSS ROAD MAINTENANCE ACCESS
PROPOSED TREE PLANTING
WET WOODLAND
500mm WIDE SWALE 750mm DEEP WITH 1 IN 4 SIDE SLOPES
ETL
Bullen Wood
El Sub Sta
Tank
Sub Sta
Mast
Rail
REV. | DATE | Drawn | Proj. | Checked | Approv. | REASON / STATUS OF REVISION
Client : SCOTTISHPOWER RENEWABLES
General Contractor / Engineering : IBERDROLA ingeniería y construcción
Author : [redacted]
Project : OSS EAST ANGLIA ONE
Title : OVERALL DRAINAGE LAYOUT
Classification :
Type of Document :
Sheet No. : 00
Rev. : -
Drawing n° : EA1-GRD-D-FHT-007860
Scale : 1:1000
Size : A0

Appendix 2

Surface Water Features: Maintenance Schedule

Indicative Schedule of Maintenance

60. The following is an indicative annual schedule of maintenance visits and the work that will be undertaken. This provides a reasonable frequency for the more common operations and a good indication of the required level of intensity of management required, but is not intended to be either fully comprehensive or restrictive.

61. An appointed contractor will be required to construct a schedule of operations specifying the necessary operations and frequency, using his own experience and horticultural knowledge.

62. The ongoing wider programme of maintenance work will include proposed frequency of visits and operations detailed in the specification. It will also include scheduled dates for:

- Infrequent operations such as re-spacing of plants, pruning, topping up of mulch, replacement of plants / restocking of beds etc.
- Planting review and refurbishment.
- Monitoring and review.
- The effectiveness of the management operations is to be closely and continually monitored and reviewed annually against the NBS Specification and this Maintenance Plan, with any resulting changes incorporated into the subsequent years' programme.

The surface water SuDS features consist of a mixture of planted wetland and species rich grassland, grass swale areas along with the planting associated with the detention basin and the permanent pond within the Wet Woodland.

The following tables summarise the proposed maintenance activities and the indicative number of visits.

Table 1: Wetland and Species Rich Grassland areas – Activities and Number of Visits

Month	Weeding	Mowing (leave arisings 1 week)
January		
February		
March		1
April		
May	1	
June		
July		
August		
September	1	1
October		
November		
December		

Table 2: Swale Maintenance – Activities and General Frequency

Maintenance	Action	Frequency
Regular Maintenance	Litter and debris removal from site	Monthly
	Amenity grass cutting at 35-50mm	As required
	Grass cut to swales, access and overflows 75-100mm not to exceed 150mm	Monthly or as required
	Wetland or meadow vegetation cut at 50mm and remove to wildlife or compost piles	Monthly or as required
	Inspect and clear inlets, outlets and overflows	Monthly
Occasional tasks	Remove leaf accumulation	As required
	Cut back overhanging branches to allow dense vegetation growth	As required
Remedial work	Repair erosion, level uneven surfaces or damage by re-turfing or seeding	As required
	Remove silt and spread locally outside design profile and reinstate surface	As required
	Repair inlets, outlets or check dam structures to design detail	As required

Table 3: Temporary and Permanent Detention Basin Maintenance – Activities and General Frequency

Maintenance	Action	Frequency
Regular maintenance	Litter and debris removal from site	Monthly
	Amenity grass cutting at 35-50mm	As required
	Grass cutting to access routes, overflows and basin, where required, at 75-100mm not to exceed 150mm	As required
	Meadow grass, where appropriate, cut at 50mm and remove to wildlife or compost piles	Annually
	Manage wetland planting in micro-pools by cutting and remove to wildlife areas or compost piles	As required
	Inspect and clear inlets, outlets, control structures and overflows	Monthly
Occasional tasks	Remove leaf accumulation	Seasonal and as required
	Cut back overhanging branches to allow dense vegetation growth	As required
	Remove sediments from fore bay, inlets and pre-treatment structures Silts to be spread on site or removed from site, subject to agreement with EA	As required
Remedial work	Inspect and repair damage to inlets, outlets, banks and overflows	As required

Table 4 Permanent Pond Maintenance – Activities and General Frequency

Maintenance	Action	Frequency
Regular maintenance	Litter and debris removal from site	Monthly
	Amenity grass 35-50mm for access, paths and visual requirements	As required
	Grass cut to pond edges, access and overflows 75-100mm and not to exceed 150mm	Monthly or as required
	Wetland, meadow or rough grass cut at 50mm and remove to wildlife or compost piles	Annually or as required
	Cut pond vegetation if required and no more than 30% 100mm above pond base and remove to wildlife or compost piles	Annually or as required
	Inspect and clear inlets, outlets and control structures	Monthly
	Remove any accumulated sediment from fore bay structures, and spread on site or remove from site, subject to agreement with the Environment Agency	Annually
Occasional tasks	Review silt accumulation remove and spread on site or remove from site, subject to agreement with the Environment Agency, if necessary	As required
	Removal of tree or shrub growth within 5m of pond edge	As required
Remedial work	Repair or replace inlets, outlets or control structures to design detail	As required