Green Create W2V Kent Ltd

Odour Management Plan

Version 1

October 2020

On behalf of:
Green Create W2V Kent Ltd
40 Craven Street
London
WC2N 5NG

E4environment Ltd, Hilley Farm,
Pentre, Shropshire SY4 1BP

Odour Management Plan for Green Create Anaerobic Digestion site at Knoxbridge Farm, Kent.

Odour Management Plan

Version 1

October 2020

Checked By:

NJS

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Quality Sheet

Version	Amendment Made	Date of Revision	Confirmed by (Signed)
1	Initial issue	23 October 2020	Nicola Strudwick (E4environment Ltd)

Contents

Introduction

1. This Odour Management Plan has been prepared to outline the controls that have been put in place by the operator, Green Create W2V Kent Ltd, in order to assess, reduce and prevent potentially odourous emissions from their anaerobic digestion (AD) site at Knoxbridge Farm to comply with the requirements of the Environmental Permitting Regulations.
2. This document has been written in line with the Environment Agency Guidance – 'H4 Odour Management – how to comply with your environmental permit', which outlines the Environment Agency's regulatory requirements with regard to odour, advice on the management of odour and aspects that should be addressed within the Odour Management Plan (OMP).

Scope

3. This OMP covers operations at the anaerobic digestion plant only. The adjacent chicken egg production unit operates under a separate environmental permit, and as such, OMP.
4. The OMP is developed and used to identify and engage all appropriate measures to minimise the generation and release of odourous substances that are likely to cause nuisance to local receptors. It is also used to identify and reduce the risk of any accidental odour release incidents at the site.
5. The OMP is a controlled document that forms part of the site's Environmental Management System. It is reviewed regularly, as per the requirements of the Environmental Management System. This review will take place at least annually, or as required (for example, should a complaint be received or when any significant changes are made to the infrastructure of the site).

Site Information

6. The AD plant is located at Knoxbridge Farm, Cranbrook Road, Knoxbridge, Kent, TN17 2BT. The National Grid Reference (NGR) for the approximate centre point of the site is TQ 79426 41202.
7. Knoxbridge Farm is in a rural area at an altitude of approximately 28m AOD. The AD plant lies 550m to the north east of the village of Knoxbridge and 1.5km to the southeast of the village of Staplehurst. The farm lies in the margins of the Low Weald of Kent rising up to the High Weald.
8. The site lies adjacent to an existing egg production unit, owned and operated by Friday's Ltd. The egg production facility operates its own OMP.

Sensitive Receptors

9. The likelihood and extent of exposure to odour arising from the operation is determined by the magnitude of the odour, the prevailing meteorological conditions and the distance and location of potential sensitive receptors in relation to the site. Sensitive receptors are defined as locations where people spend time and expect a realistic level of amenity, and would include residences, public footpaths and recreational areas.
10. Appendix 2 Sensitive Receptors Plan outlines the nearest sensitive receptors to the AD plant. There are a number of residences, farms, public footpaths, scheduled monuments and listed buildings within a 2km radius of the site.

Sensitive Receptor	Distance from Development (m)	Direction from Site
Footpaths – a number within the vicinity of the site	150	South
	160	North
	325	East
Little Wadd Farm and surrounding buildings	396	South East
Great Wadd Farm House Great Wadd Oast House	564	South East
Rose Cottage Farm Rose Cottage Barn Rose Cottage Oast	609	South South West
Knoxbridge Oast House	710	South West
1-3 Fir Tree Cottages	771	South West
1-4 Orchard Cottages	776	West South West
Hop Bine Inn	788	South South West
Iden Grange	803	North West
Elm Cottage	808	South West
Wayside	814	West South West
Knoxbridge Café The Knoxbridge Public House	818	South West
1-4 Thrift Cottages	818	South West
Little Knoxbridge	838	West South West
Iden Manor	844	North West
Maplehurst Farm	858	North North East
Kingsbrooke	908	West
Bumbles Plant Centre	957	South West
Rock Farm House	960	South

Table 1.0 Sensitive Receptors within 1km of the anaerobic digestion facility at Knoxbridge Farm.

Local Odour Sources

11. There are a number of farms within the vicinity of the AD plant, including the adjacent egg production facility at Knoxbridge Farm (Friday's Ltd), that are likely to cause odours owing to agricultural operations such as spreading of slurry and other odourous materials to land.

12. The poultry manure feedstock for the AD site is generated by the adjacent egg production facility and is also brought in from other Friday's Ltd farms in the vicinity. Prior to the AD site being operational, the poultry manure was collected in trailers and removed from the site for spreading directly to land or stored within the existing manure store (which is now the Operations Building for the AD plant).

13. Friday's Ltd also operate a free-range egg laying facility at Tolehurst Farm, with sheds approximately 1.4km south south west and 1.8km south west of the site.

Metereology

14. Atmospheric conditions will affect the ways in which odours reach potentially sensitive receptors. Low wind speeds would reduce the dispersal of odours whereas high winds would increase dispersal of odour and any odour would be diluted owing to turbulence.

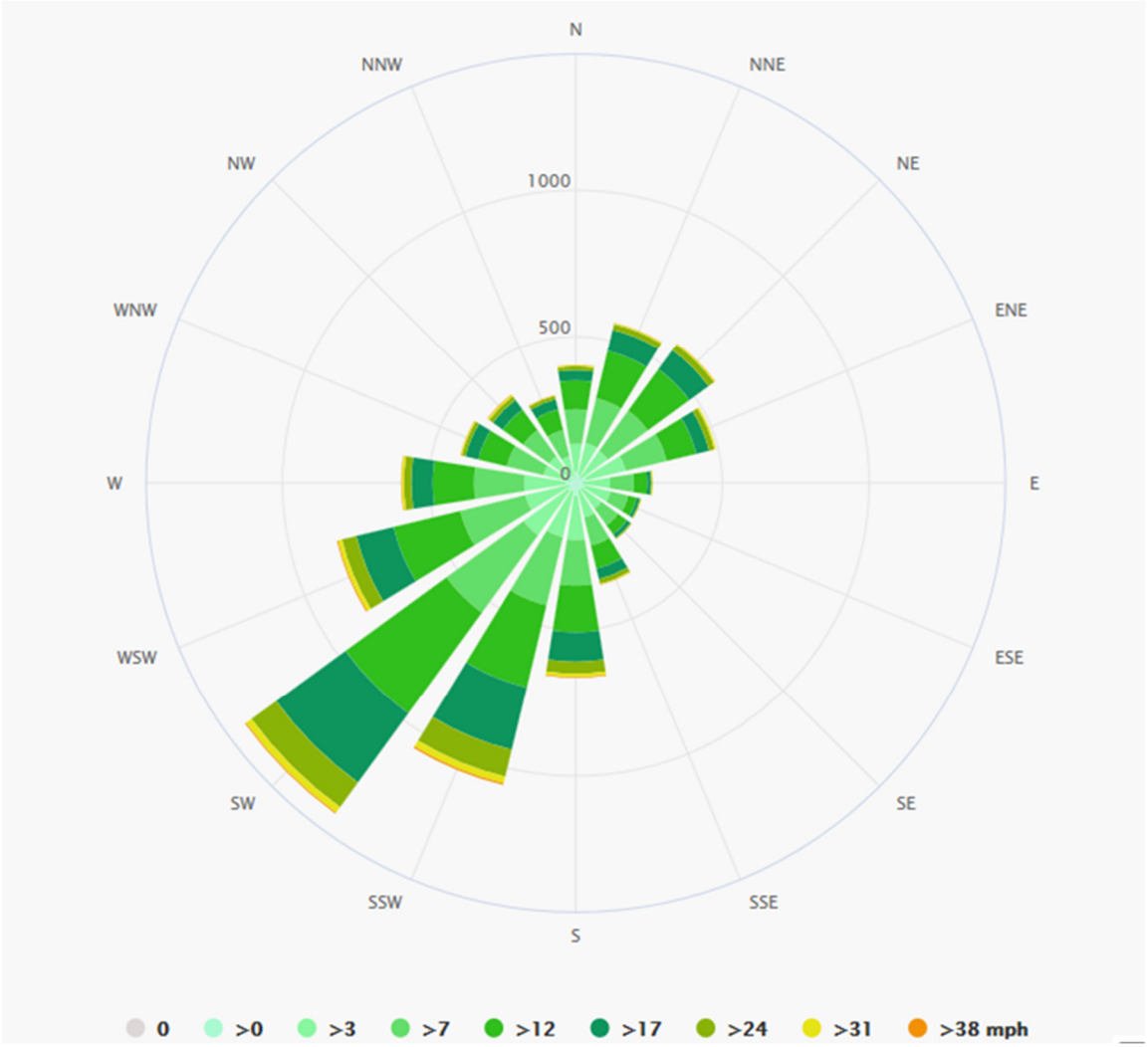


Figure 1.0 Windrose for Tunbridge Wells showing how many hours per year the wind blows from a certain direction, based on 30 years of hourly historical weather data.

15. A windrose for Tunbridge Wells weather station, which is located approximately 20km west of the site, is shown in Figure 1.0. The predominant wind direction is from the south west, as is the case for the majority of the UK.

16. The closest residential properties to the northeast, where the prevailing winds would predominantly blow, are approximately 1km away from the site. Footpaths travelling from west to east lie 150m to the south and 160m to the north of the site.

Process Information

17. Anaerobic digestion is a biological process whereby naturally occurring bacteria break down organic material in the absence of oxygen. The process of anaerobic digestion results in the production of biogas, which is cleaned and upgraded to produce

biomethane which is injected into the national gas grid or used to generate electricity to power the plant.

18. Other products from this AD process are heat, digestate and ammonium sulphate.

19. The AD site will process 57,500 tonnes of poultry manure from the adjacent egg production unit and other units in the vicinity in two plug flow anaerobic digesters.

20. Prior to the construction of the AD plant, the manure was either transported on overhead conveyors from the sheds or directly loaded into tractors and trailers and removed from the site for spreading to land within a 25 mile radius or stored within the manure store (which is now the Operations Building for the AD plant). The feedstock will continue to be transported via the covered conveyor system to the Operations Building, before being fed into the digesters. Manure from some of the outlying sheds on the adjacent unit will be brought to the Operations Building via tractor and covered trailer. Feedstock from nearby farms will be brought to the site in tractors and covered trailers.

21. The feedstock will be transferred to the manure storage area before being loaded into the solid feedstock hopper by a toploader system. It is then pumped into the grit removal tank via an auger/feed pump. Liquor from the combi bag and potable water are added to this tank to reduce the dry matter of the material and aid the removal of grit. The material is then transferred to the digester feed tank where it is homogenised and further diluted to achieve the dry matter content required by the AD process. The material is transferred to the digesters using two pumps. The feedstock storage area, grit removal tank, digester feed tank and feed pumps are located within the Operations Building.

22. Grit is removed from the process and stored in a skip for off-site removal.

23. The average daily feed of materials via the solid feedstock hopper is 158 tonnes/day. The maximum amount of feedstock that would be stored in the Operations Building would be 500 tonnes.

24. Feedstock is pumped to one of the two digesters' inlet chambers using dedicated pumps. The digester uses the principles of a conventional plug flow and continuous mixed digester system. The feedstock is retained within the digester for approximately 25 days at a temperature of 38°C, during which time the volatile, odourous components of the feedstock are broken down into carbon dioxide, methane and salts.

25. Biogas generated during the process fills the headspace of two of the four chambers within the digester. It is then utilised by the Combined Heat and Power (CHP) unit and the biogas upgrade plant. The heat required to maintain the process temperature is provided by the CHP with the heat shortfall being provided by a natural gas boiler.

26. The resulting digestate is fed into an ammonia recovery plant. The digestate is heated to a temperature of approximately 70°C and aerated using blowers. This step in the ammonia recovery plant acts as a pasteurisation step. The ammonia recovery process causes the ammonium within the digestate to be converted to free ammonia. The 'ammonia-rich' gas offtake is sent to an acid tower, where sulphuric acid is used to absorb the ammonia by forming ammonium sulphate. The ammonium sulphate solution is then transferred to a storage tank located outside of the process building.

27. Following the ammonia recovery process, the treated digestate is pumped to a solids separation plant to separate the solid fraction (solid digestate) from the liquid fraction (liquor). The liquid effluent is recirculated back into the feeding system (via the grit removal and feed tank) to dilute the feedstock or it is stored in the combi bag.

28. Solid digestate will be sold as a soil conditioner and fertiliser. Ammonium sulphate will be sold as an agricultural fertiliser.

29. The AD process takes place in a sealed system, from the mixing pump through to discharge of digestate.

Possible Odour Sources

30. Potential odour sources arising from the AD operation are outlined below in Table 2.0.

Potential source of odour	Considerations	Odour risk assessment		Odour risk Rating
		Probability of exposure	Potential consequence	
Delivery of feedstock by tractor and trailer	Poultry manure is transported from some of the sheds and brought in from neighbouring farms via tractor and covered trailer. Vehicles are only allowed on to the site if they are clean and well maintained.	Medium	Low	Medium
Feedstock storage	Feedstock is stored in the Operations Building in two lanes contained by push walls. Doors to the building are kept shut except when deliveries are taking place. Feedstock is kept dry at all times and used on a first-in first-out basis. Good housekeeping is maintained at all times. The manure storage lanes are emptied and cleaned every week.	Medium	Low	Medium
Feedstock loading	Agitation of the poultry manure can increase the potential for odour release and will be kept to a minimum. The feedstock is loaded using a toploader system.	Medium	Low	Medium
Anaerobic digestion process	Anaerobic digestion takes place in a fully enclosed system thus resulting in no odour release. The process is monitored to ensure optimal digestion and to prevent inefficient processing.	Low	Low	Low
Release of biogas from pressure release valves.	The pressure release valves are only used as an emergency measure. Odours may be released should the valves be opened, however this would not take place on a regular basis.	Low	Low	Low
Ammonia recovery process	The ammonia recovery process takes place in a fully enclosed system and does not result in odour release.	Low	Low	Low

Biogas upgrade plant	The biogas upgrade plant utilises carbon filters to remove hydrogen sulphide (H_2S) from the gas. The H_2S is trapped inside the carbon substrate and breaks down, removing odour. Carbon filters will be managed and maintained as per manufacturer's instructions.	Low	Low	Low
Digestate separation	The solids separation plant is located within the Operations Building and is a fully enclosed system. Liquid digestate is maintained within enclosed pipes and pumped to the combi bag. Solid digestate is collected within the Operations Building. Doors to the Operations Building are kept shut except when deliveries are taking place.	Low	Low	Low
Digestate storage	The liquid fraction is stored in the combi bag and recirculated back into the digester tank. Solid digestate is collected within the Operations Building before being removed from the site. Doors to the Operations Building are kept shut except when deliveries are taking place.	Medium	Low	Medium
Digestate removal	Solid digestate is removed from site in covered lorries or tractor and covered trailers. Only clean, well maintained vehicles are used.	Low	Low	Low
Sumps and drains	The site will be subject to rigorous inspection and regular odour monitoring regimes. Good housekeeping will be maintained at all times. Should sumps and drains become contaminated, early detection would prevent odours forming.	Low	Low	Low

Table 2.0 Potential odour sources and associated risks

Odour Mitigation

31. The design, management and operation of the AD plant is such that Best Available Techniques (BAT) are utilised at all times, with the prevention of the formation or emissions of odour a priority.

32. Good housekeeping is maintained at the site at all times in order to minimise any fugitive odours arising from spillages etc. Daily inspections will take place to ensure that good housekeeping is upheld.

33. The site operates a Pest Management Plan and a British Pest Control Association approved pest control operative has been appointed.
34. Process monitoring and control takes place continually to ensure that the plant is operating effectively and within its parameters.
35. Feedstock is either brought to the Operations Building by a covered conveyor system from the adjacent sheds or delivered by tractor and covered trailer. It is fed directly into the process using a toploader system, located within the Operations Building, with manure storage only taking place when there is an excess. Prior to the construction the plant, poultry manure was collected from Friday's Ltd farms in tractors and trailers for spreading to land.
36. Only clean, well maintained delivery vehicles are permitted to enter the site.
37. The digester takes 158 tonnes of feedstock per day. The maximum amount of manure to be stored within the Operations Building is 500 tonnes. No feedstock will be stored outside. Feedstock within the Operations Building is kept dry at all times and is loaded on a first-in first-out basis.
38. No mixing or moving of the stored manure takes place other than when loading feedstock into the process. Any spilled materials will be cleared away immediately.
39. The Operations Building is constructed of concrete panels and timber cladding with a concrete floor. It was used by the adjacent egg production facility as a manure store prior to the AD plant being constructed. Vehicle access to the Operations Building is via a fast-acting roller shutter doors, which open and close on pressure switches. The door to the Operations Building is kept shut except when deliveries are taking place.
40. The personnel door to the Operations Building is fitted with a self-closing device.
41. The AD process takes place within sealed units and does not form a source of odour under normal operating conditions. Release of odour/biogas would indicate a problem with the system and would be immediately flagged and investigated. Any leaks would be immediately detected through the computerised SCADA monitoring system.
42. Continual monitoring, using the SCADA system, of all operational systems and pressure release valves will indicate any potential build-up of gas that requires venting. Any requirement to release gas would be through the fully enclosed flare.
43. Retention time in the digester is approximately 25 days, which allows for a significant reduction in volatile fatty acids (VFA), known odour causing chemicals. The reduction in VFA results in a reduction in odour by 86 - 96% (*Laura H Page et al - Reduction of Volatile Fatty Acids and Odour Offensiveness by Anaerobic Digestion and Solid Separation of Dairy Manure during Manure Storage, 2015)*.
44. The contents of catch pits, sumps and filter drains are checked regularly for signs of contamination and, should any be found, are cleaned as soon as is practicable.
45. Digestate is passed through the ammonia recovery chamber, where 60% of the ammonia is removed in the form of an ammonium sulphate solution, which is stored in a sealed tank. This, again, reduces the odour potential of the digestate.
46. Digestate is separated in the solids separation plant, which is located within the Operations Building. Low odour liquid digestate is pumped to the combi bag for storage before being recirculated through the process. Solid digestate is stored temporarily within the Operations Building prior to removal for spreading to land.
47. The use of the sealed combi bag, rather than a lagoon, for storage of liquid digestate has been chosen in order to reduce the likelihood of odour release.
48. The biogas is either upgraded or combusted through the CHP with any excess being disposed of by a fully enclosed flare. Products of combustion do not typically have any

associated odour and as such have not been considered an odour source in the context of this OMP.

49. The biogas upgrade plant utilises carbon filters to remove hydrogen sulphide (H_2S) from the gas. The H_2S is trapped inside the carbon substrate and breaks down, removing odour. Carbon filters will be managed and maintained as per manufacturer's instructions.

50. The processing of poultry manure via the AD plant rather than being collected in tractors and trailers, transported up to 25 miles, potentially stored and then spread to land will reduce overall odour nuisance within the vicinity.

Plant Breakdown

51. Monitoring and preventative maintenance of all equipment is carried out on a regular basis, in line with manufacturer's recommendations.

52. In the event of a breakdown, that prevents the normal operation of the digester, feedstock will not be fed into the plant. Friday's Ltd are able to divert the feedstock to a number of contractors, should the digester be unable to accept feedstock.

53. In order to minimise down time, a supply of critical spares is maintained on site. Repairs are carried out by on-site staff, where possible and a list of contractors is available if needed.

System Failure

54.

55. The AD process is continually monitored using the on-site SCADA system, which will alert operators should headspace pressure rise above set parameters.

56. A Hazard and Operability Study (HAZOP) has been completed to identify the correct operating ranges for the plant.

57. Excess biogas can be combusted in the emergency flare, in the event that the system is shut down for maintenance or the CHP offline.

Contingencies

58. Where monitoring activities indicate that a potential odour source is not completely under control or that adverse impact has already occurred, the site will operate its contingency plans.

59. These situations include accidents/incidents resulting in a loss in control of odourous substances and could cause unacceptable but short term loss of amenity. This includes detection of odour during monitoring or receipt of an odour related complaint.

Odour Monitoring Procedures

60. Daily Odour Monitoring takes place as part of the Daily Site Inspection Procedure by trained operatives. Records are kept detailing any odour, its potential source and intensity. Odour monitoring takes place at specified locations throughout the site, with particular emphasis on areas that are potential odour sources. Information such as weather conditions and activities taking place on the site are also recorded.

61. An odour scale from 1-5 is used to record the level of odour at the site, with '1' representing 'no detectable odour' and '5' representing 'a very strong odour'.

62. Any odour identified at the site boundary will be further assessed to ascertain if the odour has originated from the AD site or from elsewhere. If the odour is thought to have been

generated at the AD site, an assessment takes place to determine if the odour has caused a nuisance off site. Contingency measures are initiated and the problem that caused the odour shall be remedied to prevent continuation of the odour.

63. All details of Daily Odour Monitoring shall be recorded on the Daily Inspection Sheet and any odours are also recorded in the Site Diary and the Site Manager informed.

64. Should an odour be detected, more frequent monitoring will take place until the odour is reduced to an acceptable level.

65. The Environment Agency will be informed, if required.

Complaints

66. Any complaints received are recorded on the Complaints Form and in the Site Diary (to include details of location, time, date and complainant details). The Site Manager is informed.

67. Following receipt of the complaint the following assessment takes place;

- Comprehensive review of all site operations prior to and at the time of the complaint (for example to determine if feedstock was being delivered or loaded; if any abnormal operations, accidents or incidents occurred or if any emergency situation took place)
- To identify any potential odour sources from outside the AD site boundary;
- Review of weather conditions at the time of the complaint;
- Analysis of previous complaints to identify any patterns or trends.

68. Records of the investigation following a complaint are kept.

69. The complainant is contacted and reassurance given that the source of the odour has been identified and suitable action taken.

70. The Environment Agency would be consulted, if required.

71. Complaints are monitored on a regular basis.

Engagement with Neighbours

72. Green Create W2V Kent Ltd endeavours to maintain good relationships with local residents. The following measures have been put in place –

- Engagement and communication with local residents;
- The company telephone number is made available to all local residents to encourage communication;
- Should any odour problems be anticipated, local residents will be informed;
- Any odour complaints will be dealt with promptly and courteously with the complainant being informed of any outcomes.

Staff Training

73. All staff are trained with regard to the Environmental Management System and operating procedures prior to commencement of work on the site, with ongoing training taking place during employment.

74. Staff are trained with regard to the importance of odour management and are made aware of the Odour Management Plan and associated documents.

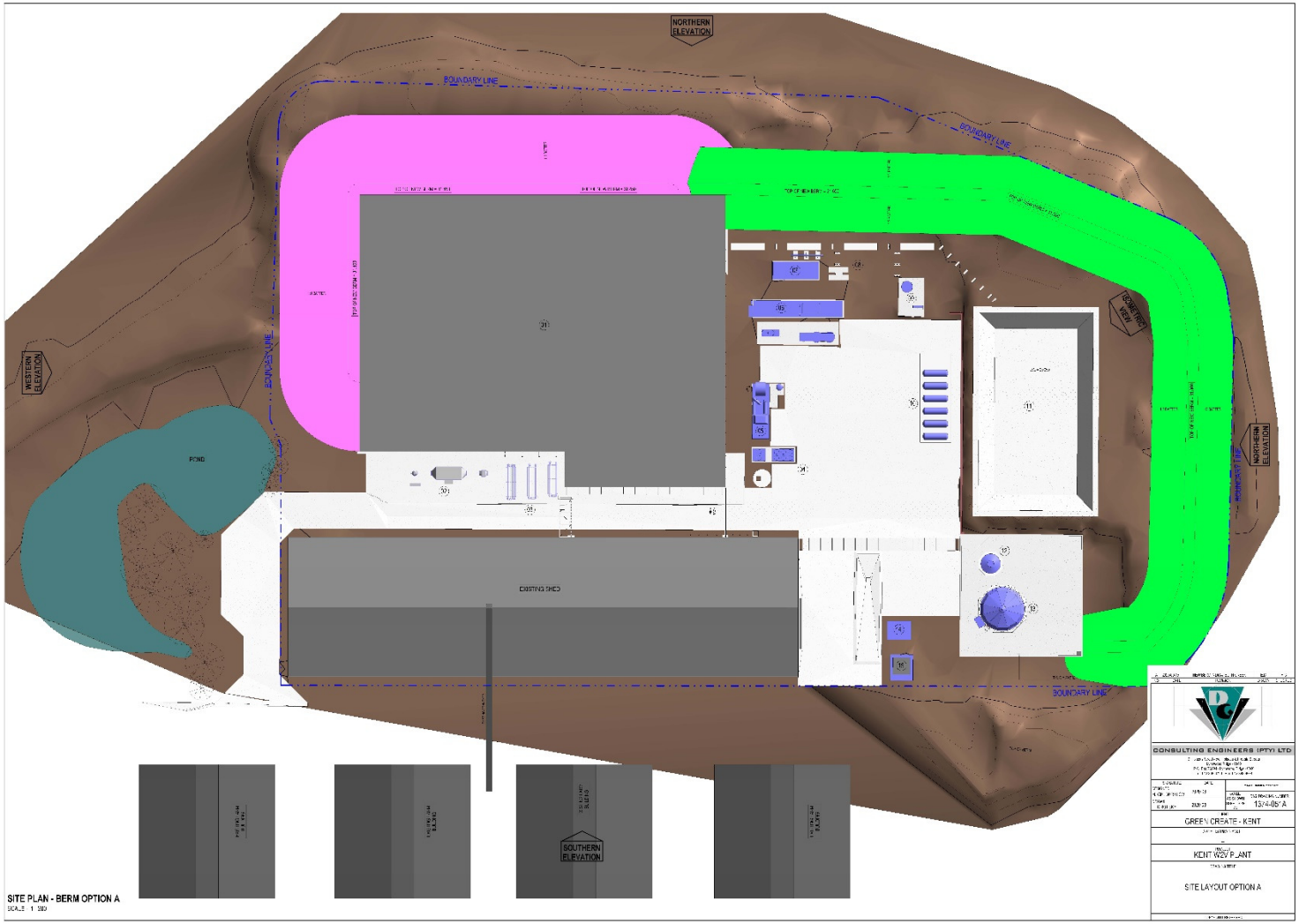
Record Keeping

75. Records are kept of daily monitoring of the site and include;
    - Results of daily inspections for odour carried out by site personnel;
    - Weather conditions, including wind direction;
    - Any operational issues that may have occurred, including date, time, duration;
    - Complaints including details of complainant, date and time;
    - Details of corrective actions taken and any changes to operational procedures.
76. Details are recorded on the appropriate documents or in the Site Diary, as appropriate. Records are kept in the site office.
77. Examples of the Daily Odour Monitoring Form and Complaints Form (Odour) are included as Appendices 4 and 5.

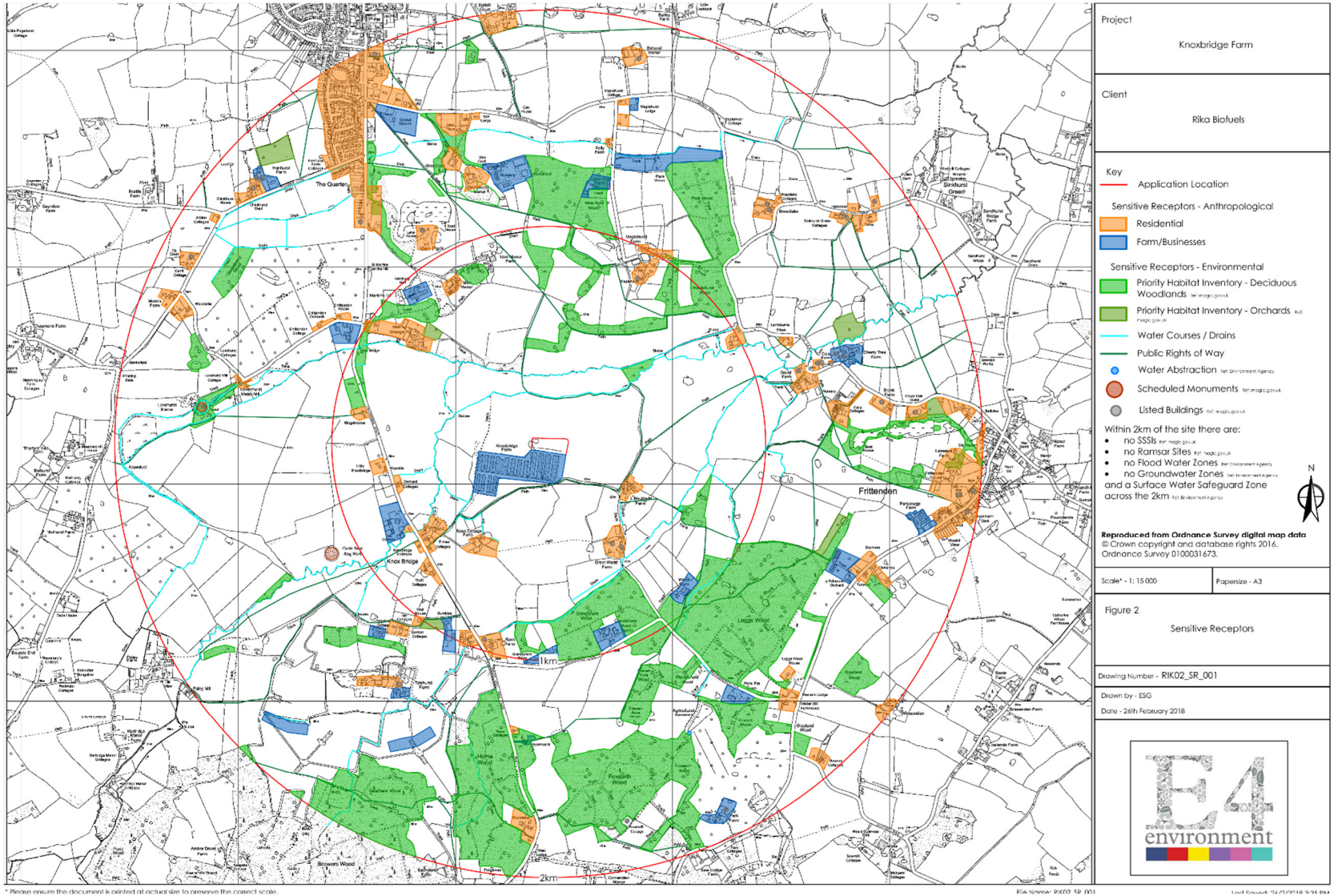
Conclusion

78. The AD site at Knoxbridge Farm is located in a rural setting adjacent to an existing egg production facility. The poultry manure feedstock for the plant will be supplied by Friday's Ltd egg production facilities in the vicinity, with the main provider being adjacent to the AD site. Prior to the AD facility being constructed, the poultry manure was removed from the sites using tractors and trailers and spread directly to land or stored in the manure store, which now functions as the Operations Building for the AD plant.
79. The processing of poultry manure via the AD plant rather than being collected in tractors and trailers, stored on/off-site, transported up to 25 miles and then spread to land will reduce overall odour nuisance within the vicinity.
80. The presence of numerous farms in the vicinity indicate that background odours would be considered normal for the area.
81. Odour emissions will be minimised by the use of procedures, as detailed in the Environmental Management System, and maintaining good housekeeping at all times.

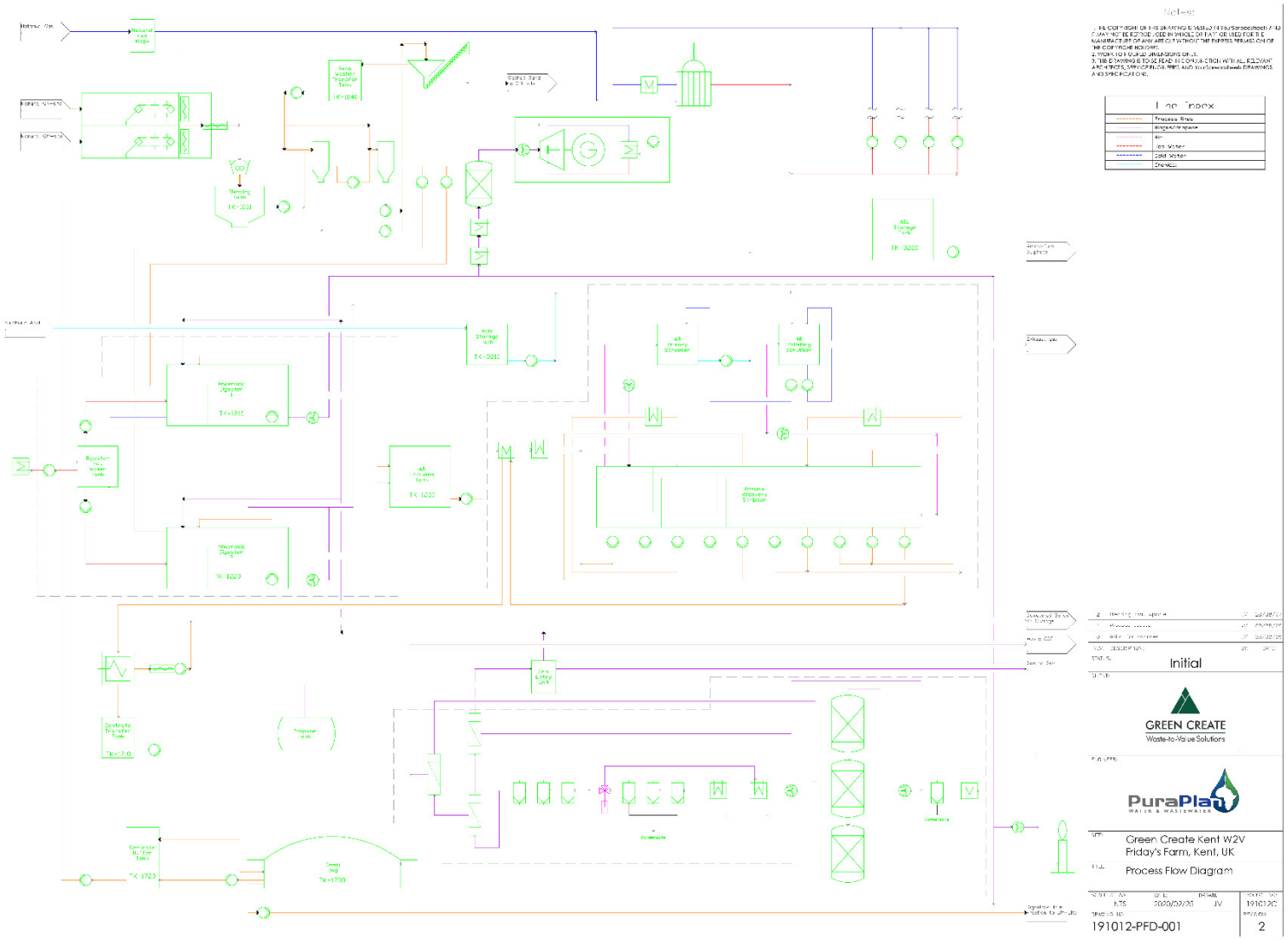
Appendix 1 – Site Plan



Appendix 2 - Sensitive Receptors Plan



Appendix 3 – Process Flow Diagram



Appendix 4 – Daily Odour Monitoring Form

Daily Odour Monitoring	**Green Create W2V Kent Ltd**		**Knoxbridge Farm**		
Date			**Completed by**		
Site Location	Boundary Location 1	Boundary Location 2	Sumps and Drains	Outside Operations Building Door	Combi Bag
Weather Conditions					
Wind Direction					
Wind Strength					
Odour Description					
Odour Intensity 1-5 1(no odour) - 5 (very strong odour)					
Odour Constant?					
Source of Odour (if known)					
Any Actions Taken					

Appendix 5 – Complaints Form (Odour)

Complaints Form – Odour Green Create W2V Kent Ltd Knoxbridge Farm			
Date and Time		Complaint Recorded By	
Complaint Received By Telephone / email / in person		Complainant Name, Address and Telephone Number	
To be completed when communicating with complainant -			
Date / time odour first detected			
Duration of odour detection (hours, days etc)			
Location of odour			
Description of odour (type of odour, constant or intermittent)			
Strength of odour			
To be completed by site personnel -			
Weather / wind direction / wind strength			
Possible odour source? From AD plant or external?			
Site operating conditions at time of complaint			
Previous related complaints			
Actions taken			
Signed		Date	