



CLEVE HILL SOLAR PARK

UPDATES TO APPLICATION DOCUMENTS OUTLINE SPECIAL PROTECTION AREA CONSTRUCTION NOISE MANAGEMENT PLAN

November 2019
Revision C

Document Reference: 6.4.12.10
Submitted: Deadline 7

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**OUTLINE SPECIAL PROTECTION AREA - CONSTRUCTION NOISE
MANAGEMENT PLAN
(OUTLINE SPA CNMP)**

NOVEMBER 2019



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1 INTRODUCTION

This outline Special Protection Area Construction Noise Management Plan (SPA CNMP) establishes appropriate noise thresholds for the control of noise associated with the construction and decommissioning of Cleve Hill Solar Park (CHSP; the Development) which has the potential to disturb ornithological receptors associated with The Swale Special Protection Area (SPA).

An outline assessment of modelled construction noise impacts is presented with outline mitigation proposals.

As the equipment and detailed design of the Development is not fixed at the time of writing, this outline SPA CNMP is a live document to be updated prior to the commencement of construction.

2 ORNITHOLOGICAL ASSESSMENT

Noise and visual stimuli during construction and decommissioning of the Development may cause disturbance to breeding, foraging and resting/roosting birds both within the Development site and beyond its boundaries, such as in the adjacent freshwater grazing marsh/reedbeds and intertidal habitats of the Swale. There will be works activities in the local landscape during the construction and decommissioning periods, including movements of large plant vehicles (*e.g.*, excavator, dump truck, and transport), presence of personnel and operation of one or more piling rigs.

The potential for noise and visual disturbance to birds within The Swale Special Protection Area (SPA) has been identified for the construction and decommissioning phases of the Development. Further detail on the background to this is included in Environmental Statement (ES) Chapter 9: Ornithology (DCO document reference: 6.1.9).

This SPA Construction Noise Management Plan (SPA CNMP) is therefore required to govern noise within the SPA during construction and decommissioning.

3 PHASING

The construction period is likely to be undertaken in at least two phases:

- Phase one will include the construction of all aspects of the Development except the for installation of electrical components associated with the energy storage facility; and
- Phase two will include the construction of the energy storage facility (phase two in itself could be undertaken in multiple phases in order to deliver smaller amounts of energy storage capacity gradually).

Phase 1 will include all site preparation and civil engineering works associated with the energy storage facility, and construction activities during phase 2 are likely to be limited to installation of electric cabling, import of components to site and installation of the energy storage units.

4 NOISE THRESHOLDS

Noise thresholds have been set based on the analysis carried out in ES Chapter 9: Ornithology. Following consultation responses, separate thresholds have been set for active piling noise, based on an L_{Amax} level as it is impulsive, and for all other construction noise based on an L_{Aeq} level.

The noise thresholds represent precautionary noise levels above which there is potential for significant disturbance to ornithological receptors associated with the Swale SPA.

Disturbance is defined for the purposes of this document in accordance with Natural England's supplementary advice on the conservation objectives for the SPA: "*Disturbance should be judged as significant if an action (alone or in combination with other effects) impacts on (water)birds in such a way as to be likely to cause impacts on populations of a species through either*

- I. changed local distribution on a continuing basis; and/or*
- II. changed local abundance on a sustained basis; and/or*
- III. the reduction of ability of any significant group of birds to survive, breed, or rear their young."*

The most sensitive receptor locations during the breeding and wintering seasons are considered separately, and the threshold noise levels have been derived to reflect the seasonal variation with reference to literature as set out in ES Chapter 9: Ornithology.

The construction and decommissioning phases will be designed and planned to avoid exceeding the identified noise thresholds in the relevant areas described.

Table 1 summarises the relevant noise thresholds which are also described in the following sections. These are the thresholds levels that will not be exceeded in the relevant areas as a result of construction noise.

Table 1: Noise Thresholds

Season	Receptor Location within the SPA	Active Piling Noise Threshold (dB L _{Amax})	Other Construction Noise Threshold (dB L _{Aeq})
Breeding (1 March to 31 August)	South Bank of the Swale LNR	65	65
Wintering (1 September to 28 February)	Seaward of MHWS	70	70
Core Winter (1 November to 28 February)	Castle Coote	55	55
Wintering (1 September to 28 February)	AR HMA	70	70

As described in ES Chapter 9: Ornithology, birds using the intertidal habitats may exhibit behavioural responses at noise levels below these thresholds, but such disturbance would not be significant due to the temporary nature of the stimulus and response and relatively small area affected at any one time.

5 ASSESSMENT METHODOLOGY

The assessment of construction noise on ecological receptors has been undertaken based on the methodology detailed in Section 12.3.2 of the Noise Chapter.

In summary, the distance between the closest points to the ecological receptor at which each construction activity occurs has been identified, and used to calculate worst case noise levels using the source data and methodology described in BS 5228-1:2014.

The assessment of active piling operations has been undertaken based on predicted L_{Amax} levels, while other construction activities are based on predicted L_{Aeq} levels.

This outline assessment presents an indication of the likely noise levels based on typical construction activities and equipment that will be used on site. This assessment will be updated, once manufacturers' data becomes available, to ensure that the mitigation appropriately mitigates significantly disturbing activities and minimises impacts on birds within The Swale SPA.

6 OUTLINE ASSESSMENT

A precautionary assessment is presented in order to demonstrate how construction activity could proceed in compliance with the thresholds set in Section 4.

As stated in Section 1, this assessment will be updated prior to construction using the detailed design and data from the actual plant and equipment to be deployed onsite during construction.

The assessment is considered to be worst case and precautionary as noise generated during construction will not be continuous in any one location for long durations *e.g.*, the largest field adjacent to the SPA is expected to take 6 weeks to complete. Therefore any one part of the SPA will be subject to noise emissions approaching the threshold for only a few days.

6.1 Active Piling Operations

6.1.1 Phase 1

Table 2 presents the predicted dB L_{Amax} level at the SPA boundary, MHWS and Castle Coote roost due to active piling operations, at the closest position to each receptor that active piling takes place.

The distance from the closest positions at which active piling could take place (solar PV module installation) to the SPA boundary, MHWS and Castle Coote is as follows:

- SPA boundary – 20 m;
- MHWS – 80 m; and
- Castle Coote – 80 m.

Table 2: Predicted Active Piling Noise Level, dB L_{Amax}

Receptor	Active Piling Noise Threshold	Active Piling
		Predicted Noise Level, dB, L_{Amax} ¹
SPA Boundary (Breeding Season 1 March to 31 August)	65 dB L_{Amax}	94
MHWS (Wintering Season 1 September to 28 February)	70 dB L_{Amax}	77
Castle Coote (1 November to 28 February)	55 dB L_{Amax}	77

¹ Please note the predicted L_{Amax} noise levels presented in this table have been updated since the ES. Previously, the ES assumed 4 piling rigs operating simultaneously at the same location, however in practice the L_{Amax} level at any one point on the SPA is highly unlikely to increase regardless of the number of piling rigs, as the L_{Amax} event (i.e. the hammer strike) would have to occur at precisely the same time from all four pilers, at the same distance to the SPA. The predictions and resultant mitigation specified in the ES represents the theoretical worst case, however the predictions made in the CNMP have been are being updated to reflect a more realistic scenario.

For calculation of noise at MHWS and Castle Coote, an additional 5 dB reduction has been applied for the sea wall acting as a noise barrier.

Based upon the above assessment, as a result of 'active piling noise', an area of significant disturbance (*i.e.*, noise levels in excess of the thresholds) is anticipated at the SPA boundary during the breeding season, and the MHWS and Castle Coote during winter season.

Noise levels level will extend into the AR HMA, however the mitigation implemented to reduce noise in the winter intertidal area will also reduce noise levels within the AR HMA, as discussed in Section 7 of this report.

6.1.2 Phase 2

Given that no piling is anticipated during Phase 2, assessment of piling noise on the AR HMA has not been undertaken.

6.2 Other Construction Activity

6.2.1 Phase 1

The distance to the closest position at which construction takes place to each ecological receptor is presented in Table 3.

For each activity, the distance to each activity is presented, as well as the closest distance to the haul road, so that the assessment takes into account both the nearest activity and on-going haulage noise.

Table 3: Distance between receptor and construction activity

Receptor	Construction Activity				
	Hardstanding & Track Construction	Manoeuvring Piling Plant	Installation of PV Panels	Installation of Substation	Construction Compound
	Closest Distance to Receptor, m				
SPA Boundary (Breeding Season 1 March to 31 August)	500	20	20	475	500
MHWS (Wintering Season 1 September to 28 February)	560	80	80	535	560
Castle Coote (1 November to 28 February)	560	80	80	770	560

Table 4 presents noise emission levels due to other construction activities at the SPA boundary, MHWS and Castle Coote.

In each case the noise from each construction activity has been combined with the noise from the nearest haul road to calculate an overall dB, L_{Aeq} at each receptor.

Table 4: Predicted Other Construction Noise Level, dB L_{Aeq}

Receptor	Construction Activity				
	Hardstanding & Track Construction	Manoeuvring Piling Plant	Installation of PV Panels	Installation of Substation	Construction Compound
	Predicted Noise Level, dB, L _{Aeq}				
SPA Boundary (Breeding Season 1 March to 31 August) 65 dB L _{Aeq}	54.5	76.7	76.0	58.1	54.5
MHWS (Wintering Season 1 September to 28 February) 70 dB L _{Aeq}	50.7	60.1	59.5	51.5	50.8
Castle Coote (1 November to 28 February) 55 dB L _{Aeq}	50.7	60.1	59.5	49.3	50.8

The above predictions are based on the following assumptions:

- All plant and machinery located at the closest point to the respective receptor where a given activity will take place;
- Refuelling will take place at least 500 m from the SPA;
- 5 dB reduction has been applied to the predicted levels at MHWS and Castle Coote to account for the sea wall;
- Soft ground between source and receiver;
- On-time for each activity is assumed to be 100%, as the threshold levels for ecological receptors do not account for the time over which activities take place; and
- No reduction in noise due to barrier effects created by the progressive installation of the solar PV modules.

Based upon the above assessment, as a result of 'other construction noise' an area of potentially significant disturbance (*i.e.*, noise levels in excess of the thresholds) is anticipated at the SPA boundary during the breeding season and at Castle Coote during the core winter season.

No significant disturbance (*i.e.*, noise levels in excess of 70 dB, L_{Aeq}) is anticipated at or beyond MHWS during the wintering season.

6.2.2 Phase 2

As discussed, construction operations during phase 2 are limited to installation of the energy storage facility. In the absence of specific data, noise levels are anticipated to be similar to those undertaken during installation of the substation.

The distance to the closest position at which construction takes place to each ecological receptor is presented in Table 5.

For each activity, the distance to each activity is presented, as well as the closest distance to the haul road, so that the assessment takes into account both the nearest activity and on-going haulage noise.

Table 5: Distance between Receptor and Installation of Energy Storage Facility

	Closest Distance to Receptor, m	
	Activity	Haul Rd
SPA Boundary (Breeding Season 1 March to 31 August)	475	180
MHWS (Wintering Season 1 September to 28 February)	535	560
AR HMA (Wintering Season 1 September to 28 February)	60	110
Castle Coote (1 November to 28 February)	535	560

Table 6 presents noise emission levels due to construction of the energy storage facility at the SPA boundary, MHWS and AR HMA.

Noise from installation of the energy facility has been combined with the noise from the nearest haul road to calculate an overall dB, L_{Aeq} at each receptor. Note that as a worst-case assumption, haul road noise has been calculated based on 37 movements per hour i.e. the maximum number of movements anticipated during peak construction. In practice, vehicle movements during phase 2 will be significantly lower than those in phase 1.

Table 6: Predicted Installation of Energy Storage Facility Noise Level, dB L_{Aeq}

Receptor	Other Construction Noise Threshold	Predicted Noise Level, dB, L_{Aeq}
SPA Boundary (Breeding Season 1 March to 31 August)	65 dB L_{Aeq}	58
MHWS (Wintering Season 1 September to 28 February)	70 dB L_{Aeq}	51
AR HMA (Wintering Season 1 September to 28 February)	70 dB L_{Aeq}	64
Castle Coote (1 November to 28 February)	55 dB L_{Aeq}	52

The above predictions are based on the following assumptions:

- All plant and machinery located at the closest point to the respective receptor where a given activity will take place;
- Refuelling will take place at least 500 m from the SPA / HMA;
- 5 dB reduction has been applied to the predicted levels to account for the energy storage facility bund;
- Soft ground between source and receiver; and
- On-time for each activity is assumed to be 100%.

Based upon the above assessment, as a result of construction work undertaken during phase 2, no significant disturbance (*i.e.*, noise levels in excess of noise thresholds) is anticipated at ecological receptors.

7 OUTLINE MITIGATION

Construction will be carried out in such a way that it can be demonstrated that noise thresholds in Section 4 are not exceeded. Where mitigation is required to achieve this, examples of such mitigation are provided below. Prior to commencement of construction, the proposed construction plant and methods will be subject to a revised noise assessment, to demonstrate how noise thresholds will be met.

7.1 Specific Mitigation Measures

7.1.1 Phase 1

7.1.1.1 Piling Noise Mitigation

The predicted noise levels during active piling has the potential to result in significant disturbance effects at the SPA Boundary, MHWS and Castle Coote.

In order to reduce noise at ecological receptors during active piling operations, it is considered that a 10 dB reduction in noise levels can be achieved through implementation of one (or more) of the following:

- Use of pile hammer shrouds;
- Use of pile press rather than hammer; or
- Use of acoustic quilts, barriers or water jackets.

The implementation of mitigation to reduce noise from active piling will result in residual effects of 84 dB L_{Amax} at the SPA Boundary, and 67 dB L_{Amax} at MHWS and Castle Coote. As can be seen, the implementation of mitigation reducing piling noise by 10 dB will reduce noise at MHWS to below the 70 dB L_{Amax} threshold. Noise levels at the SPA Boundary and Castle Coote exceed the 65 dB L_{Amax} and 55 dB L_{Amax} threshold respectively.

Taking account of the mitigation above, Appendix 1 shows indicative noise contours for a location at the most northerly edge of the solar panel development area closest to the intertidal area of the SPA/Ramsar Site (MHWS). Appendix 2 shows indicative noise contours for a location at the most northerly edge of the solar PV development area closest to the SPA/Ramsar Site boundary.

As shown in Appendix 1, the AR HMA will receive potentially disturbing noise levels across approximately 10 – 15 % of the area during construction of fields H and I. As discussed in Chapter 9 of the ES, due to the temporary nature of the effects of disturbance during construction/decommissioning, the small extent of area affected, and the proven resilience to the absence of availability of foraging resources within functionally linked arable land over the course of some winter seasons, there would be no long-term decline in the survival or productivity of ecological receptors.

In order to address the potentially significant disturbance effects identified for the SPA Boundary and Castle Coote, further mitigation is required. This may include (for example):

- The use of quieter plant and equipment than assessed;
- Modelling and application of additional noise mitigation measures, for example a combination of those given above; and/or
- Applying set-back distances at which specific construction activities can take place.

In terms of set-back distances, in order to show the possible area of disturbance for wintering birds on Castle Coote and breeding birds on the SPA, the distance at which 55 dB and 65 dB L_{Amax} have been calculated for the noise emissions predicted above. These calculations include the 10 dB mitigation specified earlier in this section.

The indicative distance at which piling noise will exceed 55 dB L_{Amax} within the potential bird roosting areas on Castle Coote is 350 m, while the indicative distance at which piling noise will exceed 65 dB L_{Amax} on the SPA boundary is 120 m. Appendix 3 presents these setback distances in relation to their respective designations.

During the core winter period between 1 November – 28 February (as well as during periods of two or more consecutive days in October or March of temperatures below 0°C), piling operations should be restricted within the 350 m exclusions zone around Castle Coote. Between 1 March and 31 August, piling operations should be restricted within the 120 m exclusion zone around the SPA boundary.

7.1.1.2 Other Construction Noise

As set out in Section 6.2, unmitigated, the noise from manoeuvring piling plant and installation of PV panels in areas near the SPA Boundary and Castle Coote could result in significant disturbance effects during the breeding season and core winter season respectively.

Given that these exceedances are associated with piling activities, it is considered that the mitigation and proposed setback distances specified in Section 7.1.1.1, when also applied to other construction activities, will be sufficient to ensure these activities do not exceed the identified noise thresholds.

7.1.2 Phase 2

As discussed in Section 6.2.2, noise from construction during Phase 2 is not predicted to exceed the noise thresholds. As such, no specific mitigation measures have been specified at this stage. As discussed, this section will be updated, if required, if it is found that noise thresholds are exceeded once specific details of construction plant becomes available.

7.2 Best Practice Mitigation Measures for All Construction Activities

The best practice mitigation measures apply to construction activities undertaken during both Phase 1 and Phase 2.

7.2.1 General Best Practice

In addition to the setback distances for piling works and other construction noise, general best practice measures should be applied to all construction activities (including piling) at all times of year, as follows:

- Use the quietest item of plant suitable for the required task;
- Static noisy plant (such as generators) should be located as far from the SPA as is feasible for the particular activity;
- Plant access/maintenance panels to be kept closed;
- Plant should be turned off when not in use;
- No manoeuvring alarms to be fitted to piling rigs;
- Minimise the use of reversing alarms through the considerate positioning of plant and vehicles;
- The ECoW overseeing work undertaken adjacent to the northern boundary of the site and observing ornithological responses to inform any further action;
- Fit broadband, rather than tonal reversing alarms where practicable; and
- Walkie-talkies/mobile phones should be used to communicate across the site; no shouting unless in an emergency.

Application of the above measures to manage construction noise will ensure that effects are minimised as far as reasonably practicable.

7.2.2 Irregular Noise Levels

In order to minimise the impact of sudden, irregular noise, it is recommended that piling works begin as far from the SPA as practicable (*i.e.*, in the south of the fields in most cases), and work towards the SPA. Once piling has begun, it should be undertaken with as few breaks as possible to reduce intermittency.

7.2.3 Minimising the Period of Construction

In order to minimise the length of time the SPA is exposed to construction noise close to the threshold levels, and to ensure construction noise levels are as consistent as practicable, it is suggested that multiple piling rigs are used, working close together in each field. While one piling rig actively piles, the remaining piling rigs can manoeuvre into position. This will also minimise the intermittency of the piling noise, which will help the birds to habituate quicker than a slower, more intermittent process.

It is recommended that the piling schedule is developed in consultation with the Ecological Clerk of Works.

8 CONCLUSION

Following mitigation, construction noise at the identified SPA receptor locations during the seasons as set out, will not exceed the noise thresholds in Table 1 of this SPA CNMP. This will prevent significant disturbing effects from occurring on birds within the SPA.

9 GLOSSARY

Active piling: The process of driving a pile i.e., not including manoeuvring, setting up etc.

Decibel (dB): The decibel is the basic unit of noise measurement. It relates to the cyclical changes in air pressure created by the sound (Sound Pressure Level) and operates on a logarithmic scale, ranging upwards from 0 dB. 0 dB is equivalent to the normal threshold of hearing at a frequency of 1000 Hz. Each increase of 3 dB on the scale represents a doubling in the Sound Pressure Level, and is typically the minimum noticeable change in sound level under normal listening conditions. For example, while an increase in noise level from 32 dB to 35 dB represents a doubling in sound pressure level, this change would only just be noticeable to the majority of listeners.

dB(A): Environmental noise levels are usually discussed in terms of dB(A). This is known as the A-weighted sound pressure level, and indicates that a correction factor has been applied, which corresponds to the human ear's response to sound across the range of audible frequencies. As stated in Jackson (2010)², research shows that the shape of most birds' audibility curves are similar to those of humans. Therefore, whilst the A-weighted frequency curve correction was not specifically designed with avian receptors in mind, it is considered appropriate for the purposes of this assessment.

Frequency: The frequency of a sound is equivalent to its pitch in musical terms. The units of frequency are Hertz (Hz), which represents the number of cycles (vibrations) per second.

Noise Emission: The sound power level emitted from a given source.

L_{Aeq,t}: This term is known as the A-weighted equivalent continuous sound pressure level. It is similar to an average, and represents the sound pressure level of a steady, continuous noise which has the same energy as the actual measured noise.

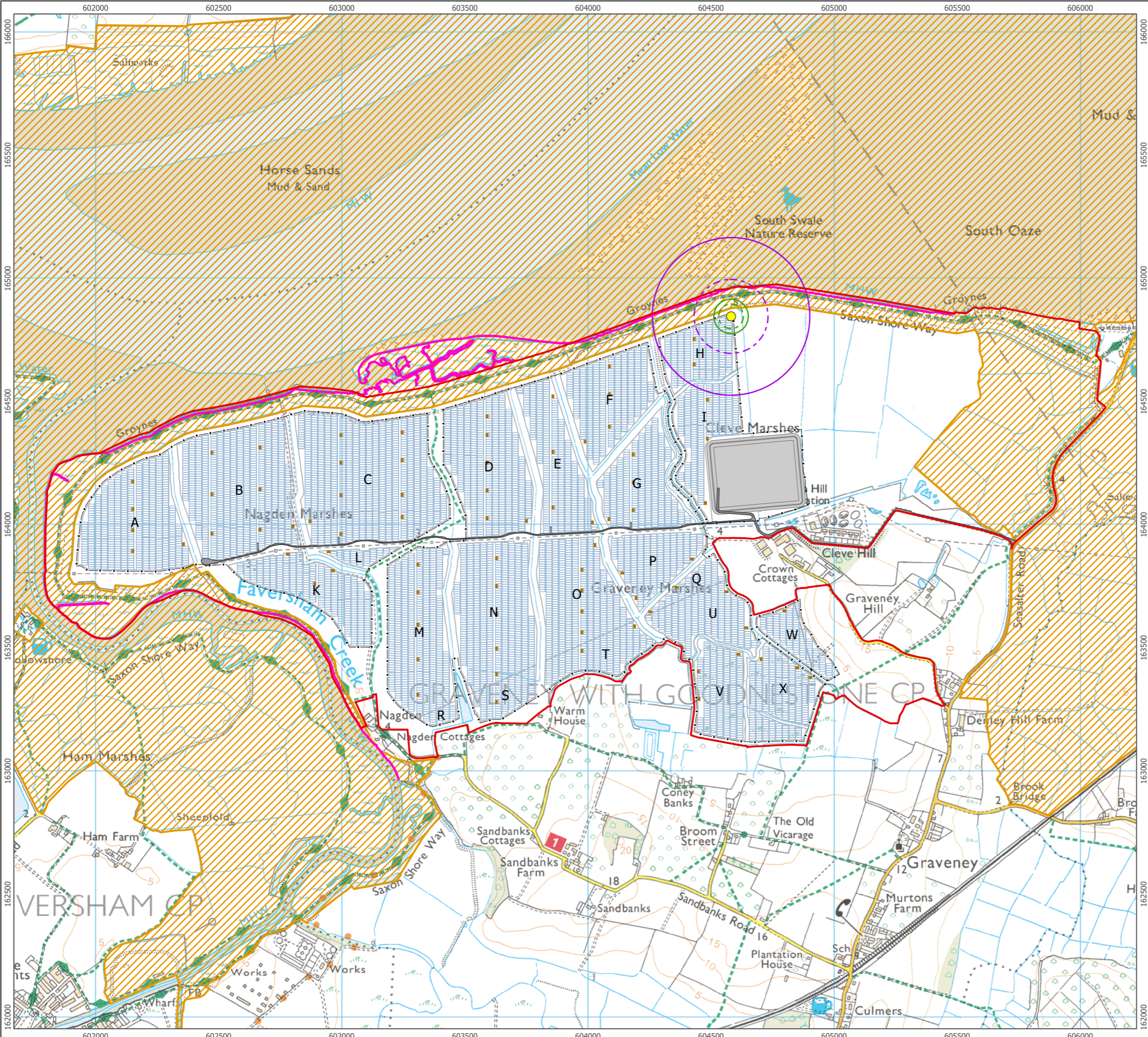
L_{Amax}: The maximum A-weighted sound pressure level measured over a given period.














Noise: Unwanted sound. May refer to both natural (e.g. wind, birdsong etc.) and artificial sounds (e.g. traffic)

² Jackson, P. Noise Impact Assessment on Wintering Birds Anna's Road Exploration Well Site, Westby Blackpool. Spectrum Acoustics 2012.

APPENDIX 1 – WINTERING BIRD NOISE THRESHOLD

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-  Site Boundary
-  The Swale SPA and Ramsar Site
- Indicative Noise Contours
- Piling Noise (L_{max})
 -  70 dBA (70 m)
 -  55 dBA (320 m)
- Other Construction Noise (L_{Aeq})
 -  70 dBA (50 m)
 -  55 dBA (150 m)
 -  MHWS
- Site Layout
 -  Transformer
 -  Solar Panels
 -  Boundary Fence
 -  Haul Road
 -  Proposed Compound
 -  Development Parcel



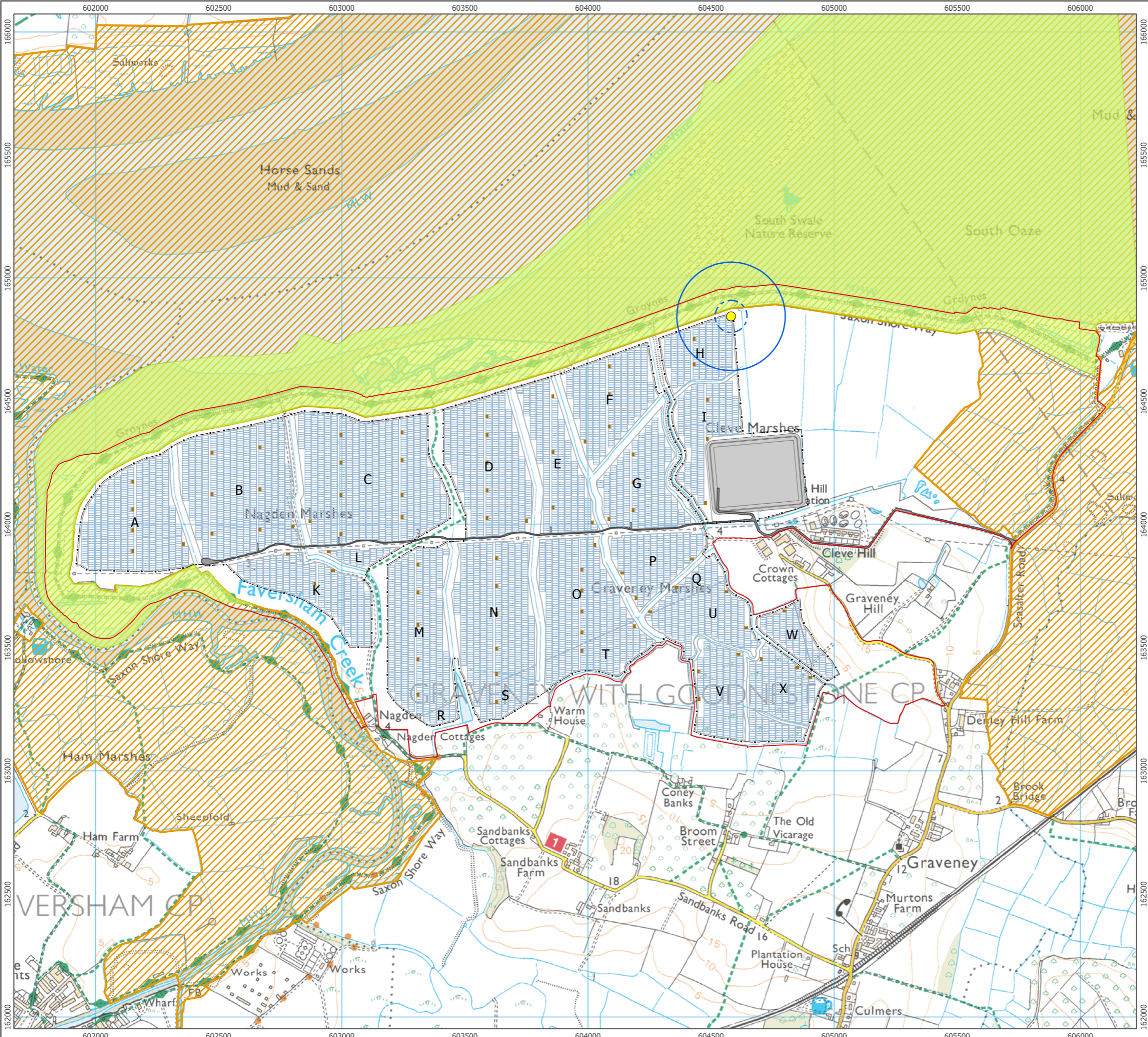
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Checked By: MA	Date: 12/11/2019

Wintering Bird Noise Threshold
Figure 1

**Cleve Hill Solar Park
SPA CNMP**

APPENDIX 2 – BREEDING BIRD NOISE THRESHOLD

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- Site Boundary
- The Swale SPA and Ramsar Site
- South Bank of The Swale LNR
- Piling Location
- Indicative Noise Contours
- Piling Noise (L_{Amax})
- 65 dBA (220 m)
- Other Construction Noise (L_{Aeq})
- 65 dBA (65 m)
- Site Layout
- Transformer
- Solar Panels
- Boundary Fence
- Proposed Compound
- Development Parcel
- Haul Road

1:15,000 Scale @ A3

0 250 500 m

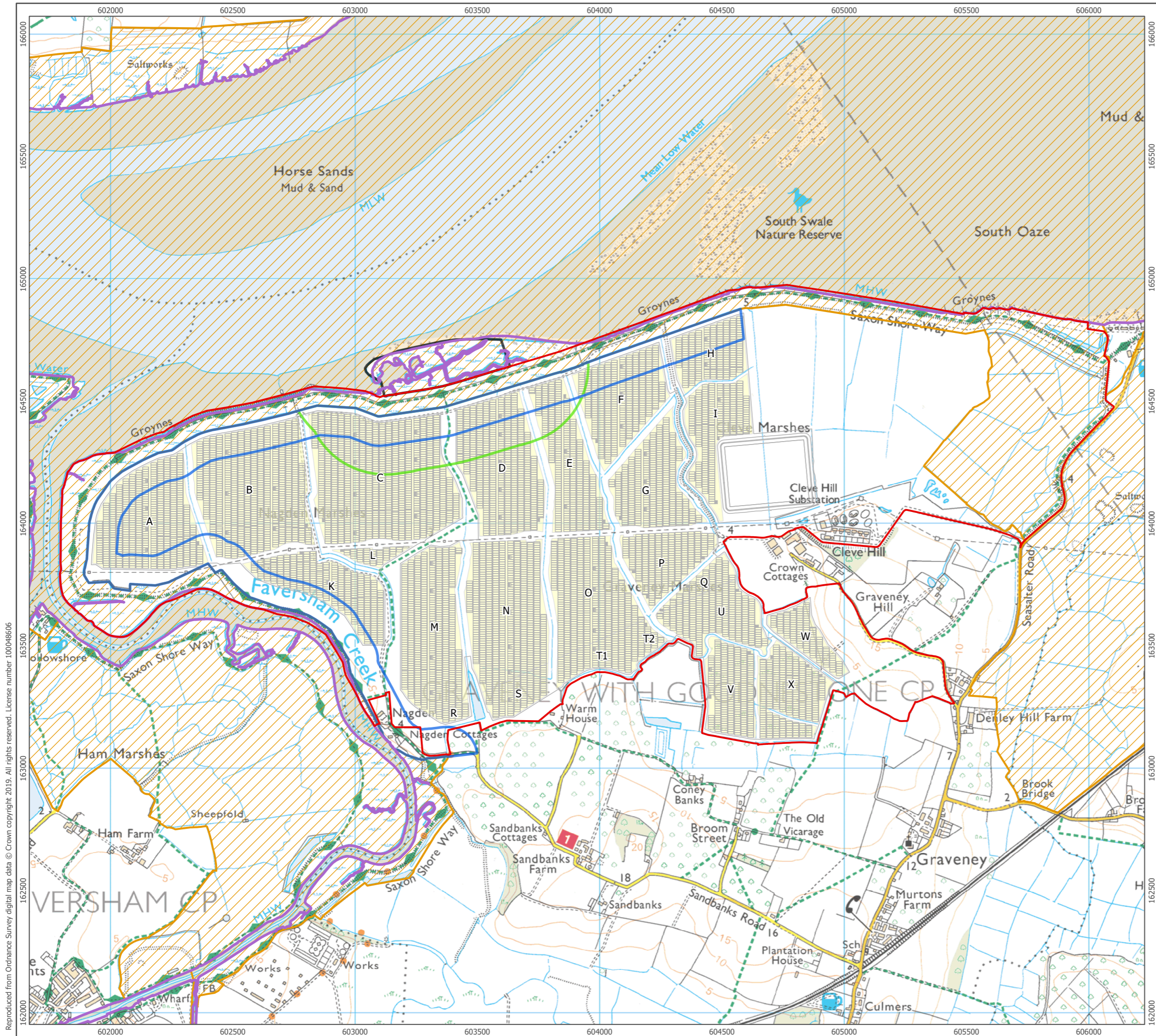
 NORTH









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Breeding Bird Noise Threshold
Figure 2

**Cleve Hill Solar Park
SPA CNMP**

APPENDIX 3 – INDICATIVE SETBACK DISTANCES



-  Site Boundary
-  The Swale SPA and Ramsar Site
-  Site Infrastructure
-  Castle Coote
-  Castle Coote - 55 dB LAmax (320 m)
-  SPA - LAmax (65 dB)
-  Mean High Water Spring
-  Fields

1:15,000 Scale @ A3

 0 250 500 m

 NORTH

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Castle Coote Exclusion
Figure 3

Cleve Hill Solar Park
CNMP