Outer Dowsing Offshore Wind

Environmental Statement

Chapter 26 Noise and Vibration

Volume 3 Appendices

Appendix 26.4 Noise Model Outputs

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Outer Dowsing Offshore Wind Environmental Statement

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Acronyms and Abbreviations

Acronym	Expanded name
AIS	Air Insulated Switchgear
dB	Decibel
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
GIS	Gas Insulated Switchgear
kV	Kilovolts
MDS	Maximum Design Scenario
NSR	Noise Sensitive Receptor
ODOW	Outer Dowsing Offshore Wind
OnSS	Onshore Substation
SWL	Sound Power Lever

Terminology

Term	Definition
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the sensitivity of the receptor, in accordance with defined significance criteria.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Landfall	The location at the land-sea interface where the offshore export cables and fibre optic cables will come ashore.
Maximum Design Scenario	The project design parameters, or a combination of project design parameters that are likely to result in the greatest potential for change in relation to each impact assessed
Mitigation	Mitigation measures are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as ‘residential’ or those using areas for amenity or recreation), watercourses etc.

26.0 Noise Model Outputs

26.1 Onshore Substation Operational

26.1.1 Introduction

1. As part of the Outer Dowsing Offshore Wind (ODOW) Project, it is proposed to construct an Onshore Substation (OnSS).
2. To inform the assessment of noise effects within the Environmental Impact Assessment (EIA) (see Volume 1, Chapter 26: Noise and Vibration (document reference 6.1.26)), noise modelling has been undertaken for the OnSS using the proprietary noise modelling software CadnaA®. The modelling has been undertaken on the basis of the type, quantity and size of plant that is likely to be required at a OnSS of the size in the application. It should, however, be noted that the final design of the OnSS has not been determined and so a maximum design scenario (MDS) has been assessed. In particular, there is the potential for two possible types of technology, being either Air Insulated Switchgear (AIS) or Gas Insulated Switchgear (GIS), to be utilised for the OnSS.
3. In conjunction with the MDS shown in Table 26.32 of Chapter 26 (document reference 6.1.26), the modelling has assumed that the AIS OnSS would be chosen, as this has the potential to generate higher noise levels as the OnSS equipment is not housed within a building. In addition, as set out in the MDS, a layout for an AIS OnSS that does not place substation buildings between noise emitting equipment and Noise Sensitive Receptors (NSR) was utilised in order to undertake a worst-case assessment.

26.1.2 Sound Power Levels and Modelling Protocol

26.1.2.1 Sound Power Levels

4. The operational sound power levels of the plant associated with the OnSS have been provided by the Applicant and are shown in Table 26.1 below.

Table 26.1: OnSS operational plant sound power levels

OnSS Option	Item of Plant	Sound Power Level (SWL), dB	Quantity	Source Height
AIS Switchgear	400/275/33 kV supergrid auto transformer	95	4	5.3
	275 kV harmonic filters	95	4	6.1
	400 kV harmonic filters	95	2	6.25
	275 kV shunt reactor	85	8	4.7
	Emergency Generator	85	1	4.0
	33 kV statcom	75	4	3.5
	Earthing/auxiliary transformer 33/0,4 kV	65	4	4.0
	275 kV voltage transformer	40	16	2.4
	400 kV voltage transformer	40	2	3.5

26.1.2.2 Modelling Protocol

5. The modelling has been undertaken based on the following set of assumptions:
    - All the plant is operating simultaneously 100% of the time;
    - All sources modelled as point sources at the centre of each source footprint and height, e.g. a 275kV shunt reactor compound measuring 14m x 11.6m, with plant of heights up to 9.4m, would be modelled at a height of 4.7m in the centre of the compound;
    - The attenuation provided by the 7m high fire walls located between the shunt reactors and either side of the supergrid auto transformers.
    - As no 1/3 octave band data all predictions have been undertaken in the 500Hz frequency band;
    - G = 0 hard ground within the OnSS footprint;
    - G = 0.9 soft ground between the OnSS footprint and each receptor;
    - A daytime receiver height of 1.5m and a night-time receiver height of 4m, approximate height of a ground floor and first floor window respectively at all the Noise Sensitive Receptors (NSRs) considered; and
    - A reflection factor of 3.
6. The following meteorological inputs have also been used:
    - Downwind propagation between the OnSS and the receiver (NSRs);
    - Relative Humidity = 70%; and
    - Air Temperature = 10^{o}c.

26.2 Nearest Noise Sensitive Receptors (NSRs)

7. The NSRs considered within the model are described in Table 26.2 below.

Table 26.2: Noise Sensitive Receptor Locations

Location ID	Description	OS Grid Ref	
OnSS001	At a location representative of the residential property to the southwest of the substation zone.	527833	330478
OnSS002	At a location representative of the residential property to the southeast of the substation zone.	528613	330820
OnSS003	At a location representative of the residential property to the west of the substation zone.	527374	331328
OnSS004	At a location representative of the residential property to the north of the substation zone.	528486	332442

26.3 Model Outputs

8. As described in Table 26.67 in Volume 1, Chapter 26: Noise and Vibration, mitigation is proposed for the OnSS. This comprises a 10dB reduction in sound power levels to the 400/275/33kV supergrid auto transformers, 275kV harmonic filters, and 400kV harmonic filters.

9. The noise model outputs of the unmitigated and mitigated OnSS are presented in Plate 26.1 and Plate 26.2 respectively. The grids are set at 4m height, showing the specific sound levels for a first-floor receptor.

Plate 26.1: Unmitigated OnSS sound levels

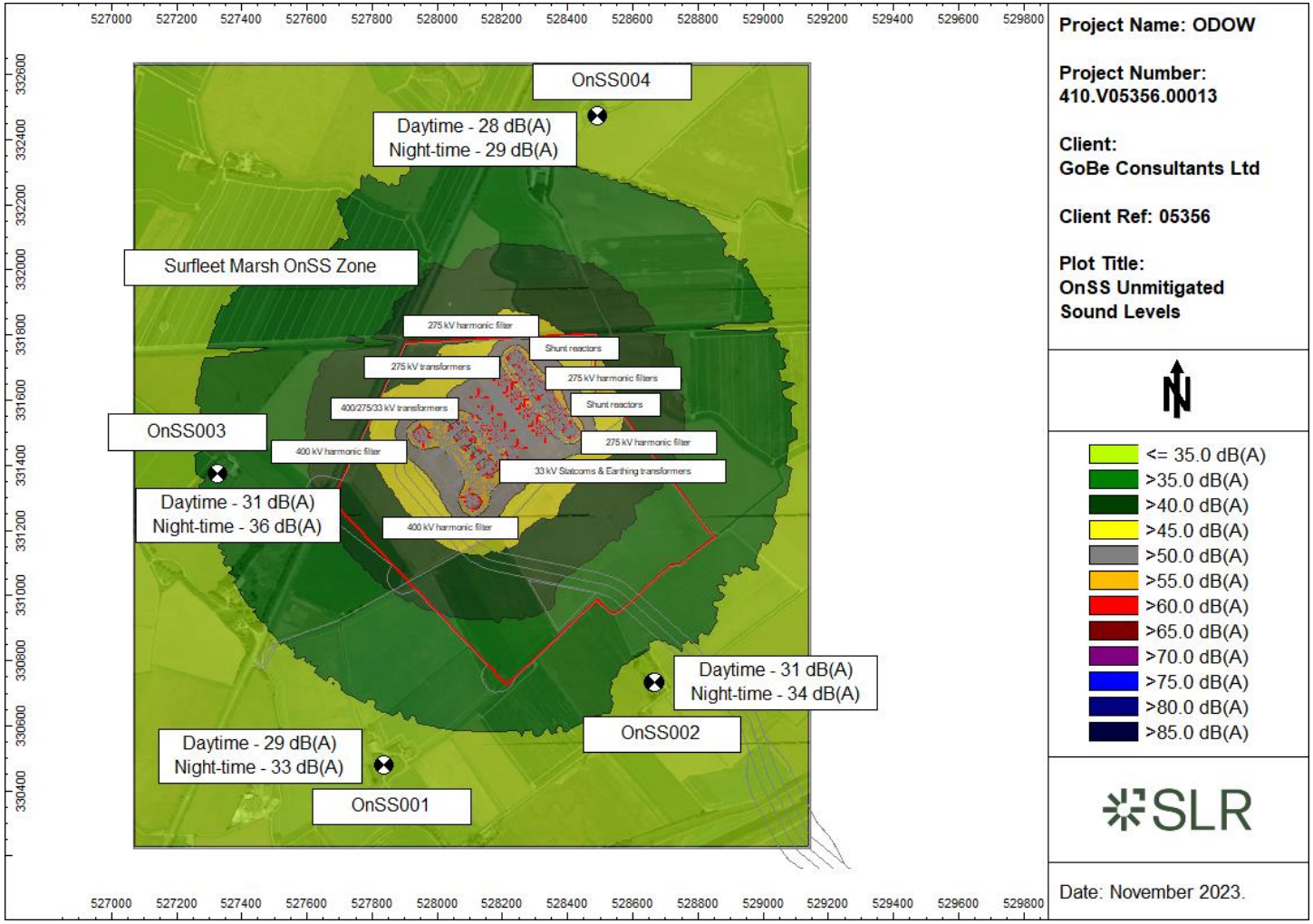
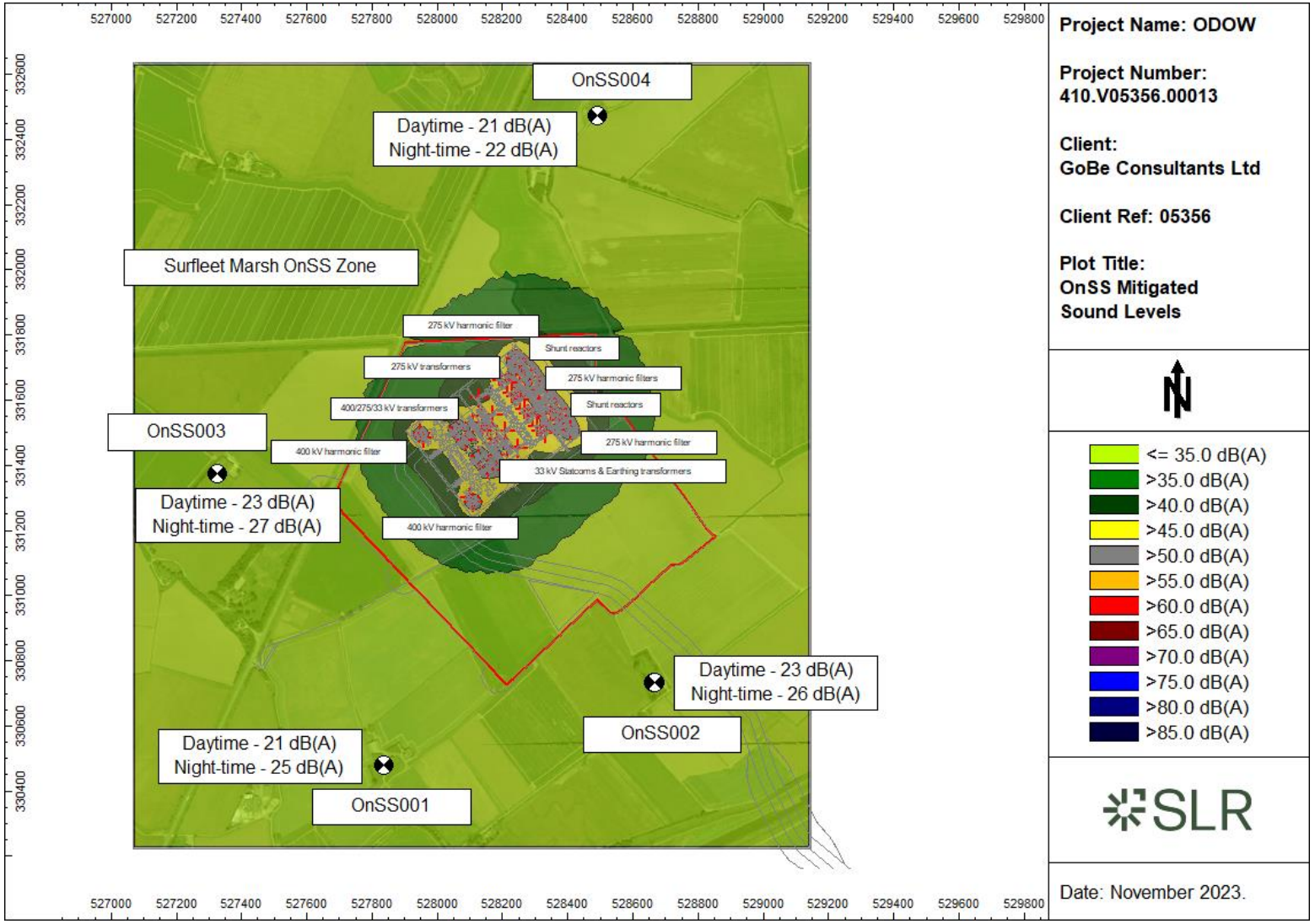


Plate 26.2: Mitigated OnSS sound levels

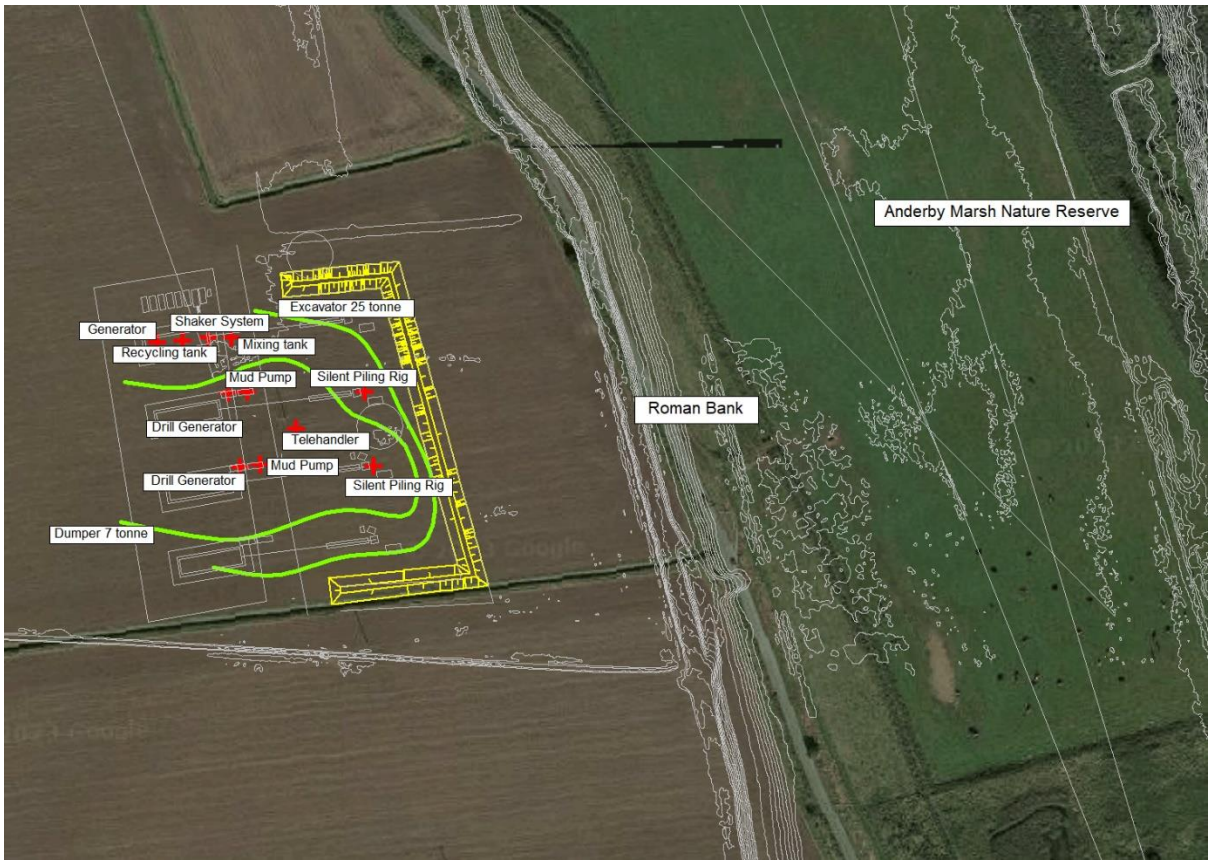


26.4 Landfall Construction Noise Model Outputs

26.4.1 Introduction

10. The offshore cables will be brought ashore at the Landfall site located at Wolla Bank, south of Anderby Creek, north of the Wolla Bank Beach car park.
11. As described in Chapter 26 (document reference 6.1.26), noise modelling has been undertaken to determine the noise levels from Landfall construction at Anderby Nature Reserve and the nearest human receptors from construction at the Landfall site. The layout of the plant modelled is shown in Plate 26.3 below.

Plate 26.3: Modelled Landfall Layout



26.4.2 Sound Power Levels and Modelling Protocol

26.4.2.1 Sound Power Levels

12. The sound power levels of the plant used in the model are shown in below.

Table 26.3: Landfall construction plant sound power levels

Vehicle / Equipment	Sound Power Level, dB(A)	Indicative Number	Estimated Percentage of Operation During Activity or Movements in hour	Resultant Sound Power Level, dB(A)	Sound Power Level of Maximum Event, dB(A)
Generator	102	1	100	102	102
Telehandler	107	1	75 (daytime only)	106	117
Silent Piling Rig	97	2	10 (daytime only)	87 (per rig)	97
Directional Drill Generator	105	2	100	105 (per generator)	105
Excavator (25 tonne)	105	1	10 movements in an hour (daytime only)	-	116
Small Dump Truck	104	1	10 movements in an hour (daytime only)	-	117
Mud Pump	108	2	100	108 (per pump)	108
Mixing Tank	103	1	100	103	103
Shaker System	98	1	100	98	98
Cuttings / Recycling Tank	108	1	100 (daytime only)	108	108

26.4.2.2 Modelling Protocol

13. The modelling has been undertaken with the following assumptions:

- As there is limited published data regarding the maximum (LAmax) noise levels from plant; these have been based on the following assumptions;
    - All static plant (i.e., generators, pumps, mixer tanks, shaker system) maximum noise levels are equal to sound power levels as these are constant noise sources without any significant variations;
    - All mobile plant (i.e., telehandler, dumper, excavator) maximum noise levels derived from maximum pass-by levels contained in BS 5228;
    - All maximum levels from mobile plant modelled as point sources at a worst-case approach to the Anderby Marsh Nature Reserve to the east of the Site;
    - Piling operations - it is understood that silent piling methods (i.e. no hammer impact or vibration) will be utilised, therefore it has been assumed that the maximum noise levels are equal to the sound power levels; and
    - The maximum noise levels from all plant assume a 100% on-time.
- Attenuation provided by the 4m high earth bund located on the eastern boundary of the landfall construction area.
- All sources at height of 2m above ground level.

- For human receptors, a receptor height during the daytime of 1.5m, representative of a ground floor window, and 4m during the night-time, representative of a first-floor window.
- A receptor height of and 0.5m for ecological receptors.
- An average ground absorbency factor of 0.8 between the sources and the receivers.
- Relevant topographical data.
- Downwind propagation between the source and the receivers; and
- 70% humidity and an average temperature of 10°C

26.4.3 Model Outputs

14. The noise model outputs of the landfall for ecological and human receptors are presented in Plate 26.4, Plate 26.5, Plate 26.6 and Plate 26.7. For the ecological receptors noise model outputs for both the predicted $L_{Aeq, 1hr}$ and L_{Amax} levels have been produced.
15. The grid is set at 0.5 m height for the ecological receptors, representative of breeding birds, 1.5m for human receptors during the daytime, representative of a ground-floor window, and 4m for human receptors during the night-time, representative of a first-floor window.

Plate 26.4: Landfall Noise Levels – Ecological Receptors – $L_{Aeq, 1hr}$

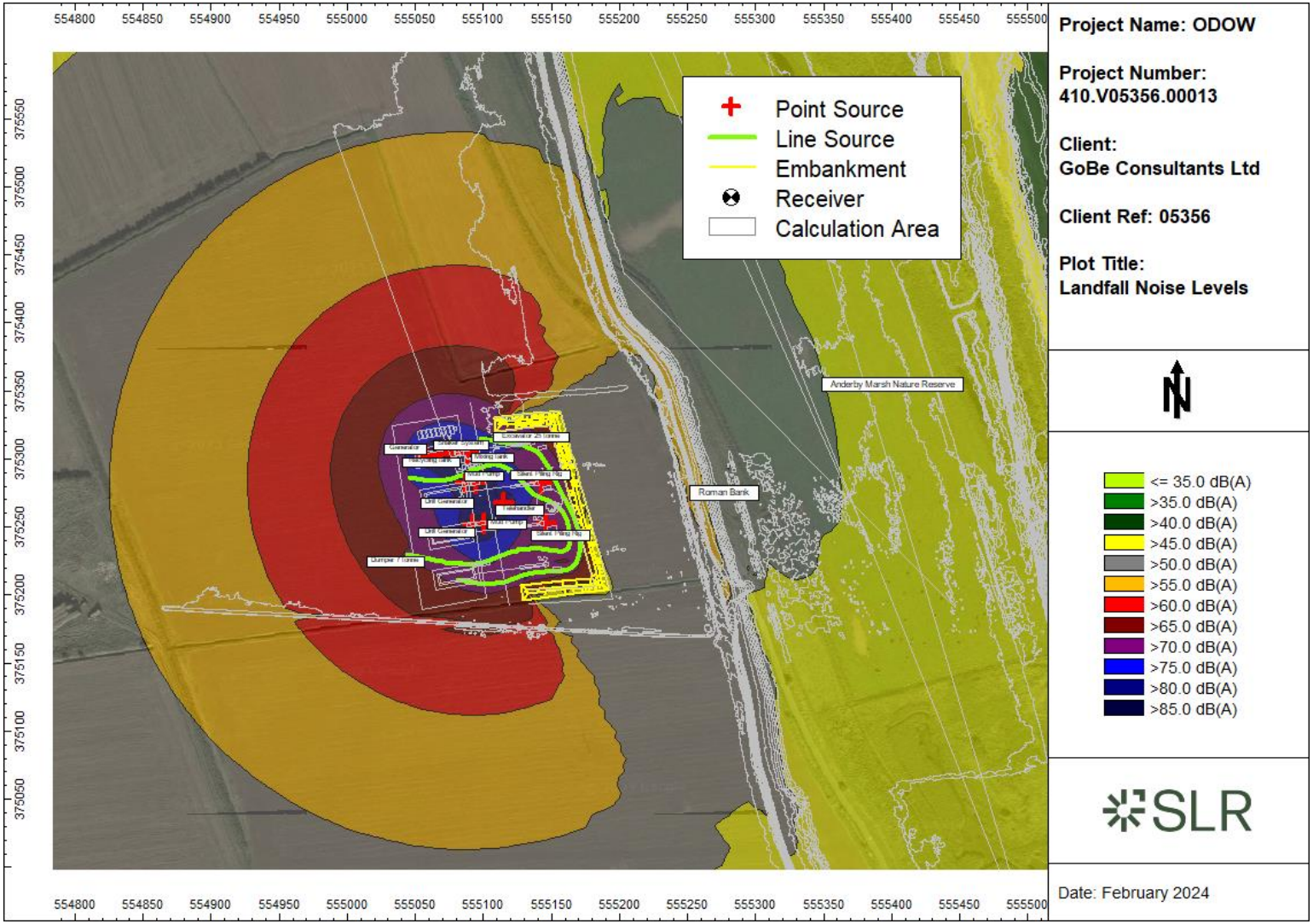


Plate 26.5: Landfall Noise Levels – Ecological Receptors – L_{Amax}

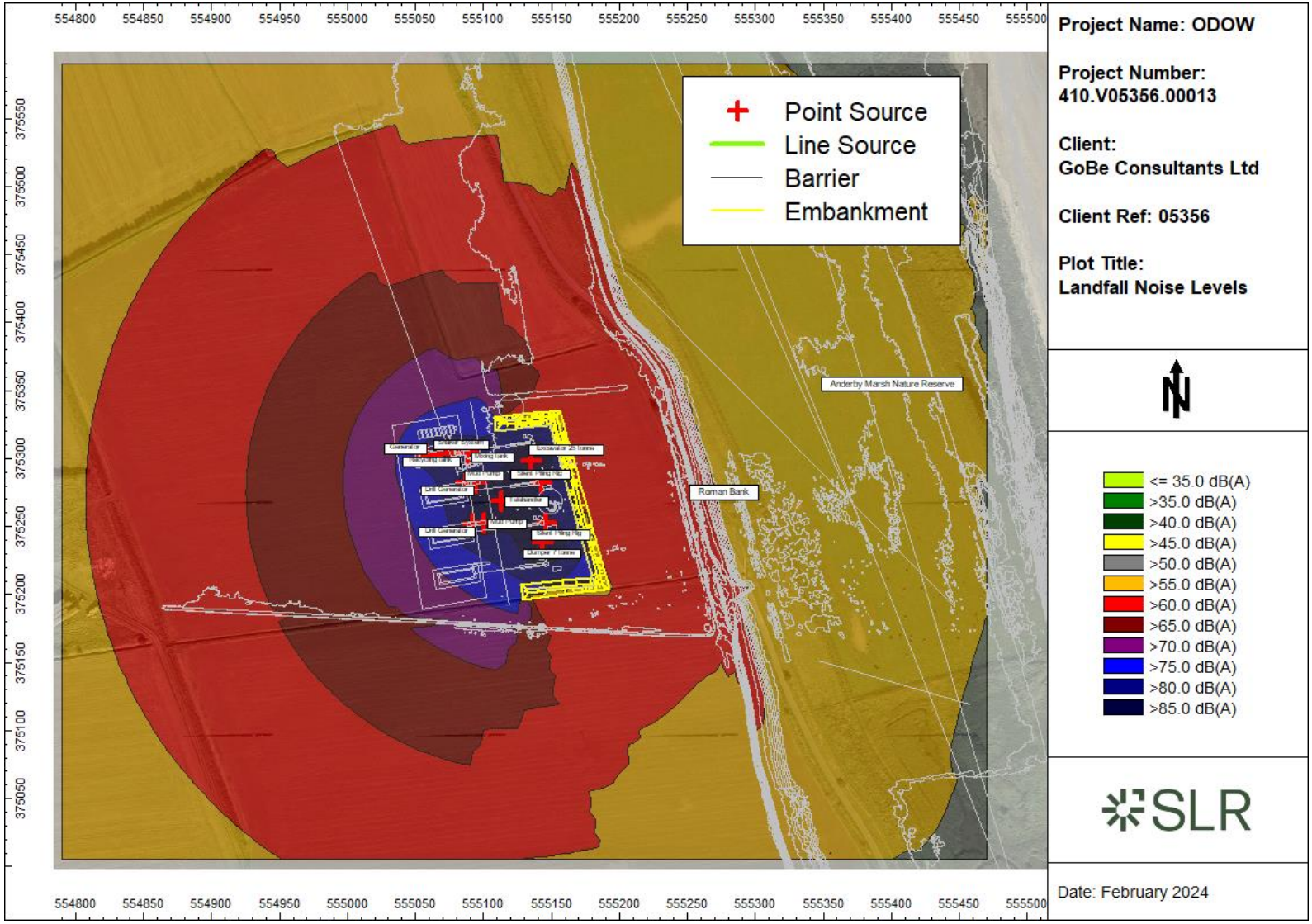


Plate 26.6: Landfall Noise Levels - Human Receptors - Daytime

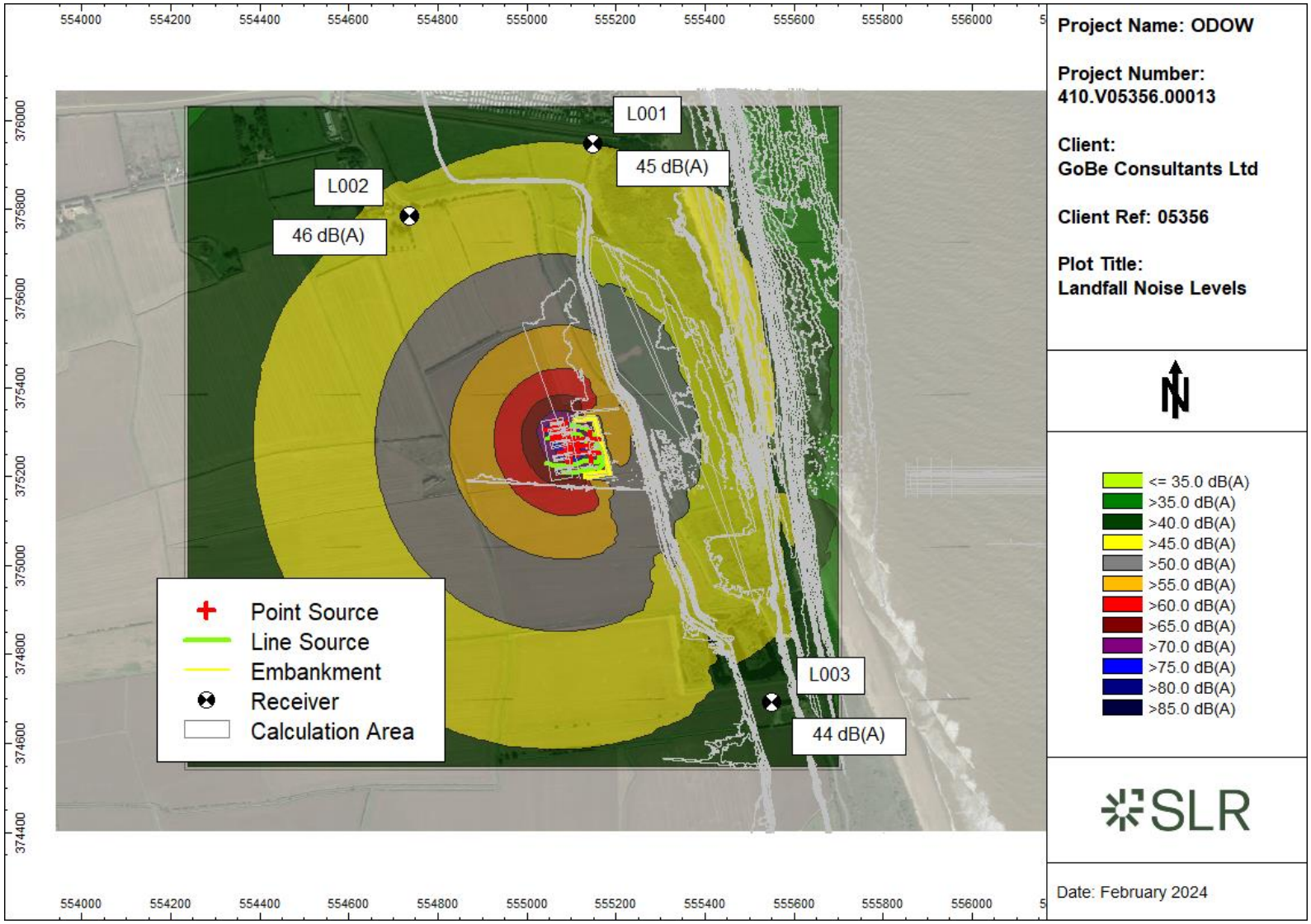
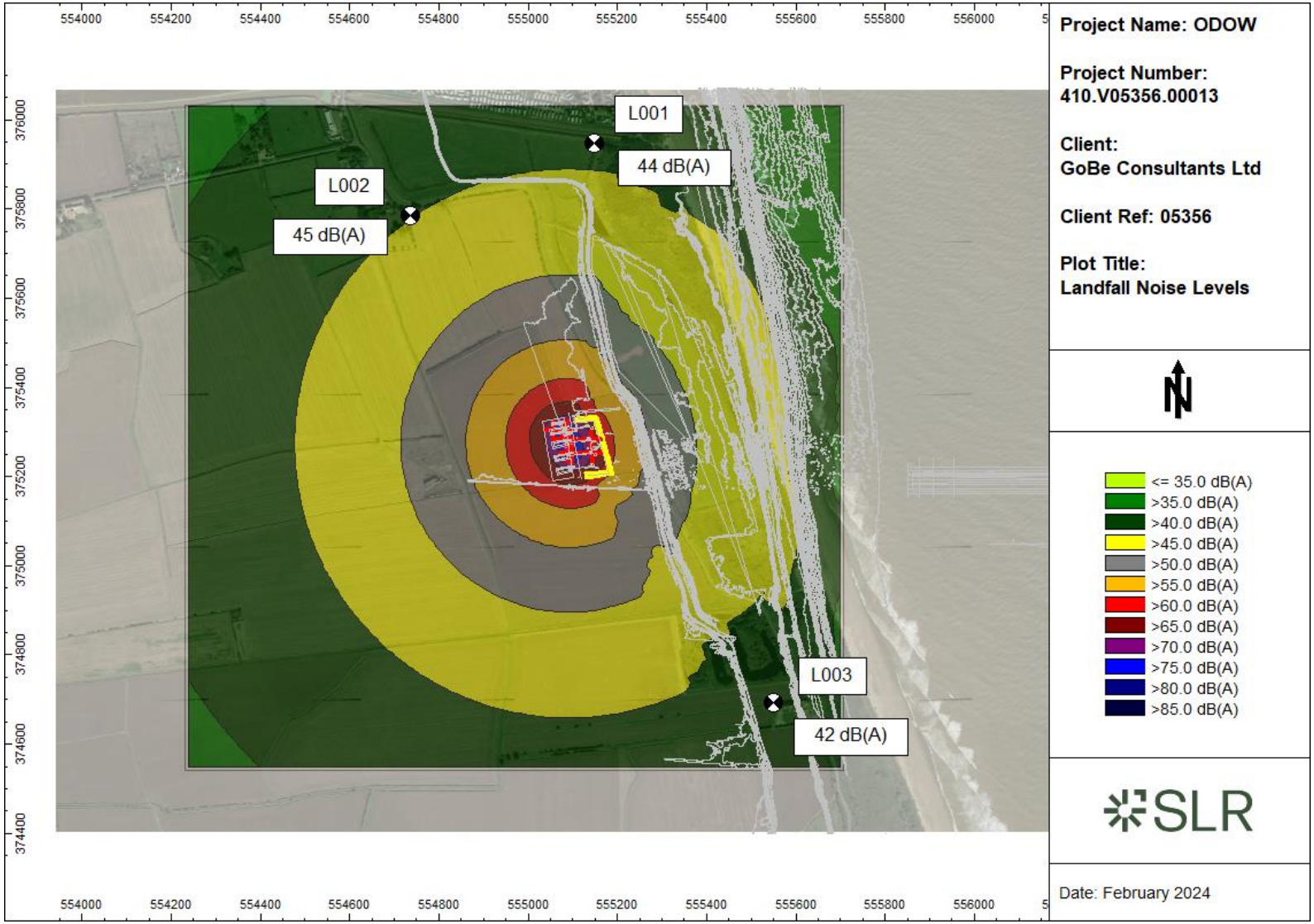
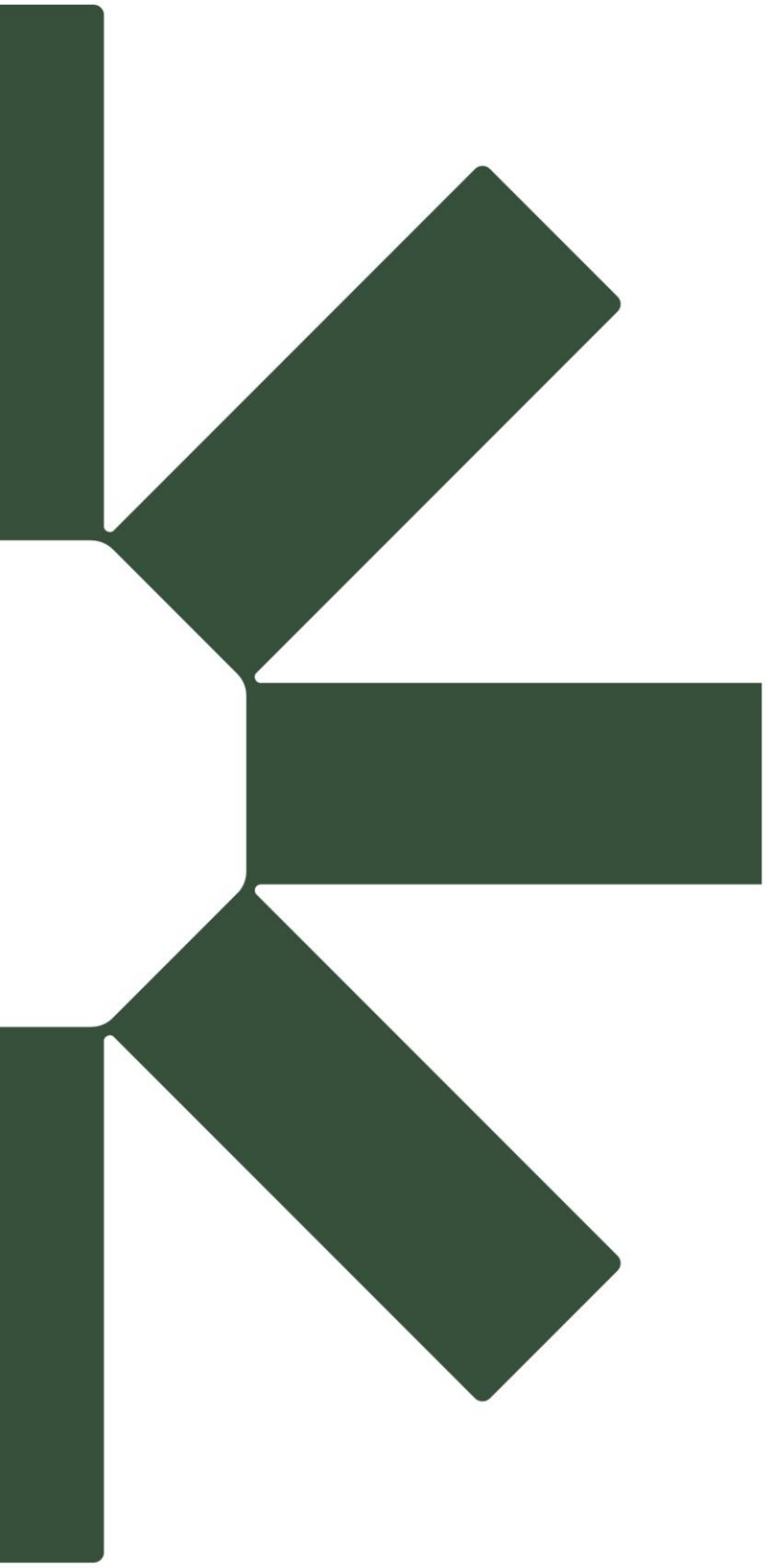


Plate 26.7: Landfall Noise Levels - Human Receptors – Night-Time





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