



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project **FORTH REPLACEMENT CROSSING**

Document title

CONSTRUCTION NOISE MONITORING REPORT: DECEMBER 2015

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1 Introduction

- 1.1** Monitoring of construction noise is being undertaken by FCBC during the construction of the new Forth Crossing and the associated road network. This report covers the month of December 2015. The objective of this report is to detail the monitoring that was undertaken across the site during this reporting period and to present the construction noise monitoring results.
- 1.2** Monitoring of construction noise has been undertaken in accordance with the Code of Construction Practice (CoCP) and the Noise and Vibration Management Plan (NVMP).

2 Noise Monitoring Locations

- 2.1 During December 2015, construction noise was monitored using permanent, continuous noise monitoring devices (01db DUOs) at locations listed in **Table 1**. These monitors were installed during November and December 2011, with additional monitors installed at Scotstoun Park (Arup's Office) and Newton during March 2012, a further sound level meter was installed at Whinny Hill during April 2012.
- 2.2 Weather stations accompany the noise monitors at Echline Field, Tigh-Na-Grian, Clufflat Brae, Dundas Home Farm, Butlaw Fisheries, Linn Mill and Whinny Hill.
- 2.3 Various construction works were undertaken across the site during December 2015. **Table 1** outlines the main construction activities in the location of each monitor.

Table 1: Monitoring Locations

Ref.	Monitoring Location	Crossing or Network	Main Construction Activities During December 2015
M1	Whinny Hill	Network	<ul style="list-style-type: none"> • Earth Works/Fill Placement • New Ferrytoll Road • FT03 & FT04 Bridge Works • FT09 Works • FT19 Works • Roadworks
M3	Tigh-Na-Grian	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works, deck lifting & stay cable installation works • North Tower rebar, formwork, concreting works, deck lifting and stay cable installation works • Pier N1 rebar formwork & concrete works • AVN works • North Tower deck section lifts and stay cable installation
M6	Port Edgar	• Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works • South Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works. • Pier S2 rebar, formwork & concrete works • Pier S1 rebar, formwork & concrete works
M7	Butlaw Fisheries	Crossing	<ul style="list-style-type: none"> • Pier S1, rebar, formwork & concrete works • Pier S2 rebar, formwork and concrete work • Central Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works • South Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works
M10	Inchgarvie Lodge	Crossing	<ul style="list-style-type: none"> • AVS ,Scaffolding,shuttering and reinforcement to deck • Pier S1, rebar, formwork & concrete works. • Central Tower rebar, formwork, concreting works ,deck section lifts and stay cable installation works. • South Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works. • South Tower Deck Section Lifts • Main carriageway earthworks
M11	Linn Mill	Network (close proximity to Crossing)	<ul style="list-style-type: none"> • AVS scaffolding, shuttering and reinforcement to deck • No night time or Sunday construction in the vicinity • Main carriageway earthworks

M13	Clufflat Brae	Crossing / Network	<ul style="list-style-type: none"> • AVS scaffolding, shuttering and reinforcement to deck • No night time or Sunday construction in the vicinity • Main carriageway earthworks
M14	Springfield	Network	<ul style="list-style-type: none"> • AVS scaffolding, shuttering and reinforcement to deck • No night time or Sunday construction in the vicinity • Main carriageway earthworks
M15	Echline	Network	<ul style="list-style-type: none"> • AVS scaffolding, shuttering and reinforcement to deck • No night time or Sunday construction in the vicinity • Main carriageway earthworks
M16	Scotstoun	Network	<ul style="list-style-type: none"> • Footpath works • Utility works • B800 Piling works • B800 North road works including bridge works (these works are directly in the location of the meter which now sits within the construction boundary). • SB bus link
M17	Dundas Home Farm	Network	<ul style="list-style-type: none"> • Utility works • B800 piling works • B800 South road works including bridge works etc... • Main carriageway works • SB bus link
M18	Newton	Network	<ul style="list-style-type: none"> • No works

3 Noise Monitoring Results

Overview

3.1 Noise monitoring results are presented in graphs (**Appendix A**) using the template provided in the *Construction Noise Monitoring Information Note* (www.transportscotland.gov.uk).

3.2 With regard to the noise monitoring graphs, the following should be noted:

- All locations are considered as either 'Main Crossing' or 'Network Connections', as set out in **Table 1**.
- Main Crossing works are undertaken during the day, evening and night time periods. Network connection works are undertaken during the daytime only.
- Linn Mill is considered as a network location which has the potential to receive noise from the marine works near the south shore. As a result, evening and night time data has been included for this location.
- Noise data for day, evening and night on which no construction works were conducted have been excluded from the monthly average results presented in the graph. L_{AFmax} exceedances during these periods would have been caused by non-construction related factors and do not require investigation. Noise results (L_{Aeq} and L_{AFmax}) for any day, evening and night on which no construction works have been conducted have been presented in the graphs in greyed out areas.
- An average for Sunday construction noise data has been included where applicable; in locations where no Sunday works were conducted no average is shown.
- As set out in the CoCP, the assessment time for evening, nights and Sunday daytime is in one hour periods. To present the construction noise results for these periods, therefore, the maximum L_{AFmax} (fast time response) and maximum L_{Aeq} within the overall evening/night time period has been taken. It should be noted, therefore, that the average shown for these periods is an average of only the highest L_{Aeq} results.
- It has been indicated on the graphs, where noise data is missing for day, evening or night-time, during which construction works were conducted. Results for the North leg were unavailable during this reported period due to the monitor being calibrated.

Results

- 3.3** Results demonstrate that the monthly average total of construction noise results for daytime are within the threshold levels for all monitoring locations during December 2015. For evening and night time periods, there were no exceedances of monthly average noise during December, with the exception of Butlaw and Clufflat during the night-time period. There are no exceedances of Sunday averages, with the exception of Butlaw during the night.
- 3.4** Most exceedances noted are not thought to have been caused by increased noise levels due to construction. Each exceedance was found to be affected by increased noise levels due to periods of adverse weather, traffic, residential noise or bird noise. Audio demonstrates that the increased levels were caused by waves and birds at Butlaw Fisheries, birds and resident activity at Inchgarvie and birds at Tigh-na-Grian. With regard to the averages reported for evening and night-time periods, it should be noted that these averages are based only on the highest L_{Aeq} levels for 1 hour periods which can affect the averages.
- 3.5** During this month, some exceedances of the maximum noise thresholds occurred. Each exceedance of the threshold was investigated using triggered audio recordings, records of construction works (i.e. site programmes and diaries and daily marine reports) and analysis of weather station data, where required for these investigations. A Noise and Vibration Investigative Report (NVIR) spread sheet has been produced detailing the results of the investigation for each construction exceedance. There were some exceedances this month that were due to construction work (See 3.7).
- 3.6** During the month of December it was noted that there was construction related noise at Linn Mill. The L_{AFmax} exceedances on the 1st, 3rd, 7th, 8th, 9th, 10th, 12th, 14th, 15th, 16th and 17th December during the day seemed to be coming from the Scaffold/Timber storage area which is near the noise monitor. The Environmental team have contacted the relevant site agent and asked that staff be reminded to keep noise to a minimum, the environmental team will continue to monitor the situation closely.
- 3.7** The majority of exceedances at all locations were caused by various noise sources, such as traffic, residential noise and birds. At some locations, notably Scotstoun and Echline, existing traffic noise had an effect on maximum noise levels during the period covered in this report. Butlaw Fisheries also records a high number of waves against the shore. Ongoing residential building works at Inchgarvie Lodge accounts for the majority of the exceedances at this location.
- 3.8** A summary of the findings for exceedances occurring at each of the locations can be found in Table 2.

Table 2: Summary of Exceedances at Monitoring Locations

Monitoring Location	Summary of Exceedance Details
Butlaw Fisheries	During December the maximum noise threshold was exceeded on 25 occasions (5 day time, 4 evening and 16 night time). Exceedances were attributed to non-construction factors notably birds, traffic, waves and wind.
Clufflat Brae	During December the maximum noise threshold was exceeded on 42 occasions (13 daytime, 9 evening and 20 night time). No exceedances were attributed to construction works. Exceedances were found to be due to birds, residential activity, planes and high winds.
Inchgarvie Lodge	During December the maximum noise threshold was exceeded on 39 occasions (12 day time, 8 evening and 19 night time). No exceedances were attributed to construction works. High winds were found to be the main contributing factors to the exceedances in this location. Other factors included vehicle movements.
Linn Mill	During December the maximum noise threshold was exceeded on 39 occasions (18 daytime, 6 evening and 15 night time). The majority of exceedances at this location were due to birds, residents and wind. There were 11 instances of construction noise exceeding the threshold (see 3.7)
Tigh-Na-Grian	During December the maximum noise threshold was exceeded on 36 occasions (12 daytime, 2 evening and 22 night time). Exceedances were mainly due to birds and wind
Dundas Home Farm	During December the maximum noise threshold was exceeded on 11 occasions. The main exceedances were due to residents and birds.
Echline	During December the maximum noise threshold was exceeded on 19 occasions. No exceedances at this location were due to construction activities. Most exceedances were attributed to vehicles passing by on the adjacent roads, wind and fireworks.
Springfield	During December the maximum noise threshold was exceeded on 11 occasions. These exceedances were due to local residents as well as birds and wind.
Scotstoun	During December the maximum noise threshold was exceeded on 20 occasions. The majority of exceedances were attributed to vehicles passing (including Sundays) on the adjacent road.
Whinny Hill	During December the maximum noise threshold was exceeded on 14 occasions. No exceedances at this location were due to construction activities.. Mostly, exceedances were due to birds, residents and wind.
Port Edgar	Recordings taken for data record purposes
Newton	Recordings taken for data record purposes



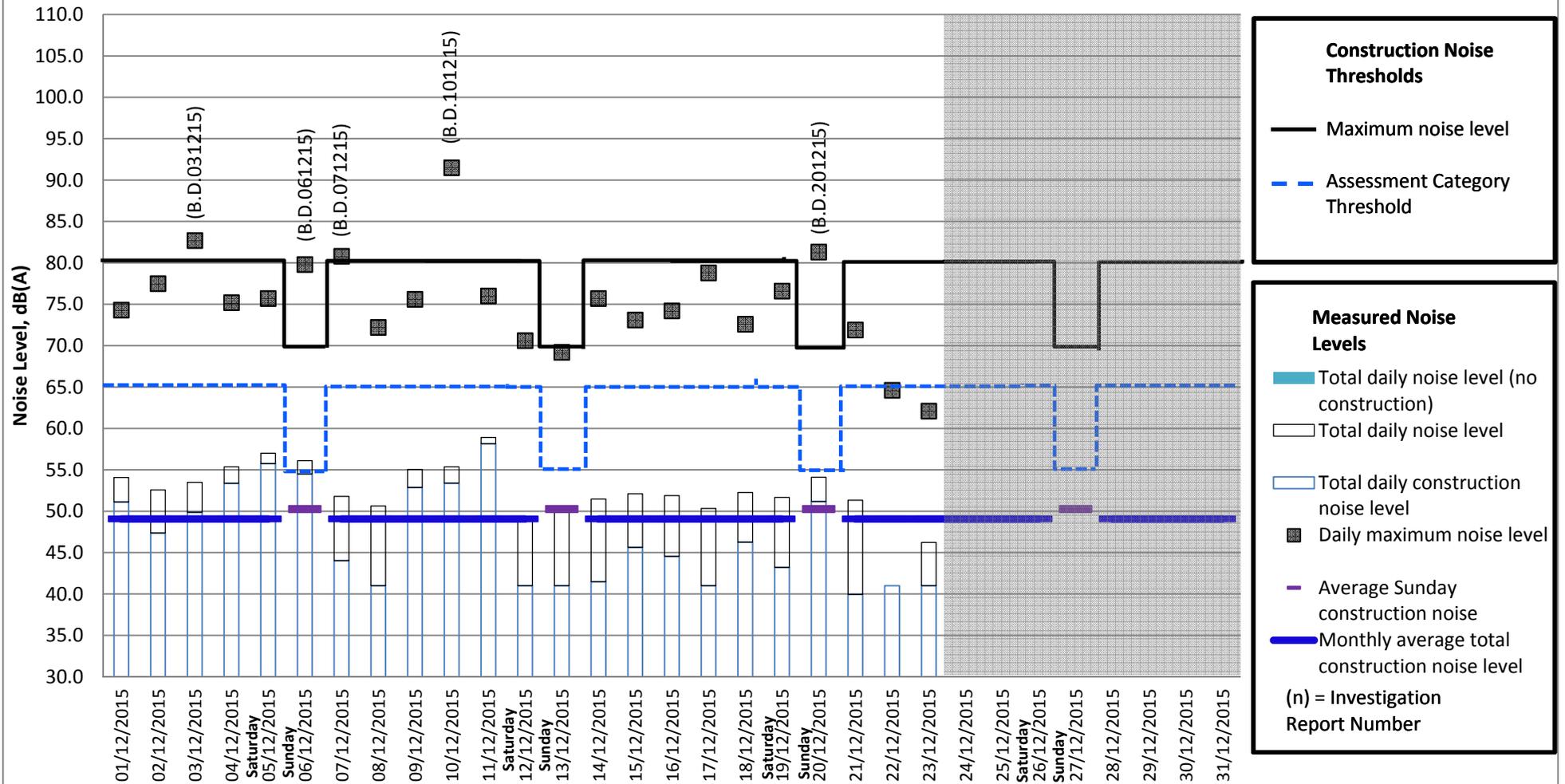
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APPENDIX A

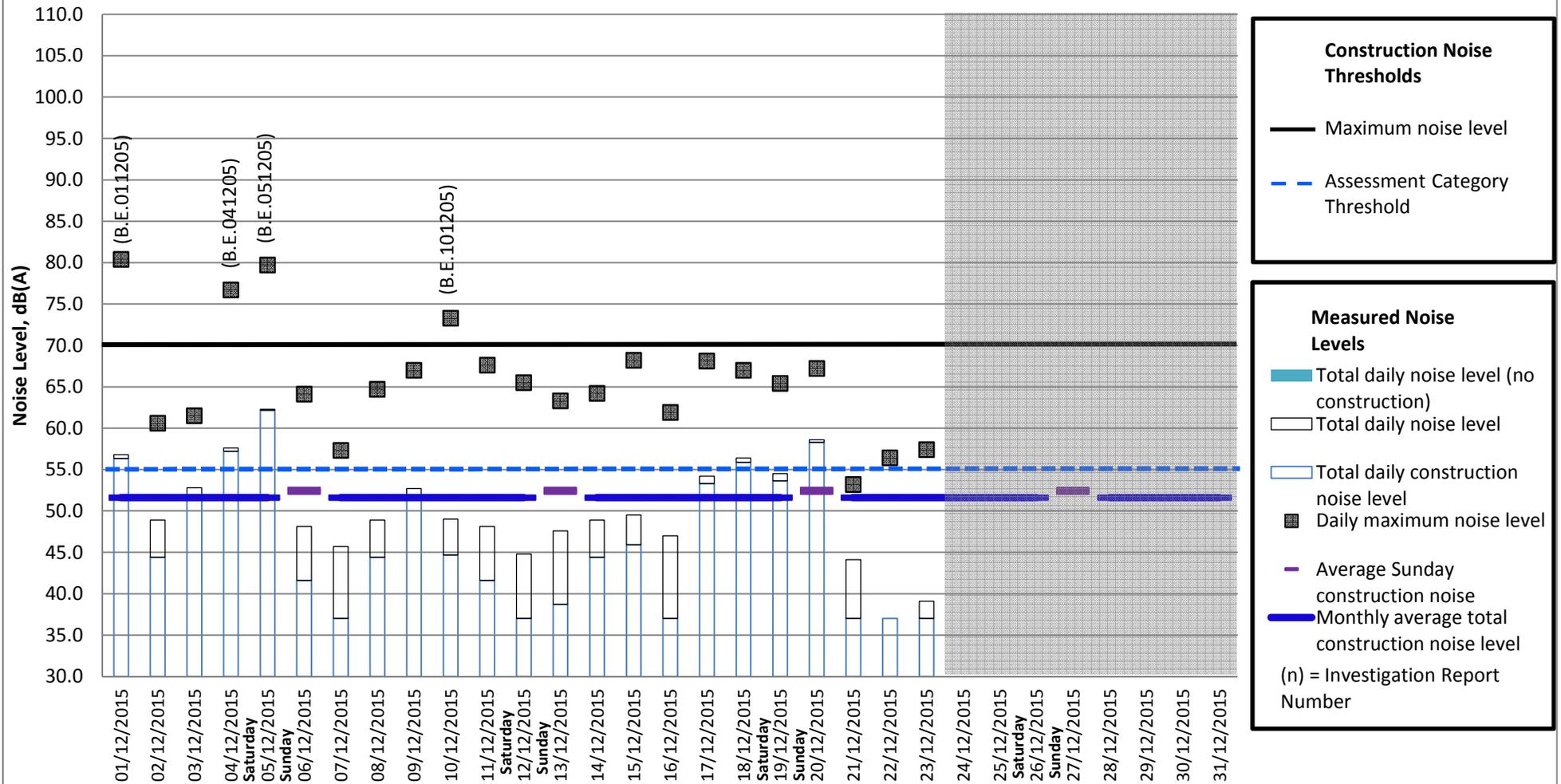
Measured Daytime Noise Levels at Butlaw Fisheries

Measurement period: December 2015



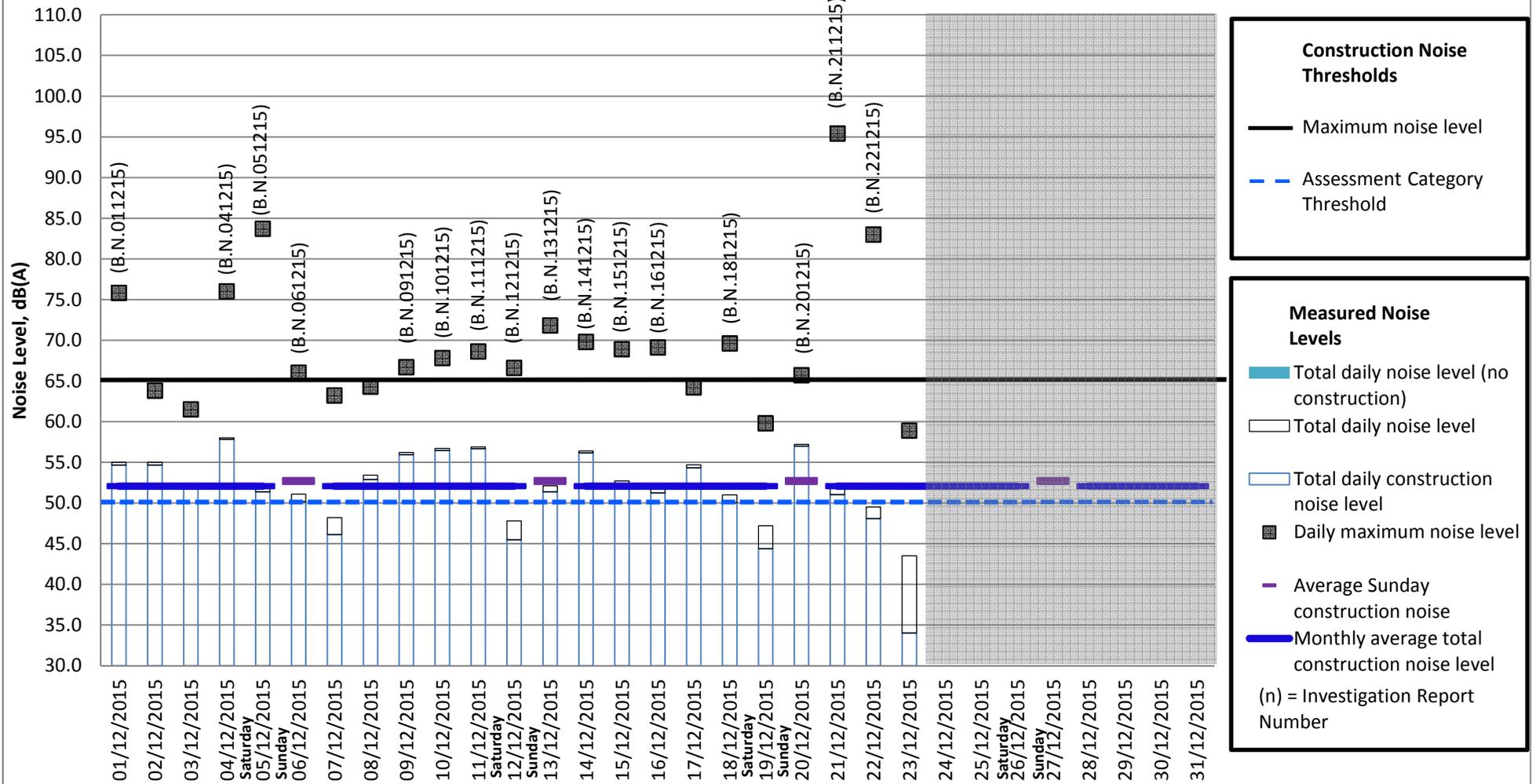
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Evening Noise Levels at Butlaw Fisheries Measurement period: December 2015



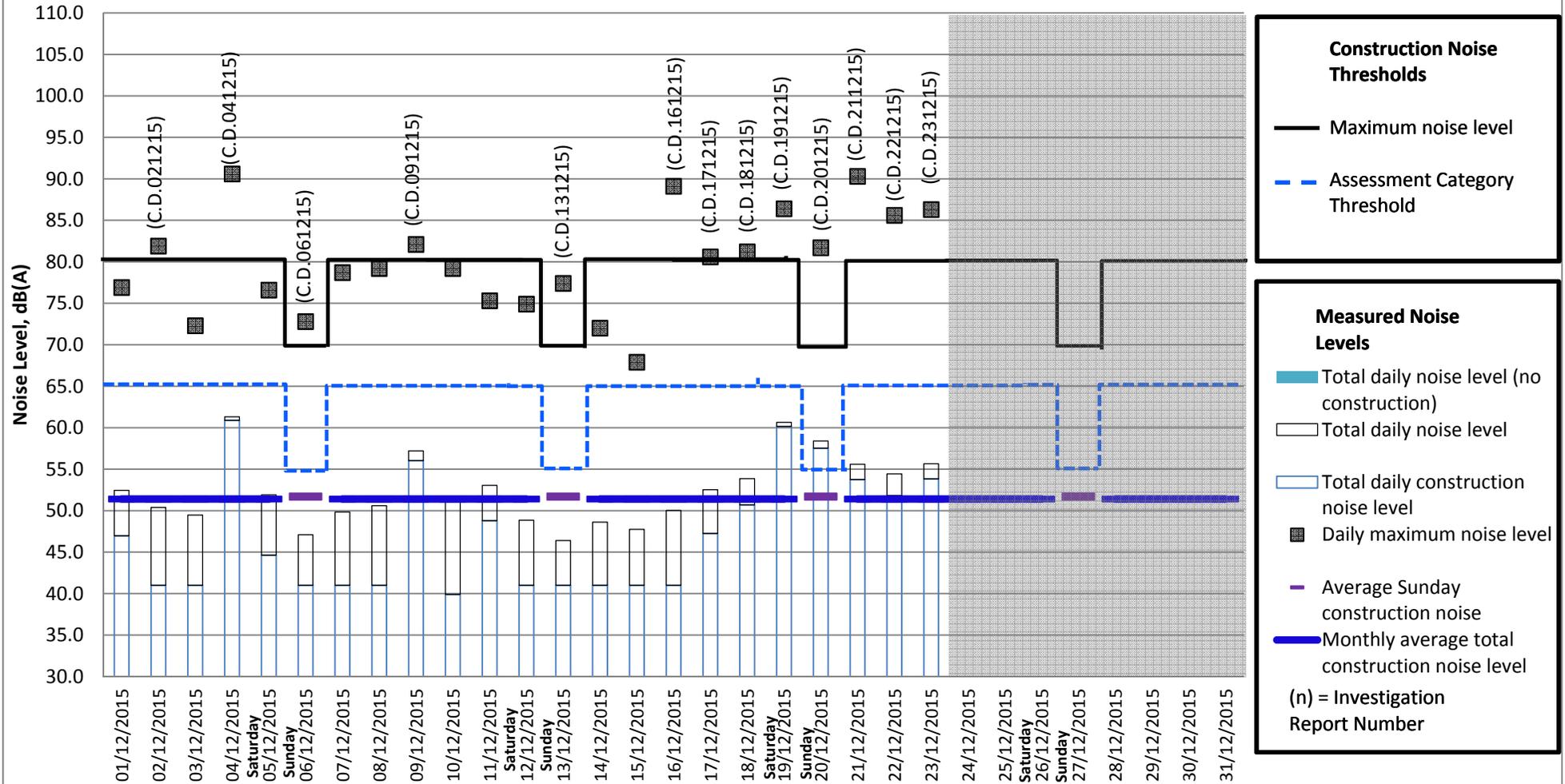
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16). After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' on the 5th December was caused by wind

Measured Night time Noise Levels at Butlaw Fisheries Measurement period: December 2015



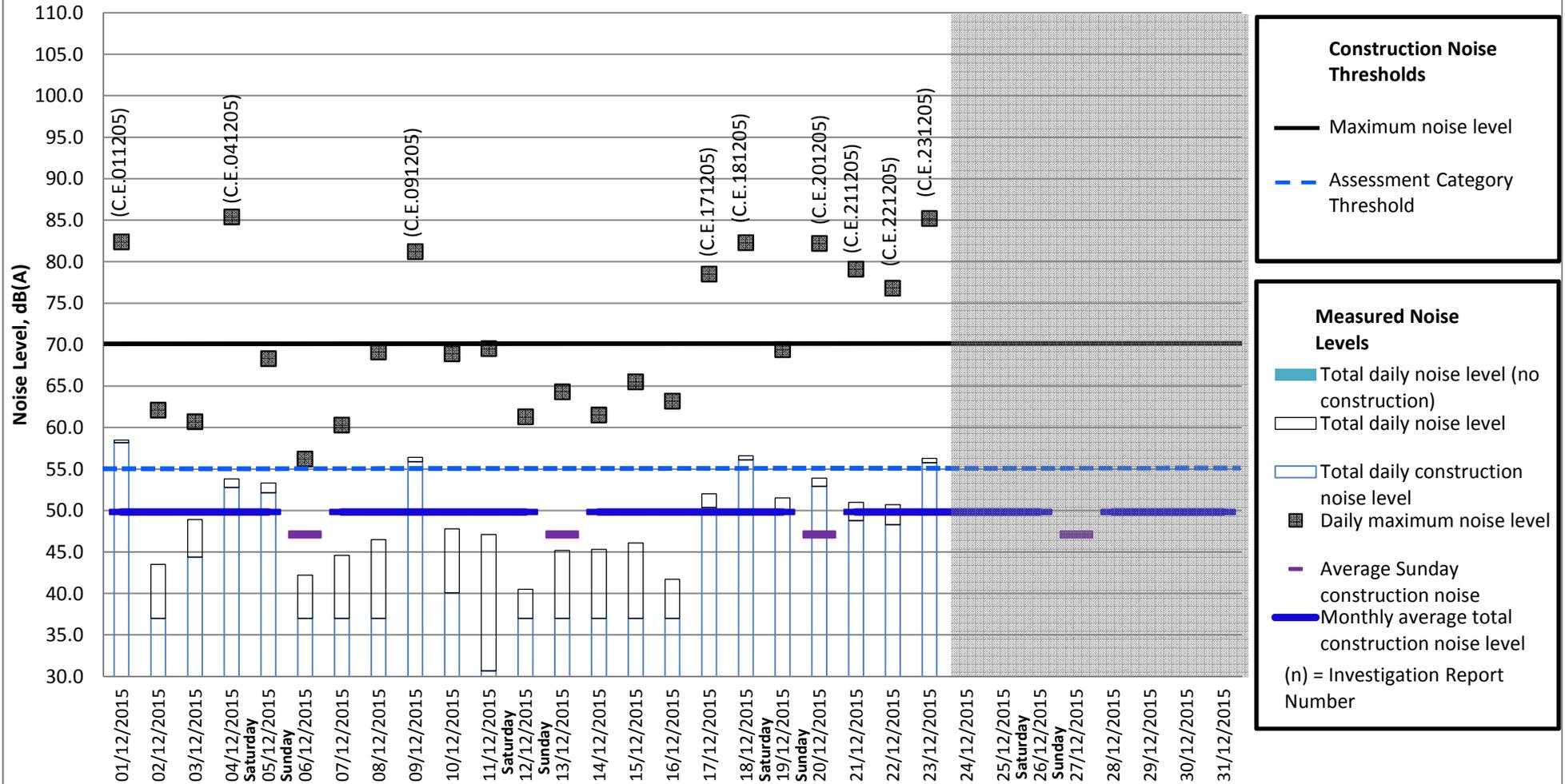
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16). After investigation, it was concluded that the exceedances of the LAeq 'Total Daily Construction' through the month were caused by wind and waves.

Measured Daytime Noise Levels at Clufflat Measurement period: December 2015



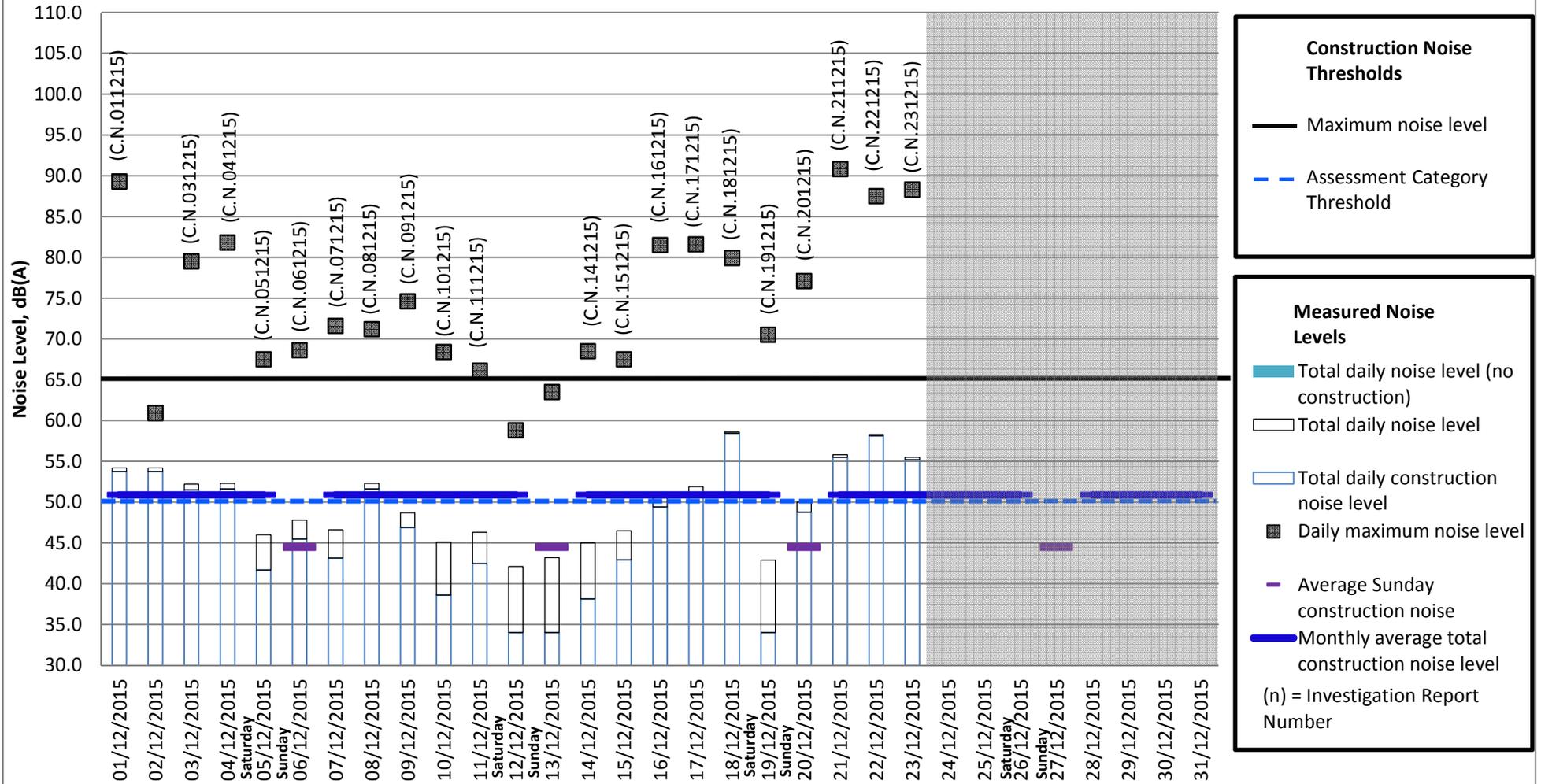
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16)

Measured Evening Noise Levels at Clufflat Measurement period: December 2015



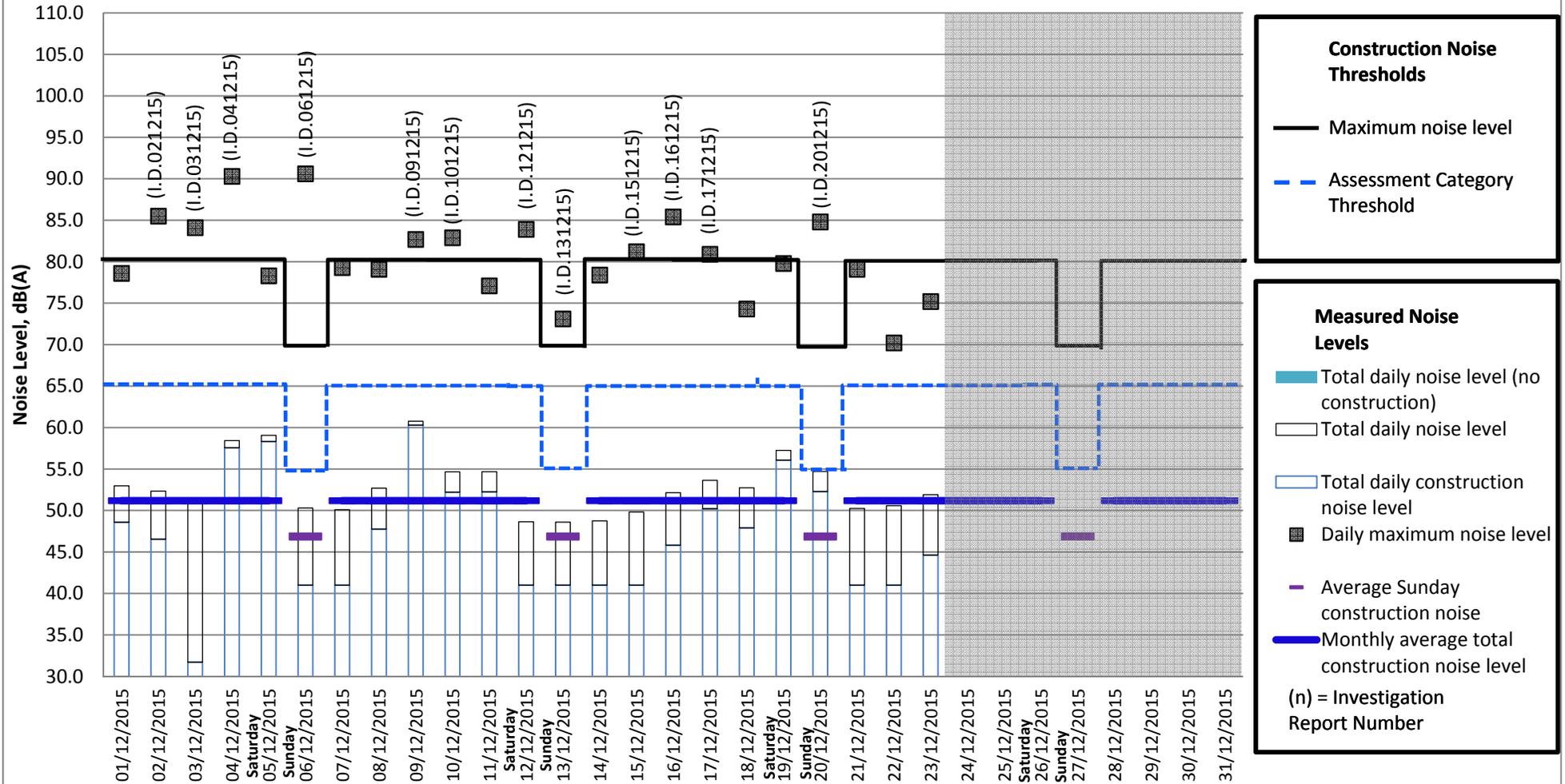
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16)

Measured Night time Noise Levels at Clufflat Measurement period: December 2015



Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16). After investigation, it was concluded that the exceedances of the LAeq 'Total Daily Construction' through the month were caused by wind

Measured Daytime Noise Levels at Inchgarvie Measurement period: December 2015



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

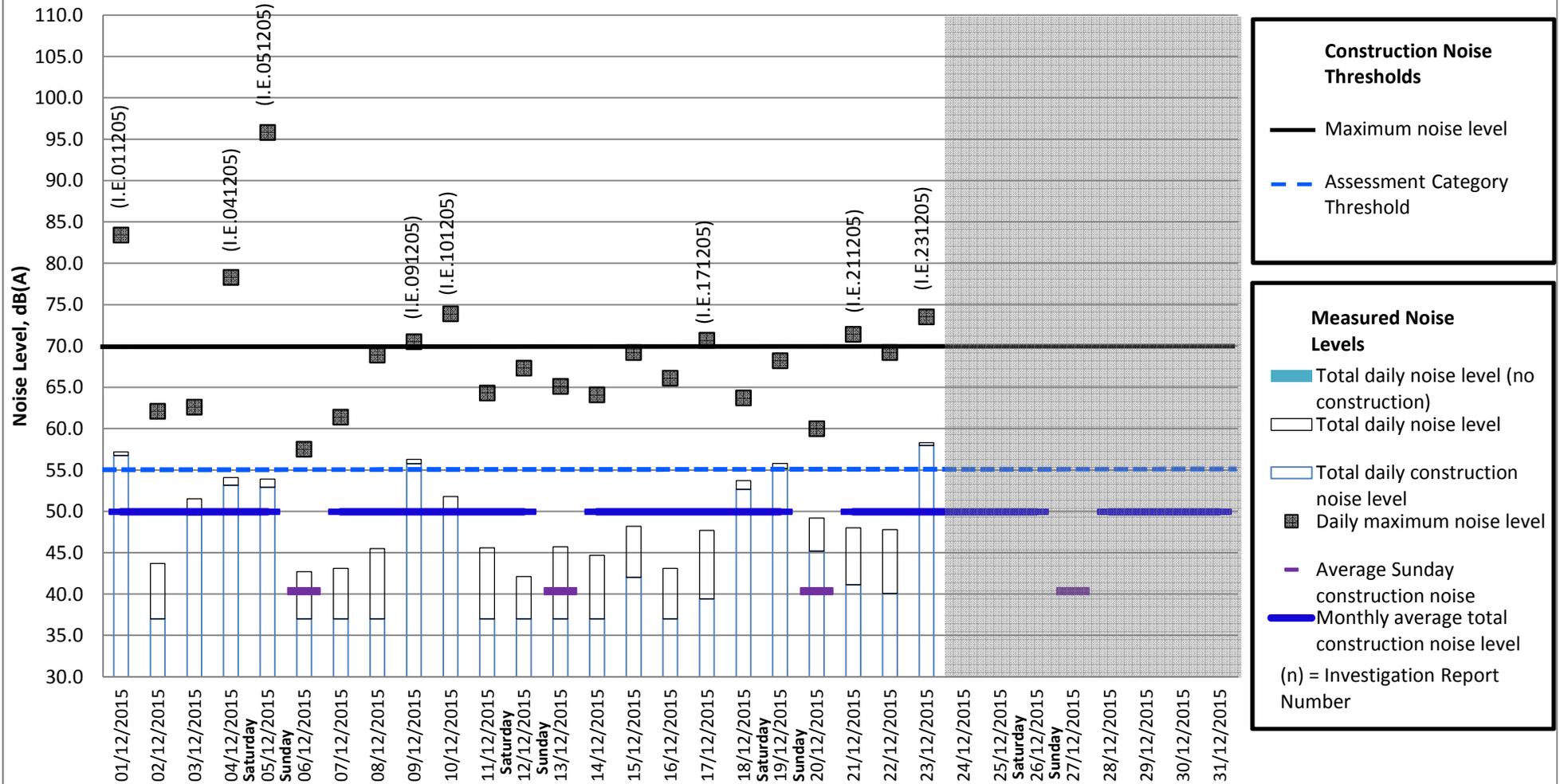
Measured Noise Levels

- Total daily noise level (no construction)
- Total daily noise level
- Total daily construction noise level
- Daily maximum noise level
- Average Sunday construction noise
- Monthly average total construction noise level

(n) = Investigation Report Number

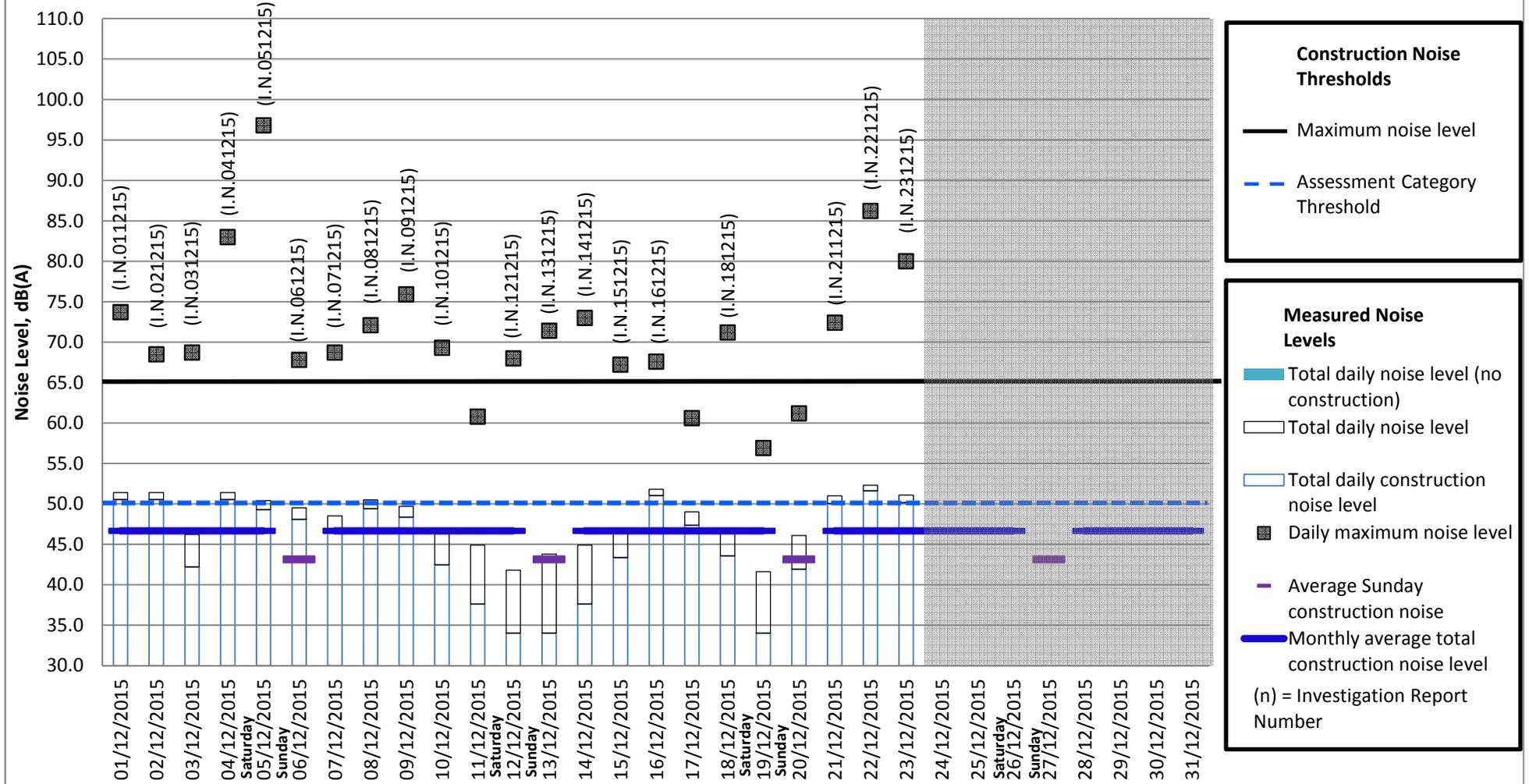
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Evening Noise Levels at Inchgarvie Measurement period: December 2015



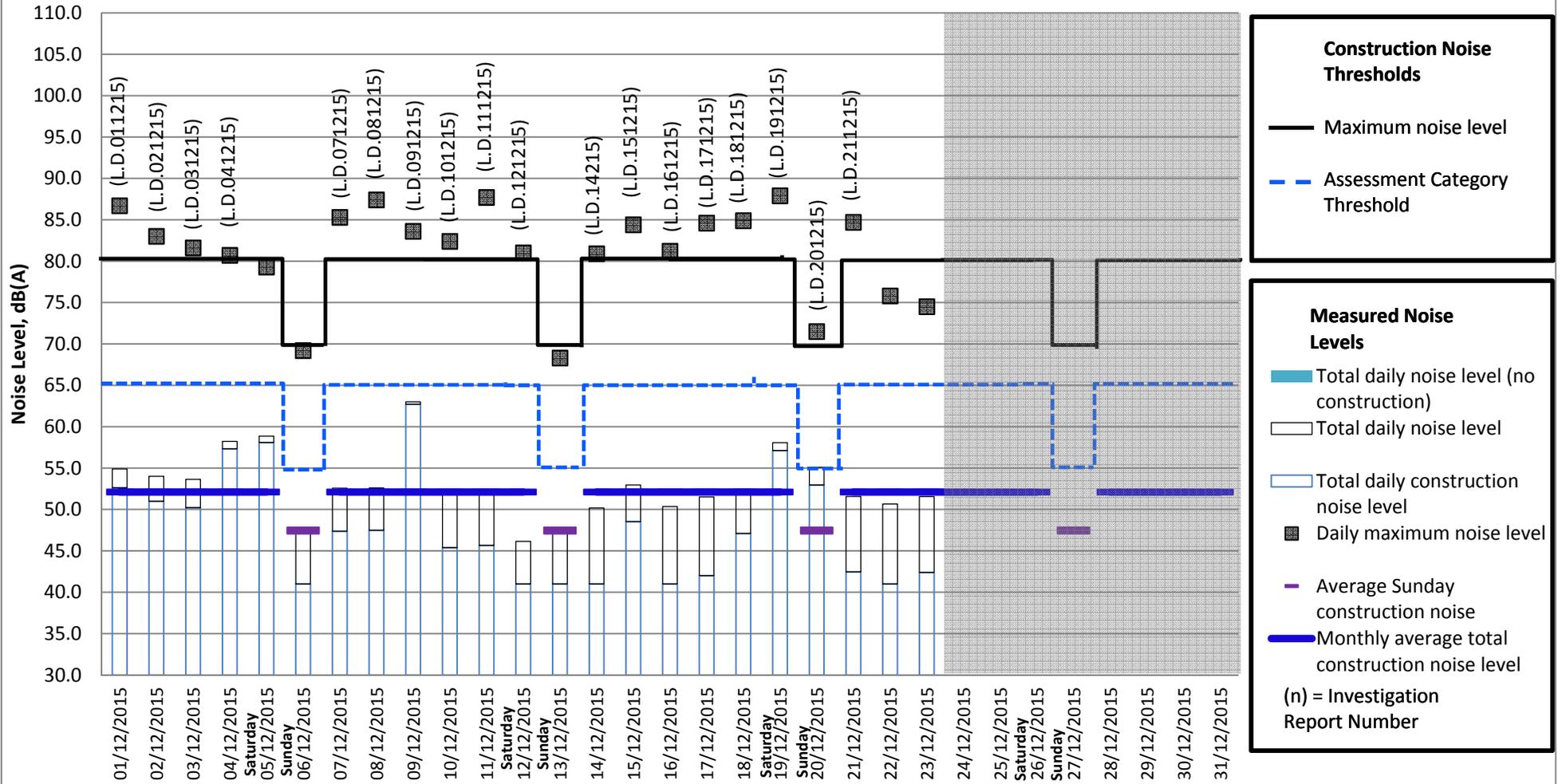
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Night time Noise Levels at Inchgarvie Measurement period: December 2015



Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Daytime Noise Levels at Linn Mill Measurement period: December 2015



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

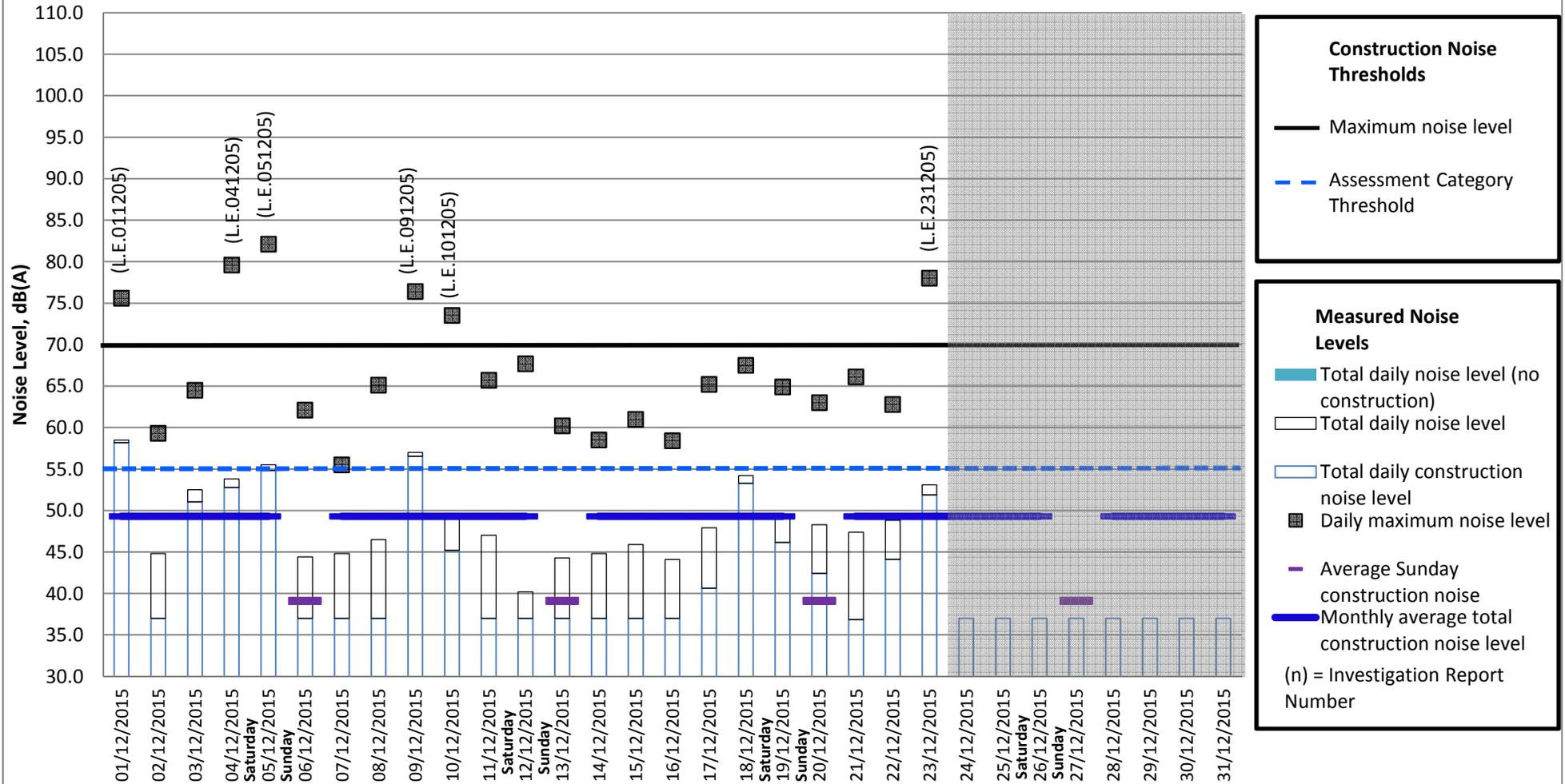
Measured Noise Levels

- Total daily noise level (no construction)
- Total daily noise level
- Total daily construction noise level
- Daily maximum noise level
- Average Sunday construction noise
- Monthly average total construction noise level

(n) = Investigation Report Number

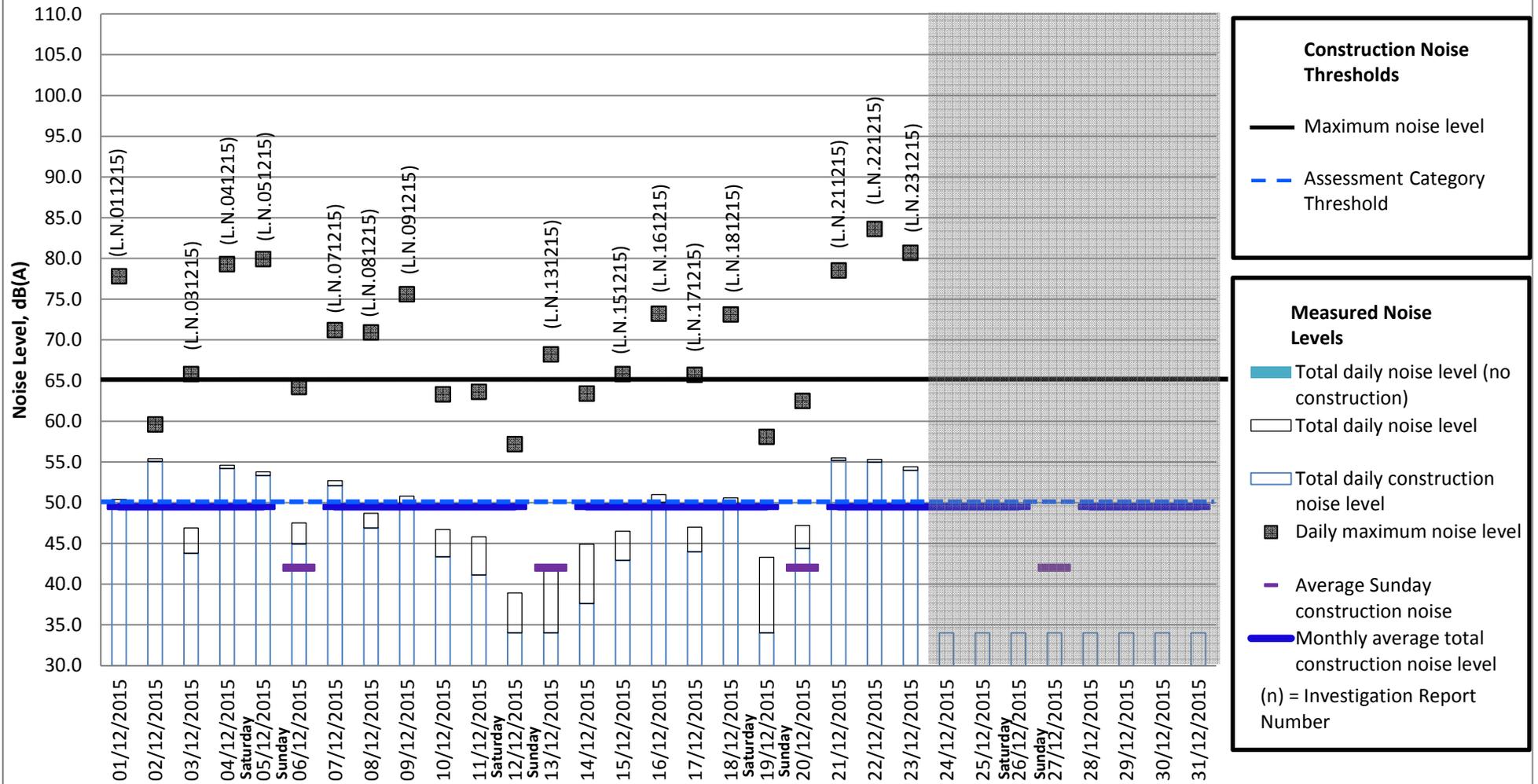
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Evening Noise Levels at Linn Mill Measurement period: December 2015



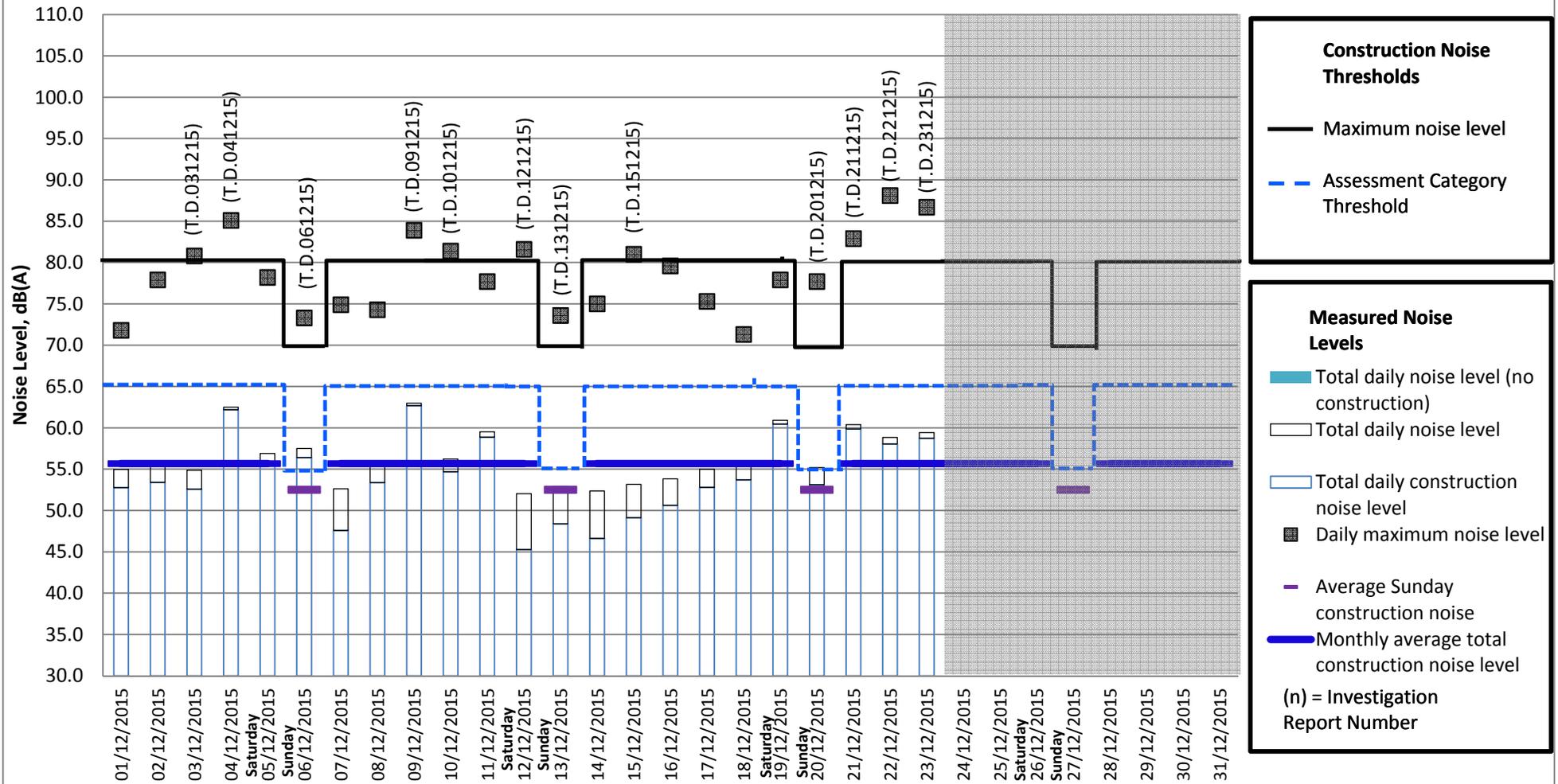
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Night time Noise Levels at Linn Mill Measurement period: December 2015



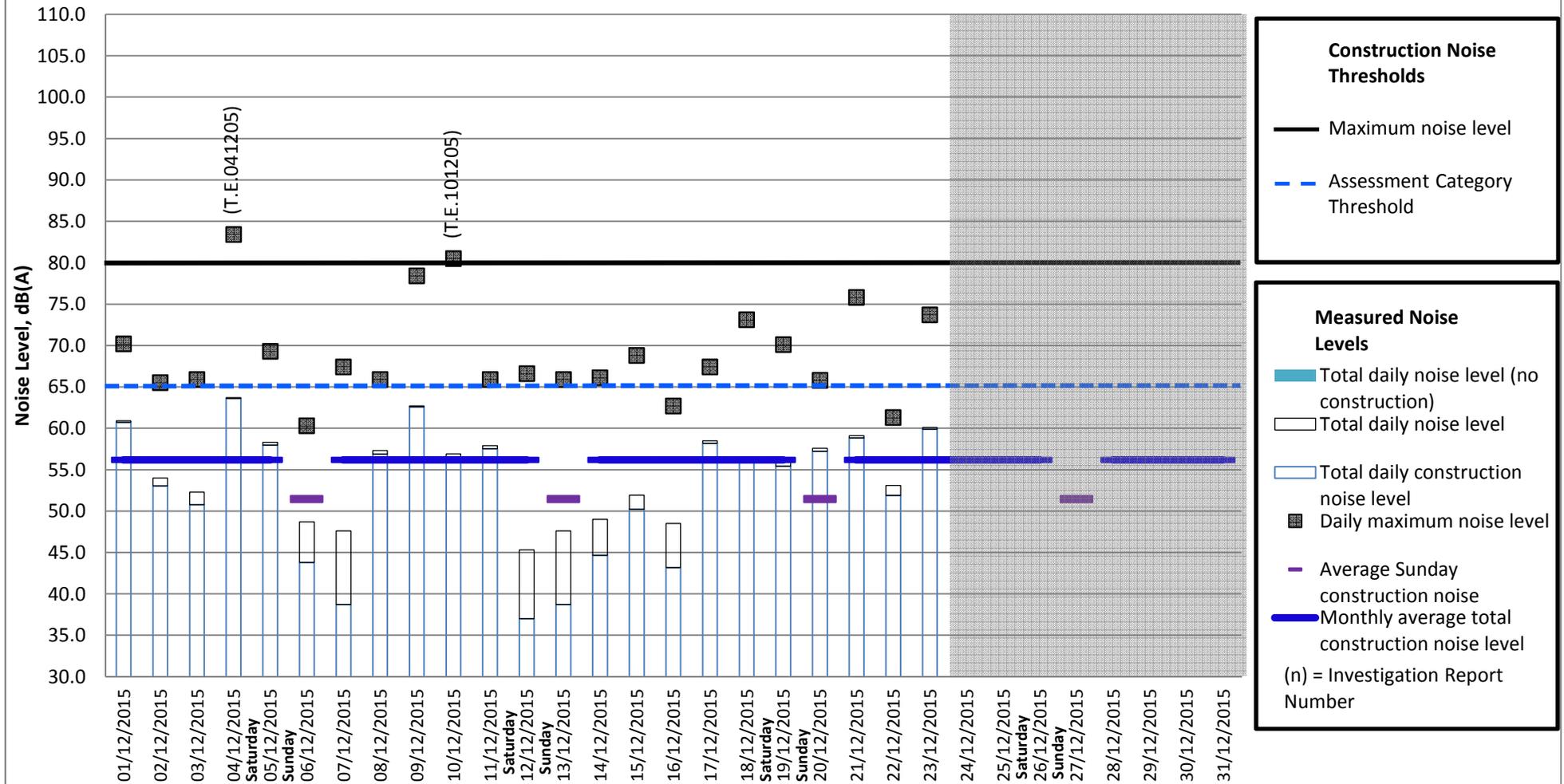
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Daytime Noise Levels at Tigh-Na-Grian Measurement period: December 2015



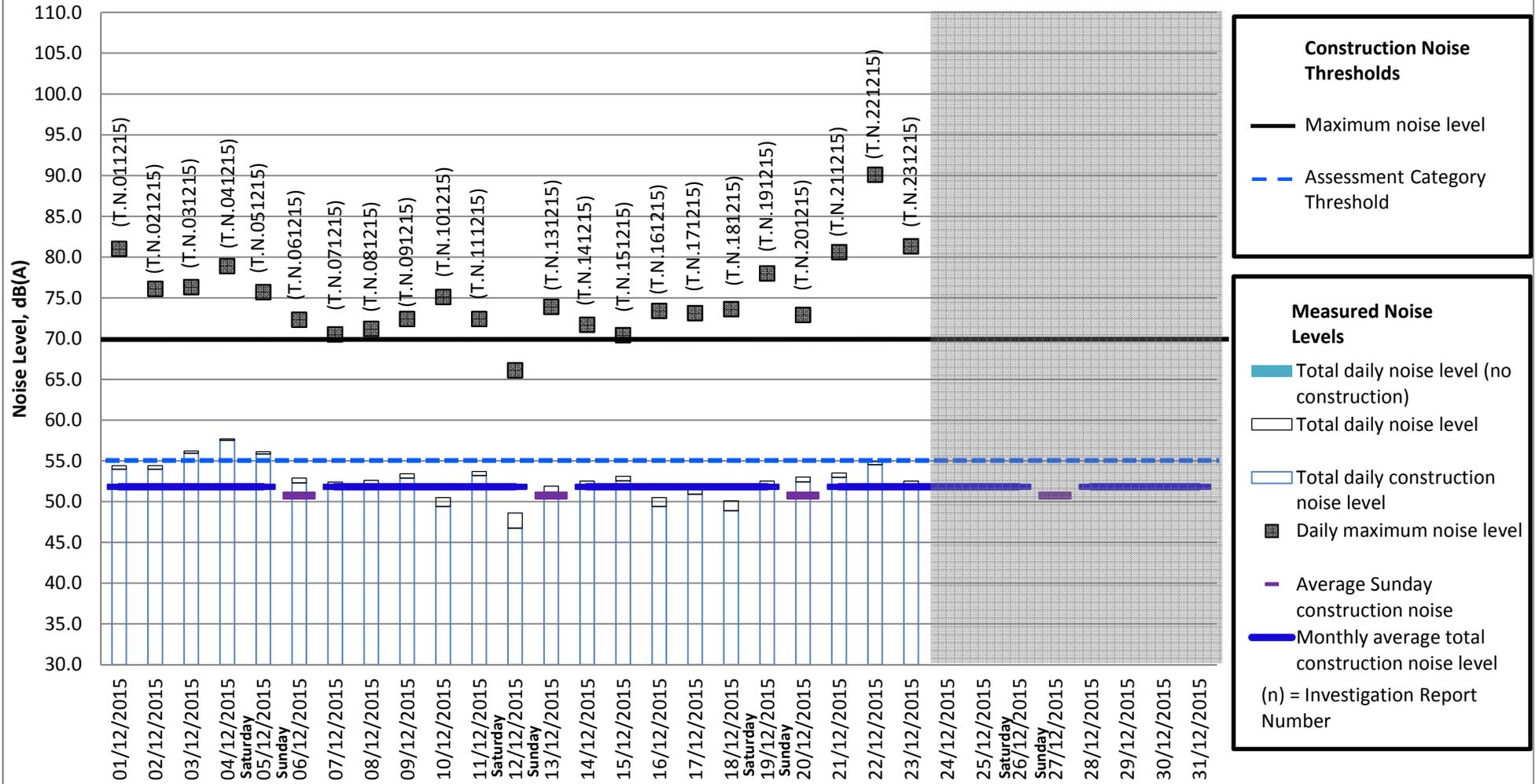
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Evening Noise Levels at Tigh-Na-Grian Measurement period: December 2015



Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Night time Noise Levels at Tigh-Na-Grian Measurement period: December 2015



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

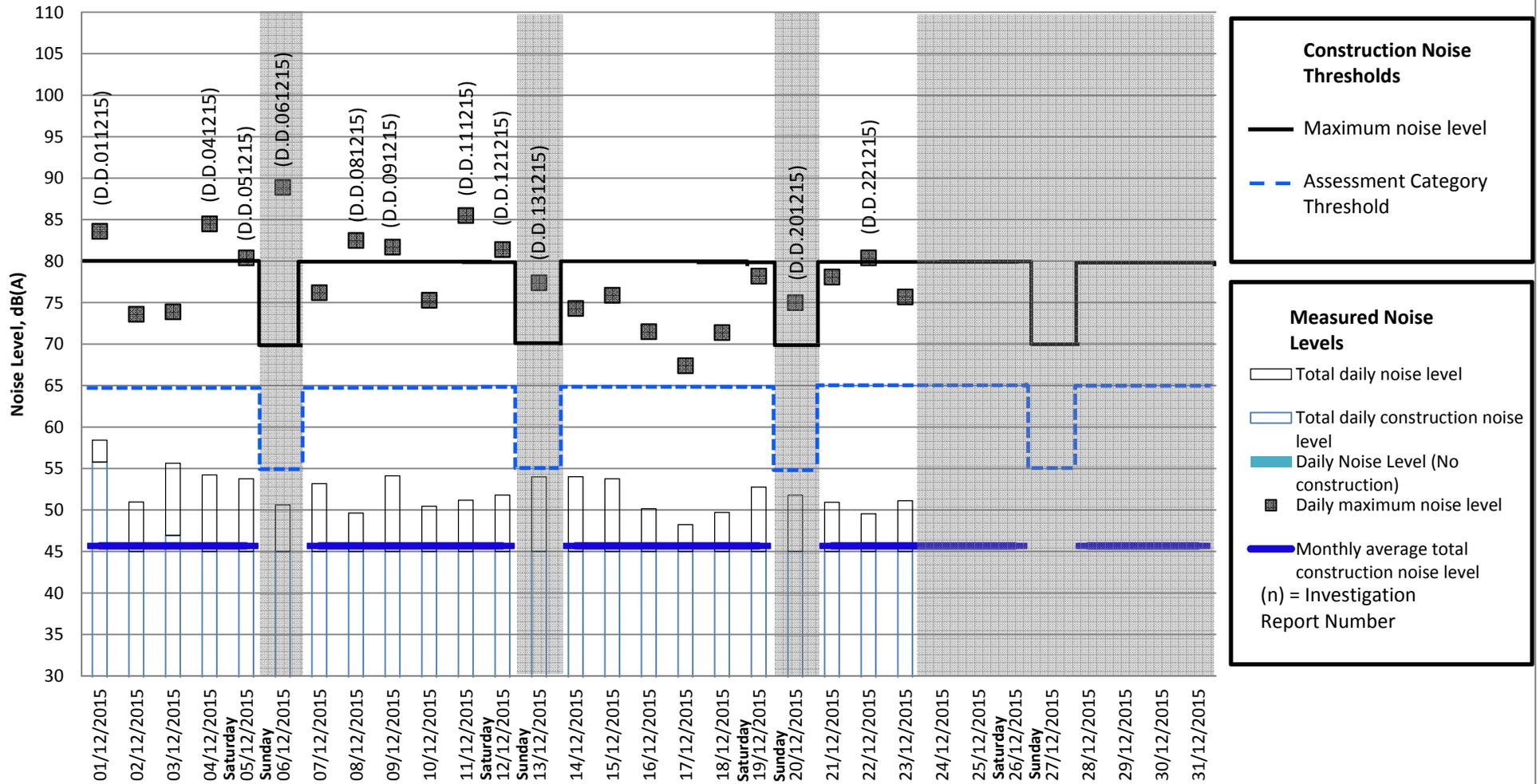
Measured Noise Levels

- Total daily noise level (no construction)
- Total daily noise level
- Total daily construction noise level
- Daily maximum noise level
- Average Sunday construction noise
- Monthly average total construction noise level

(n) = Investigation Report Number

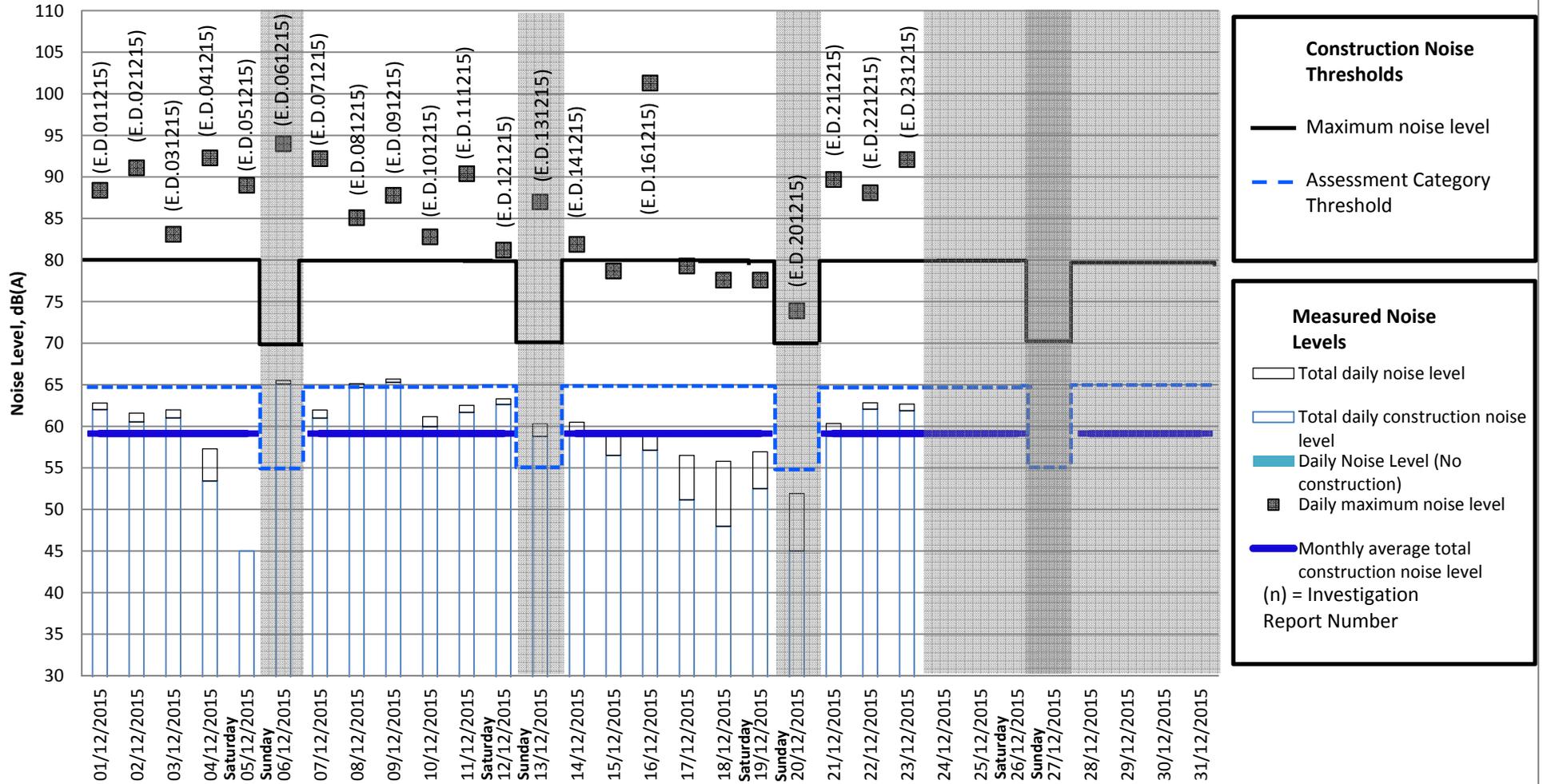
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Daytime Noise Levels at Dundas Home Farm Measurement period: December 2015



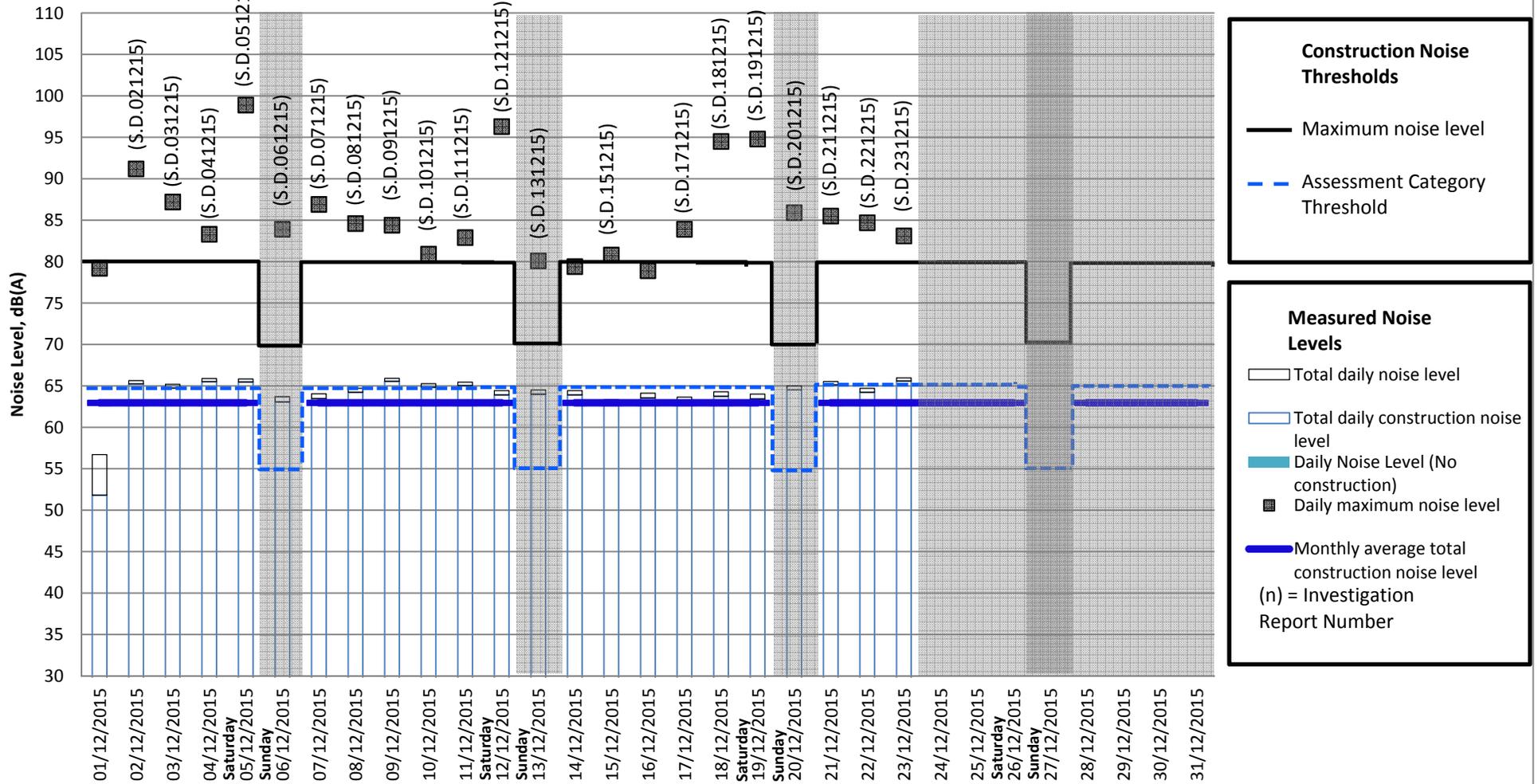
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16)

Measured Daytime Noise Levels at Echline Measurement period: December 2015



Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16)

Measured Daytime Noise Levels at Scotstoun Measurement period: December 2015



Construction Noise Thresholds

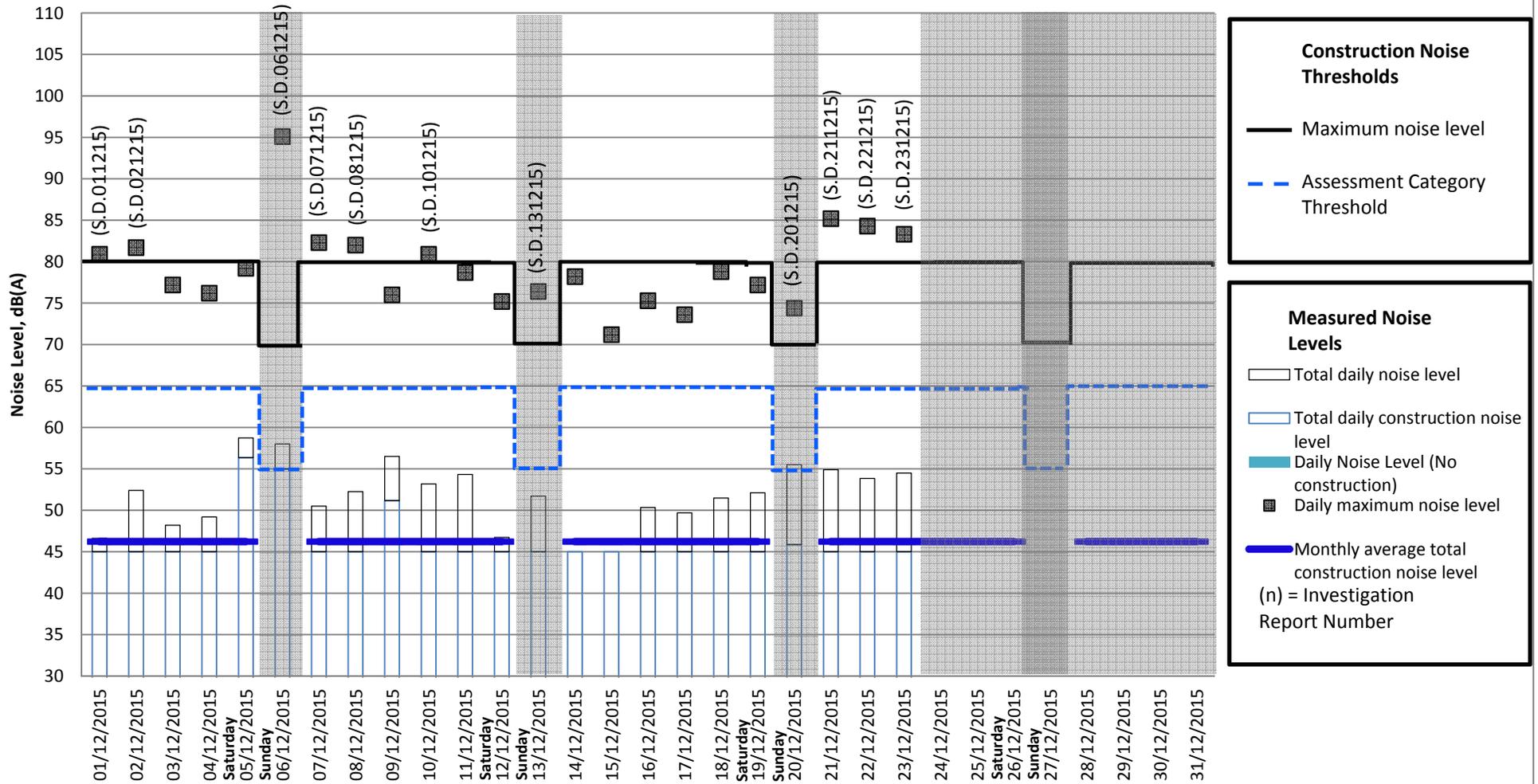
- Maximum noise level
- - - Assessment Category Threshold

Measured Noise Levels

- Total daily noise level
- Total daily construction noise level
- Daily Noise Level (No construction)
- Daily maximum noise level
- Monthly average total construction noise level (n) = Investigation Report Number

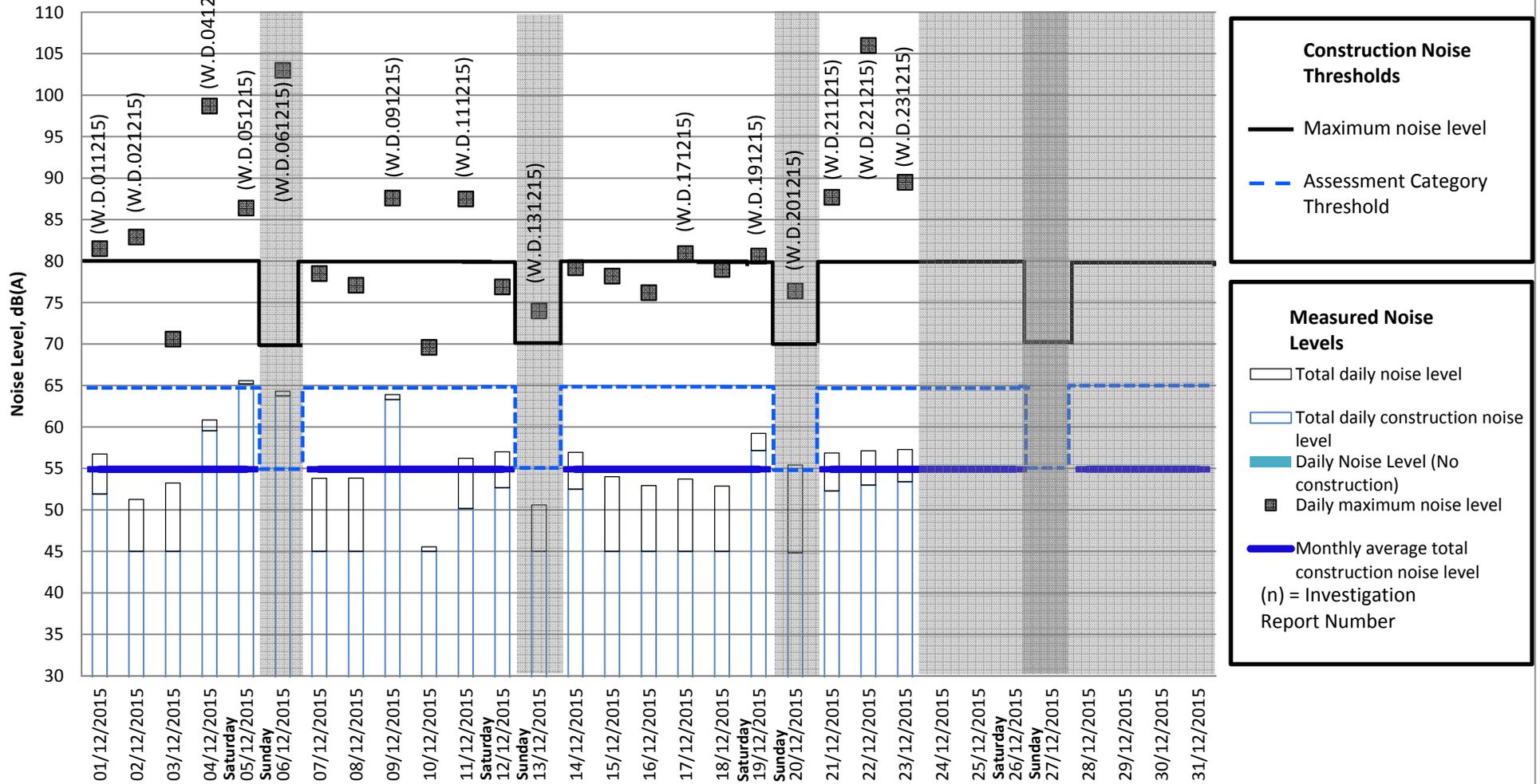
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Daytime Noise Levels at Springfield Measurement period: December 2015



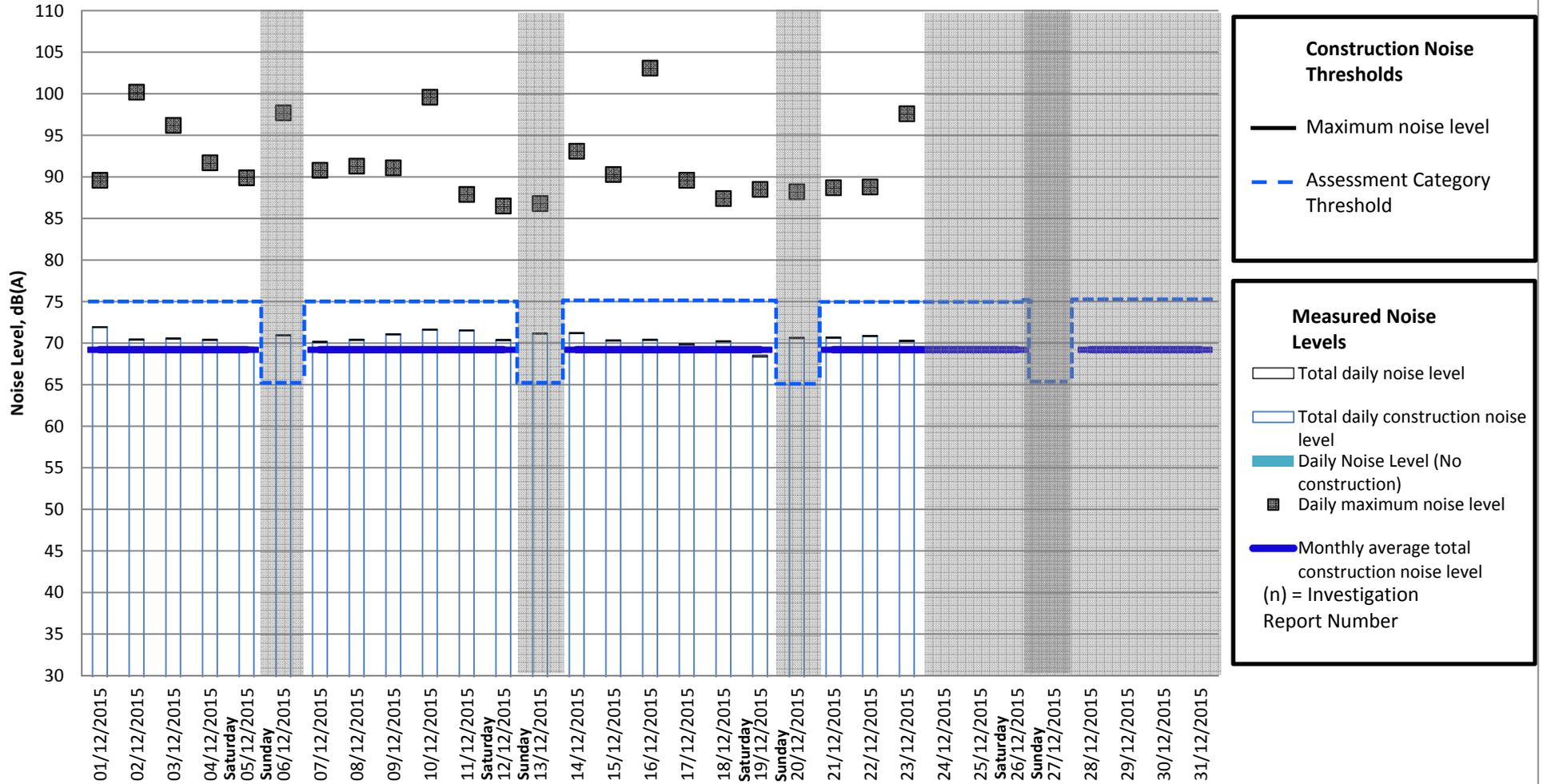
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Daytime Noise Levels at Whinnyhill Measurement period: December 2015



Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16)

Measured Daytime Noise Levels at Newton Measurement period: December 2015



Construction Noise Thresholds

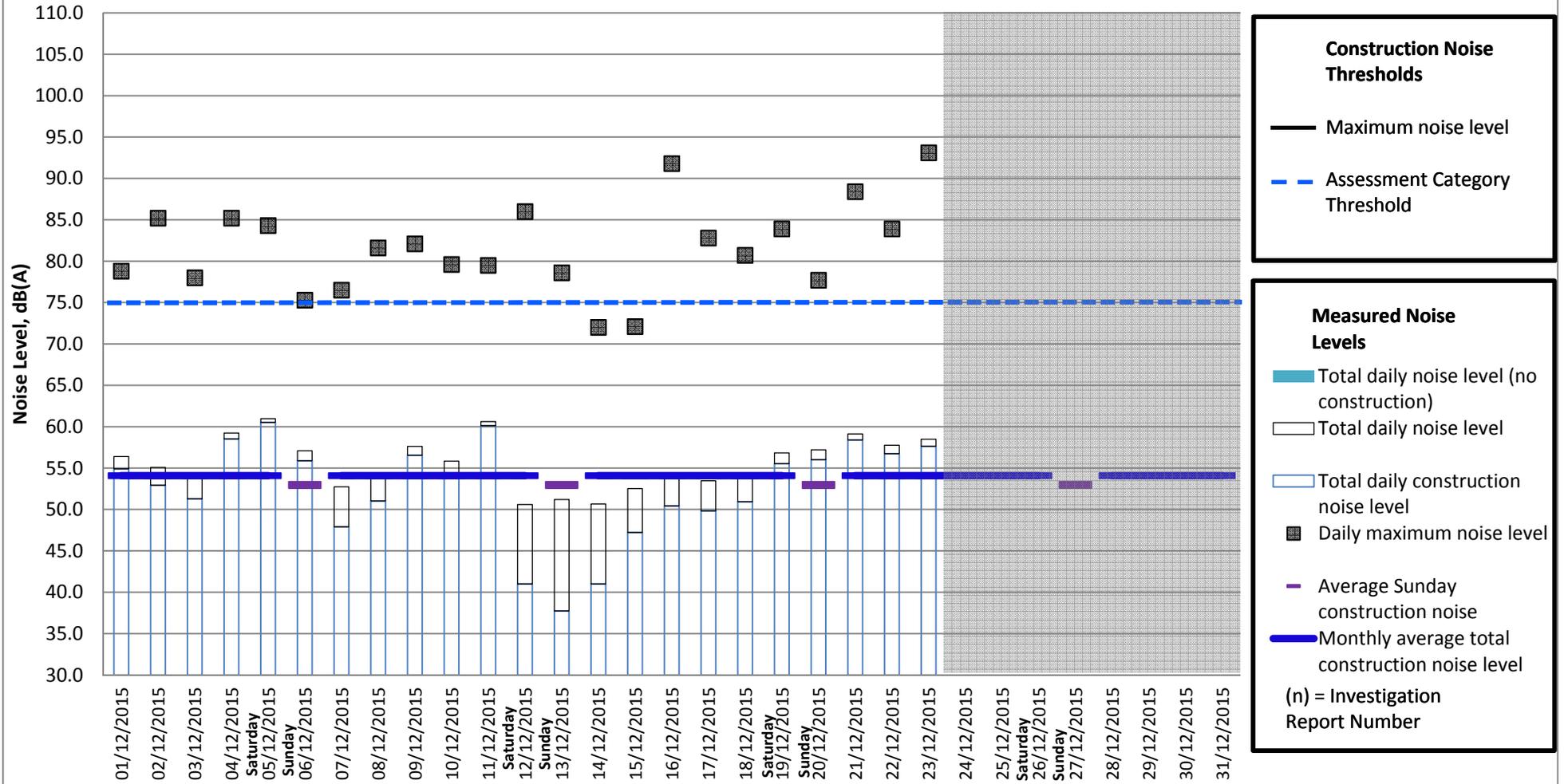
- Maximum noise level
- Assessment Category Threshold

Measured Noise Levels

- Total daily noise level
- Total daily construction noise level
- Daily Noise Level (No construction)
- Daily maximum noise level
- Monthly average total construction noise level (n) = Investigation Report Number

Note: The grey areas of the chart represent days on which no construction works have been conducted.

Measured Daytime Noise Levels at Port Edgar Measurement period: December 2015



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

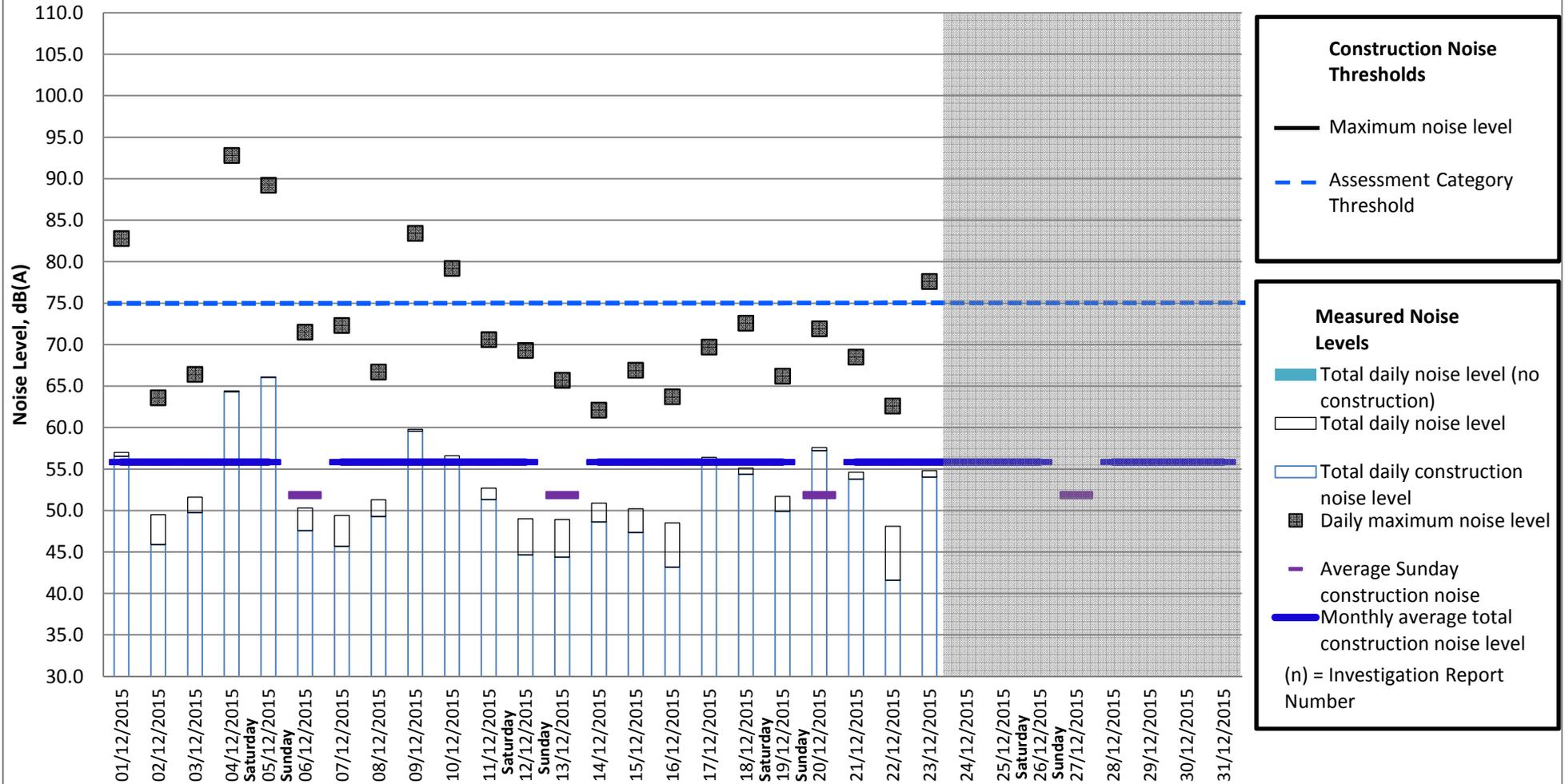
Measured Noise Levels

- Total daily noise level (no construction)
- Total daily noise level
- Total daily construction noise level
- Daily maximum noise level
- Average Sunday construction noise
- Monthly average total construction noise level

(n) = Investigation Report Number

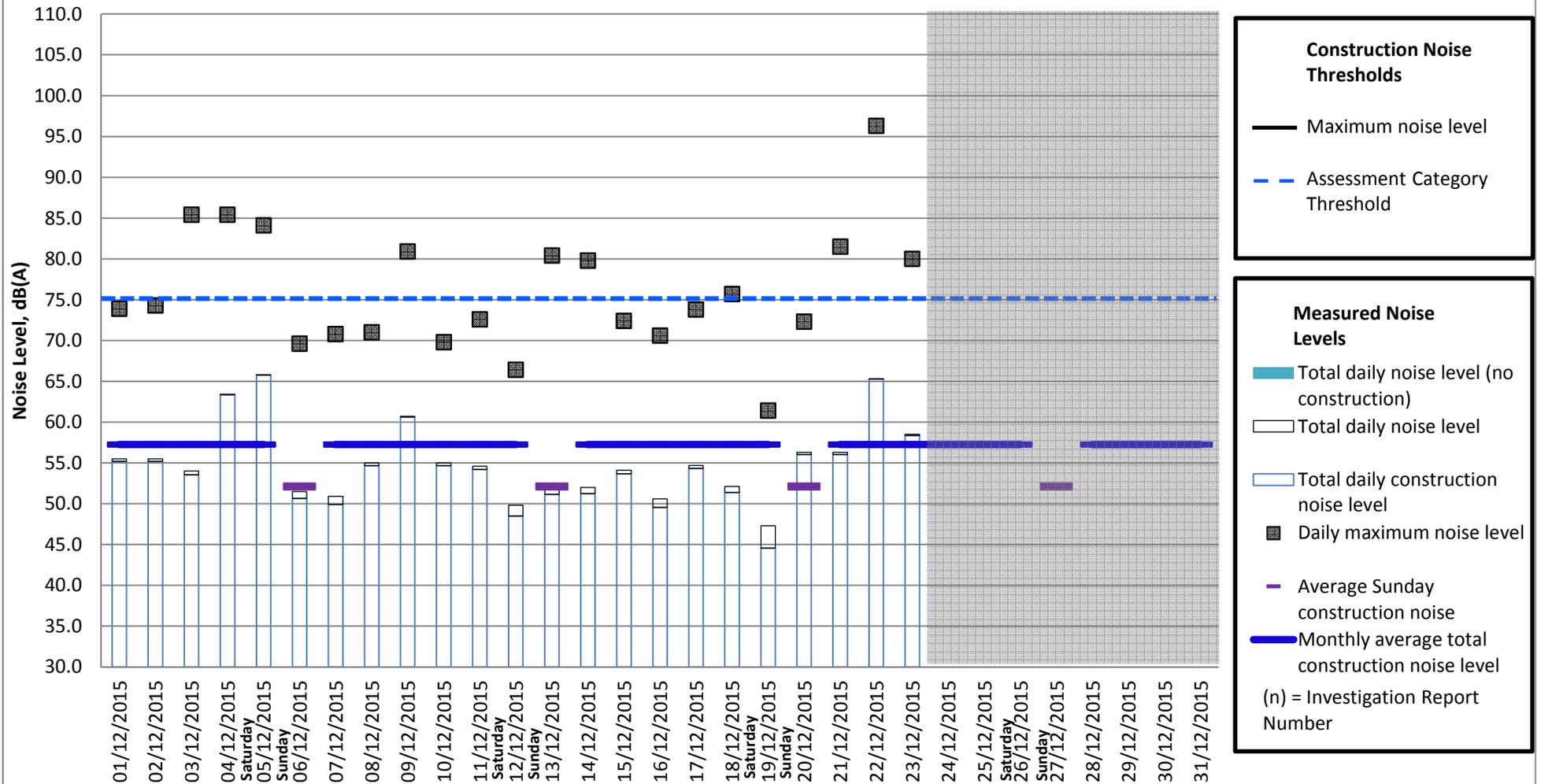
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Evening Noise Levels at Port Edgar Measurement period: December 2015



Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).

Measured Night time Noise Levels at Port Edgar Measurement period: December 2015



Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (24/12/15 to 04/01/16).