



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project **FORTH REPLACEMENT CROSSING**

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CONSTRUCTION NOISE MONITORING REPORT: NOVEMBER 2013

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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 November 2013. The objective of this report is to detail the monitoring that has been undertaken across the site during this period and to present the construction noise monitoring results acquired for November 2013.
- 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 November 2013, construction noise was monitored using permanent, continuous noise monitoring devices at the locations listed in Table 1. The majority of the monitors were installed throughout November and December 2011, with additional monitors installed at Scotstoun Park (Arup's Office) and Newton during February 2012 and a further sound level meter installed at Whinny Hill during March 2012.
- 2.2** At some monitoring locations, the noise monitoring devices are accompanied by associated weather stations. Weather stations are present 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 November 2013. The main construction activities undertaken in the locality of each of the noise meters during the period have been listed in Table 1.

Table 1: Monitoring Locations

Ref.	Monitoring Location	Crossing or Network	Main Construction Activities During November 2013
M1	Whinny Hill	Network	<ul style="list-style-type: none"> • King Malcolm Drive embankment landscaping <p>N.B. No evening, night time or Sunday daytime construction in vicinity.</p>
M3	Tigh-Na-Grian	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • North Tower rebar, formwork & concreting works • North Tower crane platform piling • Pier N1 de-stressing wells & trestle bridge foundation works
M4	North Leg	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • North Tower rebar, formwork & concreting works • North Tower crane platform piling • Pier N1 de-stressing wells & trestle bridge foundation works
M6	Port Edgar	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • South Tower rebar, formwork & concreting works • Pier S1 de-stressing wells preparatory works • Pier S3 cofferdam construction • Pier S5 rebar, formwork & concreting works • Pier S6 backfilling for crane pad • Society Road works
M7	Butlaw Fisheries	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • South Tower rebar, formwork & concreting works • Pier S1 de-stressing wells preparatory works • Pier S3 cofferdam construction • Pier S5 rebar, formwork & concreting works • Pier S6 backfilling for crane pad • Society Road works
M10	Inchgarvie Lodge	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • South Tower rebar, formwork & concreting works • Pier S1 de-stressing wells preparatory works • Pier S3 cofferdam construction • Pier S5 rebar, formwork & concreting works • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Society Road works
M11	Linn Mill	Network (close proximity to Crossing)	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Society Road works

M13	Clufflat Brae	Crossing	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Society Road works
M14	Springfield	Network	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Society Road works • Echline cut – ripping rock and crushing <p>N.B. No evening, night time or Sunday daytime construction in vicinity.</p>
M15	Echline Field	Network	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Echline cut – ripping rock and crushing • Gyratory – installation of beams • A904 tie in road works, including drainage works <p>N.B. No evening, night time or Sunday daytime construction in vicinity.</p>
M16	Scotstoun	Network	<ul style="list-style-type: none"> • Utilities works • Structure works <p>N.B. No evening, night time or Sunday daytime construction in vicinity.</p>
M17	Dundas Home Farm	Network	<ul style="list-style-type: none"> • Utility works • Mainline works <p>N.B. No evening, night time or Sunday daytime construction in vicinity.</p>
M18	Newton	Network	<ul style="list-style-type: none"> • No works

3 Noise Monitoring Results

3.1 All noise monitoring results for construction days have been presented in charts using the template provided in the Construction Noise Monitoring Information Note, as available on the project website (http://www.transportscotland.gov.uk/files/documents/projects/forth-replacement/FRC_Construction_Noise_Monitoring_Information_Note_2_.pdf). All charts can be found in the appendices of this report.

3.2 With regard to the noise monitoring results charts, 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, however, are undertaken during the daytime only. The inclusion of data in the graphs reflects this. Although Linn Mill is considered as a network location, the potential for marine works near the south shore to be heard has been recognised. As a result, evening and night time data has been included for this location although no network connection construction activities have been undertaken during these periods.
- Noise data for days, evening and nights on which no construction works were conducted have been excluded from the monthly average results presented in the graph. Additionally, no investigations into the L_{AFmax} exceedances during these periods have been made as they would have been caused by non-construction related factors. However, noise results (L_{Aeq} and L_{AFmax}) for any days, evenings and nights 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 on the graphs where applicable; in locations where no Sunday works have been undertaken no average is shown.
- As set out in the CoCP, the assessment time for evening, nights and Sunday daytime is 1 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.

- Where noise data is missing for days, evening or nights during which construction works were conducted, this has been indicated. Short periods of data are missing from the following locations: 28 to 30 November at Dundas due to device error, Port Edgar for 2 days and 4 evenings and nights, also due to device error
- 3.3** Results demonstrate that the monthly average total construction noise results for daytime were within the threshold levels for all monitoring locations for November 2013, with the exception of Scotstoun. For the evening period, all monitoring locations were within the threshold levels. For the night time periods, there were exceedances at only one location, Butlaw Fisheries, with all other locations within the threshold levels. With regard to the Sunday averages (for applicable monitoring locations), exceedances of the threshold were noted for Sunday daytime and night time at Butlaw Fisheries, with all other Sunday averages within the threshold levels.
- 3.4** The exceedances noted are not thought to have been caused by increased noise levels due to construction. The night time average at Butlaw Fisheries was found to be affected by increased noise levels due to waves breaking on the shore and periods of adverse weather. Where audio is available, it demonstrates that the increased levels were caused by waves. It should also be noted that screening and distance attenuation should be considered as these factors result in a lowering of the noise levels to within the threshold level at the nearest sensitive receptors; attended monitoring has illustrated a drop of at least 5 – 10 dB from Butlaw Fisheries to the nearest sensitive receptors with respect to noise generated around the south shore area of the estuary.
- 3.5** With regard to the exceedances of the Sunday averages, a review of the Sunday works undertaken indicates that, where the specific works undertaken are considered, alongside locations and associated distances; it is highly unlikely that the exceedances of the Sunday averages were related to construction works. Rather waves and adverse weather conditions are thought to have influence the levels, particularly on the 3 November. Furthermore, it should be noted that all the averages reported for day time, evening, night time and Sunday periods, are based only on the highest L_{Aeq} levels for 1 hour periods which can affect the averages.
- 3.6** The exceedance of the daytime average at Scotstoun is due to increased background noise levels due to the location of the meter directly adjacent to the road. The average for November is consistent with levels for previous months.

- 3.7** During November 2013, some exceedances of the maximum noise thresholds also 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. A Noise and Vibration Investigative Report (NVIR) spread sheet has been produced detailing the results of the investigation for each exceedance. Where the exceedances are due to construction works, a detailed NVIR has been completed which details the results of the investigation in addition to any additional mitigation measures required.
- 3.8** Investigations of the exceedances of the maximum noise level thresholds show the majority to have occurred as a result of non-construction related noise, notably due to bird calls, some periods of adverse weather and localised noises at nearby properties. At some locations, notably Scotstoun and Echline, existing traffic noise had an effect on maximum noise levels during the period covered in this report.
- 3.9** Where an exceedance due to construction works was identified, the works were investigated as soon as practicably reasonable and a detailed NVIR was completed, within which any additional mitigation measures were recognised and subsequently implemented where practicable.
- 3.10** The daytime L_{AFmax} threshold was exceeded during November on two occasions. These exceedances occurred during the night time period at Butlaw Fisheries and Inchgarvie and were found to be caused by the night works at Society Road. All construction related exceedances were investigated and mitigation measures implemented where possible; the relevant NVIRs provide more detail with regard to each exceedance.
- 3.11** A summary of the findings for exceedances occurring at each of the locations can be found in Table 2. All construction related exceedances are detailed in Table 3; further information on related remedial actions is detailed in the relevant NVIR.

Table 2: Summary of Exceedances at Monitoring Locations

Monitoring Location	Summary of Exceedance Details
Butlaw Fisheries	During November the maximum noise threshold was exceeded on 44 occasions (daytime, 9; evening, 10; night time, 25). One night time exceedance was caused by works at Society Road. All other exceedances were attributed to non-construction factors, including waves, adverse weather, birds and fireworks.
Clufflat Brae	During November the maximum noise threshold was exceeded on 42 occasions (daytime, 14; evening, 11; night time, 17). No exceedances were found to be due to construction works. Exceedances were found to be largely due to wind, fireworks and dogs barking.
Inchgarvie Lodge	During November the maximum noise threshold was exceeded on 32 occasions (daytime, 10; evening, 11; night time, 11). One exceedance at this location was found to be due to construction works at Society Road. However, investigations found residents at the property, birds and fireworks to be the main contributing factors to the exceedances at this location.
Linn Mill	During November the maximum noise threshold was exceeded on 55 occasions (daytime, 18; evening, 12; night time, 25). No construction related exceedances were recorded at this location. The exceedances at this location were largely caused by fireworks, birds and adverse weather.
Tigh-Na-Grian	During November the maximum noise threshold was exceeded on 30 occasions (daytime, 8; evening, 2; night time, 20). Exceedances were due to non-construction factors, notably birds and wind.
Dundas Home Farm	During November the maximum noise threshold was exceeded on 1 occasion. This exceedance was not caused by the works. The exceedance was due to a plane.
Echline	During November the maximum noise threshold was exceeded on 26 occasions. No exceedances at this location were due to construction activities. Exceedances were largely attributed to vehicles passing by on the adjacent roads.
Springfield	During November the maximum noise threshold was exceeded on 11 occasions. The exceedances were not caused by construction works at this location. Exceedances were due to a range of factors including fireworks and dogs barking.
Scotstoun	During November the maximum noise threshold was exceeded on 26 occasions. No exceedances were due to construction. Exceedances were largely attributed to vehicles passing by on the adjacent road.
Whinny Hill	During November the maximum noise threshold was exceeded on 13 occasions. Exceedances were not due to construction activities. A range of factors were found to cause exceedances at this location, including dogs barking and localised banging (not related to construction works).

Table 3: Summary of Construction Exceedances at Monitoring Locations

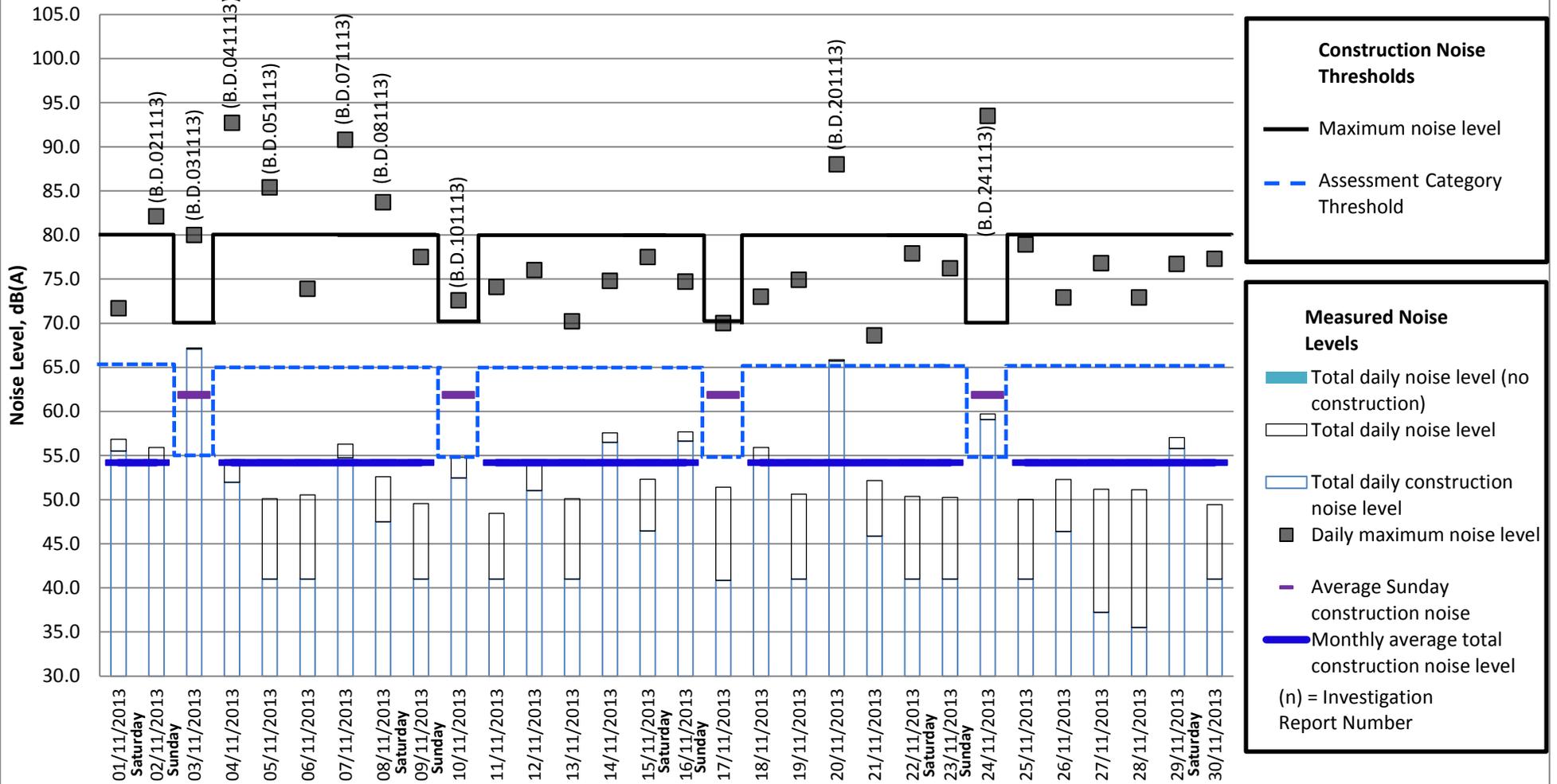
Construction Related Noise Exceedances - November 2013						
Date	Monitor	Period	Description	Lmax (dB(A))	Threshold (dB(A))	NVIR No.
04/11/2013	Linn Mill (Echline Field)	Day	Isolated bang from plant in Echline Field	80.6	80.0	L.D.041113
27/11/2013		Day	Isolated bang from Excavator	80.8	80.0	L.D.271113
12/11/2013	Butlaw Fisheries (South Shore)	Night	Society Rd Nightworks - Vibratory Roller	73.2	65.0	B.N.121113
12/11/2013	Inchgarvie Lodge (Society Road)	Night	Society Rd Nightworks - Engine Noise, Tipping of Material & Vibratory Roller	75	65.0	I.N.121113



APPENDIX A

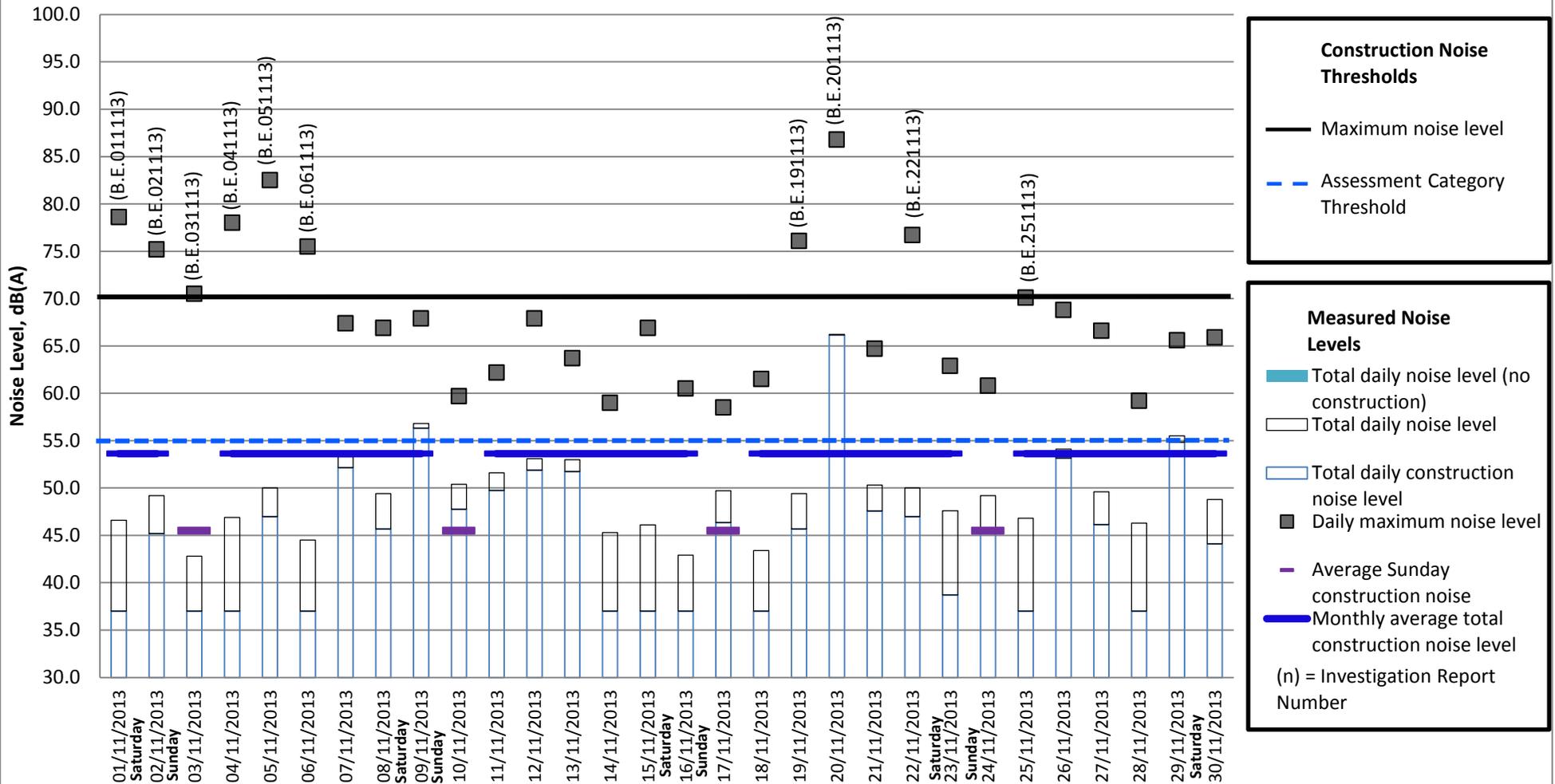
Measured Daytime Noise Levels at Butlaw Fisheries

Measurement period: November 2013



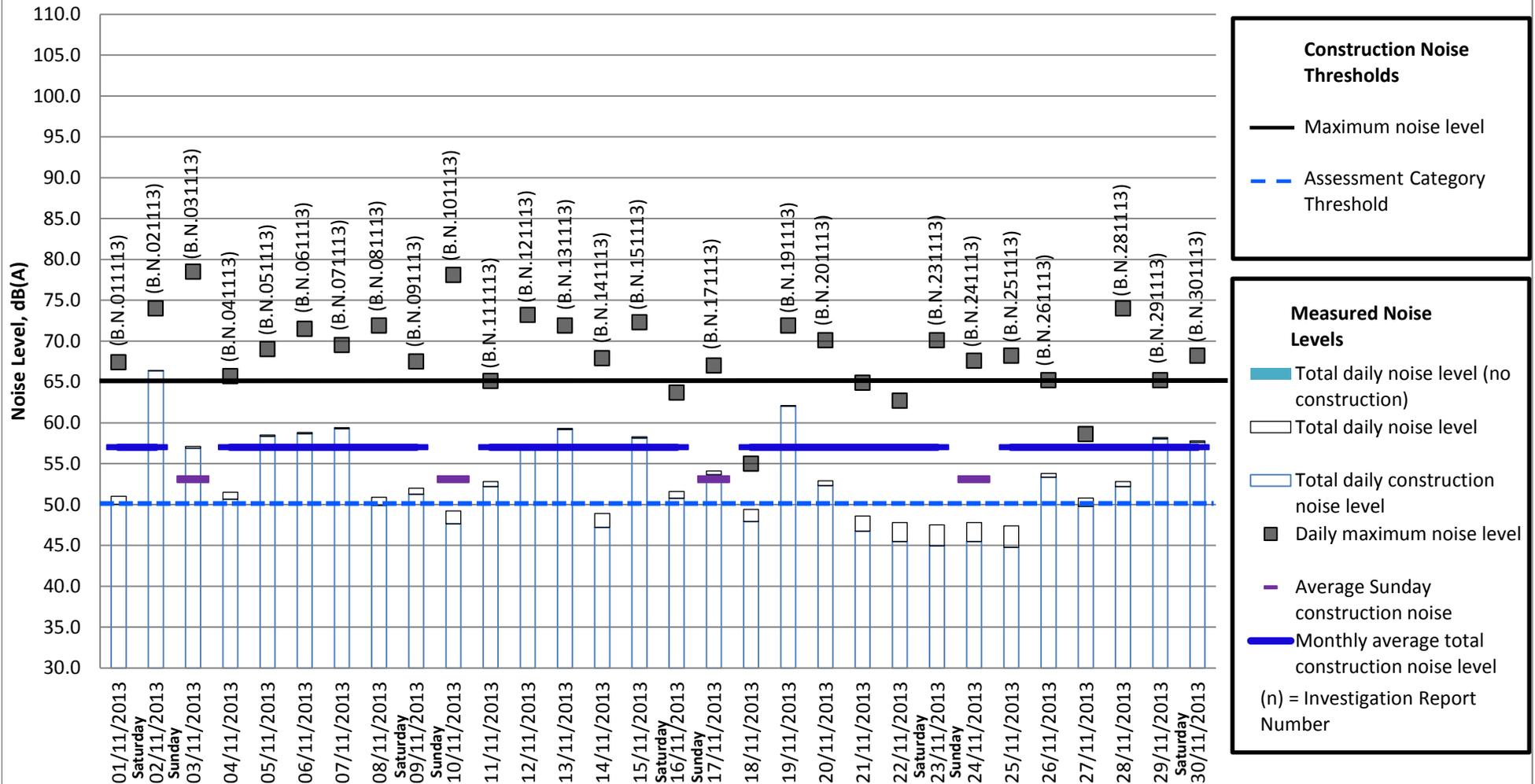
Measured Evening Noise Levels at Butlaw Fisheries

Measurement period: November 2013

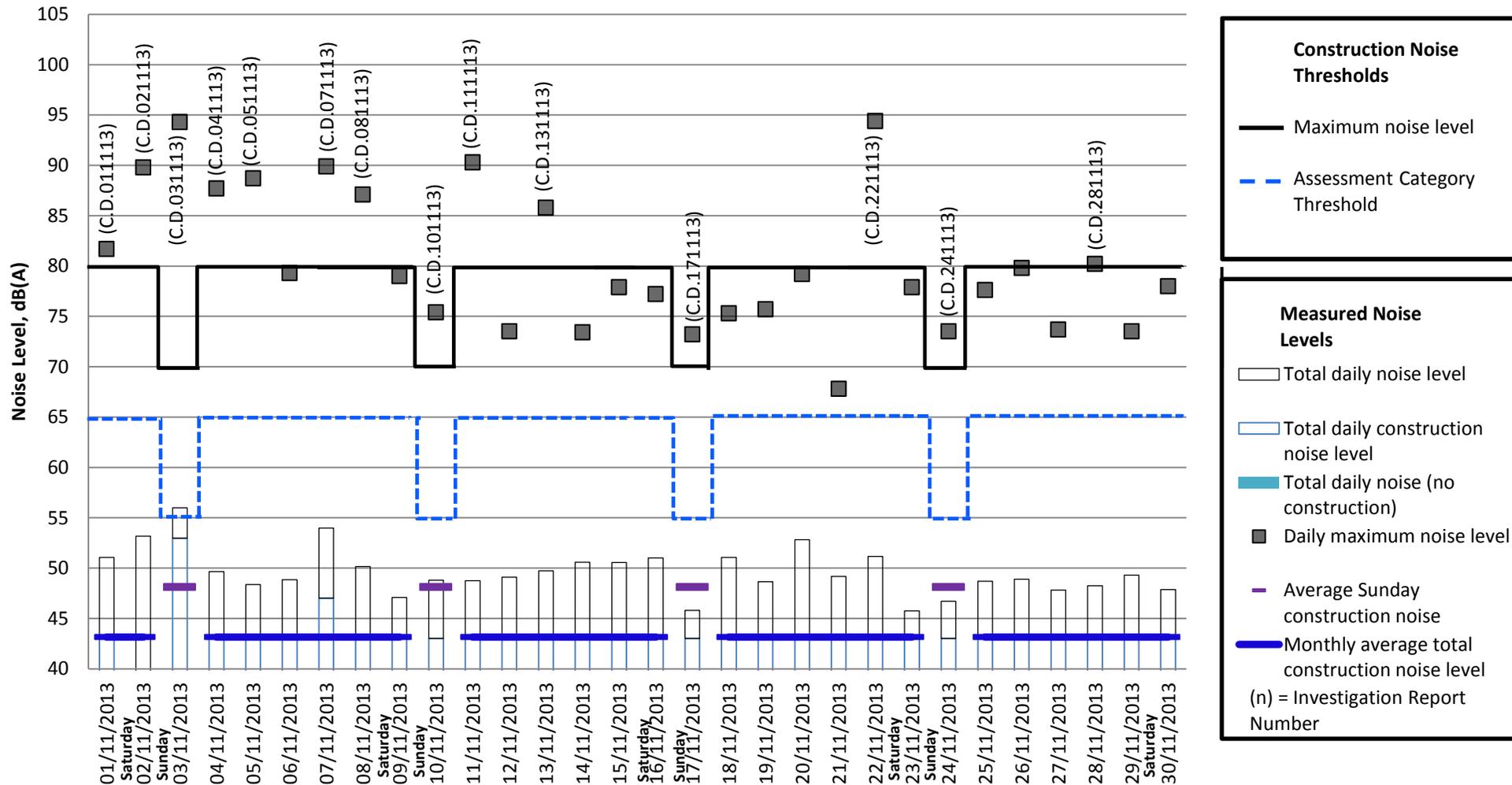


Measured Night time Noise Levels at Butlaw Fisheries

Measurement period: November 2013

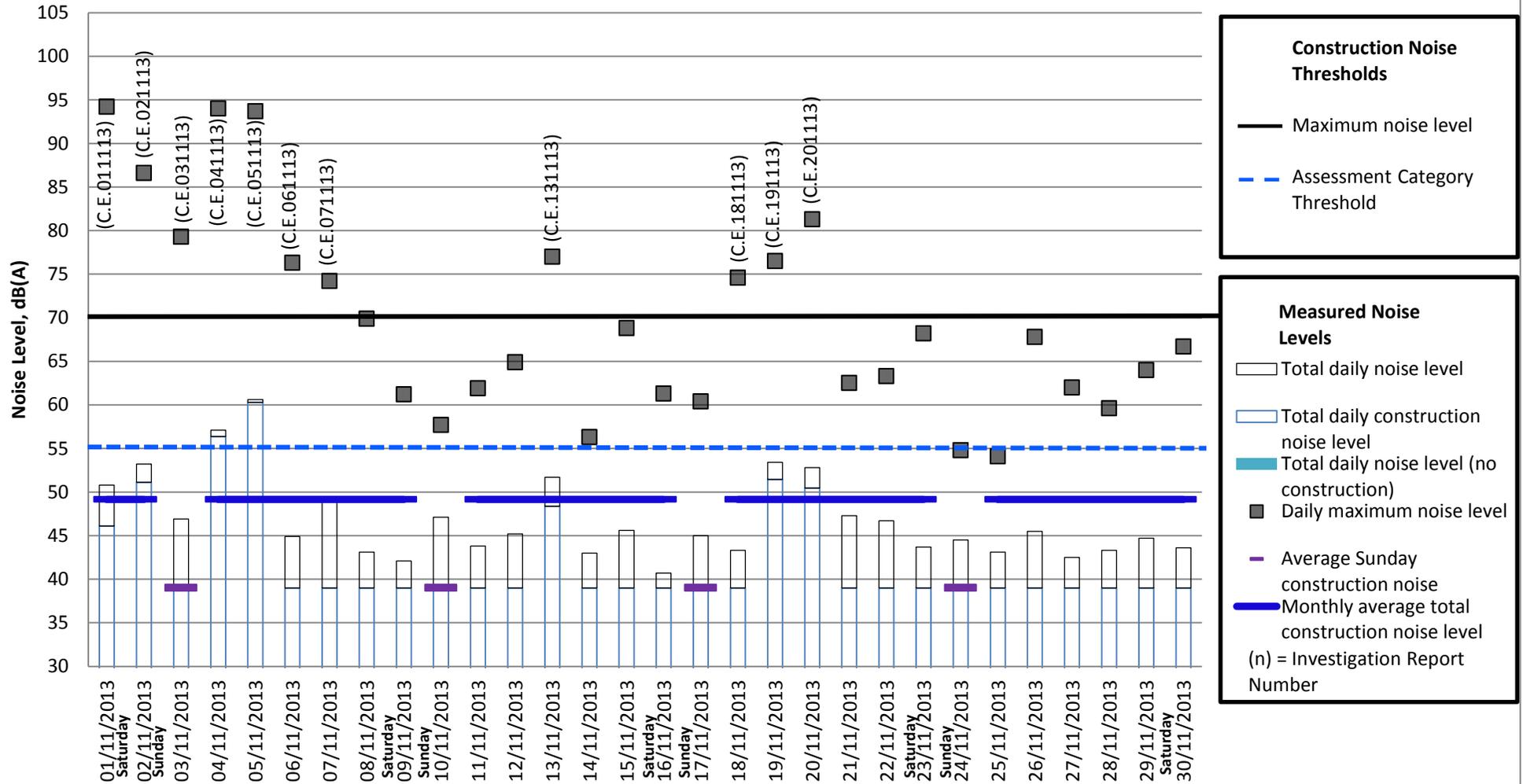


Measured Daytime Noise Levels at Clufflat Brae Measurement period: November 2013



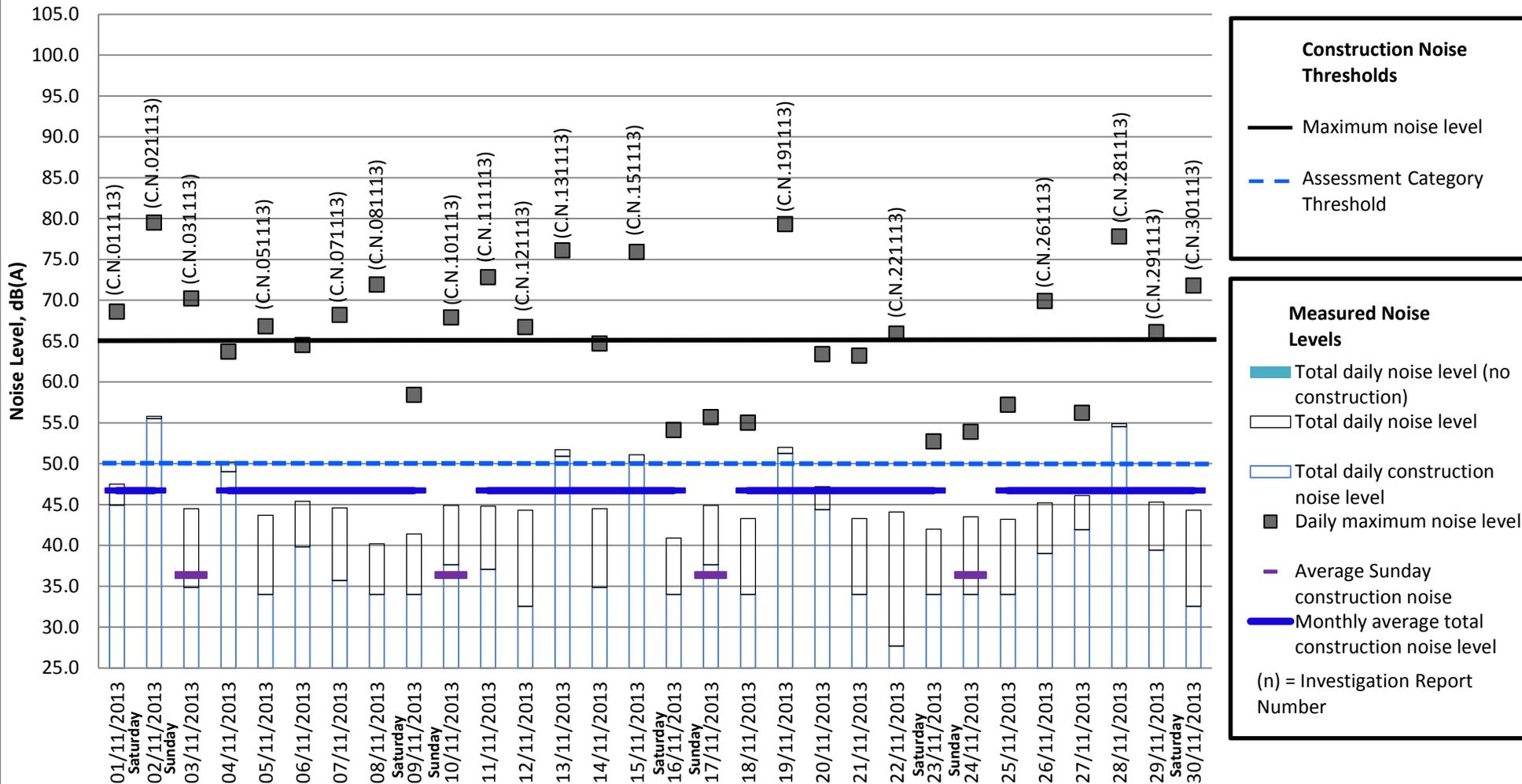
Measured Evening Noise Levels at Clufflat Brae

Measurement period: November 2013

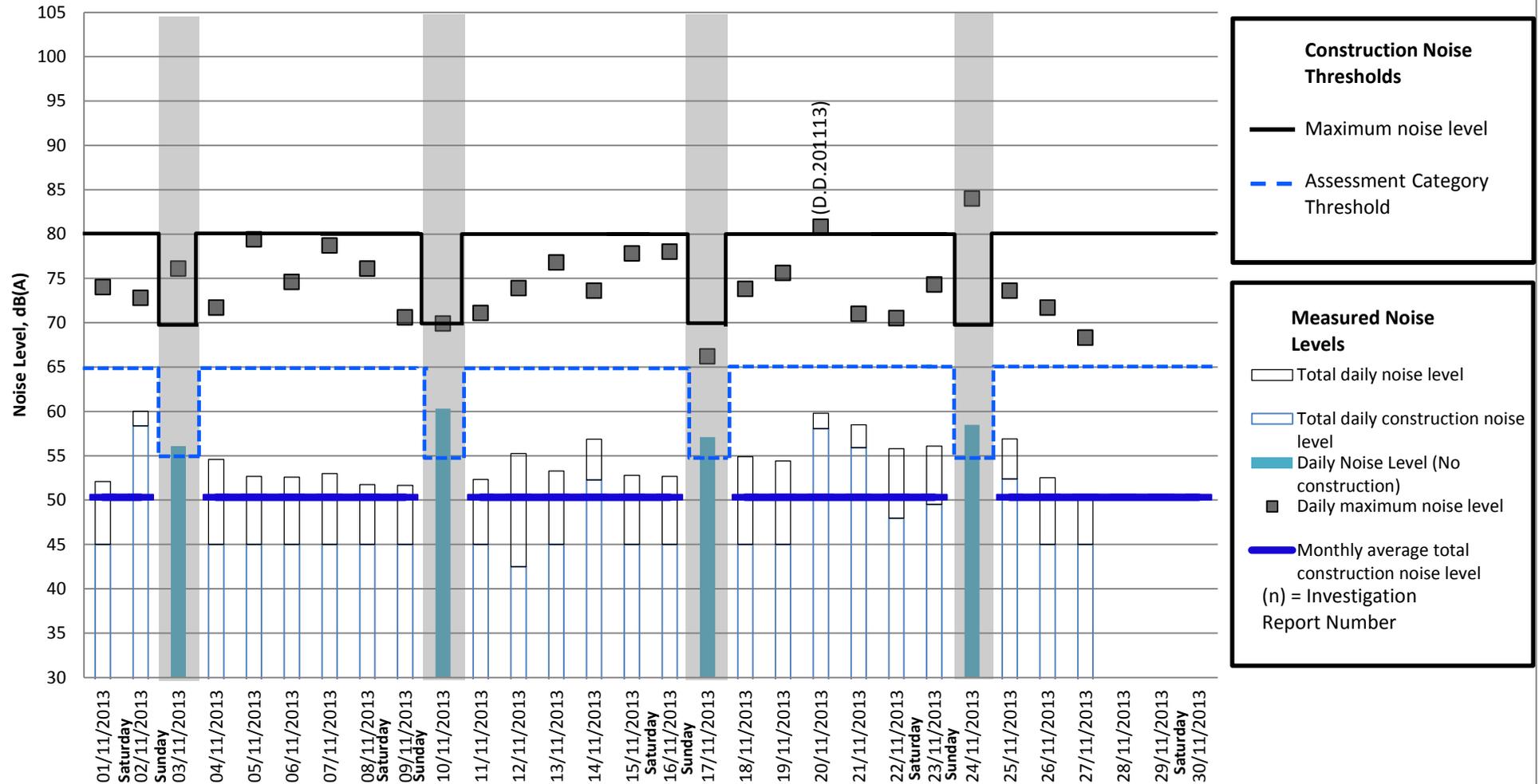


Measured Night-time Noise Levels at Clufflat Brae

Measurement period: November 2013

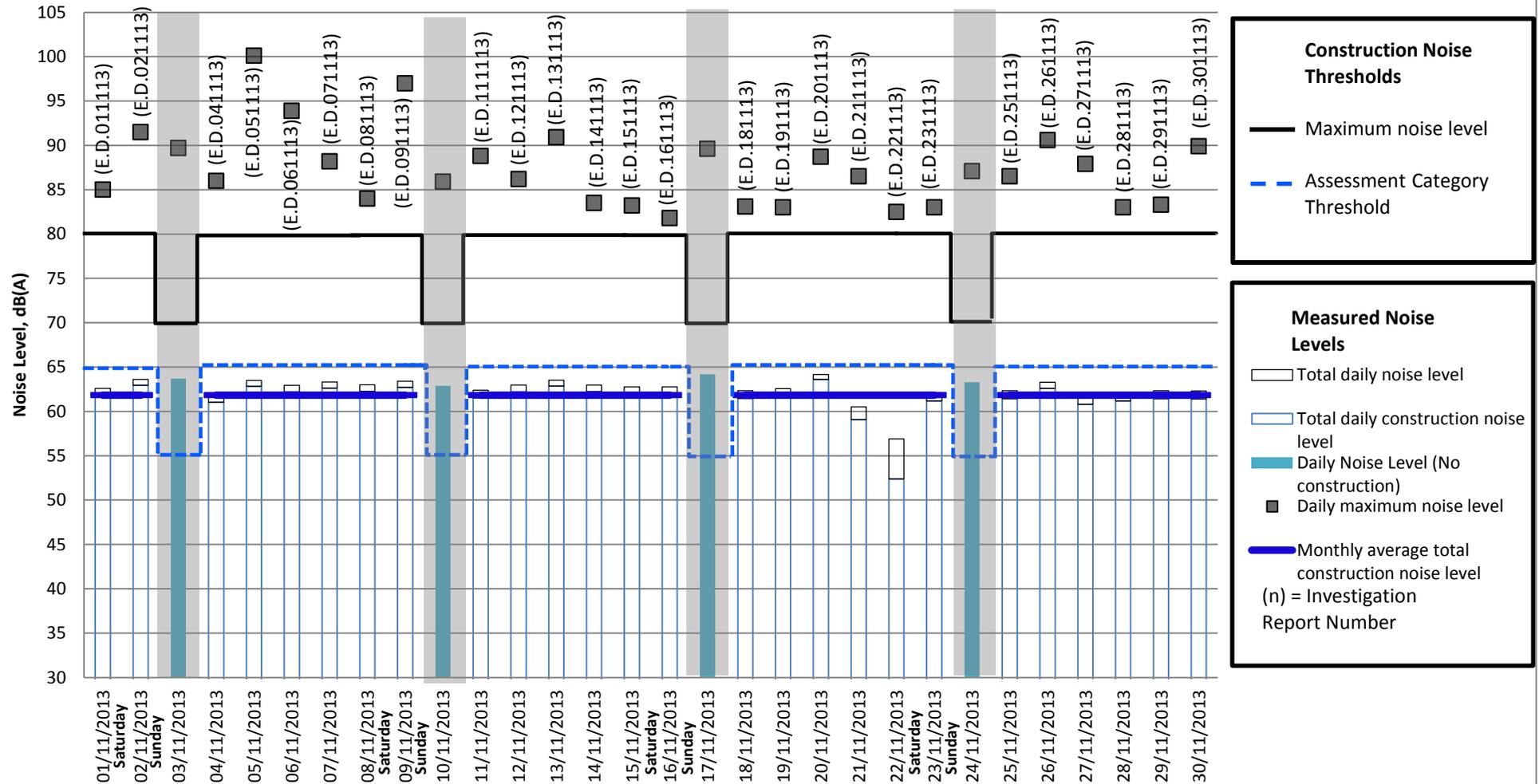


Measured Daytime Noise Levels at Dundas Home Farm Measurement period: November 2013



Note: The grey areas of the chart represent days on which no construction works have been undertaken at this location; no Sunday works have been undertaken at this location. Data is missing for 28/11/13 to 30/11/13 due to device error.

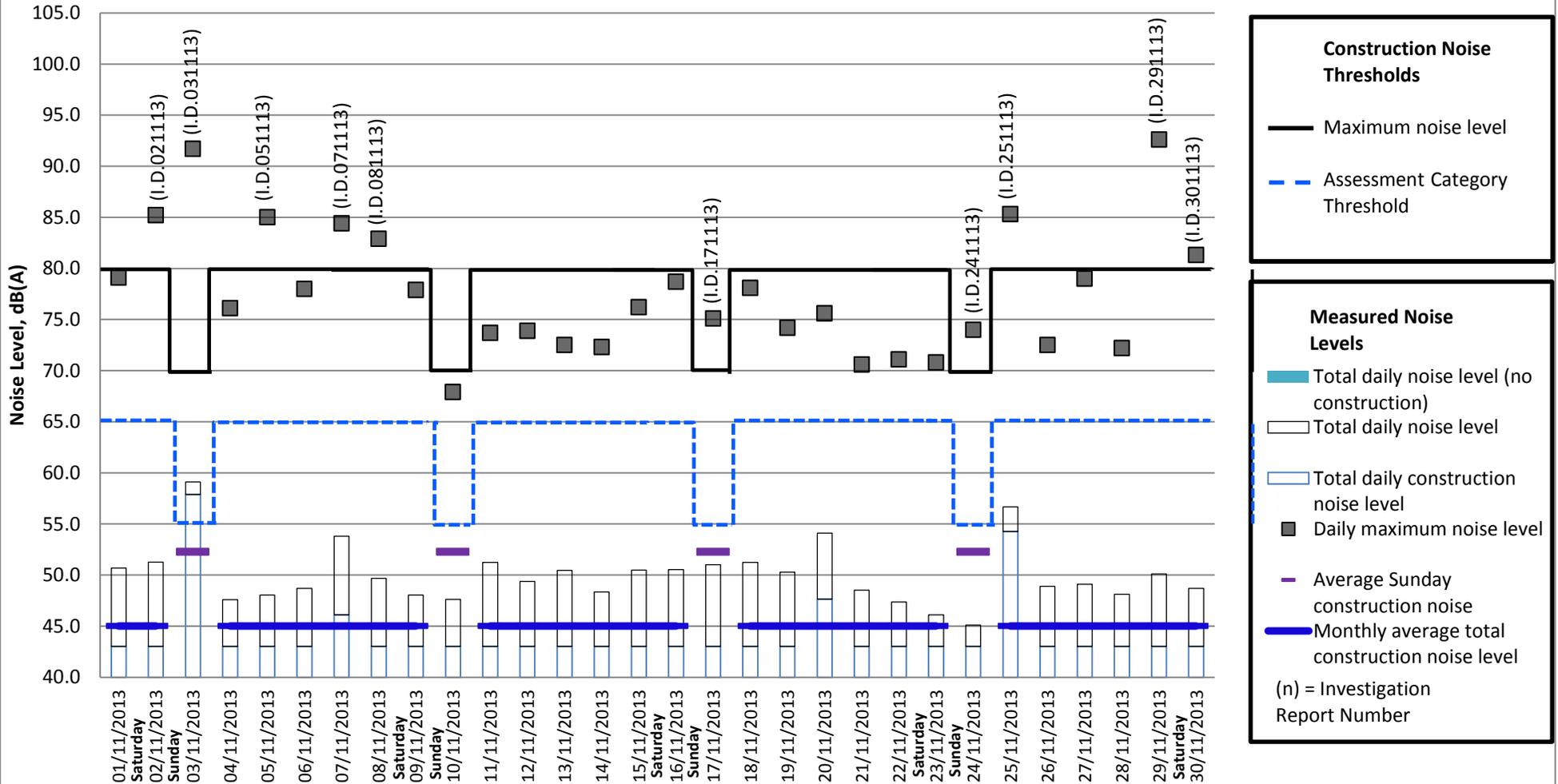
Measured Daytime Noise Levels at Echline Measurement period: November 2013



Note: The grey areas of the chart represent days on which no construction works have been conducted. The Sunday average has not been included as no Sunday works have been conducted at this location.

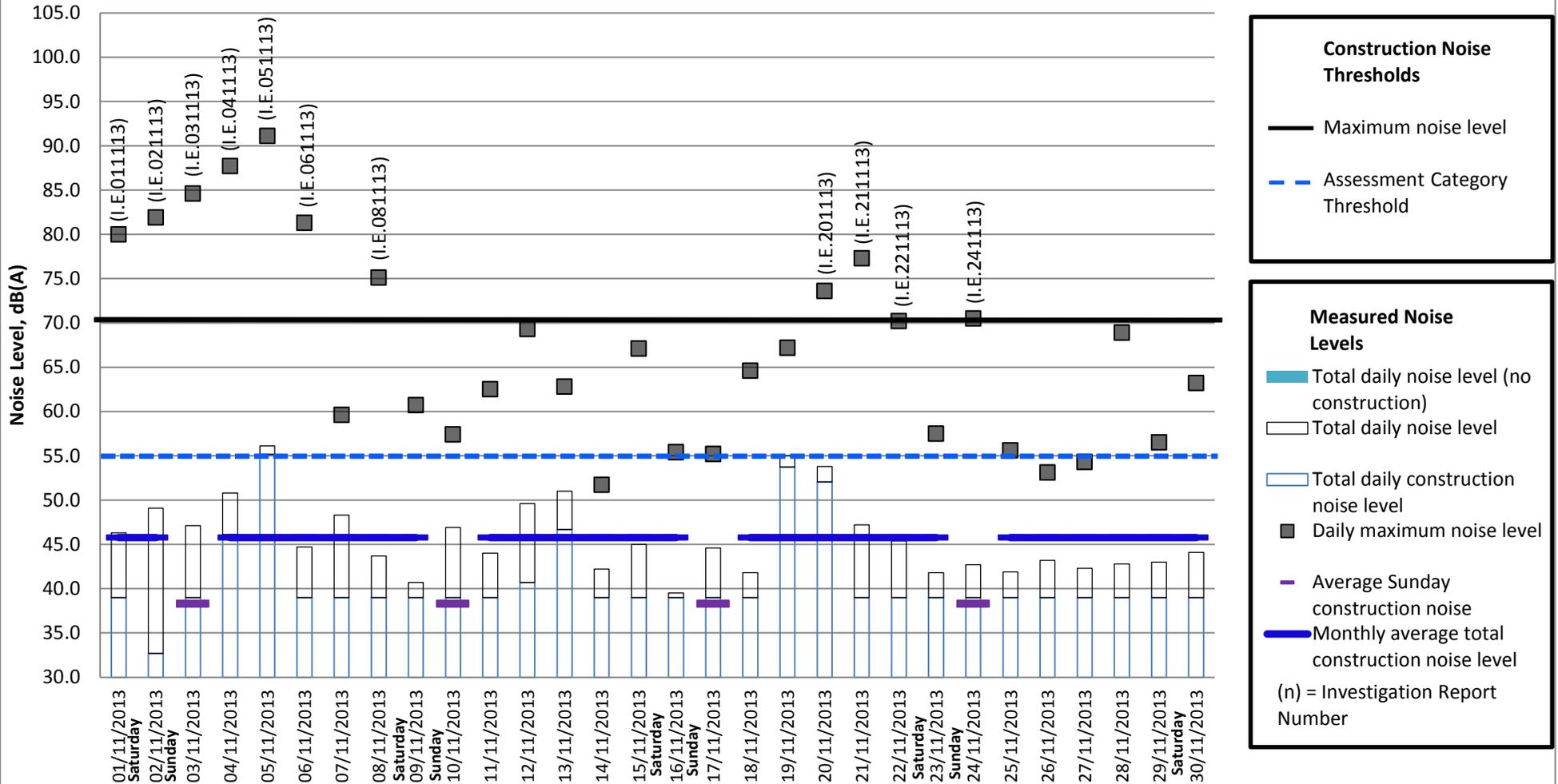
Measured Daytime Noise Levels at Inchgarvie

Measurement period: November 2013



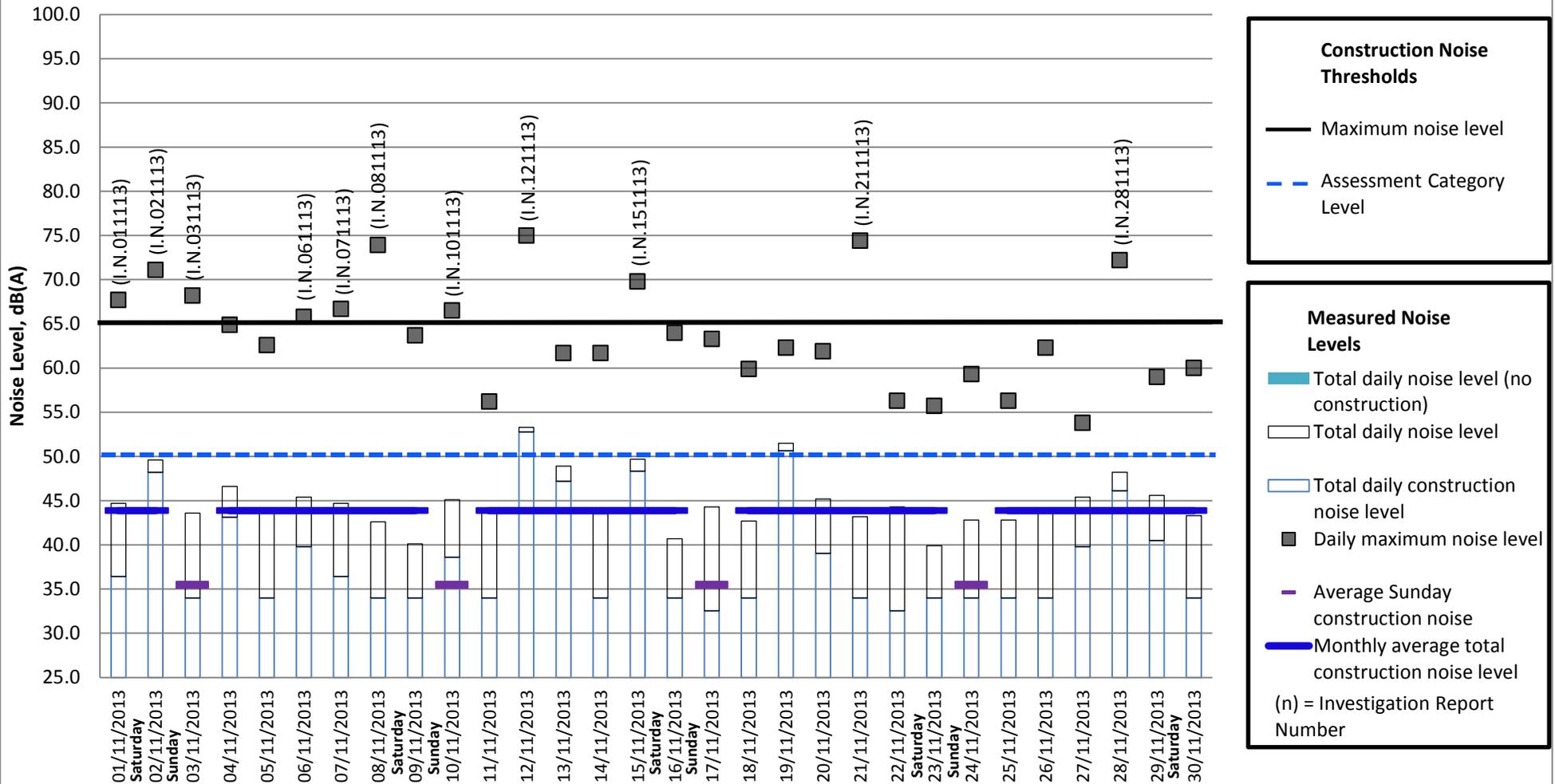
Measured Evening Noise Levels at Inchgarvie

Measurement period: November 2013



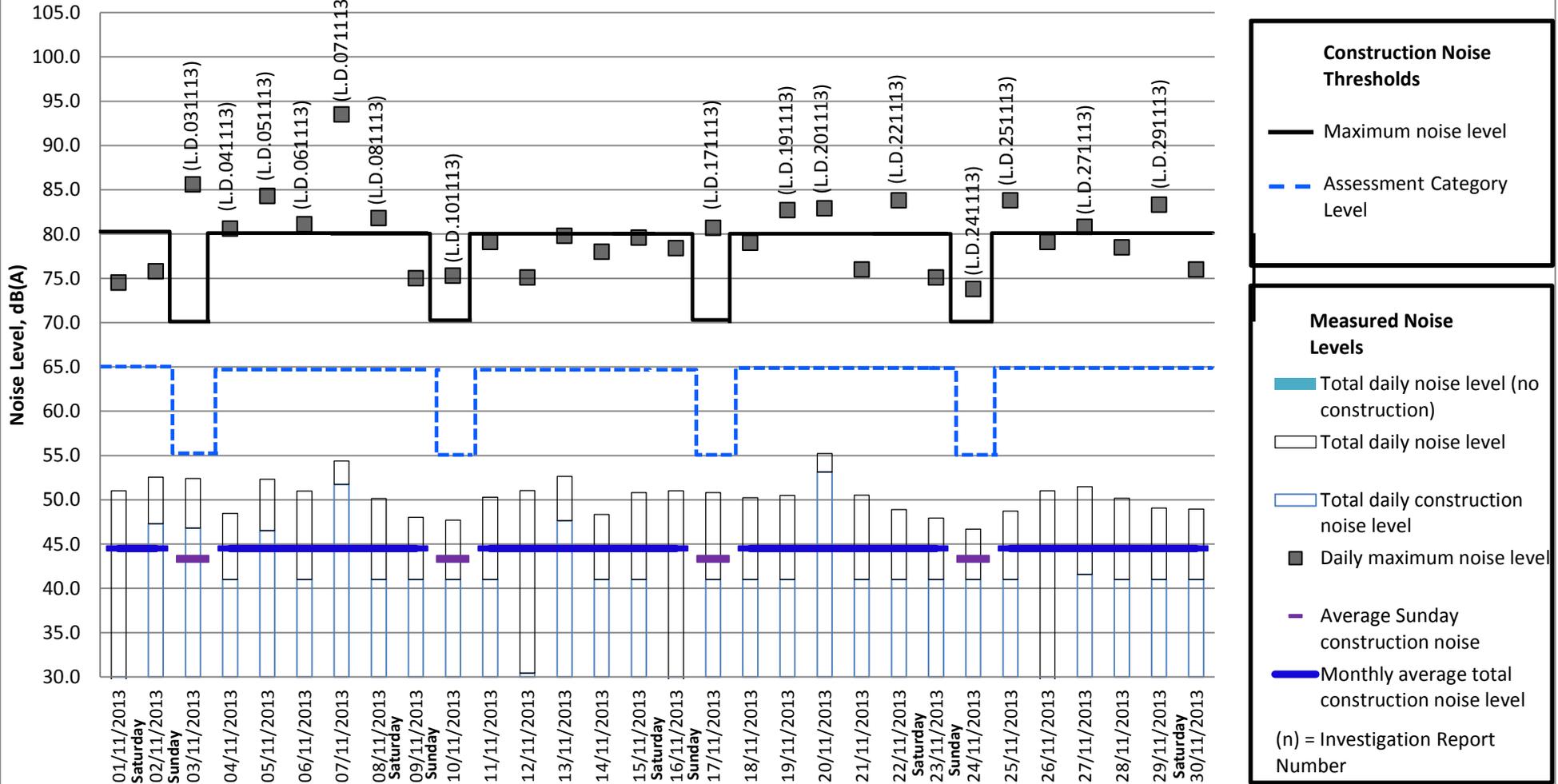
Measured Night-time Noise Levels at Inchgarvie

Measurement period: November 2013



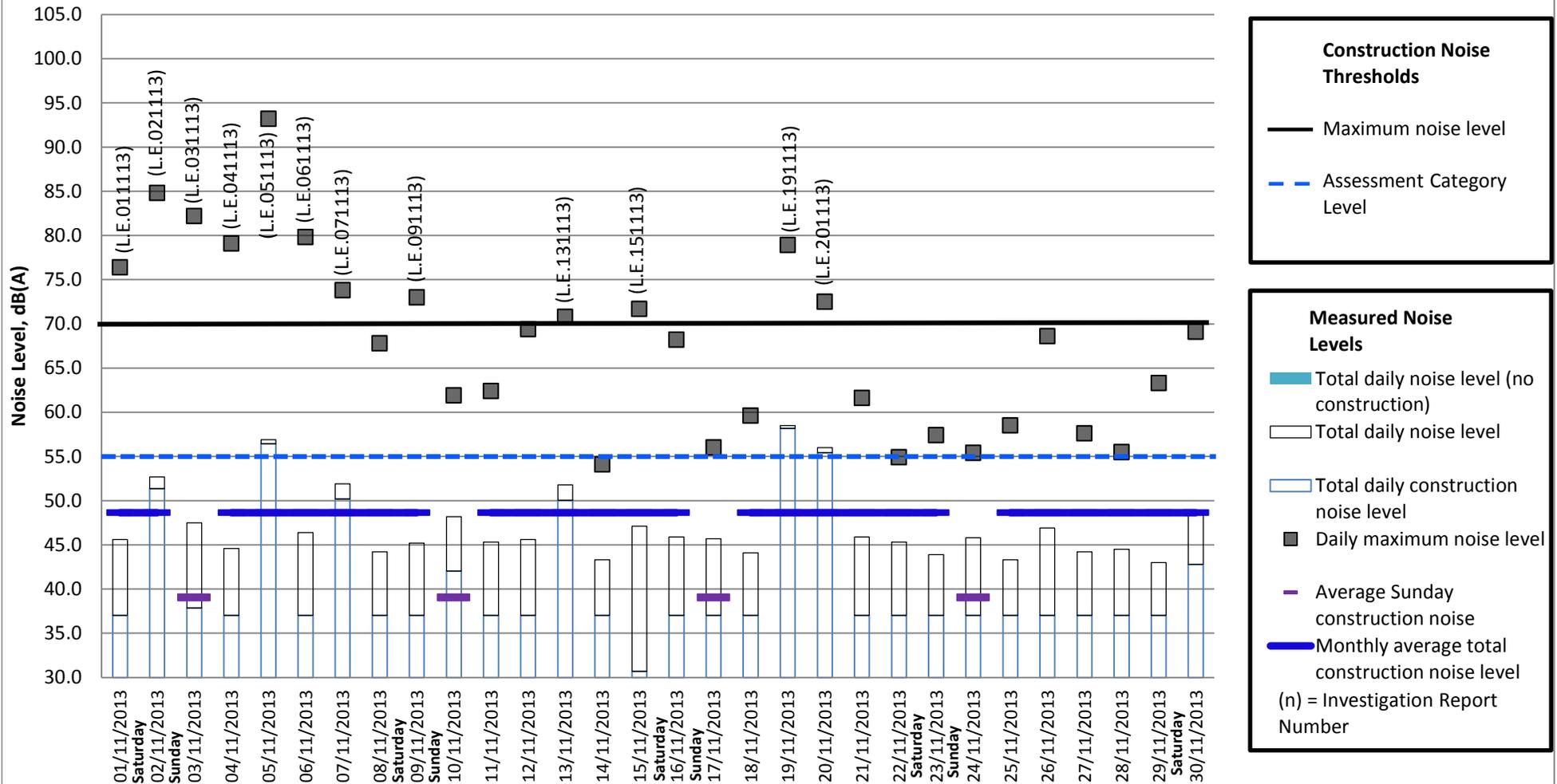
Measured Daytime Noise levels at Linn Mill

Measurement period: November 2013



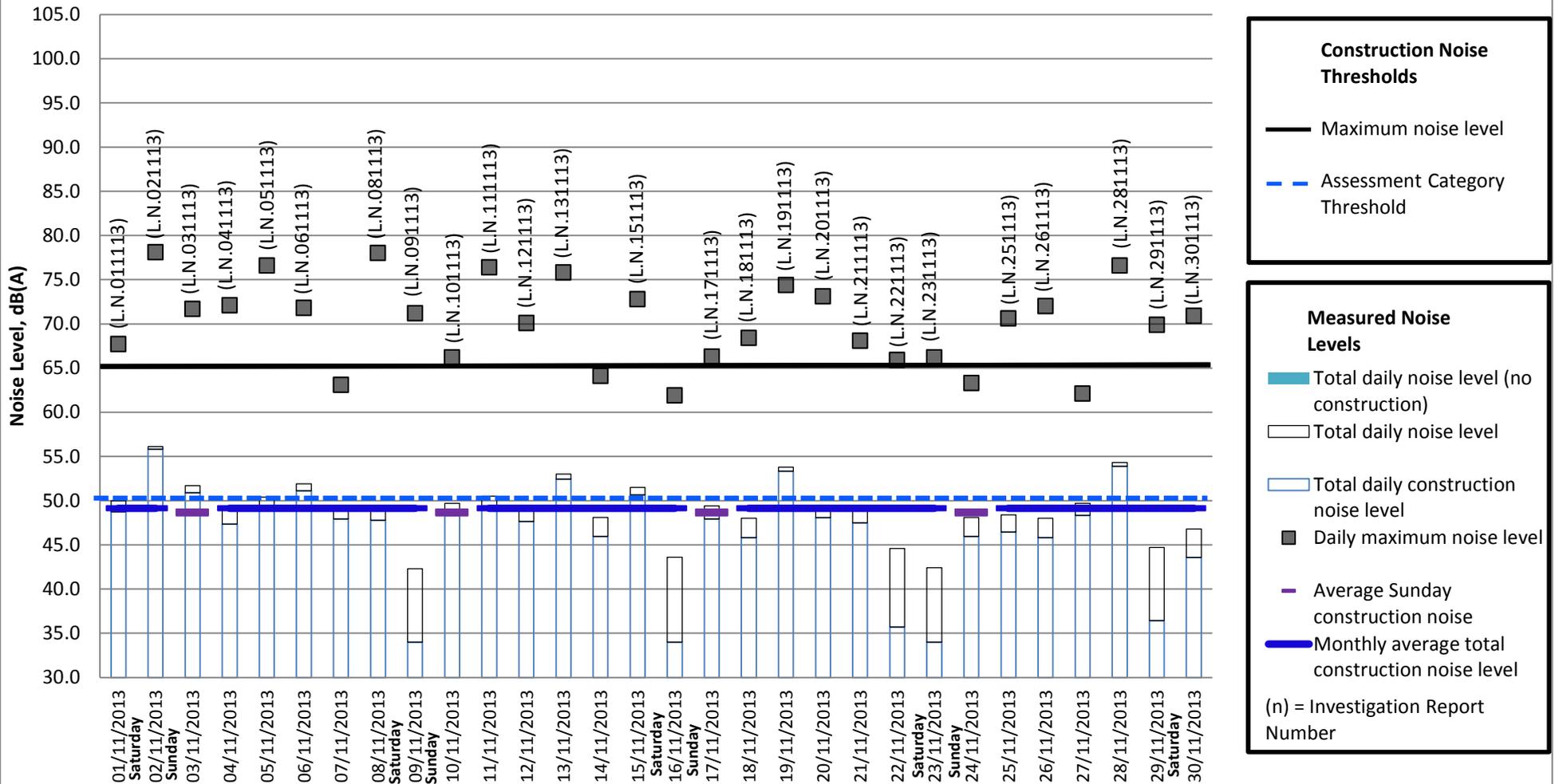
Measured Evening Noise Levels at Linn Mill

Measurement period: November 2013

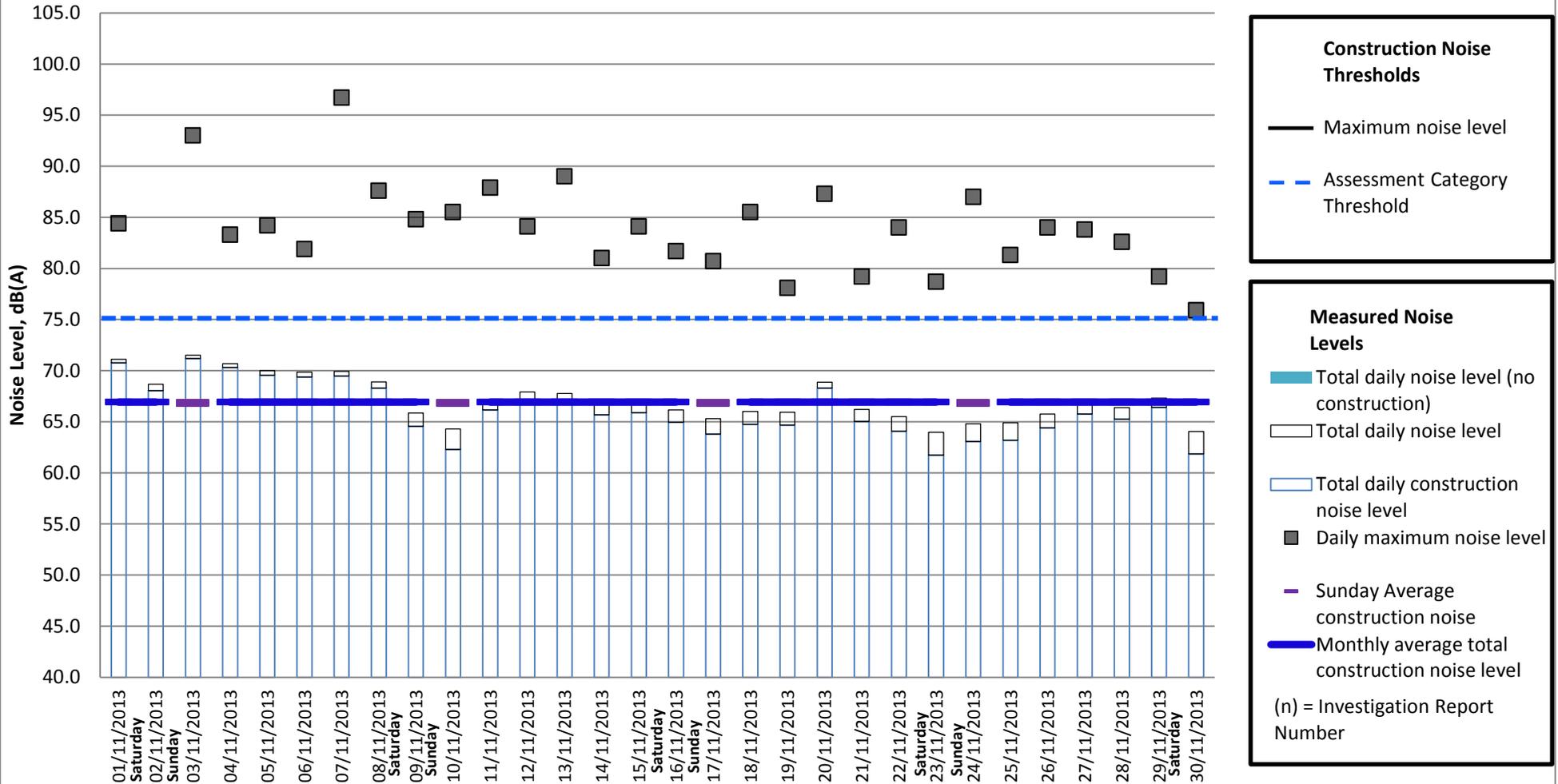


Measured Night-time Noise Levels at Linn Mill

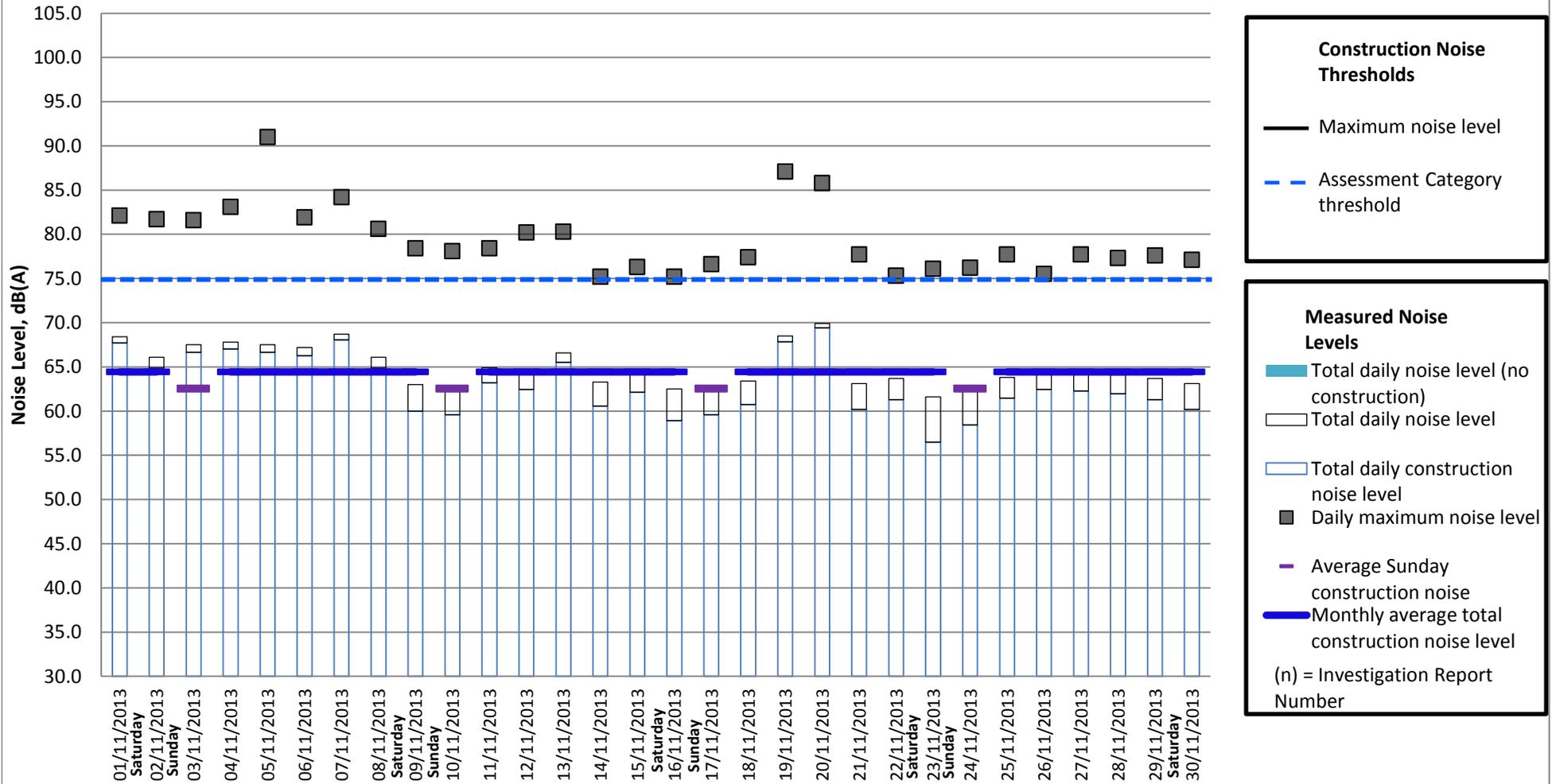
Measurement period: November 2013



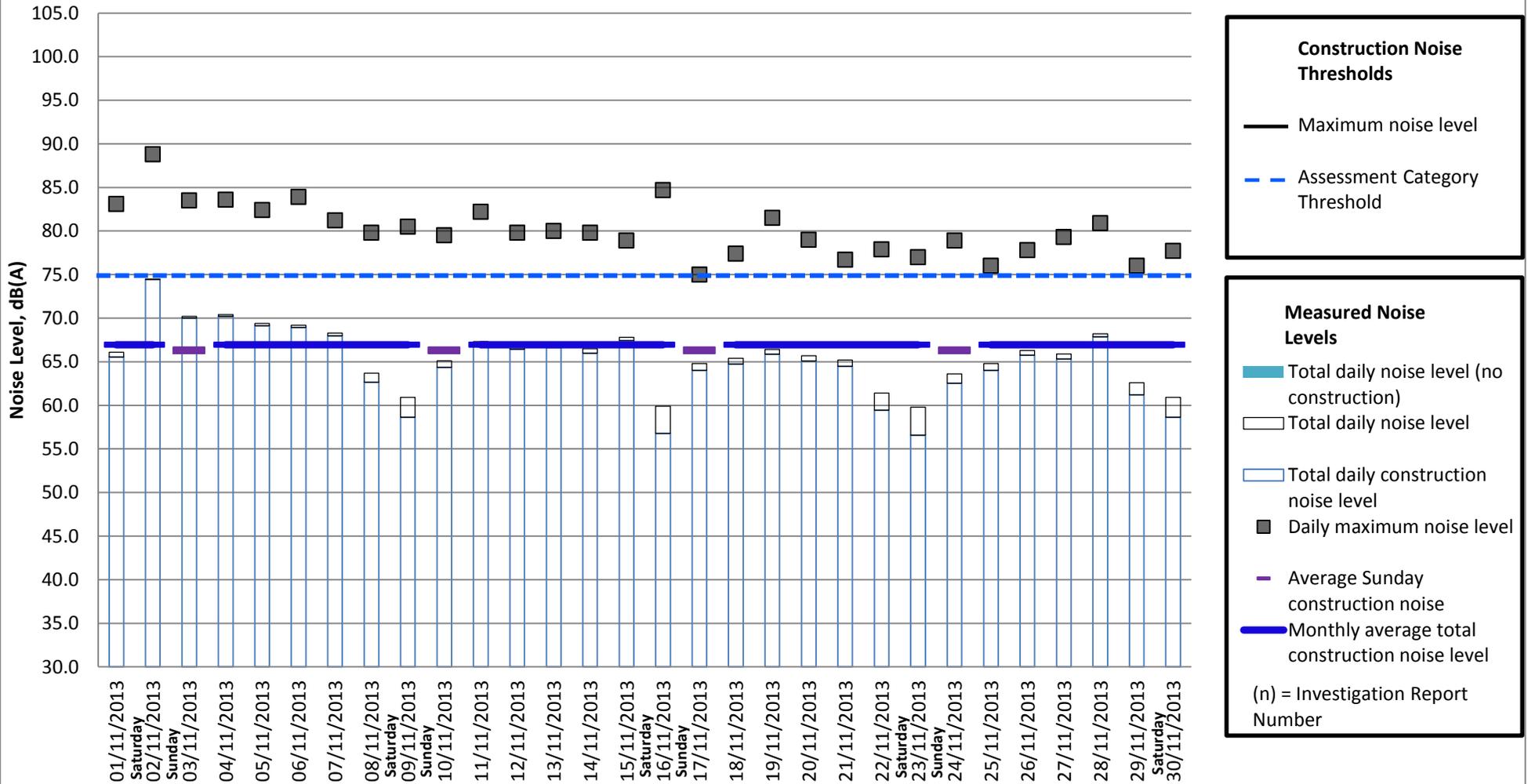
Measured Daytime Noise Levels at North Leg Measurement period: November 2013



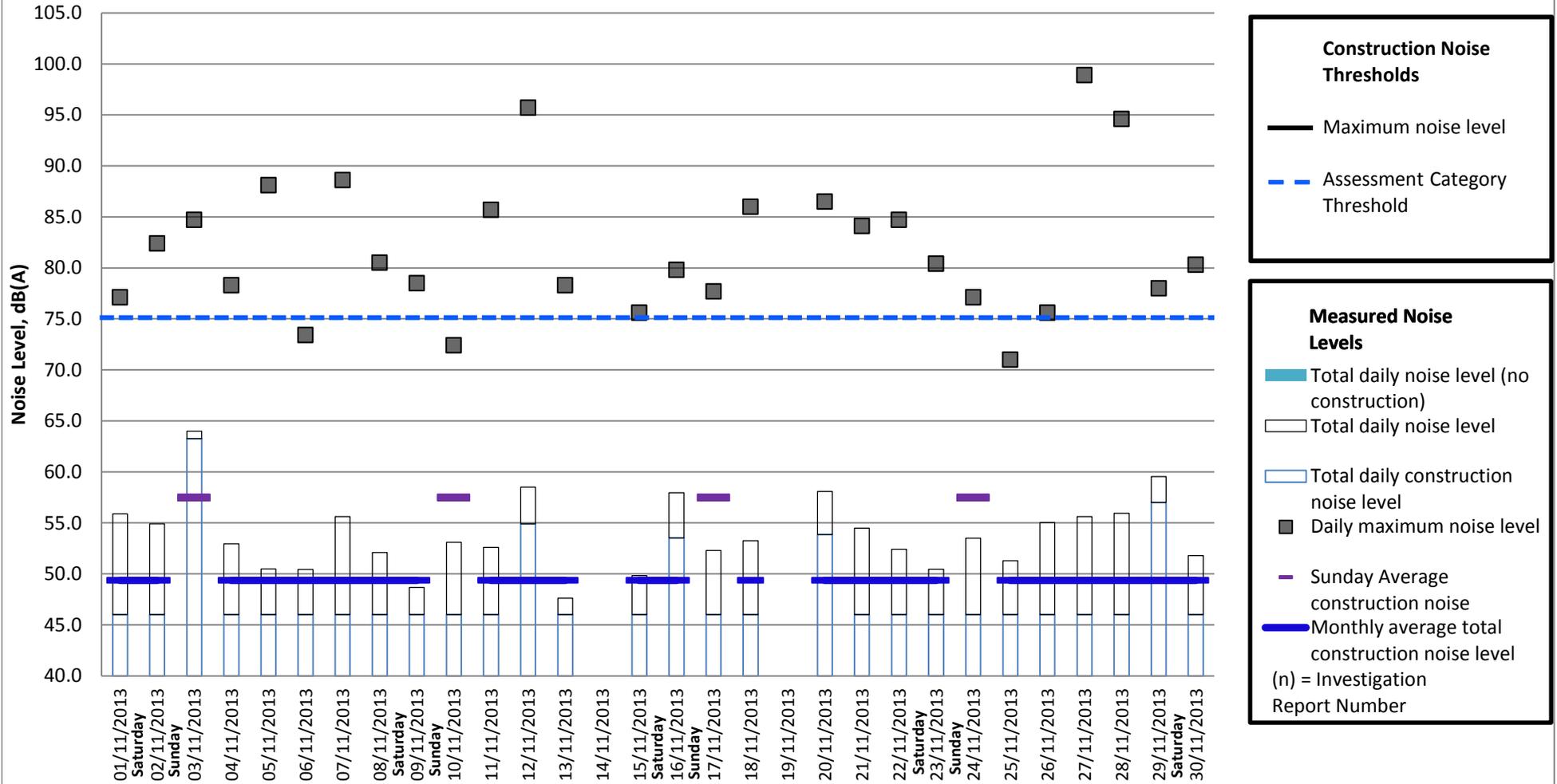
Measured Evening Noise Levels at North Leg Measurement period: November 2013



Measured Night-time Noise Levels at North Leg Measurement period: November 2013

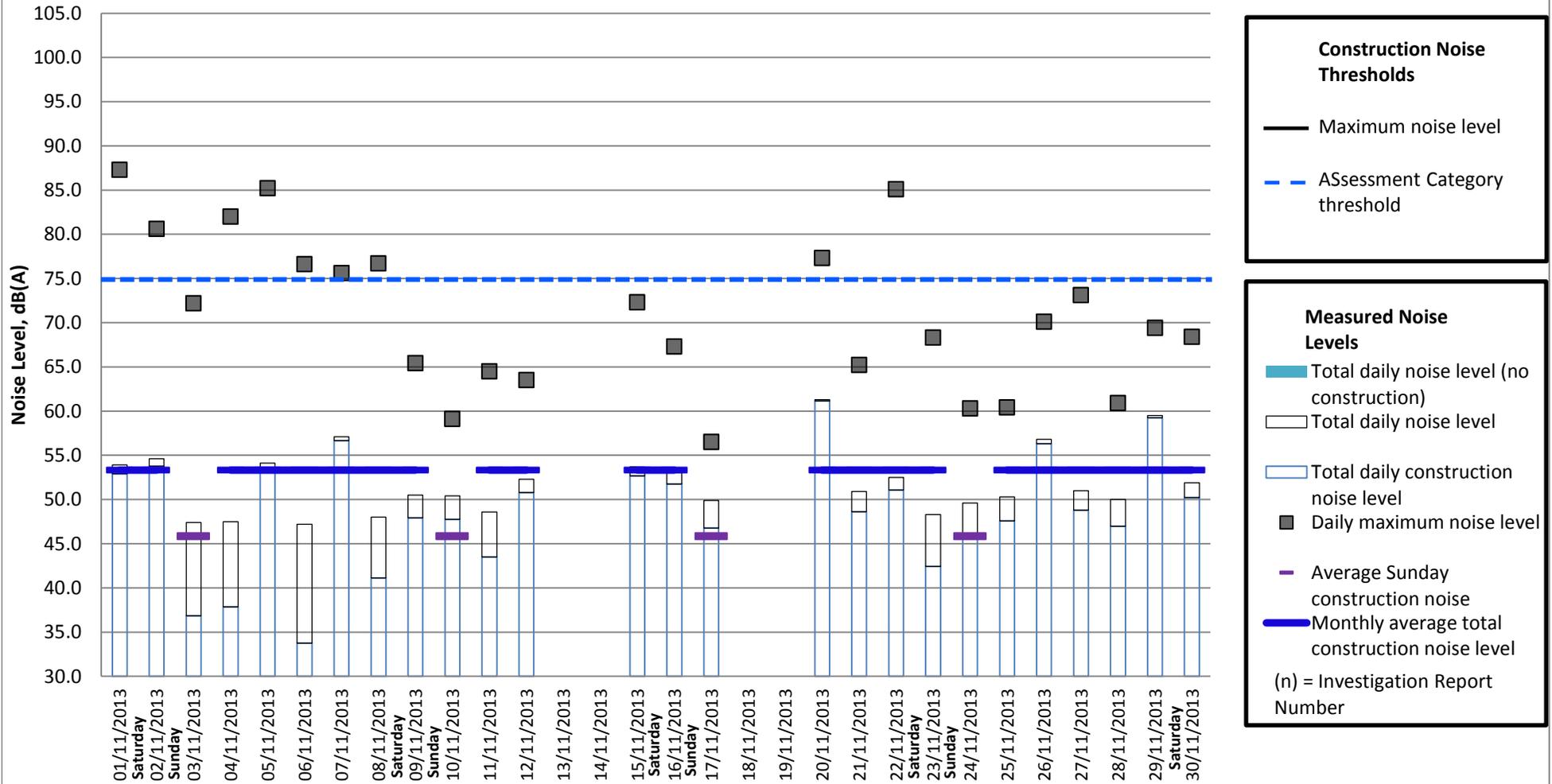


Measured Daytime Noise Levels at Port Edgar Measurement period: November 2013



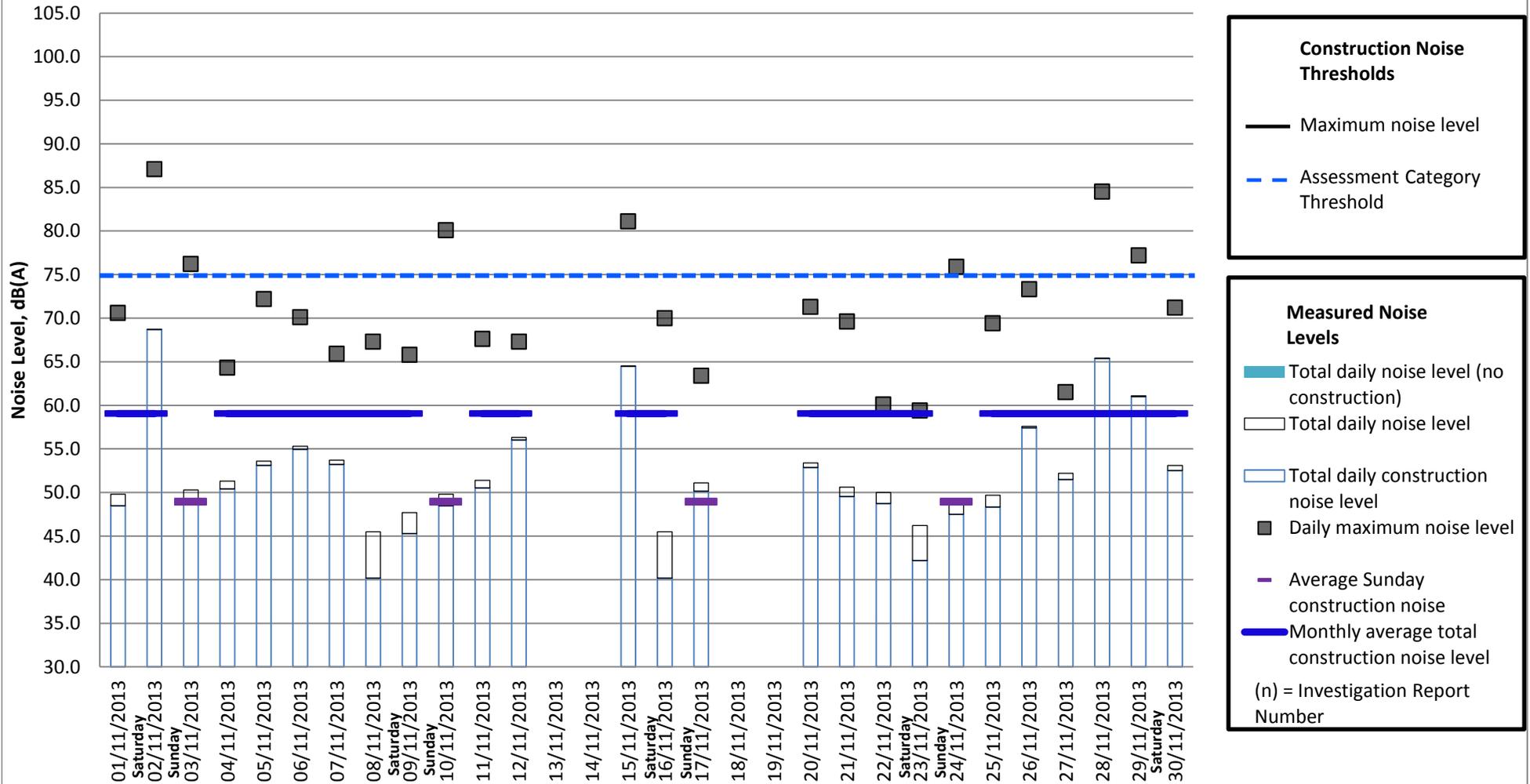
Note: Data is missing for 14/11/13 and 19/11/13 due to device error.

Measured Evening Noise Levels at Port Edgar Measurement period: November 2013



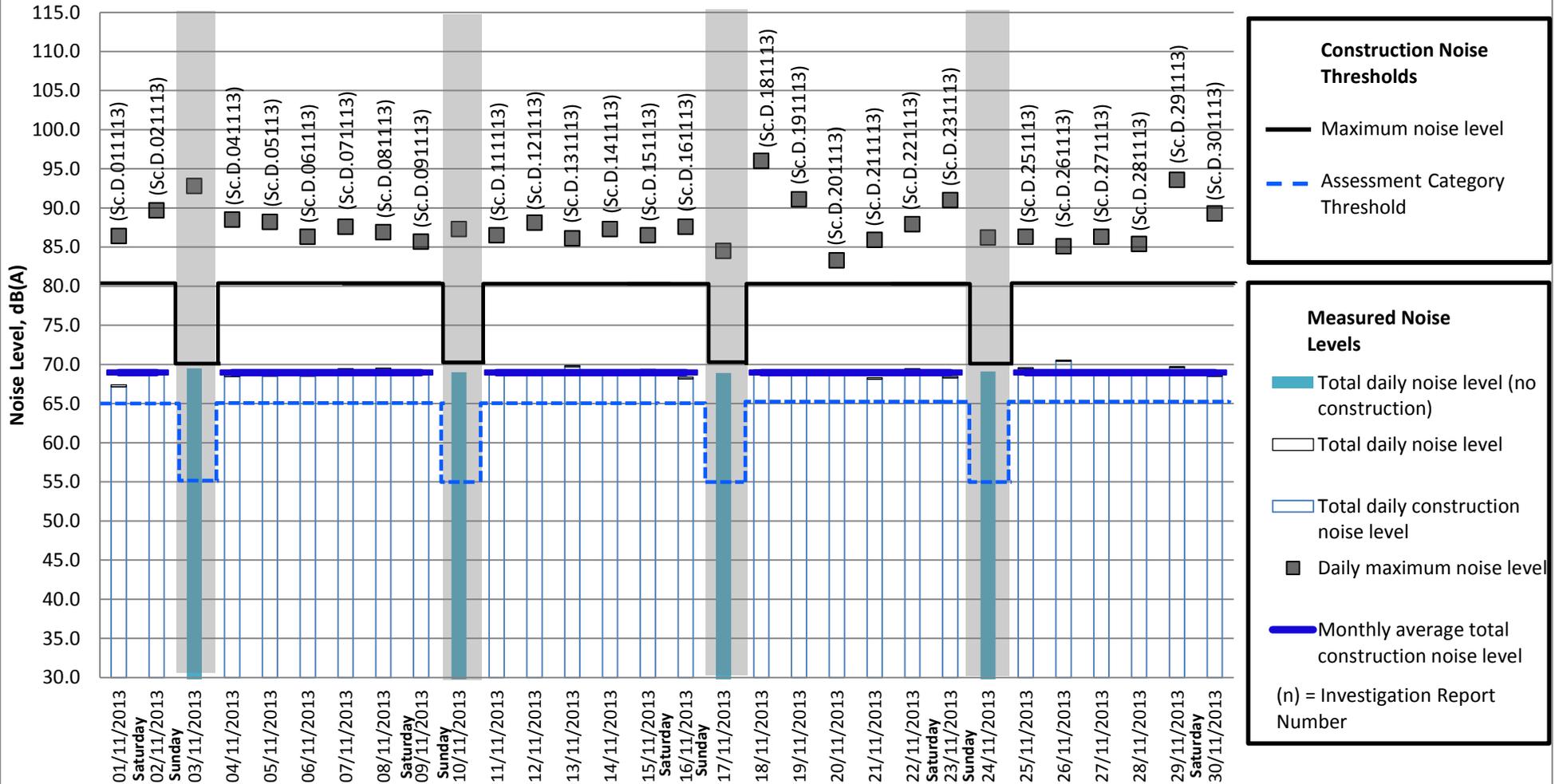
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Measured Night-time Noise Levels at Port Edgar Measurement period: November 2013



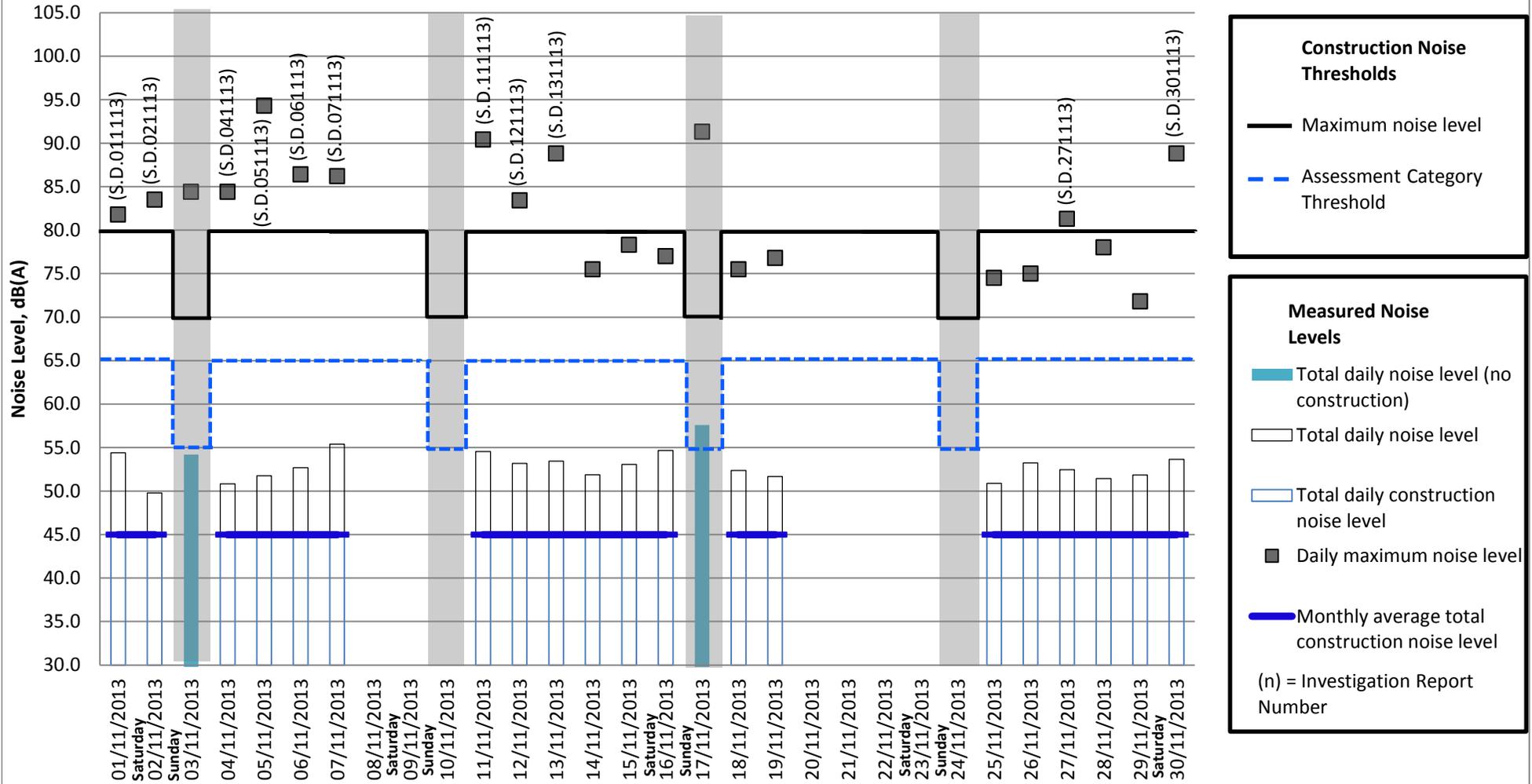
Note: Data is missing for 13/11/13 to 14/11/13 and 18/11/13 to 19/11/13 due to device error.

Measured Daytime Noise Levels at Scotstoun Measurement period: November 2013



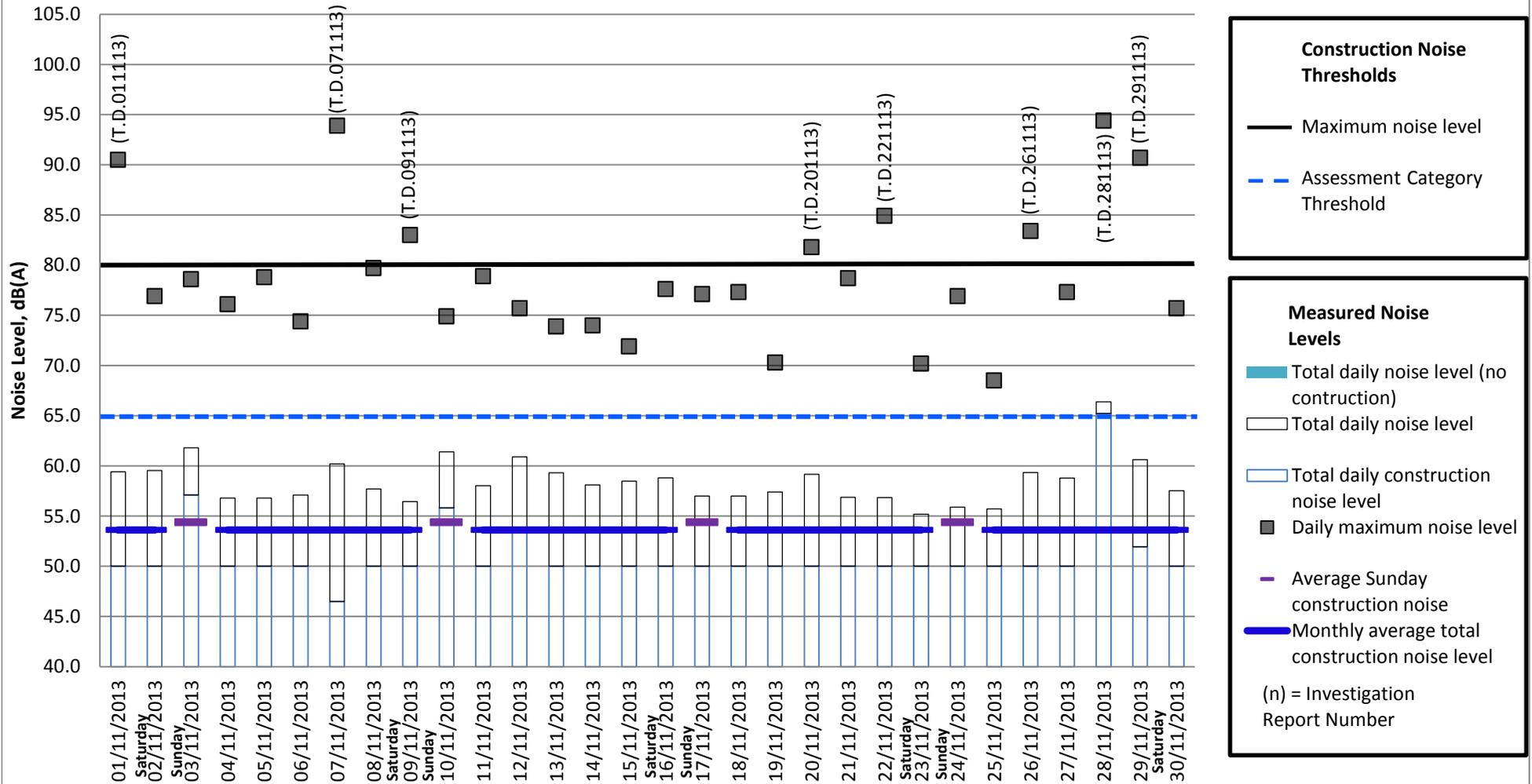
Note: The grey areas of the chart represent days on which no construction works have been conducted. The monthly average construction noise for Sunday has not been included as no Sunday works have been conducted at this location .

Measured Daytime Noise Levels at Springfield Measurement period: November 2013



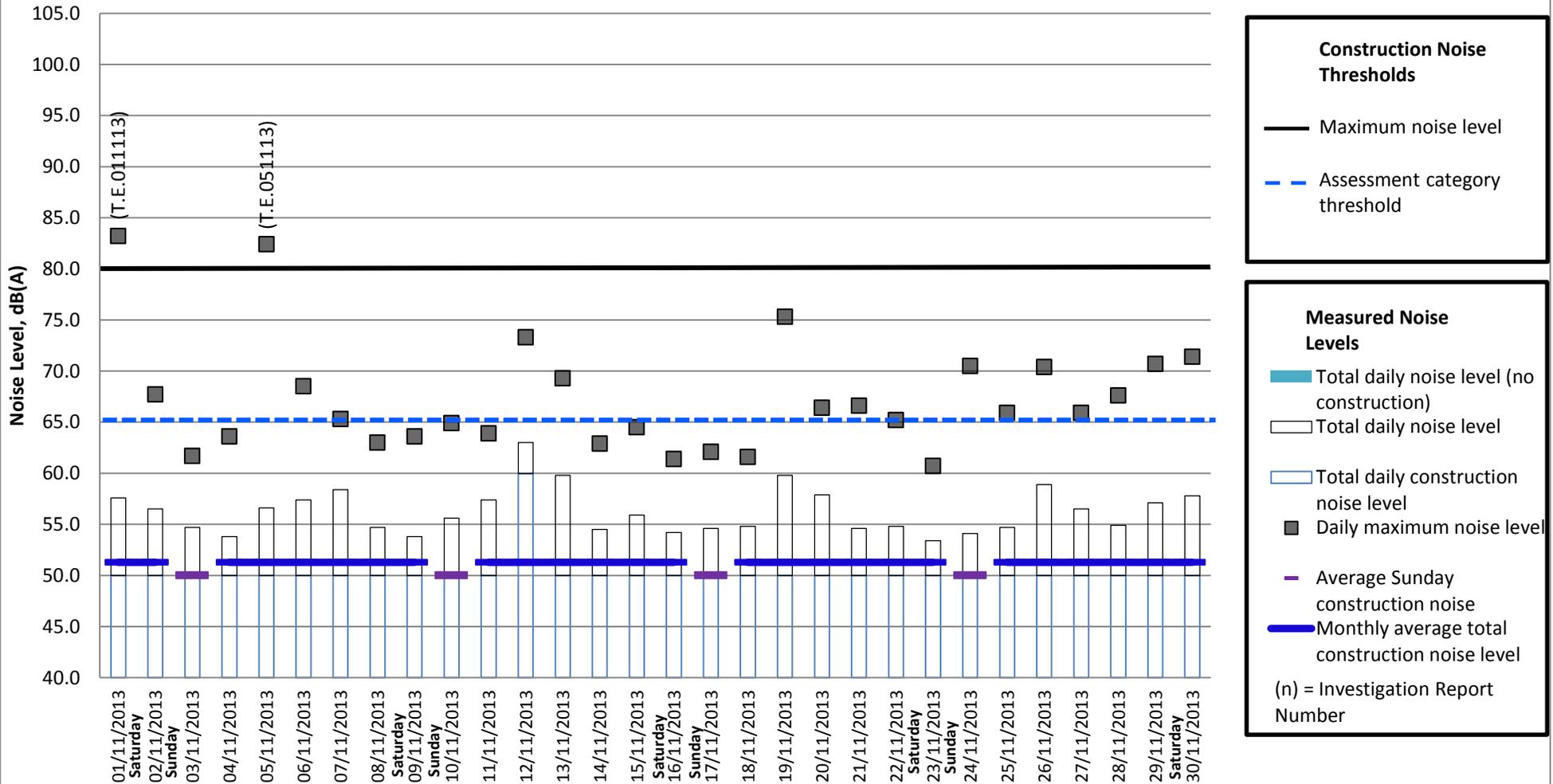
Note: The grey areas of the chart represent days on which no construction works have been conducted. Data is missing for 08/11/13 to 10/11/13 due to an error associated with the download of the data. Data is missing for 20/11/12 to 24/11/12 due to device error.

Measured Daytime Noise Levels at Tigh-Na-Grian Measurement period: November 2013



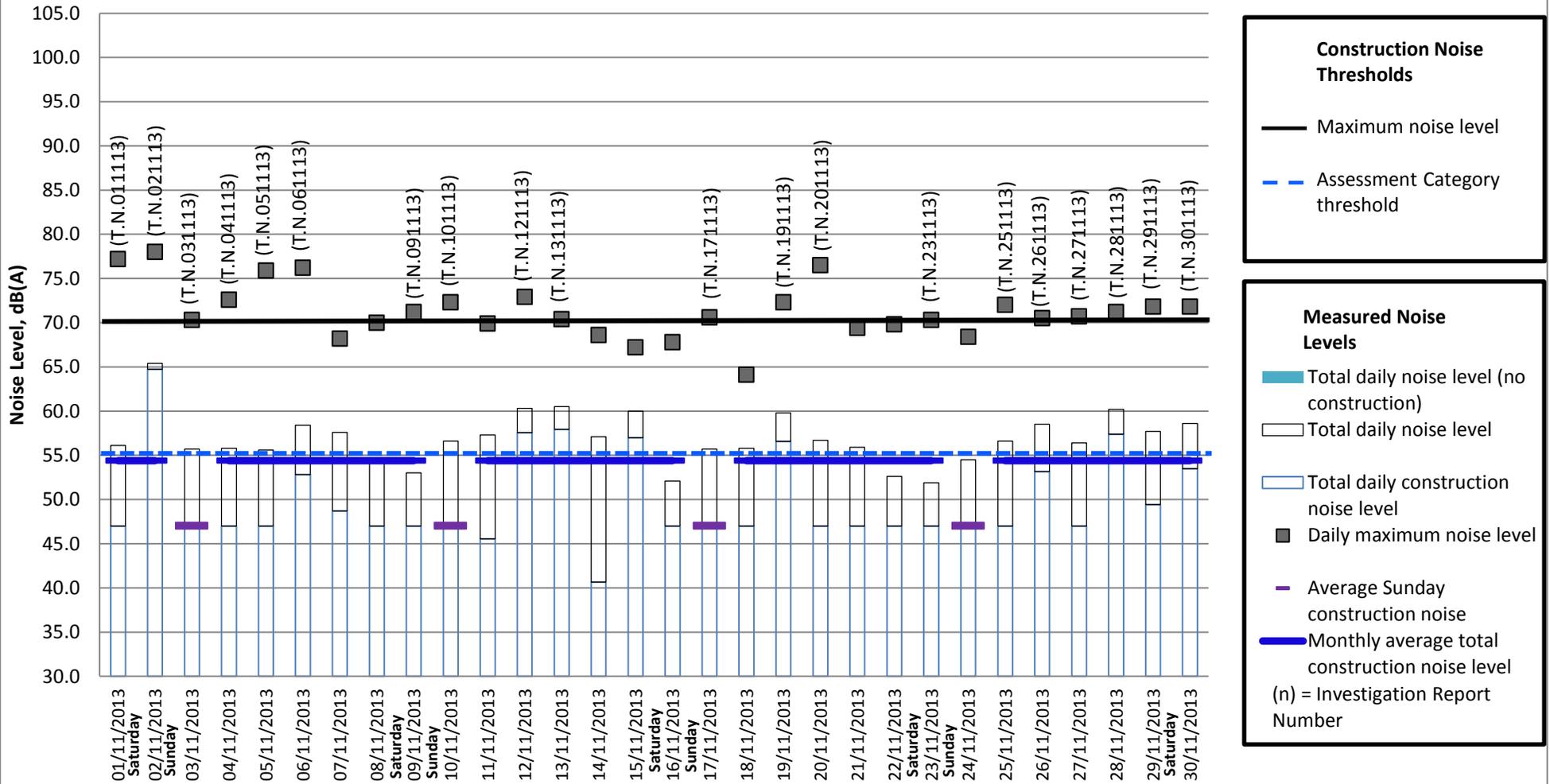
Measured Evening Noise Levels at Tigh-Na-Grian

Measurement period: November 2013



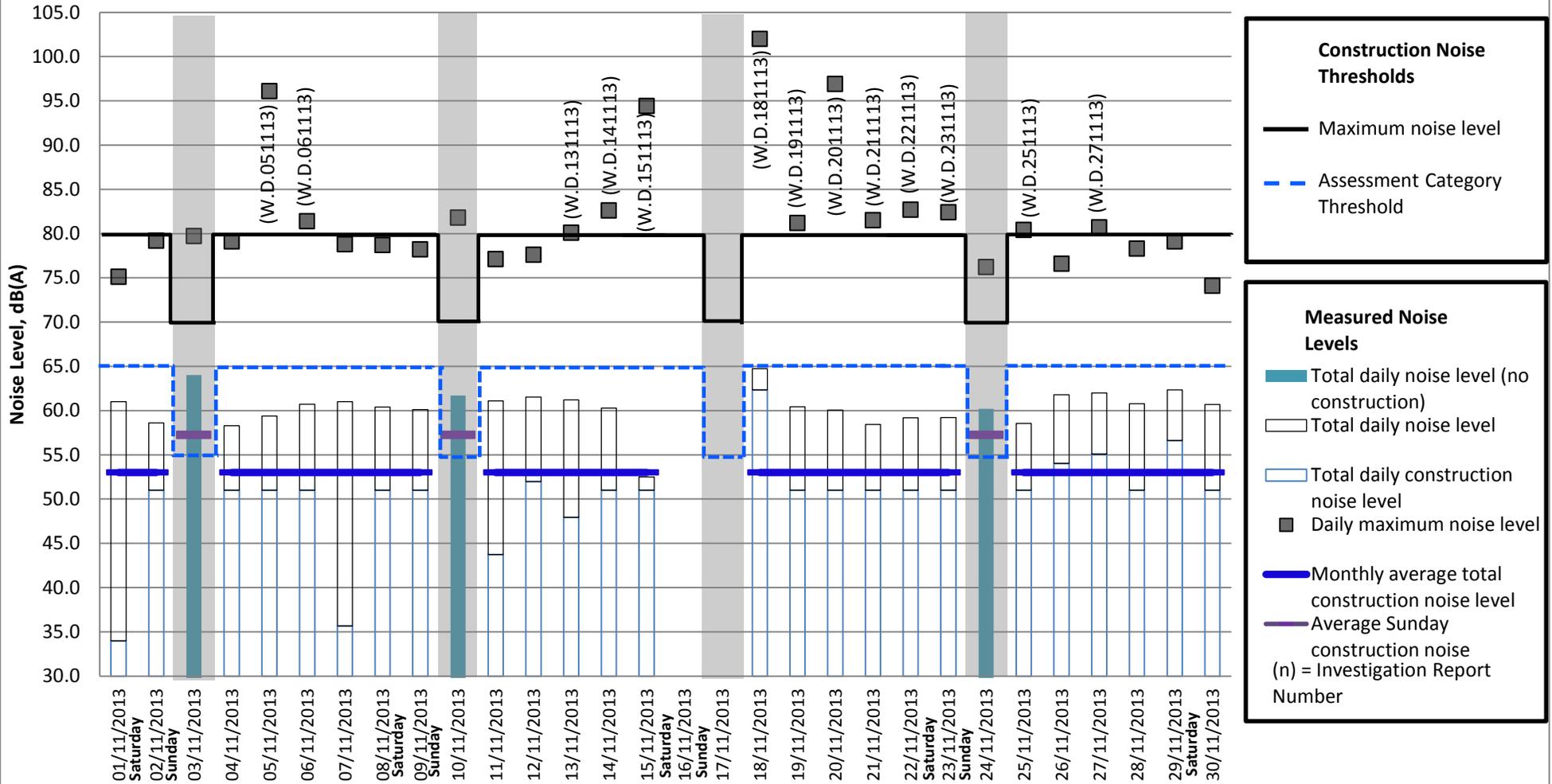
Measured Night-time Noise Levels at Tigh-Na-Grian

Measurement period: November 2013



Measured Daytime Noise Levels at Whinny Hill

Measurement period: November 2013



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