



Contractor



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Project **FORTH REPLACEMENT CROSSING**

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CONSTRUCTION NOISE MONITORING REPORT: MARCH 2016

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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 March 2016. 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 March 2016, 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, Linn Mill and Whinny Hill.
- 2.3 Various construction works were undertaken across the site during March 2016. **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 March 2016
M1	Whinny Hill	Network	<ul style="list-style-type: none"> • Earth Works/Fill Placement • Hope Street roadworks • FT03 & FT04 Bridge Works • FT09 Works • FT19 Works • FT07 bridge demolition • Main carriageway roadworks • Rock crushing
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 & N2 bearing works • AVN Launch
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 • AVS rebar & concrete deck 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 • AVS rebar & concrete deck works
M10	Inchgarvie Lodge	Crossing	<ul style="list-style-type: none"> • AVS rebar & concrete deck works • 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. • Main carriageway roadworks
M11	Linn Mill	Network (close	<ul style="list-style-type: none"> • AVS rebar & concrete deck works • No night time or Sunday construction in the



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		proximity to Crossing)	vicinity • Main carriageway roadworks
M13	Clufflat Brae	Crossing / Network	<ul style="list-style-type: none"> • AVS rebar and concrete deck works • No night time or Sunday construction in the vicinity • Main carriageway roadworks
M14	Springfield	Network	<ul style="list-style-type: none"> • AVS rebar and concrete deck works • No night time or Sunday construction in the vicinity • Main carriageway roadworks
M15	Echline	Network	<ul style="list-style-type: none"> • AVS rebar and concrete deck works • No night time or Sunday construction in the vicinity • Main carriageway roadworks
M16	Scotstoun	Network	<ul style="list-style-type: none"> • Footpath works • Utility works • ESQ11 rebar works • B800 roadworks including bridge works (these works are directly in the location of the meter which now sits within the construction boundary). • Main carriageway roadworks
M17	Dundas Home Farm	Network	<ul style="list-style-type: none"> • Utility works • ESQ11 rebar works • B800 Roadworks • Main carriageway roadworks
M18	Newton	Network	• 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 as 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

- 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 March 2016 with the exception of Scotstoun. For evening and night time periods, there were exceedances of monthly average noise at Butlaw, Inchgarvie, Linn Mill and Tigh-Na-Grian during the night-time period. There were also exceedances of Sunday averages at Butlaw and Tigh-Na-Grian during the night.
- 3.4** The daytime exceedances at Scotstoun are likely to be due to the very close proximity of construction to the monitoring location. The works are very similar to previous works in the vicinity and construction noise levels at residential receptors were unlikely to be higher than before. No complaints were received from any of the residents in the location of the works during this period. There were construction related exceedances at Scotstoun on the 24th 30th and 31st March.
- 3.5** 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 recordings demonstrate 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.
- 3.6** 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, 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 construction exceedance. There were some exceedances this month that were due to construction work.
- 3.7** Construction related noise at Linn Mill. The L_{AFmax} exceedances on the 12th, 14th, 15th, 17th, 18th and 30th March occurred during the day and 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. No complaints were received regarding the exceedances.

- 3.8** There were three exceedances at Butlaw which occurred during the night time period. The exceedances on the 4th, 7th and 23rd were caused by hammering. Foremen have been re-briefed and toolbox talks undertaken with regards to noise management.
- 3.9** FT07 bridge demolition took place from 11 March at 22:00 until 14 March at 06:00. There were exceedances on the 12th March at Whinnyhill during the night time period through this demolition. The works were carried out implementing best practical means practices. Graphs have been included for the period of the demolition works
- 3.10** 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 recorded a high number of waves breaking against the shore. Ongoing residential building works at Inchgarvie Lodge accounts for the majority of the exceedances at this location.
- 3.11** 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 March the maximum noise threshold was exceeded on 46 occasions (9 day time, 7 evening and 30 night time). Exceedances were mostly attributed to non-construction factors notably birds, waves and wind. There were three instances of construction noise exceeding the threshold (see 3.7)
Clufflat Brae	During March the maximum noise threshold was exceeded on 35 occasions (6 daytime, 7 evening and 22 night time). Exceedances were mainly found to be due to birds and high winds.
Inchgarvie Lodge	During March the maximum noise threshold was exceeded on 53 occasions (16 day time, 6 evening and 31 night time). Residential work to the property was found to be the main contributing factors to the exceedances in this location. Other factors included high winds and birds.
Linn Mill	During March the maximum noise threshold was exceeded on 31 occasions (12 daytime, 7 evening and 22 night time). The majority of exceedances at this location were due to birds, wind and rain. There were six instances of construction noise exceeding the threshold (see 3.7)
Tigh-Na-Grian	During March the maximum noise threshold was exceeded on 51 occasions (12 daytime, 10 evening and 29 night time). Exceedances were mainly due to birds and wind.
Dundas Home Farm	During March the maximum noise threshold was exceeded on 12 occasions. The main exceedances were due to residents and birds.
Echline	During March the maximum noise threshold was exceeded on 31 occasions. No exceedances at this location were due to construction activities. Most exceedances were attributed to vehicles passing by on the adjacent roads and wind.
Springfield	During March the maximum noise threshold was exceeded on 20 occasions. These exceedances were due to local residents, birds and wind.
Scotstoun	During March the maximum noise threshold was exceeded on 31 occasions. These exceedances were mostly attributed to general traffic on the adjacent road however there were three instances of construction noise exceeding the threshold (see 3.4)
Whinny Hill	During March the maximum noise threshold was exceeded on 17 occasions during the daytime. Except for the FT07 demolition works, no exceedances at this location were attributed to construction activities. Most exceedances were due to birds and wind. (see 3.8)
Port Edgar	Recordings taken for data record purposes
Newton	Recordings taken for data record purposes

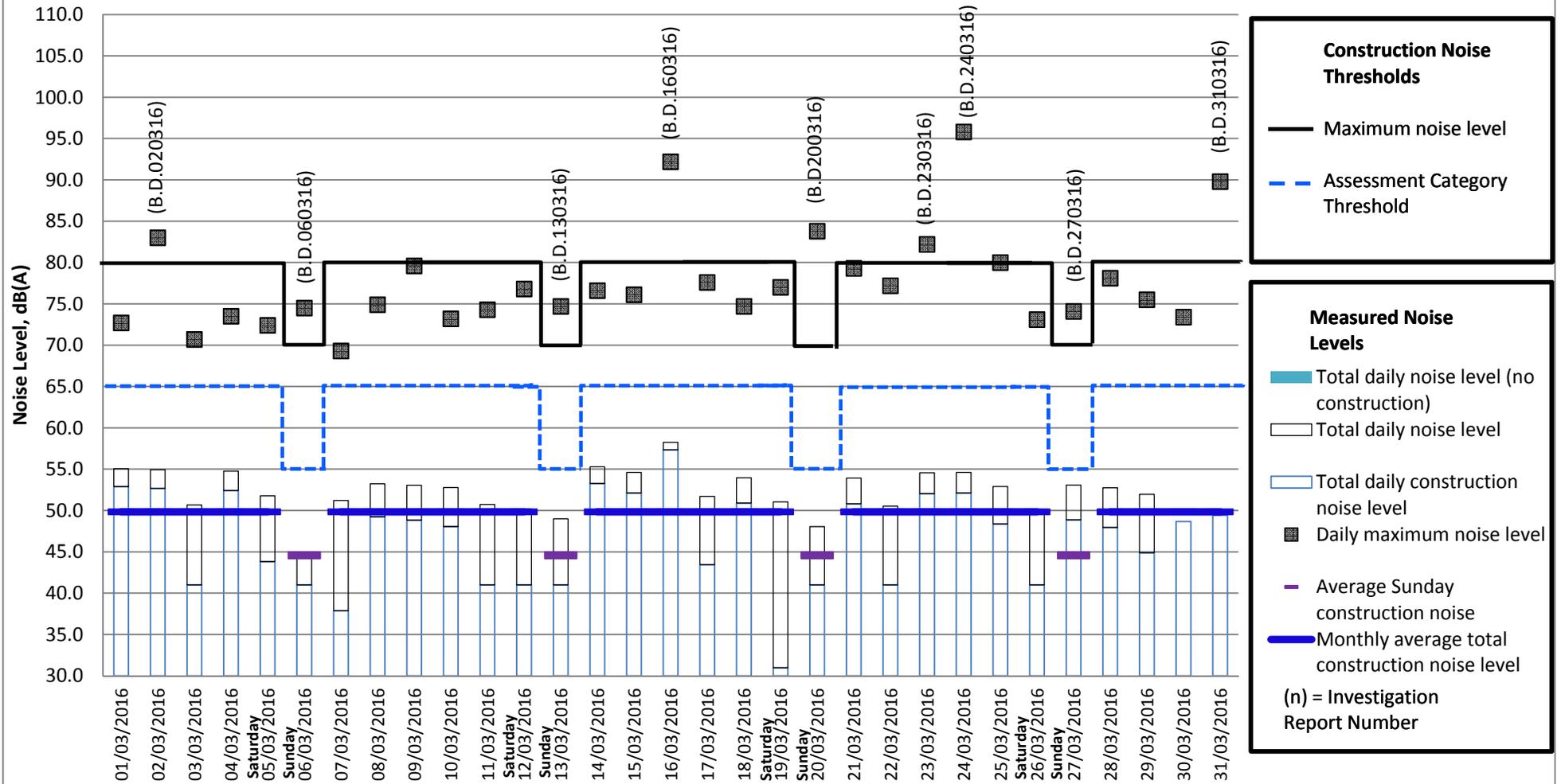


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APPENDIX A

Measured Daytime Noise Levels at Butlaw Fisheries

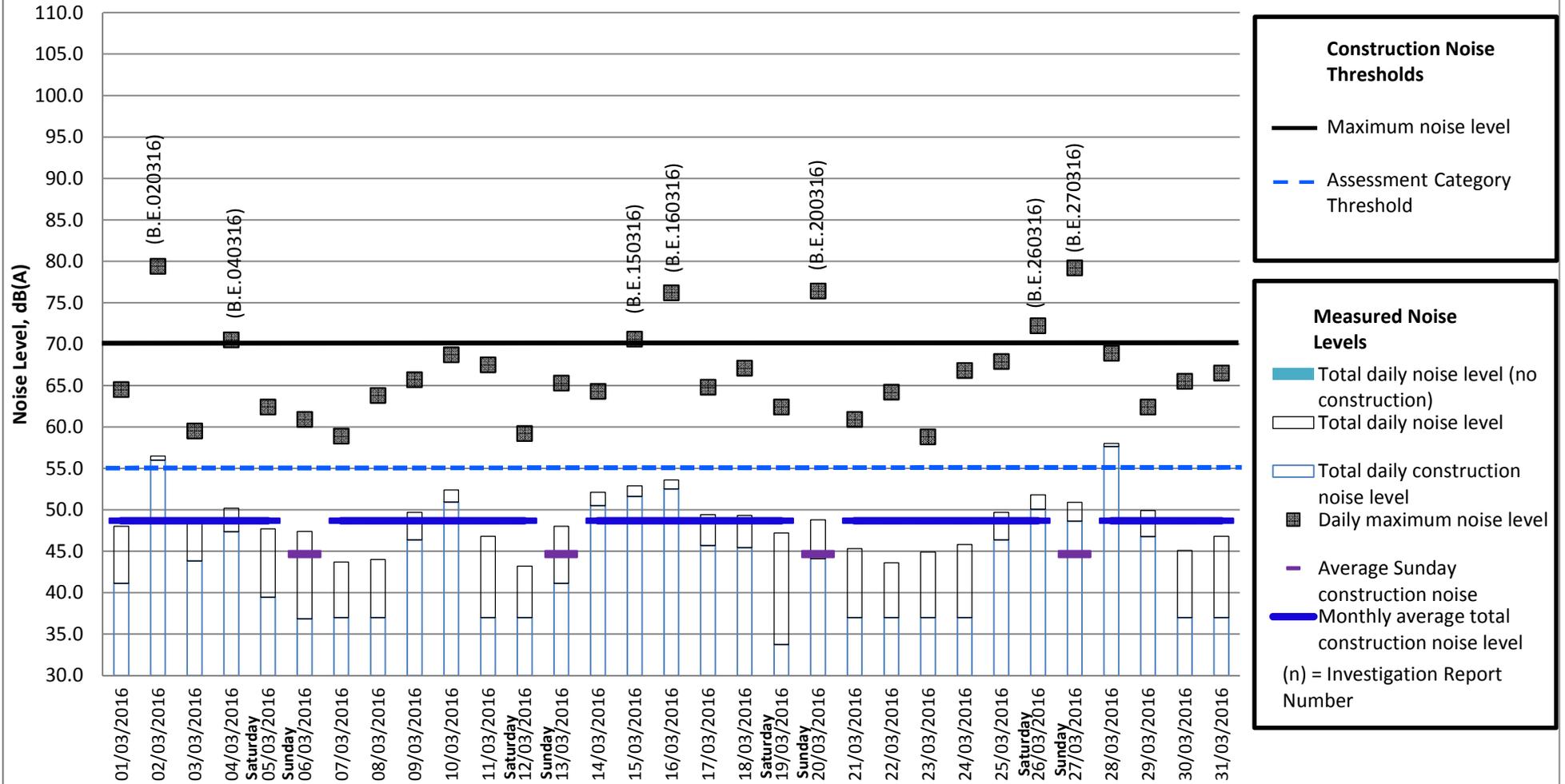
Measurement period: March 2016



Note:

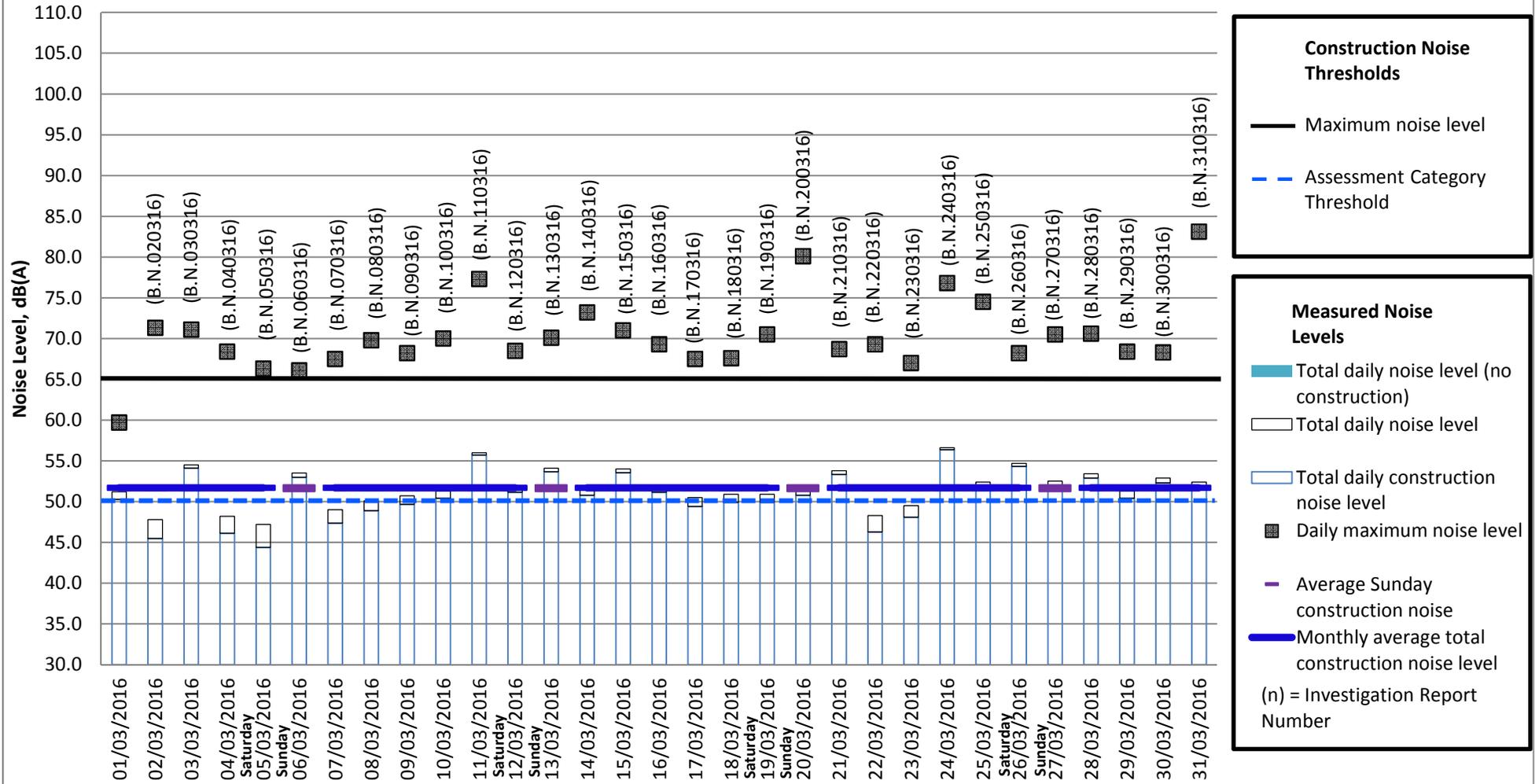
Measured Evening Noise Levels at Butlaw Fisheries

Measurement period: March 2016



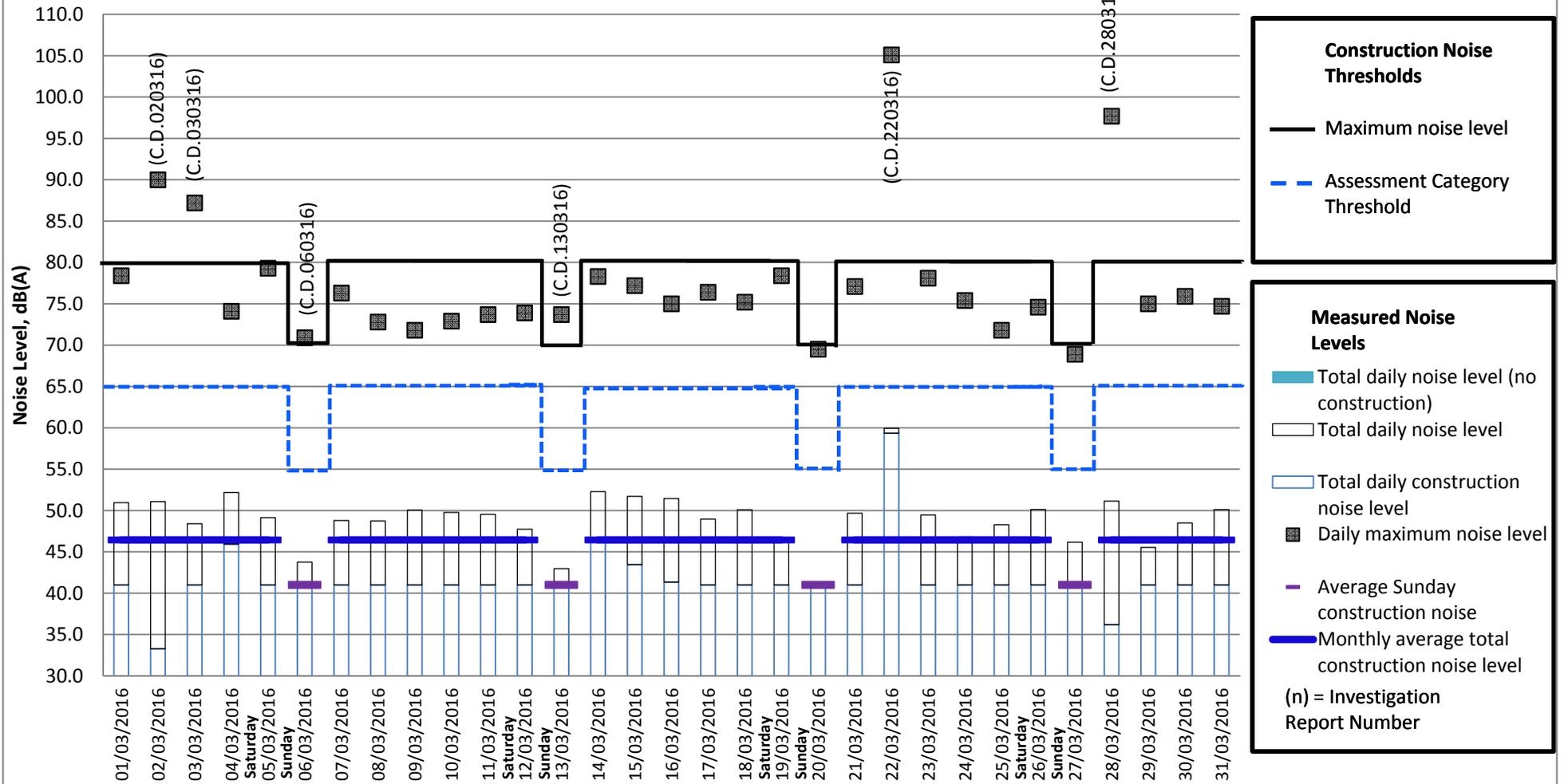
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Measured Night time Noise Levels at Butlaw Fisheries Measurement period: March 2016



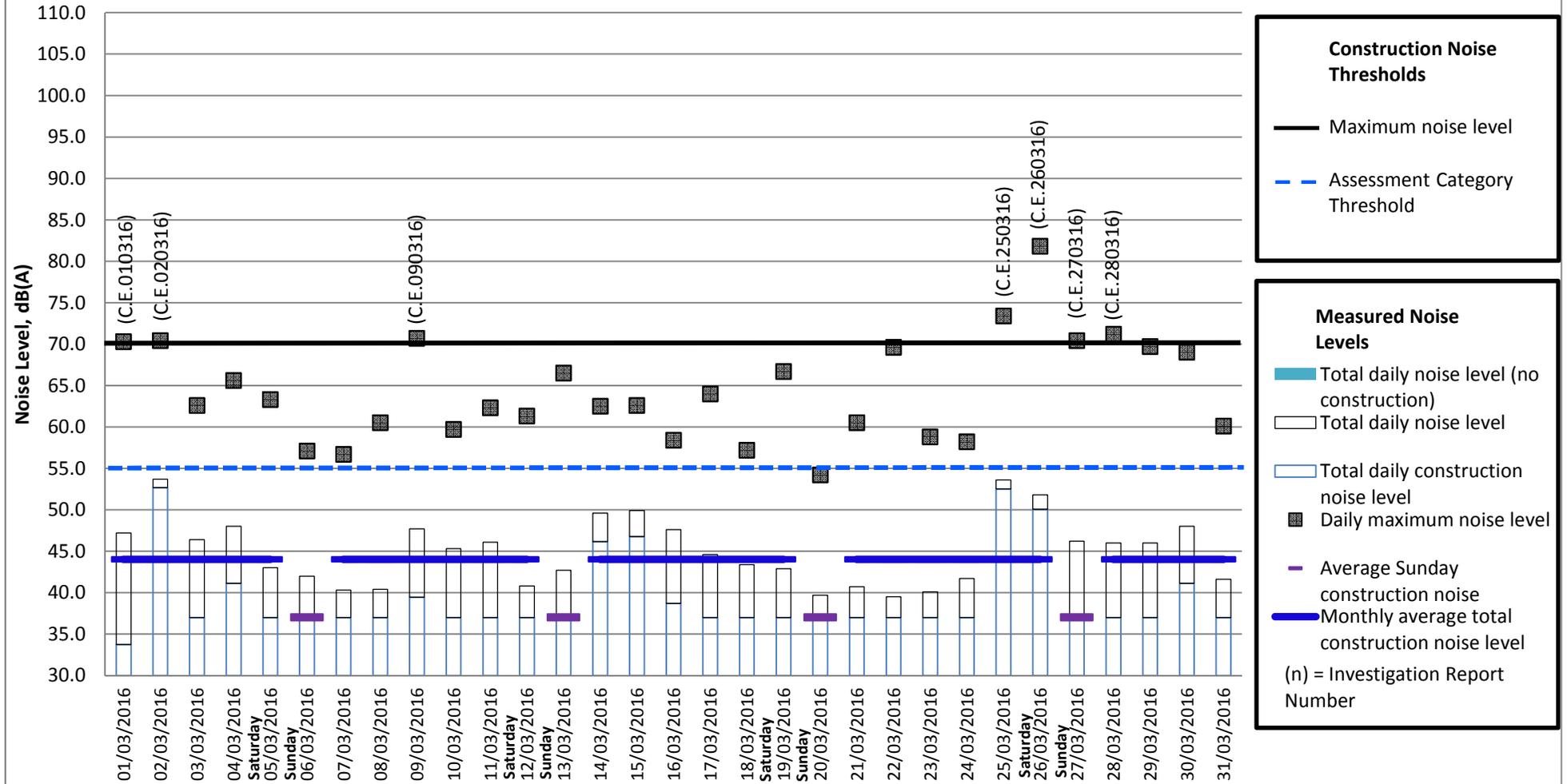
Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by birds and waves

Measured Daytime Noise Levels at Clufflat Brae Measurement period: March 2016



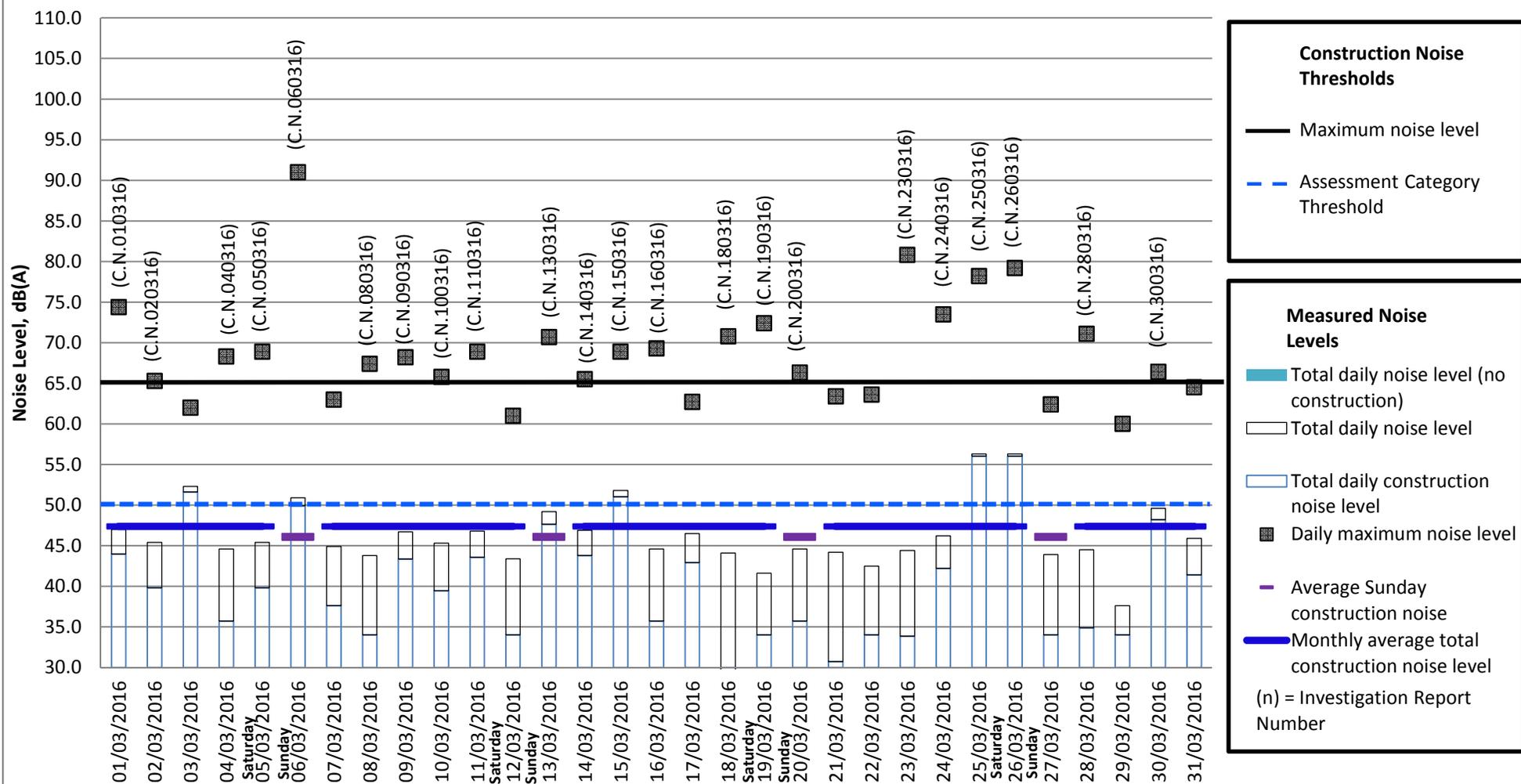
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Measured Evening Noise Levels at Clufflat Brae Measurement period: March 2016



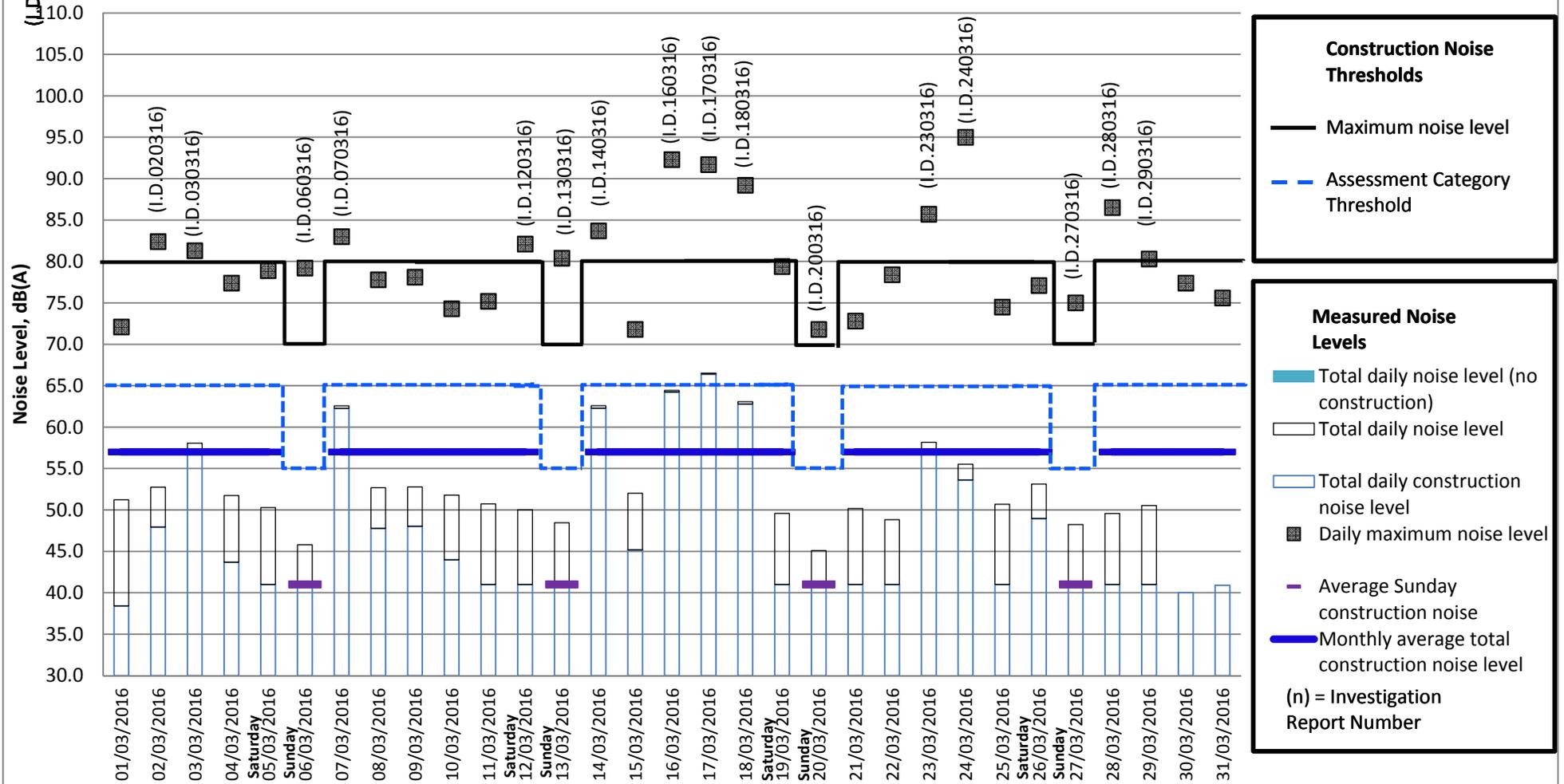
Note:

Measured Night time Noise Levels at Clufflat Brae Measurement period: March 2016



Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' on the 25th and 26th were caused by wind

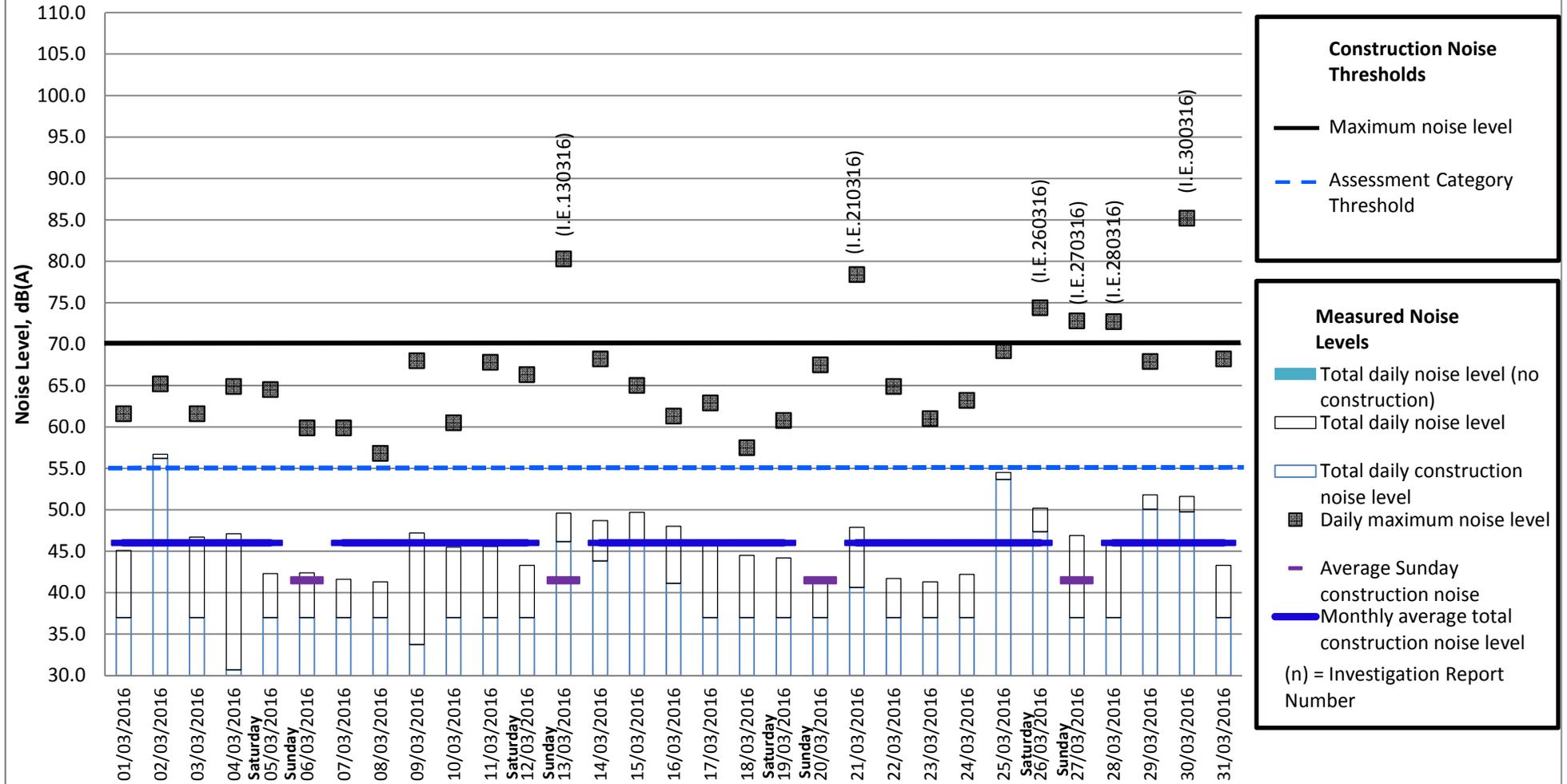
Measured Daytime Noise Levels at Inchgarvie Measurement period: March 2016



Note:

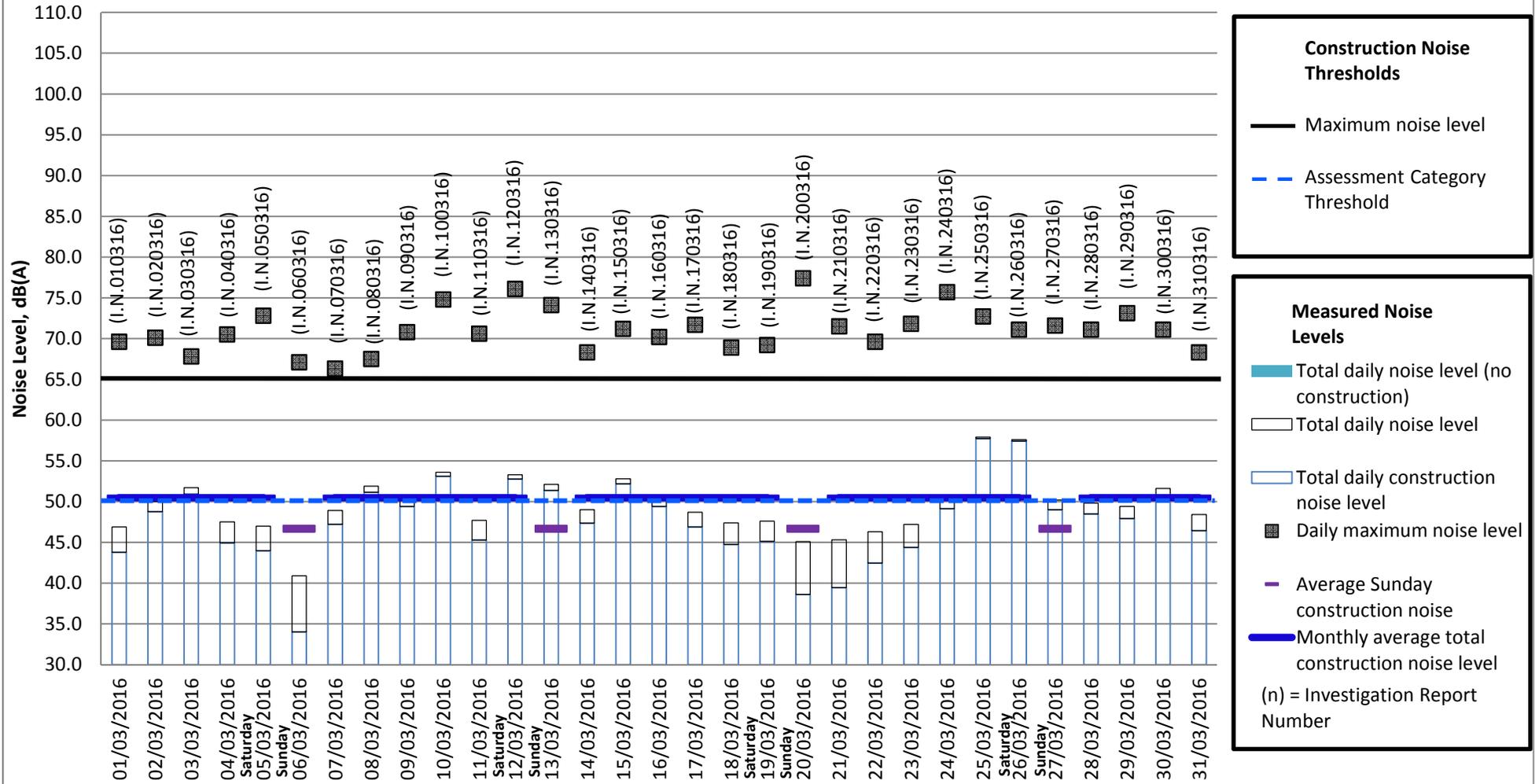
Measured Evening Noise Levels at Inchgarvie

Measurement period: March 2016



Note:

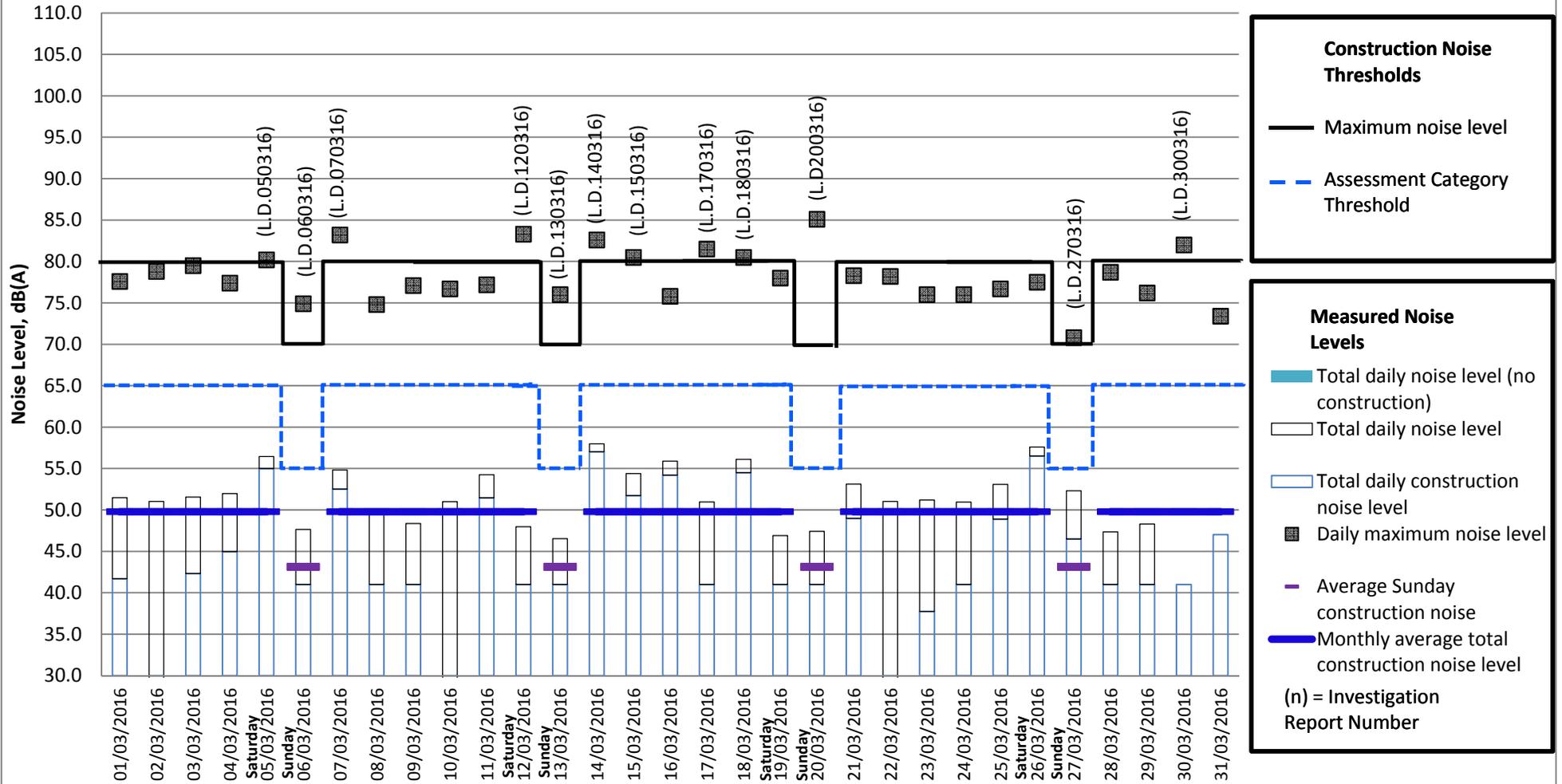
Measured Night time Noise Levels at Inchgarvie Measurement period: March 2016



Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by wind and birds

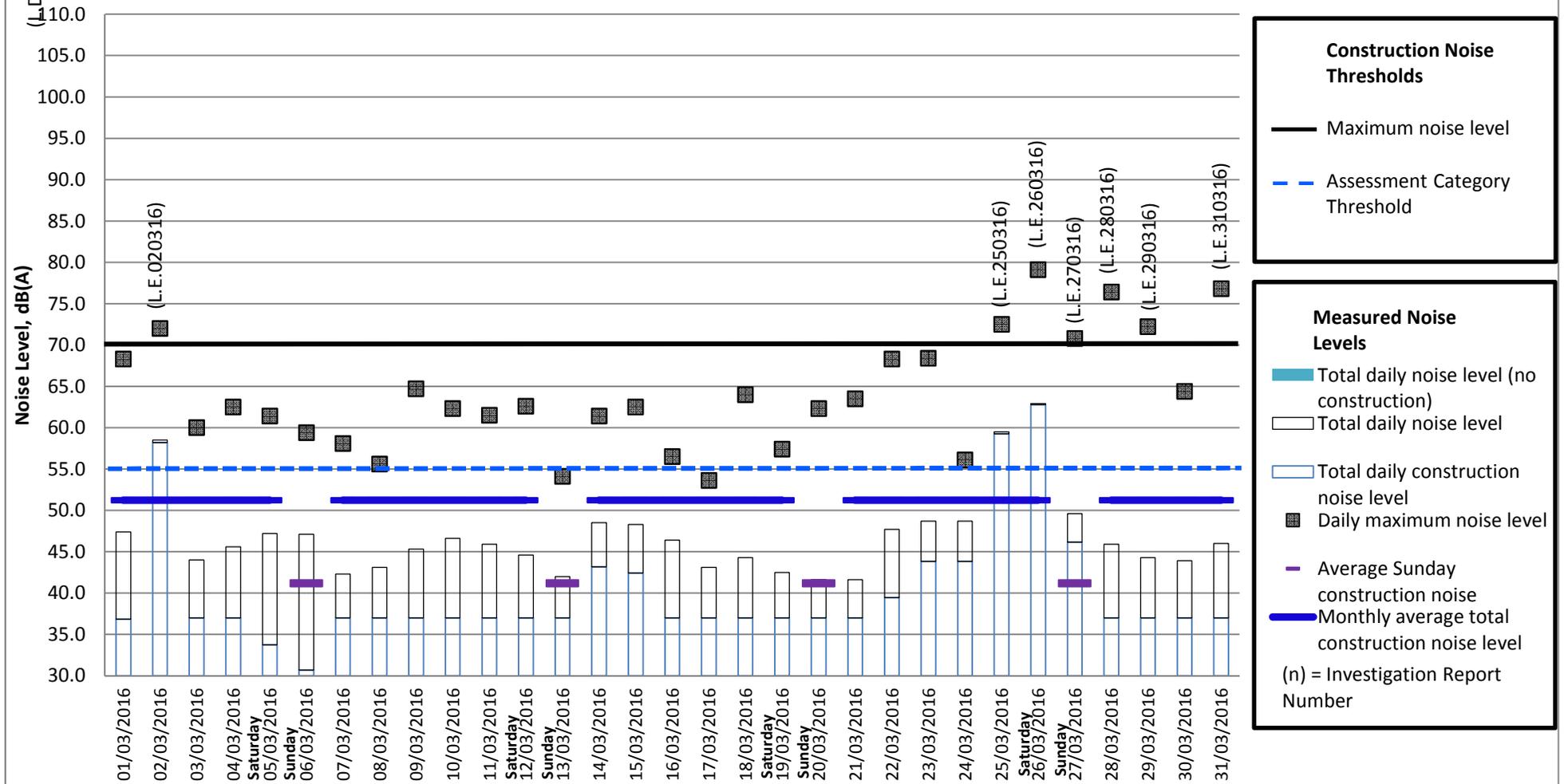
Measured Daytime Noise Levels at Linn Mill

Measurement period: March 2016



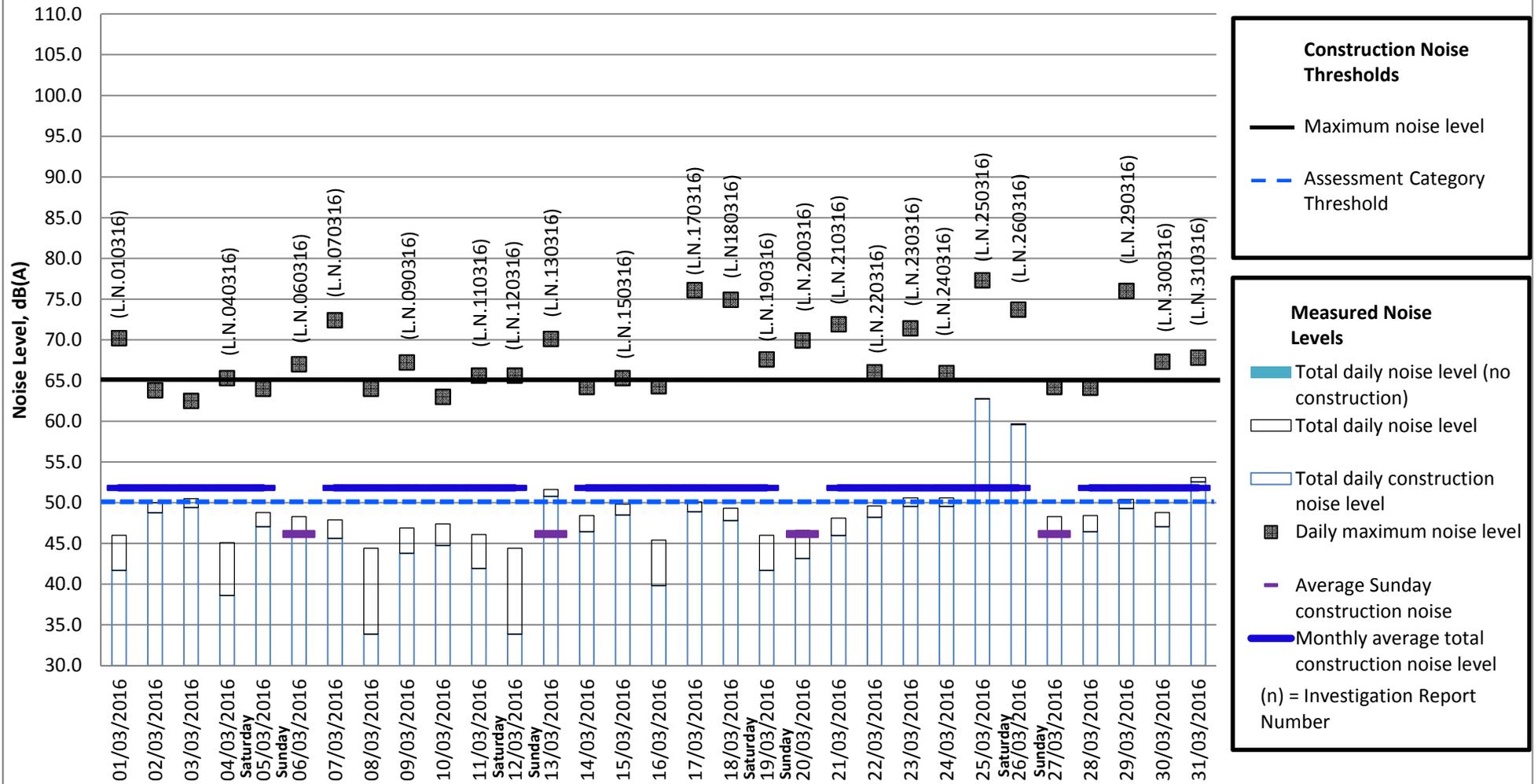
Note:

Measured Evening Noise Levels at Linn Mill Measurement period: March 2016



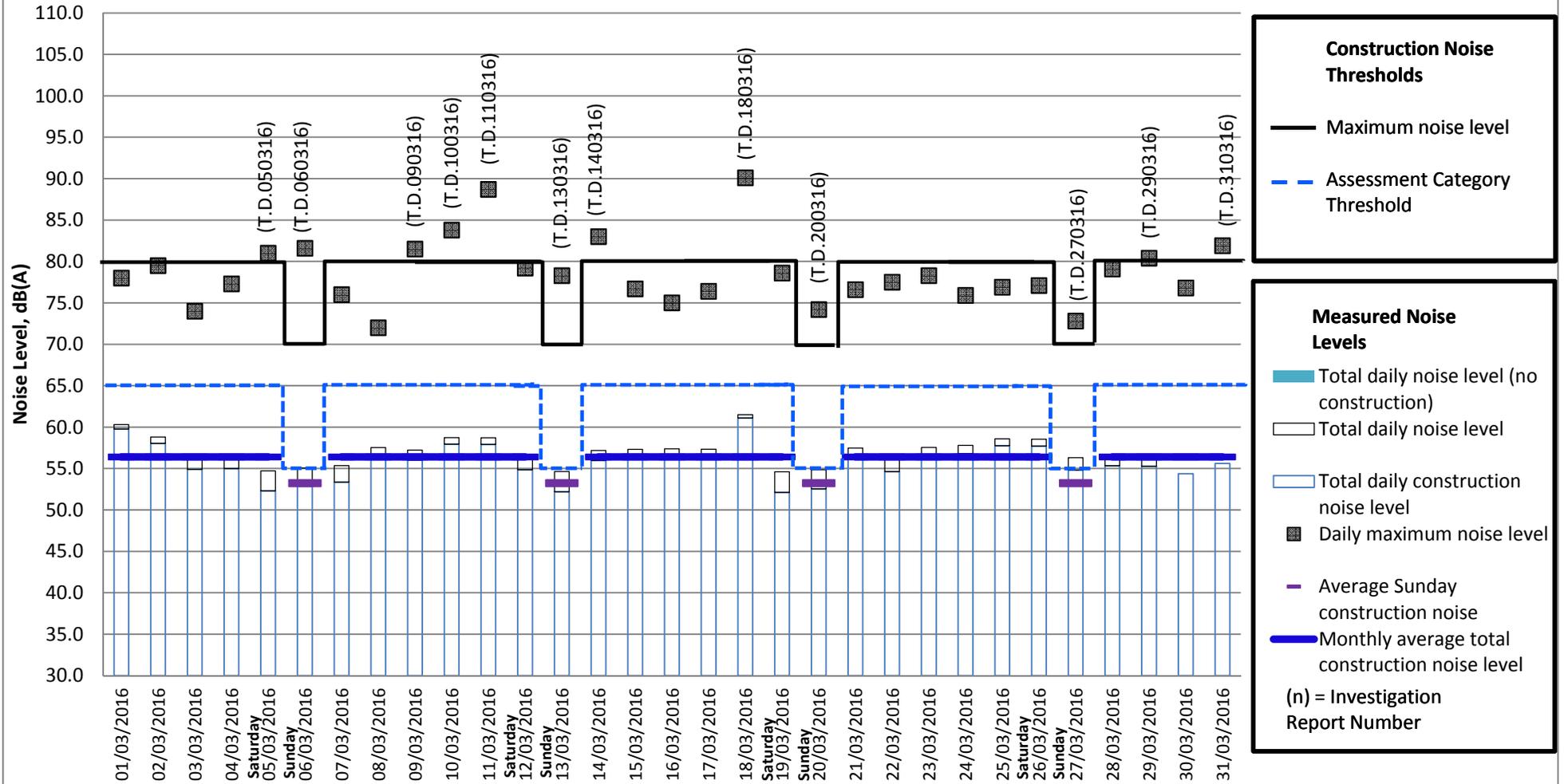
Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by wind

Measured Night time Noise Levels at Linn Mill Measurement period: March 2016



Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by wind and birds

Measured Daytime Noise Levels at Tigh-Na-Grian Measurement period: March 2016



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

Measured Noise Levels

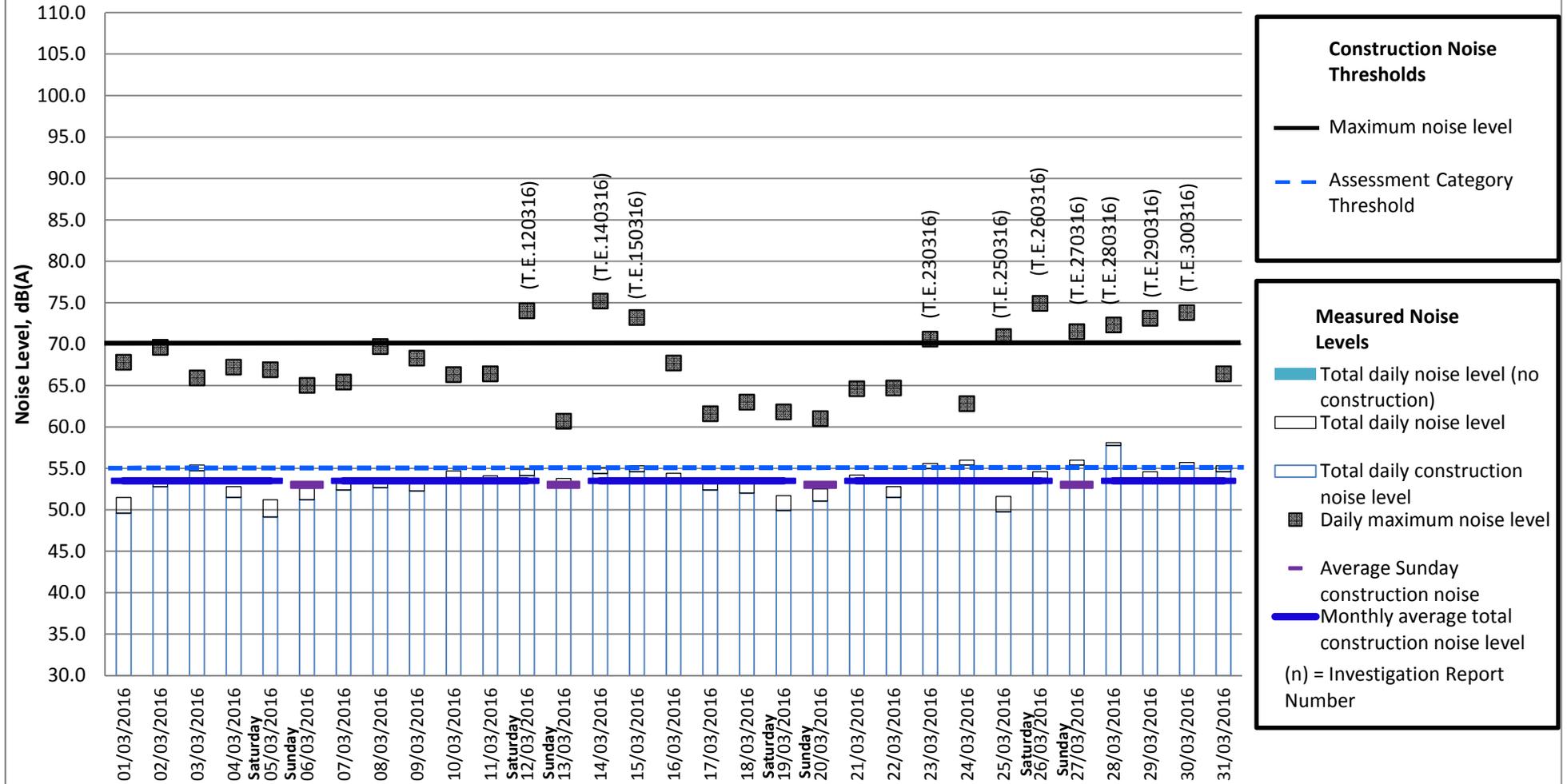
- Total daily noise level (no construction)
- Total daily noise level
- Total daily construction noise level
- Daily maximum noise level
- Average Sunday construction noise
- Monthly average total construction noise level

(n) = Investigation Report Number

Note:

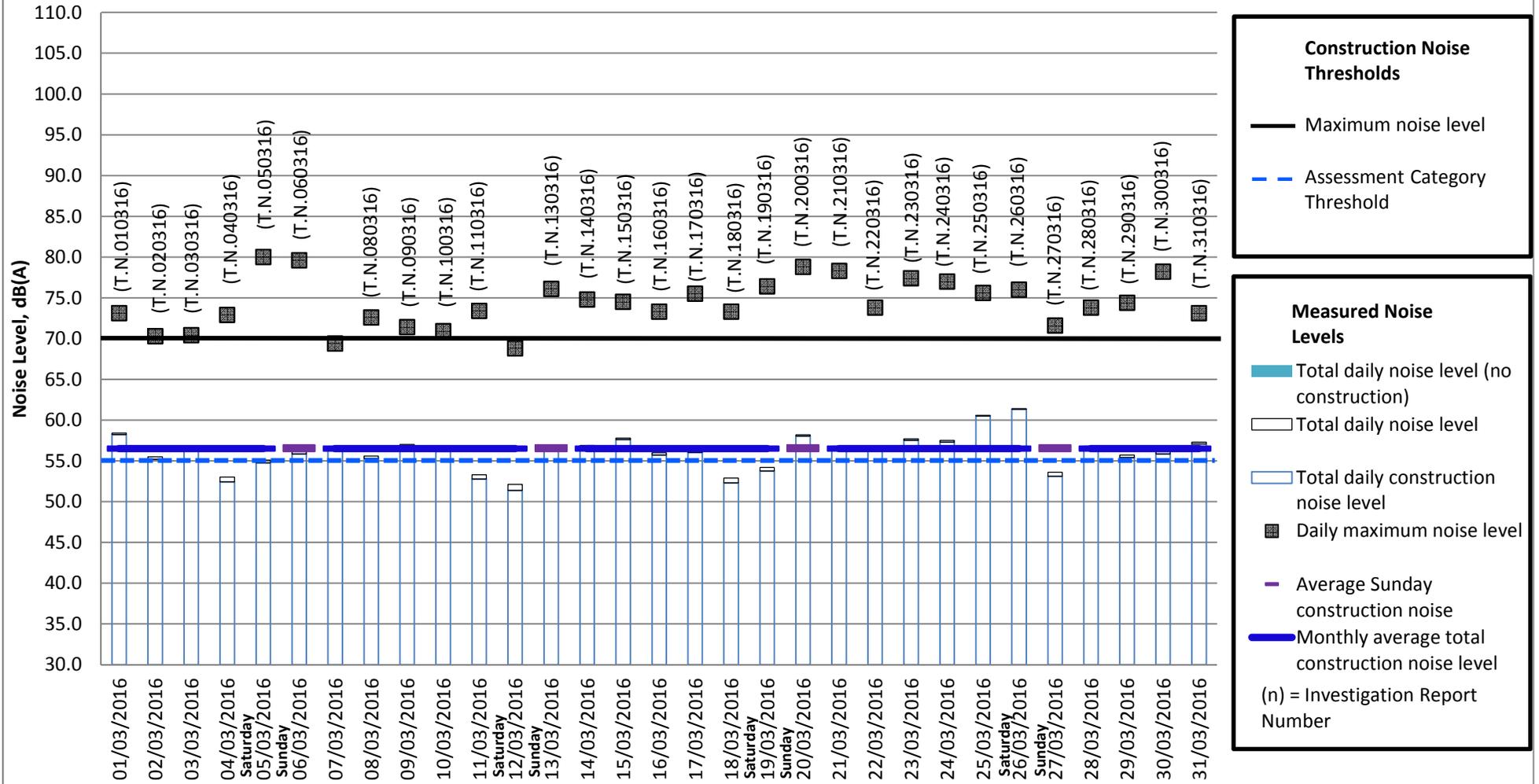
Measured Evening Noise Levels at Tigh-Na-Grian

Measurement period: March 2016



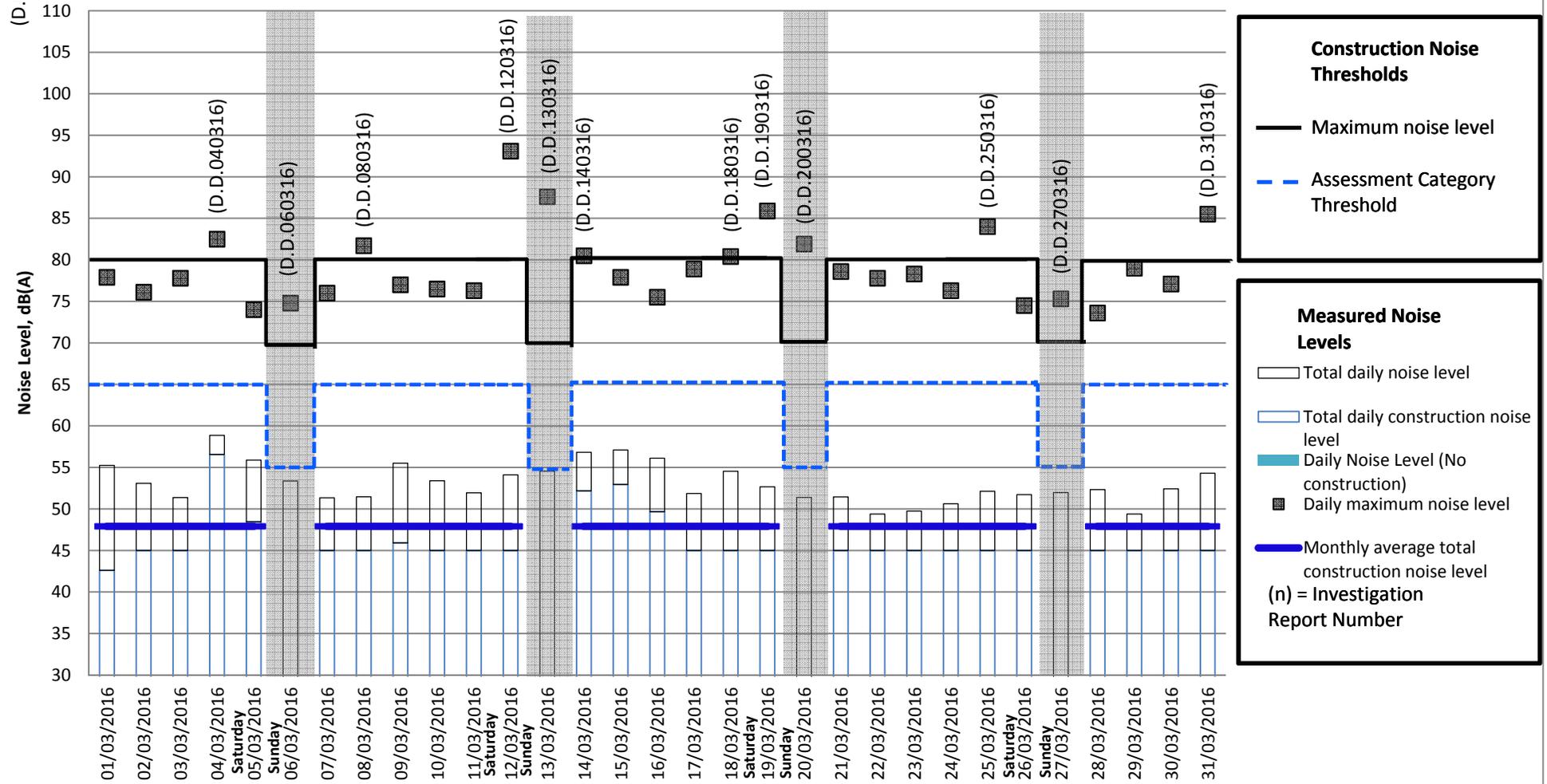
Note:

Measured Night time Noise Levels at Tigh-Na-Grian Measurement period: March 2016



Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by birds and wind

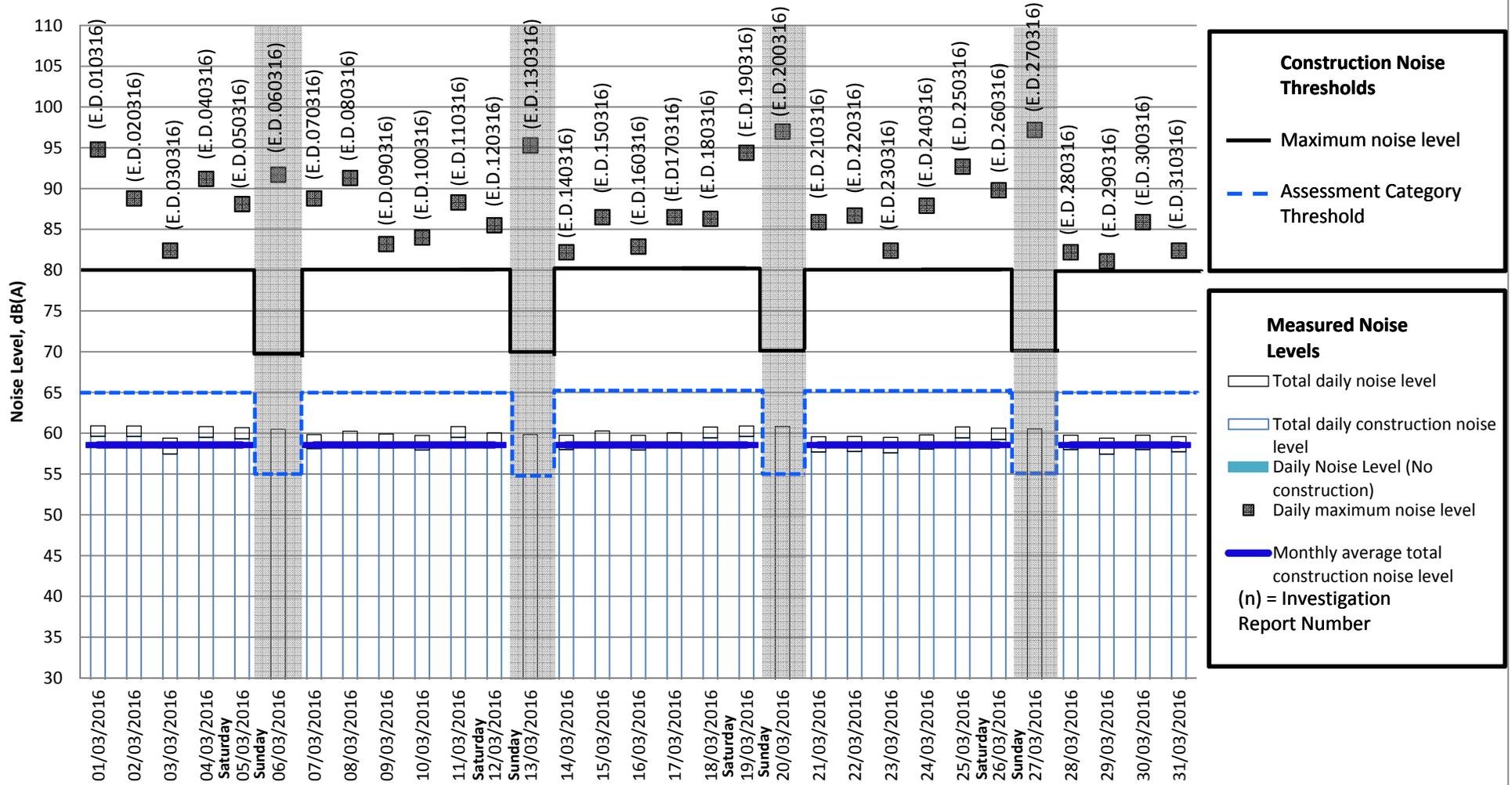
Measured Daytime Noise Levels at Dundas Home Farm Measurement period: March 2016



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

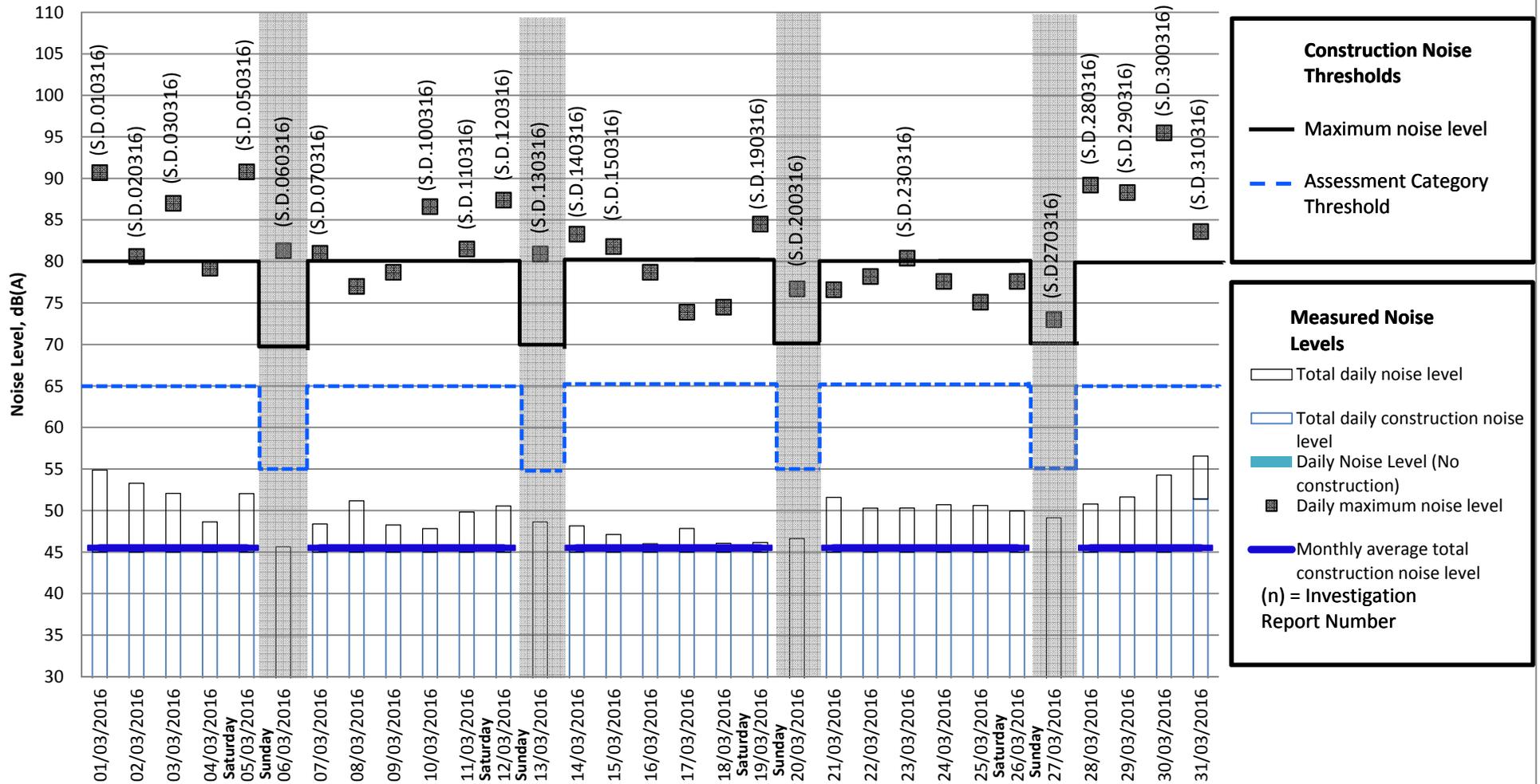
Measured Daytime Noise Levels at Echline

Measurement period: March 2016



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

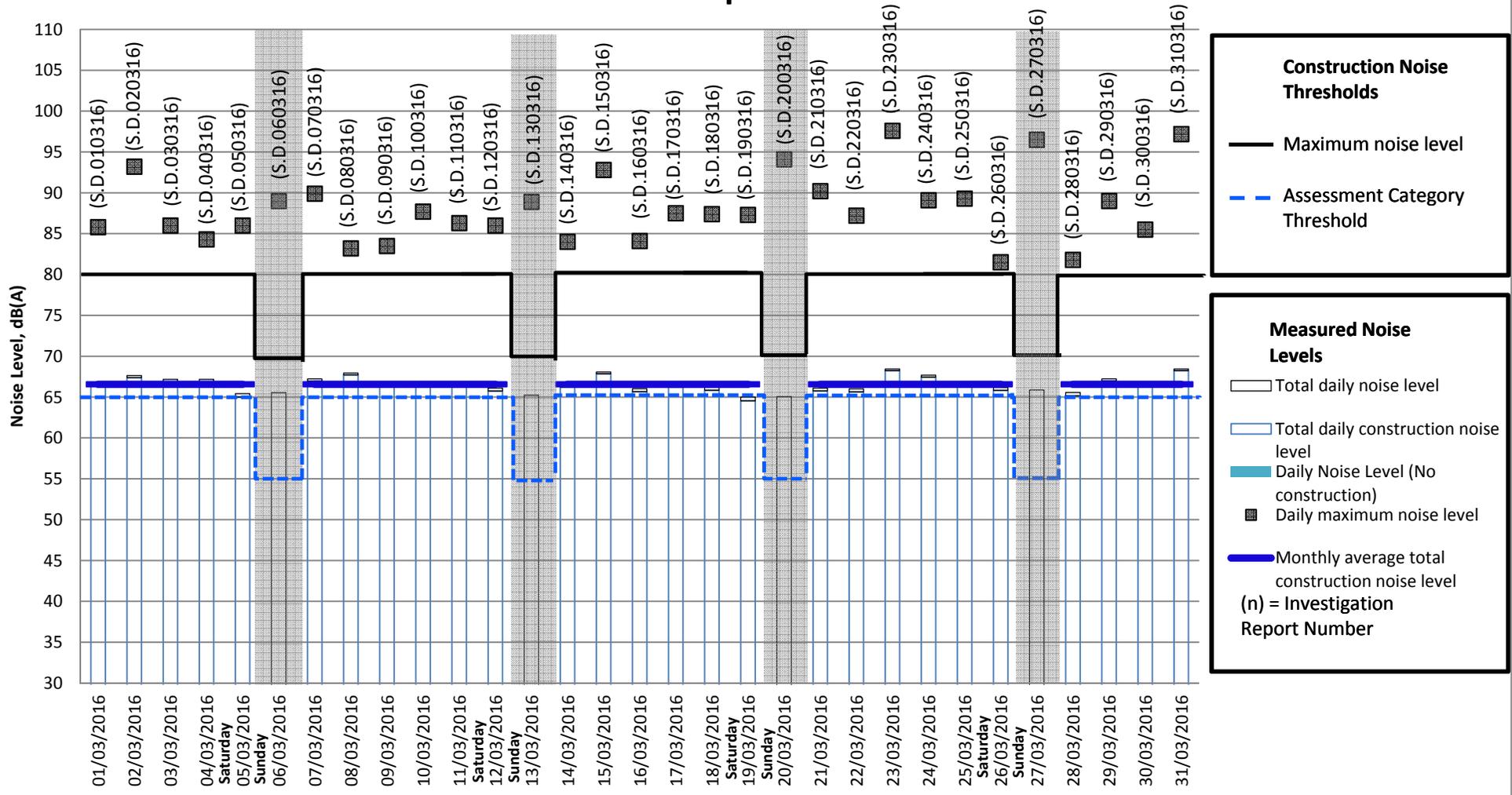
Measured Daytime Noise Levels at Springfield Measurement period: March 2016



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

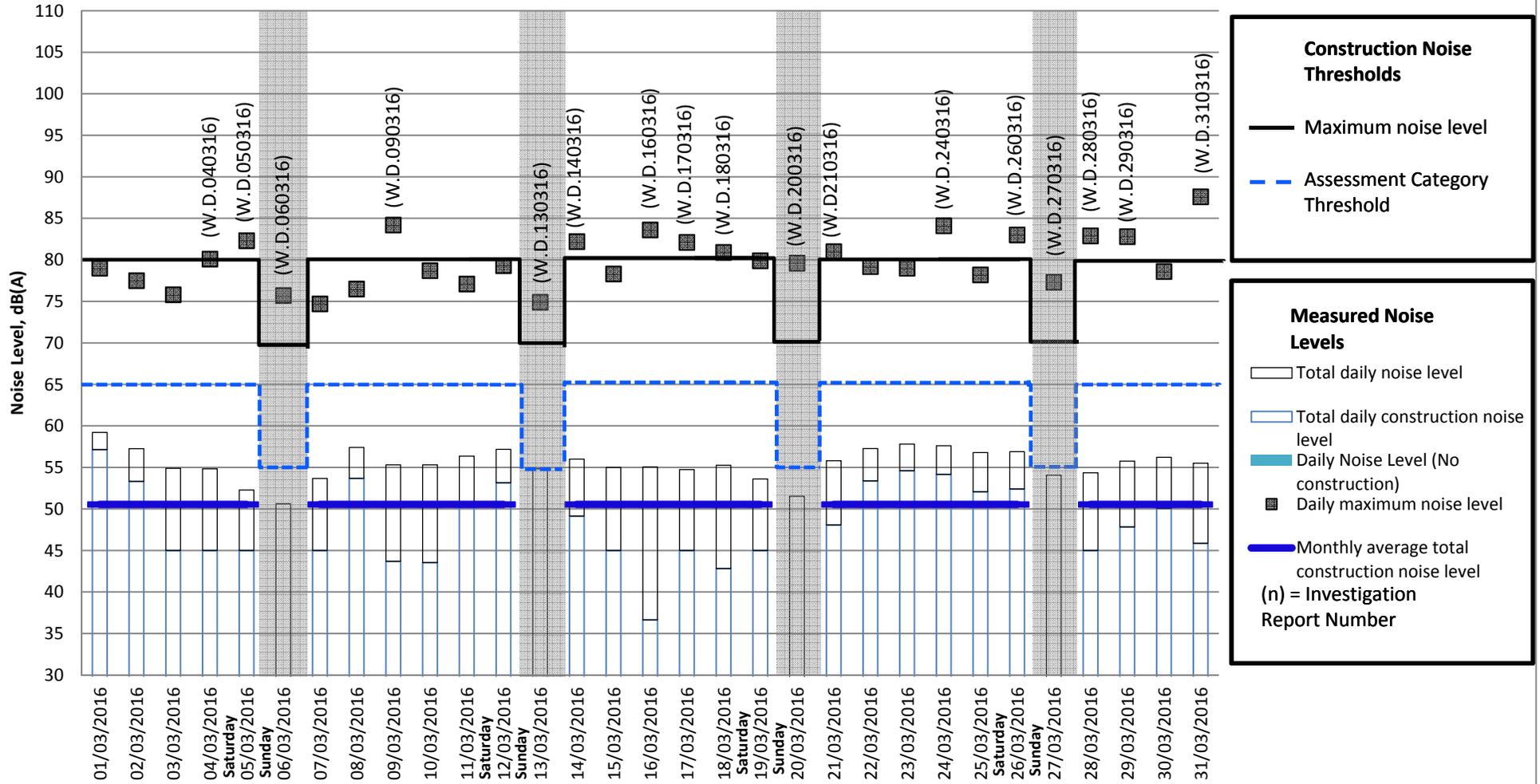
Measured Daytime Noise Levels at Scotstoun

Measurement period: March 2016



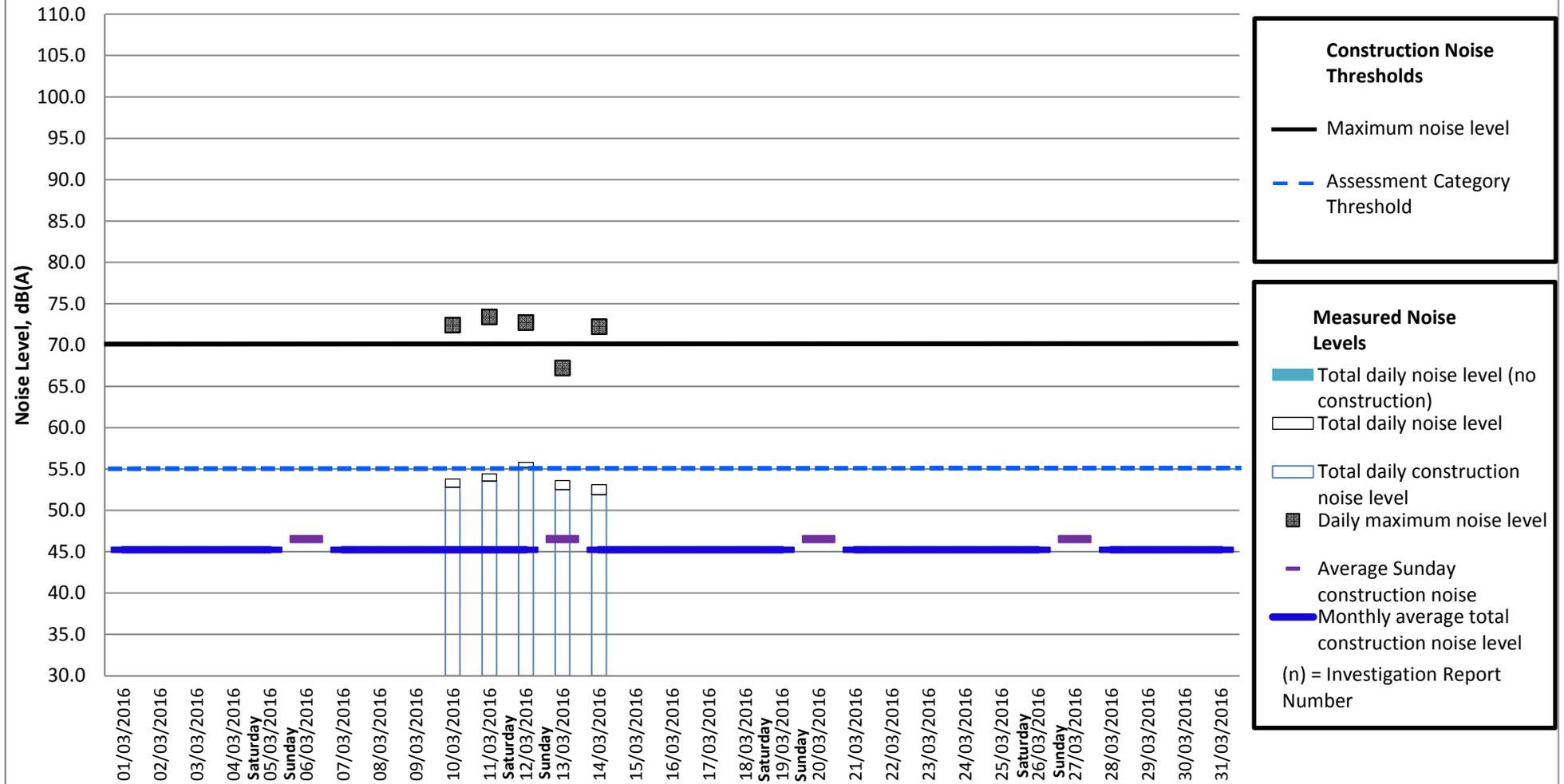
Note: The grey areas of the chart represent days on which no construction works have been conducted;

Measured Daytime Noise Levels at Whinnyhill Measurement period: March 2016



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

Measured Evening Noise Levels at Whinnyhill Measurement period: March 2016



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

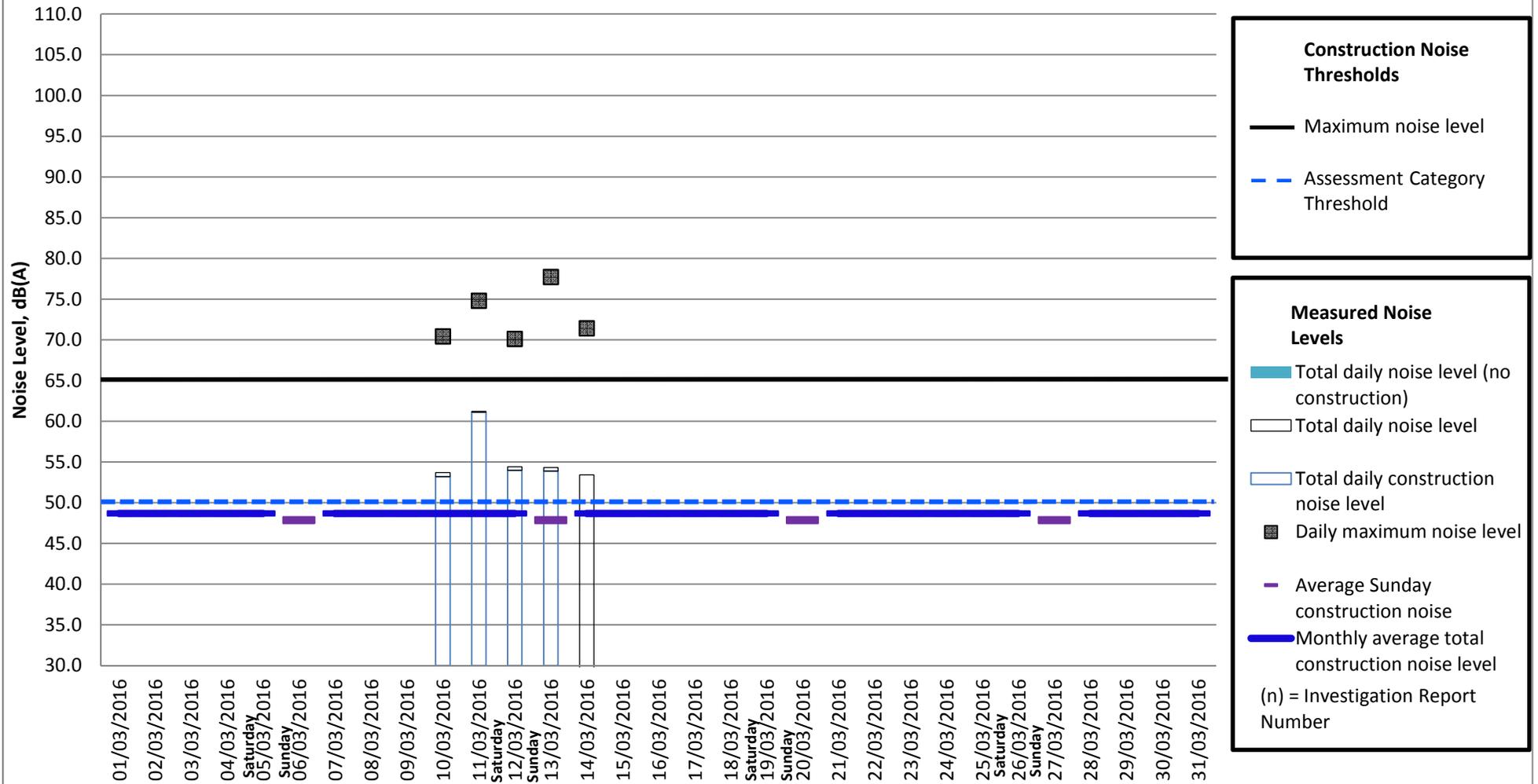
Measured Noise Levels

- 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

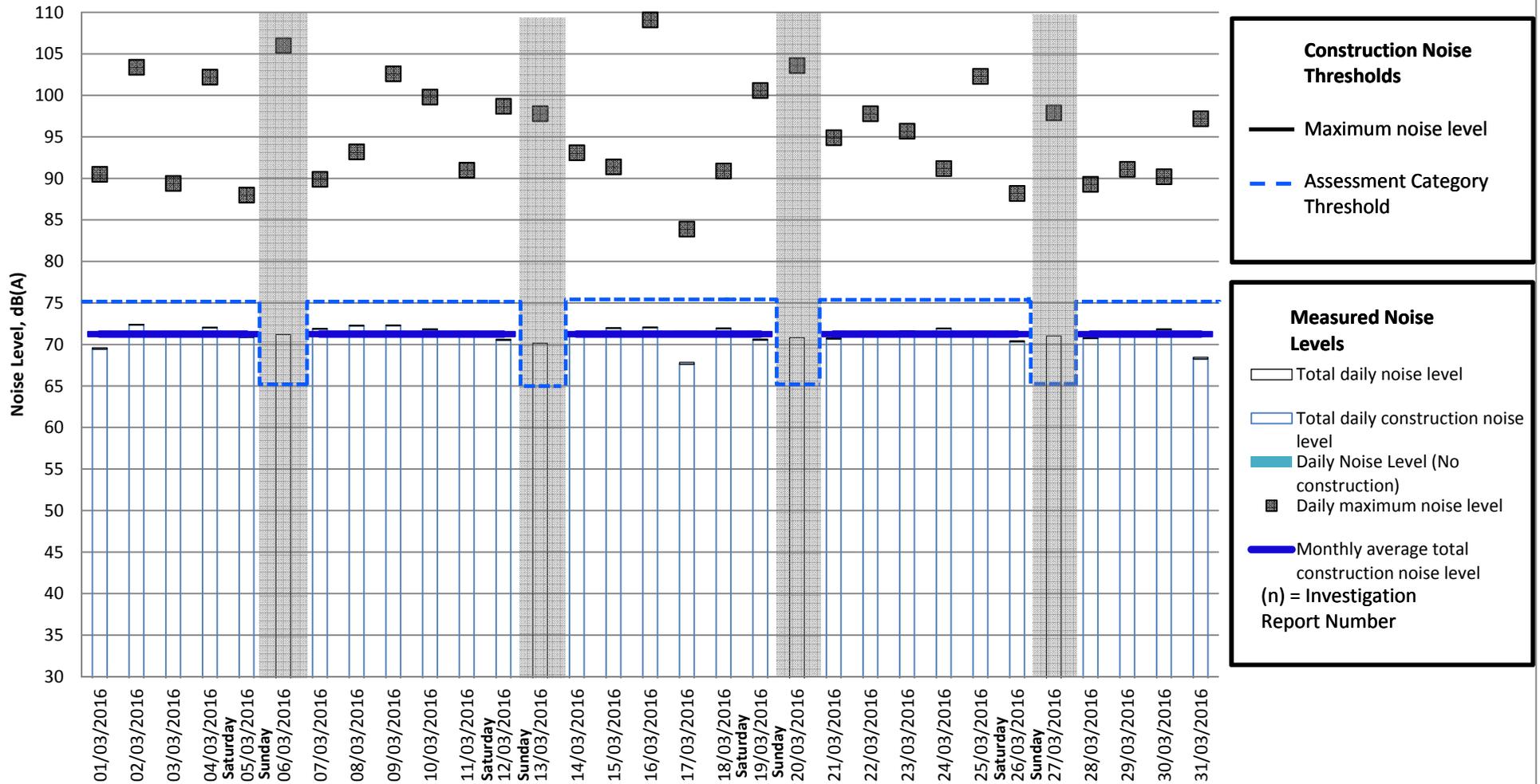
(n) = Investigation Report Number

Note: FT07 bridge demolition took place over from 11/03/2016 at 22:00 until 14/03/2016 at 06:00. Noise levels have been included for this month

Measured Night time Noise Levels at Whinnyhill Measurement period: March 2016



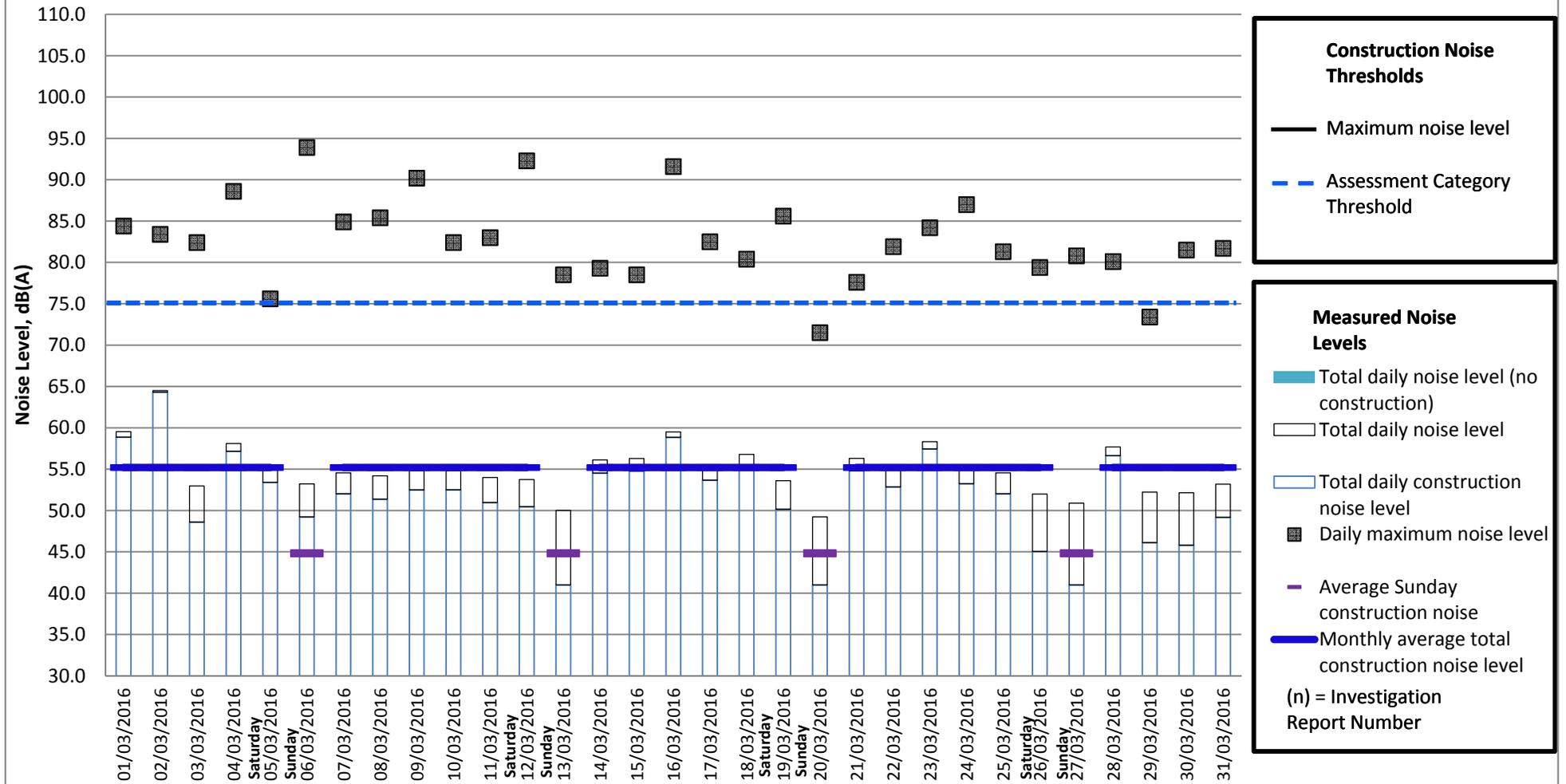
Measured Daytime Noise Levels at Newton Measurement period: March 2016



Note: The grey areas of the chart represent days on which no construction works have been conducted. It should be noted that the measured noise levels Mon - Fri can not be attributed to construction works due to the considerable distance (1.75 kilometers) between this monitoring location and the closest construction works.

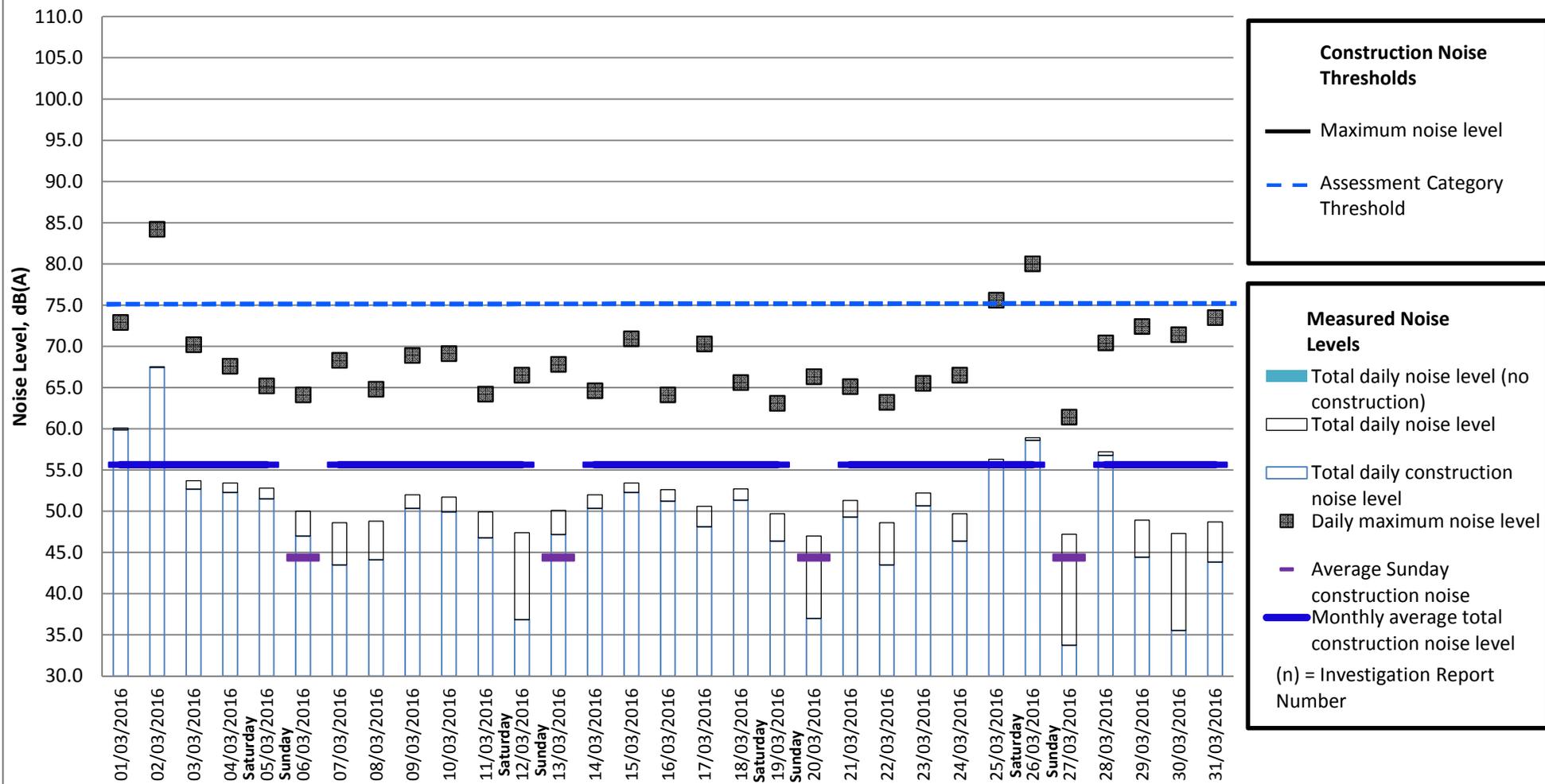
Measured Daytime Noise Levels at Port Edgar

Measurement period: March 2016



Note:

Measured Evening Noise Levels at Port Edgar Measurement period: March 2016



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

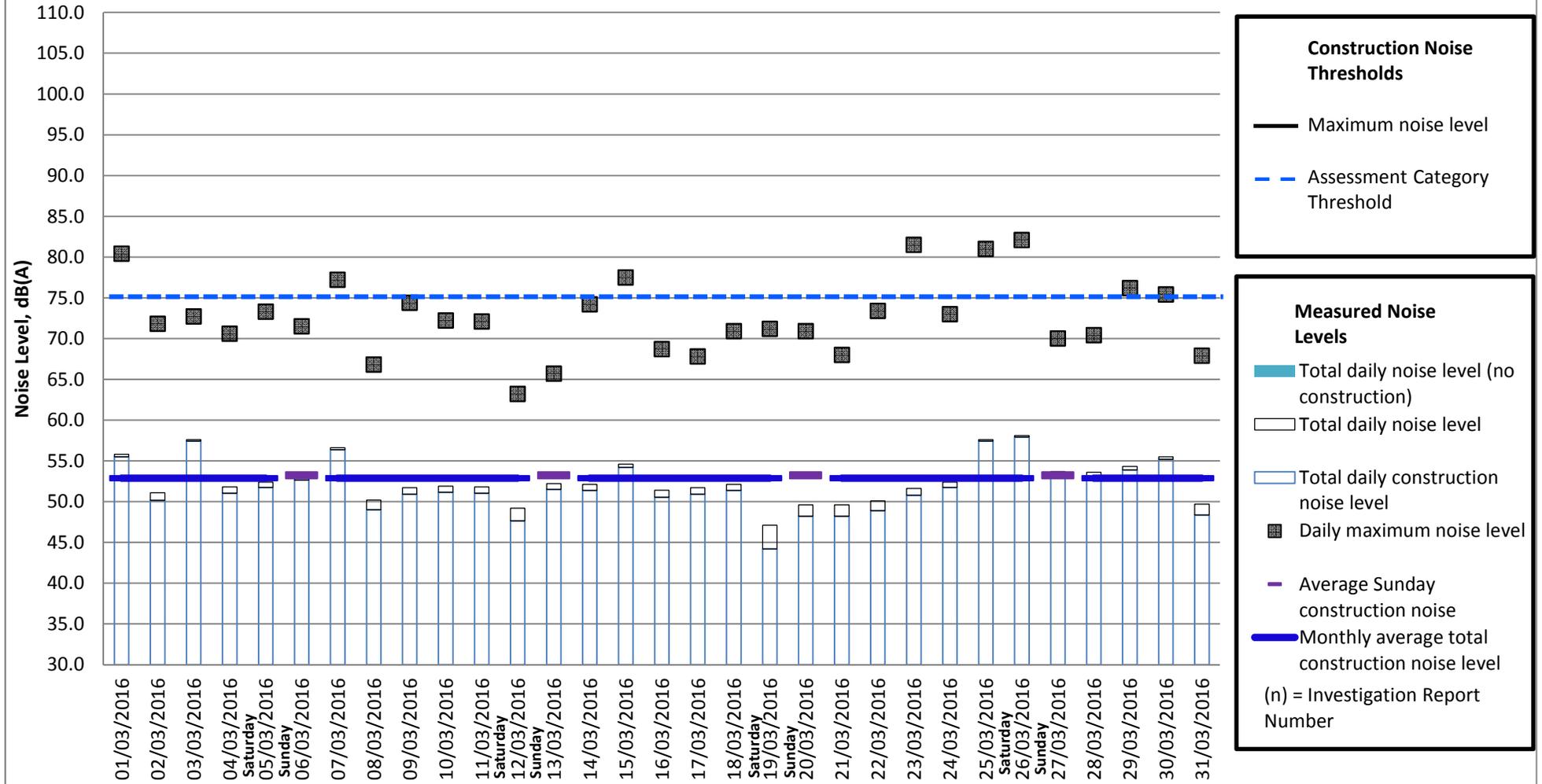
Measured Noise Levels

- 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:

Measured Night time Noise Levels at Port Edgar Measurement period: March 2016



Note:

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