



Contractor



**Forth Crossing** Bridge Constructors

HOCHTIEF Solutions  
American Bridge International  
DRAGADOS  
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Project **FORTH REPLACEMENT CROSSING**

Document title

**CONSTRUCTION NOISE MONITORING REPORT: JUNE 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 June 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 June 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 June 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 June 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 June 2013
M1	Whinny Hill	Network	Band drains at King Malcolm Drive Excavation works at Castlandhill Road  N.B. No evening, night time or Sunday daytime construction in vicinity.
M3	Tigh-Na-Grian	Crossing	Works within Central Tower cofferdam North Tower airlifting works
M4	North Leg	Crossing	Works within Central Tower cofferdam North Tower airlifting works South Tower excavation & airlifting Pier S1 caisson excavation Pier S4 airlifting Pier S5 airlifting & concrete works Pier S6 cleaning and backfilling
M6	Port Edgar	Crossing	Works within Central Tower cofferdam South Tower excavation & airlifting Pier S1 caisson excavation Pier S4 airlifting Pier S5 airlifting & concrete works Pier S6 cleaning and backfilling
M7	Butlaw Fisheries	Crossing	Works within Central Tower cofferdam South Tower excavation & airlifting Pier S1 caisson excavation Pier S4 airlifting Pier S5 airlifting & concrete works Pier S6 cleaning and backfilling Society Road embankment works
M10	Inchgarvie Lodge	Crossing	South Tower excavation & airlifting Pier S1 caisson excavation Pier S4 airlifting Pier S5 airlifting & concrete works South Abutment works, including concreting and backfilling Launch – reconditioning of batters, installation of drains and crane rails, excavation for launch foundations, backfill of lay down area Pier trials Society road embankment works
M11	Linn Mill	Network (close proximity to Crossing)	South Abutment works, including concreting and backfilling Launch – reconditioning of batters, installation of drains and crane rails, excavation for launch foundations, backfill of lay down area Pier trials Society road embankment works

M13	Clufflat Brae	Crossing	South Abutment works, including concreting and backfilling Launch – reconditioning of batters, installation of drains and crane rails, excavation for launch foundations, backfill of lay down area Pier trials
M14	Springfield	Network	South Abutment works, including concreting and backfilling Launch – reconditioning of batters, installation of drains and crane rails, excavation for launch foundations, backfill of lay down area Pier trials Gyratory – structures  N.B. No evening, night time or Sunday daytime construction in vicinity.
M15	Echline Field	Network	Launch – reconditioning of batters, installation of drains and crane rails, excavation for launch foundations, backfill of lay down area Completion of U221 Bulk excavation for mainline  N.B. No evening, night time or Sunday daytime construction in vicinity.
M16	Scotstoun	Network	Bus link embankment works including import of fill Vegetation clearance to West of B800  N.B. No evening, night time or Sunday daytime construction in vicinity.
M17	Dundas Home Farm	Network	Utilities works Fill using clay for road network  N.B. No evening, night time or Sunday daytime construction in vicinity.
M18	Newton	Network	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](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. Some device errors were encountered in June, resulting in loss of data for short periods. Data is missing for Butlaw for the period between night time on the 28 June and night time on 30 June, at Tigh-Na-Grian on 29 and 30 June, at Echline between 4 and 6 June and at Inchgarvie on 9, 14 to 16 and 18 to 20 June. Each of these short periods of missing data was due to device error. In each instance the error was resolved as soon as reasonably practicable.
- 3.3** Results demonstrate that the monthly average total construction noise results for daytime were within the threshold limits for all monitoring locations for June 2013, with the exception of Scotstoun. For the evening period, all monitoring locations, with the exception of Butlaw Fisheries, were within the threshold limits. With regard to the night time periods, with exceedances were recorded at Butlaw Fisheries and Inchgarvie for the night time period. All other monitoring stations not listed were within the threshold limits for the night time period.
- 3.4** With regard to the Sunday averages (for applicable monitoring locations), exceedances of the threshold were noted for the following Sunday averages; Sunday daytime and night time average at Butlaw Fisheries and Sunday night time average at Inchgarvie. All other locations not listed were found to be within the Sunday average threshold for all periods.
- 3.5** The exceedances of the night time averages at Inchgarvie are not considered to have been caused by increased noise levels due to construction, but rather can be attributed to bird calls at dawn. At Butlaw, the evening average was found to be affected by waves on the shore causing an increase on the recorded noise levels at this monitoring location; particularly elevated levels were recorded on 13 and 28 of June due to waves on the shore. With regard to the exceedance of the night time average and the Sunday night time average, waves were also found to be influential, in addition to bird calls at dawn. The Sunday day time average is also not thought to be due to construction works. However, 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
- 3.6** Furthermore, it should be noted that for all the averages reported for both night time and Sunday daytime periods, these are based only on the highest  $L_{Aeq}$  levels for 1 hour periods which can affect the averages.

- 3.7** 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. Traffic noise at this location is further increased during periods of wet weather.
- 3.8** During June 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.
- 3.9** 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.
- 3.10** 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.
- 3.11** The daytime  $L_{AFmax}$  threshold was exceeded on five occasions. Two of these occurred at Butlaw Fisheries due to marine works. Each of the marine based exceedances was due to excavation work at the Pier S1 caisson. Three exceedances occurred at Linn Mill due to works associated with the network connections; the exceedances were associated with excavation works at the west SUDS basin which is in close proximity to the noise meter. All construction related exceedances have been investigated and mitigation measures have been implemented where possible; the relevant NVIRs provide more detail with regard to these exceedances.
- 3.12** 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 June the maximum noise threshold was exceeded on 50 occasions (daytime, 10; evening, 14; night time, 26). Two night time exceedances occurred due to excavation works at Pier S1. The majority of exceedances, however, were attributed to a range of non-construction factors, notably birds, wind, waves and vehicles.
Clufflat Brae	During June the maximum noise threshold was exceeded on 50 occasions (daytime, 7; evening, 15; night time, 28). No exceedances were attributable to construction works. Exceedances were found to be largely due to birds and residents at nearby properties.
Inchgarvie Lodge	During June the maximum noise threshold was exceeded on 52 occasions (daytime, 13; evening, 18; night time, 21). No exceedances were found to be due to construction works. However, investigations found residents at the property and birds to be the main contributing factors to the exceedances at this location. It should also be noted, that due to a triggering error with the device, there are some days for which recordings are not available. This issue was resolved as soon as reasonable practicable.
Linn Mill	During June the maximum noise threshold was exceeded on 57 occasions (daytime, 15; evening, 12; night time, 30). Three exceedances were due to works associated with the excavation of the West SUDS pond. However, the majority of exceedances were caused by winds causing a gate (or similar) to bang and birds.
Tigh-Na-Grian	During June the maximum noise threshold was exceeded on 69 occasions (daytime, 26; evening, 15; night time, 28). Exceedances were due to non-construction factors, notably birds.
Dundas Home Farm	During June the maximum noise threshold was exceeded on 9 occasions. Exceedances were not attributable to construction works. Exceedances were due to a range of factors, including gardening works, birds and traffic.
Echline	During June the maximum noise threshold was exceeded on 21 occasions. No exceedances at this location were due to construction activities. Exceedances were largely attributed to vehicles passing by on the adjacent roads and birds.
Springfield	During June the maximum noise threshold was exceeded on 16 occasions. The exceedances were not caused by construction works at this location. The majority of exceedances were due to local residents, birds and dogs barking.
Scotstoun	During June the maximum noise threshold was exceeded on 16 occasions. Exceedances were largely attributed to vehicles passing by on the adjacent road.
Whinny Hill	During June the maximum noise threshold was exceeded on 16 occasions. Exceedances were not due to construction activities. A range of factors were found to cause exceedances at this location, including birds, dogs barking and trains/planes.

**Table 3: Summary of Construction Exceedances at Monitoring Locations**

<b>Monitor</b>	<b>Date</b>	<b>Period</b>	<b>Description</b>	<b>NVIR No.</b>
Linn Mill	05/06/13	Day	Excavation works at West SUDS pond	L.D.050613
	10/06/13			L.D.100613
	11/06/13			L.D.110613
Butlaw Fisheries	06/06/13	Night	Excavation works at Pier S1 caisson	B.N.060613
	18/06/13			B.N.180613



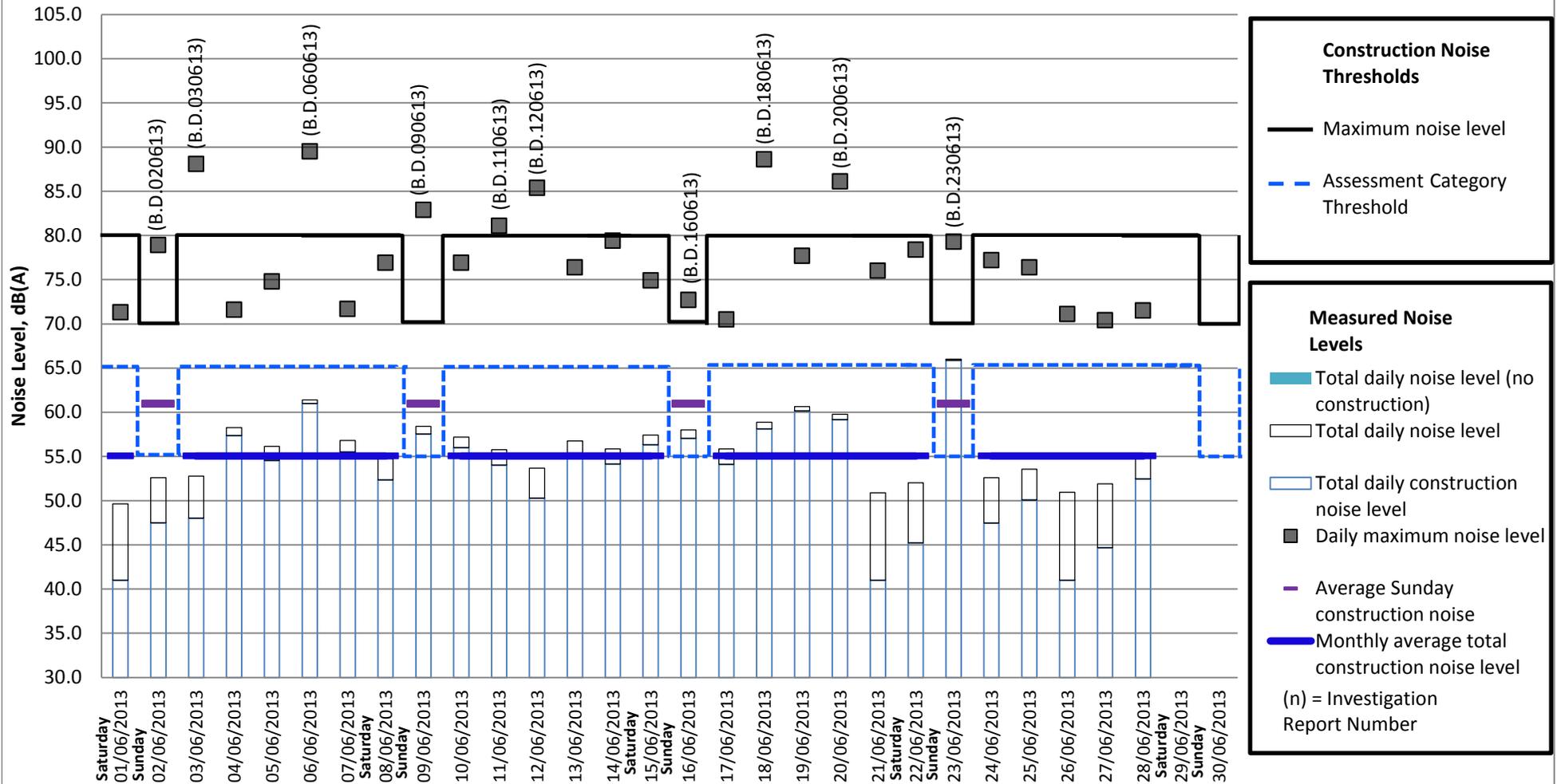
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## **APPENDIX A**

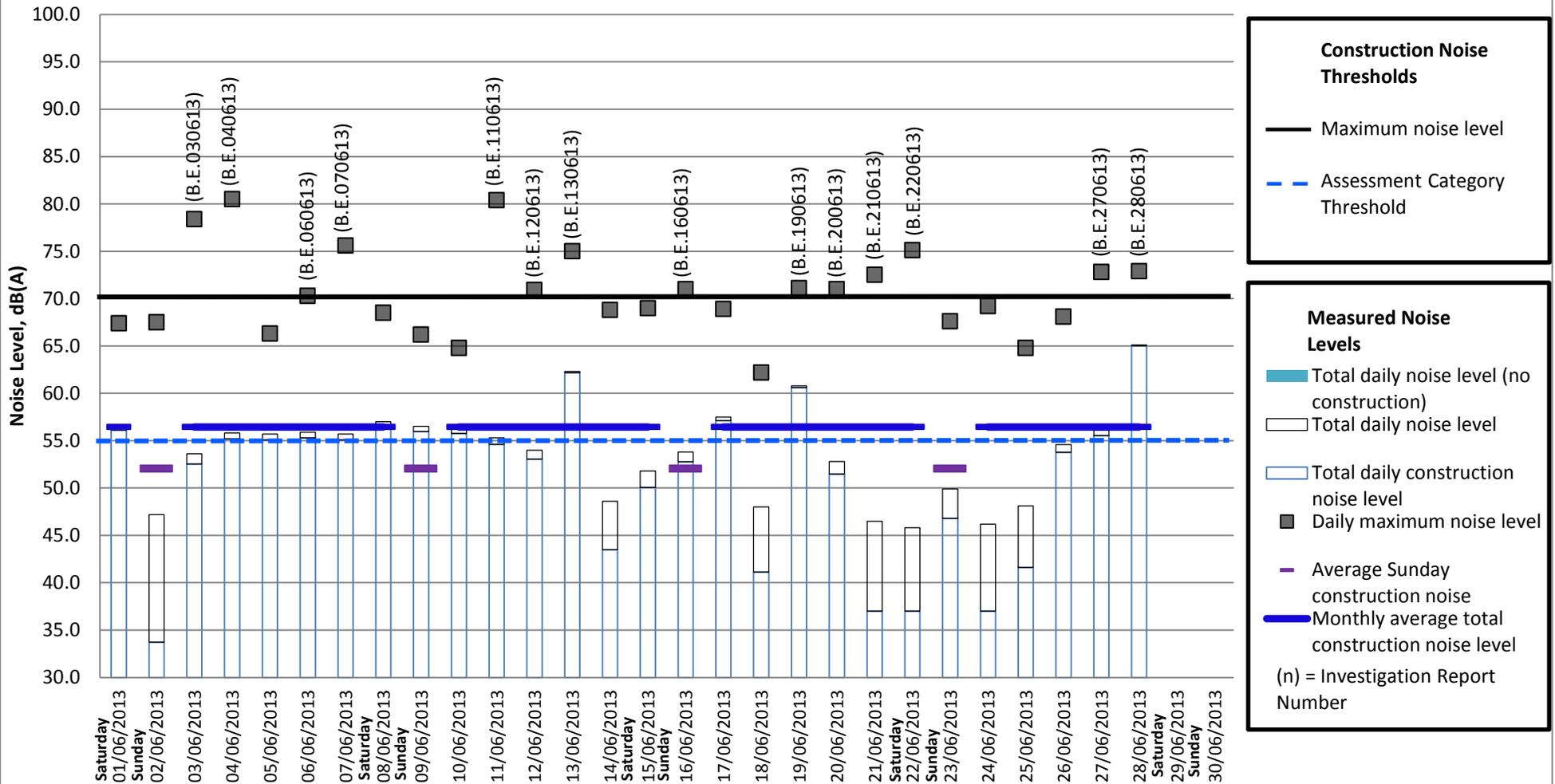
# Measured Daytime Noise Levels at Butlaw Fisheries

## Measurement period: June 2013



**Note:** Data is missing for 29/06/13 and 30/06/13 due to device error.

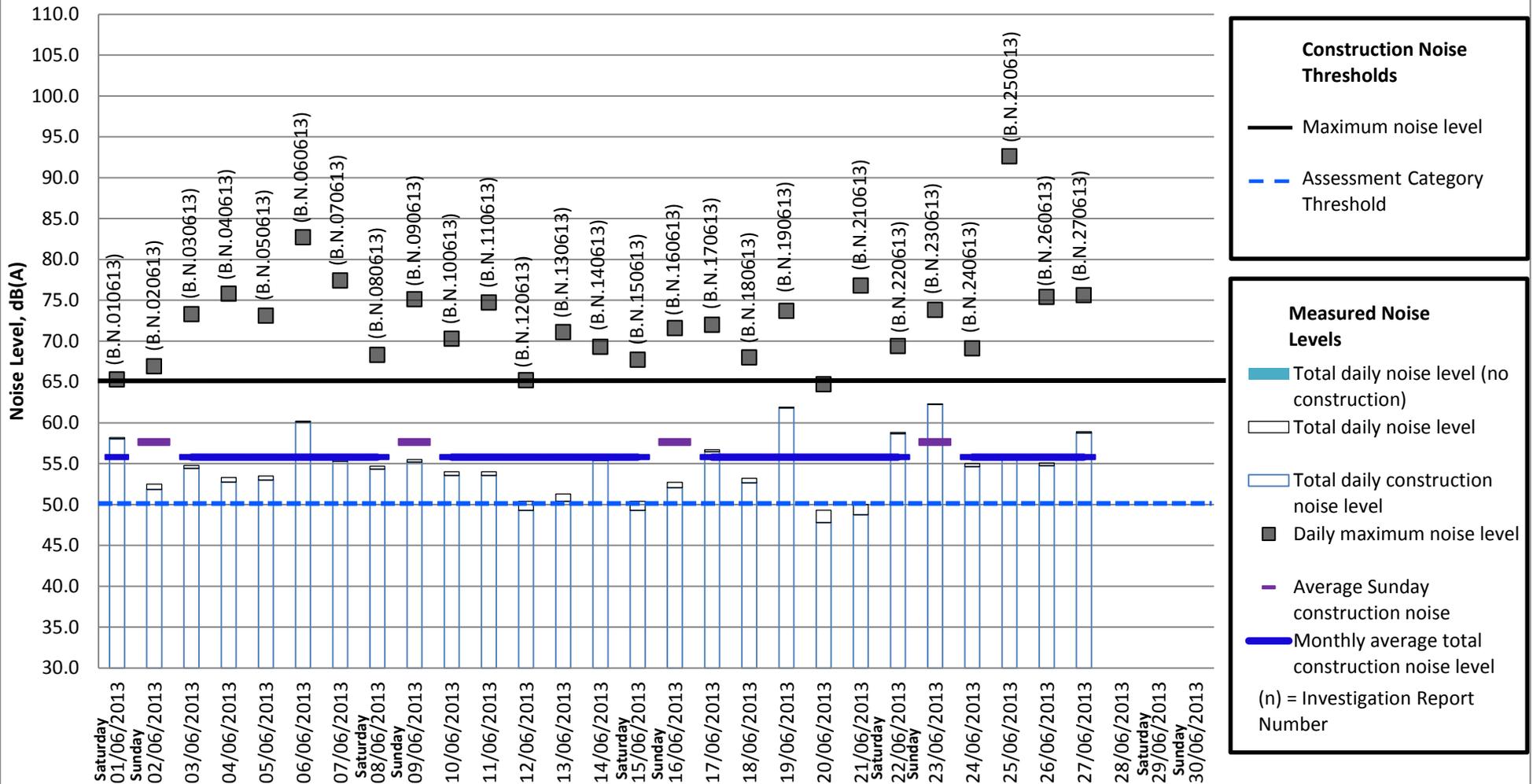
## Measured Evening Noise Levels at Butlaw Fisheries Measurement period: June 2013



**Note:** Data is missing for 29/06/13 and 30/06/13 due to device error.

# Measured Night time Noise Levels at Butlaw Fisheries

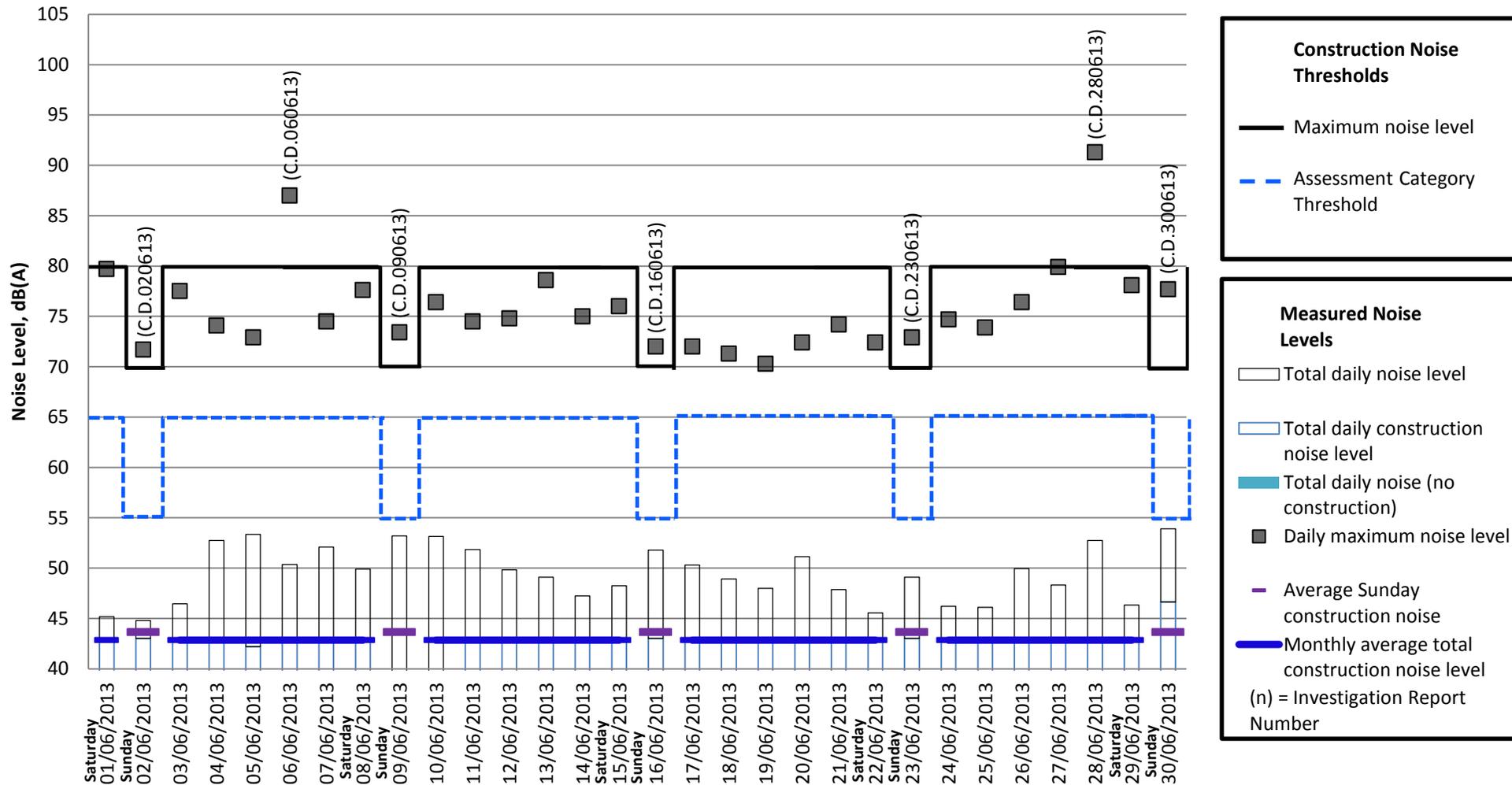
## Measurement period: June 2013



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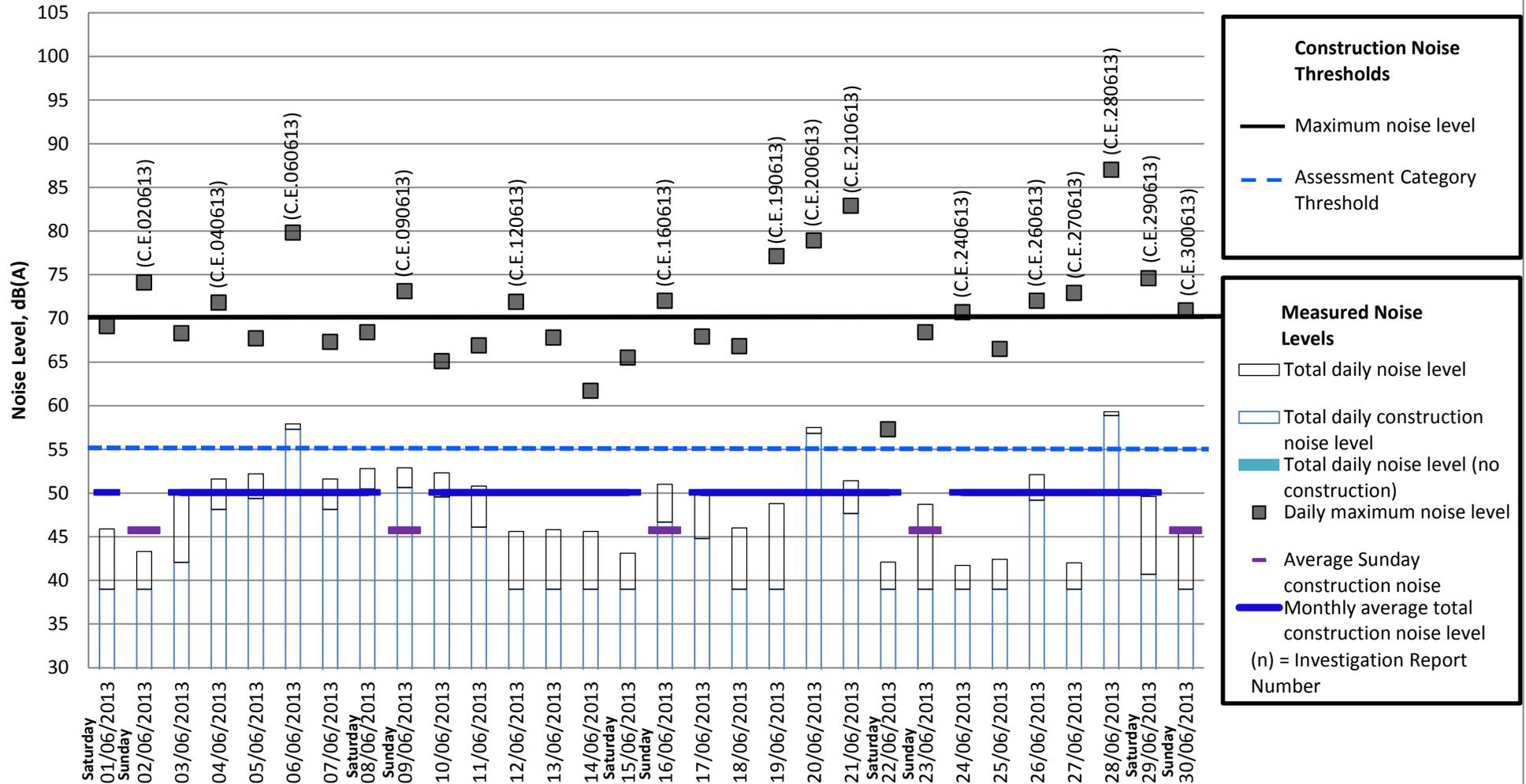
# Measured Daytime Noise Levels at Clufflat Brae

## Measurement period: June 2013



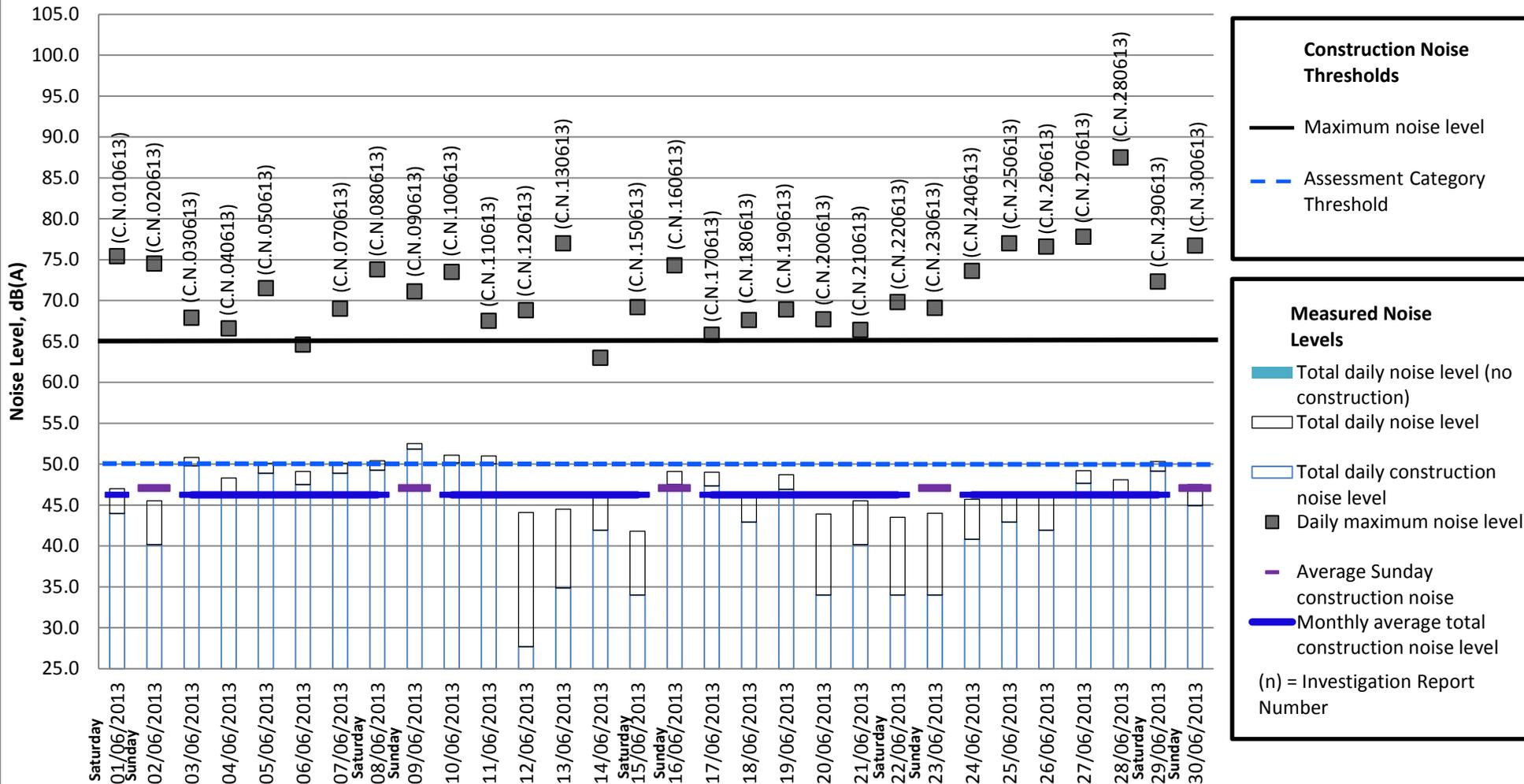
# Measured Evening Noise Levels at Clufflat Brae

## Measurement period: June 2013



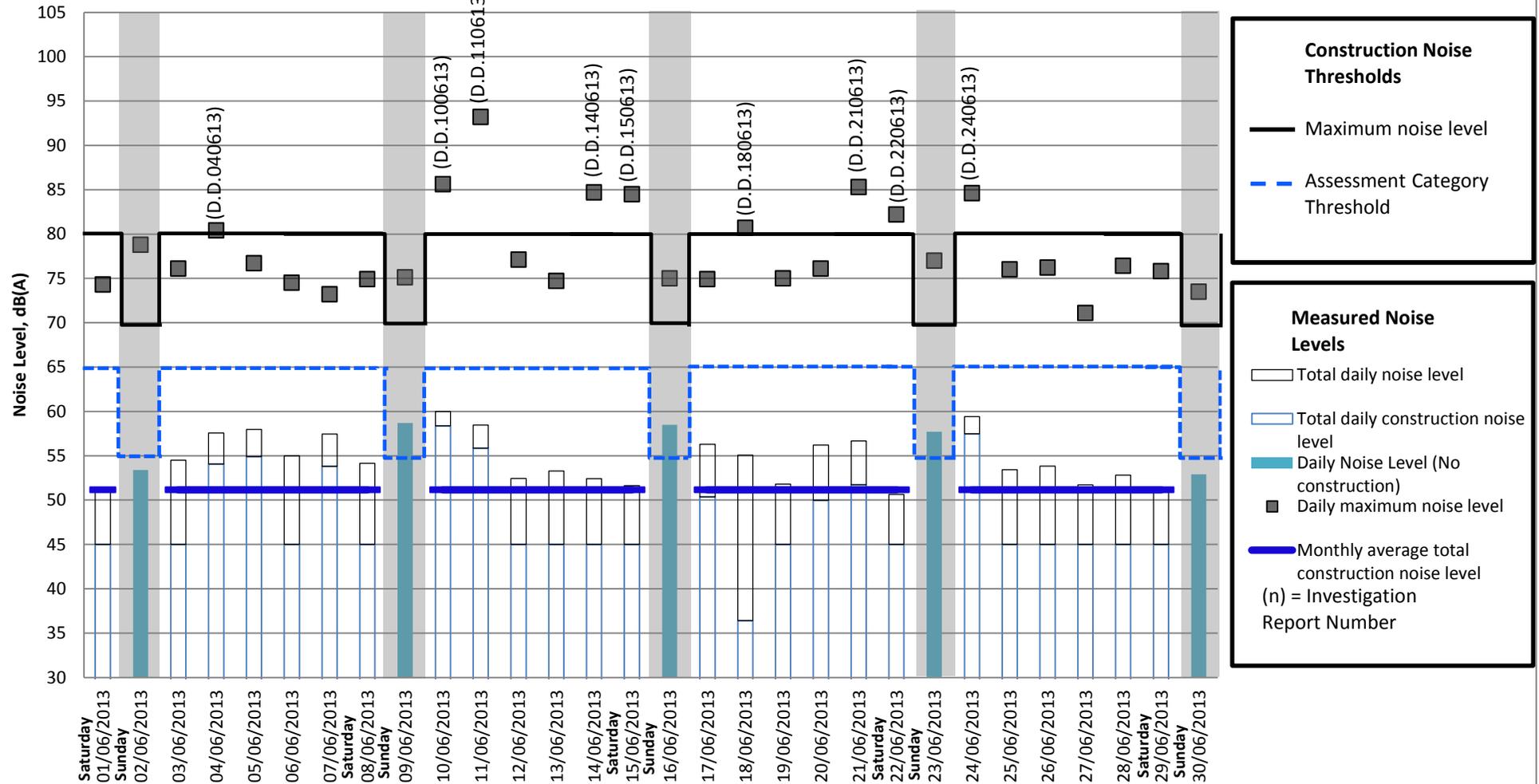
# Measured Night-time Noise Levels at Clufflat Brae

## Measurement period: June 2013



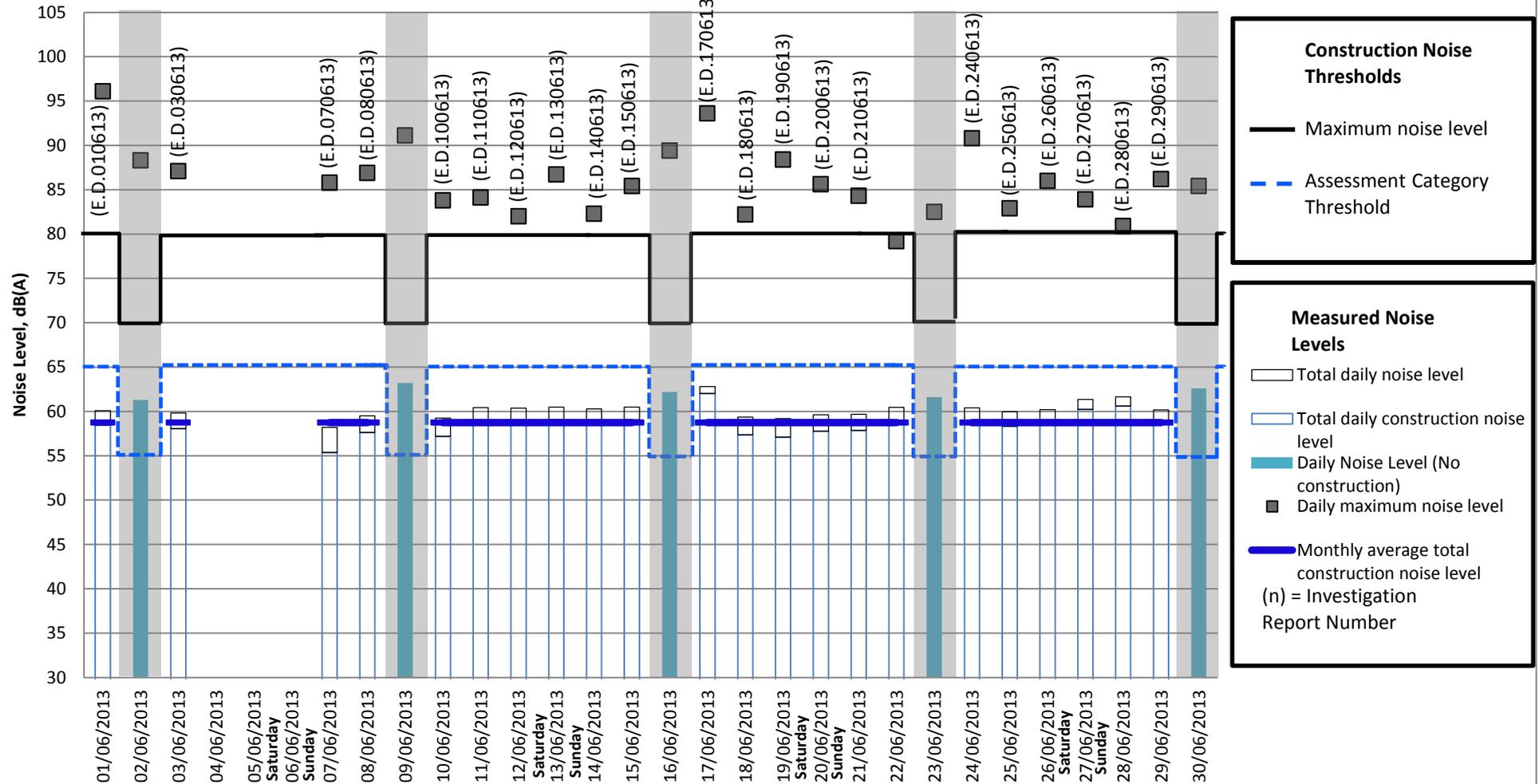
# Measured Daytime Noise Levels at Dundas Home Farm

## Measurement period: June 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

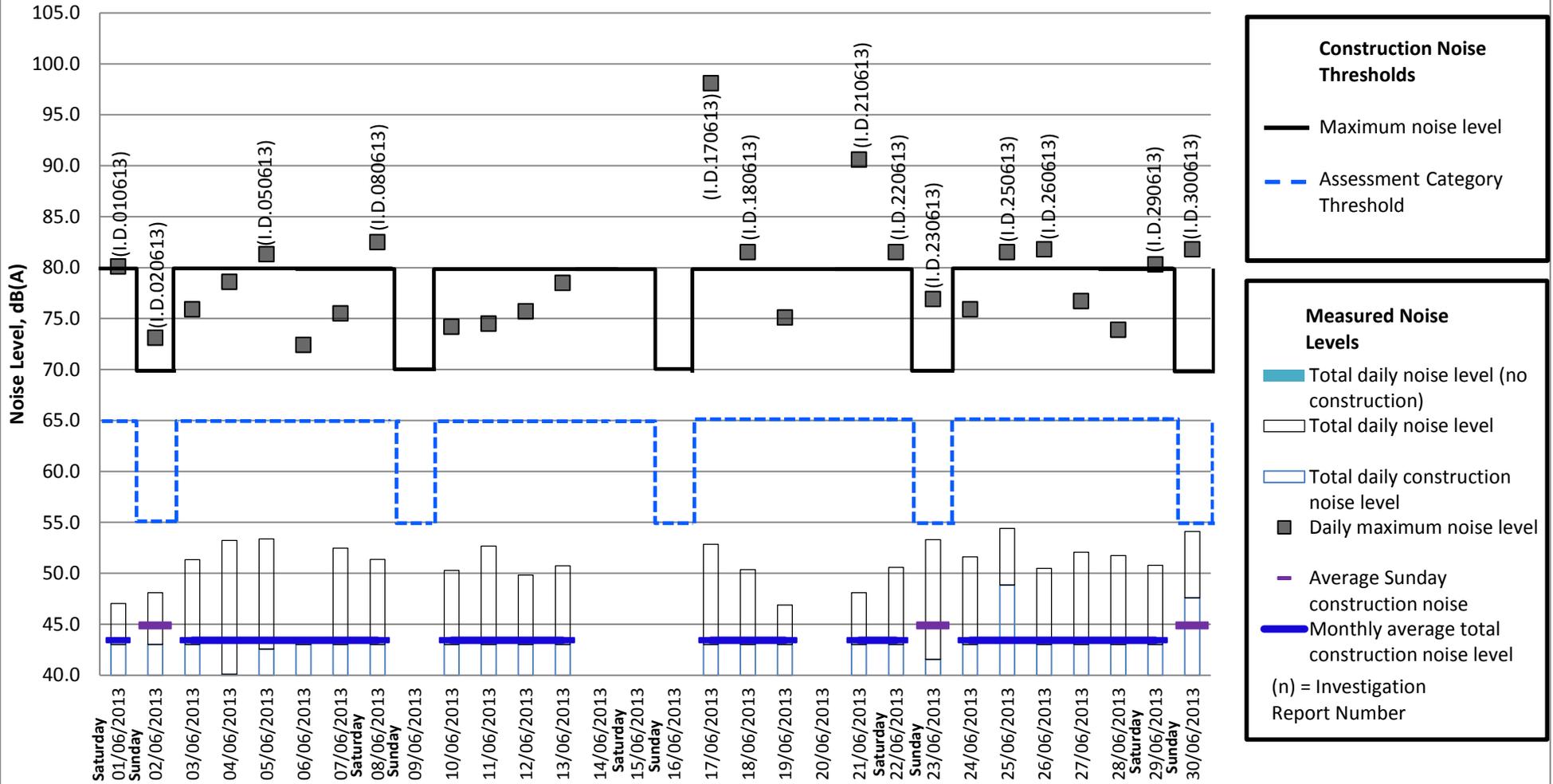
## Measured Daytime Noise Levels at Echline Measurement period: June 2013



**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. Data is missing for 04/06/13 to 06/06/13 due to device error.

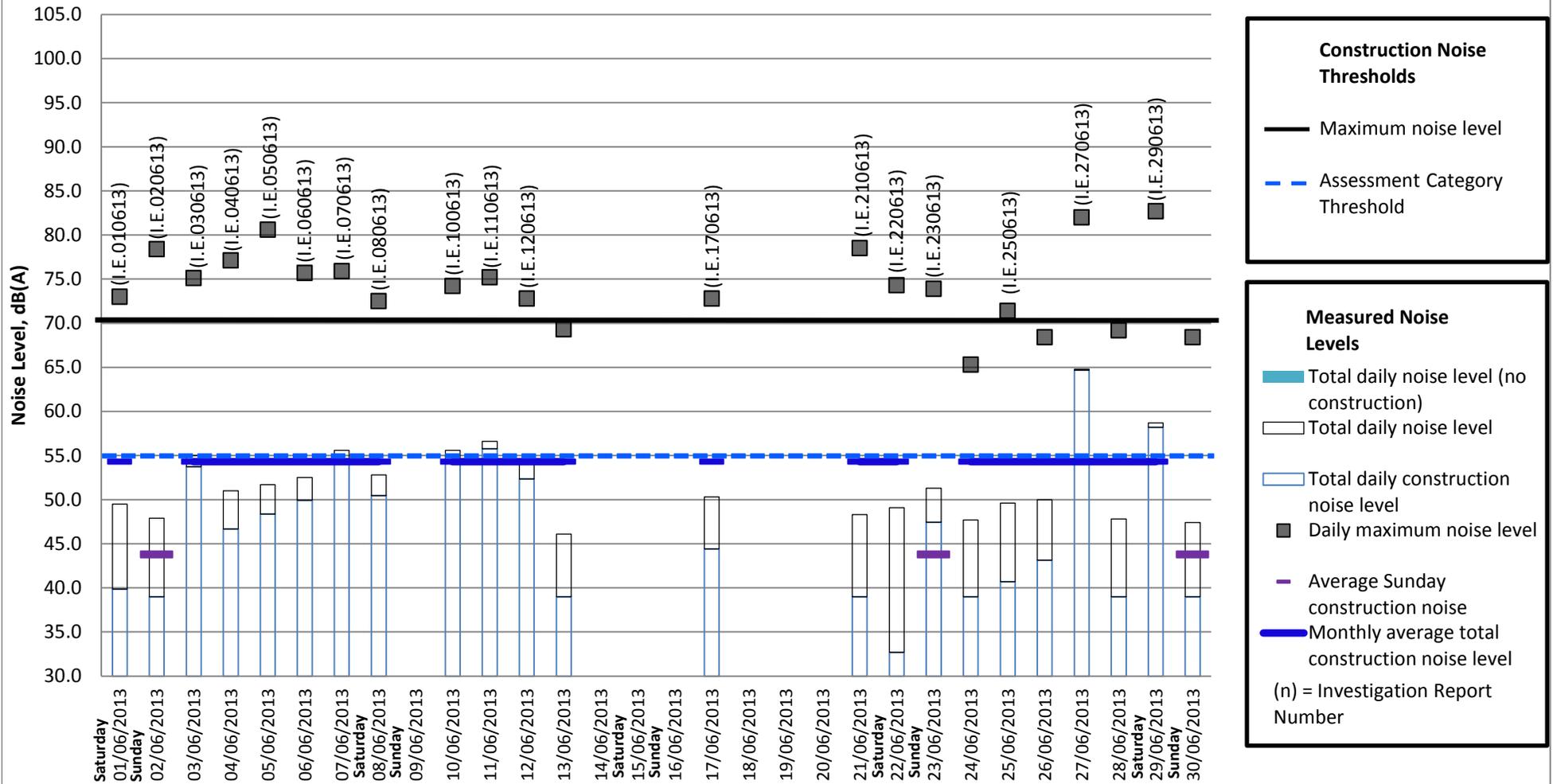
# Measured Daytime Noise Levels at Inchgarvie

## Measurement period: June 2013



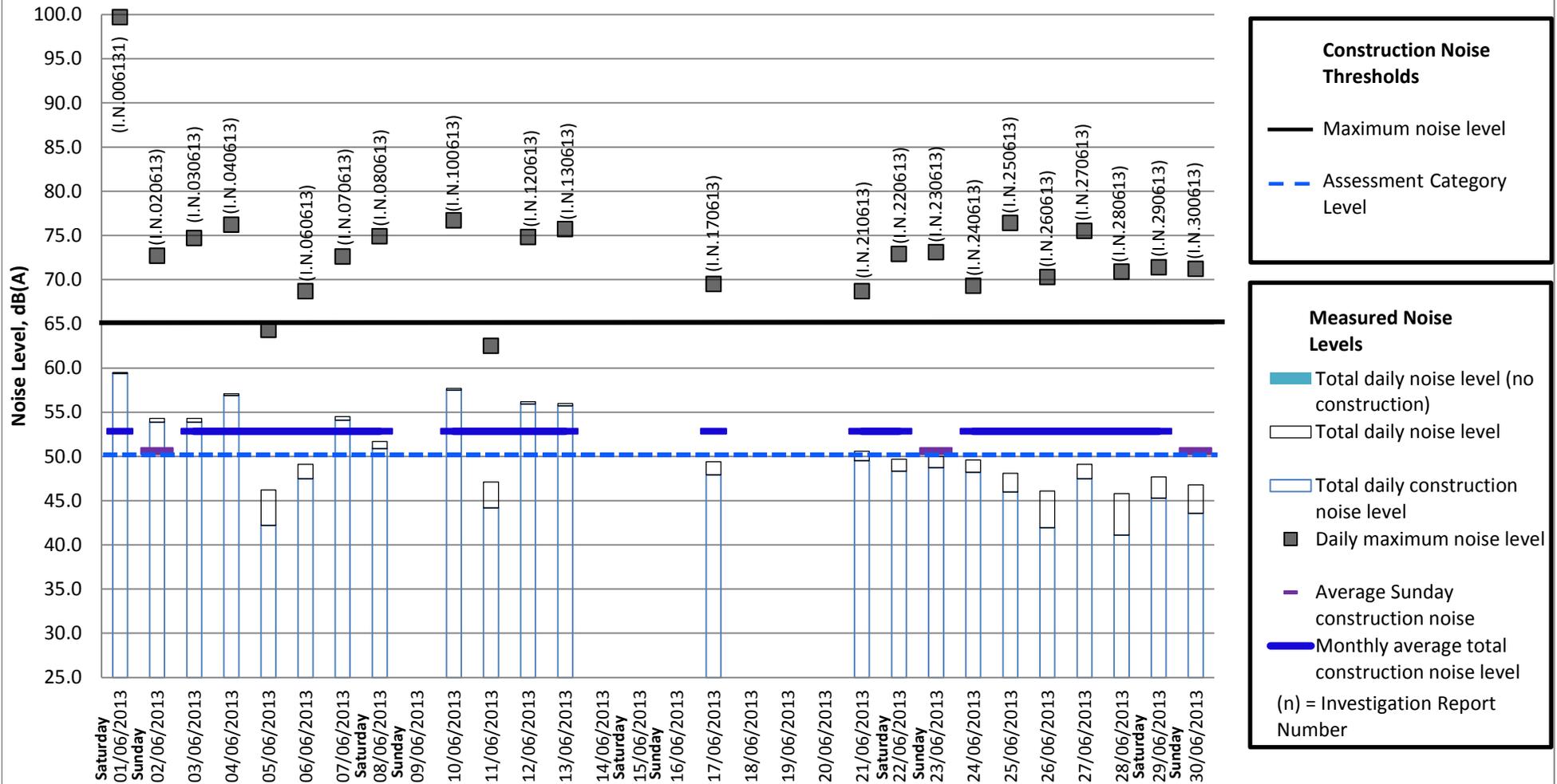
**Note:** Data is missing for this location on 09/06/13, 14/06/13 to 16/06/13 and 20/06/13 due to device error.

## Measured Evening Noise Levels at Inchgarvie Measurement period: June 2013



**Note:** Data is missing at this location for 09/06/13, 14/06/13 to 16/06/13 and 18/06/13 to 20/06/13 due to device error.

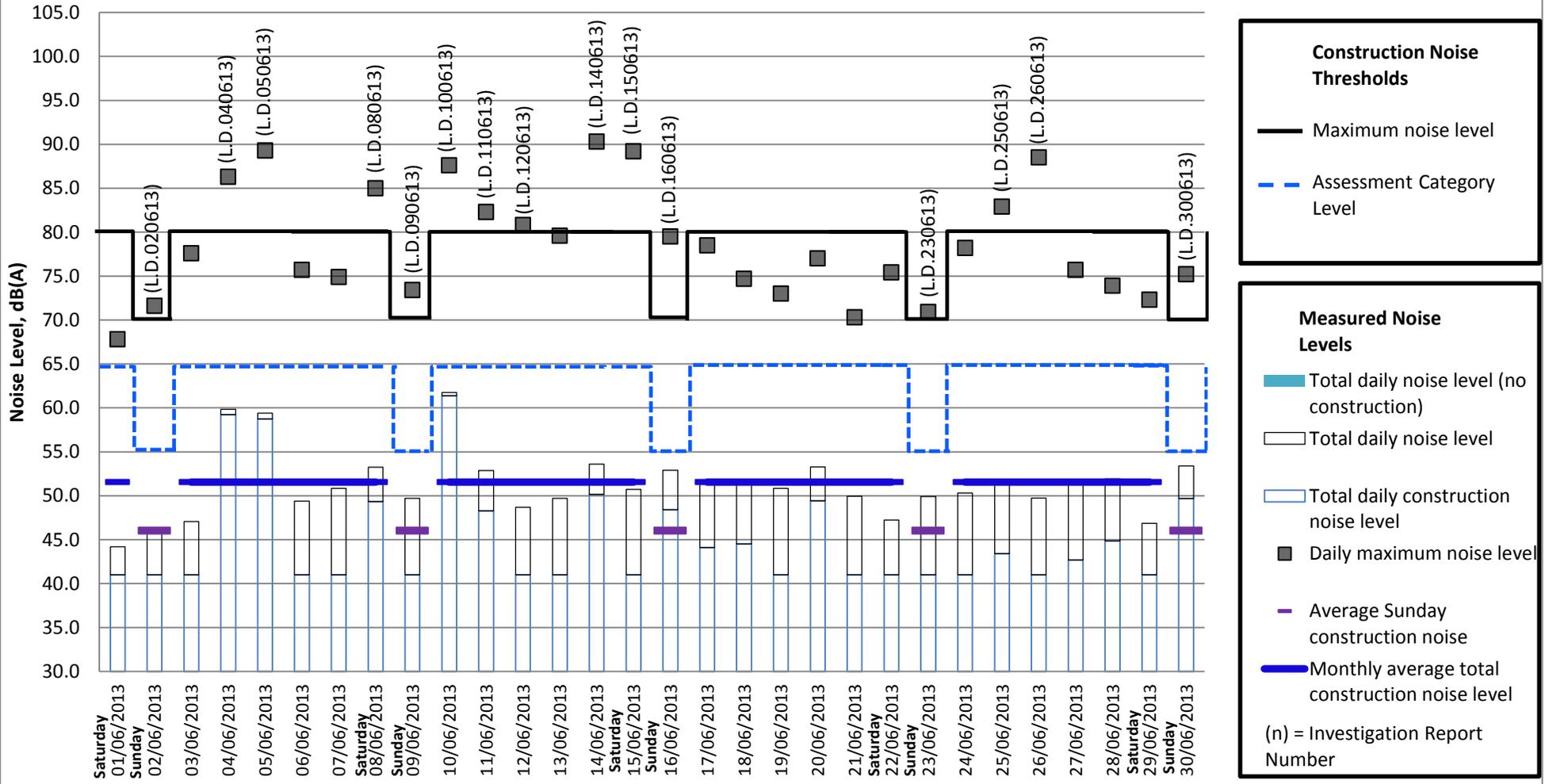
## Measured Night-time Noise Levels at Inchgarvie Measurement period: June 2013



**Note:** Data is missing for 09/06/13, 14/06/13 to 16/06/13 and 18/06/13 to 20/06/13 due to device error.

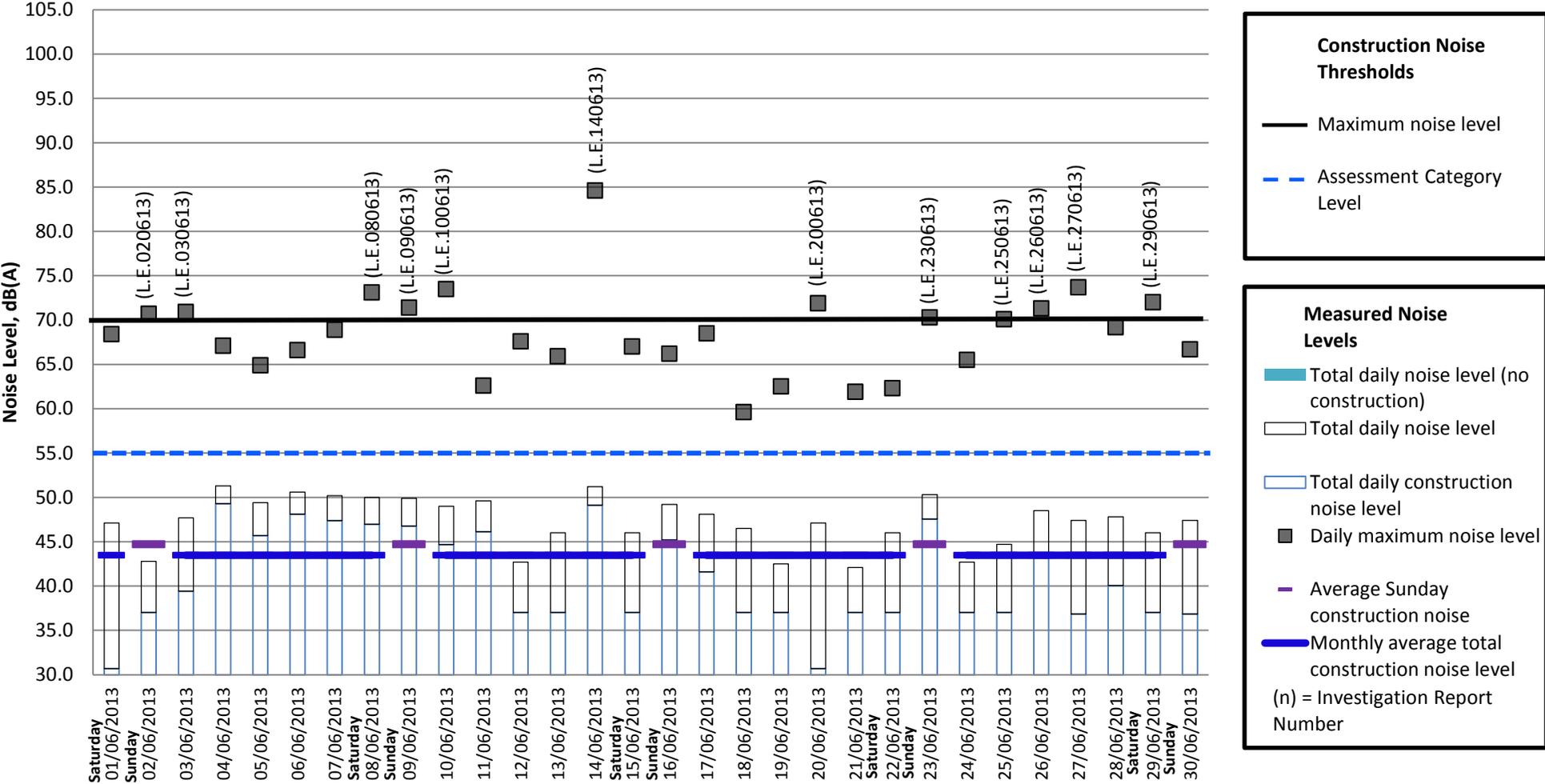
# Measured Daytime Noise levels at Linn Mill

## Measurement period: June 2013



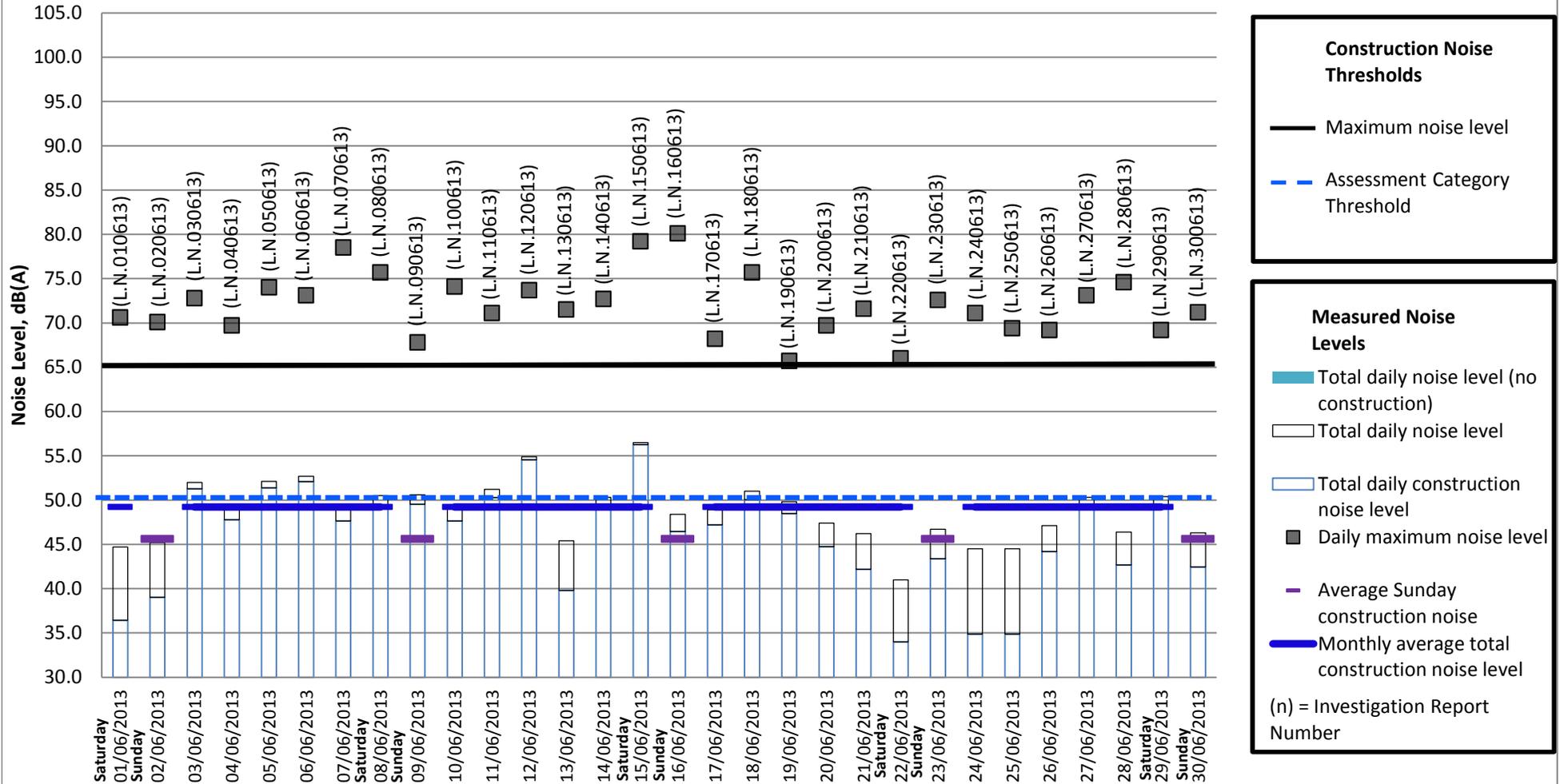
# Measured Evening Noise Levels at Linn Mill

## Measurement period: June 2013

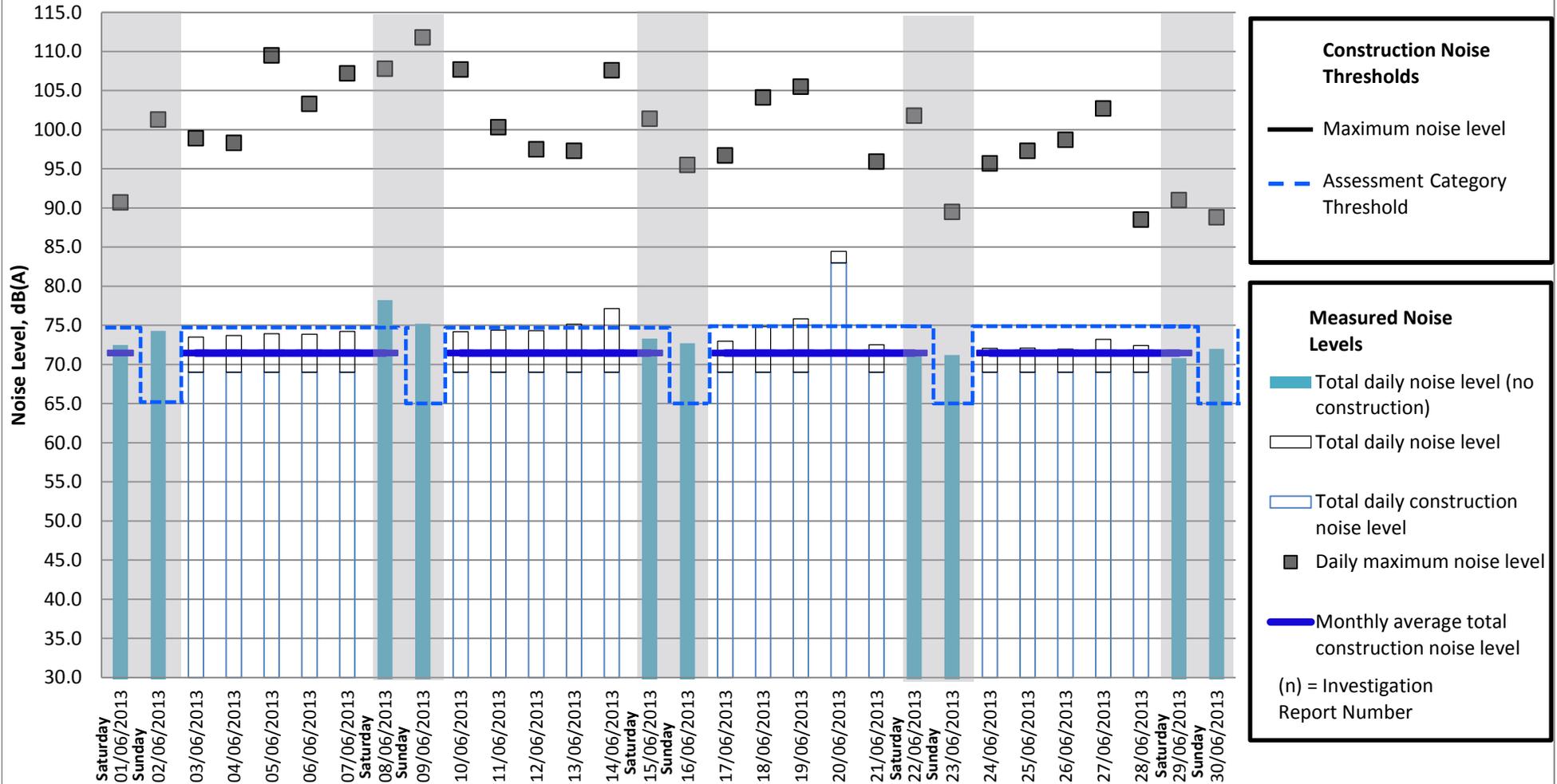


# Measured Night-time Noise Levels at Linn Mill

## Measurement period: June 2013

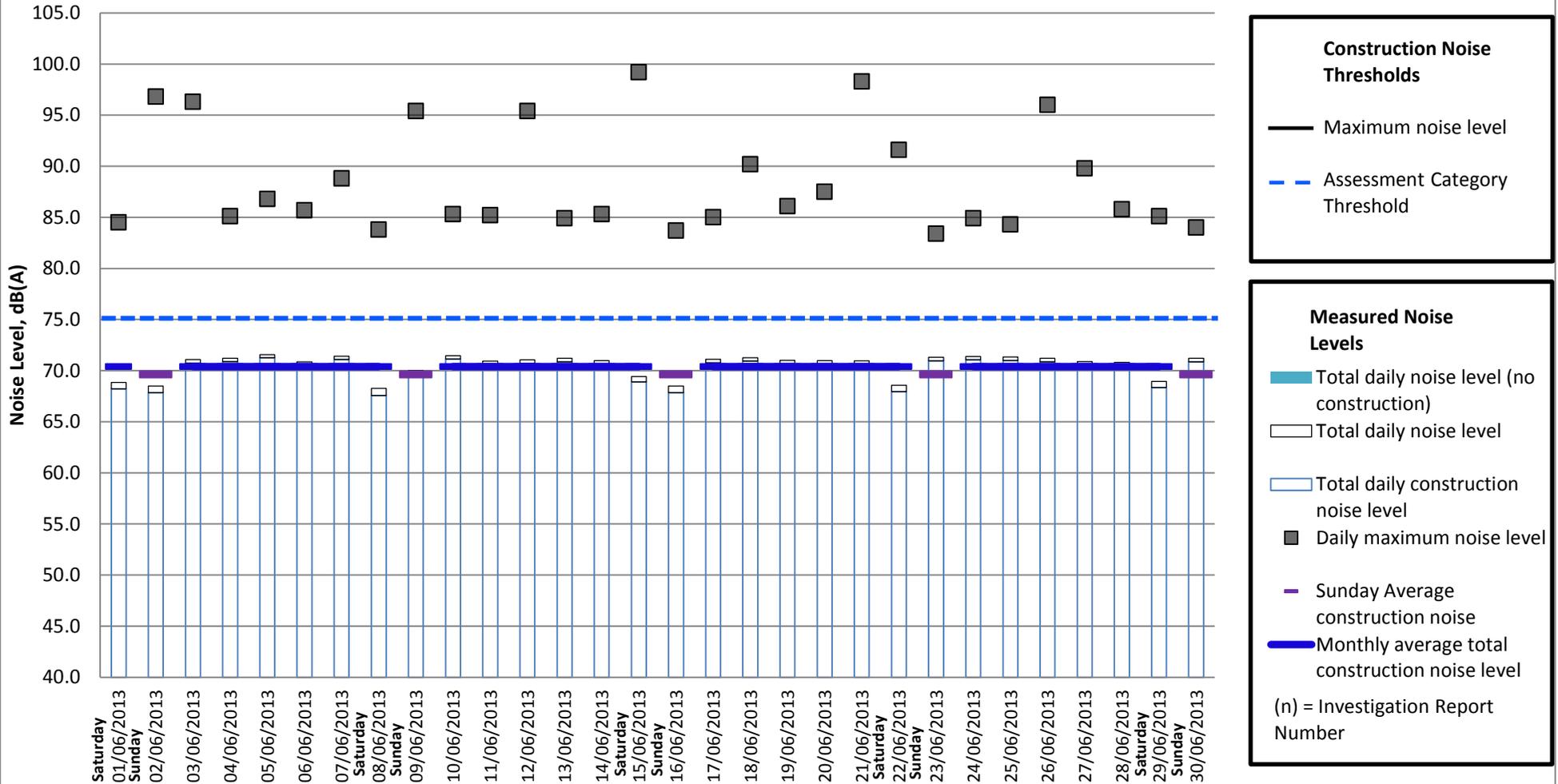


## Measured Daytime Noise Levels at Newton Measurement period: June 2013

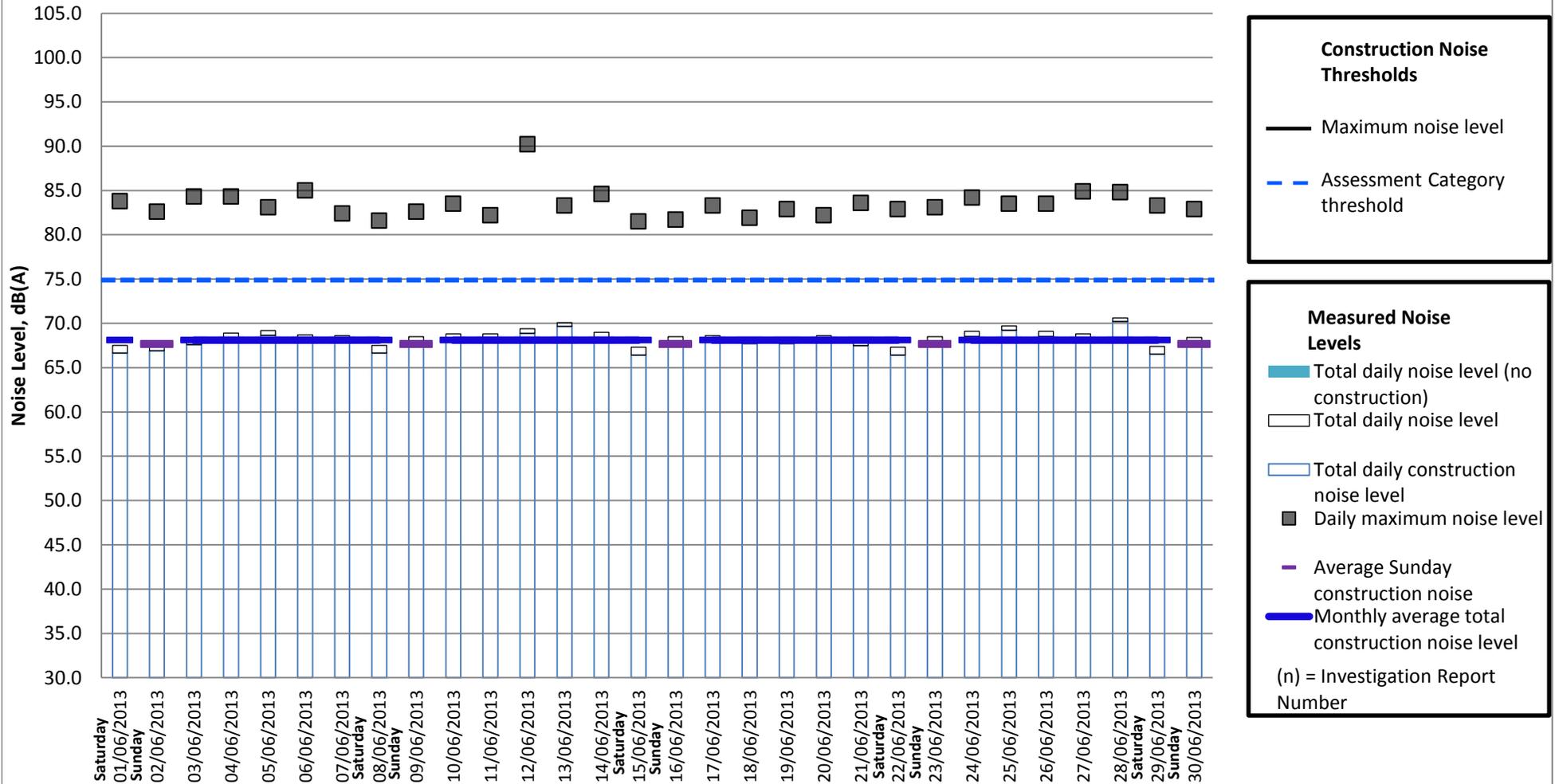


**Note:** The grey areas of the chart represent days on which no construction works have been conducted; no works have been conducted near this location on Saturday or Sunday. It should be noted that the measured noise levels Mon - Fri can not be attributed to construction works due to the considerable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

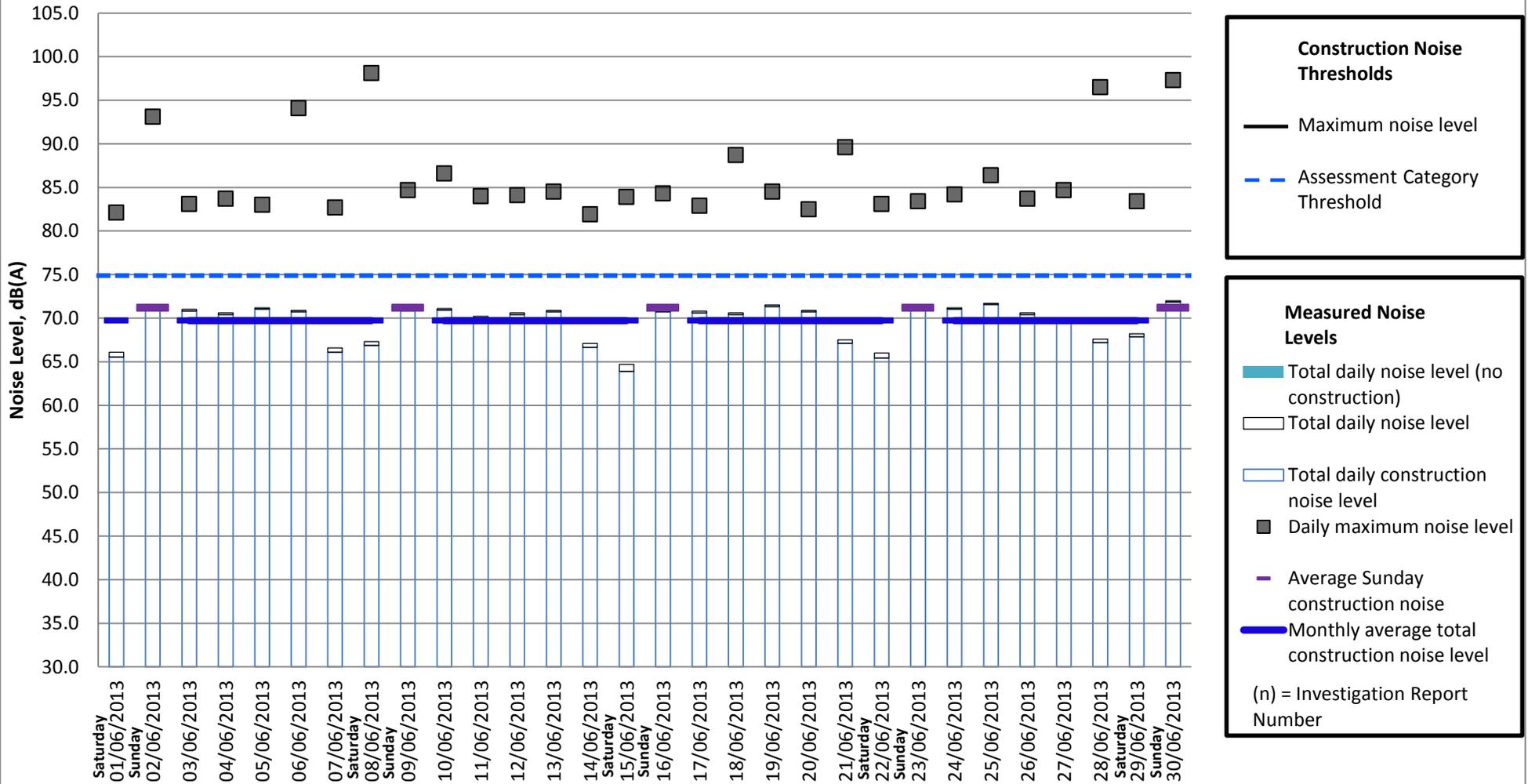
## Measured Daytime Noise Levels at North Leg Measurement period: June 2013



## Measured Evening Noise Levels at North Leg Measurement period: June 2013

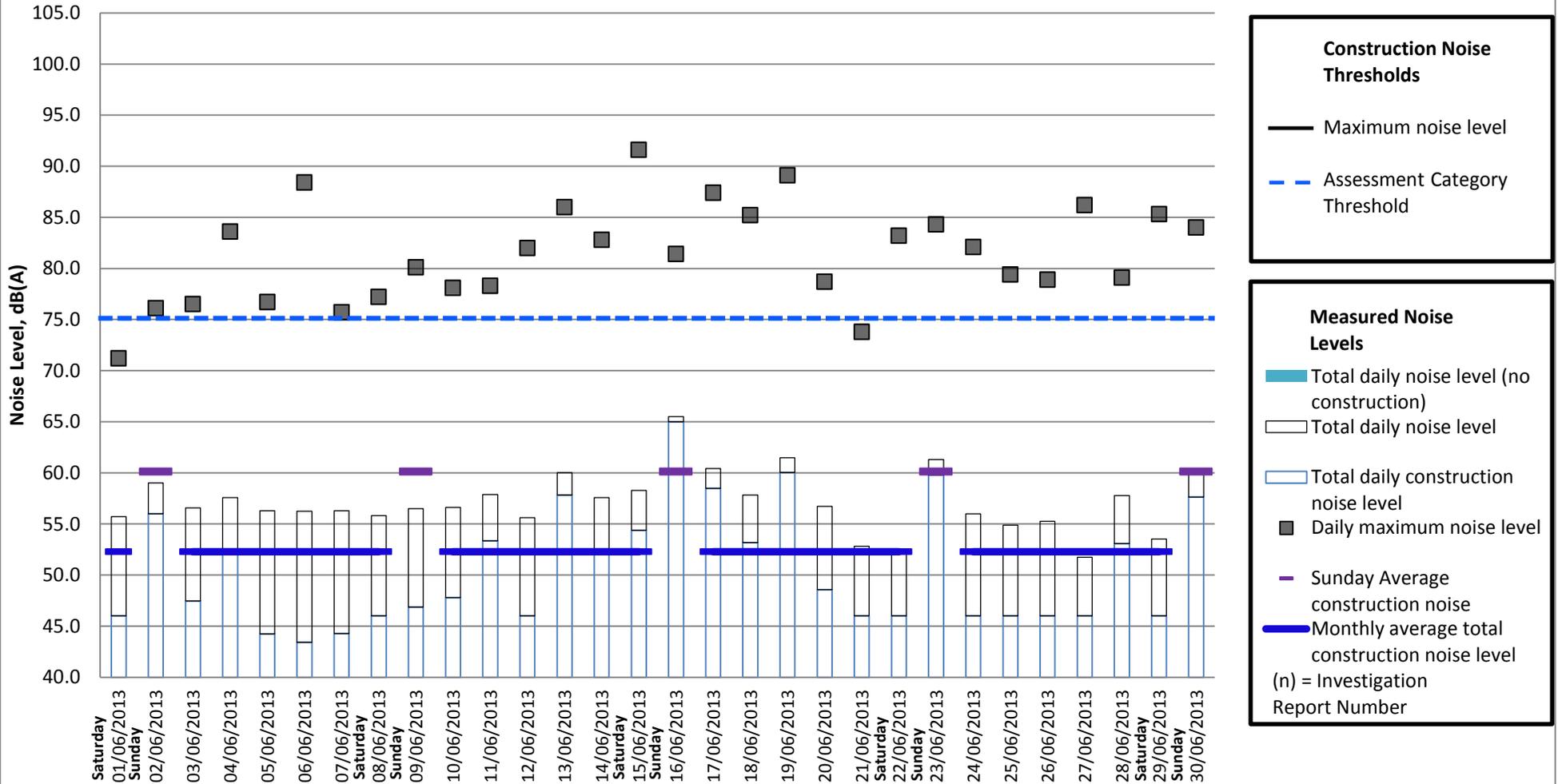


## Measured Night-time Noise Levels at North Leg Measurement period: June 2013



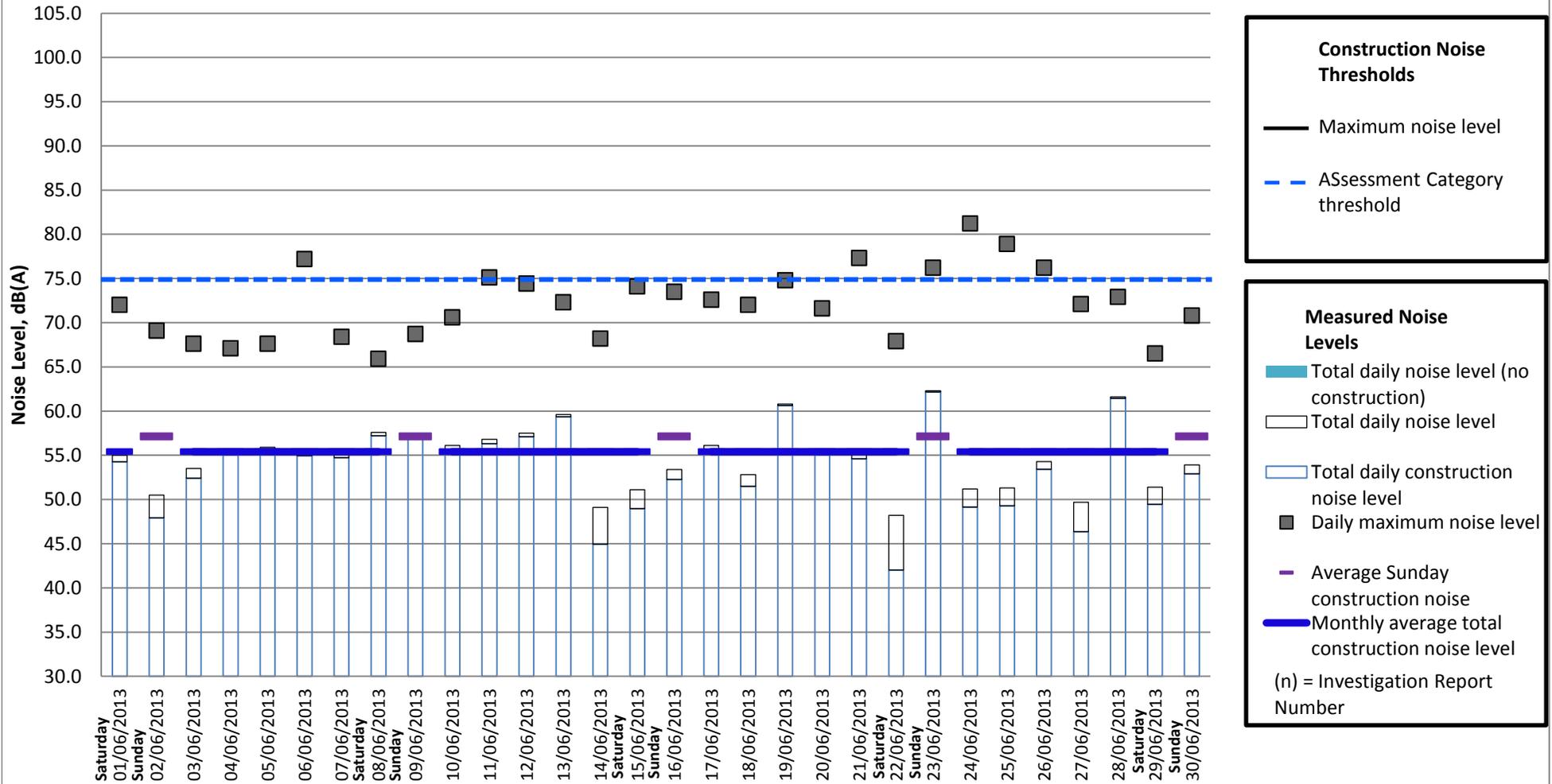
# Measured Daytime Noise Levels at Port Edgar

## Measurement period: June 2013



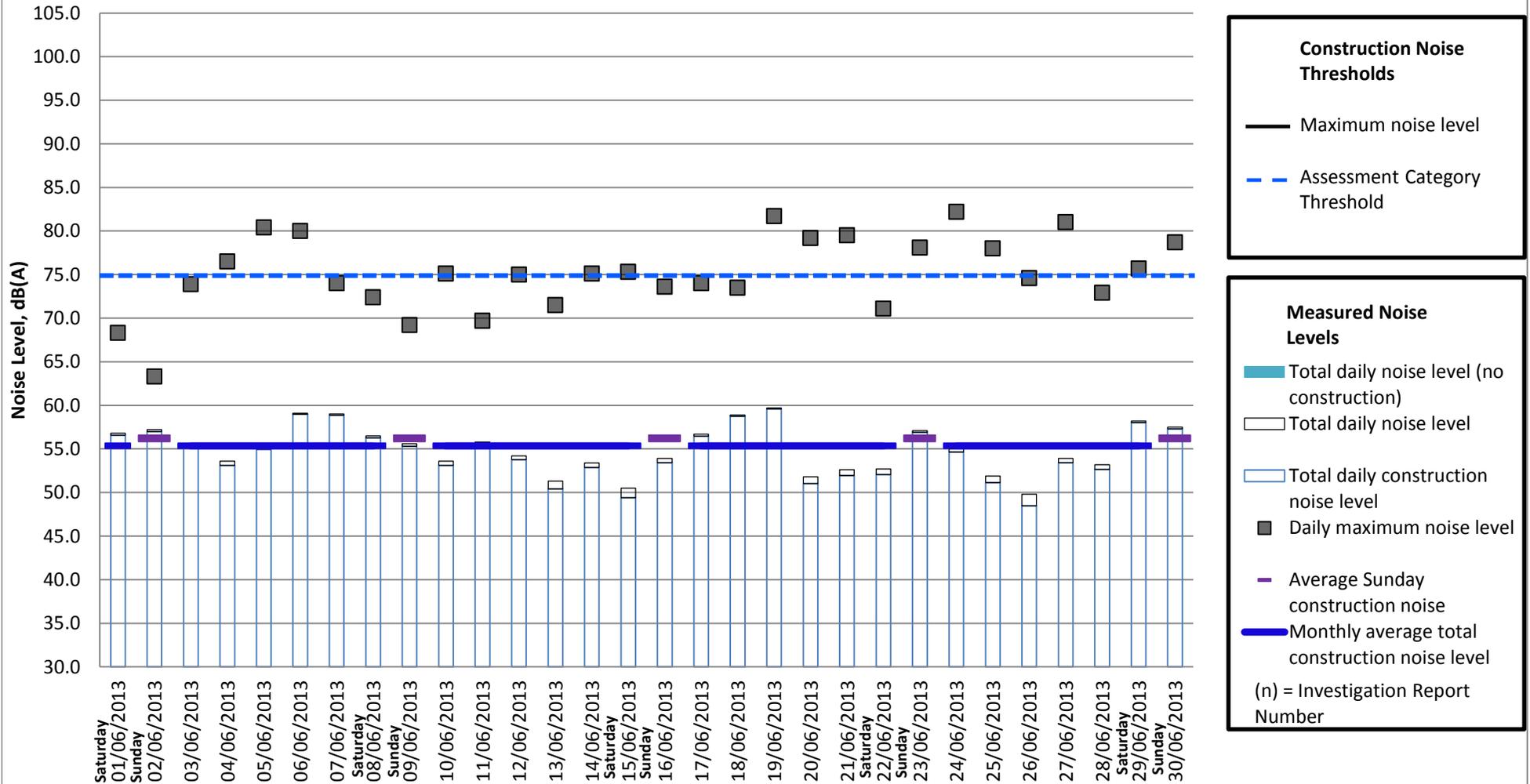
# Measured Evening Noise Levels at Port Edgar

## Measurement period: June 2013

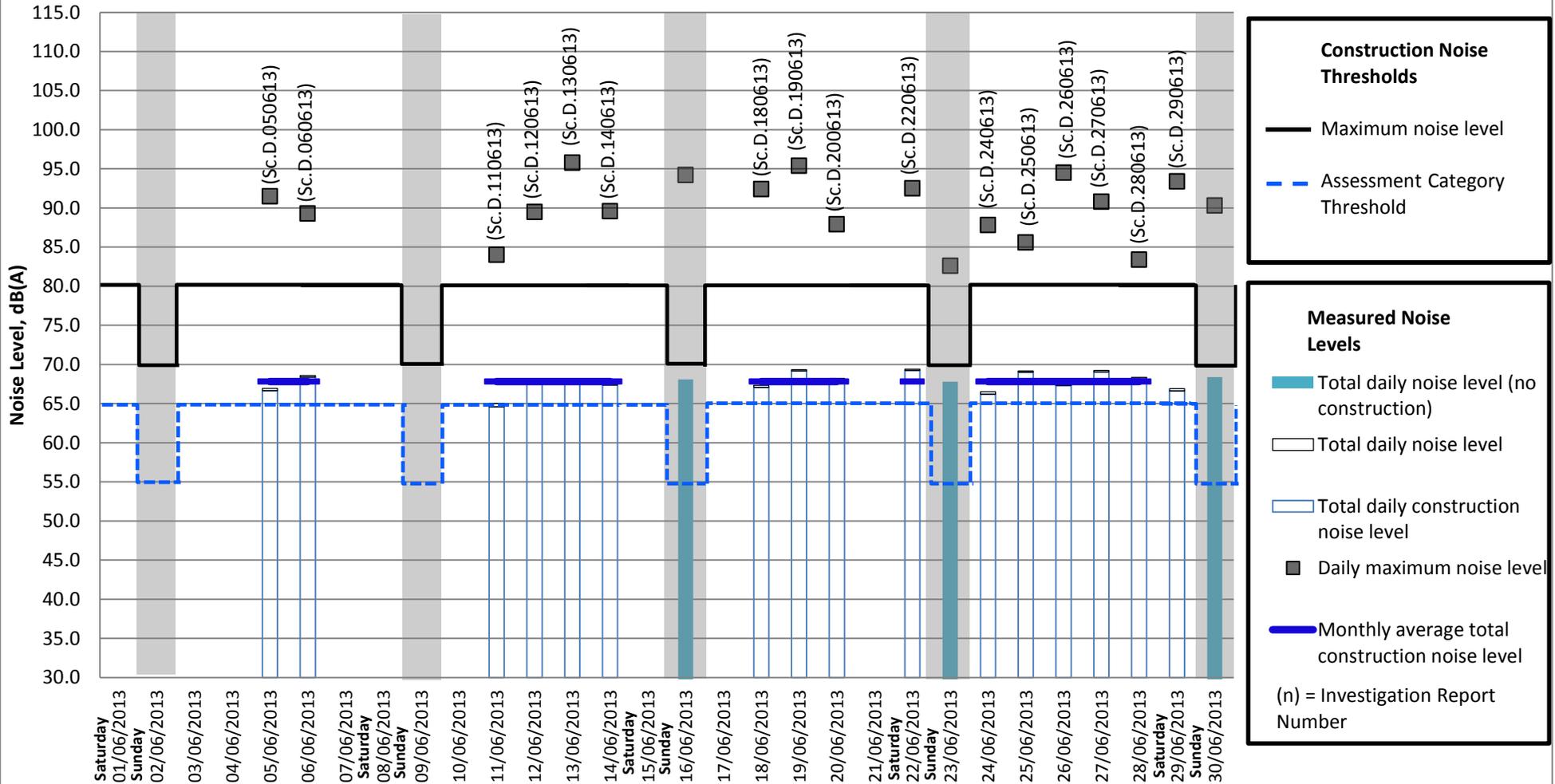


# Measured Night-time Noise Levels at Port Edgar

## Measurement period: June 2013



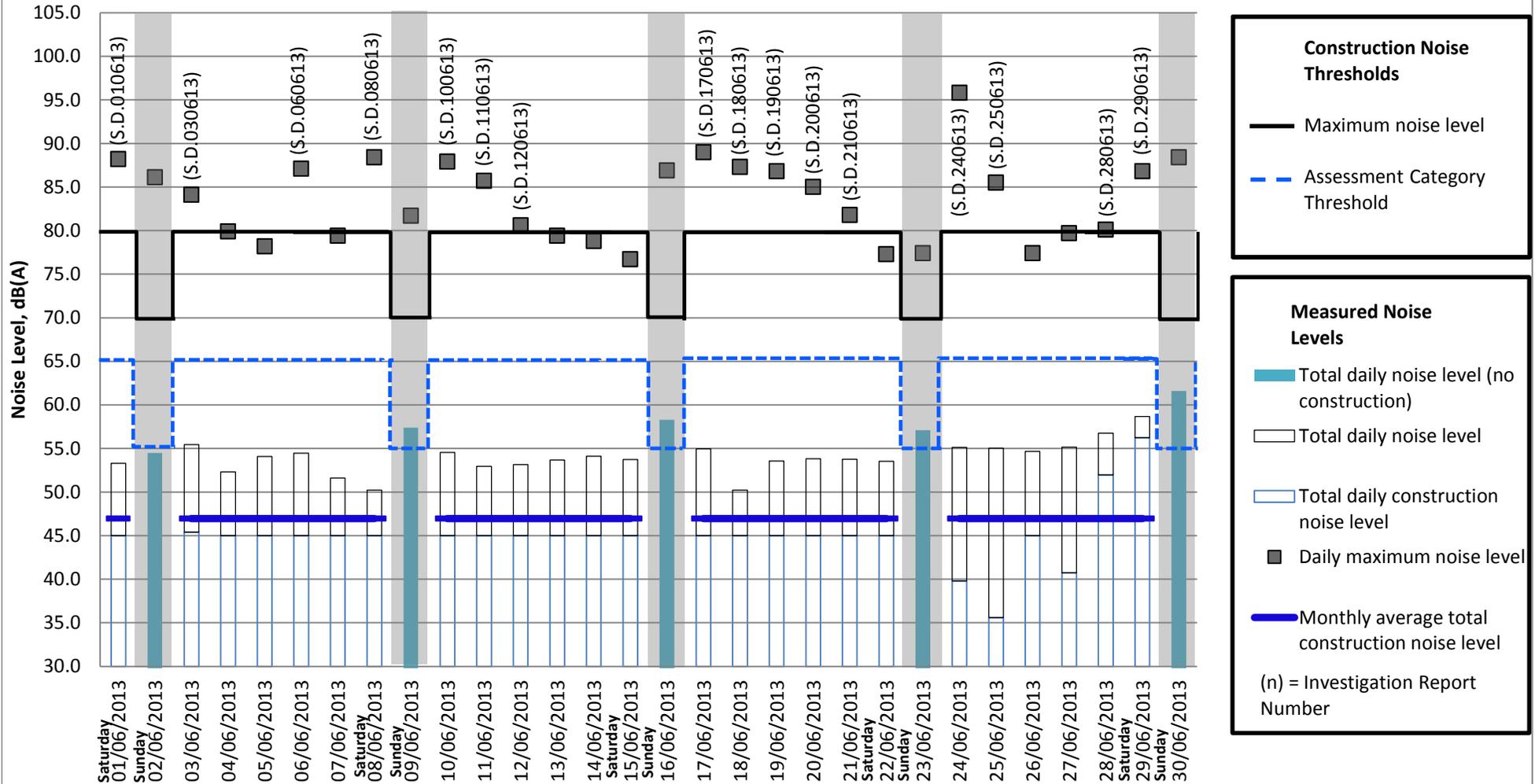
## Measured Daytime Noise Levels at Scotstoun Measurement period: June 2013



**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. Data is missing for 01/06/13 to 04/06/13, 07/06/13 to 10/06/13, 15/06/13 to 17/06/13 and 21/06/13 due loss of power supply associated with a change to the site boundary.

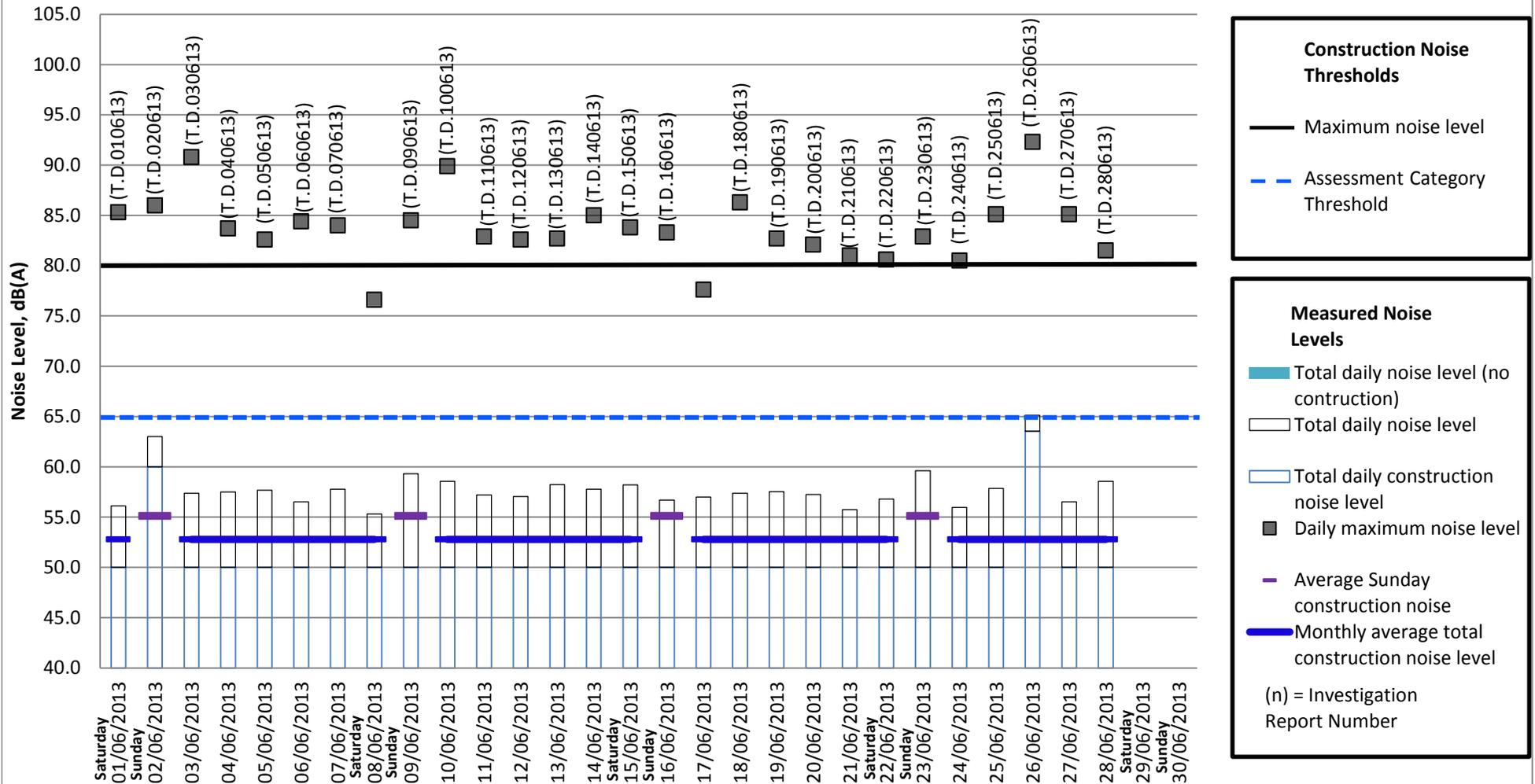
# Measured Daytime Noise Levels at Springfield

## Measurement period: June 2013



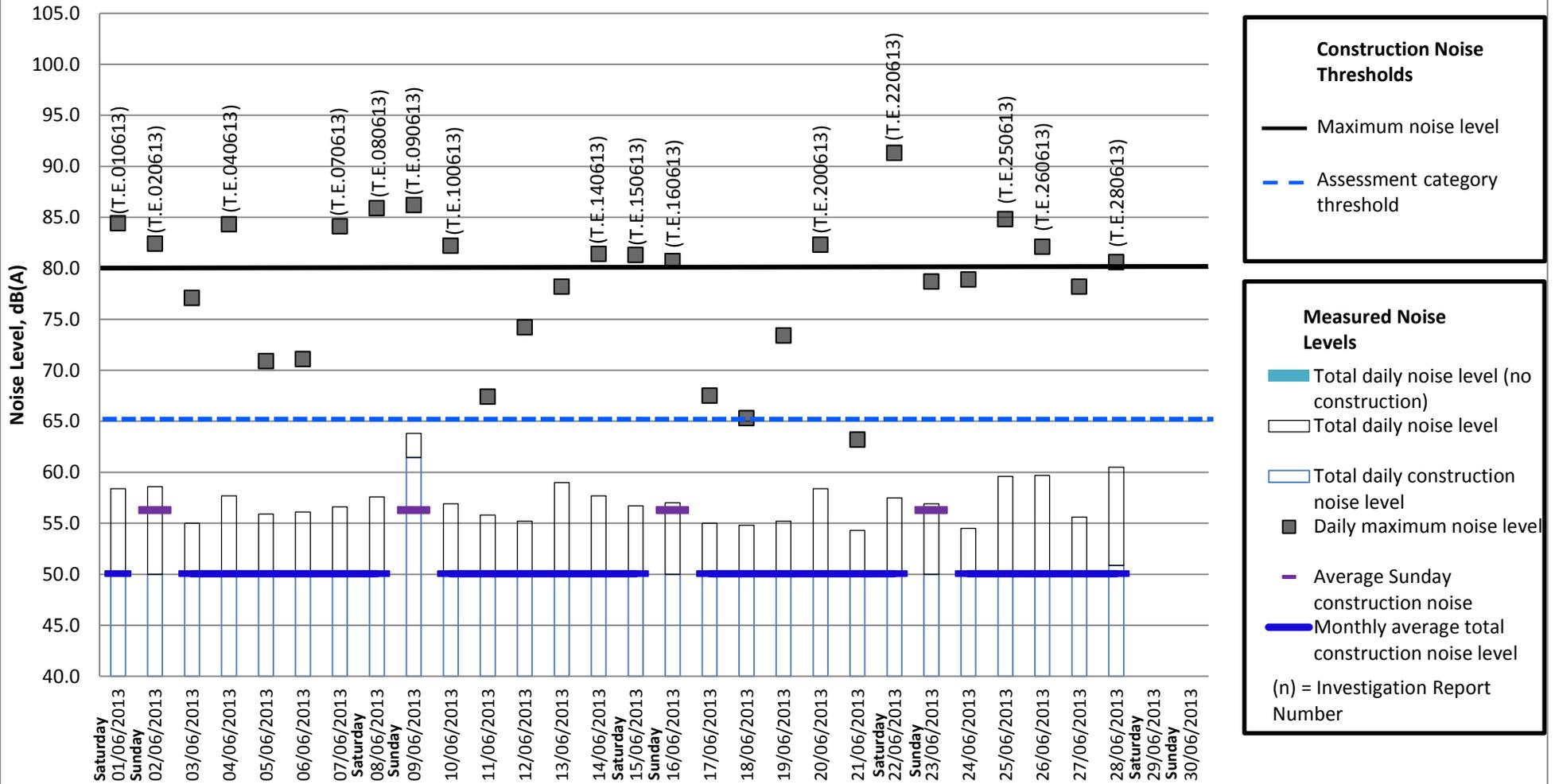
**Note:** The grey areas of the chart represent days on which no construction works have been conducted.

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



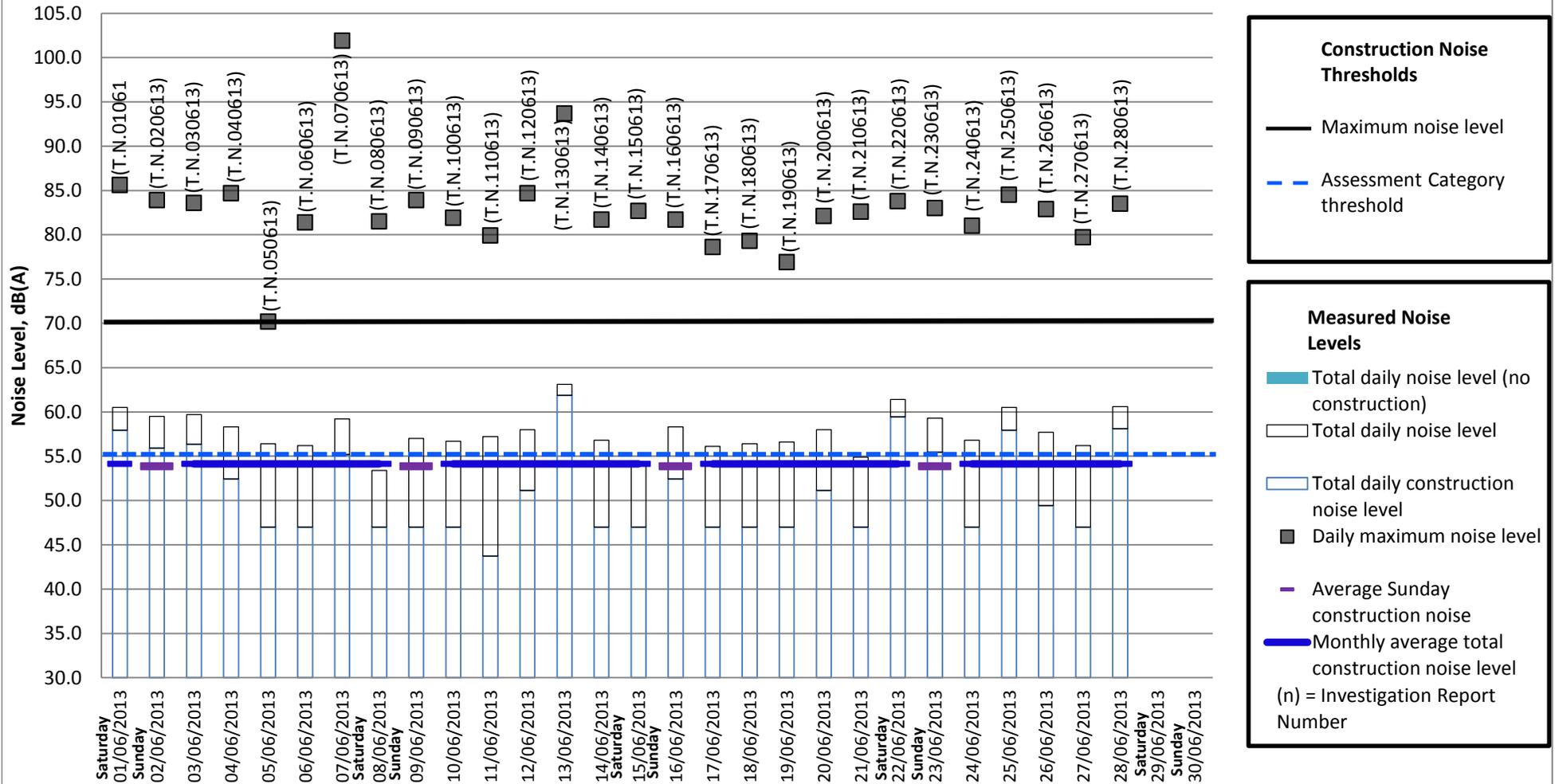
**Note:** Data is missing for 29/06/13 and 30/06/13 due to device error.

## Measured Evening Noise Levels at Tigh-Na-Grian Measurement period: June 2013



**Note:** Data is missing for 29/06/13 and 30/06/13 due to device error.

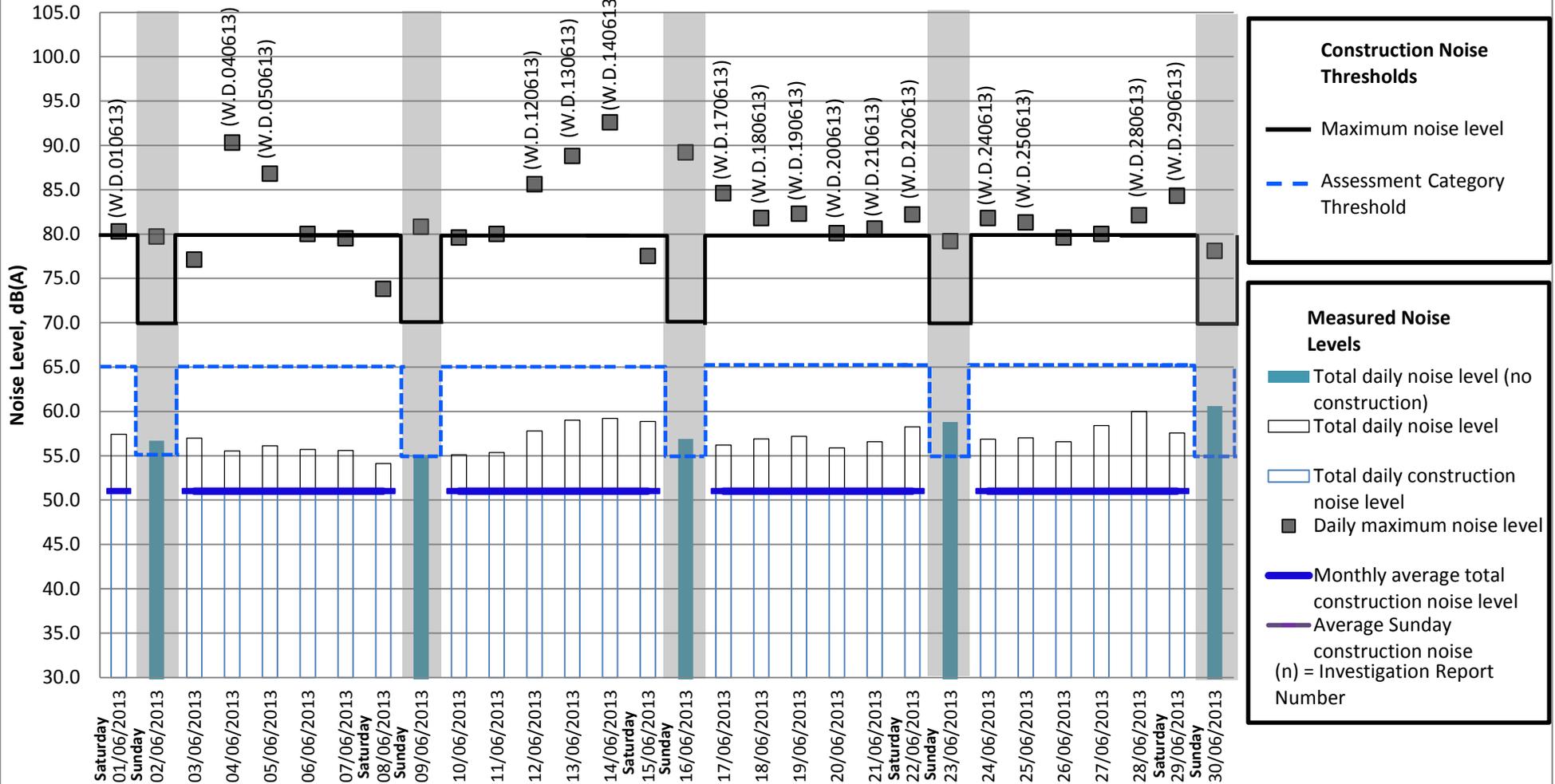
## Measured Night-time Noise Levels at Tigh-Na-Grian Measurement period: June 2013



**Note:** Data is missing on 29/06/13 and 30/06/13 due to device error.

# Measured Daytime Noise Levels at Whinny Hill

## Measurement period: June 2013



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