



Forth Replacement Crossing

**Employer's Delivery Team
Construction Vibration Monitoring Report**

**M9 Junction 1a Contract
(January to April 2012)**



An agency of  The Scottish Government



FORTH REPLACEMENT CROSSING

**EMPLOYER'S DELIVERY TEAM
CONSTRUCTION VIBRATION MONITORING REPORT**

**M9 JUNCTION 1A CONTRACT
(JANUARY TO APRIL 2012)**

Revision Status

Revision	Date	Description	Author	Approved for Use
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FORTH REPLACEMENT CROSSING

**EMPLOYER'S DELIVERY TEAM
CONSTRUCTION VIBRATION MONITORING REPORT**

CONTENTS

1. INTRODUCTION..... 3

2. M9 J1A CONTRACT VIBRATION MONITORING..... 4

APPENDIX A – M9 J1A CONTRACT CONSTRUCTION VIBRATION CHARTS

1. INTRODUCTION

1.1 This report sets out the results of the construction vibration monitoring undertaken on the M9 Junction 1a Contract between January 2012 and April 2012 as part of the Forth Replacement Crossing project.

2. M9 J1A CONTRACT VIBRATION MONITORING

VIBRATION MONITORING LOCATIONS

2.1 Continuous vibration monitoring was carried out at fixed monitor locations between January 2012 and April 2012 as outlined in Tables 2.1a to 2.1d below/overleaf. The main construction activities carried out adjacent to the monitor locations are also listed.

Monitoring Location	Monitoring Period	Main Construction Activities
93/95 King Edwards Way (CNV02)	January 2012	<ul style="list-style-type: none"> • Site clearance • Tree harvesting
15-17 Buie Rigg (CNV07)	January 2012	<ul style="list-style-type: none"> • Site clearance • Tree harvesting, • Traffic management on M9 Spur • Construction of temporary ramps to M9 Spur
8 Kirklands Park Grove (CNV16)	January 2012	<ul style="list-style-type: none"> • Earthworks • Piling works • Traffic management on M9 Spur • Construction of temporary ramps to M9 Spur

Table 2.1a Long Term Monitoring Locations - January

Monitoring Location	Monitoring Period	Main Construction Activities
93/95 King Edwards Way (CNV02)	February 2012	<ul style="list-style-type: none"> • Site clearance • Tree harvesting • Piling works
15-17 Buie Rigg (CNV07)	February 2012	<ul style="list-style-type: none"> • Site clearance • Tree harvesting • Traffic management on M9 Spur • Temporary sheet piling at Newmains Bridge
8 Kirklands Park Grove (CNV16)	February 2012	<ul style="list-style-type: none"> • Earthworks • Piling works • Traffic management on M9 Spur • Temporary sheet piling at Newmains Bridge

Table 2.1b Long Term Monitoring Locations – February

Monitoring Location	Monitoring Period	Main Construction Activities
93/95 King Edwards Way (CNV02)	March 2012	<ul style="list-style-type: none"> • Installation of Niddry Burn culvert • Excavation of attenuation pond
15-17 Buie Rigg (CNV07)	March 2012	<ul style="list-style-type: none"> • Traffic management on M9 Spur • M9J1a eastbound diverge earthworks • Piling at M9 bridge
8 Kirklands Park Grove (CNV16)	March 2012	<ul style="list-style-type: none"> • Traffic management on M9 Spur • Removal of wingwalls on Newmains Bridge • Erection of Gantries 13,14,15,16 • Construction of service areas to Gantries • Earthworks widening at M9 Spur

Table 2.1c Long Term Monitoring Locations - March

Monitoring Location	Monitoring Period	Main Construction Activities
93/95 King Edwards Way (CNV02)	April 2012	<ul style="list-style-type: none"> • Earthworks at M9 • Installation of Drainage at Almond River
15-17 Buie Rigg (CNV07)	April 2012	<ul style="list-style-type: none"> • Earthworks to rear of Kirkliston Leisure Centre and Kirklands Park Grove • Eastbound diverge ramp • Piling Works to G5, G10 • Demolition of Newmains Bridge Wingwall
8 Kirklands Park Grove (CNV16)	April 2012	<ul style="list-style-type: none"> • Earthworks to rear of Kirkliston Leisure Centre and Kirklands Park Grove • Earthworks adjacent to Gateside • Eastbound diverge ramp • Communications and ITS works along M9 Spur • Installation of V-drains and embankment construction M9 Spur

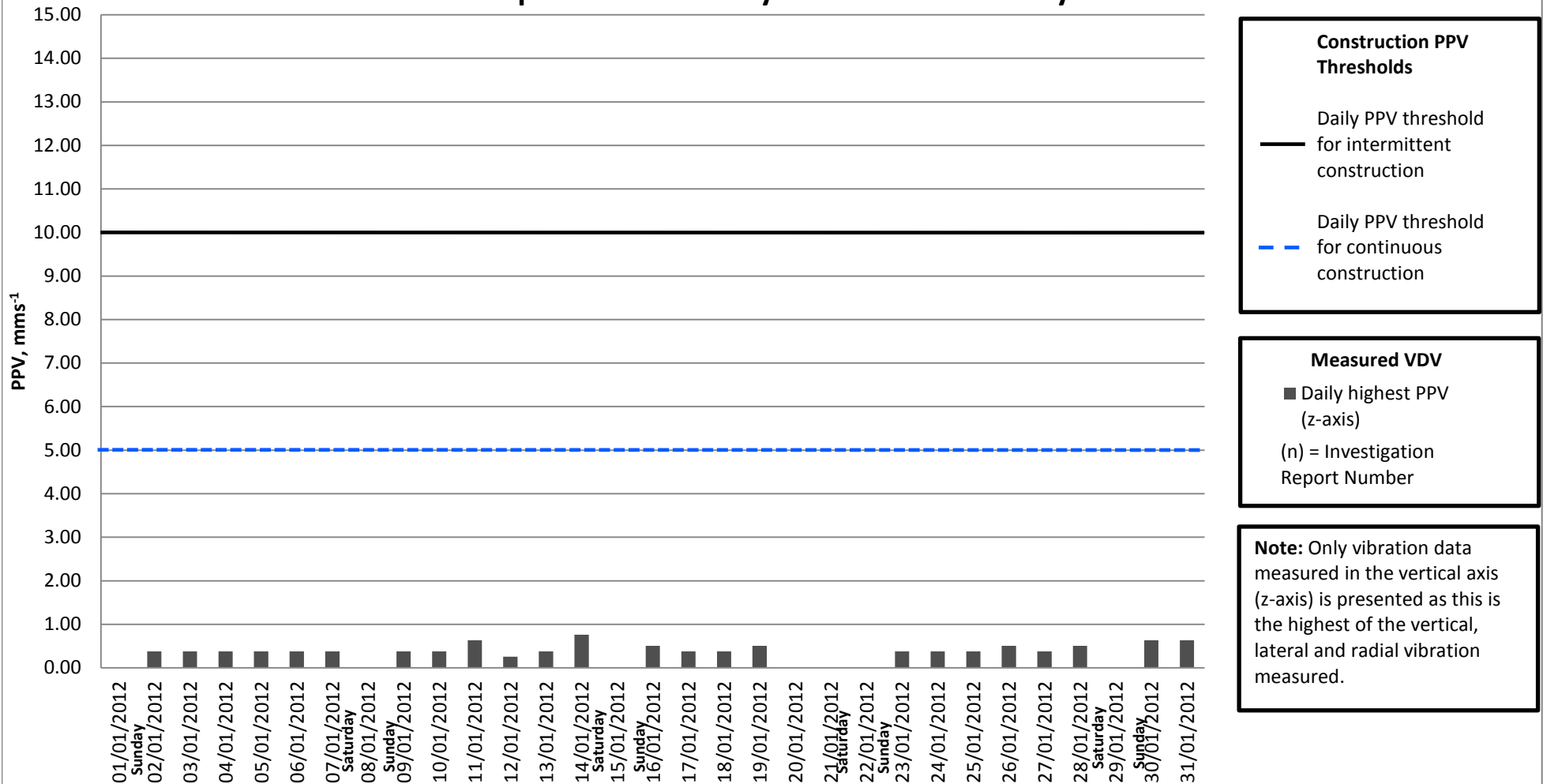
Table 2.1d Long Term Monitoring Locations - April

NOISE MONITORING RESULTS

- 2.2 The results of the M9 J1a Contract construction vibration monitoring are provided in chart format in Appendix A of this report.
- 2.3 The charts show the Vibration Dose Values (VDV) and Peak Particle Velocities (PPV) recorded at receptors. VDV levels are recorded in order to monitor the potential for disturbance to the occupants of buildings (as discussed in BS 6472) and PPV values are recorded in order to monitor the potential for damage to buildings (as discussed in BS 7385).
- 2.4 The charts indicate that no exceedances of the vibration thresholds occurred during the period and that all construction activities were carried out in accordance with the vibration thresholds set out in the project Code of Construction Practice.

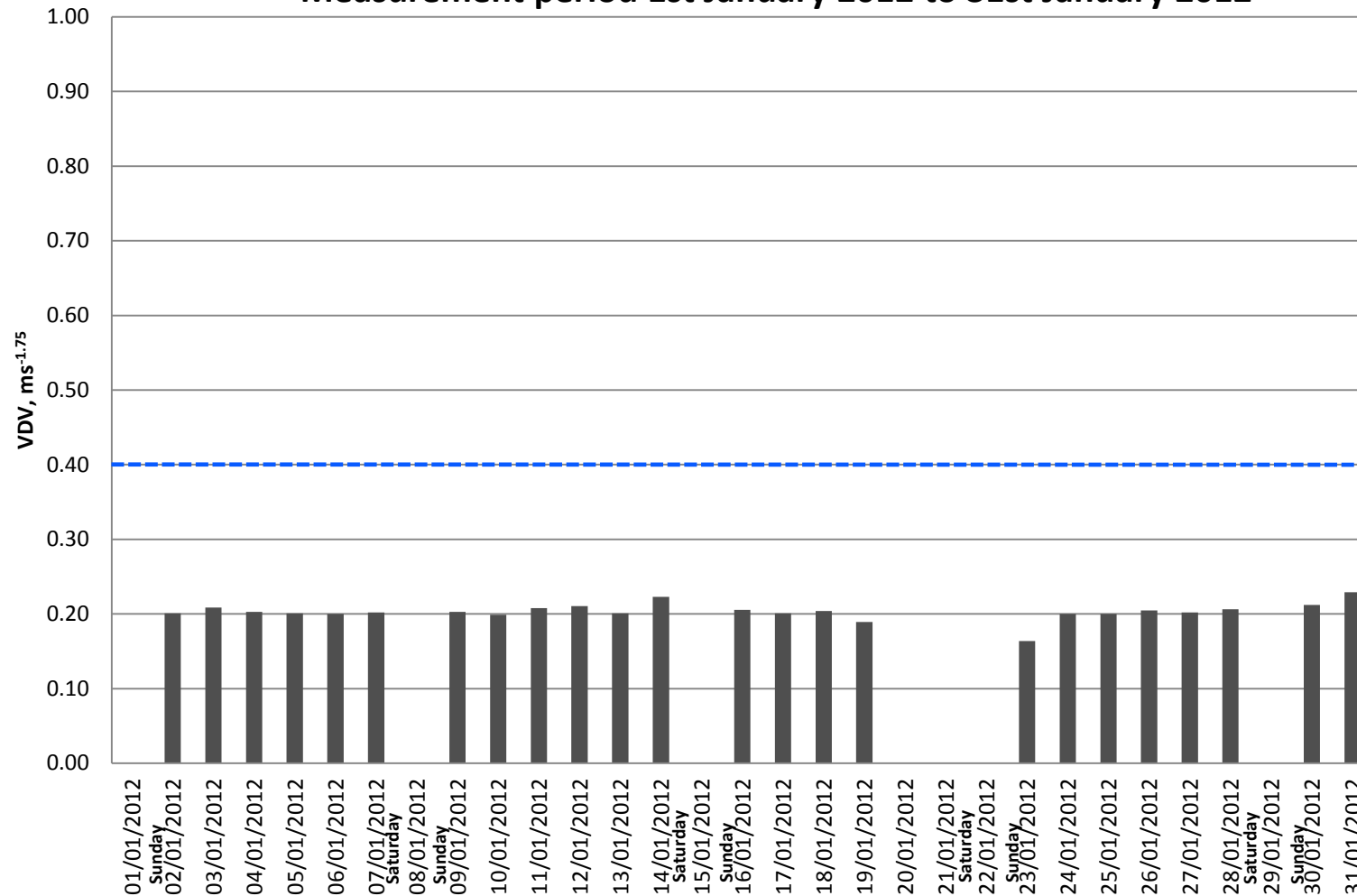
**APPENDIX A - M9 J1A CONTRACT CONSTRUCTION VIBRATION
CHARTS**

Measured highest daily Peak Particle Velocity (PPV), 93/95 King Edwards Way (CNV02) Measurement period 1st January 2012 to 31st January 2012



Sunday data have not been included as no construction works have been conducted during these hours.

**Measured daytime (07:00-23:00) Vibration Dose Values (VDV),
93/95 King Edwards Way (CNV02)
Measurement period 1st January 2012 to 31st January 2012**



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

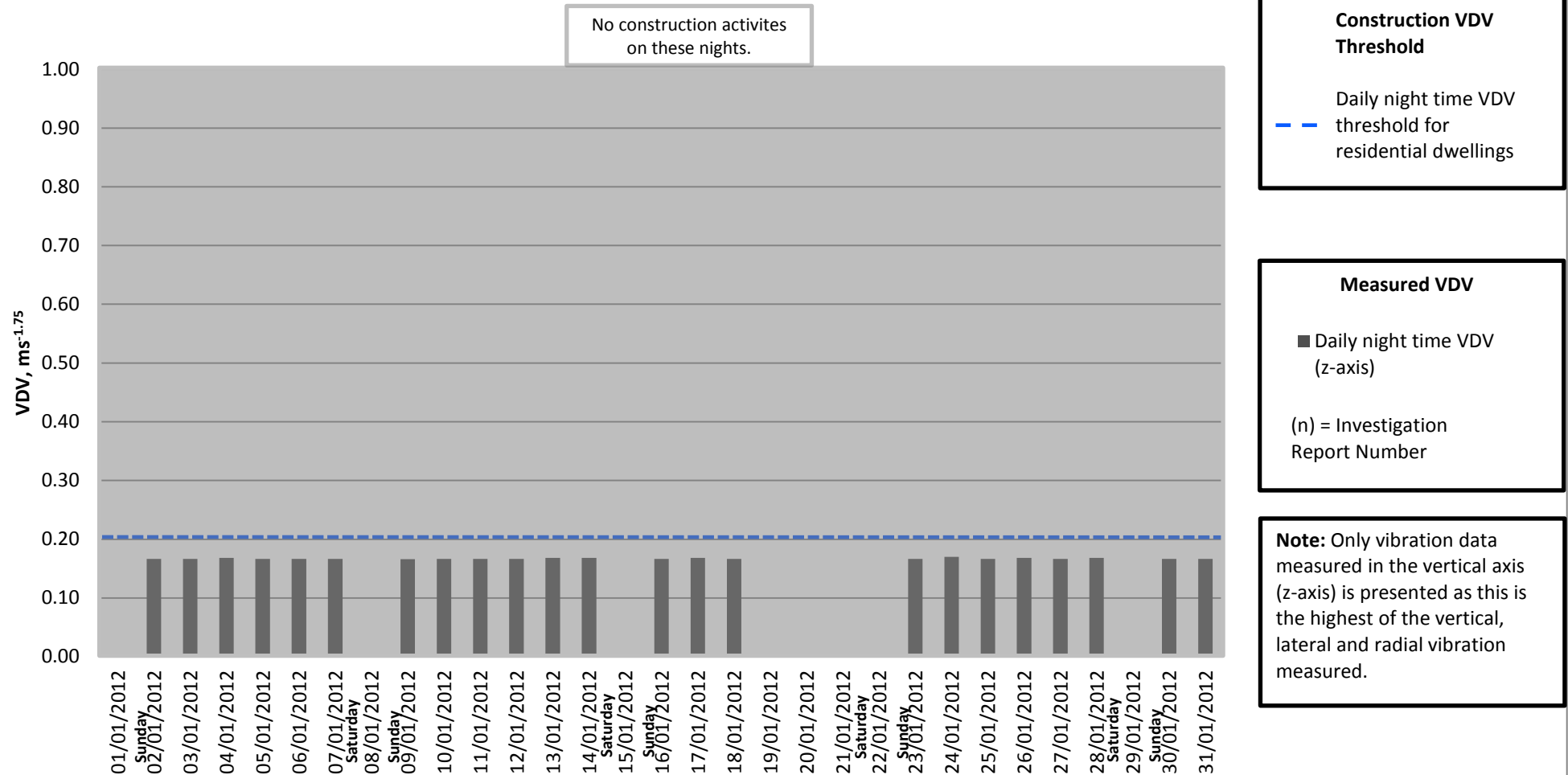
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Sunday data have not been included as no construction works have been conducted during these hours. VDV threshold for Education establishments, offices and similar is 0.40ms^{-1.75} and Commercial is 0.80ms^{-1.75}. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed.

Measured night time (23:00-07:00) Vibration Dose Values (VDV), 93/95 King Edwards Way (CNV02) Measurement period 1st January 2012 to 31st January 2012



Construction VDV Threshold

— Daily night time VDV threshold for residential dwellings

Measured VDV

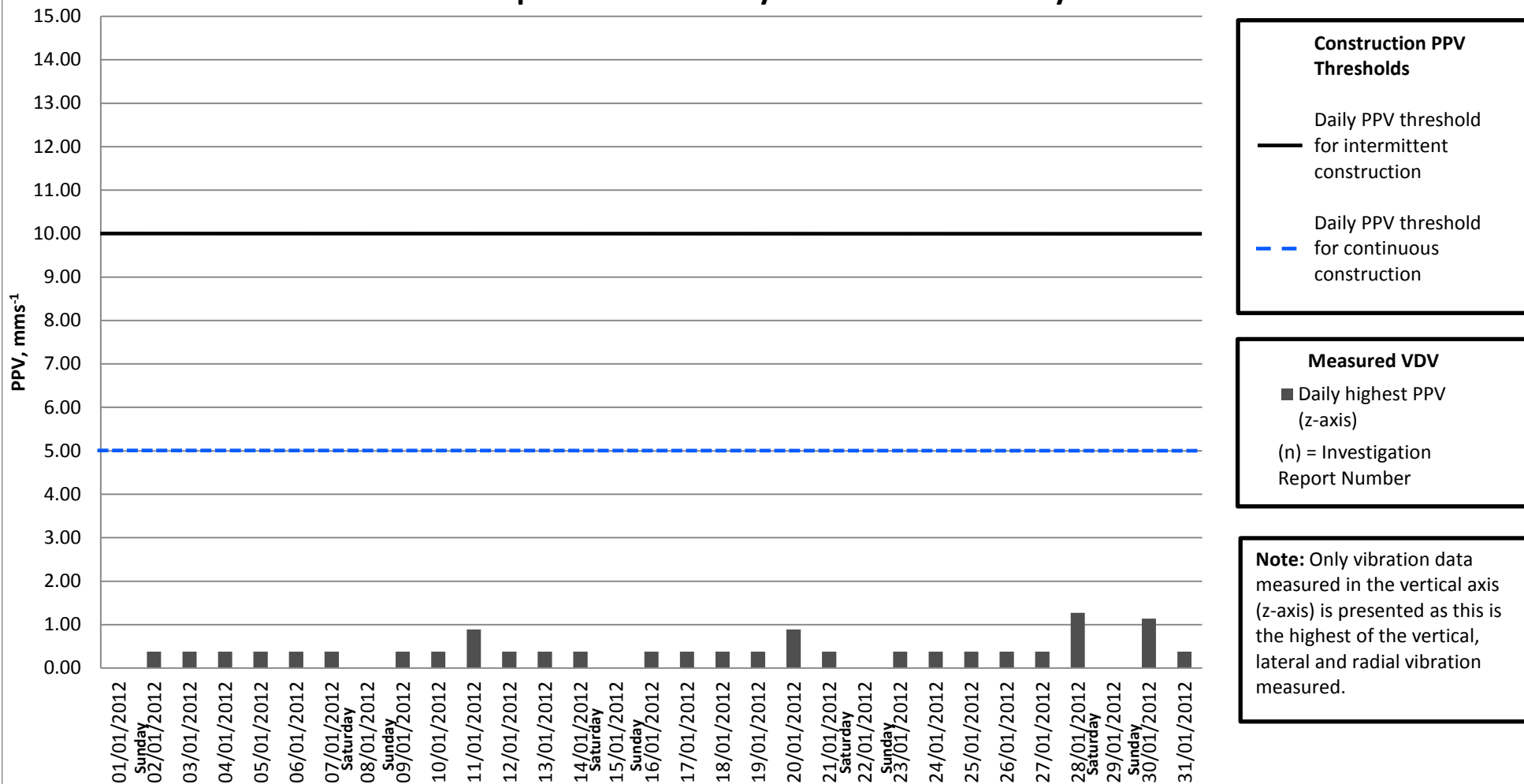
■ Daily night time VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

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Measured highest daily Peak Particle Velocity (PPV), 15-17 Buie Rigg (CNV07) Measurement period 1st January 2012 to 31st January 2012



Construction PPV Thresholds

- Daily PPV threshold for intermittent construction (solid black line)
- Daily PPV threshold for continuous construction (dashed blue line)

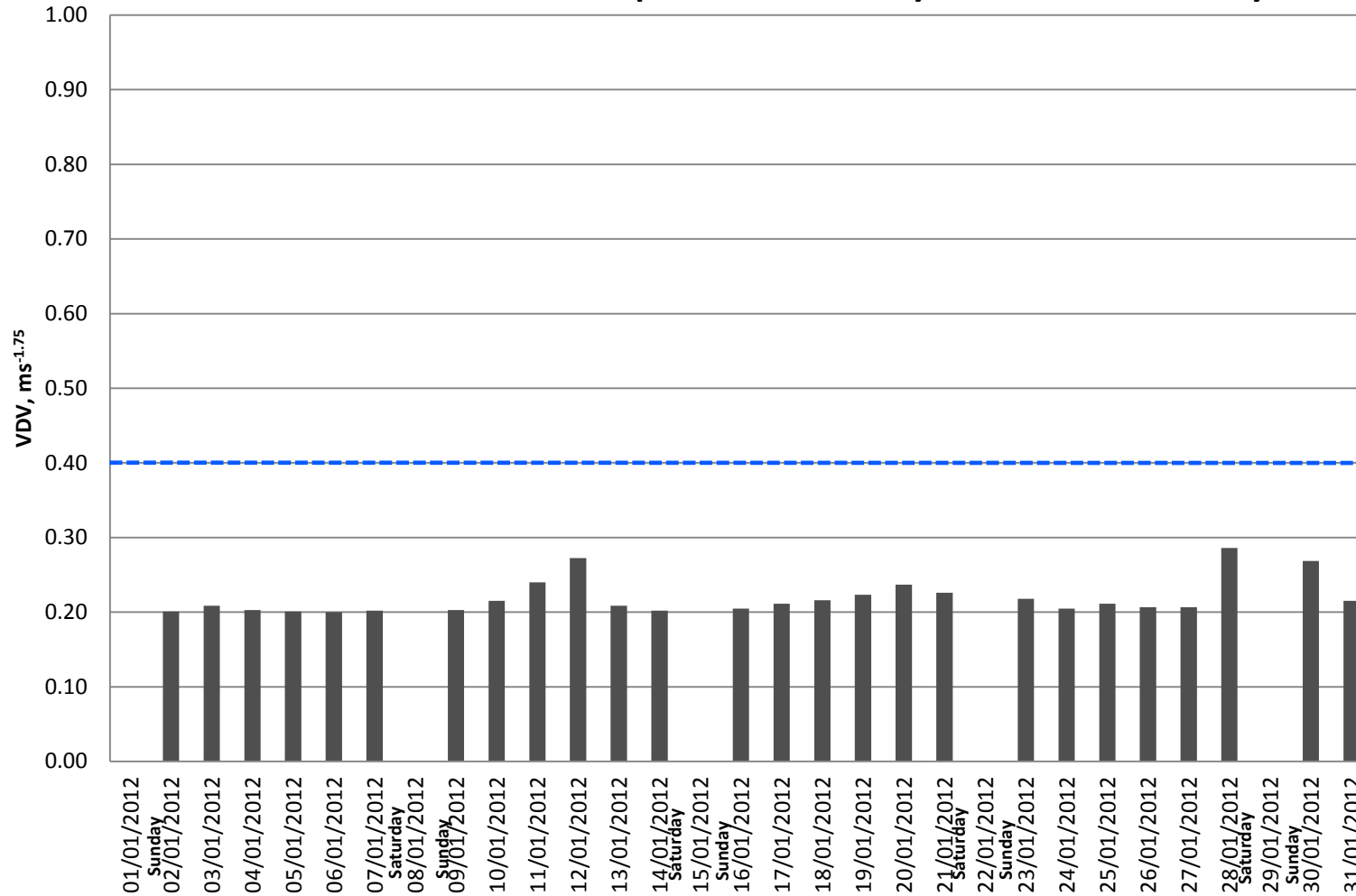
Measured VDV

- Daily highest PPV (z-axis) (grey bars)
- (n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Sunday data have not been included as no construction works have been conducted during these hours.

**Measured daytime (07:00-23:00) Vibration Dose Values (VDV),
15-17 Buie Rigg (CNV07)
Measurement period 1st January 2012 to 31st January 2012**



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

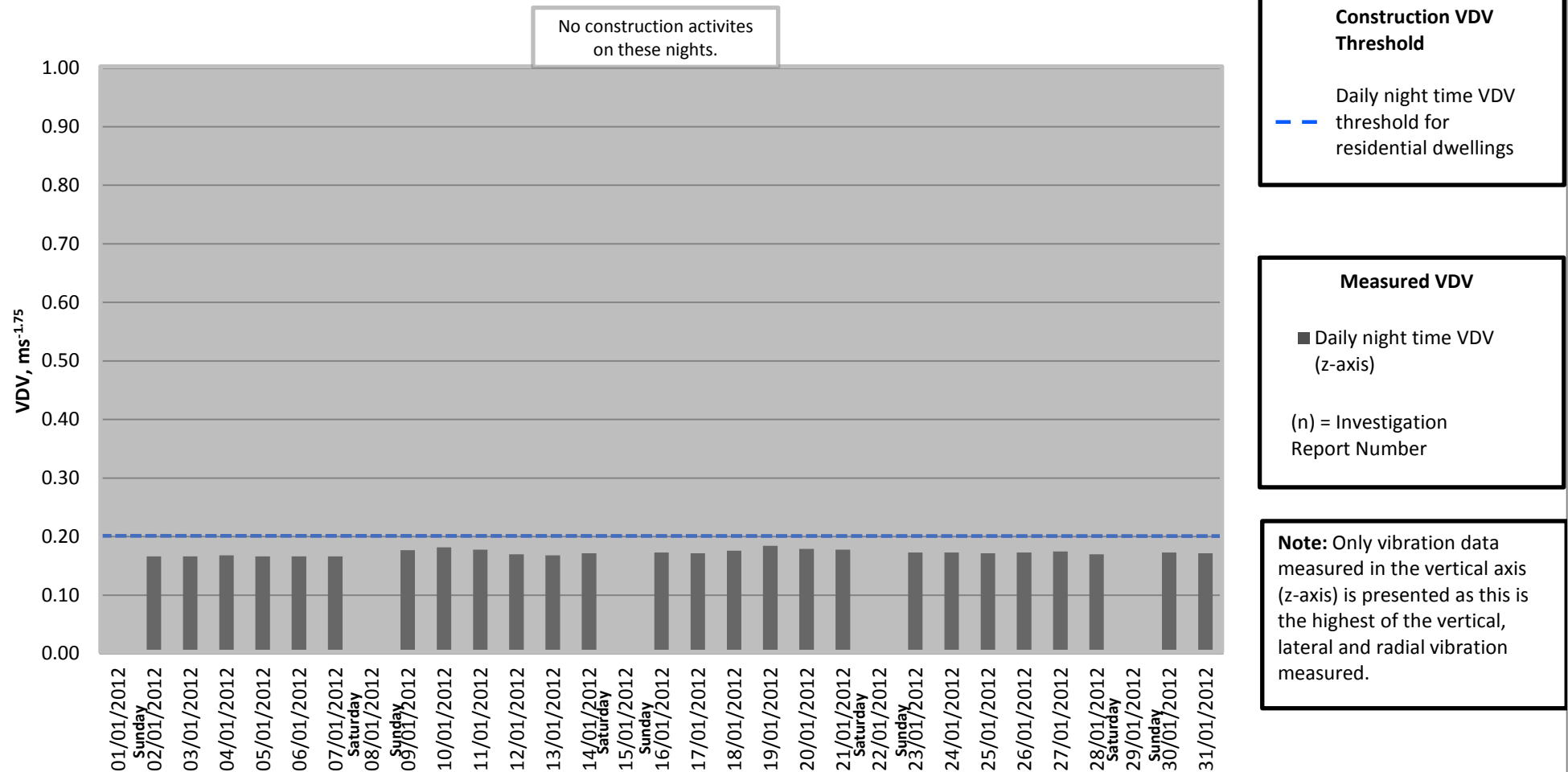
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

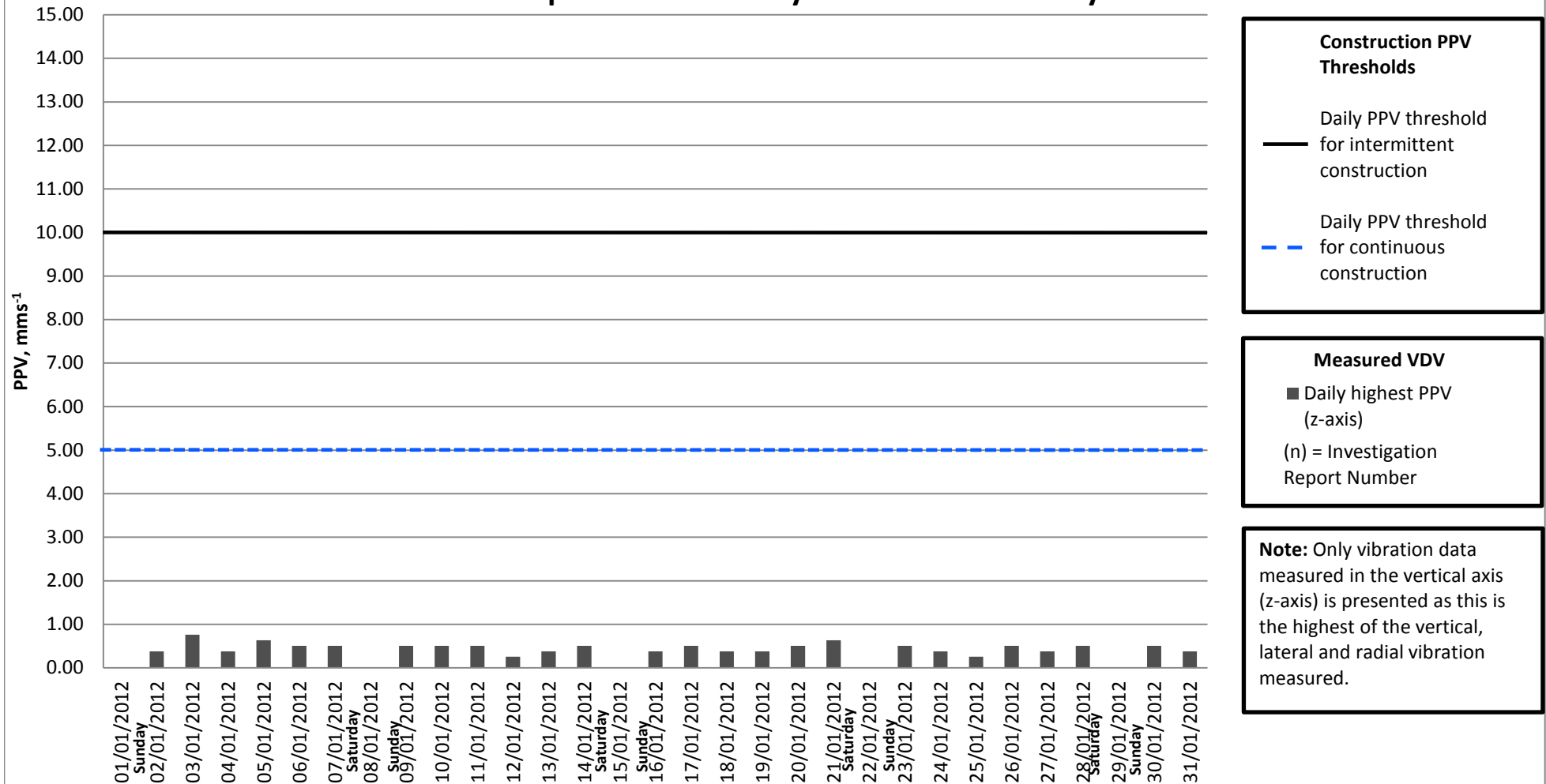
Sunday data have not been included as no construction works have been conducted during these hours. VDV threshold for Education establishments, offices and similar is 0.40ms^{-1.75} and Commercial is 0.80ms^{-1.75}. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed.

Measured night time (23:00-07:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07) Measurement period 1st January 2012 to 31st January 2012



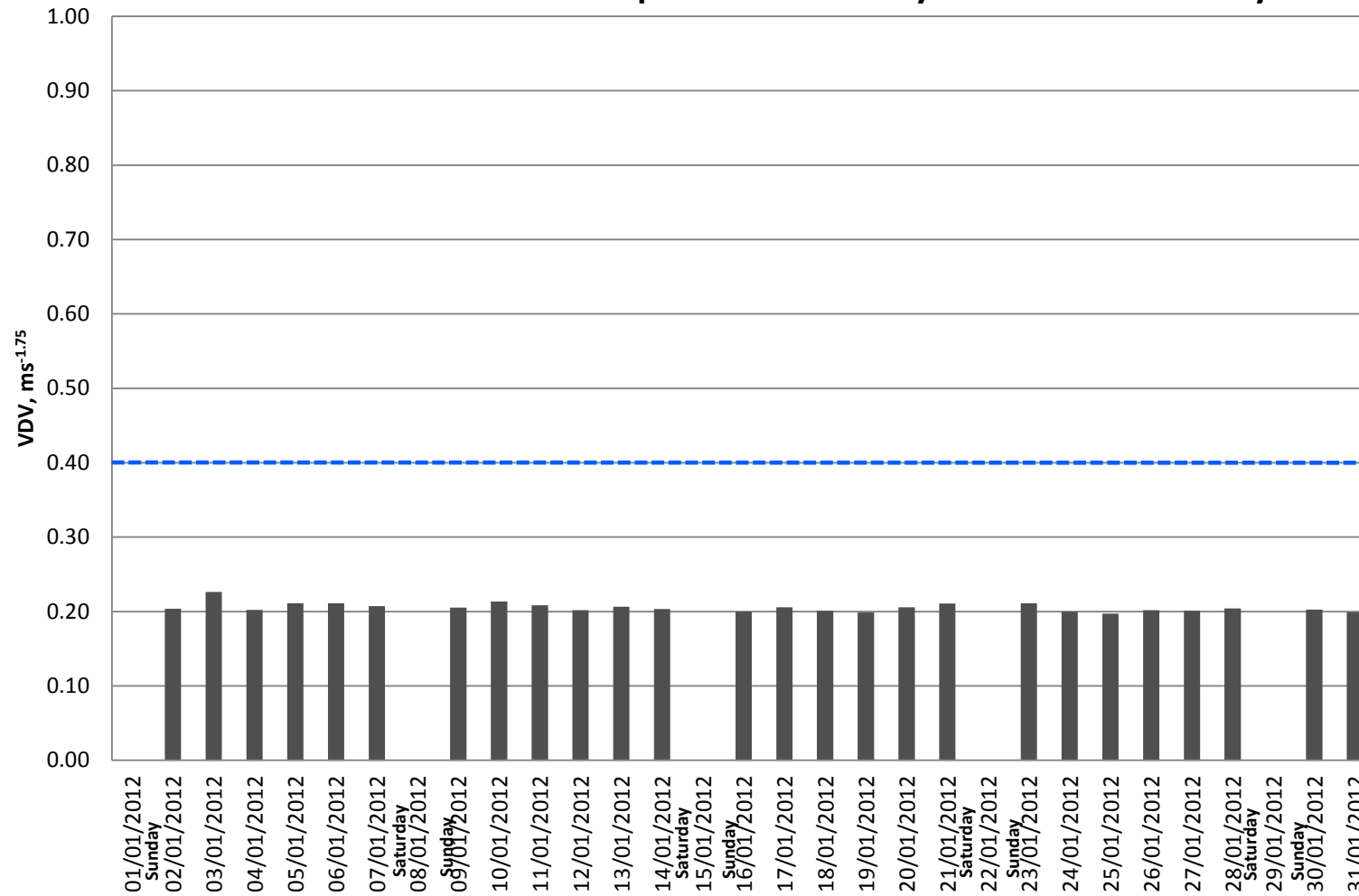
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Measured highest daily Peak Particle Velocity (PPV), 8 Kirklands Park Grove (CNV16) Measurement period 1st January 2012 to 31st January 2012



Sunday data have not been included as no construction works have been conducted during these hours.

**Measured daytime (07:00-23:00) Vibration Dose Values (VDV),
8 Kirklands Park Grove (CNV16)
Measurement period 1st January 2012 to 31st January 2012**



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

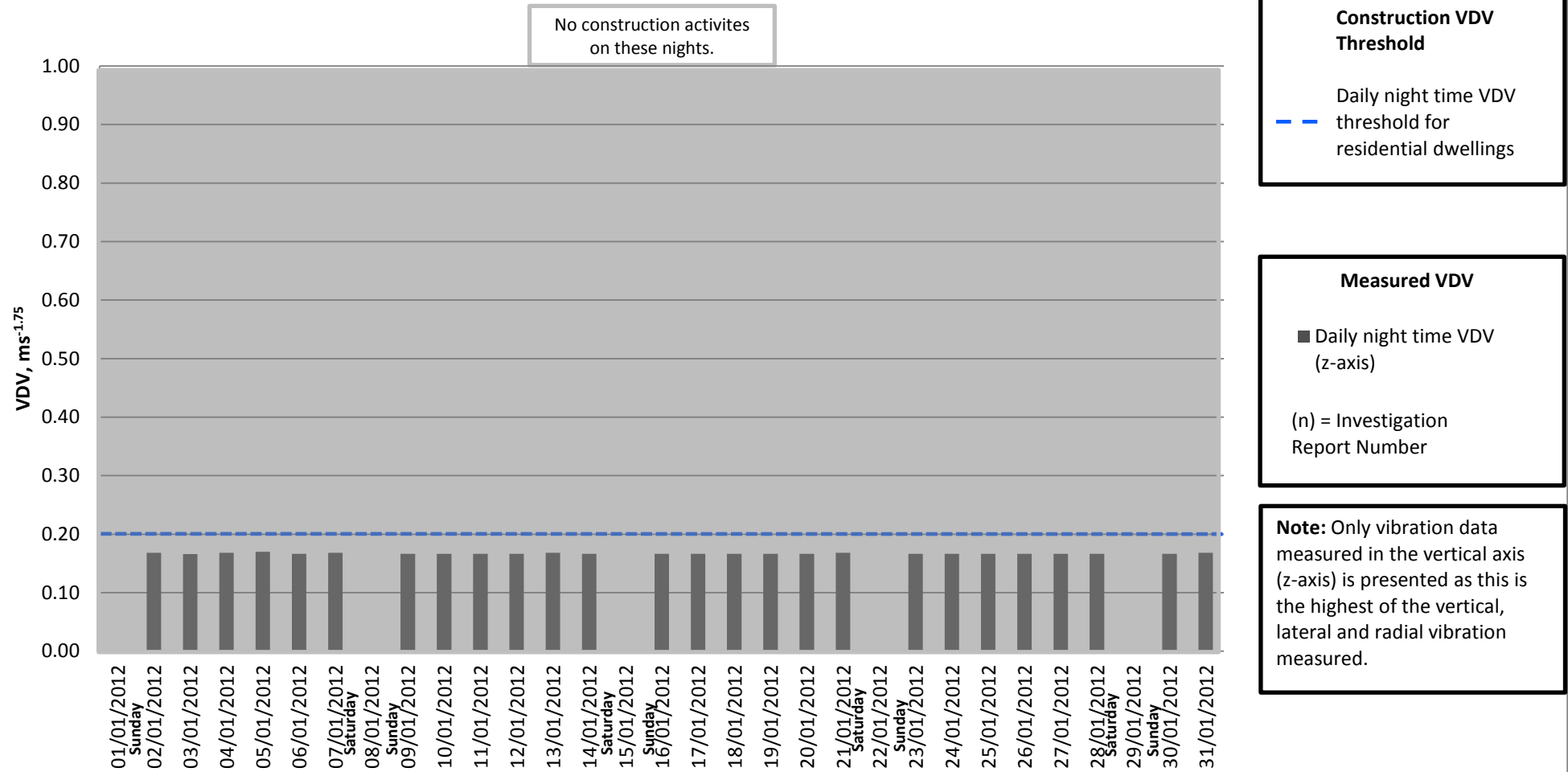
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

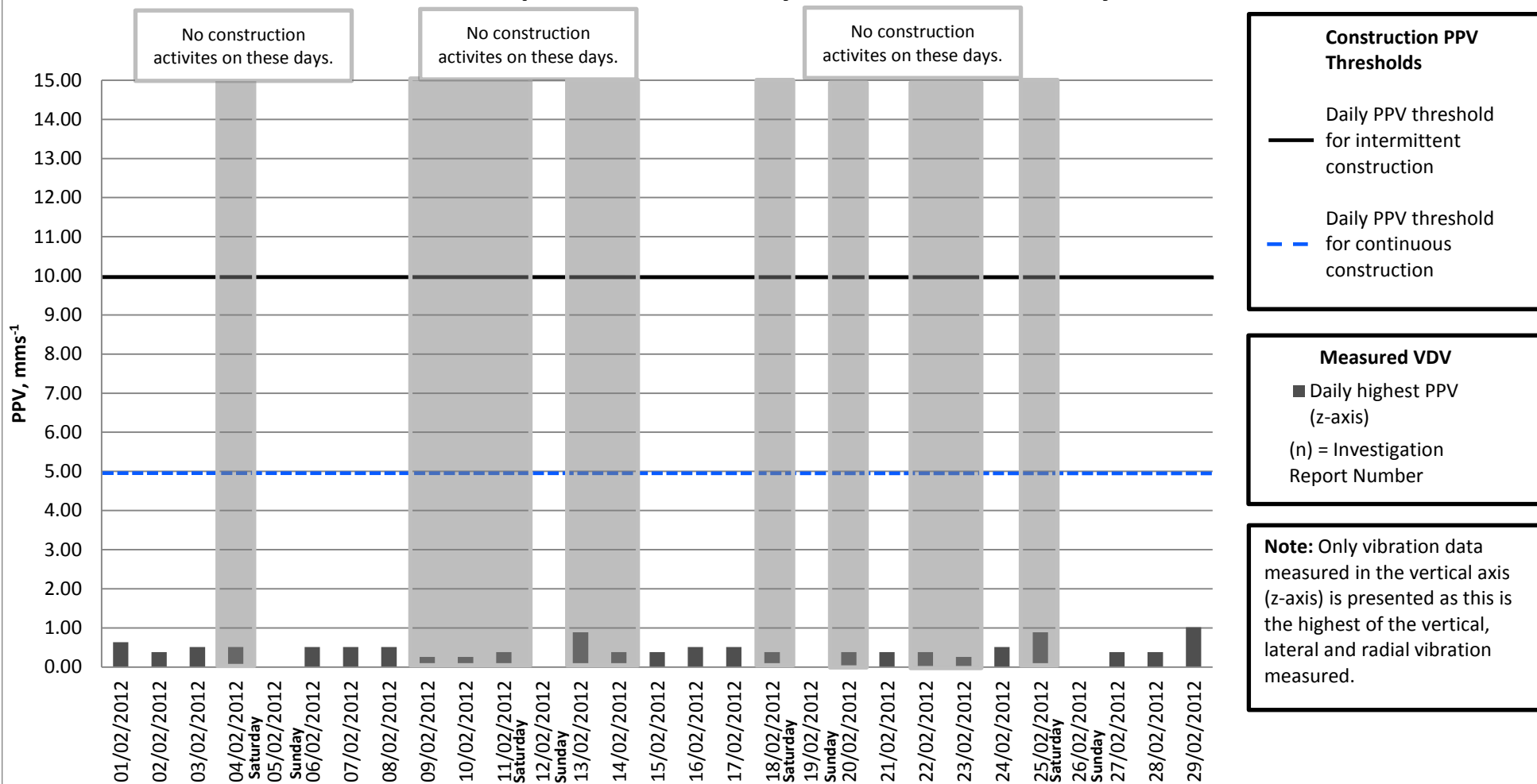
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Measured night time (23:00-07:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16) Measurement period 1st January 2012 to 31st January 2012



Sunday data have not been included as no construction works have been conducted during these hours. VDV threshold for Education establishments, offices and similar is $0.40\text{ms}^{-1.75}$ and Commercial is $0.80\text{ms}^{-1.75}$. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed..

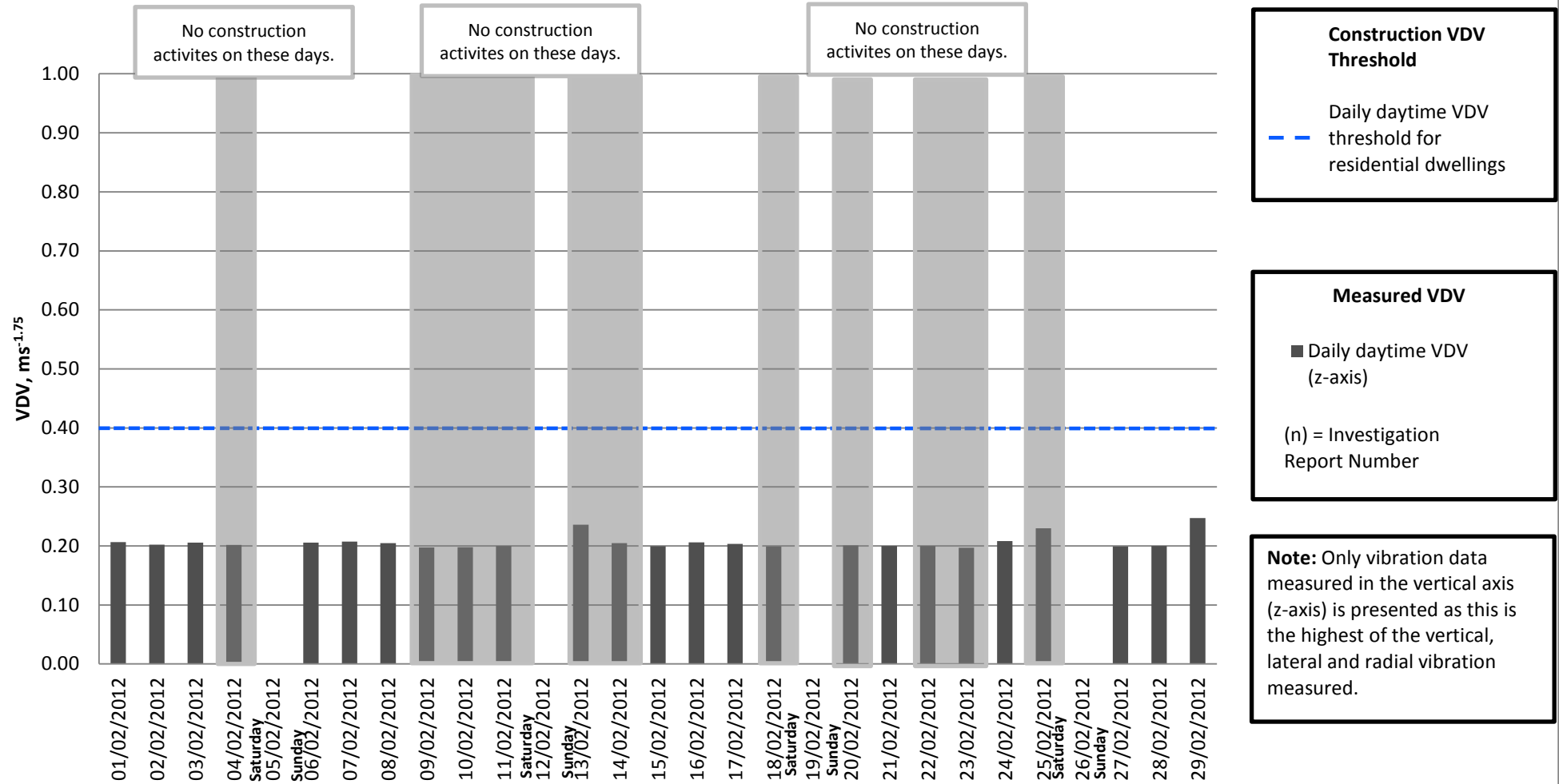
Measured highest daily Peak Particle Velocity (PPV), 93/95 King Edwards Way (CNV02) Measurement period 1st February 2012 to 29th February 2012



Sunday data have not been included as no construction works have been conducted during these hours.

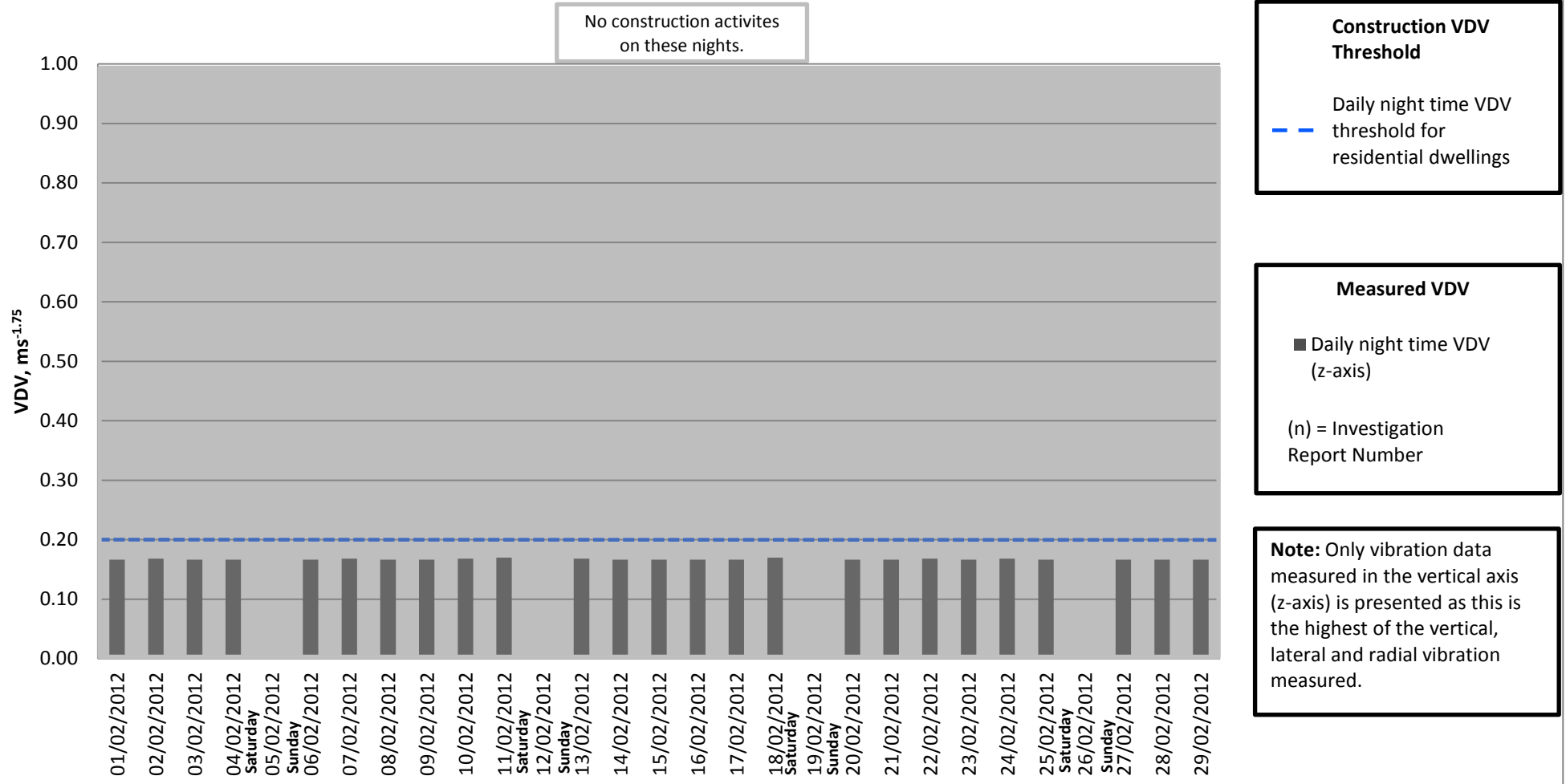
Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 93/95 King Edwards Way (CNV02)

Measurement period 1st February 2012 to 29th February 2012



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**Measured night time (23:00-07:00) Vibration Dose Values (VDV),
93/95 King Edwards Way (CNV02)
Measurement period 1st February 2012 to 29th February 2012**



Construction VDV Threshold

Daily night time VDV threshold for residential dwellings

Measured VDV

■ Daily night time VDV (z-axis)

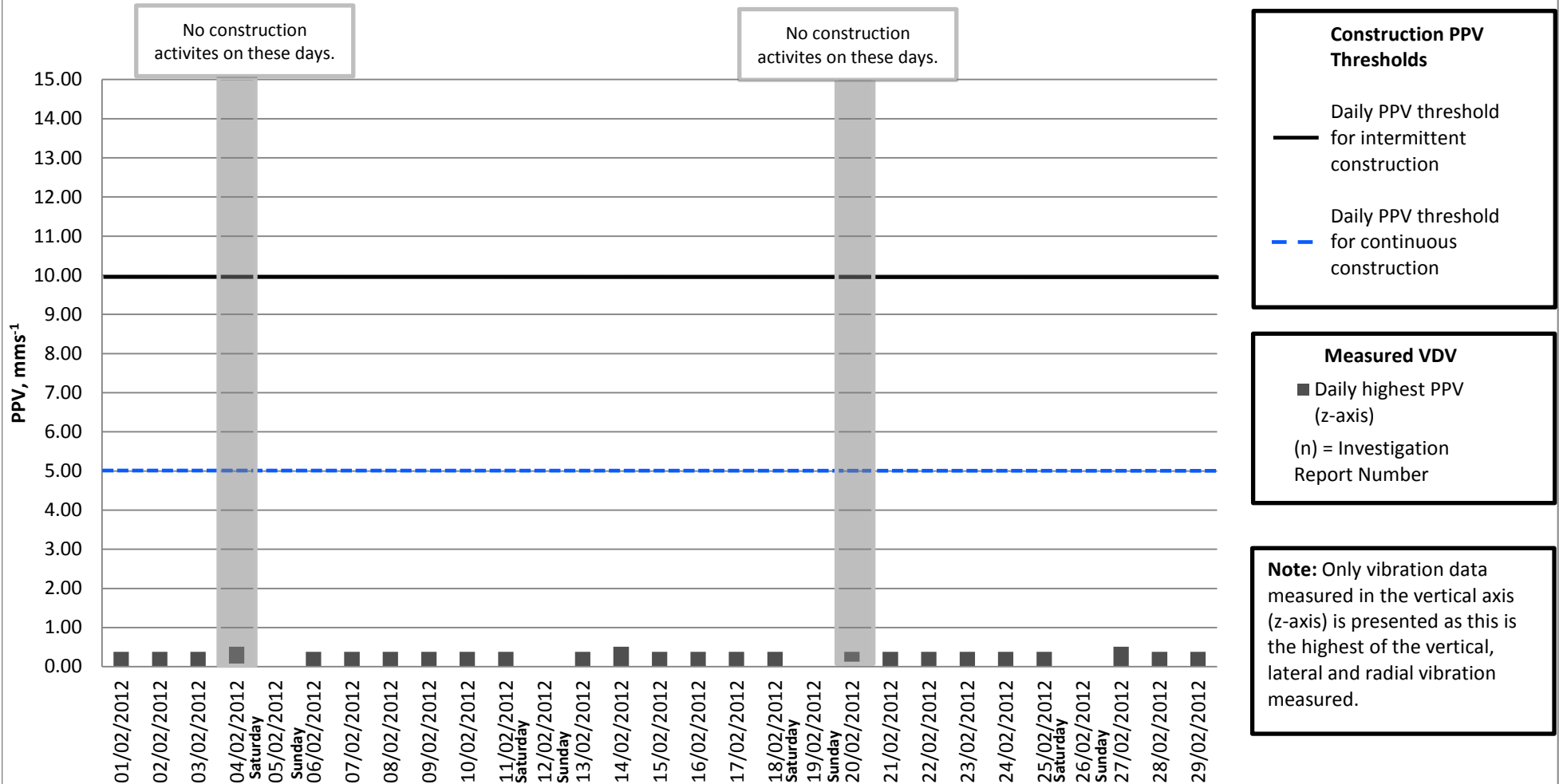
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Measured highest daily Peak Particle Velocity (PPV), 15-17 Buie Rigg (CNV07)

Measurement period 1st February 2012 to 29th February 2012



Construction PPV Thresholds

- Daily PPV threshold for intermittent construction (solid black line)
- Daily PPV threshold for continuous construction (dashed blue line)

Measured VDV

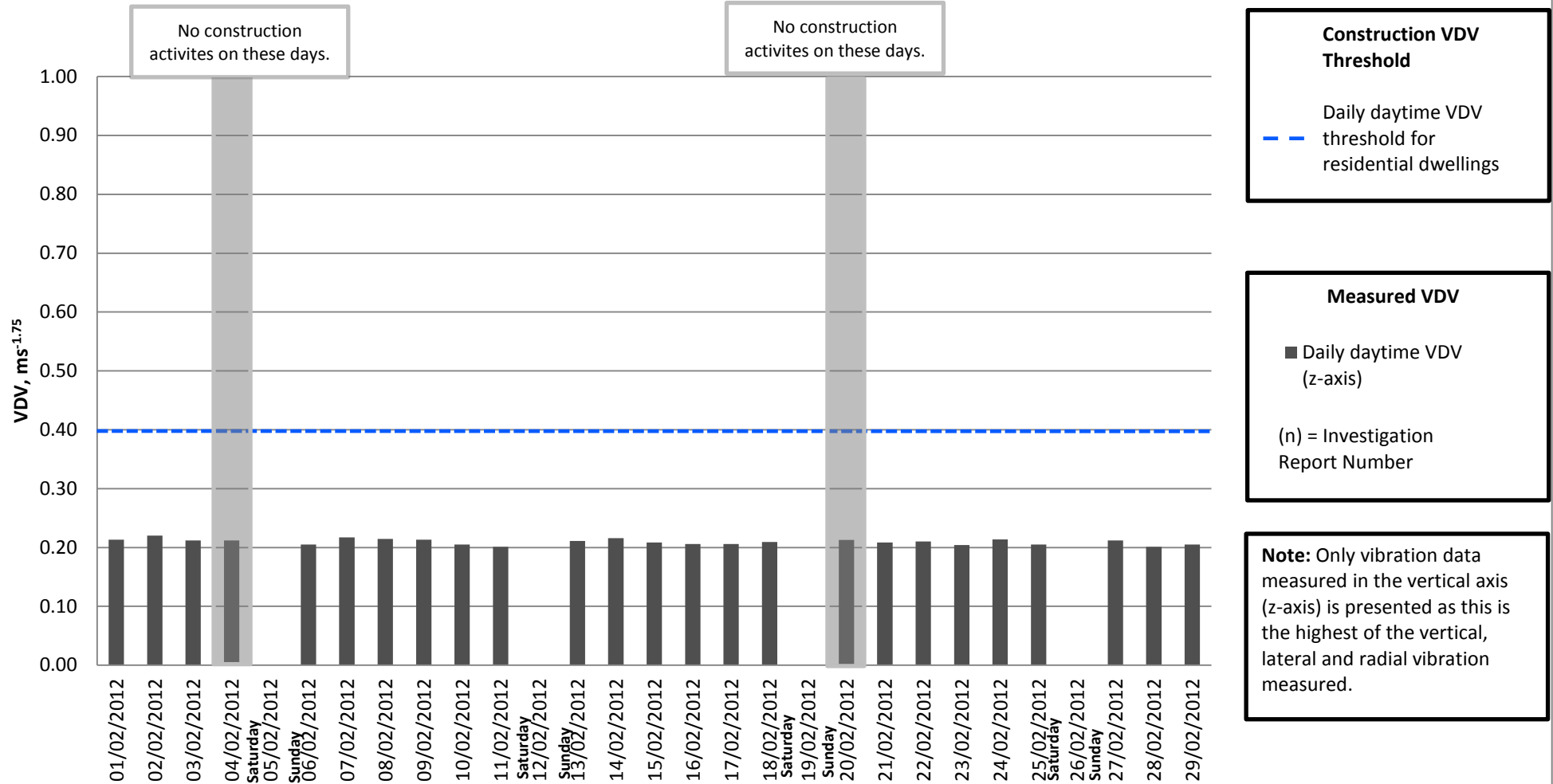
- Daily highest PPV (z-axis) (grey bar)
- (n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

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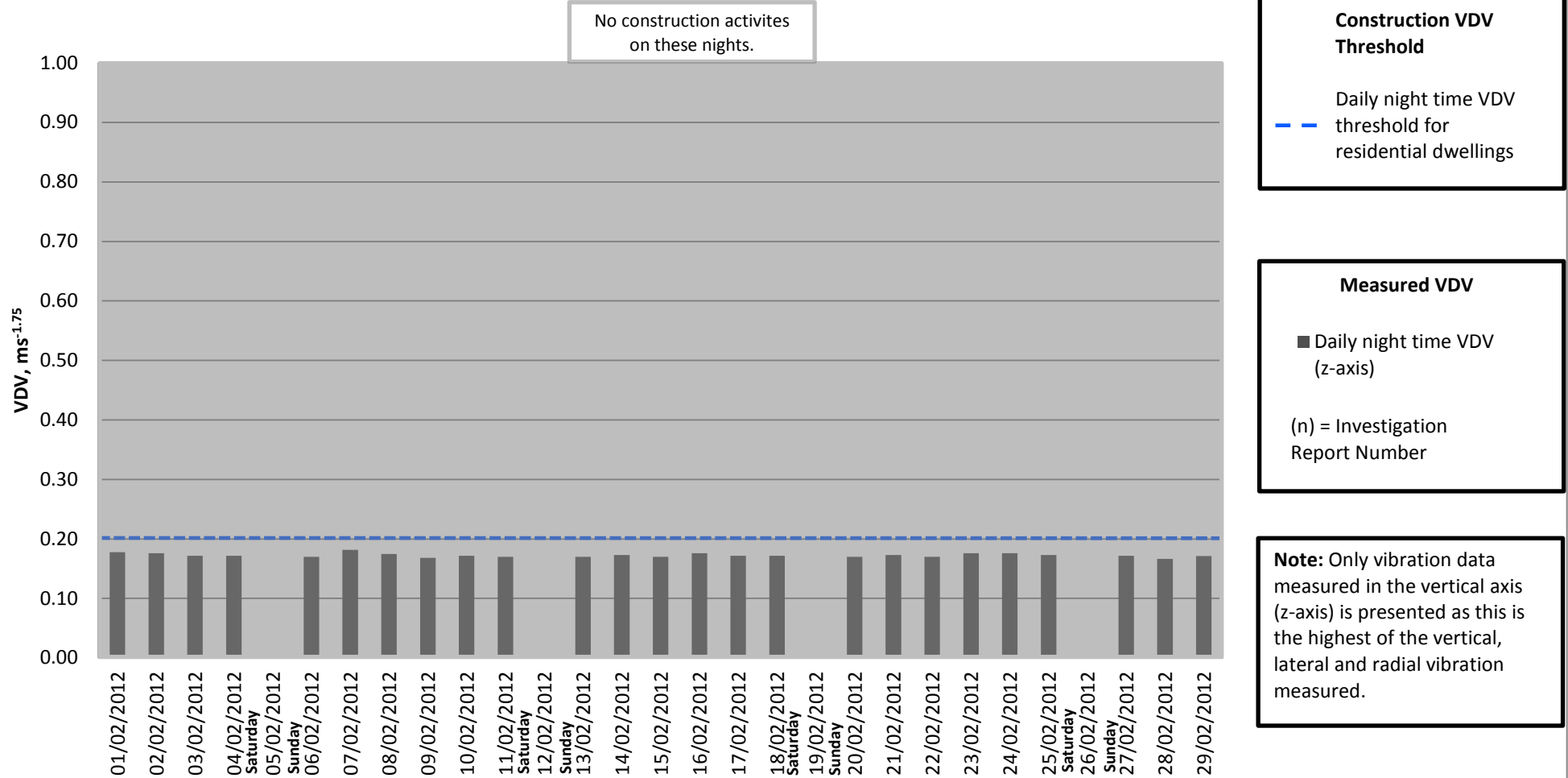
Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07)

Measurement period 1st February 2012 to 29th February 2012



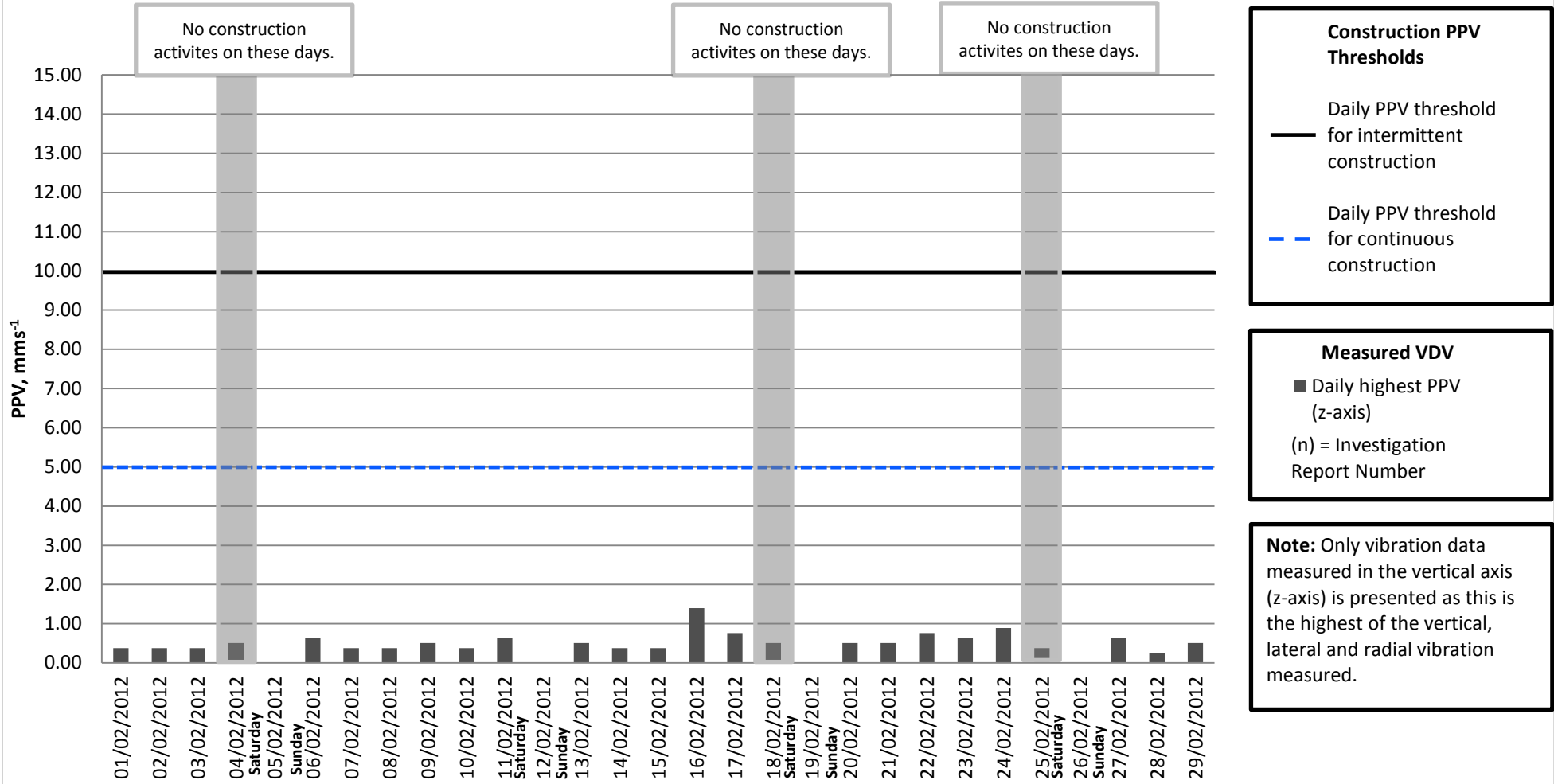
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Measured night time (23:00-07:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07) Measurement period 1st February 2012 to 29th February 2012



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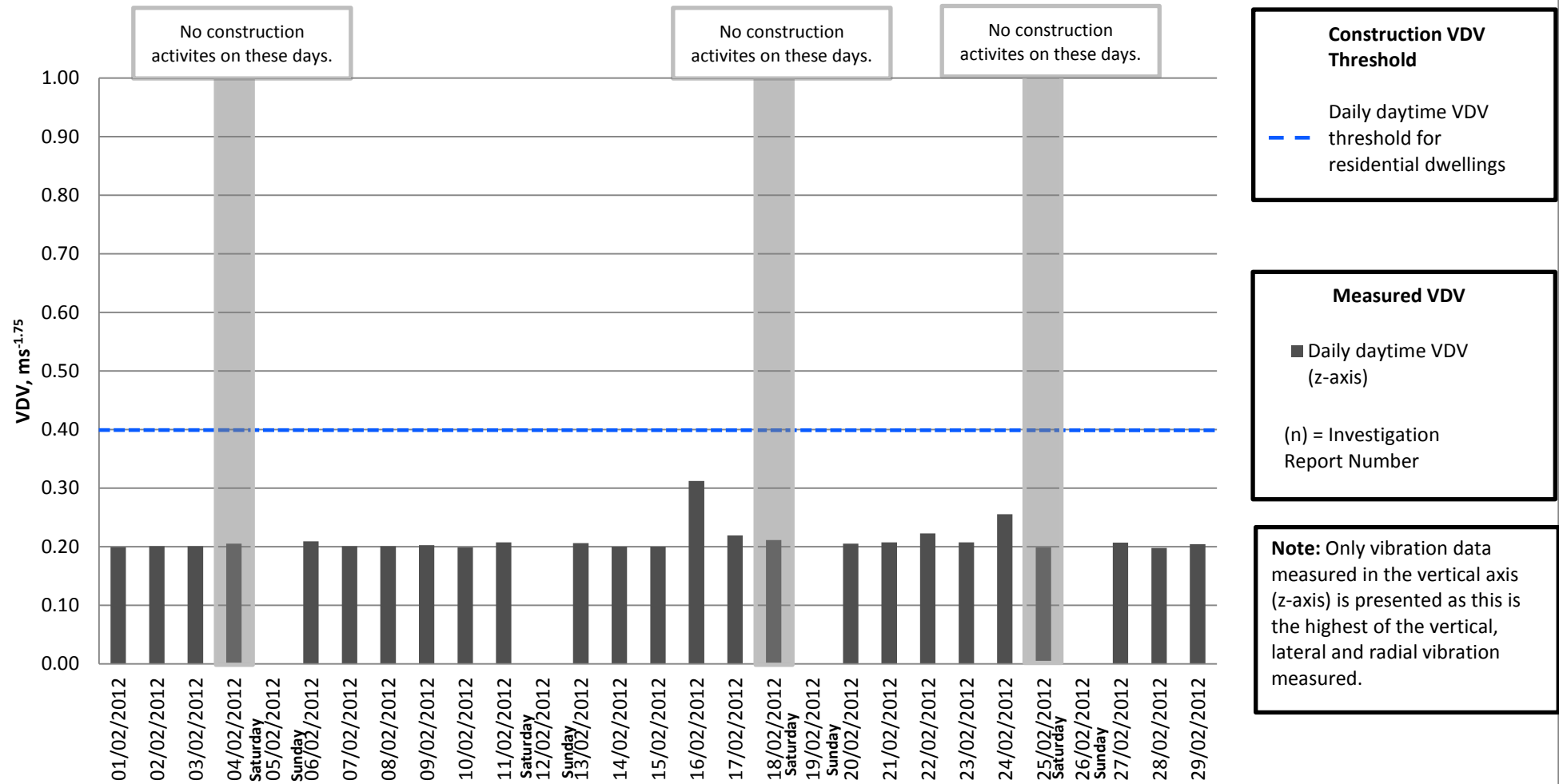
Measured highest daily Peak Particle Velocity (PPV), 8 Kirklands Park Grove (CNV16) Measurement period 1st February 2012 to 29th February 2012



Sunday data have not been included as no construction works have been conducted during these hours.

Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16)

Measurement period 1st February 2012 to 29th February 2012



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

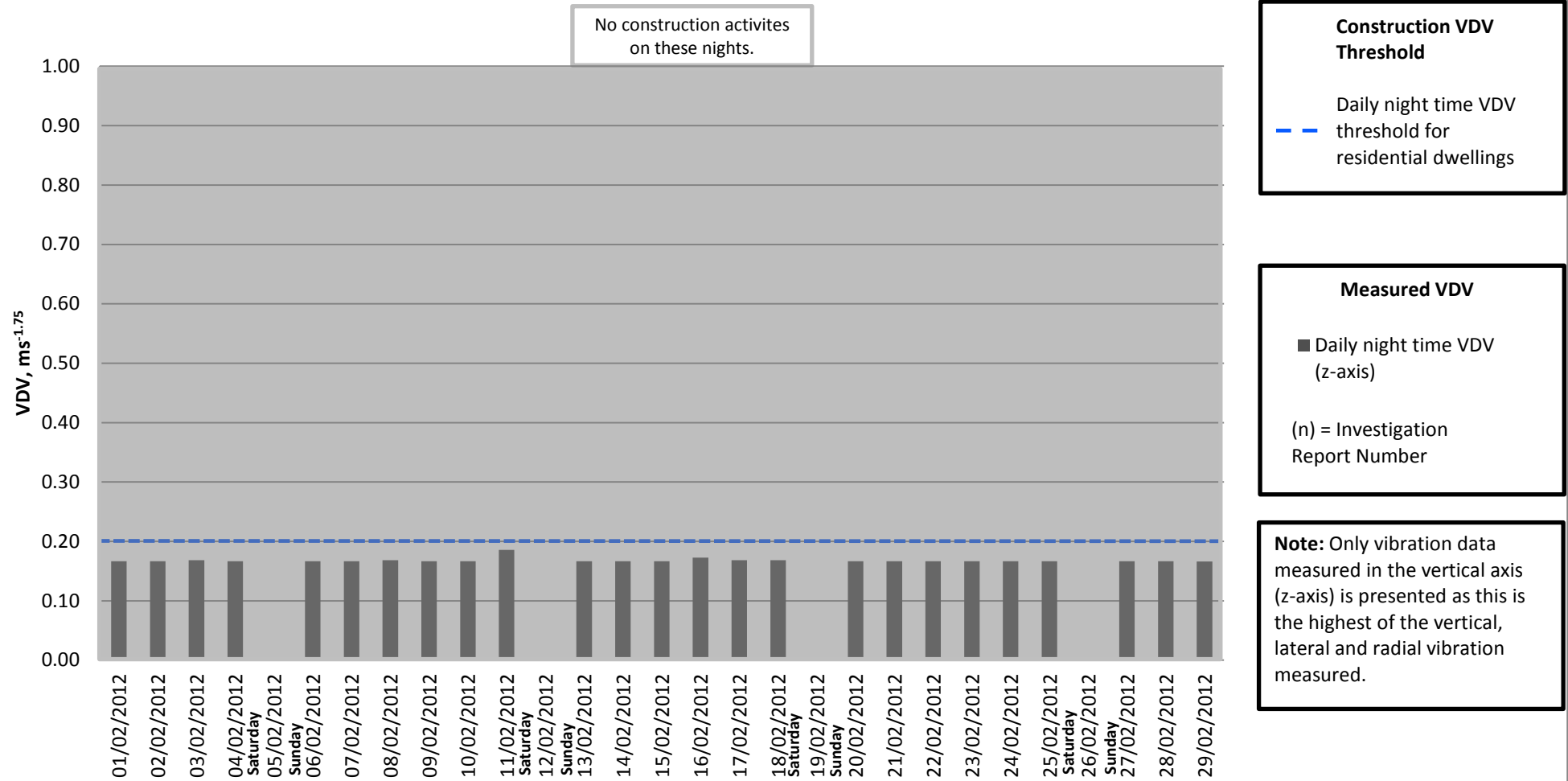
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

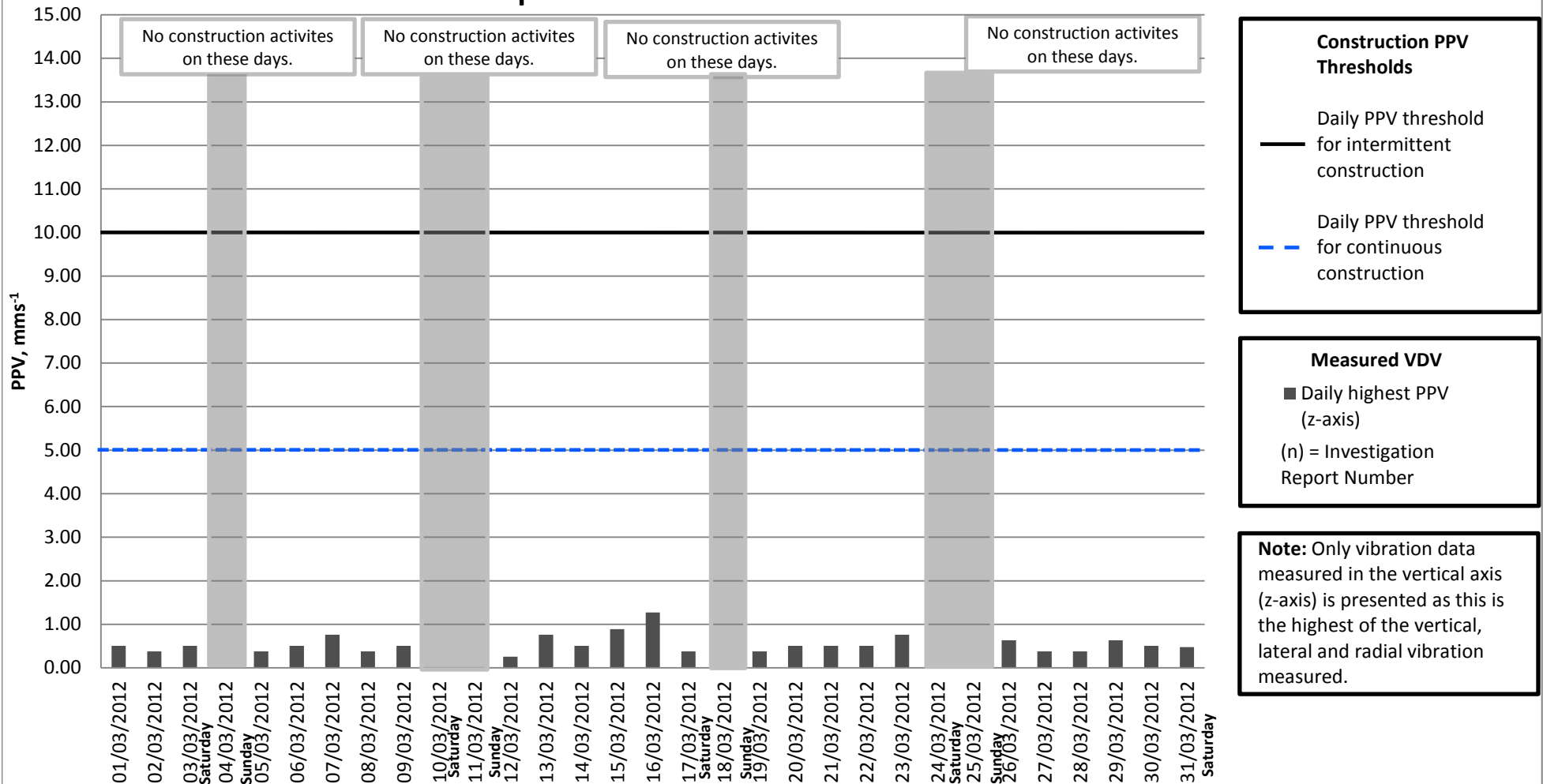
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Measured night time (23:00-07:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16) Measurement period 1st February 2012 to 29th February 2012



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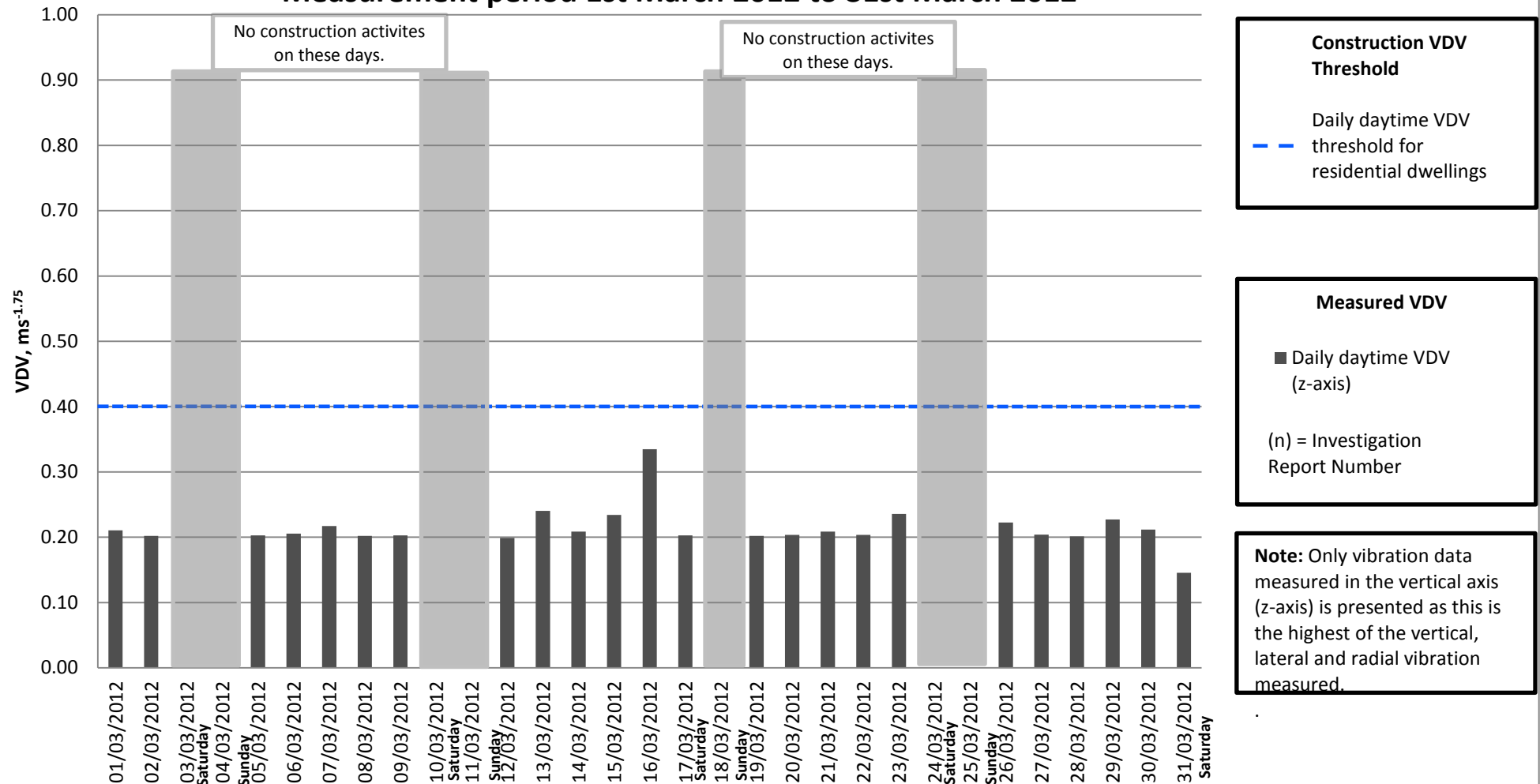
Measured highest daily Peak Particle Velocity (PPV), 93/95 King Edwards Way (CNV02) Measurement period 1st March 2012 to 31st March 2012



Sunday data have not been included as no construction works have been conducted during these hours.

Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 93/95 King Edwards Way (CNV02)

Measurement period 1st March 2012 to 31st March 2012



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

■ Daily daytime VDV (z-axis)

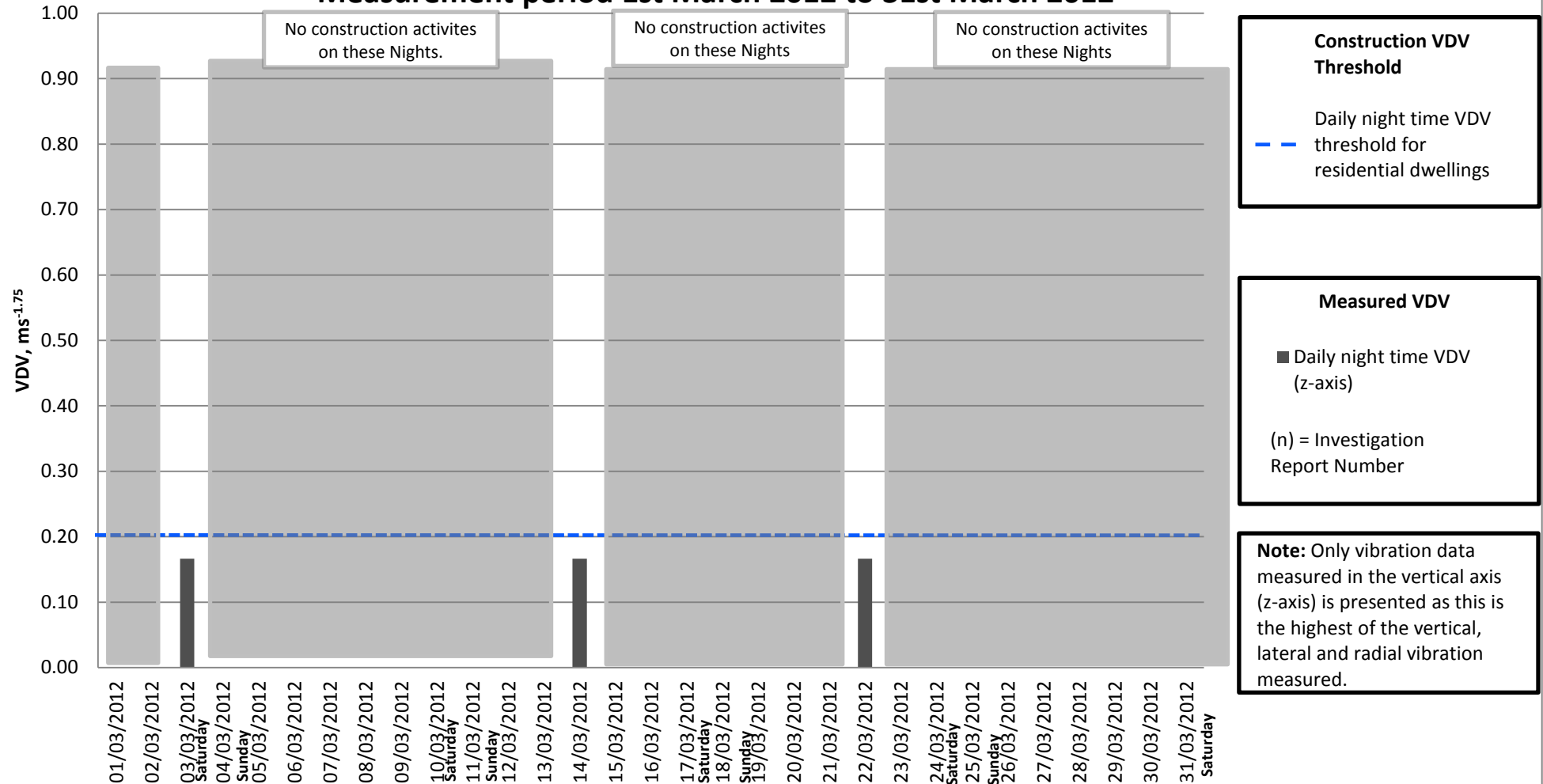
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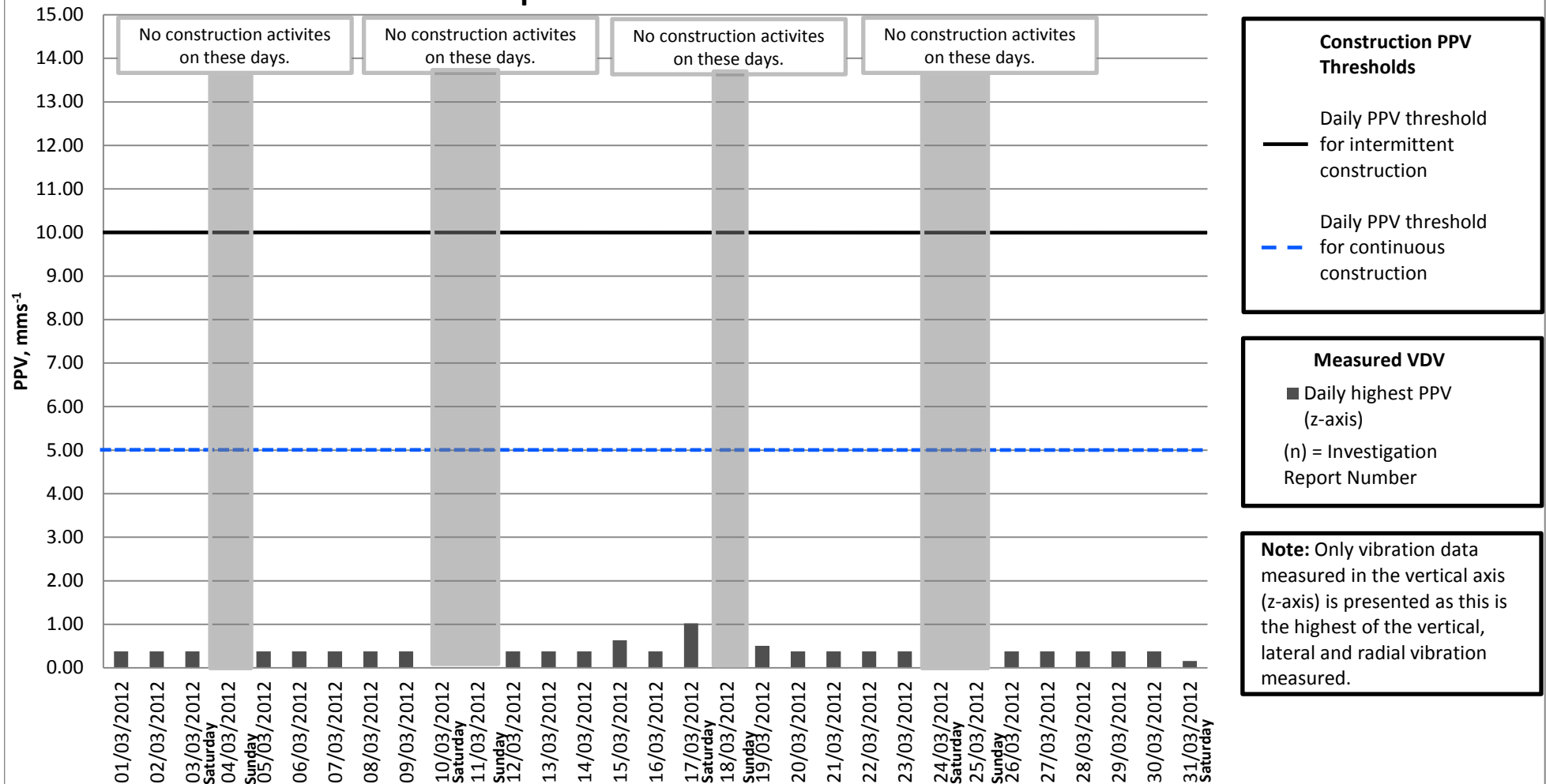
Measured night time (23:00-07:00) Vibration Dose Values (VDV), 93/95 King Edwards Way (CNV02)

Measurement period 1st March 2012 to 31st March 2012



Sunday data have not been included as no construction works have been conducted during these hours. VDV threshold for Education establishments, offices and similar is 0.40ms^{-1.75} and Commercial is 0.80ms^{-1.75}. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed..

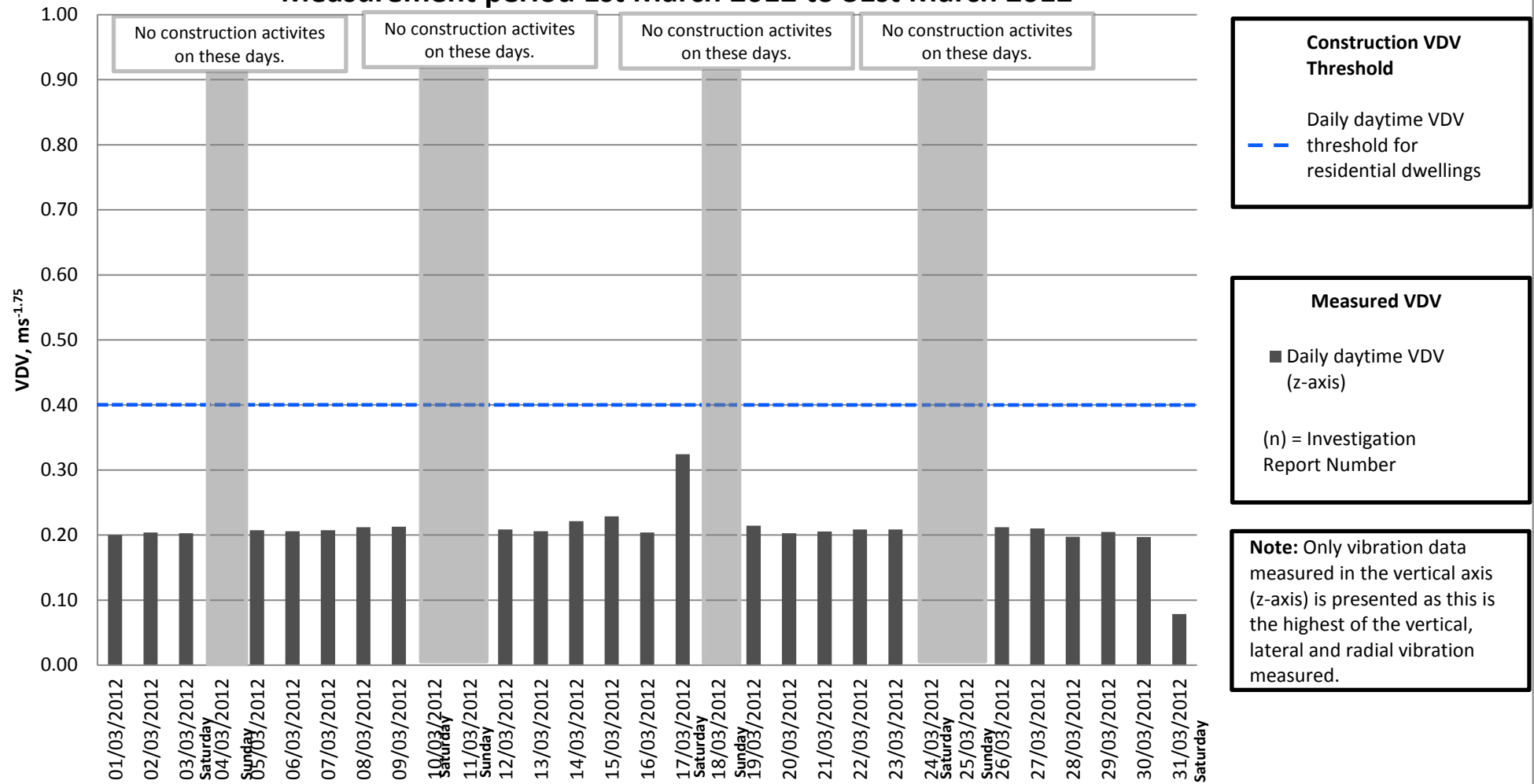
Measured highest daily Peak Particle Velocity (PPV), 15-17 Buie Rigg (CNV07) Measurement period 1st March 2012 to 31st March 2012



Sunday data have not been included as no construction works have been conducted during these hours.

Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07)

Measurement period 1st March 2012 to 31st March 2012



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

■ Daily daytime VDV (z-axis)

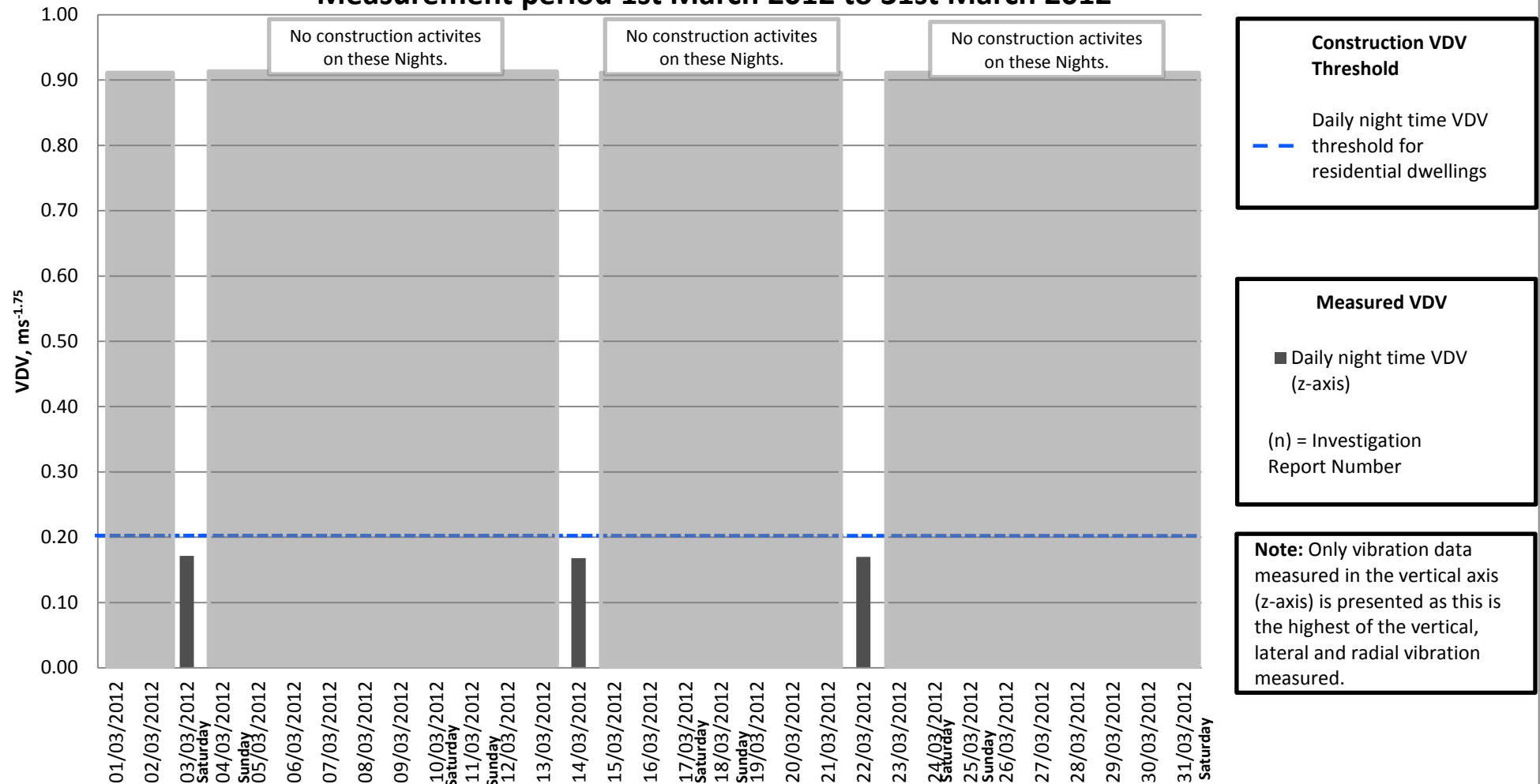
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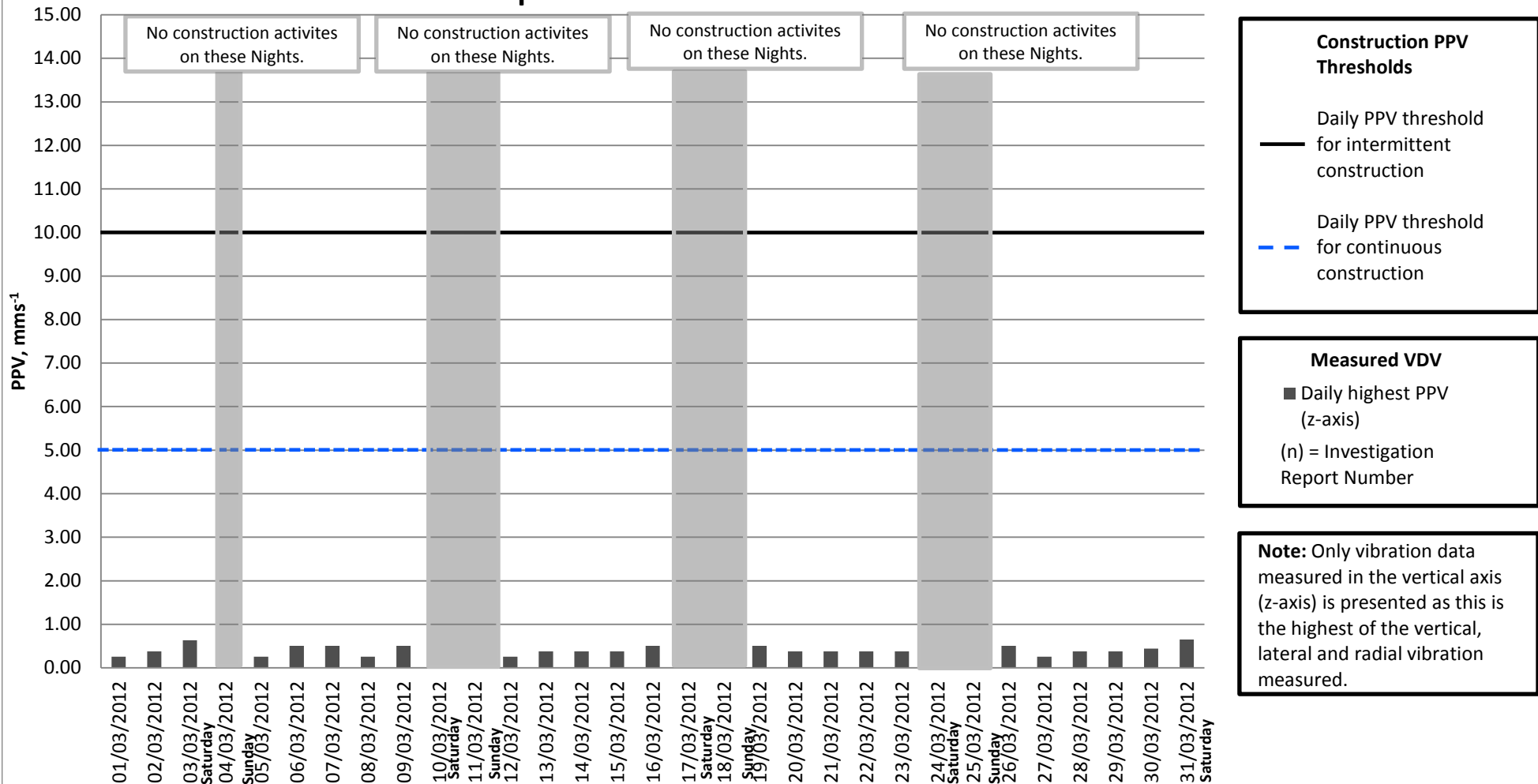
Measured night time (23:00-07:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07)

Measurement period 1st March 2012 to 31st March 2012



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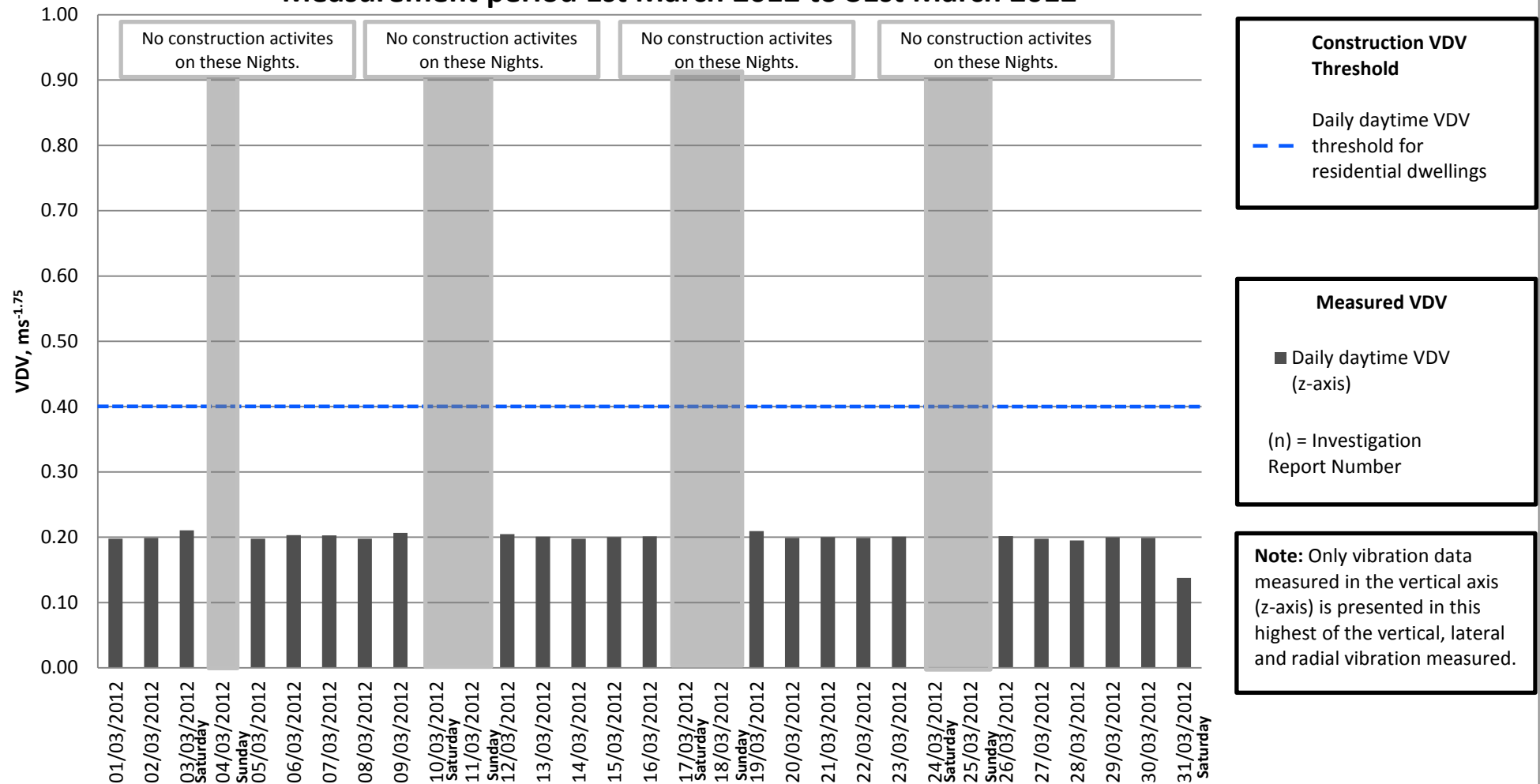
Measured highest daily Peak Particle Velocity (PPV), 8 Kirklands Park Grove (CNV16) Measurement period 1st March 2012 to 31st March 2012



Sunday data have not been included as no construction works have been conducted during these hours.

Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16)

Measurement period 1st March 2012 to 31st March 2012



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

■ Daily daytime VDV (z-axis)

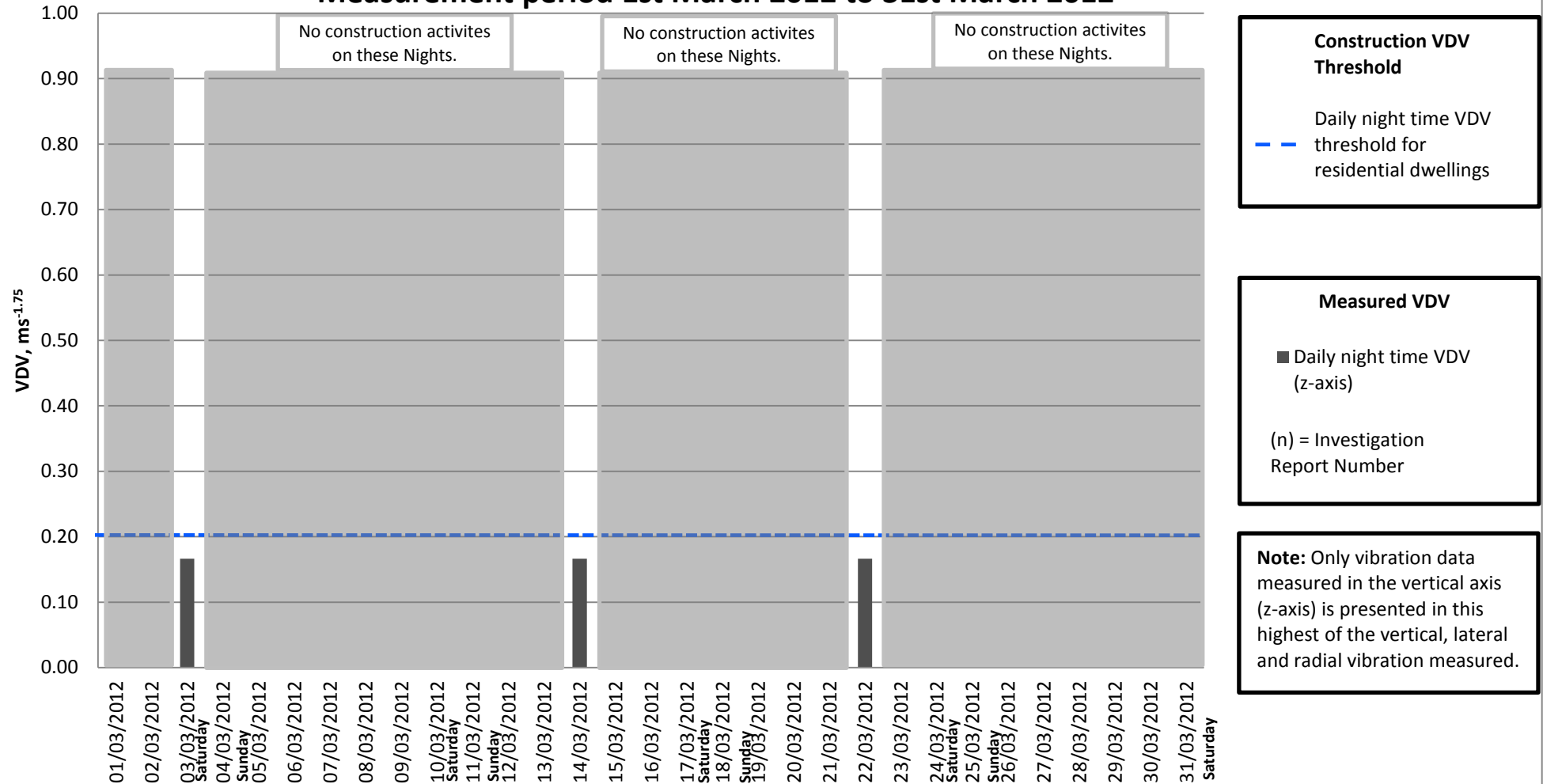
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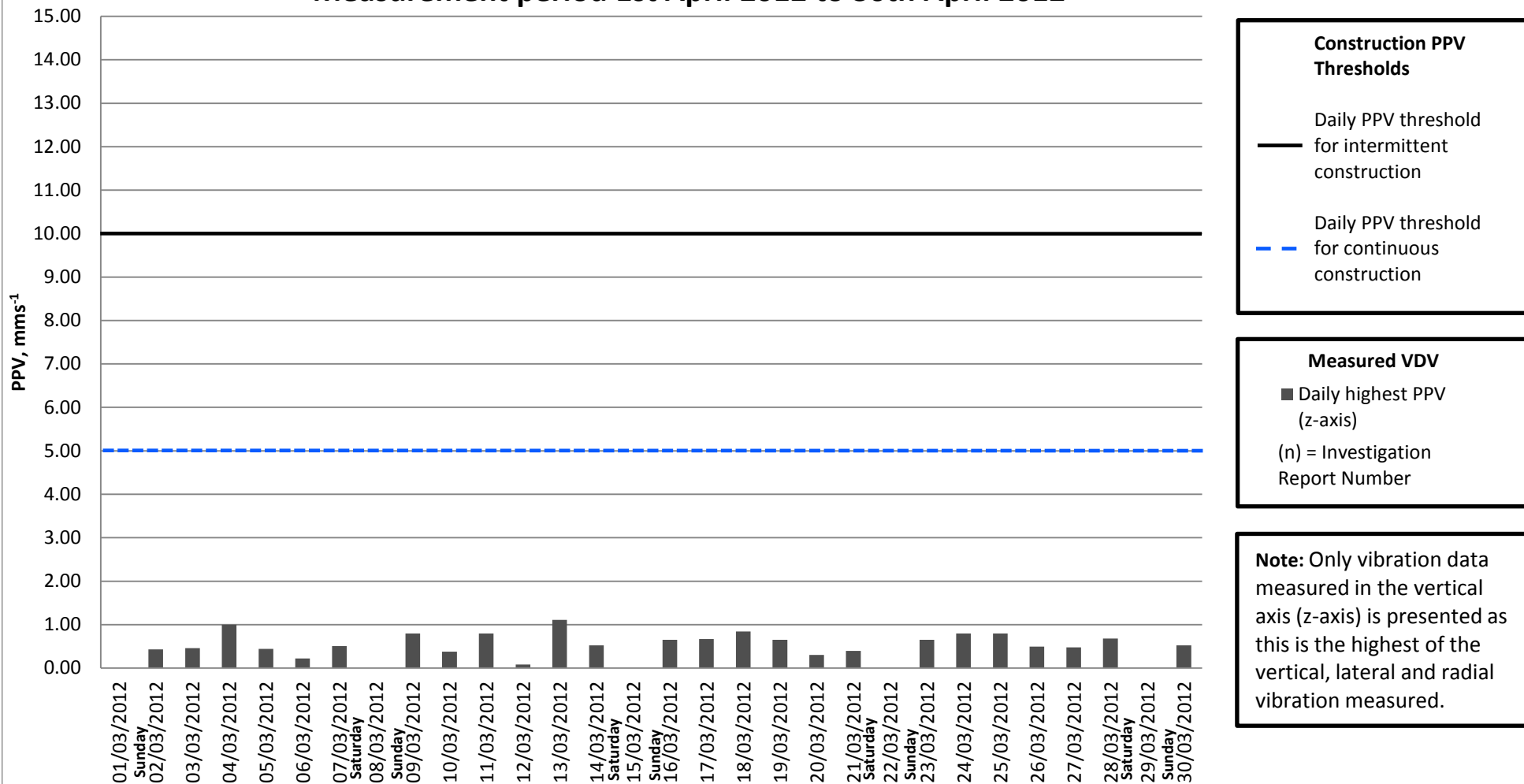
Measured night time (23:00-07:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16)

Measurement period 1st March 2012 to 31st March 2012



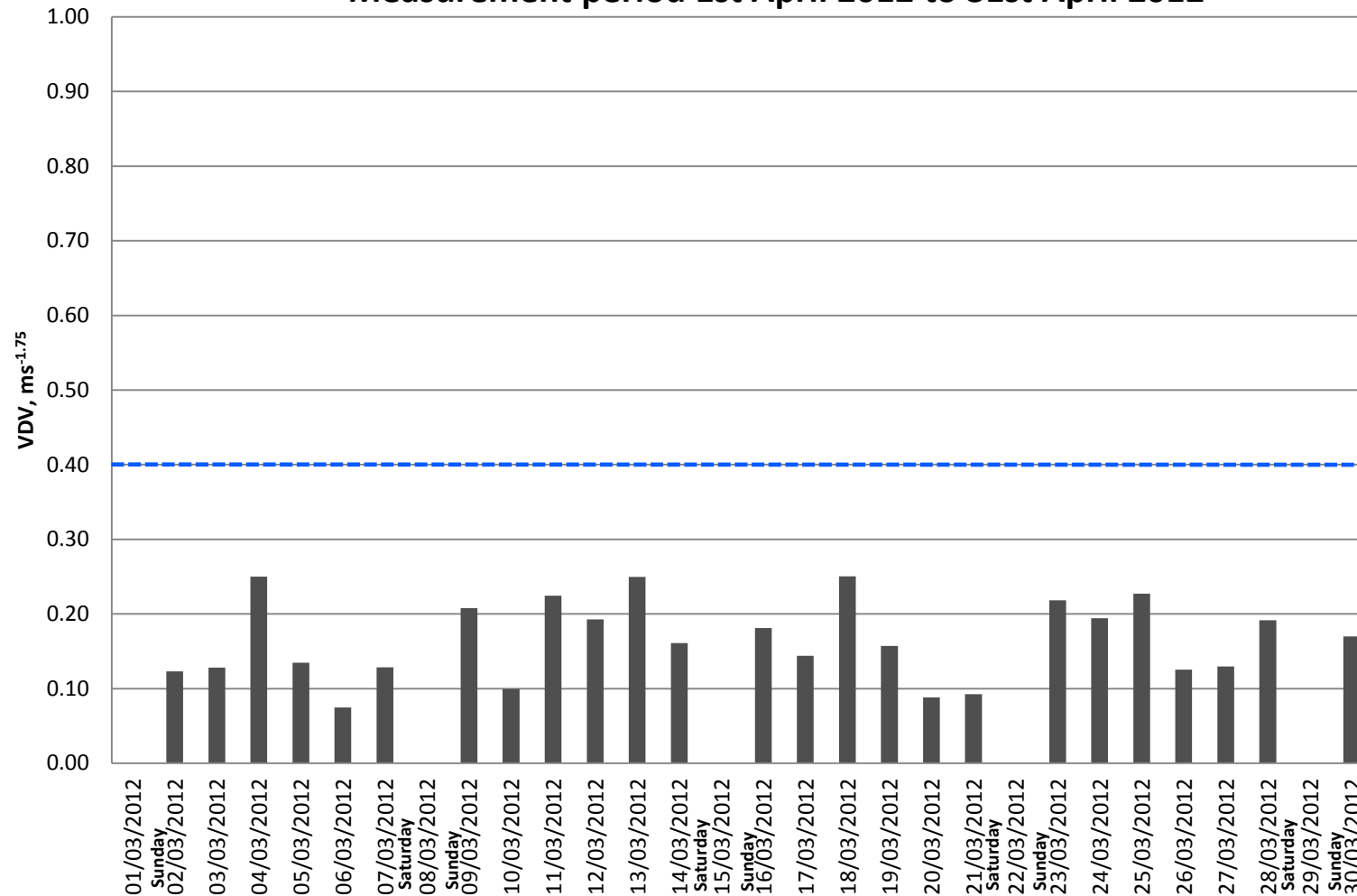
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Measured highest daily Peak Particle Velocity (PPV), 93/95 King Edwards Way (CNV02) Measurement period 1st April 2012 to 30th April 2012



Sunday data have not been included as no construction works have been conducted during these hours.

**Measured daytime (07:00-23:00) Vibration Dose Values (VDV),
93/95 King Edwards Way (CNV02)
Measurement period 1st April 2012 to 31st April 2012**



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

■ Daily daytime VDV (z-axis)

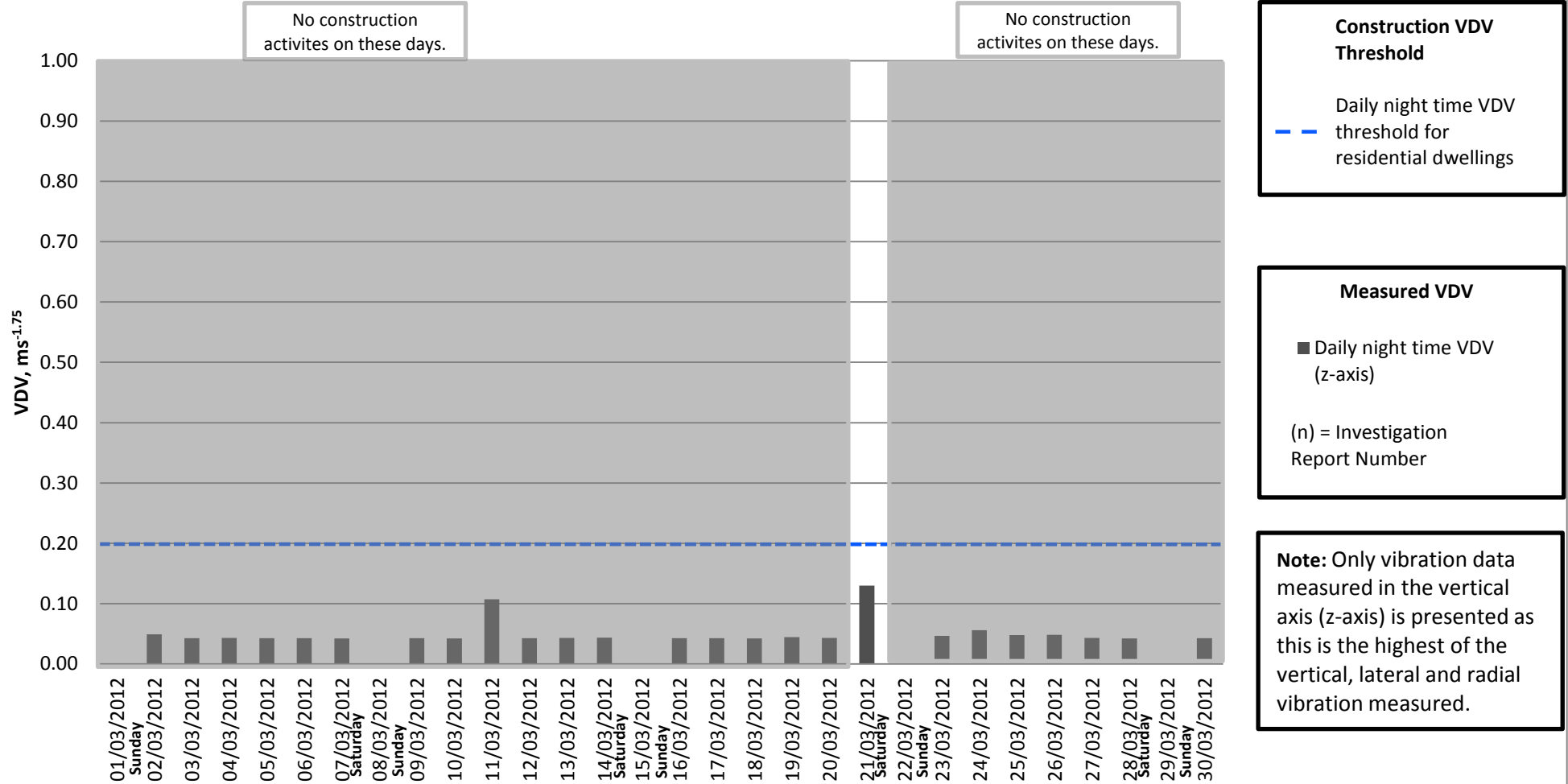
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Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

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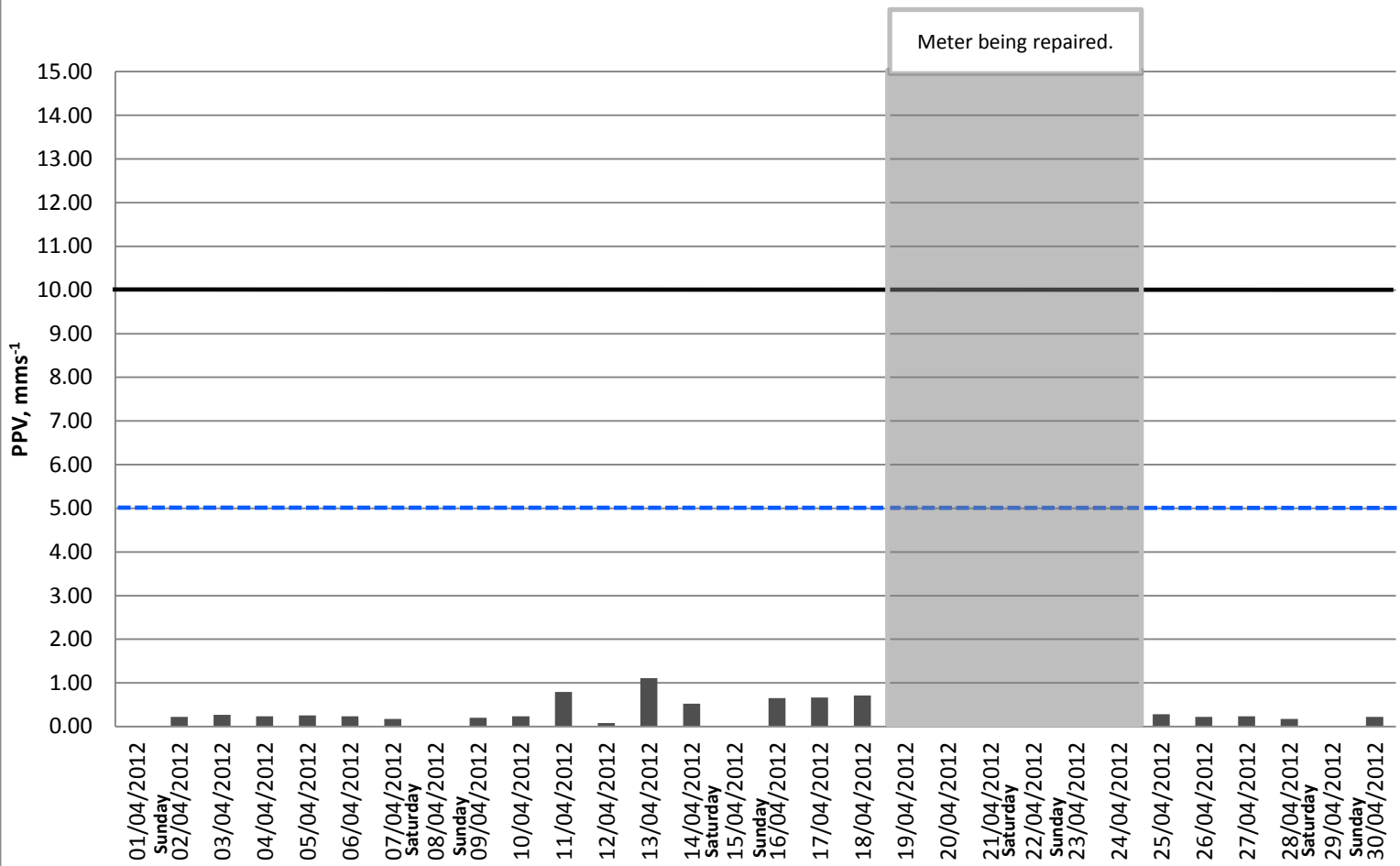
Measured night time (23:00-07:00) Vibration Dose Values (VDV), 93/95 King Edwards Way (CNV02)

Measurement period 1st April 2012 to 30th April 2012



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**Measured highest daily Peak Particle Velocity (PPV),
15-17 Buie Rigg (CNV07)
Measurement period 1st April 2012 to 30th April 2012**



Construction PPV Thresholds

- Daily PPV threshold for intermittent construction (solid black line)
- Daily PPV threshold for continuous construction (dashed blue line)

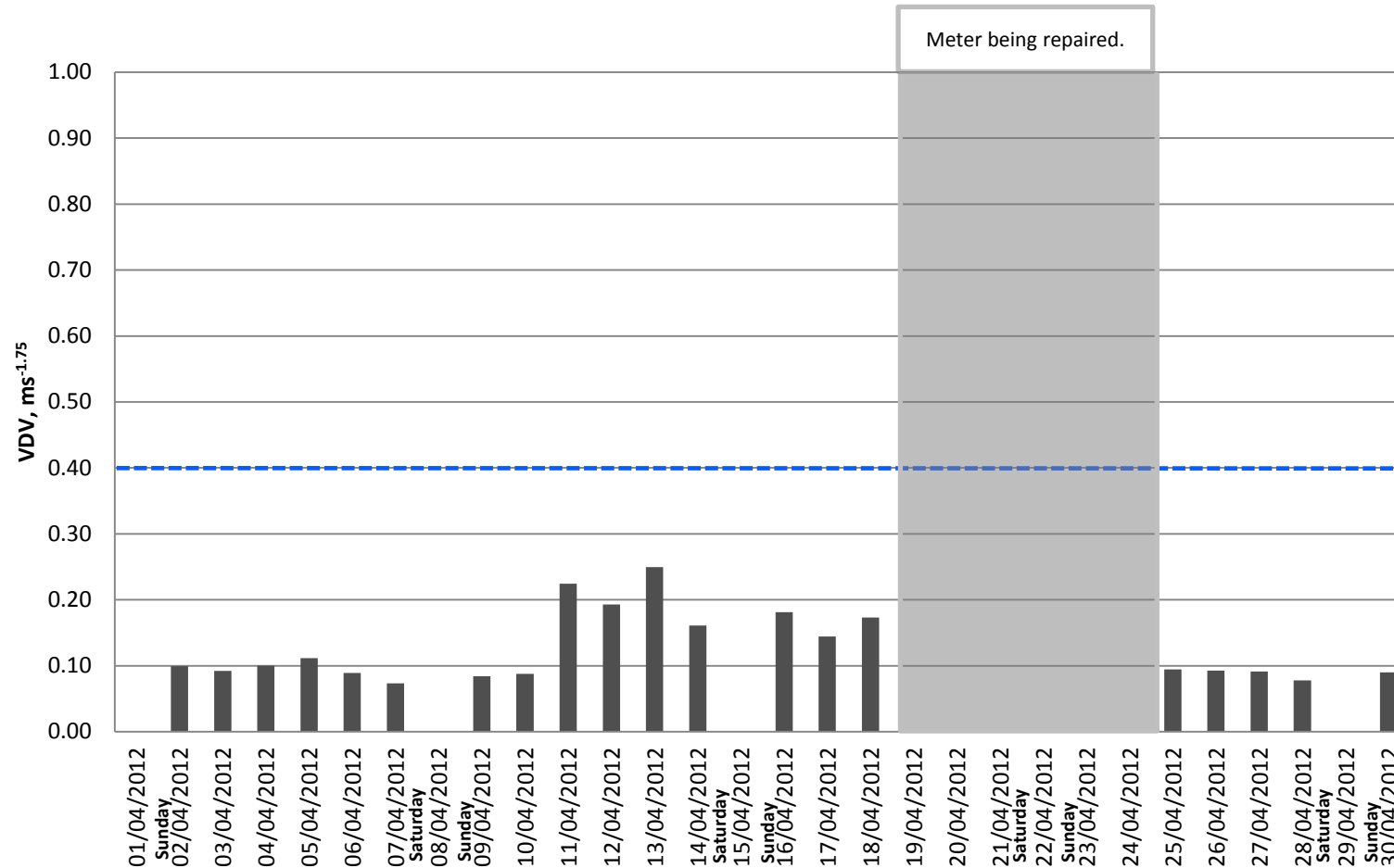
Measured VDV

- Daily highest PPV (z-axis) (grey bars)
- (n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Sunday data have not been included as no construction works have been conducted during these hours.

**Measured daytime (07:00-23:00) Vibration Dose Values (VDV),
15-17 Buie Rigg Way (CNV07)
Measurement period 1st April 2012 to 30th April 2012**



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

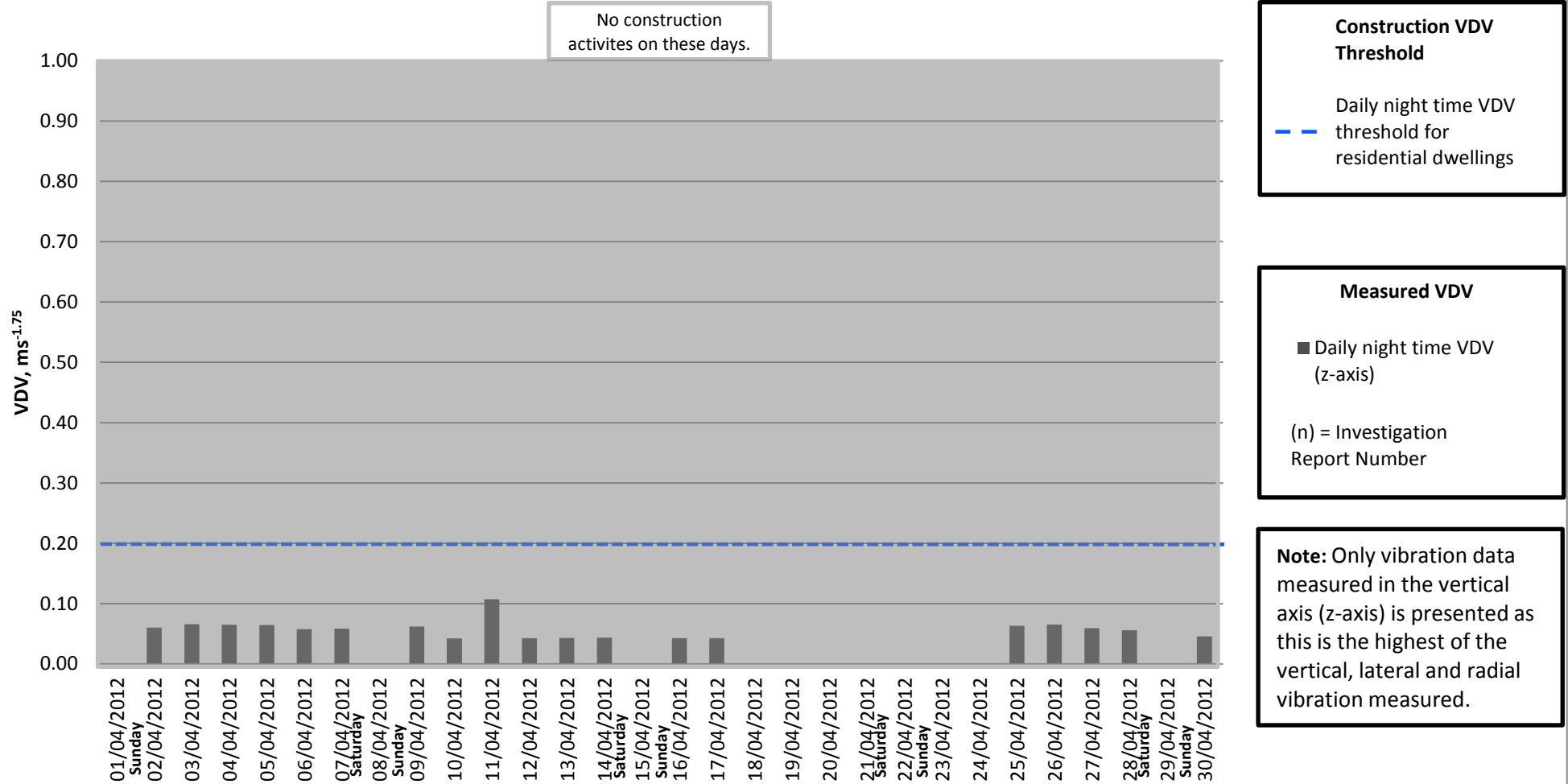
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

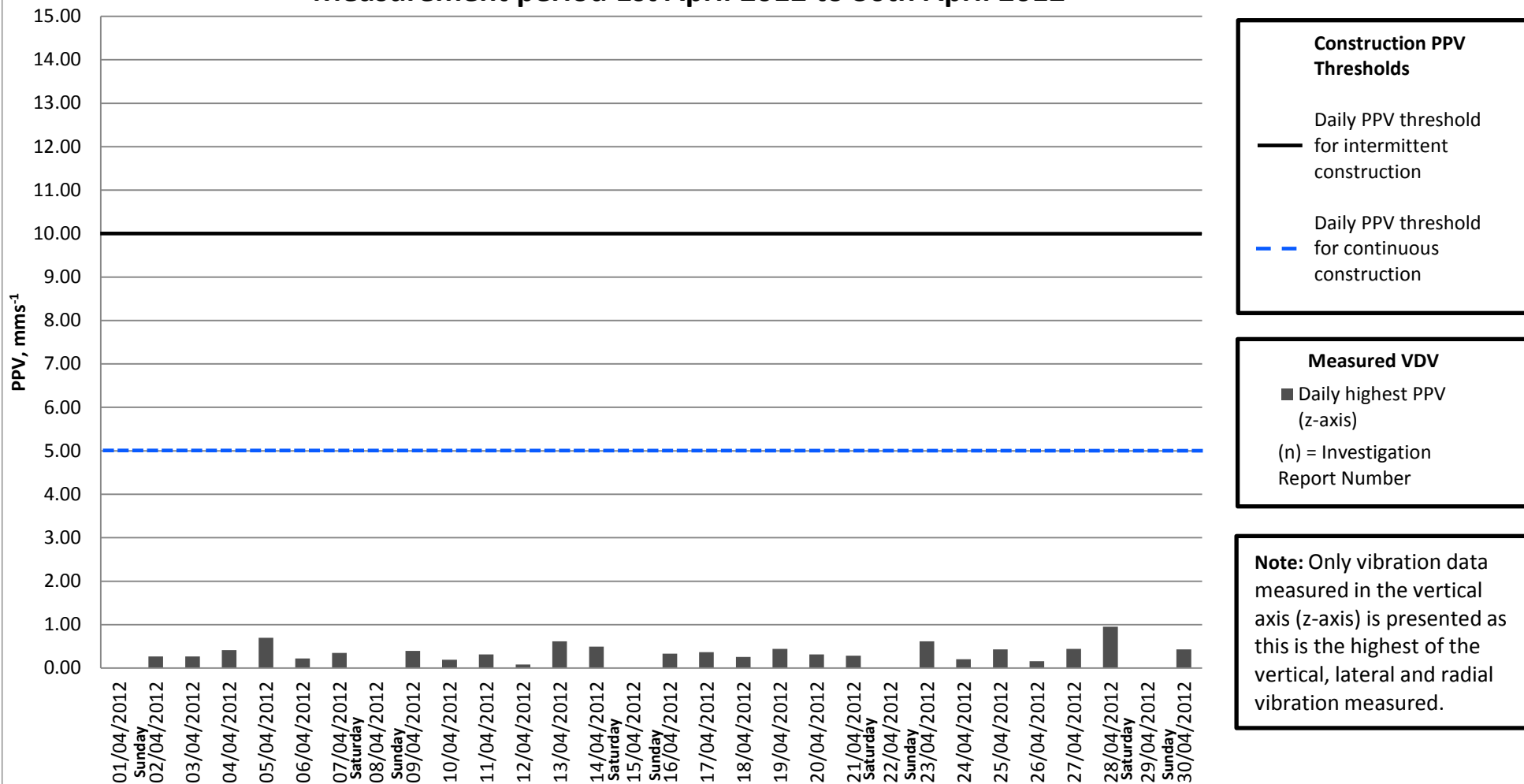
Sunday data have not been included as no construction works have been conducted during these hours. VDV threshold for Education establishments, offices and similar is 0.40ms^{-1.75} and Commercial is 0.80ms^{-1.75}. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed.

Measured night time (23:00-07:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07) Measurement period 1st April 2012 to 30th April 2012



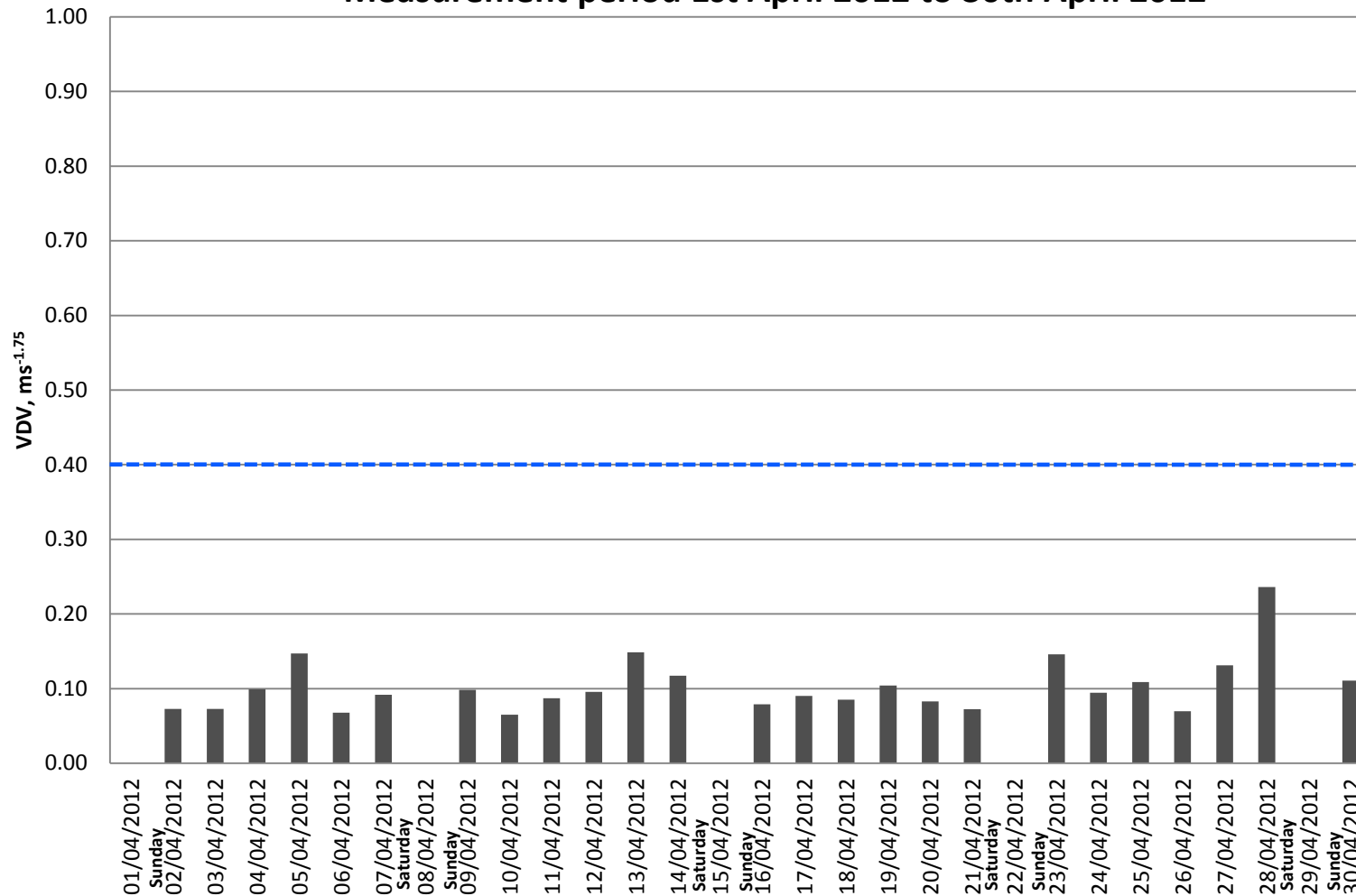
Sunday data have not been included as no construction works have been conducted during these hours. VDV threshold for Education establishments, offices and similar is $0.40\text{ms}^{-1.75}$ and Commercial is $0.80\text{ms}^{-1.75}$. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed..

Measured highest daily Peak Particle Velocity (PPV), 8 Kirklands Park Grove (CNV16) Measurement period 1st April 2012 to 30th April 2012



Sunday data have not been included as no construction works have been conducted during these hours.

**Measured daytime (07:00-23:00) Vibration Dose Values (VDV),
8 Kirklands Park Grove (CNV16)
Measurement period 1st April 2012 to 30th April 2012**



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

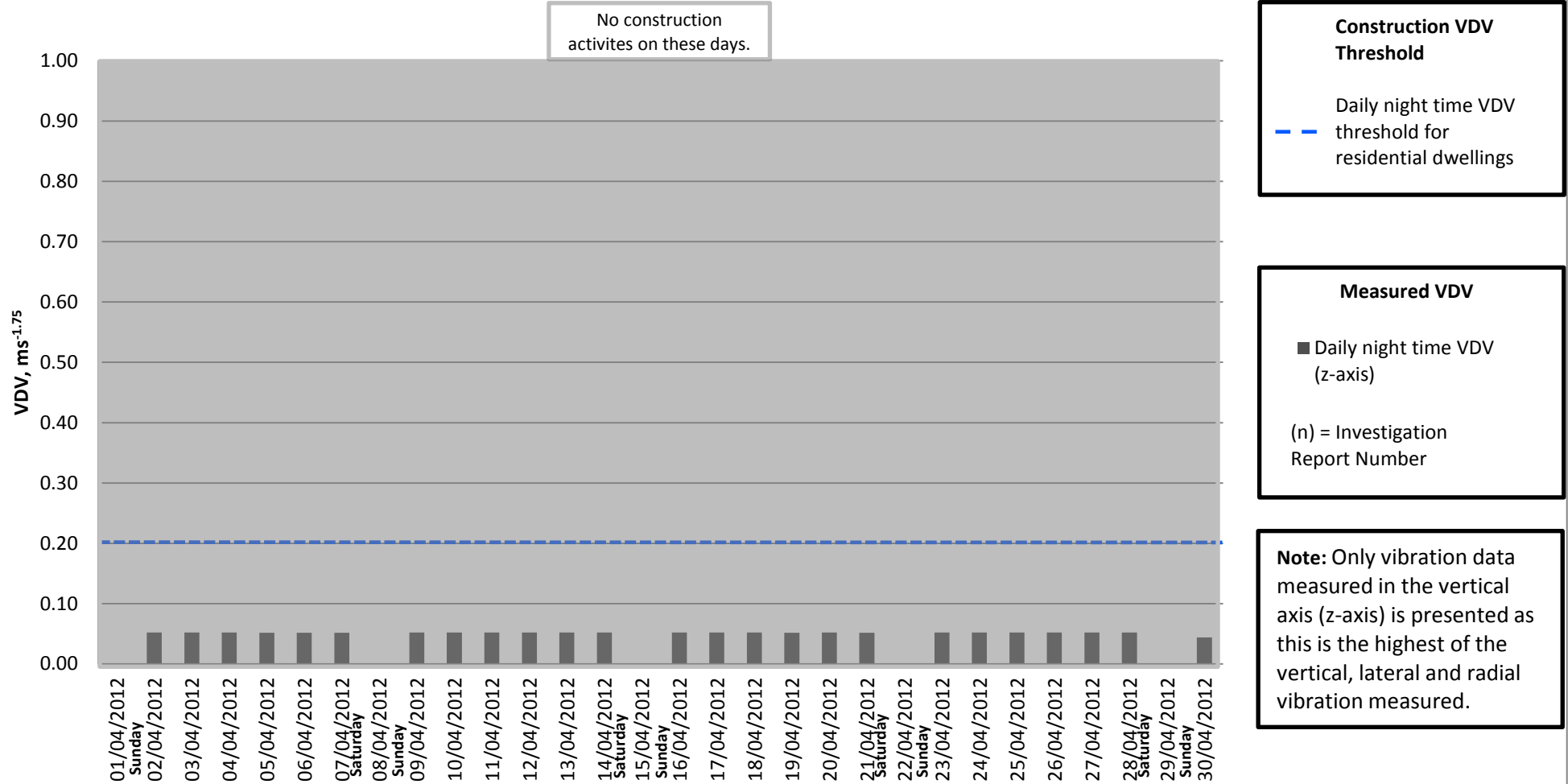
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Sunday data have not been included as no construction works have been conducted during these hours. VDV threshold for Education establishments, offices and similar is $0.40\text{ms}^{-1.75}$ and Commercial is $0.80\text{ms}^{-1.75}$. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed.

Measured night time (23:00-07:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16) Measurement period 1st April 2012 to 30th April 2012



Construction VDV Threshold

— Daily night time VDV threshold for residential dwellings

Measured VDV

■ Daily night time VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Sunday data have not been included as no construction works have been conducted during these hours. VDV threshold for Education establishments, offices and similar is 0.40ms^{-1.75} and Commercial is 0.80ms^{-1.75}. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed..