NOISE AND VIBRATION MONITORING REPORT MARCH 2025

LIVERPOOL HEALTH AND ACADEMIC PRECINCT - STAGE 2

LENDLEASE BUILDING PTY LTD

PROPERTY RISK AUSTRALIA

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This report has been prepared by Property Risk Australia Pty Ltd (PRA) for the benefit of Lendlease Construction Pty Ltd (hereafter the 'Client') in accordance with the agreement/contract between PRA and the Client. The works carried out in preparing this report have been performed in accordance with the proposal, scope of works, general terms and conditions and special terms and conditions, agreed in consultation with the Client.

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DOCUMENT QUALITY CONTROL

Report Title:	Noise and Vibration Monitoring Report - March 2025
Site Name:	Liverpool Health and Academic Precinct – Stage 2
Site Address:	Goulburn Street, Liverpool NSW 2170
Client Name:	Lendlease Construction Pty Ltd
Job Number:	PRJ-000719

Revision Number	Revision Date	Author(s)	Reviewer(s)	Status
1	1/04/2025	Ian Ahern	Gary Mace	Final

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1 INTRODUCTION

Property Risk Australia Pty Ltd (PRA) conducted construction noise and vibration monitoring on behalf of **Lendlease Construction Pty Ltd** (Lendlease, the 'Client') for the redevelopment works at Liverpool Health and Academic Precinct, Goulburn Street, Liverpool NSW 2170 (hereafter the 'site') throughout the duration of main stage 1 and 2 works. The Site and redevelopment locations are provided in **Appendix A** – **Figures 1 and 2**.

1.1 Scope

The objective of the noise and vibration monitoring is to assist with management during the works by providing ongoing unattended noise monitoring to assess compliance against the project Noise Management Levels (NMLs) and real-time vibration monitoring. Noise and vibration alerts are provided to the project team based on real time monitoring at sensitive receivers located at the site's periphery. This report will provide guidance to Lendlease regarding the noise and vibration levels present at Liverpool Hospital during March 2025.

2 GUIDELINES AND STANDARDS

The primary guidelines, specifications, and policy documents relevant to the monitoring include, but are not limited to:

- Turner (2020). Noise and Vibration in the Vivarium: Recommendations for Developing a Measurement Plan. J Am Assoc Lab Anim Sci. 2020 Nov 1;59(6):665-672.
- NSW DECC. (2009). *Interim Construction Noise Guideline* (ICNG).
- NSW EPA. (2020). *Draft Construction Noise Guideline* (DCNG).
- NSW DEC. (2006). *Assessing Vibration: A Technical Guideline*.
- Australian Standard. (2010). AS 2436:2010: *Acoustics – Guide to Noise Control on Construction, Maintenance and Demolition Sites.*
- British Standards Institute. (2008).BS 6472-1:2008. *Guide to evaluation of human exposure to vibration in buildings, Part 1: Vibration sources other than blasting.*[1]
- British Standards Institute. (1993). BS 7385-2:1993. *Evaluation and measurement of vibration in buildings – Guide to damage levels from groundborne vibration.*
- British Standards Institute. (2014). *BS 5228-2:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.*
- DIN Standards Committee Building and Civil Engineering (DIN). (2016). *DIN 4150-3:2016-12. Vibration in buildings – Part 3: Effects on structures.*

3 PROJECT OVERVIEW

3.1 Site Location and Existing Environment

Liverpool Hospital, located 26 kilometres south-west of the Sydney CBD, is part of the South-Western Sydney Local Health District. It is bound by Goulburn Street to the West, Elizabeth Street to the South and Campbell Street to the North and is bisected by the Sydney Trains Main South Railway Line.

The area immediately surrounding the hospital features a variety of usages including Bigge Park to the south, educational institutions such as Liverpool Boys and Girls High Schools to the North and TAFE

[1] Together with BS 6472-2:2008 this part of BS 6472 supersedes BS 6472:1992, which is withdrawn.

NSW to the south. A variety of mixed use (MU1) and high-density residential properties (R4) are located to the west, whilst general industrial (E4) activity dominates the east.

The Sites regional setting and stages of work are presented in **Appendix A** – **Figure 1**.

3.2 Summary of Works

The Liverpool Health and Academic Precinct (LHAP) is a significant $830 million redevelopment of Liverpool Hospital, designed to enhance healthcare services and medical research capabilities. The project includes an integrated cancer centre, critical care services, maternity and paediatric facilities, an aged care and rehabilitation centre, ambulatory care services, and a new multi-storey car park.

The redevelopment is being delivered in two stages. Stage 1, now complete, included upgrades to the hospital's main entrance, maternity services, outpatient and support services, a new pathology department, and an expansion of the Emergency Department, which is set to open in 2025. The multi-storey car park was completed in 2022.

Stage 2, currently underway and scheduled for completion in 2027, includes the construction of a new Integrated Services Building (ISB), a wellness centre, and a loading dock. Refurbishment works across various hospital departments, including critical care areas, are also being undertaken to modernise facilities and improve patient care.

4 CONSTRUCTION NOISE MONITORING

4.1 Unattended Noise Monitoring

Four (4) NATA-calibrated unattended noise monitoring systems were deployed at Liverpool Hospital to conduct noise monitoring throughout March 2025. Monitoring was conducted using one (1) ARL NGARA 4G and three (3) Svan SV307 Class 1 sound level meters (SLMs). Each SLM was field calibrated prior to monitoring using a Pulsar Model 105 field calibrator for the ARL NGARA 4G and a Svan SV33B for the Svan SV307. Monitoring was continuous, covering day, evening, and night periods, with a trigger set at the project noise management levels to capture exceedances and alert the Client via email. The relevant NATA calibration certificates are provided in **Appendix D**.

The monitors were positioned at locations representative of ambient noise levels experienced by hospital occupants and neighbouring sensitive receivers, in general accordance with the DCNG (NSW EPA, 2020), ICNG (DECC, 2009), and AS 2436:2010. All noise loggers were securely mounted, with microphones positioned 1.5 m above ground level using windshields. Where possible, loggers were placed at least 3 m away from reflective surfaces (e.g., walls) to minimise interference.

Residential Receiver (N1)- A Svan SV307 SLM was installed on 14 January 2025 at 55-59 Goulburn Street, Liverpool, NSW 2170, positioned on the Level 1 balcony, approximately 10 m from the nearest residence. The monitor was set up 1.5 m above ground level with a direct line of sight to the LHAP construction site.

Oncology Storeroom (N2)- A noise monitor was installed within Storeroom G6192 of the Oncology Ward on 14 January 2025. This location was selected due to its proximity to the demolition cutline for Stage 2 main works, ensuring the most conservative vibration data is captured to protect sensitive equipment.

Ingham Institute for Applied Medical Research (N3)- A Svan SV307 SLM was installed within the Archive Storeroom of the Ingham Institute for Applied Medical Research on 14 January 2025. This location was selected to monitor construction noise impacts on the Animal Research Laboratory,

minimising potential disturbance to lab animals. Research indicates that construction noise and vibration can reduce breeding success and cause behavioural disturbances. Typical laboratory conditions should not exceed 55 dB(A), with rodents generally comfortable at levels below 50 dB(A). The storeroom was chosen as it is relatively unoccupied, reducing background noise from human activities. The Highly Noise Affected level for the N3 location has been set at 70 dB(A). Research on the impacts of noise and vibration on laboratory vivariums suggests that laboratory mice may be disturbed by sound levels exceeding 45 dB(A), with chronic noise exposure above 70 dB(A) potentially leading to negative effects on laboratory animals, including disruptions to sleep and impacts on the cardiovascular system (Turner 2020).

Audiology Storeroom (N4)- The ARL NGARA 4G SLM was installed within the Audiology storeroom, adjacent to the hearing assessment booths, in June 2023 during Stage 1 main works. This location was selected to minimise noise from office activities (e.g., staff talking) and better represent construction noise impacts on hearing assessments. The noise logger is positioned 1.5 m from the hearing assessment booth, separated by a sound-isolating wall, and approximately 2 m above ground level due to space constraints.

4.2 Noise Management Levels

The ICNG specifies Noise Management Levels (NMLs) that guide the need to apply work practices to minimise noise impacts. The ICGN recommends the following actions upon exceedance of NMLs.

Exceedance of the Noise Affected NML:

The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Exceedance of the Highly Noise Affected NML:

The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:

- *times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences*
- *if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times*

Background noise monitoring was undertaken by Acoustic Logic in June 2018 (EIS ref.: *Appendix A SSD Acoustic Assessment 4_kh*) to establish rating background levels (RBLs) for the site. The RBLs were used to calculate the Noise Management Levels (NMLs) and Highly Affected Noise Management Levels (HNML) for the Site (**Table 1**) in accordance with the *ICNG* (DECC, 2009) and most relevant sources (Taylor, 2020).

Table 1: Unattended Noise Monitor Locations and Noise Management Levels

Monitor Number	Receiver	Noise Management Levels, $L_{Aeq, 15min}$ (dB)			Highly Affected Noise Management Levels, $L_{Aeq, 15min}$ (dB)
		Day (7am–6pm)	Evening (6pm-10pm)	Night (10pm–7am)	
N1	External, 55-59 Goulburn Street, residential balcony	52	47	44	75
N2	Internal, Oncology Department, Ground Level, Storeroom - G6192	45			75
N3	Internal, Ingham Institute for Applied Medical Research Building, Basement, Archive Storeroom, southern wall	45			70 (Taylor, 2020)
N4	Internal, Level 1, Audiology Department, storeroom	45			75

4.3 Unattended Noise Monitoring Results

Table 2 contains a summary of the noise data by comparing the percentage of noise readings during construction that exceed the NMLs by various dB ranges in March 2025. **Appendix B** contain time history charts for noise results at each noise logging location during the monthly reporting period.

Table 2: Summary of Unattended Noise Monitoring During Construction Hours

Criterion	Exceedance Category	N1: Residential Receiver	N2: Oncology Storeroom	N3: Ingham Institute	N4: Audiology
Noise Affected NML, $L_{Aeq, 15min}$ [dB]	≤0 dB(A)	64.71%	64.71%	64.71%	96.47%
	>0 and ≤5 dB(A)	3.06%	0.03%	34.69%	2.69%
	>5 and ≤10 dB(A)	27.46%	30.45%	0.54%	0.44%
	>10 and ≤15 dB(A)	3.63%	3.73%	0.07%	0.07%
	>15 and ≤20 dB(A)	0.77%	0.47%	0.00%	0.00%
	>20 dB(A)	0.37%	0.61%	0.00%	0.34%
Highly Noise Affected NML, $L_{Aeq, 15min}$ [dB]	Exceedance >75 dB(A)	0.20%	0.07%	0.00%	0.00%

4.4 Noise Monitoring Discussion

During the monthly reporting period, noise levels at all monitoring locations remained mostly below the Highly Affected Noise Management Level (NML) of 75 dB(A), except for two (2) locations:

- Goulburn Street (6 events):
  - Monday, 3 March @ 12:15 hrs – 77.2 dB(A)
  - Monday, 3 March @ 12:30 hrs – 77.1 dB(A)
  - Monday, 3 March @ 15:15 hrs – 79.9 dB(A)
  - Monday, 3 March @ 15:30 hrs – 79.5 dB(A)
  - Tuesday, 4 March @ 10:15 hrs – 76.5 dB(A)
  - Friday, 14 March @ 15:30 hrs – 77.1 dB(A)
- Oncology Storeroom (2 events):
  - Wednesday, 26 March @ 14:00 hrs – 75.4 dB(A)
  - Wednesday, 26 March @ 14:15 hrs – 76.3 dB(A)

Noise levels at N1 (a residential property opposite the Site on Goulburn Road) exceeded the Highly Affected NML on six (6) occasions during the reporting period, accounting for 0.20% of the approved site operational hours in March 2025. However, noise levels remained below the Noise Affected NML (<0 dB(A)) for approximately 64.71% of the Site's operating hours. This suggests that external noise sources—most notably road traffic on Goulburn Road—significantly influenced recorded noise levels and likely contributed to many of the NML exceedances observed during operational hours. Notably, noise levels did not exceed the Noise Affected NML by more than 10 dB for 95.23% of the time.

At N2 (Oncology Storeroom), noise levels remained below the Noise Affected NML for 64.31% of the Site's operating hours. Exceedances above the NML by more than 10 dB were minimal, occurring 4.81% of the time. Typical noise levels at this location appear to be around 55 dB, with exceedances above the 45 dB NML most likely attributed to human activity adjacent to the storeroom.

At N3 (Ingham Institute), noise levels remained below the Noise Affected NML for 64.71% of the Site's operating hours, with no exceedances of the Highly Affected NML recorded during the reporting period. Noise levels were minimal, with exceedances above the NML by more than 5 dB occurring only 0.61% of the time. Typical noise levels at the Ingham Institute were around 50 dB, which aligns with background noise levels and human activity near the monitoring location, likely influencing the recorded measurements.

At N4 (Audiology Storeroom), noise levels remained below the Noise Affected NML for 96.47% of the site's operating hours. There were no exceedances of the Highly Affected NML at any time during the reporting period. Noise levels exceeded the NML by more than 5 dB only 0.85% of the time. The rare instances where NML exceedances of 15–20 dB was recorded (0.34% of the reporting period) were likely caused by staff accessing the storeroom rather than construction activities.

The 45 dB LAeq, 15min NML is considered a low noise threshold. For context, AS 2822-1985 Acoustics – Methods of Assessing and Predicting Speech Privacy and Speech Intelligibility suggests that 45 dB is equivalent to conversational speech at 4 m. Based on this, speech within or near the Ingham Institute, Oncology, and Audiology monitoring locations could have contributed to the reported NML exceedances.

5 VIBRATION MONITORING

5.1 Vibration Criteria

Condition C20 of the Planning Approval (SSD 10389) states that vibration caused by construction must comply with the criteria set out in the latest version of DIN 4150-3:2016-12 – Vibration in Buildings – Part 3: Effects on Structures, published by the German DIN Standards Committee for Building and Civil Engineering (2016). This standard provides recommendations for vibration levels below which cosmetic or structural damage is unlikely. The vibration criteria are expressed in terms of Peak Particle Velocity (PPV) in millimetres per second (mm/s) across various frequency ranges for different types of building construction.

Criteria for assessing human response to vibration are specified in the NSW DEC (now NSW EPA) guidelines:

- Assessing Vibration: A Technical Guideline (2006), based on British Standard BS 6472:1992 – Evaluation of Human Exposure to Vibration in Buildings (1-80 Hz) (currently superseded by BS 6472-1:2008).

This standard evaluates the probability of adverse human responses to vibration in different building types using Vibration Dose Value (VDV). The VDV is a root-mean-quad average of frequency-weighted vibration acceleration measured on the floors of a building. Table C1.1 in Appendix C of the Assessing Vibration: A Technical Guideline (DEC, 2006) presents vibration criteria for exposure to continuous and impulsive vibration across different units.

For construction-related vibration, it is generally more appropriate to assess potential impacts using PPV, as this parameter is more commonly measured in practice and aligns with the primary concern of potential building damage. **Table 3** presents the vibration criteria adopted for this project, with guideline values for PPV derived from Appendix C of the DEC (2006) guidelines.

5.1.1 Hospital-Specific Vibration Considerations

According to the UK Hospitals Guide, different rooms and facilities within a hospital have varying sensitivity to vibration due to their use case and function. To account for this, a multiplication factor can be applied based on room type:

- Operating theatres and medical imaging rooms: Response factor 1 (most sensitive)
- Intensive care wards: Response factor 2
- Offices: Response factor 4 (least sensitive)

Table 3: Human Response to Vibration in Buildings Criteria

Place	Period	Preferred Value, PPV (mm/s)	Maximum Value, PPV (mm/s)
Critical Working Areas (e.g., hospital operating theatres, precision laboratories)	Day or Night-Time	0.14	0.28
Residences	Day Time	0.28	0.56
	Night-Time	0.20	0.40
Offices	Day or Night-Time	0.56	1.1

For additional context, **Table 4** reproduces suggestions of expected community reactions to various levels of constriction vibration from British Standard *BS 5228-2:2009*.

Table 4: Guidance on the Effects of Vibration Levels (*BS 5228-2:2009*, Annex B)

Peak Vibration Level (mm/s)	Likely Stakeholder Response
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

5.1.2 Structure Vibration Damage Criteria

The German Standard DIN 4150-3 provides guidelines for acceptable levels of vibration velocity in building foundations to assess the effects of vibration on structures. The standard outlines maximum acceptable velocity values at the foundation and at the highest floor level of various building types to prevent structural damage.

Table 5 presents the peak particle velocity (PPV), defined as the maximum absolute value of velocity signals for the three orthogonal axis components (x, y, and z axes). This is measured as:

- The maximum value of any of the three orthogonal component particle velocities when measured at the foundation, and
- The maximum levels measured in the x- and y-horizontal directions in the plane of the uppermost floor.

Since all vibration loggers installed on-site were positioned at foundation levels, we will consider the maximum value of all three orthogonal axes in our assessment.

It is noted that if measured vibration levels remain below the guidelines listed in **Table 3**, structural damage that reduces the serviceability of the building is unlikely to occur. If structural damage is observed despite compliance with these guidelines, it is assumed that other activities or sources may be responsible.

Furthermore, the DIN 4150-3 guidelines state the following regarding the limits presented in Table 1 of the standard:

- "Exceeding the guideline value does not necessarily lead to damage. Should they be exceeded, however, further investigations may be necessary, such as determining and evaluating the stresses as detailed in Sections 4.3 and 4.4."

Table 5 Structural Building Vibration Criteria

Type of Structure		Peak Particle Velocity (mm/s)			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		<10 HZ	10 Hz to 50 Hz	50 Hz to 100 Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/ or use	5	5 to 15	15 to 20	15
3	Structures that because of their sensitivity to vibration, do not correspond to those listed in Lines 1 and 2 and have intrinsic values (e.g. buildings that are under preservation order)	3	3 to 8	8 to 10	8

The most conservative and sensitive **Type 3** criteria will be adopted for each vibration logger Site location.

5.2 Unattended Vibration Monitoring

Three (3) NATA-calibrated unattended vibration monitors were deployed to monitor project-associated vibrations during the Liverpool Health and Academic Precinct Stage 2 main works. Vibration monitoring was conducted using a Svantek SV 803, which records Peak Particle Velocity (PPV) over time. The NATA-accredited calibration certificate is provided in **Appendix C**.

5.2.1 Sensitive Receiver Locations

Two (2) sensitive receiver locations—the Oncology Bunker and the Ingham Institute—were selected for monitoring to ensure protection against sensitive equipment. Given the nature of these locations, we have adopted the critical working area criteria (e.g. hospital operating theatres, precision laboratories) as outlined in **Table 3**.

- The Oncology vibration monitor was installed vertically within the Oncology Ward, inside a fire hose reel cupboard, adjacent to Treatment Room 7.
- The Ingham Institute vibration monitor was installed vertically within the internal southern fire stair, at the basement level of the Ingham Institute for Applied Medical Research, located at 1 Campbell St, Liverpool, NSW 2170.

5.2.2 General Hospital Location

One (1) additional vibration monitor was installed at the Integrated Services Building (ISB) location, where the Site-adopted criteria classify it as an "Offices" location. This corresponds to a response factor of four (4), as referenced in **Table 3**.

- The monitor was installed horizontally to the floor surface adjacent to the Stage 2 main works demolition cut line, making it representative of vibration impacts on offices and general hospital rooms. Specifically, the monitor was placed near the Lift F demolition cut line, within the northern redundant toilet location.

5.3 Vibration Results

The tables below provide a summary of the measured maximum vibration levels, recorded as Peak Particle Velocity (PPV) in mm/s, during the March 2025 assessment period. These results have been assessed against the Site-adopted criteria for:

- Human Response to Vibration
- Structural Building Vibration

PRJ-000719 - Lendlease Construction
Liverpool Health and Academic Precinct - Stage 2
Vibration Monitoring Summary Chart - Ingham Institute

March 2025

Date	Daily SOH Exceedance >0.28 PPV [%]	Daily PPV Max [mm/s]	PPV Max Recorded Time	Max Orthogonal Direction	Human Vibration Compliance	Structural Building Vibration Compliance
Saturday, 1 March 2025	0.00	0.04	12:16:58 PM	Y	Compliant	Compliant
Monday, 3 March 2025	0.00	0.19	8:44:16 AM	Y	Compliant	Compliant
Tuesday, 4 March 2025	0.00	0.18	1:12:03 PM	Y	Compliant	Compliant
Wednesday, 5 March 2025	0.00	0.08	1:12:25 PM	Y	Compliant	Compliant
Thursday, 6 March 2025	0.00	0.18	8:03:54 AM	Y	Compliant	Compliant
Friday, 7 March 2025	0.00	0.12	11:25:27 AM	X	Compliant	Compliant
Saturday, 8 March 2025	0.00	0.05	10:22:27 AM	Y	Compliant	Compliant
Monday, 10 March 2025	0.00	0.39	11:12:46 AM	Y	Non-Compliant	Compliant
Tuesday, 11 March 2025	0.00	0.11	10:25:58 AM	Y	Compliant	Compliant
Wednesday, 12 March 2025	0.00	0.41	9:49:39 AM	Y	Non-Compliant	Compliant
Thursday, 13 March 2025	0.00	0.09	9:58:46 AM	Y	Compliant	Compliant
Friday, 14 March 2025	0.00	0.15	7:18:39 AM	Y	Compliant	Compliant
Saturday, 15 March 2025	0.00	0.05	12:56:47 PM	Y	Compliant	Compliant
Monday, 17 March 2025	0.00	0.46	1:23:56 PM	Y	Non-Compliant	Compliant
Tuesday, 18 March 2025	0.00	0.76	3:44:46 PM	Y	Non-Compliant	Compliant
Wednesday, 19 March 2025	0.00	0.50	11:06:05 AM	Y	Non-Compliant	Compliant
Thursday, 20 March 2025	0.00	0.17	4:06:21 PM	Y	Compliant	Compliant
Friday, 21 March 2025	0.00	0.11	11:16:22 AM	Y	Compliant	Compliant
Saturday, 22 March 2025	0.00	0.06	12:08:21 PM	Y	Compliant	Compliant
Monday, 24 March 2025	0.00	0.10	10:16:37 AM	Y	Compliant	Compliant
Friday, 28 March 2025	0.00	0.11	4:43:52 PM	Y	Compliant	Compliant
Saturday, 29 March 2025	0.00	0.14	11:57:45 AM	Y	Compliant	Compliant
Monday, 31 March 2025	0.00	0.15	8:02:50 AM	Y	Compliant	Compliant

PRJ-000719 - Lendlease Construction Liverpool Health and Academic Precinct - Stage 2 Monthly Vibration Monitoring Summary Chart - Integrated Service Building

March 2025

Date	Daily SOH Exceedance >1.1 PPV [%]	Daily PPV Max [mm/s]	PPV Max Recorded Time	Max Orthogonal Direction	Human Vibration Compliance	Structural Building Vibration Compliance
Saturday, 1 March 2025	0.00	0.31	10:05:27 AM	X	Compliant	Compliant
Monday, 3 March 2025	0.00	0.57	8:29:14 AM	X	Compliant	Compliant
Tuesday, 4 March 2025	0.00	0.49	11:53:13 AM	Z	Compliant	Compliant
Wednesday, 5 March 2025	0.00	0.16	9:06:14 AM	Z	Compliant	Compliant
Thursday, 6 March 2025	0.00	0.28	2:33:08 PM	Z	Compliant	Compliant
Friday, 7 March 2025	0.00	0.27	2:47:00 PM	Z	Compliant	Compliant
Saturday, 8 March 2025	0.00	0.16	8:42:28 AM	Z	Compliant	Compliant
Monday, 10 March 2025	0.00	0.12	10:09:51 AM	Z	Compliant	Compliant
Tuesday, 11 March 2025	0.00	0.18	11:51:51 AM	Z	Compliant	Compliant
Wednesday, 12 March 2025	0.00	0.76	9:21:53 AM	Z	Compliant	Compliant
Thursday, 13 March 2025	0.00	0.55	9:19:59 AM	Z	Compliant	Compliant
Friday, 14 March 2025	0.00	0.37	12:03:28 PM	Z	Compliant	Compliant
Saturday, 15 March 2025	0.00	0.13	8:28:04 AM	Z	Compliant	Compliant
Monday, 17 March 2025	0.00	0.34	1:13:21 PM	Z	Compliant	Compliant
Tuesday, 18 March 2025	0.00	0.18	2:08:24 PM	Z	Compliant	Compliant
Wednesday, 19 March 2025	0.00	0.17	2:15:17 PM	Z	Compliant	Compliant
Thursday, 20 March 2025	0.00	0.62	7:15:54 AM	Z	Compliant	Compliant
Friday, 21 March 2025	0.00	0.65	9:31:40 AM	Z	Compliant	Compliant
Saturday, 22 March 2025	0.00	0.13	11:52:01 AM	Z	Compliant	Compliant
Monday, 24 March 2025	0.00	0.26	12:46:15 PM	Z	Compliant	Compliant
Tuesday, 25 March 2025	0.00	0.36	11:07:33 AM	Z	Compliant	Compliant
Wednesday, 26 March 2025	0.00	0.29	9:15:26 AM	Z	Compliant	Compliant
Thursday, 27 March 2025	0.00	0.70	7:10:23 AM	Z	Compliant	Compliant
Friday, 28 March 2025	0.00	0.10	10:38:38 AM	Z	Compliant	Compliant
Saturday, 29 March 2025	0.00	0.13	11:24:49 AM	Z	Compliant	Compliant
Monday, 31 March 2025	0.00	0.52	2:44:24 PM	Z	Compliant	Compliant

PRJ-000719 - Lendlease Construction Liverpool Health and Academic Precinct - Stage 2 Vibration Monitoring Summary Chart - Oncology Bunker

March 2025

Date	Daily SOH Exceedance >0.28 PPV [%]	Daily PPV Max [mm/s]	PPV Max Recorded Time	Max Orthogonal Direction	Human Vibration Compliance	Structural Building Vibration Compliance
Tuesday, 4 March 2025	0.00	0.25	12:39:34 PM	Z	Compliant	Compliant
Wednesday, 5 March 2025	0.00	0.19	3:29:00 PM	X	Compliant	Compliant
Thursday, 6 March 2025	0.00	0.10	5:14:14 PM	Z	Compliant	Compliant
Friday, 7 March 2025	0.00	0.10	1:52:25 PM	X	Compliant	Compliant
Saturday, 8 March 2025	0.00	0.09	10:10:56 AM	Z	Compliant	Compliant
Monday, 10 March 2025	0.00	0.42	2:11:35 PM	Z	Non-Compliant	Compliant
Tuesday, 11 March 2025	0.00	0.10	8:30:19 AM	X	Compliant	Compliant
Wednesday, 12 March 2025	0.00	0.15	9:23:31 AM	Z	Compliant	Compliant
Thursday, 13 March 2025	0.00	0.26	2:09:30 PM	Y	Compliant	Compliant
Friday, 14 March 2025	0.00	0.25	9:08:52 AM	X	Compliant	Compliant
Saturday, 15 March 2025	0.00	0.14	10:53:52 AM	Z	Compliant	Compliant
Monday, 17 March 2025	0.00	0.27	7:11:20 AM	Z	Compliant	Compliant
Tuesday, 18 March 2025	0.00	0.14	10:50:14 AM	Z	Compliant	Compliant
Wednesday, 19 March 2025	0.00	0.23	1:12:04 PM	Z	Compliant	Compliant
Thursday, 20 March 2025	0.00	0.13	10:04:06 AM	X	Compliant	Compliant
Friday, 21 March 2025	0.00	0.38	2:57:12 PM	Z	Non-Compliant	Compliant
Saturday, 22 March 2025	0.00	0.25	10:17:00 AM	Z	Compliant	Compliant
Monday, 24 March 2025	0.00	0.18	12:03:35 PM	Z	Compliant	Compliant
Tuesday, 25 March 2025	0.00	0.18	12:07:24 PM	Z	Compliant	Compliant
Wednesday, 26 March 2025	0.00	0.18	3:20:31 PM	X	Compliant	Compliant
Thursday, 27 March 2025	0.00	0.85	3:31:59 PM	X	Non-Compliant	Compliant
Friday, 28 March 2025	0.00	0.46	1:47:54 PM	Y	Non-Compliant	Compliant
Saturday, 29 March 2025	0.02	0.96	10:57:14 AM	Y	Non-Compliant	Compliant
Monday, 31 March 2025	0.00	0.20	9:38:51 AM	Z	Compliant	Compliant

5.4 Vibration Discussion

Ingham Institute (Internal):

Vibration levels were generally higher, with five (5) non-compliant days recorded where vibration exceeded the site-adopted human comfort criteria during the monitoring period. These exceedances occurred on:

- Monday, 10 March 2025 measured at PPV 0.39 mm/s measured at 11:12 hrs, on the y -axis; and
- Wednesday, 12 March 2025 measured at PPV 0.41 mm/s measured at 09:49 hrs, on the y -axis
- Monday, 17 March 2025 measured at PPV 0.46 mm/s measured at 13:23 hrs, on the y -axis; and
- Tuesday, 18 March 2025 measured at PPV 0.76 mm/s measured at 15:44 hrs, on the y -axis
- Wednesday, 19 March 2025 measured at PPV 0.50 mm/s measured at 11:06 hrs, on the y -axis

It was noted that unrelated works, not part of the LHAP Stage 2 main works, were occurring within the Ingham Institute Building at the times these exceedances were recorded.

ISB Building (Internal):

Vibration levels remained within the Site-adopted criteria throughout the monitoring period.

Oncology Bunker (Internal):

Vibration levels were generally within the site-adopted criteria, except for five (5) exceedance events:

- Monday, 10 March 2025 measured at PPV 0.42 mm/s measured at 14:11 hrs, on the z -axis; and
- Friday, 21 March 2025 measured at PPV 0.38 mm/s measured at 14:57 hrs, on the z -axis
- Thursday, 27 March 2025 measured at PPV 0.85 mm/s measured at 15:31 hrs, on the x -axis; and
- Friday, 28 March 2025 measured at PPV 0.46 mm/s measured at 13:47 hrs, on the y -axis
- Saturday, 29 March 2025 measured at PPV 0.96 mm/s measured at 10:57 hrs, on the y -axis

These exceedances coincided with the commencement of hard demolition works in the final week of March 2025, occurring adjacent to the monitoring location within the Oncology/Radiology wards.

It should be noted that structural vibration limits were not exceeded at any time during the monitoring period. Each recorded exceedance was related to human comfort criteria, with vibration levels marginally surpassing the threshold of 0.28 mm/s. These values align with expectations for office environments, and no complaints were received regarding the events.

Additionally, hard demolition works were ongoing during the morning period.

APPENDIX A FIGURES

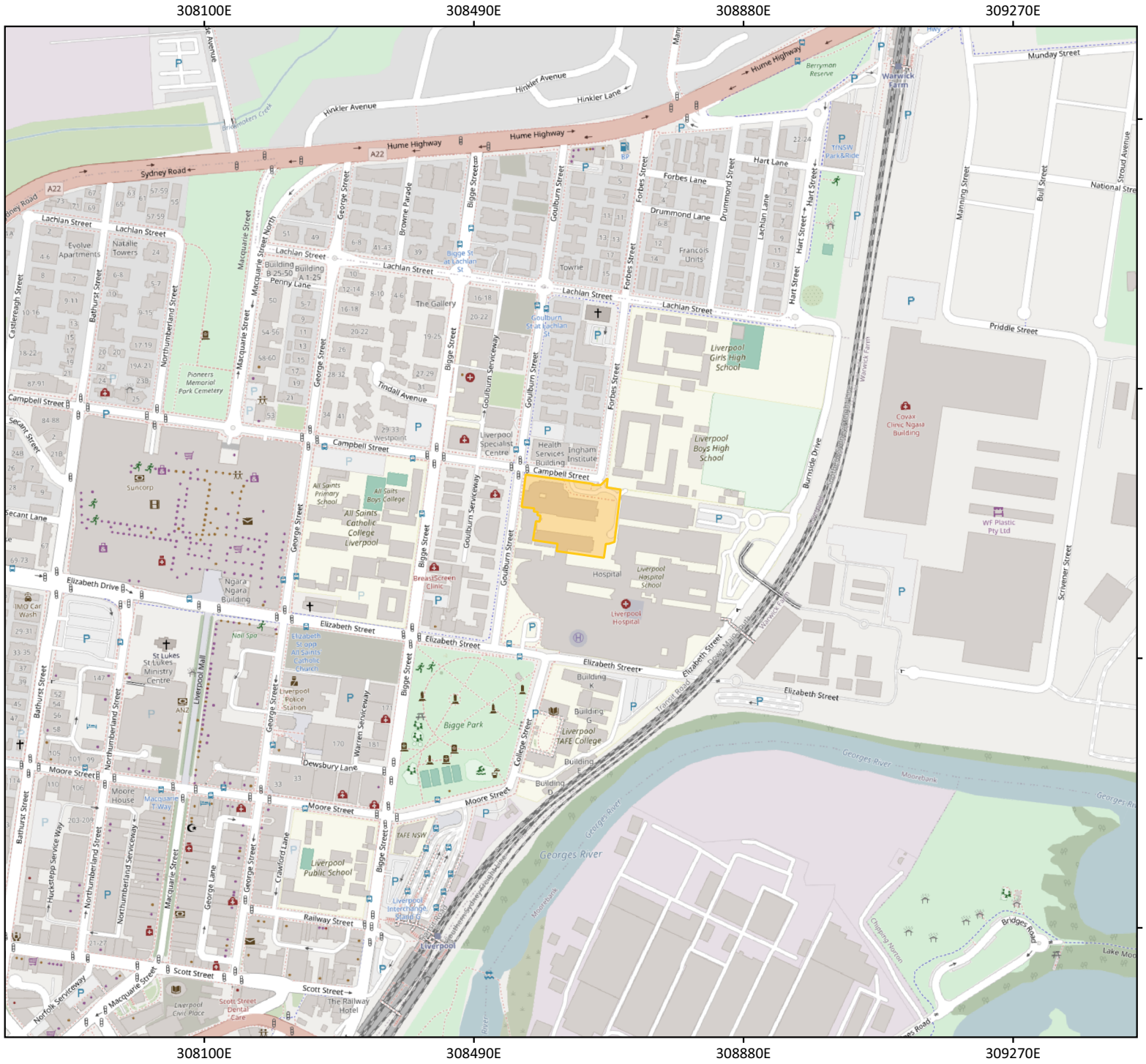
PROPERTY RISK AUSTRALIA

Title:	Site Location and Regional Context
Project ID:	PRJ-000719
Project Location:	Liverpool Health and Academic Precinct (LHAP) Goulburn and Elizabeth Street, Liverpool NSW 2170
Lot/DP:	501/DP1165217
Figure Number:	01
Client:	Lendlease Construction Pty Ltd
Map Scale:	1:8,000
CRS:	GDA2020 / MGA zone 56
Source:	Open Street Map
Prepared By:	Ian Ahern
Reviewed By:	Gary Mace
Date:	13/03/2025

Legend

Site Boundary

All extents and locations are approximate.



Disclaimer: Property Risk Australia Pty Ltd (PRA) compiled this map from numerous sources to provide a summary of spatial information for this project. This map was not prepared for, nor suitable for legal, engineering or surveying purpose.

PROPERTY RISK AUSTRALIA

Title:	LHAP Stage 2 Noise and Vibration Monitoring
Project ID:	PRJ-000719
Project Location:	Goulburn and Elizabeth Street, Liverpool NSW 2170
Figure Number:	02
Client:	Lendlease Construction Pty Ltd
Map Scale:	1:1,300
CRS:	GDA2020 / MGA zone 56
Source:	Nearmap (28 Jan 2025)
Prepared By:	Ian Ahern
Reviewed By:	Gary Mace
Date:	13/03/2025
Revision:	V1

Legend

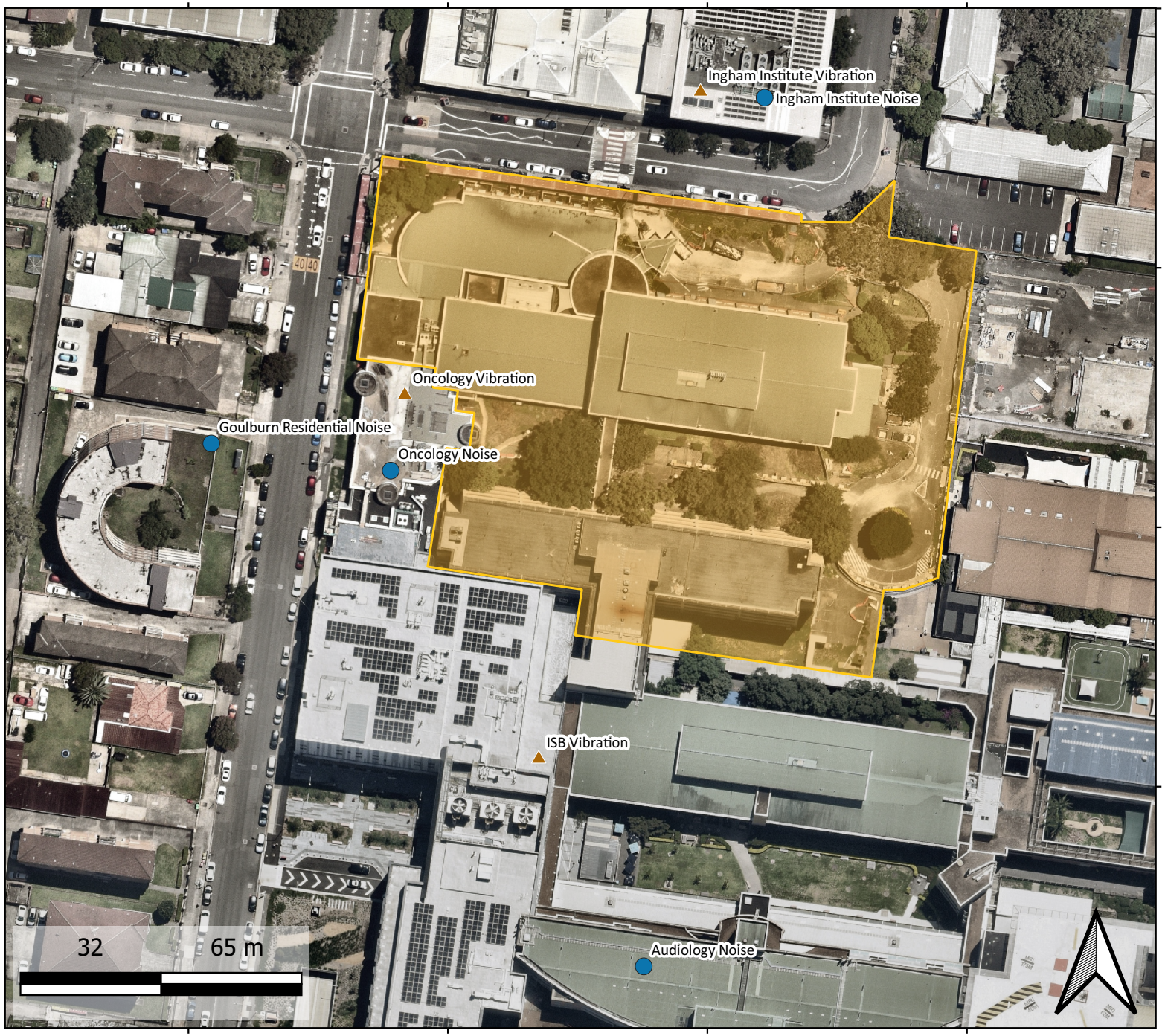
Site Boundary

Environmental Monitoring Locations

Vibration Monitor

Noise Monitor

All extents and locations are approximate.



Disclaimer: Property Risk Australia Pty Ltd (PRA) compiled this map from numerous sources to provide a summary of spatial information for this project. This map was not prepared for, nor suitable for legal, engineering or surveying purpose.

APPENDIX B NOISE CHARTS

PRJ-000719 - Lendlease Construction
Liverpool Health and Academic Precinct - Stage 2
Noise Monitoring Summary Chart - Residential (Goulburn Street)

March 2025

Overall Project Performance within approved operating hours

Highly Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
Non-exceedance	99.82
Exceedance	0.18

Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
≤0 dB	63.95
>0 and ≤5 dB	3.33
>5 and ≤10 dB	28.15
>10 and ≤15 dB	3.23
>15 and ≤20 dB	0.96
>20 dB	0.38

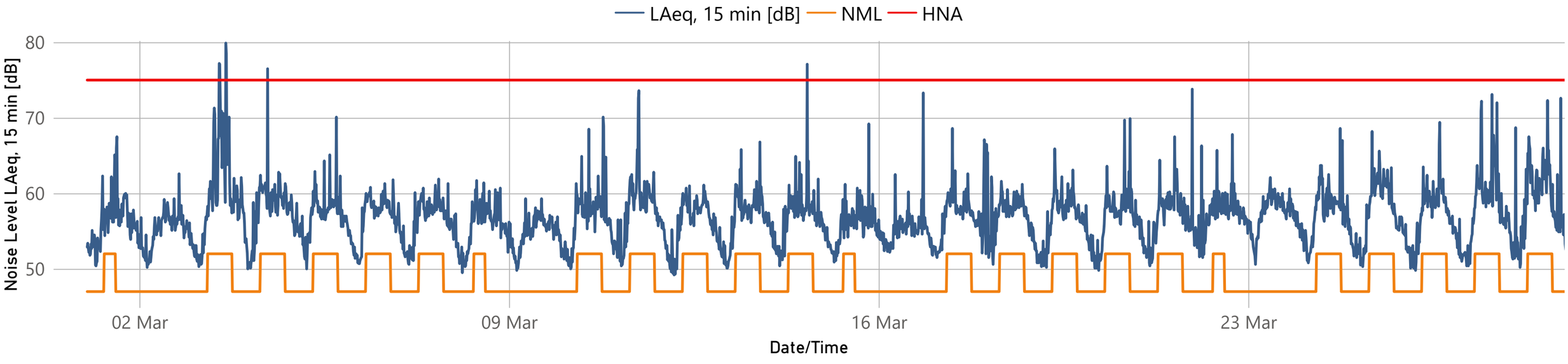
Monthly Performance within approved operating hours

Highly Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
Non-exceedance	99.8
Exceedance	0.2

Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
≤0 dB	64.71
>0 and ≤5 dB	3.06
>5 and ≤10 dB	27.46
>10 and ≤15 dB	3.63
>15 and ≤20 dB	0.77
>20 dB	0.37



PRJ-000719 - Lendlease Construction
Liverpool Health and Academic Precinct - Stage 2
Noise Monitoring Summary Chart - Oncology Storeroom

March 2025

Overall Project Performance within approved operating hours

Highly Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
Non-exceedance	99.9
Exceedance	0.1

Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
≤0 dB	65.05
>0 and ≤5 dB	7.61
>5 and ≤10 dB	21.45
>10 and ≤15 dB	4.94
>15 and ≤20 dB	0.45
>20 dB	0.5

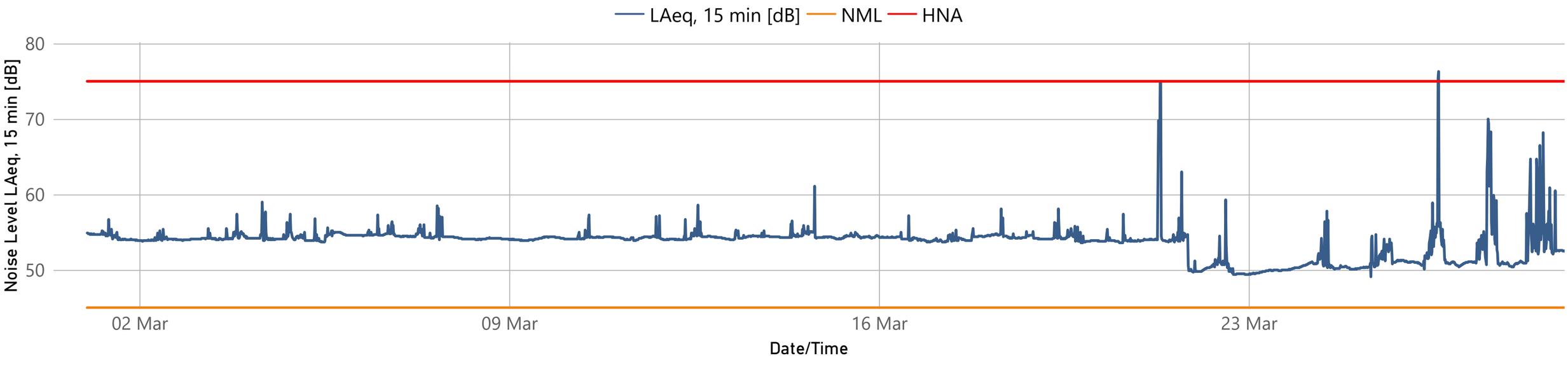
Monthly Performance within approved operating hours

Highly Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
Non-exceedance	99.93
Exceedance	0.07

Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
≤0 dB	64.71
>0 and ≤5 dB	0.03
>5 and ≤10 dB	30.45
>10 and ≤15 dB	3.73
>15 and ≤20 dB	0.47
>20 dB	0.61



PRJ-000719 - Lendlease Construction
Liverpool Health and Academic Precinct - Stage 2
Noise Monitoring Summary Chart - Ingham Institute

March 2025

Overall Project Performance within approved operating hours

Highly Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
Non-exceedance	99.89
Exceedance	0.11

Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
≤0 dB	71.58
>0 and ≤5 dB	27.13
>5 and ≤10 dB	0.75
>10 and ≤15 dB	0.23
>15 and ≤20 dB	0.14
>20 dB	0.16

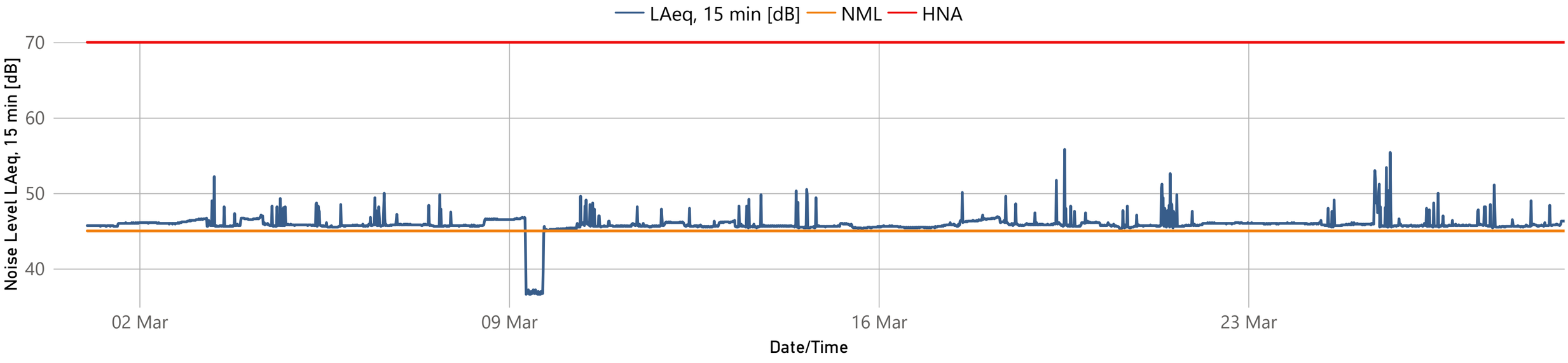
Monthly Performance within approved operating hours

Highly Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
Non-exceedance	100
Exceedance	0

Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
≤0 dB	64.71
>0 and ≤5 dB	34.69
>5 and ≤10 dB	0.54
>10 and ≤15 dB	0.07



PRJ-000719 - Lendlease Construction
Liverpool Health and Academic Precinct - Stage 2
Noise Monitoring Summary Chart - Audiology

March 2025

Overall Project Performance within approved operating hours

Highly Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
Non-exceedance	99.99
Exceedance	0.01

Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
≤0 dB	96.71
>0 and ≤5 dB	2.69
>5 and ≤10 dB	0.43
>10 and ≤15 dB	0.02
>15 and ≤20 dB	0.01
>20 dB	0.14

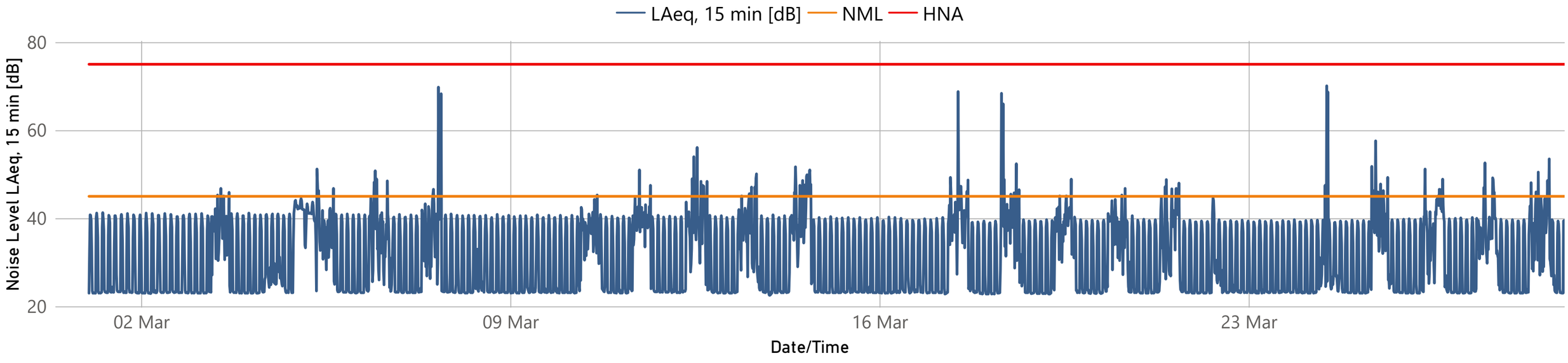
Monthly Performance within approved operating hours

Highly Noise Affected NML - LAeq, 15min [dB]

Category	Percentage [%]
Non-exceedance	100
Exceedance	0

Noise Affected NML - LAeq, 15min [dB]

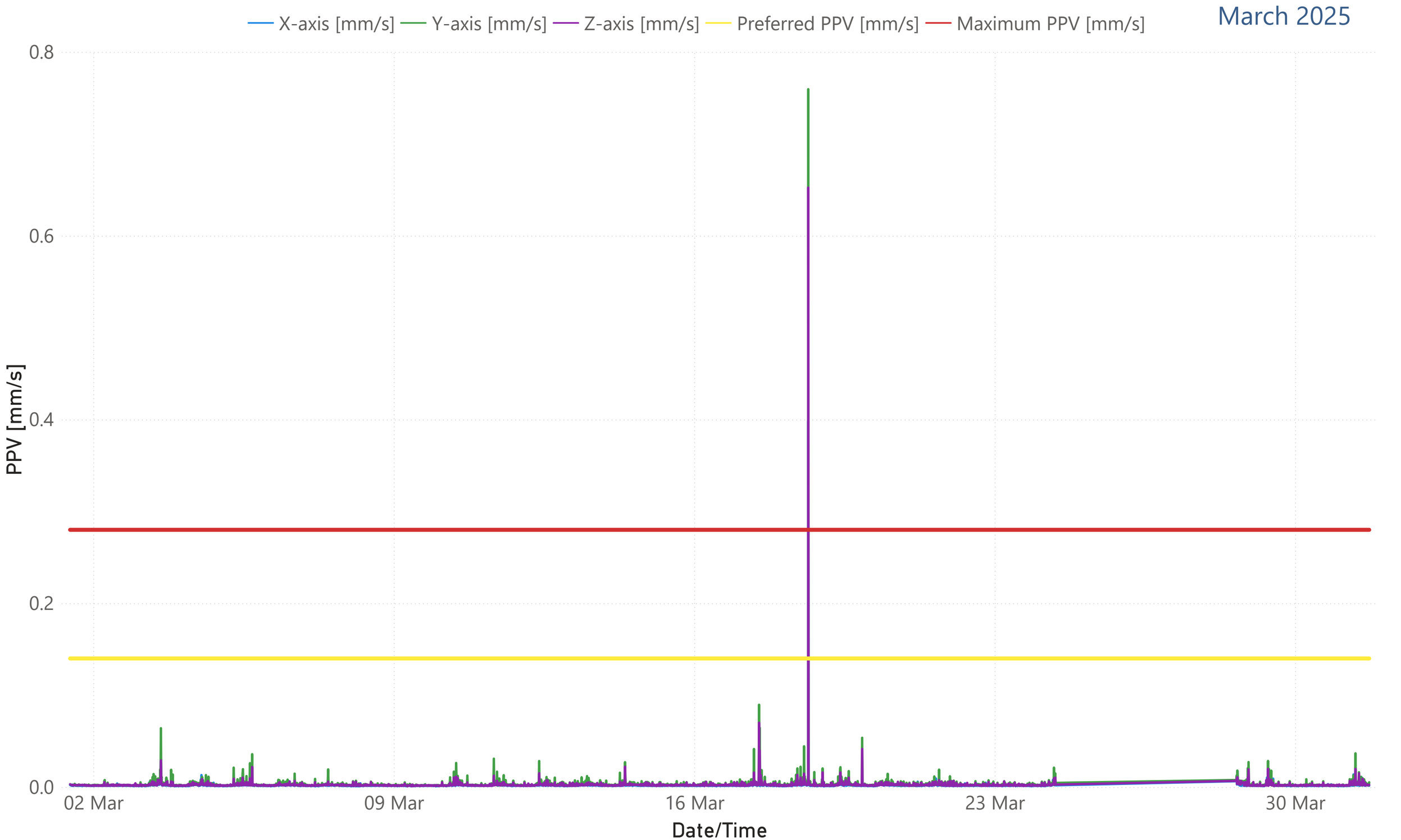
Category	Percentage [%]
≤0 dB	96.47
>0 and ≤5 dB	2.69
>5 and ≤10 dB	0.44
>10 and ≤15 dB	0.07
>20 dB	0.34



APPENDIX C VIBRATION CHARTS

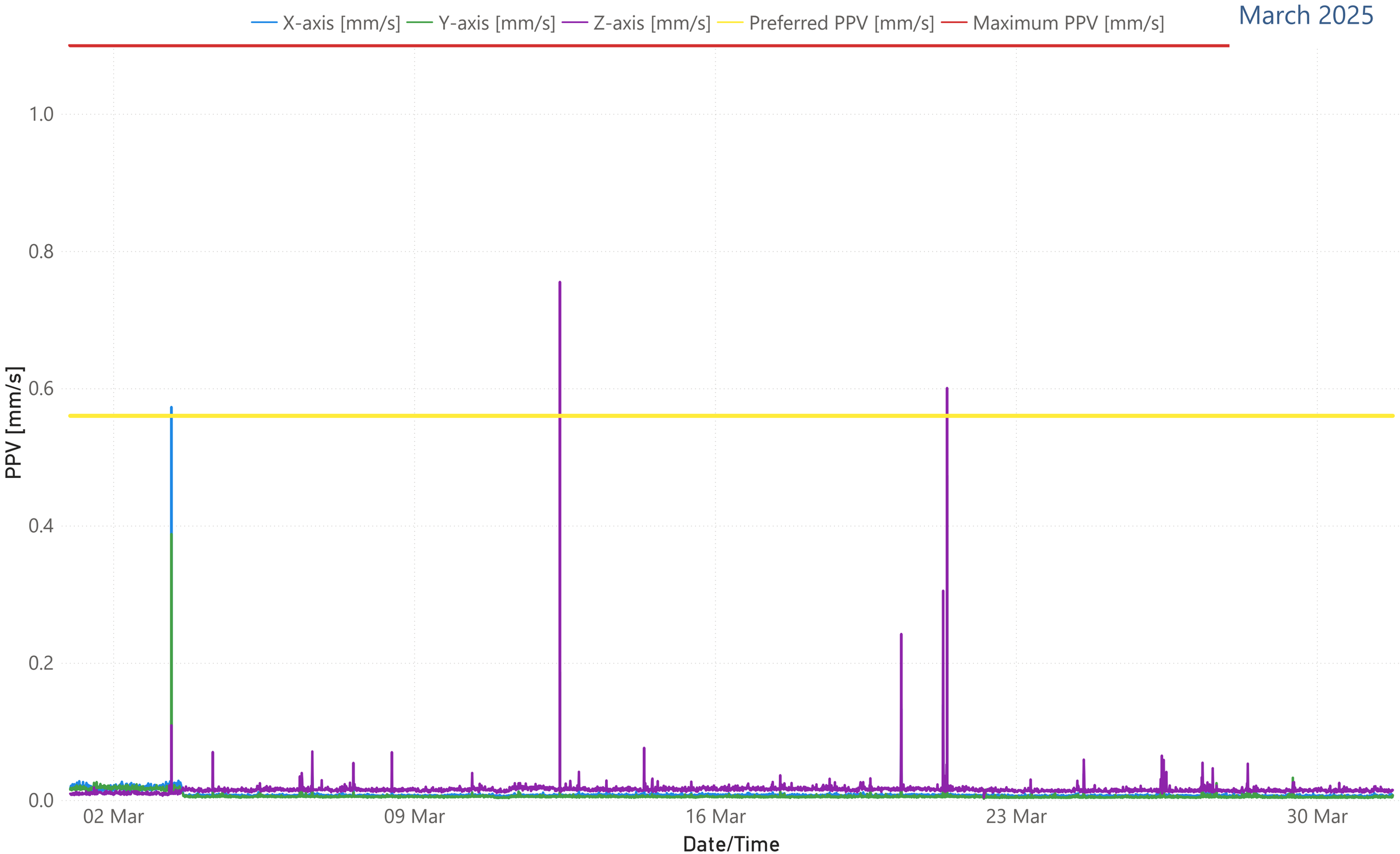
PRJ-000719 - Lendlease Construction
Liverpool Health and Academic Precinct - Stage 2
Vibration Monitoring Summary Chart - Ingham Institute

March 2025



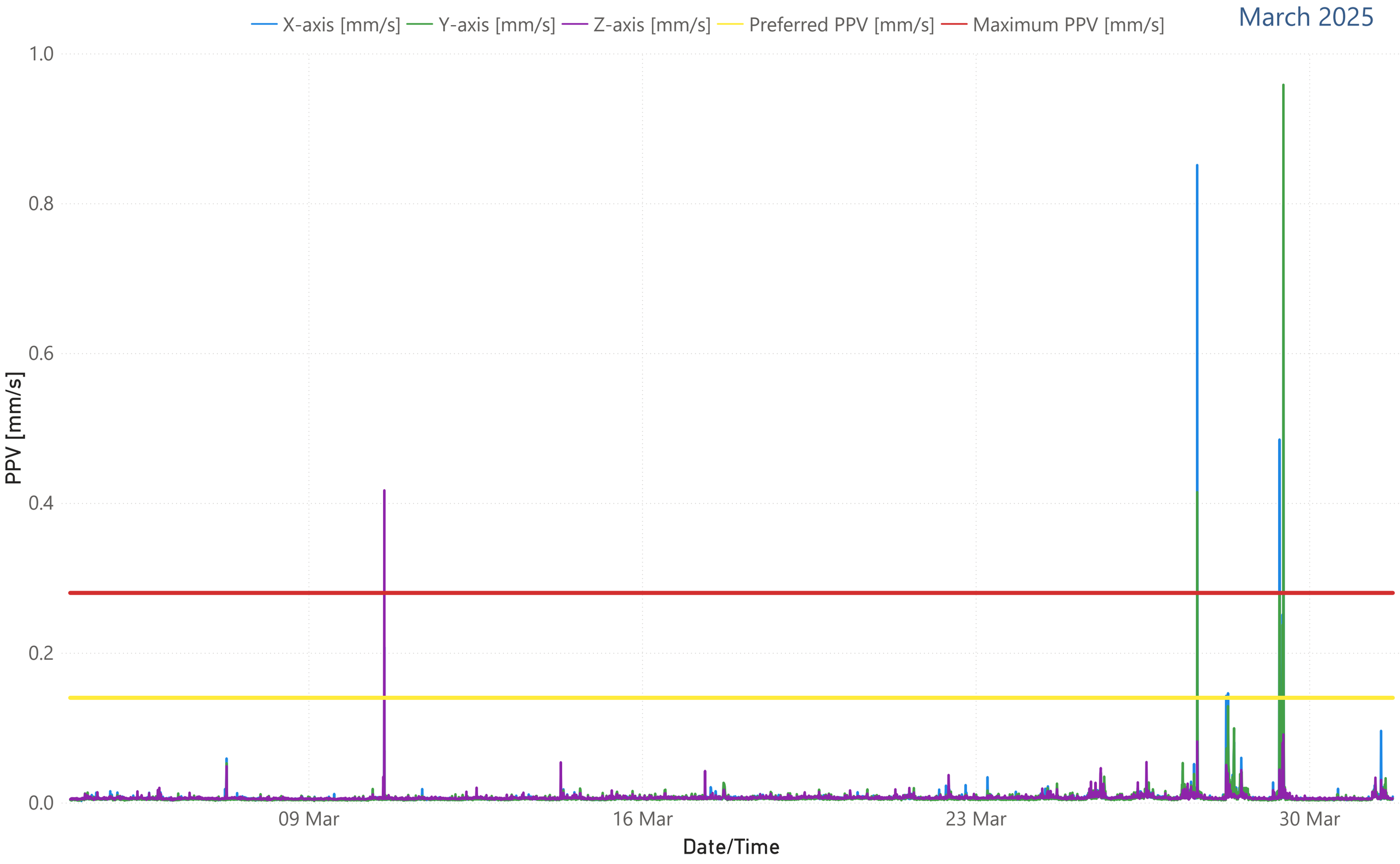
PRJ-000719 - Lendlease Construction
Liverpool Health and Academic Precinct - Stage 2
Vibration Monitoring Summary Chart - Integrated Service Building

March 2025



PRJ-000719 - Lendlease Construction
Liverpool Health and Academic Precinct - Stage 2
Vibration Monitoring Summary Chart - Oncology Bunker

March 2025



APPENDIX D CALIBRATION CERTIFICATES

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G52355

EQUIPMENT TESTED : Vibration Measuring System

Manufacturer: Svantek
Meter Type: SV 803 **Serial No:** 160000

Owner: Property Risk Australia
34-36 Ralph Street
Alexandria, NSW 2015

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 23 °C ±1° C
Relative Humidity 57 % ±5%

Date of Receipt : 07/01/2025
Date of Calibration : 07/01/2025
Date of Issue : 08/01/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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NATA
WORLD RECOGNISED
ACCREDITATION
Accredited Laboratory
No. 9262
Acoustic and Vibration
Measurements

Calibration Method

The method is described in ACU-VIB procedure AVP15, Calibration of Ground Vibration Monitors and Low Frequency Transducers, Revision 1.5 Authorised on 19th October 2023.

Test Description

Each sensor of the triaxial vibration measuring system is calibrated using the back-to-back method as described in ISO 16063-21 to provide a response according to the DIN 45669-1:2020 Standard.

The Sensor is excited using a horizontally oriented and/or a vertically oriented simple harmonic motion shaker, at listed frequencies and amplitudes.

Calibration Results

This report applies only to the item identified in the report and may not be reproduced in part. The Results are provided on pages 3 - 5 of this report including the uncertainity of measurements.

Metrological Traceability Statement

Acu-Vib Electronics has accreditation under ISO/IEC 17025 from NATA for calibrations at frequencies from 0.8 Hz to 10000 Hz.

Results of the tests, calibration and/or measurements included in this document are traceable to the SI units system through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

Measurement Uncertainty Statement

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated. The uncertainty only applies at the time of measurement and takes no account of any drift, environmental effects or other conditional effects that may apply afterwards. Estimation of uncertainty at any later time should consider the historical performance of the transducer and the manufacture's specifications.

Sensor Sensitivity or Calibration Factor

Where possible and permissible, the transducer sensitivity or calibration factor before and after calibration at reference conditions is noted from the system and tabulated below. The values reported here are indicative for information only as seen from the meter display.

Reference conditions are at 15.915 Hz with exciation levels of 10mms^{-1}

Reported units are in volts per meter per second.

Channel	Before Calibration	**After Calibration**
L (X)	27.38	**27.63**
T (Y)	26.97	**27.22**
V (Z)	26.91	**26.91**

NA*, Not Applicable, values left as found.

Additional Notes

Unless otherwise stated, all measurements of velocity are in Peak.

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Horizontal Geophone Serial No: 3240000208

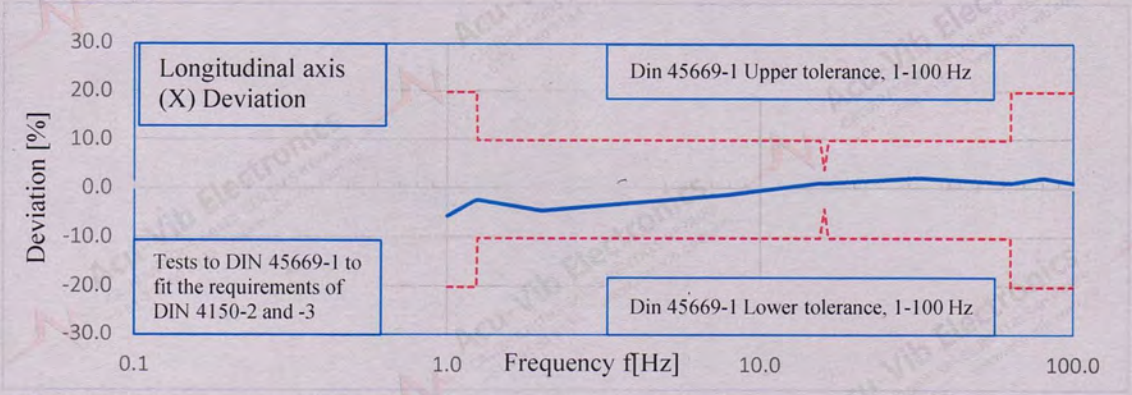
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the longitudial axis (X-axis)

Frequency	**Reference**	**Indication**	**X- Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.4	-5.6%	1.70%	± 20 %
1.25	10.0	9.8	-2.3%		
2.00	10.0	9.6	-4.5%	1.00%	± 10 %
4.00	10.0	9.2	-7.8%	0.90%	
8.00	10.0	9.9	-1.2%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.52	4.0%		
15.92	1.00	1.02	2.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.07	1.4%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.2	1.0%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.2	2.3%		± 20 %
100.00	10.0	10.1	1.2%	1.10%	
125.00	10.0	10.0	0.0%		
250.00	1.0	0.9	-10.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Horizontal Geophone Serial No: 3240000207

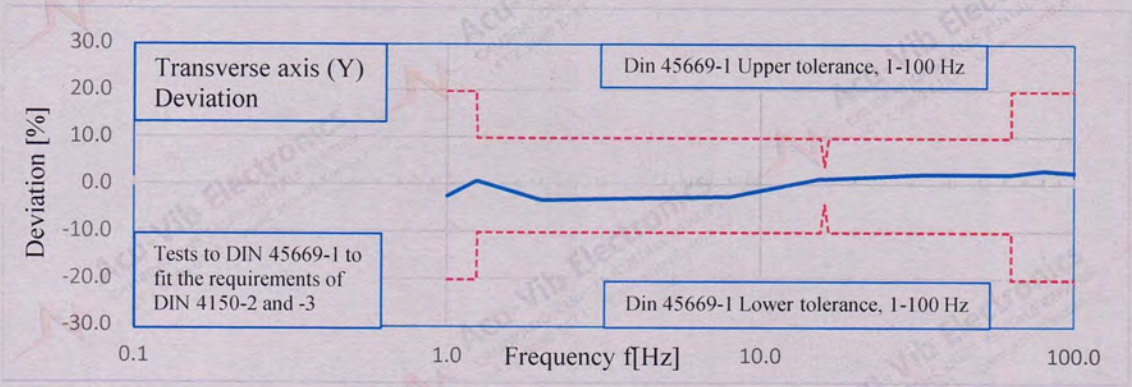
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Transverse axis (Y-axis)

Frequency	**Reference**	**Indication**	**Y-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-2.3%	1.70%	± 20 %
1.25	10.0	10.1	0.9%		
2.00	10.0	9.7	-3.1%	1.00%	± 10 %
4.00	10.0	9.1	-8.7%	0.90%	
8.00	10.0	9.8	-2.4%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.04	4.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.08	1.6%		
15.92	**10.0**	**10.2**	**1.5%**		
15.92	20.0	20.3	1.6%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.4%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.2	2.4%		
80.00	10.0	10.3	3.2%		± 20 %
100.00	10.0	10.3	2.7%	1.10%	
125.00	10.0	10.2	2.1%		
250.00	1.0	1.0	-5.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Vertical Geophone Serial No: 2240000314

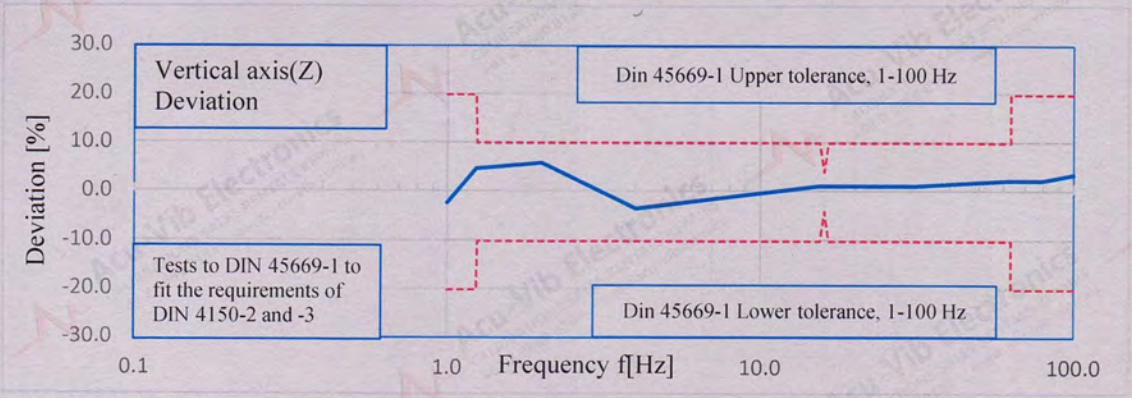
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Vertical axis (Z-axis)

Frequency	**Reference**	**Indication**	**Z-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-2.3%	1.70%	± 20 %
1.25	10.0	10.5	4.7%		
2.00	10.0	10.6	5.9%	1.00%	± 10 %
4.00	10.0	9.7	-3.4%	0.90%	
8.00	10.0	9.9	-1.1%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.21	5.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.03	3.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.07	1.4%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.0	0.2%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.1	1.2%		± 10 %
63.00	10.0	10.2	2.3%		
80.00	10.0	10.2	2.3%		± 20 %
100.00	10.0	10.4	3.5%	1.10%	
125.00	10.0	10.2	2.3%		
250.00	1.00	1.0	-2.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

-----ooooo End of report ooooo-----

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G52355

EQUIPMENT TESTED : Vibration Measuring System

Manufacturer: Svantek
Meter Type: SV 803 **Serial No:** 160000

Owner: Property Risk Australia
34-36 Ralph Street
Alexandria, NSW 2015

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 23 °C ±1° C
Relative Humidity 57 % ±5%

Date of Receipt : 07/01/2025
Date of Calibration : 07/01/2025
Date of Issue : 08/01/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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No. 9262
Acoustic and Vibration
Measurements

Calibration Method

The method is described in ACU-VIB procedure AVP15, Calibration of Ground Vibration Monitors and Low Frequency Transducers, Revision 1.5 Authorised on 19th October 2023.

Test Description

Each sensor of the triaxial vibration measuring system is calibrated using the back-to-back method as described in ISO 16063-21 to provide a response according to the DIN 45669-1:2020 Standard.

The Sensor is excited using a horizontally oriented and/or a vertically oriented simple harmonic motion shaker, at listed frequencies and amplitudes.

Calibration Results

This report applies only to the item identified in the report and may not be reproduced in part. The Results are provided on pages 3 - 5 of this report including the uncertainty of measurements.

Metrological Traceability Statement

Acu-Vib Electronics has accreditation under ISO/IEC 17025 from NATA for calibrations at frequencies from 0.8 Hz to 10000 Hz.

Results of the tests, calibration and/or measurements included in this document are traceable to the SI units system through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

Measurement Uncertainty Statement

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated. The uncertainty only applies at the time of measurement and takes no account of any drift, environmental effects or other conditional effects that may apply afterwards. Estimation of uncertainty at any later time should consider the historical performance of the transducer and the manufacture's specifications.

Sensor Sensitivity or Calibration Factor

Where possible and permissible, the transducer sensitivity or calibration factor before and after calibration at reference conditions is noted from the system and tabulated below. The values reported here are indicative for information only as seen from the meter display.

Reference conditions are at 15.915 Hz with excitation levels of 10mms^{-1}

Reported units are in volts per meter per second.

Channel	Before Calibration	**After Calibration**
L (X)	27.38	**27.63**
T (Y)	26.97	**27.22**
V (Z)	26.91	**26.91**

NA*, Not Applicable, values left as found.

Additional Notes

Unless otherwise stated, all measurements of velocity are in Peak.

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Horizontal Geophone Serial No: 3240000208

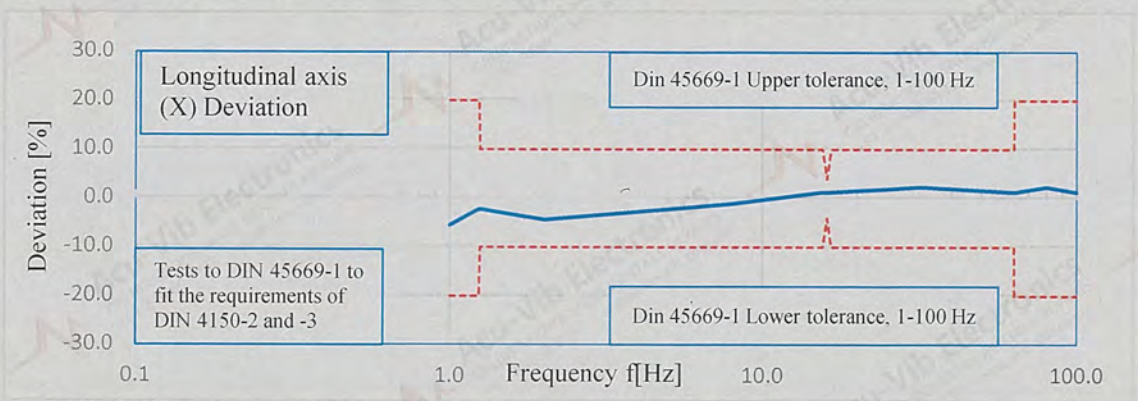
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the longitudial axis (X-axis)

Frequency	**Reference**	**Indication**	**X- Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.4	-5.6%	1.70%	± 20 %
1.25	10.0	9.8	-2.3%		
2.00	10.0	9.6	-4.5%	1.00%	± 10 %
4.00	10.0	9.2	-7.8%	0.90%	
8.00	10.0	9.9	-1.2%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.52	4.0%		
15.92	1.00	1.02	2.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.07	1.4%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.2	1.0%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.2	2.3%		± 20 %
100.00	10.0	10.1	1.2%	1.10%	
125.00	10.0	10.0	0.0%		
250.00	1.0	0.9	-10.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Horizontal Geophone Serial No: 3240000207

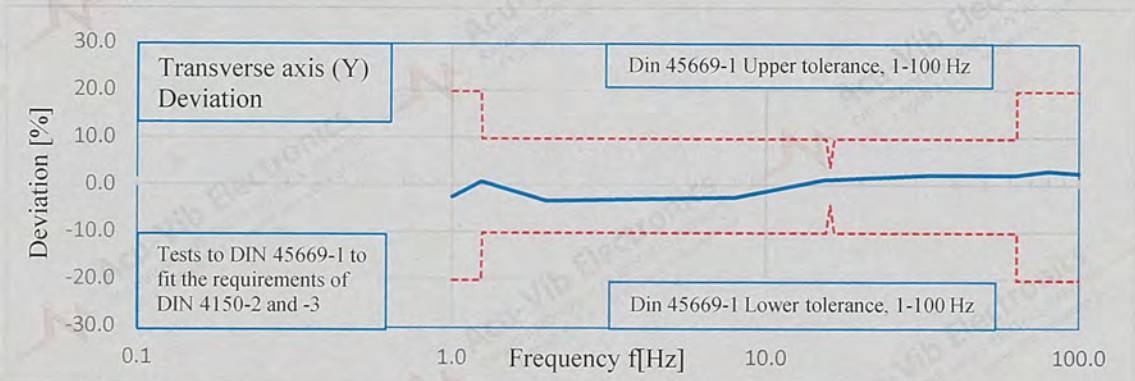
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Transverse axis (Y-axis)

Frequency	**Reference**	**Indication**	**Y-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-2.3%	1.70%	± 20 %
1.25	10.0	10.1	0.9%		
2.00	10.0	9.7	-3.1%	1.00%	± 10 %
4.00	10.0	9.1	-8.7%	0.90%	
8.00	10.0	9.8	-2.4%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.04	4.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.08	1.6%		
15.92	**10.0**	**10.2**	**1.5%**		
15.92	20.0	20.3	1.6%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.4%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.2	2.4%		
80.00	10.0	10.3	3.2%		± 20 %
100.00	10.0	10.3	2.7%	1.10%	
125.00	10.0	10.2	2.1%		
250.00	1.0	1.0	-5.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Vertical Geophone Serial No: 2240000314

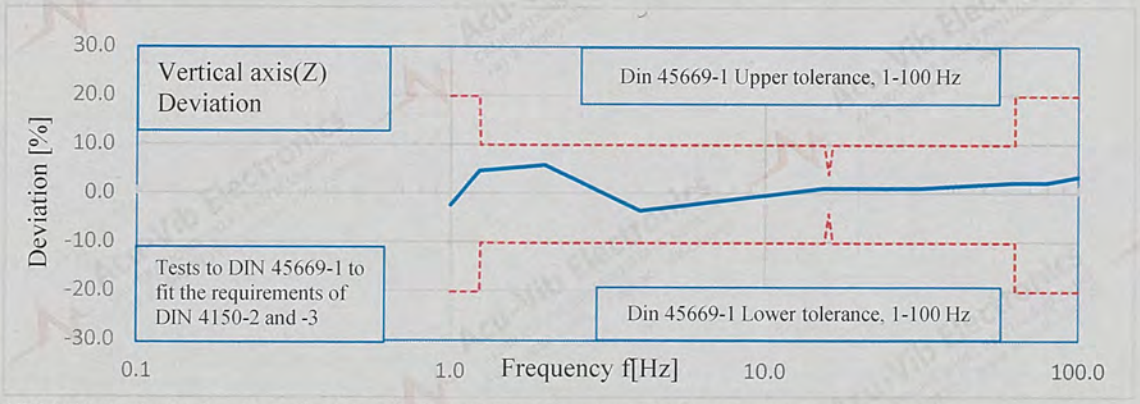
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Vertical axis (Z-axis)

Frequency	**Reference**	**Indication**	**Z-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-2.3%	1.70%	± 20 %
1.25	10.0	10.5	4.7%		
2.00	10.0	10.6	5.9%	1.00%	± 10 %
4.00	10.0	9.7	-3.4%	0.90%	
8.00	10.0	9.9	-1.1%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.21	5.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.03	3.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.07	1.4%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.0	0.2%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.1	1.2%		± 10 %
63.00	10.0	10.2	2.3%		
80.00	10.0	10.2	2.3%		± 20 %
100.00	10.0	10.4	3.5%	1.10%	
125.00	10.0	10.2	2.3%		
250.00	1.00	1.0	-2.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

-----ooooo End of report ooooo-----

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G52356

EQUIPMENT TESTED : Vibration Measuring System

Manufacturer: Svantek
Meter Type: SV 803 **Serial No:** 160001

Owner: Property Risk Australia
34-36 Ralph Street
Alexandria, NSW 2015

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 23 °C ±1° C
Relative Humidity 57 % ±5%

Date of Receipt : 07/01/2025
Date of Calibration : 07/01/2025
Date of Issue : 08/01/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: ..... Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Accredited Laboratory No. 9262
Acoustic and Vibration Measurements

Calibration Method

The method is described in ACU-VIB procedure AVP15, Calibration of Ground Vibration Monitors and Low Frequency Transducers, Revision 1.5 Authorised on 19th October 2023.

Test Description

Each sensor of the triaxial vibration measuring system is calibrated using the back-to-back method as described in ISO 16063-21 to provide a response according to the DIN 45669-1:2020 Standard.

The Sensor is excited using a horizontally oriented and/or a vertically oriented simple harmonic motion shaker, at listed frequencies and amplitudes.

Calibration Results

This report applies only to the item identified in the report and may not be reproduced in part. The Results are provided on pages 3 - 5 of this report including the uncertainity of measurements.

Metrological Traceability Statement

Acu-Vib Electronics has accreditation under ISO/IEC 17025 from NATA for calibrations at frequencies from 0.8 Hz to 10000 Hz.

Results of the tests, calibration and/or measurements included in this document are traceable to the SI units system through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

Measurement Uncertainty Statement

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated. The uncertainty only applies at the time of measurement and takes no account of any drift, environmental effects or other conditional effects that may apply afterwards. Estimation of uncertainty at any later time should consider the historical performance of the transducer and the manufacture's specifications.

Sensor Sensitivity or Calibration Factor

Where possible and permissible, the transducer sensitivity or calibration factor before and after calibration at reference conditions is noted from the system and tabulated below. The values reported here are indicative for information only as seen from the meter display.

Reference conditions are at 15.915 Hz with exciation levels of 10mms^{-1}

Reported units are in volts per meter per second.

Channel	Before Calibration	**After Calibration**
L (X)	26.21	**26.48**
T (Y)	26.73	**27.00**
V (Z)	26.79	**26.91**

NA*, Not Applicable, values left as found.

Additional Notes

Unless otherwise stated, all measurements of velocity are in Peak.

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Horizontal Geophone Serial No: 3240000211

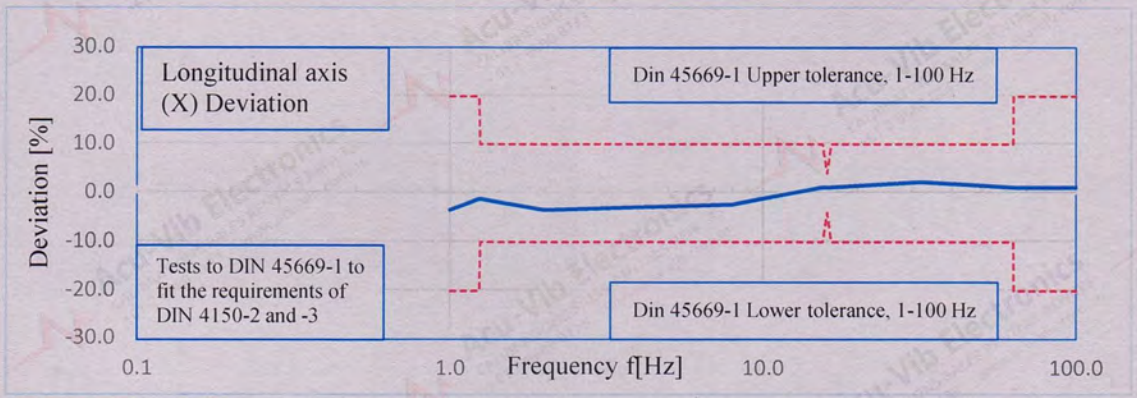
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the longitudial axis (X-axis)

Frequency	**Reference**	**Indication**	**X- Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.7	-3.4%	1.70%	± 20 %
1.25	10.0	9.9	-1.2%		
2.00	10.0	9.7	-3.4%	1.00%	± 10 %
4.00	10.0	9.2	-7.8%	0.90%	
8.00	10.0	9.8	-2.3%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.03	3.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.04	0.8%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.4	2.1%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.1	1.2%		± 20 %
100.00	10.0	10.1	1.2%	1.10%	
125.00	10.0	10.0	0.0%		
250.00	1.0	0.9	-9.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Horizontal Geophone Serial No: 3240000353

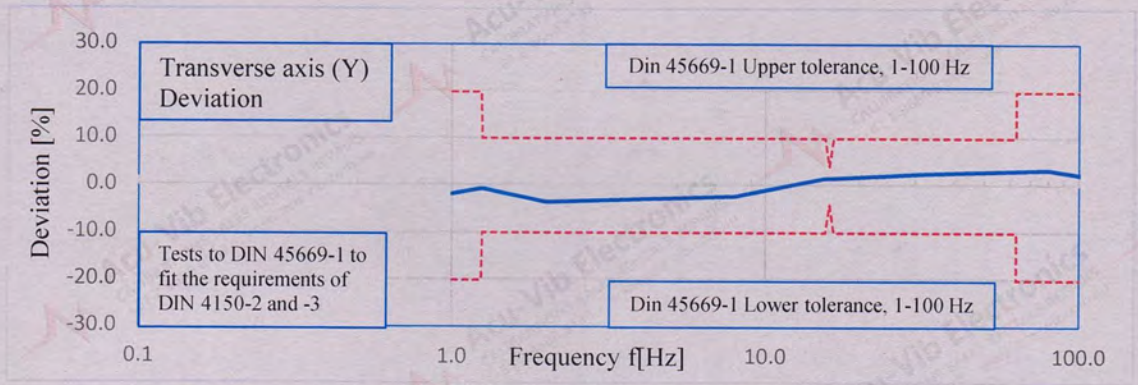
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Transverse axis (Y-axis)

Frequency	Reference	Indication	Y-Deviation	Expanded uncertainty	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**
1.00	10.0	9.8	-1.9%	1.70%	± 20 %
1.25	10.0	9.9	-0.8%		
2.00	10.0	9.6	-3.6%	1.00%	± 10 %
4.00	10.0	9.2	-8.4%	0.90%	
8.00	10.0	9.8	-2.4%		
15.92	0.10	0.11	12.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.52	4.0%		
15.92	1.00	1.02	2.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.04	0.8%		
15.92	**10.0**	**10.1**	**1.3%**		
15.92	20.0	20.3	1.3%		
15.92	50.0	50.8	1.6%		
16.00	10.0	10.1	1.4%		
32.00	10.0	10.2	2.4%		± 10 %
63.00	10.0	10.3	3.0%		
80.00	10.0	10.3	3.2%		± 20 %
100.00	10.0	10.2	2.2%	1.10%	
125.00	10.0	10.2	2.0%		
250.00	1.0	1.0	-5.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Vertical Geophone Serial No: 2240000315

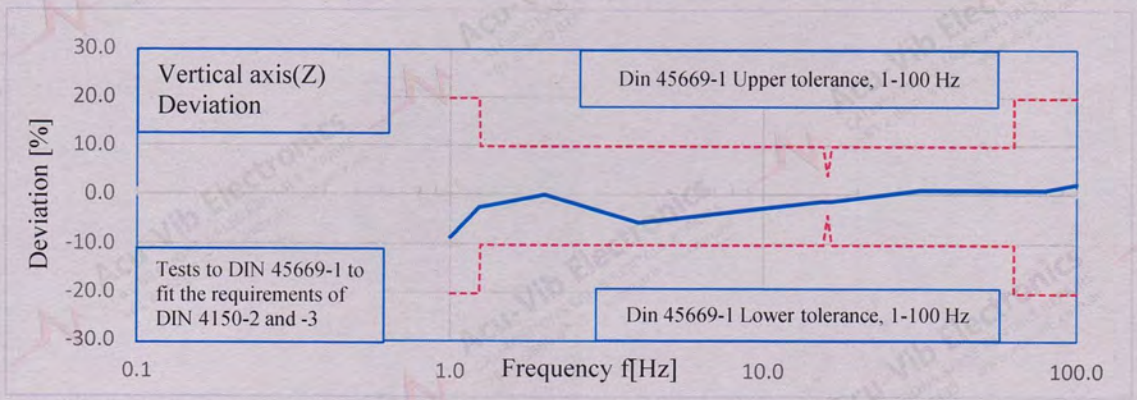
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Vertical axis (Z-axis)

Frequency	**Reference**	**Indication**	**Z-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.2	-8.5%	1.70%	± 20 %
1.25	10.0	9.8	-2.4%		
2.00	10.0	10.0	0.2%	1.00%	± 10 %
4.00	10.0	9.5	-5.5%	0.90%	
8.00	10.0	9.6	-3.6%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.54	8.0%		
15.92	1.00	1.08	8.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.02	0.4%		
15.92	**10.0**	**10.0**	**0.0%**		
15.92	20.0	20.0	0.0%		
15.92	50.0	50.0	0.0%		
16.00	10.0	9.9	-1.1%		
32.00	10.0	10.1	1.2%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.1	1.2%		± 20 %
100.00	10.0	10.2	2.4%	1.10%	
125.00	10.0	10.1	0.8%		
250.00	1.00	0.9	-6.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



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-----ooooo End of report ooooo-----

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G52356

EQUIPMENT TESTED : Vibration Measuring System

Manufacturer: Svantek
Meter Type: SV 803 **Serial No:** 160001

Owner: Property Risk Australia
34-36 Ralph Street
Alexandria, NSW 2015

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 23 °C ±1° C
Relative Humidity 57 % ±5%

Date of Receipt : 07/01/2025
Date of Calibration : 07/01/2025
Date of Issue : 08/01/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
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The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Measurements

Calibration Method

The method is described in ACU-VIB procedure AVP15, Calibration of Ground Vibration Monitors and Low Frequency Transducers, Revision 1.5 Authorised on 19th October 2023.

Test Description

Each sensor of the triaxial vibration measuring system is calibrated using the back-to-back method as described in ISO 16063-21 to provide a response according to the DIN 45669-1:2020 Standard.

The Sensor is excited using a horizontally oriented and/or a vertically oriented simple harmonic motion shaker, at listed frequencies and amplitudes.

Calibration Results

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Sensor Sensitivity or Calibration Factor

Where possible and permissible, the transducer sensitivity or calibration factor before and after calibration at reference conditions is noted from the system and tabulated below. The values reported here are indicative for information only as seen from the meter display.

Reference conditions are at 15.915 Hz with excitation levels of 10mms^{-1}

Reported units are in volts per meter per second

Channel	Before Calibration	After Calibration
L (X)	26.21	**26.48**
T (Y)	26.73	**27.00**
V (Z)	26.79	**26.91**

NA*, Not Applicable, values left as found.

Additional Notes

Unless otherwise stated, all measurements of velocity are in Peak.

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Horizontal Geophone Serial No: 3240000211

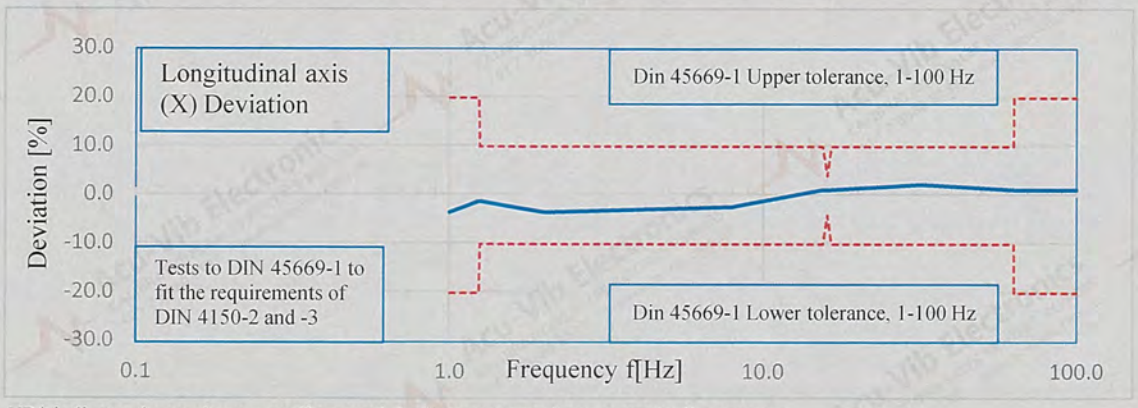
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the longitudial axis (X-axis)

Frequency	**Reference**	**Indication**	**X- Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.7	-3.4%	1.70%	± 20 %
1.25	10.0	9.9	-1.2%		
2.00	10.0	9.7	-3.4%	1.00%	± 10 %
4.00	10.0	9.2	-7.8%	0.90%	
8.00	10.0	9.8	-2.3%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.03	3.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.04	0.8%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.4	2.1%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.1	1.2%		± 20 %
100.00	10.0	10.1	1.2%	1.10%	
125.00	10.0	10.0	0.0%		
250.00	1.0	0.9	-9.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Horizontal Geophone Serial No: 3240000353

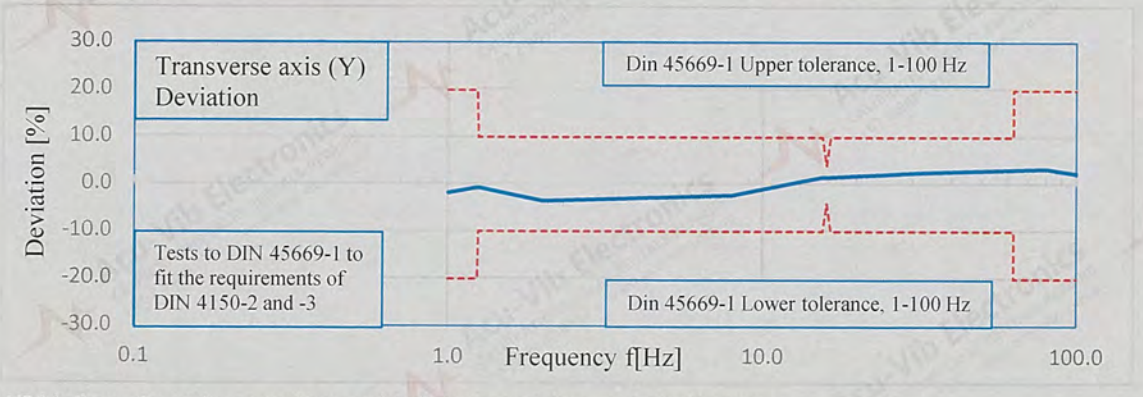
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Transverse axis (Y-axis)

Frequency	**Reference**	**Indication**	**Y-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-1.9%	1.70%	± 20 %
1.25	10.0	9.9	-0.8%		
2.00	10.0	9.6	-3.6%	1.00%	± 10 %
4.00	10.0	9.2	-8.4%	0.90%	
8.00	10.0	9.8	-2.4%		
15.92	0.10	0.11	12.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.52	4.0%		
15.92	1.00	1.02	2.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.04	0.8%		
15.92	**10.0**	**10.1**	**1.3%**		
15.92	20.0	20.3	1.3%		
15.92	50.0	50.8	1.6%		
16.00	10.0	10.1	1.4%		
32.00	10.0	10.2	2.4%		± 10 %
63.00	10.0	10.3	3.0%		
80.00	10.0	10.3	3.2%		± 20 %
100.00	10.0	10.2	2.2%	1.10%	
125.00	10.0	10.2	2.0%		
250.00	1.0	1.0	-5.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Vertical Geophone Serial No: 2240000315

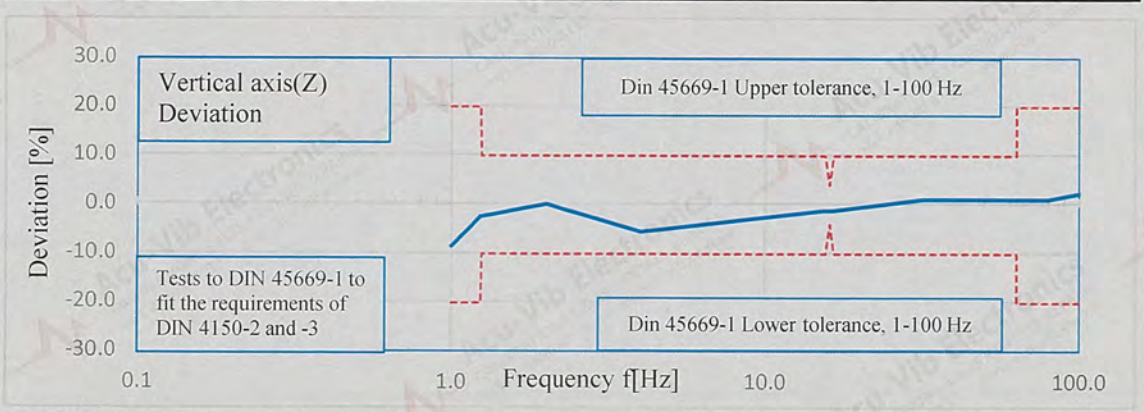
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Vertical axis (Z-axis)

Frequency	**Reference**	**Indication**	**Z-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.2	-8.5%	1.70%	± 20 %
1.25	10.0	9.8	-2.4%		
2.00	10.0	10.0	0.2%	1.00%	± 10 %
4.00	10.0	9.5	-5.5%	0.90%	
8.00	10.0	9.6	-3.6%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.54	8.0%		
15.92	1.00	1.08	8.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.02	0.4%		
15.92	**10.0**	**10.0**	**0.0%**		
15.92	20.0	20.0	0.0%		
15.92	50.0	50.0	0.0%		
16.00	10.0	9.9	-1.1%		
32.00	10.0	10.1	1.2%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.1	1.2%		± 20 %
100.00	10.0	10.2	2.4%	1.10%	
125.00	10.0	10.1	0.8%		
250.00	1.00	0.9	-6.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

-----ooooo End of report ooooo-----

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G36473

EQUIPMENT TESTED : Ground Vibration Monitor

Manufacturer: Svantek
Meter Type: SV-803 **Serial No:** 141562
Transducers A: Triaxial **Serial No:** 141562

Owner: Property Risk Australia (ACT) Pty Ltd
U2, 5-7 Kemble Court
Mitchell, ACT 2911

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 22 °C ±1° C
Relative Humidity 38 % ±5%

Date of Receipt : 14/08/2023
Date of Calibration : 14/08/2023
Date of Issue : 14/08/2023

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer) based on AS2187.2 & DIN45669-1

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Htin Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Acoustic and Vibration Measurements

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Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

Frequency response and linearity characteristics for

l Vibration Monitor type **SV 803** Serial No. **141562**

Geophone Type **Triaxial** Serial No. **141562**

Constant velocity of 10 mm/sec Peak applied for response

(Except at 250.0 Hz where applied level limited to 1.0 mm/s peak)

For amplitude linearity applied level varied at 15.915 Hz

Frequency		Expected indication mm/sec Peak	Indication mm/sec Peak			Expanded uncertainty
Hz	Radians/sec		X Channel	Y Channel	Z Channel	U_{95} %
0.796	5.0	10	NA	NA	NA	1.25%
1.592	10.0	10	10.6	10.8	10.7	1.25%
3.183	20.0	10	10.2	10.4	10.6	1.00%
4.775	30.0	10	10.0	10.1	10.4	0.90%
7.958	50.0	10	10.0	10.1	10.2	0.90%
15.915	100.0	0.5	0.52	0.53	0.55	0.90%
15.915	100.0	1	1.04	1.04	1.05	0.90%
15.915	100.0	5	5.07	5.06	5.12	0.90%
15.915	**100.0**	**10**	**10.2**	**10.1**	**10.2**	**0.90%**
15.915	100.0	20	20.4	20.3	20.7	0.90%
15.915	100.0	50	50.7	50.6	51.3	0.90%
15.915	100.0	100	102.3	101.5	103.5	0.90%
31.831	200.0	10	10.2	10.2	10.4	0.50%
79.577	500.0	10	10.4	10.3	10.4	0.50%
159.16	1000.0	10	10.5	10.7	10.8	0.50%
250.00	2000.0	1	1.09	1.19	1.07	0.50%

Note1: The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz to 5kHz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

Note2: The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated.

End of Certificate

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G52355

EQUIPMENT TESTED : Vibration Measuring System

Manufacturer: Svantek
Meter Type: SV 803 **Serial No:** 160000

Owner: Property Risk Australia
34-36 Ralph Street
Alexandria, NSW 2015

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 23 °C ±1° C
Relative Humidity 57 % ±5%

Date of Receipt : 07/01/2025
Date of Calibration : 07/01/2025
Date of Issue : 08/01/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Calibration Method

The method is described in ACU-VIB procedure AVP15, Calibration of Ground Vibration Monitors and Low Frequency Transducers, Revision 1.5 Authorised on 19th October 2023.

Test Description

Each sensor of the triaxial vibration measuring system is calibrated using the back-to-back method as described in ISO 16063-21 to provide a response according to the DIN 45669-1:2020 Standard.

The Sensor is excited using a horizontally oriented and/or a vertically oriented simple harmonic motion shaker, at listed frequencies and amplitudes.

Calibration Results

This report applies only to the item identified in the report and may not be reproduced in part. The Results are provided on pages 3 - 5 of this report including the uncertainity of measurements.

Metrological Traceability Statement

Acu-Vib Electronics has accreditation under ISO/IEC 17025 from NATA for calibrations at frequencies from 0.8 Hz to 10000 Hz.

Results of the tests, calibration and/or measurements included in this document are traceable to the SI units system through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

Measurement Uncertainty Statement

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated. The uncertainty only applies at the time of measurement and takes no account of any drift, environmental effects or other conditional effects that may apply afterwards. Estimation of uncertainty at any later time should consider the historical performance of the transducer and the manufacture's specifications.

Sensor Sensitivity or Calibration Factor

Where possible and permissible, the transducer sensitivity or calibration factor before and after calibration at reference conditions is noted from the system and tabulated below. The values reported here are indicative for information only as seen from the meter display.

Reference conditions are at 15.915 Hz with exciation levels of 10mms^{-1}

Reported units are in volts per meter per second.

Channel	Before Calibration	**After Calibration**
L (X)	27.38	**27.63**
T (Y)	26.97	**27.22**
V (Z)	26.91	**26.91**

NA*, Not Applicable, values left as found.

Additional Notes

Unless otherwise stated, all measurements of velocity are in Peak.

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Horizontal Geophone Serial No: 3240000208

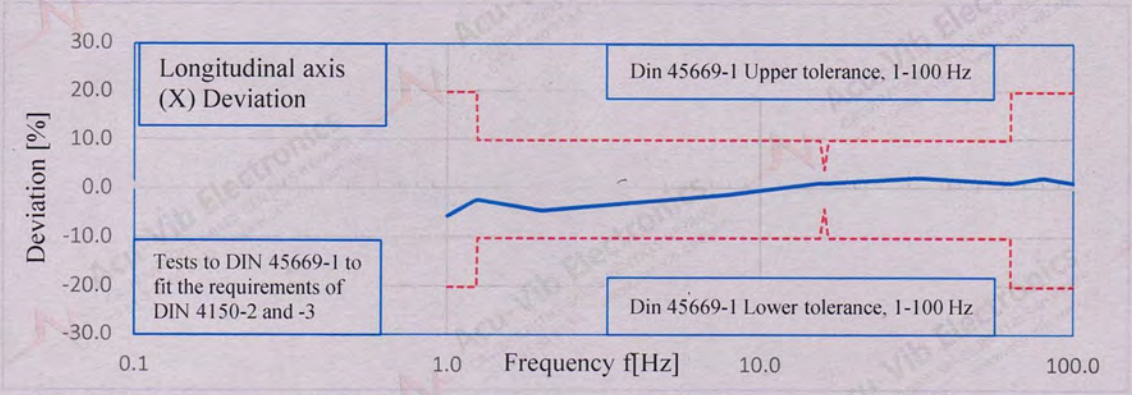
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the longitudial axis (X-axis)

Frequency	**Reference**	**Indication**	**X- Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.4	-5.6%	1.70%	± 20 %
1.25	10.0	9.8	-2.3%		
2.00	10.0	9.6	-4.5%	1.00%	± 10 %
4.00	10.0	9.2	-7.8%	0.90%	
8.00	10.0	9.9	-1.2%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.52	4.0%		
15.92	1.00	1.02	2.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.07	1.4%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.2	1.0%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.2	2.3%		± 20 %
100.00	10.0	10.1	1.2%	1.10%	
125.00	10.0	10.0	0.0%		
250.00	1.0	0.9	-10.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Horizontal Geophone Serial No: 3240000207

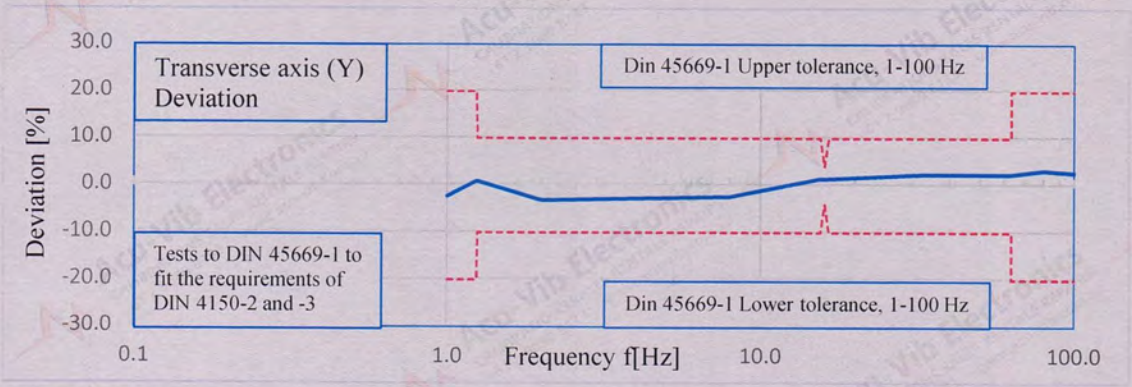
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Transverse axis (Y-axis)

Frequency	**Reference**	**Indication**	**Y-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-2.3%	1.70%	± 20 %
1.25	10.0	10.1	0.9%		
2.00	10.0	9.7	-3.1%	1.00%	± 10 %
4.00	10.0	9.1	-8.7%	0.90%	
8.00	10.0	9.8	-2.4%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.04	4.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.08	1.6%		
15.92	**10.0**	**10.2**	**1.5%**		
15.92	20.0	20.3	1.6%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.4%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.2	2.4%		
80.00	10.0	10.3	3.2%		± 20 %
100.00	10.0	10.3	2.7%	1.10%	
125.00	10.0	10.2	2.1%		
250.00	1.0	1.0	-5.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Vertical Geophone Serial No: 2240000314

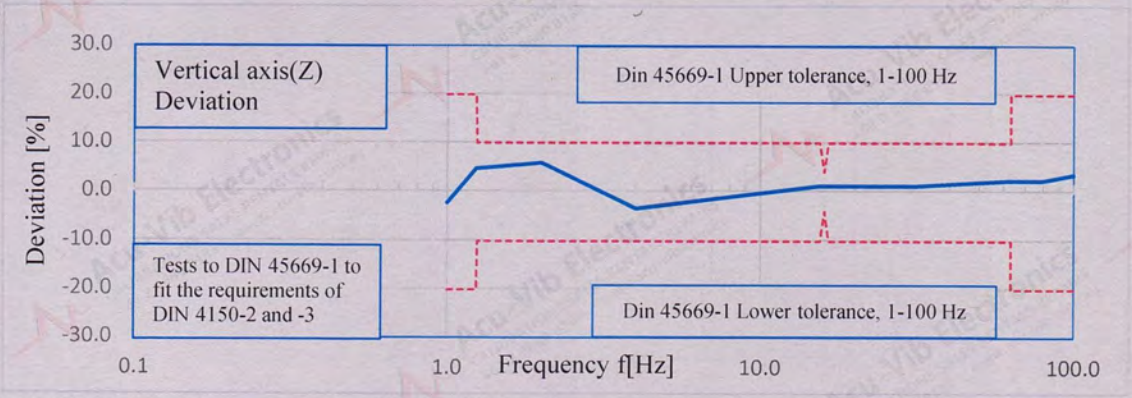
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Vertical axis (Z-axis)

Frequency	**Reference**	**Indication**	**Z-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-2.3%	1.70%	± 20 %
1.25	10.0	10.5	4.7%		
2.00	10.0	10.6	5.9%	1.00%	± 10 %
4.00	10.0	9.7	-3.4%	0.90%	
8.00	10.0	9.9	-1.1%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.21	5.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.03	3.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.07	1.4%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.0	0.2%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.1	1.2%		± 10 %
63.00	10.0	10.2	2.3%		
80.00	10.0	10.2	2.3%		± 20 %
100.00	10.0	10.4	3.5%	1.10%	
125.00	10.0	10.2	2.3%		
250.00	1.00	1.0	-2.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

-----ooooo End of report ooooo-----

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G52355

EQUIPMENT TESTED : Vibration Measuring System

Manufacturer: Svantek
Meter Type: SV 803 **Serial No:** 160000

Owner: Property Risk Australia
34-36 Ralph Street
Alexandria, NSW 2015

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 23 °C ±1° C
Relative Humidity 57 % ±5%

Date of Receipt : 07/01/2025
Date of Calibration : 07/01/2025
Date of Issue : 08/01/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Calibration Method

The method is described in ACU-VIB procedure AVP15, Calibration of Ground Vibration Monitors and Low Frequency Transducers, Revision 1.5 Authorised on 19th October 2023.

Test Description

Each sensor of the triaxial vibration measuring system is calibrated using the back-to-back method as described in ISO 16063-21 to provide a response according to the DIN 45669-1:2020 Standard.

The Sensor is excited using a horizontally oriented and/or a vertically oriented simple harmonic motion shaker, at listed frequencies and amplitudes.

Calibration Results

This report applies only to the item identified in the report and may not be reproduced in part. The Results are provided on pages 3 - 5 of this report including the uncertainty of measurements.

Metrological Traceability Statement

Acu-Vib Electronics has accreditation under ISO/IEC 17025 from NATA for calibrations at frequencies from 0.8 Hz to 10000 Hz.

Results of the tests, calibration and/or measurements included in this document are traceable to the SI units system through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

Measurement Uncertainty Statement

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated. The uncertainty only applies at the time of measurement and takes no account of any drift, environmental effects or other conditional effects that may apply afterwards. Estimation of uncertainty at any later time should consider the historical performance of the transducer and the manufacture's specifications.

Sensor Sensitivity or Calibration Factor

Where possible and permissible, the transducer sensitivity or calibration factor before and after calibration at reference conditions is noted from the system and tabulated below. The values reported here are indicative for information only as seen from the meter display.

Reference conditions are at 15.915 Hz with excitation levels of 10mms^{-1}

Reported units are in volts per meter per second.

Channel	Before Calibration	**After Calibration**
L (X)	27.38	**27.63**
T (Y)	26.97	**27.22**
V (Z)	26.91	**26.91**

NA*, Not Applicable, values left as found.

Additional Notes

Unless otherwise stated, all measurements of velocity are in Peak.

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Horizontal Geophone Serial No: 3240000208

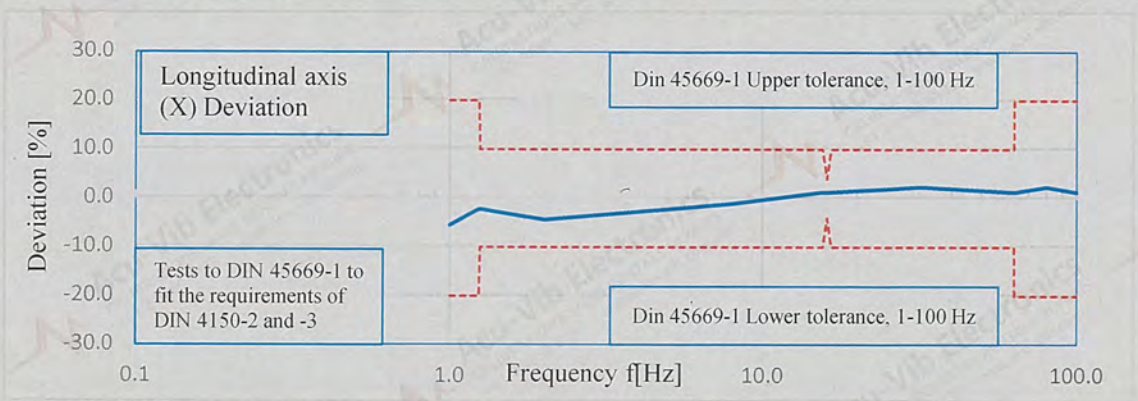
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the longitudial axis (X-axis)

Frequency	**Reference**	**Indication**	**X- Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.4	-5.6%	1.70%	± 20 %
1.25	10.0	9.8	-2.3%		
2.00	10.0	9.6	-4.5%	1.00%	± 10 %
4.00	10.0	9.2	-7.8%	0.90%	
8.00	10.0	9.9	-1.2%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.52	4.0%		
15.92	1.00	1.02	2.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.07	1.4%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.2	1.0%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.2	2.3%		± 20 %
100.00	10.0	10.1	1.2%	1.10%	
125.00	10.0	10.0	0.0%		
250.00	1.0	0.9	-10.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Horizontal Geophone Serial No: 3240000207

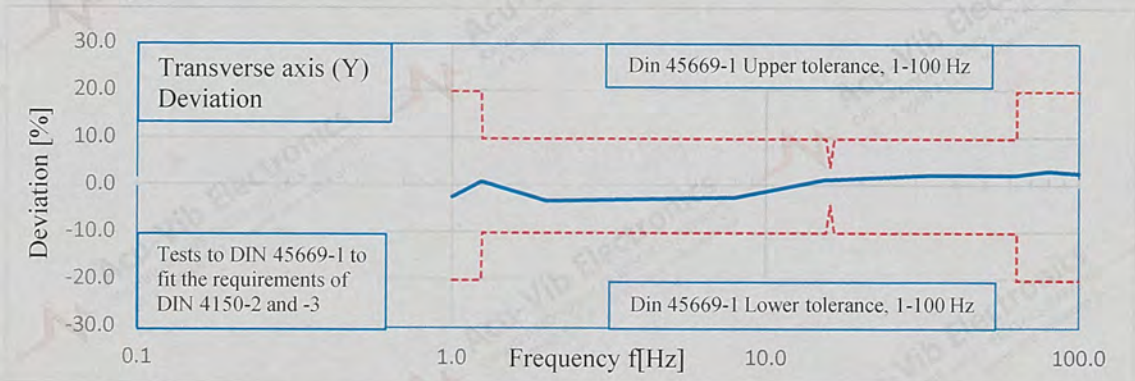
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Transverse axis (Y-axis)

Frequency	**Reference**	**Indication**	**Y-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-2.3%	1.70%	± 20 %
1.25	10.0	10.1	0.9%		
2.00	10.0	9.7	-3.1%	1.00%	± 10 %
4.00	10.0	9.1	-8.7%	0.90%	
8.00	10.0	9.8	-2.4%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.04	4.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.08	1.6%		
15.92	**10.0**	**10.2**	**1.5%**		
15.92	20.0	20.3	1.6%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.4%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.2	2.4%		
80.00	10.0	10.3	3.2%		± 20 %
100.00	10.0	10.3	2.7%	1.10%	
125.00	10.0	10.2	2.1%		
250.00	1.0	1.0	-5.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52355 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160000

Type: Vertical Geophone Serial No: 2240000314

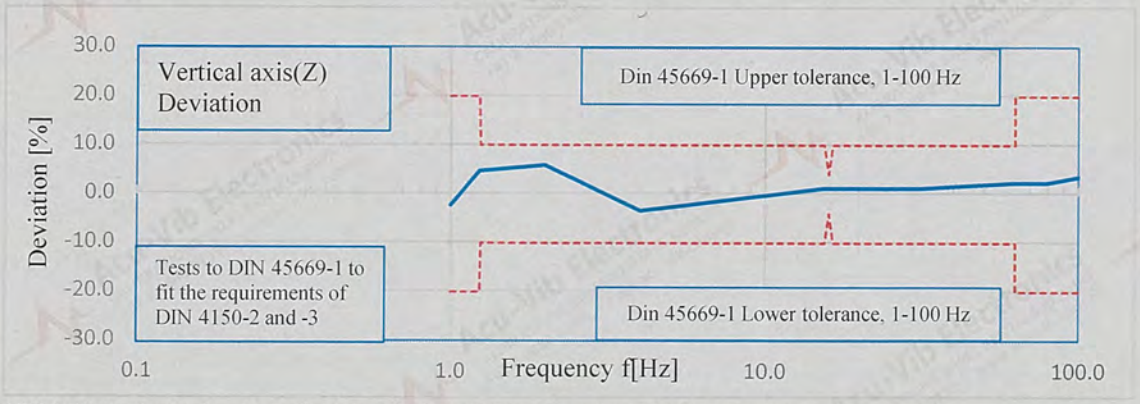
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Vertical axis (Z-axis)

Frequency	**Reference**	**Indication**	**Z-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-2.3%	1.70%	± 20 %
1.25	10.0	10.5	4.7%		
2.00	10.0	10.6	5.9%	1.00%	± 10 %
4.00	10.0	9.7	-3.4%	0.90%	
8.00	10.0	9.9	-1.1%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.21	5.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.03	3.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.07	1.4%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.0	0.2%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.1	1.2%		± 10 %
63.00	10.0	10.2	2.3%		
80.00	10.0	10.2	2.3%		± 20 %
100.00	10.0	10.4	3.5%	1.10%	
125.00	10.0	10.2	2.3%		
250.00	1.00	1.0	-2.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G52356

EQUIPMENT TESTED : Vibration Measuring System

Manufacturer: Svantek
Meter Type: SV 803 **Serial No:** 160001

Owner: Property Risk Australia
34-36 Ralph Street
Alexandria, NSW 2015

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 23 °C ±1° C
Relative Humidity 57 % ±5%

Date of Receipt : 07/01/2025
Date of Calibration : 07/01/2025
Date of Issue : 08/01/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: ..... Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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WORLD RECOGNISED ACCREDITATION
Accredited Laboratory No. 9262
Acoustic and Vibration Measurements

Calibration Method

The method is described in ACU-VIB procedure AVP15, Calibration of Ground Vibration Monitors and Low Frequency Transducers, Revision 1.5 Authorised on 19th October 2023.

Test Description

Each sensor of the triaxial vibration measuring system is calibrated using the back-to-back method as described in ISO 16063-21 to provide a response according to the DIN 45669-1:2020 Standard.

The Sensor is excited using a horizontally oriented and/or a vertically oriented simple harmonic motion shaker, at listed frequencies and amplitudes.

Calibration Results

This report applies only to the item identified in the report and may not be reproduced in part. The Results are provided on pages 3 - 5 of this report including the uncertainity of measurements.

Metrological Traceability Statement

Acu-Vib Electronics has accreditation under ISO/IEC 17025 from NATA for calibrations at frequencies from 0.8 Hz to 10000 Hz.

Results of the tests, calibration and/or measurements included in this document are traceable to the SI units system through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

Measurement Uncertainty Statement

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated. The uncertainty only applies at the time of measurement and takes no account of any drift, environmental effects or other conditional effects that may apply afterwards. Estimation of uncertainty at any later time should consider the historical performance of the transducer and the manufacture's specifications.

Sensor Sensitivity or Calibration Factor

Where possible and permissible, the transducer sensitivity or calibration factor before and after calibration at reference conditions is noted from the system and tabulated below. The values reported here are indicative for information only as seen from the meter display.

Reference conditions are at 15.915 Hz with exciation levels of 10mms^{-1}

Reported units are in volts per meter per second.

Channel	Before Calibration	**After Calibration**
L (X)	26.21	**26.48**
T (Y)	26.73	**27.00**
V (Z)	26.79	**26.91**

NA*, Not Applicable, values left as found.

Additional Notes

Unless otherwise stated, all measurements of velocity are in Peak.

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Horizontal Geophone Serial No: 3240000211

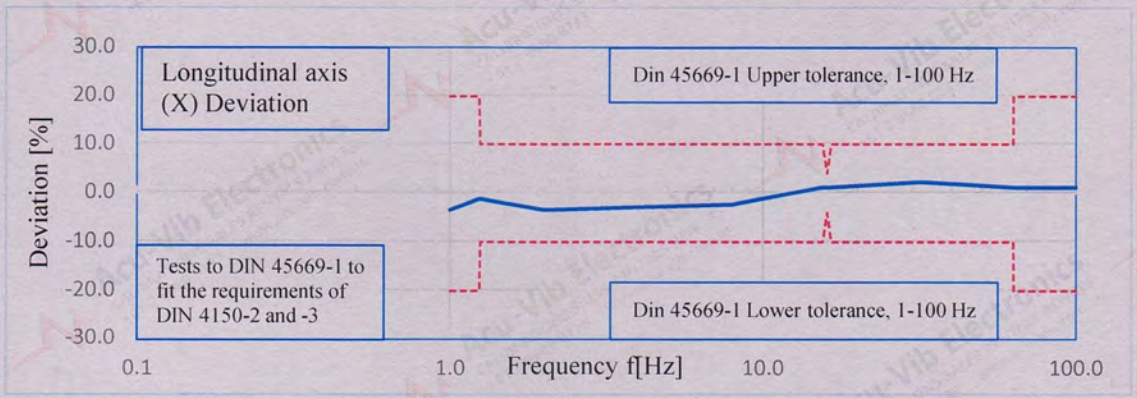
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the longitudial axis (X-axis)

Frequency	**Reference**	**Indication**	**X- Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.7	-3.4%	1.70%	± 20 %
1.25	10.0	9.9	-1.2%		
2.00	10.0	9.7	-3.4%	1.00%	± 10 %
4.00	10.0	9.2	-7.8%	0.90%	
8.00	10.0	9.8	-2.3%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.03	3.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.04	0.8%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.4	2.1%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.1	1.2%		± 20 %
100.00	10.0	10.1	1.2%	1.10%	
125.00	10.0	10.0	0.0%		
250.00	1.0	0.9	-9.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Horizontal Geophone Serial No: 3240000353

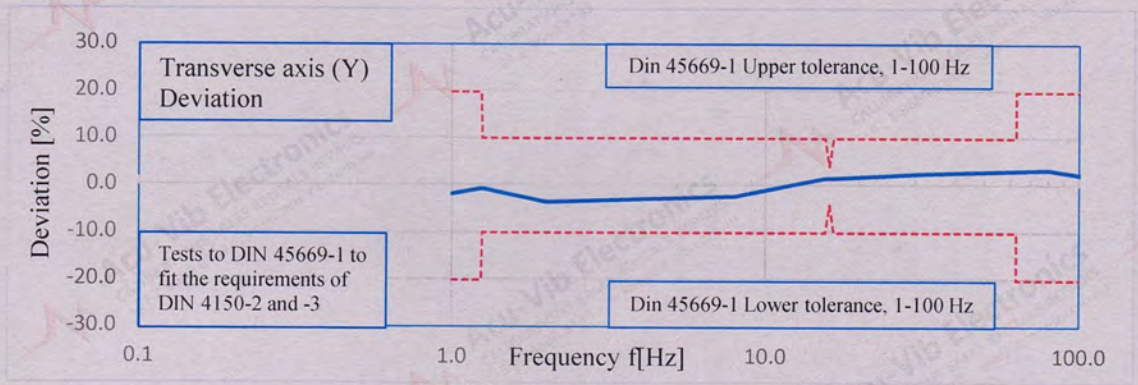
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Transverse axis (Y-axis)

Frequency	Reference	Indication	Y-Deviation	Expanded uncertainty	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**
1.00	10.0	9.8	-1.9%	1.70%	± 20 %
1.25	10.0	9.9	-0.8%		
2.00	10.0	9.6	-3.6%	1.00%	± 10 %
4.00	10.0	9.2	-8.4%	0.90%	
8.00	10.0	9.8	-2.4%		
15.92	0.10	0.11	12.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.52	4.0%		
15.92	1.00	1.02	2.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.04	0.8%		
15.92	**10.0**	**10.1**	**1.3%**		
15.92	20.0	20.3	1.3%		
15.92	50.0	50.8	1.6%		
16.00	10.0	10.1	1.4%		
32.00	10.0	10.2	2.4%		± 10 %
63.00	10.0	10.3	3.0%		
80.00	10.0	10.3	3.2%		± 20 %
100.00	10.0	10.2	2.2%	1.10%	
125.00	10.0	10.2	2.0%		
250.00	1.0	1.0	-5.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Vertical Geophone Serial No: 2240000315

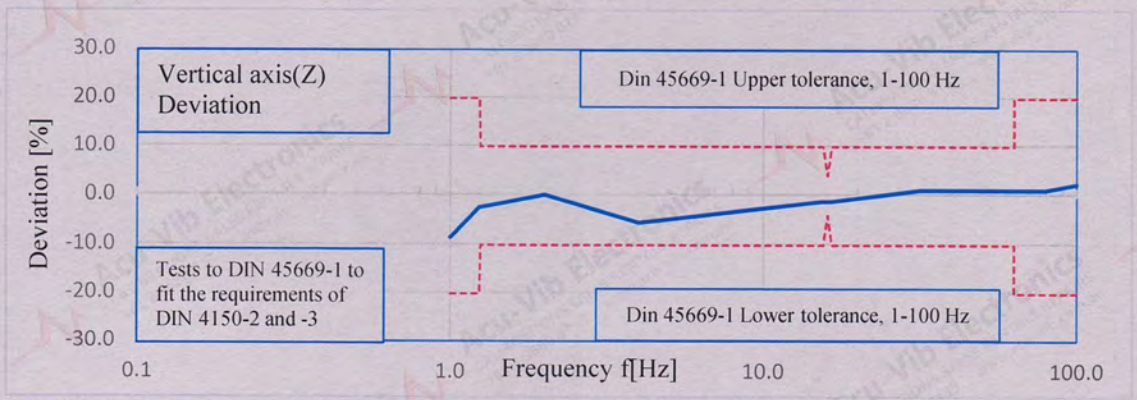
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Vertical axis (Z-axis)

Frequency	**Reference**	**Indication**	**Z-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.2	-8.5%	1.70%	± 20 %
1.25	10.0	9.8	-2.4%		
2.00	10.0	10.0	0.2%	1.00%	± 10 %
4.00	10.0	9.5	-5.5%	0.90%	
8.00	10.0	9.6	-3.6%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.54	8.0%		
15.92	1.00	1.08	8.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.02	0.4%		
15.92	**10.0**	**10.0**	**0.0%**		
15.92	20.0	20.0	0.0%		
15.92	50.0	50.0	0.0%		
16.00	10.0	9.9	-1.1%		
32.00	10.0	10.1	1.2%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.1	1.2%		± 20 %
100.00	10.0	10.2	2.4%	1.10%	
125.00	10.0	10.1	0.8%		
250.00	1.00	0.9	-6.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

-----ooooo End of report ooooo-----

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G52356

EQUIPMENT TESTED : Vibration Measuring System

Manufacturer: Svantek
Meter Type: SV 803 **Serial No:** 160001

Owner: Property Risk Australia
34-36 Ralph Street
Alexandria, NSW 2015

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 23 °C ±1° C
Relative Humidity 57 % ±5%

Date of Receipt : 07/01/2025
Date of Calibration : 07/01/2025
Date of Issue : 08/01/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Acoustic and Vibration
Measurements

Calibration Method

The method is described in ACU-VIB procedure AVP15, Calibration of Ground Vibration Monitors and Low Frequency Transducers, Revision 1.5 Authorised on 19th October 2023.

Test Description

Each sensor of the triaxial vibration measuring system is calibrated using the back-to-back method as described in ISO 16063-21 to provide a response according to the DIN 45669-1:2020 Standard.

The Sensor is excited using a horizontally oriented and/or a vertically oriented simple harmonic motion shaker, at listed frequencies and amplitudes.

Calibration Results

This report applies only to the item identified in the report and may not be reproduced in part. The Results are provided on pages 3 - 5 of this report including the uncertainty of measurements.

Metrological Traceability Statement

Acu-Vib Electronics has accreditation under ISO/IEC 17025 from NATA for calibrations at frequencies from 0.8 Hz to 10000 Hz.

Results of the tests, calibration and/or measurements included in this document are traceable to the SI units system through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

Measurement Uncertainty Statement

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated. The uncertainty only applies at the time of measurement and takes no account of any drift, environmental effects or other conditional effects that may apply afterwards. Estimation of uncertainty at any later time should consider the historical performance of the transducer and the manufacture's specifications.

Sensor Sensitivity or Calibration Factor

Where possible and permissible, the transducer sensitivity or calibration factor before and after calibration at reference conditions is noted from the system and tabulated below. The values reported here are indicative for information only as seen from the meter display.

Reference conditions are at 15.915 Hz with excitation levels of 10mms^{-1}

Reported units are in volts per meter per second

Channel	Before Calibration	After Calibration
L (X)	26.21	**26.48**
T (Y)	26.73	**27.00**
V (Z)	26.79	**26.91**

NA*, Not Applicable, values left as found.

Additional Notes

Unless otherwise stated, all measurements of velocity are in Peak.

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Horizontal Geophone Serial No: 3240000211

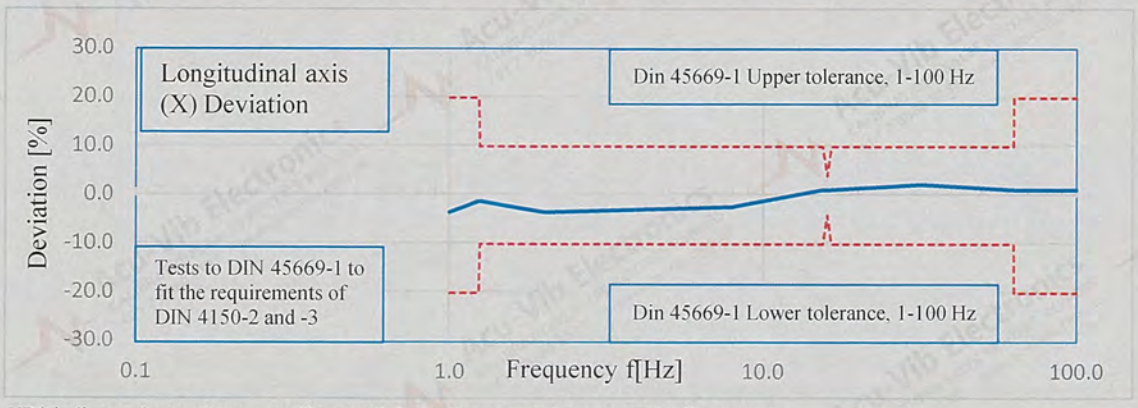
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the longitudial axis (X-axis)

Frequency	**Reference**	**Indication**	**X- Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.7	-3.4%	1.70%	± 20 %
1.25	10.0	9.9	-1.2%		
2.00	10.0	9.7	-3.4%	1.00%	± 10 %
4.00	10.0	9.2	-7.8%	0.90%	
8.00	10.0	9.8	-2.3%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.51	2.0%		
15.92	1.00	1.03	3.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.04	0.8%		
15.92	**10.0**	**10.1**	**1.2%**		
15.92	20.0	20.4	2.1%		
15.92	50.0	50.7	1.4%		
16.00	10.0	10.1	1.2%		
32.00	10.0	10.2	2.3%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.1	1.2%		± 20 %
100.00	10.0	10.1	1.2%	1.10%	
125.00	10.0	10.0	0.0%		
250.00	1.0	0.9	-9.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Horizontal Geophone Serial No: 3240000353

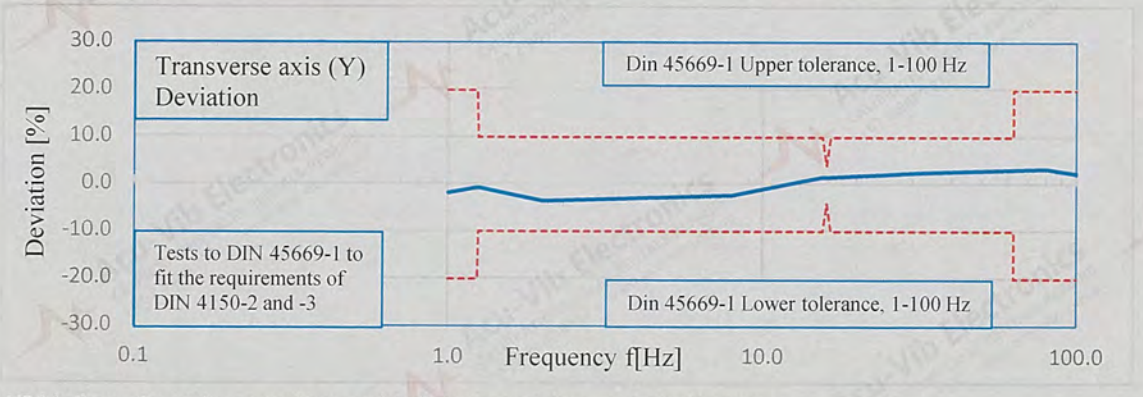
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Transverse axis (Y-axis)

Frequency	**Reference**	**Indication**	**Y-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.8	-1.9%	1.70%	± 20 %
1.25	10.0	9.9	-0.8%		
2.00	10.0	9.6	-3.6%	1.00%	± 10 %
4.00	10.0	9.2	-8.4%	0.90%	
8.00	10.0	9.8	-2.4%		
15.92	0.10	0.11	12.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.52	4.0%		
15.92	1.00	1.02	2.0%		
15.92	2.00	2.04	2.0%		
15.92	5.00	5.04	0.8%		
15.92	**10.0**	**10.1**	**1.3%**		
15.92	20.0	20.3	1.3%		
15.92	50.0	50.8	1.6%		
16.00	10.0	10.1	1.4%		
32.00	10.0	10.2	2.4%		± 10 %
63.00	10.0	10.3	3.0%		
80.00	10.0	10.3	3.2%		± 20 %
100.00	10.0	10.2	2.2%	1.10%	
125.00	10.0	10.2	2.0%		
250.00	1.0	1.0	-5.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

Test No: G 52356 Test date: 7/01/2025

Frequency response and linearity characteristics for

SVANTEK

Type: SV 803 Serial No: 160001

Type: Vertical Geophone Serial No: 2240000315

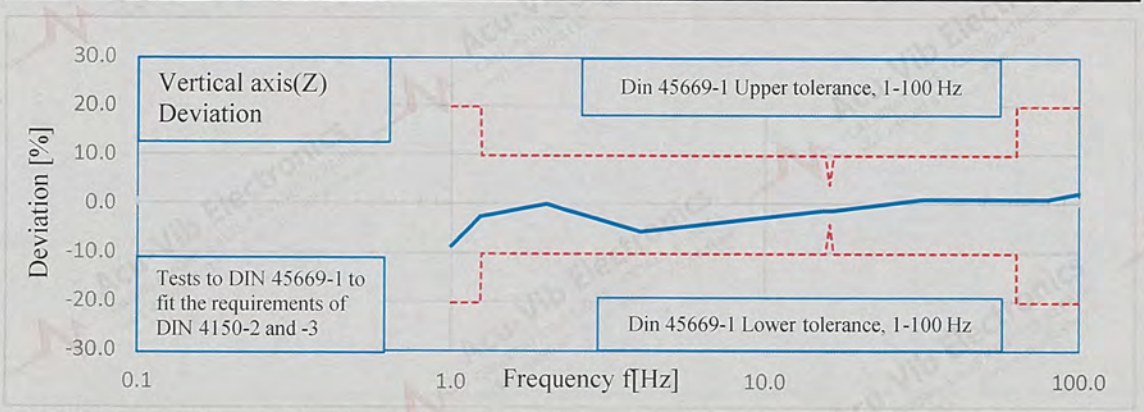
Constant velocity of 10 mm/sec (Peak) applied for response

(unless otherwise indicated)

For amplitude linearity, applied level varied at 15.915 Hz (100 radians/sec)

For the Vertical axis (Z-axis)

Frequency	**Reference**	**Indication**	**Z-Deviation**	**Expanded uncertainty**	Tolerance, (DIN 45669-1:2020-06
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	%
1.00	10.0	9.2	-8.5%	1.70%	± 20 %
1.25	10.0	9.8	-2.4%		
2.00	10.0	10.0	0.2%	1.00%	± 10 %
4.00	10.0	9.5	-5.5%	0.90%	
8.00	10.0	9.6	-3.6%		
15.92	0.10	0.11	10.0%		± 4 %
15.92	0.20	0.22	10.0%		
15.92	0.50	0.54	8.0%		
15.92	1.00	1.08	8.0%		
15.92	2.00	2.03	1.5%		
15.92	5.00	5.02	0.4%		
15.92	**10.0**	**10.0**	**0.0%**		
15.92	20.0	20.0	0.0%		
15.92	50.0	50.0	0.0%		
16.00	10.0	9.9	-1.1%		
32.00	10.0	10.1	1.2%		± 10 %
63.00	10.0	10.1	1.2%		
80.00	10.0	10.1	1.2%		± 20 %
100.00	10.0	10.2	2.4%	1.10%	
125.00	10.0	10.1	0.8%		
250.00	1.00	0.9	-6.0%		
Hz	**mms^{-1}**	**mms^{-1}**	**%**	**U_{95} %**	**%**



UR* indicates the results are non-linear and the insturment readings are under linear range

-----ooooo End of report ooooo-----

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G36473

EQUIPMENT TESTED : Ground Vibration Monitor

Manufacturer: Svantek
Meter Type: SV-803 **Serial No:** 141562
Transducers A: Triaxial **Serial No:** 141562

Owner: Property Risk Australia (ACT) Pty Ltd
U2, 5-7 Kemble Court
Mitchell, ACT 2911

Tests Performed: Measured Frequency response, Correct level display, Linearity display
Comments: Detailed overleaf.

CONDITION OF TEST:
Temperature 22 °C ±1° C
Relative Humidity 38 % ±5%

Date of Receipt : 14/08/2023
Date of Calibration : 14/08/2023
Date of Issue : 14/08/2023

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer) based on AS2187.2 & DIN45669-1

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Htin Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Lab No. 9262
Acoustic and Vibration Measurements

Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

Frequency response and linearity characteristics for

l Vibration Monitor type **SV 803** Serial No. **141562**

Geophone Type **Triaxial** Serial No. **141562**

Constant velocity of 10 mm/sec Peak applied for response

(Except at 250.0 Hz where applied level limited to 1.0 mm/s peak)

For amplitude linearity applied level varied at 15.915 Hz

Frequency		Expected indication mm/sec Peak	Indication mm/sec Peak			Expanded uncertainty
Hz	Radians/sec		X Channel	Y Channel	Z Channel	U_{95} %
0.796	5.0	10	NA	NA	NA	1.25%
1.592	10.0	10	10.6	10.8	10.7	1.25%
3.183	20.0	10	10.2	10.4	10.6	1.00%
4.775	30.0	10	10.0	10.1	10.4	0.90%
7.958	50.0	10	10.0	10.1	10.2	0.90%
15.915	100.0	0.5	0.52	0.53	0.55	0.90%
15.915	100.0	1	1.04	1.04	1.05	0.90%
15.915	100.0	5	5.07	5.06	5.12	0.90%
15.915	**100.0**	**10**	**10.2**	**10.1**	**10.2**	**0.90%**
15.915	100.0	20	20.4	20.3	20.7	0.90%
15.915	100.0	50	50.7	50.6	51.3	0.90%
15.915	100.0	100	102.3	101.5	103.5	0.90%
31.831	200.0	10	10.2	10.2	10.4	0.50%
79.577	500.0	10	10.4	10.3	10.4	0.50%
159.16	1000.0	10	10.5	10.7	10.8	0.50%
250.00	2000.0	1	1.09	1.19	1.07	0.50%

Note1: The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz to 5kHz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

Note2: The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated.

End of Certificate