Sydney Metro City and Southwest – North Corridor Works

Summary Report – NCW Noise and Vibration Monitoring – October 2019 – May 2020

Project

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12/06/2020	V0.1	LOR-NCW-Noise and Vibration Monitoring-Nov19-May20 Summary Report
29/07/2020	V0.2	Address Sydney Metro commens and reissue

1. Overview

Main North and North Shore Corridor Works Project (MNNSCW): Portion 7 - Northern Corridor Works (NCW) was carried out by Laing O'Rourke Australia Construction Pty Ltd (LOR) on behalf of Sydney Metro. LOR engaged Environmental Resources Management Australia Pty Ltd (ERM) to undertake environmental noise and vibration monitoring during select works.

The monitoring was undertaken with due regard to, and in accordance with, the NCW – Construction Noise and Vibration Management Plan (CNVMP), last updated November 2018 and other relevant policy, guidelines and standards as listed in the reference section of this report.

This technical report was prepared to summarise the results and findings of operator attended noise and vibration monitoring as well as unattended noise and vibration monitoring completed from October 2019 to May 2020 inclusive.

The noise and vibration monitoring was conducted throughout various track possession works as described in the approved Out-of-Hours Work (OOHW) application forms (OOHWAF), application numbers 31 to 39 prepared by LOR (i.e. OOHWAF031-039). LOR identified the potential for these works to generate noise and vibration impacts, and as such the monitoring was conducted (by qualified and/or suitably experienced specialists) to measure levels, evaluated compliance and provide recommendations for any new or modified mitigation.

The aim of this summary report is to provide an overview of recent monitoring activities, information on the outcomes, and any further recommendations to reduce noise and vibration-related impacts. The structure of this report is as follows:

- **Section 1 (this section)**: brief overview of the 2019-2020 monitoring period and report objectives.
- **Section 2**: summary of the monitoring conducted and technical discussion.
- **Section 3**: summary of typical monitoring outcomes and recommendations.
- **Section 4**: conclusion.
- **Appendix A**: noise and vibration monitoring methodology.

This report is supported by the *LOR-NCW-Noise and Vibration Monitoring-Oct19-May20 Addendum*, which contains monitoring location maps, recorded data sets and supporting graphs of noise and vibration monitoring conducted for each monitoring period.

2. Monitoring Summary (2019-2020)

Table 2.1 presents a summary of the noise and vibration monitoring activities, both attended and unattended, for the period inclusive of October 2019 to May 2020. The full noise and vibration data sets are provided in the *LOR-NCW-Noise and Vibration Monitoring-Oct19-May20 Addendum*.

Table 2.1 – Noise and Vibration Monitoring Events Summary

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
04.10.19 (RP40 – Hopetoun Avenue works, refer to Appendix A of the addendum document)	N/A	Hopetoun Avenue works included plant and equipment generally observed on site during monitoring: • 1 x Crane Truck + Chains • Hand tools • Light vehicles	**No complaints** were received regarding noise during the monitoring period.	Attended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the Hopetoun Avenue works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq,\ 15\ minutes}$) were between 67 - 80 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the Hopetoun Avenue works were 23 dBA **above the Noise Management Level** (NML). No unattended noise monitoring was undertaken during this period.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
11.11.19 to 15.11.19 (RP42 – MW19, refer to Appendix B of the addendum document)	OOHWAF-031	MW19 works included: • Signalling and Commissioning Construction Works • Overhead Wiring preparation works for Temporary Down Slew (TDS) • Installation and removal of OHW Structures • Delivery of materials • Down GST Installation • Material Movement	**Complaints** were received relating to demobilisation of plant and equipment through the site access point at Drake Street. Noise measurements were undertaken at Drake Street (measurement location A02) throughout the MW19 works to confirm site related noise levels	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW19 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions (Leq, 15 minutes) were between 48 - 73 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW19 works were 24 dBA **above the NML**. Comparison of site noise levels to the predicted values presented in OOHWAF-031 indicate that on average, actual emissions associated with MW19 works were 2 dBA **above the predicted values**. Exceedances in predicted values noted when several vehicles arrived and were poorly managed at the Drake Street site entrance. LOR was informed of the exceedance and the site manager co-ordinated site vehicle movements to prevent further exceedances. All relevant AMMs were in place during this activity (notification, noise monitoring and respite/alternative accommodation, where required). The exceedances did not result in the application of additional AMMs. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW19 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track the possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
16.11.19 to 17.11.19 (RP43a – WE20, refer to Appendix C of the addendum document)	OOHWAF-031	WE20 works included: • Signalling and Commissioning Construction works • Steelwork modifications- installation and removal of OHW structures • Construction of Skeleton Track • Guard Rail Installation • 11+159 Footing Construction and OHW Steel installation and removal • Temporary Cess Drains • Down on GST installation • Installation of Tuning Units and Surface Run Conduits • Demobilisation of plant at Drake Street • Stockpile Management at Lower Brand Street	**A complaint** was received during WE20 relating to noise associated with NCW activities. This complaint was received from a resident in relation to demobilisation of plant through the site access point at Drake Street. Noise measurements were undertaken at Drake Street (measurement location A01) throughout the WE20 works to confirm site related noise levels.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE20 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq,\ 15\ minutes}$) were between 46 and 70 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the WE20 works were 17 dBA **above the NML.** Comparison of site noise levels to the predicted values presented in OOHWAF-031 indicated that on average, actual emissions associated with WE20 works were 2 dBA below the predicted values. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE20 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01, UNM02, UNM03, UNM04, UNM05 and UNM06 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **generally above the NML**'s at all unattended devices, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
16.11.19 to 17.11.19 (RP43b – WE20, refer to Appendix D of the addendum document)	OOHWAF-031	WE20 works included: • Signalling and Commissioning Construction works • Steelwork modifications- installation and removal of OHW structures • Construction of Skeleton Track • Guard Rail Installation • 11+159 Footing Construction and OHW Steel installation and removal • Temporary Cess Drains • Down on GST installation • Installation of Tuning Units and Surface Run Conduits • Demobilisation of plant at Drake Street • Stockpile Management at Lower Brand Street	**No complaints** were received regarding vibration during the WE20 monitoring period.	Unattended Vibration	Vibration generated by WE20 works was at times perceptible at UVM01. When vibration-generating activities occurred the vibration generated by the works dominated the emissions perceived and detected at the receptor. General construction activities were occurring throughout WE20 however, vibration generated by the majority of works was imperceptible. Ambient vibration associated with the existing acoustics environment also remained imperceptible. Despite certain events being perceptible throughout WE20, the highest measured vibration levels (0.9 mm/s) and associated characteristic frequencies (<1Hz) are **below and compliant with the applicable BS7385 vibration guideline values**, as identified in the CNVMP.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
27.01.20 to 28.01.20 (RP44 – MW30, refer to Appendix E of the addendum document)	OOHWAF-033	MW30 works included: • Signalling and Commissioning Construction works • Standby OHW Crew • Rail Movements • Construction of Skeleton Track • St Leonards Sliding Ballast Movements • Movement of Sleepers Hampden Road • Stockpile Management • Installation of Tuning Units and Surface Run Conduits • Construction of GST • Hill Street material movement • Grouting of 225 Drainage Line • Removal of footing 10+765 • Demobilisation of plant at Drake Street • Installation of ballast mats	**No complaints** were received regarding noise and/or vibration during the MW30 monitoring period.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW30 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq,\ 15\ minutes}$) were between 23 - 73 dBA over the monitoring period, depending on the type of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW30 works were 20 dBA **above the NML**. Comparison of site noise levels to the predicted values presented in OOHWAF-033 indicated that on average, actual emissions associated with MW30 works were 2 dBA **below the predicted values** in OOHWAF-033. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW30 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track the possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at UNM01, which is expected for the type of activities being undertaken. Estimated site noise level contributions were **below the NML**'s at UNM02, with the exception of the two highest values recorded at UNM02.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
03.02.20 to 07.02.20 (RP45 – MW31, refer to Appendix F of the addendum document)	OOHWAF-034	MW31 works included: • OHW Slew Preparation • Track construction to support track slew • Hampden road material movement • Possession prep works at various locations • Construction of tuning units • Construction of GST along down cess	**Complaints** were received in relation to the operation of construction plant and equipment within the rail corridor during the MW31 monitoring period. Noise measurements were undertaken at select locations throughout MW31 works to confirm site related noise emissions and characteristics.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW31 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq,\ 15\ minutes}$) were between 30 - 66 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW31 works were 18 dBA **above the NML.** Comparison of site noise levels to the predicted values presented in OOHWAF-034 indicated that on average, actual emissions associated with MW31 works were 5 dBA **below the predicted values** in OOHWAF-034. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW31 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
08.02.20 to 09.02.20 (RP46 – WE32, refer to Appendix G of the addendum document)	OOHWAF-034	WE32 works included: • Signalling and Commissioning Construction works • Overhead wiring - temporary down shore slew • Track slew on TDS • Ballast drop and tamping • Track Adjustments • St Leonards sliding ballast movements • Stockpile management (Lower Brand St) • Construction of tuning units • Hill Street plant movement • Demobilisation of plant at Drake Street	**No complaints** were received regarding noise during the WE32 monitoring period.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE32 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq, 15\ minutes}$) were between 44 - 72 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the W32 works were 22 dBA **above the NML**. Comparison of site noise levels to the predicted values presented in OOHWAF-034 indicated that on average, actual emissions associated with W32 works were 2 dBA **below the predicted values** in OOHWAF-034. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE32 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
10.02.20 to 14.02.20 (RP47 – MW32, refer to Appendix H of the addendum document)	OOHWAF-034	MW32 works included: • Track Adjustments	**Complaints** were received in relation to the operation of construction plant and equipment within the rail corridor during the MW32 monitoring period. Noise measurements were undertaken at select locations throughout MW32 works to confirm site related noise emissions and characteristics.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW32 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq,\ 15\ minutes}$) were between 27 - 67 dBA over the monitoring period, depending on the type of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW32 works were 17 dBA **above the NML**. Comparison of site noise levels to the predicted values presented in OOHWAF-034 indicated that on average, actual emissions associated with MW32 works were 6 dBA **below the predicted values** in OOHWAF-034. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW32 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track the possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
02.03.20 to 06.03.20 (RP48 – MW35, refer to Appendix I of the addendum document)	OOHWAF-036	MW35 works included: (OOHWAF-036) • Possession Preparation Works • Track Adjustments	**Complaints** were received in relation to the operation of construction plant and equipment within the rail corridor during the MW35 monitoring period. Noise measurements were undertaken at select locations throughout MW35 works to confirm site related noise emissions and characteristics.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW35 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq,\ 15\ minutes}$) were between 30 - 61 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the MW35 works were 14 dBA **above the NML**. Comparison of site noise levels to the predicted values presented in OOHWAF-036 indicated that on average, actual emissions associated with MW35 works were 7 dBA **below the predicted values** in OOHWAF-036. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW35 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
07.03.20 to 08.03.20 (RP49 – WE36, refer to Appendix J of the addendum document)	OOHWAF-036	WE36 works included: • Removal of Redundant OHW Structures, Earthing & bonding testing and Weight Adjustments • Signal support, Signal Commissioning works and Compressed Air Removal • Move and install concrete barriers along temp alignment • Removal of OHWS Footings • Temporary Cess Drain completion • Brand Street material laydown area • Combined service route works • Demobilisation of plant • Removal and installation of Timber Isolation Fencing • Hill Street material delivery and transport to site	**No complaints** were received regarding vibration during the WE36 monitoring period.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE36 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq, 15\ minutes}$) were between 48 - 68 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average site, noise level contributions for the WE36 works were 19 dBA **above the NML**. Comparison of site noise levels to the predicted values presented in OOHWAF-036 indicated that on average, actual emissions associated with WE36 works were 3 dBA **below the predicted values** in OOHWAF-036. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the WE36 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
27.03.20 to 29.04.20 (RP50a – Special Works, refer to Appendix K of the addendum document)	N/A – Works were completed during standard construction hours.	Special Works included: • Delivery of materials and equipment • Excavation works • Compaction works • Laying new pavements (asphalt, concrete or unsealed pavements depending on the area)	**No complaints** were received regarding noise during the Special Works monitoring period.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the Special Works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects, and domestic animals), wind-blown vegetation, distant traffic and aircraft passing overhead. Measured site noise level contributions ($L_{eq, 15\ minutes}$) were between 36 - 75 dBA over the monitoring period, depending on the type of construction activity and the duration of noise events that occurred within the sample period. As works were undertaken during standard construction hours, no OOHWAF was warranted, and as such, predicted site noise levels have been compared to the noise management levels presented in the CNVMP. On average site, noise level contributions for the Special Works were 9 dBA **above the NML**. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the Special Works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • non-project related rail traffic (outside of track the possession hours) • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at UNM01 and UNM02, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
01.04.20 to 03.04.20 (RP50a – MW39, refer to Appendix K of the addendum document)	OOHWAF-039	MW39 works included: • Sign on/off at Elizabeth Street (Library), Artarmon • Installation of permanent survey plaques	**No complaints** regarding noise were received during the MW39 monitoring period.	Attended and Unattended Noise	During **attended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW39 works was generally dominated by non-project related noise emissions, including those generated by residences near the measurement position, animals (birds and insects and domestic animals), wind-blown vegetation and aircraft passing overhead. Measured site noise level contributions ($L_{eq,\ 15\ minutes}$) were between 25 - 65 dBA over the monitoring period, depending on the type (and proximity) of construction activity and the duration of noise events that occurred within the sample period. On average, site noise level contributions for the MW39 works were 11 dBA **above the NML**. Comparison of site noise levels to the predicted values presented in OOHWAF-039 indicated that on average, actual emissions associated with MW39 works were 5 dBA **below the predicted values** in OOHWAF-039. During **unattended noise monitoring**, the existing noise environment (in the absence of site noise) at the majority of community locations near to the MW39 works was generally dominated by non-project related road traffic on public roads and other non-project emissions including: • those generated by residences near the measurement position • animals (birds and insects, domestic animals) • wind-blown vegetation and aircraft passing overhead Noise at UNM01 and UNM02 was dominated by project noise emissions during times of documented activity at the site. Estimated site noise level contributions were **above the NML**'s at all unattended devices, which is expected for the type of activities being undertaken.

Date (Report - Possession Ref.)	Approvals Documentation	Summary of Works	Complaints	Monitoring Type	Discussion
27.03.20 to 29.04.20 (RP50b – Special Works / MW39, refer to Appendix L of the addendum document)	OOHWAF-039	Special Works included: • Delivery of materials and equipment. • Excavation works. • Compaction works. • Laying new pavements (asphalt, concrete or unsealed pavements depending on the area) MW39 works included: • Sign on/off at Elizabeth Street (Library), Artarmon • Installation of permanent survey plaques	**No complaints** were received regarding vibration during the Special Works / MW39 monitoring period.	Unattended Vibration	Vibration generated by Special Works / MW39 was at times perceptible at UVM02. When vibration-generating activities occurred the vibration generated by the works dominated the emissions perceived and detected at the receptor. General construction activities were occurring throughout Special Works / MW39 however, and were perceptible at times. It is expected that these activities contributed to the perceptible vibration levels and VDV exceedances. As noted above, the VDV criteria for “adverse comment possible” was exceeded on three occasions during the MW39 monitoring period, however no complaints were received during the monitoring period. It should also be noted that the vibration monitoring location was within the rail corridor i.e. much closer to the vibration generating activities than the most sensitive receptors. As a result, recorded vibration levels are higher than those that would be experienced at nearby sensitive receptors. Despite certain events being perceptible throughout Special Works / MW39, the highest measured vibration levels (6.3 mm/s and 5.7 mm/s respectively) and associated characteristic frequencies (34Hz and 34Hz respectively) are **below and compliant with the applicable BS7385 vibration guideline values**, as identified in the CNVMP.

3. Outcomes and Recommendations

Technical reports were prepared for each monitoring period throughout October 2019 to May 2020 with specific recommendations provided throughout, based on the compliance evaluation and the magnitude and extent of impacts measured and/or observed. LOR (and their sub-contractors) were successful in implementing these recommendations where feasible, reasonable, practical and safe to do so.

Examples of the noise and vibration-reducing mitigation and management measures that were implemented throughout October 2019 to May 2020 are provided below:

- **Respite management measures** i.e. providing one hour of respite between every three hours of noise-generating activities.
- Utilising the **existing rail corridor noise barriers** to reduce site emissions. Based on measurements conducted during 2019-2020, the current rail noise barrier reduced site noise emissions by approximately 10 dBA or more.
  - This measure was implemented for OOHW, particularly near the Hopetoun Avenue access/egress point (prior to its removal), and for any high noise-generating activities.
  - Additionally, temporary acoustic fencing was established along the fence line near the Drake Street site entrance, which was observed to reduce site noise emissions by approximately 5 dBA.
- Continued implementation of the **CNVMP** (established with due regard to the Construction Noise and Vibration Impact Statement (CNVIS)) during all NCW activities.
- Continued prediction of noise levels in support of the OOHWAF and ensuring that additional/all locations (e.g. where works could occur and monitoring may be required) are assessed. LOR assessed all receptors that may be impacted by a work activity to ensure additional mitigation measures were correctly applied. This information is then summarised in the OOHWAF.
- Implementation of the **Additional Mitigation Measures Matrix** (AMMM) as outlined in the CNVMP.
- **Noise (and/or vibration) monitoring** as per the requirements specified in the construction noise and vibration monitoring program established for NCW.
- Continued application the TfNSW **safe working distances for vibration intensive activities** to all works undertaken as part of the project, as far as practicable.
- Continued consideration of Peak Particle Velocity (PPV, mm/s) and Vibration Dose Values (VDV, $m/s^{1.75}$) to estimate potential for vibration generating activities to impact nearby sensitive receptors throughout future OOHWA, with reference to the Safe Working Distances of the CNVMP.
  - continuous vibration monitoring (attended or unattended) at the nearest sensitive receptors whenever vibration generating activities need to take place inside the TfNSW safe-working distances.
  - quantify the vibration levels associated with these construction activities and in the event of a complaint being received, as per the requirements specified in the construction noise and vibration monitoring program established for NCW.

Where measured noise levels were found to repeatedly exceed predicted noise levels for specific work activities, Additional Mitigation Measures were recommended as outlined in the CNVMP. Through consultation with ERM acoustics consultants, training was provided to LOR on how to predict more accurate noise levels for certain construction activities. Future OOHWAs contained more accurate predictions for work activities, which aligned more closely to measured values derived during attended noise monitoring. More accurate predictions in the OOHWA process allowed for a more appropriate level of mitigation to be applied during specific OOHW activities, to minimise impacts as much as practical during track possessions.

4. Conclusion

LOR remained aware of the potential for nuisance, or unacceptable levels of amenity to occur due to construction noise and vibration in order to appropriately manage the NCW.

Construction noise and vibration levels were reduced and impacts minimised with the successful implementation of the actions summarised in **Section 3** above.

Impacts may not always be reduced to negligible levels for all receptors during all construction activities; however, the measures summarised above have ensured that any residual impacts were minimised as far as practically achievable.

References

Laing O'Rourke - Sydney Metro City and Southwest - Northern Corridor Works - **Construction Noise and Vibration Impact Statement (CNVIS)**, prepared by ERM and last updated February 2018

Laing O'Rourke - Sydney Metro City and Southwest - Northern Corridor Works - **Construction Noise and Vibration Management Plan (CNVMP)**, prepared by ERM and dated October 2017

Laing O'Rourke - Sydney Metro City and Southwest - Northern Corridor Works - **Construction Noise and Vibration Monitoring Program**, prepared by ERM and dated October 2017

NSW Environment Protection Authority – NSW Environmental Noise Management – **Industrial Noise Policy (INP)**, January 2000 and relevant application notes

NSW Department of Environment and Climate Change – **NSW Interim Construction Noise Guideline (ICNG)**, July 2009

NSW Government – Sydney Metro **Construction Noise and Vibration Strategy (CNVS)**, August 2017

Standards Australia AS1055–1997™ (AS1055) – **Description and Measurement of Environmental Noise**, Parts 1, 2 and 3

Standards Australia AS IEC 61672.1–2004™ (AS61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring or Standards Australia AS1259.2-1990™ (AS1259) – **Acoustics – Sound Level Meters – Integrating Averaging**

Standards Australia AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) – Australian Standard™ – **Electroacoustics – Sound Calibrators**

Appendix A – Noise and Vibration Monitoring Methodology

Noise Monitoring

A summary of the noise monitoring methodology is provided below. The monitoring was conducted with due regard to and by the CNVMP and other relevant policy, guidelines and standards as listed in the reference section of this report; and as per the construction noise and vibration monitoring program established for NCW.

1. Overview

1.1 Attended noise monitoring

For all monitoring events, a qualified and suitably experienced operator visited community areas surrounding the NCW works and completed operator attended noise measurements. In all cases, the closest receptors were targeted for monitoring, with actual measurement locations selected based on the position of site works and the potentially most affected receptors.

Overall noise levels (L_{max}, L_{min}, L_{eq}, L_1, L_{10} and L_{90} in dBA) were measured at all locations. Based on the measured overall values and observations made during each operator attended noise measurement a site $L_{eq, 15minute}$ noise level contribution in dBA was determined in the absence of any influential source not associated with the project.

1.2 Unattended noise monitoring

Details of the unattended noise monitoring are summarised below:

- Unattended noise monitoring was conducted continuously at the location. Overall noise levels (L_{max}, L_{min}, L_{eq}, L_1, L_{10} and L_{90} in dBA) were measured in 15 minutes samples;
- The unattended noise monitoring devices do not directly measure the site contribution. To estimate potential site noise contributions (in the absence of any influential source not associated with the project), it has been assumed that any measured $L_{eq, 15\text{-}minute}$ noise level above 35 dBA at the noise monitoring devices are associated with the site, while works are known to be in progress. These threshold values were determined based on recent monitoring and observations completed near the site.

1.3 Monitoring Locations

Each monitoring location is individually described in the corresponding OOHW technical monitoring report.

2. Technical Requirements

All construction noise monitoring was undertaken in accordance with the "construction noise and vibration monitoring guideline" that is included in Appendix A of the Construction Noise and Vibration Strategy (CNVS) and outlines the minimum requirements for contractors undertaking monitoring on the Sydney Metro Project.

In accordance with the CNVIS, both attended and unattended measurements were the focus of all noise monitoring based on the scope of works for P7. Attended noise monitoring results fed back directly to the project team and actions taken without delay during the works.

In accordance with Condition of Approval (CoA) – C11 monitoring data was made available to the construction team, and LOR and this report can be provided to the Environmental Representative and/or Acoustics Advisor, the Department of Planning and Environment (DP&E) and the NSW Environment Protection Authority (EPA) if needed.

2.1 Noise Monitoring Equipment

All noise measurements were conducted by suitably experienced and qualified personnel with due regard to, and by, the relevant local and international standards for environmental monitoring.

The noise measurement instrumentation used to conduct the monitoring complied with the requirements of AS 61672.1 and AS/IEC 60942. Each noise device had the current National Association of Testing Authorities, Australia (NATA) calibration certificates, with certification at intervals not exceeding two years at the time of use.

Noise instrument calibration was checked prior to monitoring and again at the conclusion with no difference noted between the two measurements. A suitably experienced person has completed all data handling and analysis and subsequently reviewed by a qualified and experienced acoustician.

The equipment utilized during attended noise monitoring is provided below. The quantities of noise logging equipment varied to suit the requirements of each possession.

- ARL Ngara (Type 1) Environmental Noise Loggers:
    - Serial 8781B2, last calibration 18/01/2019
    - Serial 878184, last calibration 15/01/2019
    - Serial 87801C, last calibration 10/01/2020
- Brüel & Kjær 2250 Investigator (Type 1) Sound Analyser (Serial No. 3009001, last calibration 19/02/2020);
- NTi Audio XL2 Sound Level Meter (Serial No. A2A-06272-E0, last calibration 15/02/2019); and
- Brüel & Kjær 4231 (Type 1) Sound Level Calibrator (Serial No. 1897736, last calibration 19/02/2020).

2.2 Other requirements

All attended measurements were conducted by appropriately trained personnel in the analysis and assessment of construction noise and vibration. They are familiar with the requirements of the relevant standards and procedures.

The noise measurement procedures employed throughout the monitoring were established by the requirements of the Australian Standard (AS) 1055:1997 *Acoustics - Description and Measurement of Environmental Noise*.

Attended noise measurements were conducted by an operator using a handheld Type 1 'integrating-averaging' sound level meter. All analyses were completed with the sound level meter mounted to a tripod and with a windscreen fitted, at the height of 1.2 to 1.5 metres above the ground.

Instantaneous noise levels for all noted noise emission sources (extraneous or otherwise), meteorological conditions (average and maximum wind speeds, temperature, precipitation and cloud cover etc.) were recorded during all measurements. Relevant measurement parameters, i.e. L_{eq}, L_{min}, L_{max}, L_1, L_{10} and L_{90} were recorded in dBA. All noise samples were recorded using the "fast" time response of the sound level meter.

Noise monitoring was not completed within 3.5 metres of any reflective structure or wall, unless behind a barrier. A reduction of up to 2.5 dB was not applied to the measured ambient or site noise contribution ($L_{eq,\ 15\ minute}$ in dBA) as the barrier was reducing noise emissions from the site and in general, did not increase noise due to the reflective properties of the surface.

Noise monitoring was not completed during periods where wind speeds exceeded 5 m/s at the microphone. Noise monitoring was conducted during rain events however the rain was very light and had no effect on the measured data (if applicable).

The general setup of the sound level meter for attended noise measurements was as per Photo 4.1 of the Construction Noise and Vibration Monitoring Program established for NCW, as reproduced below as **Photo A2.1**.

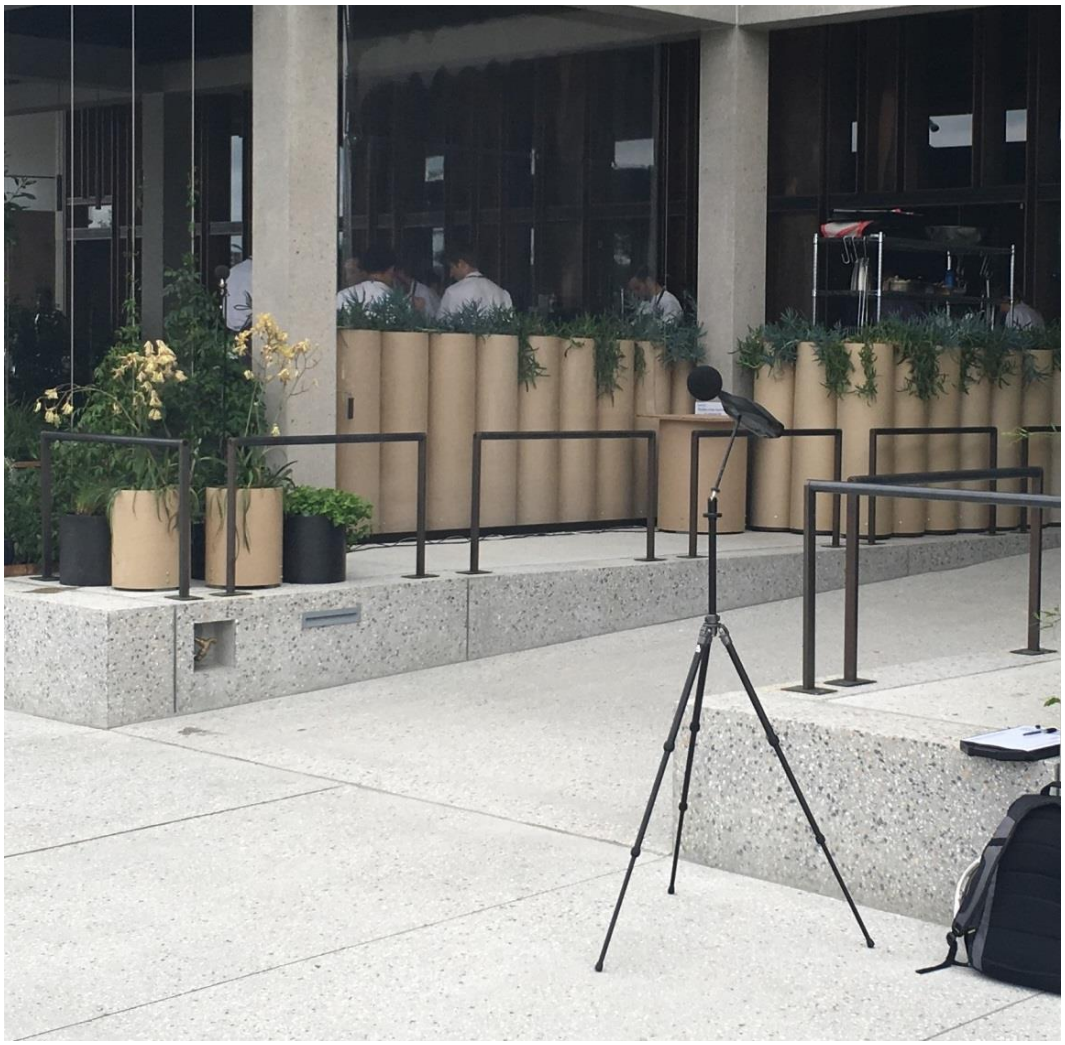

Photo A2.1: Example Attended Noise Monitoring Setup

Attended noise measurements were undertaken at the potentially most affected receptors identified in the LOR noise assessment (adapted for the phase of works) to confirm that the noise levels in the adjacent community were consistent with the predictions provided by LOR. Other potentially affected receptors were also considered as part of the monitoring regime. Monitoring occurred once works were underway but not at the commencement of activities. The duration of all community noise measurement samples was 15 minutes. The device's microphone was focused on the noise emission centre of the equipment being tested.

Vibration Monitoring Methodology

1. Monitoring Overview

1.1 Vibration Monitoring

Attended Vibration Monitoring

No attended vibration monitoring was warranted or conducted throughout the October 2019 - May 2020 period.

Unattended vibration monitoring

Unattended vibration monitoring was undertaken as requested by LOR during periods of extended, potentially vibration-generating works within the rail corridor. The closest receptors were targeted for monitoring when outside of the rail corridor, with actual measurement locations selected based on the position of site works and the potentially most affected receptors. Vibration levels were measured to determine Peak Particle Velocity (PPV, mm/s and Frequency, Hz) for structural damage, and Vibration Dose Value (VDV, in $m/s^{1.75}$) for human annoyance (in accordance with the CNVMP).

1.2 Monitoring Locations

Each monitoring location is individually described in the corresponding OOHW technical monitoring report.

1.3 Vibration Monitoring Equipment

All vibration measurements were conducted by suitably experienced and qualified ERM personnel with due regard to, and in accordance with, the relevant local and international standards for environmental monitoring.

Vibration equipment was calibrated and checked to the manufacturer's specification, with certification at intervals not exceeding one year at the time of use.

A qualified and experienced acoustician has completed all data handling and analysis.

The equipment utilized during attended noise monitoring is provided below. The quantities of vibration logging equipment varied to suit the requirements of each possession.

- Saros Minimate Plus (Series III) Environmental Vibration Monitors
    - Serial No. BE13734, last calibration 13/05/2019
    - Serial No. BE14130, last calibration 07/06/2019

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Sydney Metro City and Southwest – North Corridor Works

Addendum – NCW Noise and Vibration Monitoring – October 2019 – May 2020

Project

Title	NCW Noise and Vibration Monitoring - Addendum - October 2019 to May 2020
Client	Sydney Metro City and Southwest
Document Reference No.	LOR-NCW-Noise and Vibration Monitoring-Oct19-May20 Addendum.V01
Laing O'Rourke Project No.	K38

Document

Date	27 July 2020
Monitoring Period	October 2019 to May 2020
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Revisions

Date	Version	Description
12/06/2020	V0.1	LOR-NCW-Noise and Vibration Monitoring-Oct19-May20 Addendum
27/07/2020	V0.2	Address comments and reissue

1. Introduction

Main North and North Shore Corridor Works Project (MNNSCW): Portion 7 - Northern Corridor Works (NCW) are being carried out by Laing O'Rourke Australia Construction Pty Ltd (LOR) on behalf of Transport for New South Wales (TfNSW). LOR has engaged Environmental Resources Management Australia Pty Ltd (ERM) to undertake environmental noise and vibration monitoring during select works.

This addendum provides supporting information to LOR-NCW-Noise and Vibration Monitoring-October 2019 to May 2020 - Summary Report, which was prepared by ERM in June 2020. The addendum includes monitoring location maps, data tables and supporting graphs of noise and vibration monitoring activities in chronological order.

The structure of this addendum is as follows:

- **Appendix A - Monitoring Report (RP40):** Noise Monitoring – OOHW P7: **Hopetoun Avenue Works** - 4 October 2019.
- **Appendix B - Monitoring Report (RP42):** Noise Monitoring – OOHW P7: **MW19** - 11 to 15 November 2019.
- **Appendix C - Monitoring Report (RP43a):** Noise Monitoring – OOHW P7: **WE20** - 16 to 17 November 2019.
- **Appendix D - Monitoring Report (RP43b):** Vibration Monitoring – OOHW P7: **WE20** - 16 to 17 November 2019.
- **Appendix E - Monitoring Report (RP44):** Noise Monitoring – OOHW P7: **MW30** - 27 to 28 January 2020.
- **Appendix F - Monitoring Report (RP45):** Noise Monitoring – OOHW P7: **MW31** - 3 to 7 February 2020.
- **Appendix G - Monitoring Report (RP46):** Noise Monitoring – OOHW P7: **WE32** - 8 to 9 February 2020.
- **Appendix H - Monitoring Report (RP47):** Noise Monitoring – OOHW P7: **MW32** - 10 to 14 February 2020.
- **Appendix I - Monitoring Report (RP48):** Noise Monitoring – OOHW P7: **MW35** - 2 to 6 March 2020.
- **Appendix J - Monitoring Report (RP49):** Noise Monitoring – OOHW P7: **WE36** - 7 to 8 March 2020.
- **Appendix K - Monitoring Report (RP50a):** Noise Monitoring – OOHW P7: **Special Works / MW39** - 27 March to 29 April 2020.
- **Appendix L - Monitoring Report (RP50b):** Vibration Monitoring – OOHW P7: **Special Works / MW39** - 27 March to 29 April 2020.

Appendix A – Monitoring Report (RP40)

Noise Monitoring – OOHW P7: Hopetoun Avenue works - 4 October 2019

Figure A1.0 – Attended Noise Monitoring Locations

– NCW P7 (Friday, 4 October 2019)

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Period	Location	RBL - LA90, Period	NML - LAeq, 15 minute	Highly Noise Affected Management Level (HNAML) - LAeq, 15 minute	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to HNAML - LAeq, 15 minute	Description
Project 001	04-Oct-19	08:36	00:15:00	93.5	44.0	69.9	77.8	74.7	47.9	100	75	0.0	5.0	0.0	85	NCA01	Day	A01	42	52	75	33	23	0	A01 - Project 001-002. Measurements taken outside 13 Hopetoun Avenue. Site noise level contributions included the operation of a crane truck (and chains), hand and power tools, and clangs and bangs. Site-related noises contributed to 100% of the overall noise level. Extraneous sources were observed to include windblown vegetation and passing trains within the rail corridor.
Project 002	04-Oct-19	09:24	00:15:00	80.6	72.9	74.9	78.1	76.0	73.8	100	80	0.0	5.0	0.0	80	NCA01	Day	A01	42	52	75	38	28	5	
Project 003	04-Oct-19	09:40	00:15:00	90.7	65.1	68.4	74.9	69.5	66.4	100	73	0.0	5.0	0.0	80	NCA01	Day	A02	42	52	75	31	21	-2	A02 - Project 003-006. Measurements taken outside 12 Hopetoun Avenue. Site noise level contributions included the operation of a crane truck (and chains), hand and power tools, and clangs and bangs. Site-related noises contributed to 100% of the overall noise level. Extraneous sources were observed to include windblown vegetation and passing trains within the rail corridor.
Project 004	04-Oct-19	09:55	00:15:00	77.8	64.8	67.3	70.3	68.5	66.0	100	72	0.0	5.0	0.0	75	NCA01	Day	A02	42	52	75	30	20	-3	
Project 005	04-Oct-19	10:11	00:15:00	84.7	64.9	67.4	70.3	68.2	66.2	100	67	0.0	0.0	0.0	80	NCA01	Day	A02	42	52	75	25	15	-8	
Project 006	04-Oct-19	10:26	00:04:00	74.3	62.8	67.1	70.8	68.7	64.2	100	72	0.0	5.0	0.0	74	NCA01	Day	A02	42	52	75	30	20	-3	

Weather 4 October: Generally fine weather, hot with moderate winds. Temperatures ranged between 26 - 29 degrees Celsius over the monitoring period.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).

Appendix B – Monitoring Report (RP42)

Noise Monitoring – OOHW P7: MW19 - 11 to 15 November 2019

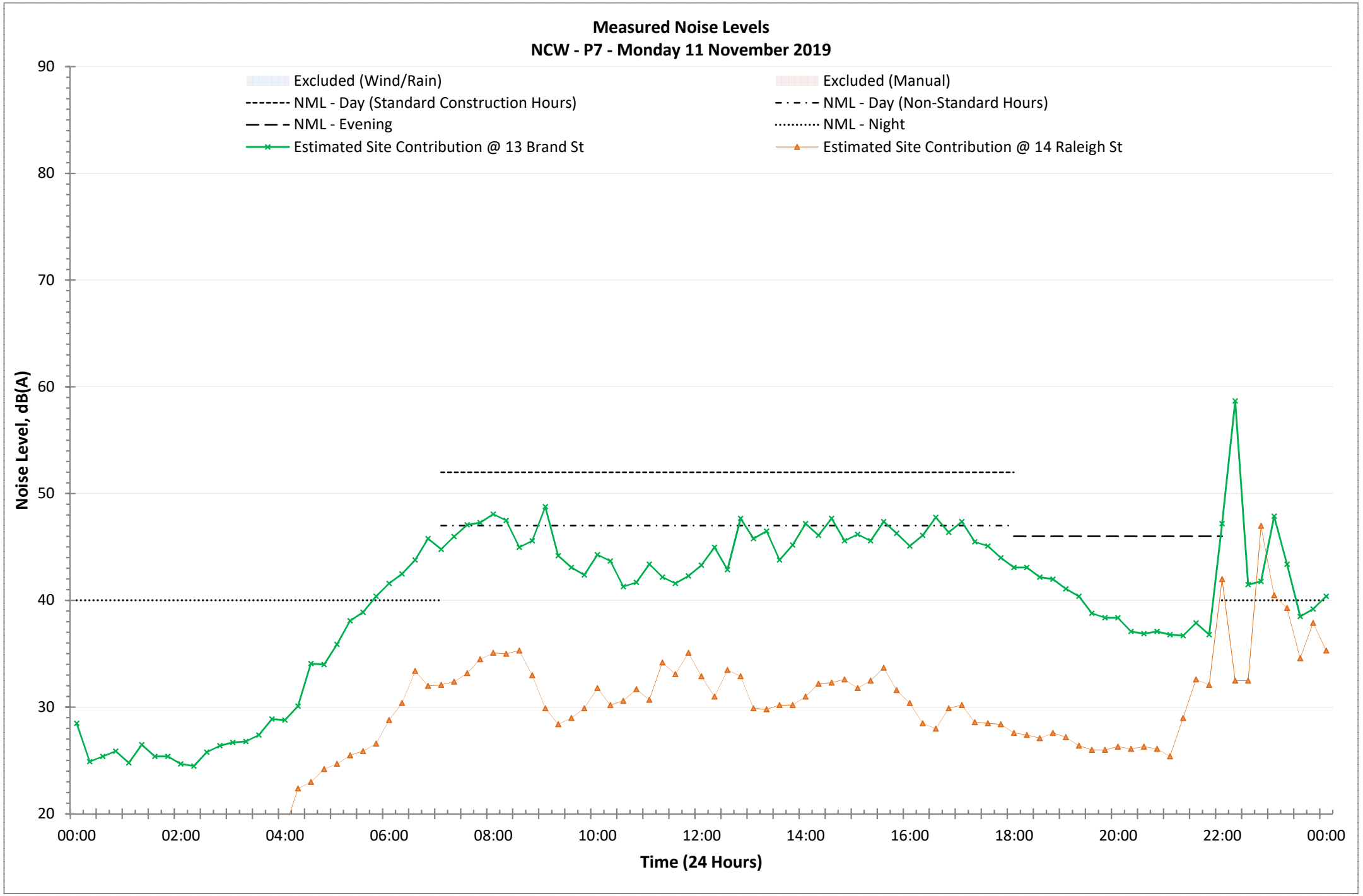
Figure A1.0 – OOHW MW19 – Attended and Unattended Noise Monitoring Locations

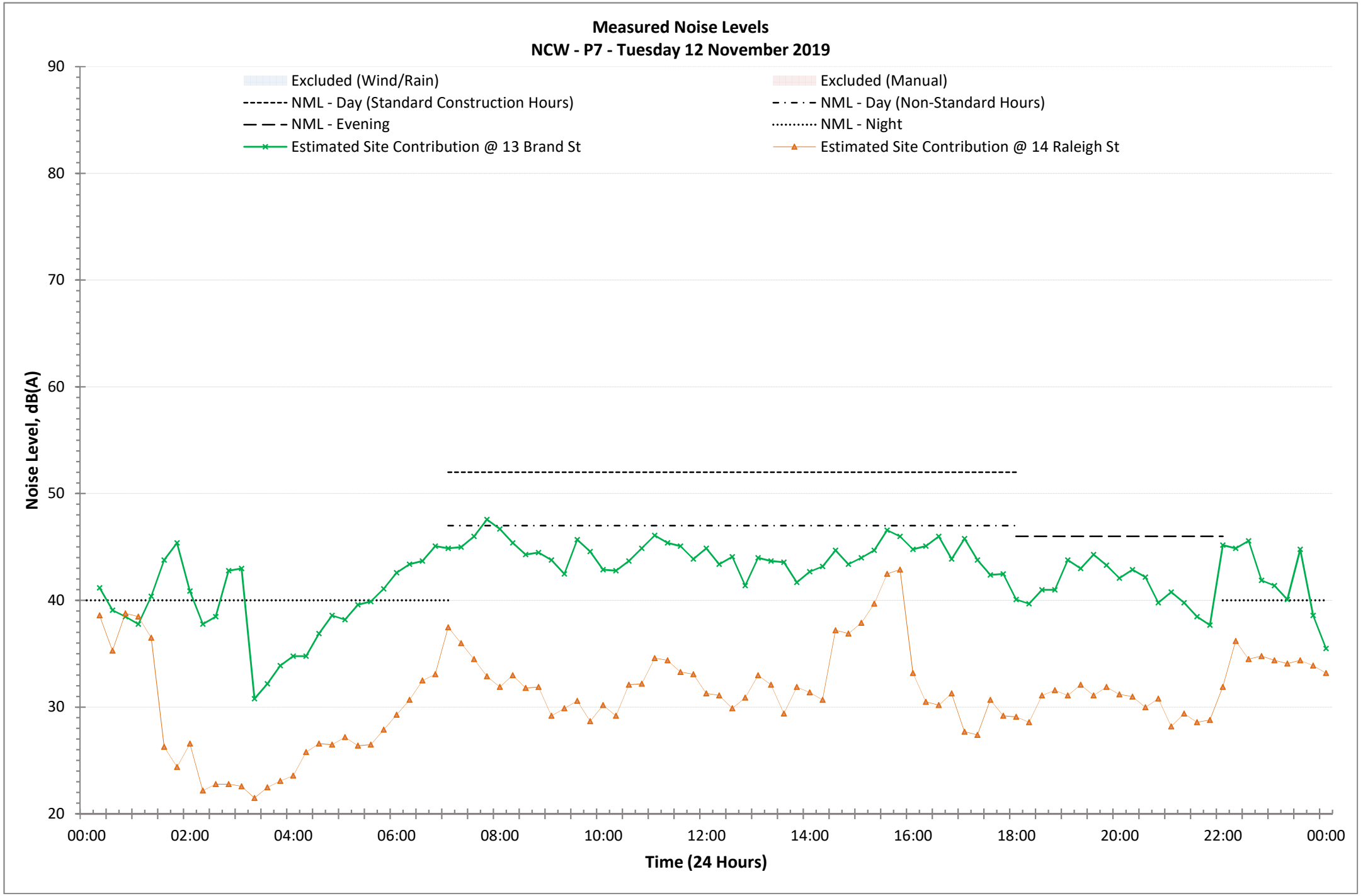
– NCW P7 (Monday, 11 November to Friday, 15 November 2019)

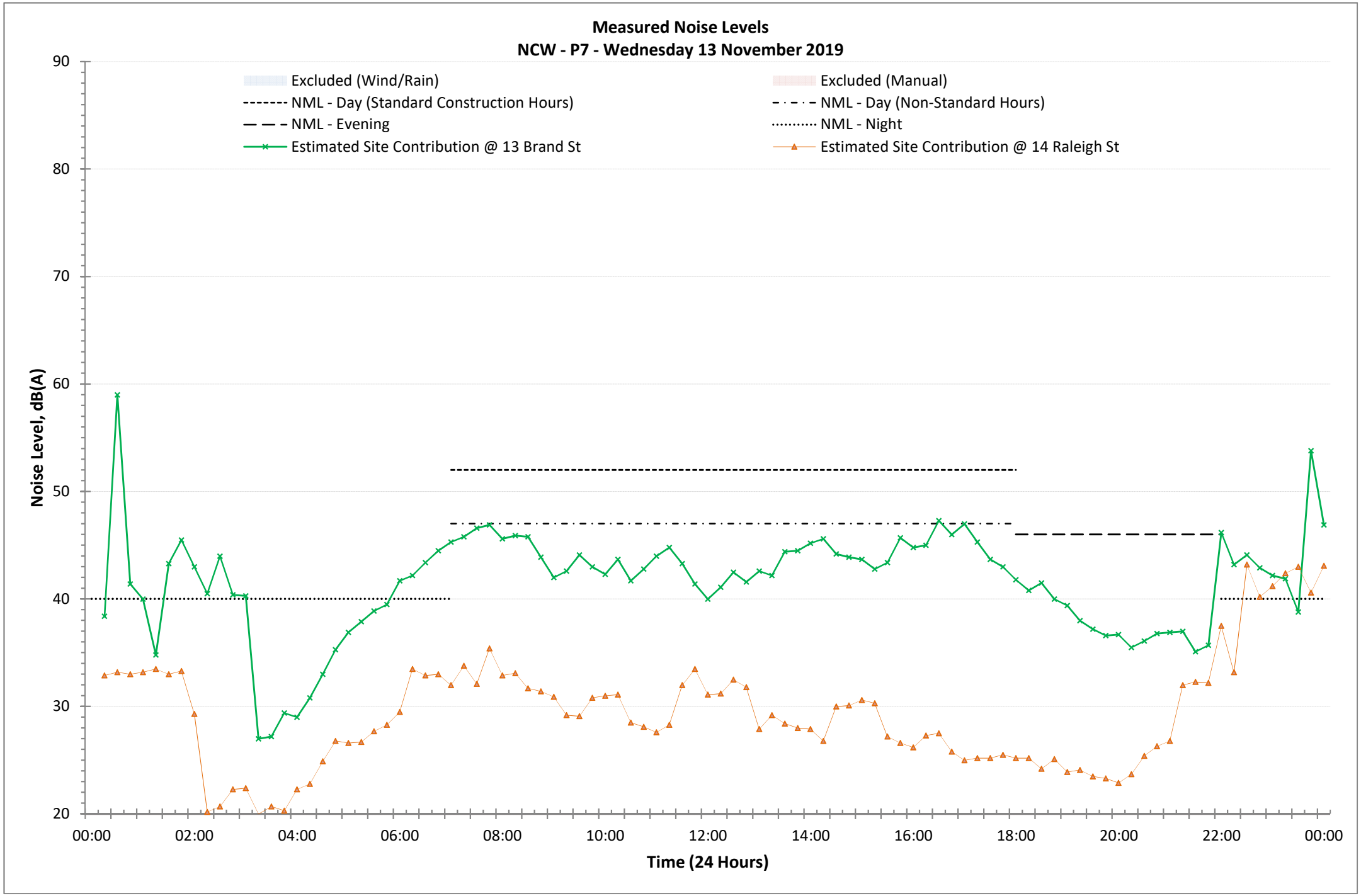
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Period	Location	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 001	11-Nov-19	22:17	00:15:00	84.0	50.1	63.2	73.6	65.6	56.5	100	63	0.0	0.0	0.0	75	NCA01	Night	A01	35	40	65	50	28	23	-2	25	A01 - Project 001. Measurement take outside 10 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from movement and unloading of plant and machinery, clangs and bangs, and site access/egress of work vehicles. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 002	11-Nov-19	23:21	00:15:00	63.3	49.4	51.3	57.7	51.8	50.2	100	51	0.0	0.0	0.0	60	NCA01	Night	A02	35	40	53	50	16	11	-2	10	A02 - Project 002-004. Measurements take outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, delivery of material and equipment, and the operation of excavators and other hi-rail plant within the rail corridor. Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 003	11-Nov-19	23:44	00:15:00	89.8	52.4	68.2	75.8	70.4	57.4	100	73	0.0	5.0	0.0	85	NCA01	Night	A02	35	40	65	50	38	33	8	35	
Project 004	12-Nov-19	00:00	00:15:00	78.6	53.4	64.2	74.0	67.0	54.9	100	69	0.0	0.0	5.0	77	NCA01	Night	A02	35	40	65	50	34	29	4	27	
Project 005	12-Nov-19	00:30	00:15:00	79.1	52.8	59.5	67.1	62.6	54.3	100	59	0.0	0.0	0.0	79	NCA01	Night	A03	35	40	63	50	24	19	-4	29	A03 - Project 005. Measurement undertaken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from the and the operation of excavators and other hi-rail plant within the rail corridor, the distribution of ballast along the train line, clangs and bangs and OHW works. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were identified to include crickets and loud passing cars.
Project 006	12-Nov-19	01:15	00:04:00	69.2	51.1	56.4	63.5	60.4	52.5	100	56	0.0	0.0	0.0	64	NCA01	Night	A02	35	40	53	50	21	16	3	14	A02 - Project 006. Measurement take outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant within the rail corridor, clangs and bangs, and site access/egress of work vehicles. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 007	12-Nov-19	01:45	00:15:00	66.2	45.3	51.7	59.5	55.0	46.8	100	57	0.0	5.0	0.0	63	NCA01	Night	A04	35	40	56	50	22	17	1	13	A04 - Project 007-008. Measurements take outside 12 Hopetoun Avenue, Chatswood, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement and operation of excavators and other hi-rail plant within the rail corridor, hand tools, clangs and bangs and OHW works . Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 008	12-Nov-19	02:00	00:15:00	72.2	38.0	49.1	57.3	52.2	39.5	100	49	0.0	0.0	0.0	66	NCA01	Night	A04	35	40	48	50	14	9	1	16	
Project 009	12-Nov-19	22:22	00:15:00	93.8	52.3	67.7	78.6	68.2	55.1	100	68	0.0	0.0	0.0	92	NCA01	Night	A02	35	40	65	50	33	28	3	42	A02 - Project 009-011. Measurements take outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, delivery of material and equipment, idle plant and work vehicles at the site entrance, and the movement of equipment within the rail corridor. Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were identified to include wind-blown vegetation.
Project 010	12-Nov-19	23:25	00:15:00	81.2	51.2	65.1	71.0	66.8	55.6	100	65	0.0	0.0	0.0	75	NCA01	Night	A02	35	40	65	50	30	25	0	25	
Project 011	12-Nov-19	23:42	00:15:00	78.7	63.7	65.4	69.2	66.3	64.5	100	70	0.0	5.0	0.0	75	NCA01	Night	A02	35	40	65	50	35	30	5	25	
Project 012	13-Nov-19	00:00	00:15:00	75.7	62.6	65.9	68.0	66.8	65.1	100	71	0.0	5.0	0.0	71	NCA01	Night	A05	35	40	65	50	36	31	6	21	A05 - Project 012. Measurement take outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from movement and unloading of plant and machinery, and clangs and bangs. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 013	13-Nov-19	00:35	00:15:00	62.6	45.7	49.1	53.2	50.2	47.3	100	49	0.0	0.0	0.0	50	NCA01	Night	A06	35	40	48	50	14	9	1	0	A06 - Project 013-014. Measurements take outside 13 Hopetoun Avenue, Chatswood, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the use of hand tools, clangs and bangs and lighting towers/generators. Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were identified to include wind-blown vegetation, distant traffic and TSE works.
Project 014	13-Nov-19	00:51	00:15:00	61.7	45.6	49.0	54.3	51.4	46.9	100	54	0.0	5.0	0.0	55	NCA01	Night	A06	35	40	48	50	19	14	6	5	
Project 015	13-Nov-19	01:32	00:15:00	73.3	59.5	67.0	70.3	68.3	64.2	100	67	0.0	0.0	0.0	73	NCA01	Night	A02	35	40	65	50	32	27	2	23	A02 - Project 015-017. Measurements take outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, delivery of material and equipment, 'squashed duck' alarm tones, and clangs and bangs. Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 016	13-Nov-19	23:28	00:15:00	79.7	48.6	62.4	73.7	66.1	52.8	100	62	0.0	0.0	0.0	75	NCA01	Night	A02	35	40	65	50	27	22	-3	25	
Project 017	13-Nov-19	23:45	00:15:00	73.8	51.3	55.3	61.0	57.9	52.8	100	55	0.0	0.0	0.0	65	NCA01	Night	A02	35	40	52	50	20	15	3	15	
Project 018	14-Nov-19	00:18	00:14:47	74.5	48.1	54.2	61.9	55.7	50.3	100	54	0.0	0.0	0.0	65	NCA01	Night	A07	35	40	59	50	19	14	-5	15	A07 - Project 018. Measurement take outside 14 Raleigh Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement and operation plant and hi-rail machinery within the rail corridor, clangs and bangs, and 'squashed duck' alarm tones. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.

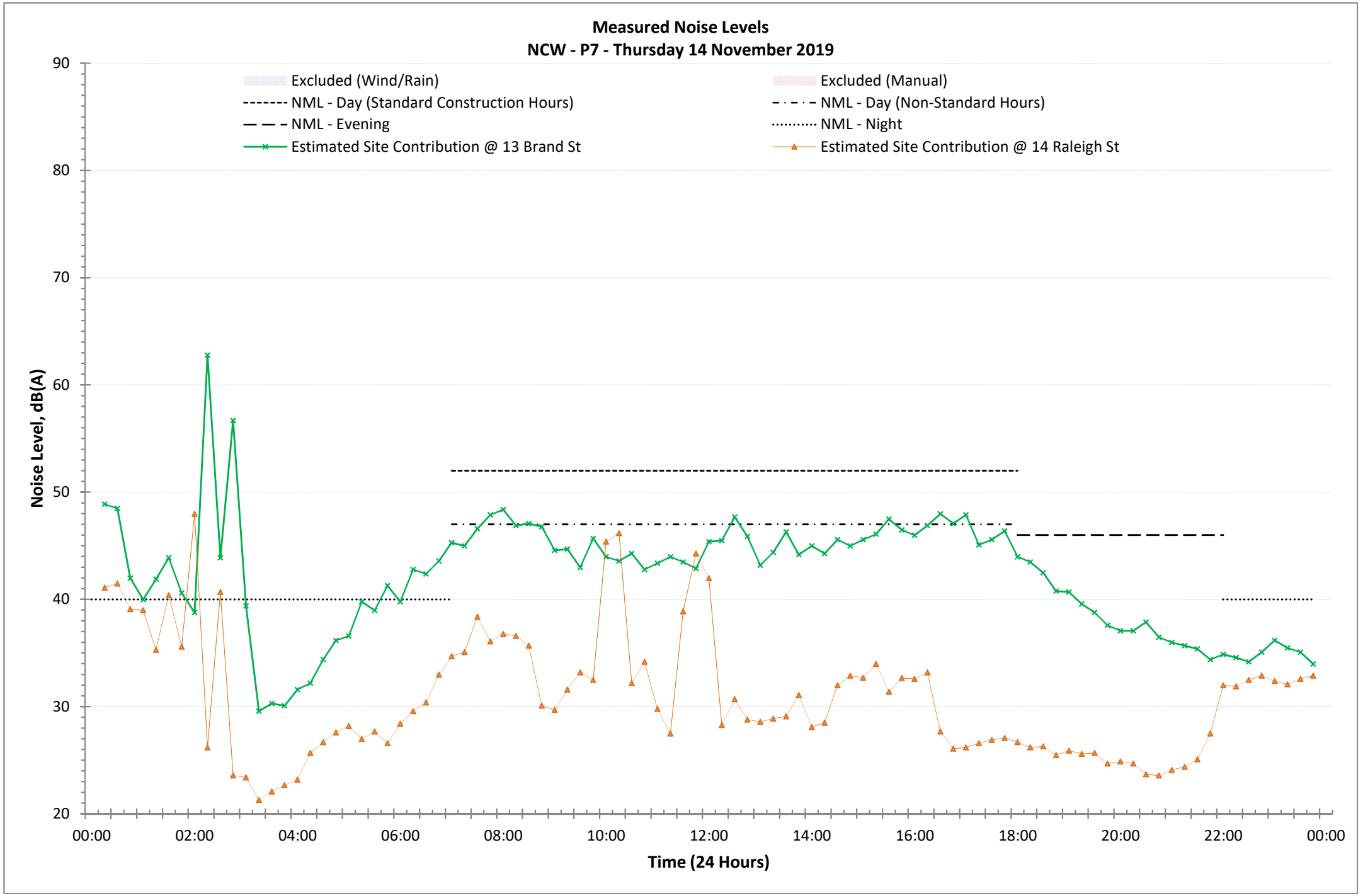
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Period	Location	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 019	14-Nov-19	00:51	00:15:00	88.1	38.4	64.5	75.1	66.6	50.7	100	70	0.0	5.0	0.0	77	NCA01	Night	A08	35	40	64	50	35	30	6	27	A08 - Project 019. Measurement taken outside 38 Hampden Road apartment block, generally facing north-north east towards works within the rail corridor (near the Artarmon Mosque). Site-related noise resulted from the movement and operation of excavators and other hi-rail plant within the rail corridor, scooping and distribution of ballast along the train line, clangs and bangs, and 'squashed duck' alarm tones. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were identified to include passing traffic.
Project 020	14-Nov-19	01:17	00:15:00	73.3	44.3	51.3	57.4	53.8	45.6	100	51	0.0	0.0	0.0	60	NCA01	Night	A04	35	40	48	50	16	11	3	10	A02 - Project 020. Measurement take outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from movement of plant and machinery in the rail corridor, clangs and bangs, and 'squashed duck' alarm tones. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 021	14-Nov-19	01:33	00:15:00	65.6	49.5	53.0	59.0	55.2	50.9	100	55	0.0	5.0	0.0	60	NCA01	Night	A06	35	40	56	50	23	18	2	10	A06 - Project 021-022. Measurements take outside 13 Hopetoun Avenue, Chatswood, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement and operation of hi-rail plant and machinery, 'squashed duck' alarm tones, hand tools and clangs and bangs. Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 022	14-Nov-19	01:48	00:15:00	64.4	44.1	49.6	57.2	52.4	45.6	100	50	0.0	0.0	0.0	57	NCA01	Night	A06	35	40	48	50	15	10	2	7	
Project 023	14-Nov-19	02:36	00:15:00	74.1	51.6	55.8	62.3	58.0	53.0	100	56	0.0	0.0	0.0	70	NCA01	Night	A02	35	40	60	50	21	16	-4	20	A02 - Project 023. Measurement take outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from movement of plant and machinery in the rail corridor, clangs and bangs, and 'squashed duck' alarm tones. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 024	14-Nov-19	22:30	00:15:00	75.9	49.4	54.2	64.4	51.9	50.3	100	54	0.0	0.0	0.0	74	NCA01	Night	A05	35	40	60	50	19	14	-6	24	A05 - Project 024-026. Measurements take outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, power tools, clangs and bangs, the operation of excavators and other hi-rail plant within the rail corridor, and the passing of the works train. Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were identified to include insects and distant traffic.
Project 025	14-Nov-19	22:48	00:15:00	80.8	49.4	58.3	71.3	56.7	50.8	100	58	0.0	0.0	0.0	75	NCA01	Night	A05	35	40	60	50	23	18	-2	25	
Project 026	14-Nov-19	23:07	00:15:00	57.7	50.5	52.0	53.4	52.6	51.5	100	57	0.0	5.0	0.0	57	NCA01	Night	A05	35	40	60	50	22	17	-3	7	
Project 027	14-Nov-19	23:38	00:15:00	70.4	47.3	56.4	68.1	58.1	49.1	100	56	0.0	0.0	0.0	69	NCA01	Night	A07	35	40	59	50	21	16	-3	19	A07 - Project 027-028. Measurements take outside 14 Raleigh Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement and operation of plant and hi-rail machinery within the rail corridor, clangs and bangs, and lighting towers/generators. Site-related noises were the dominant feature of the measurement and contributed to 100% of the overall Leq (15 min). Extraneous sources were identified to include insects and distant traffic.
Project 028	15-Nov-19	00:01	00:15:00	60.5	46.9	51.6	59.5	52.9	48.6	100	57	0.0	5.0	0.0	59	NCA01	Night	A07	35	40	59	50	22	17	-2	9	
Project 029	15-Nov-19	00:37	00:15:00	59.5	52.6	54.8	57.9	56.0	53.8	60	53	0.0	0.0	0.0	59	NCA01	Night	A09	35	40	56	50	18	13	-3	9	A09 - Project 029-030. Measurements undertaken outside 2 Berkeley Court, generally facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant within the rail corridor, hand and power tools and clangs and bangs. Site-related noises contributed to approximately 60% of the overall Leq (15 min), with extraneous sources observed to include nearby TSE works, contributing to the overall noise measurement.
Project 030	15-Nov-19	00:56	00:15:00	72.5	51.8	54.1	56.0	54.7	53.0	60	52	0.0	0.0	0.0	69	NCA01	Night	A09	35	40	56	50	17	12	-4	19	
Project 031	15-Nov-19	01:21	00:15:00	61.7	43.4	48.8	57.7	50.5	44.9	100	49	0.0	0.0	0.0	59	NCA01	Night	A04	35	40	48	50	14	9	1	9	A02 - Project 031-032. Measurements take outside 12 Hopetoun Avenue, Chatswood, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement and operation of excavators and other hi-rail plant within the rail corridor, and power and hand tools. Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic.
Project 032	15-Nov-19	01:42	00:15:00	63.0	42.1	48.3	58.3	50.9	43.3	100	48	0.0	0.0	0.0	60	NCA01	Night	A04	35	40	46	50	13	8	2	10	
Project 033	15-Nov-19	02:12	00:15:00	83.8	49.8	60.2	69.8	63.0	51.0	100	65	0.0	5.0	0.0	83	NCA01	Night	A05	35	40	65	50	30	25	0	33	A02 - Project 033-034. Measurements take outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the delivery of material and equipment, the movement and operation of excavators and other hi-rail plant within the rail corridor, 'squashed duck' alarm tones, and hand tools. Site-related noises were the dominant feature of the measurements and contributed to 100% of the overall Leq (15 min). Extraneous sources were not identified during the measurement.
Project 034	15-Nov-19	02:28	00:15:00	79.3	49.7	60.6	71.0	64.2	50.7	100	61	0.0	0.0	0.0	78	NCA01	Night	A05	35	40	65	50	26	21	-4	28	

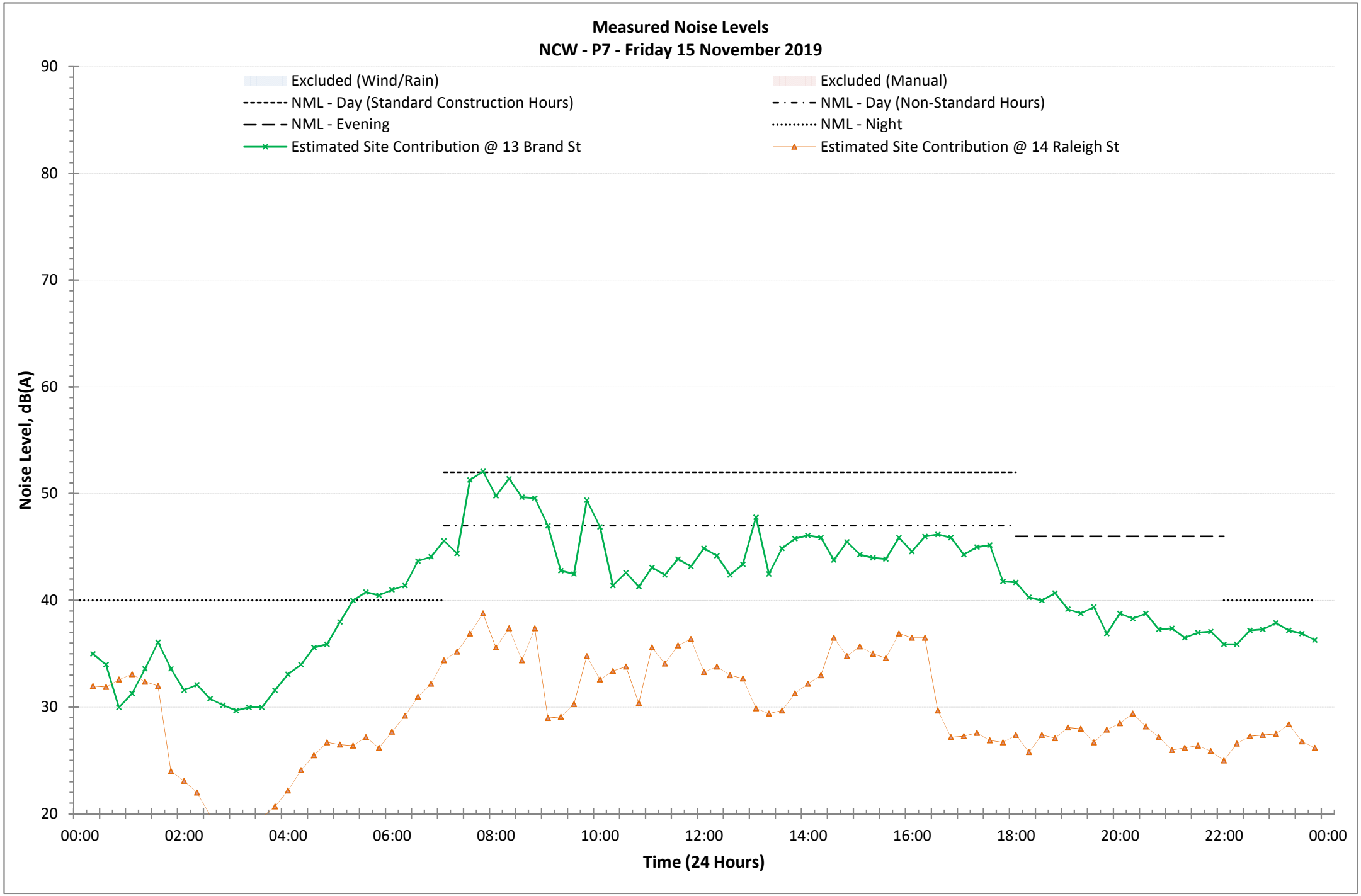
Weather 11-15 November: Generally fine weather, some low-moderate winds. Low cloud coverage. Temperatures ranged between 13 - 20 degrees Celsius over the monitoring period.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 - Monday 11 November 2019
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Brand St
Estimated Site Contribution @ 14 Raleigh St
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Tuesday 12 November 2019
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Brand St
Estimated Site Contribution @ 14 Raleigh St
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Wednesday 13 November 2019
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Brand St
Estimated Site Contribution @ 14 Raleigh St
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Thursday 14 November 2019
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Brand St
Estimated Site Contribution @ 14 Raleigh St
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Friday 15 November 2019
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Brand St
Estimated Site Contribution @ 14 Raleigh St
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

Appendix C – Monitoring Report (RP43a)

Noise Monitoring – OOHW P7: WE20 - 16 to 17 November 2019

Figure A1.0 – OOHW WE20 – Attended and Unattended Noise Monitoring Locations – Artarmon – NCW P7 (Saturday, 16 November and Sunday, 17 November 2019)

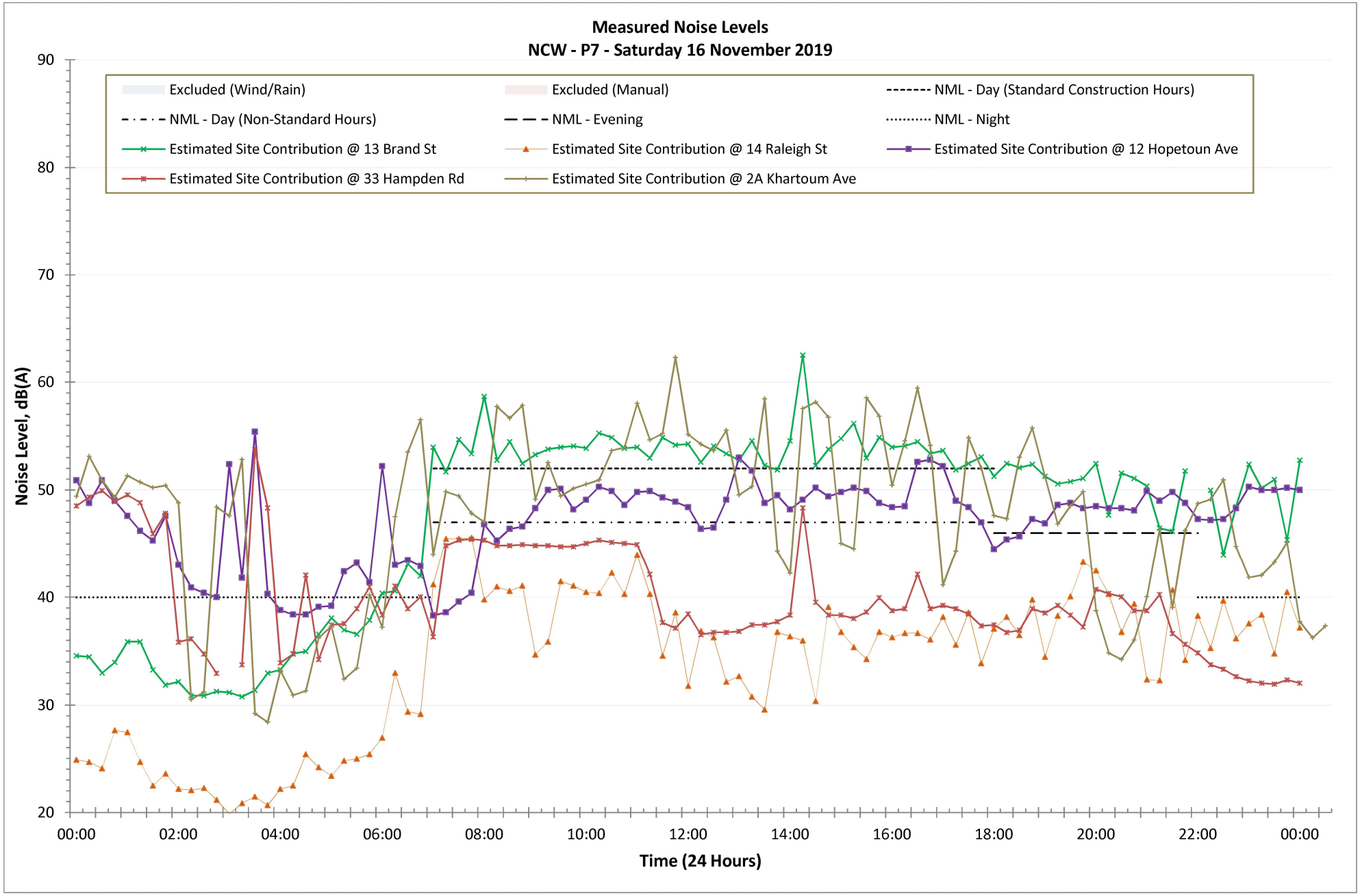
Figure A1.1 – OOHW WE20 –Unattended Noise Monitoring Location - Gordon

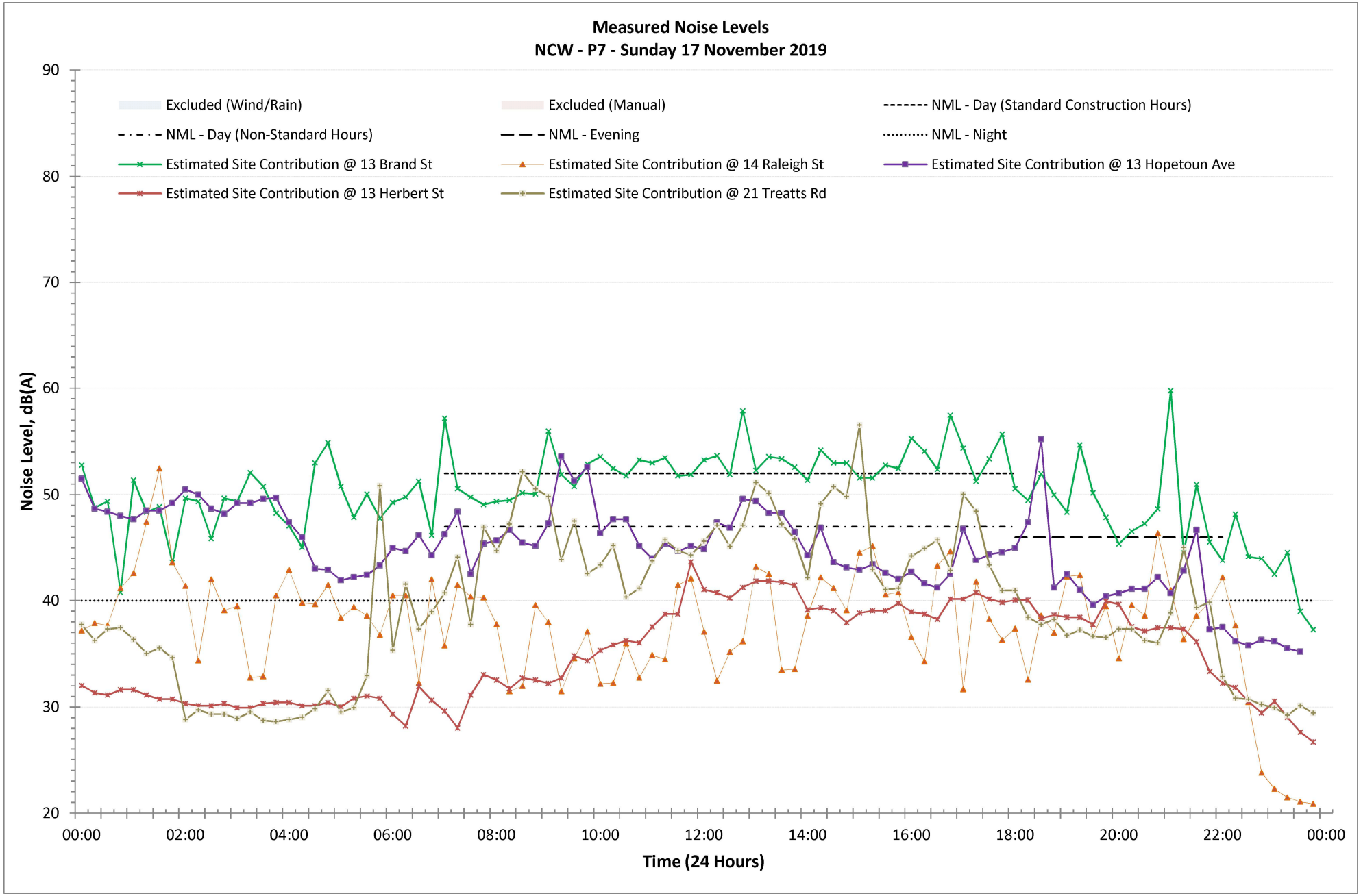
– NCW P7 (Saturday, 16 November and Sunday, 17 November 2019)

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 001	16/11/2019	17:30	0:15:00	75.0	43.8	54.9	66.3	57.1	46.3	50	57	0.0	5.0	0.0	74	NCA01	A01	Day	42	47	60	57	15	10	-3	17	
Project 002	16/11/2019	17:50	0:15:00	75.3	43.0	53.1	62.8	55.3	45.2	50	55	0.0	5.0	0.0	72	NCA01	A01	Day	41	46	60	56	14	9	-5	16	A01 - Project 001-003. Measurements taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, power tools, clangs and bangs, the operation of excavators and other hi-rail plant within the rail corridor. Site-related noises contributed to approximately 50-70% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds, distant traffic, wind-blown vegetation and neary residents.
Project 003	16/11/2019	18:08	0:15:00	76.3	44.5	58.4	67.5	62.2	48.2	70	57	0.0	0.0	0.0	72	NCA01	A01	Evening	41	46	60	56	16	11	-3	16	
Project 004	16/11/2019	18:33	0:15:00	63.7	44.6	50.3	56.6	52.9	47.3	50	47	0.0	0.0	0.0	58	NCA01	A02	Evening	41	46	59	56	6	1	-12	2	A02 - Project 004-005. Measurements taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of trucks and other hi-rail plant within the rail corridor, including motion alarms. Site-related noises contributed to approximately 50% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds, distant traffic, aircraft noise, wind-blown vegetation and neary residents.
Project 005	16/11/2019	18:50	0:15:00	64.5	46.4	50.9	57.3	53.2	48.3	50	48	0.0	0.0	0.0	58	NCA01	A02	Evening	41	46	59	56	7	2	-11	2	
Project 006	16/11/2019	20:01	0:15:00	69.5	43.0	48.6	54.1	49.4	46.0	80	48	0.0	0.0	0.0	51	NCA01	A03	Evening	41	46	52	56	7	2	-4	-5	A03 - Project 006-007. Measurements taken outside 14 Hawkins Street, facing west towards works within the rail corridor. Site-related noise resulted from staff talking, power tools, operation of trucks and other hi-rail plant within the rail corridor, including motion alarms. Site-related noises contributed to approximately 80% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include insects, distant traffic and nearby traffic.
Project 007	16/11/2019	20:18	0:15:00	63.5	42.0	47.2	56.4	49.1	43.1	80	46	0.0	0.0	0.0	62	NCA01	A03	Evening	41	46	52	56	5	0	-6	6	
Project 008	16/11/2019	20:50	0:15:00	72.0	50.8	56.6	62.6	58.0	54.0	80	61	0.0	5.0	0.0	62	NCA01	A04	Evening	41	46	62	56	20	15	-1	6	A04 - Project 008-009. Measurements taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from hand tools, operation of excavators and other hi-rail plant within the rail corridor, including motion alarms. Site-related noises contributed to approximately 80% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include insects, nearby residents, distant traffic and nearby traffic.
Project 009	16/11/2019	21:10	0:15:00	66.6	51.0	55.9	61.6	57.7	53.7	80	55	0.0	0.0	0.0	60	NCA01	A04	Evening	41	46	62	56	14	9	-7	4	
Project 010	16/11/2019	21:32	0:15:00	73.6	48.3	52.1	58.4	53.9	49.6	50	49	0.0	0.0	0.0	55	NCA01	A05	Evening	41	46	62	56	8	3	-13	-1	A05 - Project 010-011. Measurements taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from hand tools, operation of excavators and other hi-rail plant within the rail corridor, including motion alarms and horns. Site-related noises contributed to approximately 50 - 80% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include the chatswood dive site hum, distant traffic and nearby traffic.
Project 011	16/11/2019	21:48	0:15:00	63.8	46.2	50.0	55.1	52.1	47.7	80	49	0.0	0.0	0.0	56	NCA01	A05	Evening	41	46	62	56	8	3	-13	0	
Project 012	16/11/2019	22:23	0:15:00	63.8	48.0	51.2	61.6	52.3	48.9	100	56	0.0	0.0	5.0	63	NCA01	A06	Night	35	40	56	50	21	16	0	13	A06 - Project 012-015. Measurements taken outside 12 Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of cranes, excavators, generators and other hi-rail plant within the rail corridor, including motion alarms. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic.
Project 013	16/11/2019	22:41	0:15:00	72.2	48.8	52.1	58.6	53.2	49.7	100	57	0.0	5.0	0.0	58	NCA01	A06	Night	35	40	56	50	22	17	1	8	
Project 014	16/11/2019	22:59	0:15:00	77.9	49.5	55.4	61.8	57.3	52.2	100	55	0.0	0.0	0.0	73	NCA01	A06	Night	35	40	56	50	20	15	-1	23	
Project 015	16/11/2019	23:17	0:15:00	70.5	50.6	56.9	64.9	60.1	52.1	100	57	0.0	0.0	0.0	70	NCA01	A06	Night	35	40	56	50	22	17	1	20	
Project 016	17/11/2019	00:04	0:15:00	76.4	53.4	61.5	70.9	63.9	56.0	100	67	0.0	5.0	0.0	73	NCA01	A01	Night	35	40	65	50	32	27	2	23	A01 - Project 016-017. Measurements taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, the operation of cranes, trucks, excavators, generators and other hi-rail plant within the rail corridor, including motion alarms. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include insects.
Project 017	17/11/2019	00:22	0:15:00	82.0	50.9	61.1	73.2	61.3	51.8	100	61	0.0	0.0	0.0	82	NCA01	A01	Night	35	40	63	50	26	21	-2	32	
Project 018	17/11/2019	00:45	0:15:00	65.7	43.0	50.4	60.1	52.9	45.2	90	55	0.0	0.0	5.0	61	NCA01	A02	Night	35	40	59	50	20	15	-4	11	A02 - Project 018-019. Measurements taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of trucks and other hi-rail plant within the rail corridor, including motion alarms. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include birds, distant traffic and insects.
Project 019	17/11/2019	01:05	0:15:00	59.4	42.5	45.8	50.6	47.0	44.4	90	50	0.0	0.0	5.0	51	NCA01	A02	Night	35	40	59	50	15	10	-9	1	

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 020	17/11/2019	01:36	0:15:00	59.6	47.1	51.1	55.1	53.9	48.2	100	51	0.0	0.0	0.0	56	NCA01	A05	Night	35	40	62	50	16	11	-11	6	A05 - Project 020-021. Measurements taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from hand tools, operation of cranes, excavators and other hi-rail plant within the rail corridor, including motion alarms and horns. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include the chatswood dive site hum.
Project 021	17/11/2019	01:52	0:15:00	67.6	48.0	52.6	59.4	54.6	49.5	100	53	0.0	0.0	0.0	61	NCA01	A05	Night	35	40	62	50	18	13	-9	11	
Project 022	17/11/2019	02:19	0:15:00	70	49.9	56.5	63.9	59.8	51.8	100	61	0.0	5.0	0.0	70	NCA01	A06	Night	35	40	62	50	26	21	-1	20	A06 - Project 022-023. Measurements taken outside 12 Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of cranes, excavators, generators and other hi-rail plant within the rail corridor, including motion alarms and horns. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include insects.
Project 023	17/11/2019	02:37	0:15:00	75.3	48.7	55.6	62.3	58.0	51.0	100	56	0.0	0.0	0.0	75	NCA01	A06	Night	35	40	62	50	21	16	-6	25	
Project 024	17/11/2019	16:13	0:15:00	81.7	47.2	64.6	75.7	68.3	49.8	90	69	0.0	5.0	0.0	75	NCA01	A01	Day	42	47	65	57	27	22	4	18	A01 - Project 024-025. Measurements taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, the operation of cranes, trucks, excavators, generators and other hi-rail plant within the rail corridor, including motion alarms. Site-related noises dominated the measurement contributing 90 - 100% of the overall Leq (15 min). Extraneous sources were identified to include birds, dogs and distant traffic.
Project 025	17/11/2019	16:30	0:15:00	93.4	52.2	63.9	69.9	64.6	58.4	100	69	0.0	5.0	0.0	69	NCA01	A01	Day	42	47	65	57	27	22	4	12	
Project 026	17/11/2019	16:48	0:15:00	77.8	46.0	55.3	63.8	58.4	48.3	50	52	0.0	0.0	0.0	65	NCA01	A02	Day	42	47	59	57	10	5	-7	8	A02 - Project 026-027. Measurements taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of trucks, excavators and other hi-rail plant within the rail corridor, including motion alarms and horns. Site-related noises contributed to approximately 60-80% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds, nearby residents, distant traffic and nearby traffic
Project 027	17/11/2019	17:06	0:15:00	66.4	43.9	50.4	57.5	53.1	46.7	60	48	0.0	0.0	0.0	60	NCA01	A02	Day	42	47	59	57	6	1	-11	3	
Project 028	17/11/2019	17:35	0:15:00	69.8	45.9	52.1	56.3	54.0	48.4	50	49	0.0	0.0	0.0	69	NCA01	A05	Day	42	47	62	57	7	2	-13	12	A05 - Project 028-029. Measurements taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from hand tools, operation of excavators and other hi-rail plant within the rail corridor, including motion alarms and horns. Site-related noises contributed to approximately 30 - 50% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include the chatswood dive site hum, birds, distant traffic and nearby traffic.
Project 029	17/11/2019	17:53	0:15:00	70.6	46.8	51.4	58.4	53.5	48.4	30	46	0.0	0.0	0.0	54	NCA01	A05	Day	42	47	62	57	4	-1	-16	-3	
Project 030	17/11/2019	18:13	0:15:00	72.1	45.0	53.3	62.0	55.8	48.1	80	52	0.0	0.0	0.0	62	NCA01	A06	Evening	41	46	56	56	11	6	-4	6	A06 - Project 030-031. Measurements taken outside 12 Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of cranes, excavators, generators and other hi-rail plant within the rail corridor, including motion alarms and horns. Site-related noises dominated the measurement contributing 80 - 100% of the overall Leq (15 min). Extraneous sources were identified to include birds, distant traffic and nearby traffic.
Project 031	17/11/2019	18:32	0:15:00	71.5	55.4	59.3	68.0	61.4	56.4	100	59	0.0	0.0	0.0	71	NCA01	A06	Evening	41	46	56	56	18	13	3	15	
Project 032	17/11/2019	19:04	0:15:00	68.8	43.8	52.6	62.9	55.3	46.6	100	53	0.0	0.0	0.0	68	NCA01	A01	Evening	41	46	60	56	12	7	-7	12	A01 - Project 032-034. Measurements taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, the operation of cranes, trucks, excavators and other hi-rail plant within the rail corridor, including motion alarms and horns. Site-related noises dominated the measurement contributing 70 - 100% of the overall Leq (15 min). Extraneous sources were identified to include birds, aircraft, distant traffic and nearby traffic.
Project 033	17/11/2019	19:22	0:30:00	79.9	44.3	55.3	64.3	58.1	46.4	70	59	0.0	5.0	0.0	71	NCA01	A01	Evening	41	46	60	56	18	13	-1	15	
Project 034	17/11/2019	19:40	0:30:00	79.9	79.9	66.3	44.5	66.3	46.4	80	70	0.0	5.0	0.0	75	NCA01	A01	Evening	41	46	65	56	29	24	5	19	

Weather 16-17 November 2019: Generally fine weather, overcast with calm winds. Temperature ranged between 17-20 degrees Celsius over the monitoring periods.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 - Saturday 16 November 2019
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Brand St
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Estimated Site Contribution @ 33 Hampden Rd
Estimated Site Contribution @ 2A Khartoum Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Sunday 17 November 2019
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Brand St
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Hopetoun Ave
Estimated Site Contribution @ 13 Herbert St
Estimated Site Contribution @ 21 Treatts Rd
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

Appendix D – Monitoring Report (RP43b)

Vibration Monitoring – OOHW P7: WE20 - 16 to 17 November 2019

Figure A1.0 – OOHW WE20 – Unattended Vibration Monitoring Locations

– NCW P7 (Saturday, 16 November to Sunday, 17 November 2019)

Event Report - NCW WE20

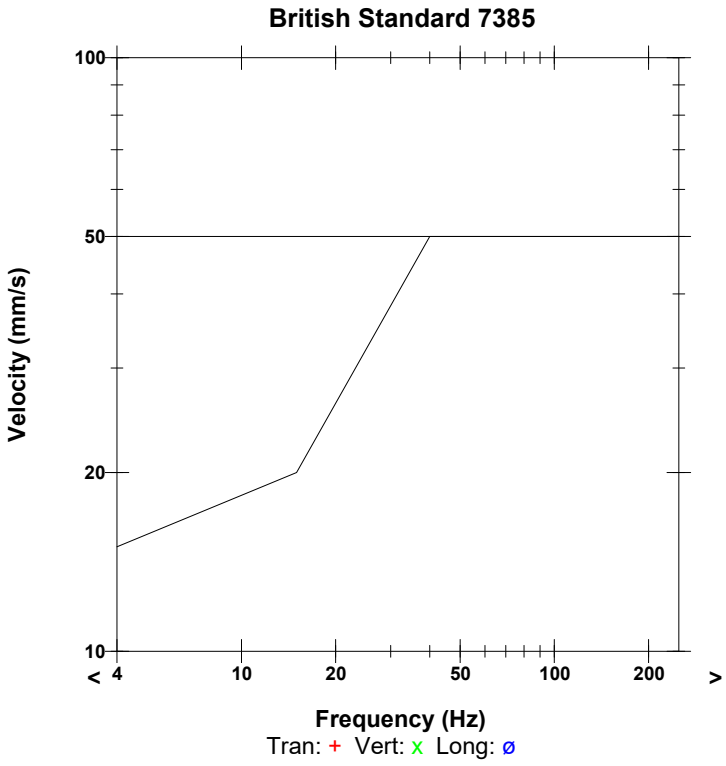
Histogram Start Time	18:06:18 November 15, 2019
Histogram Finish Time	06:00:01 November 16, 2019
Number of Intervals	714.00 at 1 minute
Range	Geo:31.75 mm/s
Sample Rate	1024sps

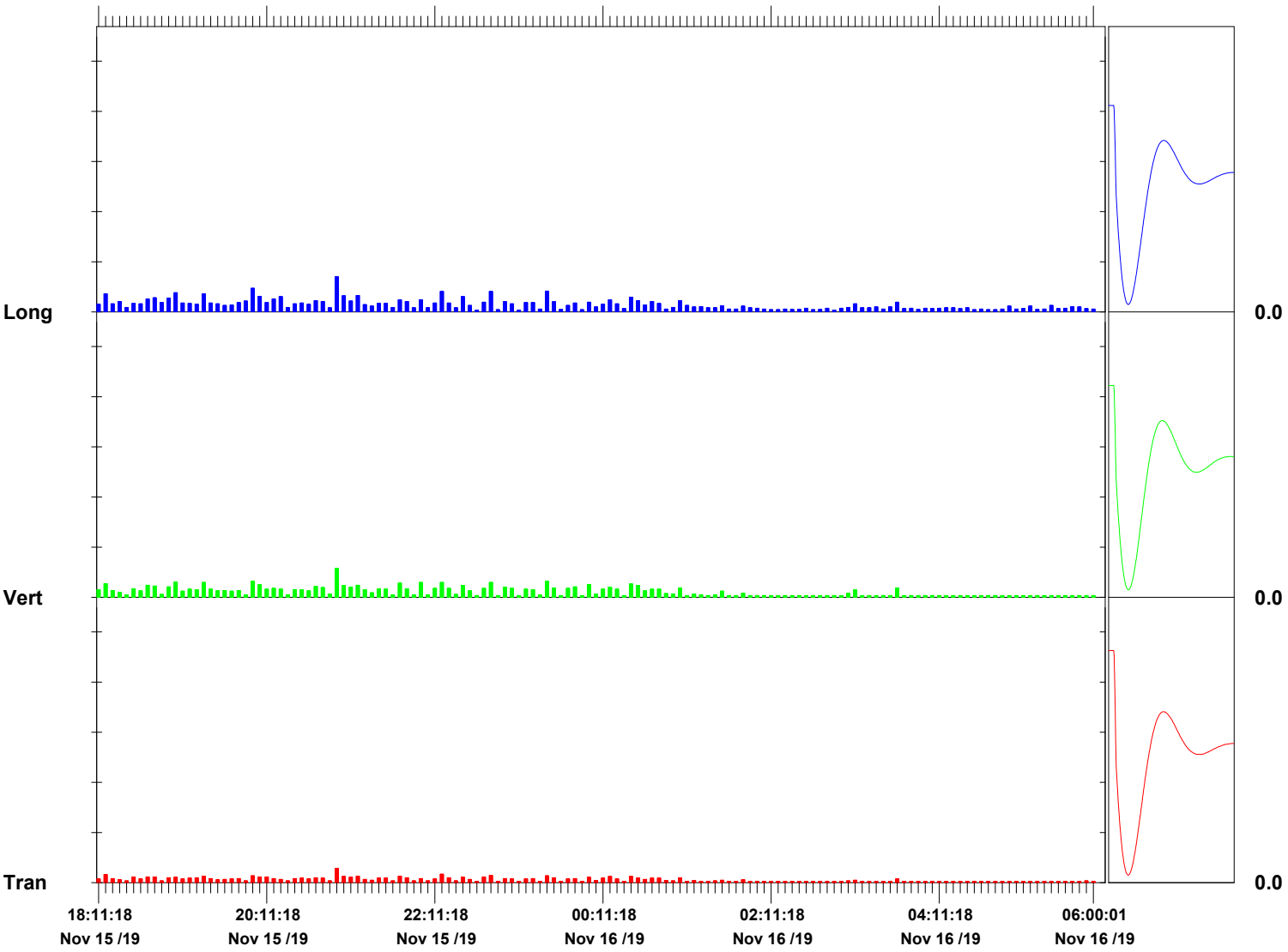
Serial Number	BE14130 V 10.72-8.17 MiniMate Plus
Battery Level	6.7 Volts
Unit Calibration	June 7, 2019 by Saros Int.
File Name	P130I76K.YI0

Notes
Location:
Client:
User Name:
General:

	Tran	Vert	Long	
PPV	0.571	1.143	1.397	mm/s
ZC Freq	57	51	51	Hz
Date	Nov 15 /19	Nov 15 /19	Nov 15 /19	
Time	20:59:18	20:59:18	20:59:18	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.6	7.3	Hz
Overswing Ratio	3.9	3.3	3.8	

Peak Vector Sum 1.770 mm/s on November 15, 2019 at 20:59:18





Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 2.000 mm/s/div Sensor Check

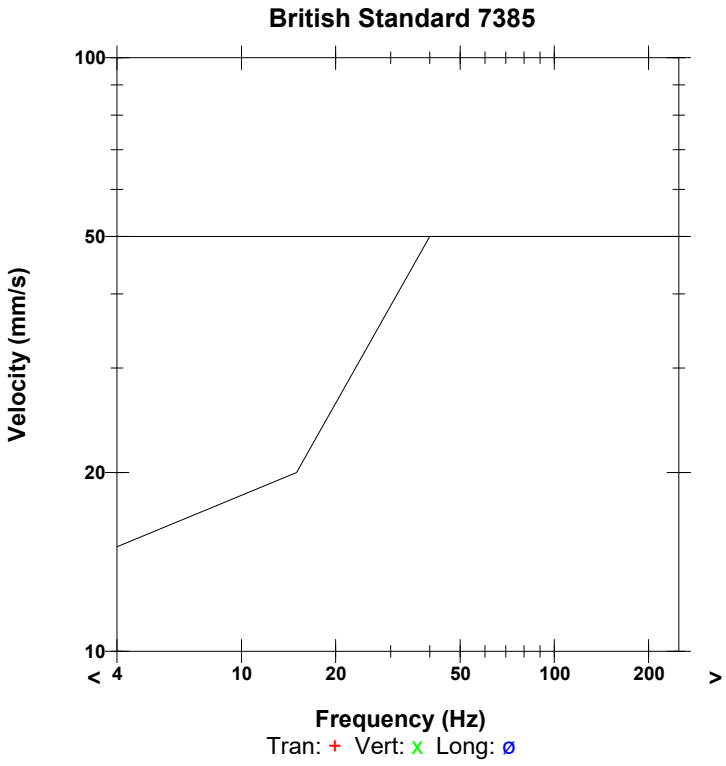
Event Report - NCW WE20

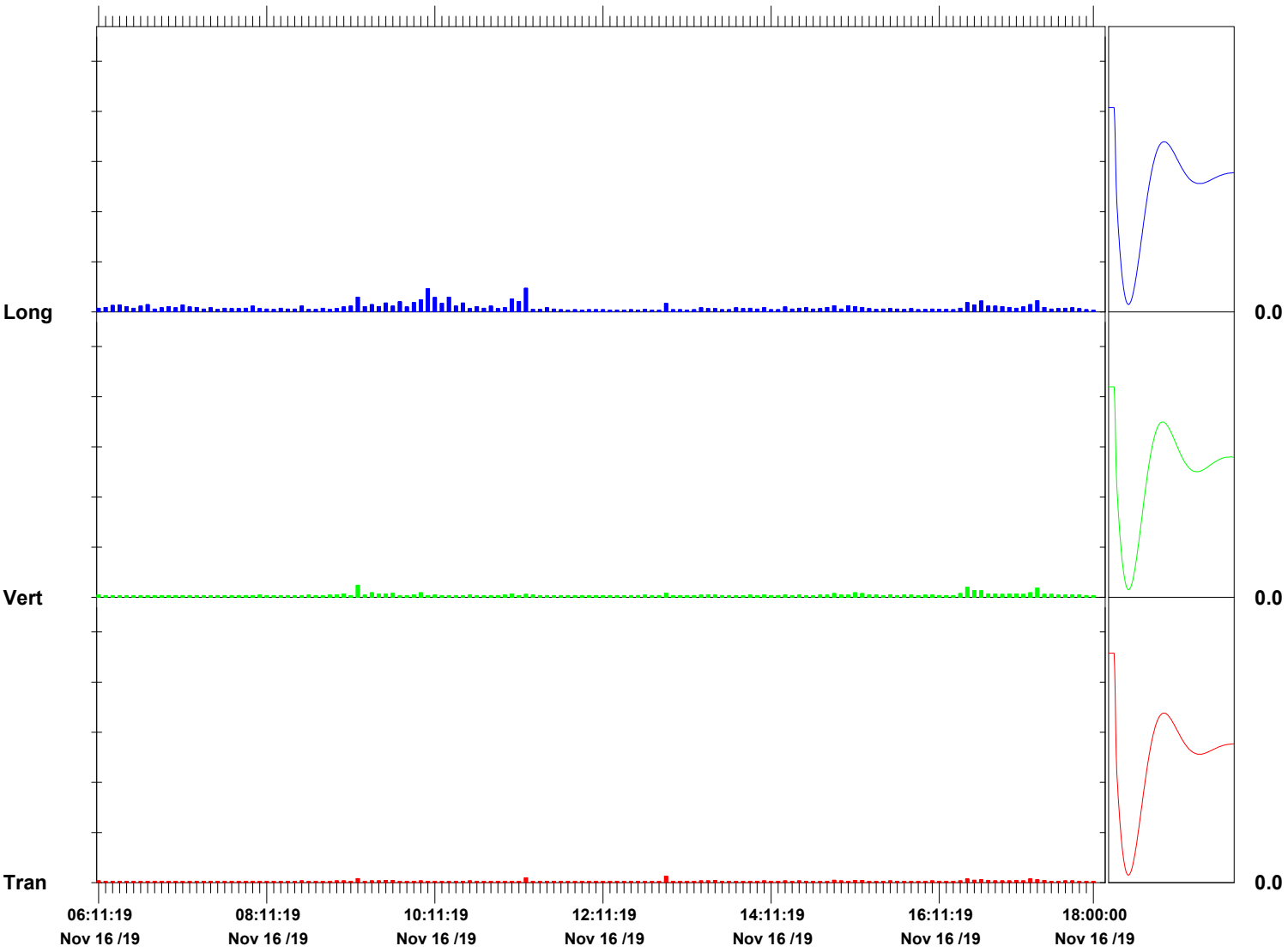
Histogram Start Time	06:06:19 November 16, 2019	**Serial Number**	BE14130 V 10.72-8.17 MiniMate Plus
Histogram Finish Time	18:00:00 November 16, 2019	**Battery Level**	6.6 Volts
Number of Intervals	714.00 at 1 minute	**Unit Calibration**	June 7, 2019 by Saros Int.
Range	Geo:31.75 mm/s	**File Name**	P130I77I.AJ0
Sample Rate	1024sps		

Notes
Location:
Client:
User Name:
General:

	Tran	Vert	Long	
PPV	0.254	0.476	0.937	mm/s
ZC Freq	64	37	<1.0	Hz
Date	Nov 16 /19	Nov 16 /19	Nov 16 /19	
Time	12:54:19	09:14:19	11:12:19	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.2	Hz
Overswing Ratio	4.1	3.5	4.0	

Peak Vector Sum 0.937 mm/s on November 16, 2019 at 11:12:19





Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 2.000 mm/s/div Sensor Check

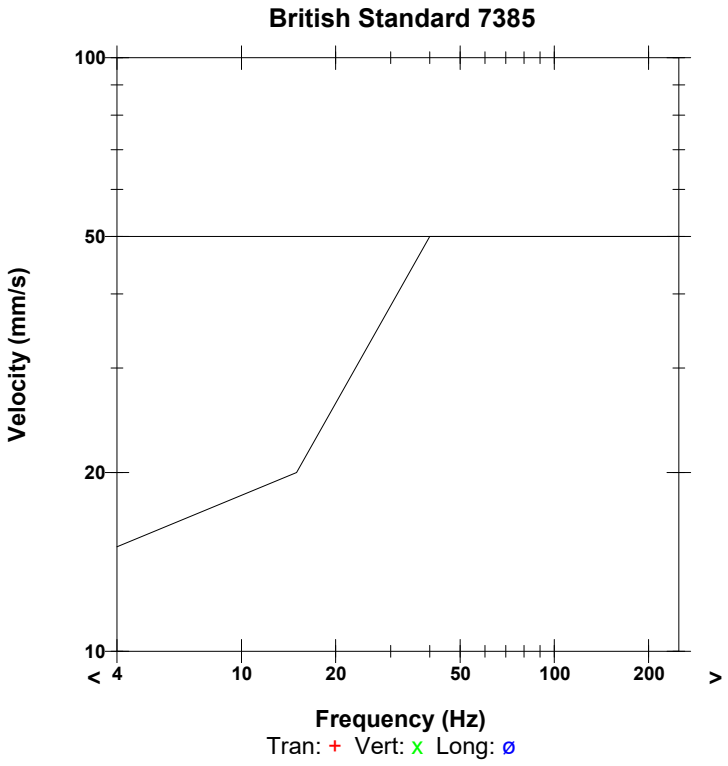
Event Report - NCW WE20

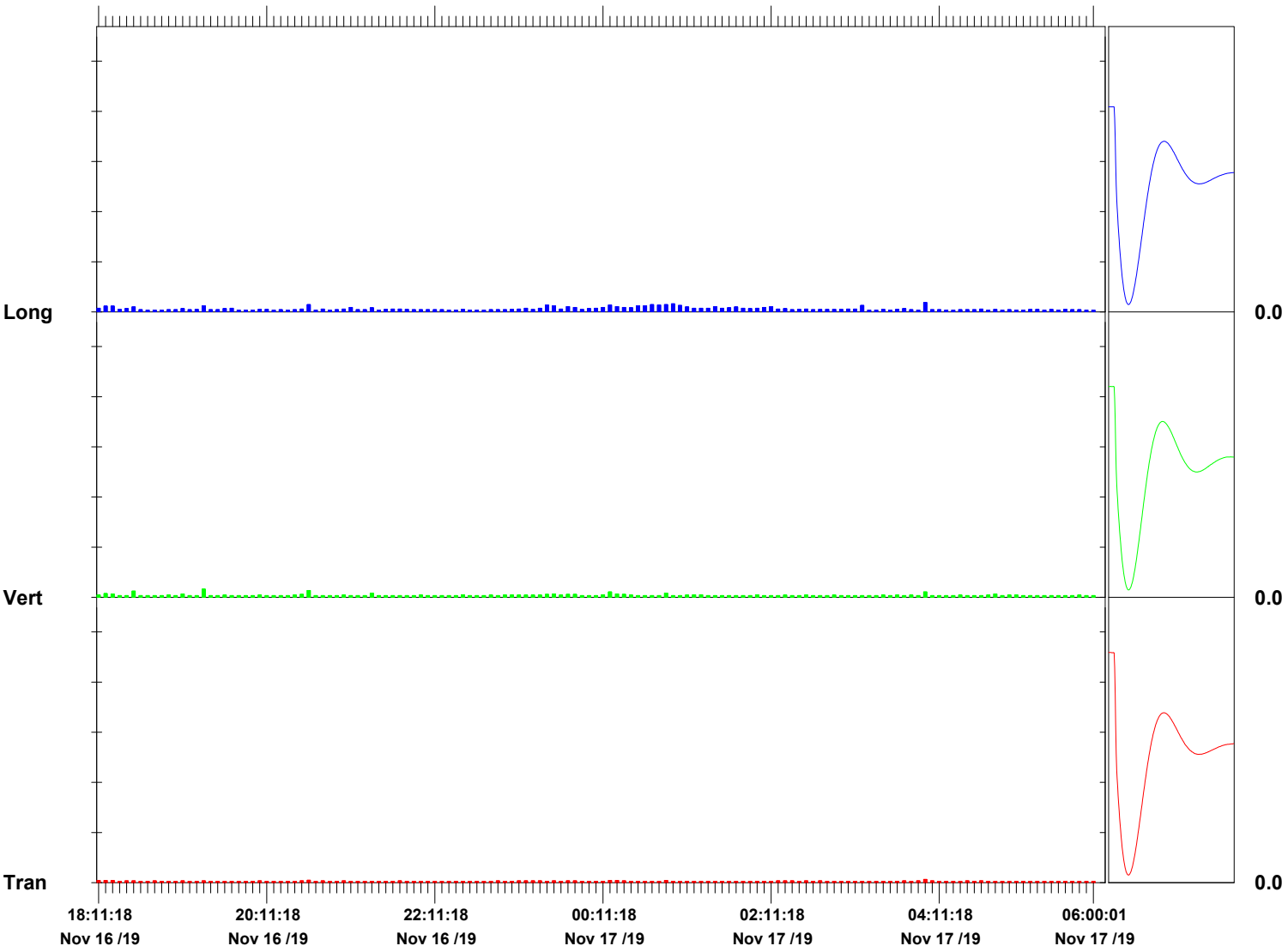
Histogram Start Time	18:06:18 November 16, 2019	**Serial Number**	BE14130 V 10.72-8.17 MiniMate Plus
Histogram Finish Time	06:00:01 November 17, 2019	**Battery Level**	6.7 Volts
Number of Intervals	714.00 at 1 minute	**Unit Calibration**	June 7, 2019 by Saros Int.
Range	Geo:31.75 mm/s	**File Name**	P130I78F.MI0
Sample Rate	1024sps		

Notes
Location:
Client:
User Name:
General:

	Tran	Vert	Long	
PPV	0.127	0.317	0.365	mm/s
ZC Freq	27	30	30	Hz
Date	Nov 17 /19	Nov 16 /19	Nov 17 /19	
Time	04:01:18	19:22:18	04:01:18	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.2	Hz
Overswing Ratio	4.0	3.4	3.9	

Peak Vector Sum 0.378 mm/s on November 17, 2019 at 04:01:18





Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 2.000 mm/s/div Sensor Check

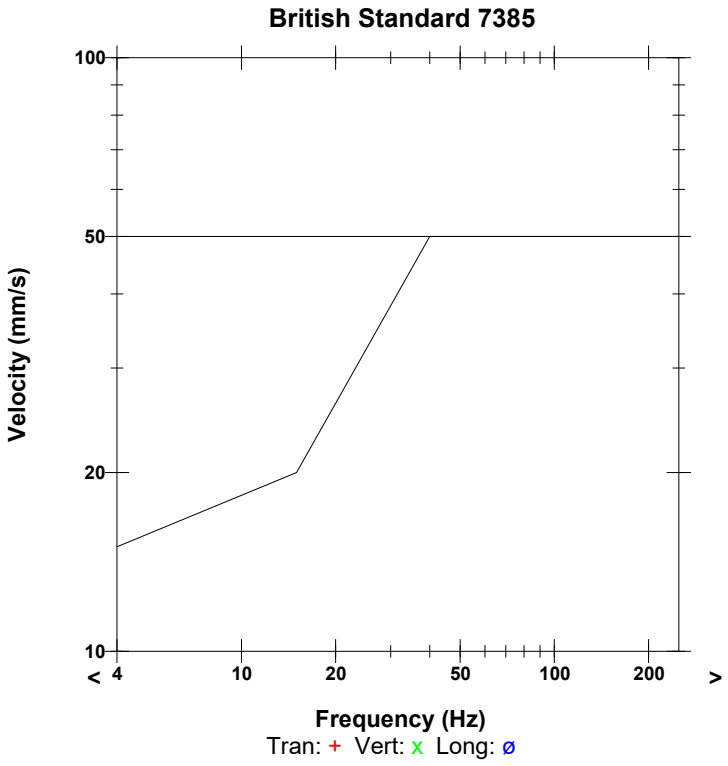
Event Report - NCW WE20

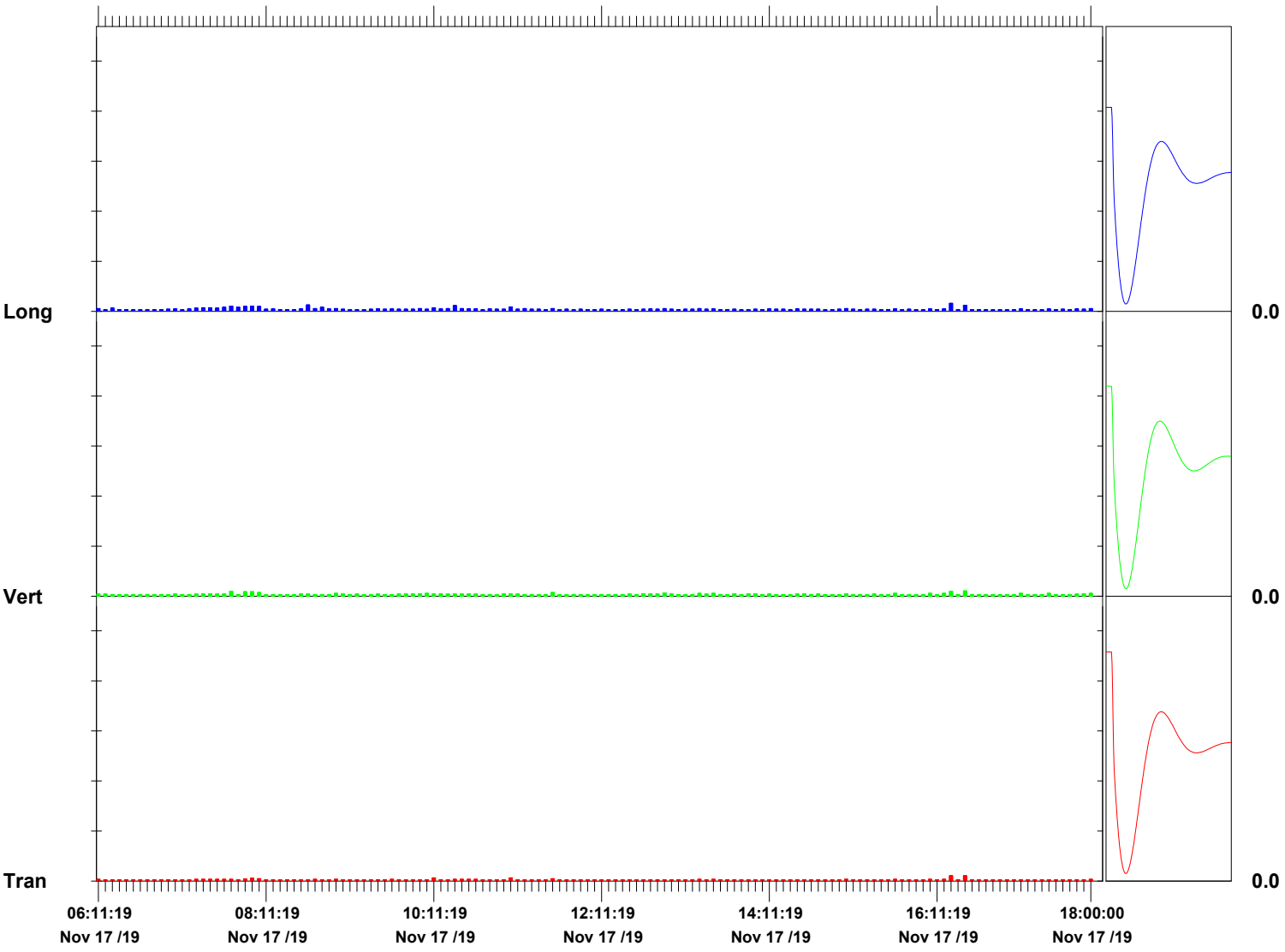
Histogram Start Time	06:06:19 November 17, 2019	**Serial Number**	BE14130 V 10.72-8.17 MiniMate Plus
Histogram Finish Time	18:00:00 November 17, 2019	**Battery Level**	6.7 Volts
Number of Intervals	714.00 at 1 minute	**Unit Calibration**	June 7, 2019 by Saros Int.
Range	Geo:31.75 mm/s	**File Name**	P130I79C.YJ0
Sample Rate	1024sps		

Notes
Location:
Client:
User Name:
General:

	Tran	Vert	Long	
PPV	0.206	0.206	0.317	mm/s
ZC Freq	>100	85	73	Hz
Date	Nov 17 /19	Nov 17 /19	Nov 17 /19	
Time	16:19:19	16:27:19	16:19:19	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.2	Hz
Overswing Ratio	4.1	3.4	4.0	

Peak Vector Sum 0.372 mm/s on November 17, 2019 at 16:19:19





Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 2.000 mm/s/div Sensor Check

Event Report - NCW WE20

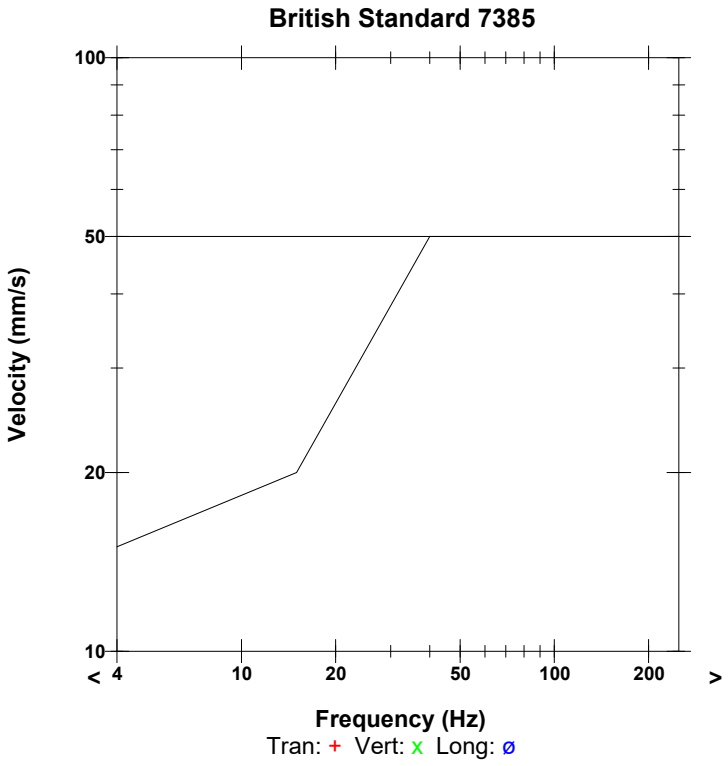
Histogram Start Time	18:06:18 November 17, 2019
Histogram Finish Time	06:00:01 November 18, 2019
Number of Intervals	714.00 at 1 minute
Range	Geo:31.75 mm/s
Sample Rate	1024sps

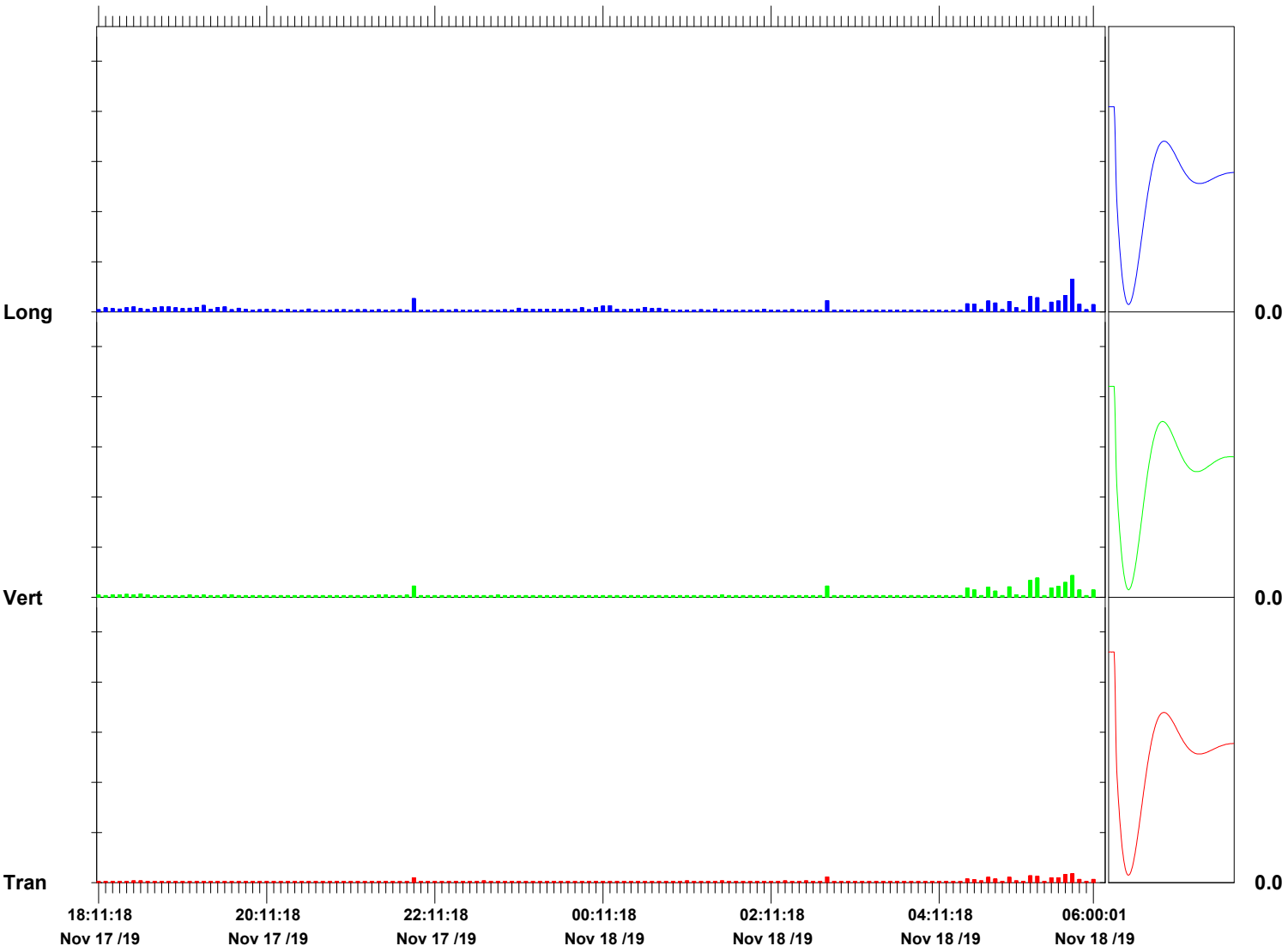
Serial Number	BE14130 V 10.72-8.17 MiniMate Plus
Battery Level	6.7 Volts
Unit Calibration	June 7, 2019 by Saros Int.
File Name	P130I7AA.AI0

Notes
Location:
Client:
User Name:
General:

	Tran	Vert	Long	
PPV	0.349	0.857	1.302	mm/s
ZC Freq	51	43	47	Hz
Date	Nov 18 /19	Nov 18 /19	Nov 18 /19	
Time	05:43:18	05:43:18	05:43:18	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.2	Hz
Overswing Ratio	4.0	3.4	3.9	

Peak Vector Sum 1.430 mm/s on November 18, 2019 at 05:43:18





Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 2.000 mm/s/div Sensor Check

Appendix E – Monitoring Report (RP44)

Noise Monitoring – OOHW P7: MW30 - 27 to 28 January 2020

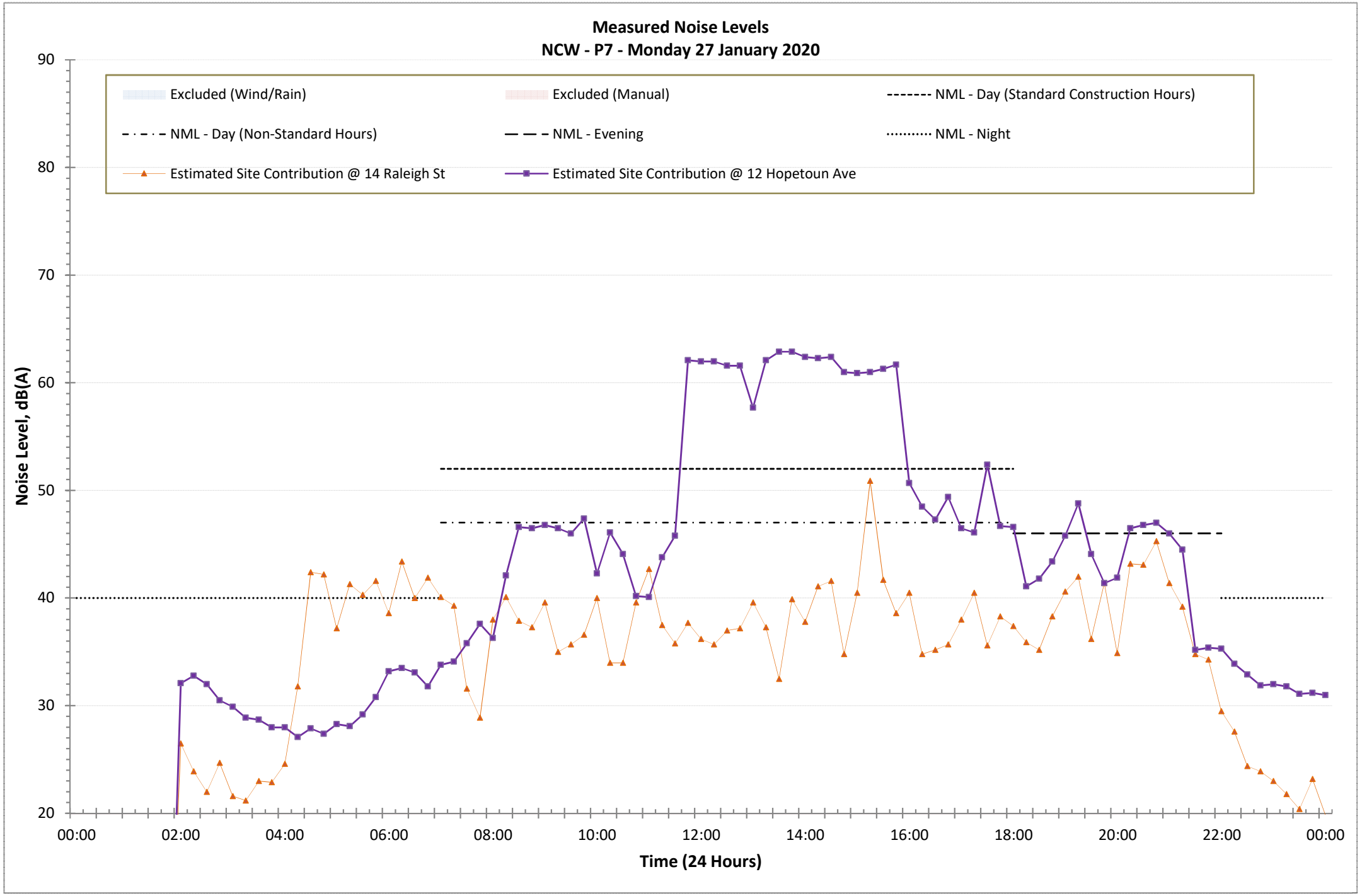
Figure A1.0 – OOHW MW30 – Attended and Unattended Noise Monitoring Locations – Artarmon to Chatswood – NCW P7 (Monday, 27 January to Tuesday, 28 January 2020)

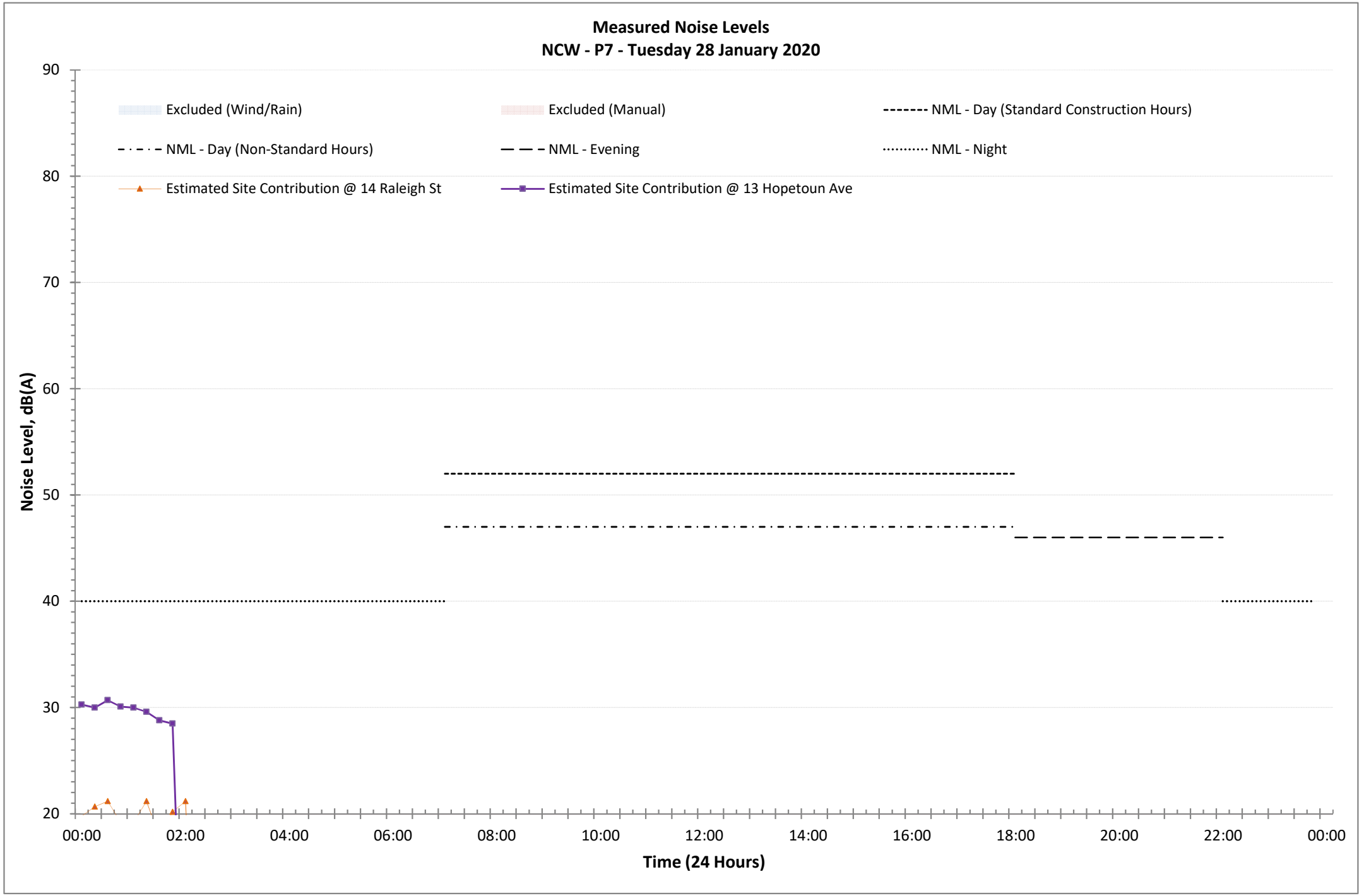
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compatison to RBL - LA90, Period	Compatison to NML - LAeq, 15minute	Compatison to Predicted Site Noise Level - LAeq, 15minute	Compatison to Sleep Disturbance Screening Level - LAmax	Description
Project 001	27/01/2020	05:21	0:15:00	91.3	55.7	67.4	74.4	69.8	61.5	100	67	-	-	-	85	NCA01	A01	Night	35	40	71	50	32	27	-4	35	A01 - Project 001-002. Measurements taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, clangs and bangs, and the operation of excavators and other hi-rail plant within the rail corridor. Site-related noises contributed to approximately 100% of the overall Le (15 min) throughout the measurements. Extraneous sources were not identified during the measurements.
Project 002	27/01/2020	05:39	0:15:00	78.3	53.5	65.4	73.2	70.7	56.1	100	65	-	-	-	77	NCA01	A01	Night	35	40	66	50	30	25	-1	27	
Project 003	27/01/2020	06:01	0:15:00	76.8	46.2	53.8	61.7	56.6	48.5	90	58	-	-	5.0	63	NCA01	A02	Night	35	40	59	50	23	18	-1	13	A02 - Project 003-004. Measurements taken outside 11 Hawkins Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of trucks and other hi-rail plant within the rail corridor, including motion alarms, and conversations on site. Site-related noises contributed to approximately 90% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds and distant traffic.
Project 004	27/01/2020	06:17	0:15:00	67.2	45.6	52.8	61.3	55.5	47.5	90	57	-	-	5.0	64	NCA01	A02	Night	35	40	59	50	22	17	-2	14	
Project 005	27/01/2020	06:35	0:15:00	78.3	40.9	58.5	65.0	62.1	43.7	80	63	-	-	5.0	73	NCA01	A03	Night	35	40	60	50	28	23	3	23	A03 - Project 005-006. Measurements taken outside 8-10 Brand Street on Valetta Lane, facing southwest towards works within the rail corridor. Site-related noise resulted from hand tools, operation of trucks, excavators and hi-rail plant within the rail corridor, and conversations on site. Site-related noises contributed to approximately 80-90% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds and distant traffic.
Project 006	27/01/2020	06:53	0:15:00	88.9	52.3	67.0	73.8	68.6	63.2	90	67	-	-	-	85	NCA01	A03	Night	35	40	60	50	32	27	7	35	
Project 007	27/01/2020	07:41	0:15:00	68.7	41.9	52.7	61.8	56.7	45.0	100	53	-	-	-	61	NCA01	A04	Day	42	47	58	57	11	6	-5	4	A04 - Project 007-008. Measurements taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant within the rail corridor, and distant site-related construction works within the rail corridor. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources (birds) were identified during the measurements.
Project 008	27/01/2020	08:01	0:15:00	68.9	41.5	50.9	60.9	53.0	44.7	100	53	-	-	2.0	61	NCA01	A04	Day	42	47	58	57	11	6	-5	4	
Project 009a	27/01/2020	08:24	0:15:00	70.1	43.7	53.3	62.4	55.9	46.5	100	53	-	-	-	67	NCA01	A05	Day	42	47	57	57	11	6	-4	10	A05 - Project 009-010. Measurements taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from the unloading and loading of ballast and materials, the operation of excavators and other hi-rail plant within the rail corridor, including motion alarms. Site-related noises contributed to approximately 50-100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic and birds.
Project 009b	27/01/2020	08:41	0:15:00	65.8	43.9	52.7	61.4	55.3	46.7	50	50	-	-	-	54	NCA01	A05	Day	42	47	57	57	8	3	-7	-3	
Project 010	27/01/2020	09:04	0:15:00	64.4	42.6	49.2	55.8	51.7	45.0	90	51	-	-	2.0	64	NCA01	A06	Day	42	47	60	57	9	4	-9	7	A06 - Project 011-012. Measurements taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from the loading and unloading of ballast and materials, and the operation of hi-rail plant within the rail corridor, including motion alarms. Site-related noises dominated the measurement contributing 80-90% of the overall Leq (15 m Extraneous sources were identified to include distant traffic, passing planes and nearby residents.
Project 011	27/01/2020	09:20	0:15:00	72.7	40.7	50.5	56.8	51.9	44.9	80	50	-	-	-	58	NCA01	A06	Day	42	47	60	57	8	3	-10	1	
Project 012	27/01/2020	10:03	0:15:00	74.1	48.3	58.5	67.8	60.8	52.4	100	58	-	-	-	72	NCA01	A07	Day	42	47	61	57	16	11	-3	15	A07 - Project 013-014. Measurements taken at the western end of Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the loading and unloading of ballast and materials, the operation of hi-rail plant within the rail corridor, hand tools and workers talking. Site-related noises dominated the measurement contributing 90-100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic and birds.
Project 013	27/01/2020	10:22	0:15:00	75.5	43.1	55.0	66.3	56.4	46.9	90	57	-	-	2.0	66	NCA01	A07	Day	42	47	61	57	15	10	-4	9	
Project 014	27/01/2020	11:32	0:15:00	74.0	51.0	63.3	70.6	65.7	57.4	100	63	-	-	-	72	NCA01	A03	Day	42	47	60	57	21	16	3	15	A03 - Project 015-016. Measurements taken outside 8-10 Brand Street on Valetta Lane, facing southwest towards works within the rail corridor. Site-related noise resulted from the operation of trucks and hi-rail plant within the rail corridor, unloading of materials, and conversations on site. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds, cicadas and distant traffic.
Project 015	27/01/2020	11:49	0:15:00	77.3	54.2	63.7	71.4	64.8	59.2	100	64	-	-	-	72	NCA01	A03	Day	42	47	60	57	22	17	4	15	
Project 016	27/01/2020	12:11	0:15:00	73.8	43.4	57.7	67.6	61.1	48.9	60	55	-	-	-	69	NCA01	A02	Day	42	47	59	57	13	8	-4	12	A02 - Project 017-018. Measurements taken outside 11 Hawkins Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant (cranes) within the rail corridor, hand tools, and distant site-related works within the rail corridor. Site-related noises contributed to approximately 40-60% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds and nearby (and distant) traffic.
Project 017	27/01/2020	12:28	0:15:00	73.9	43.2	52.8	62.9	55.6	45.1	40	49	-	-	-	60	NCA01	A02	Day	42	47	59	57	7	2	-10	3	
Project 018	27/01/2020	13:27	0:15:00	90.1	51.6	63.2	73.9	63.6	53.6	100	63	-	-	-	85	NCA01	A01	Day	42	47	66	57	21	16	-3	28	A01 - Project 019-020. Measurements taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, the operation of excavators and other hi-rail plant (cranes) within the rail corridor, and workers talking. Site-related noises contributed to approximately 100% of the

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 019	27/01/2020	13:43	0:15:00	77.0	49.9	59.0	66.9	63.4	52.7	100	59	-	-	-	72	NCA01	A01	Day	42	47	66	57	17	12	-7	15	overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds.
Project 020	27/01/2020	14:02	0:15:00	62.5	41.8	52.2	61.6	55.7	44.1	90	52	-	-	-	54	NCA01	A04	Day	42	47	58	57	10	5	-6	-3	A04 - Project 021. Measurement taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of hi-rail plant within the rail corridor, and distant site-related construction works within the rail corridor. Site-related noises contributed to approximately 90% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified during the measurement to include birds, cicadas and aircraft passing by.
Project 021	27/01/2020	14:27	0:15:00	86	65.5	69.0	72.4	70.9	66.8	100	69	-	-	-	72	NCA01	A07	Day	42	47	70	57	27	22	-1	15	A07 - Project 022-024. Measurements taken outside 12 Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of trucks and hi-rail plant within the rail corridor, loading and unloading of ballast and other materials, and truck horns. Site-related noises dominated the measurements contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include birds, distant traffic, nearby residents and wind-blown vegetation.
Project 022	27/01/2020	16:02	0:15:00	78.0	49.6	58.7	67.3	61.6	52.9	100	59	-	-	-	73	NCA01	A07	Day	42	47	61	57	17	12	-2	16	
Project 023	27/01/2020	16:25	0:15:00	77.3	44.6	59.9	64.4	62.7	49.2	100	62	-	-	2.0	64	NCA01	A07	Day	42	47	61	57	20	15	1	7	
Project 024	27/01/2020	16:52	0:15:00	65.4	41.5	51.0	58.2	53.6	45.5	100	53	-	-	2.0	64	NCA01	A06	Day	42	47	60	57	11	6	-7	7	A06 - Project 025. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from the loading and unloading of ballast and materials, the operation of hi-rail plant within the rail corridor, including motion alarms, and clangs and bangs. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, insects and birds.
Project 025	27/01/2020	17:16	0:15:00	65.4	45.7	54.2	60.7	57.6	49.1	20	47	-	-	-	58	NCA01	A05	Day	42	47	57	57	5	0	-10	1	A05 - Project 026. Measurement taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from the unloading and loading of ballast and materials, the operation of excavators and other hi-rail plant within the rail corridor, and clangs and bangs. Site-related noises contributed to approximately 20% of the overall Leq (15 min) throughout the measurement. Extraneous sources were dominant, and included distant traffic, wind-blown vegetation, nearby residents and birds.
Project 026	27/01/2020	18:06	0:15:00	67.9	45.6	55.5	64.2	59.7	47.9	100	56	-	-	-	67	NCA01	A01	Evening	41	46	66	56	15	10	-11	11	A01 - Project 027. Measurement taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, the operation of excavators and other hi-rail plant (cranes) within the rail corridor (including loading/unloading materials), and idle plant and equipment. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include birds and distant (and nearby) traffic.
Project 027	27/01/2020	18:38	0:15:00	60.9	40.3	48.1	56.9	50.9	42.9	100	48	-	-	-	59	NCA01	A04	Evening	41	46	58	56	7	2	-10	3	A04 - Project 028. Measurement taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant within the rail corridor, and clangs and bangs. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include birds, nearby residents and distant traffic.
Project 028	27/01/2020	19:21	0:15:00	76.6	47.9	61.4	69.9	63.4	57.9	100	61	-		-	72	NCA01	A03	Evening	41	46	60	56	20	15	1	16	A03 - Project 029. Measurement taken outside 8-10 Brand Street on Valetta Lane, facing southwest towards works within the rail corridor. Site-related noise resulted from the operation of front-end loaders and other plant within the rail corridor (deep excavation), and clangs and bangs. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include birds, passing and distant traffic, and nearby residents.
Project 029	27/01/2020	19:47	0:15:00	75.5	48.5	56.1	69.8	55.3	49.9	100	61	-	-	5.0	70	NCA01	A02	Evening	41	46	61	56	20	15	0	14	A02 - Project 030. Measurement taken outside 11 Hawkins Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant (cranes) within the rail corridor, clangs and bangs, lighting towers and idle plant/equipment. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include birds, wind-blown vegetation and distant traffic.
Project 030	27/01/2020	21:09	0:15:00	83.9	39.6	55.6	67.1	56.5	41.8	100	56	-	-	-	75	NCA01	A07	Evening	41	46	61	56	15	10	-5	19	A07 - Project 031. Measurement taken outside 12 Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of trucks and hi-rail plant within the rail corridor, loading and unloading of ballast and other materials, and truck horns. Site-related noises dominated the measurement contributing approximately 100% of the overall Leq (15 min). Extraneous sources were identified to include birds, distant traffic, nearby residents and wind-blown vegetation.
Project 031	27/01/2020	21:29	0:15:00	58	39.3	48.0	55.6	51.4	41.7	70	46	-	-	-	58	NCA01	A06	Evening	41	46	60	56	5	0	-14	2	A06 - Project 032. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from the loading and unloading of ballast and materials, the operation of trucks and hi-rail plant within the rail corridor, and clangs and bangs. Site-related noises contributed to approximately 70% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include distant traffic and passing aircraft.
Project 032	27/01/2020	21:49	0:30:00	71	44.2	51.3	60.1	53.5	45.8	80	55	-	-	5.0	65	NCA01	A05	Evening	41	46	57	56	14	9	-2	9	A05 - Project 033. Measurement taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from the unloading and loading of ballast and materials, and the operation of excavators and other hi-rail plant within the rail corridor. Site-related noises contributed to approximately 80% of the overall Leq (15 min) throughout the measurement. Extraneous noise sources included distant traffic, passing aircraft and insects.
Project 033	27/01/2020	22:32	0:15:00	92.1	52.5	67.6	80.3	67.5	54.5	100	73	-	-	5.0	92	NCA01	A01	Night	35	40	71	50	38	33	2	42	A01 - Project 034. Measurement taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, the operation of excavators and other hi-rail plant (cranes) within the rail corridor (including loading/unloading materials), truck movements, and idle plant and equipment. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were not identified during the measurement.
Project 034	27/01/2020	22:56	0:15:00	63.8	46.1	47.5	49.7	47.9	46.8	100	58	-	5.0	5.0	63	NCA01	A02	Night	35	40	59	50	23	18	-2	13	A02 - Project 035. Measurement taken outside 11 Hawkins Street, facing west towards works within the rail corridor. Site-related noise resulted from idle plant and equipment on site, lighting towers and clangs + bangs. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include distant and nearby traffic.
Project 035	27/01/2020	23:16	0:15:00	75.4	33.5	56.7	69.5	59.3	37.9	2	40	-	-	-	61	NCA01	A03	Night	35	40	60	50	5	0	-20	11	A03 - Project 036. Measurement taken outside 8-10 Brand Street on Valetta Lane, facing southwest towards works within the rail corridor. Site-related noise resulted from closing and opening of doors on site and staff talking. Site-related noises were barely audible, and contributed to approximately 2% of the overall Leq (15 min) throughout the measurement. Extraneous sources were dominant, and included insects, distant and nearby traffic, and nearby residents.
Project 036	27/01/2020	23:51	0:15:00	64.9	34.1	38.4	46.8	38.5	35.6	22	32	-	-	-	38	NCA01	A07	Night	35	40	61	50	-3	-8	-29	-12	A07 - Project 037. Measurement taken outside 12 Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from hand tools on site. Site-related noises were barely audible, and contributed to approximately 22% of the overall Leq (15 min) throughout the measurement. Extraneous sources were dominant, and included insects, distant and nearby traffic, and nearby residents.
Project 037	28/01/2020	00:11	0:15:00	54.9	34.4	37.5	45.2	37.8	35.6	50	39	-	-	5.0	40	NCA01	A06	Night	35	40	60	50	4	-1	-21	-10	A06 - Project 032. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from the rumble of engines on site. Site-related noises contributed to approximately 50% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include distant traffic and insects.

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 038	28/01/2020	00:36	0:15:00	63.8	31.7	37.2	43.7	39.5	33.3	0	23	-	-	-	0	NCA01	A04	Night	35	40	48	50	-12	-17	-25	-50	A04 - Project 039. Measurement taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noises were inaudible throughout the measurement, which was dominated by extraneous noise sources including birds, nearby residents and distant traffic.

Weather 27-28 January 2020: Generally fine weather, overcast with calm winds. Temperature ranged between 22-30 degrees Celsius over the monitoring periods.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 - Monday 27 January 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Tuesday 28 January 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

Appendix F – Monitoring Report (RP45)

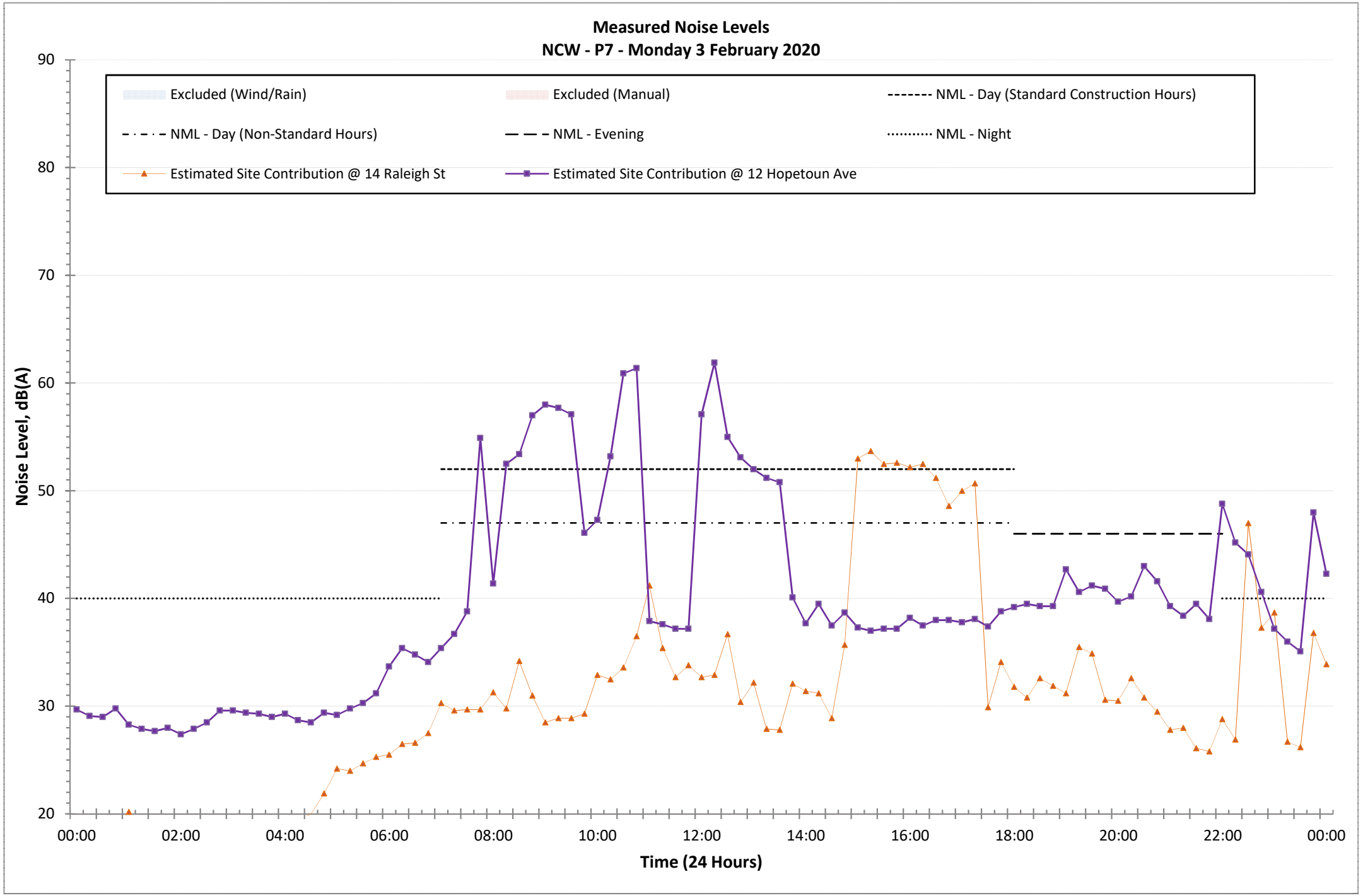
Noise Monitoring – OOHW P7: MW31 - 3 to 7 February 2020

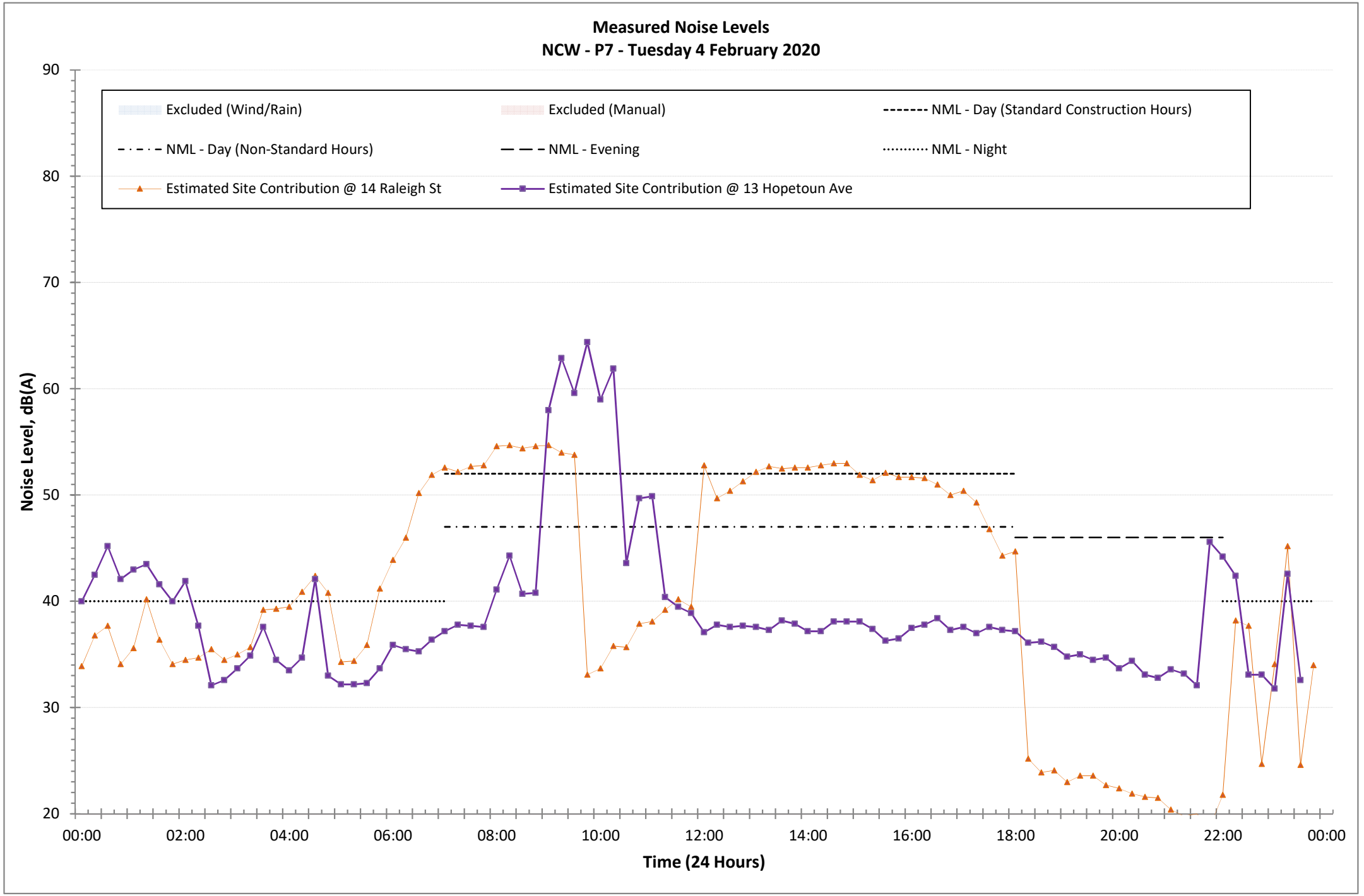
Figure A1.0 – OOHW MW31 – Attended and Unattended Noise Monitoring Locations – Artarmon to Chatswood – NCW P7 (Monday, 3 February to Friday, 7 February 2020)

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 001	3/02/2020	23:30	0:15:00	75.5	37.9	60.5	73.2	62.0	41.5	100	66	-	5.0	-	70	NCA01	A01	Night	35	40	69	50	31	26	-4	20	A01 - Project 001-002. Measurements taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from site mobilisation, clangs and bangs, staff talking, and the operation of excavators and other hi-rail plant within the rail corridor. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include wind-blown vegetation.
Project 002	4/02/2020	23:48	0:15:00	73.6	40.8	60.1	67.2	63.2	47.4	100	65	-	-	5.0	68	NCA01	A01	Night	35	40	69	50	30	25	-4	18	
Project 003	4/02/2020	00:07	0:15:00	62.1	38.7	47.4	56.1	51.7	41.4	100	52	-	-	5.0	62	NCA01	A02	Night	35	40	59	50	17	12	-7	12	A02 - Project 003. Measurement taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant within the rail corridor, distant site-related construction works within the rail corridor, clangs and bangs, and reverse alarms. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified during the measurements and include passing aircraft, wind-blown vegetation, insects and distant traffic.
Project 004	4/02/2020	00:40	0:15:00	69.3	37.0	50.7	61.9	52.2	40.1	100	51	-	-	-	68	NCA01	A03	Night	35	40	58	50	16	11	-7	18	A03 - Project 004-005. Measurements taken at the western end of Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the loading and unloading of ballast and materials, the operation of hi-rail plant within the rail corridor, hand tools and workers talking. Site-related noises dominated the measurements contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, insects and wind-blown vegetation.
Project 005	4/02/2020	01:00	0:15:00	64.7	35.5	47.0	54.3	48.7	41.3	100	52	-	-	5.0	64	NCA01	A03	Night	35	40	58	50	17	12	-6	14	
Project 006	4/02/2020	01:22	0:15:00	66.4	39.7	49.6	59.7	52.3	41.2	100	55	-	-	5.0	66	NCA01	A04	Night	35	40	54	50	20	15	1	16	A04 - Project 006. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from the loading and unloading of ballast and materials, dragging of excavator buckets on ballast, the operation of hi-rail plant within the rail corridor, including motion alarms, and clangs and bangs. Site-related noises dominated the measurement contributing to 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, insects and wind-blown vegetation.
Project 007	4/02/2020	01:43	0:15:00	66.2	41.5	49.6	57.3	52.1	44.7	100	50	-	-	-	62	NCA01	A05	Night	35	40	55	50	15	10	-5	12	A05 - Project 007. Measurement taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from the unloading and loading of materials, the operation of excavators and other hi-rail plant within the rail corridor, including motion alarms, clangs and bangs, and hand tools. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include distant traffic and wind-blown vegetation.
Project 008	4/02/2020	02:24	0:15:00	70.5	37.6	51.5	60.4	55.0	41.3	100	57	-	-	5.0	61	NCA01	A06	Night	35	40	61	50	22	17	-5	11	A06 - Project 008. Measurement taken outside 11 Hawkins Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant (cranes) within the rail corridor, dragging of excavator buckets across ballast, loading and unloading of materials, and clangs and bangs. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds and nearby (and distant) traffic.
Project 009	4/02/2020	11:35	0:15:00	75.2	34.7	56.4	69.9	57.4	37.9	5	43	-	-	-	53	NCA01	A07	Night	35	40	61	50	8	3	-18	3	A07 - Project 009-010. Measurements taken outside 111 Hampden Road, facing east towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant within the rail corridor, generators/lighting towers and clangs and bangs. Site-related noises were minimal and contributed to approximately 5-10% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included distant and passing traffic (including buses and ambulances) and nearby residents.
Project 010	4/02/2020	23:53	0:15:00	73.5	35.2	54.8	68.5	55.6	37.3	8	44	-	-	-	46	NCA01	A07	Night	35	40	61	50	9	4	-17	-4	
Project 011	5/02/2020	00:29	0:15:00	75.8	41.1	55.6	65.1	59.2	44.7	100	56	-	-	-	65	NCA01	A03	Night	35	40	58	50	21	16	-2	15	A03 - Project 011. Measurement taken at the western end of Hopetoun Avenue, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the loading and unloading of ballast and materials, the operation of hi-rail plant within the rail corridor, hand tools and workers talking. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, insects and conversations with residents.
Project 012	5/02/2020	01:00	0:15:00	67.9	35.4	48.8	59.7	51.7	37.1	100	49	-	-	-	65	NCA01	A04	Night	35	40	54	50	14	9	-5	15	A04 - Project 012-013. Measurements taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from the loading and unloading of ballast and materials, dragging of excavator buckets on ballast, the operation of hi-rail plant within the rail corridor, staff talking, and clangs and bangs. Site-related noises dominated the measurements contributing to 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic.
Project 013	5/02/2020	01:18	0:15:00	68.4	37.5	49.0	59.7	51.8	39.8	100	49	-	-	-	68	NCA01	A04	Night	35	40	54	50	14	9	-5	18	
Project 014	5/02/2020	01:39	0:15:00	63.9	41.8	48.6	58.9	51.8	43.0	100	54	-	-	5.0	61	NCA01	A05	Night	35	40	55	50	19	14	-1	11	A05 - Project 014. Measurement taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from the unloading and loading of materials, the operation of excavators and other hi-rail plant within the rail corridor, clangs and bangs, and staff talking. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include distant traffic and nearby traffic, and insects.
Project 015	5/02/2020	02:15	0:15:00	56.7	29.9	36.1	43.7	38.1	31.6	36	32	-	-	-	45	NCA01	A02	Night	35	40	59	50	-3	-8	-27	-5	A02 - Project 015. Measurement taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from distant site-related construction works within the rail corridor, clangs and bangs, lighting towers/generators, and staff talking. Site-related noises contributed to approximately 36% of the overall Leq (15 min) throughout the measurement. Extraneous sources were dominant during the measurements and included insects, and distant and nearby traffic.
Project 016	5/02/2020	02:41	0:15:00	52.8	26.7	35.8	46.9	39.2	28.1	26	30	-	-	-	50	NCA01	A01	Night	35	40	60	50	-5	-10	-30	0	A01 - Project 016. Measurement taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from clangs and bangs, staff talking, and distant works within the rail corridor. Site-related noises contributed to approximately 26% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant throughout the measurement and included animals and insects, and distant and nearby traffic.
Project 017	5/02/2020	23:14	0:15:00	85.3	52.6	59.4	65.7	60.6	54.3	100	64	-	-	5.0	79	NCA01	A01	Night	35	40	69	50	29	24	-5	29	A01 - Project 017. Measurement taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from frequent clangs and bangs, staff talking, and the operation of excavators and other hi-rail plant within the rail corridor (including movement of materials). Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified throughout the measurements to include distant and nearby traffic.
Project 018	5/02/2020	23:38	0:15:00	76.6	38.1	57.9	70.8	60.2	41.1	3	43	-	-	-	56	NCA01	A07	Night	35	40	61	50	8	3	-18	6	A07 - Project 018-019. Measurements taken outside 111 Hampden Road, facing east towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant within the rail corridor, welding and other hand tools, and clangs and bangs. Site-related noises were minimal and contributed to approximately 3-20% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included distant and passing traffic (including buses, ambulances and motorcycles), insects, and nearby residents.
Project 019	5/02/2020	23:54	0:15:00	80.9	36.9	58.8	72.6	58.5	39.7	20	52	-	-	-	57	NCA01	A07	Night	35	40	61	50	17	12	-9	7	

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 020	6/02/2020	00:25	0:15:00	69.4	38.6	50.1	59.5	53.2	41.0	70	54	-	-	5.0	57	NCA01	A06	Night	35	40	61	50	19	14	-7	7	A06 - Project 020. Measurement taken outside 11 Hawkins Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and other hi-rail plant (cranes) within the rail corridor, dragging of excavator buckets across ballast, loading and unloading of materials, lighting towers/generators, and clangs and bangs. Site-related noises contributed to approximately 70% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic and nearby road works on Brand Street.
Project 021	6/02/2020	00:46	0:15:00	76.6	52.8	60.7	69.0	64.0	53.6	100	66	-	-	5.0	74	NCA01	A01	Night	35	40	69	50	31	26	-3	24	A01 - Project 021. Measurement taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from clangs and bangs, staff talking, lighting towers/generators, and the operation of excavators and other hi-rail plant within the rail corridor (including movement of materials and ballast). Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were not identified during the measurement.
Project 022	6/02/2020	01:28	0:15:00	63	37.0	46.5	54.2	49.9	38.9	100	52	-	-	5.0	56	NCA01	A04	Night	35	40	54	50	17	12	-3	6	A04 - Project 022. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from the dragging of excavator buckets on ballast, grinding/drilling/jack-hammering, the operation of hi-rail plant within the rail corridor, including motion alarms, and clangs and bangs. Site-related noises dominated the measurement contributing to 100% of the overall Leq (15 min). Extraneous sources were identified to include insects.
Project 023	6/02/2020	01:51	0:15:00	70.9	36.6	49.3	61.1	50.1	43.2	40	50	-	-	5.0	51	NCA01	A05	Night	35	40	55	50	15	10	-5	1	A05 - Project 014. Measurement taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from the unloading and loading of materials, the operation of excavators and other hi-rail plant within the rail corridor, including motion alarms, clangs and bangs, and staff talking and lighting towers/generators. Site-related noises contributed to approximately 40% of the overall Leq (15 min) throughout the measurement. Extraneous sources were dominant and included distant traffic and nearby traffic, and nearby wildlife.
Project 024	7/02/2020	01:54	0:15:00	62.1	34.5	41.1	48.6	42.8	36.7	100	46	-	-	5.0	47	NCA01	A04	Night	35	40	54	50	11	6	-8	-3	A04 - Project 024. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from the operation of hi-rail plant within the rail corridor, including motion alarms, staff talking, lighting towers/generators, and clangs and bangs. Site-related noises dominated the measurement contributing to 100% of the overall Leq (15 min). Extraneous sources were identified to include distant and nearby traffic.
Project 025	7/02/2020	02:26	0:15:00	73.5	34.6	51.5	63.2	52.1	36.6	100	62	-	5.0	5.0	71	NCA01	A01	Night	35	40	69	50	27	22	-8	21	A01 - Project 025. Measurement taken outside 13 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from clangs and bangs, staff talking, lighting towers/generators, and the movement of trucks on site. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include birds, nearby residents and distant traffic.

Weather 3-7 February 2020: Generally fine weather, overcast with periods of rain throughout the latter half of the week. Temperature ranged between 19-23 degrees Celsius over the monitoring periods.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 - Monday 3 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Tuesday 4 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
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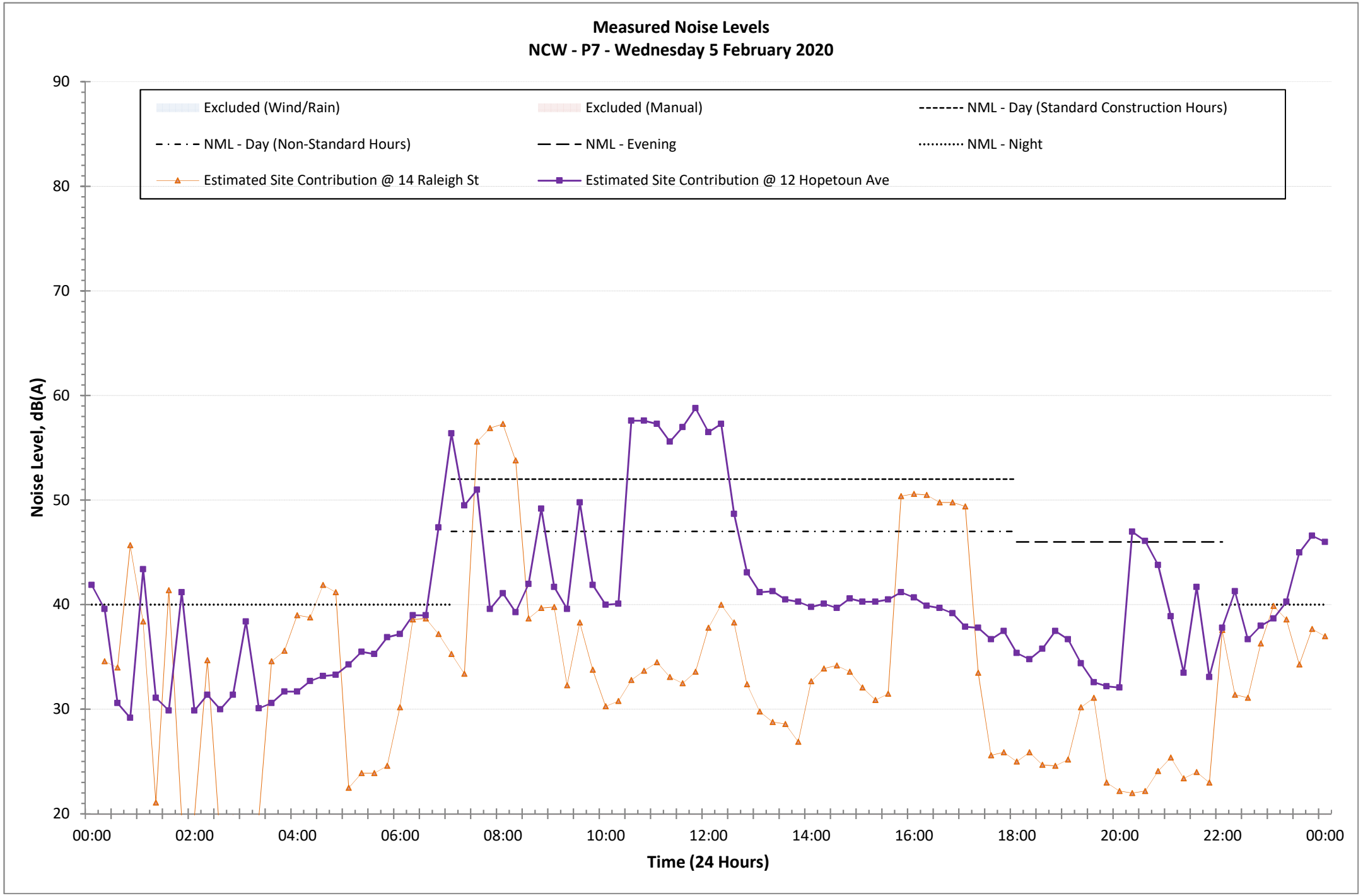
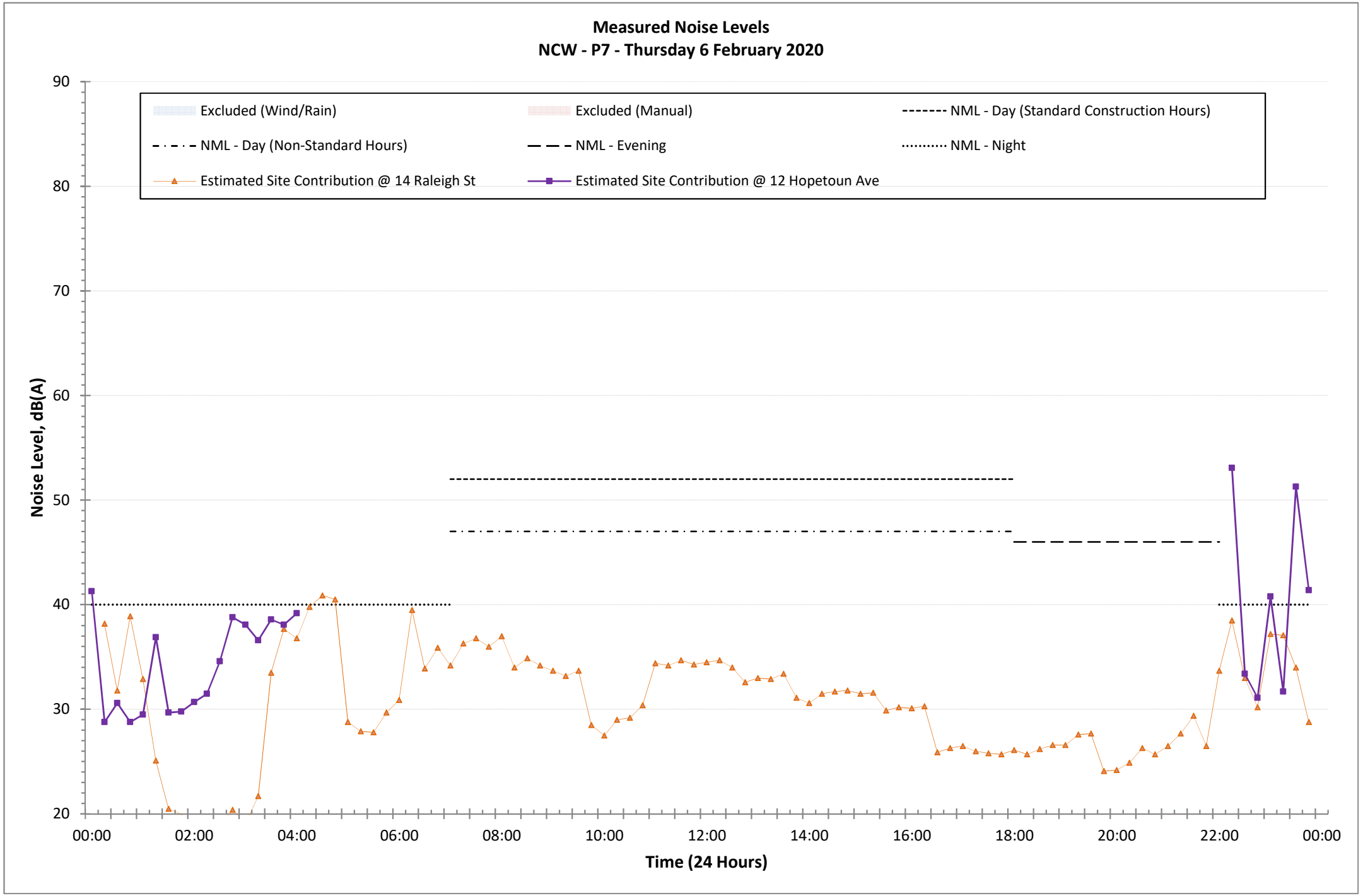
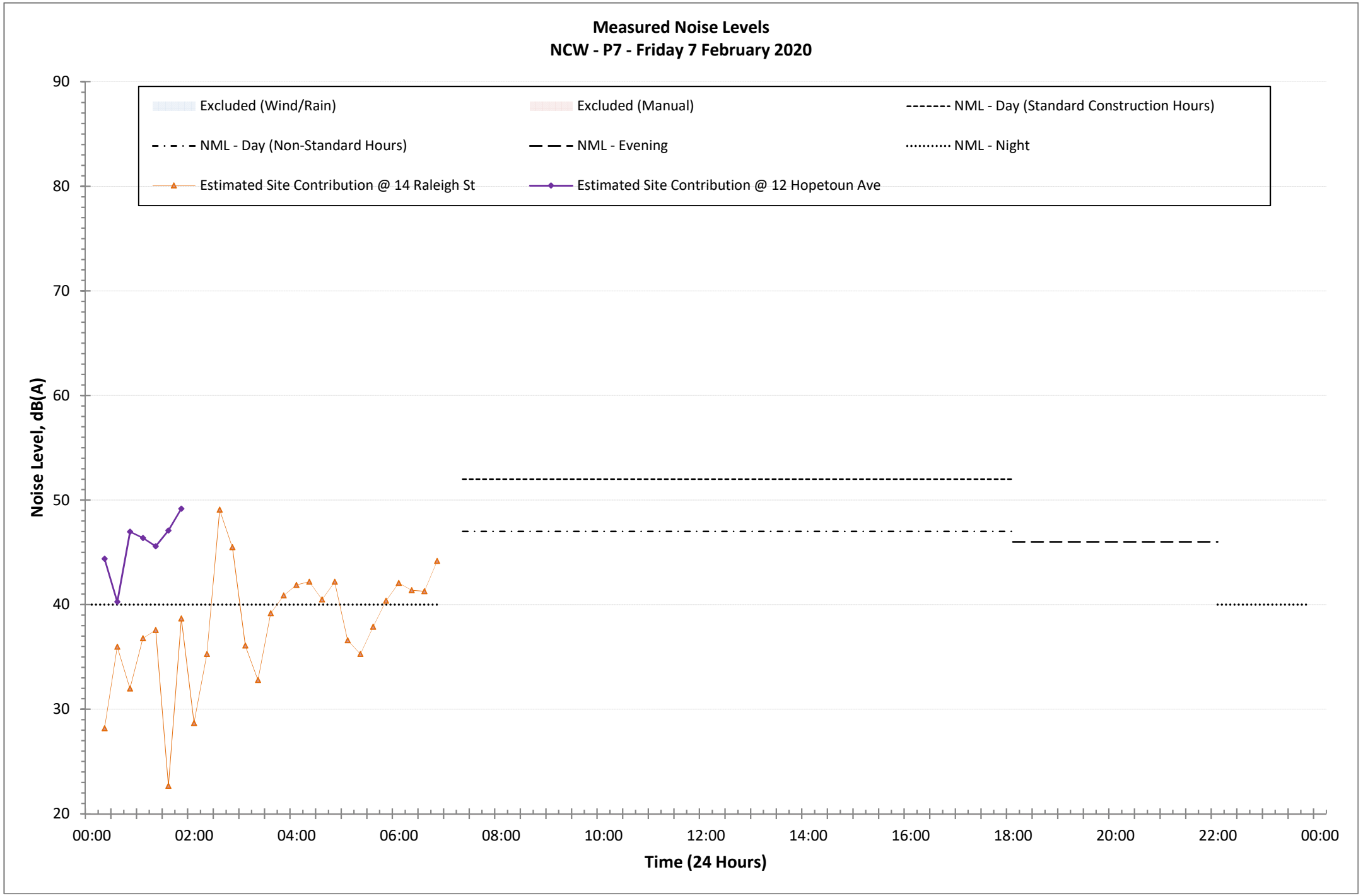
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Wednesday 5 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

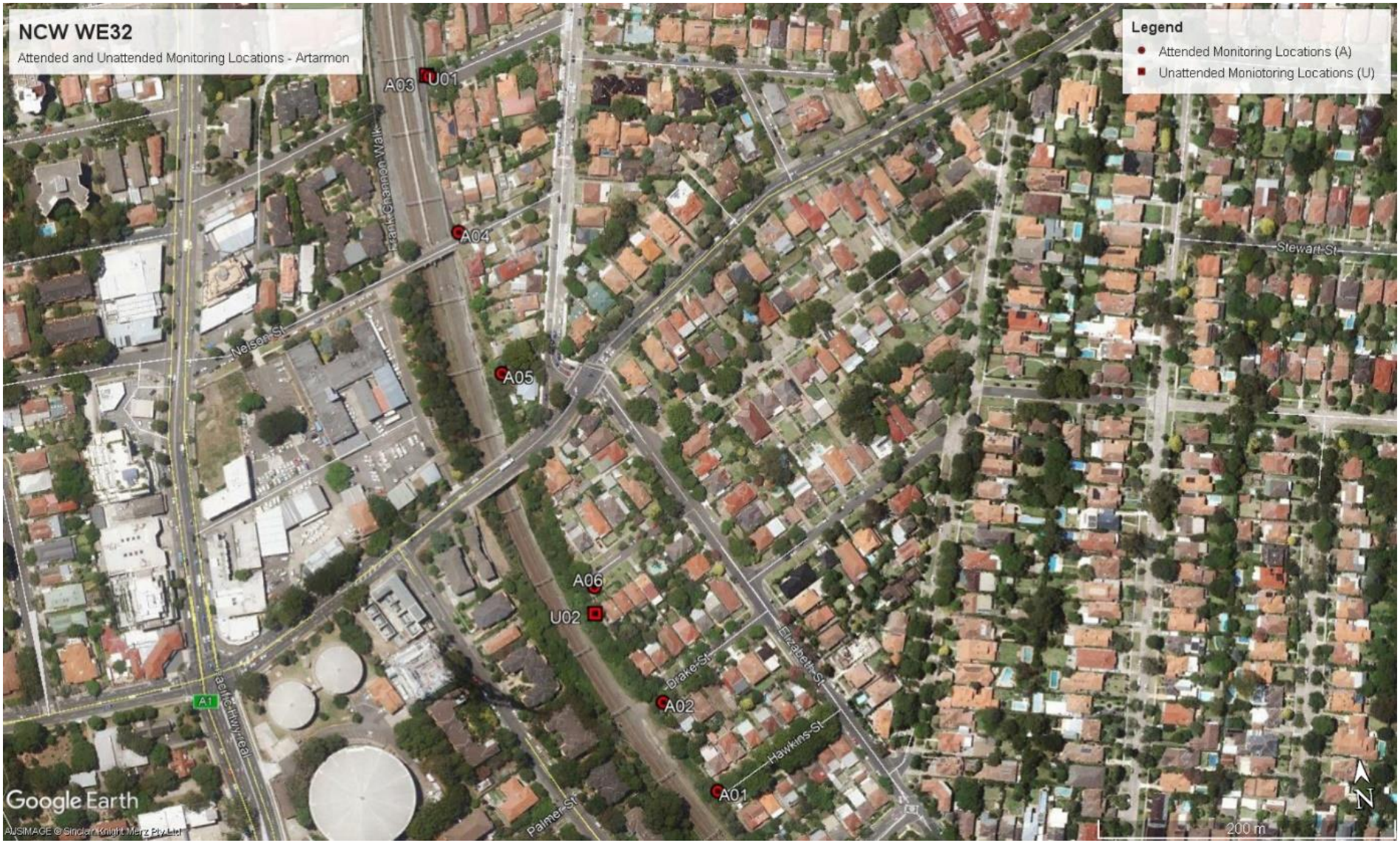

Measured Noise Levels
NCW - P7 - Thursday 6 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Friday 7 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

Appendix G – Monitoring Report (RP46)

Noise Monitoring – OOHW P7: WE32 - 8 to 9 February 2020

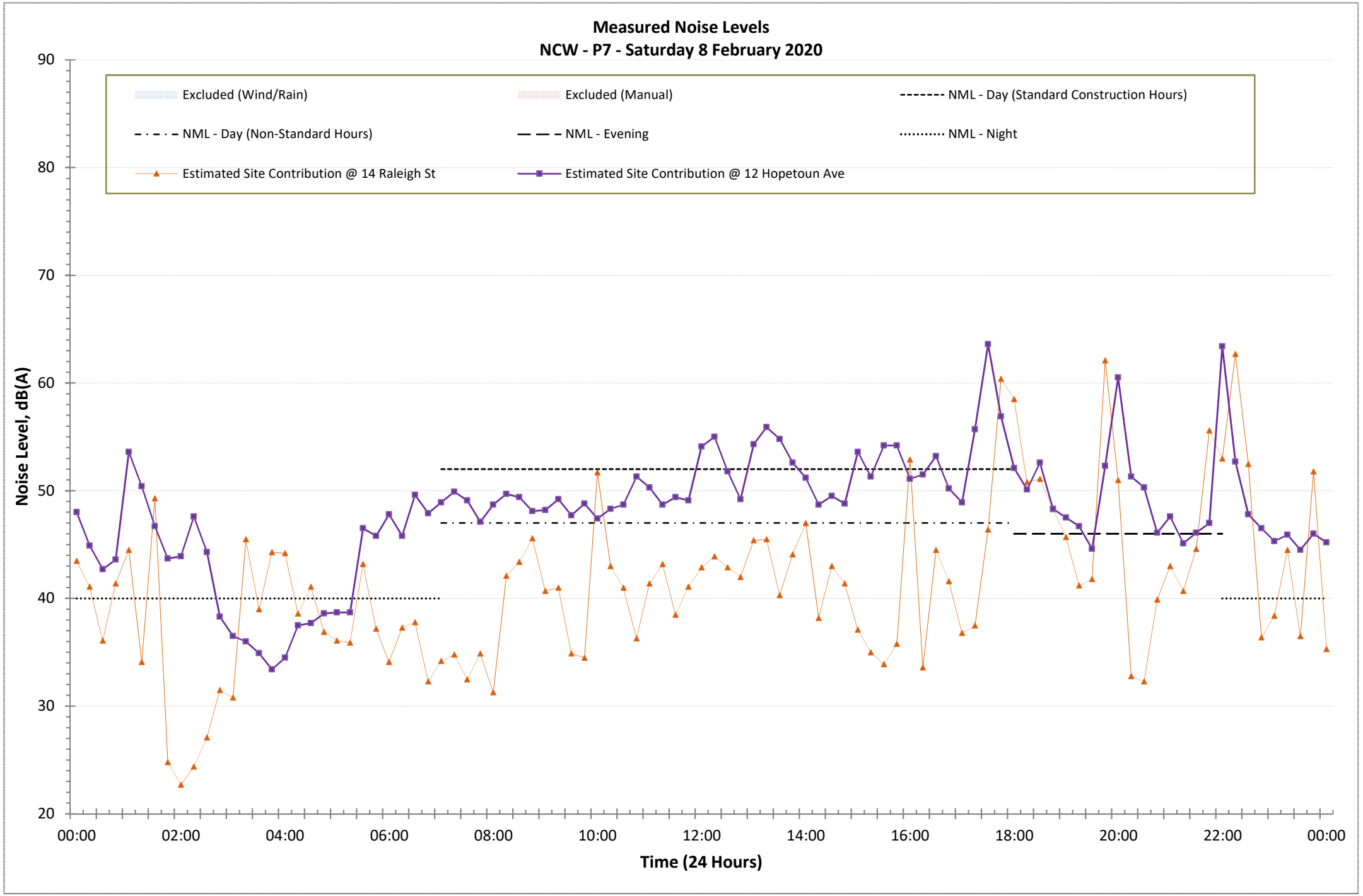
Figure A1.0 – OOHW WE32 – Attended and Unattended Noise Monitoring Locations – Artarmon to Chatswood – NCW P7 (Saturday, 8 February and Sunday, 9 February 2020)



File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	Low Frequency Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 001	8/02/2020	04:17:08	0:15:00	76.2	54.7	60.6	71.0	61.7	55.6	100	63	-	-	2.0	76	NCA01	A01	Night	35	40	61	50	28	23	2	26	A01 - Project 001. Measurements taken outside Hawkins Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from lighting tower, workers talking, excavator operating, movement of tools, work train, loading of materials and hi-rail plant within the rail corridor. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. There were no extraneous sources identified.
Project 002	8/02/2020	04:45:02	0:15:00	81.5	53.5	67.8	76.9	72.2	58.5	100	68	-	-	-	82	NCA01	A02	Night	35	40	72	50	33	28	-4	32	A02 - Project 002-003. Measurements taken outside Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from excavator and two cranes operating, workers talking and beeps. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include cars passing by.
Project 003	8/02/2020	05:03:04	0:15:00	77.3	62.2	64.5	71.2	65.3	63.1	100	70	-	-	5.0	77	NCA01	A02	Night	35	40	72	50	35	30	-3	27	
Project 004	8/02/2020	05:50:02	0:15:00	86.1	46.4	55.9	64.1	56.7	49.7	100	61	-	-	5.0	86	NCA01	A03	Night	35	40	71	50	26	21	-10	36	A03 - Project 004-005. Measurements taken outside Hopetoun Avenue, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavator, workers talking, hand tools, drilling operations and movement of ballast. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include birds.
Project 005	8/02/2020	06:07:06	0:15:00	78.8	47.5	56.6	65.4	58.9	49.0	100	62	-	-	5.0	79	NCA01	A03	Night	35	40	71	50	27	22	-9	29	
Project 006	8/02/2020	06:28:10	0:15:00	71.9	43.9	52.2	61.9	53.4	47.1	90	57	-	-	5.0	72	NCA01	A04	Night	35	40	71	50	22	17	-14	22	A04 - Project 006-007. Measurements taken outside Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from excavator operating, hand tools and work with metals. Site-related noises contributed to approximately 90% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic, birds and aircrafts.
Project 007	8/02/2020	06:46:04	0:15:00	70.3	43.8	49.7	55.7	51.8	46.0	90	54	-	-	5.0	70	NCA01	A04	Night	35	40	71	50	19	14	-17	20	
Project 008	8/02/2020	07:06:08	0:15:00	67.6	48.3	54.9	61.2	57.3	51.1	70	55	-	-	2.0	70	NCA01	A05	Day	42	47	54	57	13	8	1	13	A05 - Project 008. Measurements taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from hand tools and operation of excavators. Site-related noises contributed to approximately 70% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to birds and distant traffic.
Project 009	8/02/2020	19:55:04	0:15:00	80.1	59.5	69.0	74.1	71.8	64.1	100	69	-	-	-	80	NCA01	A03	Evening	41	46	70	56	28	23	-1	24	A03 - Project 009-010. Measurements taken outside Hopetoun Avenue, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators, movement of ballast and horns. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. There were no extraneous sources identified.
Project 010	8/02/2020	20:12:08	0:15:00	69.3	53.0	62.8	67.5	65.7	56.6	100	63	-	-	-	69	NCA01	A03	Evening	41	46	70	56	22	17	-7	13	
Project 011	8/02/2020	20:32:16	0:15:00	72.6	50.5	62.6	69.3	67.3	53.7	90	62	-	-	-	73	NCA01	A04	Evening	41	46	70	56	21	16	-8	17	A04 - Project 011-012. Measurements taken outside Berkeley Court, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of excavators, hi-rail plant, train horns, distant works and movement of ballast. Site-related noises dominated the measurement contributing 90% of the overall Leq (15 min). Extraneous sources were identified to include cicadas, wind, distant traffic, vehicles passing by and neighbours talking.
Project 012	8/02/2020	20:49:04	0:15:00	78.5	45.5	52.4	59.5	54.8	47.6	90	57	-	-	5.0	79	NCA01	A04	Evening	41	46	70	56	16	11	-13	23	
Project 013	8/02/2020	21:09:04	0:15:00	67.2	50.0	56.0	60.8	58.1	52.8	80	55	-	-	-	67	NCA01	A05	Evening	41	46	70	56	14	9	-15	11	A05 - Project 013. Measurements taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from operation of excavators and horns. Site-related noises contributed to approximately 80% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to distant traffic, horns and wind.
Project 014	8/02/2020	22:13:10	0:15:00	74.9	53.7	58.4	67.0	60.8	54.8	80	57	-	-	-	75	NCA01	A01	Night	35	40	61	50	22	17	-4	25	A01 - Project 014-015. Measurements taken outside Hawkins Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from work train engine's hum and operation of excavator. Site-related noises contributed to approximately 80% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to swelling running water and rustling trees.
Project 015	8/02/2020	22:32:10	0:15:00	75.2	53.5	57.3	66.1	57.9	54.8	80	61	-	-	5.0	75	NCA01	A01	Night	35	40	61	50	26	21	0	25	
Project 016	8/02/2020	22:52:06	0:15:00	85.8	55.9	62.8	72.6	63.0	58.4	100	63	-	-	-	86	NCA01	A02	Night	35	40	72	50	28	23	-9	36	A02 - Project 016-017. Measurements taken outside Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from movement of material and ballast, lighting tower, horns, hi-rail operating, bulldozer's engine, staff talking, staff passing by and hand tools. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). There were no extraneous sources identified.
Project 017	8/02/2020	23:21:04	0:15:00	80.8	57.5	67.8	78.1	73.1	58.8	100	68	-	-	-	81	NCA01	A02	Night	35	40	72	50	33	28	-4	31	
Project 018	9/02/2020	00:37:04	0:15:00	95.6	46.1	64.1	66.7	55.2	48.0	100	64	-	-	-	96	NCA01	A06	Night	35	40	59	50	29	24	5	46	A06 - Project 018-019. Measurements taken outside Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from the distant works, operation of excavator and hi-rail, work train and train's horn. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, cicadas, wind and water running.
Project 019	9/02/2020	01:05:02	0:15:00	77.5	47.4	55.5	67.1	54.8	49.5	100	61	-	-	5.0	78	NCA01	A06	Night	35	40	59	50	26	21	2	28	

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	Low Frequency Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 020	9/02/2020	01:58:08	0:15:00	69.3	47.4	54.2	63.9	57.1	49.4	100	59	-	-	5.0	64	NCA01	A03	Night	35	40	65	50	24	19	-6	14	A03 - Project 020. Measurements taken outside Hopetoun Avenue, facing west towards works within the rail corridor. Site-related noise resulted from operation of excavators, hand tools, hammering and movement of ballast. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include water running.
Project 021	9/02/2020	02:38:10	0:15:00	78.5	51.6	55.6	63.3	56.2	52.6	100	61	-	-	5.0	79	NCA01	A02	Night	35	40	71	50	26	21	-10	29	A02 - Project 021. Measurements taken outside Drake Street, facing west towards works within the rail corridor. Site-related noise resulted from lighting tower, operation of excavators, hand tools and vehicles entering the site. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include raining, wind and rustling trees.
Project 022	9/02/2020	18:35:02	0:15:00	81	56.3	62.7	73.6	64.0	57.6	50	60	-	-	-	81	NCA01	A06	Evening	41	46	59	56	19	14	1	25	A06 - Project 022-023. Measurements taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of excavators, cranes, hi-rail plant, drilling works, horns and automatic tools. Site-related noises dominated the measurement contributing between 10-50% of the overall Leq (15 min). Extraneous sources were identified to include raining.
Project 023	9/02/2020	19:21:06	0:15:00	76.8	59.9	66.6	73.6	69.7	61.4	10	57	-	-	-	77	NCA01	A06	Evening	41	46	59	56	16	11	-2	21	
Project 024	9/02/2020	19:52:04	0:15:00	99.1	56.1	73.4	81.2	72.5	58.9	80	72	-	-	-	99	NCA01	A02	Evening	41	46	72	56	31	26	0	43	A012- Project 024-025. Measurements taken outside Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of cranes, trucks entering in the site, hand tools and lighting tower. Site-related noises dominated the measurement contributing 80-90% of the overall Leq (15 min). Extraneous sources were identified to include raining and wind.
Project 025	9/02/2020	20:10:04	0:15:00	87.5	61.8	70.3	77.3	72.9	63.8	90	70	-	-	-	88	NCA01	A02	Evening	41	46	72	56	29	24	-2	32	
Project 026	9/02/2020	21:20:22	0:15:00	69.5	50.2	56.8	64.0	59.2	52.5	5	44	-	-	-	70	NCA01	A03	Evening	41	46	65	56	3	-2	-21	14	A03 - Project 026. Measurements taken outside Hopetoun Avenue, facing west towards works within the rail corridor. Site-related noise resulted from the mobilisation of the hi-rail. Site-related noises contributed to approximately 5% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include raining and wind.

Weather 8-9 February 2020: Generally rainy weather, overcast and windy. Temperature ranged between 20-21 degrees Celsius over the monitoring periods.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the **INP**. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 - Saturday 8 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
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14:00
16:00
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20:00
22:00
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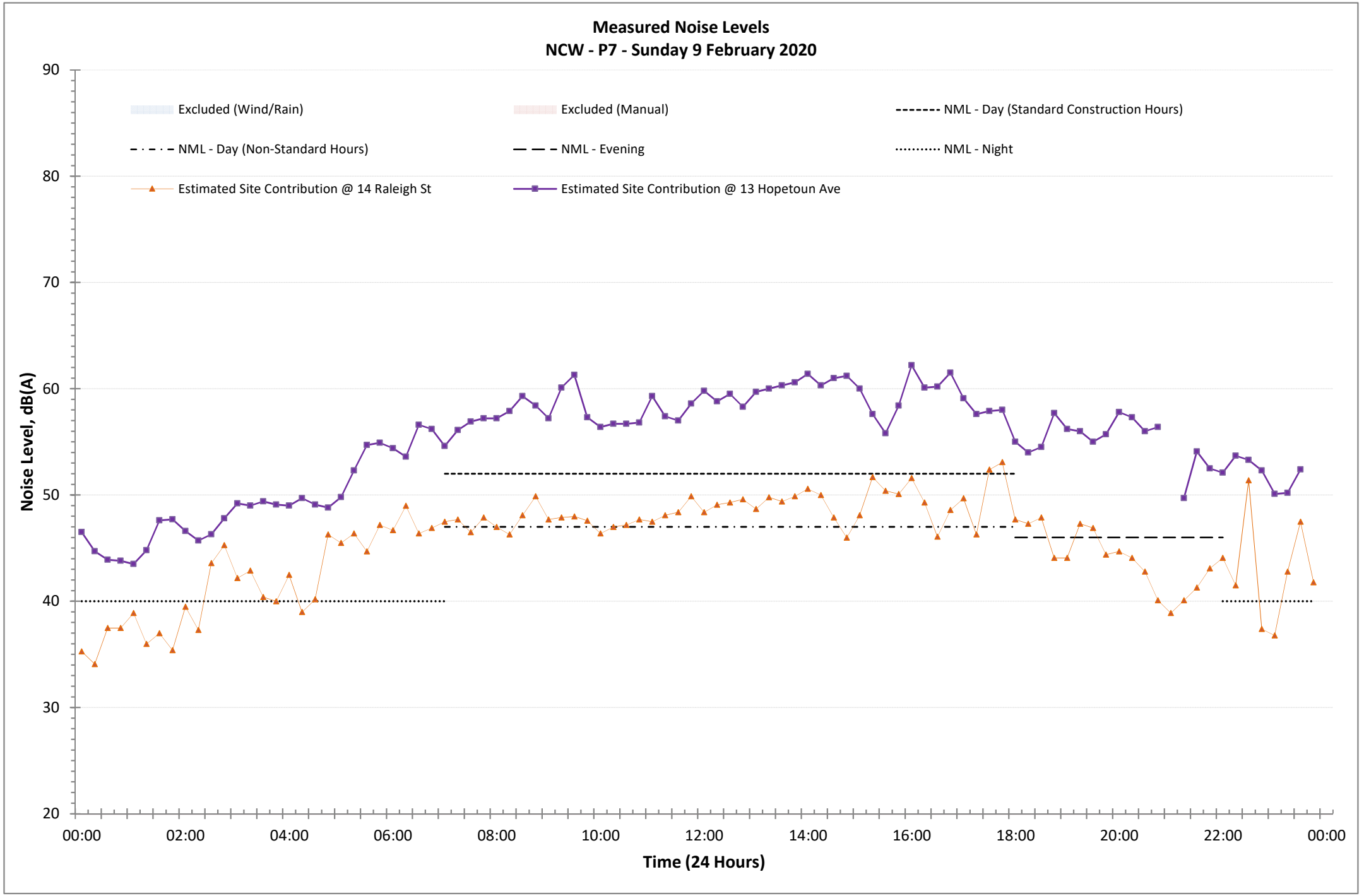
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Sunday 9 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

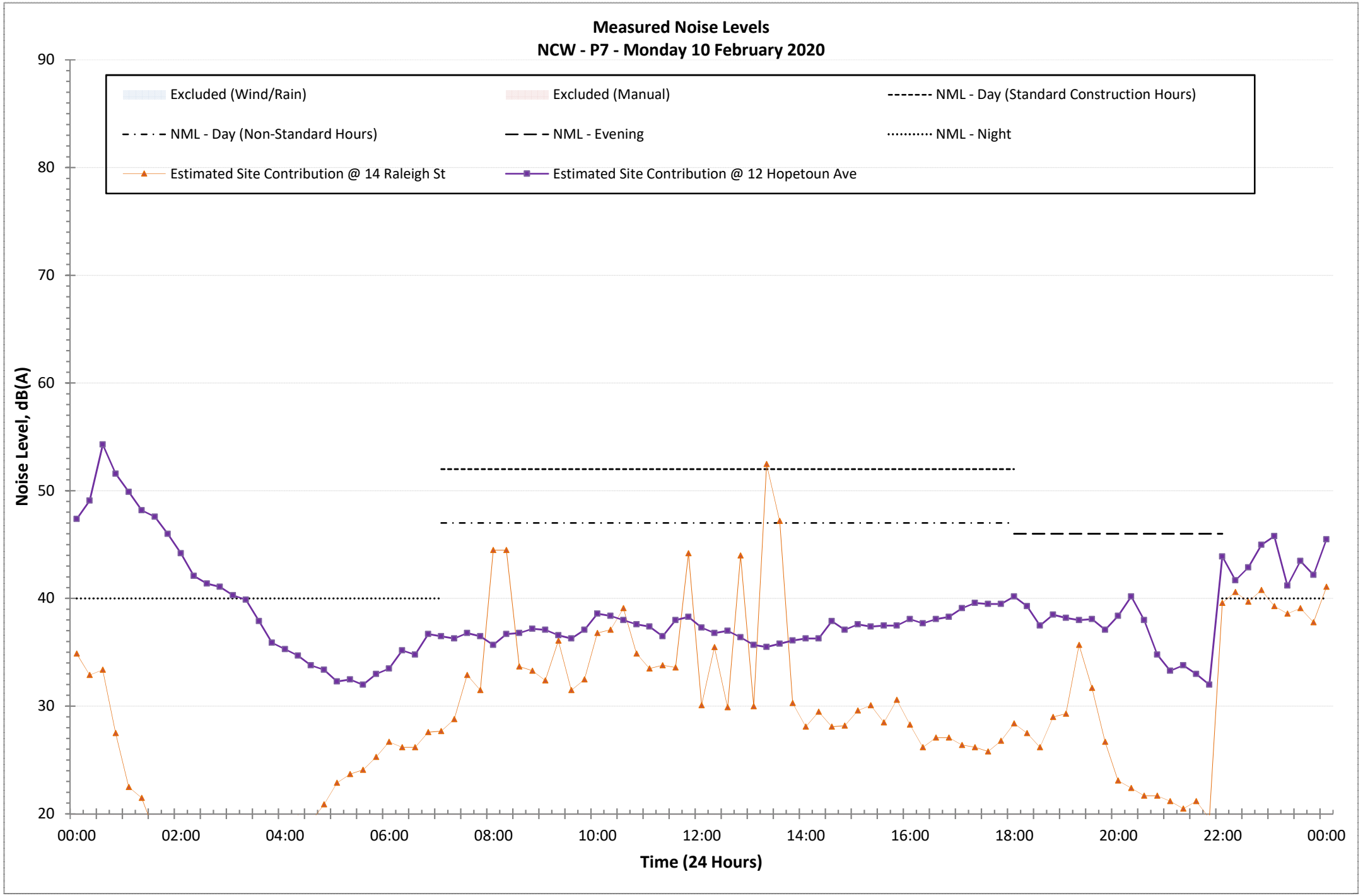
Appendix H – Monitoring Report (RP47)

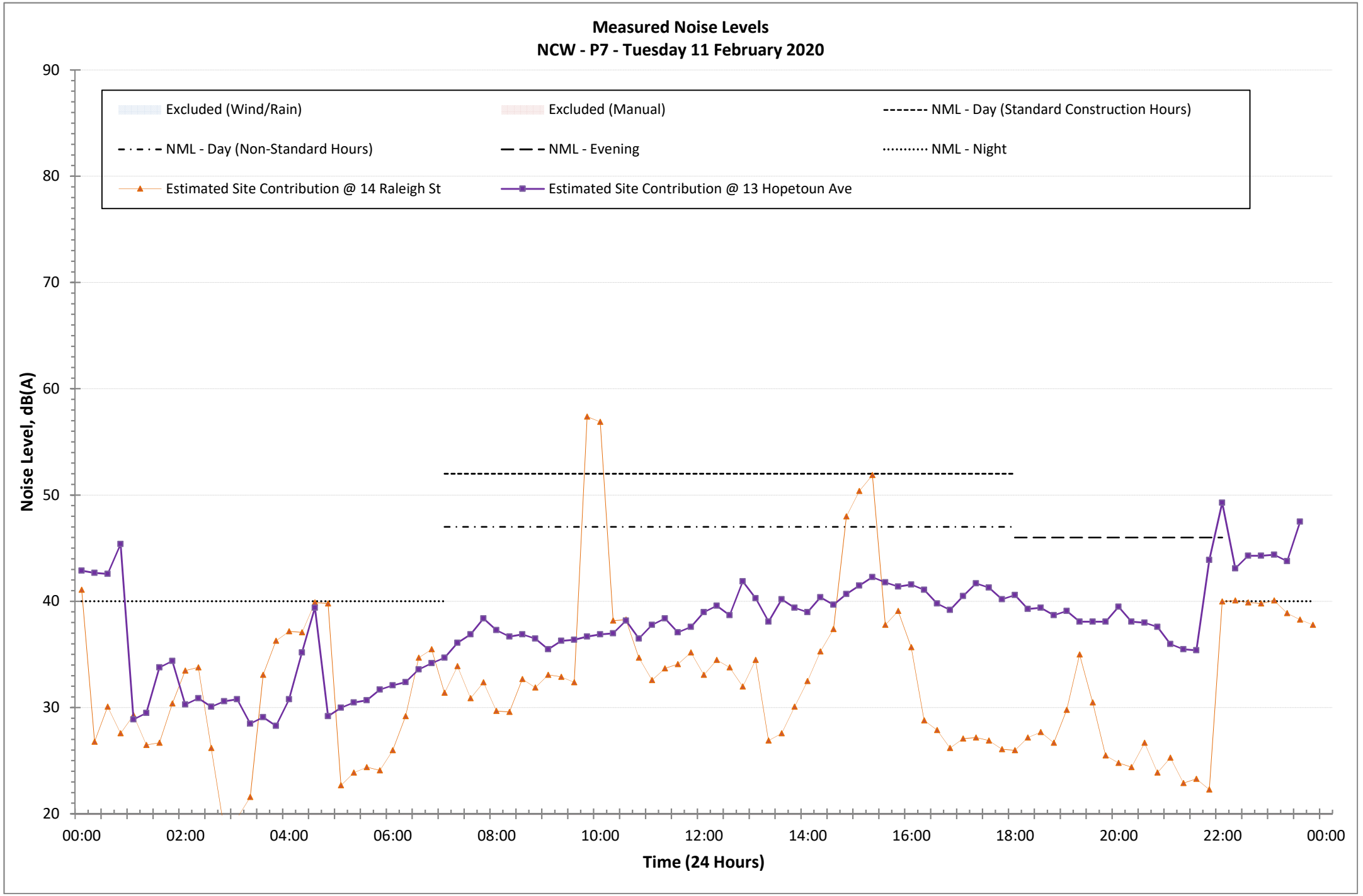
Noise Monitoring – OOHW P7: MW32 - 10 to 14 February 2020

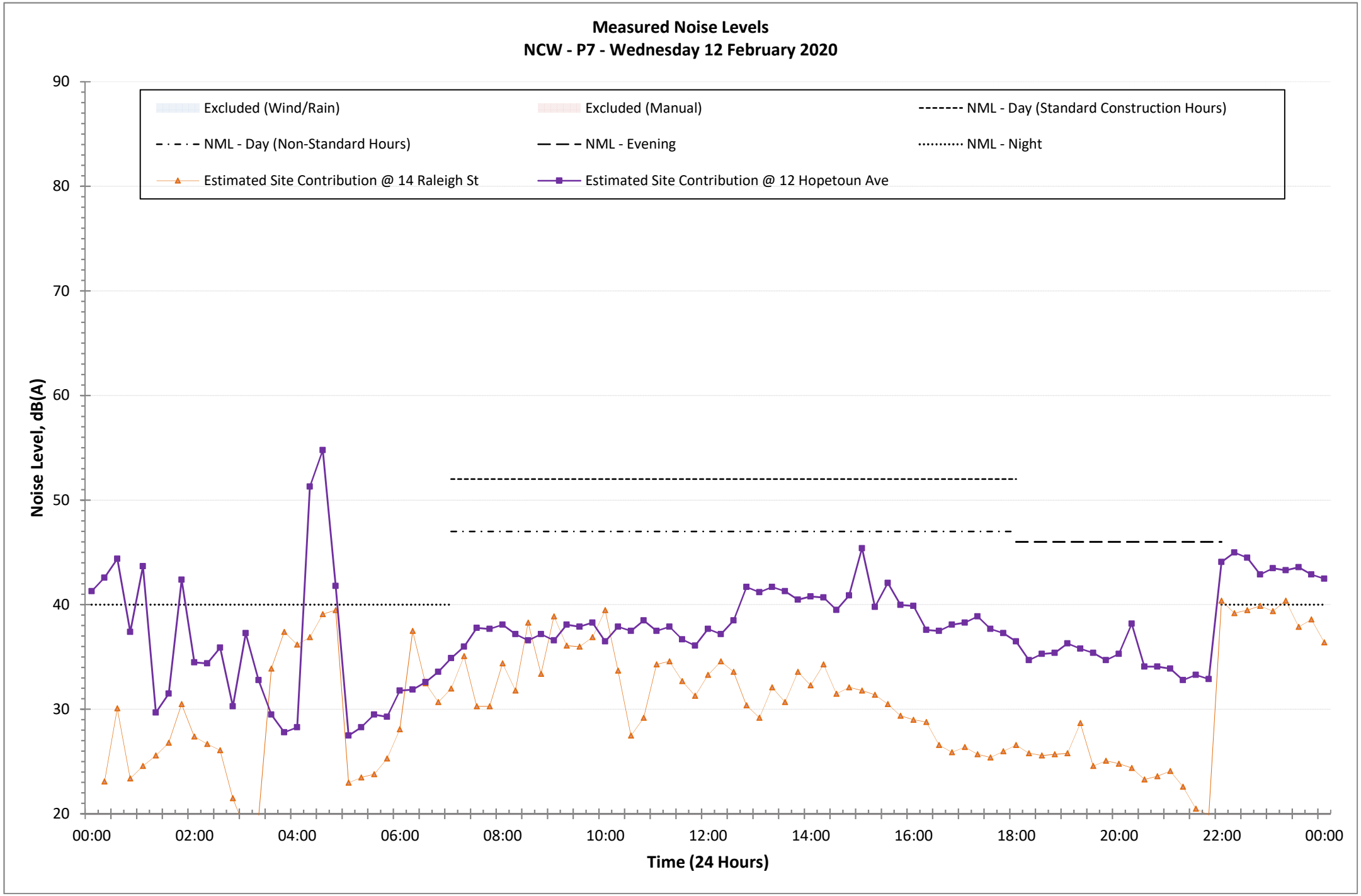
Figure A1.0 – OOHW MW32 – Attended and Unattended Noise Monitoring Locations – Artarmon to Chatswood – NCW P7 (Monday, 10 February to Friday, 14 February 2020)

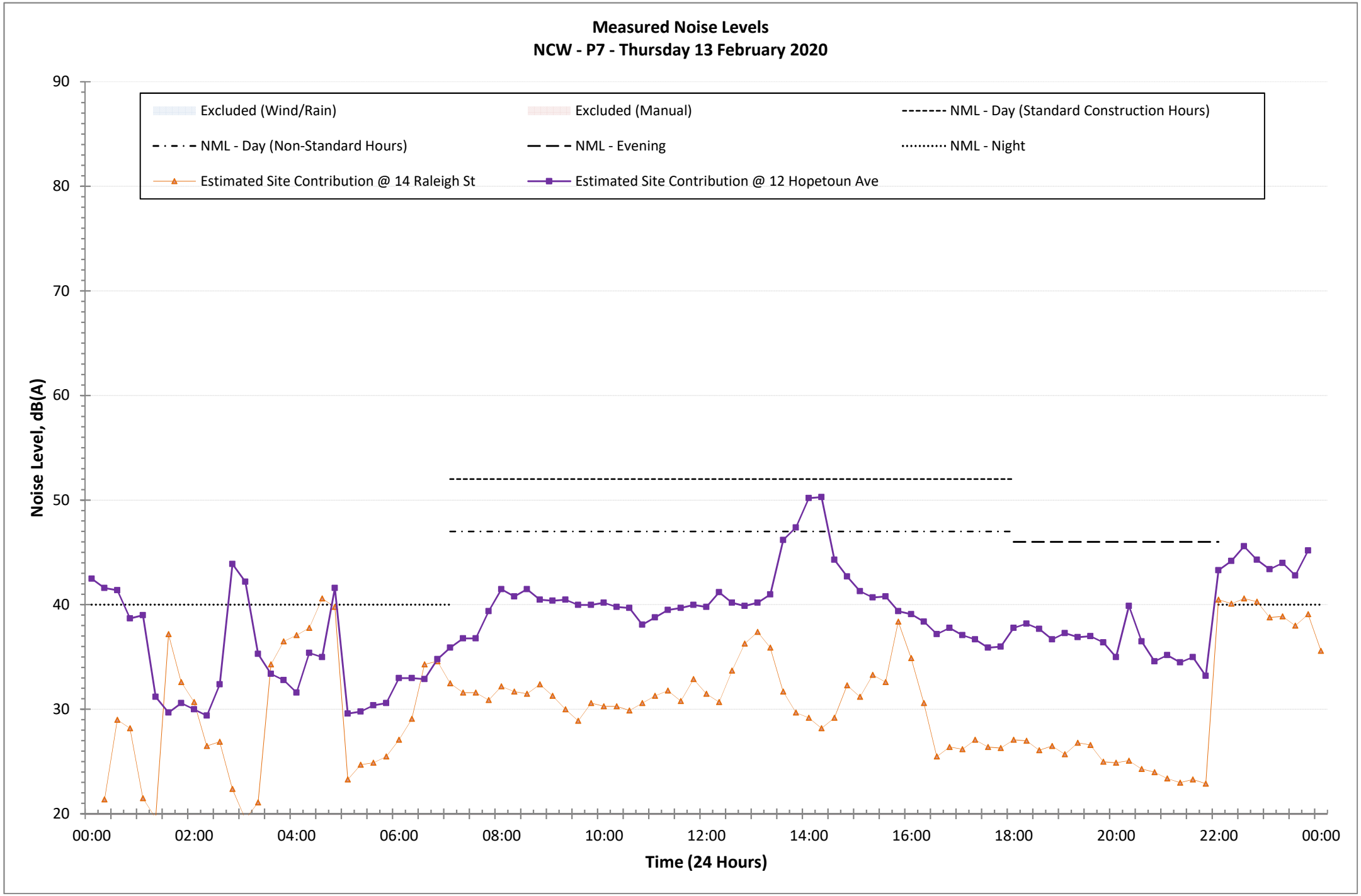
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 000	11/02/2020	00:24:20	0:15:00	82.2	31.1	58.1	67.9	62.0	34.1	100	63	-	5.0	-	80	NCA01	A01	Night	35	40	69	50	28	23	-6	30	A01 - Project 000-001. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the traveling of vehicles to the site, opening and closing of site door, slamming the vehicle doors, clangs and bangs, hand tools, unloading the instruments by staff, reverse alarm, light tower and staff talking. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects and trains.
Project 001	11/02/2020	00:40:18	0:15:00	84.6	32.5	57.7	65.1	59.8	53.4	80	67	-	5.0	5.0	79	NCA01	A01	Night	35	40	69	50	32	27	-2	29	
Project 002	11/02/2020	01:27:04	0:15:00	52.8	32.3	38.4	46.7	41.4	34.3	32	33	-	-	-	51	NCA01	A02	Night	35	40	54	50	-2	-7	-21	1	A02 - Project 002-005. Measurements taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from hand tools, generator, reverse alarm, hi rail movement of vehicle, rail saw, grinding, staff talking and clangs and bangs. Site-related noises were generally dominant and contributed to approximately 30-100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified during the measurements and include insects and distant traffic.
Project 003	11/02/2020	01:53:02	0:15:00	74.4	34.4	52.7	65.8	52.4	37.9	100	53	-	-	-	74	NCA01	A02	Night	35	40	54	50	18	13	-1	24	
Project 004	11/02/2020	02:13:26	0:15:00	65.3	35.5	45.2	55.8	47.3	38.5	81	44	-	-	-	55	NCA01	A02	Night	35	40	54	50	9	4	-10	5	
Project 005	11/02/2020	02:32:30	0:15:00	63.1	36.6	45.2	55.6	48.2	38.2	65	43	-	-	-	50	NCA01	A02	Night	35	40	54	50	8	3	-11	0	
Project 006	11/02/2020	02:55:56	0:15:00	54.7	34.4	39.6	48.6	41.4	35.7	45	36	-	-	-	46	NCA01	A03	Night	35	40	57	50	1	-4	-21	-4	A03 - Project 006-007. Measurements taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from hand tools, generator, reverse alarm, rail saw, staff talking and clangs and bangs. Site-related noises were generally dominant and contributed to approximately 45-97% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic and wind-blown vegetation.
Project 007	11/02/2020	03:12:40	0:15:00	57.1	33.7	45.0	49.7	47.7	36.1	97	45	-	-	-	50	NCA01	A03	Night	35	40	57	50	10	5	-12	0	
Project 008	11/02/2020	03:35:44	0:15:00	66.2	32.4	36.6	43.4	36.8	33.7	10.5	27	-	-	-	38	NCA01	A04	Night	35	40	58	50	-8	-13	-31	-12	A04 - Project 008. Measurement taken at the western end of Hopetoun Avenue, facing west towards site walls and works within the rail corridor. Site-related noise resulted from reverse alarm, site vehicle and clangs and bangs. Site-related noises were minimal and contributed to approximately 11% of the overall Leq (15 min) throughout the measurement. Extraneous sources were dominant and included distant and passing traffic and insects.
Project 009	12/02/2020	01:08:28	0:15:00	73.4	31.5	53.4	67.9	54.0	34.8	75.0	57	-	5.0	-	70	NCA01	A01	Night	35	40	59	50	22	17	-2	20	A01 - Project 009-010. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from traveling of vehicles to the site, slamming the vehicle doors, clangs and bangs, hand tools, preparation of instruments by staff, reverse alarm, light tower and staff talking. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, insects and roadwork noise.
Project 010	12/02/2020	01:33:48	0:15:00	65.2	46.4	48.8	55.6	49.8	47.0	100.0	59	-	5.0	5.0	63	NCA01	A01	Night	35	40	59	50	24	19	0	13	
Project 011	12/02/2020	02:09:42	0:15:00	58.1	31.5	41.3	51.9	44.6	33.1	100.0	41	-	-	-	55	NCA01	A04	Night	35	40	58	50	6	1	-17	5	A04 - Project 011. Measurement taken at the western end of Hopetoun Avenue, facing west towards site walls and works within the rail corridor. Site-related noise resulted from hand tool rail saw, staff walking and clangs and bangs. Site-related noises dominated the measurement contributing to 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic.
Project 012	12/02/2020	02:44:32	0:15:00	57.3	34.9	41.9	47.0	43.8	37.1	100.0	47	-	5.0	-	49	NCA01	A05	Night	35	40	54	50	12	7	-7	-1	A05 - Project 012-013. Measurements taken on 9-11 Nelson Street, facing east towards works within the rail corridor. Site-related noise resulted from hand tools, generator, rail saw, grinding, welding, staff talking and clangs and bangs. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic and nearby warehouse ventilation, and insects.
Project 013	12/02/2020	03:02:08	0:15:00	57.5	40.7	45.8	50.0	47.4	42.5	100.0	46	-	-	-	57	NCA01	A05	Night	35	40	54	50	11	6	-8	7	
Project 014	12/02/2020	03:35:42	0:15:00	66.8	29.3	40.9	52.9	38.9	31.3	9.0	30	-	-	-	38	NCA01	A02	Night	35	40	54	50	-5	-10	-24	-12	A02 - Project 014. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from hand tools, generator, grinding, welding, and clangs and bangs. Site-related noises contributed to approximately 10% of the overall Leq (15 min) throughout the measurement. Extraneous sources were dominant during the measurements and included insects, and distant and nearby traffic.

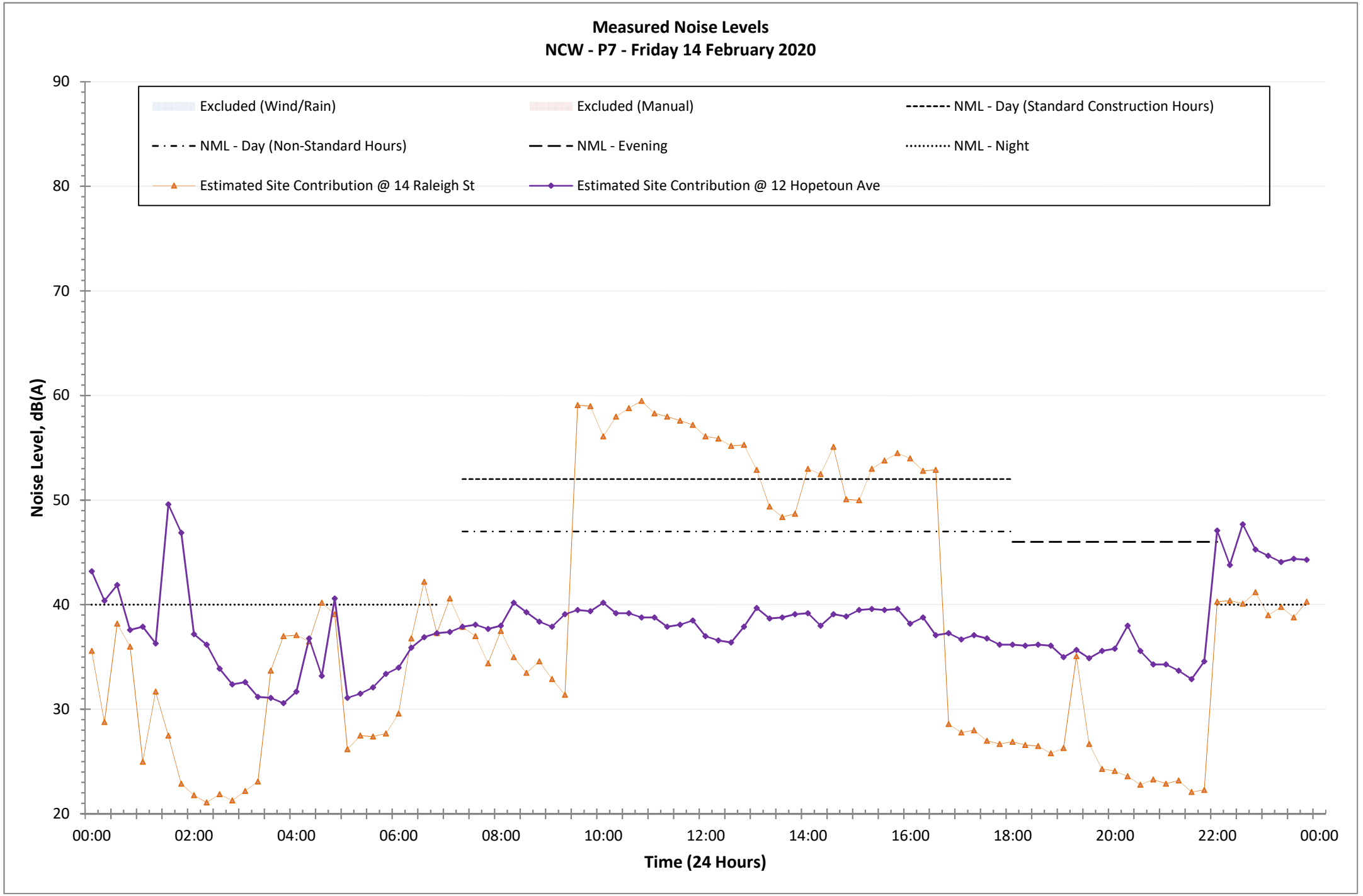
Weather 3-7 February 2020: Generally fine weather, overcast with periods of rain throughout the latter half of the week. Temperature ranged between 19-23 degrees Celsius over the monitoring periods.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 - Monday 10 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Tuesday 11 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Wednesday 12 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Thursday 13 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Friday 14 February 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

Appendix I – Monitoring Report (RP48)

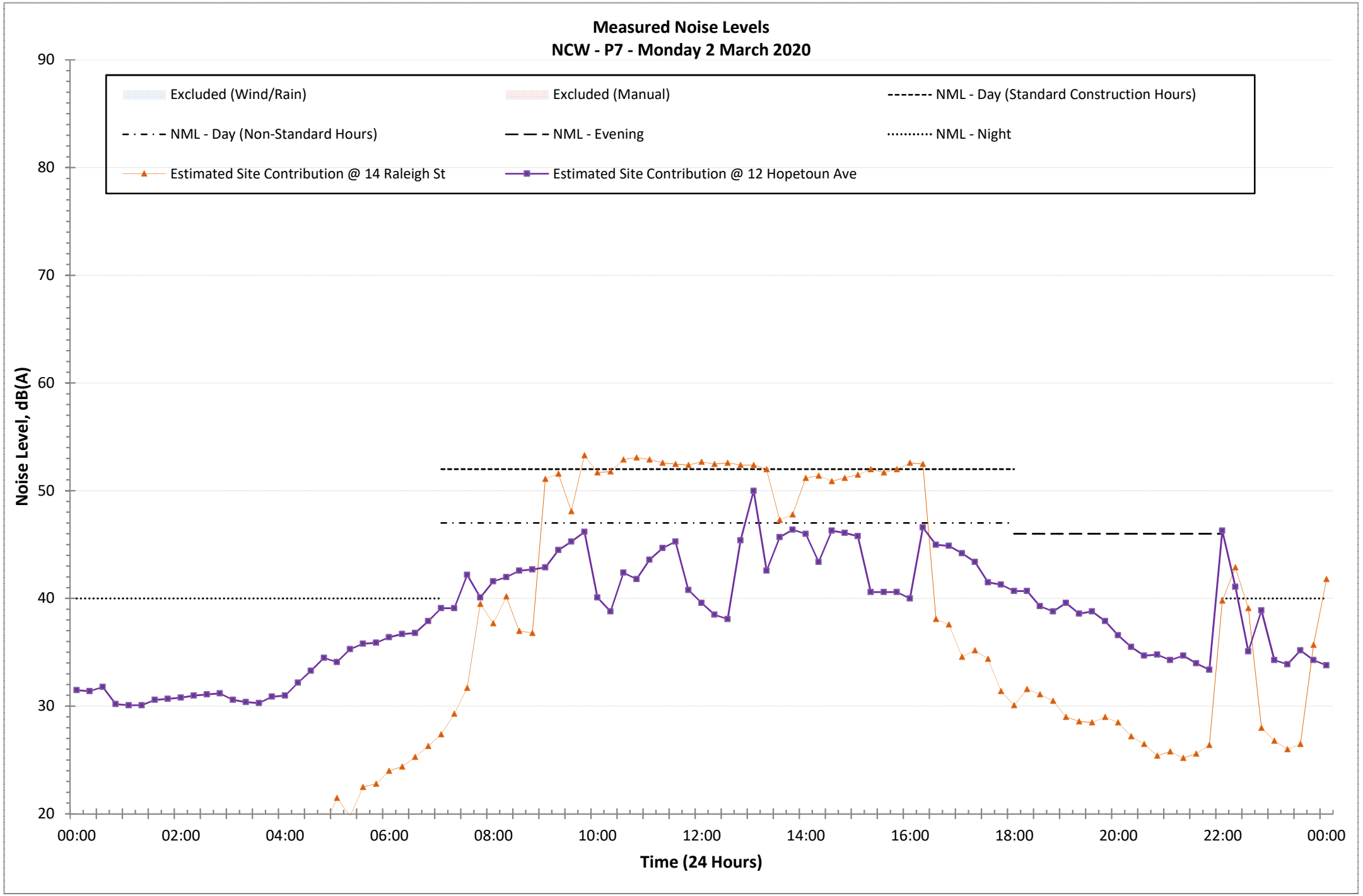
Noise Monitoring – OOHW P7: MW35 - 2 to 6 March 2020

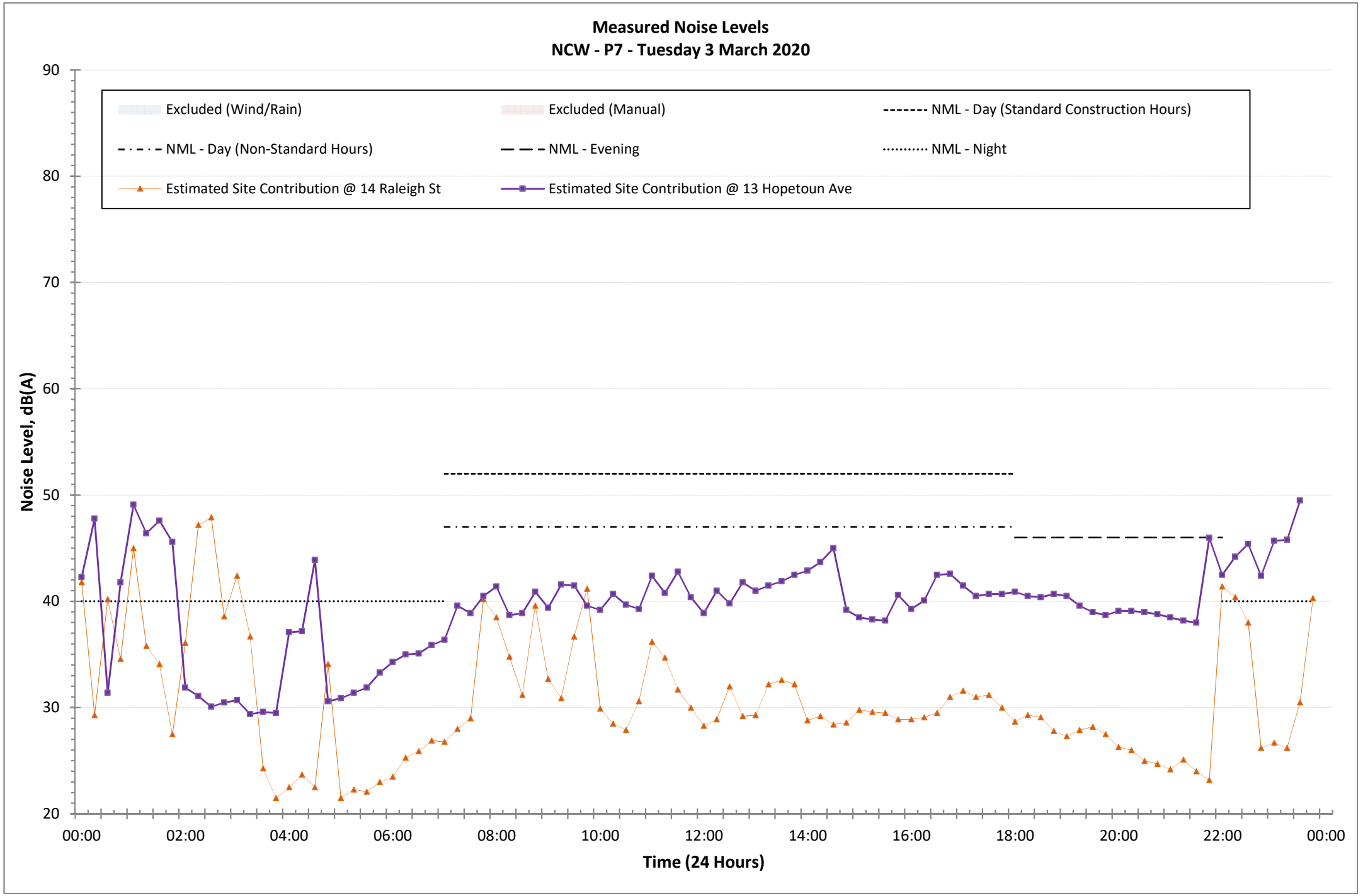
Figure A1.0 – OOHW MW35 – Attended and Unattended Noise Monitoring Locations – Artarmon to Chatswood – NCW P7 (Monday, 2 March to Friday, 6 March 2020)

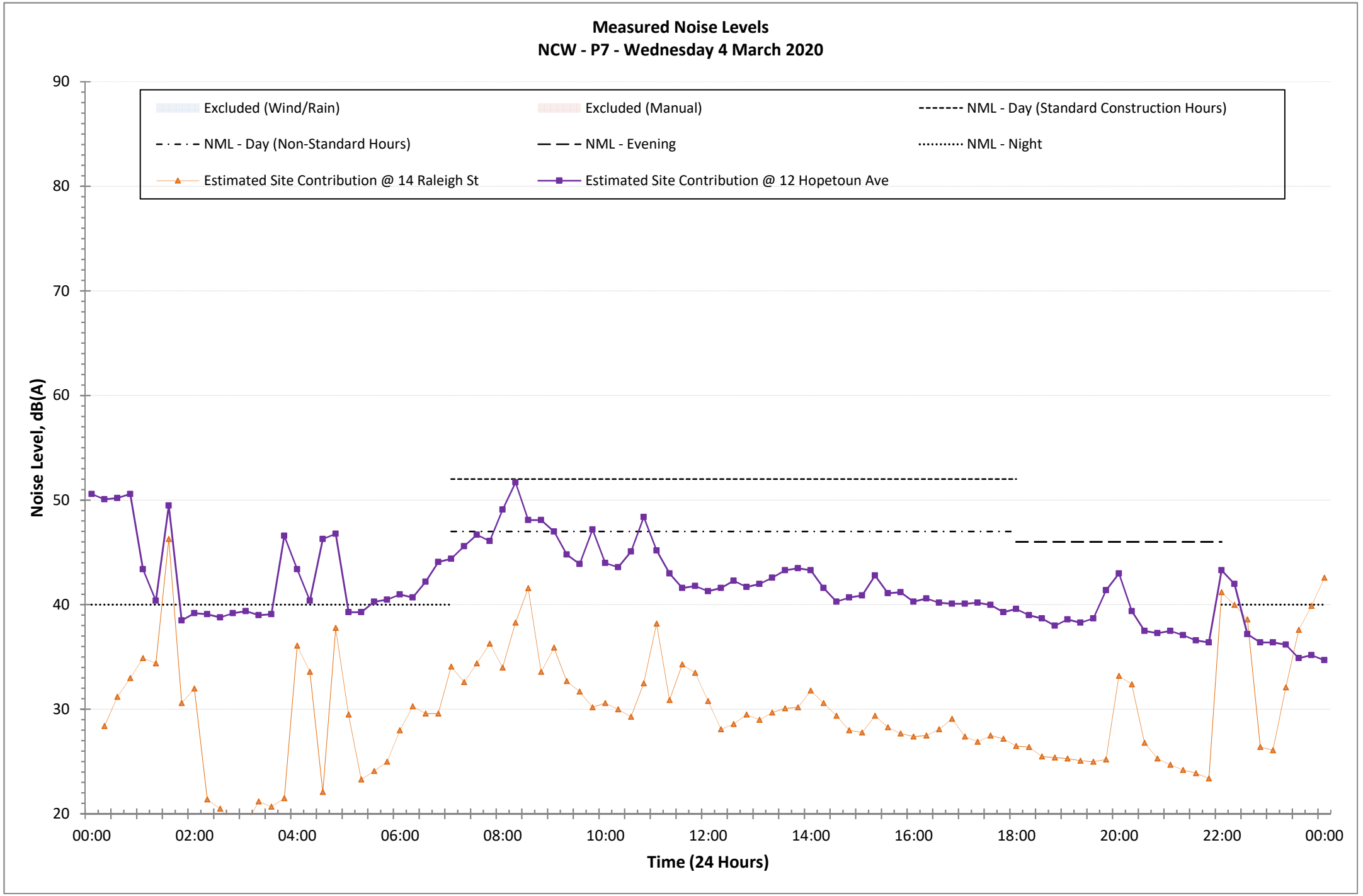
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 000	2020-03-02	23:13:42	0:15:00	74	42.4	48.8	57.7	50.5	43.6	100	59	-	5.0	5.0	72	NCA01	A01	Night	35	40	52	50	24	19	7	22	A01 - Project 000-001. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from preparation of excavator, the traveling of vehicles to the site, slamming the vehicle doors, clangs and bangs, hand tools, excavator working and in idling conditions, and staff talking. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects, distant traffic, car passing by and wind-blown vegetation.
Project 001	2020-03-02	23:34:26	0:15:00	75.4	37.2	52	62.8	56.6	39.8	100	52	-	-	-	74	NCA01	A01	Night	35	40	52	50	17	12	0	24	
Project 002	2020-03-03	00:06:26	0:15:00	65	33.6	39.1	46.4	40.2	35.5	100	39	-	-	-	58	NCA01	A02	Night	35	40	62	50	4	-1	-23	8	A02 - Project 002-003. Measurements taken at the western end of Hopetoun Avenue, facing west towards site walls and works within the rail corridor. Site-related noise resulted from hi-rail excavator, clangs and bangs, hand tools, reverse alarm, loading and unloading of materials, and staff talking. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects, distant traffic, residents, aircraft, and wind-blown vegetation.
Project 003	2020-03-03	00:24:02	0:15:00	80.8	33.9	55.3	65.9	53.7	36.4	100	55	-	-	-	76	NCA01	A02	Night	35	40	62	50	20	15	-7	26	
Project 004	2020-03-03	00:50:30	0:15:00	55.4	32.5	38.3	44.1	39.4	35.9	36	34	-	-	-	49	NCA01	A03	Night	35	40	62	50	-1	-6	-28	-1	A03 - Project 004. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from reverse alarm, hi rail excavator, staff talking and clangs and bangs. Site-related noises were minimal and contributed to approximately 36% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified during the measurements and include insects and distant traffic, residents, and wind-blown vegetation.
Project 005	2020-03-03	01:12:06	0:15:00	61.8	36.1	47.6	58.1	51	38.9	53	45	-	-	-	59	NCA01	A04	Night	35	40	62	50	10	5	-17	9	A04- Project 005. Measurement taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from hi rail excavator and clangs and bangs. Site-related noises were generally dominant and contributed to approximately 53% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic, insects and wind-blown vegetation.
Project 006	2020-03-03	01:39:54	0:15:00	54.6	35.5	40	46.3	41.9	37.3	10	30	-	-	-	46	NCA01	A05	Night	35	40	53	50	-5	-10	-23	-4	A05 - Project 006-007. Measurement taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from staff walking and talking, welding/grinding, generator and clangs and bangs.. Site-related noises were generally dominant and contributed to approximately 55% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic, insects and wind-blown vegetation.
Project 007	2020-03-03	01:56:46	0:15:00	67.3	34.8	54.4	62.4	57.6	37.7	100	54	-	-	-	65	NCA01	A05	Night	35	40	53	50	19	14	1	15	
Project 008	2020-03-03	02:23:38	0:15:00	78.4	33	56	66.9	60.1	36.3	100	56	-	-	-	71	NCA01	A01	Night	35	40	52	50	21	16	4	21	A01 -Project 008 - 009. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from hi-rail excavator, site vehicles, slamming the vehicle doors, movement of ballast, clangs and bangs, generator, grinding and staff talking. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include noisy people and distant traffic.
Project 009	2020-03-04	00:17:46	0:15:00	80.4	41	57.3	68.4	58.1	48	100	57	-	-	-	71	NCA01	A01	Night	35	40	52	50	22	17	5	21	
Project 010	2020-03-04	00:42:32	0:15:00	61.3	35.2	43.6	50.8	47.6	37.1	100	44	-	-	-	56	NCA01	A05	Night	35	40	53	50	9	4	-9	6	A05 - Project 010. Measurement taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from excavator, staff walking and talking, hand tools, and clangs and bangs. Site-related noises were generally dominant and contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic, residents, and insects.
Project 011	2020-03-04	01:12:58	0:15:00	79.9	35.4	57.6	72.1	53.3	36.8	1.5	44	-	-	-	52	NCA01	A06	Night	35	40	51	50	9	4	-7	2	A06 - Project 011. Measurement taken at 111 Hampden Road. Site-related noise resulted from clangs and bangs, grinding/welding, excavator movement alarm and staff talking. Site-related noises contributed to approximately 1.5% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects, distant traffic, motorcycles and buses.(As measurement inside the corridor was not possible, and the most exposed facade of the building was accessible through the private parking and the site noise was more audible this week, a 5 dB correction is applied)
Project 012	2020-03-04	01:38:44	0:15:00	76.8	32.6	54.2	66.5	56.3	34.4	100	54	-	-	-	76	NCA01	A02	Night	35	40	62	50	19	14	-8	26	A02 - Project 012 Measurement taken at the western end of Hopetoun Avenue, facing west towards site walls and works within the rail corridor. Site-related noise resulted from movement of excavator, clangs and bangs, hand tools, and staff talking. Site-related noises contributed to approximately 55% of the overall L90 (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects, distant traffic, residents, and insects.
Project 013	2020-03-04	23:03:48	0:15:00	69.7	39.1	54	64	58.7	42.7	100	43	-	-	-	61	NCA01	A01	Night	35	40	52	50	8	3	-9	11	A01-Project 013-014. Measurements taken at the western end of Drake Street, facing west towards site walls and works within the rail corridor. Site-related noise resulted from excavator, clangs and bangs, grinding/welding, slamming the door, site vehicles, and staff talking. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects, birds, distant traffic, residents, aircraft, and wind-blown vegetation.
Project 014	2020-03-04	23:22:40	0:15:00	71.7	39	56	66.4	60.4	43.1	100	56	-	-	-	69	NCA01	A01	Night	35	40	52	50	21	16	4	19	
Project 015	2020-03-04	23:49:46	0:15:00	83.7	37.9	63.6	77.1	63.8	41.7	55	44	-	-	-	49	NCA01	A06	Night	35	40	51	50	9	4	-7	-1	A06 - Project 015. Measurement taken at 111 Hampden Road. Site-related noise resulted from clangs and bangs, excavator movement alarm and staff talking. Site-related noises contributed to approximately 1.5% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects, car passing by, and wind-blown vegetation. (As measurement inside the corridor was not possible, and the most exposed facade of the building was accessible through the private parking and the site noise was more audible this week, a 5 dB correction is applied)
Project 016	2020-03-05	00:18:44	0:15:00	62.2	43.9	51.2	56.5	53.7	46.9	100	51	-	-	-	54	NCA01	A07	Night	35	40	60	50	16	11	-9	4	A06 - Project 016. Measurement taken at 342 Mowbray Road. Site-related noise resulted from clangs and bangs, excavator movement alarm, grinding/welding, movement of ballast and staff talking. Site-related noises contributed to approximately 1.5% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects, car passing by, and wind-blown vegetation.
Project 017	2020-03-05	00:49:44	0:15:00	63.8	40.8	48.9	54.7	51.2	44.2	100	49	-	-	-	57	NCA01	A04	Night	35	40	60	50	14	9	-11	7	A04- Project 017. Measurement taken on Gillam Street, adjacent to 2 Orchard Road, facing west towards works within the rail corridor. Site-related noise resulted from hi rail excavator movement alarm, and movement of ballast. Site-related noises were generally dominant and contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic, insects and wind-blown vegetation.
Project 018	2020-03-05	01:12:28	0:15:00	53	36.4	39.8	43	41	38.3	80	41	-	-	2.0	44	NCA01	A03	Night	35	40	60	50	6	1	-19	-6	A03 - Project 018. Measurement taken outside 5 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from reverse alarm, hi rail excavator, hand tools, staff talking and clangs and bangs. Site-related noises contributed to approximately 80% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified during the measurements and include insects and distant traffic, aircraft, and insects.
Project 019	2020-03-05	01:34:40	0:15:00	55.4	35.3	39.4	47.2	40	37.2	38	35	-	-	-	46	NCA01	A02	Night	35	40	62	50	0	-5	-27	-4	A02 - Project 019. Measurements taken at the western end of Hopetoun Avenue, facing west towards site walls and works within the rail corridor. Site-related noise resulted from excavator, clangs and bangs, movement of ballast, and staff talking. Site-related noises contributed to approximately 38% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include insects, and car passing by.

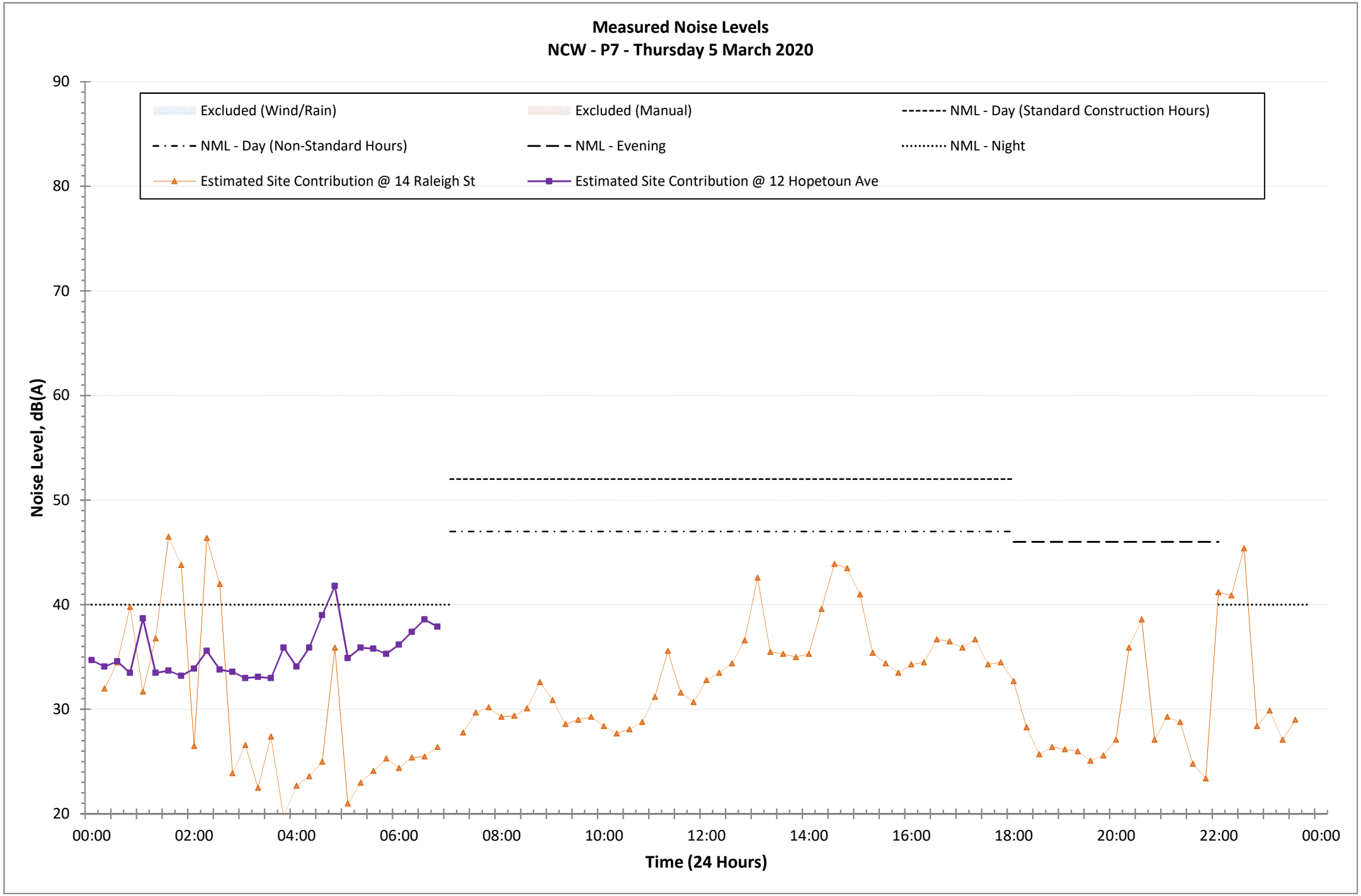
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	LF Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15minute	Comparison to Predicted Site Noise Level - LAeq, 15minute	Comparison to Sleep Disturbance Screening Level - LAmax	Description
Project 020	2020-03-05	02:03:04	0:15:00	67.8	38.1	57.5	63.5	60.6	41.6	100	58	-	-	-	67	NCA01	A05	Night	35	40	53	50	23	18	5	17	A05 - Project 020. Measurement taken outside 14 Raleigh Street, facing west towards works within the rail corridor. Site-related noise resulted from ballast movement, hand tools, generator, clangs and bangs, staff talking, welding/grinding, generator and clangs and bangs. Site-related noises were generally dominant and contributed to approximately 55% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic, insect, ambulance and wind-blown vegetation.
Project 021	2020-03-05	22:38:46	0:15:00	82	39.4	56.3	63.8	58.8	43.7	100	61	-	-	5.0	82	NCA01	A01	Night	35	40	52	50	26	21	9	32	A01 -Project 021-022. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from hi-rail excavator, excavator working, site vehicles, clangs and bangs, generator, and staff talking. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified throughout the measurements to include noisy people and distant traffic
Project 022	2020-03-06	00:52:18	0:15:00	72	33.5	49.1	60.5	52.7	36.7	100	49	-	-	-	72	NCA01	A01	Night	35	40	52	50	14	9	-3	22	

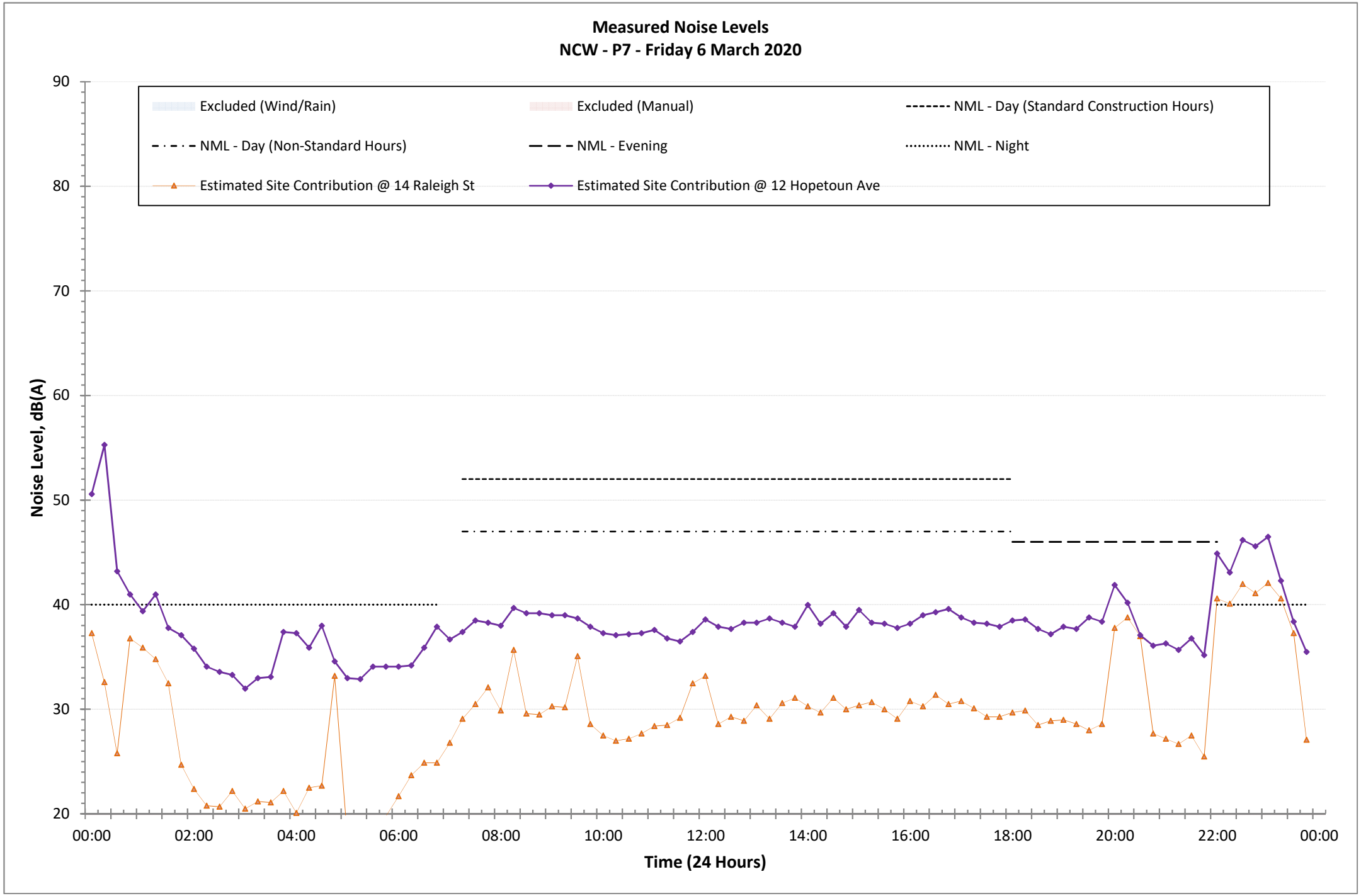
Weather 2-6 March 2020: Generally fine weather, overcast with periods of rain throughout the latter half of the week. Temperature ranged between 18-22 degrees Celsius over the monitoring periods.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was as applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 - Monday 2 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Tuesday 3 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Wednesday 4 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

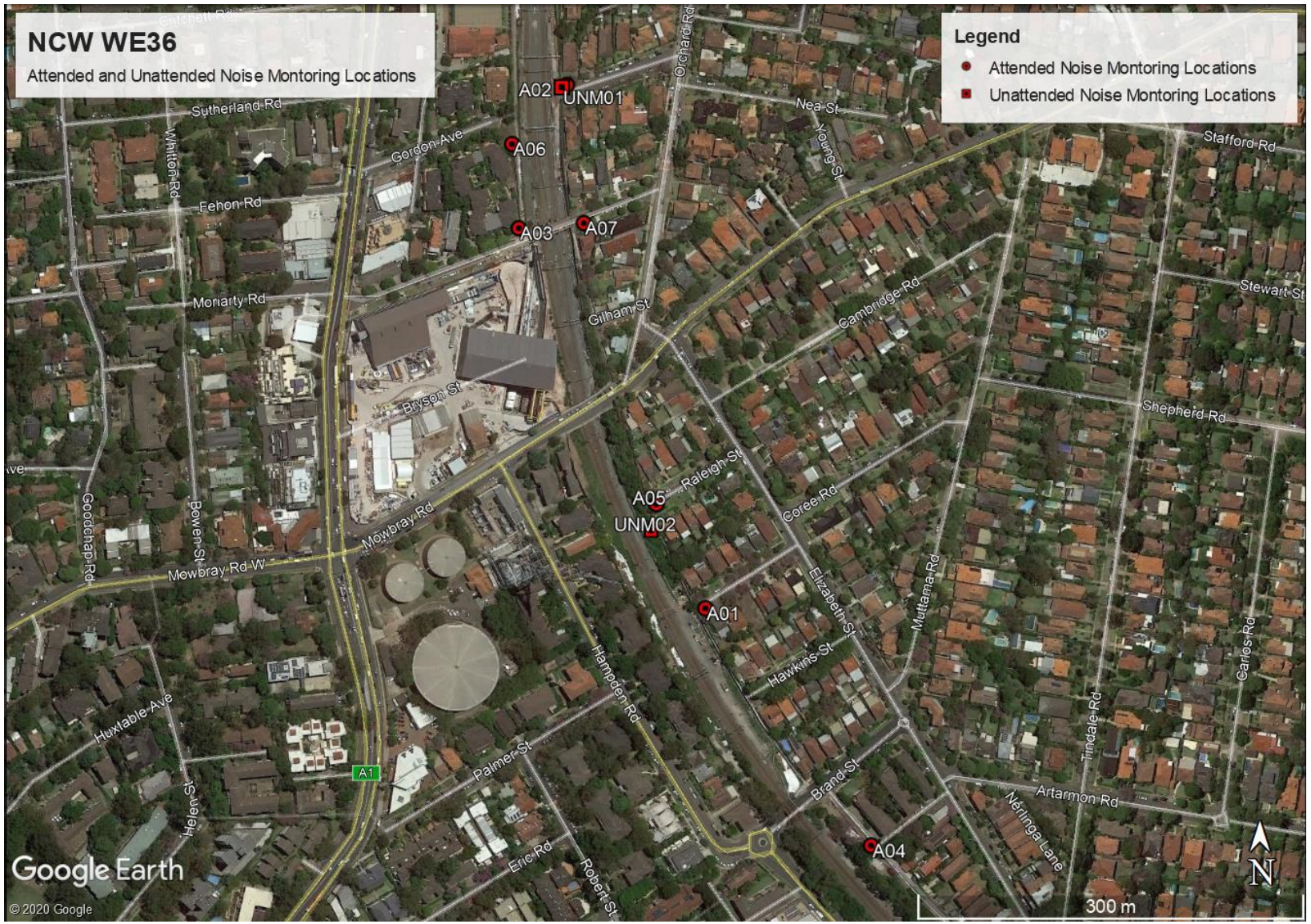

Measured Noise Levels
NCW - P7 - Thursday 5 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Friday 6 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)

Appendix J – Monitoring Report (RP49)

Noise Monitoring – OOHW P7: WE36 - 7 to 8 March 2020

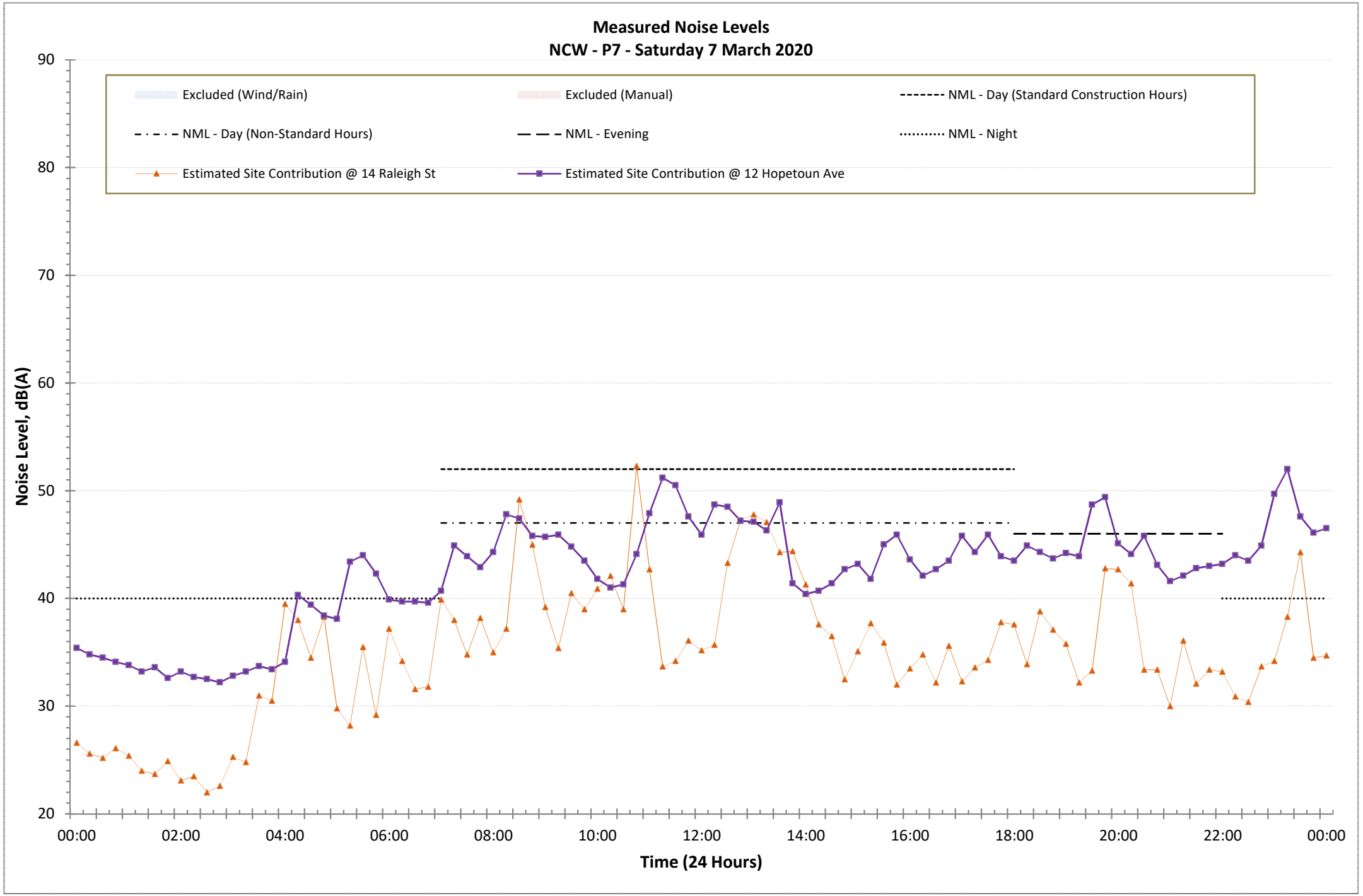
Figure A1.0 – OOHW WE36 – Attended and Unattended Noise Monitoring Locations – Artarmon to Chatswood – NCW P7 (Saturday, 7 March and Sunday, 8 March 2020)

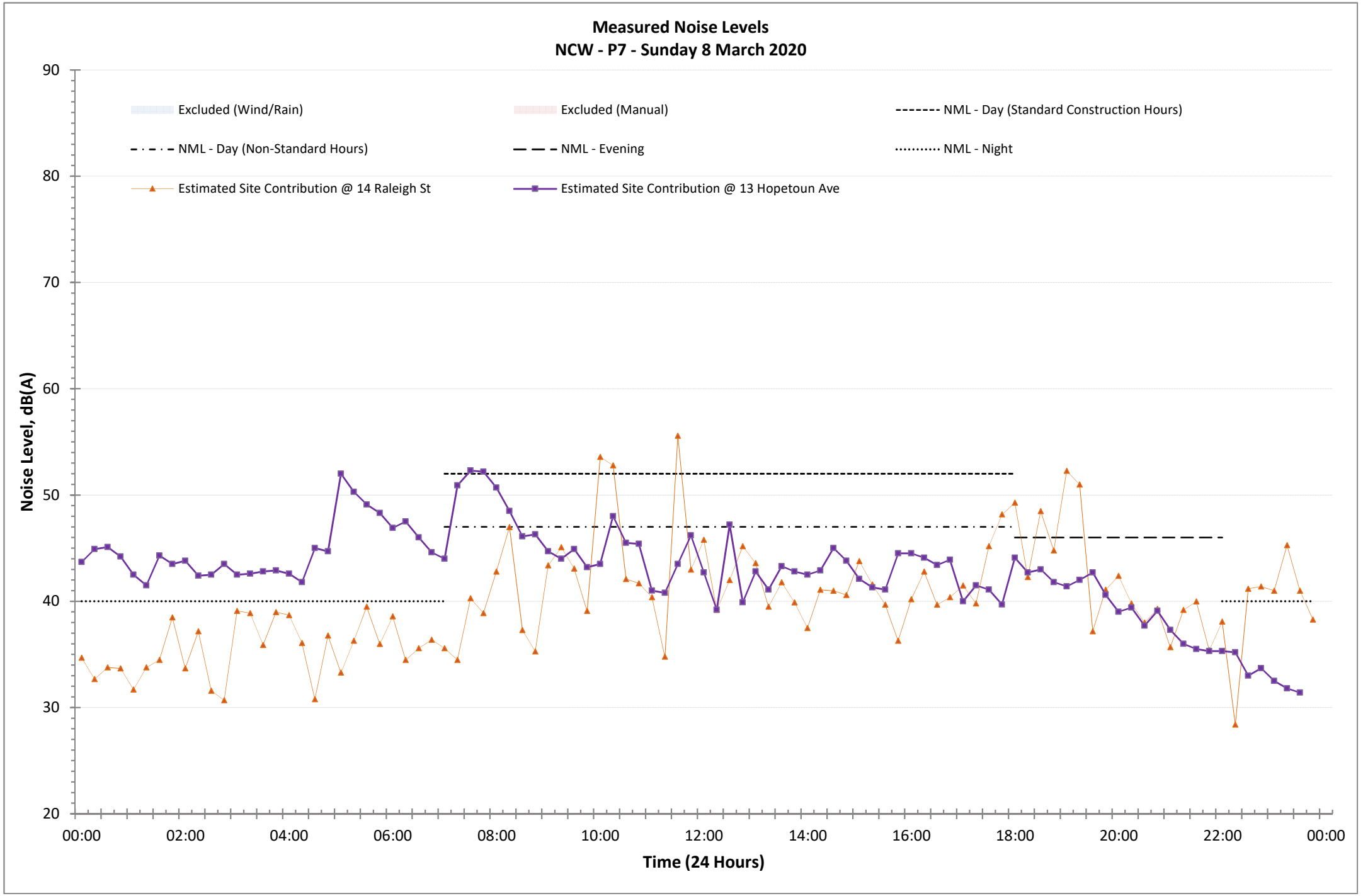


File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	Low Frequency Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 001	7/03/2020	03:15	0:15:00	83.3	52.0	63.4	70.7	64.9	56.9	100	63	-	-	-	81	NCA01	A01	Night	35	40	68	50	28	23	-5	31	
Project 002	7/03/2020	03:33	0:15:00	76.7	52.2	58.1	66.3	61.0	53.4	100	58	-	-	-	68	NCA01	A01	Night	35	40	68	50	23	18	-10	18	A01 - Project 001-003. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of plant and vehicles within and out of the site entrance, operation of plant and machinery within the rail corridor, squashed duck' reverse alarms, lighting towers and clangs and bangs. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were not identified during the measurements.
Project 003	7/03/2020	03:49	0:15:00	81.9	52.9	63.7	69.9	66.2	58.9	100	64	-	-	-	79	NCA01	A01	Night	35	40	68	50	29	24	-4	29	
Project 004	7/03/2020	04:30	0:15:00	61.1	36.7	47.8	55.6	51.6	41.1	100	48	-	-	-	58	NCA01	A02	Night	35	40	55	50	13	8	-7	8	A02 - Project 004. Measurement taken outside 13 Hopetoun Avenue, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators (including the 'scooping' and 'shifting' of ballast), 'squashed duck' reverse alarms, and distant site works. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were not identified during the measurement.
Project 005	7/03/2020	05:00	0:15:00	67.7	42.4	49.3	55.5	52.1	45.3	100	49	-	-	-	67	NCA01	A03	Night	35	40	55	50	14	9	-6	17	A03 - Project 005. Measurement taken at the eastern end of Nelson Street facing east towards works within the rail corridor. Site-related noise resulted from the operation movement and of excavators (including the 'scooping' and 'shifting' of ballast), 'squashed duck' reverse alarms, clangs and bangs and beeps. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were not identified to include distant traffic and crickets.
Project 006	7/03/2020	05:37	0:15:00	73.4	51.2	59.9	69.9	61.0	53.5	100	60	-	-	-	71	NCA01	A04	Night	35	40	61	50	25	20	-1	21	A04 - Project 006. Measurement taken on the corner of Valetta Land and Federation Lane (near Brand Street), facing west towards works within the rail corridor. Site-related noise resulted from the operation of a cement mixer / agitator truck, clangs and bangs and 'squashed duck' reverse alarms. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include nearby birds.
Project 007	7/03/2020	06:00	0:15:00	72.5	45.3	54.9	68.2	55.0	47.0	40	51	-	-	-	60	NCA01	A05	Night	35	40	47	50	16	11	4	10	A05 - Project 007. Measurement taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of distant excavators, hand tools, reverse tones (both squashed duck and tonal) and the dropping of ballast. Site-related noises contributed to approximately 40% of the overall Leq (15 min). Extraneous sources were dominant and included distant and passing traffic, nearby birds and passing planes.
Project 008	7/03/2020	06:38	0:15:00	75.4	52.9	59.5	68.7	62.7	54.1	100	64	-	-	5.0	72	NCA01	A01	Night	35	40	68	50	29	24	-4	22	A01 - Project 008-009. Measurements taken outside Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of plant and equipment within the rail corridor, crew entering and leaving site, lightings towers, 'squashed duck' reverse alarms and distant works. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include nearby birds.
Project 009	7/03/2020	06:55	0:15:00	66.6	51.1	54.9	62.8	56.8	52.3	100	60	-	-	5.0	64	NCA01	A01	Night	35	40	68	50	25	20	-8	14	
Project 010	7/03/2020	20:06	0:15:00	62.0	44.3	48.3	54.5	50.2	45.8	70	52	-	-	5.0	55	NCA01	A06	Evening	41	46	61	56	11	6	-9	-1	A06 - Project 010. Measurement taken outside 2A Gordon Avenue apartments (along Frank Channon Walk), facing east towards the rail corridor. Site-related noise resulted from the operation of excavators, scooping of ballast, power tools, lighting towers and clangs and bangs. Site-related noises dominated the measurement contributing approximately 70% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, nearby pedestrians and crickets.
Project 011	7/03/2020	21:38	0:15:00	70.4	45.0	48.7	56.0	49.6	46.7	70	52	-	-	5.0	56	NCA01	A05	Evening	41	46	47	56	11	6	5	0	A05 - Project 011. Measurements taken outside 14 Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from lighting towers, conversations on site, plant within the rail corridor, clangs and bangs and 'squashed duck' reverse alarms.. Site-related noises dominated the measurement contributing between approximately 60-70% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, nearby residents, crickets and planes passing by.
Project 012	7/03/2020	22:01	0:15:00	64.6	45.2	50.4	56.0	52.4	47.9	90	55	-	-	5.0	60	NCA01	A07	Night	41	46	63	56	14	9	-8	4	A07 - Project 012-013. Measurements taken outside 2 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from movement and operation of plant within the rail corridor, lighting towers, power tools, clangs and bangs and 'squashed duck' reverse alarms. Site-related noises dominated the measurement contributing approximately 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic.
Project 013	7/03/2020	22:16	0:15:00	67.8	46.7	53.4	60.3	56.3	48.8	100	58	-	-	5.0	64	NCA01	A07	Night	41	46	63	56	17	12	-5	8	
Project 014	7/03/2020	23:32	0:15:00	74.2	52.1	59.7	69.6	62.4	53.4	100	65	-	-	5.0	74	NCA01	A01	Night	35	40	68	50	30	25	-3	24	A01 - Project 014-015. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from lighting tower, staff talking and opening site gate, clangs and bangs, idle plant in the rail corridor and passing plant along the rail tracks. Site-related noises dominated the measurement contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include nearby residents.
Project 015	7/03/2020	23:47	0:15:00	73.8	51.5	55.7	66.1	57.6	52.6	100	61	-	-	5.0	69	NCA01	A01	Night	35	40	68	50	26	21	-7	19	
Project 016	8/03/2020	00:12	0:15:00	62.9	41.3	48.0	55.2	50.7	43.3	100	53	-	-	5.0	57	NCA01	A02	Night	35	40	55	50	18	13	-2	7	A02 - Project 016-107. Measurements taken outside 13 Hopetoun Avenue, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators within the rail corridor, 'squashed duck' reverse alarms, lighting towers, clangs and bangs, hand tools and distant site works. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include nearby residents, crickets and running water post-rainfall event.
Project 017	8/03/2020	00:28	0:15:00	63.9	45.4	48.8	52.9	50.9	46.5	100	54	-	-	5.0	55	NCA01	A02	Night	35	40	55	50	19	14	-1	5	
Project 018	8/03/2020	01:39	0:15:00	75.5	48.9	56.7	66.2	60.0	50.0	100	62	-	-	5.0	70	NCA01	A01	Night	35	40	68	50	27	22	-6	20	A01 - Project 018-019. Measurements taken outside 12 Drake Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators and hydremas within the rail corridor, lighting towers, vehicles entering and leaving the site, and 'squashed duck' reverse alarms. Site-related noises dominated the measurements, contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include nearby residents.
Project 019	8/03/2020	02:00	0:15:00	74.3	48.1	55.6	66.8	58.3	49.4	100	61	-	-	5.0	73	NCA01	A01	Night	35	40	68	50	26	21	-7	23	

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	Low Frequency Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Compliance to RBL - LA90, Period	Compliance to NML - LAeq, 15minute	Compliance to Predicted Site Noise Level - LAeq, 15minute	Compliance to Sleep Disturbance Screening Level - LAmax	Description
Project 020	8/03/2020	02:23	0:15:00	74.7	43.4	54.9	67.3	56.1	45.2	100	55	-	-	-	72	NCA01	A02	Night	35	40	55	50	20	15	0	22	A02 - Project 020. Measurement taken outside 13 Hopetoun Avenue, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators (including the 'scooping' and 'dumping' of ballast), 'squashed duck' reverse alarms, lighting towers, and the screeching of plant along tracks. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurement. Extraneous sources were not identified during the measurement.
Project 021	8/03/2020	17:17	0:15:00	79.5	51.2	59.8	68.7	62.1	54.2	100	62	-	-	2.0	75	NCA01	A01	Day	42	47	68	57	20	15	-6	18	A01 - Project 021-022. Measurements taken outside 12 Drake Street, facing west towards works within the rail corridor. Site-related noise resulted from the operation and movement of plant within rail corridor (including scooping ballast), movement of plant along rail tracks, clangs and bangs, site vehicles enter and leave site and conversations on site. Site-related noises dominated the measurements, contributing 100% of the overall Leq (15 min). Extraneous sources were identified to include birds and nearby residents.
Project 022	8/03/2020	17:33	0:15:00	84	49.4	60.7	71.0	62.7	53.0	100	61	-	-	-	77	NCA01	A01	Day	42	47	68	57	19	14	-7	20	
Project 023	8/03/2020	18:26	0:15:00	67.4	40.8	50.9	59.9	53.5	44.1	80	50	-	-	-	65	NCA01	A07	Evening	41	46	53	56	9	4	-3	9	A07 - Project 023. Measurement taken outside 2 Berkeley Court, facing west towards works within the rail corridor. Site-related noise resulted from movement and operation of plant within the rail corridor, scooping ballast, power tools, clangs and bangs and 'squashed duck' reverse alarms. Site-related noises dominated the measurement contributing approximately 100% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, birds and planes passing by.
Project 024	8/03/2020	18:51	0:15:00	72.3	42.6	53.7	59.9	57.6	46.0	80	53	-	-	-	69	NCA01	A06	Evening	41	46	61	56	12	7	-8	13	A06 - Project 024. Measurement taken outside 2A Gordon Avenue apartments (along Frank Channon Walk), facing east towards the rail corridor. Site-related noise resulted from the operation of excavators and other plant, scooping of ballast, power tools, clangs and bangs and 'squashed duck' reverse alarms. Site-related noises dominated the measurement contributing approximately 80% of the overall Leq (15 min). Extraneous sources were identified to include distant traffic, nearby pedestrians and planes passing by.
Project 025	8/03/2020	19:38	0:15:00	78.0	52.6	58.6	64.9	61.1	54.8	100	64	-	-	5.0	72	NCA01	A01	Evening	41	46	68	56	23	18	-4	16	
Project 026	8/03/2020	19:54	0:15:00	75.6	52.5	56.8	65.1	58.2	54.1	100	62	-	-	5.0	69	NCA01	A01	Evening	41	46	68	56	21	16	-6	13	
Project 027	8/03/2020	20:09	0:15:00	81.6	50.2	57.7	64.5	60.7	52.0	100	63	-	-	5.0	75	NCA01	A01	Evening	41	46	68	56	22	17	-5	19	
Project 028	8/03/2020	20:25	0:15:00	91.0	51.5	61.1	65.7	59.4	53.1	100	61	-	-	-	85	NCA01	A01	Evening	41	46	68	56	20	15	-7	29	A01- Project 025-031. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of plant within rail corridor, demobilisation of plant, staff and vehicles from site (including loading of plant onto trucks), clangs and bangs, lighting towers, street sweeper on Drake Street, 'squashed duck' reverse alarms and hydraulic braking of large trucks. Site-related noises dominated the measurement contributing to approximately 100% of the overall Leq (15 min) throughout all measurements. Extraneous sources were identified to include crickets and distant sirens.
Project 029	8/03/2020	20:41	0:15:00	89.5	51.2	64.1	72.0	64.7	52.9	100	64	-	-	-	88	NCA01	A01	Evening	41	46	68	56	23	18	-4	32	
Project 030	8/03/2020	21:02	0:15:00	89.6	55.5	68.3	79.9	70.0	60.2	100	68	-	-	-	85	NCA01	A01	Evening	41	46	68	56	27	22	0	29	
Project 031	8/03/2020	21:17	0:15:00	81.4	50.3	65.2	75.6	70.8	53.4	100	65	-	-	-	79	NCA01	A01	Evening	41	46	68	56	24	19	-3	23	

Weather 7-8 March 2020: Generally rainy weather, overcast and windy at times. Temperature ranged betwe een 18-22 degrees Celsius over the monitoring periods.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 - Saturday 7 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 12 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 - Sunday 8 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Hopetoun Ave
Noise Level, dB(A)
90
80
70
60
50
40
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Time (24 Hours)

Appendix K – Monitoring Report (RP50a)

Noise Monitoring – OOHW P7: Special Works / MW39 - 27 March to 29 April 2020

Figure A1.0 – Spec Works – Attended and Unattended Monitoring Locations

– NCW P7 (Thursday, 27 March to Wednesday, 29 April 2020)

Figure A1.1 – OOHW MW39 – Attended and Unattended Noise Monitoring Locations – NCW P7 (Friday, 3 April 2020)

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	Low Frequency Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Sleep Disturbance Screening Level - LAmax	Description
Project 001	2020-03-27	08:21:26	0:15:00	83.7	44	63.3	76.3	66.1	46.2	50	60	-	-	-	76	NCA01	A01	Day	42	52	57	18	8	19	A01 - Project 001-002. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of vehicles within and out of the site entrance, operation of machinery within the rail corridor, hi-rail excavator, staff talking and clangs and bangs. Site-related noises contributed to approximately 20-50% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included Sydney metro train, neighbour constructions, neighbour cars, distant and local traffic
Project 002	2020-03-27	08:38:48	0:15:00	71	44.9	58.5	67.6	63.1	48	20	52	-	-	-	64	NCA01	A01	Day	42	52	57	10	0	7	
Project 003	2020-03-27	09:02:24	0:15:00	73.8	46.2	55.7	64.1	60	47.8	35	51	-	-	-	61	NCA01	A02	Day	42	52	57	9	-1	4	A02 - Project 003-004. Measurement taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of distant excavators, site vehicles, hand tools and reverse tones. Site-related noises contributed to approximately 35-40% of the overall Leq (15 min). Extraneous sources were dominant and included Sydney metro train, distant and passing traffic, nearby birds and passing planes.
Project 004	2020-03-27	09:20:48	0:15:00	76.4	46	58	69.2	59.8	48.4	40	54	-	-	-	65	NCA01	A02	Day	42	52	57	12	2	8	
Project 005	2020-03-27	09:50:04	0:15:00	88.1	73.1	75.3	79.8	76.4	73.9	100	75	-	-	-	80	NCA01	A03	Day	42	52	57	33	23	23	A03 - Project 005. Measurement taken outside 340 Mowbray Road , facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of generator, drilling and staff talking. Site-related noises contributed to approximately 100% of the overall Leq (15 min). Extraneous sources included distant and passing traffic.
Project 006	2020-03-27	10:13:58	0:15:00	76.1	53.5	59.7	66.2	62.2	56	40	56	-	-	-	67	NCA01	A02	Day	42	52	57	14	4	10	A02 - Project 006. Measurement taken outside Raleigh Street, facing towards site works within the rail corridor. Site-related noise resulted from the operation of excavator, distant dragging, hi-rail excavator, generator, movement of material and clangs and bangs. Site-related noises contributed to approximately 40% of the overall Leq (15 min). Extraneous sources included distant and Sydney metro trains.
Project 007	2020-03-27	10:33:26	0:15:00	82.4	42.6	61.5	74.7	62.5	45.6	70	60	-	-	-	82	NCA01	A01	Day	42	52	57	18	8	25	A01 - Project 007-012. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of site vehicles within and out of the site entrance, trucks, staff talking, clangs and bangs. Site-related noises contributed to approximately 1-70% of the overall Leq (15 min) throughout the measurements. Extraneous sources included Sydney metro trains, neighbour constructions, mower, neighbour cars, birds, insects, wind-blown vegetation, local traffic, people talking.
Project 008	2020-03-27	10:59:08	0:15:00	72.6	43.4	56	67.3	58.3	45.9	30	51	-	-	-	61	NCA01	A01	Day	42	52	57	9	-1	4	
Project 009	2020-03-27	11:20:50	0:15:00	75.6	43.6	55.6	67.5	55.2	45.9	1	36	-	-	-	49	NCA01	A01	Day	42	52	57	-6	-16	-8	
Project 010	2020-03-27	11:39:14	0:15:00	80.1	44.9	61	72.8	64.9	48.6	30	56	-	-	-	80	NCA01	A01	Day	42	52	57	14	4	23	
Project 011	2020-03-27	12:01:10	0:15:00	84.3	47.1	63.9	77	66	49.2	30	59	-	-	-	84	NCA01	A01	Day	42	52	57	17	7	27	
Project 012	2020-03-30	08:42:26	0:15:00	72.9	43	57.8	67.4	63.3	45.8	10	48	-	-	-	51	NCA01	A01	Day	42	52	57	6	-4	-6	
Project 013	2020-03-30	09:03:48	0:15:00	76	46.5	56.3	64.5	59.3	49.5	30	51	-	-	-	61	NCA01	A02	Day	42	52	57	9	-1	4	A02 - Project 013-014. Measurement taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of distant excavators, hand tools, reverse tones, staff talking and clangs and bangs. Site-related noises contributed to approximately 25-30% of the overall Leq (15 min). Extraneous sources were dominant and included Sydney metro trains, distant and passing traffic, wind-blown vegetation, neighbour cars and nearby birds.
Project 014	2020-03-30	09:22:16	0:15:00	73.5	45	56.2	65	59.1	48.4	25	50	-	-	-	61	NCA01	A02	Day	42	52	57	8	-2	4	
Project 015	2020-03-30	09:45:32	0:15:00	78	39.2	59.4	70	64	43.6	5	46	-	-	-	53	NCA01	A01	Day	42	52	57	4	-6	-4	A01 - Project 015-016. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the site vehicles, wheeled front-end loader, clangs and bangs, movement of materials and staff talking. Site-related noises contributed to approximately 5% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included Sydney metro trains, neighbour constructions, aircrafts, mower, neighbour cars and trucks, birds, insects, local traffic, people talking.
Project 016	2020-03-30	10:02:24	0:15:00	76.7	41.8	58.4	68.1	64.5	44.7	6	46	-	-	-	67	NCA01	A01	Day	42	52	57	4	-6	10	
Project 017	2020-03-30	10:25:42	0:15:00	81.3	46.5	65.1	76.2	67.5	51.4	10	55	-	-	-	76	NCA01	A04	Day	42	52	57	13	3	19	A04 - Project 017. Measurements taken at the western end of Hawkins Street, Artarmon, generally facing towards the site and works within the rail corridor. Site-related noise resulted from the site vehicles, wheeled front-end loader, dragging and movement alarm. Site-related noises contributed to approximately 10% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included Sydney metro trains, train horn, dogs barking, cars passing by, local and distant traffic.
Project 018	2020-03-30	10:47:48	0:15:00	69.7	40.4	51.8	62.1	54.8	42.8	6	40	-	-	-	61	NCA01	A05	Day	42	52	57	-2	-12	4	A05 - Project 018. Measurements taken outside 13 Brand Street, Artarmon, generally facing towards the site entrance and works within the rail corridor. Site-related noise resulted from the site vehicles, trailers, staff talking and working. Site-related noises contributed to approximately 6% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included Sydney metro trains, train horn, birds, local and distant traffic.
Project 019	2020-03-30	11:11:28	0:15:00	78.2	45.1	53.9	63.7	55.9	46.7	15	46	-	-	-	59	NCA01	A02	Day	42	52	57	4	-6	2	A02 - Project 019. Measurement taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of distant excavators, hand tools, reverse tones and trucks. Site-related noises contributed to approximately 15% of the overall Leq (15 min). Extraneous sources were dominant and included distant and passing traffic, nearby birds and passing planes.

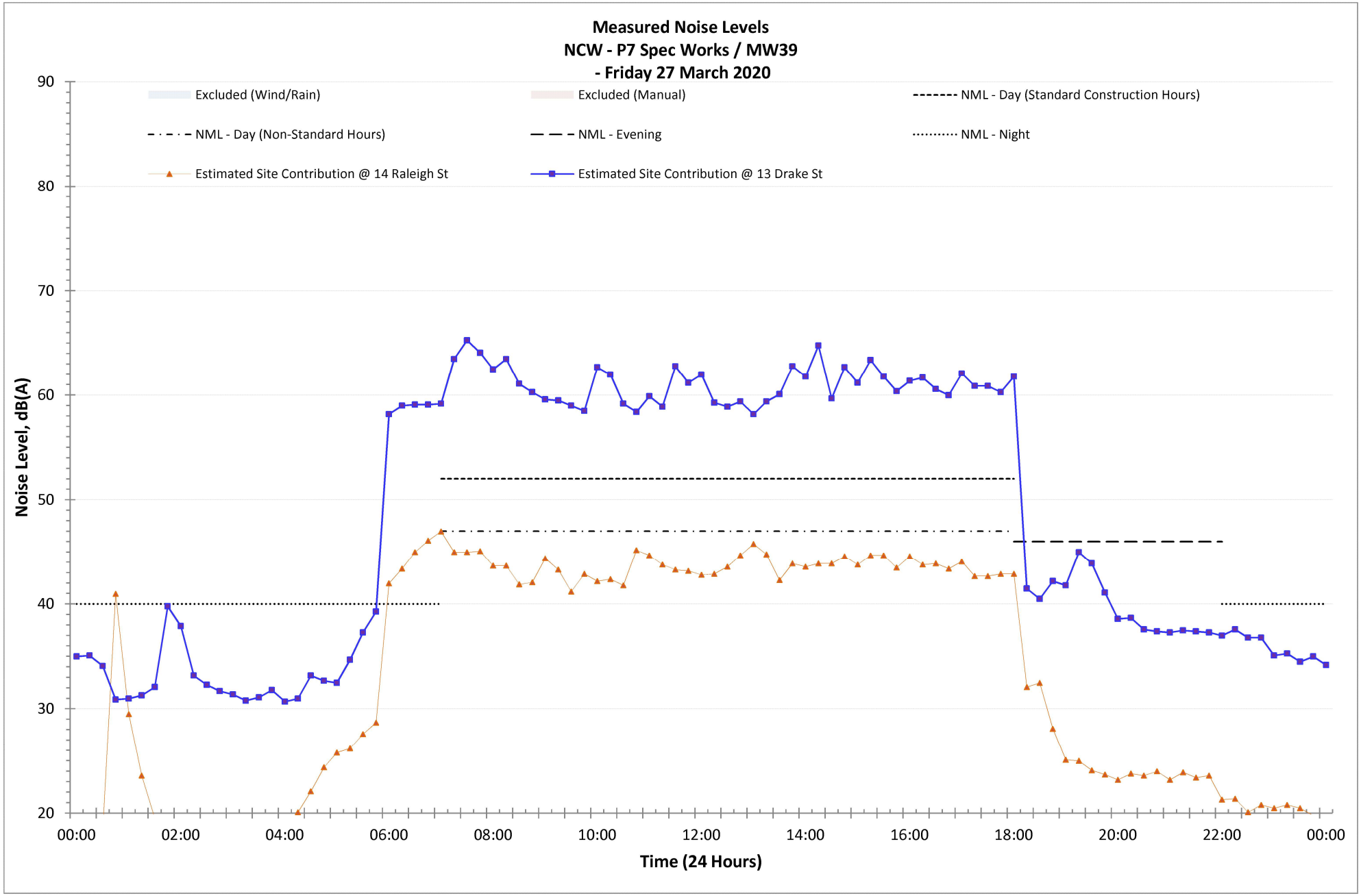
File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	Low Frequency Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Sleep Disturbance Screening Level - LAmax	Description
Project 020	2020-03-30	11:36:00	0:15:00	72.6	43.4	56.4	67	59.5	46.5	20	49	-	-	-	61	NCA01	A01	Day	42	52	57	7	-3	4	A01 - Project 020. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of vehicles within and out of the site entrance, operation of machinery within the rail corridor, hand tools, and staff talking dragging and clangs and bangs. Site-related noises contributed to approximately 20% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included Sydney metro trains, distant and local traffic, neighbour cars and insects .
Project 021	2020-04-01	08:29:56	0:15:00	73.2	49.8	59.9	68.3	64.9	51.1	70	58	-	-	-	71	NCA01	A01	Day	42	52	57	16	6	14	A01 - Project 021-022. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of vehicles within and out of the site entrance, operation of machinery within the rail corridor, hand tools, excavators, and staff talking dragging and clangs and bangs. Site-related noises contributed to approximately 70% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included Sydney metro trains, distant and local traffic, neighbour cars and insects.
Project 022	2020-04-01	08:45:36	0:15:00	79	41.6	58.5	67.9	63.9	44.4	70	57	-	-	-	75	NCA01	A01	Day	42	52	57	15	5	18	
Project 023	2020-04-01	09:04:28	0:15:00	79.7	38.8	55	63	57.5	42.4	25	49	-	-	-	58	NCA01	A05	Day	42	52	57	7	-3	1	A05 - Project 023. Measurements taken at Hawkins Street, Artarmon, generally facing towards site works within the rail corridor. Site-related noise resulted from the movement of vehicles wheeled front-end loader and staff talking. Site-related noises contributed to approximately 25% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included Sydney metro trains, neighbour construction, distant and local traffic, neighbour cars and insects.
Project 024	2020-04-01	09:25:08	0:15:00	73.1	44.1	57.5	65.9	59.7	51.4	100	58	-	-	-	60	NCA01	A02	Day	42	52	57	16	6	3	A02 - Project 024-025. Measurements taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of distant excavators, trucks, wheeled front-end loader, movement of material, clangs and bangs and hand tools. Site-related noises contributed to approximately 80-100% of the overall Leq (15 min). Extraneous sources included Sydney metro trains, train horn, distant traffic and nearby birds.
Project 025	2020-04-01	09:42:58	0:15:00	71.5	48	56.6	65.7	59.3	50.9	80	58	-	-	2.0	67	NCA01	A02	Day	42	52	57	16	6	10	
Project 026	2020-04-01	10:08:18	0:15:00	81.6	41.5	62.4	75.7	65.2	43.7	100	62	-	-	-	81	NCA01	A01	Day	42	52	57	20	10	24	A01 - Project 026. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of site vehicles within and out of the site entrance, trucks, staff talking, clangs and bangs. Site-related noises contributed to approximately 100% of the overall Leq (15 min) throughout the measurements. Extraneous sources included Sydney metro trains, neighbour constructions, mower, neighbour cars, birds, insects, wind-blown vegetation, local traffic, people talking.
Project 027	2020-04-01	10:29:38	0:15:00	68	42.8	54.7	62.5	59.1	45.5	35	50	-	-	-	61	NCA01	A05	Day	42	52	57	8	-2	4	A05 - Project 027. Measurement taken at Hawkins Street, Artarmon, generally facing towards the site and works within the rail corridor. Site-related noise resulted from the site vehicles, trucks, excavator and staff talking. Site-related noises contributed to approximately 35% of the overall Leq (15 min) throughout the measurement. Extraneous sources included Sydney metro trains, train horn, birds, wind-blown vegetation and distant traffic.
Project 028	2020-04-01	10:50:42	0:15:00	94.4	43.9	67.4	77.1	68.8	50.1	15	59	-	-	-	94	NCA01	A04	Day	42	52	57	17	7	37	A04 - Project 028-029. Measurements taken outside 13 Brand Street, Artarmon, generally facing towards the site entrance and works within the rail corridor. Site-related noise resulted from the site vehicles, trailers, generator, trucks, staff talking and clangs and bangs. Site-related noises contributed to approximately 15% of the overall Leq (15 min) throughout the measurements. Extraneous sources were dominant and included Sydney metro trains, train horn, birds, wind-blown vegetation, aircraft, local and distant traffic.
Project 029	2020-04-01	11:08:08	0:15:00	82	44.5	65.9	76.1	70	50.2	15	58	-	-	-	82	NCA01	A04	Day	42	52	57	16	6	25	
Project 030	2020-04-01	11:28:58	0:15:00	87.6	44.4	60.4	69.4	63.8	47.1	70	59	-	-	-	87	NCA01	A01	Day	42	52	57	17	7	30	A01 - Project 030. Measurement taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of site vehicles within and out of the site entrance, trucks, staff talking, clangs and bangs. Site-related noises contributed to approximately 70% of the overall Leq (15 min) throughout the measurement. Extraneous sources included Sydney metro trains, neighbour constructions, mower, neighbour cars, birds, insects, wind-blown vegetation, local traffic and people talking.
Project 031	23/04/2020	08:15:05	0:15:00	83.78	49.8	61.43	67.57	64.46	55.75	100	61	-	-	-	79	NCA01	A01	Day	42	52	57	19	9	22	
Project 032	23/04/2020	08:33:03	0:15:00	72.3	47.9	60.4	69	64.1	52.6	90	60	-	-	-	72	NCA01	A01	Day	42	52	57	18	8	15	A01 - Project 031-033. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of excavators and other plant within the rail corridor, movement of site vehicles within and out of the site entrance, distant site works, hand tools, staff talking, and clangs and bangs. Site-related noises contributed to approximately 60-100% of the overall Leq (15 min) throughout the measurements. Extraneous sources included Sydney metro trains, nearby construction at neighbouring residences, and birds.
Project 033	23/04/2020	08:51:03	0:15:00	78.7	47	60.4	68.7	64.3	50.4	60	58	-	-	-	72	NCA01	A01	Day	42	52	57	16	6	15	
Project 034	23/04/2020	09:14:04	0:15:00	76.69	49.06	62.03	69.86	65.36	54.49	70	62	-	-	2.0	72	NCA01	A05	Day	42	52	57	20	10	15	A05 - Project 034-035. Measurements taken at Hawkins Street, Artarmon, generally facing towards the site and works within the rail corridor. Site-related noise resulted from trucks, distant site works, small excavators operating and staff talking. Site-related noises contributed to approximately 20-70% of the overall Leq (15 min) throughout the measurements. Extraneous sources included Sydney metro trains, birds, nearby residents, distant traffic and sirens.
Project 035	23/04/2020	09:33:05	0:15:00	77.17	38.96	55.93	65.77	59.43	43.73	20	49	-	-	-	58	NCA01	A05	Day	42	52	57	7	-3	1	
Project 036	23/04/2020	09:59:03	0:15:00	68.48	42.87	52.91	62.55	56.15	45.65	20	46	-	-	-	57	NCA01	A02	Day	42	52	57	4	-6	0	A02 - Project 036-037. Measurements taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of distant works and excavators, idle plant and equipment, trucks, and unloading of material. Site-related noises contributed to approximately 15-20% of the overall Leq (15 min) throughout the measurements. Extraneous sources included Sydney metro trains, train horn, distant traffic, and nearby birds and other animals.
Project 037	23/04/2020	10:17:04	0:15:00	70.98	40.46	52.87	63.19	56.17	44.55	15	45	-	-	-	58	NCA01	A02	Day	42	52	57	3	-7	1	
Project 038	23/04/2020	10:45:05	0:15:00	86.5	53.3	70.2	77.9	73.4	59.3	5	57	-	-	-	71	NCA01	A03	Day	42	52	57	15	5	14	A03 - Project 038-039. Measurements taken outside 340 Mowbray Road, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators, drilling, clangs and bangs, hand tools and vehicle movements. Site-related noises contributed to approximately 5% of the overall Leq (15 min) throughout the measurements. Extraneous sources dominated the measurements and included Sydney Trains, distant and passing traffic on Mowbray Road, and the operation of cranes and other plant/equipment within the TSE site compound.
Project 039	23/04/2020	11:03:00	0:15:00	89.5	59.7	71.1	80.4	74.2	64.4	5	58	-	-	-	78	NCA01	A03	Day	42	52	57	16	6	21	

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal Modifying Factor?	Low Frequency Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL - LA90, Period	NML - LAeq, 15 minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL - LA90, Period	Comparison to NML - LAeq, 15 minute	Comparison to Sleep Disturbance Screening Level - LAmax	Description
Project 040	27/04/2020	08:18:05	0:15:00	72.19	42.91	59.01	69.01	64.23	46.36	15	51	-	-	-	68	NCA01	A01	Day	42	52	57	9	-1	11	
Project 041	27/04/2020	08:36:05	0:15:00	70.13	45.17	58.3	67.74	63.32	50.56	40	54	-	-	-	63	NCA01	A01	Day	42	52	57	12	2	6	A01 - Project 040-042. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of excavators and other plant within the rail corridor, movement of site vehicles within and out of the site entrance, hand tools, staff talking, and reverse alarms. Site-related noises contributed to approximately 15-40% of the overall Leq (15 min) throughout the measurements. Extraneous sources included Sydney metro trains, train horns, birds and distant traffic.
Project 042	27/04/2020	08:54:07	0:15:00	75.42	44.91	58.64	68.12	62.62	50.01	30	53	-	-	-	62	NCA01	A01	Day	42	52	57	11	1	5	
Project 043	27/04/2020	09:17:04	0:15:00	73.45	45.83	55.68	63.35	58.58	49.64	50	53	-	-	-	61	NCA01	A02	Day	42	52	57	11	1	4	
Project 044	27/04/2020	09:37:04	0:15:00	71.91	42.19	53.93	63.45	56.67	45.9	60	52	-	-	-	57	NCA01	A02	Day	42	52	57	10	0	0	A02 - Project 043-045. Measurements taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the operation of distant and nearby excavators, idle plant and equipment, movement of trucks, and distant site works (Mowbray Rd). Site-related noises contributed to approximately 50-60% of the overall Leq (15 min) throughout the measurements. Extraneous sources included Sydney metro trains, train horn, distant traffic, and nearby birds.
Project 045	27/04/2020	09:56:06	0:15:00	70.64	45.83	57.97	64.06	61.52	51	60	58	-	-	2.0	63	NCA01	A02	Day	42	52	57	16	6	6	
Project 046	27/04/2020	10:43:03	0:15:00	84.59	59.59	70.74	78.13	74.06	63.69	5	58	-	-	-	84	NCA01	A03	Day	42	52	57	16	6	27	A03 - Project 046-047. Measurements taken outside 340 Mowbray Road, facing west towards works within the rail corridor. Site-related noise resulted from the operation of excavators, movement of ballast, reverse alarms, and distant site related works within the rail corridor. Site-related noises contributed to approximately 5% of the overall Leq (15 min) throughout the measurements. Extraneous sources dominated the measurements and included Sydney Trains, distant and passing traffic on Mowbray Road, birds, nearby residents, and the operation of cranes and other plant/equipment within the TSE site compound.
Project 047	27/04/2020	11:01:15	0:15:00	82.98	59.09	70.15	77.77	73.72	63.24	5	57	-	-	-	72	NCA01	A03	Day	42	52	57	15	5	15	
Project 048	27/04/2020	11:34:04	0:15:00	69.48	43.7	55.2	64.19	58.95	46.69	50	52	-	-	-	67	NCA01	A05	Day	42	52	57	10	0	10	A05 - Project 048. Measurement taken at Hawkins Street, Artarmon, generally facing towards the site and works within the rail corridor. Site-related noise resulted from trucks, excavators operating, clangs and bangs, and staff talking. Site-related noises contributed to approximately 50% of the overall Leq (15 min) throughout the measurement. Extraneous sources included Sydney metro trains, birds, and nearby residents.

Weather 27, 31 March and 1, 23, 27 April 2020: Generally fine weather, overcast and windy at times. Temperature ranged between 17-23 degrees Celsius over the monitoring periods.
Note: all predicted noise levels were reproduced from the LOR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).

File Name	Date	Start Time	Elapsed Time	LAFmax	LAFmin	LAeq	LAF1.0	LAF10.0	LAF90.0	Percentage Site Contribution (%)	Measured Site Noise Level - LAeq, 15minute	Impulsive Modifying Factor?	Tonal/Modifying Factor?	Low Frequency Modifying Factor?	Measured Site Noise Level - LAmax	NCA	Location	Period	RBL, LA90, Period	NML, LAeq, 15 minute	Predicted Site Noise Level - LAeq, 15minute	Sleep Disturbance Screening Level - LAmax	Comparison to RBL LA90, Period	Comparison to NML LAeq, 15 minute	Comparison to Predicted Noise Level - LAeq, 15minute	Comparison to Sleep Disturbance Screening Level - LAmax	Description
Project 001	3/04/2020	01:02	0:15:00	86.9	35.7	54.5	65.5	55.7	37.5	50	51	-	-	-	66	NCA01	A01	Night	35	40	64	50	16	11	-13	16	A01 - Project 001. Measurement taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of vehicles within and out of the site entrance, and workers within the rail corridor. Site-related noises contributed to approximately 50% of the overall Leq (15 min) throughout the measurement. Extraneous sources were identified to include cicadas, distant traffic, passing aeroplanes, and train movements.
Project 002	3/04/2020	01:25	0:15:00	52.9	37.9	42.0	47.6	43.4	39.9	0	39	-	-	-	0	NCA01	A02	Night	35	40	48	50	-5	-10	-18	-50	A02 - Project 002. Measurement taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise was not audible during the measurement. Extraneous sources were dominant and included distant and passing traffic, and cicidas.
Project 003	3/04/2020	01:58	0:15:00	57.6	34.5	38.6	43.9	39.6	36.3	0	26	-	-	-	0	NCA01	A03	Night	35	40	48	50	-9	-14	-22	-50	A03 - Project 003. Measurement taken outside 13 Hopetoun Avenue, facing west towards works within the rail corridor. Site-related noise was not audible during the measurement. Extraneous sources were dominant and included distant and passing traffic, and cicidas.
Project 004	3/04/2020	06:59	0:15:00	75.7	41.7	58.5	69.1	62.2	44.3	40	55	-	-	-	63	NCA01	A01	Night	35	40	64	50	20	15	-9	13	
Project 005	3/04/2020	07:16	0:15:00	82.1	48.2	63.5	72.7	67.1	51.5	90	63	-	-	-	77	NCA01	A01	Day	42	52	64	57	21	11	-1	20	A01 - Project 004-006. Measurements taken outside 12 Drake Street, Artarmon, generally facing west towards site entrance and works within the rail corridor. Site-related noise resulted from the movement of plant and vehicles within and out of the site entrance, operation of plant and machinery within the rail corridor, squashed duck' reverse alarms, staff conversations, and clangs and bangs. Site-related noises contributed to approximately 40-90% of the overall Leq (15 min) throughout the measurements. Extraneous sources were identified to include distant traffic, wildlife, and train movements.
Project 006	3/04/2020	07:33	0:15:00	83.6	54.0	65.5	75.3	68.8	57.3	90	65	-	-	-	80	NCA01	A01	Day	42	52	64	57	23	13	1	23	
Project 007	3/04/2020	07:50	0:15:00	76.5	47.0	57.7	68.4	62.0	50.0	90	57	-	-	-	69	NCA01	A02	Day	42	52	64	57	15	5	-7	12	A02 - Project 007. Measurement taken outside Raleigh Street, facing west towards site entrance and works within the rail corridor. Site-related noise resulted from distant site-related works within the rail corridor. Site-related noises contributed to approximately 90% of the overall Leq (15 min). Extraneous sources were identified to include distant and passing traffic, nearby birds and passing planes.

Weather 3 April 2020: Generally fine weather, with mild wind at times. Temperature was recorded at approximately 19 degrees Celsius over the monitoring period.
Note: all predicted noise levels were reproduced from the LCR OOHWA Form for this track possession.
Note: Low frequency, tonality and impulsive noise tests were conducted in accordance with the INP. The measured Leq data was applied in all cases. Modifying factor (penalty) values were applied as applicable to the low frequency, tonal or impulsive components detectable or attributable to the sites noise emission. The site noise contribution reported here is inclusive of all modifying factors (if applicable).


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Friday 27 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Drake St
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
04:00
06:00
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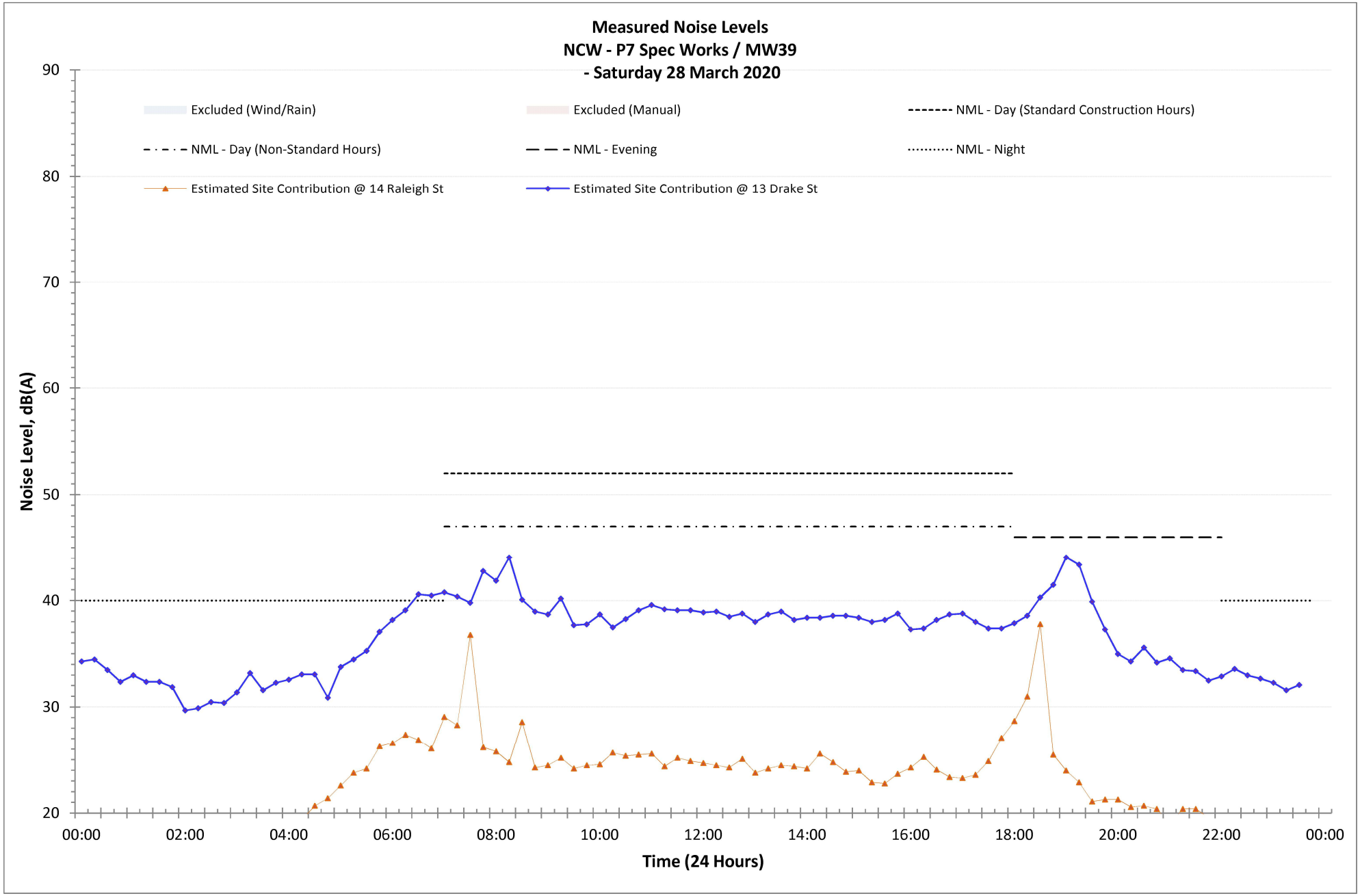
16:00
18:00
20:00
22:00
00:00
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Saturday 28 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 14 Raleigh St
Estimated Site Contribution @ 13 Drake St
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
02:00
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20:00
22:00
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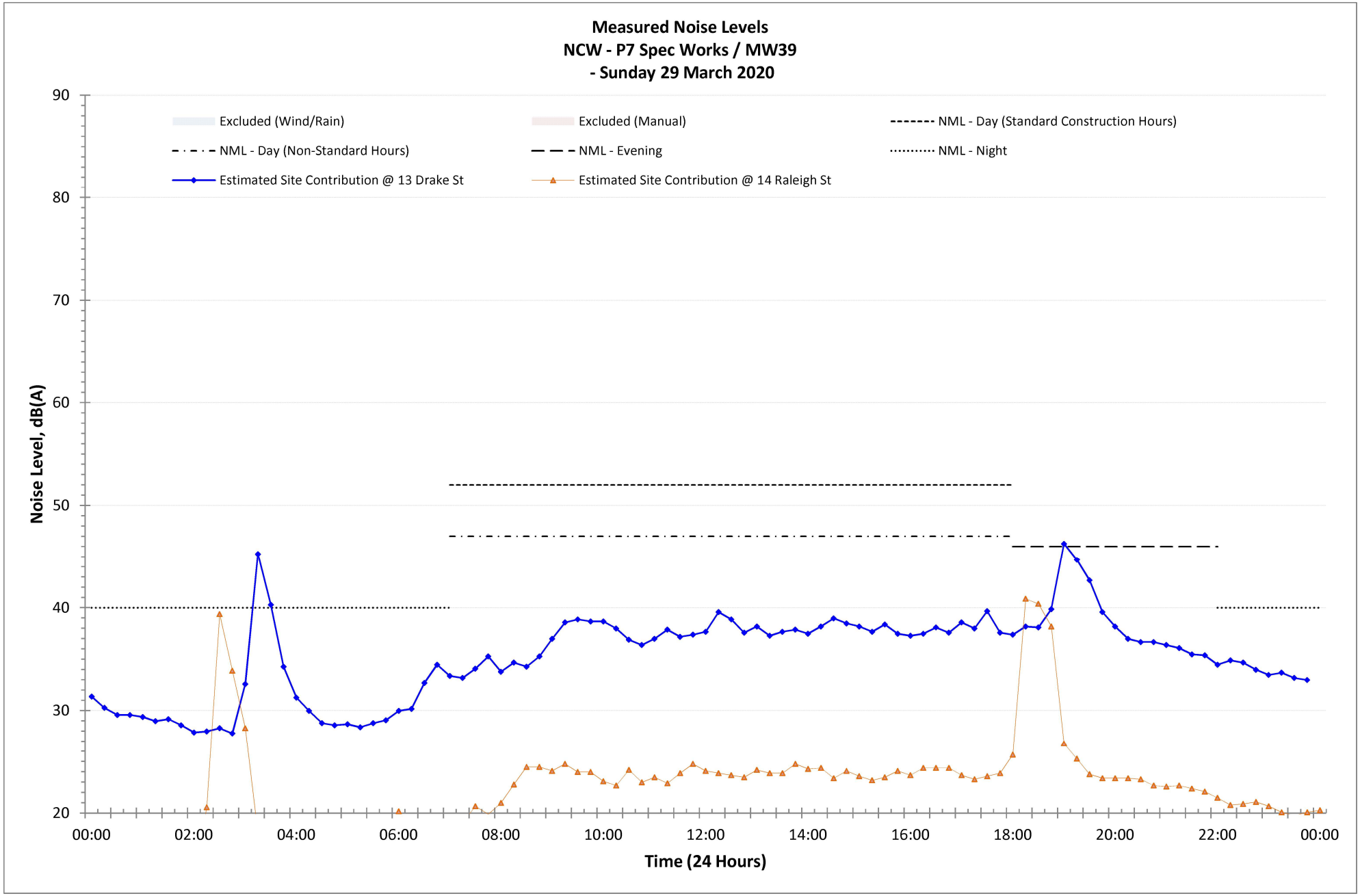
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Sunday 29 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Noise Level, dB(A)
90
80
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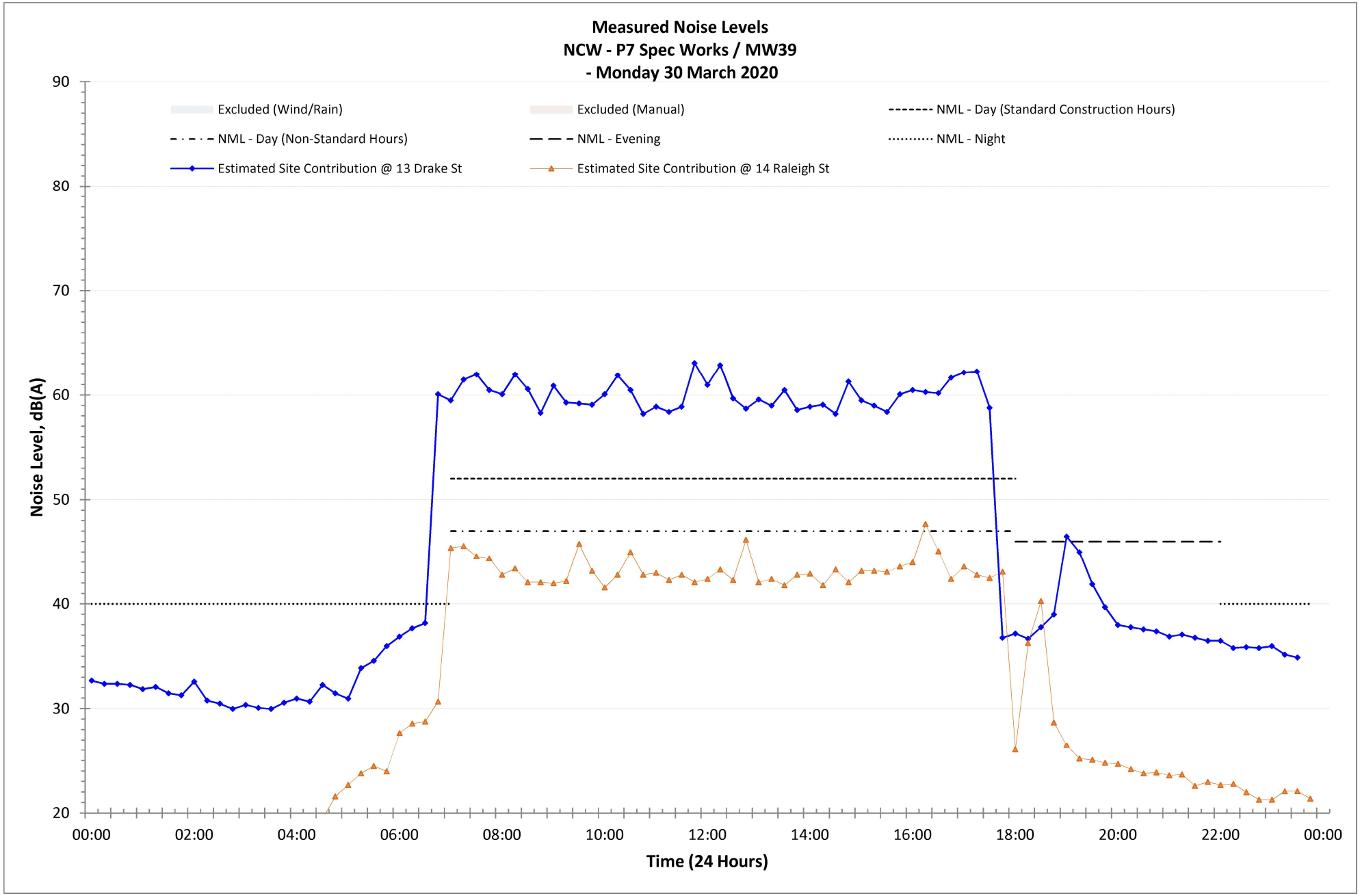
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Monday 30 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Noise Level, dB(A)
90
80
70
60
50
40
30
20
00:00
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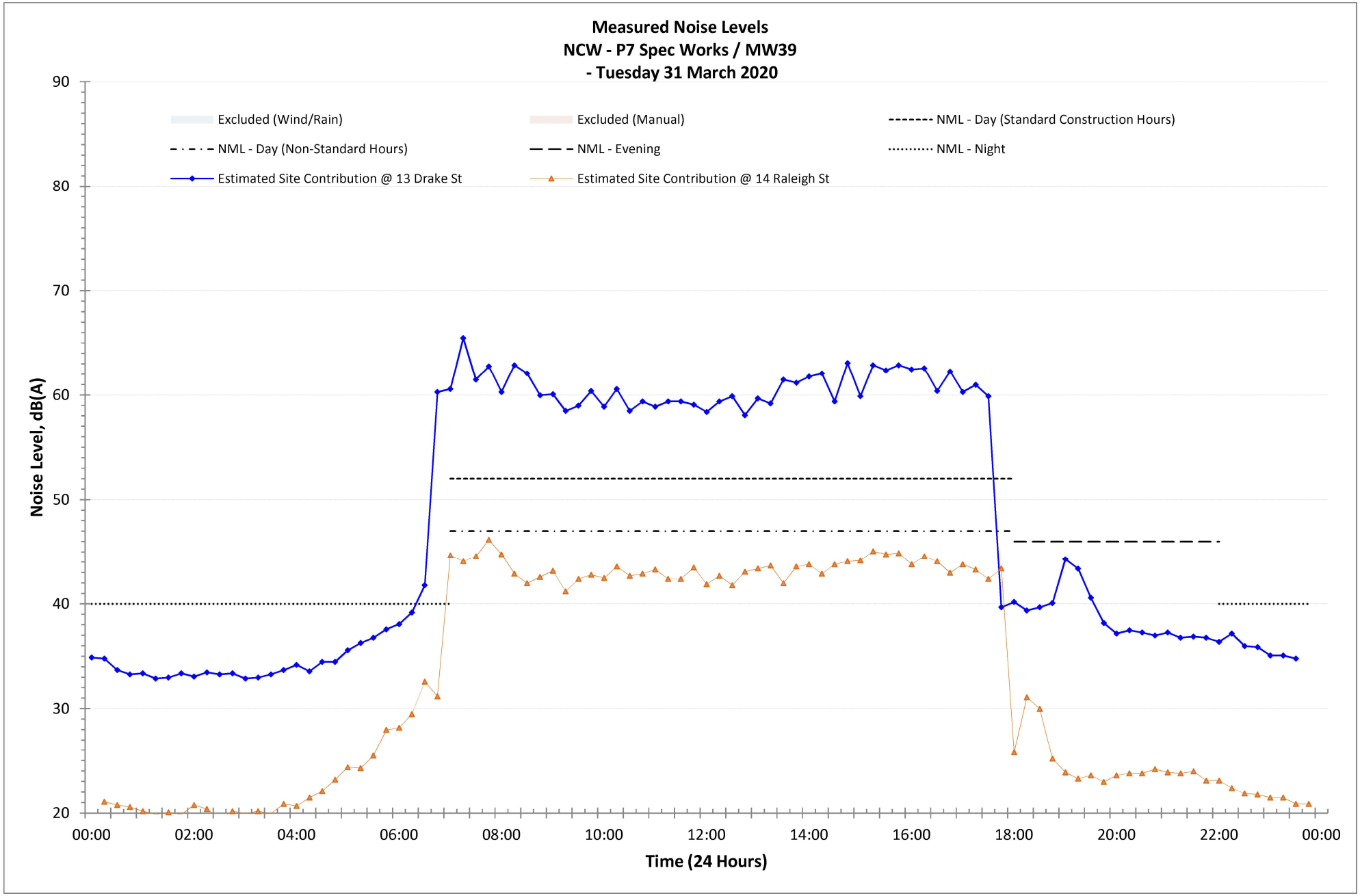
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Tuesday 31 March 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Noise Level, dB(A)
90
80
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60
50
40
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00:00
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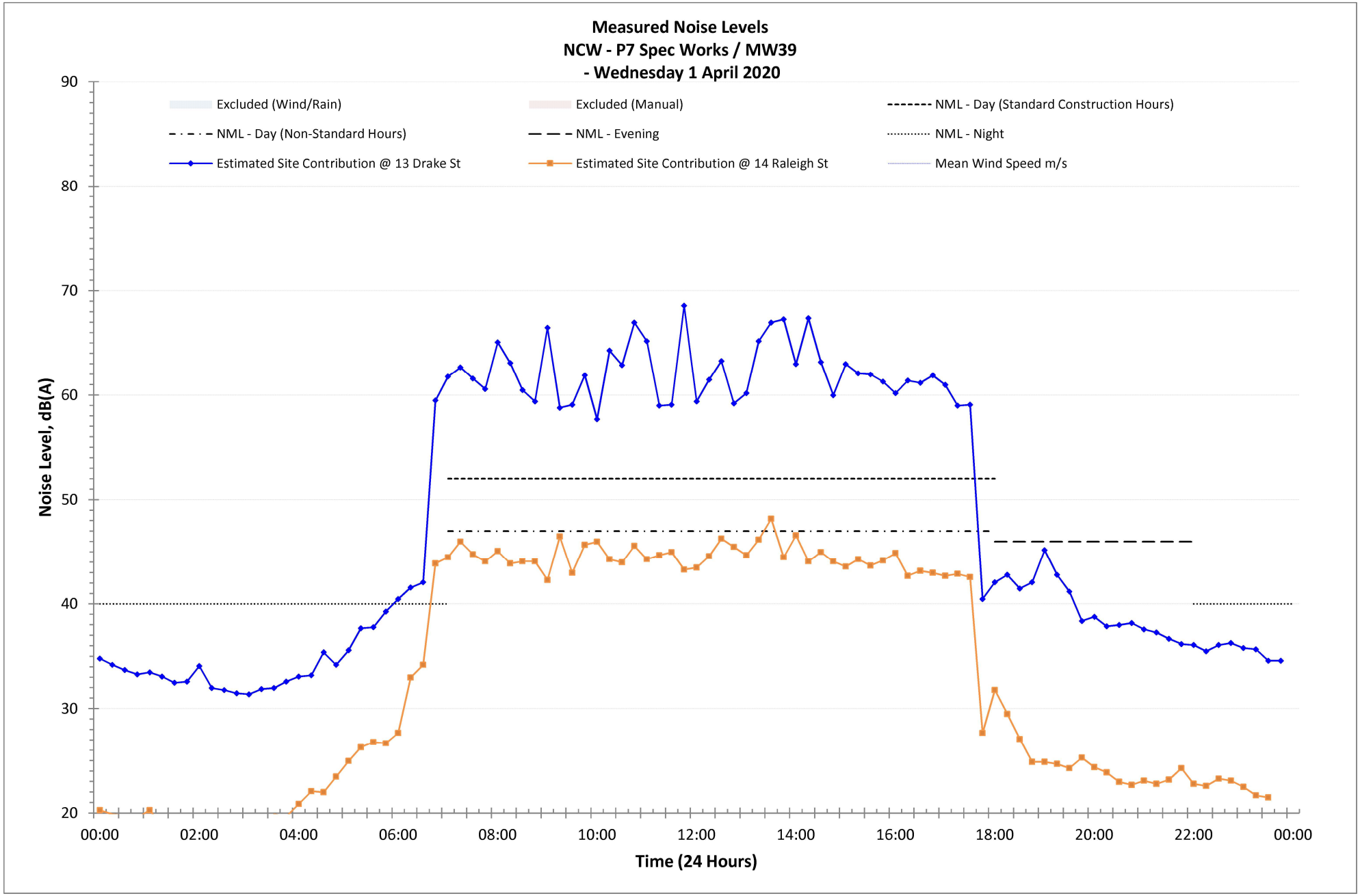
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Wednesday 1 April 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Mean Wind Speed m/s
Noise Level, dB(A)
90
80
70
60
50
40
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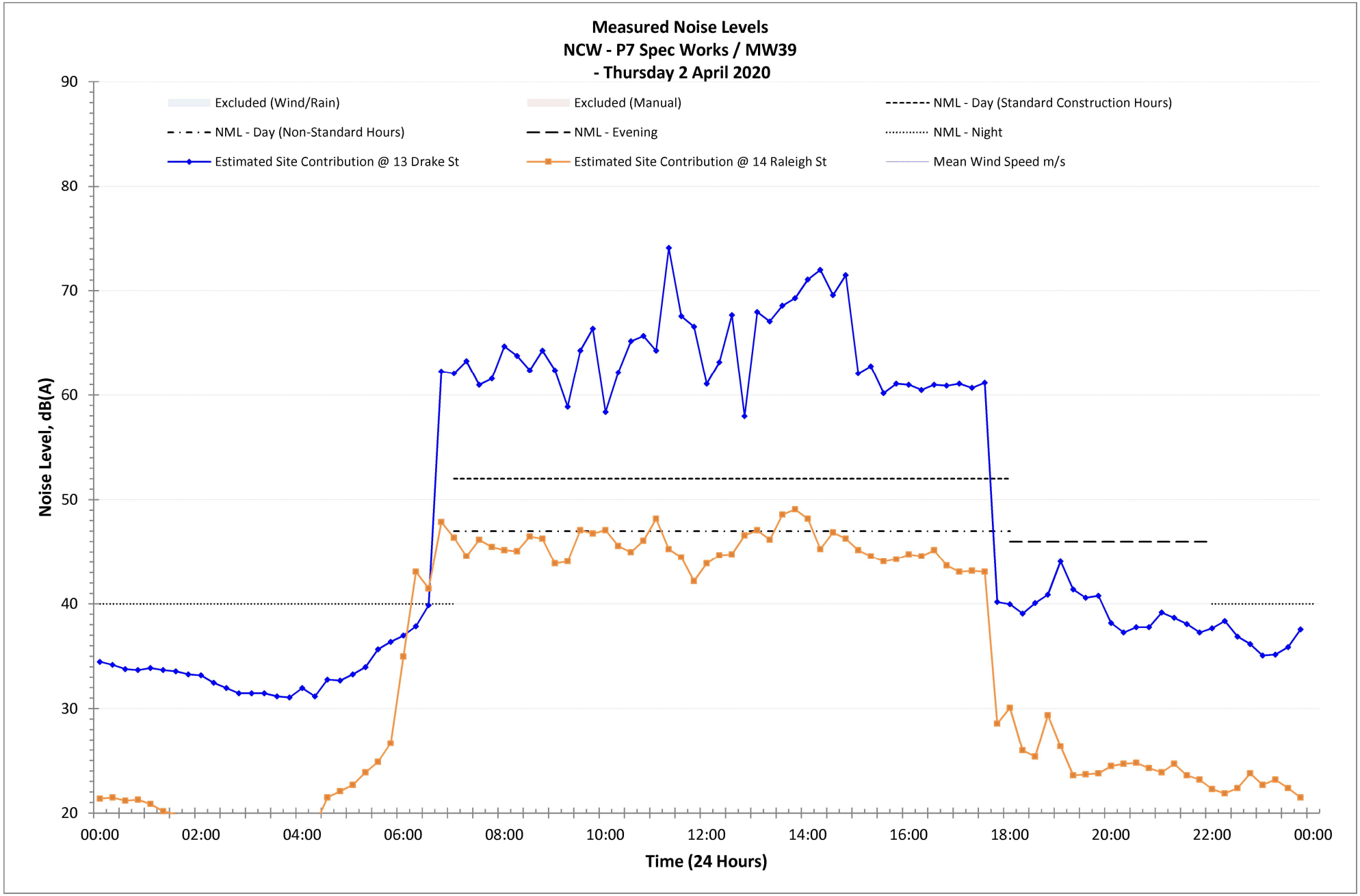
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Thursday 2 April 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Mean Wind Speed m/s
Noise Level, dB(A)
90
80
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60
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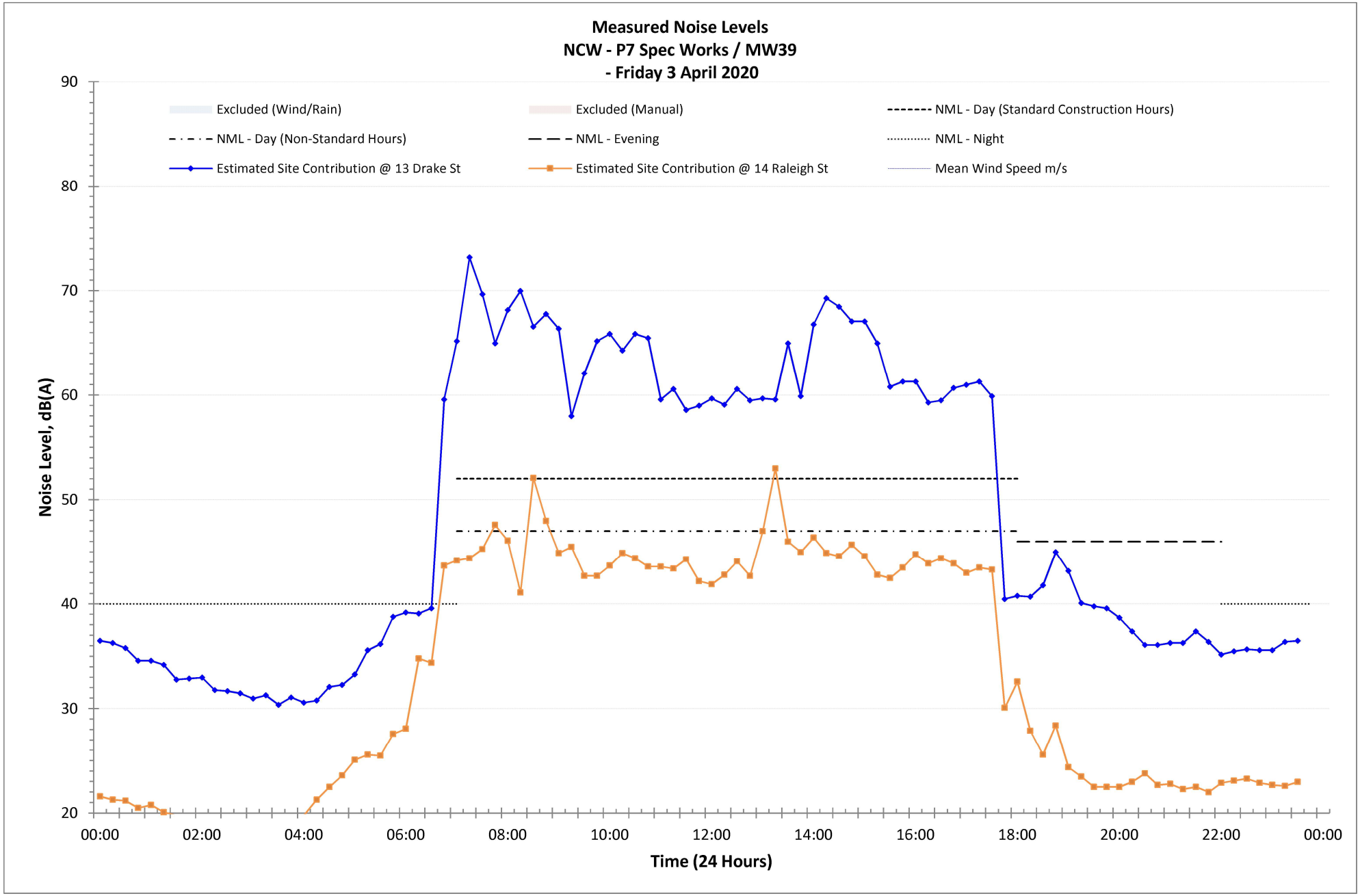
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Friday 3 April 2020
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
NML - Evening
NML - Night
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Mean Wind Speed m/s
Noise Level, dB(A)
90
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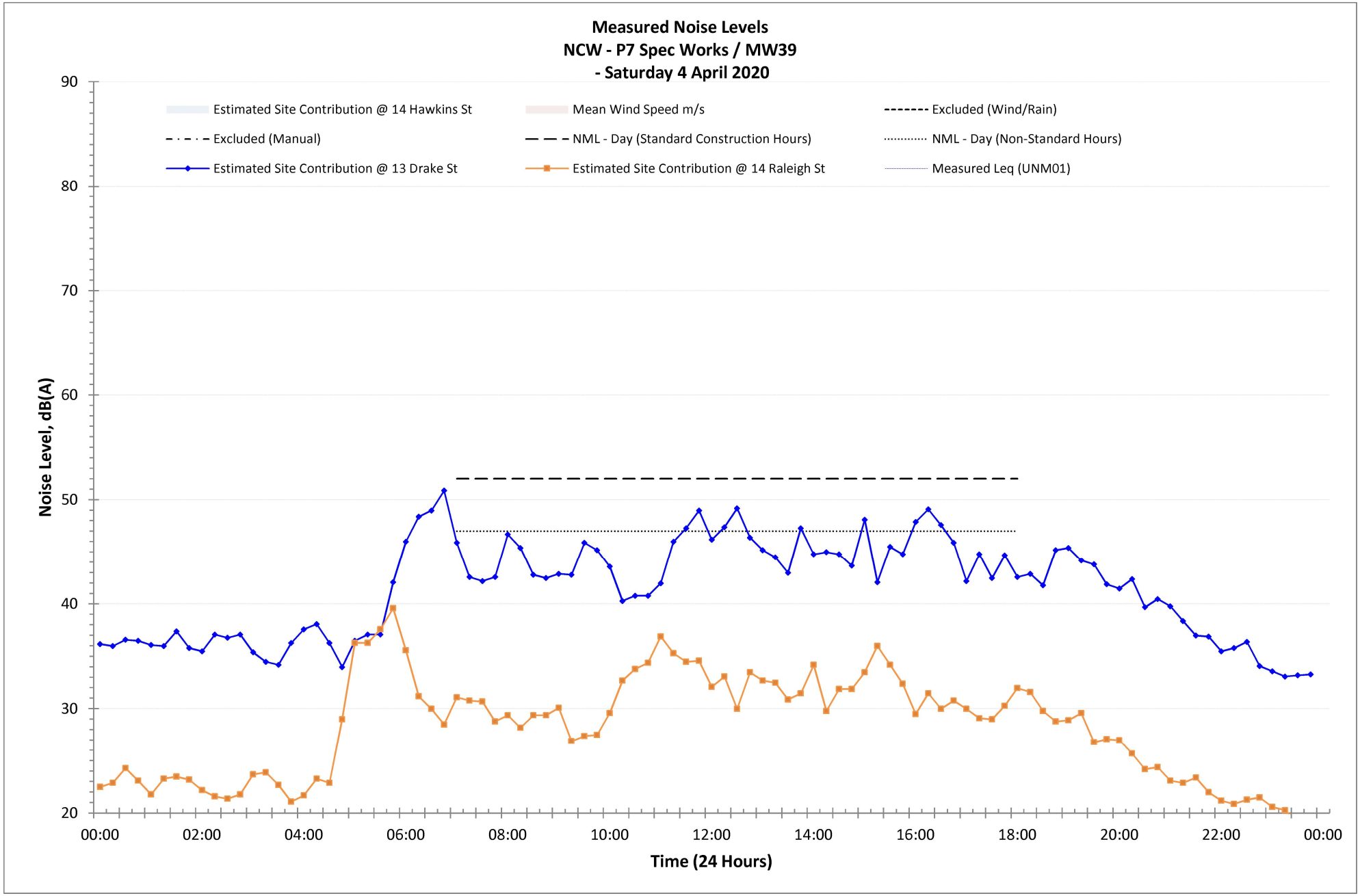
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Saturday 4 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise Level, dB(A)
90
80
70
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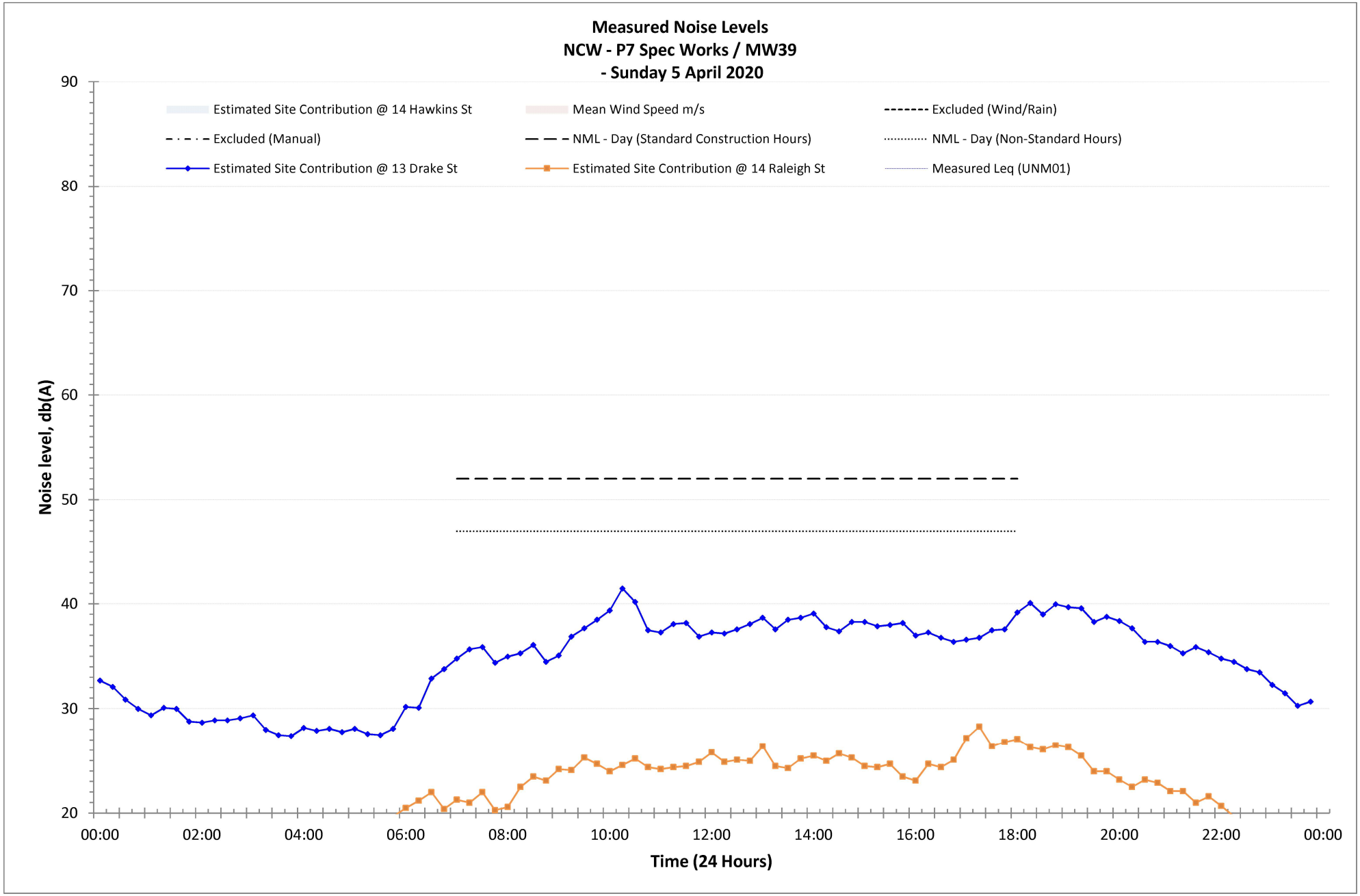
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Sunday 5 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
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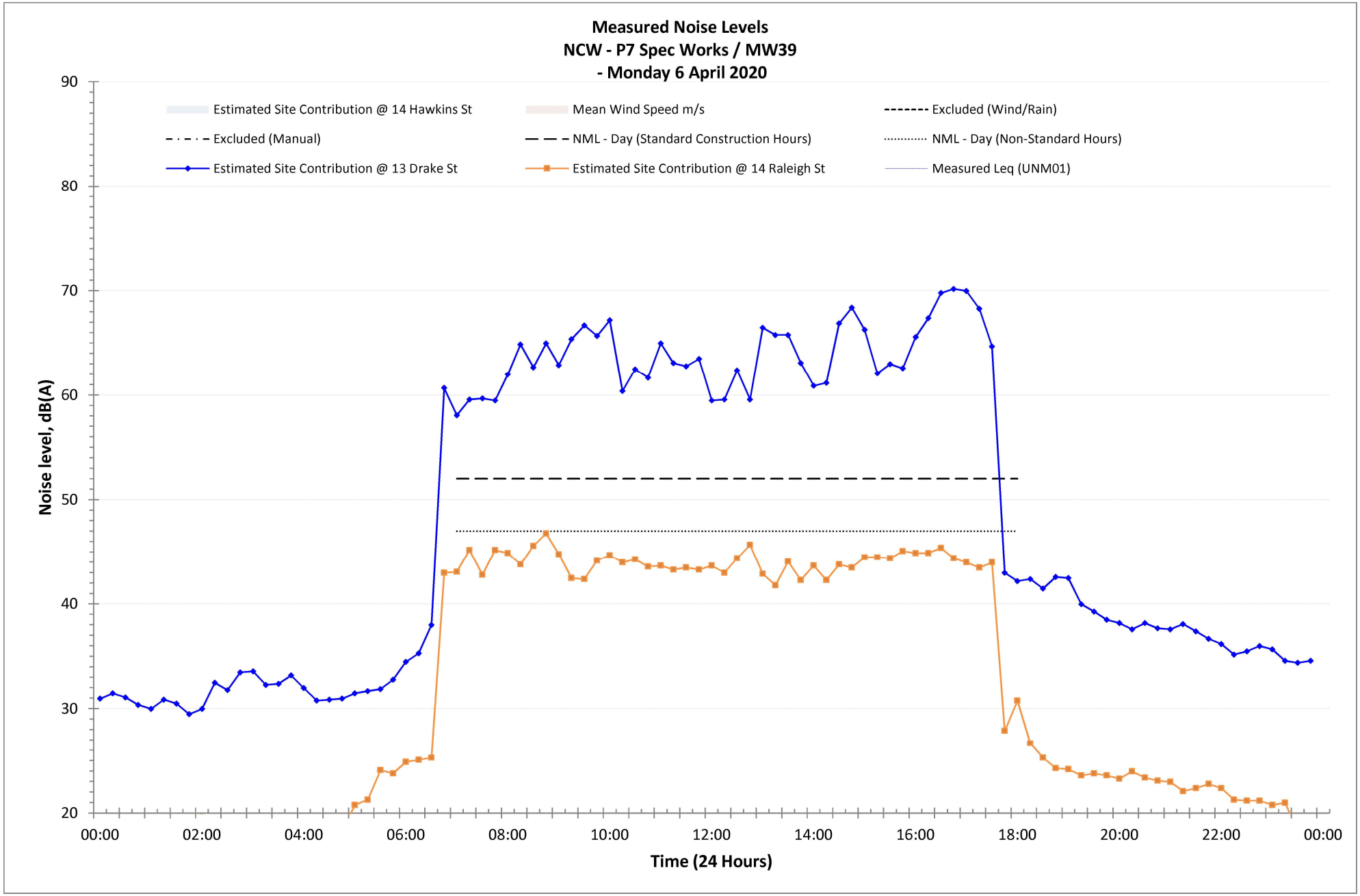
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Monday 6 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, dB(A)
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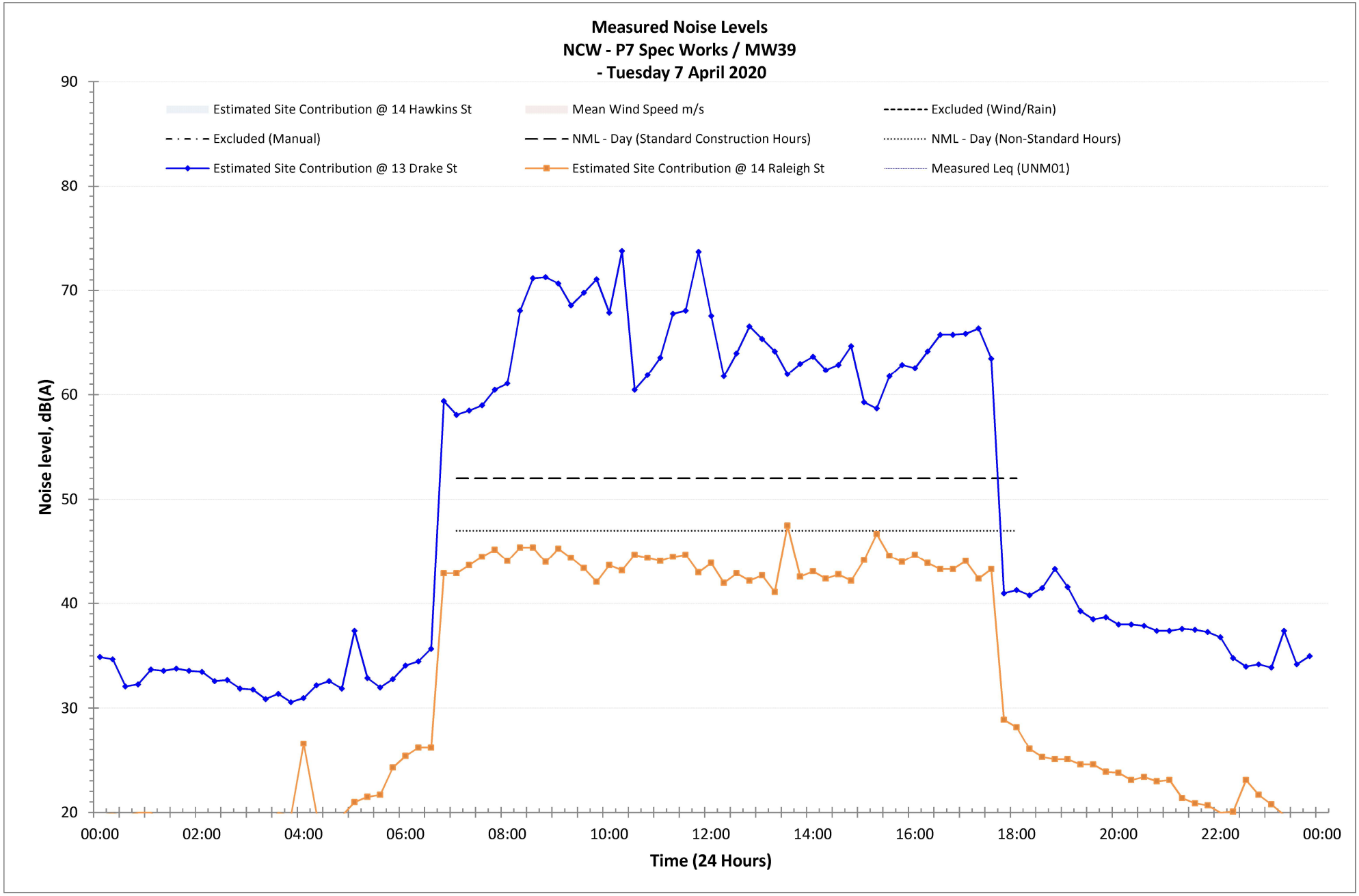
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Tuesday 7 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, dB(A)
90
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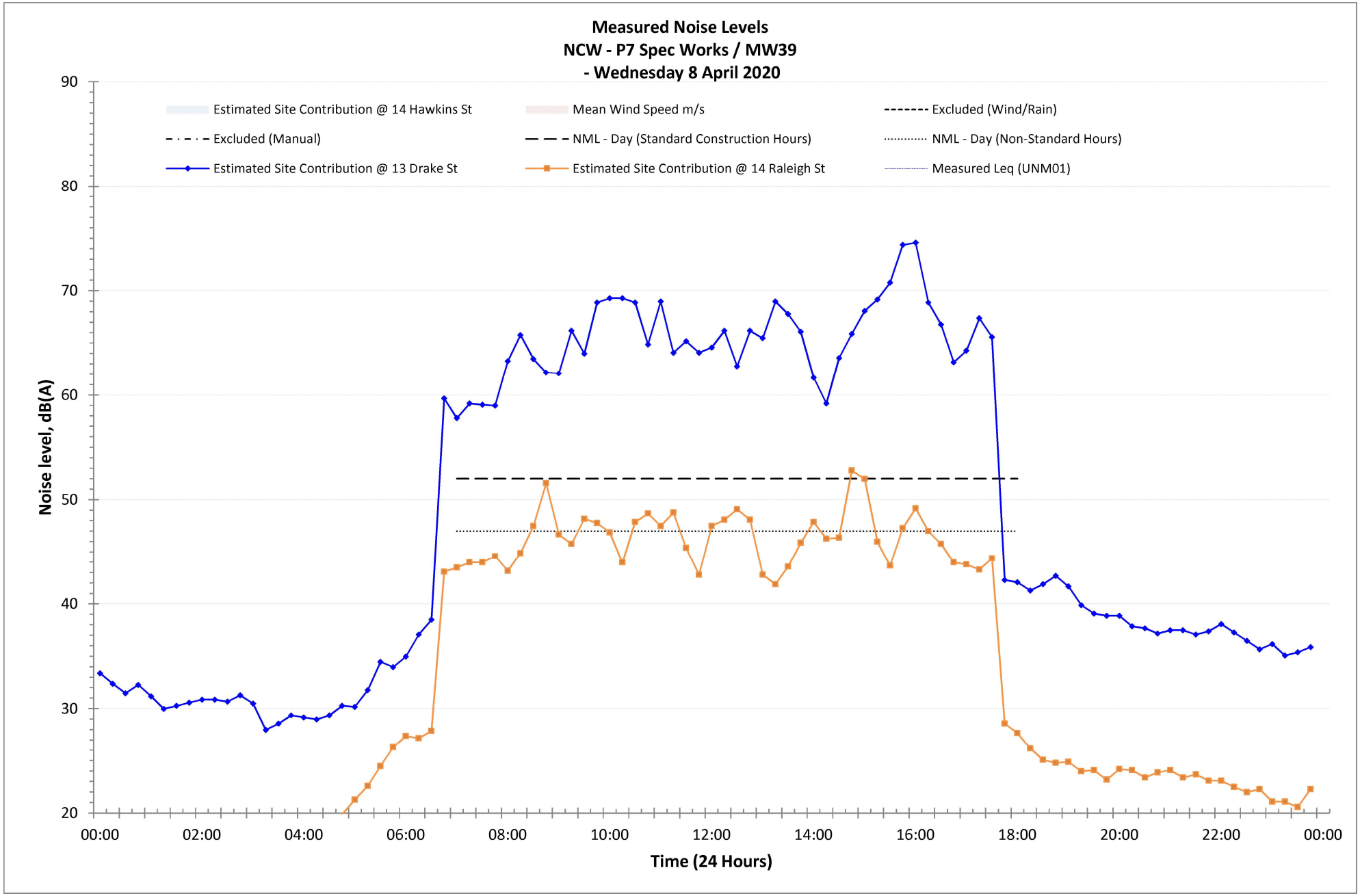
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Wednesday 8 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, dB(A)
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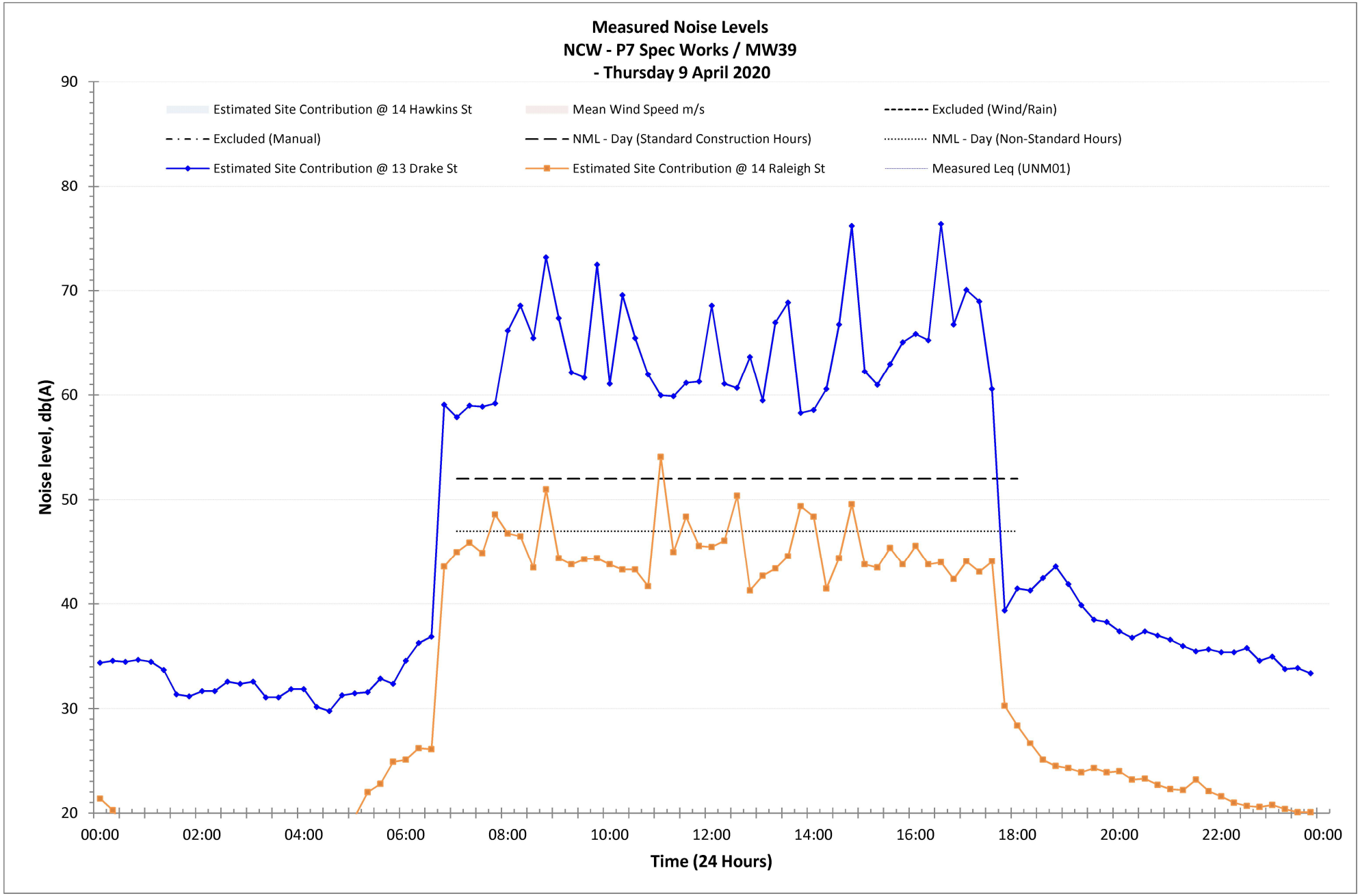
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Thursday 9 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
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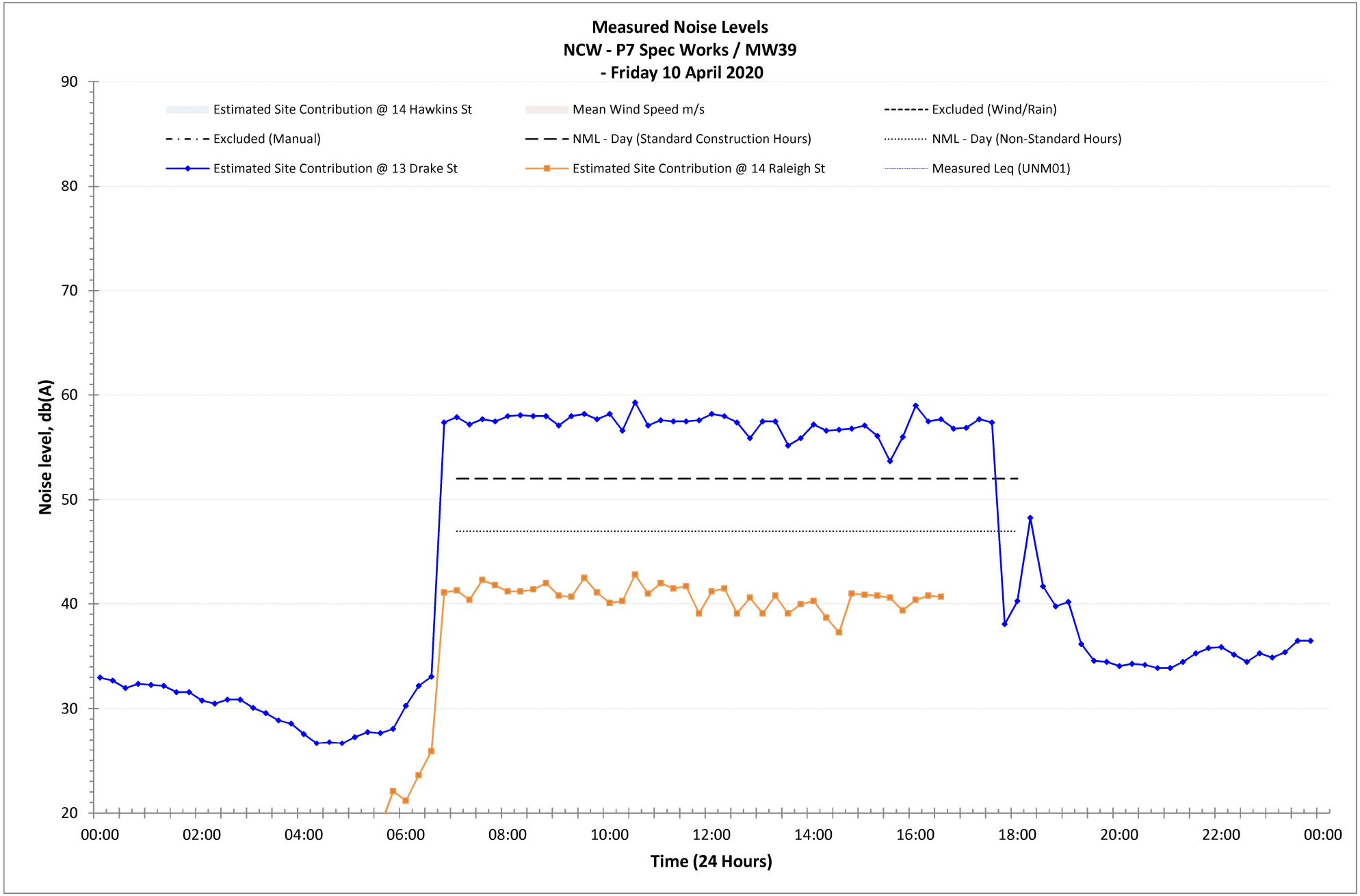
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Friday 10 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
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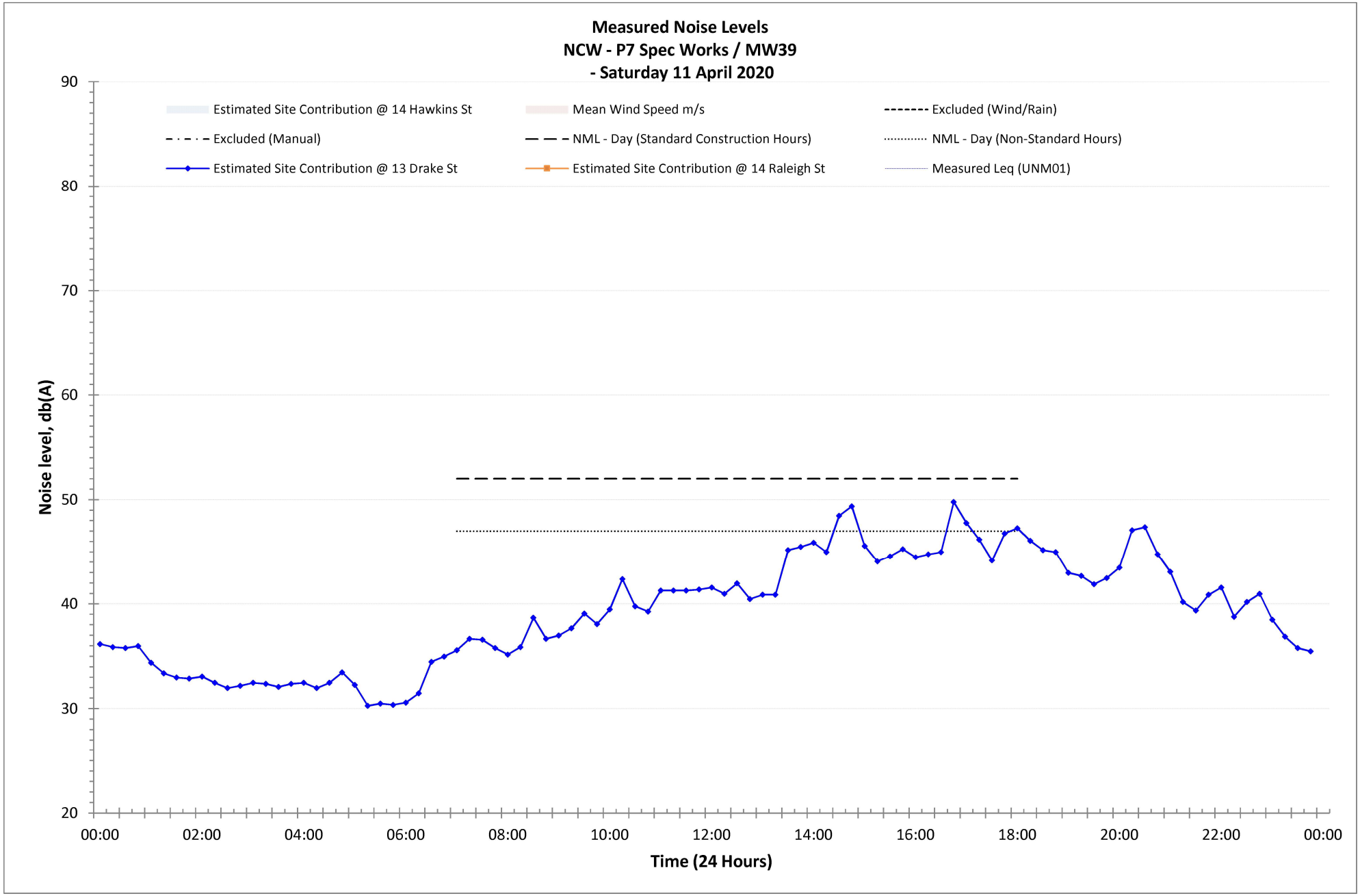
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Saturday 11 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
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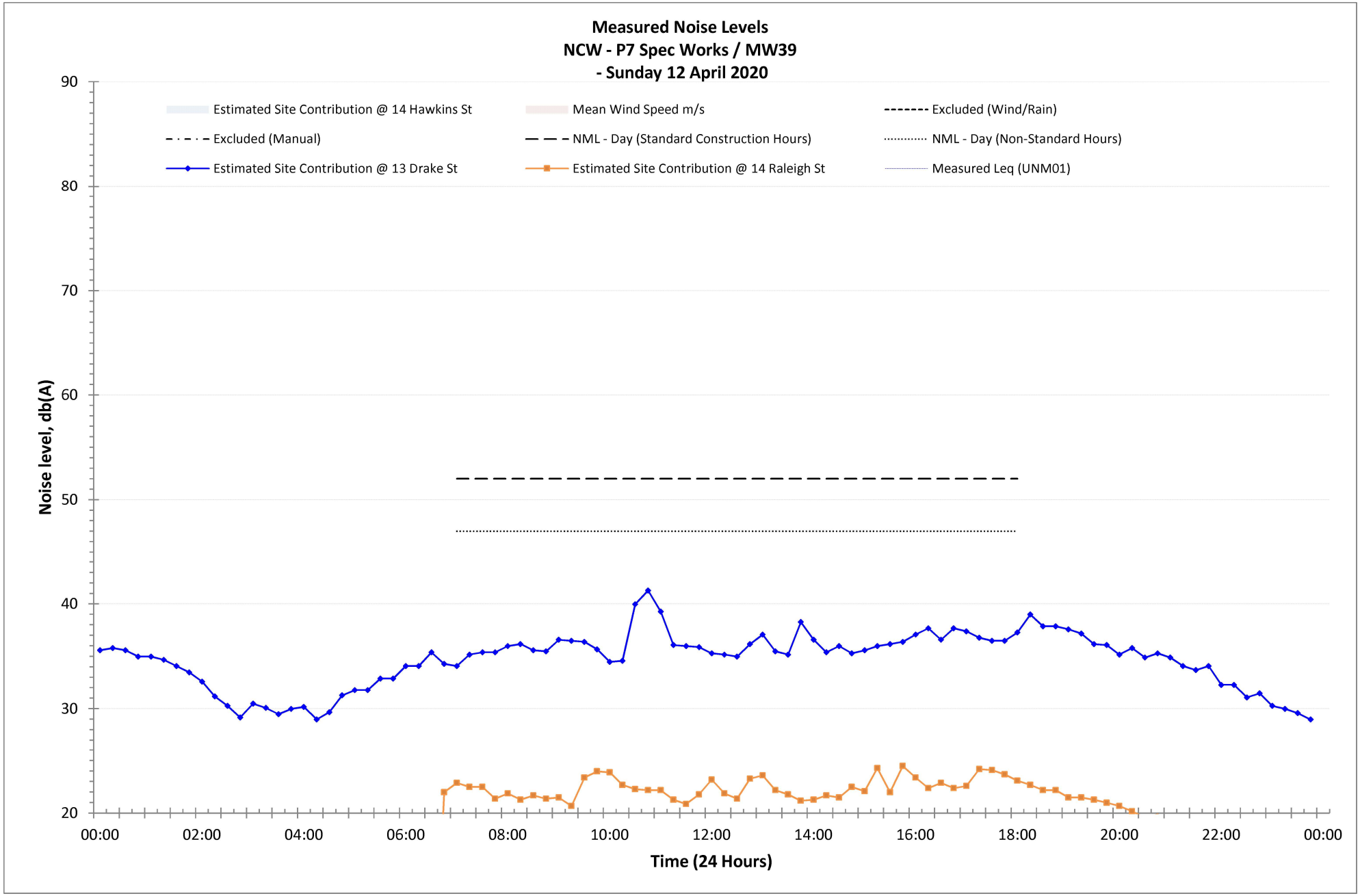
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Sunday 12 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
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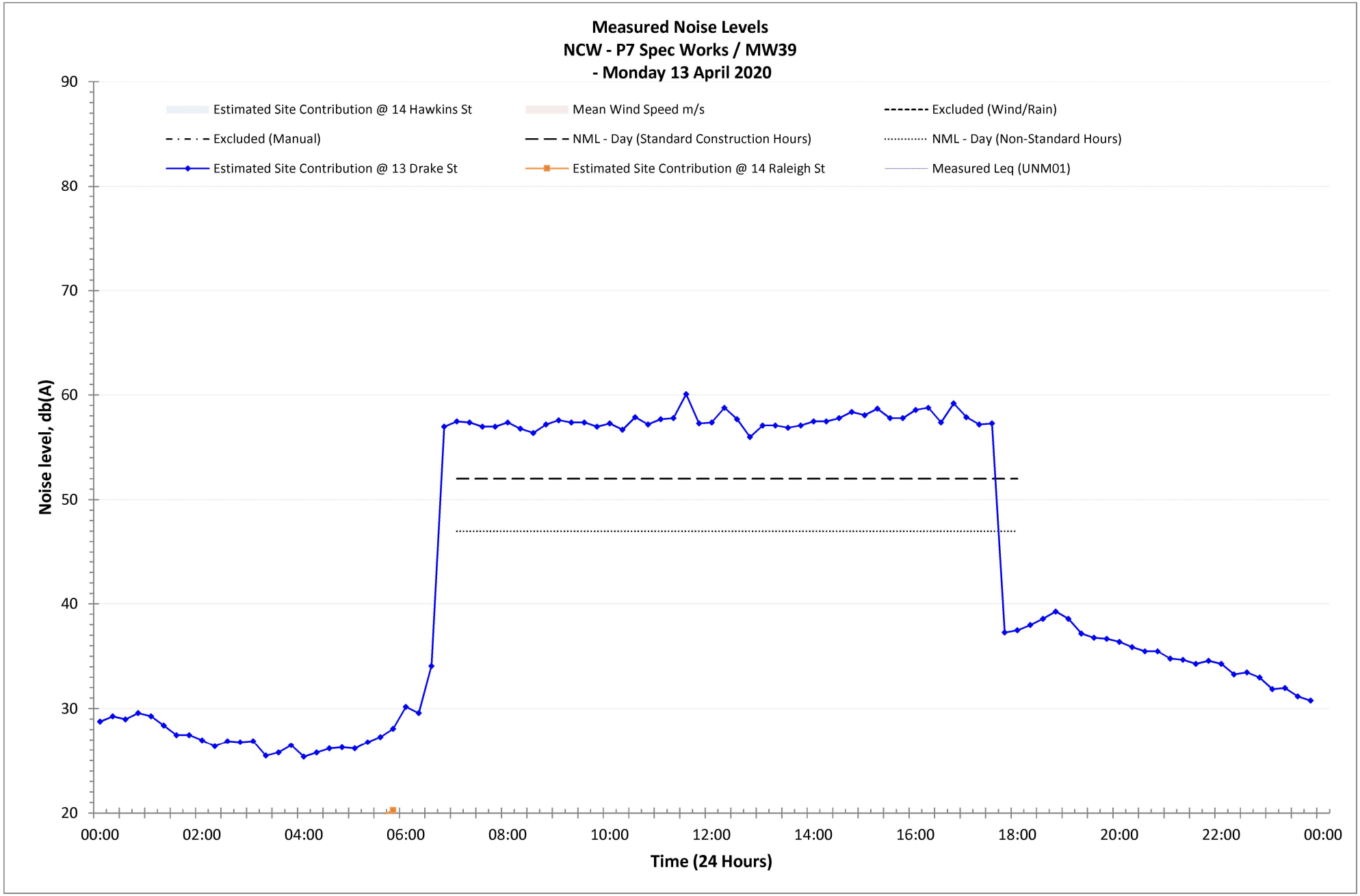
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Monday 13 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
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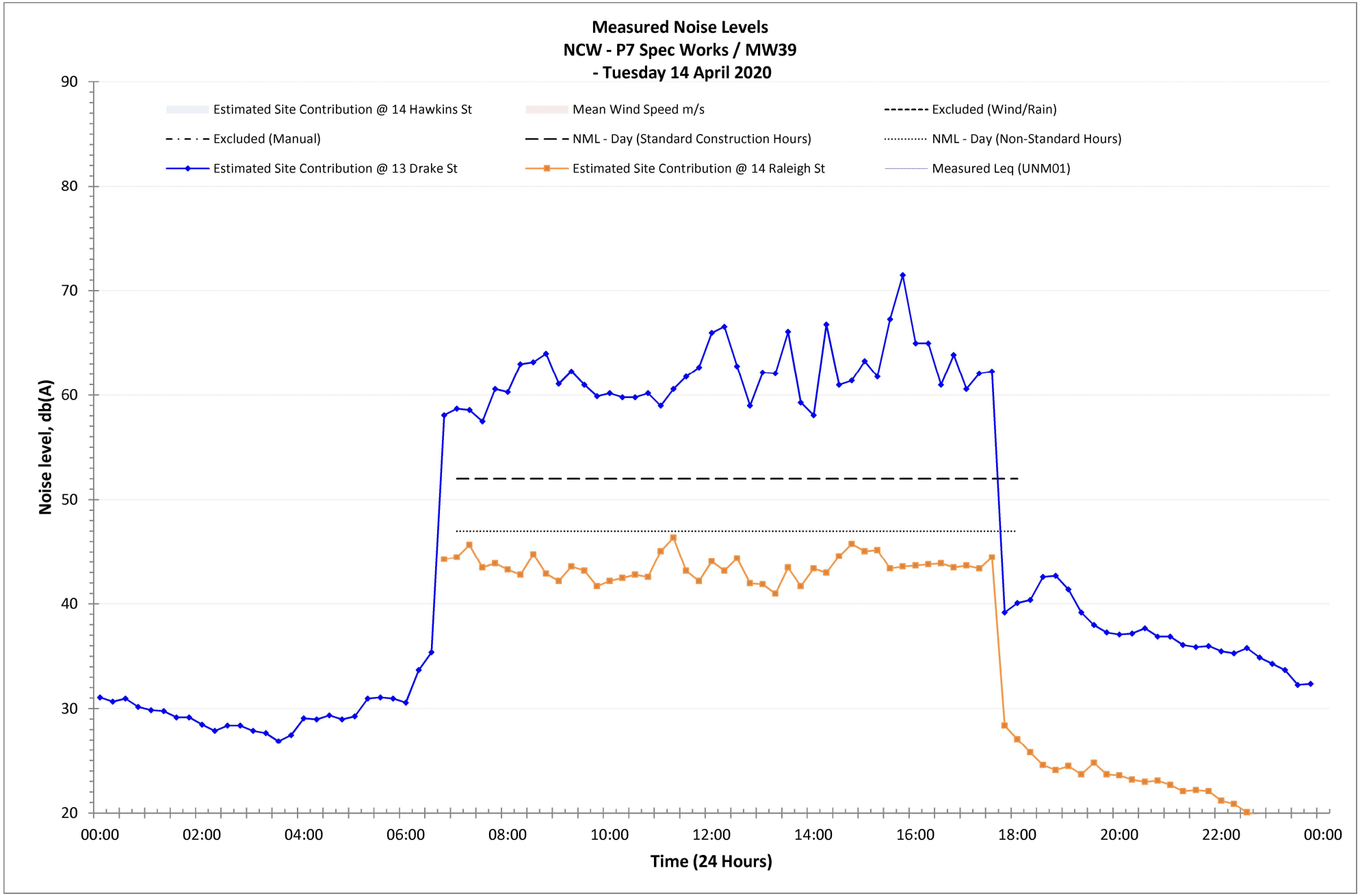
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Tuesday 14 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
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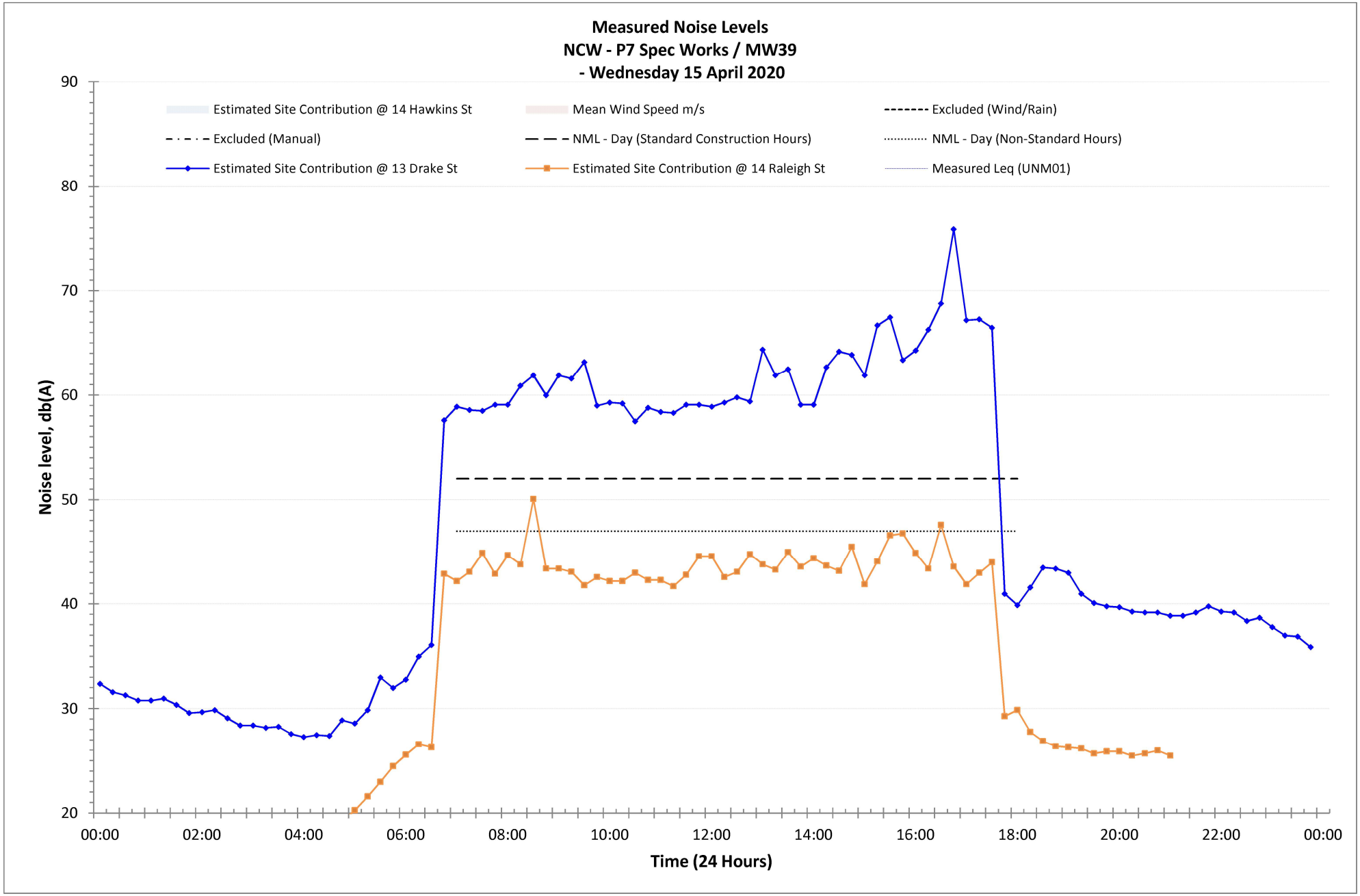
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Wednesday 15 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
90
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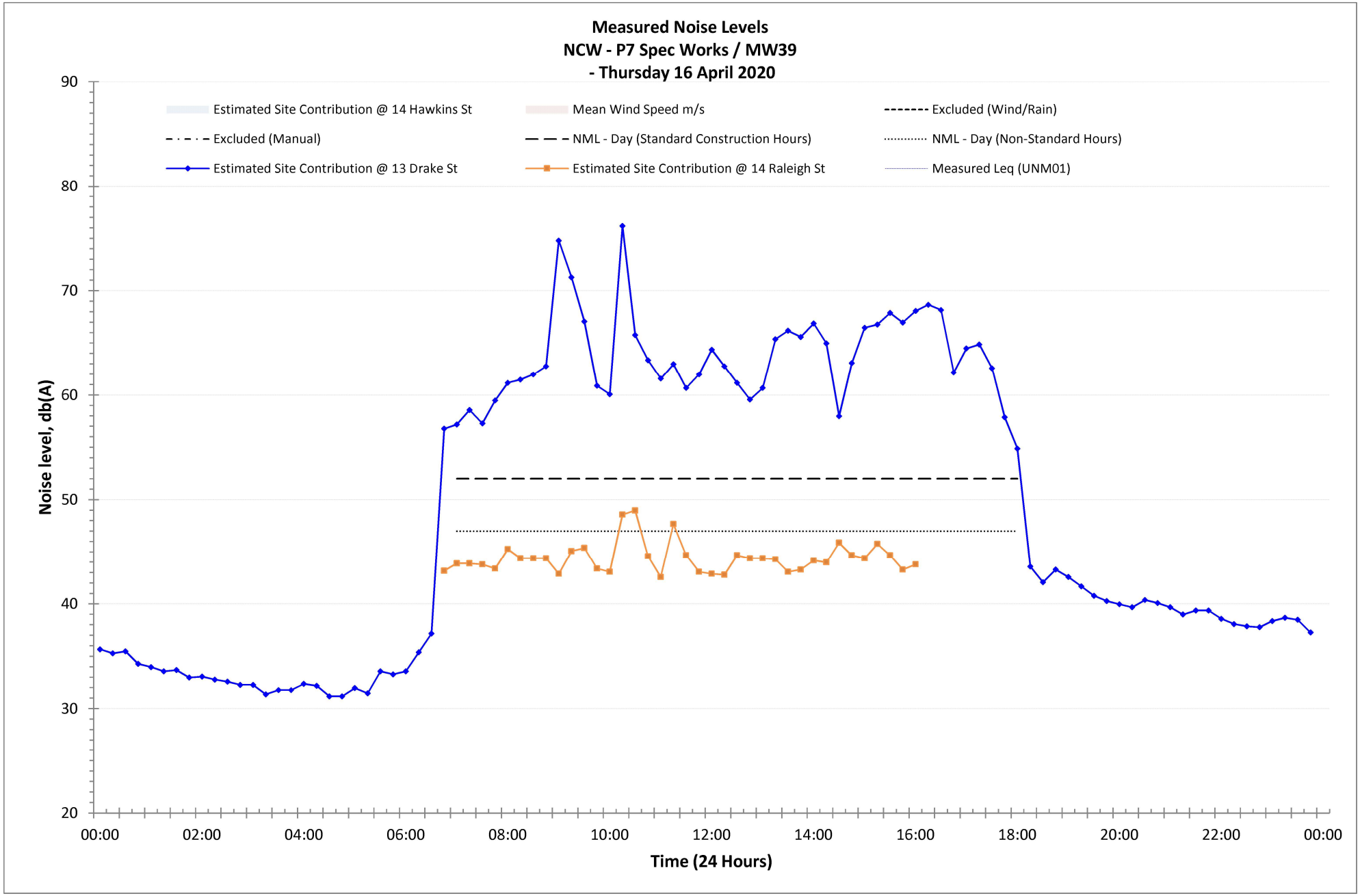
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Thursday 16 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
NML - Day (Non-Standard Hours)
Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
Measured Leq (UNM01)
Noise level, db(A)
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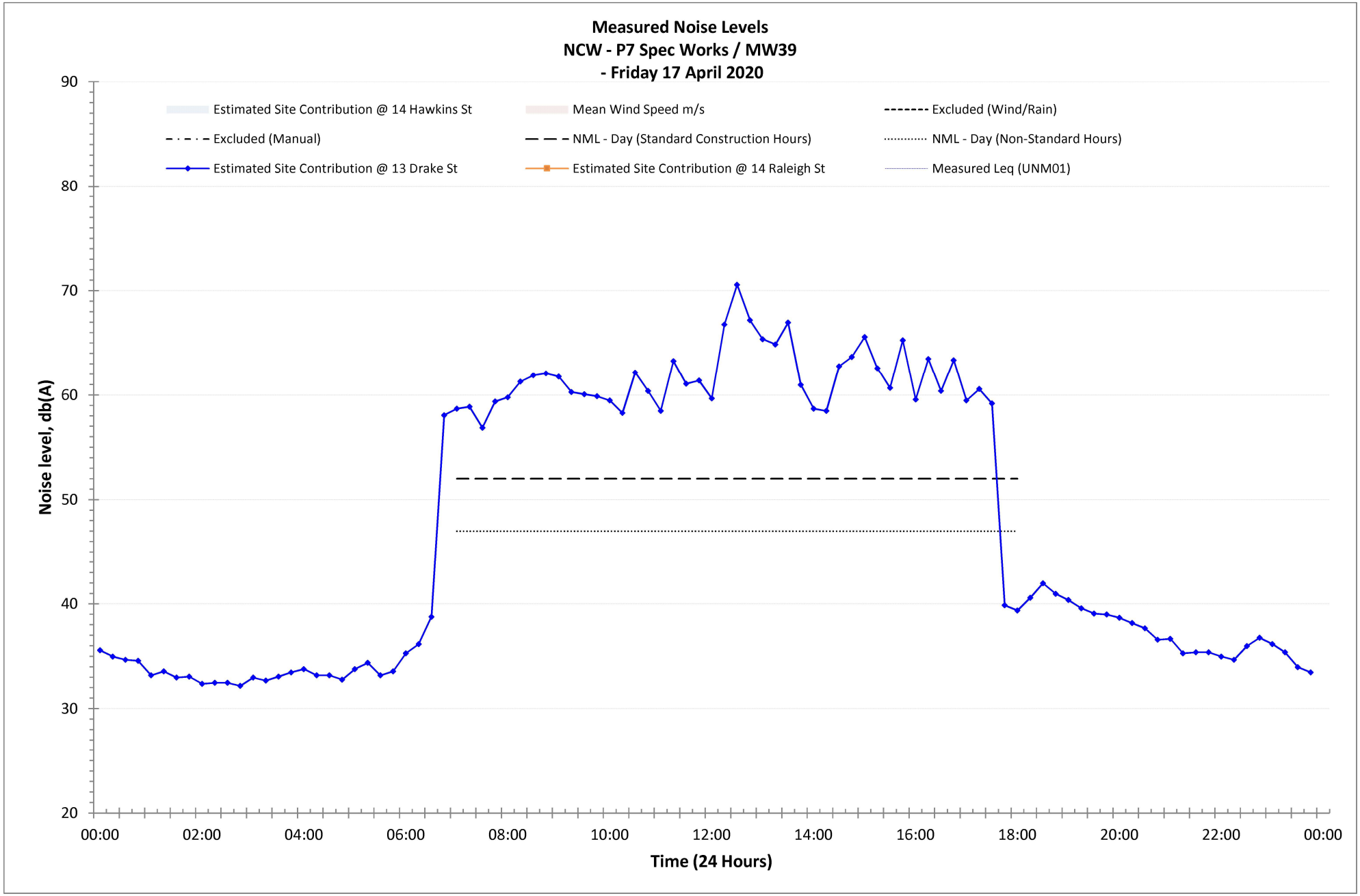
Time (24 Hours)


Measured Noise Levels
NCW - P7 Spec Works / MW39
- Friday 17 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
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Estimated Site Contribution @ 13 Drake St
Estimated Site Contribution @ 14 Raleigh St
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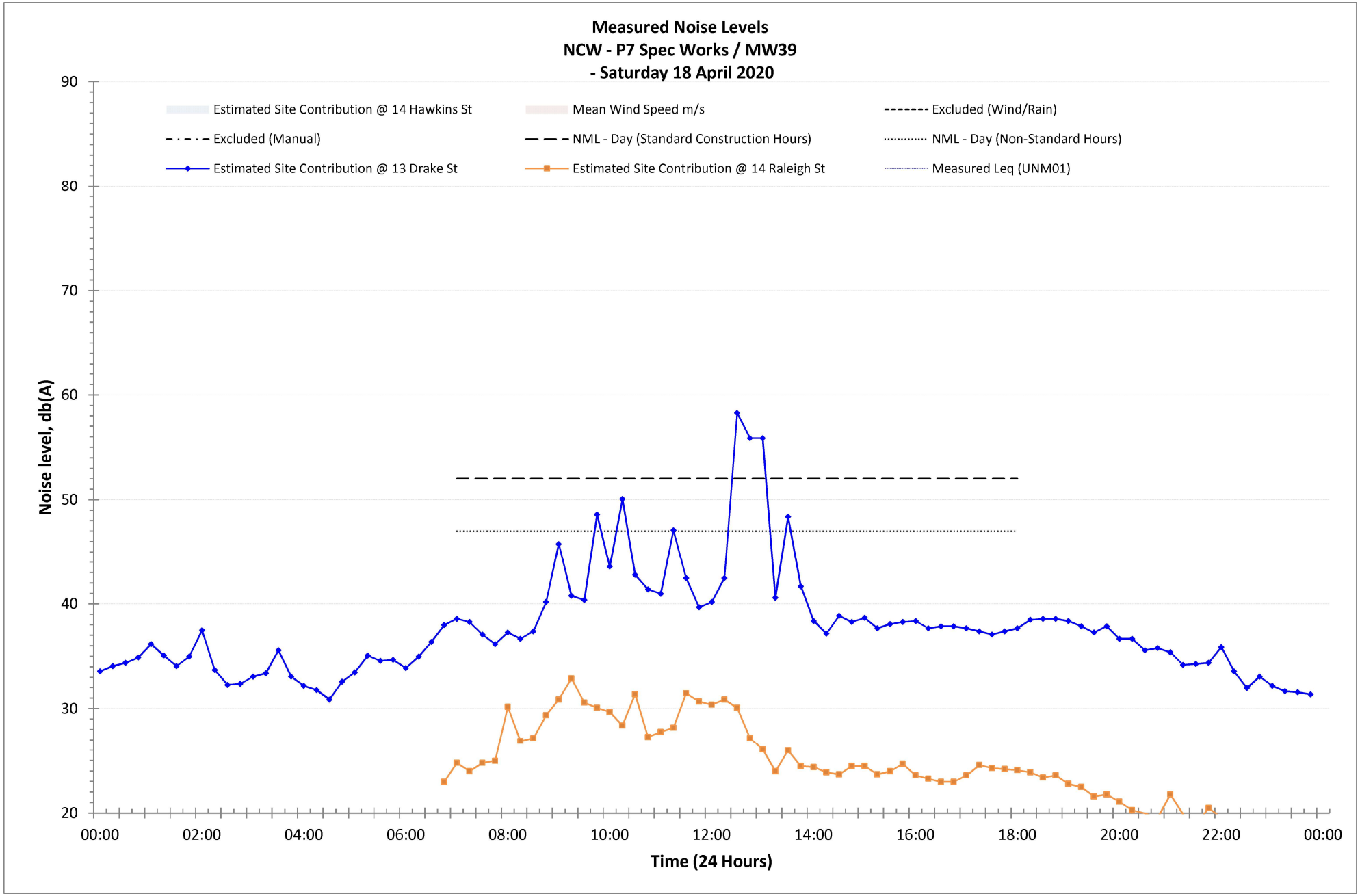
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Saturday 18 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
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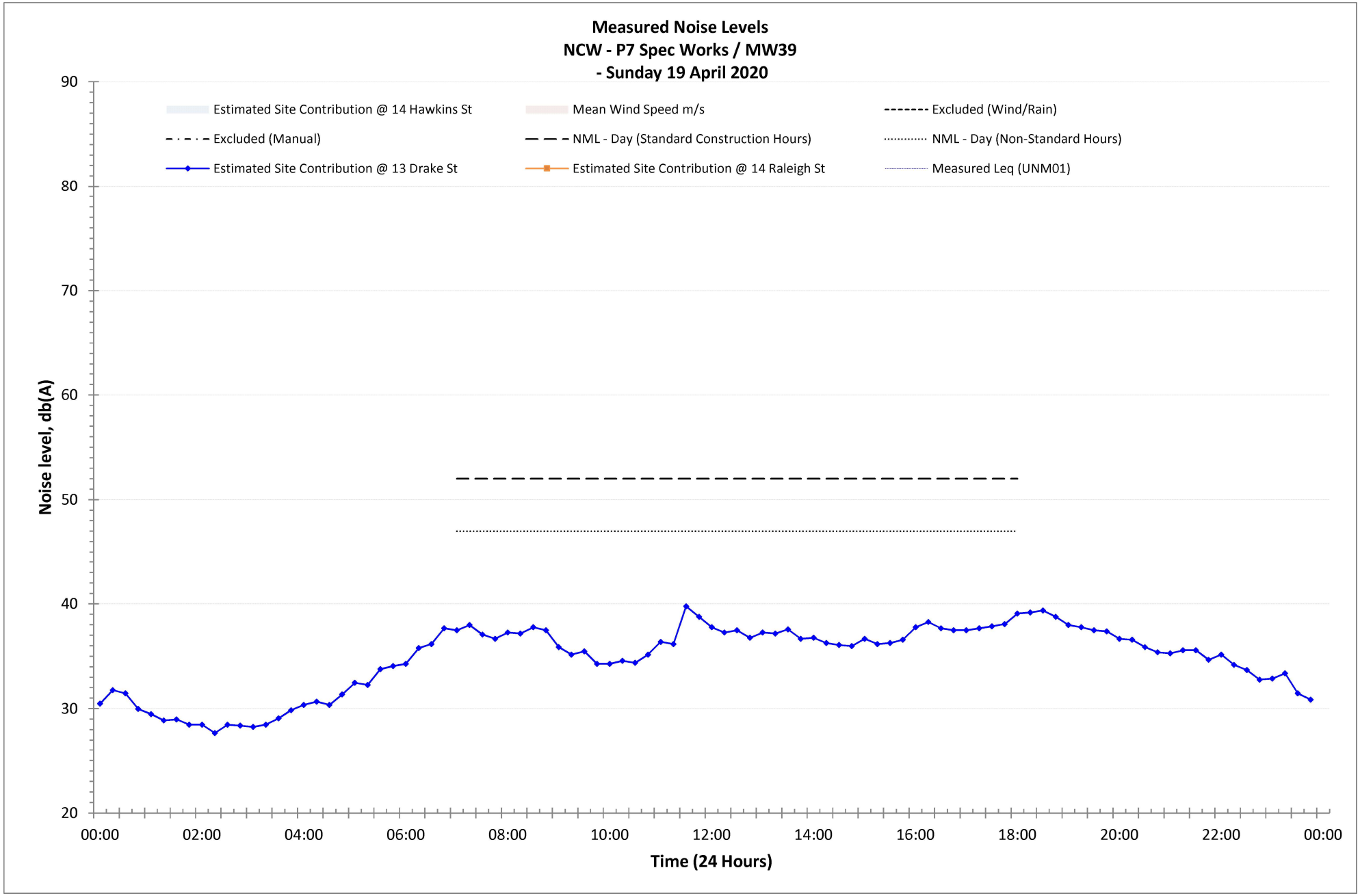
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NCW - P7 Spec Works / MW39
- Sunday 19 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
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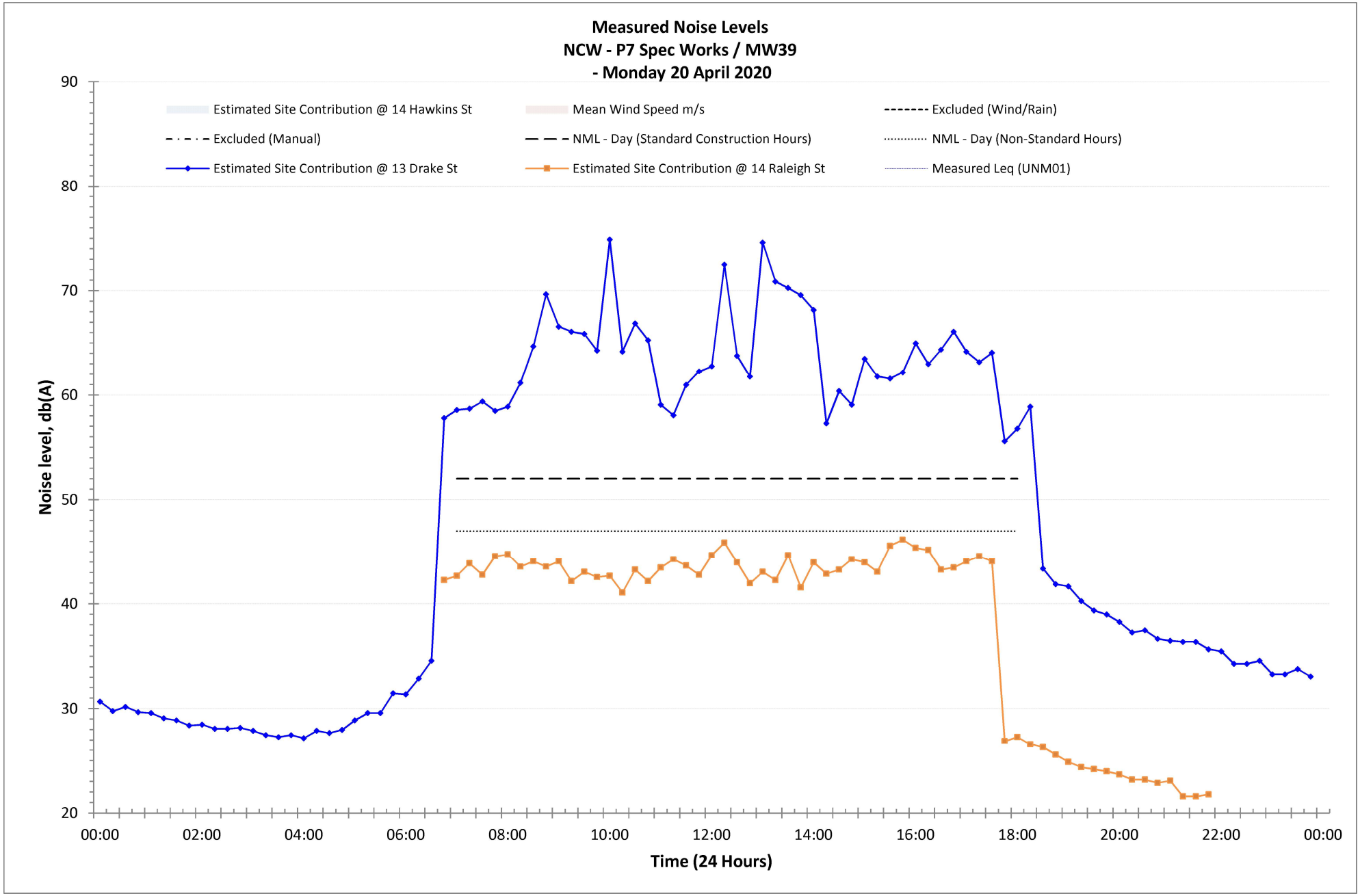
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Monday 20 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
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Estimated Site Contribution @ 13 Drake St
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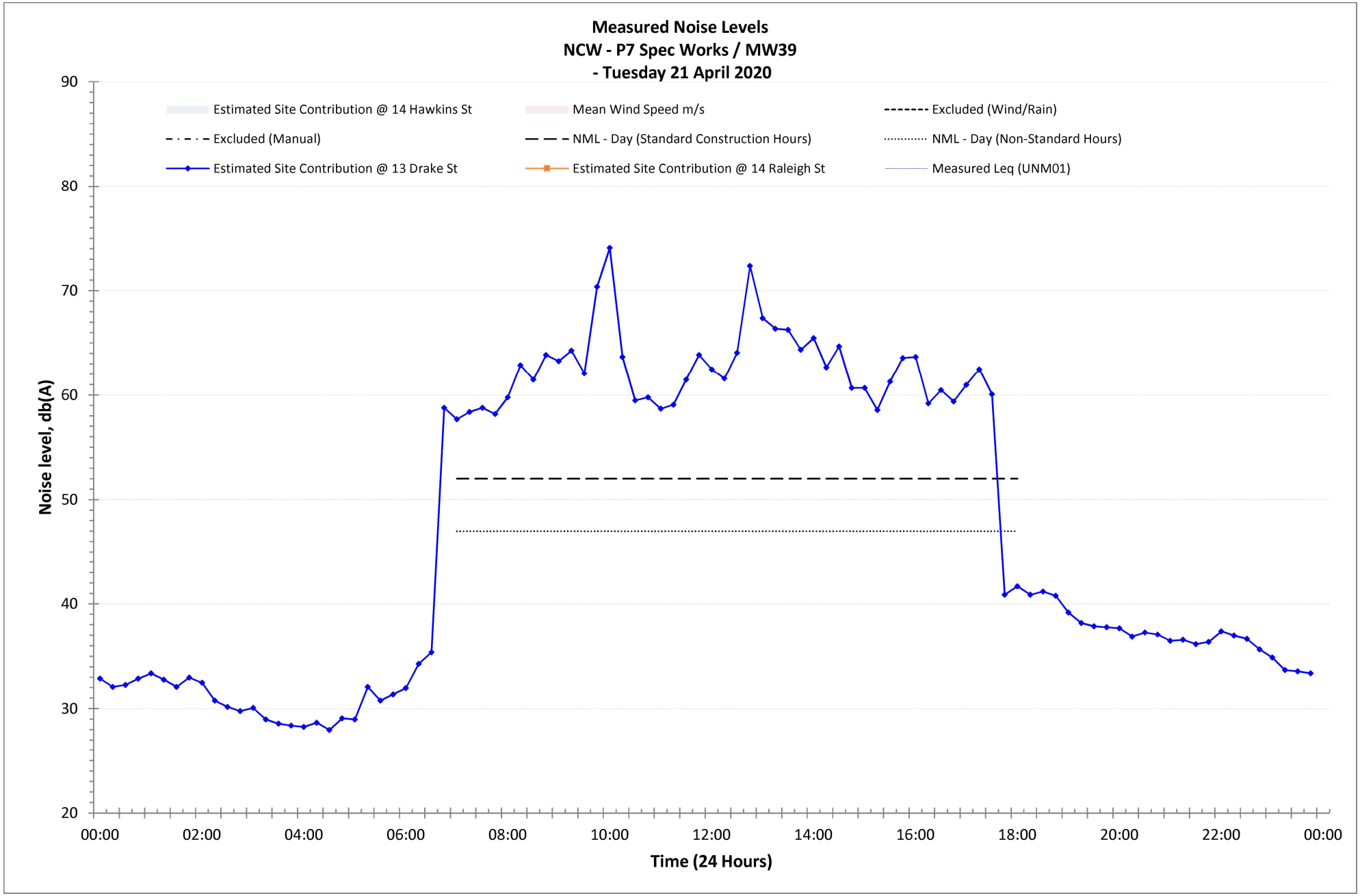
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Tuesday 21 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
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Estimated Site Contribution @ 13 Drake St
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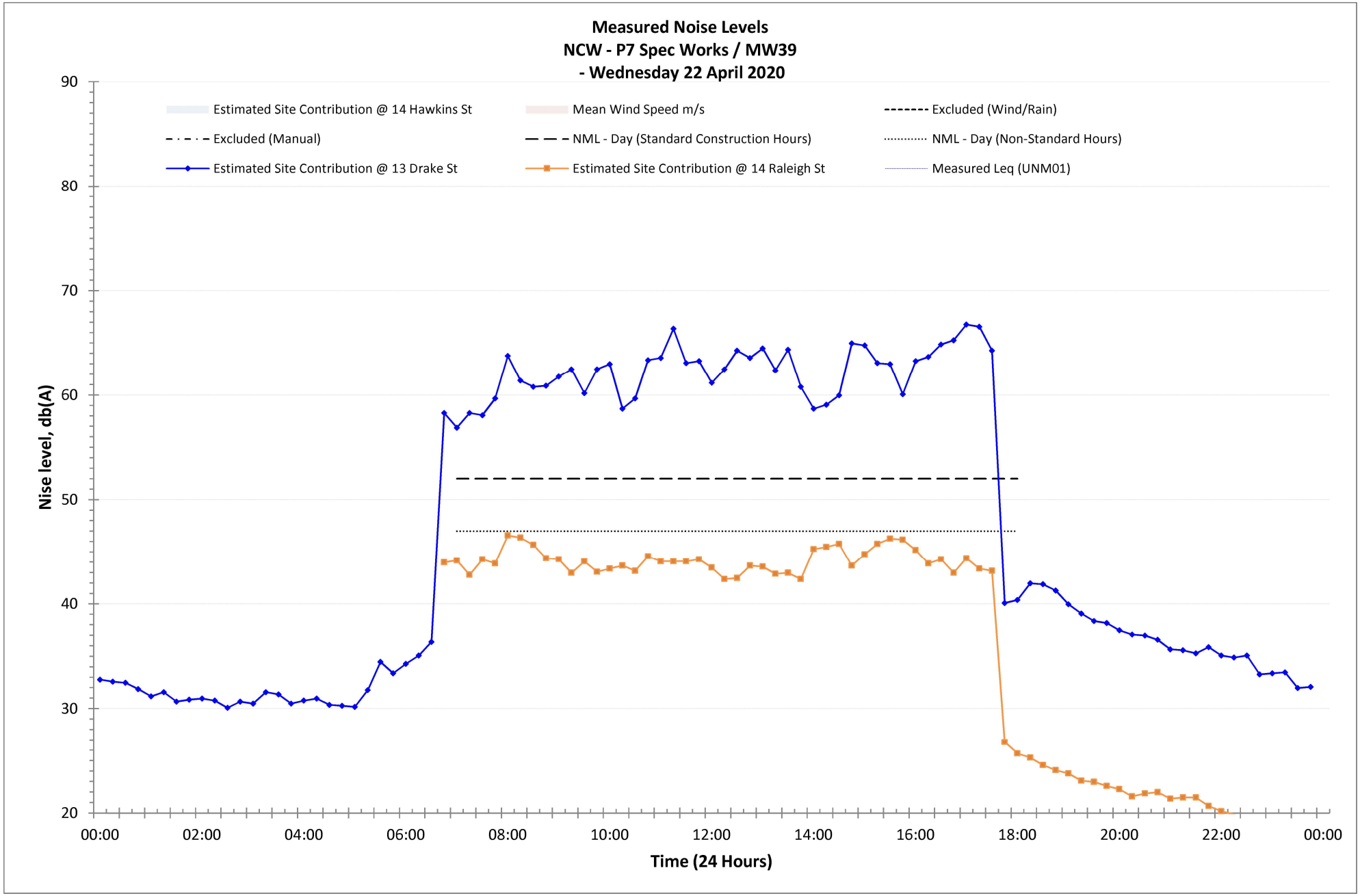
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NCW - P7 Spec Works / MW39
- Wednesday 22 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
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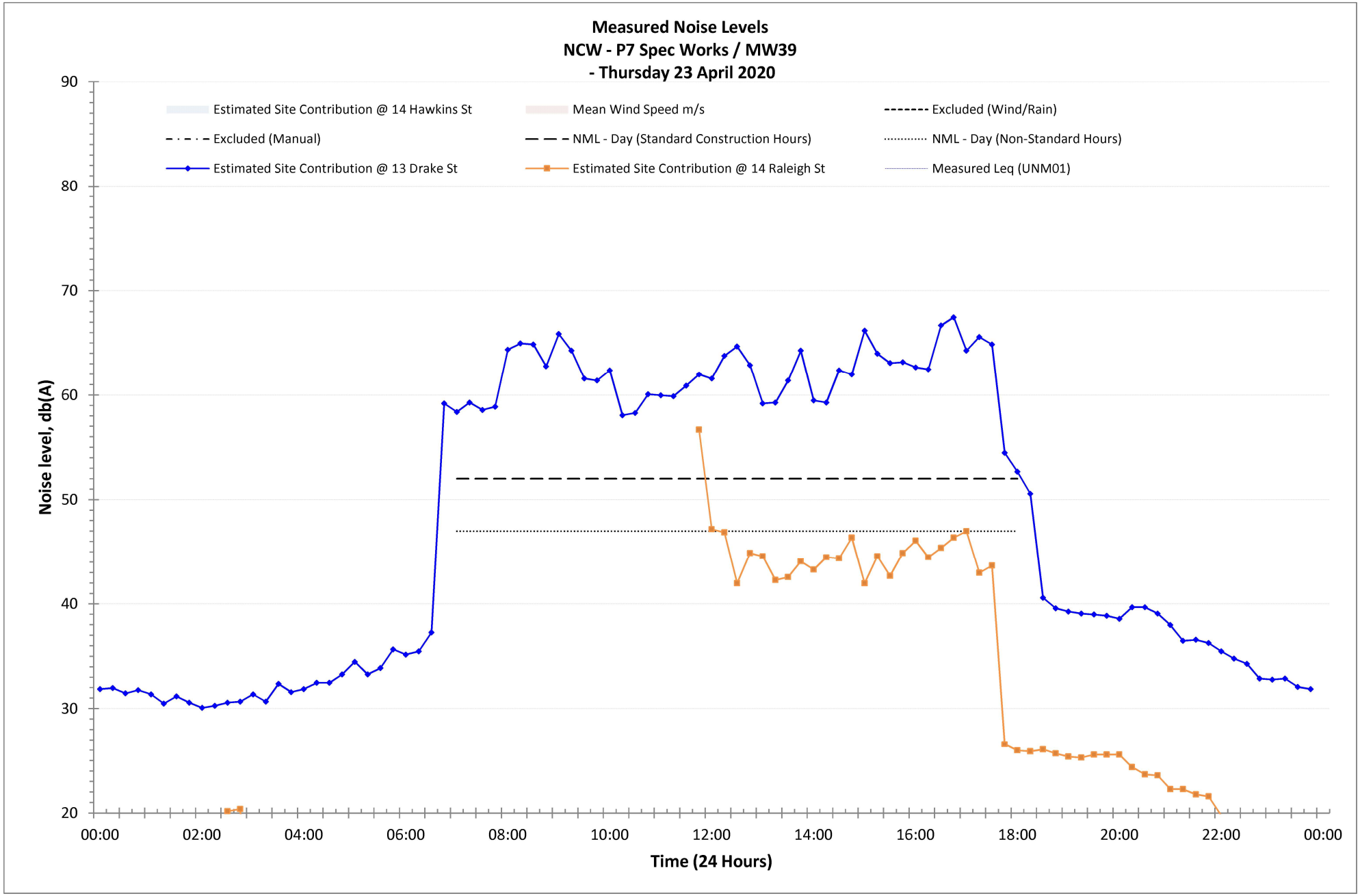
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Thursday 23 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
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NML - Day (Standard Construction Hours)
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Estimated Site Contribution @ 13 Drake St
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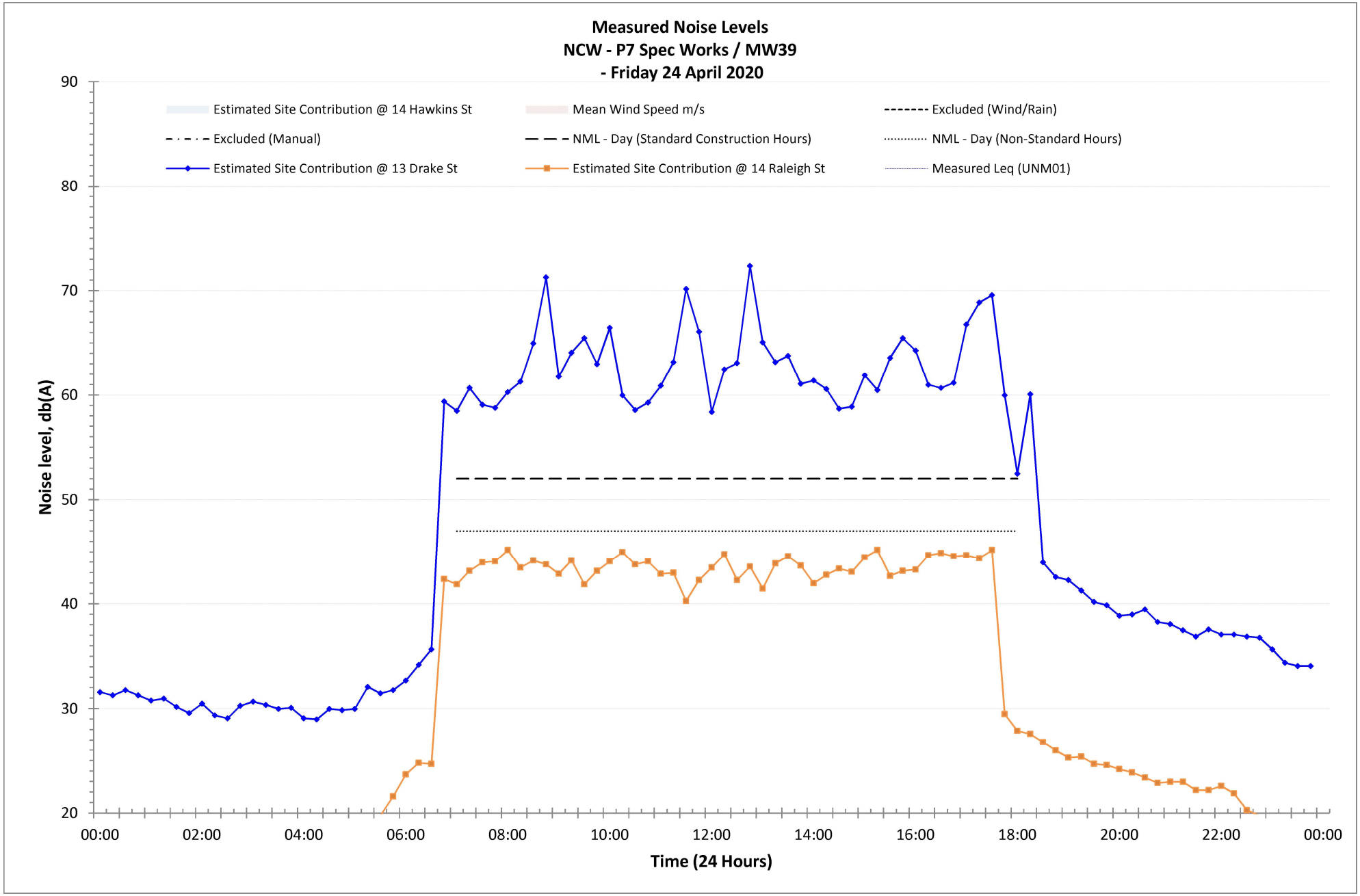
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Friday 24 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
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NML - Day (Standard Construction Hours)
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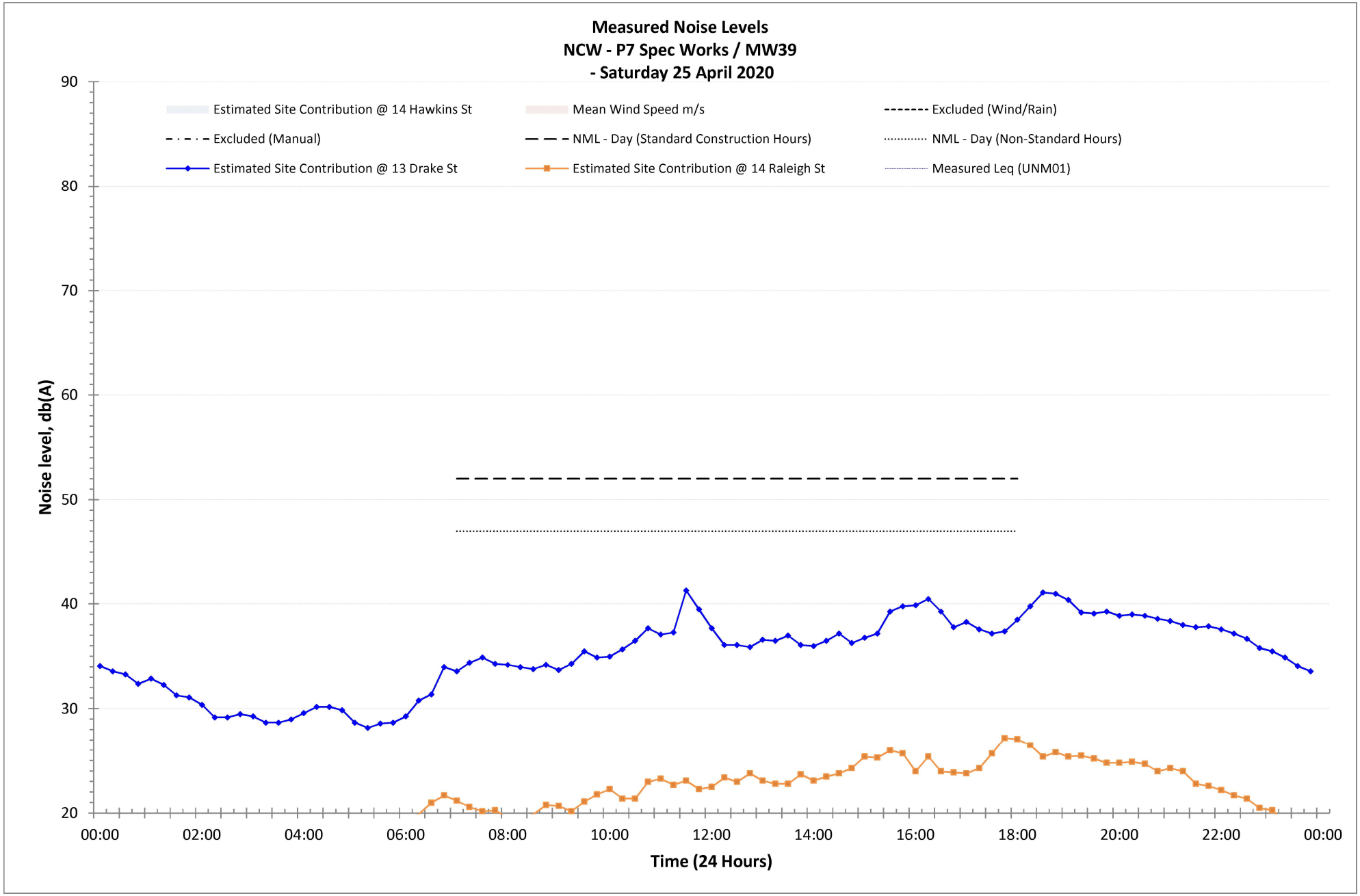
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Saturday 25 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
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NML - Day (Standard Construction Hours)
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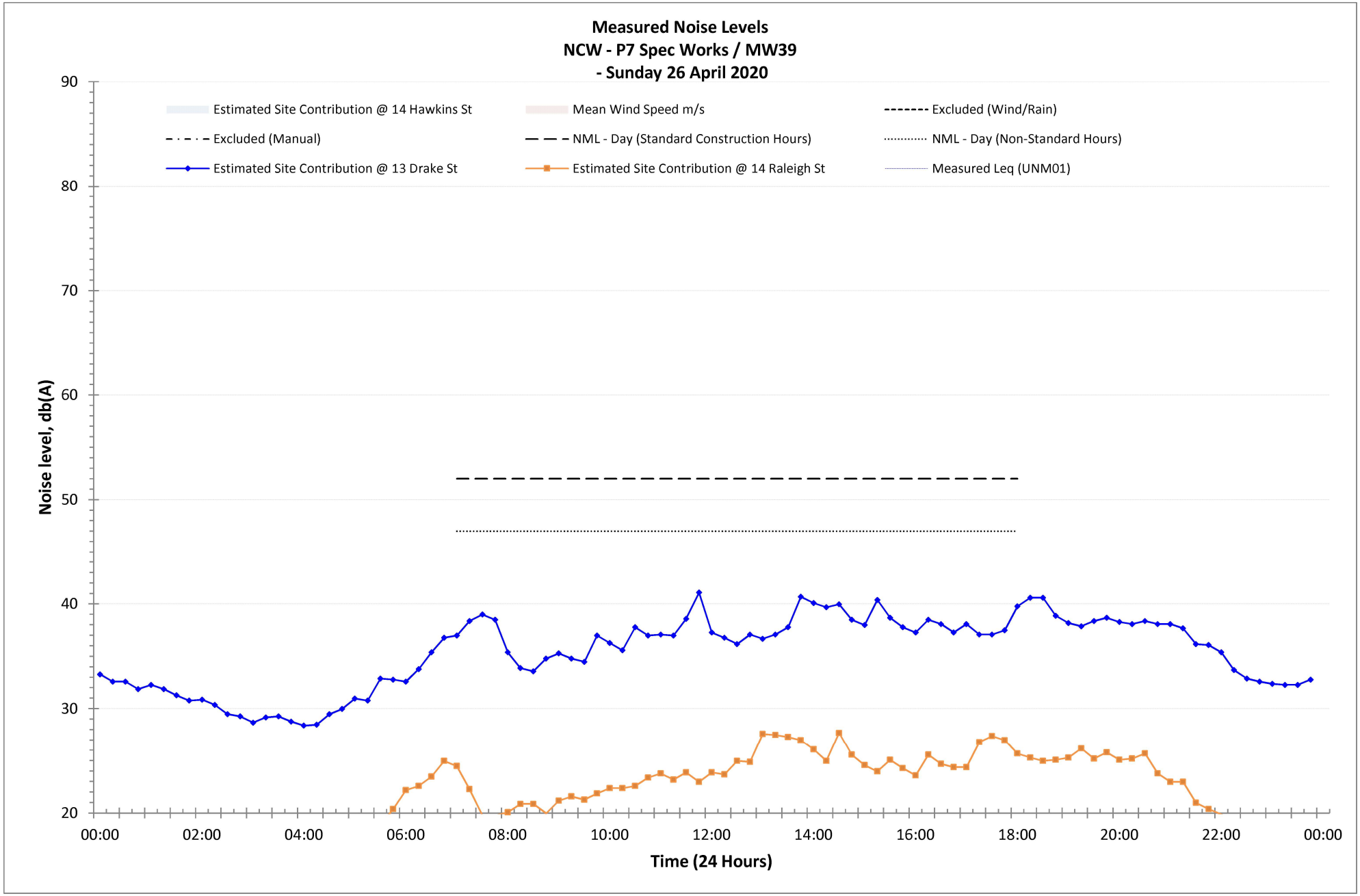
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Sunday 26 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
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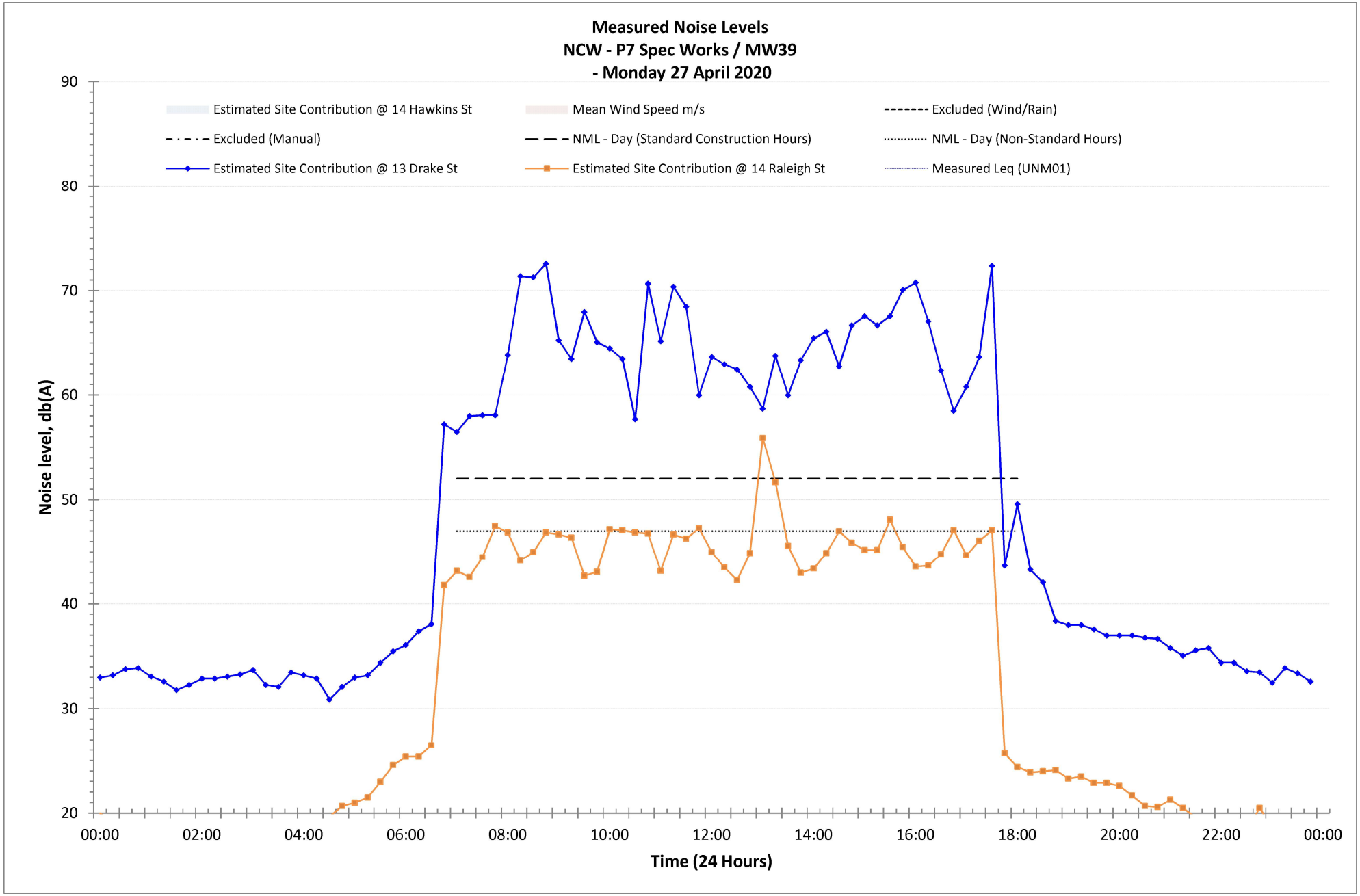
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Monday 27 April 2020
Estimated Site Contribution @ 14 Hawkins St
Mean Wind Speed m/s
Excluded (Wind/Rain)
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NML - Day (Standard Construction Hours)
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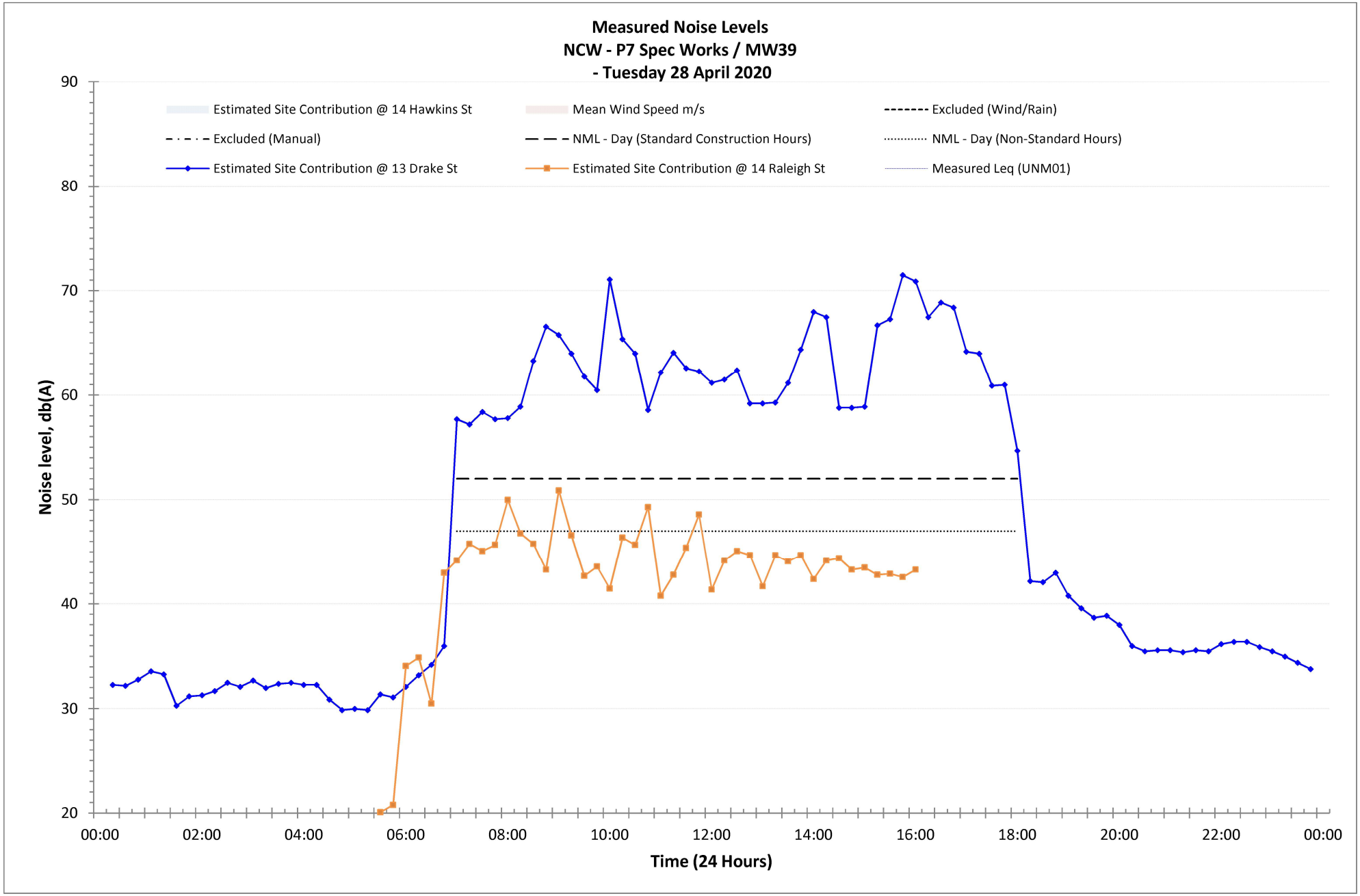
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Tuesday 28 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
Excluded (Manual)
NML - Day (Standard Construction Hours)
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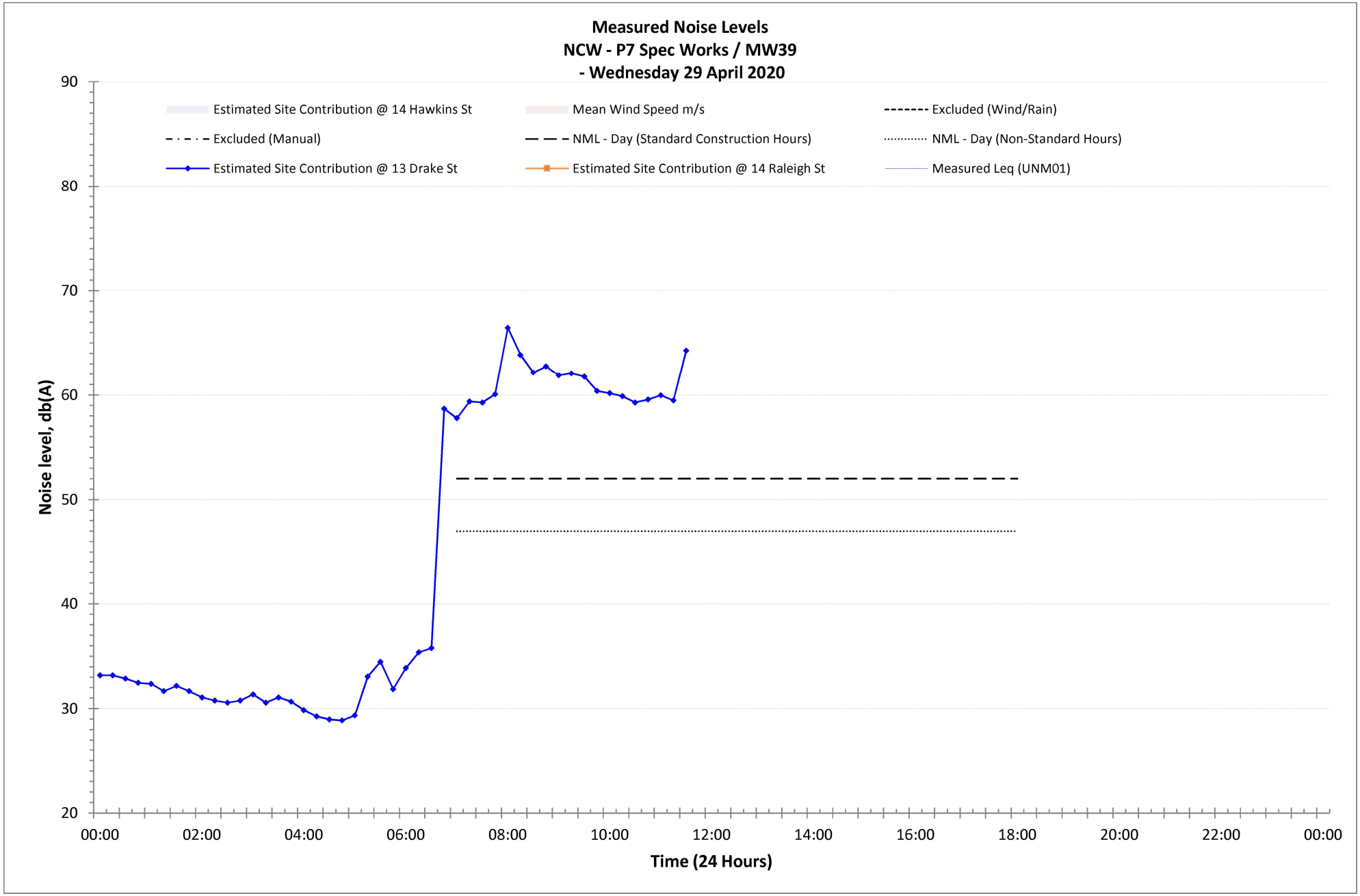
Measured Noise Levels
NCW - P7 Spec Works / MW39
- Wednesday 29 April 2020
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Mean Wind Speed m/s
Excluded (Wind/Rain)
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NML - Day (Standard Construction Hours)
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Appendix L – Monitoring Report (RP50b)

Vibration Monitoring – OOHW P7: Special Works / MW39 - 27 March to 29 April 2020

Figure A1.0 – Spec Works and OOHW MW39 Monitoring Period – Unattended Vibration Monitoring Locations – NCW P7 (Thursday, 27 March to Wednesday, 29 April 2020)

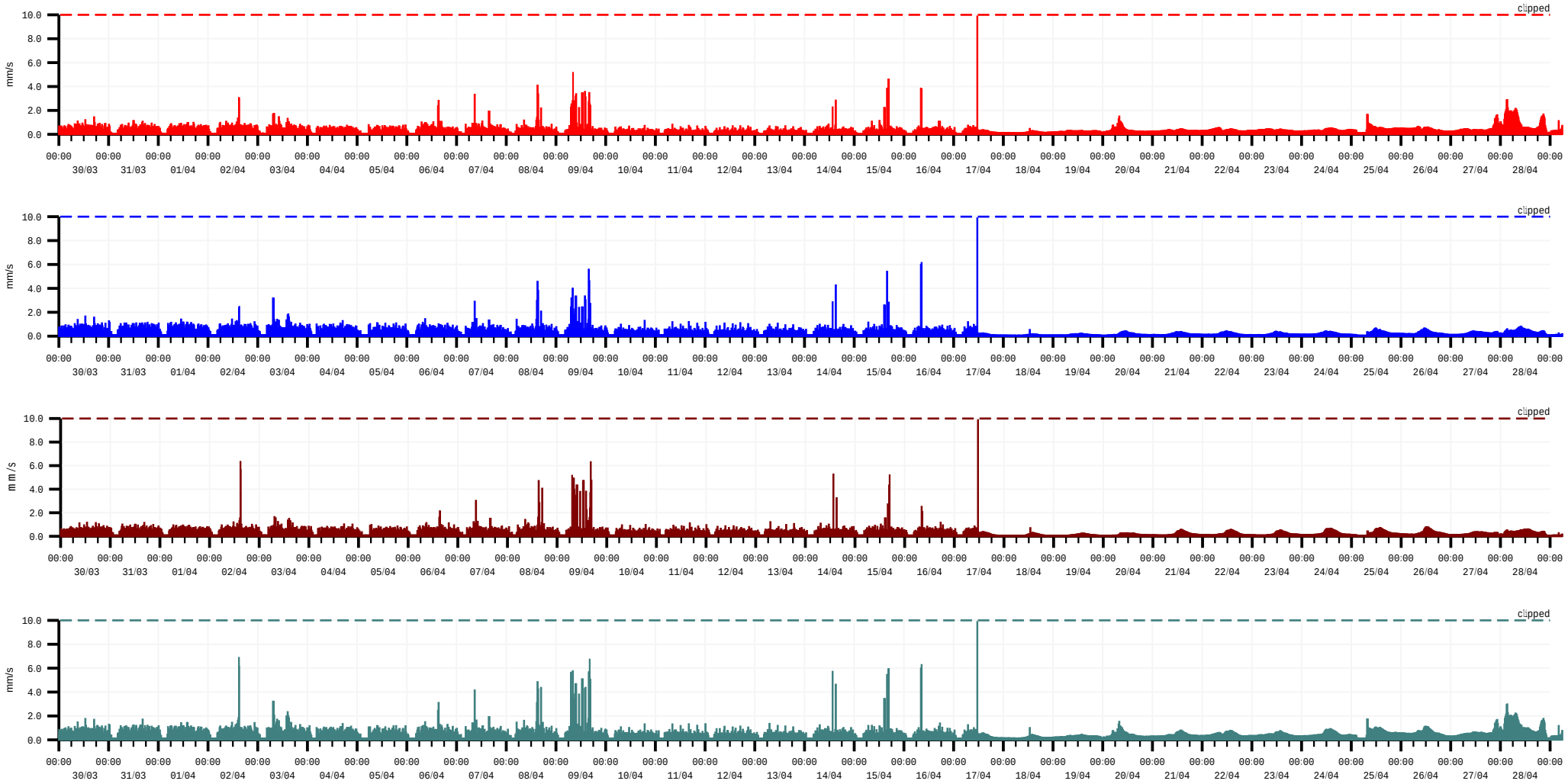
Quick report

Rail Corridor

Start	30/03/2020
End	29/04/2020
Monitoring Location	UVM02

Monitoring Results

PPV max	31.75 mm/s
PPV max (99.9 %)	2.70 mm/s



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Appendix A – Monitoring Report (RP40)

Noise Monitoring – OOHW P7: Hopetoun Avenue works - 4 October 2019

Appendix B – Monitoring Report (RP42)

Noise Monitoring – OOHW P7: MW19 - 11 to 15 November 2019

Appendix C – Monitoring Report (RP43a)

Noise Monitoring – OOHW P7: WE20 - 16 to 17 November 2019

Appendix D – Monitoring Report (RP43b)

Vibration Monitoring – OOHW P7: WE20 - 16 to 17 November 2019

Appendix E – Monitoring Report (RP44)

Noise Monitoring – OOHW P7: MW30 - 27 to 28 January 2020

Appendix F – Monitoring Report (RP45)

Noise Monitoring – OOHW P7: MW31 - 3 to 7 February 2020

Appendix G – Monitoring Report (RP46)

Noise Monitoring – OOHW P7: WE32 - 8 to 9 February 2020

Appendix H – Monitoring Report (RP47)

Noise Monitoring – OOHW P7: MW32 - 10 to 14 February 2020

Appendix I – Monitoring Report (RP48)

Noise Monitoring – OOHW P7: MW35 - 2 to 6 March 2020

Appendix J – Monitoring Report (RP49)

Noise Monitoring – OOHW P7: WE36 - 7 to 8 March 2020

Appendix K – Monitoring Report (RP50a)

Noise Monitoring – OOHW P7: Special Works / MW39 - 27 March to 29 April 2020

Appendix L – Monitoring Report (RP50b)

Vibration Monitoring – OOHW P7: Special Works / MW39 - 27 March to 29 April 2020

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ENDORSEMENT

CITY & SOUTHWEST ACOUSTIC ADVISOR

Review of	**Laing O'Rourke North Corridor Works Noise and Vibration Monitoring Report October 2019 – May 2020**	**Document reference:**	LOR-NCW-Noise and Vibration Monitoring-Oct19-May20 Summary Report V0.2 Dated 29 July 2020
Prepared by:	Larry Clark, Alternate Acoustics Advisor		
Date of issue:	11 August 2020		

As approved Alternate Acoustics Advisor for the Sydney Metro City & Southwest project, I have reviewed and provided comment on the Noise and Vibration Monitoring Report October 2019 – May 2020 for the North Corridor Works (NCW), as required under A27 (d) of the project approval conditions.

I previously reviewed and commented on Version 1 of the Report. Version 2 has been updated to satisfactorily address my comments.

The NCW Noise and Vibration Monitoring Report is to be submitted to the Department of Planning and Environment in accordance with Condition of Approval C16 and the LOR Construction Noise and Vibration Monitoring Plan (CNVMP).

I have reviewed the monitoring report and am satisfied that it meets the requirements for construction noise and vibration monitoring for NCW, as outlined in the NCW CNVMP. I endorse the report.

Larry Clark, City & Southwest Alternate Acoustics Advisor