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# Noise Impact Assessment for an Environmental Permit

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**Thurrock Peaking Plant**

**For Thurrock Power Limited**



Report Quality Management			
<b>Prepared by:</b>	Peter Barling BSc (Hons), PGDip, MIOA	Associate Acoustics, Noise and Vibration	
<b>Review &amp; Authorisation:</b>	Phil Evans BSc (Hons), MSc, FIOA, FGS	Director Acoustics, Noise and Vibration	
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<b>Prepared by:</b>	Peter Barling BSc (Hons), PGDip, MIOA	Associate Acoustics, Noise and Vibration
<b>Reviewed by:</b>	Phil Evans BSc (Hons), MSc, FIOA, FGS	Director Acoustics, Noise and Vibration

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# 1 Executive Summary

- 1.1 The Acoustics, Noise and Vibration Team at Savills has been appointed by Thurrock Power Limited (TPL) to undertake a noise impact assessment to support an 'Environmental Permit' (EP) application for a power generation facility (gas engines with associated plant). The facility will be constructed on land to the north of Tilbury substation and southwest of Station Road in Thurrock, Essex.
- 1.2 From a noise emissions perspective, the primary source of noise associated with the operation of the facility would be the gas engines themselves. Whilst these will be enclosed in concrete structures, providing significant attenuation, there will be necessary ventilation inlets and outlets where internal noise would 'break out'. The other primary noise source will be the external radiators, which will provide the cooling required. Other more minor sources of noise include the exhaust stacks and ductwork and associated transformers.
- 1.3 Noise emissions from the site will be controlled through the selection of quiet plant and inclusion of physical mitigation measures (engine enclosures, attenuated louvres, stack silencers). Due to technical and spatial constraints (cooling demand required and area of site respectively), it is not feasible to include additional techniques. In this regard, all appropriate preventative measures have been applied to minimise noise pollution and hence 'best available techniques' (BAT) have been demonstrated in accordance with the requirements of the Environmental Permitting Regulations.
- 1.4 Maximum Rating Levels at noise sensitive receptor locations, i.e. when the facility is producing maximum power generation, would be up to 4, 8 and 10 dB above the representative background sound levels during the daytime, evening and night-time periods, respectively.
- 1.5 However, due to low reasonably low Rating Levels and resultant ambient sound levels not noticeably changing or being of a magnitude likely to increase the risk for annoyance in external amenity areas or sleep disturbance, it is considered that significant adverse impacts would not occur.
- 1.6 Furthermore, the risk for adverse impact during night-time periods is significantly reduced as, based on operational experience of other similar facilities, for only around 88 hours of the night-time period (23:00 to 07:00 hours) over a year, would the facility operate, i.e. 3% of the night-time period on average. Also, Rating Levels would often be lower than considered, reflecting the reduced power demand.
- 1.7 Consequently, when considering the operation of the facility over the entire year period, the resulting site noise impact would be minor adverse to adverse at all NSRs for all time periods. However, on the basis that significant adverse impacts would be avoided, and adverse impacts minimised, the proposed development would comply with the 'Noise Policy Statement for England', which sets out the long term overarching vision of Government noise policy.

## 2 Introduction

- 2.1 The Acoustics, Noise and Vibration Team at Savills has been appointed by Thurrock Power Limited (TPL) to undertake a noise impact assessment to support an 'Environmental Permit' (EP) application for a power generation facility (gas engines with associated plant). The facility will be constructed on land to the north of Tilbury substation and southwest of Station Road, Thurrock, Essex.
- 2.2 From a noise emissions perspective, the primary source of noise associated with the operation of the facility would be the operation of the gas engines themselves. Whilst these will be enclosed in concrete structures providing significant attenuation, there will be necessary ventilation air intake modules and air outlet attenuators, where internal noise would 'break out'. The other primary noise source will be the external radiator cooling units. Other more minor sources of noise include the exhaust stacks and ductwork, and associated transformers.
- 2.3 Whilst the facility will potentially operate on a 24/7 basis, it is envisaged to primarily only operate during peak periods of electricity demand or to prevent system instability. This would most typically be for a period ranging from one to seven hours per day, between 08:00 and 20:00 hours. However, there is the potential that the facility could be required to operate during a major power shortage or system stress events (e.g. a Notification of Inadequate System Margin) at any time of the day or night. It should be noted that the likelihood of the facility being required to start up at night is extremely low as peak electricity demand does not occur overnight.
- 2.4 Based on operational experience of other similar facilities, for only around 88 hours of the night-time period (23:00 to 07:00 hours) over a year, would the facility operate, i.e. 3% of the night-time period on average.
- 2.5 The assessment has been undertaken based upon information on the proposed development provided by the project team and their experience of operating similar sites. The assessment considers potential adverse noise impacts affecting the nearest 'noise sensitive receptors' (NSRs) to the proposed development site. The assessment has been undertaken following a baseline noise survey and desktop assessment.
- 2.6 As the facility is a new development and is not currently constructed/operational, no previous surveys or assessments for operational noise have been completed.
- 2.7 The technical content of this assessment has been provided by Savills personnel, all of whom are corporate members, i.e. Member (MIOA) or Fellow (FIOA), of the Institute of Acoustics (IOA), the UK's professional body for those working in acoustics, noise and vibration. The assessment has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the IOA.

- 2.8 The Team is also a member of the Association of Noise Consultants (ANC) which seeks to raise the standards of acoustic consultancy and improve recognition of the vital role which good acoustics, and the management and mitigation of noise and vibration play in achieving good design and effective planning in the built and natural environment. Membership of the ANC indicates that the Team is sufficiently competent to pass the high standards for entry to the association.
- 2.9 This report and assessment has been peer reviewed within the Savills team to ensure that it is technically robust and meets the requirements of our Integrated Management System.
- 2.10 Personnel and individual qualifications are provided within the Quality Management table at the start of this report and in Appendix A in accordance with the requirement of Section 12 of British Standard (BS) 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (BS 4142) [1].

### 3 Site, Area and Baseline Acoustic Environment

#### Site Layout & Noise Sources

3.1 Figure 3.1 below shows the current proposed site layout. The gas engine enclosures (gensets) are grouped, typically with two engine exhausts feeding into one main stack (exit point will be at 20 m above ground level). Radiators are located on the roof of the enclosures, in addition to ventilation outlets. Ventilation inlets are located on the ends of the enclosures.

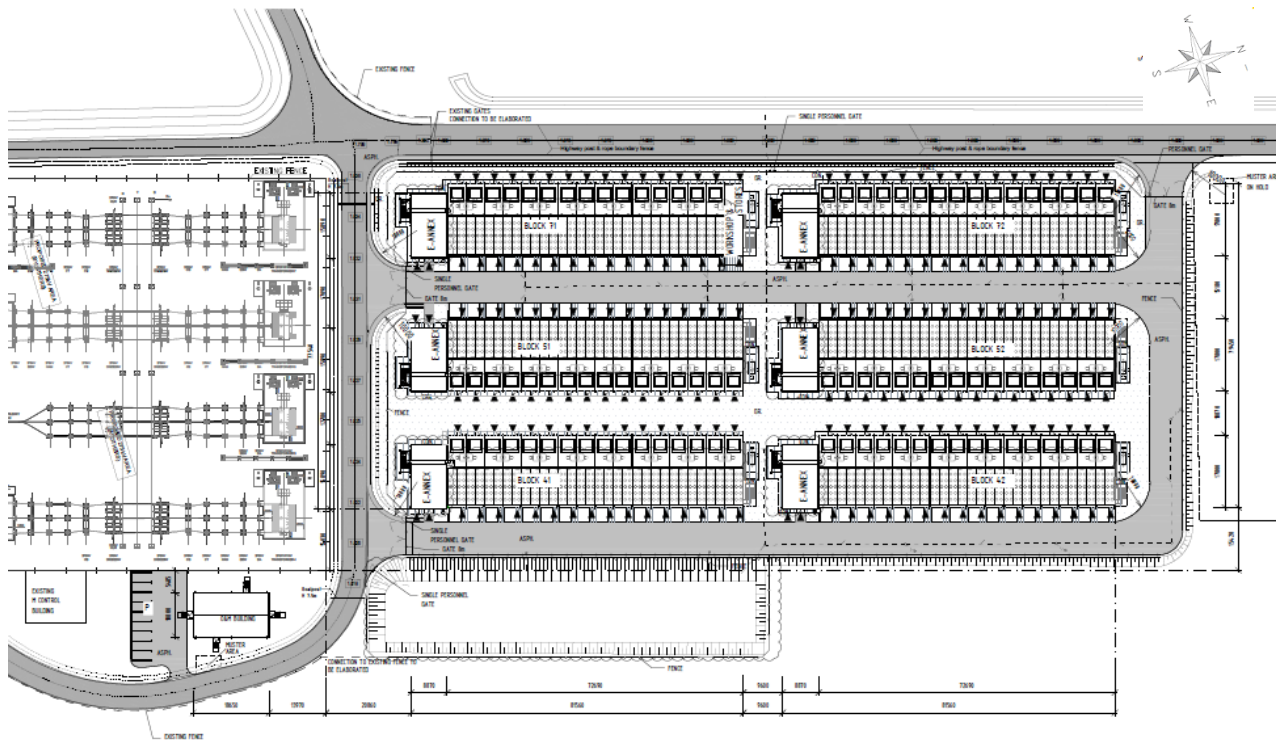
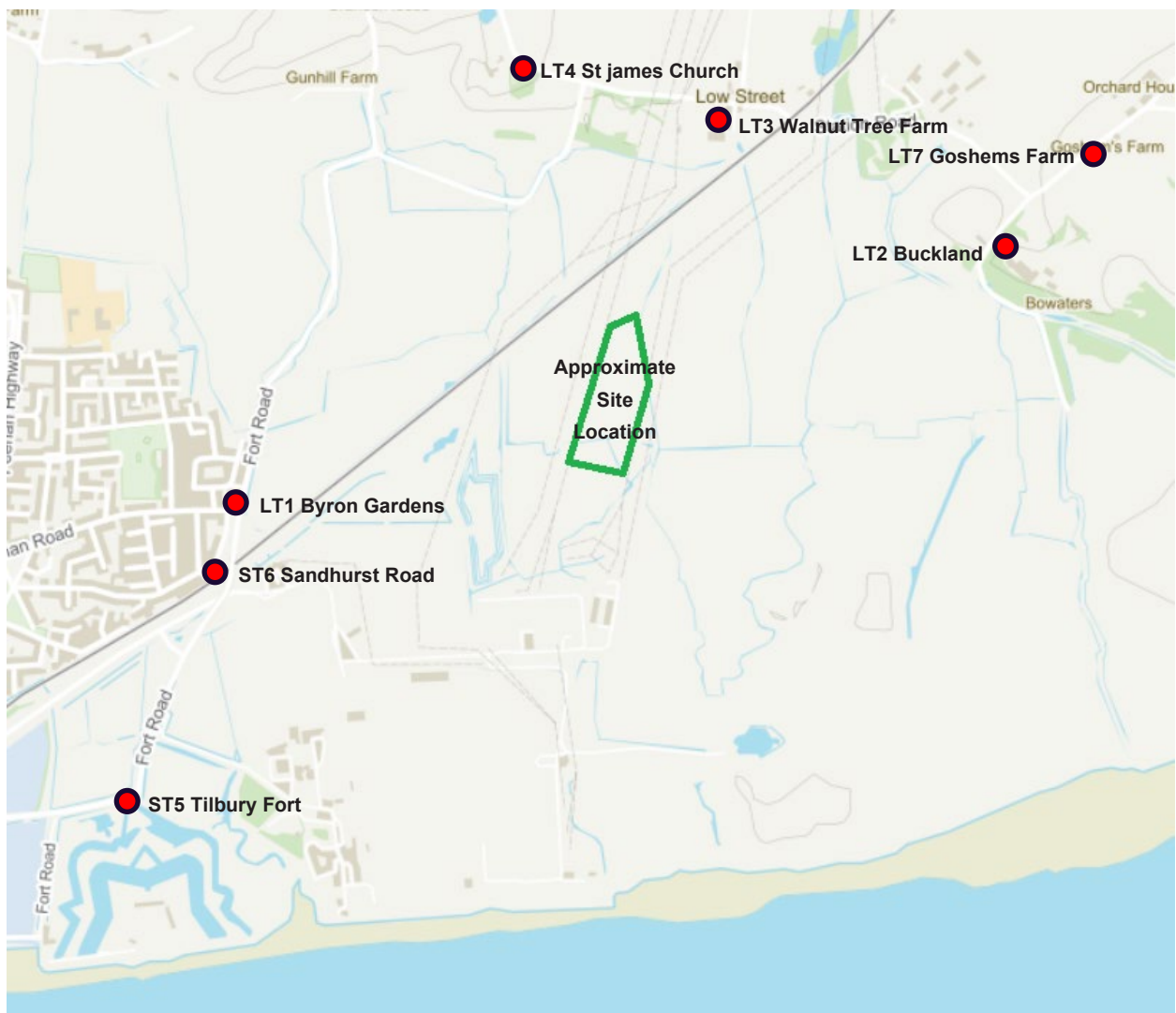


Figure 3.1: Site Layout & Noise Sources

## Site and Wider Area

3.2 Figure 3.2 below shows the overall facility boundary and genset installation area, wider area and identified NSRs. Also identified are the locations of baseline sound level monitoring (LT1 to LT7), undertaken in February 2018. Further surveys at locations LT1, LT2 and LT3 were undertaken in June and July 2024, as detailed below.



**Figure 3.2: Site, Wider Area and Baseline Sound Level Monitoring Locations**

3.3 The site of the proposed facility is on land to the north of the existing Tilbury substation.

3.4 The ground type between the site and the nearest NSRs is soft, open ground (grass fields, foliage etc.), with some hard ground (roads, railways etc.) with an increasing number of intervening structures further from the site.



## Baseline Conditions

### 2018 Baseline Surveys

- 3.5 In order to establish baseline acoustic conditions at NSR locations to inform the original 2018 Development Consent Order' (DCO) application, five long term (19-day) unattended sound level surveys were undertaken in February 2018, together with two short-term surveys.
- 3.6 Full details of the baseline surveys undertaken are include in Appendix B. Information includes survey locations (including photos), observations, equipment details (serial numbers etc.), meteorological conditions, graphical time histories and statistical analysis.

### 2024 Baseline Surveys

- 3.7 In order to establish baseline acoustic conditions at the nearest NSR locations to the site and to determine if the acoustic environment has changed in the intervening period, baseline sound level data (LT2 and LT3) have been obtained from National Highways regarding the 'Lower Thames Crossing' (LTC) project, for which unattended sound level surveys have been ongoing since 2023. Data have been provided by the LTC Team for the 207 day period between 01 October 2023 and 25 April 2024.
- 3.8 LT2 is deployed at Norrskern at 4 m above ground in a free field position, approximately 500 m east of the site boundary and in the same location as the original 2018 LT2 survey. This location is also consider to be representative of Buckland, located approximately 70 m to the east<sup>1</sup>.
- 3.9 LT3 is deployed at Havers Lodge at 4 m above ground in a free field position at a position approximately 240 m to the north of the site boundary and 150 m west of the original 2018 LT3 survey location at Walnut Tree Farm<sup>2</sup>.
- 3.10 In both cases, the microphone is mounted at 4 m above ground level in a free-field position (at least 3.5 m from any reflecting surface, excluding the ground) using a Class 1 Svantek 307 sound level meters (SLM) in accordance with BS 7445-2:1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use' [2]. The SLM was set to log the A-weighted broadband sound pressure level (SPL) in 125 ms. Raw data have been post processed into 5-minute periods.

<sup>1</sup> Savills has visited the LT2 survey location in 2024 and the following noise sources were noted as affecting the acoustic environment: distant road traffic movements, use of machinery on land to the south, distant industry (metal recycling facility), rustling trees and occasional aircraft.

<sup>2</sup> Savills has visited the LT3 survey location in 2024 and the following noise sources were noted as affecting the acoustic environment: distant road traffic movements, use of machinery on land to the south, distant industry (metal recycling facility), rustling trees and occasional aircraft.



- 3.11 In addition to the above, Savills has undertaken additional long term unattended monitoring at a third location (LT1) between Thursday 27 June 2024 and Thursday 04 July 2024.
- 3.12 LT1 was deployed at Sandhurst Road, approximately 870 m to the south-west of the site boundary and 90 m south of the original 2018 LT1 survey location on Byron Gardens.
- 3.13 The microphone was mounted at 1.8 m above ground level in a free-field position (at least 3.5 m from any reflecting surface, excluding the ground) using a Class 1 NSRT Mk3 sound level meter (SLM) in accordance with BS 7445-2:1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use'. The SLM was set to log the A-weighted broadband sound pressure level (SPL) in 125 ms. Raw data were post processed into 15 minute periods.
- 3.14 At the time of setting up and collecting the LT1 survey, the following noise sources were noted as affecting the acoustic environment: regular road traffic movements on Fort Road and Brennan Road, occasional aircraft overhead and local pedestrians.
- 3.15 The equipment calibration level for each measurement was checked with a Rion NC-75 handheld calibrator to 94.0 dB prior to and after the monitoring period; no significant deviation (i.e. above 0.5 dB) was noted.
- 3.16 Meteorological conditions were monitored with a Luft WS600-UMB Smart Weather Sensor, deployed at the location of LT2. The LT1 survey period (Thursday 27 June 2024 and Thursday 04 July 2024) was largely dry with only one period of rain and wind speeds were low at all times (below 5 m/s). As such, sound level data logged during the period of rain have been removed from the subsequent analysis. However, it should be noted that comparison of the complete dataset with dataset with the periods of rain removed, shows only a negligible difference of less than 1 dB and only for some metrics.
- 3.17 With regard to the LT2 and LT3 survey data, as this has been obtained over a 207 day period, no data have been removed in the subsequent analysis.
- 3.18 Raw data, time histories, equipment details (serial numbers, calibration certificates etc.) and photos of survey locations are provided in Appendix C.

## 4 Methodology

### Assessment Methodology

- 4.1 In accordance with Environment Agency (EA) guidance, this assessment has been undertaken based on the methodology detailed in BS 4142, a summary of which is provided below.
- 4.2 BS 4142 primarily provides a numerical method by which to determine the significance of sound of a commercial and/or industrial nature, i.e. the 'specific sound', at NSR locations.
- 4.3 The specific sound level may then be corrected for the character of the sound, if appropriate, and is then termed the 'Rating Level' whether corrections are made or not.
- 4.4 The commentary to paragraph 9.2 of BS 4142 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds:

#### *Tonality*

*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a rating penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.*

#### *Impulsivity*

*A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.*

#### *Intermittency*

*When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. ... If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*

#### *Other sound characteristics*

*Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."*

- 4.5 The Rating Level is then compared to the background sound level, which should be representative of the period being assessed.

- 4.6 The approach that has been adopted for this project is based on unattended surveys to obtain 15-minute values of  $L_{A90,T}$  for a continuous period of at least 1-week at each assessment location. Representative background sound levels for the daytime and night-time periods have been derived from a combination of statistical data analysis; review of the temporal variations of sound and meteorological data throughout the survey period; and professional judgment supplemented by aural and visual observations of the acoustic environment at the survey locations.
- 4.7 Only data that were measured when the wind speeds were at or less than 5 m/s were included in the dataset used to derive the baseline noise levels. The standard indicates that measurements can be taken in wind speeds up to 5 m/s, i.e. it states *“Exercise caution when making measurements in poor weather conditions such as wind speeds greater than 5 m/s”*. It is considered that, by only using data obtained when wind speeds are at or less than 5 m/s, data will be obtained that is valid in this respect in accordance with BS 4142.
- 4.8 An initial estimate of the impact of the specific sound is obtained by subtracting the representative background sound level from the Rating Level.
- 4.9 Typically, the greater this difference, the greater is the magnitude of the impact:
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
  - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- 4.10 The lower the rating level is relative to the representative background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- 4.11 The significance of the effect of the noise in question should be determined on the basis of the initial estimate of impact significance from the BS 4142 assessment with reference to the examples of outcomes described within the PPG-N and after having considered the context of the sound. It is necessary to consider all pertinent factors, including:
- the absolute level of sound;
  - the character and level of the residual sound compared to the character and level of the specific sound; and
  - the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

## Noise Propagation Methodology

- 4.12 As the facility is not yet operational, specific sound levels associated with operation of the facility at NSR locations have been predicted using a 3D sound model, built using SoundPLAN v9.0 noise modelling software.
- 4.13 The model predicts sound levels under light down-wind conditions based on hemispherical sound propagation with corrections for atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613-2:1996 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation' [3].
- 4.14 Note this has recently been superseded by BS ISO 9613-2:2024 'Acoustics — Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors' [4]; however this is not yet implemented in the software.

## 5 Noise Monitoring Data and Predictions

### Representative Baseline Sound Levels

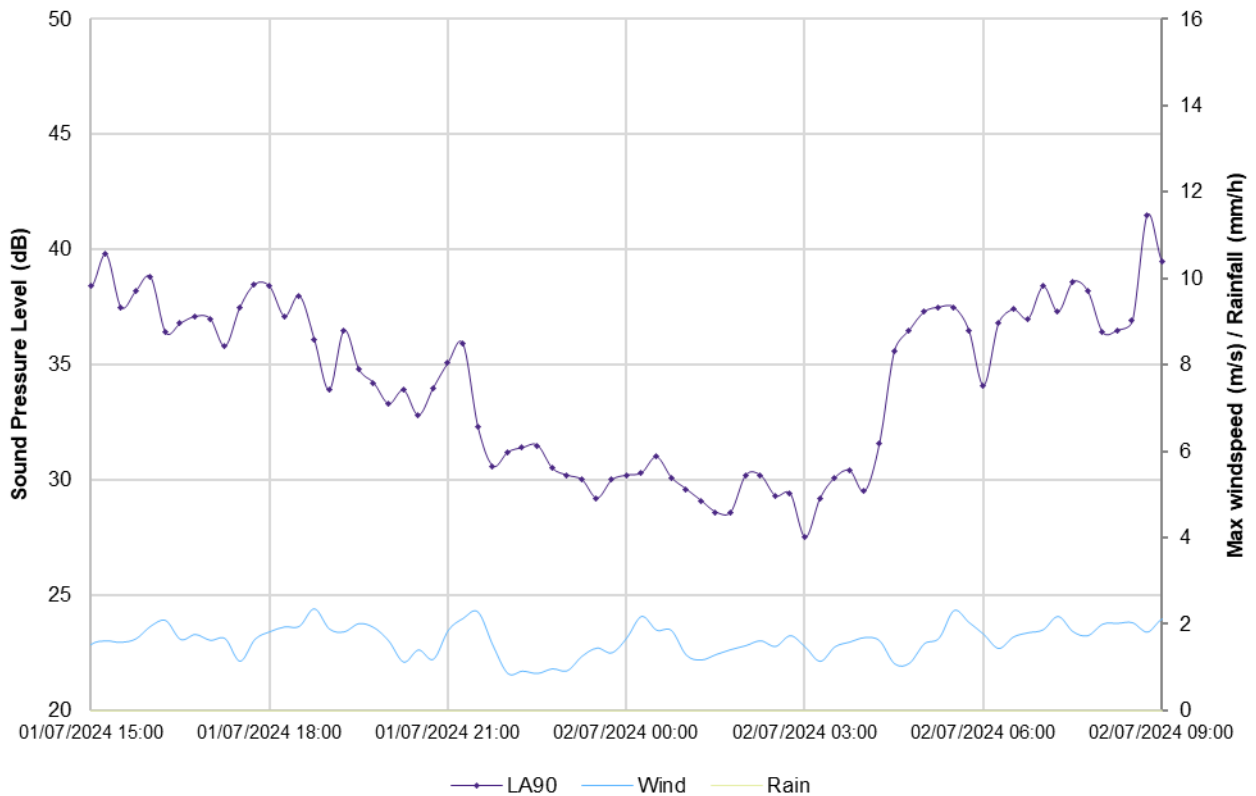
- 5.1 Tables 5.1 to 5.3 and Figures 5.1 to 5.3 below provide a tabular and graphical summary of the 5- and 15-minute baseline sound levels measured at LT1, LT2 and LT3 respectively, for the daytime (07:00 to 23:00 hours), evening (19:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods. Note that the figures only show background sound levels.
- 5.2 BS 4142 requires that the background sound levels adopted for the assessment are representative of the period being assessed. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period because it can be subject to a wide variation in background sound levels between the beginning and end of the night period, and the quieter middle part of the night period. The accompanying note states that *"a representative level should account for the range of background sounds levels and should not automatically be assumed to be either the minimum or modal value"*.
- 5.3 In this instance, for the daytime and evening periods, the 25<sup>th</sup> percentile levels of the long term survey data have been used to characterise the baseline sound environment at all NSRs.
- 5.4 This is not the lowest sound level encountered but is lower than that obtained using the average. It therefore represents somewhere in the range of lower sound levels that are likely to be encountered and provides a precautionary assessment. For 75% of the time, baseline sound levels will be higher than the 25<sup>th</sup> percentile levels. Use of the 25<sup>th</sup> percentile ensures that any periods when higher wind speeds (or other extraneous noise) could have affected the measured baseline sound levels do not unduly affect the analysis.
- 5.5 With regard to the 2023/2024 LT2 and LT3 survey data, as this has been obtained over a 207 day period, no data logged during periods of precipitation or high wind has been removed from the statistical analysis. However, as the analysis considers the lower quartile of data. obtained over a substantially long period, it is considered that this provides a very representative view of the prevailing acoustic environment at the two survey locations, allowing for a robust assessment to be undertaken.
- 5.6 For the night-time period, the 50<sup>th</sup> percentile levels of the long term survey data have been used to characterise the baseline sound environment at all NSRs.
- 5.7 This on the basis that night-time operation of the power generation facility would be generally very limited (around 3% of the night time period) and would be very much more likely to occur during the morning shoulder period, in the hour or so before 07:00 hours, when potential demand would be highest. During these periods, the background sound level is higher than during the quietest



period of the night, typically 02:00 to 04:00 hours. As such, if using the 25<sup>th</sup> percentile value, background sound levels would be skewed to this period, when the facility is unlikely to be in operation. It should still be noted that, for 50% of the time, background sound levels would be higher.

5.8 This is indicated below on the time history chart for LT1, which shows that, during the morning shoulder period, the background sound level is approximate 3 to 7 dB higher than the lowest level occurring at around 03:00 hours (further data in Appendix B).

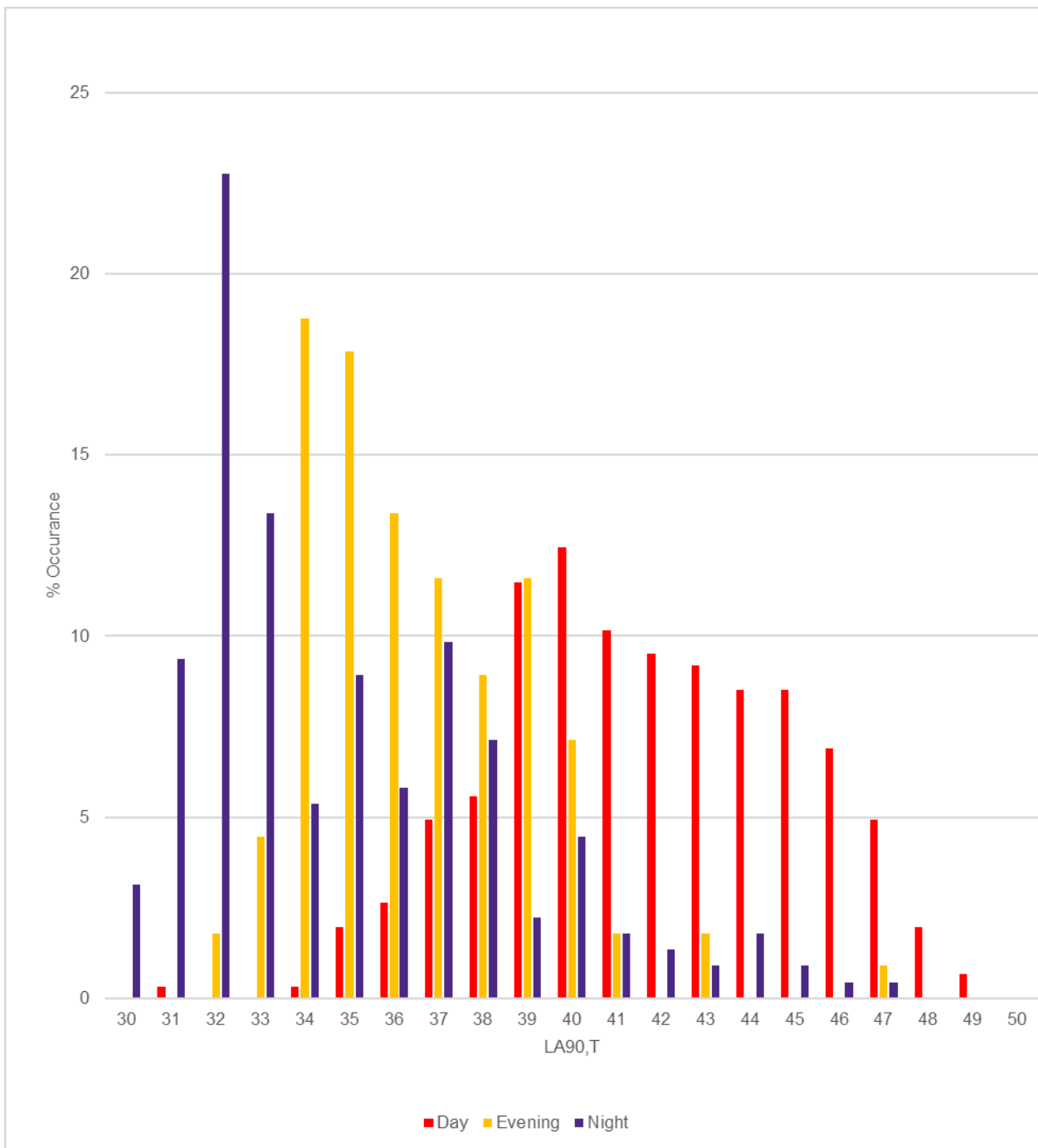
5.9 Representative baseline residual levels have been based on the 50<sup>th</sup> percentile level, i.e. the median value.



**Figure 5.1: LT1 LA<sub>90,T</sub> Time History**

**Table 5.1: LT1 Baseline Sound Levels**

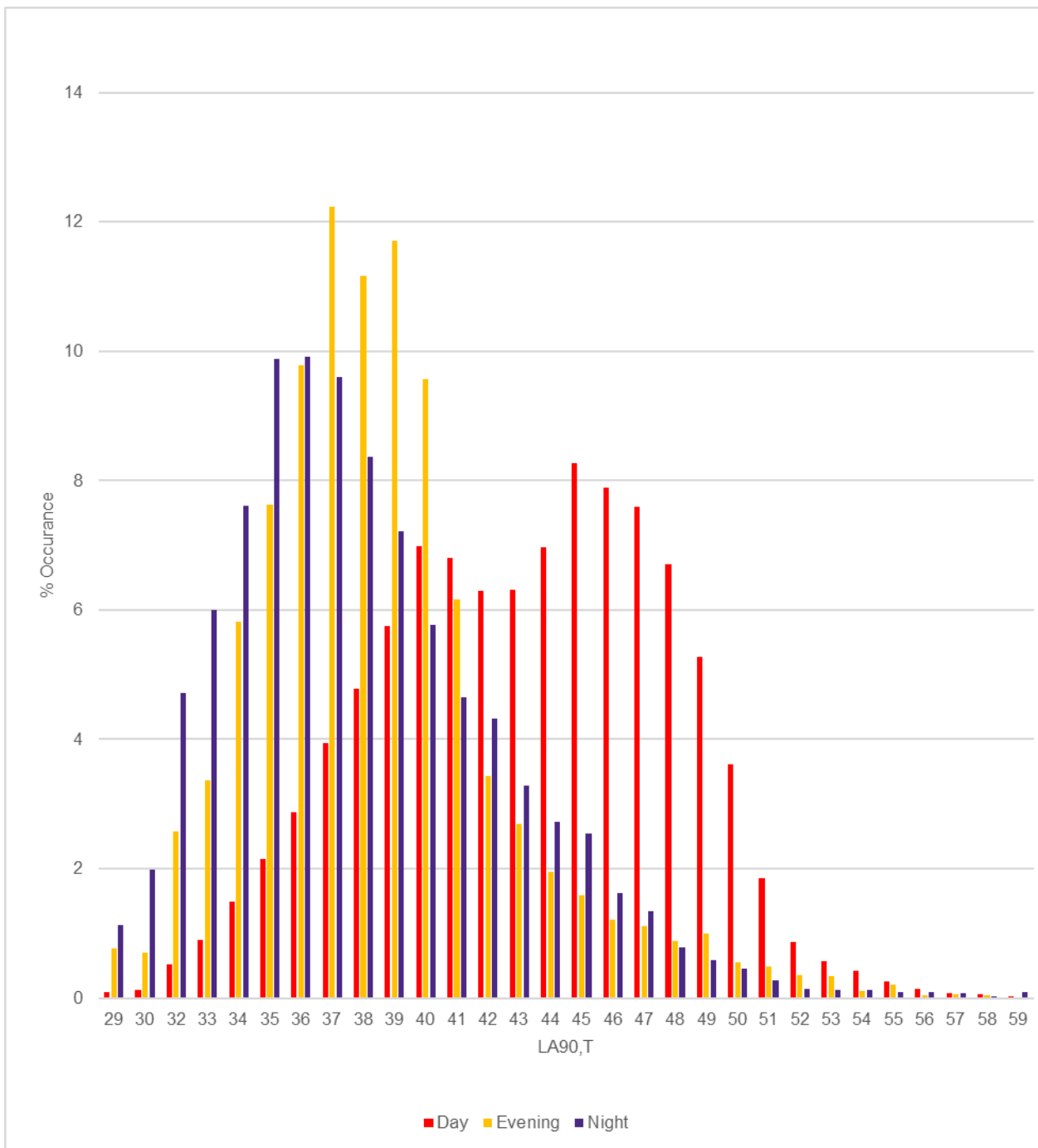
Period	Background Sound Levels (dB L <sub>A90,15min</sub> )					Residual Sound Levels (dB L <sub>Aeq,15min</sub> )				
	Min	25 <sup>th</sup> % <sup>1</sup>	50 <sup>th</sup> %	75 <sup>th</sup> %	Max	Min	25 <sup>th</sup> %	50 <sup>th</sup> %	75 <sup>th</sup> %	Max
Daytime	31	39	42	44	62	45	55	59	64	79
Evening	32	35	36	38	62	38	50	53	59	71
Night-time	30	32	34	37	47	32	41	49	55	72



**Figure 5.2: LT1 LA<sub>90,T</sub> Distribution**

**Table 5.2: LT2 Baseline Sound Levels**

Period	Background Sound Levels (dB L <sub>A90,15min</sub> )					Residual Sound Levels (dB L <sub>Aeq,15min</sub> )				
	Min	25 <sup>th</sup> % <sup>1</sup>	50 <sup>th</sup> %	75 <sup>th</sup> %	Max	Min	25 <sup>th</sup> %	50 <sup>th</sup> %	75 <sup>th</sup> %	Max
Daytime	27	40	44	47	68	31	46	49	52	80
Evening	24	36	38	40	68	27	39	41	45	72
Night-time	23	34	37	40	62	25	37	40	44	68

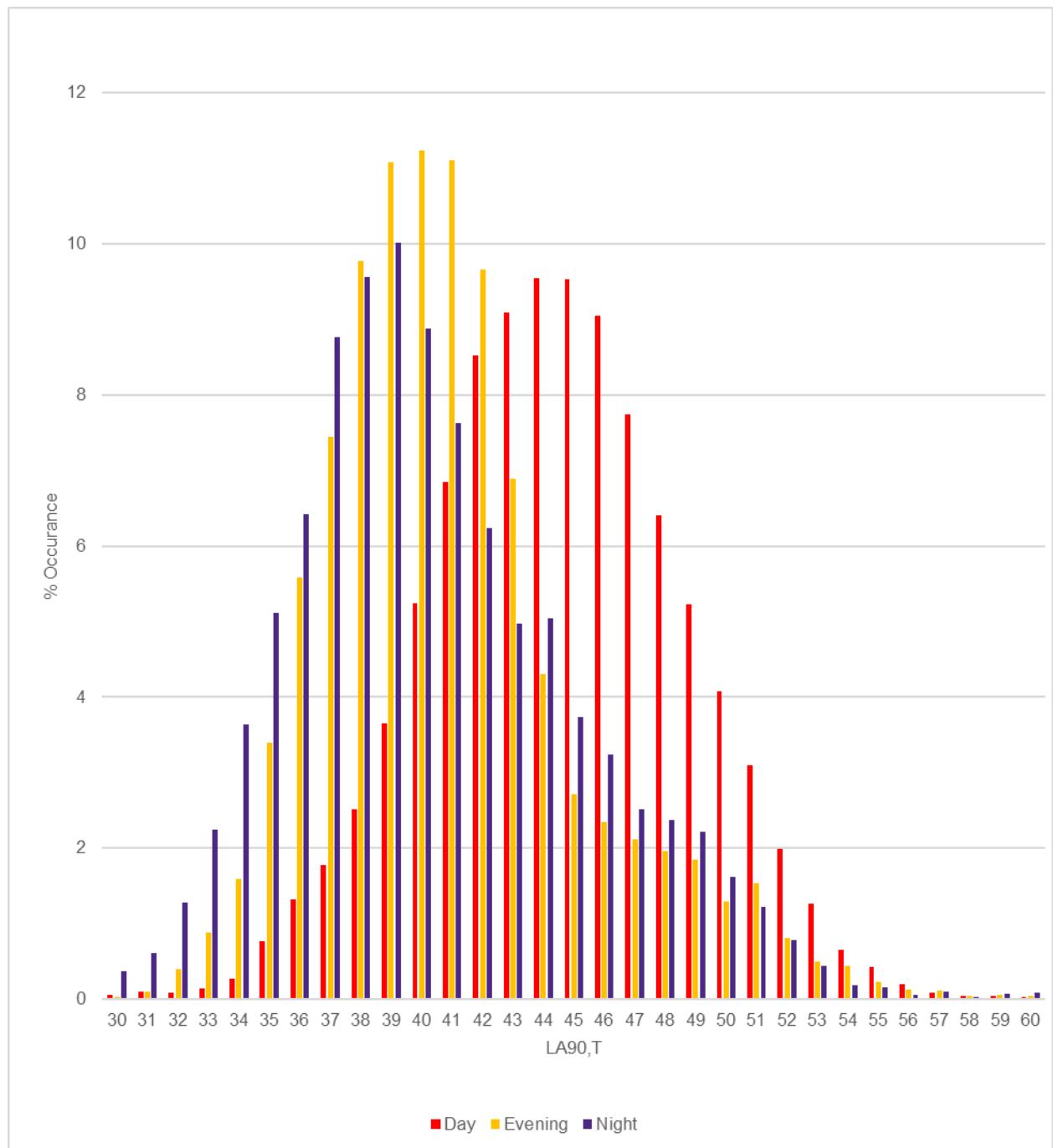


**Figure 5.3: LT2 LA<sub>90,T</sub> Distribution**



**Table 5.3: LT3 Baseline Sound Levels**

Period	Background Sound Levels (dB L <sub>A90,15min</sub> )					Residual Sound Levels (dB L <sub>Aeq,15min</sub> )				
	Min	25 <sup>th</sup> % <sup>1</sup>	50 <sup>th</sup> %	75 <sup>th</sup> %	Max	Min	25 <sup>th</sup> %	50 <sup>th</sup> %	75 <sup>th</sup> %	Max
Daytime	26	42	44	47	67	30	49	51	53	83
Evening	27	38	40	43	67	30	43	46	49	74
Night-time	25	37	40	43	65	27	40	44	49	70



**Figure 5.4: LT3 LA<sub>90,T</sub> Distribution**

5.10 On the basis of the above, Tables 5.4 to 5.5 below provide representative baseline sound levels that have been used in the subsequent assessment.

**Table 5.4: LT1 Representative Baseline Sound Levels (Sandhurst Road and Byron Gardens)**

Period	Background Sound Level $L_{A90, T}$ (dB)	Residual Sound Level $L_{Aeq, T}$ (dB)
Daytime <sup>1</sup>	39	59
Evening <sup>2</sup>	35	53
Night-time <sup>3</sup>	34	49
Notes 1. 07:00 hours and 19:00 hours. 2. 19:00 to 23:00 hours. 3. 23:00 to 07:00 hours.		

**Table 5.5: LT2 Representative Baseline Sound Levels (Norrskan and Buckland)**

Period	Background Sound Level $L_{A90, T}$ (dB)	Residual Sound Level $L_{Aeq, T}$ (dB)
Daytime	40	49
Evening	36	41
Night-time	37	40

**Table 5.6: LT3 Representative Baseline Sound Levels (Havers Lodge)**

Period	Background Sound Level $L_{A90, T}$ (dB)	Residual Sound Level $L_{Aeq, T}$ (dB)
Daytime	42	51
Evening	38	46
Night-time	40	44

### Comparison with Historic 2018 Baseline Data

5.11 Tables 5.7 and 5.8 below provide a summary of the representative background and residual sound levels at survey location LT1, LT2 and LT3 as measured in 2024 and 2018. Further details of the 2018 data are provided in Appendix B.

**Table 5.7: 2024 and 2018 Representative Background Sound Levels**

Period	LT1: Byron Gardens (dB $L_{A90, T}$ )			LT2: Buckland (dB $L_{A90, T}$ )			LT 3: Havers Lodge (dB $L_{A90, T}$ )		
	2018	2024	Delta	2018	2024	Delta	2018	2024	Delta
Day	40	39	-1	38	40	+2	42	42	0
Eve	36	35	-1	34	36	+2	36	38	+2
Night	39	34	-5	35	37	+2	37	40	+3

**Table 5.8: 2024 and 2018 Representative Residual Sound Levels**

Period	LT1: Byron Gardens (dB L <sub>Aeq,T</sub> )			LT2: Buckland (dB L <sub>Aeq,T</sub> )			LT 3: Havers Lodge (dB L <sub>Aeq,T</sub> )		
	2018	2024	Delta	2018	2024	Delta	2018	2024	Delta
Day	62	59	-3	48	49	+1	57	51	-6
Eve	56	53	-3	42	41	-1	49	46	-3
Night	50	49	-1	39	40	+1	44	44	0

5.12 With reference to Tables 5.7 and 5.8 above, representative baseline sound levels are broadly comparable as measured in 2028 and 2023/2024 at all three surveys locations and for all three time periods. It should be noted that survey location LT3 was located in closer proximity to the road in 2018 compared to 2024 and this is the reason for the significantly lower residual sound level, particularly during the daytime period.

5.13 Nevertheless, in 2018 an addition to the above locations was surveyed, St James' Church (LT4), which, given the proximity to survey location LT3 (490 m to the east) and similar acoustic environment at both locations (as previously determined in 2018), a similar change to the 2018 baseline sound levels have been applied to the measured levels in 2024.

5.14 On the basis of the above, Table 5.9 below provides the representative baseline sound levels that have been used in the subsequent assessment.

**Table 5.9: Representative Baseline Sound Levels**

Location	Period	Background Sound Level L <sub>A90, T</sub> (dB)	Residual Sound Level L <sub>Aeq, T</sub> (dB)
LT1	Daytime <sup>1</sup>	39	59
	Evening <sup>2</sup>	35	53
	Night-time <sup>3</sup>	34	49
LT2	Daytime	40	49
	Evening	36	41
	Night-time	37	40
LT3	Daytime	42	51
	Evening	38	46
	Night-time	40	44
LT4	Daytime	41	48
	Evening	35	44
	Night-time	41	41

Notes:  
1. Daytime 07:00 to 19:00 hours.  
2. Evening 19:00 to 23:00 hours.  
3. Night-time 23:00 to 07:00 hours

**Comment**

- 5.15 It is acknowledged that night-time background sound levels are the same or higher than the evening. This is considered to be reasonable on the basis that the facility is more likely to operate at the shoulder periods of night when demand is highest, associated with increased general activity resulting in higher background sound levels.
- 5.16 It should also be noted that all locations and for all periods, background sound levels are low and are about 30 dB L<sub>A90,T</sub> for LT2, LT3 and LT4 which, for the 1997 version of BS 4142, was considered to be very low.
- 5.17 The adopted representative survey locations for the nearest affected NSRs to the facility are presented in Table 5.10, below. These NSRs have been identified as the likely most affected receptors during the operation of the facility.

**Table 5.10: Adopted Representative Survey Locations for NSRs**

<b>NSR</b>	<b>Representative Survey Location</b>
Byron Gardens	LT1
Gun Hill Farm	LT4
Galsworthy Road	LT1
Havers Lodge	LT3
Buckland	LT2
St James' Church	LT4
Clarendon Road	LT3

**Specific Sound Level Predictions**

- 5.18 The externally located noise generating aspects of the facility include 95 genset enclosures (with capacity for up to 96), albeit these are generally located directly adjacent to each other and are not individually positioned.
- 5.19 Each enclosure has an associated ventilation air intake module at low level and air outlet attenuator at roof level. Also at roof level are the cooling radiators.
- 5.20 Each enclosure/genset has associated exhaust ductwork which feeds into an attenuated stack with a discharge point (at 20 m AGL). Generally, two gensets are grouped into one stack.
- 5.21 Model input data and manufacturer's data sheets (where available) are provided as Appendix D and are summarised below.

### Gensets

- 5.22 Each genset has a 'sound power level' (SWL) of 126 dBA  $L_w$ . Based on the dimensions of the genset enclosures, the internal reverberant sound pressure level would be 112 dBA  $L_{p_i}^3$ . Each genset is housed in a concrete enclosure (48 dB  $R_w$ ).
- 5.23 On this basis, the resultant façade radiating SWL is 65 dBA  $L_w$  per unit area, with each enclosure then having an effective total SWL of 89 dBA  $L_w$ . Octave band data have been provided by the manufacturer. The genset enclosures have been modelled as industrial buildings with four radiating facades and a roof.

### Radiators

- 5.24 Each genset has two associated radiators located above the roof level of the enclosure. Each radiator has a SWL of 90 dBA  $L_w$  and these have been modelled as area sources above the genset enclosures.

### Ventilation Air Intake Modules

- 5.25 Each genset enclosure has a ventilation air intake module at low level. Based on a similar gas engine scheme and the acoustic design requirements for this project, the SWL of these modules is 86 dBA  $L_w$ . These have been modelled as vertical area sources (4 x 4 m).

### Air Outlet Attenuators

- 5.26 Each genset enclosure has a ventilation air intake module at roof level. Based on a similar gas engine scheme and the acoustic design requirements for this project, the SWL of these outlet attenuators is 89 dBA  $L_w$ . These have been modelled as four vertical area sources, each with a SWL of 83 dBA  $L_w$ .

### Exhaust Stacks

- 5.27 Each individual genset has an exhaust, with two exhausts feeding into a single silenced stack, which terminates at 20 m AGL. Each silenced exhaust outlet (two engine exhausts) has a SWL of 84 dBA  $L_w$  (73 dBA  $L_p$  at 1 m). A standard stack directivity has been applied.

### Exhaust Ductwork

- 5.28 Exhaust ductwork at the exit point from the enclosures to the exhaust stacks has been modelled as line sources with a unit length SWL of 70 dBA  $L_w$  per unit length. This is based on data measured at similar other facilities and accounts for lagging materials that are fixed to the ductwork.

<sup>3</sup> 17.6 x 4.8 x 4 m.  $L_p = L_w - 10\log(V) + 10\log(T) + 14$ , assumed 0.5 s T

### Gas Pressure Regulator Skid

5.29 The Gas Pressure Regulator Skid (PRS) has been modelled as a point source with a SWL of 93 dBA  $L_W$ , typical for a PRS (85 dBA  $L_p$  at 1 m).

### Transformers

5.30 Transformers have been modelled as point sources at 1 m AGL.

5.31 The following assumptions have been incorporated into the noise model:

- the topography of the site and the surrounding area has been obtained from publicly available data sources;
- the effect of screening from solid structures (buildings) has been incorporated into the modelling process by importing OS Open Data ‘Settlement Area’ shape file data into the model and publicly available data; and
- the ground type in the model has been set G=1 hard for the site and soft (G=0) for the surrounding area.

5.32 On the basis of the above, Table 5.11 below provides a summary of modelled maximum specific sound levels at the nearest NSRs. Specific sound levels are at 1.5 m from facades in free field equivalent locations and at 1.5 and 4 m AGL.

5.33 Figure 1 at the end of the report provides a graphical presenting of noise levels at 4 m AGL.

5.34 It should be noted that the specific sound levels presented below are on the basis that the facility would be providing maximum power, with all plant in operation at 100% design capacity, i.e. a ‘worst case’ scenario in terms of noise. Typically, demand would be lower and noise emissions would be correspondingly reduced as a result. For example, if half the demand is required, specific sound levels would be 3 dB lower.

**Table 5.11 Predicted Maximum Specific Sound Levels**

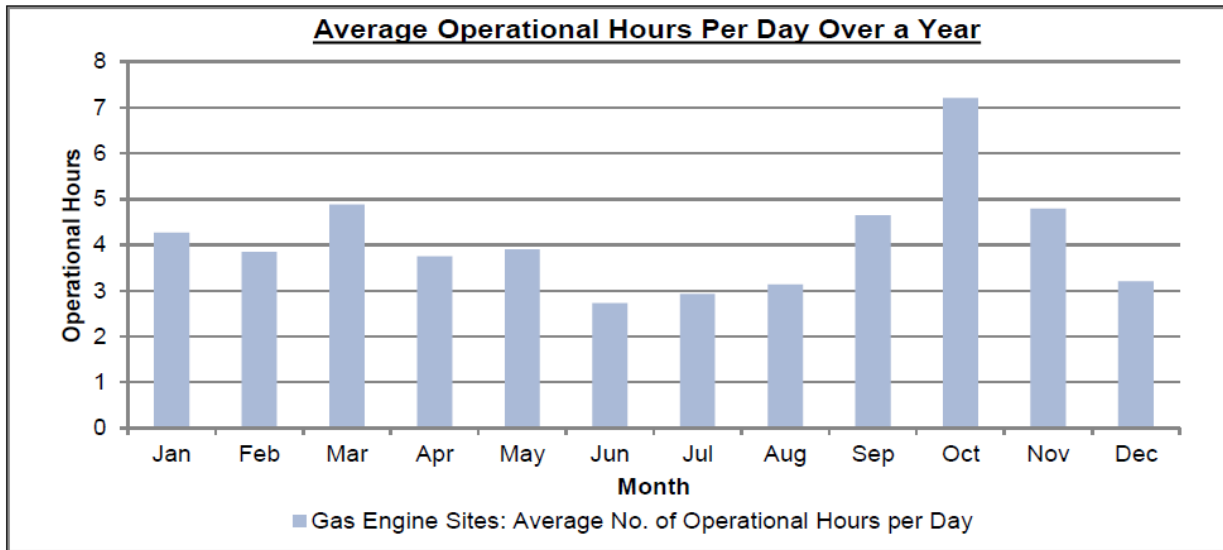
NSR	Specific Sound Level $L_{Aeq,Tr}$ (dB)	
	1.5 m AGL	4 m AGL
Byron Gardens	43	44
Gun Hill Farm	41	42
Galsworthy Road	40	41
Havers Lodge	44	44
Buckland	40	41
St James’ Church	42	43

## Rating Levels

- 5.35 With reference to BS 4142, a character correction can be applied to the specific sound level depending on the acoustic characteristics of the sound at the assessment location, including corrections for impulsivity, tonality, intermittency or other distinctive character.
- 5.36 In this case, it has not been considered appropriate to apply any correction for Scenarios 1 and 2 at any assessment/NSR location. This is on the basis that:
1. The specific sound would not be impulsive or intermittent, rather it would be on at least for a full assessment period (1-hour during the daytime, 15-minutes during the night-time), potentially gradually ramping up/down at any one time.
  2. Based on professional experience, whilst the radiators incorporate a fan, with potential for tonal emissions, the surrounding parts of the coolers (grilles etc.) act to provide a masking sound such that the resulting emissions are more broadband/aerodynamic and '*whooshing*' in nature.
  3. As it is considered that the only source of tonal noise from the proposed development is from the transformers and the contribution from this source to the overall specific sound is negligible, it is unlikely that noise levels at the nearby NSRs would be perceived or characterised as tonal.
  4. The specific sound is broadband in nature and steady with little variation or unusual sound/features that might be considered incongruous or readily distinctive compared to the residual acoustic environment.
- 5.37 On the basis of the above, specific sound levels are equal to the Rating Levels at all NSRs.

## Operating conditions

- 5.38 The development would operate during peak periods of electricity demand or to prevent system instability. Based on information provided at the planning and DCO stage, this would most typically be for a period ranging from one to seven hours, between 08:00 and 20:00 hours.
- 5.39 However, there is the potential that the proposed development could be required to operate during a major power shortage or system stress events (e.g. a Notification of Inadequate System Margin) at any time of the day or night. It should be noted that the likelihood of the facility being required to start up in the middle of the night is extremely low as peak electricity demand does not occur overnight.
- 5.40 On this basis, Figure 5.5 below shows an indicative typical pattern of average daily operating hours in each month of the year. A further breakdown of indicative typical operating hours at each time of the day during the winter, summer and annual periods is presented in Table 1.1. These breakdowns are based on data from similar operational peaking plant provided by the applicant; they are indicative of likely seasonal and diurnal cycles to inform the assessment of impacts, but are not the fixed operating hours of the proposed facility.



**Figure 5.5: Site, Wider Area and Baseline Sound Level Monitoring Locations**

5.41 As can be seen from Table 5.12, operational hours during night-time periods (23:00 to 07:00 hours) account for less than 2% of the total operating hours over the course of a year, at a similar peaking power facility site operated by the applicant. Significant night-time operation is therefore unlikely.

**Table 5.12 Typical Daily Operating Times Breakdown of an Operational Peaking Plant**

Period (hours)	Percentage total operational time (%)
04:00 to 07:00	2
07:00 to 16:00	41
16:00 to 19:00	44
19:00 to 23:00	12
23:00 to 07:00	0.2



## 6 Noise Impact Assessment

6.1 Tables 6.1, 6.2 and 6.3 below provide an initial estimate of the noise impact at the nearest NSRs for the daytime, evening and night-time periods, respectively. Note daytime and evening Rating Levels are at ground floor level (1.5 m AGL) and night-time at first floor level (4 m AGL).

**Table 6.1 Daytime (07:00 to 19:00 hours) BS 4142 Numerical Assessment**

NSR	Specific Sound Level, dB L <sub>Aeq,Tr</sub>	Rating Penalty, dB	Rating Level, dB L <sub>A,r,Tr</sub>	Background Level, dB L <sub>A90,T</sub>	Rating / Background Level Difference, dB
Byron Gardens	43	0	43	39	+4
Gun Hill Farm	41	0	41	41	0
Galsworthy Road	40	0	40	39	+1
Havers Lodge	44	0	44	42	+2
Buckland	40	0	40	40	0
St James' Church	42	0	42	41	+1

**Table 6.2 Evening (19:00 to 23:00 hours) BS 4142 Numerical Assessment**

NSR	Specific Sound Level, dB L <sub>Aeq,Tr</sub>	Rating Penalty, dB	Rating Level, dB L <sub>A,r,Tr</sub>	Background Level, dB L <sub>A90,T</sub>	Rating / Background Level Difference, dB
Byron Gardens	43	0	43	35	+8
Gun Hill Farm	41	0	41	35	+6
Galsworthy Road	40	0	40	35	+5
Havers Lodge	44	0	44	38	+6
Buckland	40	0	40	36	+4
St James' Church	42	0	42	35	+7

**Table 6.3 Night-time (23:00 to 07:00 hours) BS 4142 Numerical Assessment**

NSR	Specific Sound Level, dB L <sub>Aeq,Tr</sub>	Rating Penalty, dB	Rating Level, dB L <sub>A,r,Tr</sub>	Background Level, dB L <sub>A90,T</sub>	Rating / Background Level Difference, dB
Byron Gardens	44	0	44	34	+10
Gun Hill Farm	42	0	42	41	+1
Galsworthy Road	41	0	41	34	+7
Havers Lodge	44	0	44	40	+4
Buckland	41	0	41	37	+4

NSR	Specific Sound Level, dB L <sub>Aeq,Tr</sub>	Rating Penalty, dB	Rating Level, dB L <sub>Ar,Tr</sub>	Background Level, dB L <sub>A90,T</sub>	Rating / Background Level Difference, dB
St James' Church	43	0	43	41	+2

6.2 With regard to the rating/background level differences, BS 4142:2014+A1:2019 states:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

6.3 On the basis of the above, and with reference to Table 6.1, it is considered that, during the daytime period there is a low risk that operation of the facility would result in adverse impact at NSRs, significant or otherwise, as Rating Levels are, at most, up to 4 dB above background.

6.4 With reference to Tables 6.2 and 6.3 during the evening and night-time periods, as rating Levels are up to 8 and 10 dB above background, there is a risk that operation of the facility would result in adverse or significant adverse impact at NSRs, depending on the context.

6.5 In this instance, it is considered that the context of the noise does reduce the risk for adverse impact at all NSRs, such that significant adverse impact would be unlikely to occur during all time periods as explained below.

6.6 Maximum Rating Levels of 39 to 44 dB L<sub>Ar,Tr</sub> are considered to be of a reasonably low magnitude (note that the 1997 revision of BS 4142 considered Rating Levels below 35 dB to be very low) and a magnitude on its own to unlikely to result in significant adverse impact regardless of the difference to the background sound level.

6.7 In this regard, BS 4142:2014 states:

*“Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.”*

6.8 Considering absolute sound levels and the likelihood for impact, the addition of the maximum specific sound to the existing residual sound level would result in no more than a 1 and 2 dB increase in ambient sound level during the daytime and evening periods respectively. This change in ambient sound level is summarised in Tables 6.4 and 6.5 below

**Table 6.4 Scenario 1: Daytime (07:00 to 19:00 hours) Ambient Noise Change Assessment**

NSR	Specific Sound Level, dB $L_{Aeq,Tr}$	Residual Sound Level, dB $L_{Aeq,T}$	Ambient Sound Level, dB $L_{Aeq,T}$	Change (dB)
Byron Gardens	43	59	59	0
Gun Hill Farm	41	48	49	+1
Galsworthy Road	40	59	59	0
Havers Lodge	44	51	52	+1
Buckland	40	49	50	+1
St James' Church	42	48	49	+1

**Table 6.5 Scenario 1: Evening (19:00 to 23:00 hours) Ambient Noise Change Assessment**

NSR	Specific Sound Level, dB $L_{Aeq,Tr}$	Residual Sound Level, dB $L_{Aeq,T}$	Ambient Sound Level, dB $L_{Aeq,T}$	Change (dB)
Byron Gardens	43	53	53	0
Gun Hill Farm	41	44	46	+2
Galsworthy Road	40	53	53	0
Havers Lodge	44	46	48	+2
Buckland	40	41	44	+3
St James' Church	42	44	46	+2

- 6.9 For steady sources of a similar character, a +/-3 dB change is generally taken as the minimum change that is perceptible to most people. On this basis, as the specific sound would be steady, a change of +2 dB is not considered to be a significant increase and would likely not be noticeable.
- 6.10 Furthermore, the addition of the specific sound would not result in ambient sound levels increasing from below 50 or 55 dB  $L_{Aeq,T}$  to above. On this basis, there would be no increase in the risk for the specific sound to increase the risk for annoyance in external amenity areas.
- 6.11 On the basis of the above, whilst the specific sound may be discernible during quiet periods, when the facility is maximum power, it would not be of a magnitude to result in overall ambient sound levels noticeably increasing or increase the risk for annoyance.
- 6.12 It should also be noted that, at the most affected NSRs (St James' Church and Havers Lodge), distant industrial activity was observed as affecting the acoustic environment (as noted in Appendix B). As such, the new noise source would not be as discernible as it may otherwise be compared to the situation where industrial/commercial noise did not already affect the environment.
- 6.13 Furthermore, the above assessment is based on use of the 25<sup>th</sup> percentile of all background sound level data. As such, for 75% of the daytime and evening periods, background sound levels would be higher and the difference between the Rating and background sound levels, lower. For example, at the most affected NSR, St James' Church, during the daytime and evening periods for 50% of

the time, the background sound level is 2 dB higher, such the Rating/background sound level difference would be +4 dB for the evening period.

- 6.14 Finally, it should be noted that the assessment above has been completed on the basis that the facility would be providing maximum power, i.e. a ‘worst case’ scenario in terms of noise. Typically, demand would be lower and noise emissions would be correspondingly lower as a result.
- 6.15 On the basis that maximum demand is more likely to occur during the daytime period, rather than the evening (or night-time, as detailed below), it is likely that Rating Levels during the evening would normally be lower. For example, if half the demand is required, Rating Levels would be 3 dB lower and no more than 3 dB above the evening 25<sup>th</sup> percentile background sound level and 1 dB above the evening 50<sup>th</sup> percentile background sound level.

### Night-time

- 6.16 Similarly as for the daytime and evening periods, the maximum Rating Levels of 38 to 44 dB  $L_{A,r,T}$  are considered to be of a reasonably low magnitude, and are considered to not be of sufficient magnitude likely to result in adverse impact, such as sleep disturbance, particularly as the sound would be steady with no impulsive or intermittent features.
- 6.17 With reference to the ‘Guidelines for Community Noise’ (GCN) [5] document, resultant ambient sound levels would be of a magnitude below that which sleep disturbance may result (45 dB  $L_{Aeq,T}$ ) at all NSRs where the residual sound level is currently below that level, apart from the NSR Havers Lodge. This change in ambient noise level is summarised in Table 6.6 below.

**Table 6.6 Scenario 2: Night-time (23:00 to 07:00 hours) Ambient Noise Change Assessment**

NSR	Specific Sound Level, dB $L_{Aeq,T}$	Residual Sound Level, dB $L_{Aeq,T}$	Ambient Sound Level, dB $L_{Aeq,T}$	Change (dB)
Byron Gardens	44	49	50	+1
Gun Hill Farm	42	41	45	+4
Galsworthy Road	41	49	50	+1
Havers Lodge	44	44	47	+3
Buckland	41	40	44	+4
St James’ Church	43	41	45	+4

- 6.18 Whilst the Rating/background level difference is up to +10 dB during the night-time period, this relates to an external assessment location, whereas during this period residents are more likely to be inside dwellings, where associated sound levels would be lower. On the basis that the facades of dwellings will attenuate external sound by 12 to 20 dB, considered to be a reasonable assumption as partially open windows provide ~15 dB attenuation, appropriate internal sound levels for sleeping would be achieved (internal ambient sound levels <30 dBA), and sleep disturbance would be unlikely to result.

- 6.19 In addition to the low maximum Rating Level, a critical aspect reducing the risk for adverse impact during the night-time period is the very limited number of times and likely durations the facility would operate during the night-time period and, if in operation, whether maximum demand would be provided.
- 6.20 Based on operational experience of other similar facilities, for only around 88 hours of the night-time period (23:00 to 07:00 hours) over the course of a year, would the facility likely be operational i.e. 3% of the night-time period on average. Such operation would likely be during the shoulder period (before 07:00 hours) when background noise levels are higher. The facility would be very unlikely to operate at the quietest part of the night (02:00 to 04:00 hours).
- 6.21 On this basis, whilst a +10 dB maximum Rating/background level difference, with a Rating Level of 44 dB  $L_{A,T,r}$ , may result in a moderate adverse impact if occurring for the whole, or majority of the night, if only occurring for 88-hours out of 2,920 night-time hours over the course of a year, the risk for long term impact is significantly reduced.
- 6.22 Furthermore, if only providing half the maximum demand, Rating Levels would be 3 dB lower and only 7 dB above the night-time background sound level.
- 6.23 Consequently, it is considered that night-time impacts, across a period of time, would be negligible at the majority of NSRs during the night-time period, albeit potentially minor impact may result at the most affected NSRs.

### Summary

- 6.24 Maximum Rating Levels at NSR locations, i.e. when the facility is producing maximum power, would be up to 4, 8 and 10 dB above the representative background sound level during the daytime, evening and night-time periods, respectively.
- 6.25 However, due to low Rating Levels and resultant ambient sound levels not noticeably changing or being of a magnitude likely to increase the risk for annoyance in external amenity areas or cause sleep disturbance, it is considered that significant adverse impacts would not occur.
- 6.26 Furthermore, the risk for adverse impact during night-time period for is significantly reduced as for only 88 hours of the night-time period (23:00 to 07:00 hours) over the course of a year, would the facility likely be operational i.e. 3% of the night-time period on average. Also, Rating Levels would often be lower than considered, reflecting the reduced power demand.
- 6.27 Consequently, when considering the operation of the facility over the entire year period, the resulting site noise impact would be no greater than adverse, i.e. significant impacts/effects avoided at all NSRs for all time periods, as summarised in Table 6.7 below.
- 6.28 On the basis that significant adverse impacts would be avoided, and adverse impacts minimised (through the application of noise control methods/techniques detailed in Section 7) the proposed



development would comply with the ‘Noise Policy Statement for England’ (NPSE) [6], which sets out the long term overarching vision of Government noise policy.

**Table 6.7 Overall Site Noise Impact**

NSR	Overall: Site Noise Impact		
	Daytime	Evening	Night-time
Byron Gardens	Negligible	Adverse	Adverse
Gun Hill Farm	Negligible	Minor	Negligible
Galsworthy Road	Negligible	Minor	Adverse
Havers Lodge	Minor	Adverse	Adverse
Buckland	Negligible	Minor	Negligible
St James' Church	Negligible	Adverse	Negligible

## 7 Noise Control

- 7.1 With reference to Section 6 above, operation of the facility over the entire year period would result in negligible to minor adverse noise impacts at all NSRs for all time periods.
- 7.2 However, this is based on the following application of noise control methods/techniques:
- the gensets housed in concrete enclosures;
  - attenuation of the genset air inlets and outlets;
  - silencers fitted to the genset exhausts; and
  - location of plant away from NSRs.
- 7.3 Due to technical and spatial constraints, it is not feasible to select radiators with lower noise emissions or install the radiators differently, i.e. at low/ground level or be more enclosed.
- 7.4 On the basis of the above, all techniques have been employed to minimise noise emissions as far as reasonably practicable.
- 7.5 In this regard, the facility has applied all appropriate preventative measures taken to minimise noise pollution, in particular with the application of 'best available techniques' (BAT), in accordance with the Environmental Permitting Regulations.
- 7.6 A Noise Management Plan is include as Appendix E of the report.

## 8 Uncertainty

- 8.1 In all assessments, it is good practice to consider uncertainty which can arise from a number of different aspects. There are degrees of uncertainty associated with: instrumentation used for surveying; measurement technique and the variables influencing the measurement results such as transmission path and weather conditions; source terms used for modelling; calculation uncertainty; assessment uncertainty; and the subjective response of residents to noise sources.
- 8.2 Uncertainty due to instrumentation has been significantly reduced with the introduction of more modern instrumentation and is reduced further by undertaking field calibration checks on sound level meters before and after each measurement period with no significant drift (less than 0.5 dB) and that all instrumentation is within accepted laboratory calibration intervals.
- 8.3 Every effort has been made to reduce the uncertainty of the baseline sound level measurements. The duration of the baseline survey is considered to significantly reduce the uncertainty associated with the baseline sound levels. Data logged during periods of rainfall has been removed from the analysis. Based on professional judgement including substantial experience of acquiring and analysing baseline data for numerous sites in various locations, and a desk-based review of the site and surrounding area, it is considered that the baseline data acquired during the survey is typical of the area.
- 8.4 Representative baseline sound levels used in the assessment have been based on the 25% of all data logged, i.e. for 75% of the time, baseline sound levels are higher than used in the assessment. This approach will favour a reasonable 'worst case' scenario and a robust assessment to be completed. Representative baseline sound levels have been calculated for three accepted time periods daytime (07:00 to 19:00 hours), evening (19:00 to 23:00 hours) and night-time (23:00 to 07:00 hours).
- 8.5 For two survey and assessment locations, representative baseline sound levels have been derived through a statistical analysis of 207 days of data, a substantially long period.
- 8.6 Calculation uncertainty and assessment uncertainty have been reduced by peer review of all baseline data, model input data, model results and assessment calculations, and by using the appropriate level of precision at each stage of the assessment calculations.
- 8.7 With regard to the primary noise source, the 95 gensets (with capacity for up to 98) and radiators, acoustic and operational data has been provided by the manufacturer so it is considered there is minimal uncertainty with regard to this data. Acoustic data for the flue stack exhausts has been based on that provided by the silencer manufacture.
- 8.8 There are uncertainties in any prediction methodology. ISO 9613 Part 2 provides a method for predicting acoustic propagation outdoors. The method is applicable in practice to a great variety of sound sources and environments. It is applicable (directly or indirectly) to most situations including



industrial sound sources, construction activities and many other ground-based sound sources. The estimated accuracy for values of the average downwind sound pressure level is stated as +/-3 dB for a mean source/receptor height of up to five metres and source/propagation separation distance of up to 1 km. For a mean source height between 5 and 30 m, the estimated accuracy is given as +/-1 dB for a source/propagation separation distance of 0 to 100 m and +/- 3 dB for a source/propagation separation distance of >100 m. This is a standard approach and is considered to be an acceptable prediction methodology.

- 8.9 Specific sound levels have been calculated at ground and first floor level for the daytime and night-time periods respectively, at locations of facades albeit in free-field locations.
- 8.10 Intervening structures between the site and NSR location and the ground type has been based on a review of mapping and site observations.
- 8.11 A quantitative assessment has been undertaken based on information provided by the project team for the proposed development and professional judgement based on recognised and accepted empirical calculation methodologies. Where assumptions have been made, these have been informed through assessment and visiting similar facilities and have favoured a worst-case scenario, allowing for a reasonable and robust assessment.
- 8.12 With regards to subjective response, the noise standards adopted for the assessment are based upon the subjective response of the majority of the population or will be based upon the most likely response of the majority of the population. This is considered to be the best that can be achieved in a population of varying subjective response which will vary dependent upon a wide range of factors.
- 8.13 All areas and potential consequences of uncertainty have been minimised at every stage of the assessment process. On the basis of the above, and in the context of subjective response, the effects of uncertainty on the assessment conclusions are considered minimal.

## 9 Summary and Conclusions

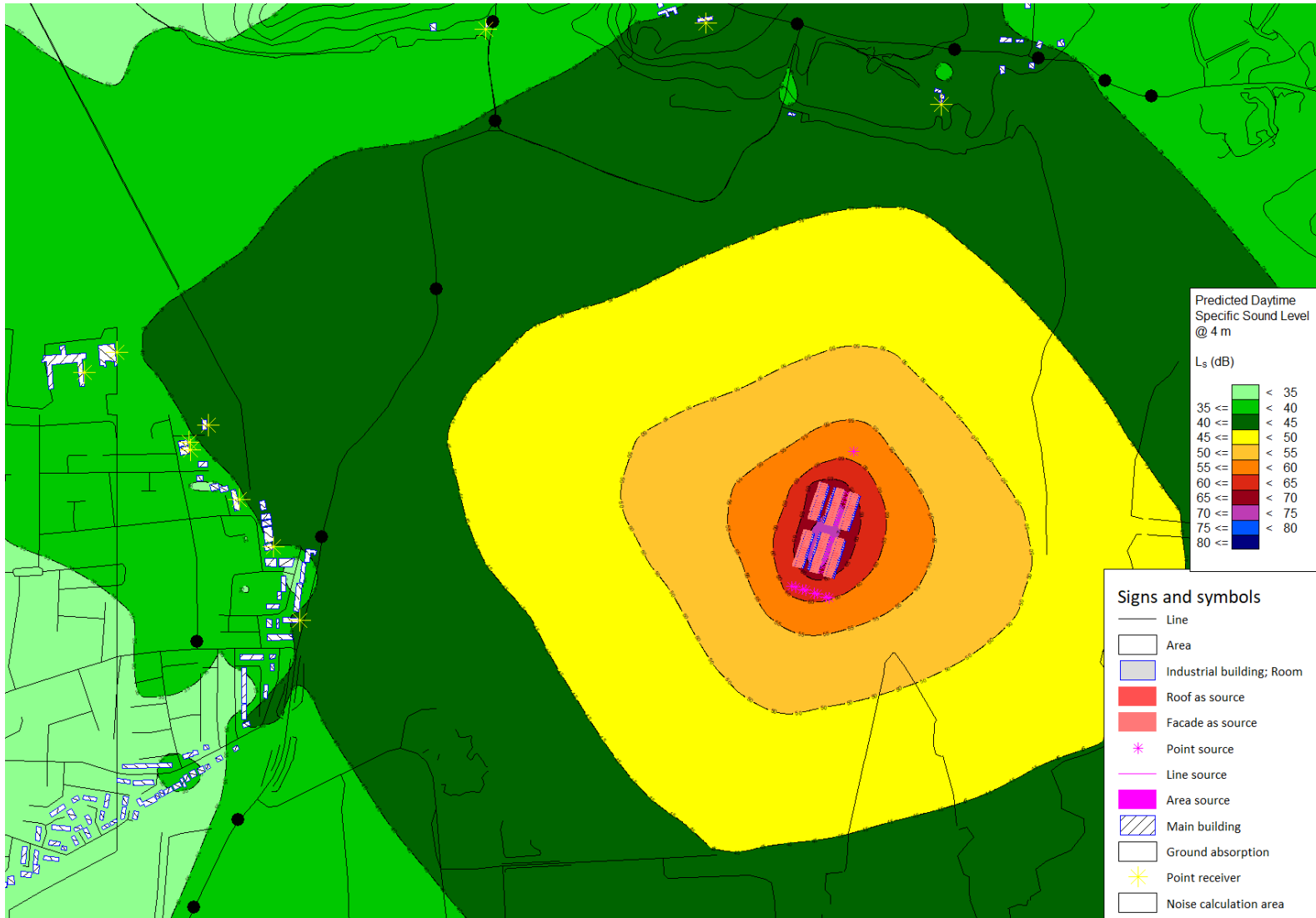
- 9.1 The Acoustics, Noise and Vibration Team at Savills has been appointed by TPL to undertake a noise impact assessment to support an 'Environmental Permit' (EP) application for a power generation facility (gas engines with associated plant). The facility will be constructed on land to the north of Tilbury substation and southwest of Station Road, Thurrock, Essex.
- 9.2 Noise emissions from the facility will be controlled through the application of noise control methods/techniques, including the gensets housed in concrete enclosures, attenuation of the genset air inlets and outlets and silencers fitted to the genset exhausts.
- 9.3 Maximum Rating Levels at NSR locations, i.e. when the facility is producing maximum power, would be up to 4, 8 and 10 dB above the representative background sound level during the daytime, evening and night-time periods, respectively.
- 9.4 Due to low Rating Levels and resultant ambient sound levels not noticeably changing or being of a magnitude likely to increase the risk for annoyance in external amenity areas or sleep disturbance, it is considered that significant adverse impacts would not occur.
- 9.5 Furthermore, the risk for adverse impact during night-time periods is significantly reduced as, for only around 88 hours of the night-time period (23:00 to 07:00 hours) over the course of a year, would the facility likely be operational i.e.3% of the night time period on average. Also, Rating Levels would often be lower than considered, reflecting the reduced power demand.
- 9.6 Consequently, when considering the operation of the facility over the entire year period, the resulting site noise impact would be negligible adverse to adverse at all NSRs for all time periods.
- 9.7 All techniques have been employed within the design of the facility to minimise noise emissions as far as reasonably practicable. In this regard the facility has applied all appropriate preventative measures taken to minimise noise pollution, in particular with the application of 'best available techniques' (BAT), in accordance with the Environmental Permitting Regulations.
- 9.8 On the basis that significant adverse impacts would be avoided, and adverse impacts minimised, the proposed development would comply with the 'Noise Policy Statement for England' (NPSE), which sets out the long term overarching vision of Government noise policy.

## References

- 1 British Standards Institution. British Standard 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound.
- 2 British Standards Institution. British Standard 7445-2:1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use.
- 3 ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.
- 4 ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.
- 5 Berglund, B. et al. Guidelines for Community Noise. World Health Organisation. 2000.
- 6 Department for Environment, Food and Rural Affairs. Noise Policy Statement for England. Defra. 2010.



# Figures



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**Notes**

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Mocatta House, Trafalgar Place  
Brighton, East Sussex BN1 4DU

Client:

Project:

Job Ref: 631937

File location:

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**Figure 1: Specific Sound Levels**

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# Appendices



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# Appendix A: BS 4142 Statements



**Phil Evans: Director - Acoustics**

*BSc (Hons) Geology; MSc Acoustics, Vibration and Noise Control; Fellow of the Geological Society; Fellow of the Institute of Acoustics; Associate Member Acoustical Society of America*

- A.1 Phil is a Director and leads the Savills Acoustics Team. He is a specialist in environmental acoustics and is active on a number of committees including the Association of Noise Consultants' Vibration Working Group; British Standards Institution (BSi) Committee GME/21/6/4 - BS 6472: Guide to Evaluation of Human Exposure to Vibration in Buildings; BSi Committee B/564/01 on BS 5228: Noise and Vibration Control on Construction and Open Sites which has now also revised and issued BS 8233:2014 Guidance on sound insulation and noise reduction in buildings. He has been a corporate Member of the Institute of Acoustics (MIOA) for over 20 years.
- A.2 Phil has over 25 years' experience in the project management of, and technical input to, environmental noise and vibration impact assessments for major developments. He is an expert in the industrial/commercial, transportation and construction sectors including the measurement, calculation, evaluation and mitigation of environmental noise and vibration. Phil has significant experience in the preparation and presentation of technical evidence and reports for public inquiries and planning applications. He is experienced in consultation and liaison with government departments, local authorities and other statutory bodies. He is an experienced expert witness. He has a Continuous Professional Development Record to support this competency and experience.
- A.3 Phil has been involved in many BS 4142 noise assessments for both the previous and current 2014 version of BS 4142. He has given evidence at public inquiries where BS 4142 has been the primary assessment methodology. He is very familiar with the Standard and attended the joint ANC/BSi launch of the 2014 version of the Standard. On the basis of Phil's overall experience in acoustics combined with particular focus on BS 4142, he is deemed competent for BS 4142 assessments.
- A.4 For this project, Phil has taken on the role of Project Director and has been responsible for overseeing and delivering the project.





**Peter Barling: Associate - Acoustics**

*BSc (Hons) Physics; PGDip Environmental Assessment and Management; Member of the Institute of Acoustics*

- A.6 Peter is an Associate Consultant in Acoustics and environmental acoustics specialist with over 10e years' experience. He has a Degree in Physics and also has a Post Graduate Diploma in Environmental Assessment and Management. He has been a member of the Institute of Acoustics since 2013.
- A.7 Peter has project managed and undertaken noise assessments for a variety of developments, including: large scale mixed-use developments, incorporating commercial, retail, leisure and residential elements; on-shore substations for off-shore windfarms; energy from waste facilities; manufacturing facilities; distribution centres; retail units; minerals extraction and exploration; solar farms; and petrol service filling stations. He has provided input into Environmental Impact Assessments (EIAs) and undertaken noise assessments to support planning applications and discharge planning conditions. He has a Continuous Professional Development (CPD) Record to support this competency and experience.
- A.8 Peter has undertaken BS 4142 noise assessments for both the previous and current 2014 version of BS 4142. He is familiar with the Standard and has attended and participated in internal and external CPD training seminars regarding the revised 2014 version of the Standard. On the basis of Peter's overall experience in acoustics, combined with particular focus on BS 4142, he is deemed competent for BS 4142 assessments.
- A.9 Peter was responsible for undertaking the baseline acoustic survey, and preparation of the assessment and report.



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# Appendix B: 2018 Baseline Data





## **Thurrock Flexible Generation Plant**

**Environmental Statement Volume 6  
Appendix 11.1: Baseline Sound Monitoring Report**

**Date:** September 2019



**Environmental Impact Assessment**  
**Preliminary Environmental Information Report**

**Volume 6**  
**Appendix 11.1**

---

Report Number: OXF10872

Version: Final

Date: September

This report is also downloadable from the Thurrock Flexible Generation Plant website at:  
<http://www.thurrockpower.co.uk>

Thurrock Power Ltd  
1st Floor  
145 Kensington Church Street  
London W8 7LP

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Prepared by: Josh Wilson

Checked by: Simon Stephenson

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It has been checked and authorised by Simon Stephenson, a Technical Director within the Acoustics Team and full member of the Institute of Acoustics, who has 20 years' experience of environmental noise impact assessment.

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## Summary

This Appendix provides details of the baseline noise monitoring undertaken as part of the noise assessment, and in accordance with BS 4142:2014+A1:2019.

## Qualifications

This document has been prepared by Josh Wilson, an Acoustic Consultant and full Member of the Institute of Acoustics, who has over four years' experience of environmental noise impact assessment.

## 1. Introduction

- 1.1.1 RPS has been commissioned by Thurrock Power Ltd to undertake baseline noise monitoring to inform the noise impact assessment for a proposed flexible generation plant comprising gas engines and battery storage near Tilbury (the proposed development).
- 1.1.2 This report provides the results of baseline sound measurements undertaken to characterise the sound environment in the vicinity of the nearest Noise Sensitive Receptors (NSRs) to the proposed development including its potential road access and supply gas pipeline routes. These baseline levels will be used in the assessment of effects for the operational and construction noise and vibration assessments to be reported in the Preliminary Environmental Impact Report (PEIR).
- 1.1.3 Access to all survey locations was agreed with the landowners. The surveys were undertaken between Thursday 1st and Wednesday 21st February 2018.
- 1.1.4 This report provides a summary of the survey data for each survey location. As stated above, these levels will be relied upon within the assessment carried out for the PEIR. Survey sheets indicating details and locations of noise monitoring equipment are provided in Annex A.

## 2. Baseline Survey Methodology

### 2.1 Consultation with Local Planning Authority

2.1.1 The proposed approach to the baseline surveys was described in the Baseline Noise Monitoring Plan issued on 18 January 2018. The survey methodology was subject to consultation and was agreed to be appropriate by Mark Gentry, Environmental Health Officer for Thurrock Council.

### 2.2 Survey locations

2.2.1 Survey locations were chosen to characterise baseline conditions in the vicinity of the nearest noise sensitive receptors to the proposed development and based on their proximity to the site. The proposed monitoring were as follows:

- LT1 – Byron Gardens: This location is approximately 750 m west of the proposed development and is representative of the residential properties west of Fort Road. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.
- LT2 – Buckland: This location is approximately 1 km east-north-east of the proposed development and is representative of the residential properties in this area. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.
- LT3 – Walnut Tree Farm: This location is approximately 840 m north-north-east of the proposed development and is representative of the residential properties in this area. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.
- LT4 – St James Church: This location is approximately 1 km north of the proposed development and is representative of the church and town hall as well as the wider settlement of West Tilbury. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.
- ST5 – Tilbury Fort: This location is approximately 1.2 km south-west of the proposed development and is representative of the Fort which is controlled by English Heritage and operated as a tourist attraction. It is proposed to undertake short-term noise monitoring at this location during the daytime.
- ST6 – Sandhurst Road: This location is approximately 850 m west of the proposed development and is representative of the residential properties west of Fort Road but nearer to the railway line and existing industrial areas than those properties at Byron Gardens. It is proposed to undertake short-term noise monitoring at this location.

- LT7 – Goshem’s Farm: This location is approximately 1.6 km north east of the proposed development and close to the potential gas connection compound and is representative of the residential properties in the area. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.

2.2.2 Table 2.1 provides a summary of the baseline survey locations and grid co-ordinates of where the survey equipment was positioned. All survey locations are identified in Figure 2.1 overleaf.

**Table 2.1: Survey locations.**

Ref.	Long Term (LT)/ Short- Term (ST)	Representative Address	Coordinates	
			<i>Easting</i>	<i>Northing</i>
LT1	LT	143 Byron Gardens	565355	176550
LT2	LT	Buckland	567531	177202
LT3	LT	Walnut Tree Farm	566753	177610
LT4	LT	St James Church	566129	177695
ST5	ST	Tilbury Fort	564870	175222
ST6	ST	Sandhurst Road	565283	176332
LT7	LT	Goshem's Farm	567819	177511



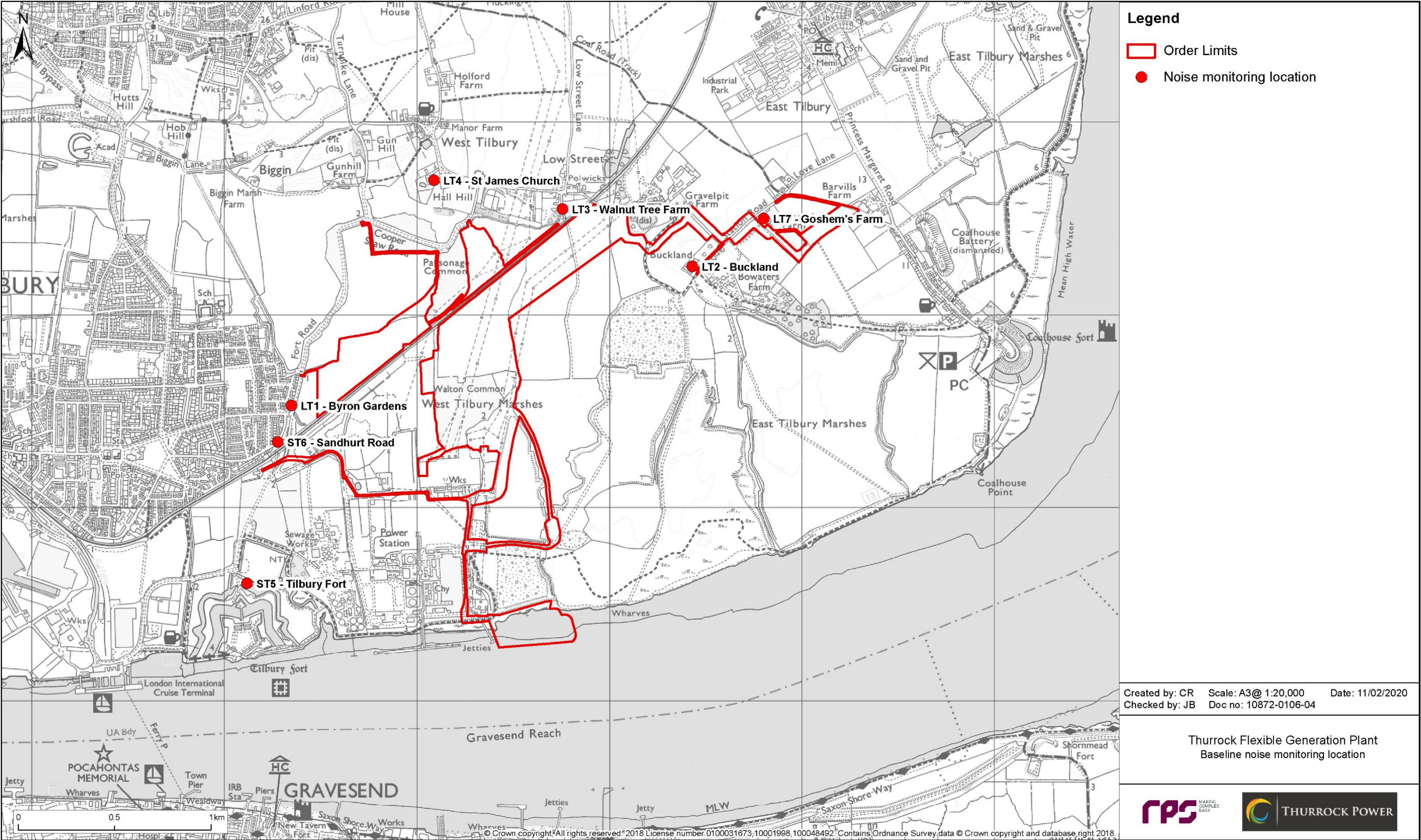


Figure 2.1: Baseline survey locations.



## 2.3 Baseline survey procedure

- 2.3.1 Long term unattended baseline sound level monitoring was undertaken between Thursday 1st and Wednesday 21st February 2018 at five locations in closest proximity to the proposed development. At each long term survey location, concurrent, short-term, attended surveys were carried out during the day (07:00 – 19:00 hours), evening (19:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods. Attended short term surveys were also undertaken at two additional locations.
- 2.3.2 All sound level monitoring was carried out using one of the following 'Class 1' sound level meters (SLM): Rion NL-52, Rion NA-28 or Rion NL-31. Each SLM was checked for calibration prior to and immediately following the survey with no significant deviation found. At the long term monitoring locations, continuous data were logged of the fast time weighted, A-weighted, broadband sound pressure levels in 100 ms periods. Short-term attended survey data were logged of the fast time weighted, A-weighted, broadband sound pressure levels in 15 minute periods.
- 2.3.3 The long term surveys were established during the day and observations made of sources and other conditions in accordance with the requirements of British Standard (BS) 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (British Standards Institution (BSI), 2019). As a minimum, the following noise parameters were recorded;  $L_{Aeq}$ ,  $L_{Amax}$ ,  $L_{A10}$  and  $L_{A90}$ . Third octave band measurements were carried out at all locations, with the exception of ST6, to determine the frequency content of the baseline sound. It is considered that spectral data acquired at LT1 is representative of ST6.
- 2.3.4 In addition to each long term survey location, concurrent attended surveys were carried out during the day (07:00-1900), evening (19:00-23:00) and night-time (23:00-07:00) periods. Short-term attended surveys consisted of the following: three 15 minute discontinuous periods during the daytime; one 15 minute period during the evening; and three 15 minute periods during the night-time.
- 2.3.5 Long term surveys were undertaken following guidance contained in BS 7445 2:1991 'Description and measurement of environmental noise, Part 2: Guide to the acquisition of data pertinent to land use' (BSI, 1991).
- 2.3.6 Meteorological conditions were monitored during the long-term surveys with an unattended weather station installed at LT2. Average wind speeds did not exceed 5 m/s during the survey period. There were no significant periods of precipitation. Some limited light precipitation was recorded on 2nd February 2018 however this did not have a significant influence on the measured sound levels. Therefore no data have been excluded from the dataset due to adverse weather conditions.

- 2.3.7 Meteorological conditions were also measured during each short-term attended measurement using a hand held anemometer.

### **3. Baseline Survey Details and Results**

- 3.1.1 Survey record sheets for each survey location detailing the position of the noise monitors are presented in Annex A. Time histories of the measured sound levels and meteorological conditions during the survey period are presented in Annex B. Results of the short term attended monitoring are presented in Annex C.

## 4. Discussion of Results

### 4.1 Determining representative baseline levels

- 4.1.1 To ascertain the typical sound levels at the measurement locations, time history plots have been produced and presented for each long term monitoring position. These are presented with the summary results tables in Annex B. The summaries of results in Annex B are based on analysis of the measured sound levels processed into 15 minute samples.
- 4.1.2 Representative baseline sound levels will be determined, where possible, from long-term monitoring survey locations. For receptor locations where long-term monitoring was not undertaken, the baseline sound levels will be determined from short-term survey data. The data obtained will be analysed and compared against other datasets in order to obtain a representative baseline sound level.

### 4.2 Operational noise assessment

- 4.2.1 BS 4142:2014+A1:2019 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period because it can be subject to a wide variation in background sound levels between the shoulder night periods. The accompanying note to paragraph 8.1.4 states that:

*"a representative level ought to account for the range of background sounds levels and ought not automatically to be assumed to be either the minimum or modal value".*

- 4.2.2 In determining representative baseline noise levels for receptors identified within the Environmental Statement, it will be necessary to analyse each location individually to ensure the most representative level is considered. BS 4142:2014+A1:2019 states that:

*"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."*

### 4.3 Construction noise assessment

- 4.3.1 To determine the most representative ambient sound levels, the equivalent continuous A-weighted sound pressure level,  $L_{Aeq}$ , will be calculated based on standard construction hours and presented as a logarithmic average of the 15 minute period data over the relevant time periods.

## 5. References

British Standards Institution. British Standard 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound.

British Standards Institution. British Standard 7445-2:1991 Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use.

## Annex A Survey Record Sheets


Location		LT1: 143 Byron Gardens				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
<b>Sound Measurement System</b>						
RPS ID	Manufacturer / Model	Serial Number	Last Lab Verification	Filename	Memory Card ID	
115	Rion NL-52	943366	16/08/2018	Auto_0001		
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	100 ms	25 - 138	Fast	A	Freefield	x
START			END			
Personnel		PB		PB		
Date / time		01/02/2018 14:45		21/02/2018 12:15		
Calibrator	RPS ID	15		15		
	Manufacturer / Model	RION NC-74		RION NC-74		
	Serial Number	110090		110090		
	Date last verification	17/11/2017		17/11/2017		
	Reference level	94		94		
	Meter reading	94		93.8		
Weather	Cloud cover (100%= 8 oktas)	5		4		
	Temperature (degrees Celsius)	9		7		
	Subjective description / additional details	Sunny cold, still, damp ground		6°C		
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Long term in the corner of a garden, adjacent to road, grass between SLM and road						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Road traffic on the main road dominant. Some typical residential sound in wider area but survey location mainly affected by traffic movements. Some wind rattle and aircraft						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Road traffic on the main road dominant. Some typical residential sound in wider area but survey location mainly affected by traffic movements. Some wind rattle and aircraft						

Figure 1: LT1 survey record sheet.


Location		LT2: Buckland				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
<b>Sound Measurement System</b>						
RPS ID	Manufacturer / Model	Serial Number	Last Lab Verification	Filename	Memory Card ID	
116	Rion NL-52	943367	27/01/2017	Auto_0002		
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	100 ms	25 - 138	Fast	A	Freefield	x
START			END			
Personnel		PB		PB		
Date / time		01/02/2018 13:30		21/02/2018 12:00		
Calibrator	RPS ID	15		15		
	Manufacturer / Model	RION NC-74		RION NC-74		
	Serial Number	110090		110090		
	Date last verification	17/11/2017		17/11/2017		
	Reference level	94		94		
	Meter reading	94		94		
Weather	Cloud cover (100%= 8 oktas)	5		4		
	Temperature (degrees Celsius)	9		7		
	Subjective description / additional details	Sunny cold, still, damp ground		6°C		
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Scrub adjacent to dirt road, in farm yard, near to barns						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Wind rustle, metal recycling (continuous), birds, 1 gun shot, occasional aircraft. Industrial noise fairly audible, both from the docks area and nearby metal recycling, otherwise fairly normal rural						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Wind rustle, metal recycling (continuous), birds, occasional aircraft. Industrial noise fairly audible, both from the docks area and nearby metal recycling, otherwise fairly normal rural						

Figure 2: LT2 survey record sheet.




Location		LT3: Walnut Tree Farm				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
<b>Sound Measurement System</b>						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
126	Rion NL-52		164423	13/04/2017	Auto_0003	
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	100 ms	25 - 138	Fast	A	Freefield	x
			<b>START</b>	<b>END</b>		
Personnel			PB		PB	
Date / time			01/02/2018 14:20		21/02/2018 11:45	
Calibrator	RPS ID		15		15	
	Manufacturer / Model		RION NC-74		RION NC-74	
	Serial Number		110090		110090	
	Date last verification		17/11/2017		17/11/2017	
	Reference level		94		94	
	Meter reading		94		93.8	
Weather	Cloud cover (100%= 8 oktas)		5		4	
	Temperature (degrees Celsius)		9		7	
	Subjective description / additional details		Sunny cold, still, damp ground		6°C	
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Garden adjacent to access road						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Soundscape similar to LT2 but a much higher percentage of HGV traffic dominating. Trains are also audible, and metal recycling facility. Regular HGVs to industrial units						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Local roads, continuous from metal recycling, birds						

Figure 3: LT3 survey record sheet.


Location		LT4: St James Church				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
<b>Sound Measurement System</b>						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
113	Rion NL-52		943364	27/01/2017	Auto_0004	
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.2 m	100 ms	25 - 138	Fast	A	Freefield	x
			<b>START</b>	<b>END</b>		
Personnel			PB		PB	
Date / time			01/02/2018 15:25		21/02/2018 11:30	
Calibrator	RPS ID		15		15	
	Manufacturer / Model		RION NC-74		RION NC-74	
	Serial Number		110090		110090	
	Date last verification		17/11/2017		17/11/2017	
	Reference level		94		94	
	Meter reading		94		93.8	
Weather	Cloud cover (100%= 8 oktas)		5		4	
	Temperature (degrees Celsius)		9		7	
	Subjective description / additional details		Sunny cold, still, damp ground		6°C	
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Rear garden area of church. Soft ground in general area and towards site. Church on top of hill and elevated above general area.						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Relatively quiet, distant traffic and industry, some local traffic						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Birds, distant traffic, metal recycling, local traffic						

Figure 4: LT4 survey record sheet.

Location		ST5: Tilbury Fort									
Purpose of Monitoring		Baseline									
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014									
<b>Sound Measurement System</b>											
RPS ID	Manufacturer / Model	Serial Number	Last Lab Verification	Filename	Memory Card ID						
24	RION NL-31	352030	20/11/2017	AUT_0101-0401	-						
Microphone Height	Measurement Interval	Dynamic Range (dB)	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?					
1.5 m	15 min	20 - 110	F	A	Freefield	✓					
<b>START</b>			<b>END</b>								
Personnel			CB		PB						
Date / time			01/02/2018 16:25		02/02/2018 10:11						
Calibrator	RPS ID		15		14						
	Manufacturer / Model		RION NC-74		RION NC-74						
	Serial Number		110090		110118						
	Date last verification		17/11/2017		03/10/2017						
	Reference level		94		94						
	Meter reading		94.0		94.0						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))											
ST5	Path leading to Tilbury fort, grass, docklands to south and west, fort to east and open fields to the north										
1, 2 Day, 3 Evening, 4 Day											
<b>Observations Log</b>											
Measurement + start time	Description of sound environment			Weather							
	(principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)			Wind Speed (m/s)	Wind Direction	Cloud cover (oktas)	Temp. (degrees C)	Relative Humidity (%)	Likely temp. inversion?	Precipitation	Fog
1 16:25	Lorry movements and engine noise, distant traffic and aircraft, distant voices from docklands. Docklands - vehicles movements, reversing alarms, horns			2.5	W	8	6°C	-	·	·	Dry
2 17:21	Distant traffic, wind, water moving, distant aircraft, barges, distant reverse alarm			2.5	W	8	4°C	-	·	Light	Dry
3 21:23	Industry, distant traffic, distant horns			3.0	W	8	4°C	-	·	·	Dry
4 09:56	Distant traffic, port sounds, engines, clanging, alarms etc, distant aircraft			2.0	W	6	2°C	-	·	·	Dry

Figure 5: ST5 survey record sheet.

Location		ST6: Sandhurst Road									
Purpose of Monitoring		Baseline									
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014									
<b>Sound Measurement System</b>											
RPS ID	Manufacturer / Model	Serial Number	Last Lab Verification	Filename	Memory Card ID						
100	RION NA-28	1291243	13/10/2016	MAN_0001	-						
Microphone Height	Measurement Interval	Dynamic Range (dB)	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?					
1.5 m	15 min	20 - 110	F	A	Freefield	✓					
<b>START</b>			<b>END</b>								
Personnel			CB		CB						
Date / time			01/02/2018 15:12		02/02/2018 11:50						
Calibrator	RPS ID		14		14						
	Manufacturer / Model		RION NC-74		RION NC-74						
	Serial Number		110118		110118						
	Date last verification		03/10/2017		03/10/2017						
	Reference level		94		94						
	Meter reading		94.0		94.0						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))											
ST6	Layby off residential street, adjacent to railway and small industrial yard (likely HGV storage), broken concrete/asphalt ground bordered in scrubland.										
1 Day, 2 Evening, 3 4 5 Night, 6 7 Day											
<b>Observations Log</b>											
Measurement + start time	Description of sound environment			Weather							
	(principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)			Wind Speed (m/s)	Wind Direction	Cloud cover (oktas)	Temp. (degrees C)	Relative Humidity (%)	Likely temp. inversion?	Precipitation	Fog
1 17:12	Main road dominant, distant road apparent, distant planes. Train @ +7mins			2.5	W	8	6°C	-	·	Light	·
2 21:45	Distant motorways, very occasional local traffic, railway powerlines hum, Trains @ +2min, +8mins			2.5	W	8	4°C	-	·	·	Dry
3 23:00	Distant motorways, very occasional local traffic, railway powerlines hum			3.0	W	8	4°C	-	·	·	Dry
4 00:08	Distant motorways, very occasional local traffic, railway powerlines hum			2.0	W	8	2°C	-	·	·	Dry
5 01:25	Distant motorways, very occasional local traffic, railway powerlines hum			2.0	W	8	2°C	-	·	·	Dry
6 09:30	Distant road and aircraft, car idling nearby. Scraping (shovels on road surface). Car alarm and train together @+12mins			3.0	W	6	6°C	-	·	·	Dry
7 11:35	Distant roads, occasional local traffic			2.5	W	6	6°C	-	·	·	Dry

Figure 6: ST6 survey record sheet.




Location		LT7: Goshem's Farm				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
<b>Sound Measurement System</b>						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
-	Rion NL-52		510148	-	Auto_0007	
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.2 m	100 ms	25 - 138	Fast	A	Freefield	x
<b>START</b>			<b>END</b>			
Personnel			PB		PB	
Date / time			01/02/2018 13:30		21/02/2018 12:00	
<b>Calibrator</b>	RPS ID		15		15	
	Manufacturer / Model		RION NC-74		RION NC-74	
	Serial Number		110090		110090	
	Date last verification		17/11/2017		17/11/2017	
	Reference level		94		94	
	Meter reading		94		94.2	
<b>Weather</b>	Cloud cover (100%= 8 oktas)		5		4	
	Temperature (degrees Celsius)		9		7	
	Subjective description / additional details		Sunny cold, still, damp ground		6°C	
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Tied to fence, scrubland behind farmhouse						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Wind rustle, metal recycling (continuous), birds, occasional aircraft. Industrial noise fairly audible, and local road traffic more noticeable here. Car repair garage nearby is audible during the daytime						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Wind rustle, metal recycling (continuous), birds, occasional aircraft. Industrial noise fairly audible, and local road traffic more noticeable here. Car repair garage nearby is audible.						

Figure 7: LT7 survey record sheet.

## **Annex B Baseline Survey Results: Summary Tables and Time Histories**

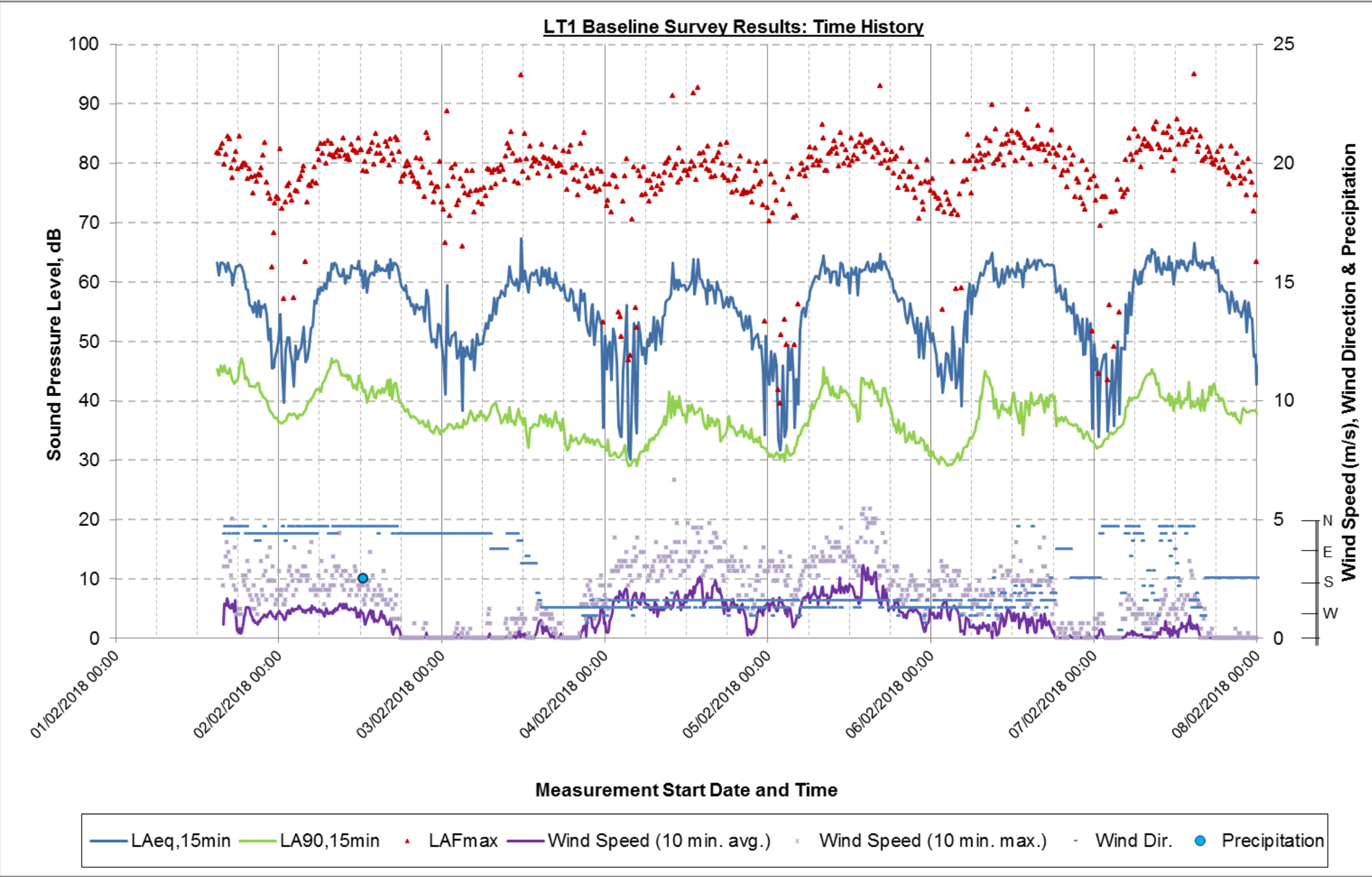


Figure 1: LT1 baseline survey results – time history graph 1

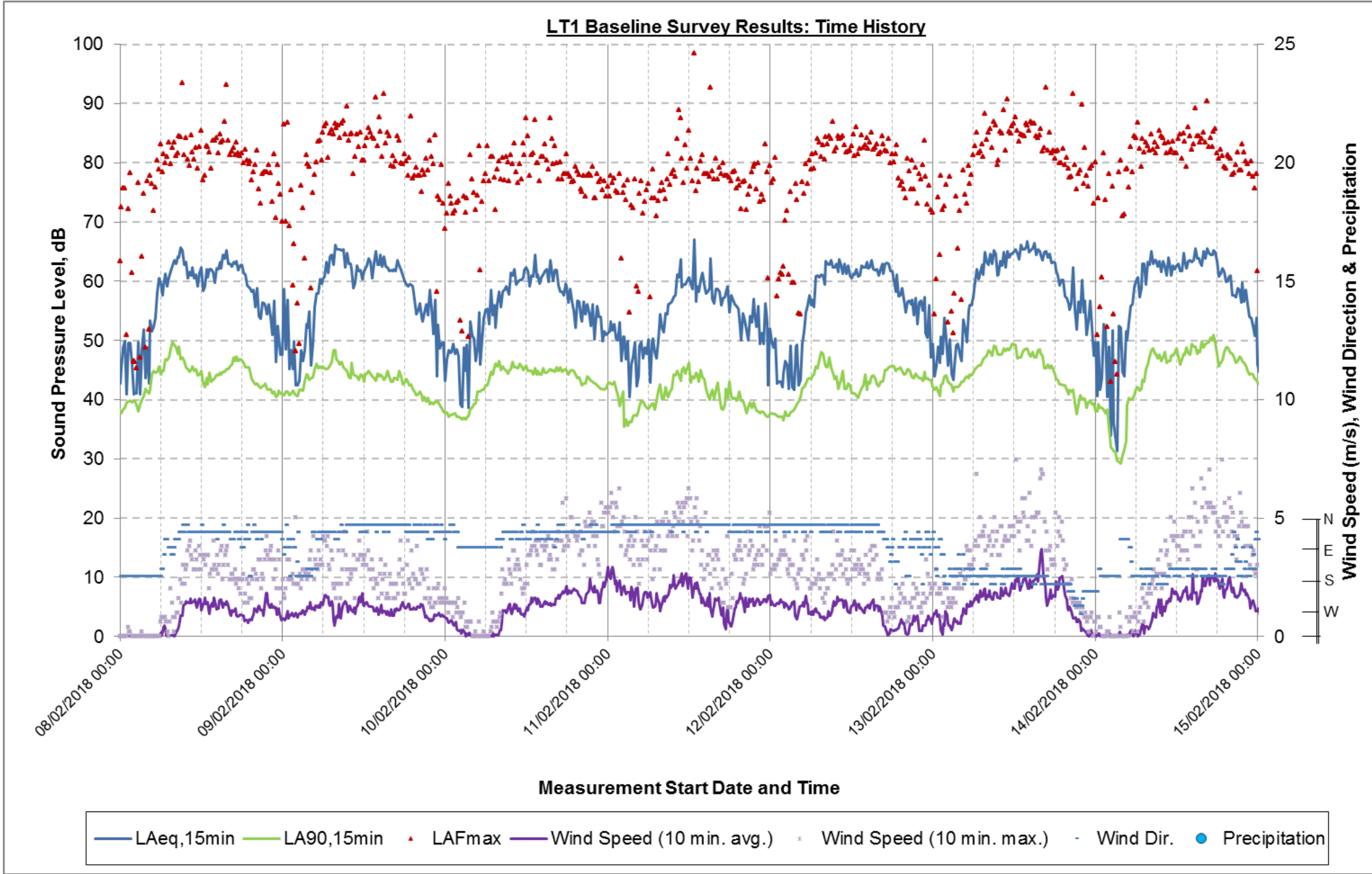


Figure 2: LT1 baseline survey results – time history graph 2

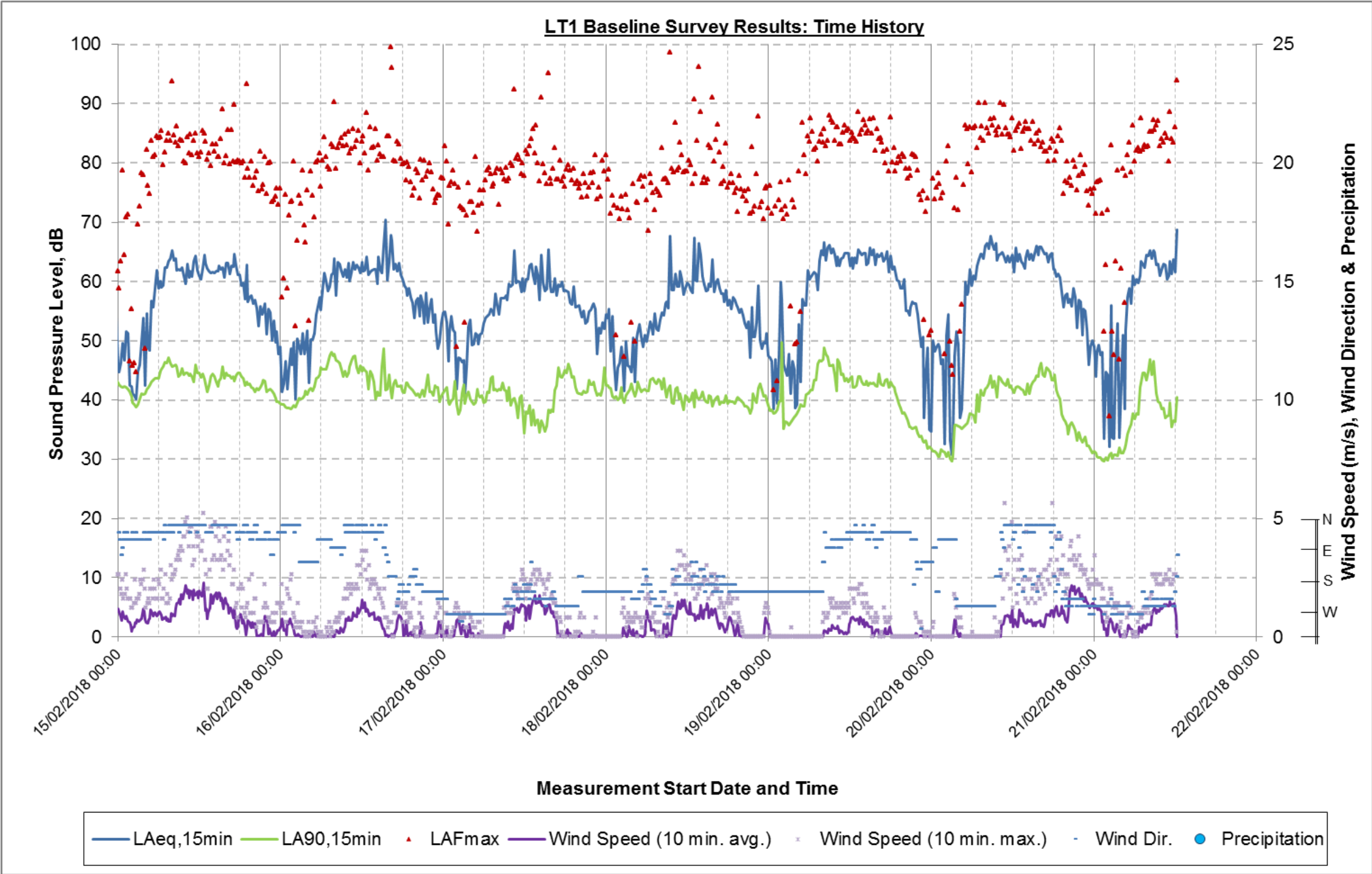


Figure 3: LT1 baseline survey results – time history graph 3



Table 1: LT1 baseline survey results summary.

	Residual sound, dB L <sub>Aeq,T</sub>			Background sound, dB L <sub>A90,T</sub>			Maximum sound, dB L <sub>AFmax,T</sub>		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	47 - 70	44 - 63	30 - 63	32 - 51	33 - 49	29 - 50	71 - 101	58 - 93	37 - 89
25th percentile	60	54	46	40	36	35	80	76	71
Median	62	56	50	43	40	39	82	78	75
75th percentile	63	57	53	45	42	42	84	80	79
Arithmetic Average	61	55	49	43	39	38	82	78	72
Standard deviation	3	3	6	4	4	4	4	3	10

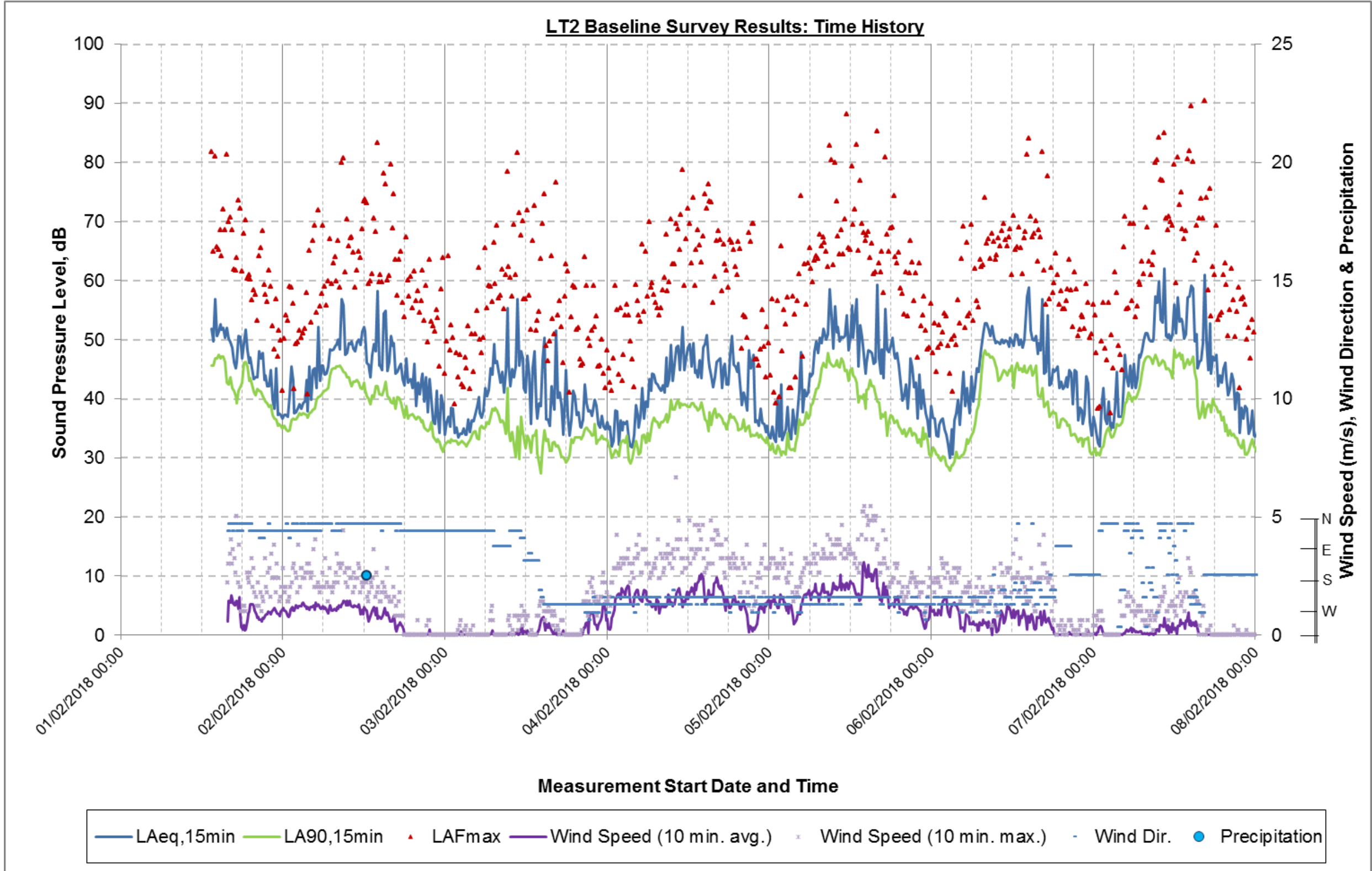


Figure 4: LT2 baseline survey results – time history graph 1

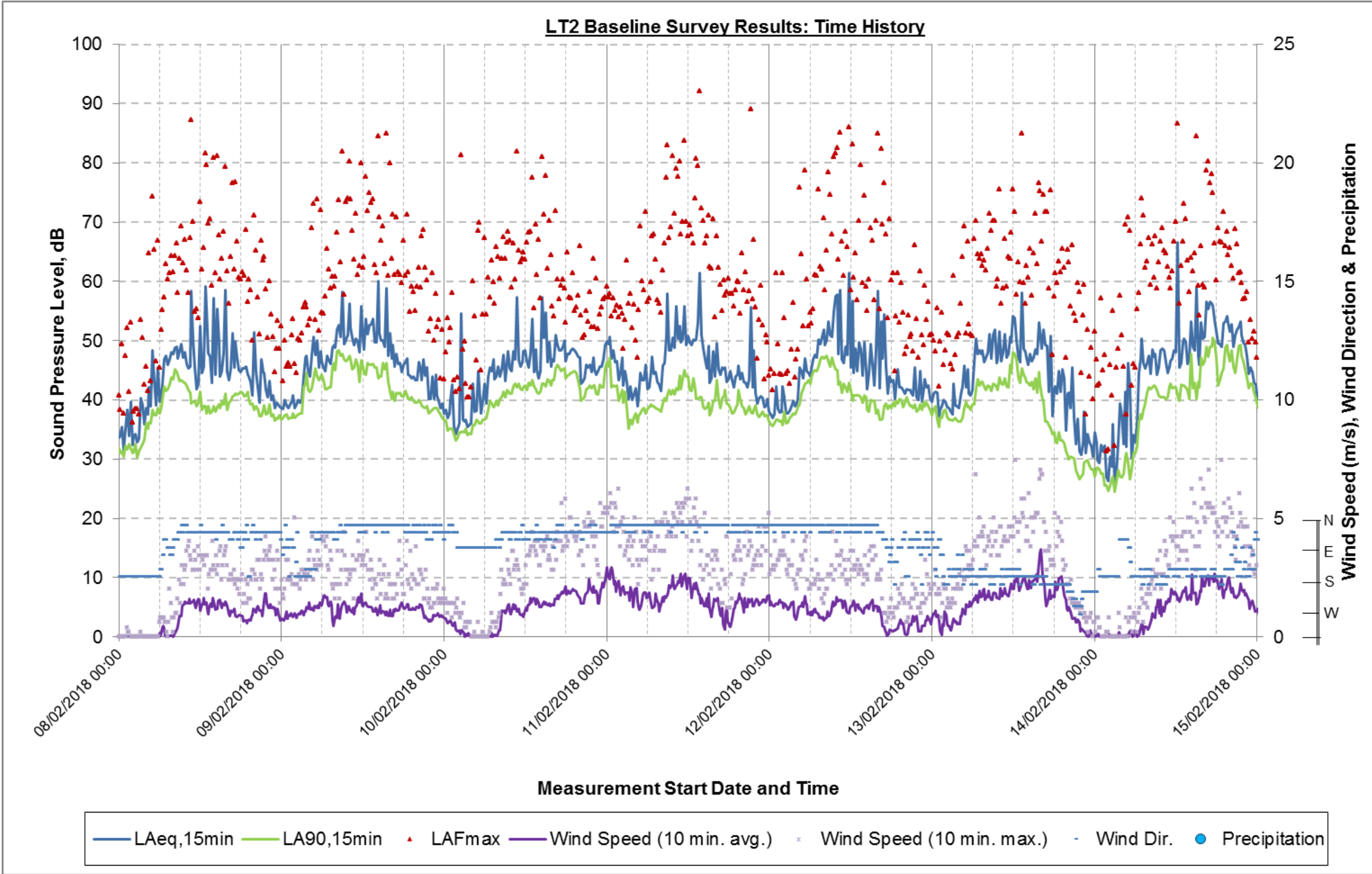


Figure 5: LT2 baseline survey results – time history graph 2



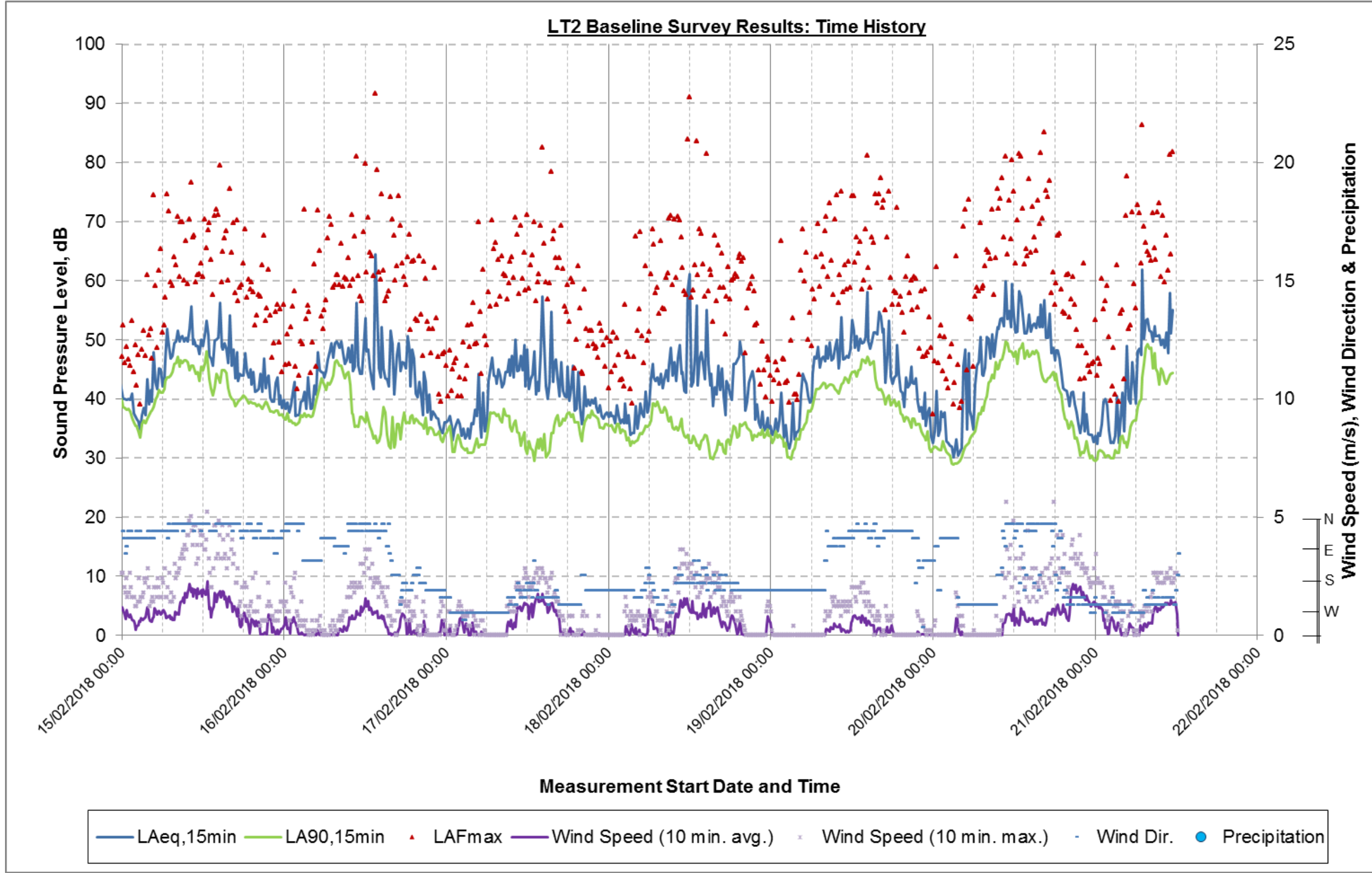


Figure 6: LT2 baseline survey results – time history graph 3

Table 2: LT2 baseline survey results summary.

	Residual sound, dB L <sub>Aeq,T</sub>			Background sound, dB L <sub>A90,T</sub>			Maximum sound, dB L <sub>AFmax,T</sub>		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	34 - 68	31 - 56	26 - 55	27 - 51	27 - 49	25 - 47	41 - 99	38 - 89	31 - 81
25th percentile	45	39	35	38	34	32	61	52	46
Median	48	42	39	42	36	35	65	57	51
75th percentile	51	45	42	45	39	38	70	61	57
Arithmetic Average	48	42	39	41	37	35	66	57	52
Standard deviation	5	4	5	5	4	4	8	6	9

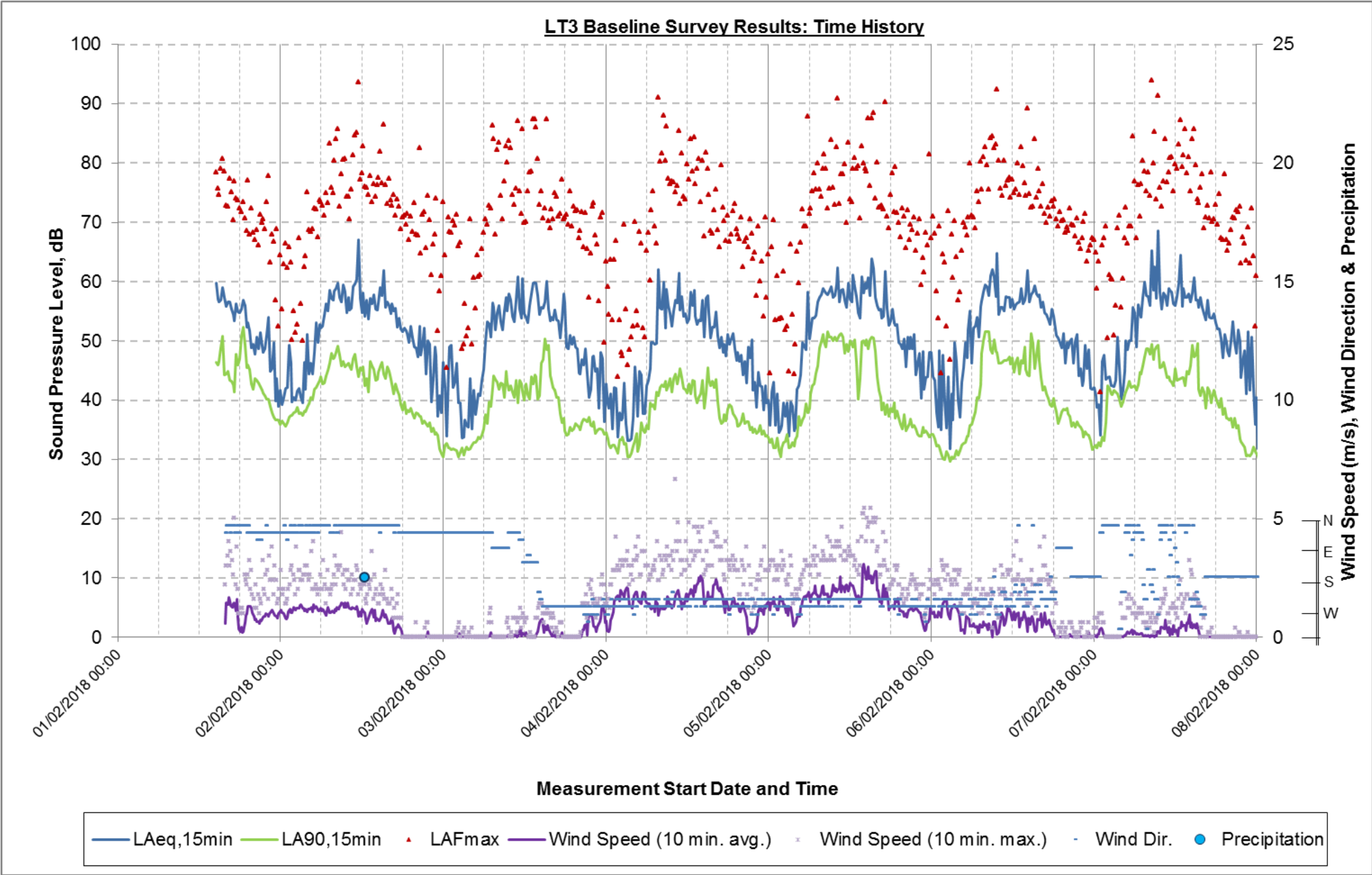


Figure 7: LT3 baseline survey results – time history graph 1

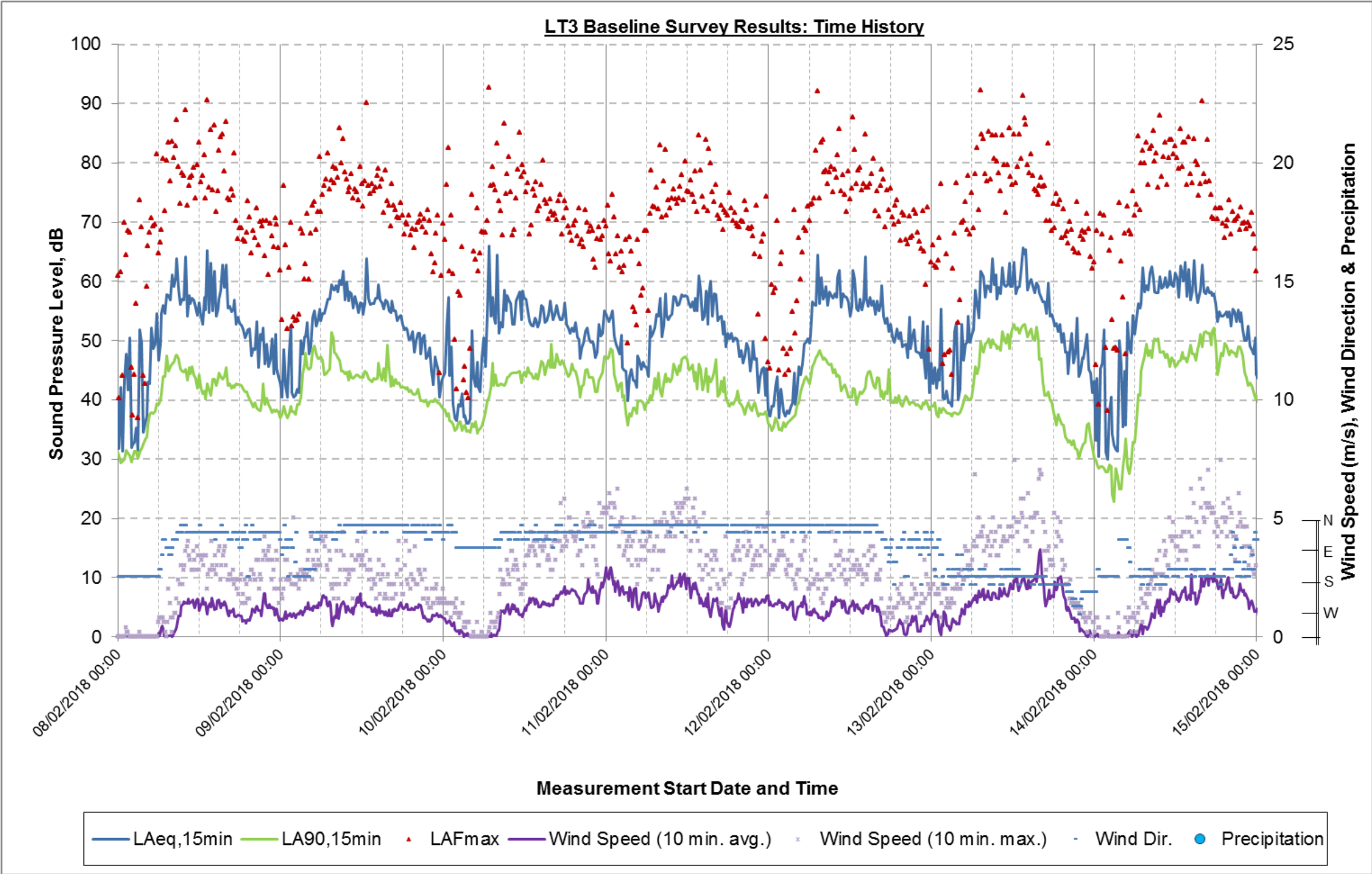


Figure 8: LT3 baseline survey results – time history graph 2



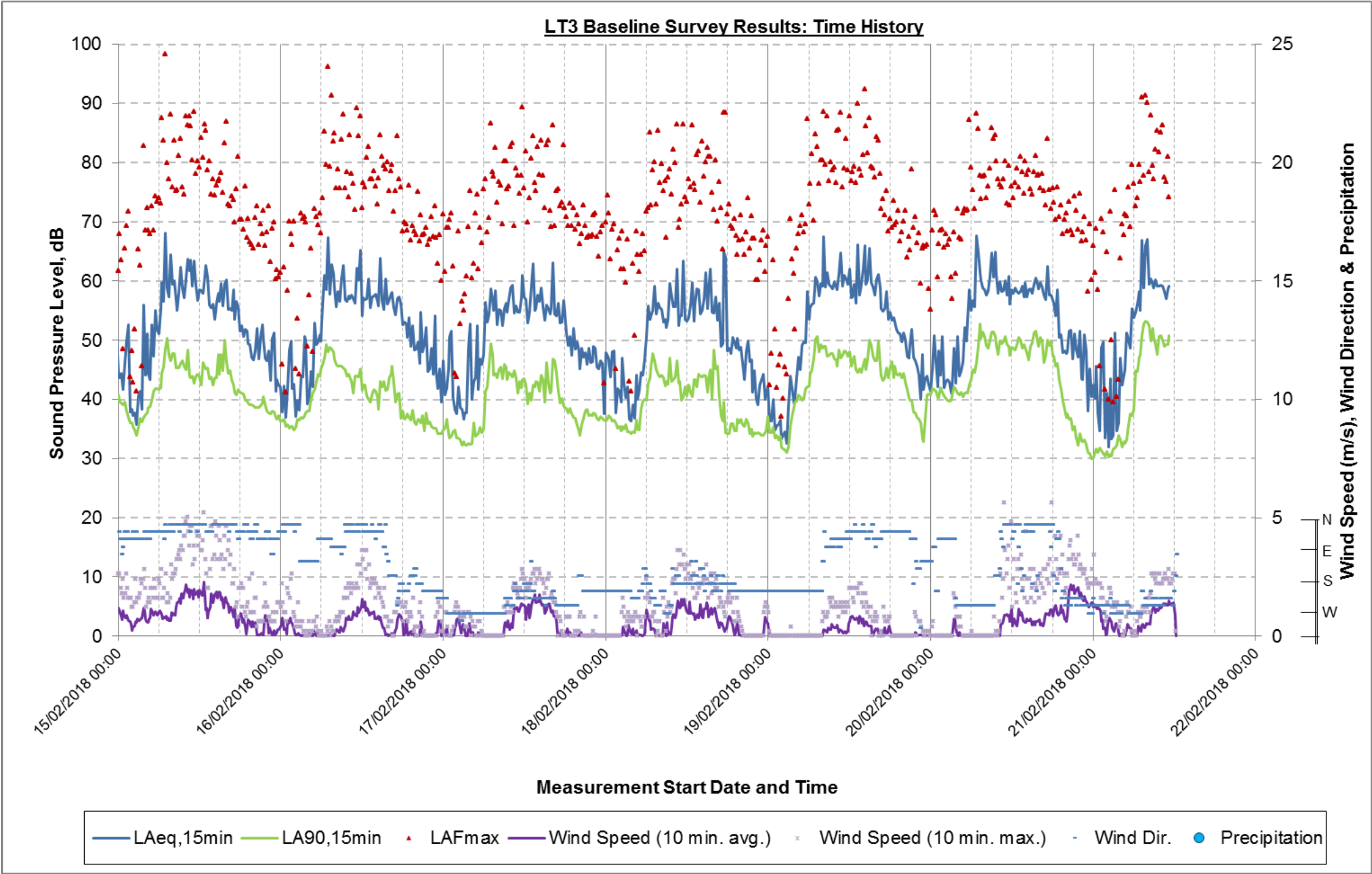


Figure 9: LT3 baseline survey results – time history graph 3

Table 3: LT3 baseline survey results summary.

	Residual sound, dB L <sub>Aeq,T</sub>			Background sound, dB L <sub>A90,T</sub>			Maximum sound, dB L <sub>AFmax,T</sub>		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	48 - 80	39 - 55	30 - 68	34 - 53	30 - 50	23 - 49	65 - 104	55 - 83	37 - 93
25th percentile	55	47	40	42	36	33	74	67	57
Median	57	49	44	45	38	37	77	69	66
75th percentile	59	51	50	48	40	40	81	71	70
Arithmetic Average	57	49	45	45	38	37	78	69	64
Standard deviation	3	3	6	4	4	5	5	3	10

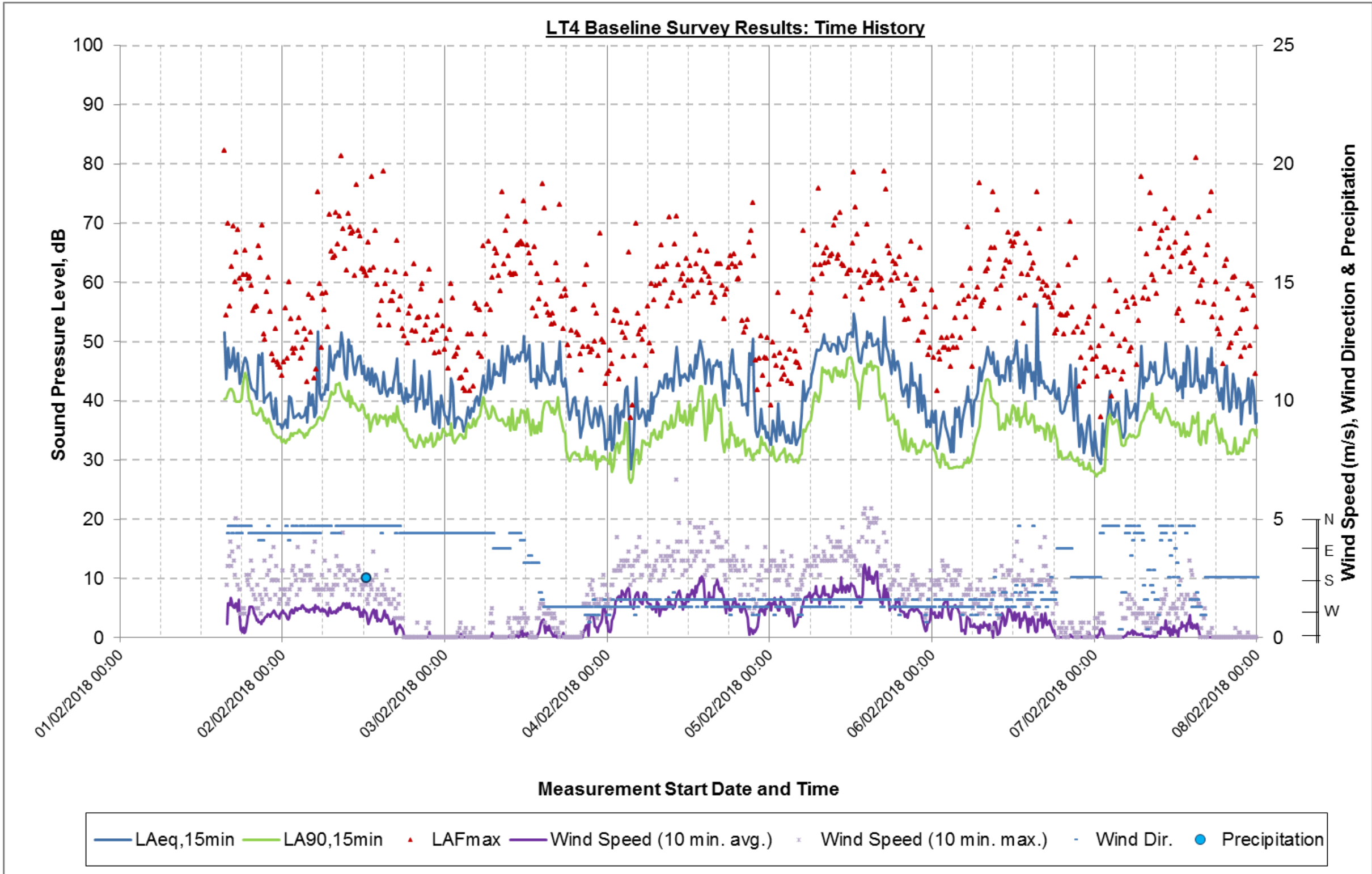


Figure 10: LT4 baseline survey results – time history graph 1

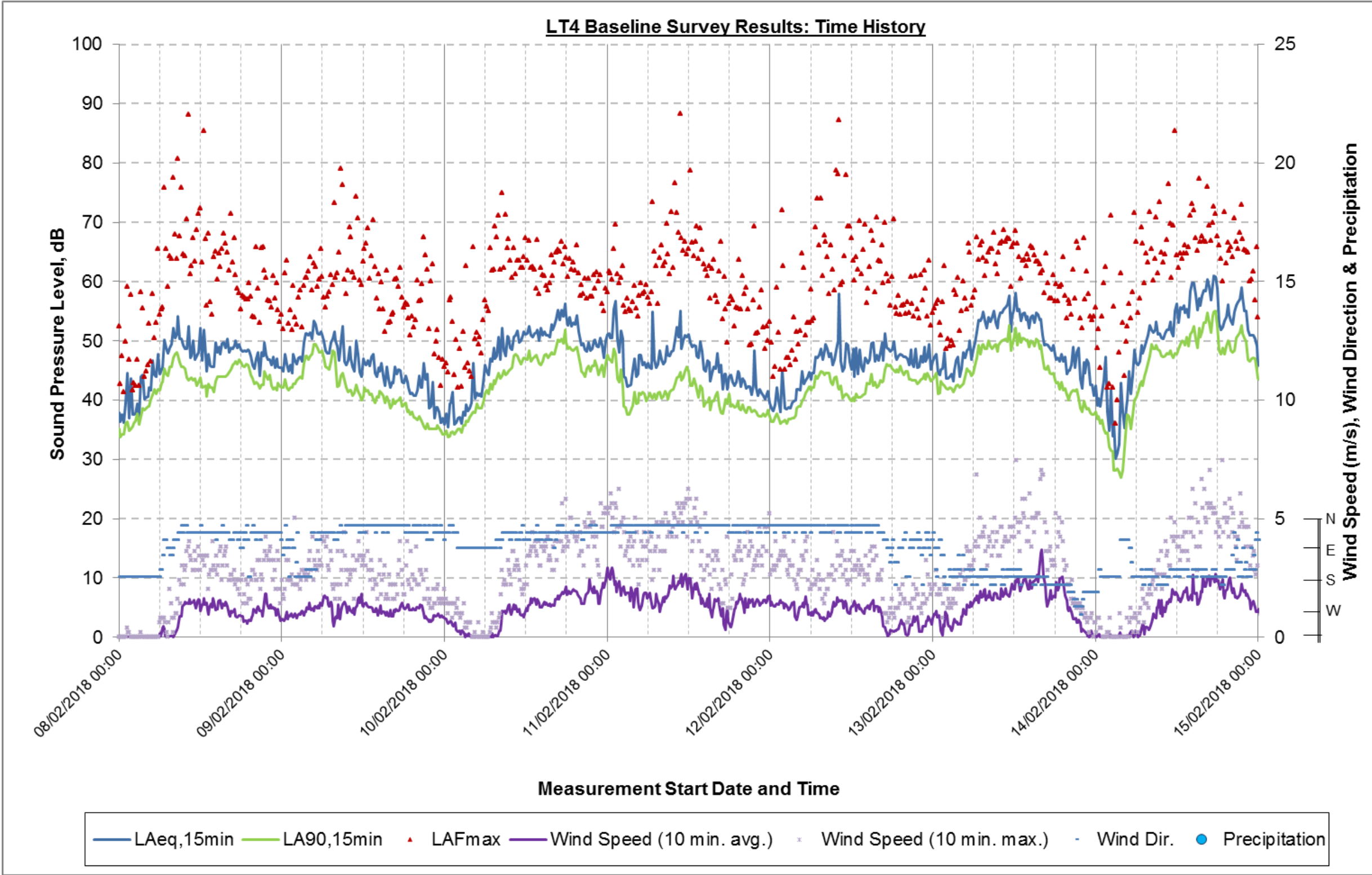


Figure 11: LT4 baseline survey results – time history graph 2



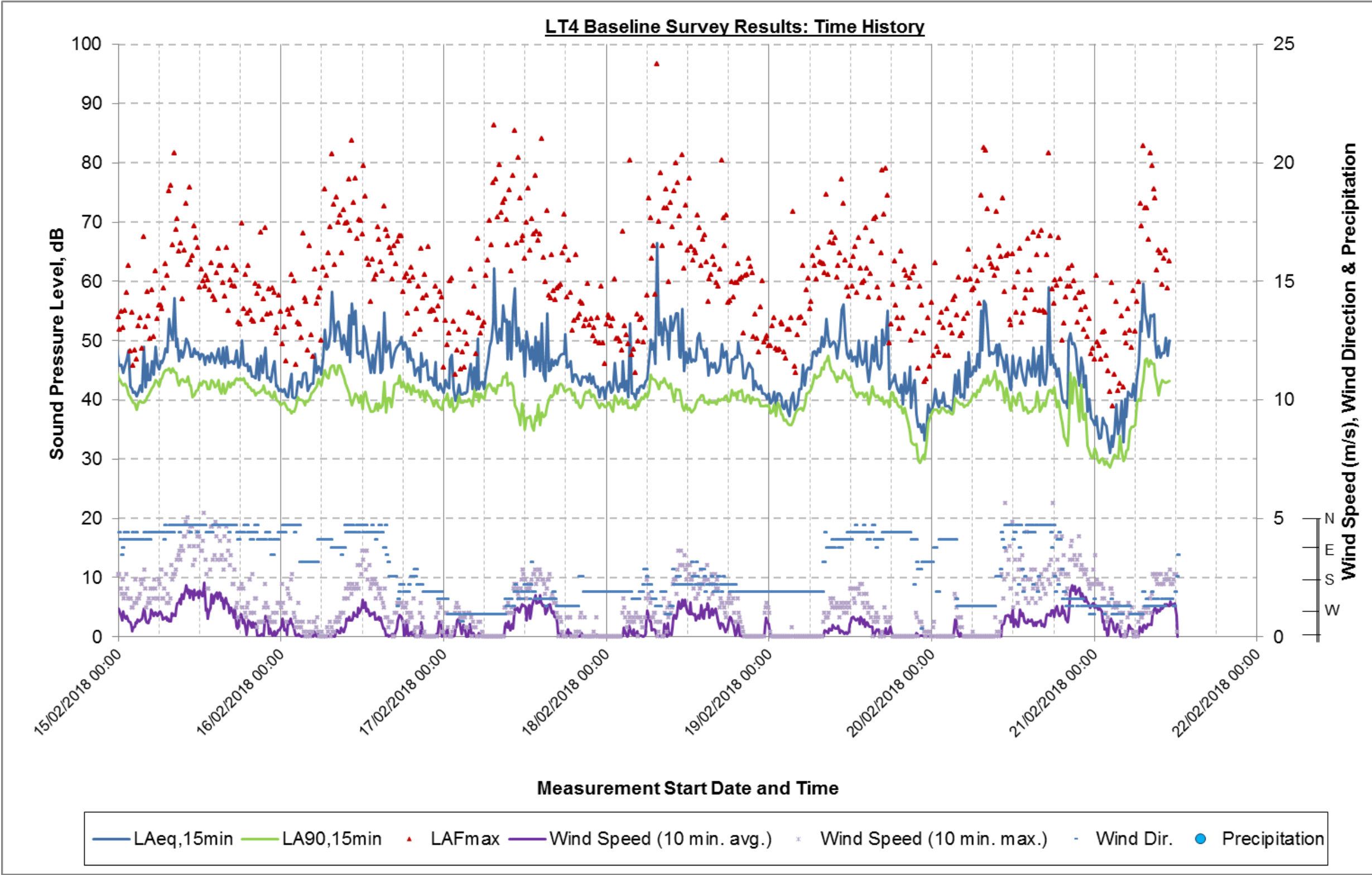


Figure 12: LT4 baseline survey results – time history graph 3

Table 4: LT4 baseline survey results summary.

	Residual sound, dB L <sub>Aeq,T</sub>			Background sound, dB L <sub>A90,T</sub>			Maximum sound, dB L <sub>AFmax,T</sub>		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	37 - 66	31 - 59	29 - 57	30 - 55	28 - 53	26 - 50	48 - 97	42 - 73	36 - 80
25th percentile	45	41	38	39	33	34	60	53	48
Median	48	44	41	41	39	38	64	57	53
75th percentile	50	47	45	44	42	41	68	61	58
Arithmetic Average	48	44	41	42	38	37	64	57	53
Standard deviation	4	5	5	4	6	5	7	6	7

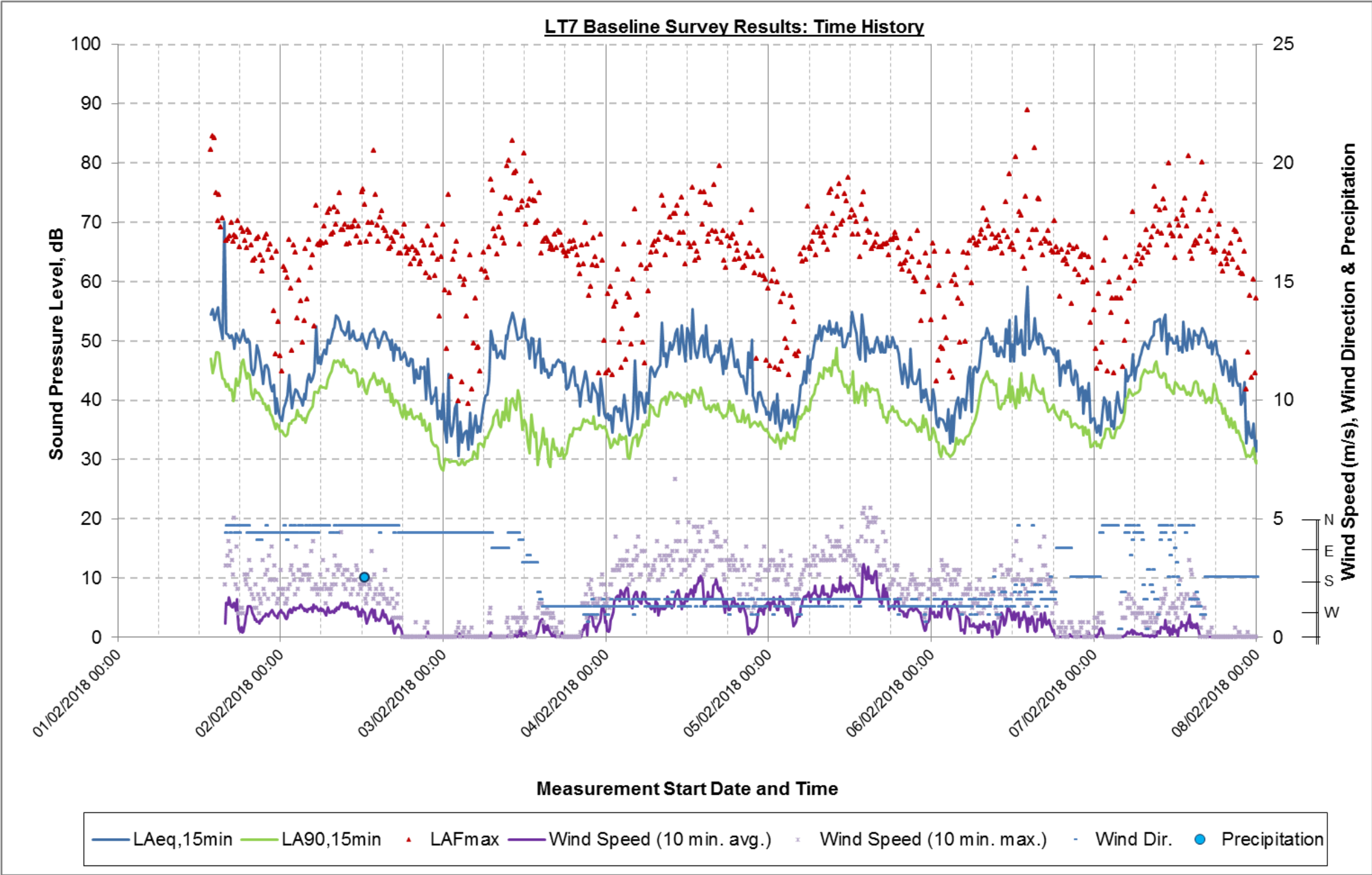


Figure 13: LT7 baseline survey results – time history graph 1

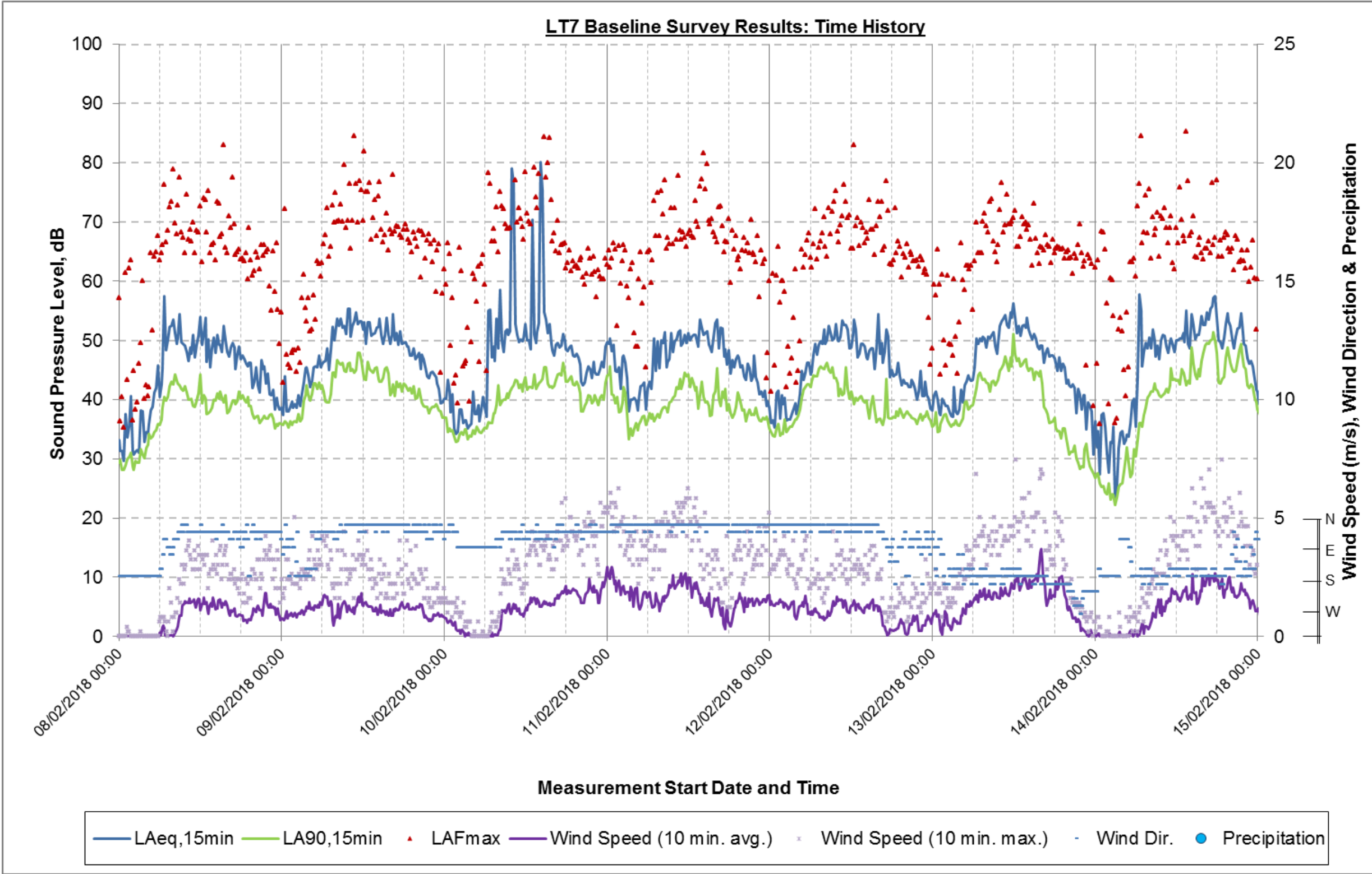


Figure 14: LT7 baseline survey results – time history graph 2



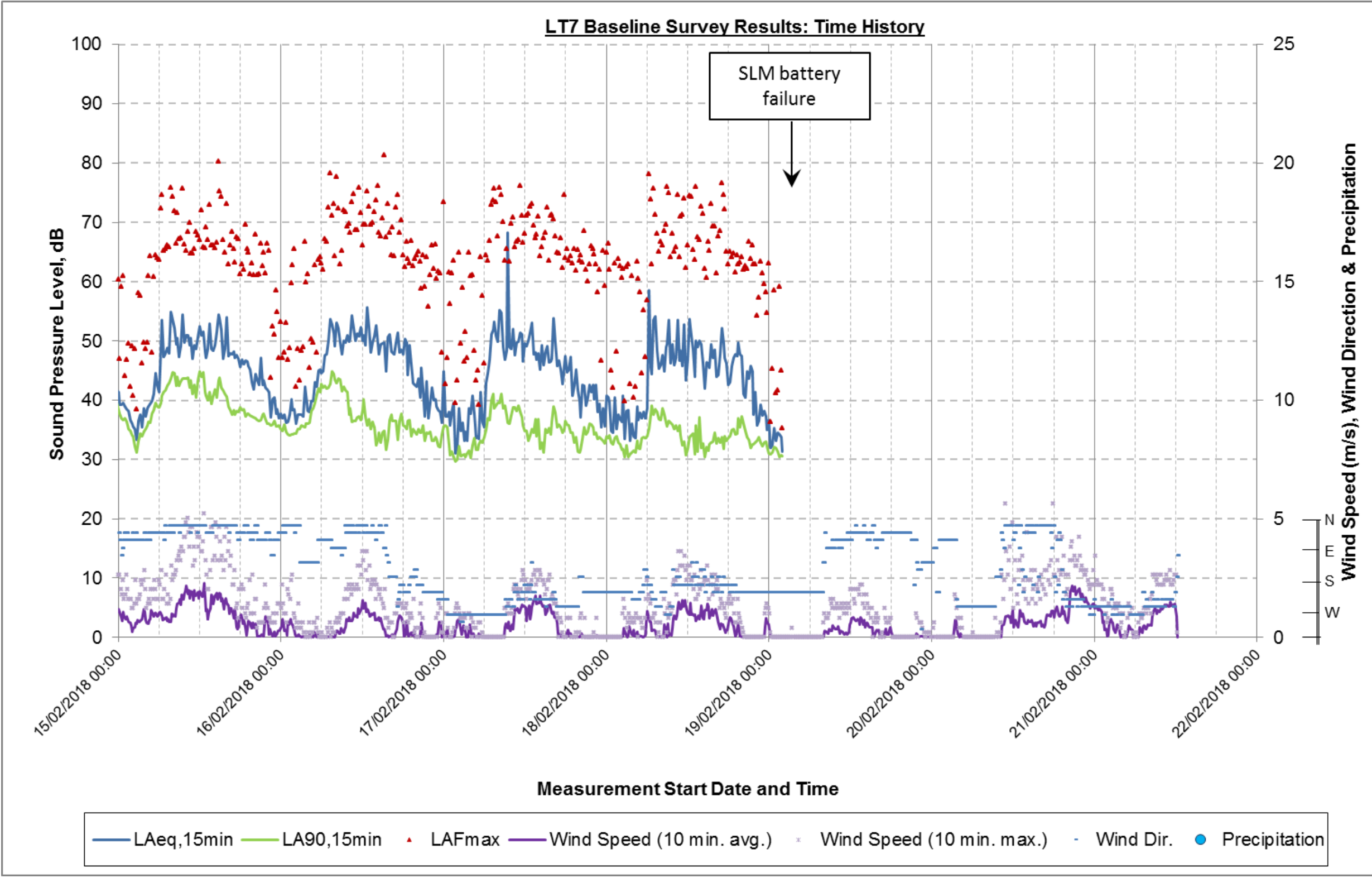


Figure 15: LT7 baseline survey results – time history graph 3

Table 5: LT7 baseline survey results summary.

	Residual sound, dB L <sub>Aeq,T</sub>			Background sound, dB L <sub>A90,T</sub>			Maximum sound, dB L <sub>AFmax,T</sub>		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	42 - 80	33 - 55	24 - 59	29 - 51	28 - 50	22 - 46	60 - 118	42 - 72	35 - 85
25th percentile	48	42	37	38	35	32	66	62	49
Median	50	44	39	41	37	35	69	64	59
75th percentile	51	46	42	43	38	37	72	66	64
Arithmetic Average	50	44	39	41	37	35	70	64	56
Standard deviation	3	3	5	4	3	4	6	4	9

## **Annex C Baseline Survey Results: Short Term Attended Measurements**

Table 1: Short term attended measurements – LT1 Byron Gardens.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms <sup>-1</sup>	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A10</sub>	L <sub>A50</sub>	L <sub>A90</sub>		
01/02/2018 16:47	2	W	7	60	4	1	2	4	1	67	88	71	53	45	0	Occasional but regular traffic on adjacent on Fort Road dominant and cause of L <sub>Amax</sub> levels (high % HGVs). Distant traffic audible. Distant industry audible.
01/02/2018 21:23	2	W	4	60	8	1	2	4	1	57	83	51	43	41	0	Very occasional but regular traffic on adjacent on Fort Road dominant and cause of L <sub>Amax</sub> levels (high % HGVs). Distant traffic, v. distant sirens and port activity, v. occasional local traffic, fence rattling. Train @ +5mins. Distant industry.
01/02/2018 23:01	3	W	5	60	6	1	2	3	3	46	69	50	40	38	0	Distant traffic, distant reverse alarm from port, distant aircraft, 2 trains, 1 passenger 1 long freight. Distant industry.
02/02/2018 00:08	3	W	5	60	3	1	2	3	3	45	73	42	38	37	0	Occasional freight train cause of L <sub>Amax</sub> levels. Distant traffic, distant aircraft. Distant industry.
02/02/2018 01:14	2	W	4	60	2	1	2	3	3	49	75	50	40	38	0	Wind, distant traffic, 2 freight trains cause of L <sub>Amax</sub> levels. Distant industry.
02/02/2018 10:26	3	W	6	60	6	1	2	4	1	59	80	59	48	44	0	Occasional but regular traffic on adjacent Fort Road dominant and cause of L <sub>Amax</sub> levels (high % HGVs). Wind rustle, distant aircraft, trains, local traffic, distant and local HGVs. Distant industry.
02/02/2018 11:30	3	W	6	60	7	1	2	4	1	61	81	60	47	42	0	Occasional but regular traffic on adjacent Fort Road dominant and cause of L <sub>Amax</sub> levels (high % HGVs). Road traffic local and distant, greater proportion of HGVs, voices, distant industry and aircraft, birds

\*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.1 Daytime ambient levels at LT1 were dominated by local road traffic movements on Fort Road, including a high percentage of HGVs. Night-time ambient levels were dominated by local road traffic movements and rail movements. Daytime and night-time background levels were primarily affected by distant traffic and industry. Daytime and night-time maxima affected by local road traffic and/or train movements.



Table 2: Short term attended measurements – LT2 Buckland.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms <sup>-1</sup>	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L <sub>Aeq</sub>	L <sub>AFmax</sub>	L <sub>A10</sub>	L <sub>A50</sub>	L <sub>A90</sub>		
01/02/2018 15:43	2	W	7	60	4	2	2	4	2	52	74	56	50	45	0	Metal recycling continuous, birds, vegetation
01/02/2018 22:12	2	W	4	60	8	1	2	3	1	46	68	49	43	41	0	Distant traffic, vegetation movement
01/02/2018 23:41	3	W	5	60	5	1	2	3	1	42	65	43	40	38	0	Distant traffic, vegetation movement
02/02/2018 00:49	3	W	5	60	2	1	2	3	1	39	58	40	37	36	0	Vegetation movement
02/02/2018 02:05	3	W	3	60	2	1	2	3	1	43	63	45	42	40	0	Vegetation movement
02/02/2018 11:08	3.5	W	6	60	6	2	2	4	2	53	66	56	51	47	0	Metal recycling continuously audible, distant traffic, vegetation

\*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.2 Daytime ambient levels at LT2 were primarily affected by local farming activity, occasional aircraft overhead and to some extent distant industry (metals recycling facility located on Station Road). Night-time ambient levels were primarily affected by distant traffic and industry. Daytime and night-time background levels were primarily affected by distant traffic and industry, and wind in flora. Daytime and night-time maxima affected by local road traffic and/or train movements.

Table 3: Short term attended measurements – LT3 Walnut Tree Farm.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms <sup>-1</sup>	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A10</sub>	L <sub>A50</sub>	L <sub>A90</sub>		
01/02/2018 16:34	2	W	7	60	4	2	1	4	1	56	76	60	46	41	0	Local road traffic on Church Road dominant with high % HGVs. Distant aircraft, birds. Quiet when traffic is low
01/02/2018 22:30	3	W	5	60	6	2	1	3	2	52	74	49	40	38	0	Occasional local road traffic movements (cars) on Church Road. Distant traffic, some local traffic, wind rustle, distant aircraft and industry
01/02/2018 23:21	3	W	5	60	6	1	1	3	2	52	78	41	38	37	0	Occasional local road traffic movements (cars) on Church Road. Distant traffic, v. occasional local traffic, vegetation movement. Train @ +2mins
02/02/2018 00:29	3	W	5	60	3	1	1	3	2	48	72	45	37	36	0	Occasional local road traffic movements (cars) on Church Road. Distant traffic, v. occasional local traffic, vegetation movement
02/02/2018 01:44	2	W	4	60	2	1	1	3	2	40	65	42	39	38	0	Occasional local road traffic movements (cars) on Church Road. Vegetation movement
02/02/2018 10:49	3	W	6	60	6	2	1	4	1	63	82	67	52	48	0	Local road traffic on Church Road dominant with high % HGVs. Road adjacent fairly busy, cars and HGVs. Traffic dominant

\*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.3 Daytime ambient levels at LT3 were dominated by local road traffic movements on Church Road, including a high percentage of HGVs. Night-time ambient levels were dominated by local road traffic movements on Church Road and rail movements. Daytime and night-time background levels were primarily affected by distant traffic and industrial sources. Daytime and night-time maxima affected by local road traffic on Church Road and/or train movements.

Table 4: Short term attended measurements – LT4 St James' Church.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms <sup>-1</sup>	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A10</sub>	L <sub>A50</sub>	L <sub>A90</sub>		
01/02/2018 16:51	3	W	5	60	7	1	2	3	1	58	78	54	46	43	0	Distant traffic and aircraft, birds, occasional local traffic on Church Road
01/02/2018 21:51	2	W	4	60	8	1	2	2	1	45	61	46	44	42	0	Distant traffic, wind rustle, dog bark
01/02/2018 23:22	3	W	5	60	5	1	2	2	1	47	72	48	40	39	0	Fox, distant traffic, wind
02/02/2018 00:29	3	W	5	60	3	1	2	2	1	42	73	41	38	37	0	Distant traffic, v. distant industry
02/02/2018 01:47	2	W	4	60	2	1	2	2	1	43	74	42	40	39	0	Wind, light distant traffic
02/02/2018 10:45	3	W	6	60	6	1	2	3	1	58	78	57	47	45	0	Wind rustle, local on Church Road and distant traffic, birds, distant aircraft
02/02/2018 11:51	3	W	6	60	7	1	2	3	1	59	77	59	48	44	0	Wind rustle, local on Church Road and distant traffic, birds, distant aircraft

\*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.4 Daytime ambient levels at LT4 were primarily affected by local road traffic movements on Church Road and occasional aircraft. Night-time ambient levels were primarily affected by local and distant road traffic movements. Daytime and night-time background levels were primarily affected by distant traffic and industrial sources, and wind in flora. Daytime and night-time maxima affected by local road traffic and/or aircraft.

Table 5: Short term attended measurements – LT5 Tilbury Fort.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms <sup>-1</sup>	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A10</sub>	L <sub>A50</sub>	L <sub>A90</sub>		
01/02/2018 16:23	2	W	7	60	4	2	1	2	1	52	65	54	52	50	0	Largely distant road traffic, distant aircraft, distant voices, fence rattle with wind. Train @ +13mins
01/02/2018 17:21	2	W	6	60	8	2	1	2	1	52	69	53	52	50	0	Distant traffic, distant reverse alarm, wind, water, distant aircraft, barges
02/02/2018 09:55	3	W	6	60	6	2	1	2	1	52	66	54	51	49	0	Distant traffic and aircraft, port activity: engines, clanging, alarms

\*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.5 Daytime ambient and background levels at ST5 were primarily affected by local activity, distant traffic and industry. Daytime maxima affected by local activity and/or aircraft.

Table 6: Short term attended measurements – LT6 Sandhurst Road.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms <sup>-1</sup>	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L <sub>Aeq</sub>	L <sub>AFmax</sub>	L <sub>A10</sub>	L <sub>A50</sub>	L <sub>A90</sub>		
01/02/2018 17:10	3	W	5	60	7	2	1	4	1	50	66	53	47	45	0	Roads dominant, local and distant, distant aircraft, train @+7mins.
01/02/2018 21:44	2	W	4	60	8	2	1	4	1	50	73	51	44	43	0	Distant traffic, occasional local traffic on Sandhurst Road close to survey location and Fort Road, railway power lines humming. Train @ +2mins, +8mins.
01/02/2018 22:59	3	W	5	60	6	2	1	3	3	57	90	59	42	41	0	Distant traffic, occasional local traffic on Sandhurst Road close to survey location and Fort Road, railway power lines humming.
02/02/2018 00:06	3	W	5	60	4	2	1	2	3	41	68	42	40	39	0	Distant traffic, railway power lines humming.
02/02/2018 01:23	2	W	4	60	2	2	1	2	3	50	70	48	41	40	0	Railway power lines humming.
02/02/2018 10:26	3	W	6	60	6	2	1	4	1	53	71	55	47	45	0	Distant roads and aircraft, car idling nearby. Car alarm and train together @ +12mins.
02/02/2018 11:31	3	W	6	60	7	2	1	4	1	52	77	54	47	44	0	Distant roads and aircraft, occasional local traffic on Sandhurst Road close to survey location and Fort Road.

\*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.6 Daytime ambient levels at ST6 were dominated by local road traffic movements on Fort Road, including a high percentage of HGVs. Night-time ambient levels were dominated by local road traffic movements and rail movements. Daytime and night-time background levels were primarily affected by distant traffic and industrial sources. Daytime and night-time maxima affected by local road traffic and/or train movements.

Table 7: Short term attended measurements – LT7 Goshem's Farms.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms <sup>-1</sup>	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L <sub>Aeq</sub>	L <sub>AFmax</sub>	L <sub>A10</sub>	L <sub>A50</sub>	L <sub>A90</sub>		
01/02/2018 16:14	2	W	7	60	4	2	2	3	2	51	68	54	47	43	0	Metal recycling audible, local traffic, distant aircraft, birds
01/02/2018 22:10	2	W	4	60	8	1	2	2	2	50	76	48	40	38	0	Distant traffic, wind, distant industry (not metal recycling)
01/02/2018 23:44	3	W	5	60	4	1	2	2	2	44	73	45	40	37	0	Distant traffic, wind, distant industry(not metal recycling)
02/02/2018 00:52	2	W	4	60	2	1	2	2	2	39	65	40	36	34	0	Distant traffic, wind, distant industry (not metal recycling), distant train
02/02/2018 02:07	3	W	3	60	2	1	2	2	2	43	69	45	40	37	0	Distant traffic and industry (not metal recycling), wind
02/02/2018 11:07	3.5	W	6	60	6	2	2	3	2	60	83	57	48	44	0	Local traffic on Station Road (cause of LAmax levels) and metal recycling: metal clanging, reverse alarm. Distant traffic and aircraft, birds, trains
02/02/2018 12:11	3	W	6	60	8	2	2	3	2	62	84	60	48	44	0	Local traffic on Station Road (cause of LAmax levels) and metal recycling: metal clanging, reverse alarm. Distant traffic and aircraft, birds, trains

\*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.7 Daytime ambient levels at LT7 were primarily affected by local road traffic movements on Station Road, local commercial activity (vehicle service centre), and to some extent distant industry (metals recycling facility located on Station Road). Night-time ambient levels were dominated by local road traffic movements and rail movements. Daytime and night-time background levels were primarily affected by distant traffic and industrial sources, and wind in flora. Daytime and night-time maxima affected by local road traffic movements.




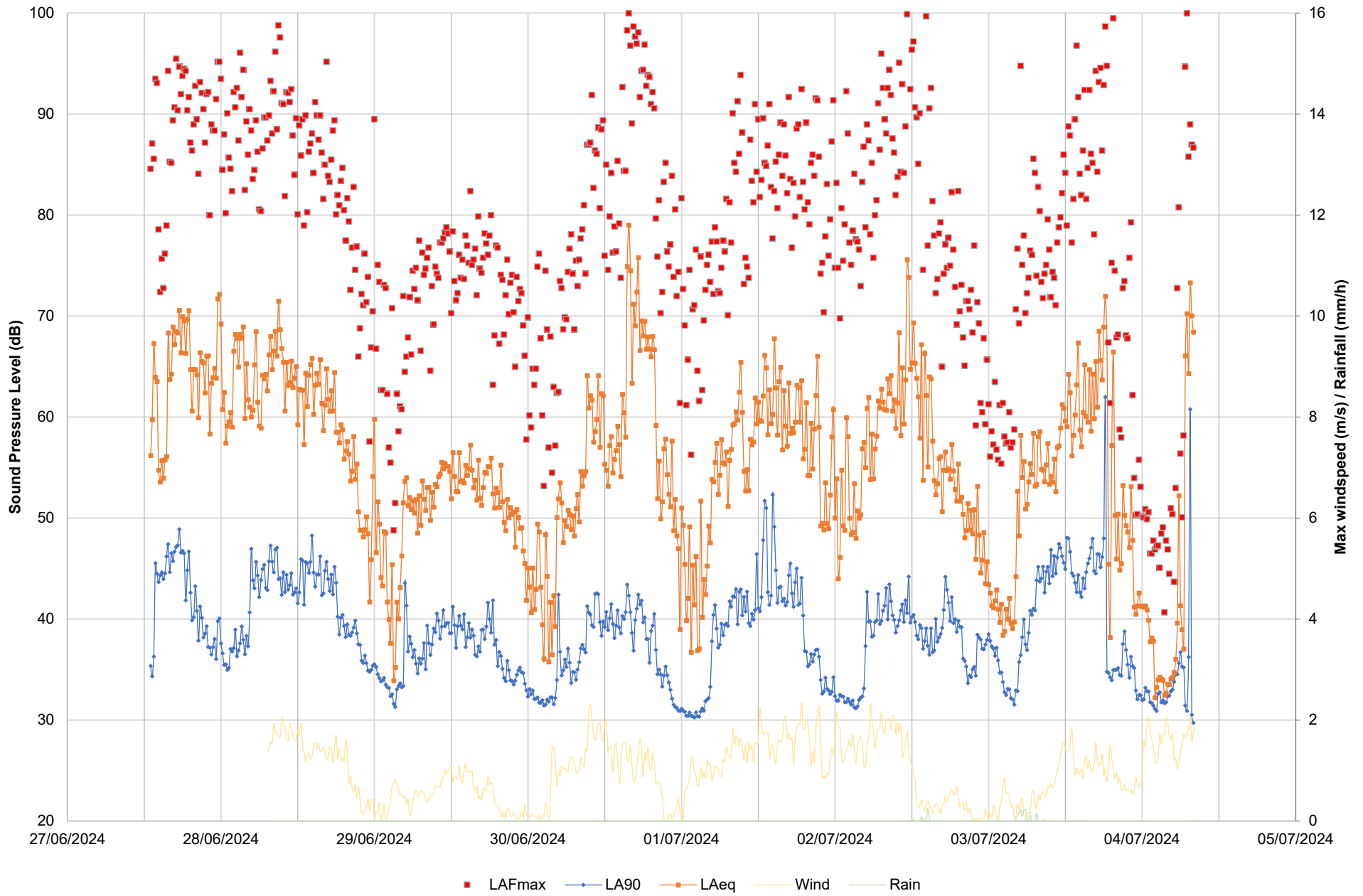


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# Appendix C: 2024 Baseline Data

## Sound Level Survey Record

Project Name and Number		Thurrock	
Location		LT1	
Purpose of Monitoring		Baseline	
Relevant Guidance / Standard		BS 4142:2014	
<b>Sound Measurement System</b>			
ID	Manufacturer / Model	Serial Number	Last Lab Verification
-	Convergence		17/02/2023
Microphone Height	Façade / Freefield	Measurement Interval	Filename
1.5	Free	125 ms	1
		<b>START</b>	<b>END</b>
Personnel		PB	JT
Date / time		27/06/2024 13:00	04/07/2024 08:00
Call brat	Reference level	94.0	94.0
	Meter reading	94.0	94.0
Photographs of Measurement Location			
			
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))			
<p>LT1 was deployed at Sandhurst Road, approximately 870 m to the south-west of the site boundary and 90 m south of the original 2018 LT1 survey location on Byron Gardens.</p>			
Description of sound environment (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)			
<p>At the time of setting up and collecting the LT1 survey, the following noise sources were noted as affecting the acoustic environment: regular road traffic movements on Fort Road and Brennan Road, occasional aircraft overhead, and local pedestrians.</p>			



Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
27/06/2024 13:15	45.6	56.6		
27/06/2024 13:30	46.2	50.2		
27/06/2024 13:45	44.9	48.8		
27/06/2024 14:00	45.1	47.6		
27/06/2024 14:15	46.8	58.4		
27/06/2024 14:30	46.0	55.6		
27/06/2024 14:45	46.1	48.6		
27/06/2024 15:00	45.2	48.9		
27/06/2024 15:15	45.0	47.9		
27/06/2024 15:30	45.3	48.3		
27/06/2024 15:45	44.9	47.0		
27/06/2024 16:00	44.1	47.1		
27/06/2024 16:15	44.4	47.9		
27/06/2024 16:30	45.0	51.7		
27/06/2024 16:45	45.2	51.2		
27/06/2024 17:00	44.3	48.9		
27/06/2024 17:15	45.3	47.5		
27/06/2024 17:30	40.4	51.4		
27/06/2024 17:45	37.2	42.2		
27/06/2024 18:00	38.2	43.2		
27/06/2024 18:15	38.3	43.9		
27/06/2024 18:30	35.7	45.0		
27/06/2024 18:45	38.5	44.4		
27/06/2024 19:00	39.1	45.7		
27/06/2024 19:15	35.3	42.9		
27/06/2024 19:30	35.5	45.1		
27/06/2024 19:45	36.3	44.0		
27/06/2024 20:00	34.7	42.5		
27/06/2024 20:15	34.4	45.0		
27/06/2024 20:30	34.5	40.5		
27/06/2024 20:45	35.7	45.0		
27/06/2024 21:00	35.4	41.2		
27/06/2024 21:15	34.1	40.1		
27/06/2024 21:30	32.9	41.3		
27/06/2024 21:45	33.7	42.9		
27/06/2024 22:00	34.6	39.9		
27/06/2024 22:15	34.4	43.8		
27/06/2024 22:30	34.5	41.6		
27/06/2024 22:45	36.7	40.8		
27/06/2024 23:00	33.4	38.6		
27/06/2024 23:15	36.4	40.5		
27/06/2024 23:30	34.8	42.9		
27/06/2024 23:45	35.9	42.3		
28/06/2024 00:00	35.2	41.4		
28/06/2024 00:15	34.1	39.1		
28/06/2024 00:30	32.8	36.9		
28/06/2024 00:45	32.0	37.2		
28/06/2024 01:00	31.6	35.9		
28/06/2024 01:15	32.4	37.2		
28/06/2024 01:30	32.7	36.2		
28/06/2024 01:45	33.7	36.6		
28/06/2024 02:00	36.7	41.1		
28/06/2024 02:15	34.7	38.7		
28/06/2024 02:30	37.1	42.0		
28/06/2024 02:45	34.2	41.0		
28/06/2024 03:00	36.3	41.5		
28/06/2024 03:15	34.3	39.2		

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
28/06/2024 03:30	34.2	41.6		
28/06/2024 03:45	36.4	41.6		
28/06/2024 04:00	35.3	39.4		
28/06/2024 04:15	38.3	45.2		
28/06/2024 04:30	36.7	45.4		
28/06/2024 04:45	36.1	42.6		
28/06/2024 05:00	36.5	42.1		
28/06/2024 05:15	38.1	46.0		
28/06/2024 05:30	38.5	46.7		
28/06/2024 05:45	38.4	43.9		
28/06/2024 06:00	38.9	42.9		
28/06/2024 06:15	38.1	42.1		
28/06/2024 06:30	38.6	42.6		
28/06/2024 06:45	38.1	44.3		
28/06/2024 07:00	45.5	48.7		
28/06/2024 07:15	45.1	48.5	1.4	0.0
28/06/2024 07:30	44.6	47.5	1.4	0.0
28/06/2024 07:45	45.5	47.9	1.6	0.0
28/06/2024 08:00	45.0	47.1	1.5	0.0
28/06/2024 08:15	44.3	47.0	1.9	0.0
28/06/2024 08:30	44.8	47.3	1.8	0.0
28/06/2024 08:45	44.5	47.2	1.7	0.0
28/06/2024 09:00	44.3	46.9	1.7	0.0
28/06/2024 09:15	46.1	56.1	1.7	0.0
28/06/2024 09:30	44.5	56.9	2.1	0.0
28/06/2024 09:45	44.3	46.3	1.9	0.0
28/06/2024 10:00	43.9	46.5	1.9	0.0
28/06/2024 10:15	43.7	45.9	1.6	0.0
28/06/2024 10:30	42.9	52.3	1.6	0.0
28/06/2024 10:45	42.7	47.4	1.9	0.0
28/06/2024 11:00	43.7	46.9	1.8	0.0
28/06/2024 11:15	43.1	48.0	1.7	0.0
28/06/2024 11:30	43.3	50.2	1.6	0.0
28/06/2024 11:45	43.8	48.0	1.6	0.0
28/06/2024 12:00	44.0	47.9	1.8	0.0
28/06/2024 12:15	44.1	49.1	1.7	0.0
28/06/2024 12:30	44.0	50.2	1.9	0.0
28/06/2024 12:45	44.3	46.9	1.5	0.0
28/06/2024 13:00	44.0	46.5	1.4	0.0
28/06/2024 13:15	44.7	51.2	1.2	0.0
28/06/2024 13:30	44.0	51.3	1.3	0.0
28/06/2024 13:45	45.2	50.9	1.3	0.0
28/06/2024 14:00	44.6	47.6	1.2	0.0
28/06/2024 14:15	45.3	59.0	1.3	0.0
28/06/2024 14:30	45.5	48.4	1.5	0.0
28/06/2024 14:45	44.0	46.3	1.5	0.0
28/06/2024 15:00	45.5	51.4	1.4	0.0
28/06/2024 15:15	44.8	46.8	1.5	0.0
28/06/2024 15:30	44.2	48.3	1.4	0.0
28/06/2024 15:45	44.8	47.0	1.4	0.0
28/06/2024 16:00	43.8	47.3	1.5	0.0
28/06/2024 16:15	43.1	45.0	1.4	0.0
28/06/2024 16:30	34.0	43.8	1.2	0.0
28/06/2024 16:45	35.2	47.8	1.3	0.0
28/06/2024 17:00	34.6	42.6	1.5	0.0
28/06/2024 17:15	34.8	47.5	1.4	0.0
28/06/2024 17:30	33.4	39.8	1.2	0.0

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
28/06/2024 17:45	35.0	47.8	1.4	0.0
28/06/2024 18:00	31.5	43.0	1.7	0.0
28/06/2024 18:15	34.2	47.4	1.2	0.0
28/06/2024 18:30	32.9	60.5	1.4	0.0
28/06/2024 18:45	32.4	41.7	1.2	0.0
28/06/2024 19:00	31.6	37.4	1.3	0.0
28/06/2024 19:15	30.9	37.1	1.2	0.0
28/06/2024 19:30	29.9	38.2	1.6	0.0
28/06/2024 19:45	29.0	38.7	1.3	0.0
28/06/2024 20:00	29.6	55.7	0.8	0.0
28/06/2024 20:15	29.9	35.0	0.9	0.0
28/06/2024 20:30	31.9	41.5	0.7	0.0
28/06/2024 20:45	30.9	41.4	0.6	0.0
28/06/2024 21:00	31.5	39.8	0.7	0.0
28/06/2024 21:15	30.7	35.1	0.5	0.0
28/06/2024 21:30	30.6	35.8	0.7	0.0
28/06/2024 21:45	31.0	42.1	0.4	0.0
28/06/2024 22:00	30.1	36.2	0.2	0.0
28/06/2024 22:15	29.3	30.7	0.1	0.0
28/06/2024 22:30	30.9	34.1	0.2	0.0
28/06/2024 22:45	31.1	34.8	0.3	0.0
28/06/2024 23:00	30.3	33.9	0.4	0.0
28/06/2024 23:15	29.5	33.5	0.2	0.0
28/06/2024 23:30	29.4	31.8	0.4	0.0
28/06/2024 23:45	31.1	40.0	0.4	0.0
29/06/2024 00:00	29.9	36.0	0.1	0.0
29/06/2024 00:15	29.9	33.1	0.2	0.0
29/06/2024 00:30	29.0	31.3	0.2	0.0
29/06/2024 00:45	29.9	34.9	0.4	0.0
29/06/2024 01:00	29.1	31.7	0.0	0.0
29/06/2024 01:15	29.8	31.6	0.1	0.0
29/06/2024 01:30	29.4	33.6	0.3	0.0
29/06/2024 01:45	30.1	31.5	0.1	0.0
29/06/2024 02:00	29.7	30.9	0.1	0.0
29/06/2024 02:15	30.4	34.1	0.2	0.0
29/06/2024 02:30	28.4	30.8	0.4	0.0
29/06/2024 02:45	28.1	29.6	0.7	0.0
29/06/2024 03:00	28.4	30.7	0.8	0.0
29/06/2024 03:15	27.2	28.6	0.8	0.0
29/06/2024 03:30	27.3	28.9	0.7	0.0
29/06/2024 03:45	27.9	30.2	0.7	0.0
29/06/2024 04:00	29.6	40.0	0.5	0.0
29/06/2024 04:15	34.6	44.2	0.5	0.0
29/06/2024 04:30	31.5	47.1	0.5	0.0
29/06/2024 04:45	31.9	43.5	0.5	0.0
29/06/2024 05:00	32.3	48.8	0.3	0.0
29/06/2024 05:15	31.5	39.9	0.4	0.0
29/06/2024 05:30	33.6	43.7	0.1	0.0
29/06/2024 05:45	32.9	41.9	0.2	0.0
29/06/2024 06:00	32.6	37.1	0.4	0.0
29/06/2024 06:15	32.8	41.6	0.5	0.0
29/06/2024 06:30	34.3	40.7	0.6	0.0
29/06/2024 06:45	33.7	38.6	0.5	0.0
29/06/2024 07:00	35.1	46.1	0.5	0.0
29/06/2024 07:15	42.9	47.3	0.6	0.0
29/06/2024 07:30	42.3	46.1	0.6	0.0
29/06/2024 07:45	42.1	44.7	0.5	0.0



Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
29/06/2024 08:00	42.2	45.1	0.4	0.0
29/06/2024 08:15	42.1	44.4	0.4	0.0
29/06/2024 08:30	42.7	45.0	0.4	0.0
29/06/2024 08:45	41.8	43.7	0.5	0.0
29/06/2024 09:00	42.1	44.5	0.5	0.0
29/06/2024 09:15	42.0	46.1	0.5	0.0
29/06/2024 09:30	41.7	44.2	0.7	0.0
29/06/2024 09:45	40.8	47.0	0.7	0.0
29/06/2024 10:00	42.0	45.8	0.7	0.0
29/06/2024 10:15	41.7	47.4	0.7	0.0
29/06/2024 10:30	42.1	48.2	0.8	0.0
29/06/2024 10:45	41.8	58.4	0.8	0.0
29/06/2024 11:00	41.4	61.4	1.0	0.0
29/06/2024 11:15	40.9	52.4	0.9	0.0
29/06/2024 11:30	40.6	43.7	1.0	0.0
29/06/2024 11:45	41.4	48.1	1.0	0.0
29/06/2024 12:00	41.0	50.5	1.1	0.0
29/06/2024 12:15	32.5	43.2	0.8	0.0
29/06/2024 12:30	31.2	44.3	0.9	0.0
29/06/2024 12:45	30.8	42.0	0.9	0.0
29/06/2024 13:00	31.2	38.4	0.8	0.0
29/06/2024 13:15	30.5	42.1	1.1	0.0
29/06/2024 13:30	31.1	44.0	0.8	0.0
29/06/2024 13:45	30.0	44.1	0.8	0.0
29/06/2024 14:00	31.3	61.0	1.0	0.0
29/06/2024 14:15	32.1	54.2	1.1	0.0
29/06/2024 14:30	31.6	45.7	1.0	0.0
29/06/2024 14:45	31.7	47.9	1.0	0.0
29/06/2024 15:00	31.4	44.7	1.0	0.0
29/06/2024 15:15	30.7	35.9	1.0	0.0
29/06/2024 15:30	30.6	41.5	0.7	0.0
29/06/2024 15:45	29.7	41.0	0.6	0.0
29/06/2024 16:00	29.2	55.0	0.7	0.0
29/06/2024 16:15	27.1	45.5	0.4	0.0
29/06/2024 16:30	29.1	34.7	0.5	0.0
29/06/2024 16:45	29.3	39.9	0.4	0.0
29/06/2024 17:00	29.6	41.4	0.7	0.0
29/06/2024 17:15	28.9	38.3	0.6	0.0
29/06/2024 17:30	29.3	35.7	0.6	0.0
29/06/2024 17:45	27.6	36.2	0.9	0.0
29/06/2024 18:00	29.2	33.8	0.7	0.0
29/06/2024 18:15	26.7	38.7	0.8	0.0
29/06/2024 18:30	27.9	39.1	0.7	0.0
29/06/2024 18:45	26.8	35.8	0.4	0.0
29/06/2024 19:00	27.3	37.2	0.3	0.0
29/06/2024 19:15	26.7	44.1	0.3	0.0
29/06/2024 19:30	26.2	45.2	0.2	0.0
29/06/2024 19:45	27.1	40.0	0.2	0.0
29/06/2024 20:00	27.9	44.6	0.1	0.0
29/06/2024 20:15	27.7	36.7	0.2	0.0
29/06/2024 20:30	27.9	38.5	0.1	0.0
29/06/2024 20:45	28.5	40.9	0.2	0.0
29/06/2024 21:00	27.9	32.1	0.2	0.0
29/06/2024 21:15	27.5	31.1	0.1	0.0
29/06/2024 21:30	27.6	31.9	0.1	0.0
29/06/2024 21:45	30.2	34.4	0.2	0.0
29/06/2024 22:00	30.5	32.7	0.1	0.0

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
29/06/2024 22:15	30.7	36.2	0.0	0.0
29/06/2024 22:30	31.3	35.1	0.1	0.0
29/06/2024 22:45	31.1	33.0	0.1	0.0
29/06/2024 23:00	30.8	39.7	0.2	0.0
29/06/2024 23:15	30.6	37.4	0.1	0.0
29/06/2024 23:30	30.2	31.6	0.3	0.0
29/06/2024 23:45	30.4	32.5	0.1	0.0
30/06/2024 00:00	29.8	34.1	0.1	0.0
30/06/2024 00:15	29.9	33.7	0.1	0.0
30/06/2024 00:30	29.3	33.8	0.1	0.0
30/06/2024 00:45	28.8	34.9	0.1	0.0
30/06/2024 01:00	29.3	31.4	0.1	0.0
30/06/2024 01:15	27.8	31.5	0.1	0.0
30/06/2024 01:30	28.2	31.0	0.1	0.0
30/06/2024 01:45	27.0	29.0	0.1	0.0
30/06/2024 02:00	27.2	29.7	0.0	0.0
30/06/2024 02:15	28.5	30.6	0.1	0.0
30/06/2024 02:30	28.8	32.8	0.1	0.0
30/06/2024 02:45	27.6	31.0	0.4	0.0
30/06/2024 03:00	27.0	30.2	0.2	0.0
30/06/2024 03:15	27.3	33.6	0.1	0.0
30/06/2024 03:30	26.7	33.5	0.5	0.0
30/06/2024 03:45	29.4	33.3	1.5	0.0
30/06/2024 04:00	28.6	35.6	1.5	0.0
30/06/2024 04:15	30.5	46.0	1.2	0.0
30/06/2024 04:30	30.4	43.8	0.7	0.0
30/06/2024 04:45	30.1	45.0	1.0	0.0
30/06/2024 05:00	30.7	49.4	0.9	0.0
30/06/2024 05:15	30.2	41.5	1.1	0.0
30/06/2024 05:30	31.1	44.7	1.0	0.0
30/06/2024 05:45	31.0	49.3	1.0	0.0
30/06/2024 06:00	31.3	39.6	1.0	0.0
30/06/2024 06:15	30.3	35.7	1.0	0.0
30/06/2024 06:30	29.7	35.2	1.3	0.0
30/06/2024 06:45	29.4	38.6	1.3	0.0
30/06/2024 07:00	28.3	42.1	1.2	0.0
30/06/2024 07:15	28.2	35.9	1.1	0.0
30/06/2024 07:30	28.6	38.2	1.0	0.0
30/06/2024 07:45	28.7	49.6	0.9	0.0
30/06/2024 08:00	27.9	46.1	1.0	0.0
30/06/2024 08:15	28.5	43.2	1.2	0.0
30/06/2024 08:30	29.0	44.1	1.1	0.0
30/06/2024 08:45	29.6	38.7	1.1	0.0
30/06/2024 09:00	28.3	35.5	1.4	0.0
30/06/2024 09:15	29.6	37.2	1.4	0.0
30/06/2024 09:30	34.2	44.8	2.2	0.0
30/06/2024 09:45	33.1	44.5	2.3	0.0
30/06/2024 10:00	31.2	37.4	2.0	0.0
30/06/2024 10:15	30.6	38.8	1.7	0.0
30/06/2024 10:30	31.4	46.6	1.6	0.0
30/06/2024 10:45	31.2	40.8	1.7	0.0
30/06/2024 11:00	32.3	44.7	1.9	0.0
30/06/2024 11:15	32.9	40.4	1.9	0.0
30/06/2024 11:30	32.2	37.7	1.6	0.0
30/06/2024 11:45	32.4	41.2	1.6	0.0
30/06/2024 12:00	31.3	38.9	1.9	0.0
30/06/2024 12:15	33.0	37.5	2.0	0.0

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
30/06/2024 12:30	30.6	42.0	1.4	0.0
30/06/2024 12:45	30.6	36.1	1.5	0.0
30/06/2024 13:00	31.2	44.0	1.4	0.0
30/06/2024 13:15	31.4	40.9	1.0	0.0
30/06/2024 13:30	31.9	35.7	1.4	0.0
30/06/2024 13:45	31.9	45.5	1.5	0.0
30/06/2024 14:00	31.1	43.5	1.2	0.0
30/06/2024 14:15	33.3	42.6	0.7	0.0
30/06/2024 14:30	33.2	39.4	1.0	0.0
30/06/2024 14:45	32.8	40.3	1.5	0.0
30/06/2024 15:00	32.2	42.3	1.5	0.0
30/06/2024 15:15	32.6	40.9	1.5	0.0
30/06/2024 15:30	33.1	40.0	1.3	0.0
30/06/2024 15:45	36.2	41.8	1.2	0.0
30/06/2024 16:00	34.4	39.7	1.5	0.0
30/06/2024 16:15	33.6	44.0	1.1	0.0
30/06/2024 16:30	31.6	42.0	0.8	0.0
30/06/2024 16:45	32.7	44.0	0.8	0.0
30/06/2024 17:00	33.0	37.2	1.0	0.0
30/06/2024 17:15	31.3	43.7	1.4	0.0
30/06/2024 17:30	33.9	49.4	1.6	0.0
30/06/2024 17:45	32.3	39.7	1.4	0.0
30/06/2024 18:00	31.7	38.0	0.9	0.0
30/06/2024 18:15	31.8	39.3	1.3	0.0
30/06/2024 18:30	31.2	39.8	1.2	0.0
30/06/2024 18:45	30.8	38.7	1.5	0.0
30/06/2024 19:00	30.2	47.7	1.0	0.0
30/06/2024 19:15	31.5	40.8	1.0	0.0
30/06/2024 19:30	31.6	43.7	1.3	0.0
30/06/2024 19:45	31.8	44.1	1.1	0.0
30/06/2024 20:00	30.8	42.7	0.7	0.0
30/06/2024 20:15	30.6	38.3	0.8	0.0
30/06/2024 20:30	30.4	42.7	0.8	0.0
30/06/2024 20:45	31.5	42.0	0.6	0.0
30/06/2024 21:00	30.0	37.4	0.5	0.0
30/06/2024 21:15	30.4	37.3	0.0	0.0
30/06/2024 21:30	30.3	39.7	0.0	0.0
30/06/2024 21:45	29.9	40.5	0.0	0.0
30/06/2024 22:00	28.4	34.5	0.1	0.0
30/06/2024 22:15	29.1	34.5	0.1	0.0
30/06/2024 22:30	28.6	31.2	0.0	0.0
30/06/2024 22:45	28.3	33.2	0.1	0.0
30/06/2024 23:00	28.7	31.6	0.2	0.0
30/06/2024 23:15	27.8	43.5	0.3	0.0
30/06/2024 23:30	27.8	31.1	0.4	0.0
30/06/2024 23:45	26.9	34.4	0.2	0.0
01/07/2024 00:00	25.7	30.5	0.2	0.0
01/07/2024 00:15	26.2	29.8	0.0	0.0
01/07/2024 00:30	25.5	28.4	0.6	0.0
01/07/2024 00:45	24.6	31.0	0.6	0.0
01/07/2024 01:00	25.3	37.8	0.7	0.0
01/07/2024 01:15	24.4	29.1	0.9	0.0
01/07/2024 01:30	29.0	34.2	1.3	0.0
01/07/2024 01:45	24.9	27.1	1.2	0.0
01/07/2024 02:00	24.5	26.8	1.0	0.0
01/07/2024 02:15	24.9	28.0	0.9	0.0
01/07/2024 02:30	24.4	25.5	0.7	0.0

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
01/07/2024 02:45	25.4	27.0	0.8	0.0
01/07/2024 03:00	25.7	27.3	1.1	0.0
01/07/2024 03:15	25.6	27.3	0.8	0.0
01/07/2024 03:30	25.6	26.5	1.0	0.0
01/07/2024 03:45	26.5	28.9	0.8	0.0
01/07/2024 04:00	27.3	30.0	1.2	0.0
01/07/2024 04:15	29.7	35.1	1.1	0.0
01/07/2024 04:30	30.6	44.6	1.1	0.0
01/07/2024 04:45	29.5	38.7	0.8	0.0
01/07/2024 05:00	33.0	44.8	0.9	0.0
01/07/2024 05:15	32.1	48.2	1.1	0.0
01/07/2024 05:30	31.3	44.4	1.0	0.0
01/07/2024 05:45	31.8	41.2	1.0	0.0
01/07/2024 06:00	32.0	38.3	0.9	0.0
01/07/2024 06:15	32.9	42.9	0.9	0.0
01/07/2024 06:30	33.0	43.7	1.2	0.0
01/07/2024 06:45	34.2	42.6	1.2	0.0
01/07/2024 07:00	34.8	46.3	1.5	0.0
01/07/2024 07:15	40.9	47.9	1.3	0.0
01/07/2024 07:30	45.8	49.5	1.3	0.0
01/07/2024 07:45	45.2	47.7	1.2	0.0
01/07/2024 08:00	45.6	48.2	1.8	0.0
01/07/2024 08:15	45.9	48.1	1.5	0.0
01/07/2024 08:30	45.1	48.1	1.7	0.0
01/07/2024 08:45	44.5	47.7	1.6	0.0
01/07/2024 09:00	44.7	48.4	1.5	0.0
01/07/2024 09:15	45.1	52.3	1.6	0.0
01/07/2024 09:30	45.1	52.5	1.5	0.0
01/07/2024 09:45	45.2	51.4	1.2	0.0
01/07/2024 10:00	45.0	47.5	1.5	0.0
01/07/2024 10:15	44.9	48.0	1.2	0.0
01/07/2024 10:30	44.8	58.1	1.5	0.0
01/07/2024 10:45	45.8	56.9	1.4	0.0
01/07/2024 11:00	44.6	50.7	1.5	0.0
01/07/2024 11:15	43.3	50.2	1.2	0.0
01/07/2024 11:30	44.6	59.8	1.6	0.0
01/07/2024 11:45	46.0	54.6	1.5	0.0
01/07/2024 12:00	45.2	55.8	1.6	0.0
01/07/2024 12:15	45.2	49.1	2.2	0.0
01/07/2024 12:30	45.7	48.3	1.9	0.0
01/07/2024 12:45	42.5	46.2	1.7	0.0
01/07/2024 13:00	45.4	48.3	1.8	0.0
01/07/2024 13:15	44.5	47.5	1.8	0.0
01/07/2024 13:30	45.0	48.3	1.8	0.0
01/07/2024 13:45	44.3	46.4	1.3	0.0
01/07/2024 14:00	44.0	47.8	1.5	0.0
01/07/2024 14:15	44.0	49.9	1.5	0.0
01/07/2024 14:30	43.5	45.9	1.3	0.0
01/07/2024 14:45	44.7	50.6	1.1	0.0
01/07/2024 15:00	43.8	46.6	1.5	0.0
01/07/2024 15:15	43.4	54.7	1.6	0.0
01/07/2024 15:30	43.7	47.4	1.6	0.0
01/07/2024 15:45	44.3	50.3	1.6	0.0
01/07/2024 16:00	43.9	46.2	1.9	0.0
01/07/2024 16:15	43.7	51.2	2.1	0.0
01/07/2024 16:30	44.2	47.1	1.6	0.0
01/07/2024 16:45	43.4	51.2	1.8	0.0

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
01/07/2024 17:00	43.7	52.1	1.6	0.0
01/07/2024 17:15	43.4	46.7	1.7	0.0
01/07/2024 17:30	33.9	45.2	1.1	0.0
01/07/2024 17:45	33.3	52.1	1.6	0.0
01/07/2024 18:00	34.1	41.7	1.8	0.0
01/07/2024 18:15	34.4	46.9	1.9	0.0
01/07/2024 18:30	35.8	48.4	1.9	0.0
01/07/2024 18:45	34.2	45.2	2.3	0.0
01/07/2024 19:00	33.9	39.1	1.9	0.0
01/07/2024 19:15	33.5	40.0	1.8	0.0
01/07/2024 19:30	33.1	38.5	2.0	0.0
01/07/2024 19:45	31.3	40.5	1.9	0.0
01/07/2024 20:00	31.6	36.3	1.6	0.0
01/07/2024 20:15	30.3	35.0	1.1	0.0
01/07/2024 20:30	30.4	39.9	1.4	0.0
01/07/2024 20:45	32.6	41.6	1.2	0.0
01/07/2024 21:00	32.9	40.3	1.8	0.0
01/07/2024 21:15	34.3	40.8	2.1	0.0
01/07/2024 21:30	30.7	35.5	2.3	0.0
01/07/2024 21:45	29.5	31.2	1.5	0.0
01/07/2024 22:00	29.5	31.5	0.8	0.0
01/07/2024 22:15	30.0	41.3	0.9	0.0
01/07/2024 22:30	30.4	37.6	0.8	0.0
01/07/2024 22:45	29.0	31.0	1.0	0.0
01/07/2024 23:00	29.4	32.4	0.9	0.0
01/07/2024 23:15	29.2	32.6	1.2	0.0
01/07/2024 23:30	28.0	35.0	1.4	0.0
01/07/2024 23:45	29.3	33.3	1.3	0.0
02/07/2024 00:00	29.5	33.8	1.7	0.0
02/07/2024 00:15	29.4	33.2	2.2	0.0
02/07/2024 00:30	30.1	33.0	1.8	0.0
02/07/2024 00:45	30.0	35.8	1.8	0.0
02/07/2024 01:00	28.2	32.0	1.3	0.0
02/07/2024 01:15	28.1	34.9	1.2	0.0
02/07/2024 01:30	28.0	34.4	1.3	0.0
02/07/2024 01:45	28.0	36.0	1.4	0.0
02/07/2024 02:00	29.8	32.6	1.5	0.0
02/07/2024 02:15	29.3	32.3	1.6	0.0
02/07/2024 02:30	29.1	33.9	1.5	0.0
02/07/2024 02:45	28.3	42.5	1.7	0.0
02/07/2024 03:00	26.9	29.8	1.5	0.0
02/07/2024 03:15	28.0	29.9	1.1	0.0
02/07/2024 03:30	29.3	31.6	1.5	0.0
02/07/2024 03:45	29.8	34.6	1.6	0.0
02/07/2024 04:00	28.2	33.1	1.7	0.0
02/07/2024 04:15	29.1	34.4	1.6	0.0
02/07/2024 04:30	31.0	40.3	1.1	0.0
02/07/2024 04:45	32.8	57.2	1.1	0.0
02/07/2024 05:00	33.2	39.5	1.5	0.0
02/07/2024 05:15	35.1	49.9	1.7	0.0
02/07/2024 05:30	35.3	40.3	2.3	0.0
02/07/2024 05:45	34.4	48.1	2.0	0.0
02/07/2024 06:00	32.8	42.8	1.8	0.0
02/07/2024 06:15	34.3	41.4	1.4	0.0
02/07/2024 06:30	37.3	41.7	1.7	0.0
02/07/2024 06:45	39.7	45.4	1.8	0.0
02/07/2024 07:00	40.8	47.9	1.9	0.0

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
02/07/2024 07:15	43.9	46.3	2.2	0.0
02/07/2024 07:30	43.6	46.3	1.8	0.0
02/07/2024 07:45	43.5	47.1	1.7	0.0
02/07/2024 08:00	43.7	48.2	2.0	0.0
02/07/2024 08:15	43.7	47.8	2.0	0.0
02/07/2024 08:30	43.5	46.4	2.0	0.0
02/07/2024 08:45	42.9	44.8	1.8	0.0
02/07/2024 09:00	41.7	48.9	2.1	0.0
02/07/2024 09:15	41.7	48.1	2.0	0.0
02/07/2024 09:30	41.8	47.7	1.7	0.0
02/07/2024 09:45	41.4	43.8	2.0	0.0
02/07/2024 10:00	41.9	46.9	1.8	0.0
02/07/2024 10:15	40.6	44.9	1.9	0.0
02/07/2024 10:30	41.6	56.9	1.3	0.0
02/07/2024 10:45	41.9	49.2	1.4	0.0
02/07/2024 11:00	41.7	47.3	1.5	0.0
02/07/2024 11:15	41.0	48.8	1.8	0.0
02/07/2024 11:30	41.2	55.8	1.4	0.0
02/07/2024 11:45	41.9	52.6	1.2	0.0
02/07/2024 12:00	41.1	49.2	1.1	0.0
02/07/2024 12:15	39.6	51.5	0.9	0.0
02/07/2024 12:30	35.9	42.2	0.8	0.0
02/07/2024 12:45	34.7	39.9	0.3	0.0
02/07/2024 13:00	33.5	40.3	0.3	0.0
02/07/2024 13:15	34.3	39.1	0.3	0.0
02/07/2024 13:30	35.4	47.6	0.4	0.1
02/07/2024 13:45	39.5	45.5	0.3	0.0
02/07/2024 14:00	37.4	44.0	0.2	0.0
02/07/2024 14:15	34.0	49.8	0.3	0.0
02/07/2024 14:30	37.5	48.8	0.4	0.3
02/07/2024 14:45	37.8	43.4	0.3	0.0
02/07/2024 15:00	36.2	43.0	0.3	0.0
02/07/2024 15:15	35.2	41.5	0.1	0.0
02/07/2024 15:30	34.6	47.1	0.3	0.0
02/07/2024 15:45	31.6	50.3	0.3	0.0
02/07/2024 16:00	31.2	36.8	0.3	0.0
02/07/2024 16:15	28.2	51.0	0.3	0.0
02/07/2024 16:30	28.6	39.0	0.2	0.0
02/07/2024 16:45	30.1	38.5	0.3	0.0
02/07/2024 17:00	30.9	42.2	0.3	0.0
02/07/2024 17:15	30.6	41.3	0.5	0.0
02/07/2024 17:30	27.9	46.0	0.4	0.0
02/07/2024 17:45	29.1	44.5	0.5	0.0
02/07/2024 18:00	29.6	45.6	0.6	0.0
02/07/2024 18:15	30.1	38.0	0.6	0.0
02/07/2024 18:30	29.8	44.8	0.5	0.0
02/07/2024 18:45	29.6	45.1	0.5	0.0
02/07/2024 19:00	28.8	44.2	0.7	0.0
02/07/2024 19:15	29.9	42.3	0.5	0.0
02/07/2024 19:30	30.2	40.1	0.3	0.0
02/07/2024 19:45	31.5	39.5	0.4	0.0
02/07/2024 20:00	31.4	41.2	0.4	0.0
02/07/2024 20:15	29.5	42.4	0.2	0.0
02/07/2024 20:30	29.5	41.4	0.4	0.0
02/07/2024 20:45	29.9	39.0	0.2	0.0
02/07/2024 21:00	31.0	44.6	0.2	0.0
02/07/2024 21:15	29.9	35.8	0.1	0.0



Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
02/07/2024 21:30	30.6	35.1	0.1	0.0
02/07/2024 21:45	29.4	33.8	0.0	0.0
02/07/2024 22:00	29.5	34.5	0.1	0.0
02/07/2024 22:15	30.5	43.8	0.0	0.0
02/07/2024 22:30	31.3	35.5	0.1	0.0
02/07/2024 22:45	31.1	35.6	0.0	0.0
02/07/2024 23:00	30.4	35.9	0.0	0.0
02/07/2024 23:15	29.4	31.0	0.1	0.0
02/07/2024 23:30	28.9	31.2	0.2	0.0
02/07/2024 23:45	29.5	33.3	0.1	0.0
03/07/2024 00:00	30.0	34.3	0.0	0.0
03/07/2024 00:15	30.6	32.5	0.2	0.0
03/07/2024 00:30	30.7	32.5	0.1	0.0
03/07/2024 00:45	29.9	33.0	0.3	0.0
03/07/2024 01:00	30.5	32.3	0.2	0.0
03/07/2024 01:15	31.0	37.1	0.1	0.0
03/07/2024 01:30	32.3	35.2	0.0	0.0
03/07/2024 01:45	31.3	34.4	0.3	0.0
03/07/2024 02:00	31.2	35.5	0.4	0.0
03/07/2024 02:15	30.1	33.3	0.7	0.0
03/07/2024 02:30	29.0	32.3	0.9	0.0
03/07/2024 02:45	29.4	36.9	0.6	0.0
03/07/2024 03:00	30.8	33.7	0.5	0.0
03/07/2024 03:15	30.8	36.3	0.5	0.0
03/07/2024 03:30	29.5	31.3	0.3	0.0
03/07/2024 03:45	29.3	33.7	0.3	0.0
03/07/2024 04:00	29.7	36.7	0.1	0.0
03/07/2024 04:15	29.2	36.3	0.1	0.1
03/07/2024 04:30	34.9	40.3	0.4	0.1
03/07/2024 04:45	39.1	42.9	0.2	0.2
03/07/2024 05:00	39.3	47.5	0.4	0.2
03/07/2024 05:15	37.0	46.1	0.4	0.1
03/07/2024 05:30	41.8	47.1	0.1	0.2
03/07/2024 05:45	38.5	45.7	0.0	0.2
03/07/2024 06:00	37.1	39.4	0.1	0.0
03/07/2024 06:15	35.7	41.0	0.2	0.0
03/07/2024 06:30	37.2	43.0	0.1	0.1
03/07/2024 06:45	36.5	41.6	0.5	0.0
03/07/2024 07:00	39.2	44.4	0.6	0.0
03/07/2024 07:15	40.4	46.0	0.4	0.0
03/07/2024 07:30	37.0	45.4	0.2	0.2
03/07/2024 07:45	35.6	43.8	0.5	0.0
03/07/2024 08:00	35.7	44.1	0.4	0.0
03/07/2024 08:15	34.9	44.9	0.5	0.0
03/07/2024 08:30	35.7	45.9	0.6	0.0
03/07/2024 08:45	36.7	41.7	0.6	0.0
03/07/2024 09:00	35.9	45.4	0.5	0.0
03/07/2024 09:15	35.5	47.9	0.7	0.0
03/07/2024 09:30	36.3	45.4	0.7	0.0
03/07/2024 09:45	42.6	45.1	0.7	0.0
03/07/2024 10:00	38.0	44.7	0.7	0.0
03/07/2024 10:15	36.8	46.8	0.7	0.0
03/07/2024 10:30	37.1	42.5	0.9	0.0
03/07/2024 10:45	41.3	50.3	1.0	0.0
03/07/2024 11:00	39.9	49.9	1.1	0.0
03/07/2024 11:15	41.5	46.7	1.3	0.0
03/07/2024 11:30	43.7	49.9	1.5	0.0

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
03/07/2024 11:45	42.8	49.3	1.6	0.0
03/07/2024 12:00	40.7	47.6	1.4	0.0
03/07/2024 12:15	42.9	50.9	1.4	0.0
03/07/2024 12:30	44.7	48.1	1.4	0.0
03/07/2024 12:45	41.3	46.4	1.5	0.0
03/07/2024 13:00	39.0	47.2	1.8	0.0
03/07/2024 13:15	39.4	46.2	1.4	0.0
03/07/2024 13:30	38.6	44.2	0.9	0.0
03/07/2024 13:45	41.9	48.3	1.1	0.0
03/07/2024 14:00	42.1	45.5	0.9	0.0
03/07/2024 14:15	42.0	50.8	1.0	0.0
03/07/2024 14:30	38.7	46.1	1.0	0.0
03/07/2024 14:45	38.9	46.5	0.8	0.0
03/07/2024 15:00	39.5	44.0	1.2	0.0
03/07/2024 15:15	40.1	53.3	1.3	0.0
03/07/2024 15:30	40.4	61.4	1.0	0.0
03/07/2024 15:45	38.4	54.5	1.2	0.0
03/07/2024 16:00	39.1	46.4	1.0	0.0
03/07/2024 16:15	39.2	45.7	1.0	0.0
03/07/2024 16:30	38.5	44.3	1.1	0.0
03/07/2024 16:45	38.9	45.3	1.6	0.0
03/07/2024 17:00	39.5	43.8	1.2	0.0
03/07/2024 17:15	39.5	44.7	1.1	0.0
03/07/2024 17:30	38.5	44.6	1.2	0.0
03/07/2024 17:45	37.1	47.2	1.3	0.0
03/07/2024 18:00	37.6	46.1	0.9	0.0
03/07/2024 18:15	37.7	49.5	1.0	0.0
03/07/2024 18:30	36.5	42.9	0.8	0.0
03/07/2024 18:45	37.0	42.4	1.1	0.0
03/07/2024 19:00	36.4	45.2	1.5	0.0
03/07/2024 19:15	36.3	45.4	1.3	0.0
03/07/2024 19:30	36.5	42.0	1.0	0.0
03/07/2024 19:45	36.9	44.2	0.8	0.0
03/07/2024 20:00	37.1	47.5	1.0	0.0
03/07/2024 20:15	36.6	40.7	0.8	0.0
03/07/2024 20:30	35.9	39.4	0.8	0.0
03/07/2024 20:45	36.0	40.4	0.6	0.0
03/07/2024 21:00	36.3	45.1	0.6	0.0
03/07/2024 21:15	37.1	39.8	0.7	0.0
03/07/2024 21:30	36.0	40.3	0.6	0.0
03/07/2024 21:45	35.3	39.9	0.7	0.0
03/07/2024 22:00	35.5	37.4	0.6	0.0
03/07/2024 22:15	35.1	36.7	0.6	0.0
03/07/2024 22:30	34.9	37.4	0.5	0.0
03/07/2024 22:45	35.1	41.6	0.6	0.0
03/07/2024 23:00	35.7	38.3	0.9	0.0
03/07/2024 23:15	35.1	37.5	0.7	0.0
03/07/2024 23:30	34.7	36.9	0.7	0.0
03/07/2024 23:45	33.6	37.3	0.7	0.0
04/07/2024 00:00	35.3	40.1	0.9	0.0
04/07/2024 00:15	35.4	39.1	1.6	0.0
04/07/2024 00:30	34.2	38.2	1.5	0.0
04/07/2024 00:45	33.0	40.1	1.9	0.0
04/07/2024 01:00	33.8	37.0	2.1	0.0
04/07/2024 01:15	32.4	36.7	1.7	0.0
04/07/2024 01:30	32.9	37.7	1.6	0.0
04/07/2024 01:45	31.5	36.6	1.5	0.0

Start	Buckland		Wind (m/s)	Rain (mm/s)
	dB LA90,T	dB LAeq,T		
04/07/2024 02:00	30.1	32.7	1.2	0.0
04/07/2024 02:15	30.7	33.8	1.1	0.0
04/07/2024 02:30	30.9	34.2	1.2	0.0
04/07/2024 02:45	31.2	41.2	1.7	0.0
04/07/2024 03:00	31.5	35.1	1.5	0.0
04/07/2024 03:15	32.1	34.8	1.7	0.0
04/07/2024 03:30	33.1	36.3	1.7	0.0
04/07/2024 03:45	32.7	34.8	2.0	0.0
04/07/2024 04:00	31.7	33.3	2.0	0.0
04/07/2024 04:15	32.1	34.3	1.7	0.0
04/07/2024 04:30	33.7	40.3	1.6	0.0
04/07/2024 04:45	34.3	42.6	1.7	0.0
04/07/2024 05:00	34.1	45.7	1.2	0.0
04/07/2024 05:15	35.0	44.5	1.2	0.0
04/07/2024 05:30	35.5	42.4	1.0	0.0
04/07/2024 05:45	36.1	46.4	1.2	0.0
04/07/2024 06:00	36.6	48.6	1.4	0.0
04/07/2024 06:15	37.4	46.6	1.5	0.0
04/07/2024 06:30	38.8	46.0	1.7	0.0
04/07/2024 06:45	40.8	46.1	1.7	0.0
04/07/2024 07:00	43.9	47.9	1.8	0.0
04/07/2024 07:15	42.4	47.3	1.8	0.0
04/07/2024 07:30	43.5	48.2	2.1	0.0
04/07/2024 07:45			1.6	0.0
04/07/2024 08:00			1.8	0.0
04/07/2024 08:15			1.8	0.0















MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m	MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m	MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m
20190315:07	20190315:07	54.1	48.3	47.2	48.8	20190315:14	20190315:14	58.8	62.2	49.4	54.4	20190315:21	20190315:21	48.1	56.8	37.1	51.9
20190315:08	20190315:08	52.2	46.4	45.3	46.9	20190315:15	20190315:15	56.9	60.3	47.5	52.5	20190315:22	20190315:22	46.2	54.9	43.2	49.8
20190315:09	20190315:09	52.5	46.5	45.5	47.1	20190315:16	20190315:16	53.3	56.4	47.2	52.9	20190315:23	20190315:23	46.3	54.8	38.7	49.1
20190315:10	20190315:10	52.8	46.8	45.8	47.4	20190315:17	20190315:17	51.1	54.1	47.1	52.7	20190315:24	20190315:24	46.4	54.7	48.8	49.2
20190315:11	20190315:11	53.9	46.9	45.9	47.5	20190315:18	20190315:18	52.2	55.2	47.0	52.6	20190315:25	20190315:25	46.5	54.6	48.8	49.2
20190315:12	20190315:12	54.2	47.2	46.2	47.8	20190315:19	20190315:19	52.7	55.7	46.9	52.5	20190315:26	20190315:26	46.6	54.5	48.8	49.2
20190315:13	20190315:13	54.5	47.5	46.5	48.1	20190315:20	20190315:20	52.8	55.8	46.8	52.4	20190315:27	20190315:27	46.7	54.4	48.8	49.2
20190315:14	20190315:14	54.7	47.7	46.7	48.3	20190315:21	20190315:21	52.9	55.9	46.7	52.3	20190315:28	20190315:28	46.8	54.3	48.8	49.2
20190315:15	20190315:15	54.9	47.9	46.9	48.5	20190315:22	20190315:22	53.0	56.0	46.6	52.2	20190315:29	20190315:29	46.9	54.2	48.8	49.2
20190315:16	20190315:16	55.0	48.0	47.0	48.6	20190315:23	20190315:23	53.1	56.1	46.5	52.1	20190315:30	20190315:30	47.0	54.1	48.8	49.2
20190315:17	20190315:17	55.1	48.1	47.1	48.7	20190315:24	20190315:24	53.2	56.2	46.4	52.0	20190315:31	20190315:31	47.1	54.0	48.8	49.2
20190315:18	20190315:18	55.2	48.2	47.2	48.8	20190315:25	20190315:25	53.3	56.3	46.3	51.9	20190315:32	20190315:32	47.2	53.9	48.8	49.2
20190315:19	20190315:19	55.3	48.3	47.3	48.9	20190315:26	20190315:26	53.4	56.4	46.2	51.8	20190315:33	20190315:33	47.3	53.8	48.8	49.2
20190315:20	20190315:20	55.4	48.4	47.4	49.0	20190315:27	20190315:27	53.5	56.5	46.1	51.7	20190315:34	20190315:34	47.4	53.7	48.8	49.2
20190315:21	20190315:21	55.5	48.5	47.5	49.1	20190315:28	20190315:28	53.6	56.6	46.0	51.6	20190315:35	20190315:35	47.5	53.6	48.8	49.2
20190315:22	20190315:22	55.6	48.6	47.6	49.2	20190315:29	20190315:29	53.7	56.7	45.9	51.5	20190315:36	20190315:36	47.6	53.5	48.8	49.2
20190315:23	20190315:23	55.7	48.7	47.7	49.3	20190315:30	20190315:30	53.8	56.8	45.8	51.4	20190315:37	20190315:37	47.7	53.4	48.8	49.2
20190315:24	20190315:24	55.8	48.8	47.8	49.4	20190315:31	20190315:31	53.9	56.9	45.7	51.3	20190315:38	20190315:38	47.8	53.3	48.8	49.2
20190315:25	20190315:25	55.9	48.9	47.9	49.5	20190315:32	20190315:32	54.0	57.0	45.6	51.2	20190315:39	20190315:39	47.9	53.2	48.8	49.2
20190315:26	20190315:26	56.0	49.0	48.0	49.6	20190315:33	20190315:33	54.1	57.1	45.5	51.1	20190315:40	20190315:40	48.0	53.1	48.8	49.2
20190315:27	20190315:27	56.1	49.1	48.1	49.7	20190315:34	20190315:34	54.2	57.2	45.4	51.0	20190315:41	20190315:41	48.1	53.0	48.8	49.2
20190315:28	20190315:28	56.2	49.2	48.2	49.8	20190315:35	20190315:35	54.3	57.3	45.3	50.9	20190315:42	20190315:42	48.2	52.9	48.8	49.2
20190315:29	20190315:29	56.3	49.3	48.3	49.9	20190315:36	20190315:36	54.4	57.4	45.2	50.8	20190315:43	20190315:43	48.3	52.8	48.8	49.2
20190315:30	20190315:30	56.4	49.4	48.4	50.0	20190315:37	20190315:37	54.5	57.5	45.1	50.7	20190315:44	20190315:44	48.4	52.7	48.8	49.2
20190315:31	20190315:31	56.5	49.5	48.5	50.1	20190315:38	20190315:38	54.6	57.6	45.0	50.6	20190315:45	20190315:45	48.5	52.6	48.8	49.2
20190315:32	20190315:32	56.6	49.6	48.6	50.2	20190315:39	20190315:39	54.7	57.7	44.9	50.5	20190315:46	20190315:46	48.6	52.5	48.8	49.2
20190315:33	20190315:33	56.7	49.7	48.7	50.3	20190315:40	20190315:40	54.8	57.8	44.8	50.4	20190315:47	20190315:47	48.7	52.4	48.8	49.2
20190315:34	20190315:34	56.8	49.8	48.8	50.4	20190315:41	20190315:41	54.9	57.9	44.7	50.3	20190315:48	20190315:48	48.8	52.3	48.8	49.2
20190315:35	20190315:35	56.9	49.9	48.9	50.5	20190315:42	20190315:42	55.0	58.0	44.6	50.2	20190315:49	20190315:49	48.9	52.2	48.8	49.2
20190315:36	20190315:36	57.0	50.0	49.0	50.6	20190315:43	20190315:43	55.1	58.1	44.5	50.1	20190315:50	20190315:50	49.0	52.1	48.8	49.2
20190315:37	20190315:37	57.1	50.1	49.1	50.7	20190315:44	20190315:44	55.2	58.2	44.4	50.0	20190315:51	20190315:51	49.1	52.0	48.8	49.2
20190315:38	20190315:38	57.2	50.2	49.2	50.8	20190315:45	20190315:45	55.3	58.3	44.3	49.9	20190315:52	20190315:52	49.2	51.9	48.8	49.2
20190315:39	20190315:39	57.3	50.3	49.3	50.9	20190315:46	20190315:46	55.4	58.4	44.2	49.8	20190315:53	20190315:53	49.3	51.8	48.8	49.2
20190315:40	20190315:40	57.4	50.4	49.4	51.0	20190315:47	20190315:47	55.5	58.5	44.1	49.7	20190315:54	20190315:54	49.4	51.7	48.8	49.2
20190315:41	20190315:41	57.5	50.5	49.5	51.1	20190315:48	20190315:48	55.6	58.6	44.0	49.6	20190315:55	20190315:55	49.5	51.6	48.8	49.2
20190315:42	20190315:42	57.6	50.6	49.6	51.2	20190315:49	20190315:49	55.7	58.7	43.9	49.5	20190315:56	20190315:56	49.6	51.5	48.8	49.2
20190315:43	20190315:43	57.7	50.7	49.7	51.3	20190315:50	20190315:50	55.8	58.8	43.8	49.4	20190315:57	20190315:57	49.7	51.4	48.8	49.2
20190315:44	20190315:44	57.8	50.8	49.8	51.4	20190315:51	20190315:51	55.9	58.9	43.7	49.3	20190315:58	20190315:58	49.8	51.3	48.8	49.2
20190315:45	20190315:45	57.9	50.9	49.9	51.5	20190315:52	20190315:52	56.0	59.0	43.6	49.2	20190315:59	20190315:59	49.9	51.2	48.8	49.2
20190315:46	20190315:46	58.0	51.0	50.0	51.6	20190315:53	20190315:53	56.1	59.1	43.5	49.1	20190316:00	20190316:00	50.0	51.1	48.8	49.2
20190315:47	20190315:47	58.1	51.1	50.1	51.7	20190315:54	20190315:54	56.2	59.2	43.4	49.0						
20190315:48	20190315:48	58.2	51.2	50.2	51.8	20190315:55	20190315:55	56.3	59.3	43.3	48.9						
20190315:49	20190315:49	58.3	51.3	50.3	51.9	20190315:56	20190315:56	56.4	59.4	43.2	48.8						
20190315:50	20190315:50	58.4	51.4	50.4	52.0	20190315:57	20190315:57	56.5	59.5	43.1	48.7						
20190315:51	20190315:51	58.5	51.5	50.5	52.1	20190315:58	20190315:58	56.6	59.6	43.0	48.6						
20190315:52	20190315:52	58.6	51.6	50.6	52.2	20190315:59	20190315:59	56.7	59.7	42.9	48.5						
20190315:53	20190315:53	58.7	51.7	50.7	52.3	20190316:00	20190316:00	56.8	59.8	42.8	48.4						
20190315:54	20190315:54	58.8	51.8	50.8	52.4			56.9	59.9	42.7	48.3						
20190315:55	20190315:55	58.9	51.9	50.9	52.5			57.0	60.0	42.6	48.2						
20190315:56	20190315:56	59.0	52.0	51.0	52.6			57.1	60.1	42.5	48.1						
20190315:57	20190315:57	59.1	52.1	51.1	52.7			57.2	60.2	42.4	48.0						
20190315:58	20190315:58	59.2	52.2	51.2	52.8			57.3	60.3	42.3	47.9						
20190315:59	20190315:59	59.3	52.3	51.3	52.9			57.4	60.4	42.2	47.8						
20190316:00	20190316:00	59.4	52.4	51.4	53.0			57.5	60.5	42.1	47.7						

MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m	MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m	MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m
20190316:01	20190316:01	59.5	52.5	51.5	53.1	20190316:08	20190316:08	60.2	60.2	52.2	49.4	20190316:15	20190316:15	60.9	60.9	52.9	50.2
20190316:02	20190316:02	59.6	52.6	51.6	53.2	20190316:09	20190316:09	60.3	60.3	52.3	49.5	20190316:16	20190316:16	61.0	61.0	53.0	50.3
20190316:03	20190316:03	59.7	52.7	51.7	53.3	20190316:10	20190316:10	60.4	60.4	52.4	49.6	20190316:17	20190316:17	61.1	61.1	53.1	50.4
20190316:04	20190316:04	59.8	52.8	51.8	53.4	20190316:11	20190316:11	60.5	60.5	52.5	49.7	20190316:18	20190316:18	61.2	61.2	53.2	50.5
20190316:05	20190316:05	59.9	52.9	51.9	53.5	20190316:12	20190316:12	60.6	60.6	52.6	49.8	20190316:19	20190316:19	61.3	61.3	53.3	50.6
20190316:06	20190316:06	60.0	53.0	52.0	53.6	20190316:13	20190316:13	60.7	60.7	52.7	49.9	20190316:20	20190316:20	61.4	61.4	53.4	50.7
20190316:07	20190316:07	60.1	53.1	52.1	53.7	20190316:14	20190316:14	60.8	60.8	52.8	50.0	20190316:21	20190316:21	61.5	61.5	53.5	50.8
20190316:08	20190316:08	60.2	53.2	52.2	53.8	20190316:15	20190316:15	60.9	60.9	52.9	50.1	20190					





























































MeasurementTime	MeasurementDate	Lane	Lane	Lane	Lane	MeasurementTime	MeasurementDate	Lane	Lane	Lane	Lane	MeasurementTime	MeasurementDate	Lane	Lane	Lane	Lane
19010201	19010201	478	321	321	478	19010201	19010201	481	324	324	481	19010201	19010201	484	327	327	484
19010202	19010202	479	322	322	479	19010202	19010202	482	325	325	482	19010202	19010202	485	328	328	485
19010203	19010203	480	323	323	480	19010203	19010203	483	326	326	483	19010203	19010203	486	329	329	486
19010204	19010204	481	324	324	481	19010204	19010204	484	327	327	484	19010204	19010204	487	330	330	487
19010205	19010205	482	325	325	482	19010205	19010205	485	328	328	485	19010205	19010205	488	331	331	488
19010206	19010206	483	326	326	483	19010206	19010206	486	329	329	486	19010206	19010206	489	332	332	489
19010207	19010207	484	327	327	484	19010207	19010207	487	330	330	487	19010207	19010207	490	333	333	490
19010208	19010208	485	328	328	485	19010208	19010208	488	331	331	488	19010208	19010208	491	334	334	491
19010209	19010209	486	329	329	486	19010209	19010209	489	332	332	489	19010209	19010209	492	335	335	492
19010210	19010210	487	330	330	487	19010210	19010210	490	333	333	490	19010210	19010210	493	336	336	493
19010211	19010211	488	331	331	488	19010211	19010211	491	334	334	491	19010211	19010211	494	337	337	494
19010212	19010212	489	332	332	489	19010212	19010212	492	335	335	492	19010212	19010212	495	338	338	495
19010213	19010213	490	333	333	490	19010213	19010213	493	336	336	493	19010213	19010213	496	339	339	496
19010214	19010214	491	334	334	491	19010214	19010214	494	337	337	494	19010214	19010214	497	340	340	497
19010215	19010215	492	335	335	492	19010215	19010215	495	338	338	495	19010215	19010215	498	341	341	498
19010216	19010216	493	336	336	493	19010216	19010216	496	339	339	496	19010216	19010216	499	342	342	499
19010217	19010217	494	337	337	494	19010217	19010217	497	340	340	497	19010217	19010217	500	343	343	500
19010218	19010218	495	338	338	495	19010218	19010218	498	341	341	498	19010218	19010218	501	344	344	501
19010219	19010219	496	339	339	496	19010219	19010219	499	342	342	499	19010219	19010219	502	345	345	502
19010220	19010220	497	340	340	497	19010220	19010220	500	343	343	500	19010220	19010220	503	346	346	503
19010221	19010221	498	341	341	498	19010221	19010221	501	344	344	501	19010221	19010221	504	347	347	504
19010222	19010222	499	342	342	499	19010222	19010222	502	345	345	502	19010222	19010222	505	348	348	505
19010223	19010223	500	343	343	500	19010223	19010223	503	346	346	503	19010223	19010223	506	349	349	506
19010224	19010224	501	344	344	501	19010224	19010224	504	347	347	504	19010224	19010224	507	350	350	507
19010225	19010225	502	345	345	502	19010225	19010225	505	348	348	505	19010225	19010225	508	351	351	508
19010226	19010226	503	346	346	503	19010226	19010226	506	349	349	506	19010226	19010226	509	352	352	509
19010227	19010227	504	347	347	504	19010227	19010227	507	350	350	507	19010227	19010227	510	353	353	510
19010228	19010228	505	348	348	505	19010228	19010228	508	351	351	508	19010228	19010228	511	354	354	511
19010229	19010229	506	349	349	506	19010229	19010229	509	352	352	509	19010229	19010229	512	355	355	512
19010230	19010230	507	350	350	507	19010230	19010230	510	353	353	510	19010230	19010230	513	356	356	513
19010231	19010231	508	351	351	508	19010231	19010231	511	354	354	511	19010231	19010231	514	357	357	514
19010232	19010232	509	352	352	509	19010232	19010232	512	355	355	512	19010232	19010232	515	358	358	515
19010233	19010233	510	353	353	510	19010233	19010233	513	356	356	513	19010233	19010233	516	359	359	516
19010234	19010234	511	354	354	511	19010234	19010234	514	357	357	514	19010234	19010234	517	360	360	517
19010235	19010235	512	355	355	512	19010235	19010235	515	358	358	515	19010235	19010235	518	361	361	518
19010236	19010236	513	356	356	513	19010236	19010236	516	359	359	516	19010236	19010236	519	362	362	519
19010237	19010237	514	357	357	514	19010237	19010237	517	360	360	517	19010237	19010237	520	363	363	520
19010238	19010238	515	358	358	515	19010238	19010238	518	361	361	518	19010238	19010238	521	364	364	521
19010239	19010239	516	359	359	516	19010239	19010239	519	362	362	519	19010239	19010239	522	365	365	522
19010240	19010240	517	360	360	517	19010240	19010240	520	363	363	520	19010240	19010240	523	366	366	523
19010241	19010241	518	361	361	518	19010241	19010241	521	364	364	521	19010241	19010241	524	367	367	524
19010242	19010242	519	362	362	519	19010242	19010242	522	365	365	522	19010242	19010242	525	368	368	525
19010243	19010243	520	363	363	520	19010243	19010243	523	366	366	523	19010243	19010243	526	369	369	526
19010244	19010244	521	364	364	521	19010244	19010244	524	367	367	524	19010244	19010244	527	370	370	527
19010245	19010245	522	365	365	522	19010245	19010245	525	368	368	525	19010245	19010245	528	371	371	528
19010246	19010246	523	366	366	523	19010246	19010246	526	369	369	526	19010246	19010246	529	372	372	529
19010247	19010247	524	367	367	524	19010247	19010247	527	370	370	527	19010247	19010247	530	373	373	530
19010248	19010248	525	368	368	525	19010248	19010248	528	371	371	528	19010248	19010248	531	374	374	531
19010249	19010249	526	369	369	526	19010249	19010249	529	372	372	529	19010249	19010249	532	375	375	532
19010250	19010250	527	370	370	527	19010250	19010250	530	373	373	530	19010250	19010250	533	376	376	533
19010251	19010251	528	371	371	528	19010251	19010251	531	374	374	531	19010251	19010251	534	377	377	534
19010252	19010252	529	372	372	529	19010252	19010252	532	375	375	532	19010252	19010252	535	378	378	535
19010253	19010253	530	373	373	530	19010253	19010253	533	376	376	533	19010253	19010253	536	379	379	536
19010254	19010254	531	374	374	531	19010254	19010254	534	377	377	534	19010254	19010254	537	380	380	537
19010255	19010255	532	375	375	532	19010255	19010255	535	378	378	535	19010255	19010255	538	381	381	538
19010256	19010256	533	376	376	533	19010256	19010256	536	379	379	536	19010256	19010256	539	382	382	539
19010257	19010257	534	377	377	534	19010257	19010257	537	380	380	537	19010257	19010257	540	383	383	540
19010258	19010258	535	378	378	535	19010258	19010258	538	381	381	538	19010258	19010258	541	384	384	541
19010259	19010259	536	379	379	536	19010259	19010259	539	382	382	539	19010259	19010259	542	385	385	542
19010260	19010260	537	380	380	537	19010260	19010260	540	383	383	540	19010260	19010260	543	386	386	543
19010261	19010261	538	381	381	538	19010261	19010261	541	384	384	541	19010261	19010261	544	387	387	544
19010262	19010262	539	382	382	539	19010262	19010262	542	385	385	542	19010262	19010262	545	388	388	545
19010263	19010263	540	383	383	540	19010263	19010263	543	386	386	543	19010263	19010263	546	389	389	546
19010264	19010264	541	384	384	541	19010264	19010264	544	387	387	544	19010264	19010264	547	390	390	547
19010265	19010265	542	385	385	542	19010265	19010265	545	388	388	545	19010265	19010265	548	391	391	548
19010266	19010266	543	386	386	543	19010266	19010266	546	389	389	546	19010266	19010266	549	392	392	549
19010267	19010267	544	387	387	544	19010267	19010267	547	390	390	547	19010267	19010267	550	393	393	550
19010268	19010268	545	388	388	545	19010268	19010268	548	391	391	548	19010268	19010268	551	394	394	551
19010269	19010269	546	389	389	546	19010269	19010269	549	392	392	549	190102					



















MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m	MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m	MeasurementTime	MeasurementTime	L4m	L4m	L4m	L4m
19000000:00	19000000:00	34.1	42.1	39.1	35.1	19000000:00	19000000:00	40.1	48.1	39.1	35.1	19000000:00	19000000:00	46.1	54.1	41.1	37.1
19000000:01	19000000:01	34.2	42.2	39.2	35.2	19000000:01	19000000:01	40.2	48.2	39.2	35.2	19000000:01	19000000:01	46.2	54.2	41.2	37.2
19000000:02	19000000:02	34.3	42.3	39.3	35.3	19000000:02	19000000:02	40.3	48.3	39.3	35.3	19000000:02	19000000:02	46.3	54.3	41.3	37.3
19000000:03	19000000:03	34.4	42.4	39.4	35.4	19000000:03	19000000:03	40.4	48.4	39.4	35.4	19000000:03	19000000:03	46.4	54.4	41.4	37.4
19000000:04	19000000:04	34.5	42.5	39.5	35.5	19000000:04	19000000:04	40.5	48.5	39.5	35.5	19000000:04	19000000:04	46.5	54.5	41.5	37.5
19000000:05	19000000:05	34.6	42.6	39.6	35.6	19000000:05	19000000:05	40.6	48.6	39.6	35.6	19000000:05	19000000:05	46.6	54.6	41.6	37.6
19000000:06	19000000:06	34.7	42.7	39.7	35.7	19000000:06	19000000:06	40.7	48.7	39.7	35.7	19000000:06	19000000:06	46.7	54.7	41.7	37.7
19000000:07	19000000:07	34.8	42.8	39.8	35.8	19000000:07	19000000:07	40.8	48.8	39.8	35.8	19000000:07	19000000:07	46.8	54.8	41.8	37.8
19000000:08	19000000:08	34.9	42.9	39.9	35.9	19000000:08	19000000:08	40.9	48.9	39.9	35.9	19000000:08	19000000:08	46.9	54.9	41.9	37.9
19000000:09	19000000:09	35.0	43.0	40.0	36.0	19000000:09	19000000:09	41.0	49.0	40.0	36.0	19000000:09	19000000:09	47.0	55.0	42.0	38.0
19000000:10	19000000:10	35.1	43.1	40.1	36.1	19000000:10	19000000:10	41.1	49.1	40.1	36.1	19000000:10	19000000:10	47.1	55.1	42.1	38.1
19000000:11	19000000:11	35.2	43.2	40.2	36.2	19000000:11	19000000:11	41.2	49.2	40.2	36.2	19000000:11	19000000:11	47.2	55.2	42.2	38.2
19000000:12	19000000:12	35.3	43.3	40.3	36.3	19000000:12	19000000:12	41.3	49.3	40.3	36.3	19000000:12	19000000:12	47.3	55.3	42.3	38.3
19000000:13	19000000:13	35.4	43.4	40.4	36.4	19000000:13	19000000:13	41.4	49.4	40.4	36.4	19000000:13	19000000:13	47.4	55.4	42.4	38.4
19000000:14	19000000:14	35.5	43.5	40.5	36.5	19000000:14	19000000:14	41.5	49.5	40.5	36.5	19000000:14	19000000:14	47.5	55.5	42.5	38.5
19000000:15	19000000:15	35.6	43.6	40.6	36.6	19000000:15	19000000:15	41.6	49.6	40.6	36.6	19000000:15	19000000:15	47.6	55.6	42.6	38.6
19000000:16	19000000:16	35.7	43.7	40.7	36.7	19000000:16	19000000:16	41.7	49.7	40.7	36.7	19000000:16	19000000:16	47.7	55.7	42.7	38.7
19000000:17	19000000:17	35.8	43.8	40.8	36.8	19000000:17	19000000:17	41.8	49.8	40.8	36.8	19000000:17	19000000:17	47.8	55.8	42.8	38.8
19000000:18	19000000:18	35.9	43.9	40.9	36.9	19000000:18	19000000:18	41.9	49.9	40.9	36.9	19000000:18	19000000:18	47.9	55.9	42.9	38.9
19000000:19	19000000:19	36.0	44.0	41.0	37.0	19000000:19	19000000:19	42.0	50.0	41.0	37.0	19000000:19	19000000:19	48.0	56.0	43.0	39.0
19000000:20	19000000:20	36.1	44.1	41.1	37.1	19000000:20	19000000:20	42.1	50.1	41.1	37.1	19000000:20	19000000:20	48.1	56.1	43.1	39.1
19000000:21	19000000:21	36.2	44.2	41.2	37.2	19000000:21	19000000:21	42.2	50.2	41.2	37.2	19000000:21	19000000:21	48.2	56.2	43.2	39.2
19000000:22	19000000:22	36.3	44.3	41.3	37.3	19000000:22	19000000:22	42.3	50.3	41.3	37.3	19000000:22	19000000:22	48.3	56.3	43.3	39.3
19000000:23	19000000:23	36.4	44.4	41.4	37.4	19000000:23	19000000:23	42.4	50.4	41.4	37.4	19000000:23	19000000:23	48.4	56.4	43.4	39.4
19000000:24	19000000:24	36.5	44.5	41.5	37.5	19000000:24	19000000:24	42.5	50.5	41.5	37.5	19000000:24	19000000:24	48.5	56.5	43.5	39.5
19000000:25	19000000:25	36.6	44.6	41.6	37.6	19000000:25	19000000:25	42.6	50.6	41.6	37.6	19000000:25	19000000:25	48.6	56.6	43.6	39.6
19000000:26	19000000:26	36.7	44.7	41.7	37.7	19000000:26	19000000:26	42.7	50.7	41.7	37.7	19000000:26	19000000:26	48.7	56.7	43.7	39.7
19000000:27	19000000:27	36.8	44.8	41.8	37.8	19000000:27	19000000:27	42.8	50.8	41.8	37.8	19000000:27	19000000:27	48.8	56.8	43.8	39.8
19000000:28	19000000:28	36.9	44.9	41.9	37.9	19000000:28	19000000:28	42.9	50.9	41.9	37.9	19000000:28	19000000:28	48.9	56.9	43.9	39.9
19000000:29	19000000:29	37.0	45.0	42.0	38.0	19000000:29	19000000:29	43.0	51.0	42.0	38.0	19000000:29	19000000:29	49.0	57.0	44.0	40.0
19000000:30	19000000:30	37.1	45.1	42.1	38.1	19000000:30	19000000:30	43.1	51.1	42.1	38.1	19000000:30	19000000:30	49.1	57.1	44.1	40.1
19000000:31	19000000:31	37.2	45.2	42.2	38.2	19000000:31	19000000:31	43.2	51.2	42.2	38.2	19000000:31	19000000:31	49.2	57.2	44.2	40.2
19000000:32	19000000:32	37.3	45.3	42.3	38.3	19000000:32	19000000:32	43.3	51.3	42.3	38.3	19000000:32	19000000:32	49.3	57.3	44.3	40.3
19000000:33	19000000:33	37.4	45.4	42.4	38.4	19000000:33	19000000:33	43.4	51.4	42.4	38.4	19000000:33	19000000:33	49.4	57.4	44.4	40.4
19000000:34	19000000:34	37.5	45.5	42.5	38.5	19000000:34	19000000:34	43.5	51.5	42.5	38.5	19000000:34	19000000:34	49.5	57.5	44.5	40.5
19000000:35	19000000:35	37.6	45.6	42.6	38.6	19000000:35	19000000:35	43.6	51.6	42.6	38.6	19000000:35	19000000:35	49.6	57.6	44.6	40.6
19000000:36	19000000:36	37.7	45.7	42.7	38.7	19000000:36	19000000:36	43.7	51.7	42.7	38.7	19000000:36	19000000:36	49.7	57.7	44.7	40.7
19000000:37	19000000:37	37.8	45.8	42.8	38.8	19000000:37	19000000:37	43.8	51.8	42.8	38.8	19000000:37	19000000:37	49.8	57.8	44.8	40.8
19000000:38	19000000:38	37.9	45.9	42.9	38.9	19000000:38	19000000:38	43.9	51.9	42.9	38.9	19000000:38	19000000:38	49.9	57.9	44.9	40.9
19000000:39	19000000:39	38.0	46.0	43.0	39.0	19000000:39	19000000:39	44.0	52.0	43.0	39.0	19000000:39	19000000:39	50.0	58.0	45.0	41.0
19000000:40	19000000:40	38.1	46.1	43.1	39.1	19000000:40	19000000:40	44.1	52.1	43.1	39.1	19000000:40	19000000:40	50.1	58.1	45.1	41.1
19000000:41	19000000:41	38.2	46.2	43.2	39.2	19000000:41	19000000:41	44.2	52.2	43.2	39.2	19000000:41	19000000:41	50.2	58.2	45.2	41.2
19000000:42	19000000:42	38.3	46.3	43.3	39.3	19000000:42	19000000:42	44.3	52.3	43.3	39.3	19000000:42	19000000:42	50.3	58.3	45.3	41.3
19000000:43	19000000:43	38.4	46.4	43.4	39.4	19000000:43	19000000:43	44.4	52.4	43.4	39.4	19000000:43	19000000:43	50.4	58.4	45.4	41.4
19000000:44	19000000:44	38.5	46.5	43.5	39.5	19000000:44	19000000:44	44.5	52.5	43.5	39.5	19000000:44	19000000:44	50.5	58.5	45.5	41.5
19000000:45	19000000:45	38.6	46.6	43.6	39.6	19000000:45	19000000:45	44.6	52.6	43.6	39.6	19000000:45	19000000:45	50.6	58.6	45.6	41.6
19000000:46	19000000:46	38.7	46.7	43.7	39.7	19000000:46	19000000:46	44.7	52.7	43.7	39.7	19000000:46	19000000:46	50.7	58.7	45.7	41.7
19000000:47	19000000:47	38.8	46.8	43.8	39.8	19000000:47	19000000:47	44.8	52.8	43.8	39.8	19000000:47	19000000:47	50.8	58.8	45.8	41.8
19000000:48	19000000:48	38.9	46.9	43.9	39.9	19000000:48	19000000:48	44.9	52.9	43.9	39.9	19000000:48	19000000:48	50.9	58.9	45.9	41.9
19000000:49	19000000:49	39.0	47.0	44.0	40.0	19000000:49	19000000:49	45.0	53.0	44.0	40.0	19000000:49	19000000:49	51.0	59.0	46.0	42.0
19000000:50	19000000:50	39.1	47.1	44.1	40.1	19000000:50	19000000:50	45.1	53.1	44.1	40.1	19000000:50	19000000:50	51.1	59.1	46.1	42.1
19000000:51	19000000:51	39.2	47.2	44.2	40.2	19000000:51	19000000:51	45.2	53.2	44.2	40.2	19000000:51	19000000:51	51.2	59.2	46.2	42.2
19000000:52	19000000:52	39.3	47.3	44.3	40.3	19000000:52	19000000:52	45.3	53.3	44.3	40.3	19000000:52	19000000:52	51.3	59.3	46.3	42.3
19000000:53	19000000:53	39.4	47.4	44.4	40.4	19000000:53	19000000:53	45.4	53.4	44.4	40.4	19000000:53	19000000:53	51.4	59.4	46.4	42.4
19000000:54	19000000:54	39.5	47.5	44.5	40.5	19000000:54	19000000:54	45.5	53.5	44.5	40.5	19000000:54	19000000:54	51.5	59.5	46.5	42.5
19000000:55	19000000:55	39.6	47.6	44.6	40.6	19000000:55	19000000:55	45.6	53.6	44.6	40.6	19000000:55	19000000:55	51.6	59.6	46.6	42.6
19000000:56	19000000:56	39.7	47.7	44.7	40.7	19000000:56	19000000:56	45.7	53.7	44.7	40.7	19000000:56	19000000:56	51.7	59.7	46.7	42.7
19000000:57	19000000:57	39.8	47.8	44.8	40.8	19000000:57	19000000:57	45.8	53.8	44.8	40.8	19000000:57	19000000:57	51.8	59.8	46.8	42.8
19000000:58	19000000:58	39.9	47.9	44.9	40.9	19000000:58	19000000:58	45.9	53.9	44.9	40.9	19000000:58					



















































MeasurementDate	MeasurementDate	L461	L462	L463	L464	L465	MeasurementDate	MeasurementDate	L461	L462	L463	L464	L465	MeasurementDate	MeasurementDate	L461	L462	L463	L464	L465
2040024101	2040024101	35	42.1	32.2	35.1	33.8	2040024111	2040024111	35.8	42.8	32.9	35.4	34.1	2040024121	2040024121	36.1	43.1	33.2	35.7	34.4
2040024102	2040024102	35.1	41.8	31.9	34.8	33.5	2040024112	2040024112	36.2	43.1	33.3	35.5	34.2	2040024122	2040024122	36.2	43.1	33.3	35.7	34.5
2040024103	2040024103	35.2	41.9	32.0	34.9	33.6	2040024113	2040024113	36.3	43.2	33.4	35.6	34.3	2040024123	2040024123	36.3	43.2	33.4	35.8	34.6
2040024104	2040024104	35.3	42.0	32.1	35.0	33.7	2040024114	2040024114	36.4	43.3	33.5	35.7	34.4	2040024124	2040024124	36.4	43.3	33.5	35.9	34.7
2040024105	2040024105	35.4	42.1	32.2	35.1	33.8	2040024115	2040024115	36.5	43.4	33.6	35.8	34.5	2040024125	2040024125	36.5	43.4	33.6	36.0	34.8
2040024106	2040024106	35.5	42.2	32.3	35.2	33.9	2040024116	2040024116	36.6	43.5	33.7	35.9	34.6	2040024126	2040024126	36.6	43.5	33.7	36.1	34.9
2040024107	2040024107	35.6	42.3	32.4	35.3	34.0	2040024117	2040024117	36.7	43.6	33.8	36.0	34.7	2040024127	2040024127	36.7	43.6	33.8	36.2	35.0
2040024108	2040024108	35.7	42.4	32.5	35.4	34.1	2040024118	2040024118	36.8	43.7	33.9	36.1	34.8	2040024128	2040024128	36.8	43.7	33.9	36.3	35.1
2040024109	2040024109	35.8	42.5	32.6	35.5	34.2	2040024119	2040024119	36.9	43.8	34.0	36.2	34.9	2040024129	2040024129	36.9	43.8	34.0	36.4	35.2
2040024110	2040024110	35.9	42.6	32.7	35.6	34.3	2040024120	2040024120	37.0	43.9	34.1	36.3	35.0	2040024130	2040024130	37.0	43.9	34.1	36.5	35.3
2040024111	2040024111	36.0	42.7	32.8	35.7	34.4	2040024121	2040024121	37.1	44.0	34.2	36.4	35.1	2040024131	2040024131	37.1	44.0	34.2	36.6	35.4
2040024112	2040024112	36.1	42.8	32.9	35.8	34.5	2040024122	2040024122	37.2	44.1	34.3	36.5	35.2	2040024132	2040024132	37.2	44.1	34.3	36.7	35.5
2040024113	2040024113	36.2	42.9	33.0	35.9	34.6	2040024123	2040024123	37.3	44.2	34.4	36.6	35.3	2040024133	2040024133	37.3	44.2	34.4	36.8	35.6
2040024114	2040024114	36.3	43.0	33.1	36.0	34.7	2040024124	2040024124	37.4	44.3	34.5	36.7	35.4	2040024134	2040024134	37.4	44.3	34.5	36.9	35.7
2040024115	2040024115	36.4	43.1	33.2	36.1	34.8	2040024125	2040024125	37.5	44.4	34.6	36.8	35.5	2040024135	2040024135	37.5	44.4	34.6	37.0	35.8
2040024116	2040024116	36.5	43.2	33.3	36.2	34.9	2040024126	2040024126	37.6	44.5	34.7	36.9	35.6	2040024136	2040024136	37.6	44.5	34.7	37.1	35.9
2040024117	2040024117	36.6	43.3	33.4	36.3	35.0	2040024127	2040024127	37.7	44.6	34.8	37.0	35.7	2040024137	2040024137	37.7	44.6	34.8	37.2	36.0
2040024118	2040024118	36.7	43.4	33.5	36.4	35.1	2040024128	2040024128	37.8	44.7	34.9	37.1	35.8	2040024138	2040024138	37.8	44.7	34.9	37.3	36.1
2040024119	2040024119	36.8	43.5	33.6	36.5	35.2	2040024129	2040024129	37.9	44.8	35.0	37.2	35.9	2040024139	2040024139	37.9	44.8	35.0	37.4	36.2
2040024120	2040024120	36.9	43.6	33.7	36.6	35.3	2040024130	2040024130	38.0	44.9	35.1	37.3	36.0	2040024140	2040024140	38.0	44.9	35.1	37.5	36.3
2040024121	2040024121	37.0	43.7	33.8	36.7	35.4	2040024131	2040024131	38.1	45.0	35.2	37.4	36.1	2040024141	2040024141	38.1	45.0	35.2	37.6	36.4
2040024122	2040024122	37.1	43.8	33.9	36.8	35.5	2040024132	2040024132	38.2	45.1	35.3	37.5	36.2	2040024142	2040024142	38.2	45.1	35.3	37.7	36.5
2040024123	2040024123	37.2	43.9	34.0	36.9	35.6	2040024133	2040024133	38.3	45.2	35.4	37.6	36.3	2040024143	2040024143	38.3	45.2	35.4	37.8	36.6
2040024124	2040024124	37.3	44.0	34.1	37.0	35.7	2040024134	2040024134	38.4	45.3	35.5	37.7	36.4	2040024144	2040024144	38.4	45.3	35.5	37.9	36.7
2040024125	2040024125	37.4	44.1	34.2	37.1	35.8	2040024135	2040024135	38.5	45.4	35.6	37.8	36.5	2040024145	2040024145	38.5	45.4	35.6	38.0	36.8
2040024126	2040024126	37.5	44.2	34.3	37.2	35.9	2040024136	2040024136	38.6	45.5	35.7	37.9	36.6	2040024146	2040024146	38.6	45.5	35.7	38.1	36.9
2040024127	2040024127	37.6	44.3	34.4	37.3	36.0	2040024137	2040024137	38.7	45.6	35.8	38.0	36.7	2040024147	2040024147	38.7	45.6	35.8	38.2	37.0
2040024128	2040024128	37.7	44.4	34.5	37.4	36.1	2040024138	2040024138	38.8	45.7	35.9	38.1	36.8	2040024148	2040024148	38.8	45.7	35.9	38.3	37.1
2040024129	2040024129	37.8	44.5	34.6	37.5	36.2	2040024139	2040024139	38.9	45.8	36.0	38.2	36.9	2040024149	2040024149	38.9	45.8	36.0	38.4	37.2
2040024130	2040024130	37.9	44.6	34.7	37.6	36.3	2040024140	2040024140	39.0	45.9	36.1	38.3	37.0	2040024150	2040024150	39.0	45.9	36.1	38.5	37.3
2040024131	2040024131	38.0	44.7	34.8	37.7	36.4	2040024141	2040024141	39.1	46.0	36.2	38.4	37.1	2040024151	2040024151	39.1	46.0	36.2	38.6	37.4
2040024132	2040024132	38.1	44.8	34.9	37.8	36.5	2040024142	2040024142	39.2	46.1	36.3	38.5	37.2	2040024152	2040024152	39.2	46.1	36.3	38.7	37.5
2040024133	2040024133	38.2	44.9	35.0	37.9	36.6	2040024143	2040024143	39.3	46.2	36.4	38.6	37.3	2040024153	2040024153	39.3	46.2	36.4	38.8	37.6
2040024134	2040024134	38.3	45.0	35.1	38.0	36.7	2040024144	2040024144	39.4	46.3	36.5	38.7	37.4	2040024154	2040024154	39.4	46.3	36.5	38.9	37.7
2040024135	2040024135	38.4	45.1	35.2	38.1	36.8	2040024145	2040024145	39.5	46.4	36.6	38.8	37.5	2040024155	2040024155	39.5	46.4	36.6	39.0	37.8
2040024136	2040024136	38.5	45.2	35.3	38.2	36.9	2040024146	2040024146	39.6	46.5	36.7	38.9	37.6	2040024156	2040024156	39.6	46.5	36.7	39.1	37.9
2040024137	2040024137	38.6	45.3	35.4	38.3	37.0	2040024147	2040024147	39.7	46.6	36.8	39.0	37.7	2040024157	2040024157	39.7	46.6	36.8	39.2	38.0
2040024138	2040024138	38.7	45.4	35.5	38.4	37.1	2040024148	2040024148	39.8	46.7	36.9	39.1	37.8	2040024158	2040024158	39.8	46.7	36.9	39.3	38.1
2040024139	2040024139	38.8	45.5	35.6	38.5	37.2	2040024149	2040024149	39.9	46.8	37.0	39.2	37.9	2040024159	2040024159	39.9	46.8	37.0	39.4	38.2
2040024140	2040024140	38.9	45.6	35.7	38.6	37.3	2040024150	2040024150	40.0	46.9	37.1	39.3	38.0	2040024160	2040024160	40.0	46.9	37.1	39.5	38.3
2040024141	2040024141	39.0	45.7	35.8	38.7	37.4	2040024151	2040024151	40.1	47.0	37.2	39.4	38.1	2040024161	2040024161	40.1	47.0	37.2	39.6	38.4
2040024142	2040024142	39.1	45.8	35.9	38.8	37.5	2040024152	2040024152	40.2	47.1	37.3	39.5	38.2	2040024162	2040024162	40.2	47.1	37.3	39.7	38.5
2040024143	2040024143	39.2	45.9	36.0	38.9	37.6	2040024153	2040024153	40.3	47.2	37.4	39.6	38.3	2040024163	2040024163	40.3	47.2	37.4	39.8	38.6
2040024144	2040024144	39.3	46.0	36.1	39.0	37.7	2040024154	2040024154	40.4	47.3	37.5	39.7	38.4	2040024164	2040024164	40.4	47.3	37.5	39.9	38.7
2040024145	2040024145	39.4	46.1	36.2	39.1	37.8	2040024155	2040024155	40.5	47.4	37.6	39.8	38.5	2040024165	2040024165	40.5	47.4	37.6	40.0	38.8
2040024146	2040024146	39.5	46.2	36.3	39.2	37.9	2040024156	2040024156	40.6	47.5	37.7	39.9	38.6	2040024166	2040024166	40.6	47.5	37.7	40.1	38.9
2040024147	2040024147	39.6	46.3	36.4	39.3	38.0	2040024157	2040024157	40.7	47.6	37.8	40.0	38.7	2040024167	2040024167	40.7	47.6	37.8	40.2	39.0
2040024148	2040024148	39.7	46.4	36.5	39.4	38.1	2040024158	2040024158	40.8	47.7	37.9	40.1	38.8	2040024168	2040024168	40.8	47.7	37.9	40.3	39.1
2040024149	2040024149	39.8	46.5	36.6	39.5	38.2	2040024159	2040024159	40.9	47.8	38.0	40.2	38.9	2040024169	2040024169	40.9	47.8	38.0	40.4	39.2
2040024150	2040024150	39.9	46.6	36.7	39.6	38.3	2040024160	2040024160	41.0	47.9	38.1	40.3	39.0	2040024170	2040024170	41.0	47.9	38.1	40.5	39.3
2040024151	2040024151	40.0	46.7	36.8	39.7	38.4	2040024161	2040024161	41.1	48.0	38.2	40.4	39.1	2040024171	2040024171	41.1	48.0	38.2	40.6	39.4
2040024152	2040024152	40.1	46.8	36.9	39.8	38.5	2040024162	2040024162	41.2	48.1	38.3	40.5	39.2	2040024172	2040024172	41.2	48.1	38.3	40.7	39.5
2040024153	2040024153	40.2	46.9	37.0	39.9	38.6	2040024163	2040024163	41.3	48.2	38.4	40.6	39.3	2040024173	2040024173	41.3				







MeasurementDate	MeasurementDate	LAWS	LAWS	LAWS	LAWS	MeasurementDate	MeasurementDate	LAWS	LAWS	LAWS	LAWS	MeasurementDate	MeasurementDate	LAWS	LAWS	LAWS	LAWS
08/11/2023 0:00	08/11/2023 0:00	58.5	74.8	48.8	58.5	08/11/2023 0:00	08/11/2023 0:00	41.1	48.4	48.4	41.1	08/11/2023 0:00	08/11/2023 0:00	48.4	48.4	48.4	48.4
08/11/2023 0:00	08/11/2023 0:00	68.2	84.7	48.3	68.2	08/11/2023 0:00	08/11/2023 0:00	48.4	58.5	48.4	48.4	08/11/2023 0:00	08/11/2023 0:00	58.5	68.2	48.3	58.5
08/11/2023 0:00	08/11/2023 0:00	78.1	94.6	48.2	78.1	08/11/2023 0:00	08/11/2023 0:00	58.5	68.2	58.5	58.5	08/11/2023 0:00	08/11/2023 0:00	68.2	78.1	48.2	68.2
08/11/2023 0:00	08/11/2023 0:00	88.0	104.5	48.1	88.0	08/11/2023 0:00	08/11/2023 0:00	68.2	78.1	68.2	68.2	08/11/2023 0:00	08/11/2023 0:00	78.1	88.0	48.1	78.1
08/11/2023 0:00	08/11/2023 0:00	97.9	114.4	48.0	97.9	08/11/2023 0:00	08/11/2023 0:00	78.1	88.0	78.1	78.1	08/11/2023 0:00	08/11/2023 0:00	88.0	97.9	48.0	88.0
08/11/2023 0:00	08/11/2023 0:00	107.8	124.3	47.9	107.8	08/11/2023 0:00	08/11/2023 0:00	88.0	97.9	88.0	88.0	08/11/2023 0:00	08/11/2023 0:00	97.9	107.8	47.9	97.9
08/11/2023 0:00	08/11/2023 0:00	117.7	134.2	47.8	117.7	08/11/2023 0:00	08/11/2023 0:00	97.9	107.8	97.9	97.9	08/11/2023 0:00	08/11/2023 0:00	107.8	117.7	47.8	107.8
08/11/2023 0:00	08/11/2023 0:00	127.6	144.1	47.7	127.6	08/11/2023 0:00	08/11/2023 0:00	107.8	117.7	107.8	107.8	08/11/2023 0:00	08/11/2023 0:00	117.7	127.6	47.7	117.7
08/11/2023 0:00	08/11/2023 0:00	137.5	154.0	47.6	137.5	08/11/2023 0:00	08/11/2023 0:00	117.7	127.6	117.7	117.7	08/11/2023 0:00	08/11/2023 0:00	127.6	137.5	47.6	127.6
08/11/2023 0:00	08/11/2023 0:00	147.4	163.9	47.5	147.4	08/11/2023 0:00	08/11/2023 0:00	127.6	137.5	127.6	127.6	08/11/2023 0:00	08/11/2023 0:00	137.5	147.4	47.5	137.5
08/11/2023 0:00	08/11/2023 0:00	157.3	173.8	47.4	157.3	08/11/2023 0:00	08/11/2023 0:00	137.5	147.4	137.5	137.5	08/11/2023 0:00	08/11/2023 0:00	147.4	157.3	47.4	147.4
08/11/2023 0:00	08/11/2023 0:00	167.2	183.7	47.3	167.2	08/11/2023 0:00	08/11/2023 0:00	147.4	157.3	147.4	147.4	08/11/2023 0:00	08/11/2023 0:00	157.3	167.2	47.3	157.3
08/11/2023 0:00	08/11/2023 0:00	177.1	193.6	47.2	177.1	08/11/2023 0:00	08/11/2023 0:00	157.3	167.2	157.3	157.3	08/11/2023 0:00	08/11/2023 0:00	167.2	177.1	47.2	167.2
08/11/2023 0:00	08/11/2023 0:00	187.0	203.5	47.1	187.0	08/11/2023 0:00	08/11/2023 0:00	167.2	177.1	167.2	167.2	08/11/2023 0:00	08/11/2023 0:00	177.1	187.0	47.1	177.1
08/11/2023 0:00	08/11/2023 0:00	196.9	213.4	47.0	196.9	08/11/2023 0:00	08/11/2023 0:00	177.1	187.0	177.1	177.1	08/11/2023 0:00	08/11/2023 0:00	187.0	196.9	47.0	187.0
08/11/2023 0:00	08/11/2023 0:00	206.8	223.3	46.9	206.8	08/11/2023 0:00	08/11/2023 0:00	187.0	196.9	187.0	187.0	08/11/2023 0:00	08/11/2023 0:00	196.9	206.8	46.9	196.9
08/11/2023 0:00	08/11/2023 0:00	216.7	233.2	46.8	216.7	08/11/2023 0:00	08/11/2023 0:00	196.9	206.8	196.9	196.9	08/11/2023 0:00	08/11/2023 0:00	206.8	216.7	46.8	206.8
08/11/2023 0:00	08/11/2023 0:00	226.6	243.1	46.7	226.6	08/11/2023 0:00	08/11/2023 0:00	206.8	216.7	206.8	206.8	08/11/2023 0:00	08/11/2023 0:00	216.7	226.6	46.7	216.7
08/11/2023 0:00	08/11/2023 0:00	236.5	253.0	46.6	236.5	08/11/2023 0:00	08/11/2023 0:00	216.7	226.6	216.7	216.7	08/11/2023 0:00	08/11/2023 0:00	226.6	236.5	46.6	226.6
08/11/2023 0:00	08/11/2023 0:00	246.4	262.9	46.5	246.4	08/11/2023 0:00	08/11/2023 0:00	226.6	236.5	226.6	226.6	08/11/2023 0:00	08/11/2023 0:00	236.5	246.4	46.5	236.5
08/11/2023 0:00	08/11/2023 0:00	256.3	272.8	46.4	256.3	08/11/2023 0:00	08/11/2023 0:00	236.5	246.4	236.5	236.5	08/11/2023 0:00	08/11/2023 0:00	246.4	256.3	46.4	246.4
08/11/2023 0:00	08/11/2023 0:00	266.2	282.7	46.3	266.2	08/11/2023 0:00	08/11/2023 0:00	246.4	256.3	246.4	246.4	08/11/2023 0:00	08/11/2023 0:00	256.3	266.2	46.3	256.3
08/11/2023 0:00	08/11/2023 0:00	276.1	292.6	46.2	276.1	08/11/2023 0:00	08/11/2023 0:00	256.3	266.2	256.3	256.3	08/11/2023 0:00	08/11/2023 0:00	266.2	276.1	46.2	266.2
08/11/2023 0:00	08/11/2023 0:00	286.0	302.5	46.1	286.0	08/11/2023 0:00	08/11/2023 0:00	266.2	276.1	266.2	266.2	08/11/2023 0:00	08/11/2023 0:00	276.1	286.0	46.1	276.1
08/11/2023 0:00	08/11/2023 0:00	295.9	312.4	46.0	295.9	08/11/2023 0:00	08/11/2023 0:00	276.1	286.0	276.1	276.1	08/11/2023 0:00	08/11/2023 0:00	286.0	295.9	46.0	286.0
08/11/2023 0:00	08/11/2023 0:00	305.8	322.3	45.9	305.8	08/11/2023 0:00	08/11/2023 0:00	286.0	295.9	286.0	286.0	08/11/2023 0:00	08/11/2023 0:00	295.9	305.8	45.9	295.9
08/11/2023 0:00	08/11/2023 0:00	315.7	332.2	45.8	315.7	08/11/2023 0:00	08/11/2023 0:00	295.9	305.8	295.9	295.9	08/11/2023 0:00	08/11/2023 0:00	305.8	315.7	45.8	305.8
08/11/2023 0:00	08/11/2023 0:00	325.6	342.1	45.7	325.6	08/11/2023 0:00	08/11/2023 0:00	305.8	315.7	305.8	305.8	08/11/2023 0:00	08/11/2023 0:00	315.7	325.6	45.7	315.7
08/11/2023 0:00	08/11/2023 0:00	335.5	352.0	45.6	335.5	08/11/2023 0:00	08/11/2023 0:00	315.7	325.6	315.7	315.7	08/11/2023 0:00	08/11/2023 0:00	325.6	335.5	45.6	325.6
08/11/2023 0:00	08/11/2023 0:00	345.4	361.9	45.5	345.4	08/11/2023 0:00	08/11/2023 0:00	325.6	335.5	325.6	325.6	08/11/2023 0:00	08/11/2023 0:00	335.5	345.4	45.5	335.5
08/11/2023 0:00	08/11/2023 0:00	355.3	371.8	45.4	355.3	08/11/2023 0:00	08/11/2023 0:00	335.5	345.4	335.5	335.5	08/11/2023 0:00	08/11/2023 0:00	345.4	355.3	45.4	345.4
08/11/2023 0:00	08/11/2023 0:00	365.2	381.7	45.3	365.2	08/11/2023 0:00	08/11/2023 0:00	345.4	355.3	345.4	345.4	08/11/2023 0:00	08/11/2023 0:00	355.3	365.2	45.3	355.3
08/11/2023 0:00	08/11/2023 0:00	375.1	391.6	45.2	375.1	08/11/2023 0:00	08/11/2023 0:00	355.3	365.2	355.3	355.3	08/11/2023 0:00	08/11/2023 0:00	365.2	375.1	45.2	365.2
08/11/2023 0:00	08/11/2023 0:00	385.0	401.5	45.1	385.0	08/11/2023 0:00	08/11/2023 0:00	365.2	375.1	365.2	365.2	08/11/2023 0:00	08/11/2023 0:00	375.1	385.0	45.1	375.1
08/11/2023 0:00	08/11/2023 0:00	394.9	411.4	45.0	394.9	08/11/2023 0:00	08/11/2023 0:00	375.1	385.0	375.1	375.1	08/11/2023 0:00	08/11/2023 0:00	385.0	394.9	45.0	385.0
08/11/2023 0:00	08/11/2023 0:00	404.8	421.3	44.9	404.8	08/11/2023 0:00	08/11/2023 0:00	385.0	394.9	385.0	385.0	08/11/2023 0:00	08/11/2023 0:00	394.9	404.8	44.9	394.9
08/11/2023 0:00	08/11/2023 0:00	414.7	431.2	44.8	414.7	08/11/2023 0:00	08/11/2023 0:00	394.9	404.8	394.9	394.9	08/11/2023 0:00	08/11/2023 0:00	404.8	414.7	44.8	404.8
08/11/2023 0:00	08/11/2023 0:00	424.6	441.1	44.7	424.6	08/11/2023 0:00	08/11/2023 0:00	404.8	414.7	404.8	404.8	08/11/2023 0:00	08/11/2023 0:00	414.7	424.6	44.7	414.7
08/11/2023 0:00	08/11/2023 0:00	434.5	451.0	44.6	434.5	08/11/2023 0:00	08/11/2023 0:00	414.7	424.6	414.7	414.7	08/11/2023 0:00	08/11/2023 0:00	424.6	434.5	44.6	424.6
08/11/2023 0:00	08/11/2023 0:00	444.4	460.9	44.5	444.4	08/11/2023 0:00	08/11/2023 0:00	424.6	434.5	424.6	424.6	08/11/2023 0:00	08/11/2023 0:00	434.5	444.4	44.5	434.5
08/11/2023 0:00	08/11/2023 0:00	454.3	470.8	44.4	454.3	08/11/2023 0:00	08/11/2023 0:00	434.5	444.4	434.5	434.5	08/11/2023 0:00	08/11/2023 0:00	444.4	454.3	44.4	444.4
08/11/2023 0:00	08/11/2023 0:00	464.2	480.7	44.3	464.2	08/11/2023 0:00	08/11/2023 0:00	444.4	454.3	444.4	444.4	08/11/2023 0:00	08/11/2023 0:00	454.3	464.2	44.3	454.3
08/11/2023 0:00	08/11/2023 0:00	474.1	490.6	44.2	474.1	08/11/2023 0:00	08/11/2023 0:00	454.3	464.2	454.3	454.3	08/11/2023 0:00	08/11/2023 0:00	464.2	474.1	44.2	464.2
08/11/2023 0:00	08/11/2023 0:00	484.0	500.5	44.1	484.0	08/11/2023 0:00	08/11/2023 0:00	464.2	474.1	464.2	464.2	08/11/2023 0:00	08/11/2023 0:00	474.1	484.0	44.1	474.1
08/11/2023 0:00	08/11/2023 0:00	493.9	510.4	44.0	493.9	08/11/2023 0:00	08/11/2023 0:00	474.1	484.0	474.1	474.1	08/11/2023 0:00	08/11/2023 0:00	484.0	493.9	44.0	484.0
08/11/2023 0:00	08/11/2023 0:00	503.8	520.3	43.9	503.8	08/11/2023 0:00	08/11/2023 0:00	484.0	493.9	484.0	484.0	08/11/2023 0:00	08/11/2023 0:00	493.9	503.8	43.9	493.9
08/11/2023 0:00	08/11/2023 0:00	513.7	530.2	43.8	513.7	08/11/2023 0:00	08/11/2023 0:00	493.9	503.8	493.9	493.9	08/11/2023 0:00	08/11/2023 0:00	503.8	513.7	43.8	503.8
08/11/2023 0:00	08/11/2023 0:00	523.6	540.1	43.7	523.6	08/11/2023 0:00	08/11/2023 0:00	503.8	513.7	503.8	503.8	08/11/2023 0:00	08/11/2023 0:00	513.7	523.6	43.7	513.7
08/11/2023 0:00	08/11/2023 0:00	533.5	550.0	43.6	533.5	08/11/2023 0:00	08/11/2023 0:00	513.7	523.6	513.7	513.7	08/11/2023 0:00	08/11/2023 0:00	523.6	533.5	43.6	523.6
08/11/2023 0:00	08/11/2023 0:00	543.4	559.9	43.5	543.4	08/11/2023 0:00	08/11/2023 0:00	523.6	533.5	523.6	523.6	08/11/2023 0:00	08/11/2023 0:00	533.5	543.4	43.5	533.5
08/11/2023 0:00	08/11/2023 0:00	553.3	569.8	43.4	553.3	08/11/2023 0:00	08/11/2023 0:00	533.5	543.4	533.5	533.5	08/11/2023 0					







MeasurementDate	MeasurementDate	LAWS	LAWS	LAWS	LAWS
20110201-00	20110201-00	48.9	58.8	45.4	52.7
20110201-01	20110201-01	48.2	58.1	44.7	52.0
20110201-02	20110201-02	50.3	60.2	46.7	54.0
20110201-03	20110201-03	49.5	59.4	45.9	53.2
20110201-04	20110201-04	48.1	58.0	45.1	52.4
20110201-05	20110201-05	47.3	57.2	44.3	51.6
20110201-06	20110201-06	46.5	56.4	43.5	50.8
20110201-07	20110201-07	45.7	55.6	42.7	50.0
20110201-08	20110201-08	44.9	54.8	41.9	49.2
20110201-09	20110201-09	44.1	54.0	41.1	48.4
20110201-10	20110201-10	43.3	53.2	40.3	47.6
20110201-11	20110201-11	42.5	52.4	39.5	46.8
20110201-12	20110201-12	41.7	51.6	38.7	46.0
20110201-13	20110201-13	40.9	50.8	37.9	45.2
20110201-14	20110201-14	40.1	50.0	37.1	44.4
20110201-15	20110201-15	39.3	49.2	36.3	43.6
20110201-16	20110201-16	38.5	48.4	35.5	42.8
20110201-17	20110201-17	37.7	47.6	34.7	42.0
20110201-18	20110201-18	36.9	46.8	33.9	41.2
20110201-19	20110201-19	36.1	46.0	33.1	40.4
20110201-20	20110201-20	35.3	45.2	32.3	39.6
20110201-21	20110201-21	34.5	44.4	31.5	38.8
20110201-22	20110201-22	33.7	43.6	30.7	38.0
20110201-23	20110201-23	32.9	42.8	29.9	37.2
20110201-24	20110201-24	32.1	42.0	29.1	36.4
20110201-25	20110201-25	31.3	41.2	28.3	35.6
20110201-26	20110201-26	30.5	40.4	27.5	34.8
20110201-27	20110201-27	29.7	39.6	26.7	34.0
20110201-28	20110201-28	28.9	38.8	25.9	33.2
20110201-29	20110201-29	28.1	38.0	25.1	32.4
20110201-30	20110201-30	27.3	37.2	24.3	31.6
20110201-31	20110201-31	26.5	36.4	23.5	30.8
20110202-00	20110202-00	25.7	35.6	22.7	30.0
20110202-01	20110202-01	24.9	34.8	21.9	29.2
20110202-02	20110202-02	24.1	34.0	21.1	28.4
20110202-03	20110202-03	23.3	33.2	20.3	27.6
20110202-04	20110202-04	22.5	32.4	19.5	26.8
20110202-05	20110202-05	21.7	31.6	18.7	26.0
20110202-06	20110202-06	20.9	30.8	17.9	25.2
20110202-07	20110202-07	20.1	30.0	17.1	24.4
20110202-08	20110202-08	19.3	29.2	16.3	23.6
20110202-09	20110202-09	18.5	28.4	15.5	22.8
20110202-10	20110202-10	17.7	27.6	14.7	22.0
20110202-11	20110202-11	16.9	26.8	13.9	21.2
20110202-12	20110202-12	16.1	26.0	13.1	20.4
20110202-13	20110202-13	15.3	25.2	12.3	19.6
20110202-14	20110202-14	14.5	24.4	11.5	18.8
20110202-15	20110202-15	13.7	23.6	10.7	18.0
20110202-16	20110202-16	12.9	22.8	9.9	17.2
20110202-17	20110202-17	12.1	22.0	9.1	16.4
20110202-18	20110202-18	11.3	21.2	8.3	15.6
20110202-19	20110202-19	10.5	20.4	7.5	14.8
20110202-20	20110202-20	9.7	19.6	6.7	14.0
20110202-21	20110202-21	8.9	18.8	5.9	13.2
20110202-22	20110202-22	8.1	18.0	5.1	12.4
20110202-23	20110202-23	7.3	17.2	4.3	11.6
20110202-24	20110202-24	6.5	16.4	3.5	10.8
20110202-25	20110202-25	5.7	15.6	2.7	10.0
20110202-26	20110202-26	4.9	14.8	1.9	9.2
20110202-27	20110202-27	4.1	14.0	1.1	8.4
20110202-28	20110202-28	3.3	13.2	0.3	7.6
20110202-29	20110202-29	2.5	12.4	-0.5	6.8
20110202-30	20110202-30	1.7	11.6	-1.3	6.0
20110203-00	20110203-00	0.9	10.8	-2.1	5.2
20110203-01	20110203-01	0.1	10.0	-2.9	4.4
20110203-02	20110203-02	-0.7	9.2	-3.7	3.6
20110203-03	20110203-03	-1.5	8.4	-4.5	2.8
20110203-04	20110203-04	-2.3	7.6	-5.3	2.0
20110203-05	20110203-05	-3.1	6.8	-6.1	1.2
20110203-06	20110203-06	-3.9	6.0	-6.9	0.4
20110203-07	20110203-07	-4.7	5.2	-7.7	-0.4
20110203-08	20110203-08	-5.5	4.4	-8.5	-1.2
20110203-09	20110203-09	-6.3	3.6	-9.3	-2.0
20110203-10	20110203-10	-7.1	2.8	-10.1	-2.8
20110203-11	20110203-11	-7.9	2.0	-10.9	-3.6
20110203-12	20110203-12	-8.7	1.2	-11.7	-4.4
20110203-13	20110203-13	-9.5	0.4	-12.5	-5.2
20110203-14	20110203-14	-10.3	-0.4	-13.3	-6.0
20110203-15	20110203-15	-11.1	-1.2	-14.1	-6.8
20110203-16	20110203-16	-11.9	-2.0	-14.9	-7.6
20110203-17	20110203-17	-12.7	-2.8	-15.7	-8.4
20110203-18	20110203-18	-13.5	-3.6	-16.5	-9.2
20110203-19	20110203-19	-14.3	-4.4	-17.3	-10.0
20110203-20	20110203-20	-15.1	-5.2	-18.1	-10.8
20110203-21	20110203-21	-15.9	-6.0	-18.9	-11.6
20110203-22	20110203-22	-16.7	-6.8	-19.7	-12.4
20110203-23	20110203-23	-17.5	-7.6	-20.5	-13.2
20110203-24	20110203-24	-18.3	-8.4	-21.3	-14.0
20110203-25	20110203-25	-19.1	-9.2	-22.1	-14.8
20110203-26	20110203-26	-19.9	-10.0	-22.9	-15.6
20110203-27	20110203-27	-20.7	-10.8	-23.7	-16.4
20110203-28	20110203-28	-21.5	-11.6	-24.5	-17.2
20110203-29	20110203-29	-22.3	-12.4	-25.3	-18.0
20110203-30	20110203-30	-23.1	-13.2	-26.1	-18.8
20110204-00	20110204-00	-23.9	-14.0	-26.9	-19.6
20110204-01	20110204-01	-24.7	-14.8	-27.7	-20.4
20110204-02	20110204-02	-25.5	-15.6	-28.5	-21.2
20110204-03	20110204-03	-26.3	-16.4	-29.3	-22.0
20110204-04	20110204-04	-27.1	-17.2	-30.1	-22.8
20110204-05	20110204-05	-27.9	-18.0	-30.9	-23.6
20110204-06	20110204-06	-28.7	-18.8	-31.7	-24.4
20110204-07	20110204-07	-29.5	-19.6	-32.5	-25.2
20110204-08	20110204-08	-30.3	-20.4	-33.3	-26.0
20110204-09	20110204-09	-31.1	-21.2	-34.1	-26.8
20110204-10	20110204-10	-31.9	-22.0	-34.9	-27.6
20110204-11	20110204-11	-32.7	-22.8	-35.7	-28.4
20110204-12	20110204-12	-33.5	-23.6	-36.5	-29.2
20110204-13	20110204-13	-34.3	-24.4	-37.3	-30.0
20110204-14	20110204-14	-35.1	-25.2	-38.1	-30.8
20110204-15	20110204-15	-35.9	-26.0	-38.9	-31.6
20110204-16	20110204-16	-36.7	-26.8	-39.7	-32.4
20110204-17	20110204-17	-37.5	-27.6	-40.5	-33.2
20110204-18	20110204-18	-38.3	-28.4	-41.3	-34.0
20110204-19	20110204-19	-39.1	-29.2	-42.1	-34.8
20110204-20	20110204-20	-39.9	-30.0	-42.9	-35.6
20110204-21	20110204-21	-40.7	-30.8	-43.7	-36.4
20110204-22	20110204-22	-41.5	-31.6	-44.5	-37.2
20110204-23	20110204-23	-42.3	-32.4	-45.3	-38.0
20110204-24	20110204-24	-43.1	-33.2	-46.1	-38.8
20110204-25	20110204-25	-43.9	-34.0	-46.9	-39.6
20110204-26	20110204-26	-44.7	-34.8	-47.7	-40.4
20110204-27	20110204-27	-45.5	-35.6	-48.5	-41.2
20110204-28	20110204-28	-46.3	-36.4	-49.3	-42.0
20110204-29	20110204-29	-47.1	-37.2	-50.1	-42.8
20110204-30	20110204-30	-47.9	-38.0	-50.9	-43.6
20110205-00	20110205-00	-48.7	-38.8	-51.7	-44.4
20110205-01	20110205-01	-49.5	-39.6	-52.5	-45.2
20110205-02	20110205-02	-50.3	-40.4	-53.3	-46.0
20110205-03	20110205-03	-51.1	-41.2	-54.1	-46.8
20110205-04	20110205-04	-51.9	-42.0	-54.9	-47.6
20110205-05	20110205-05	-52.7	-42.8	-55.7	-48.4
20110205-06	20110205-06	-53.5	-43.6	-56.5	-49.2
20110205-07	20110205-07	-54.3	-44.4	-57.3	-50.0
20110205-08	20110205-08	-55.1	-45.2	-58.1	-50.8
20110205-09	20110205-09	-55.9	-46.0	-58.9	-51.6
20110205-10	20110205-10	-56.7	-46.8	-59.7	-52.4
20110205-11	20110205-11	-57.5	-47.6	-60.5	-53.2
20110205-12	20110205-12	-58.3	-48.4	-61.3	-54.0
20110205-13	20110205-13	-59.1	-49.2	-62.1	-54.8
20110205-14	20110205-14	-59.9	-50.0	-62.9	-55.6
20110205-15	20110205-15	-60.7	-50.8	-63.7	-56.4
20110205-16	20110205-16	-61.5	-51.6	-64.5	-57.2
20110205-17	20110205-17	-62.3	-52.4	-65.3	-58.0
20110205-18	20110205-18	-63.1	-53.2	-66.1	-58.8
20110205-19	20110205-19	-63.9	-54.0	-66.9	-59.6
20110205-20	20110205-20	-64.7	-54.8	-67.7	-60.4
20110205-21	20110205-21	-65.5	-55.6	-68.5	-61.2
20110205-22	20110205-22	-66.3	-56.4	-69.3	-62.0
20110205-23	20110205-23	-67.1	-57.2	-70.1	-62.8
20110205-24	20110205-24	-67.9	-58.0	-70.9	-63.6
20110205-25	20110205-25	-68.7	-58.8	-71.7	-64.4
20110205-26	20110205-26	-69.5	-59.6	-72.5	-65.2
20110205-27	20110205-27	-70.3	-60.4	-73.3	-66.0
20110205-28	20110205-28	-71.1	-61.2	-74.1	-66.8
20110205-29	20110205-29	-71.9	-62.0	-74.9	-67.6
20110205-30	20110205-30	-72.7	-62.8	-75.7	-68.4
20110206-00	20110206-00	-73.5	-63.6	-76.5	-69.2
20110206-01	20110206-01	-74.3	-64.4	-77.3	-70.0
20110206-02	20110206-02	-75.1	-65.2	-78.1	-70.8
20110206-03	20110206-03	-75.9	-66.0	-78.9	-71.6
20110206-04	20110206-04	-76.7	-66.8	-79.7	-72.4
20110206-05	20110206-05	-77.5	-67.6	-80.5	-73.2
20110206-06	20110206-06	-78.3	-68.4	-81.3	-74.0
20110206-07	20110206-07	-79.1	-69.2	-82.1	-74.8
20110206-08	20110206-08	-79.9	-70.0	-82.9	-75.6
20110206-09	20110206-09	-80.7	-70.8	-83.7	-76.4
20110206-10	20110206-10	-81.5	-71.6	-84.5	-77.2
20110206-11	20110206-11	-82.3	-72.4	-85.3	-78.0
20110206-12	20110206-12	-83.1	-73.2	-86.1	-78.8
20110206-13	20110206-13	-83.9	-74.0	-86.9	-79.6
20110206-14	20110206-14	-84.7	-74.8	-87.7	-80.4
20110206-15	20110206-15	-85.5	-75.6	-88.5	-81.2
20110206-16</					































MeasurementDate	MeasurementDate	Lat	Lat	Lat	Lat
00010001-01	00010001-01	52.0	47.0	42.0	37.0
00010001-02	00010001-02	52.1	47.1	42.1	37.1
00010001-03	00010001-03	52.2	47.2	42.2	37.2
00010001-04	00010001-04	52.3	47.3	42.3	37.3
00010001-05	00010001-05	52.4	47.4	42.4	37.4
00010001-06	00010001-06	52.5	47.5	42.5	37.5
00010001-07	00010001-07	52.6	47.6	42.6	37.6
00010001-08	00010001-08	52.7	47.7	42.7	37.7
00010001-09	00010001-09	52.8	47.8	42.8	37.8
00010001-10	00010001-10	52.9	47.9	42.9	37.9
00010001-11	00010001-11	53.0	48.0	43.0	38.0
00010001-12	00010001-12	53.1	48.1	43.1	38.1
00010001-13	00010001-13	53.2	48.2	43.2	38.2
00010001-14	00010001-14	53.3	48.3	43.3	38.3
00010001-15	00010001-15	53.4	48.4	43.4	38.4
00010001-16	00010001-16	53.5	48.5	43.5	38.5
00010001-17	00010001-17	53.6	48.6	43.6	38.6
00010001-18	00010001-18	53.7	48.7	43.7	38.7
00010001-19	00010001-19	53.8	48.8	43.8	38.8
00010001-20	00010001-20	53.9	48.9	43.9	38.9
00010001-21	00010001-21	54.0	49.0	44.0	39.0
00010001-22	00010001-22	54.1	49.1	44.1	39.1
00010001-23	00010001-23	54.2	49.2	44.2	39.2
00010001-24	00010001-24	54.3	49.3	44.3	39.3
00010001-25	00010001-25	54.4	49.4	44.4	39.4
00010001-26	00010001-26	54.5	49.5	44.5	39.5
00010001-27	00010001-27	54.6	49.6	44.6	39.6
00010001-28	00010001-28	54.7	49.7	44.7	39.7
00010001-29	00010001-29	54.8	49.8	44.8	39.8
00010001-30	00010001-30	54.9	49.9	44.9	39.9
00010001-31	00010001-31	55.0	50.0	45.0	40.0
00010001-32	00010001-32	55.1	50.1	45.1	40.1
00010001-33	00010001-33	55.2	50.2	45.2	40.2
00010001-34	00010001-34	55.3	50.3	45.3	40.3
00010001-35	00010001-35	55.4	50.4	45.4	40.4
00010001-36	00010001-36	55.5	50.5	45.5	40.5
00010001-37	00010001-37	55.6	50.6	45.6	40.6
00010001-38	00010001-38	55.7	50.7	45.7	40.7
00010001-39	00010001-39	55.8	50.8	45.8	40.8
00010001-40	00010001-40	55.9	50.9	45.9	40.9
00010001-41	00010001-41	56.0	51.0	46.0	41.0
00010001-42	00010001-42	56.1	51.1	46.1	41.1
00010001-43	00010001-43	56.2	51.2	46.2	41.2
00010001-44	00010001-44	56.3	51.3	46.3	41.3
00010001-45	00010001-45	56.4	51.4	46.4	41.4
00010001-46	00010001-46	56.5	51.5	46.5	41.5
00010001-47	00010001-47	56.6	51.6	46.6	41.6
00010001-48	00010001-48	56.7	51.7	46.7	41.7
00010001-49	00010001-49	56.8	51.8	46.8	41.8
00010001-50	00010001-50	56.9	51.9	46.9	41.9
00010001-51	00010001-51	57.0	52.0	47.0	42.0
00010001-52	00010001-52	57.1	52.1	47.1	42.1
00010001-53	00010001-53	57.2	52.2	47.2	42.2
00010001-54	00010001-54	57.3	52.3	47.3	42.3
00010001-55	00010001-55	57.4	52.4	47.4	42.4
00010001-56	00010001-56	57.5	52.5	47.5	42.5
00010001-57	00010001-57	57.6	52.6	47.6	42.6
00010001-58	00010001-58	57.7	52.7	47.7	42.7
00010001-59	00010001-59	57.8	52.8	47.8	42.8
00010001-60	00010001-60	57.9	52.9	47.9	42.9
00010001-61	00010001-61	58.0	53.0	48.0	43.0
00010001-62	00010001-62	58.1	53.1	48.1	43.1
00010001-63	00010001-63	58.2	53.2	48.2	43.2
00010001-64	00010001-64	58.3	53.3	48.3	43.3
00010001-65	00010001-65	58.4	53.4	48.4	43.4
00010001-66	00010001-66	58.5	53.5	48.5	43.5
00010001-67	00010001-67	58.6	53.6	48.6	43.6
00010001-68	00010001-68	58.7	53.7	48.7	43.7
00010001-69	00010001-69	58.8	53.8	48.8	43.8
00010001-70	00010001-70	58.9	53.9	48.9	43.9
00010001-71	00010001-71	59.0	54.0	49.0	44.0
00010001-72	00010001-72	59.1	54.1	49.1	44.1
00010001-73	00010001-73	59.2	54.2	49.2	44.2
00010001-74	00010001-74	59.3	54.3	49.3	44.3
00010001-75	00010001-75	59.4	54.4	49.4	44.4
00010001-76	00010001-76	59.5	54.5	49.5	44.5
00010001-77	00010001-77	59.6	54.6	49.6	44.6
00010001-78	00010001-78	59.7	54.7	49.7	44.7
00010001-79	00010001-79	59.8	54.8	49.8	44.8
00010001-80	00010001-80	59.9	54.9	49.9	44.9
00010001-81	00010001-81	60.0	55.0	50.0	45.0
00010001-82	00010001-82	60.1	55.1	50.1	45.1
00010001-83	00010001-83	60.2	55.2	50.2	45.2
00010001-84	00010001-84	60.3	55.3	50.3	45.3
00010001-85	00010001-85	60.4	55.4	50.4	45.4
00010001-86	00010001-86	60.5	55.5	50.5	45.5
00010001-87	00010001-87	60.6	55.6	50.6	45.6
00010001-88	00010001-88	60.7	55.7	50.7	45.7
00010001-89	00010001-89	60.8	55.8	50.8	45.8
00010001-90	00010001-90	60.9	55.9	50.9	45.9
00010001-91	00010001-91	61.0	56.0	51.0	46.0
00010001-92	00010001-92	61.1	56.1	51.1	46.1
00010001-93	00010001-93	61.2	56.2	51.2	46.2
00010001-94	00010001-94	61.3	56.3	51.3	46.3
00010001-95	00010001-95	61.4	56.4	51.4	46.4
00010001-96	00010001-96	61.5	56.5	51.5	46.5
00010001-97	00010001-97	61.6	56.6	51.6	46.6
00010001-98	00010001-98	61.7	56.7	51.7	46.7
00010001-99	00010001-99	61.8	56.8	51.8	46.8
00010001-100	00010001-100	61.9	56.9	51.9	46.9

MeasurementDate	MeasurementDate	Lat	Lat	Lat	Lat
00010001-101	00010001-101	62.0	57.0	52.0	47.0
00010001-102	00010001-102	62.1	57.1	52.1	47.1
00010001-103	00010001-103	62.2	57.2	52.2	47.2
00010001-104	00010001-104	62.3	57.3	52.3	47.3
00010001-105	00010001-105	62.4	57.4	52.4	47.4
00010001-106	00010001-106	62.5	57.5	52.5	47.5
00010001-107	00010001-107	62.6	57.6	52.6	47.6
00010001-108	00010001-108	62.7	57.7	52.7	47.7
00010001-109	00010001-109	62.8	57.8	52.8	47.8
00010001-110	00010001-110	62.9	57.9	52.9	47.9
00010001-111	00010001-111	63.0	58.0	53.0	48.0
00010001-112	00010001-112	63.1	58.1	53.1	48.1
00010001-113	00010001-113	63.2	58.2	53.2	48.2
00010001-114	00010001-114	63.3	58.3	53.3	48.3
00010001-115	00010001-115	63.4	58.4	53.4	48.4
00010001-116	00010001-116	63.5	58.5	53.5	48.5
00010001-117	00010001-117	63.6	58.6	53.6	48.6
00010001-118	00010001-118	63.7	58.7	53.7	48.7
00010001-119	00010001-119	63.8	58.8	53.8	48.8
00010001-120	00010001-120	63.9	58.9	53.9	48.9
00010001-121	00010001-121	64.0	59.0	54.0	49.0
00010001-122	00010001-122	64.1	59.1	54.1	49.1
00010001-123	00010001-123	64.2	59.2	54.2	49.2
00010001-124	00010001-124	64.3	59.3	54.3	49.3
00010001-125	00010001-125	64.4	59.4	54.4	49.4
00010001-126	00010001-126	64.5	59.5	54.5	49.5
00010001-127	00010001-127	64.6	59.6	54.6	49.6
00010001-128	00010001-128	64.7	59.7	54.7	49.7
00010001-129	00010001-129	64.8	59.8	54.8	49.8
00010001-130	00010001-130	64.9	59.9	54.9	49.9
00010001-131	00010001-131	65.0	60.0	55.0	50.0
00010001-132	00010001-132	65.1	60.1	55.1	50.1
00010001-133	00010001-133	65.2	60.2	55.2	50.2
00010001-134	00010001-134	65.3	60.3	55.3	50.3
00010001-135	00010001-135	65.4	60.4	55.4	50.4
00010001-136	00010001-136	65.5	60.5	55.5	50.5
00010001-137	00010001-137	65.6	60.6	55.6	50.6
00010001-138	00010001-138	65.7	60.7	55.7	50.7
00010001-139	00010001-139	65.8	60.8	55.8	50.8
00010001-140	00010001-140	65.9	60.9	55.9	50.9
00010001-141	00010001-141	66.0	61.0	56.0	51.0
00010001-142	00010001-142	66.1	61.1	56.1	51.1
00010001-143	00010001-143	66.2	61.2	56.2	51.2
00010001-144	00010001-144	66.3	61.3	56.3	51.3
00010001-145	00010001-145	66.4	61.4	56.4	51.4
00010001-146	00010001-146	66.5	61.5	56.5	51.5
00010001-147	00010001-147	66.6	61.6	56.6	51.6
00010001-148	00010001-148	66.7	61.7	56.7	51.7
00010001-149	00010001-149	66.8	61.8	56.8	51.8
00010001-150	00010001-150	66.9	61.9	56.9	51.9
00010001-151	00010001-151	67.0	62.0	57.0	52.0
00010001-152	00010001-152	67.1	62.1	57.1	52.1
00010001-153	00010001-153	67.2	62.2	57.2	52.2
00010001-154	00010001-154	67.3	62.3	57.3	52.3
00010001-155	00010001-155	67.4	62.4	57.4	52.4
00010001-156	00010001-156	67.5	62.5	57.5	52.5
00010001-157	00010001-157	67.6	62.6	57.6	52.6
00010001-158	00010001-158	67.7	62.7	57.7	52.7
00010001-159	00010001-159	67.8	62.8	57.8	52.8
00010001-160	00010001-160	67.9	62.9	57.9	52.9
00010001-161	00010001-161	68.0	63.0	58.0	53.0
00010001-162	00010001-162	68.1	63.1	58.1	53.1
00010001-163	00010001-163	68.2	63.2	58.2	53.2
00010001-164	00010001-164	68.3	63.3	58.3	53.3
00010001-165	00010001-165	68.4	63.4	58.4	53.4
00010001-166	00010001-166	68.5	63.5	58.5	53.5
00010001-167	00010001-167	68.6	63.6	58.6	53.6
00010001-168	00010001-168	68.7	63.7	58.7	













































MeasurementTime	MeasurementDate	Lat	Latm	LatD	LatO	MeasurementTime	MeasurementDate	Lat	Latm	LatD	LatO
19890204:00	19890204:00	36.1	42.1	36.1	36.1	19890204:00	19890204:00	45.8	48.8	36.1	36.1
19890204:05	19890204:05	37.1	43.1	37.1	37.1	19890204:05	19890204:05	50.8	53.8	37.1	37.1
19890204:10	19890204:10	38.1	44.1	38.1	38.1	19890204:10	19890204:10	55.8	58.8	38.1	38.1
19890204:15	19890204:15	39.1	45.1	39.1	39.1	19890204:15	19890204:15	60.8	63.8	39.1	39.1
19890204:20	19890204:20	40.1	46.1	40.1	40.1	19890204:20	19890204:20	65.8	68.8	40.1	40.1
19890204:25	19890204:25	41.1	47.1	41.1	41.1	19890204:25	19890204:25	70.8	73.8	41.1	41.1
19890204:30	19890204:30	42.1	48.1	42.1	42.1	19890204:30	19890204:30	75.8	78.8	42.1	42.1
19890204:35	19890204:35	43.1	49.1	43.1	43.1	19890204:35	19890204:35	80.8	83.8	43.1	43.1
19890204:40	19890204:40	44.1	50.1	44.1	44.1	19890204:40	19890204:40	85.8	88.8	44.1	44.1
19890204:45	19890204:45	45.1	51.1	45.1	45.1	19890204:45	19890204:45	90.8	93.8	45.1	45.1
19890204:50	19890204:50	46.1	52.1	46.1	46.1	19890204:50	19890204:50	95.8	98.8	46.1	46.1
19890204:55	19890204:55	47.1	53.1	47.1	47.1	19890204:55	19890204:55	100.8	103.8	47.1	47.1
19890205:00	19890205:00	48.1	54.1	48.1	48.1	19890205:00	19890205:00	105.8	108.8	48.1	48.1
19890205:05	19890205:05	49.1	55.1	49.1	49.1	19890205:05	19890205:05	110.8	113.8	49.1	49.1
19890205:10	19890205:10	50.1	56.1	50.1	50.1	19890205:10	19890205:10	115.8	118.8	50.1	50.1
19890205:15	19890205:15	51.1	57.1	51.1	51.1	19890205:15	19890205:15	120.8	123.8	51.1	51.1
19890205:20	19890205:20	52.1	58.1	52.1	52.1	19890205:20	19890205:20	125.8	128.8	52.1	52.1
19890205:25	19890205:25	53.1	59.1	53.1	53.1	19890205:25	19890205:25	130.8	133.8	53.1	53.1
19890205:30	19890205:30	54.1	60.1	54.1	54.1	19890205:30	19890205:30	135.8	138.8	54.1	54.1
19890205:35	19890205:35	55.1	61.1	55.1	55.1	19890205:35	19890205:35	140.8	143.8	55.1	55.1
19890205:40	19890205:40	56.1	62.1	56.1	56.1	19890205:40	19890205:40	145.8	148.8	56.1	56.1
19890205:45	19890205:45	57.1	63.1	57.1	57.1	19890205:45	19890205:45	150.8	153.8	57.1	57.1
19890205:50	19890205:50	58.1	64.1	58.1	58.1	19890205:50	19890205:50	155.8	158.8	58.1	58.1
19890205:55	19890205:55	59.1	65.1	59.1	59.1	19890205:55	19890205:55	160.8	163.8	59.1	59.1
19890206:00	19890206:00	60.1	66.1	60.1	60.1	19890206:00	19890206:00	165.8	168.8	60.1	60.1
19890206:05	19890206:05	61.1	67.1	61.1	61.1	19890206:05	19890206:05	170.8	173.8	61.1	61.1
19890206:10	19890206:10	62.1	68.1	62.1	62.1	19890206:10	19890206:10	175.8	178.8	62.1	62.1
19890206:15	19890206:15	63.1	69.1	63.1	63.1	19890206:15	19890206:15	180.8	183.8	63.1	63.1
19890206:20	19890206:20	64.1	70.1	64.1	64.1	19890206:20	19890206:20	185.8	188.8	64.1	64.1
19890206:25	19890206:25	65.1	71.1	65.1	65.1	19890206:25	19890206:25	190.8	193.8	65.1	65.1
19890206:30	19890206:30	66.1	72.1	66.1	66.1	19890206:30	19890206:30	195.8	198.8	66.1	66.1
19890206:35	19890206:35	67.1	73.1	67.1	67.1	19890206:35	19890206:35	200.8	203.8	67.1	67.1
19890206:40	19890206:40	68.1	74.1	68.1	68.1	19890206:40	19890206:40	205.8	208.8	68.1	68.1
19890206:45	19890206:45	69.1	75.1	69.1	69.1	19890206:45	19890206:45	210.8	213.8	69.1	69.1
19890206:50	19890206:50	70.1	76.1	70.1	70.1	19890206:50	19890206:50	215.8	218.8	70.1	70.1
19890206:55	19890206:55	71.1	77.1	71.1	71.1	19890206:55	19890206:55	220.8	223.8	71.1	71.1
19890207:00	19890207:00	72.1	78.1	72.1	72.1	19890207:00	19890207:00	225.8	228.8	72.1	72.1
19890207:05	19890207:05	73.1	79.1	73.1	73.1	19890207:05	19890207:05	230.8	233.8	73.1	73.1
19890207:10	19890207:10	74.1	80.1	74.1	74.1	19890207:10	19890207:10	235.8	238.8	74.1	74.1
19890207:15	19890207:15	75.1	81.1	75.1	75.1	19890207:15	19890207:15	240.8	243.8	75.1	75.1
19890207:20	19890207:20	76.1	82.1	76.1	76.1	19890207:20	19890207:20	245.8	248.8	76.1	76.1
19890207:25	19890207:25	77.1	83.1	77.1	77.1	19890207:25	19890207:25	250.8	253.8	77.1	77.1
19890207:30	19890207:30	78.1	84.1	78.1	78.1	19890207:30	19890207:30	255.8	258.8	78.1	78.1
19890207:35	19890207:35	79.1	85.1	79.1	79.1	19890207:35	19890207:35	260.8	263.8	79.1	79.1
19890207:40	19890207:40	80.1	86.1	80.1	80.1	19890207:40	19890207:40	265.8	268.8	80.1	80.1
19890207:45	19890207:45	81.1	87.1	81.1	81.1	19890207:45	19890207:45	270.8	273.8	81.1	81.1
19890207:50	19890207:50	82.1	88.1	82.1	82.1	19890207:50	19890207:50	275.8	278.8	82.1	82.1
19890207:55	19890207:55	83.1	89.1	83.1	83.1	19890207:55	19890207:55	280.8	283.8	83.1	83.1
19890208:00	19890208:00	84.1	90.1	84.1	84.1	19890208:00	19890208:00	285.8	288.8	84.1	84.1
19890208:05	19890208:05	85.1	91.1	85.1	85.1	19890208:05	19890208:05	290.8	293.8	85.1	85.1
19890208:10	19890208:10	86.1	92.1	86.1	86.1	19890208:10	19890208:10	295.8	298.8	86.1	86.1
19890208:15	19890208:15	87.1	93.1	87.1	87.1	19890208:15	19890208:15	300.8	303.8	87.1	87.1
19890208:20	19890208:20	88.1	94.1	88.1	88.1	19890208:20	19890208:20	305.8	308.8	88.1	88.1
19890208:25	19890208:25	89.1	95.1	89.1	89.1	19890208:25	19890208:25	310.8	313.8	89.1	89.1
19890208:30	19890208:30	90.1	96.1	90.1	90.1	19890208:30	19890208:30	315.8	318.8	90.1	90.1
19890208:35	19890208:35	91.1	97.1	91.1	91.1	19890208:35	19890208:35	320.8	323.8	91.1	91.1
19890208:40	19890208:40	92.1	98.1	92.1	92.1	19890208:40	19890208:40	325.8	328.8	92.1	92.1
19890208:45	19890208:45	93.1	99.1	93.1	93.1	19890208:45	19890208:45	330.8	333.8	93.1	93.1
19890208:50	19890208:50	94.1	100.1	94.1	94.1	19890208:50	19890208:50	335.8	338.8	94.1	94.1
19890208:55	19890208:55	95.1	101.1	95.1	95.1	19890208:55	19890208:55	340.8	343.8	95.1	95.1
19890209:00	19890209:00	96.1	102.1	96.1	96.1	19890209:00	19890209:00	345.8	348.8	96.1	96.1
19890209:05	19890209:05	97.1	103.1	97.1	97.1	19890209:05	19890209:05	350.8	353.8	97.1	97.1
19890209:10	19890209:10	98.1	104.1	98.1	98.1	19890209:10	19890209:10	355.8	358.8	98.1	98.1
19890209:15	19890209:15	99.1	105.1	99.1	99.1	19890209:15	19890209:15	360.8	363.8	99.1	99.1
19890209:20	19890209:20	100.1	106.1	100.1	100.1	19890209:20	19890209:20	365.8	368.8	100.1	100.1
19890209:25	19890209:25	101.1	107.1	101.1	101.1	19890209:25	19890209:25	370.8	373.8	101.1	101.1
19890209:30	19890209:30	102.1	108.1	102.1	102.1	19890209:30	19890209:30	375.8	378.8	102.1	102.1
19890209:35	19890209:35	103.1	109.1	103.1	103.1	19890209:35	19890209:35	380.8	383.8	103.1	103.1
19890209:40	19890209:40	104.1	110.1	104.1	104.1	19890209:40	19890209:40	385.8	388.8	104.1	104.1
19890209:45	19890209:45	105.1	111.1	105.1	105.1	19890209:45	19890209:45	390.8	393.8	105.1	105.1
19890209:50	19890209:50	106.1	112.1	106.1	106.1	19890209:50	19890209:50	395.8	398.8	106.1	106.1
19890209:55	19890209:55	107.1	113.1	107.1	107.1	19890209:55	19890209:55	400.8	403.8	107.1	107.1
19890210:00	19890210:00	108.1	114.1	108.1	108.1	19890210:00	19890210:00	405.8	408.8	108.1	108.1
19890210:05	19890210:05	109.1	115.1	109.1	109.1	19890210:05	19890210:05	410.8	413.8	109.1	109.1
19890210:10	19890210:10	110.1	116.1	110.1	110.1	19890210:10	19890210:10	415.8	418.8	110.1	110.1
19890210:15	19890210:15	111.1	117.1	111.1	111.1	19890210:15	19890210:15	420.8	423.8	111.1	111.1
19890210:20	19890210:20	112.1	118.1	112.1	112.1	19890210:20	19890210:20	425.8	428.8	112.1	112.1
19890210:25	19890210:25	113.1	119.1	113.1	113.1	19890210:25	19890210:25	430.8	433.8	113.1	113.1
19890210:30	19890210:30	114.1	120.1	114.1	114.1	19890210:30	19890210:30	435.8	438.8	114.1	114.1
19890210:35	19890210:35	115.1	121.1	115.1	115.1	19890210:35	19890210:35	440.8	443.8	115.1	115.1
19890210:40	19890210:40	116.1	122.1	116.1	116.1	19890210:40	19890210:40	445.8	448.8	116.1	116.1
19890210:45	19890210:45	117.1	123.1	117.1	117.1	19890210:45	19890210:45	450.8	453.8	117.1	117.1
19890210:50	19890210:50	118.1	124.1	118.1	118.1	19890210:50	19890210:50	455.8	458.8	118.1	118.1
19890210:55	19890210:55	119.1	125.1	119.1	119.1	19890210:55	19890210:55	460.8	463.8	119.1	119.1
19890211:00	19890211:00	120.1	126.1	120.1	120.1	19890211:00	19890211:00	465.8	468.8	120.1	120.1
19890211:05	19890211:05	121.1	127.1	121.1	121.1	198902					



MeasurementTime	MeasurementDate	Lat	Latn	LatS	LatO	LatD	LatU	MeasurementTime	MeasurementDate	Lat	Latn	LatS	LatO	LatD	LatU
1555000028	1555000028	51.9	62.1	45.3	47.8	49.8	51.9	1555000029	1555000029	51.9	62.1	45.3	47.8	49.8	51.9
1555000030	1555000030	49.8	57.9	49.8	57.9	49.8	57.9	1555000031	1555000031	49.8	57.9	49.8	57.9	49.8	57.9
1555000032	1555000032	52.9	63.9	45.7	54.9	52.9	63.9	1555000033	1555000033	52.9	63.9	45.7	54.9	52.9	63.9
1555000035	1555000035	57.7	68.7	45.7	52.7	47.7	57.7	1555000036	1555000036	57.7	68.7	45.7	52.7	47.7	57.7
1555000038	1555000038	52.9	62.9	45.3	53.7	47.9	52.9	1555000039	1555000039	52.9	62.9	45.3	53.7	47.9	52.9
1555000042	1555000042	51.9	61.9	45.3	53.7	47.9	51.9	1555000043	1555000043	51.9	61.9	45.3	53.7	47.9	51.9
1555000046	1555000046	50.9	60.9	45.3	53.7	47.9	50.9	1555000047	1555000047	50.9	60.9	45.3	53.7	47.9	50.9
1555000050	1555000050	52.9	62.9	45.3	53.7	47.9	52.9	1555000051	1555000051	52.9	62.9	45.3	53.7	47.9	52.9
1555000054	1555000054	50.9	60.9	45.3	53.7	47.9	50.9	1555000055	1555000055	50.9	60.9	45.3	53.7	47.9	50.9
1555000058	1555000058	49.8	57.9	49.8	57.9	49.8	57.9	1555000059	1555000059	49.8	57.9	49.8	57.9	49.8	57.9
1555000062	1555000062	52.9	62.9	45.3	53.7	47.9	52.9	1555000063	1555000063	52.9	62.9	45.3	53.7	47.9	52.9
1555000066	1555000066	51.9	61.9	45.3	53.7	47.9	51.9	1555000067	1555000067	51.9	61.9	45.3	53.7	47.9	51.9
1555000070	1555000070	50.9	60.9	45.3	53.7	47.9	50.9	1555000071	1555000071	50.9	60.9	45.3	53.7	47.9	50.9
1555000074	1555000074	49.8	57.9	49.8	57.9	49.8	57.9	1555000075	1555000075	49.8	57.9	49.8	57.9	49.8	57.9
1555000078	1555000078	48.8	56.8	49.8	57.9	48.8	56.8	1555000079	1555000079	48.8	56.8	49.8	57.9	48.8	56.8
1555000082	1555000082	47.8	55.8	49.8	57.9	47.8	55.8	1555000083	1555000083	47.8	55.8	49.8	57.9	47.8	55.8
1555000086	1555000086	46.8	54.8	49.8	57.9	46.8	54.8	1555000087	1555000087	46.8	54.8	49.8	57.9	46.8	54.8
1555000090	1555000090	45.8	53.8	49.8	57.9	45.8	53.8	1555000091	1555000091	45.8	53.8	49.8	57.9	45.8	53.8
1555000094	1555000094	44.8	52.8	49.8	57.9	44.8	52.8	1555000095	1555000095	44.8	52.8	49.8	57.9	44.8	52.8
1555000098	1555000098	43.8	51.8	49.8	57.9	43.8	51.8	1555000099	1555000099	43.8	51.8	49.8	57.9	43.8	51.8
1555000102	1555000102	42.8	50.8	49.8	57.9	42.8	50.8	1555000103	1555000103	42.8	50.8	49.8	57.9	42.8	50.8
1555000106	1555000106	41.8	49.8	49.8	57.9	41.8	49.8	1555000107	1555000107	41.8	49.8	49.8	57.9	41.8	49.8
1555000110	1555000110	40.8	48.8	49.8	57.9	40.8	48.8	1555000111	1555000111	40.8	48.8	49.8	57.9	40.8	48.8
1555000114	1555000114	39.8	47.8	49.8	57.9	39.8	47.8	1555000115	1555000115	39.8	47.8	49.8	57.9	39.8	47.8
1555000118	1555000118	38.8	46.8	49.8	57.9	38.8	46.8	1555000119	1555000119	38.8	46.8	49.8	57.9	38.8	46.8
1555000122	1555000122	37.8	45.8	49.8	57.9	37.8	45.8	1555000123	1555000123	37.8	45.8	49.8	57.9	37.8	45.8
1555000126	1555000126	36.8	44.8	49.8	57.9	36.8	44.8	1555000127	1555000127	36.8	44.8	49.8	57.9	36.8	44.8
1555000130	1555000130	35.8	43.8	49.8	57.9	35.8	43.8	1555000131	1555000131	35.8	43.8	49.8	57.9	35.8	43.8
1555000134	1555000134	34.8	42.8	49.8	57.9	34.8	42.8	1555000135	1555000135	34.8	42.8	49.8	57.9	34.8	42.8
1555000138	1555000138	33.8	41.8	49.8	57.9	33.8	41.8	1555000139	1555000139	33.8	41.8	49.8	57.9	33.8	41.8
1555000142	1555000142	32.8	40.8	49.8	57.9	32.8	40.8	1555000143	1555000143	32.8	40.8	49.8	57.9	32.8	40.8
1555000146	1555000146	31.8	39.8	49.8	57.9	31.8	39.8	1555000147	1555000147	31.8	39.8	49.8	57.9	31.8	39.8
1555000150	1555000150	30.8	38.8	49.8	57.9	30.8	38.8	1555000151	1555000151	30.8	38.8	49.8	57.9	30.8	38.8
1555000154	1555000154	29.8	37.8	49.8	57.9	29.8	37.8	1555000155	1555000155	29.8	37.8	49.8	57.9	29.8	37.8
1555000158	1555000158	28.8	36.8	49.8	57.9	28.8	36.8	1555000159	1555000159	28.8	36.8	49.8	57.9	28.8	36.8
1555000162	1555000162	27.8	35.8	49.8	57.9	27.8	35.8	1555000163	1555000163	27.8	35.8	49.8	57.9	27.8	35.8
1555000166	1555000166	26.8	34.8	49.8	57.9	26.8	34.8	1555000167	1555000167	26.8	34.8	49.8	57.9	26.8	34.8
1555000170	1555000170	25.8	33.8	49.8	57.9	25.8	33.8	1555000171	1555000171	25.8	33.8	49.8	57.9	25.8	33.8
1555000174	1555000174	24.8	32.8	49.8	57.9	24.8	32.8	1555000175	1555000175	24.8	32.8	49.8	57.9	24.8	32.8
1555000178	1555000178	23.8	31.8	49.8	57.9	23.8	31.8	1555000179	1555000179	23.8	31.8	49.8	57.9	23.8	31.8
1555000182	1555000182	22.8	30.8	49.8	57.9	22.8	30.8	1555000183	1555000183	22.8	30.8	49.8	57.9	22.8	30.8
1555000186	1555000186	21.8	29.8	49.8	57.9	21.8	29.8	1555000187	1555000187	21.8	29.8	49.8	57.9	21.8	29.8
1555000190	1555000190	20.8	28.8	49.8	57.9	20.8	28.8	1555000191	1555000191	20.8	28.8	49.8	57.9	20.8	28.8
1555000194	1555000194	19.8	27.8	49.8	57.9	19.8	27.8	1555000195	1555000195	19.8	27.8	49.8	57.9	19.8	27.8
1555000198	1555000198	18.8	26.8	49.8	57.9	18.8	26.8	1555000199	1555000199	18.8	26.8	49.8	57.9	18.8	26.8
1555000202	1555000202	17.8	25.8	49.8	57.9	17.8	25.8	1555000203	1555000203	17.8	25.8	49.8	57.9	17.8	25.8
1555000206	1555000206	16.8	24.8	49.8	57.9	16.8	24.8	1555000207	1555000207	16.8	24.8	49.8	57.9	16.8	24.8
1555000210	1555000210	15.8	23.8	49.8	57.9	15.8	23.8	1555000211	1555000211	15.8	23.8	49.8	57.9	15.8	23.8
1555000214	1555000214	14.8	22.8	49.8	57.9	14.8	22.8	1555000215	1555000215	14.8	22.8	49.8	57.9	14.8	22.8
1555000218	1555000218	13.8	21.8	49.8	57.9	13.8	21.8	1555000219	1555000219	13.8	21.8	49.8	57.9	13.8	21.8
1555000222	1555000222	12.8	20.8	49.8	57.9	12.8	20.8	1555000223	1555000223	12.8	20.8	49.8	57.9	12.8	20.8
1555000226	1555000226	11.8	19.8	49.8	57.9	11.8	19.8	1555000227	1555000227	11.8	19.8	49.8	57.9	11.8	19.8
1555000230	1555000230	10.8	18.8	49.8	57.9	10.8	18.8	1555000231	1555000231	10.8	18.8	49.8	57.9	10.8	18.8
1555000234	1555000234	9.8	17.8	49.8	57.9	9.8	17.8	1555000235	1555000235	9.8	17.8	49.8	57.9	9.8	17.8
1555000238	1555000238	8.8	16.8	49.8	57.9	8.8	16.8	1555000239	1555000239	8.8	16.8	49.8	57.9	8.8	16.8
1555000242	1555000242	7.8	15.8	49.8	57.9	7.8	15.8	1555000243	1555000243	7.8	15.8	49.8	57.9	7.8	15.8
1555000246	1555000246	6.8	14.8	49.8	57.9	6.8	14.8	1555000247	1555000247	6.8	14.8	49.8	57.9	6.8	14.8
1555000250	1555000250	5.8	13.8	49.8	57.9	5.8	13.8	1555000251	1555000251	5.8	13.8	49.8	57.9	5.8	13.8
1555000254	1555000254	4.8	12.8	49.8	57.9	4.8	12.8	1555000255	1555000255	4.8	12.8	49.8	57.9	4.8	12.8
1555000258	1555000258	3.8	11.8	49.8	57.9	3.8	11.8	1555000259	1555000259	3.8	11.8	49.8	57.9	3.8	11.8
1555000262	1555000262	2.8	10.8	49.8	57.9	2.8	10.8	1555000263	1555000263	2.8	10.8	49.8	57.9	2.8	10.8
1555000266	1555000266	1.8	9.8	49.8	57.9	1.8	9.8	1555000267	1555000267	1.8	9.8	49.8	57.9	1.8	9.8
1555000270	1555000270	0.8	8.8	49.8	57.9	0.8	8.8	1555000271	1555000271	0.8	8.8	49.8	57.9	0.8	8.8
1555000274	1555000274	0.8	7.8	49.8	57.9	0.8	7.8	1555000275	1555000275	0.8	7.8	49.8	57.9	0.8	7.8
1555000278	1555000278	0.8	6.8	49.8	57.9	0.8	6.8	1555000279	1555000279	0.8	6.8	49.8	57.9	0.8	6.8
1555000282	1555000282	0.8	5.8	49.8	57.9	0.8	5.8	1555000283	1555000283	0.8	5.8	49.8	57.9	0.8	5.8
1555000286	1555000286	0.8	4.8	49.8	57.9	0.8	4.8	1555000287	1555000287	0.8	4.8	49.8	57.9	0.8	4.8
1555000290	1555000290	0.8	3.8	49.8	57.9	0.8	3.8	1555000291	1555000291	0.8	3.8	49.8	57.9	0.8	3.8
1555000294	1555000294	0.8	2.8	49.8	57.9	0.8	2.8	1555000295	1555000295	0.8	2.8	49.8	57.9	0.8	2.8
1555000298	1555000298	0.8	1.8	49.8	57.9	0.8	1.8	1555000302	1555000302	0.8	1.8	49.8	57.9	0.8	1.8
1555000306	1555000306	0.8	0.8	49.8	57.9	0.8	0.8	1555000307	1555000307	0.8	0.8	49.8	57.9	0.8	0.8



MeasurementTime	MeasurementTime	LAWS	LAWS	LAWS	LAWS	MeasurementTime	MeasurementTime	LAWS	LAWS	LAWS	LAWS	MeasurementTime	MeasurementTime	LAWS	LAWS	LAWS	LAWS
20050204-15	20050204-15	47.4	48.2	48.4	48.6	20050204-15	20050204-15	48.8	51.1	54.4	43.6	20050204-15	20050204-15	41.8	41.8	42.3	42.7
20050204-16	20050204-16	47.9	48.9	49.1	49.3	20050204-16	20050204-16	49.3	51.7	55.1	44.0	20050204-16	20050204-16	42.3	42.3	42.8	43.2
20050204-17	20050204-17	48.4	49.4	49.6	49.8	20050204-17	20050204-17	50.8	53.2	56.6	44.4	20050204-17	20050204-17	42.8	42.8	43.3	43.7
20050204-18	20050204-18	48.9	49.9	50.1	50.3	20050204-18	20050204-18	51.3	53.7	57.1	44.8	20050204-18	20050204-18	43.3	43.3	43.8	44.2
20050204-19	20050204-19	49.4	50.4	50.6	50.8	20050204-19	20050204-19	51.8	54.2	57.6	45.2	20050204-19	20050204-19	43.8	43.8	44.3	44.7
20050204-20	20050204-20	49.9	50.9	51.1	51.3	20050204-20	20050204-20	52.3	54.7	58.1	45.6	20050204-20	20050204-20	44.3	44.3	44.8	45.2
20050204-21	20050204-21	50.4	51.4	51.6	51.8	20050204-21	20050204-21	52.8	55.2	58.6	46.0	20050204-21	20050204-21	44.8	44.8	45.3	45.7
20050204-22	20050204-22	50.9	51.9	52.1	52.3	20050204-22	20050204-22	53.3	55.7	59.1	46.4	20050204-22	20050204-22	45.3	45.3	45.8	46.2
20050204-23	20050204-23	51.4	52.4	52.6	52.8	20050204-23	20050204-23	53.8	56.2	59.6	46.8	20050204-23	20050204-23	45.8	45.8	46.3	46.7
20050204-24	20050204-24	51.9	52.9	53.1	53.3	20050204-24	20050204-24	54.3	56.7	60.1	47.2	20050204-24	20050204-24	46.3	46.3	46.8	47.2
20050204-25	20050204-25	52.4	53.4	53.6	53.8	20050204-25	20050204-25	54.8	57.2	60.6	47.6	20050204-25	20050204-25	46.8	46.8	47.3	47.7
20050204-26	20050204-26	52.9	53.9	54.1	54.3	20050204-26	20050204-26	55.3	57.7	61.1	48.0	20050204-26	20050204-26	47.3	47.3	47.8	48.2
20050204-27	20050204-27	53.4	54.4	54.6	54.8	20050204-27	20050204-27	55.8	58.2	61.6	48.4	20050204-27	20050204-27	47.8	47.8	48.3	48.7
20050204-28	20050204-28	53.9	54.9	55.1	55.3	20050204-28	20050204-28	56.3	58.7	62.1	48.8	20050204-28	20050204-28	48.3	48.3	48.8	49.2
20050204-29	20050204-29	54.4	55.4	55.6	55.8	20050204-29	20050204-29	56.8	59.2	62.6	49.2	20050204-29	20050204-29	48.8	48.8	49.3	49.7
20050204-30	20050204-30	54.9	55.9	56.1	56.3	20050204-30	20050204-30	57.3	59.7	63.1	49.6	20050204-30	20050204-30	49.3	49.3	49.8	50.2
20050204-31	20050204-31	55.4	56.4	56.6	56.8	20050204-31	20050204-31	57.8	60.2	63.6	50.0	20050204-31	20050204-31	49.8	49.8	50.3	50.7
20050205-01	20050205-01	55.9	56.9	57.1	57.3	20050205-01	20050205-01	58.3	60.7	64.1	50.4	20050205-01	20050205-01	50.3	50.3	50.8	51.2
20050205-02	20050205-02	56.4	57.4	57.6	57.8	20050205-02	20050205-02	58.8	61.2	64.6	50.8	20050205-02	20050205-02	50.8	50.8	51.3	51.7
20050205-03	20050205-03	56.9	57.9	58.1	58.3	20050205-03	20050205-03	59.3	61.7	65.1	51.2	20050205-03	20050205-03	51.3	51.3	51.8	52.2
20050205-04	20050205-04	57.4	58.4	58.6	58.8	20050205-04	20050205-04	59.8	62.2	65.6	51.6	20050205-04	20050205-04	51.8	51.8	52.3	52.7
20050205-05	20050205-05	57.9	58.9	59.1	59.3	20050205-05	20050205-05	60.3	62.7	66.1	52.0	20050205-05	20050205-05	52.3	52.3	52.8	53.2
20050205-06	20050205-06	58.4	59.4	59.6	59.8	20050205-06	20050205-06	60.8	63.2	66.6	52.4	20050205-06	20050205-06	52.8	52.8	53.3	53.7
20050205-07	20050205-07	58.9	59.9	60.1	60.3	20050205-07	20050205-07	61.3	63.7	67.1	52.8	20050205-07	20050205-07	53.3	53.3	53.8	54.2
20050205-08	20050205-08	59.4	60.4	60.6	60.8	20050205-08	20050205-08	61.8	64.2	67.6	53.2	20050205-08	20050205-08	53.8	53.8	54.3	54.7
20050205-09	20050205-09	59.9	60.9	61.1	61.3	20050205-09	20050205-09	62.3	64.7	68.1	53.6	20050205-09	20050205-09	54.3	54.3	54.8	55.2
20050205-10	20050205-10	60.4	61.4	61.6	61.8	20050205-10	20050205-10	62.8	65.2	68.6	54.0	20050205-10	20050205-10	54.8	54.8	55.3	55.7
20050205-11	20050205-11	60.9	61.9	62.1	62.3	20050205-11	20050205-11	63.3	65.7	69.1	54.4	20050205-11	20050205-11	55.3	55.3	55.8	56.2
20050205-12	20050205-12	61.4	62.4	62.6	62.8	20050205-12	20050205-12	63.8	66.2	69.6	54.8	20050205-12	20050205-12	55.8	55.8	56.3	56.7
20050205-13	20050205-13	61.9	62.9	63.1	63.3	20050205-13	20050205-13	64.3	66.7	70.1	55.2	20050205-13	20050205-13	56.3	56.3	56.8	57.2
20050205-14	20050205-14	62.4	63.4	63.6	63.8	20050205-14	20050205-14	64.8	67.2	70.6	55.6	20050205-14	20050205-14	56.8	56.8	57.3	57.7
20050205-15	20050205-15	62.9	63.9	64.1	64.3	20050205-15	20050205-15	65.3	67.7	71.1	56.0	20050205-15	20050205-15	57.3	57.3	57.8	58.2
20050205-16	20050205-16	63.4	64.4	64.6	64.8	20050205-16	20050205-16	65.8	68.2	71.6	56.4	20050205-16	20050205-16	57.8	57.8	58.3	58.7
20050205-17	20050205-17	63.9	64.9	65.1	65.3	20050205-17	20050205-17	66.3	68.7	72.1	56.8	20050205-17	20050205-17	58.3	58.3	58.8	59.2
20050205-18	20050205-18	64.4	65.4	65.6	65.8	20050205-18	20050205-18	66.8	69.2	72.6	57.2	20050205-18	20050205-18	58.8	58.8	59.3	59.7
20050205-19	20050205-19	64.9	65.9	66.1	66.3	20050205-19	20050205-19	67.3	69.7	73.1	57.6	20050205-19	20050205-19	59.3	59.3	59.8	60.2
20050205-20	20050205-20	65.4	66.4	66.6	66.8	20050205-20	20050205-20	67.8	70.2	73.6	58.0	20050205-20	20050205-20	59.8	59.8	60.3	60.7
20050205-21	20050205-21	65.9	66.9	67.1	67.3	20050205-21	20050205-21	68.3	70.7	74.1	58.4	20050205-21	20050205-21	60.3	60.3	60.8	61.2
20050205-22	20050205-22	66.4	67.4	67.6	67.8	20050205-22	20050205-22	68.8	71.2	74.6	58.8	20050205-22	20050205-22	60.8	60.8	61.3	61.7
20050205-23	20050205-23	66.9	67.9	68.1	68.3	20050205-23	20050205-23	69.3	71.7	75.1	59.2	20050205-23	20050205-23	61.3	61.3	61.8	62.2
20050205-24	20050205-24	67.4	68.4	68.6	68.8	20050205-24	20050205-24	69.8	72.2	75.6	59.6	20050205-24	20050205-24	61.8	61.8	62.3	62.7
20050205-25	20050205-25	67.9	68.9	69.1	69.3	20050205-25	20050205-25	70.3	72.7	76.1	60.0	20050205-25	20050205-25	62.3	62.3	62.8	63.2
20050205-26	20050205-26	68.4	69.4	69.6	69.8	20050205-26	20050205-26	70.8	73.2	76.6	60.4	20050205-26	20050205-26	62.8	62.8	63.3	63.7
20050205-27	20050205-27	68.9	69.9	70.1	70.3	20050205-27	20050205-27	71.3	73.7	77.1	60.8	20050205-27	20050205-27	63.3	63.3	63.8	64.2
20050205-28	20050205-28	69.4	70.4	70.6	70.8	20050205-28	20050205-28	71.8	74.2	77.6	61.2	20050205-28	20050205-28	63.8	63.8	64.3	64.7
20050205-29	20050205-29	69.9	70.9	71.1	71.3	20050205-29	20050205-29	72.3	74.7	78.1	61.6	20050205-29	20050205-29	64.3	64.3	64.8	65.2
20050205-30	20050205-30	70.4	71.4	71.6	71.8	20050205-30	20050205-30	72.8	75.2	78.6	62.0	20050205-30	20050205-30	64.8	64.8	65.3	65.7
20050205-31	20050205-31	70.9	71.9	72.1	72.3	20050205-31	20050205-31	73.3	75.7	79.1	62.4	20050205-31	20050205-31	65.3	65.3	65.8	66.2
20050206-01	20050206-01	71.4	72.4	72.6	72.8	20050206-01	20050206-01	73.8	76.2	79.6	62.8	20050206-01	20050206-01	65.8	65.8	66.3	66.7
20050206-02	20050206-02	71.9	72.9	73.1	73.3	20050206-02	20050206-02	74.3	76.7	80.1	63.2	20050206-02	20050206-02	66.3	66.3	66.8	67.2
20050206-03	20050206-03	72.4	73.4	73.6	73.8	20050206-03	20050206-03	74.8	77.2	80.6	63.6	20050206-03	20050206-03	66.8	66.8	67.3	67.7
20050206-04	20050206-04	72.9	73.9	74.1	74.3	20050206-04	20050206-04	75.3	77.7	81.1	64.0	20050206-04	20050206-04	67.3	67.3	67.8	68.2
20050206-05	20050206-05	73.4	74.4	74.6	74.8	20050206-05	20050206-05	75.8	78.2	81.6	64.4	20050206-05	20050206-05	67.8	67.8	68.3	68.7
20050206-06	20050206-06	73.9	74.9	75.1	75.3	20050206-06	20050206-06	76.3	78.7	82.1	64.8	20050206-06	20050206-06	68.3	68.3	68.8	69.2
20050206-07	20050206-07	74.4	75.4	75.6	75.8	20050206-07	20050206-07	76.8	79.2	82.6	65.2	20050206-07	20050206-07	68.8	68.8	69.3	69.7
20050206-08	20050206-08	74.9	75.9	76.1	76.3	20050206-08	20050206-08	77.3	79.7	83.1	65.6	20050206-08	20050206-08	69.3	69.3	69.8	70.2
20050206-09	20050206-09	75.4	76.4	76.6	76.8	20050206-09	20050206-09	77.8	80.2	83.6	66.0	20050206-09	20050206-09	69.8	69.8	70.3	70.7
20050206-10	20050206-10	75.9	76.9	77.1	77.3	20050206-10	20050206-10	78.3	80.7	84.1	66.4	20050206-10	20050206-10	70.3	70.3	70.8	71.2
20050206-11	20050206-11	76.4	77.4	77.6	77.8	20050206-11	20050206-11	78.8	81.2	84.6	66.8	20050206-11					

















MeasurementTime	MeasurementDate	Lane1	Lane2	Lane3	Lane4	Lane5
14602004:00	14602004:00	35.7	48.1	30.5	38.2	31.8
14602004:05	14602004:05	36.7	49.1	31.5	39.2	32.8
14602004:10	14602004:10	37.7	50.1	32.5	40.2	33.8
14602004:15	14602004:15	38.7	51.1	33.5	41.2	34.8
14602004:20	14602004:20	39.7	52.1	34.5	42.2	35.8
14602004:25	14602004:25	40.7	53.1	35.5	43.2	36.8
14602004:30	14602004:30	41.7	54.1	36.5	44.2	37.8
14602004:35	14602004:35	42.7	55.1	37.5	45.2	38.8
14602004:40	14602004:40	43.7	56.1	38.5	46.2	39.8
14602004:45	14602004:45	44.7	57.1	39.5	47.2	40.8
14602004:50	14602004:50	45.7	58.1	40.5	48.2	41.8
14602004:55	14602004:55	46.7	59.1	41.5	49.2	42.8
14602005:00	14602005:00	47.7	60.1	42.5	50.2	43.8
14602005:05	14602005:05	48.7	61.1	43.5	51.2	44.8
14602005:10	14602005:10	49.7	62.1	44.5	52.2	45.8
14602005:15	14602005:15	50.7	63.1	45.5	53.2	46.8
14602005:20	14602005:20	51.7	64.1	46.5	54.2	47.8
14602005:25	14602005:25	52.7	65.1	47.5	55.2	48.8
14602005:30	14602005:30	53.7	66.1	48.5	56.2	49.8
14602005:35	14602005:35	54.7	67.1	49.5	57.2	50.8
14602005:40	14602005:40	55.7	68.1	50.5	58.2	51.8
14602005:45	14602005:45	56.7	69.1	51.5	59.2	52.8
14602005:50	14602005:50	57.7	70.1	52.5	60.2	53.8
14602005:55	14602005:55	58.7	71.1	53.5	61.2	54.8
14602006:00	14602006:00	59.7	72.1	54.5	62.2	55.8
14602006:05	14602006:05	60.7	73.1	55.5	63.2	56.8
14602006:10	14602006:10	61.7	74.1	56.5	64.2	57.8
14602006:15	14602006:15	62.7	75.1	57.5	65.2	58.8
14602006:20	14602006:20	63.7	76.1	58.5	66.2	59.8
14602006:25	14602006:25	64.7	77.1	59.5	67.2	60.8
14602006:30	14602006:30	65.7	78.1	60.5	68.2	61.8
14602006:35	14602006:35	66.7	79.1	61.5	69.2	62.8
14602006:40	14602006:40	67.7	80.1	62.5	70.2	63.8
14602006:45	14602006:45	68.7	81.1	63.5	71.2	64.8
14602006:50	14602006:50	69.7	82.1	64.5	72.2	65.8
14602006:55	14602006:55	70.7	83.1	65.5	73.2	66.8
14602007:00	14602007:00	71.7	84.1	66.5	74.2	67.8
14602007:05	14602007:05	72.7	85.1	67.5	75.2	68.8
14602007:10	14602007:10	73.7	86.1	68.5	76.2	69.8
14602007:15	14602007:15	74.7	87.1	69.5	77.2	70.8
14602007:20	14602007:20	75.7	88.1	70.5	78.2	71.8
14602007:25	14602007:25	76.7	89.1	71.5	79.2	72.8
14602007:30	14602007:30	77.7	90.1	72.5	80.2	73.8
14602007:35	14602007:35	78.7	91.1	73.5	81.2	74.8
14602007:40	14602007:40	79.7	92.1	74.5	82.2	75.8
14602007:45	14602007:45	80.7	93.1	75.5	83.2	76.8
14602007:50	14602007:50	81.7	94.1	76.5	84.2	77.8
14602007:55	14602007:55	82.7	95.1	77.5	85.2	78.8
14602008:00	14602008:00	83.7	96.1	78.5	86.2	79.8
14602008:05	14602008:05	84.7	97.1	79.5	87.2	80.8
14602008:10	14602008:10	85.7	98.1	80.5	88.2	81.8
14602008:15	14602008:15	86.7	99.1	81.5	89.2	82.8
14602008:20	14602008:20	87.7	100.1	82.5	90.2	83.8
14602008:25	14602008:25	88.7	101.1	83.5	91.2	84.8
14602008:30	14602008:30	89.7	102.1	84.5	92.2	85.8
14602008:35	14602008:35	90.7	103.1	85.5	93.2	86.8
14602008:40	14602008:40	91.7	104.1	86.5	94.2	87.8
14602008:45	14602008:45	92.7	105.1	87.5	95.2	88.8
14602008:50	14602008:50	93.7	106.1	88.5	96.2	89.8
14602008:55	14602008:55	94.7	107.1	89.5	97.2	90.8
14602009:00	14602009:00	95.7	108.1	90.5	98.2	91.8
14602009:05	14602009:05	96.7	109.1	91.5	99.2	92.8
14602009:10	14602009:10	97.7	110.1	92.5	100.2	93.8
14602009:15	14602009:15	98.7	111.1	93.5	101.2	94.8
14602009:20	14602009:20	99.7	112.1	94.5	102.2	95.8
14602009:25	14602009:25	100.7	113.1	95.5	103.2	96.8
14602009:30	14602009:30	101.7	114.1	96.5	104.2	97.8
14602009:35	14602009:35	102.7	115.1	97.5	105.2	98.8
14602009:40	14602009:40	103.7	116.1	98.5	106.2	99.8
14602009:45	14602009:45	104.7	117.1	99.5	107.2	100.8
14602009:50	14602009:50	105.7	118.1	100.5	108.2	101.8
14602009:55	14602009:55	106.7	119.1	101.5	109.2	102.8
14602010:00	14602010:00	107.7	120.1	102.5	110.2	103.8
14602010:05	14602010:05	108.7	121.1	103.5	111.2	104.8
14602010:10	14602010:10	109.7	122.1	104.5	112.2	105.8
14602010:15	14602010:15	110.7	123.1	105.5	113.2	106.8
14602010:20	14602010:20	111.7	124.1	106.5	114.2	107.8
14602010:25	14602010:25	112.7	125.1	107.5	115.2	108.8
14602010:30	14602010:30	113.7	126.1	108.5	116.2	109.8
14602010:35	14602010:35	114.7	127.1	109.5	117.2	110.8
14602010:40	14602010:40	115.7	128.1	110.5	118.2	111.8
14602010:45	14602010:45	116.7	129.1	111.5	119.2	112.8
14602010:50	14602010:50	117.7	130.1	112.5	120.2	113.8
14602010:55	14602010:55	118.7	131.1	113.5	121.2	114.8
14602011:00	14602011:00	119.7	132.1	114.5	122.2	115.8
14602011:05	14602011:05	120.7	133.1	115.5	123.2	116.8
14602011:10	14602011:10	121.7	134.1	116.5	124.2	117.8
14602011:15	14602011:15	122.7	135.1	117.5	125.2	118.8
14602011:20	14602011:20	123.7	136.1	118.5	126.2	119.8
14602011:25	14602011:25	124.7	137.1	119.5	127.2	120.8
14602011:30	14602011:30	125.7	138.1	120.5	128.2	121.8
14602011:35	14602011:35	126.7	139.1	121.5	129.2	122.8
14602011:40	14602011:40	127.7	140.1	122.5	130.2	123.8
14602011:45	14602011:45	128.7	141.1	123.5	131.2	124.8
14602011:50	14602011:50	129.7	142.1	124.5	132.2	125.8
14602011:55	14602011:55	130.7	143.1	125.5	133.2	126.8
14602012:00	14602012:00	131.7	144.1	126.5	134.2	127.8
14602012:05	14602012:05	132.7	145.1	127.5	135.2	128.8
14602012:10	14602012:10	133.7	146.1	128.5	136.2	129.8
14602012:15	14602012:15	134.7	147.1	129.5	137.2	130.8
14602012:20	14602012:20	135.7	148.1	130.5	138.2	131.8
14602012:25	14602012:25	136.7	149.1	131.5	139.2	132.8
14602012:30	14602012:30	137.7	150.1	132.5	140.2	133.8
14602012:35	14602012:35	138.7	151.1	133.5	141.2	134.8
14602012:40	14602012:40	139.7	152.1	134.5	142.2	135.8
14602012:45	14602012:45	140.7	153.1	135.5	143.2	136.8
14602012:50	14602012:50	141.7	154.1	136.5	144.2	137.8
14602012:55	14602012:55	142.7	155.1	137.5	145.2	138.8
14602013:00	14602013:00	143.7	156.1	138.5	146.2	139.8
14602013:05	14602013:05	144.7	157.1	139.5	147.2	140.8
14602013:10	14602013:10	145.7	158.1	140.5	148.2	141.8
14602013:15	14602013:15	146.7	159.1	141.5	149.2	142.8
14602013:20	14602013:20	147.7	160.1	142.5	150.2	143.8
14602013:25	14602013:25	148.7	161.1	143.5	151.2	144.8
14602013:30	14602013:30	149.7	162.1	144.5	152.2	145.8
14602013:35	14602013:35	150.7	163.1	145.5	153.2	146.8
14602013:40	14602013:40	151.7	164.1	146.5	154.2	147.8
14602013:45	14602013:45	152.7	165.1	147.5	155.2	148.8
14602013:50	14602013:50	153.7	166.1	148.5	156.2	149.8
14602013:55	14602013:55	154.7	167.1	149.5	157.2	150.8
14602014:00	14602014:00	155.7	168.1	150.5	158.2	151.8
14602014:05	14602014:05	156.7	169.1	151.5	159.2	152.8
14602014:10	14602014:10	157.7	170.1	152.5	160.2	153.8
14602014:15	14602014:15	158.7	171.1	153.5	161.2	154.8
14602014:20	14602014:20	159.7	172.1	154.5	162.2	155.8
14602014:25	14602014:25	160.7	173.1	155.5	163.2	156.8
14602014:30	14602014:30	161.7	174.1	156.5	164.2	157.8
14602014:35	14602014:35	162.7	175.1	157.5	165.2	158.8
14602014:40	14602014:40	163.7	176.1	158.5	166.2	159.8
14602014:45	14602014:45	164.7	177.1	159.5	167.2	160.8
14602014:50	14602014:50	165.7	178.1	160.5	168.2	161.8
14602014:55	14602014:55	166.7	179.1	161.5	169.2	162.8
14602015:00	14602015:00	167.7	180.1	162.5	170.2	163.8
14602015:05	14602015:05	168.7	181.1	163.5	171.2	164.8
14602015:10	14602015:10	169.7	182.1	164.5	172.2	165.8
14602015:15	14602015:15	170.7	183.1	165.5	173.2	166.8
14602015:20	14602015:20	171.7	184.1	166.5	174.2	167.8
14602015:25	14602015:25	172.7	185.1	167.5	175.2	168.8
14602015:30	14602015:30	173.7	186.1	168.5	176.2	169.8
14602015:35	14602015:35	174.7	187.1	169.5	177.2	170.8
14602015:40	14602015:40	175.7	188.1	170.5	178.2	171.8
14602015:45	14602015:45	176.7	189.1	171.5	179.2	172.8
14602015:50	14602015:50	177.7	190.1	172.5	180.2	173.8
14602015:55	14602015:55	178.7	191.1	173.5	181.2	174.8
14602016:00	14602016:00	179.7	192.1	174.5	182.2	175.8
14602016:05	14602016:05	180.7	193.1	175.5	183.2	176.8
14602016:10	14602016:10	181.7	194.1	1		





MeasurementDate	MeasurementDate	Lat	Latm	Latn	LatO	LatD
20040214 04	20040214 05	48.1	48.2	48.3	48.4	48.5
20040214 05	20040214 06	47.7	47.7	47.5	47.5	47.5
20040214 06	20040214 07	47.4	47.3	47.1	47.0	47.0
20040214 07	20040214 08	47.1	47.0	46.8	46.7	46.7
20040214 08	20040214 09	46.8	46.7	46.5	46.4	46.4
20040214 09	20040214 10	46.5	46.4	46.2	46.1	46.1
20040214 10	20040214 11	46.2	46.1	45.9	45.8	45.8
20040214 11	20040214 12	45.9	45.8	45.6	45.5	45.5
20040214 12	20040214 13	45.6	45.5	45.3	45.2	45.2
20040214 13	20040214 14	45.3	45.2	45.0	44.9	44.9
20040214 14	20040214 15	45.0	44.9	44.7	44.6	44.6
20040214 15	20040214 16	44.7	44.6	44.4	44.3	44.3
20040214 16	20040214 17	44.4	44.3	44.1	44.0	44.0
20040214 17	20040214 18	44.1	44.0	43.8	43.7	43.7
20040214 18	20040214 19	43.8	43.7	43.5	43.4	43.4
20040214 19	20040214 20	43.5	43.4	43.2	43.1	43.1
20040214 20	20040214 21	43.2	43.1	42.9	42.8	42.8
20040214 21	20040214 22	42.9	42.8	42.6	42.5	42.5
20040214 22	20040214 23	42.6	42.5	42.3	42.2	42.2
20040214 23	20040214 24	42.3	42.2	42.0	41.9	41.9
20040214 24	20040214 25	42.0	41.9	41.7	41.6	41.6
20040214 25	20040214 26	41.7	41.6	41.4	41.3	41.3
20040214 26	20040214 27	41.4	41.3	41.1	41.0	41.0
20040214 27	20040214 28	41.1	41.0	40.8	40.7	40.7
20040214 28	20040214 29	40.8	40.7	40.5	40.4	40.4
20040214 29	20040214 30	40.5	40.4	40.2	40.1	40.1
20040214 30	20040214 31	40.2	40.1	39.9	39.8	39.8
20040214 31	20040214 32	39.9	39.8	39.6	39.5	39.5
20040214 32	20040214 33	39.6	39.5	39.3	39.2	39.2
20040214 33	20040214 34	39.3	39.2	39.0	38.9	38.9
20040214 34	20040214 35	39.0	38.9	38.7	38.6	38.6
20040214 35	20040214 36	38.7	38.6	38.4	38.3	38.3
20040214 36	20040214 37	38.4	38.3	38.1	38.0	38.0
20040214 37	20040214 38	38.1	38.0	37.8	37.7	37.7
20040214 38	20040214 39	37.8	37.7	37.5	37.4	37.4
20040214 39	20040214 40	37.5	37.4	37.2	37.1	37.1
20040214 40	20040214 41	37.2	37.1	36.9	36.8	36.8
20040214 41	20040214 42	36.9	36.8	36.6	36.5	36.5
20040214 42	20040214 43	36.6	36.5	36.3	36.2	36.2
20040214 43	20040214 44	36.3	36.2	36.0	35.9	35.9
20040214 44	20040214 45	36.0	35.9	35.7	35.6	35.6
20040214 45	20040214 46	35.7	35.6	35.4	35.3	35.3
20040214 46	20040214 47	35.4	35.3	35.1	35.0	35.0
20040214 47	20040214 48	35.1	35.0	34.8	34.7	34.7
20040214 48	20040214 49	34.8	34.7	34.5	34.4	34.4
20040214 49	20040214 50	34.5	34.4	34.2	34.1	34.1
20040214 50	20040214 51	34.2	34.1	33.9	33.8	33.8
20040214 51	20040214 52	33.9	33.8	33.6	33.5	33.5
20040214 52	20040214 53	33.6	33.5	33.3	33.2	33.2
20040214 53	20040214 54	33.3	33.2	33.0	32.9	32.9
20040214 54	20040214 55	33.0	32.9	32.7	32.6	32.6
20040214 55	20040214 56	32.7	32.6	32.4	32.3	32.3
20040214 56	20040214 57	32.4	32.3	32.1	32.0	32.0
20040214 57	20040214 58	32.1	32.0	31.8	31.7	31.7
20040214 58	20040214 59	31.8	31.7	31.5	31.4	31.4
20040214 59	20040214 60	31.5	31.4	31.2	31.1	31.1
20040214 60	20040214 61	31.2	31.1	30.9	30.8	30.8
20040214 61	20040214 62	30.9	30.8	30.6	30.5	30.5
20040214 62	20040214 63	30.6	30.5	30.3	30.2	30.2
20040214 63	20040214 64	30.3	30.2	30.0	29.9	29.9
20040214 64	20040214 65	30.0	29.9	29.7	29.6	29.6
20040214 65	20040214 66	29.7	29.6	29.4	29.3	29.3
20040214 66	20040214 67	29.4	29.3	29.1	29.0	29.0
20040214 67	20040214 68	29.1	29.0	28.8	28.7	28.7
20040214 68	20040214 69	28.8	28.7	28.5	28.4	28.4
20040214 69	20040214 70	28.5	28.4	28.2	28.1	28.1
20040214 70	20040214 71	28.2	28.1	27.9	27.8	27.8
20040214 71	20040214 72	27.9	27.8	27.6	27.5	27.5
20040214 72	20040214 73	27.6	27.5	27.3	27.2	27.2
20040214 73	20040214 74	27.3	27.2	27.0	26.9	26.9
20040214 74	20040214 75	27.0	26.9	26.7	26.6	26.6
20040214 75	20040214 76	26.7	26.6	26.4	26.3	26.3
20040214 76	20040214 77	26.4	26.3	26.1	26.0	26.0
20040214 77	20040214 78	26.1	26.0	25.8	25.7	25.7
20040214 78	20040214 79	25.8	25.7	25.5	25.4	25.4
20040214 79	20040214 80	25.5	25.4	25.2	25.1	25.1
20040214 80	20040214 81	25.2	25.1	24.9	24.8	24.8
20040214 81	20040214 82	24.9	24.8	24.6	24.5	24.5
20040214 82	20040214 83	24.6	24.5	24.3	24.2	24.2
20040214 83	20040214 84	24.3	24.2	24.0	23.9	23.9
20040214 84	20040214 85	24.0	23.9	23.7	23.6	23.6
20040214 85	20040214 86	23.7	23.6	23.4	23.3	23.3
20040214 86	20040214 87	23.4	23.3	23.1	23.0	23.0
20040214 87	20040214 88	23.1	23.0	22.8	22.7	22.7
20040214 88	20040214 89	22.8	22.7	22.5	22.4	22.4
20040214 89	20040214 90	22.5	22.4	22.2	22.1	22.1
20040214 90	20040214 91	22.2	22.1	21.9	21.8	21.8
20040214 91	20040214 92	21.9	21.8	21.6	21.5	21.5
20040214 92	20040214 93	21.6	21.5	21.3	21.2	21.2
20040214 93	20040214 94	21.3	21.2	21.0	20.9	20.9
20040214 94	20040214 95	21.0	20.9	20.7	20.6	20.6
20040214 95	20040214 96	20.7	20.6	20.4	20.3	20.3
20040214 96	20040214 97	20.4	20.3	20.1	20.0	20.0
20040214 97	20040214 98	20.1	20.0	19.8	19.7	19.7
20040214 98	20040214 99	19.8	19.7	19.5	19.4	19.4
20040214 99	20040215 00	19.5	19.4	19.2	19.1	19.1

MeasurementDate	MeasurementDate	Lat	Latm	Latn	LatO	LatD
20040215 01	20040215 02	48.1	48.2	48.3	48.4	48.5
20040215 02	20040215 03	47.7	47.7	47.5	47.5	47.5
20040215 03	20040215 04	47.4	47.3	47.1	47.0	47.0
20040215 04	20040215 05	47.1	47.0	46.8	46.7	46.7
20040215 05	20040215 06	46.8	46.7	46.5	46.4	46.4
20040215 06	20040215 07	46.5	46.4	46.2	46.1	46.1
20040215 07	20040215 08	46.2	46.1	45.9	45.8	45.8
20040215 08	20040215 09	45.9	45.8	45.6	45.5	45.5
20040215 09	20040215 10	45.6	45.5	45.3	45.2	45.2
20040215 10	20040215 11	45.3	45.2	45.0	44.9	44.9
20040215 11	20040215 12	45.0	44.9	44.7	44.6	44.6
20040215 12	20040215 13	44.7	44.6	44.4	44.3	44.3
20040215 13	20040215 14	44.4	44.3	44.1	44.0	44.0
20040215 14	20040215 15	44.1	44.0	43.8	43.7	43.7
20040215 15	20040215 16	43.8	43.7	43.5	43.4	43.4
20040215 16	20040215 17	43.5	43.4	43.2	43.1	43.1
20040215 17	20040215 18	43.2	43.1	42.9	42.8	42.8
20040215 18	20040215 19	42.9	42.8	42.6	42.5	42.5
20040215 19	20040215 20	42.6	42.5	42.3	42.2	42.2
20040215 20	20040215 21	42.3	42.2	42.0	41.9	41.9
20040215 21	20040215 22	42.0	41.9	41.7	41.6	41.6
20040215 22	20040215 23	41.7	41.6	41.4	41.3	41.3
20040215 23	20040215 24	41.4	41.3	41.1	41.0	41.0
20040215 24	20040215 25	41.1	41.0	40.8	40.7	40.7
20040215 25	20040215 26	40.8	40.7	40.5	40.4	40.4
20040215 26	20040215 27	40.5	40.4	40.2	40.1	40.1
20040215 27	20040215 28	40.2	40.1	39.9	39.8	39.8
20040215 28	20040215 29	39.9	39.8	39.6	39.5	39.5
20040215 29	20040215 30	39.6	39.5	39.3	39.2	39.2
20040215 30	20040215 31	39.3	39.2	39.0	38.9	38.9
20040215 31	20040215 32	39.0	38.9	38.7	38.6	38.6
20040215 32	20040215 33	38.7	38.6	38.4	38.3	38.3
20040215 33	20040215 34	38.4	38.3	38.1	38.0	38.0
20040215 34	20040215 35	38.1	38.0	37.8	37.7	37.7
20040215 35	20040215 36	37.8	37.7	37.5	37.4	37.4
20040215 36	20040215 37	37.5	37.4	37.2	37.1	37.1
20040215 37	20040215 38	37.2	37.1	36.9	36.8	36.8
20040215 38	20040215 39	36.9	36.8	36.6	36.5	36.5
20040215 39	20040215 40	36.6	36.5	36.3	36.2	36.2
20040215 40	20040215 41	36.3	36.2	36.0	35.9	35.9
20040215 41	20040215 42	36.0	35.9	35.7	35.6	35.6
20040215 42	20040215 43	35.7	35.6	35.4	35.3	35.3
20040215 43	20040215 44	35.4	35.3	35.1	35.0	35.0
20040215 44	20040215 45	35.1	35.0	34.8	34.7	34.7
20040215 45	20040215 46	34.8	34.7	34.5	34.4	34.4
20040215 46	20040215 47	34.5	34.4	34.2	34.1	34.1
20040215 47	20040215 48	34.2	34.1	33.9	33.8	33.8
20040215 48	20040215 49	33.9	33.8	33.6	33.5	33.5
20040215 49	20040215 50	33.6	33.5	33.3	33.2	33.2
20040215 50	20040215 51	33.3	33.2	33.0	32.9	32.9
20040215 51	20040215 52	33.0	32.9	32.7	32.6	32.6
20040215 52	20040215 53	32.7	32.6	32.4	32.3	32.3
20040215 53	20040					

## CALIBRATION CERTIFICATE

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**Certificate No:** 1501805-1

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**OBJECT OF CALIBRATION**

Manufacturer: **SVANTEK**  
Model: **SV 307A**  
Serial No.: 116192  
Description: Sound Level Meter

**SENSOR**

Manufacturer: **Svantek**  
Model: **ST30A**  
Serial No.: 118915  
Description: Microphone

**APPLICANT**

Addiscombe Environmental Consultants Ltd  
Melrose House, 42 Dingwall Road, Croydon, Surrey CR0 2NE

**ENVIRONMENTAL CONDITIONS**

Temperature: 22.6 – 22.7 °C  
Humidity: 40 – 42 %  
Pressure: 101.2 – 101.2 kPa

**DATE OF CALIBRATION**

14-07-2022

**APPROVED BY**

B. Hunt



**Date of issue:** 14-07-2022

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**CALIBRATION METHOD** Method described in instruction IN-02 "Calibration of the sound level meter", issue number 11 date 27.01.2016, written on the basis of international standard EN IEC 61672-3:2013 Electroacoustics. Part 3: Periodic tests.

**CALIBRATION RESULTS** **The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3:2013 (BS EN 61672-3:2013), for the environmental conditions under which the tests were performed.**  
The results are presented on pages 3 to 6 of this certificate (including measurement uncertainty).

**CONFORMITY WITH REQUIREMENTS** On the basis of the calibration results, it has been found that, the sound level meter meets metrological requirements specified in the standard IEC 61672-1:2013 Electroacoustics – Sound level meters. Part 1: Specifications, for class 1.

**UNCERTAINTY OF MEASUREMENTS** Uncertainty of measurement has been evaluated in compliance with EA-4/02:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor  $k = 2$ .

**NOTES**

1. *The information appearing on this certificate has been compiled specifically for this instrument. This calibration certificate is produced with traceable and advanced equipment which permit comprehensive quality assurance verification of all data supplied herein.*
2. *The measurements in this document are traceable to GUM (Central Office of Measures), Poland*
3. *This calibration certificate shall not be reproduced except in full, without written permission from AcSoft Ltd.*

**REFERENCE EQUIPMENT**

Description	Manufacturer	Model	Serial Number	Last Calibrated
Signal Generator	Svantek	SV401	124	27.08.2021
Sound & Vibration Analyser	Svantek	SV912AE	15909	22.09.2021
Thermo-Barometer	LAB-EL	LB-706B	912	27.08.2021
Acoustical Calibrator	Svantek	SV30A	83782	17.09.2021
Reference Microphone	GRAS	40AG	235709	31.08.2021
Sound Intensity Calibrator	GRAS	51AB	203319	01.09.2021



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**CALIBRATION RESULTS**

Calibration results are as follows:

**1. Indication at the calibration check frequency**

The sound level meter was calibrated in compliance with the instruction manual. During this process, the indication of this SLM was adjusted to the sound pressure level of the sound level calibrator type SV 30A, No 83782, from SVANTEK. The sound pressure level was corrected by the free-field factor.

Deviation of the acoustic pressure measurement of the A-weighted sound level using the sound calibrator type SV 30A, No 83782, from SVANTEK, was made according to the standard reference conditions: for static pressure 1003 hPa, for temperature 24 °C and for relative humidity 60 %, results:

**0.0 ± 0.2 dB**

The deviation was determined as a difference between the measured sound level and the sound level corrected by the free-field factor appropriate to mentioned sound calibrator.

**2. Self-generated noise with microphone installed**

Frequency weighting	A
The highest level of self-generated noise stated in the instruction manual [dB]	n/a
Indication [dB]	n/a

**3. Self-generated noise with microphone replaced by the electrical input signal device**

Frequency weighting	A	C	Z
The highest expected level of self-generated noise stated in the instruction manual [dB]	15.0	15.0	23.0
Level of self-generated noise [dB]	14.1	14.1	19.5

**4. Acoustical signal tests of a frequency weighting C**

Frequency	Relative frequency-weighted free-field response	Design-goal frequency weighting	The deviation of frequency weighting	Expanded uncertainty	Acceptable limits
Hz	dB	dB	dB	dB	dB
125.0	93.9	-0.2	0.1	0.3	±1.5
1000.0	94.0	0.0	0.0	0.3	±1.1
4000.0	93.5	-0.8	0.3	0.4	±1.6
8000.0	91.1	-3.0	0.1	0.4	-3.1; +2.5

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**5. Electrical signal tests of frequency weightings**

Frequency	Design-goal frequency weighting			The deviation of frequency weighting			Expanded uncertainty	Acceptable limits
	A	C	Z	A	C	Z		
Hz	dB	dB	dB	dB	dB	dB	dB	dB
63	-26,2	-0,8	0,0	0.1	0.0	0.0	0,3	±1,5
125	-16,1	-0,2	0,0	0.0	0.0	0.0	0,3	±1,5
250	-8,6	0,0	0,0	0.0	0.0	0.0	0,3	±1,4
500	-3,2	0,0	0,0	0.0	0.0	0.0	0,3	±1,4
1000	0,0	0,0	0,0	0.0	0.0	0.0	0,3	±1,1
2000	1,2	-0,2	0,0	0.0	0.0	0.0	0,3	±1,6
4000	1,0	-0,8	0,0	0.0	0.0	0.0	0,3	±1,6
8000	-1,1	-3,0	0,0	0.1	0.1	0.0	0,4	-3,1; +2,1
16000	-6,6	-8,5	0,0	-0.2	-0.2	0.0	0,6	-17,0; +3,5

**6. Frequency and time weightings at 1 kHz**

Frequency weighting	Sound level				Time-averaged sound level
	A	A	C	Z	A
Time weighting	Fast	Slow	Fast	Fast	-
Indication [dB]	114.0	114.0	114.0	114.0	114.0
The deviation of indication from the indication of A-weighted sound level with Fast time weighting [dB]	<del>0.0</del>	0.0	0.0	0.0	0.0
Expanded uncertainty [dB]	<del>0.1</del>	0.1			
Acceptable limits [dB]	<del>±0.3</del>	±0.3	±0.4	±0.4	±0.3



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**7. Level linearity**

Reference level range: HIGH

Expected sound level	Indication	Level linearity error	Expanded uncertainty	Acceptable limits
dB	dB	dB	dB	dB
119.0	118.8	-0.2	0.2	±1.1
118.0	117.9	-0.1		
117.0	116.9	-0.1		
116.0	115.9	-0.1		
115.0	114.9	-0.1		
114.0	114.0	0.0		
109.0	109.0	0.0		
104.0	104.0	0.0		
99.0	99.0	0.0		
94.0	94.0	0.0		
89.0	89.0	0.0		
84.0	84.0	0.0		
79.0	79.0	0.0		
74.0	73.9	-0.1		
69.0	68.9	-0.1		
64.0	63.9	-0.1		
59.0	58.9	-0.1		
54.0	53.9	-0.1		
49.0	48.9	-0.1		
44.0	43.9	-0.1		
39.0	38.9	-0.1		
38.0	37.9	-0.1		
37.0	36.9	-0.1		
36.0	35.9	-0.1		
35.0	34.9	-0.1		
34.0	33.9	-0.1		
33.0	32.9	-0.1		
32.0	31.8	-0.2		
31.0	30.9	-0.1		

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**8. Toneburst response**

Measurement quantity	Time weighting	Toneburst duration	The indications in response to toneburst relative to steady sound level	Reference toneburst response relative to steady sound level	Deviation of measured toneburst response from reference toneburst	Expanded uncertainty	Acceptable limits
		ms	dB	dB	dB		
Time-weighted sound level	Fast	200	-1.0	-1.0	0.0	0.2	±0.8
		2	-18.0	-18.0	0.0		-1.8; +1.3
		0.25	-27.1	-27.0	-0.1		-3.3; +1.3
Time-weighted sound level	Slow	200	-7.5	-7.4	-0.1		±0.8
		2	-27.1	-27.0	-0.1		-1.8; +1.3
Sound exposure level	-	200	-7.0	-7.0	0.0		±0.8
		2	-27.0	-27.0	0.0		-1.8; +1.3
		0.25	-36.1	-36.0	-0.1		-3.3; +1.3

**9. Peak C sound level**

Numbers of cycles in test signal	Frequency of test signal	The deviation of indication	Expanded uncertainty	Acceptable limits
	Hz	dB	dB	dB
One	8000	-0.9	0.2	±2.4
Positive half-cycle	500	0.0		±1.4
Negative half-cycle	500	0.0		

**10. Overload indication**

Frequency weighting A

The difference between the levels of the positive and negative one-half-cycles input signals that first cause the displays of overload indication	Expanded uncertainty	Maximum value of the difference
dB	dB	dB
0.4	0.3	1.8



## FACTORY CALIBRATION DATA OF THE SV 307A No. 119011

with microphone SVANTEK type ST30A No. 125105

IMEI: 352818660663732

### 1. CALIBRATION (acoustical)

LEVEL METER function; Reference frequency: 1000Hz; Sound Pressure Level: 114.07 dB.

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	114.07	114.09	0.02
A	114.07	114.09	0.02
C	114.07	114.09	0.02

Calibration measured with the microphone SVANTEK type ST30A No. 125105. Calibration factor: 0.00 dB.

### 2. LINEARITY TEST (electrical)

LEVEL METER function; Characteristic: A;  $f_{in} = 31.5$  Hz

Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	85.0
Error [dB]	-0.0	-0.0	0.0	-0.0	0.0	0.0	0.0	0.0

LEVEL METER function; Characteristic: A;  $f_{in} = 1000$  Hz

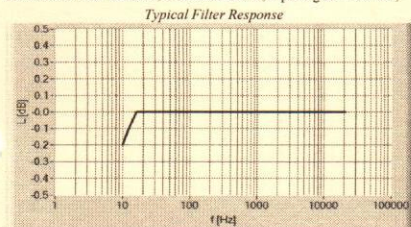
Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	100.0	120.0	125.0
Error [dB]	0.1	0.0	0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0

LEVEL METER function; Characteristic: A;  $f_{in} = 8000$  Hz

Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	100.0	120.0	124.0
Error [dB]	0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	-0.0	-0.0

### 3. FREQUENCY RESPONSE (electrical)

LEVEL METER function; Characteristic: Z; Input signal = 122 dB;



*Measured Filter Response  
(f-frequency, L-level)*

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-0.1	63	-0.0	4000	-0.0
12.5	-0.0	125	-0.0	8000	-0.0
16	0.0	250	-0.0	16000	-0.0
20	0.0	500	-0.0	20000	-0.0
25	0.0	1000	-0.0		
31.5	0.0	2000	-0.0		

All frequencies are nominal center values for the 1/3 octave bands

### 4. FREQUENCY RESPONSE (acoustical)

LEVEL METER function; Characteristic: Z; Input: 90 dB;

Frequency [Hz]	20	31.5	63	125	250	500	800	1000	2000
Pressure Response [dB]	0.1	0.2	0.2	0.3	0.3	0.2	0.1	0.1	-0.5
Free Field Response [dB]	0.1	0.2	0.2	0.3	0.2	0.1	-0.0	0.0	0.0

Frequency [Hz]	3150	4000	5000	6300	8000	10000	12500	16000
Pressure Response [dB]	-1.4	-2.2	-3.2	-4.4	-5.8	-7.2	-8.5	-10.2
Free Field Response [dB]	-0.1	0.3	0.0	-0.1	-0.1	-0.5	-1.1	-2.6

**5. INTERNAL NOISE LEVEL** (electrical - compensated)

LEVEL METER function; Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤23	≤15	≤15

**6. INTERNAL NOISE LEVEL** (acoustical - compensated)

LEVEL METER function; Characteristic: A;

Indication [dB]	≤23
-----------------	-----

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

**ENVIRONMENTAL CONDITIONS**

Temperature	Relative humidity	Ambient pressure
23 °C	48%	998 hPa

**TEST EQUIPMENT**

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	100	Signal generator
2.	SVANTEK	SVAN 912A	4369	Sound & Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV33B	93171	Acoustic calibrator
5.	G.R.A.S.	51AB	200368	Sound Intensity Calibrator
6.	G.R.A.S.	40BP	93296	1/2" Pressure Microphone
7.	G.R.A.S.	40AN	73421	1/2" Free Field Microphone
8.	SVANTEK	SL307	-	Microphone equivalent electrical impedance (18pF)

**CONFORMITY & TEST DECLARATION**

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses them.
2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.
3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Cezary Dardziński .....

Test date: 2022-05-27



---

# Appendix D: Model Input Data



Statera Energy Ltd  
Attn. Ms. Rosie Atkins  
80 Victoria Street, 4<sup>th</sup> Floor  
London, SW1E 5JL  
United Kingdom

Email: [ratkins@stateraenergy.co.uk](mailto:ratkins@stateraenergy.co.uk)

## QUOTATION - Stage 1

<i>Subject:</i>	<i>Your reference:</i>	<i>Our reference:</i>	<i>Date:</i>
Thurrock Flexible Generation Plant - 59 pcs vent. set	Ventilation System 64.2000	103079, rev. B	March 12, 2024

Dear Ms. Atkins,

We refer to your request to quote for ventilation systems, based on a very high level of ventilation flow: air inlet= 124,560 m<sup>3</sup>/h and air outlet= 105,260 m<sup>3</sup>/h.

Although we feel that this amount of air flow is way too much, we offer this so that you can compare it.

In a later stage, you can decide what the final air flow must be.  
Of course, we are open and willing to advise you on that part (if necessary).

- Pos. A : Starting points**
- Pos. B : 59 pcs air inlet**
- Pos. C : 59 pcs air outlet**
- Pos. D : 59 pcs front wall at the air inlet side**
- Pos. E : Doors for the engine rooms**
- Pos. F : Budget pricing**

### Pos. A: starting points

- Engine : Jenbacher, JMS 624.
- Installation : Inside a concrete enclosure, which is provided by others.
- Absorption : There is no absorption inside the engine rooms.
- Dimensions enclosure : L x W x H = approx. 16,500 x 4,850 x 4,000 mm.
- Air inlet flow : approx. 124,560 m<sup>3</sup>/h; including combustion air.
- Air outlet flow : approx. 105,260 m<sup>3</sup>/h.
- Air inlet : Installed horizontally at one end of the engine room.
- Air outlet : Installed vertically, with horizontal outlet, on the roof of each engine room.
- Filters : Included.
- Fans : Installed in the air inlet.
- Max. over pressure : 150 Pa.

Experts In Noise Control Solutions

Alara-Lukagro bv | Huijgensweg 3 | 2964 LL Groot-Ammers | P.O. Box 15 | 2964 ZG Groot-Ammers | The Netherlands

T +31 (0) 184 661 700 | E [info@alara-lukagro.com](mailto:info@alara-lukagro.com) | I [www.alara-lukagro.com](http://www.alara-lukagro.com)

IBAN: NL39 INGB 0662117050 | BIC: INGBNL2A | C.o.C. Rotterdam no. 23033397 | VAT NL 002707056B01







- Acoustic requirements : Air inlet : Lw= 86 dB(A)/ each.  
 : Air outlet: Lw= 89 dB(A)/ each.  
 Measured under free field conditions.

All acoustical calculations are based upon following sound spectrum (Lp/ Lw) of the genset (other sounds from piping and flue gas ducts are excluded).

	31	63	125	250	500	1k	2k	4k	8k	Hz
Genset Lp@ 1m	90	97	103	101	96	95	94	96	97	dB
Genset Lw	113	120	126	124	119	118	117	119	120	dB

**Noise Levels Gensets:**

Unsilenced noise levels for the genset according to Jenbacher Technical Description Cogeneration Unit JMS 624, ytd. 2022 Engine tolerance is +/- 3 dB. We have not calculated with these tolerances.

**General:**

- Design based on the technical specifications (SEL-THU-D-ME-SPC-0002 Technical Specification) and the starting points as described above.
- Design changes may be implemented during detailed design based upon value engineering.
- The accuracy of the given noise data determines the quality of the noise calculations. The calculations have been made with the given average noise levels.
- All plant sound pressure levels are in free field conditions with one engine running and excluding any influence from structure born noise and/or other noise sources.
- When measurements are taken on several points the average level will be determined. Measurements taken outside the airflow to avoid influence of airflow on measured values.
- All plant sound pressure level limits are at full load operating conditions.
- All plant sound pressure level limits are at the mitigated level with noise control installed.
- Any noise measures or calculations in addition to the ventilation systems are excluded.

**Pos. B: description air inlet**

Removable air inlet section, completely supplied as one unit, to be lifted into position with a crane. In the clear opening a steelwork framing will be provided (= pos. D).

Overall outside dimensions approx. W x H x L = 3,700 x 3,650 x 2,850 mm (excl. fans).

The side walls/ roof of the unit are built-up as soundproof panels to avoid noise break-out, made in pre-galvanised steel sheet. Infill of semi-rigid fibre slabs offering excellent strength and resistance to erosion. Material is inert, non-hygroscopic, vermin proof, does not support bacteriological growth and has a Class 1 rating for surface spread of flame acc. to BS 476 [Part 7, 1971].



Air inlet unit



The air inlet unit consists of following components:

#### Weather louvers

Front face entry external weather louvers as a protection against the direct ingress of rain, leaves and birds into the air inlet opening. Over a single face the air speed would be approx. 3.0 m/s.

#### Filters

25 pcs pocket filters with filter class ISO Coarse 60% (acc. ISO 16890) (former class G4). Low initial differential pressure and high dust holding capacity. Quick installation and filter changing times due to easy, safe handling. Filter elements are installed in a standard cell frame with four clamping elements for secure sealing between the frame and the filter element. Advised pressure difference to exchange filter units is 150 – 180 Pa. Door at the side of the air inlet section to exchange the pocket filters.

#### Attenuator

Attenuator part with splitter type silencers made from pre-galvanised sheet steel.

#### Volume dampers

5 pcs air volume dampers, each with 1 actuator, 24V or 230V, spring open, electrically closed, accessible from within the genset compartment. Damper operation controlled by generator control unit. Each of the damper is wired out to one central junction box. Wiring to control the unit to be provided by others.

#### Fans

5 pcs fans, suitable for frequency control [electrical control unit by third party]. Fans are axial fans, diameter 900 mm, with 7.5 kW motor (NON ATEX). The fans will each have an emergency start/ stop button, wired to a common junction box.



front side of air inlet (without louvers)



back side of air inlet



**Pos. C: description air outlet**

Fixed mounted vertical air discharge section, with horizontal outlet, on top of the concrete roof of the engine room.

Acoustic air outlet unit with overall outside dimensions approx.  $W \times H \times L = 3,200 \times 3,200 \times 4,000$  mm.

The opening in the roof of the concrete enclosure has to be provided with a concrete upstand to install the rain collar including the silencer on.



“horizontal” outlet



“horizontal” outlet

The air outlet consists of following components:

Damper plenum

Dimensions plenum:  $W \times H \times L = 3,200 \times 3,200 \times 355$  mm.

Dampers accessible from inside the genset compartment.

Dimensions dampers: 2 pcs  $W \times L = 2,000 \times 1,335$  mm. Including Belimo actuator, spring open, electrically closed. Accessible from within the genset compartment. Damper operation controlled by generator control unit [wiring to control unit by others].

Bottom flange / rain collar:

The silencer is provided with a reinforced bottom flange/ rain collar. It is installed on top of the concrete upstand. There is no need for a second/ separate rain collar.

Rain collar: See photo.



bottom flange/ rain collar



### Silencer

A rectangular absorption silencer is installed vertically on the roof curb.  
W x H x L = 3,200 x 3,200 x 1,400 mm.

### Horizontal outlet

The horizontal outlet unit is installed on top of the vertically positioned attenuator, including bird screen.

### **Pos. D: description front wall at the air inlet side**

At the air intake side of the enclosure, a steel frame including an acoustic top- and side panel will be installed. The acoustic isolation will be equivalent to the isolation values of the air inlet to achieve the same noise requirements.

The dimensions of the complete frame set is approx. W x H = 4,800 x 3,900 mm (exact dimensions to be determined) incorporating a single door plus closure panels. The door is quoted separately (= Pos. E).



Front wall

### **Materials:**

- Ducts : Pre-galvanised sheet steel, no painting.
- Attenuators : Pre-galvanised sheet steel, no painting.
- Weather louvers : Pre-galvanised sheet steel, in RAL colour, with bird protection.
- Multi-leaf dampers : Pre-galvanised sheet steel, with Belimo actuator.
- Steel profiles : Galvanized.
- Purchased parts : In manufacturer standard.

### **Conservation/ Painting/ Colour:**

Weather louvers and exterior ventilation parts are coated in C4.

Colour: any RAL colour of your choice (except metallic and/ or signal colours)

A maintenance manual will be delivered.

- Weather louvers are powder coated.
- Other ventilation parts are wet painted.
- Wall panels: wet coated.
- Other components: unpainted
- Purchased items: in manufacturer standard.

### Pos. E1: doors (not fire rated)

#### Engine rooms:

Per engine room 2 single personnel doors and 1 double equipment door are included; type AL-D/D45.

Noise reduction  $R_w = 45$  dB.

The single doors and the active door leaf of the double door are provided with an anti-panic bar on the inside and a door handle on the outside.

The passive door leaf of the double door is provided with an espagnolette lock on the inside.



single door



double door

Door provided with:

- Double sealing with special rubber design.
- Complete with door frame from 2 mm thick steel.
- Lever latch on the outside and emergency lever on the inside.

Dimensions (clear wall opening<sup>1</sup>):

- Engine room intake end : 59 pcs single door : W x H = 1,044 x 2,421 mm.
- Engine room discharge end : 59 pcs single door : W x H = 1,044 x 2,421 mm.
- Engine room discharge end : 59 pcs double door : W x H = 1,444 x 2,421 mm.

<sup>1</sup>) As per our manual 'Building tolerances for wall openings' rev.1.1. Available on request.

### Pos. E2: doors (fire rated EI2, 60 minutes)

Per engine room 2 single personnel doors and 1 double equipment door are included; type AL-D/D50.

Noise reduction  $R_w = 50$  dB.

All door leaves are rated EI2, 60 minutes.

Because of that, all door leaves are provided with a door closer.

The single doors and the active door leaf of the double door are provided with an anti-panic bar on the inside and a door handle on the outside.





**Pos. A : Starting points:**

- Engine : Jenbacher, JMS 624.
- Installation : Inside a concrete enclosure, which is provided by others.
- Absorption : There is no absorption inside the engine rooms.
- Dimensions enclosure : L x W x H = approx. 16,500 x 4,850 x 4,000 mm.
- Radiated heat : 343 kW.
- Delta T : approx. 15°C.
- Air inlet flow : approx. 90,000 m<sup>3</sup>/h; including combustion air.
- Air outlet flow : approx. 70,000 m<sup>3</sup>/h.
- Air inlet : Installed horizontally at one end of the engine room.
- Air outlet : Installed vertically, with horizontal blow out, on the roof of each engine room.
- Filters : Included.
- Fans : Installed in the air inlet.
- Max. over pressure : 150 Pa.
- Acoustic requirements : Air inlet: Lw= 86 dB(A)/ each.  
 : Air outlet: Lw= 89 dB(A) / each.  
 Measured under free field conditions.

All acoustical calculations are based upon following sound spectrum (Lp/ Lw) of the genset (other sounds from piping and flue gas ducts are excluded).

	31	63	125	250	500	1k	2k	4k	8k	Hz
Genset Lp@ 1m	90	97	103	101	96	95	94	96	97	dB
Genset Lw	113	120	126	124	119	118	117	119	120	dB

**Noise Levels Gensets:**

Unsilenced noise levels for the genset according to Jenbacher Technical Description Cogeneration Unit JMS 624, ytd. 2022 Engine tolerance is +/- 3 dB.  
 We have not calculated with these tolerances.

**General:**

- Design based on the technical specifications (SEL-THU-D-ME-SPC-0002 Technical Specification) and the starting points described above. Design changes may be implemented during detailed design based upon value engineering.
- The accuracy of the given noise data determines the quality of the noise calculations. The calculations have been made with the given average noise levels.
- All plant sound pressure levels are in free field conditions with one engine running and excluding any influence from structure born noise and/or other noise sources.
- When measurements are taken on several points the average level will be determined. Measurements taken outside the airflow to avoid influence of airflow on measured values.
- All plant sound pressure level limits are at full load operating conditions.
- All plant sound pressure level limits are at the mitigated level with noise control installed.
- Any noise measures or calculations in addition to the ventilation systems are excluded.



### **Pos. B : Description air inlet**

Removable air inlet section, completely supplied as one unit, to be lifted into position with a crane. In the clear opening a steelwork framing will be provided (= pos. D).

Overall outside dimensions approx. W x H x L = 3,300 x 3,450 x 2,750 mm (excl. fans).

The side walls/ roof of the unit are built-up as soundproof panels to avoid noise break-out, made in pre-galvanised steel sheet. Infill of semi-rigid fibre slabs offering excellent strength and resistance to erosion. Material is inert, non-hygroscopic, vermin proof, does not support bacteriological growth and has a Class 1 rating for surface spread of flame acc. to BS 476 [Part 7, 1971].

The air inlet unit consists of following components:



#### Weather louvers

Front face entry external weather louvers as a protection against the direct ingress of rain, leaves and birds into the air inlet opening. Over a single face the air speed would be approx. 3.0 m/s.

#### Filters

25 pocket filters with filter class G4 (acc. ISO 16890 ISO Coarse 60%). Low initial differential pressure and high dust holding capacity. Quick installation and filter changing times due to easy, safe handling. Filter elements are installed in a standard cell frame with four clamping elements for secure sealing between the frame and the filter element. Advised pressure difference to exchange filter units is 150 – 180 Pa. Door at the side of the air inlet section to exchange the pocket filters.

#### Attenuator

Attenuator part with splitter type silencers made in pre-galvanised sheet steel.

#### Volume dampers

4 air volume dampers, each with 1 actuator, spring open, electrically closed, accessible from within the genset compartment. Damper operation controlled by generator control unit. Each of the damper is wired out to one central junction box. Wiring to control the unit to be provided by others.

#### Fans

4 fans, suitable for frequency control [electrical control unit by third party], Fans are axial fans, diameter 900 mm, with 7.5 kW motor (NON ATEX). The 4 fans will each have an emergency start/stop button, wired to a common junction box.



### **Pos. C : Description air outlet**

Fixed mounted vertical air discharge section, with horizontal blow out, on top of the concrete roof of the engine room.

Acoustic air outlet unit with overall outside dimensions approx. W x H x L = 2,800 x 2,400 x 3,000 mm.

The opening in the roof of the concrete enclosure has to be provided with a concrete upstand to install the rain collar including the silencer on.

The air outlet consists of following components:

#### Damper plenum

Dimensions plenum: W x H x L = 2,400 x 2,800 x 355 mm.

Dampers accessible from inside the genset compartment.

Dimensions dampers: W x L = 2,000 x 1,995 mm. Including Belimo actuator, spring open, electrically closed. Accessible from within the genset compartment. Damper operation controlled by generator control unit [wiring to control unit by others].

#### Bottom flange / Rain collar

Dimensions outlet channel W x H = 2,800 x 2,400 mm

Rain collar: See photo\* on right-hand side.

To be mounted on top of the concrete upstand

\*this photo shows a so called 'penthouse' outlet

#### Silencer

Vertically mounted rectangular absorption silencer.

W x H x L = 2,800 x 2,400 x 1,400 mm.

#### Horizontal blowout

The horizontal blow out unit is assembled on top of the vertically positioned attenuator

#### Louver

Horizontal outlet is provided with a rain repellent louver as a protection against the direct ingress of rain, leaves and birds into the air outlet.







**Pos. D : Description front wall at the air inlet side**

At the air intake side of the enclosure, a steel frame including an acoustic top- & side panel will be installed. The acoustic isolation will be equivalent to the isolation values of the air inlet to achieve the same noise requirements. The dimensions of the complete frame set is approx. W x H = 4,800 x 3,900 mm incorporating single door plus closure panels. The door is quoted separately (= Pos. E).

**Materials:**

- Ducts : Pre-galvanised sheet steel, no painting.
- Attenuators : Pre-galvanised sheet steel, no painting.
- Weather louvers : Pre-galvanised sheet steel, in RAL colour, with bird protection.
- Multi-leaf dampers : Pre-galvanised sheet steel, with 24V Belimo actuator.
- Steel profiles : Galvanized.
- Purchased parts : In manufacturer standard.

**Conservation/ Painting/ Colour:**

- Weather louvers and exterior ventilation parts are coated in C4.
- Weather louvers are powder coated.
- Other ventilation parts are wet painted.
- Colour: RAL xxxx (tbc).
- Other components: unpainted
- Purchased items: in manufacturer standard.

Wall panels: coated.

For the painting a maintenance manual will be delivered.





### **Pos. E1 : Doors (not fire rated)**

#### Engine rooms:

Per engine room 2 single personnel doors and 1 double equipment door are included.

Noise reduction  $R_w = >43$  dB.

The single doors and the active door leaf of the double door are provided with an anti-panic bar on the inside and a door handle on the outside. The passive door leaf of the double door is provided with an espagnolette lock on the inside.

Door provided with:

- Double sealing with special rubber design.
- Complete with door frame from 2 mm thick steel.
- Lever latch on the outside and emergency lever on the inside.

Dimensions (clear wall opening<sup>1</sup>):

- Engine room intake end : 59 pcs single door : W x H = 1,044 x 2,421 mm.
- Engine room discharge end : 59 pcs single door : W x H = 1,044 x 2,421 mm.
- Engine room discharge end : 59 pcs double door : W x H = 1,444 x 2,421 mm.



### **Pos. E2 : Doors (fire rated EI2, 60 minutes)**

Noise reduction  $R_w = >48$  dB.

All door leaves are rated EI2, 60 minutes.

Because of that, all door leaves are provided with a door closer.

The dimensions are the same as mentioned above in pos. E1.

<sup>1</sup> As per our manual 'Building tolerances for wall openings' rev.1.1. Available on request.

# Technical Description

## Cogeneration Unit JMS 624 GS-N.L

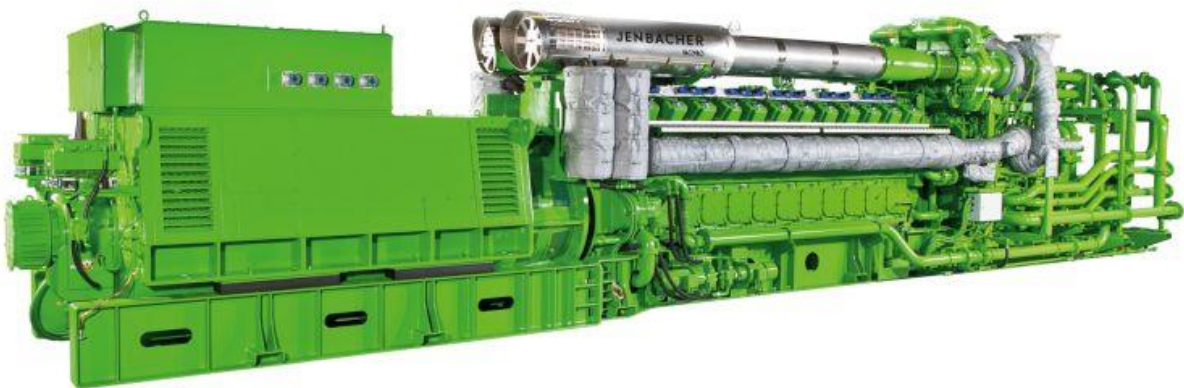
dyn. GC Profile 3 (250ms/5%)

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### Statera - Thurrock

---

SR 5984 5987 4996



Electrical output	4498	kW el.
Thermal output	2838	kW

#### Emission values

NOx < 250 mg/Nm<sup>3</sup> (5% O<sub>2</sub>) | < 95 mg/Nm<sup>3</sup> (15% O<sub>2</sub>)

Incl. Ready for H2 package up to 20vol% H2  
Incl. 100% load rejection function

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## 0.01 Technical Data (at module)

			100%	75%	50%
Power input	[2]	kW	9.896	7.607	5.304
Gas volume	*)	Nm <sup>3</sup> /h	1042	801	558
Mechanical output	[1]	kW	4.594	3.446	2.297
Electrical output	[4]	kW el.	4.498	3.367	2.223
<b>Recoverable thermal output (calculated with Glycol 37%)</b>					
~ Intercooler 1st stage	[9]	kW	1.688	1.037	491
~ Lube oil		kW	458	396	337
~ Jacket water		kW	692	604	511
~ exhaust when cooling down 351 °C -> 351 °C		kW	0	0	0
Total recoverable thermal output	[5]	kW	2.838	2.037	1.339
Total output generated		kW total	7.335	5.404	3.562
<b>Heat to be dissipated (calculated with Glycol 37%)</b>					
~ Intercooler 2nd stage		kW	---	---	---
~ Lube oil		kW	---	---	---
~ Surface heat	ca. [7]	kW	266	~	~
<b>Spec. fuel consumption of engine electric</b>					
Spec. fuel consumption of engine electric	[2]	kWh/kWel.h	2,20	2,26	2,39
<b>Spec. fuel consumption of engine</b>					
Spec. fuel consumption of engine	[2]	kWh/kWh	2,15	2,21	2,31
<b>Lube oil consumption</b>					
Lube oil consumption	ca. [3]	kg/h	0,92	~	~
<b>Electrical efficiency</b>					
Electrical efficiency			45,4%	44,3%	41,9%
<b>Thermal efficiency</b>					
Thermal efficiency			28,7%	26,8%	25,2%
<b>Total efficiency</b>					
Total efficiency	[6]		74,1%	71,0%	67,2%
<b>Hot water circuit:</b>					
Forward temperature		°C	80,0	72,1	65,2
Return temperature		°C	52,0	52,0	52,0
Hot water flow rate		m <sup>3</sup> /h	97,6	97,6	97,6
<b>Fuel gas LHV</b>					
Fuel gas LHV		kWh/Nm <sup>3</sup>	9,5		

\*) approximate value for pipework dimensioning

[ ] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...).

## Main dimensions and weights (at module)

Length	mm	~ 13.800
Width	mm	~ 2.500
Height	mm	~ 2.900
Weight empty	kg	~ 55.000
Weight filled	kg	~ 56.200

## Connections

Hot water inlet and outlet [A/B]	DN/PN	100/16
Exhaust gas outlet [C]	DN/PN	600/10
Fuel Gas (at module) [D]	DN/PN	100/16
Water drain ISO 228	G	½"
Condensate drain	DN/PN	~
Safety valve - jacket water ISO 228 [G]	DN/PN	80/16
Safety valve - hot water	DN/PN	100/10
Lube oil replenishing (pipe) [I]	mm	28
Lube oil drain (pipe) [J]	mm	28
Jacket water - filling (flex pipe) [L]	mm	13
Intercooler water-Inlet/Outlet 1st stage	DN/PN	150/16
Intercooler water-Inlet/Outlet 2nd stage [M/N]	DN/PN	80/16

## Output / fuel consumption

ISO standard fuel stop power ICFN	kW	4.594
Mean effe. press. at stand. power and nom. speed	bar	24,55
Fuel gas type		Natural gas
Based on methane number   Min. methane number	MZ	70   70 d)
Compression ratio	Epsilon	11,5
Min. fuel gas pressure for the pre chamber	bar	5,5
Min./Max. fuel gas pressure at inlet to gas train	bar	6 - 8 c)
Max. rate of gas pressure fluctuation	mbar/sec	10
Maximum Intercooler 2nd stage inlet water temperature	°C	52
Spec. fuel consumption of engine	kWh/kWh	2,15
Specific lube oil consumption	g/kWh	0,20
Max. Oil temperature	°C	~ 80
Jacket-water temperature max.	°C	~ 95
Filling capacity lube oil (refill)	lit	~ 1000

c) Lower gas pressures upon inquiry

d) based on methane number calculation software AVL 3.2 (calculated without N2 and CO2)



## 0.02 Technical data of engine

Manufacturer		JENBACHER
Engine type		J 624 GS-K12
Working principle		4-Stroke
Configuration		V 60°
No. of cylinders		24
Bore	mm	190
Stroke	mm	220
Piston displacement	lit	149,70
Nominal speed	rpm	1.500
Mean piston speed	m/s	11,00
Length	mm	9.533
Width	mm	2.111
Height	mm	2.564
Weight dry	kg	17.100
Weight filled	kg	18.100
Moment of inertia	kgm <sup>2</sup>	92,70
Direction of rotation (from flywheel view)		left
Radio interference level to VDE 0875		N
Starter motor output	kW	20
Starter motor voltage	V	24

### Thermal energy balance

Power input	kW	9.896
Intercooler	kW	1.688
Lube oil	kW	458
Jacket water	kW	692
exhaust when cooling down 180 °C	kW	1.248
exhaust when cooling down 100 °C	kW	1.818
Surface heat	kW	142

### Exhaust gas data

Exhaust gas temperature at full load	[8]	°C	351
Exhaust gas temperature at bmep= 13,5 [bar]	[8]	°C	~ 386
Exhaust gas temperature at bmep= 12,3 [bar]	[8]	°C	~ 421
Exhaust gas mass flow rate, wet		kg/h	23.865
Exhaust gas mass flow rate, dry		kg/h	22.385
Exhaust gas volume, wet		Nm <sup>3</sup> /h	18.850
Exhaust gas volume, dry		Nm <sup>3</sup> /h	17.009
Max.admissible exhaust back pressure after y-pipe		mbar	50

### Combustion air data

Combustion air mass flow rate		kg/h	23.150
Combustion air volume		Nm <sup>3</sup> /h	17.914
Max. admissible pressure drop at air-intake filter		mbar	10

basis for exhaust gas data: natural gas: 100% CH<sub>4</sub>; biogas 65% CH<sub>4</sub>, 35% CO<sub>2</sub>

## Sound pressure level

Aggregate a)			dB(A) re 20 $\mu$ Pa	103		
25	31,5	40 Hz	dB	87	83	84
50	63	80 Hz	dB	93	92	91
100	125	160 Hz	dB	95	97	101
200	250	315 Hz	dB	95	98	96
400	500	630 Hz	dB	92	91	90
800	1000	1250 Hz	dB	91	89	90
1600	2000	2500 Hz	dB	90	89	88
3150	4000	5000 Hz	dB	87	92	93
6300	8000	10000 Hz	dB	92	93	92
Exhaust gas b)			dB(A) re 20 $\mu$ Pa	123		
25	31,5	40 Hz	dB	103	100	107
50	63	80 Hz	dB	107	98	108
100	125	160 Hz	dB	115	119	112
200	250	315 Hz	dB	112	112	107
400	500	630 Hz	dB	113	113	107
800	1000	1250 Hz	dB	109	108	108
1600	2000	2500 Hz	dB	108	108	109
3150	4000	5000 Hz	dB	117	117	102
6300	8000	10000 Hz	dB	101	97	91

## Sound power level

Aggregate	dB(A) re 1pW	126
Measurement surface	m <sup>2</sup>	194
Exhaust gas	dB(A) re 1pW	131
Measurement surface	m <sup>2</sup>	6,28

a) average sound pressure level on measurement surface in a distance of 1m (converted to free field) according to DIN 45635 and ISO 3744, precision class 3.

b) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635 and ISO 3744, precision class 2.

The spectra are valid for aggregates up to bmep=24 bar. (for higher bmep add safety margin of 1dB to all values per increase of 1 bar pressure).

Engine tolerance  $\pm$  3 dB

## 0.03 Technical data of generator

Manufacturer		TDPS e)
Type		TD125-F2UB e)
Type rating	kVA	5.900
Driving power	kW	4.594
Ratings at p.f. = 1,0	kW	4.498
Ratings at p.f. = 0,8	kW	4.470
Rated output at p.f. = 0,8	kVA	5.587
Rated reactive power at p.f. = 0,8	kVar	3.352
Rated current at p.f. = 0,8	A	215
Frequency	Hz	50
Voltage	kV	15
Speed	rpm	1.500
Permissible overspeed	rpm	1.800
Power factor (lagging - leading) (UN)		0,8 - 0,9
Efficiency at p.f. = 1,0		97,9%
Efficiency at p.f. = 0,8		97,3%
Moment of inertia	kgm <sup>2</sup>	460,00
Mass	kg	19.500
Radio interference level to EN 55011 Class A (EN 61000-6-4)		N
Cable outlet		left
I <sub>k</sub> " Initial symmetrical short-circuit current	kA	1,34
I <sub>s</sub> Peak current	kA	3,40
Insulation class		F
Temperature (rise at driving power)		F
Maximum ambient temperature	°C	40

### Reactance and time constants at rated output (saturated)

x <sub>d</sub> direct axis synchronous reactance	p.u.	1,426
x <sub>d</sub> ' direct axis transient reactance	p.u.	0,237
x <sub>d</sub> " direct axis sub transient reactance	p.u.	0,175
x <sub>2</sub> negative sequence reactance	p.u.	0,227
T <sub>d</sub> " sub transient reactance time constant	ms	40
T <sub>a</sub> Time constant direct-current	ms	130
T <sub>do</sub> ' open circuit field time constant	s	2,56

e) JENBACHER reserves the right to change the generator supplier and the generator type. The contractual data of the generator may thereby change slightly. The contractual produced electrical power will not change.

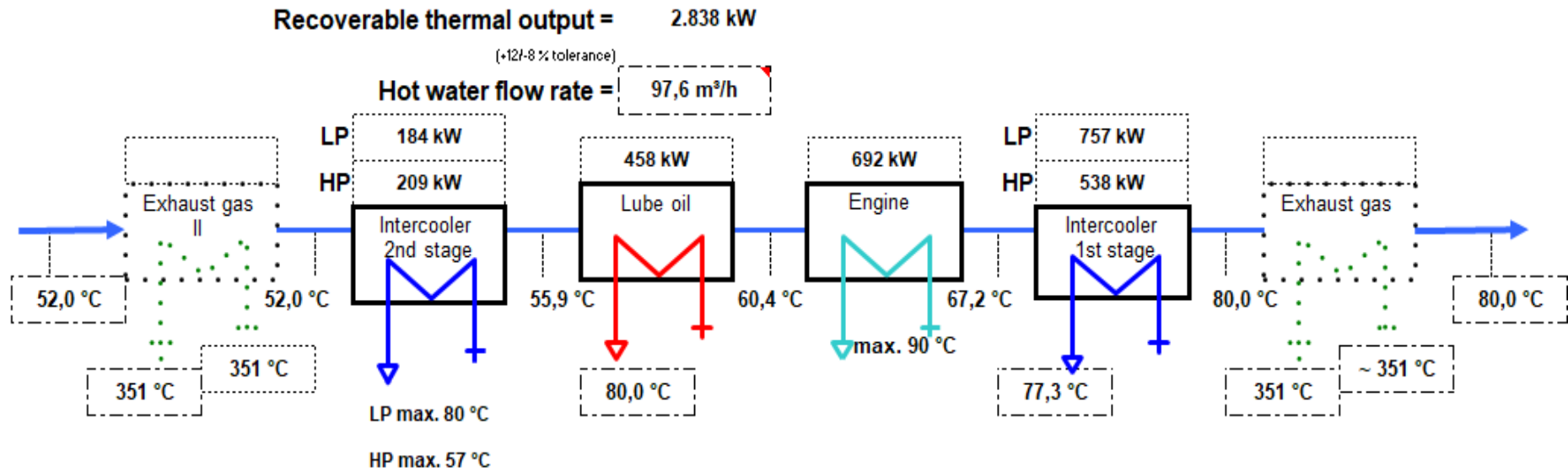
## 0.04 Technical data of heat recovery

### General data - Hot water circuit

Total recoverable thermal output	kW	2.838
Return temperature	°C	52,0
Forward temperature	°C	80,0
Hot water flow rate	m <sup>3</sup> /h	97,6
Nominal pressure of hot water	PN	10
min. operating pressure	bar	3,5
max. operating pressure	bar	9,0
Pressure drop hot water circuit	bar	1,70
Maximum Variation in return temperature	°C	+0/-5
Max. rate of return temperature fluctuation	°C/min	10

The final pressure drop will be given after final order clarification and must be taken from the P&ID order documentation.

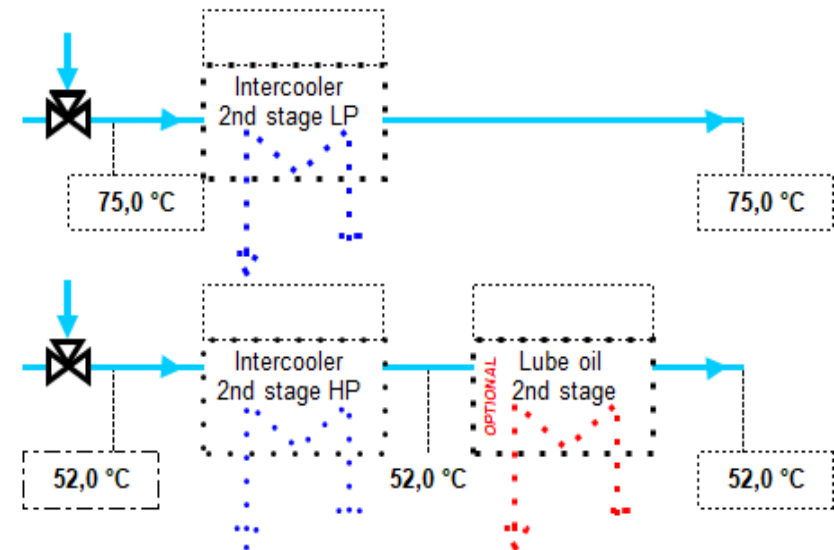
## Hot water circuit (calculated with Glycol 37%)



## Low temperature circuit (calculated with Glycol 37%)

Heat to be dissipated = 0 kW  
 (+12/-8% tolerance)

Cooling water flow rate = 50,0 m³/h



## 0.10 Technical parameters

All data in the technical specification are based on engine full load (unless stated otherwise) at specified temperatures and the methane number and subject to technical development and modifications.

All pressure indications are to be measured and read with pressure gauges (psi.g.).

[1] At nominal speed and standard reference conditions ICFN according to ISO 3046-1, respectively

[2] According to ISO 3046-1, respectively, with a tolerance of **+5 %**.

Efficiency performance is based on a new unit (immediately upon commissioning). Effects of degradation during normal operation can be mitigated through regular service and maintenance work.

[3] Average value between oil change intervals according to maintenance schedule, without oil change amount

[4] At p. f. = 1.0 according to IEC 60034-1:2017 with relative tolerances, all direct driven pumps are included

[5] Total output with a tolerance of **+12/-8 %**

[6] According to above parameters [1] through [5]

[7] As a guiding value at p.f. 0.8 and only valid for (engine, generator, TCM). Other peripheral equipment is not considered.

[8] Exhaust temperature with a tolerance of **±8 %**

Note: an optimised operating mode to minimise methane slip can result in changed exhaust gas data (exhaust gas temperature, NOx emissions, etc.) and must be taken into account in the design of the exhaust gas aftertreatment

[9] Mixture temperature at:

If the engine is designed for intake air temperatures of  $> 30^{\circ}\text{C}$ , then the stated mixture heat of the 1st stage is to be increased from  $25^{\circ}\text{C}$  in  $2^{\circ}\text{C}$  increments. The additional temperature must be added to the resulting full load point.

### Radio interference level

The ignition system of the gas engines complies the radio interference levels of CISPR 12 and EN 55011 class B, (30-75 MHz, 75-400 MHz, 400-1000 MHz) and (30-230 MHz, 230-1000 MHz), respectively.

### Definition of output

- ISO-ICFN continuous rated power:

Net break power that the engine manufacturer declares an engine is capable of delivering continuously, at stated speed, between the normal maintenance intervals and overhauls as required by the manufacturer. Power determined under the operating conditions of the manufacturer's test bench and adjusted to the standard reference conditions.

- 

Standard reference conditions:

Barometric pressure:	1000 mbar (14.5 psi) or 100 m (328 ft) above sea level
Air temperature:	$25^{\circ}\text{C}$ ( $77^{\circ}\text{F}$ ) or 298 K
Relative humidity:	30 %

- Volume values at standard conditions (fuel gas, combustion air, exhaust gas)  
Pressure: 1013 mbar (14.7 psi)  
Temperature: 0°C (32°F) or 273 K

## Loss of engine performance

### a) Performance reduction due to gas quality

If the reference methane number is not reached and the knock control responds, the ignition timing at full performance is adjusted in conjunction with the engine management system; only then is performance reduced.

H<sub>2</sub> admixtures in the range of 3–5 Vol% into the natural gas network are generally regarded as non-critical. Prerequisites for this are rates of change according to TA 1000-0300, as well as the knock resistance (minimum methane number) of the natural gas-H<sub>2</sub> mixture according to the specification. For reliable compliance with required NO<sub>x</sub> emissions, the JENBACHER LEANOX<sup>plus</sup> control is recommended (measurement of NO<sub>x</sub> emissions and correction of the LEANOX controller). Higher H<sub>2</sub> addition rates into the natural gas network must be assessed on a project-specific basis.

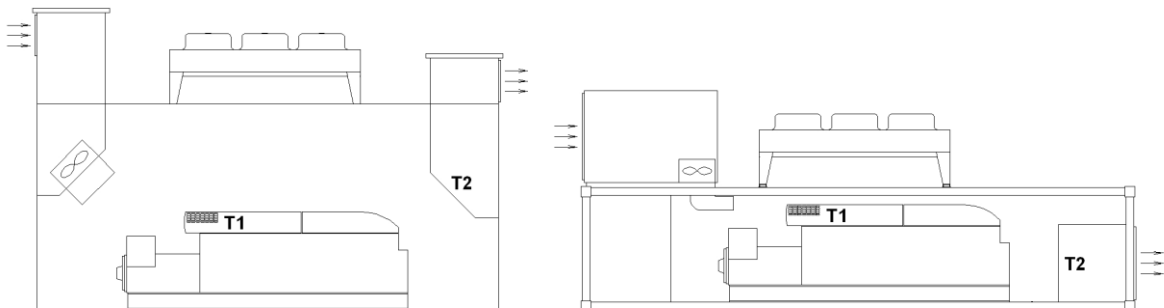
### b) Performance reduction due to voltage and frequency limits

If the voltage and frequency limits for generators specified in IEC 60034-1 Zone A are exceeded, performance is reduced.

### c) Performance reduction due to environmental conditions

Standard rating of the engines is for an installation at an altitude ≤ 500m and combustion air temperature ≤ 30°C (T<sub>1</sub>)

Engine room outlet temperature: 50°C (T<sub>2</sub>) -> engine stop



The minimum recommended air change ratio (C) must be observed to maintain the required air quality and prevent unwanted gas accumulations (refer to Section ⇒ Potentially explosive Atmospheres as per TA1100-0110). The calculation is based on TA 1100-0110 and is  $C_{min} = 50h^{-1}$  for JENBACHER modules.

## Parameters for the operation of JENBACHER gas engines

The genset fulfils the limits for mechanical vibrations according to ISO 8528-9.

The following forms an integral part of a contract and must be strictly observed: **TA 1000-0004, TA 1100 0110, TA 1100-0111, and TA 1100-0112.**

Transport by rail should be avoided. See **TA 1000-0046** for further details

Failure to adhere to the requirements of the above-mentioned TA documents can lead to engine damage and may result in loss of warranty coverage.

**Ready for H<sub>2</sub>** means a possible adaptation up to 100vol% H<sub>2</sub> operation. Performance data, timeline and costs can be determined on a project-specific basis.

## Parameters for the operation of control unit and the electrical equipment

Relative humidity 50% by maximum temperature of 40°C.  
Altitude up to 2000m above the sea level.

## 0.20 Mode of Operation

### Grid Parallel Mode

The genset is running in parallel to the utility. The unit load can be adjusted via its power control set point or designated option.

Procedure in the event of mains failure:

When the mains monitor relay (protective relay ANSI No. 27, 59, 81, 78- provided either by JENBACHER or the customer) is activated due to a mains failure, the engine is isolated from the mains by opening the generator breaker. The module is shut down without any cool-down run.

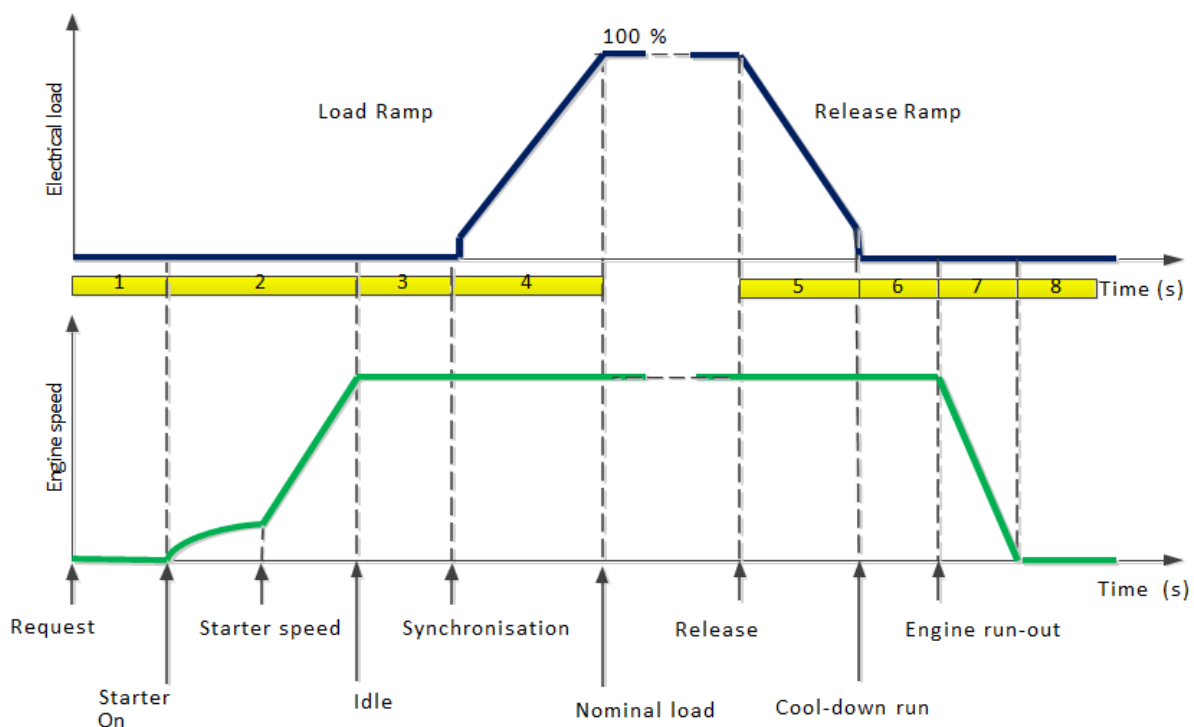
Island operation is not available in this case!

The module can be restarted following the restoration of mains power after a 5-minute mains stabilization period.

### 0.20.01 Guide values for genset - start/stop times and el. load ramps

Basic boundary conditions for engine start:

Engine conditions	Oil temperature (°C / °F)	Cooling-water temperature (°C / °F)
Fast start release	> 27 / 80.6	> 55 / 131
Start enable automatic start		> 37 / 98.6
synchronization release		> 55 / 131





The following time data of the individual start sections up to the nominal load are **guideline values** for a fully automatic start under preheated conditions for mains parallel operation. Only the total start time is observed under the various engine conditions. The individual time periods specified in the table therefore do not necessarily add up to the specification of the total start time in mains parallel operation.

**Deviations are possible for special designs.**

	J208	Type 3	Type 4	Type 612 – 620	J624
(1) Start preparation [1] *)	0	0	20	70	90
(2) Engage starter until reaching nominal speed [s] *)	20	20	25	40	40
(3) Synchronisation [s] *) **)	1-50	1 – 50	1 – 50	1 – 50	1 – 50
(4) Load application up to nominal load [s] *) **)	180	180	180	160	160
Total start-up time from request to nominal load [s]	<300	<300	<300	<300	<330

\*) The times for start-up preparation and synchronisation can vary greatly and depend on project specifications.

**\*\*) Fast start function and faster load ramps are available on request.**

The following **times for unloading the engine** are guide values for engine/generator combination inertia constant  $H < 1$  kWs/kVA (with LS, CGT, TDPS generators) and the hot operating condition.

(5) Load reduction ramp [s]	160	160	160	160	120
(6) Cool-down run [s]	60	60	60	10	10
(7) Run-down [s]	60	60	60	60	60
Total time from nominal load to run-down time [s]	280	280	280	220	180
(8A) gas tightness control [s]	<100	<100	<100	<100	<100
(8B) Flushing time exhaust tract after shutdown [s]**)				100	100
(8C) Flushing time exhaust tract after shutdown with SD and WT [s]**)				180	300
(8D) Flushing time exhaust tract after shutdown with SD, WT, SCR and greenhouse [s]**)				225	400
(8E) Blocking time for restart [s]	30	30	30	30	30

\*\*\*) The exhaust gas purging times apply when the exhaust gas purging fan is installed

The table shows the waiting time between stopping the engine and starting it again, with the gas tightness check (8A), exhaust gas scavenging (8B-D) and blocking time (8E) being carried out in parallel. The flushing times can be extended project-specifically depending on the exhaust system.

It should also be noted that the exhaust gas purge must be performed after each unsuccessful start attempt once the gas valve has been opened. (SD = silencer, WT = heat exchanger)

## 0.30 General information for connection to the public mains

Technical Instruction TA 1530-0188 describes the - possibly optional - functions and parameters for complying with the boundary conditions defined in the country-specific "Grid Codes".

**Network operator-dependent requirements must always be coordinated with JENBACHER.**

### 0.30.10 Generator operating range in mains parallel operation

#### Frequency:

Normal operation  $f_n \pm 2\%$  - without power output reduction

Extended operation:  $f_n \pm 4\text{--}6\%$  - with power output reduction between 2 – 10%/Hz

Frequency-measurement resolution:  $\leq 10\text{mHz}$  (resolution)

Generator - voltage range:  $\pm 10\%$  of generator  $U_n$

Generator power factor  $\cos \phi$  at the generator terminals: as specified in "0.03 Generator technical data"

FRT (Fault Ride Through) – capability: at mains connection point

Profile 1: 150ms/30% $U_n$  (applies to natural gas and biogas)

Profile 2 (150ms/5% $U_n$ ) and Profile 3 (250ms/5% $U_n$ ) upon request.

#### Requirement:

- mains short-circuit power must be at least 5 x SrE or 50MVA
- FRT capability of the onsite auxiliaries

**Extended project requirements and country-specific design are optionally possible after consultation and approval with JENBACHER.**

### 0.30.20 Possible mains operator requests

To protect the generating unit in mains parallel operation, appropriate mains protection monitoring functions are necessary to disconnect the generator from the mains in case of a mains fault.

The mains operator-dependent specifications such as e.g.: voltage and frequency range, active power limitation, load ramps, reactive power limitation and control, protection concept, necessary certification or declarations, process data and interfaces are to be specified in project enquiries and must be agreed with JENBACHER before conclusion of the contract.

- Selectivity assessment, protection tests and recurring tests: on-site by the system operator
- Control power provision via pool operator: on request e.g., primary, secondary, tertiary
- Black start capability and countering in own use: on request
- Power generation system (EZA) controller or central control: on-site or possible on request
- Process data scope / remote control:
  - System data must be provided by the connectee for the mains operator.
  - Remote control interface to the mains operator: on-site
  - Interface specification!

Billing measurements - installation, operation, maintenance and remote data transmission: on-site.

Models of genset and generator: simplified models executed as effective value models for mains parallel operation optionally available.

Model formats: Powerfactory, or PSS/E (as of PP23)

Validated genset models in Powerfactory according to FGW TR3, TR4 and TR8 by a body accredited for this purpose according to DIN EN ISO/IEC 17065

## **Functional scope of the models in mains parallel operation:**

- static voltage stability
- dynamic mains support
- Provision of reactive power
- Behaviour at active power setpoint
- Active power adjustment in the event of overfrequency and underfrequency (LFSM-O, LFSM-U)
- Protective devices and settings

## **0.30.20.01 Active power adjustment in the event of overfrequency and underfrequency**

### **The following functions are available:**

- LFSM-U: Limited Frequency Sensitive Mode - Underfrequency
- LFSM-O: Limited Frequency Sensitive Mode - Overfrequency
- FSM

### **Reduced power output at overfrequency: (LFSM-O function)**

The frequency threshold is freely adjustable from  $f_n + (200 - 500\text{mHz})$  and the static from 2% to 12%.

Unless the relevant mains operator specifies otherwise for the LFSM-O mode, a threshold of  $f_n + 200\text{mHz}$  and a static of 5% is set.

### **Power increase in the event of underfrequency (LFSM-U function) – (OPTIONAL as of XT4.5)**

activated according to the mains operator's specifications

The frequency-sensitive active power feed-in has the effect that the generating plant also moves permanently up and down on the frequency characteristic curve ("driving on the characteristic curve") in the frequency range between  $f_n - 200\text{mHz}$  (unless otherwise specified by the mains) and  $f_n - 2.5\text{Hz}$  with regard to its maximum possible active power feed-in.

The prerequisite for this is a corresponding power setpoint.

### **Reduced power output at underfrequency:**

below 98% of  $f_n$ , reduction by standard 10% of maximum capacity per Hz. Reduction up to maximum  $f_n - 6\%$ .

Lower reduction ramps of 2 - 10%/Hz on request

The FSM function is available as an option

The power generation system is capable of continuing to operate at this minimum power when the minimum power for controllable operation is reached.

## **1.00 Scope of supply - module**

### **Design:**

The module is built as a compact package. Engine and generator are connected through a coupling and are mounted to the base frame. To provide the best possible isolation from the transmission of vibrations the engine is mounted to the frame by means of anti-vibrational mounts. The remaining vibrations are

eliminated by mounting the module on isolating pads (e.g. Sylomer). This, in principle, allows the module to be placed directly on any floor capable of carrying the static load.

## 1.01 Spark ignited gas engine

Four-stroke, air/gas mixture turbocharged, aftercooled, with high performance ignition system and electronically controlled air/gas mixture system.

The engine is equipped with the most advanced

LEANOX® LEAN-BURN COMBUSTION SYSTEM

developed by JENBACHER.

### 1.01.01 Engine design

#### Engine block

Single-piece crankcase and cylinder block made of special casting; crank case covers for engine inspection, welded steel oil pan.

#### Crankshaft and main bearings

Drop-forged, precision ground, surface hardened, balanced; main bearings (upper bearing shell: grooved bearing / lower bearing shell: sputter bearing) arranged between crank pins, drilled oil passages for forced-feed lubrication of connecting rods.

#### Vibration damper

Maintenance free viscous damper

#### Flywheel

With ring gear for starter motor and additionally screwed on.

#### Pistons

Two-part steel piston with oil passages for cooling; piston rings made of high-quality material, main combustion chamber specially designed for lean burn operation.

#### Connecting rods

Drop-forged, heat-treated, big end diagonally split and toothed. Big end bearings (upper bearing shell: sputter bearing / lower bearing shell: sputter bearing) and connecting rod bushing for piston pin.

#### Cylinder liner

Chromium alloy gray cast iron, wet, individually replaceable.

#### Cylinder head

Specially designed and developed for JENBACHER-lean burn engines with optimized fuel consumption and emissions; water cooled, made of special casting, individually replaceable; Valve seats, valve guides and spark plug sleeves individually replaceable; exhaust and inlet valves made of high quality material; Pre-chamber with check-valve.

#### Crankcase breather

Connected to combustion air intake system.

#### Valve train

Camshaft, with replaceable bushings, driven by crankshaft through intermediate gears, valve lubrication by splash oil through rocker arms.

### **Combustion air/fuel gas system**

Motorized carburetor for automatic adjustment according fuel gas characteristic. Exhaust driven turbocharger, mixture manifold with bellows, water-cooled intercooler, throttle valve and distribution to cylinders.

### **Ignition system**

Most advanced, fully electronic high-performance ignition system, external ignition control.

**MORIS / SEMIC:** Automatically, cylinder selective registration and control of the current needed ignition voltage.

### **Lubricating system**

Gear-type lube oil pump to supply all moving parts with filtered lube oil, pressure control valve, pressure relief valve and full-flow filter cartridges. Cooling of the lube oil is arranged by a heat exchanger.

### **Engine cooling system**

Electrical jacket water pump, complete with distribution pipework and manifolds.

### **Exhaust system**

Turbocharger and exhaust manifold

### **Exhaust gas temperature measuring**

Thermocouple for each cylinder

### **Electric actuator**

For electronic speed and output control

### **Electronic speed monitoring for speed and output control**

By magnetic inductive pick up over ring gear on flywheel

### **Starter motor**

Engine mounted electric starter motor

## **1.01.02 Additional equipment for the engine (spares for commissioning)**

The required spare parts for commissioning are included in the scope of supply.

## **1.01.03 Engine accessories**

### **Insulation of exhaust manifold:**

Insulation of exhaust manifold is easily installed and removed

### **Sensors at the engine:**

- Jacket water temperature sensor
- Jacket water pressure sensor
- Lube oil temperature sensor
- Lube oil pressure sensor

- Mixture temperature sensor
- Charge pressure sensor
- Minimum and maximum lube oil level switch
- Exhaust gas thermocouple for each cylinder
- Knock sensors
- Gas mixer / gas dosing valve position reporting.
- Air Filter DP sensor
- Crankcase pressure sensor

#### **Actuator at the engine:**

- Actuator - throttle valve
- Bypass-valve for turbocharger
- Control of the gas mixer / gas dosing valve

### **1.01.04 Standard tools (per installation)**

The tools required for carrying out the most important maintenance work are included in the scope of supply and delivered in a toolbox.

## **1.02 Generator-medium voltage**

The 2-bearing generator consists of the main generator (built as rotating field machine), the exciter machine (built as rotating armature machine) and the digital excitation system ABB UNITROL 1010. The digital regulator is powered by a PMG system

#### **Main components:**

- Enclosure of welded steel construction
- Stator core consist of thin insulated electrical sheet metal with integrated cooling channels.
- Form wound double layer stator winding
- Pitch ratio: 5/6
- Rotor consist of shaft with shrunken laminated poles, Exciter rotor, PMG and fan.
- Damper cage
- Exciter machine with rotating rectifier diodes and overvoltage protection
- Dynamically balanced as per ISO 1940, Balance quality G2,5
- Drive end bracket, sleeve bearing + Aeorotherm
- Non-drive end bracket, sleeve bearing + Aeorotherm
- Cooling IC01 - open ventilated, air entry at non-drive end, air outlet at the drive end side
- Main terminal box on vibration-free support - (support supplied by INNIO, installation on concrete floor, on-site)
- Terminal clamps for power cables for cable outlet left & right with Roxtec cable glands for cable diameter 26-48 mm
- Current transformer for protection and measuring in the star point  
xx/1A, 5P10 15VA, xx/1A, 1FS5, 15VA
- Potential transformer: Primary: ...kV/ $\sqrt{3}$ , Secondary 1: 110V/ $\sqrt{3}$ , Secondary 2: 110V/3 open delta winding with damping resistor for ground fault monitoring  
3 Surge suppressors (capacitor + varistor + resistor)
- Regulator terminal box with auxiliary terminals for thermistor connection and regulator.
- Anti-condensation heater in main machine and main Terminal box
- 3 PT100 for winding temperature monitoring+3 PT100 Spare
- 2 PT100 for bearing temperature monitoring
- 1 Pt100 for cold air inlet temperature monitoring

## Electrical data and features

- Standards: IEC 60034, EN 60034, ISO 8528-3, ISO 8528-9
- Voltage adjustment range: +/- 10 % of rated voltage (continuous)
- Frequency: -6/+4% of rated frequency
- Overload capacity: 10% for one hour within 6 hours, 50% for 30 seconds
- Asymmetric load: max. 8% I<sub>2</sub> continuous, in case of fault I<sub>2</sub> x t=20
- Altitude: < 1000m
- Max permitted generator intake air temperature: 5°C - 40°C
- Max. relative air humidity: 90%
- Voltage curve THD Ph-Ph: <2,5% at idle operation and <2,5% at full load operation with linear symmetrical load
- Generator suitable for parallel operating with the grid and other generators
- Sustained short circuit current at 3-pole terminal short circuit: minimum 3 times rated current for 5 seconds.
- Over speed test with 1.2 times of rated speed for 2 minutes according to IEC 60034

Operation of a generator with an external earth fault relay in a non-earthed (IT) network is limited to a maximum of 200 hours beyond its service life.

## Digital Excitation system ABB Unitrol 1010 mounted within the AVR Terminal box with following features:

- Compact and robust Digital Excitation system for Continuous output current up to 10 A (20A Overload current 10s)
- Fast AVR response combined with high excitation voltage improves the transient stability during UVRT events.
- The system has free configurable measurement and analog or digital I/Os. The configuration is done via the local human machine interface or CMT1000
- Power Terminals
  - 3 phase excitation power input from PMG or auxiliary windings
  - Auxiliary power input 24VDC
- Excitation output
- Measurement terminals: 3 phase machine voltage, 1 phase network voltage, 1 phase machine current
- Analog I/Os: 2 outputs / 3 inputs (configurable), +10 V / -10 V
- Digital I/O: 4 inputs only (configurable), 8 inputs / outputs (configurable)
- Serial fieldbus: RS485 for Modbus RTU or VDC (Reactive power load sharing for up to 31 JENBACHER engines in island operation), CAN-Bus for dual channel communication
- Regulator Control modes: Bump less transfer between all modes
  - Automatic Voltage Regulator (AVR) accuracy 0,1% at 25°C ambient temperature
  - Field Current Regulator (FCR)
  - Power Factor Regulator (PF)
  - Reactive Power Regulator (VAR)
- Limiters: Keeping synchronous machines in a safe and stable operation area
  - Excitation current limiter (UEL min / OEL max)
  - PQ minimum limiter
  - Machine current limiter
  - V / Hz limiter
  - Machine voltage limiter
- Voltage matching during synchronization
- Rotating diode monitoring



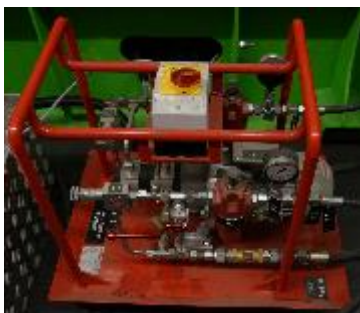
- Dual channel / monitoring: Enables the dual channel operation based on self-diagnostics and setpoint follow up over CAN communication. As Option available
- Power System Stabilizer (PSS) is available as option. Compliant with the standard IEEE 421.5-2005 2A / 2B, the PSS improves the stability of the generator over the highest possible operation range.
- Computer representation for power system stability studies: ABB 3BHS354059 E01
- Certifications: CE, cUL certification according to UL 508c (compliant with CSA), DNV Class B,
- **Commissioning and maintenance Tool CMT1000** (for trained commissioning/ maintenance personal)
- With this tool the technician can setup all parameters and tune the PID to guarantee stable operation. The CMT1000 software allows an extensive supervision of the system, which helps the user to identify and locate problems during commissioning on site. The CMT1000 is connected to the target over USB or Ethernet port, where Ethernet connection allows remote access over 100 m.
- Main window
  - Indication of access mode and device information.
  - Change of parameter is only possible in CONTROL access mode.
  - LED symbol indicates that all parameters are stored on nonvolatile memory.
- Setpoint adjust window
  - Overview of all control modes, generator status, active limiters status and alarms.
  - Adjust set point and apply steps for tuning of the PID.
- Oscilloscope
  - 6 signals can be selected out of 20 recorded channels. The time resolution is 50ms. Save files to your PC for further investigation.
- Measurement
  - All measurements on one screen.

## Routine Test

Following routine tests will be carried out by the generator manufacturer

- Measuring of the DC-resistance of stator and rotor windings
- Check of the function of the fitted components (e.g. RTDs, space heater etc.)
- Insulation resistance of the following components
  - Stator winding, rotor winding
  - Stator winding RTDs
  - Bearing RTDs
  - Space heater
- No Load saturation characteristic (remanent voltage)
- Stator voltage unbalance
- Direction of rotation, phase sequence
- High voltage test of the stator windings (2 x Unom. + 1000 V) and the rotor windings (min. 1500 V)

## 1.02.01 Hydro Jacking Oil Skid for TD125 & WD 130 Generators



**Nominal voltage:** 3x400/230, 50Hz

**Power:** 0,75 kW

**Electrical connection:** 5 x 2,5 mm<sup>2</sup>, 10m, with CEE plug

**Dimensions:** Height: 608 mm

Width: 474 mm

Depth: 674 mm

**Standard:** IEC/EN

**Connection pipe:** Suction and pressurised piping each with 4m quick connection according to DIN ISO 228



**Operating material:** HL (V) P ISO VG 32

**Function:**

The unit pressurizes the generator bearings on the drive end (DE) and non-drive end (NDE) so that the rotor will be raised by the oil pressure (see TA1503-0048).  
The hydraulic unit is a special tool which allows crankshaft to be turned.

Electrical supply via CEE connection according to IEC 60309.  
The appropriate CEE socket according to IEC 60309 to be provided locally.

**The Hydro Jacking Oil Skid consists of the following components:**

- 3-phase motor 400V 50Hz BG 80M 0,75kW 1500 rpm
- Double pump PGE104 with 1,4 L/min capacity per pump
- Pump support with connection points
- 2x Pressure filter 20 µm
- 2x Pressure limiting valve 0-200bar with hand valve
- 2x Ball valve for pressure relief
- 2x Manometer NG63 0-200 bar
- 2x connectors and hose supply 12 L
- 2x connectors and hose return supply 18 L
- 2x suction pump in return supply
- 2x In line filter 100 µm
- Terminal box

## 1.03 Module equipment

**Module frame**

Welded steel profile frame for mounting the engine, generator and heat exchangers

**Flexible coupling**

Plug-in, backlash-free coupling with torque limiter, connecting the engine and generator. The coupling isolates the generator from the main harmonic vibrations of the alternating torque of the engine.

**Coupling housing**

For a rigid centred connection between the engine and generator, with two ventilation and inspection openings for the coupling covered with perforated sheet

**Flexible mounting**

Rubber rails spaced evenly at the centre of gravity between the engine and the frame and the generator and the frame respectively, and Sylomer strips between the module frame and the foundation base plate to insulate against vibrations

**Exhaust gas piping on the module**

Connection to the turbocharger, including a compensator for taking up the thermal expansion and for isolation against vibrations

**Intake air filter**

Dry air filter with replaceable filter cartridges, flexible connections to the gas mixer, maintenance indicator for filter inspection.

## **Exhaust system flushing:**

The exhaust system is purged after a false start; this is achieved either with an exhaust gas purge fan or by turning the engine with the gas valves closed

•

## **Interface cabinet**

Fully enclosed sheet steel upright cabinet, door with rubber sealing strip. Mounted on the module, wired and ready for operation.

Paintwork: RAL 7035

Degree of protection: IP54 outside, IP20 inside (protection against accidental direct contact with live components)

Designed to comply with EN 61439-2 / IEC 61439-2  
Ambient temperature 5 - 40°C, 70% relative humidity.

Dimensions:

- Height: 2100 mm
- Width: 1000 mm
- Depth: 600 mm

Control current supplied from the battery charger.

Power supply to the auxiliaries: (from the supplier of the power supply systems for the auxiliaries)  
3 x **400 / 230 V**, **50 Hz**, 50 A

## **Contains:**

- Terminal strip
- Decentralised input/output modules connected via a data bus interface to the central engine control system in the module control cabinet
- Speed detection
- Relays, fuses, miniature circuit breakers, engine emergency circuit breaker for controlling valves and auxiliaries
- Air-conditioning unit (**optional**)

## **1.03.01 Engine jacket water system**

Closed cooling circuit, consisting of:

- Expansion tank
- Filling device (check and pressure reducing valves, pressure gauge)
- Safety valve(s)
- Thermostatic valve
- Required pipework on module
- Vents and drains
- Electrical jacket water pump, including check valve
- Jacket water preheat device

## **1.03.02 Automatic lube oil replenishing system**

## **Automatic lube oil replenishing system:**

Includes float valve in lube oil feed line, including inspection glass. Electric monitoring system will be provided for engine shut-down at lube oil levels "MINIMUM" and "MAXIMUM". Solenoid valve in oil feed line is only activated during engine operation. Manual override of the solenoid valve, for filling procedure during oil changes is included.

## **Oil drain**

By set mounted cock

## **Pre-lubrication- and aftercooling oil pump:**

Mounted on the module base frame; it is used for pre-lubrication and aftercooling of the turbochargers.

Period of operation: Pre-lubrication: 1 minute both pumps

Aftercooling: 15 minutes from engine stop only the **400/230 V** pump

Consisting of:

- 1 piece oil pump 1500 W, **400/230 V**
- 1 piece oil pump 1500 W, 24 V
- All necessary vents
- Necessary pipework

## **1.05.02 Gas train**

Pre-assembled, delivered loose, for installation into gas pipework to the module.

**Consisting of:**

- **Main gas train:**
  - Shut off valve
  - Gas filter, filter fineness <3µm
  - T-piece to the pre-chamber gas train or pre-chamber gas compressor
  - Gas admission pressure regulator
  - Pressure gauge with push button valve
  - High pressure regulator with safety-cut-off-valve (SAV)
  - Calming distance with reducer
  - Safety-blow-off-valve (SBV)
  - Pressure gauge with push button valve; after pressure regulator
  - Automatic shut-off valves
  - Leakage detector
  - Gas pressure regulator
  - Gas pressure switches (min., max.)
  - TEC JET
  - Gas flow meter (option)
  - p/t compensation (option)

The gas train complies with DIN - DVGW regulations.

Maximum distance from TEC JET outlet to gas entry on engine, including flexible connections, is 1m

• **Pre-chamber gas train:**

- Ball valve
- Gas filter, filter fineness <3µm
- Automatic shut-off valves
- Pressure regulator
- Calming distance with reducer

- Pressure gauge with push button valve

Pre chamber gas pressure regulator (incl. stabilization section) assembled at the flexible connection pre chamber gas.

## 1.07 Painting

- Quality: Oil resistant prime layer  
Synthetic resin varnish finishing coat
- Colour:

Engine:	RAL 6018 (green)
Base frame:	RAL 6018 (green)
Generator:	RAL 6018 (green)
Module interface panel:	RAL 7035 (light grey)
Control panel:	RAL 7035 (light grey)

## 1.11 Engine generator control panel per module- DIA.NE XT4(+) incl. Single synchronization of the generator breaker

### Dimensions:

- Height: 2310 mm (including 200 mm (8 in) pedestal \*)
- Width: 800 -1200mm \*)
- Depth: 600 mm \*)

### Protection class:

- external IP42
- Internal IP 20 (protection against direct contact with live parts)

\*) Control panels will be dimensioned on a project specific basis. Actual dimensions will be provided in the preliminary documentation for the project.

Control supply voltage from starter and control panel batteries: 24V DC

Auxiliary equipment supply (by the supplier of the auxiliary equipment supply system)

The following network forms are possible for the supply of the auxiliary equipment. Depending on these, appropriate protective measures are provided:

### TN- S (L1/2/3, N, PE)

- Power supply via the module control cabinet via connection terminals or directly at the 3-pole mains disconnection unit. Protection against electric shock by automatic disconnection with miniature circuit breaker or fuse.
- Additional protection for sockets with fault current breaker (RCD) type A, 30 mA
- Option:
  - According to national requirements or customer wishes, a 4-pole mains disconnecting device can also be used. Especially if the neutral conductor is not considered to be reliably earthed.
  - Downstream outputs for auxiliary equipment with neutral conductors are fused using 2 or 4 poles.

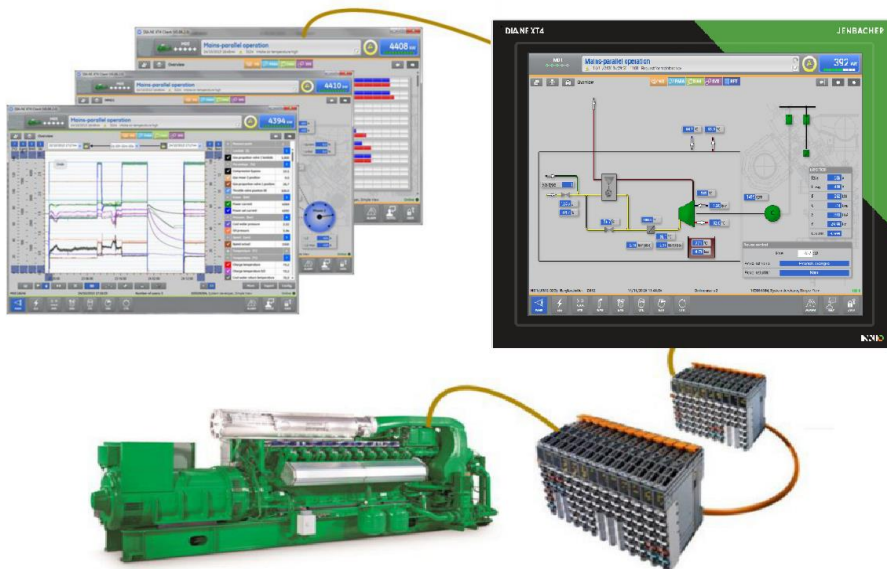
3 x 400/230 V, 50 Hz

## Consisting of:

Motor - Management - System DIA.NE

## Setup:

- Touch display visualization
- Central engine and unit control



## Touch Display Screen:

15" industrial colour graphics display with resistive touch screen.

Protection class of DIA.NE XT panel front: IP 65

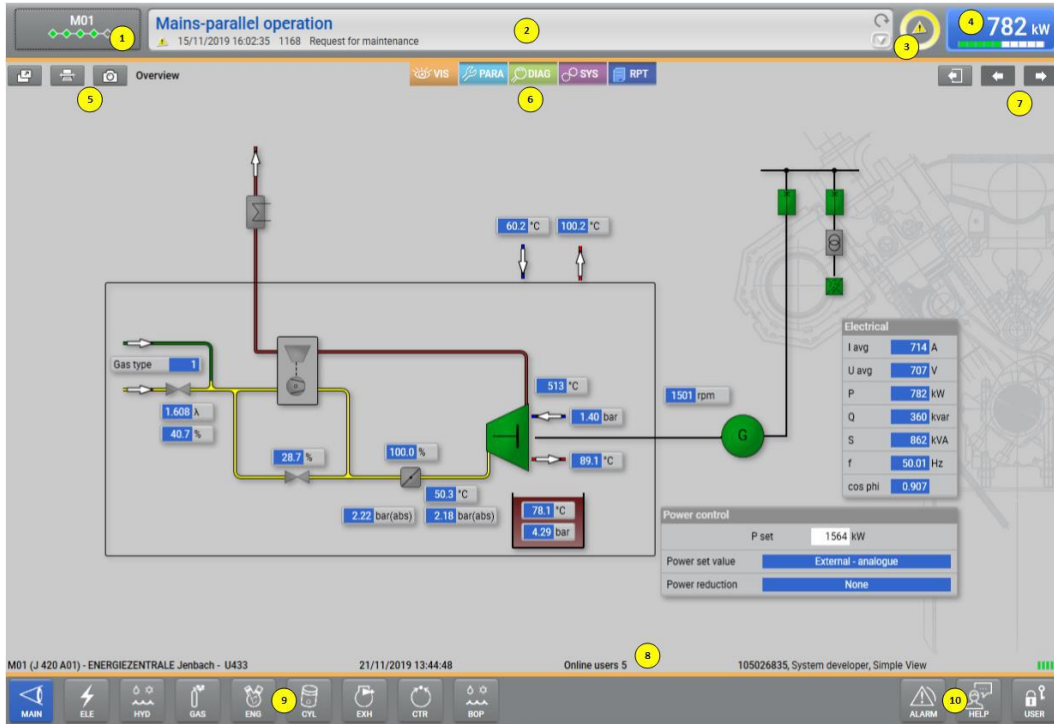
The screen shows a clear and functional summary of the measurement values and simultaneously shows a graphical summary.

Operation is via the screen buttons on the touch screen

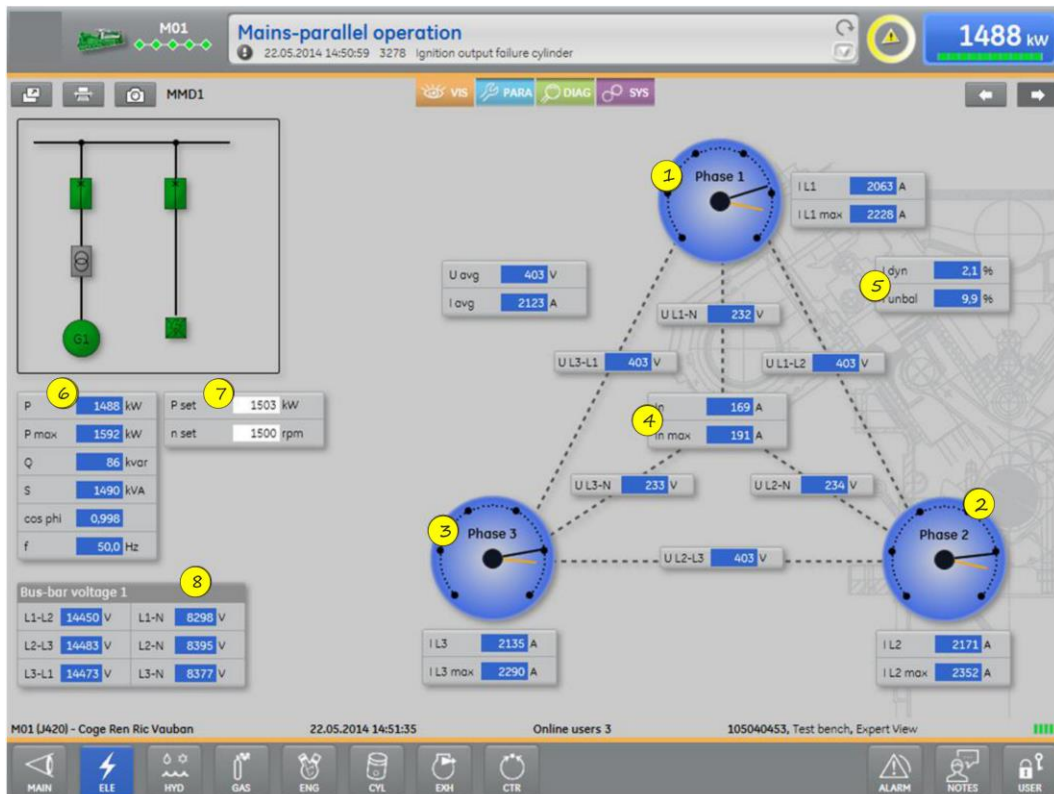
Numeric entries (set point values, parameters...) are entered on the touch numeric pad or via a scroll bar. Determination of the operation mode and the method of synchronization via a permanently displayed button panel on the touch screen.

## Main screens (examples):

Main: Display of the overview, auxiliary's status, engine start and operating data.

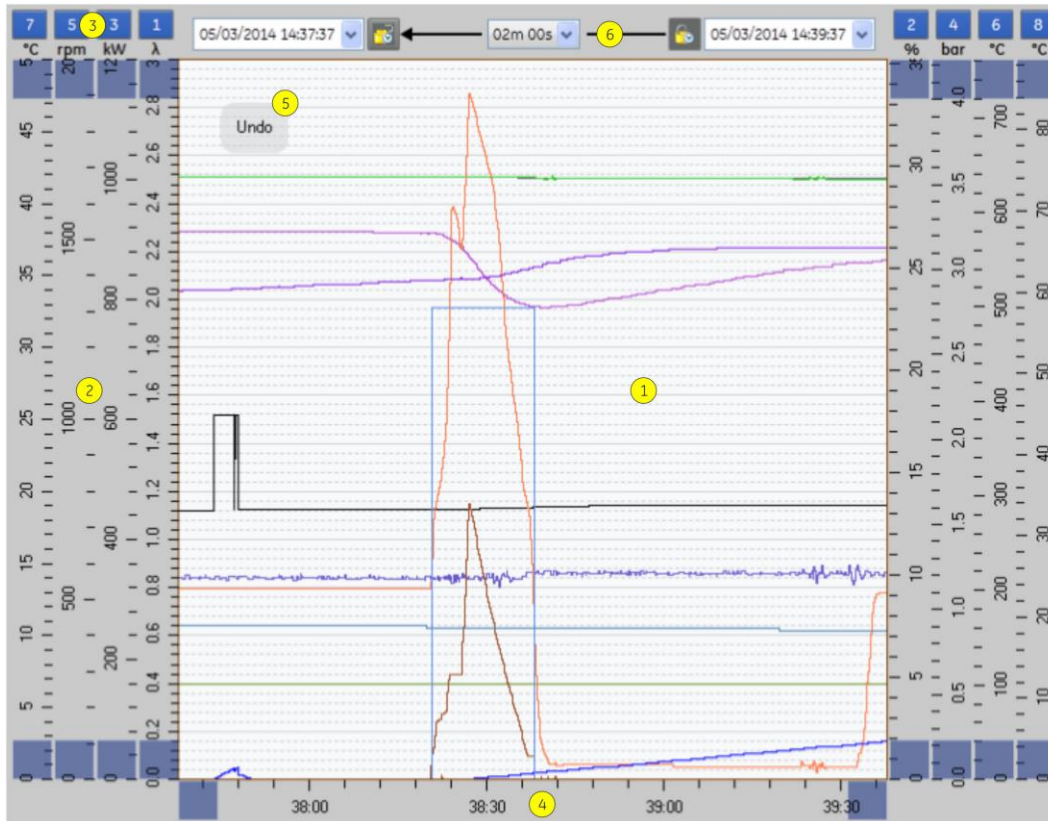


ELE: Display of the generator connection with electrical measurement values and synchronization status





Trending  
Trend with 100ms resolution



Measurement values:

- 500 data points are stored
- Measurement interval = 200ms
- Raw data availability with 200ms resolution: 24 hours + max. 50.000.000 changes in value at shut down (60 mins per shut down)
- Compression level 1: min, max, and average values with 1000ms resolution: 1 day
- Compression level 2: min, max, and average values with 30s resolution: 1 month
- Compression level 3: min, max, and average values with 10min resolution: 10 years

Messages:

1.000.000 message events

Actions (operator control actions):

100.000 Actions

System messages:

100.000 system messages

## Central engine and module control:

A control system with modular design handles all activities for module and engine-side sequencing control (start preparation, start, stop, cooling-down running, control of auxiliary systems), as well as all control functions.

### Interfaces:

- Ethernet (twisted pair) for remote monitoring access
- Ethernet (twisted pair) for connection between engines
- Ethernet (twisted pair) for the Powerlink connection to the control input and output modules.

### Connection to the local building management system according to the JENBACHER option list (OPTION)

- MODBUS-RTU Slave
- MODBUS-TCP Slave,
- PROFIBUS-DP Slave (120 words),
- PROFIBUS-DP Slave (192 words),
- ProfiNet Slave
- OPC UA Server (on request)

### Control functions:

- Speed control in idle and in island mode
- Power output control in grid parallel operation, or according to an internal or external set point value on a case by case basis
- LEANOX control system which controls boost pressure according to the power at the generator terminals, and controls the mixture temperature according to the engine driven air-gas mixer
- Knocking control: in the event of knocking detection, ignition timing adjustment, power reduction and mixture temperature reduction (if this feature is installed)
- Load sharing between engines in island mode operation (option)
- Linear power reduction in the event of excessive mixture temperature and misfiring
- Linear power reduction according to CH4 signal (if available)
- Linear power reduction according to gas pressure (option)
- Linear power reduction according to air intake temperature (option)

Multi-transducer to record the following alternator electrical values:

- Phase current (with slave pointer))
- Neutral conductor current
- Voltages Ph/Ph and Ph/N
- Active power (with slave pointer)
- Reactive power
- Apparent power
- Power factor
- Frequency
- Active and reactive energy counter

Additional 0 (4) - 20 mA interface for active power as well as a pulse signal for active energy

The following alternator monitoring functions are integrated in the multi-measuring device:

- Overload/short-circuit [51], [50]
- Over voltage [59]
- Under voltage [27]



- Asymmetric voltage [64], [59N]
- Unbalance current [46]
- Excitation failure [40]
- Over frequency [81>]
- Under frequency [81<]

### Lockable operation modes selectable via touch screen:

- "OFF" operation is not possible, running units will shut down immediately;
- "MANUAL" manual operation (start, stop) possible, unit is not available for fully automatic operation.
- "AUTOMATIC" fully automatic operation according to external demand signal:

### Demand modes selectable via touch screen:

- external demand off („OFF“)
- external demand on („REMOTE“)
- override external demand („ON“)

### Malfunction Notice list:

According to "Fault message list" (part of the documentation)

### Surveillances

- Priority 1: (ignition off, generator switch open, solenoid valves closed)  
e.g. overspeed
- Priority 2: (solenoid valves closed, generator switch open at  $P < 10\% P_n$ )  
e.g. oil pressure min.
- Priority 3: (request off, normal shutdown with cooling run)  
e.g. oil temperature max.
- Priority 4: (Warning)  
e.g. cooling water temperature min.

### Remote signals:

(volt free contacts)

1NO = 1 normally open; 1NC = 1 normally closed

- |   |     |
|---|-----|
| • Ready for automatic start (to Master control) | 1NO |
| • Operation (engine running)                    | 1NO |
| • Demand auxiliaries                            | 1NO |
| • Collective signal "shut down"                 | 1NC |
| • Collective signal "warning"                   | 1NC |

### External (by others) provided command/status signals:

- |                                       |    |
|---------------------------------------|----|
| • Engine demand (from Master control) | 1S |
| • Auxiliaries demanded and released   | 1S |

### Single synchronizing Automatic

For automatic synchronizing of the module with the generator circuit breaker to the grid by PLC-technology, integrated within the module control panel.

## Consisting of:

- Hardware extension of the programmable control for fully automatic synchronization selection and synchronization of the module and for monitoring of the generator circuit breaker closed signal.
- Lockable synchronization selection via touch screen with the following selection modes:
  - "MANUAL" Manual initiation of synchronization via touch screen button followed by fully automatic synchronization of the module
  - "AUTOMATIC" Automatic module synchronization, after synchronizing release from the module control
  - "OFF" Selection and synchronization disabled  
Control of the generator circuit breaker according to the synchronization mode selected via touch screen.
  - "Generator circuit breaker CLOSED/ Select" Touch-button on DIA.NE XT
  - "Generator circuit breaker OPEN" Touch-button on DIA.NE XT
  - Measurement Generator breaker closing time last synchronization

## Status signals:

- Generator circuit breaker closed
- Generator circuit breaker open

## Remote signals:

(volt free contacts)

- Generator circuit breaker closed 1 NO

## The following reference and status signals must be provided by the switchgear supplier:

- Generator circuit breaker CLOSED/OPEN each 1 NO
- Generator circuit breaker READY TO CLOSE 1 NO
- Mains circuit breaker CLOSED/OPEN each 1 NO
- Mains voltage via voltage transformers 3x 100 or 110V/v3 - other measuring voltages on request!
- Busbar voltage via voltage transformers 3x 100 or 110V/v3 - other measuring voltages on request!
- Generator voltage via voltage transformers 3x 100 or 110V/v3 - other measuring voltages on request!
- Generator voltage via voltage transformers 3x 100V or 110V/3 homopolar voltage for 59N for medium voltage generators

Voltage transformer in the star/star connection with minimum 50VA and Class 0,5

## The following volt free interface-signals will be provided by JENBACHER to be incorporated in switchgear:

- CLOSING/OPENING command for generator circuit breaker (permanent contact)  
1 NO + 1 NC
- Signal for circuit breaker undervoltage trip  
1 NO

Maximum distance between module control panel and engine/interface panel:	30m
Maximum distance between module control panel and power panel:	50m
Maximum distance between module control panel and master control panel:	50m
Maximum distance between alternator and generator circuit breaker:	30m

## 1.11.01 Remote messaging over MODBUS-TCP

Data transfer from the JENBACHER module control system to the customer's on-site central control system via MODBUS TCP using the ETHERNET 10 BASE-T/100BASE-TX protocol TCP/IP.

The JENBACHER module control system operates as a SLAVE unit.  
The data transfer via the customer's MASTER must be carried out in cycles.

### Data transmitted:

Fault messages, operating messages, measured values (generator power, oil pressure, oil temperature, cooling water pressure, cooling water temperature, etc.) according to JENBACHER standard (interface list).

### JENBACHER limit of supply:

RJ45 socket at the interface module in the module control cabinet

## 1.11.06 Remote Data-Transfer with DIA.NE XT4

### General

DIA.NE XT4 offers remote communication using an Ethernet connection.

### 1.) DIA.NE XT4 HMI

DIA.NE XT4 HMI is the Human-Machine-Interface of DIA.NE XT4 engine control and visualization system for JENBACHER gas engines.

The system offers extensive facilities for commissioning, monitoring, servicing and analysis of the site. By installation of the DIA.NE XT4 HMI client program it can be used to establish connection to site, if connected to a network and access rights are provided.

The system runs on Microsoft Windows Operating systems (Windows 7, Windows 8, Windows 10)

### Function

Functions of the visualization system at the engine control panel can be used remotely. These functions provide control, monitoring, trend indications, alarm management, parameter management, and access to long term data recording. By providing access to multiple systems, also with multiple clients in parallel, additional useful functions are available like

- Multi-user system
- Remote control
- Print and export functions
- Data backup.

The DIA.NE XT4 is available in several languages.

### Remote Operation:

#### Option1 - remote request/remote blocking (remote start/stop)

If the operating mode selector switch on the module control cabinet is set to "Automatic" and the request mode selector is set to "Remote", the module can be enabled (requested) or blocked (derequested) by a control element (button) on the DIA.NE XT4 HMI client. The request can come from a Windows PC in the local network or over a secure myPlant remote connection. The myPlant remote connection requires the myPlant Care package as a prerequisite (not included in the price)

**Note:**

This option also allows an additional on-site request (from the hardware or a data bus) or self-managed operation (JENBACHER station control, mains import control, etc.) to be implemented.

**Option2 – Remote Acknowledgement (remote reset)**

Error messages can also be acknowledged remotely on the DIA.NE XT4 HMI client, apart from those error messages incorporated in the safety loop - see TA 1100-0111, Section 12, for more information. Remote acknowledgement can come from a Windows PC in the local network or over a secure myPlant remote connection. A myPlant remote connection - myPlant care package is required to use the "remote reset" over the Internet (not included in the price). Use of this function requires an agreement to be concluded between the customer and JENBACHER laying down the procedure to be followed in the event of damage caused by a remote acknowledgement (preserving evidence) and how to establish responsibility. Proof of OPT training (operator training) and TJE (training on the job) is also required.

**Scope of supply**

- Software package DIA.NE XT4 HMI Client Setup (Download)
- Number of DIA.NE XT4 HMI - Client user license (Simultaneous right to access of one user to the engine control)

Nr. of license	Access
1	1 Users can be logged in at the same time with a PC (Workplace, control room or at home).
2 - "n" (Optional)	2- "n" Users can be logged in at the same time with a PC (Workplace, control room or at home). If 2- "n" users are locally connected at Computers from office or control room, then it is not possible to log in from home.

**Caution!** This option includes the DIA.NE XT4 HMI client application and its license only – NO secured, encrypted connection will be provided by JENBACHER! A secured, encrypted connection – which is mandatory – has to be provided by the customer (via LAN connection or customer-side VPN), or can be realized by using option myPlant™.

**Customer requirements**

- Broad band network connection via Ethernet(100/1000BASE-TX) at RJ45 Connector (ETH1) at DIA.NE XT4 server inside module control panel
- Standard PC with keyboard, mouse or touch and monitor (min. resolution 1024\*768)
- Operating system Windows 7, Windows 8, Windows 10
- DirectX 9.0 c compatible or newer 3D display adapter with 64 MB or higher memory

**2.) myPlant™**

myPlant\* is the remote data transfer and diagnostics solution from JENBACHER

	BASIC	CARE	PROFESSIONAL
<b>basic / advanced monitoring</b>			
Live operating status	✓	✓	✓
Historic and live data trending		✓	✓
Alarm management and notification	Alarm management only	✓	✓
Access to all engine documents	✓	✓	✓
Mobile app	✓	✓	✓
Daily status logbooks	✓	✓	✓
Remote access to engine controller		✓	✓
Fleet management		✓	✓

Engine status notifications (SMS/Email)		✓	✓
<b>increased productivity / strong performance</b>			
Recommended maintenance <sup>1</sup> (coming soon)	✓	✓	✓
Support case management <sup>1</sup>	✓	✓	✓
Predictive maintenance for spark plugs, oil and air filters <sup>2</sup>	Spark plugs lifetime prediction only	✓	✓
Oil & coolant quality monitoring <sup>3</sup>		✓	✓
Fleet emission monitoring <sup>4</sup>	Engine emission monitoring only	✓	✓
<b>artificial intelligence &amp; predictive analytics</b>			
Operator analytics package			✓
Historic performance analysis			✓
User-defined monitoring			✓
On demand: Access to myPlant data via API (Application Programming Interface) service <sup>5</sup>			✓

<sup>1</sup> Available soon for JENBACHER direct markets only

<sup>2</sup> Spark plugs, oil and air filters data might not always be available and is depending on the engine version/type and the sensors installed

<sup>3</sup> Oil and coolant reports are available in myPlant for the following laboratories: Spectro, JetCare, Polaris, MIC GSM

<sup>4</sup> May require additional hardware installation for emission monitoring (available as upgrade)

<sup>5</sup> Might require development work on customer/service provider side and includes 70 API calls per engine per month

## Scope of supply

- Access to myPlant™
- Integration of the plant in the myPlant™ system
- Access to Basic and Care level as per new installation contract
- Access to Professional level via separate contract

## Equipment to be provided by the customer

- Permanent Internet connection (wired or wireless)  
(see also option 4)
- Technical requirements as per TA 2300-0008
- Outward data connection (from the plant server to the Internet) - INWARD connections are NOT PERMITTED!

CAUTION: The customer must take technical precautions to ensure that direct access to the plant server from the Internet is prevented (e.g. by means of a firewall):

This security measure CANNOT be assumed and guaranteed by JENBACHER

## 3.) Mobile Internet (OPTION)

Connection Plant - Customer via secured Internet - connection

See also technical instruction **TA 2300 - 0006**

## Scope of delivery

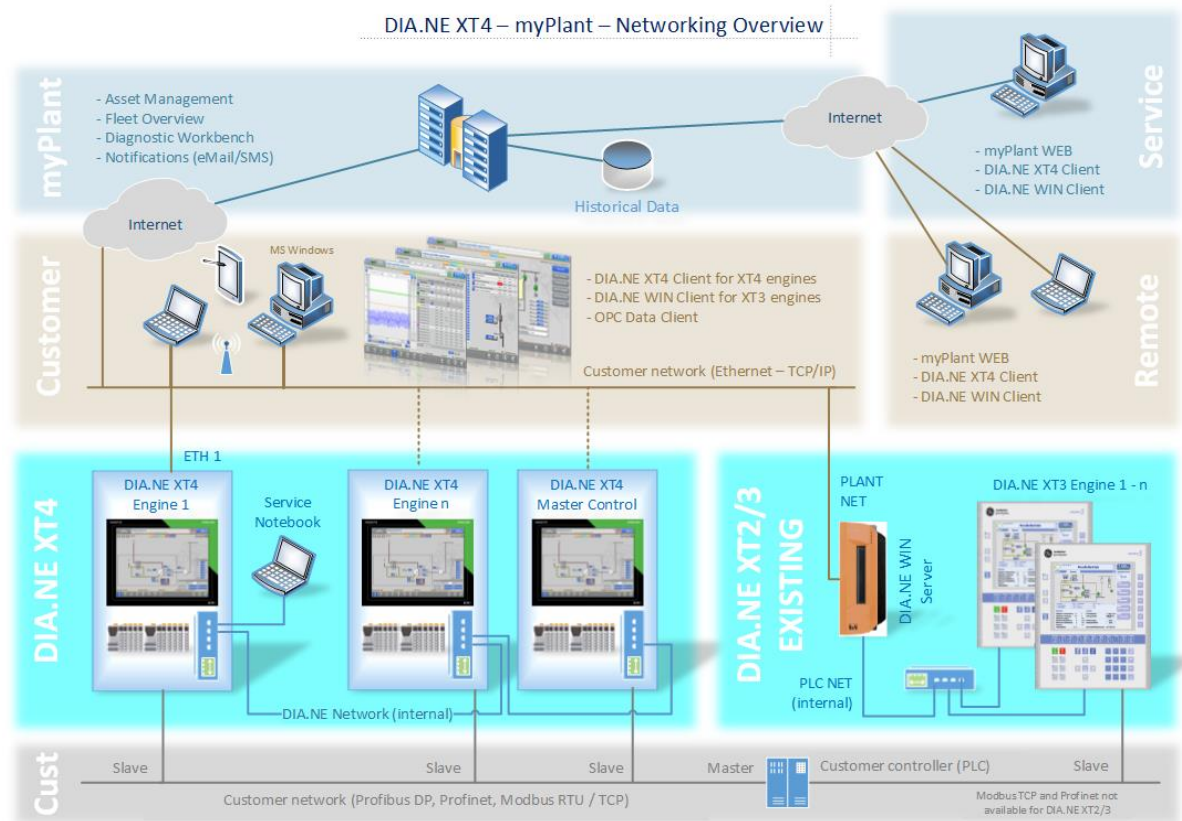
- Mobile Internet router with antenna to connect to the DIA.NE Server XT4

## Customer requirements

- SIM card for 3G / 4G

## 4.) Network overview

For information only!



### 1.11.10 Active power limitation, Reactive power control per module

#### Active power limitation:

The module can be operated with a reduced power output if the network operator requires a temporary limitation on feed-in power. Power logging is carried out at the generator terminals.

#### The customer has the option to engage in module control using the following signals:

- 0/4 - 20mA for the continuous limitation of generator active power from 100 % - 50(PMin) %
- 1 potential-free contact for blocking the module (without RESET function), as Option - in some countries the remotely shutdown of the unit within 5 seconds from receiving the signal can be required for the units of the Type Category A and B eg in Poland

or

- 4 potential-free contacts for the limitation of generator active power from 100 % - 50(PMin) %
- 1 potential-free contact for blocking the module (without RESET function), as Option - in some countries the remotely shutdown of the unit within 5 seconds from receiving the signal can be required for the units of the Type Category A and B eg in Poland

#### Reactive power control:

The reactive power/power factor control point is at the generator terminals

The module is designed for the process of reactive power control described below.

Set point setting via the customer using the following signals:

- 0/4 - 20mA for the continuous cos phi set point setting in the range of xx overexcited to xx under-excited

**The following signal is provided to the customer by JENBACHER:**

- 0/4 - 20mA for the actual value of generator reactive power
- 0/4 - 20mA for the actual value of generator active power

Further interfaces (or bus interfaces) upon request!

## 1.11.13 Out-of-step protection / pole slip protection (integrated in DIA.NE XT4)

### ANSI Function Code 78

- 3-phase monitoring, integrated in DIA.NE XT4 controller
- Uses voltage measurement at the generator and engine speed measurement (supplied by JENBACHER).
- Allows real-time calculation of rotor angle during dynamic operations
- Allows safe detection of a pole slip risk and allows operation up to the maximum limit value
- Acting on generator circuit breaker and generator de-excitation.
- Alarm message on the DIA.NE screen.
- Active in Grid and Island parallel operation

OPTIONAL on special release:

separate digital protection relay (ATTENTION: different detection as generator and mains voltage are evaluated. Tripping only possible if pole slip has occurred)

Following monitoring are integrated in the DIA.NE generator protection package

- Load angle / pole slip monitoring
- Exciter failure monitoring [ANSI 40]

## 1.11.14 Generator Overload / Short Circuit Protection

### ANSI Function Code 50/51

- Digital protection relay, 3-phase, integrated into the module control panel.
- Connected to the protective current transformers in the generator star point
- Acting on the generator circuit breaker and on the generator de-excitation
- Alarm message on the DIA.NE screen

### Characteristics / settings:

- Setting for overload: to 1,1 times of the generating set rated current,
- Dependent time characteristic acc. to IEC 60255-151: very inverse, time multiplier setting 0,6.
- Setting for short circuit: to 2,0 times of generating set rated current,
- Independent time characteristic: 300 ms (800 ms when dynamic network support).



## 1.11.15 Generator Differential Protection

### ANSI function code 87

- Digital protection relay, 3-phase, integrated into the module control panel.
- Connected to the protective current transformers in the generator star point (JENBACHER scope of supply) and to the protective current transformers in the generator circuit breaker panel (current transformers by client, secondary 1A, optionally: 5A).
- Acting on the generator circuit breaker and on the generator de-excitation
- Alarm message identified on the DIA.NE screen

In plants with a unit generator-transformer configuration the protection is realized as generator/transformer differential protection.

## 1.11.16 Generator Earth Fault Protection (nondirectional)

- Digital protection relay, integrated into the module control panel.
- Acting on the generator circuit breaker and on the generator de-excitation
- Alarm message on the DIA.NE screen

Dependent on the generator grounding method one of the following protection functions is applied:

### 1) ANSI function code 50N/G

Detection of the earth fault current e.g. by means of a window-type current transformer (Current transformer by client, secondary 1A, optionally: 5A).

### 2) ANSI function code 59N/G

Detection of the residual voltage e.g. by means of the voltage measured across the broken-delta secondary windings of grounded voltage transformers (voltage transformers by client)

## 1.11.34 Frequency sensitive control (FSM) -OPTION

The **FSM** function is used to support the stabilization of the frequency around the nominal value by moving the active power operating point when the frequency moves outside a settable dead band. In case of over frequency, the active power frequency response is limited by the minimum regulating level. (e.g. Pmin 50%)

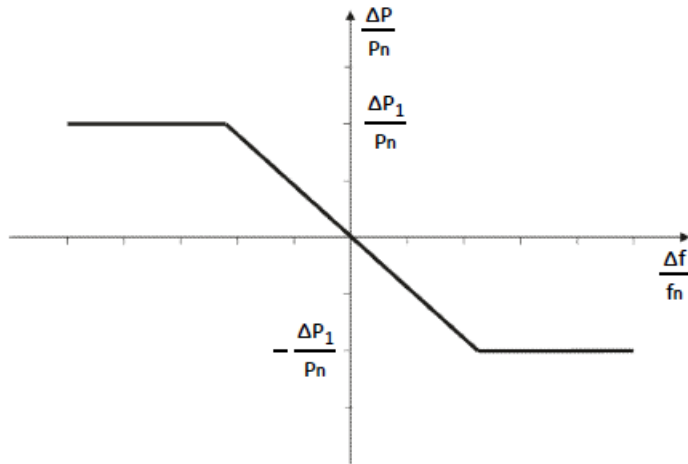
In case of under frequency, the active power frequency response is limited by the maximum capacity which is available. (e.g. Pn 100%)

The frequency thresholds and the droop settings are specified in the national Grid Codes and/or are specified by the network operator in the connection agreement.

Possible dead band can be set between 0 and 500 mHz

Active power frequency response capability of power-generating modules in **FSM**:





NC RfG (Article 15)

active power range $\Delta P_1/P_n$	1,5 – 10 %
droop $\Delta f/f_n : \Delta P/P_n$ [%]	2 - 12 %

## 1.20.03 Starting system excl. starter batteries

### Starter battery (is not included in JENBACHER scope):

6 piece 12 V AGM battery, 125 Ah (according to DIN 72311).

### Battery voltage monitoring:

Monitoring by PLC.

### Battery charging equipment:

Capable for charging the starter battery with I/U characteristic and for the supply of all connected D.C. consumers.

Charging device is mounted inside of the module interface panel or module control panel.

### • General data:

- Power supply **3 x 320 - 575 V, 47 - 63 Hz**
- max. power consumption 1040 W / 1550 W (5 sec)
- Nominal D.C. voltage 24 V(+/-1%)
- Voltage setting range 24V to 28V ( adjustable)
- Nominal current (max.) 3 x 40 A
- Degree of protection IP20 to IEC 60529
- Operating temperature 0 °C - 70 °C
- Protection class 1
- Humidity class 3K3, no condensation.
- Natural air convection
- Standards EN60950,EN50178  
UL/cUL (UL508 / UL 60950-1)

### Signalling:

Green Led: Output voltage > 21,6V

### Control accumulator:

- Pb battery 24 VDC/18 Ah



## 2.02 Grid monitoring device Standard 50Hz Profile 3

Standard for generating plants connected to the medium voltage grid with dynamic Grid Code requirements.

### Function:

For immediate disconnection of the generator from the grid in case of grid failures.

### Consisting of:

- High/low voltage monitoring
- High/low frequency monitoring
- Especially adjustable independent time for voltage and frequency monitoring
- Monitoring of the borderline of the voltage profile  $U_{LVRT}$
- Indication of all reference dimensions for normal operation and at the case of disturbance over display and LED
- Adjusting authority through password protection against adjusting of strangers

### Scope of supply:

- Digital grid protection relay with fault data storage, measured value display and self-monitoring.
- Rated input voltages: 100 V / 110 V / 400V

### Out of standard scope of supply:

- all necessary instrument transformers,
- additional protection equipment acc. to network operator's specifications and guidelines.
- Site specific Acceptance test.

### Grid protection setting values:

Limits shown are our recommendation, final limits values are specified from the utility operator

Parameter	Parameter Limit	Time Delay	Comments
$U_{>>}$ [ANSI 59]	115 %U	0,2 s	Power capability reduction with 1 %Pn/%U above 105 %U
$U_{>}$ [ANSI 59]	111 %U	60 s	Power capability reduction with 1 %Pn/%U above 105 %U
$U_{<}$ [ANSI 27]	80 %U	1,5 s	Power capability reduction with 1 %Pn/%U below 95 %U
$U_{<<}$ [ANSI 27]	30 %U	0,3 s	Power capability reduction with 1 %Pn/%U below 95 %U
$f_{>}$ [ANSI 81O]	51,5 Hz	0,1 s	Power capability reduction with 10 %Pn/Hz above 51 Hz
$f_{<}$ [ANSI 81U]	47,5 Hz	0,1 s	Power capability reduction within the boundaries of 2 %Pn/Hz below 49 Hz; 10 %Pn/Hz below 49,5 Hz. Default: 10 %Pn/Hz below 49 Hz
Monitoring of the voltage profile $U_{LVRT}$ [ANSI 27T]	3 %U	0 s	
	68 %U	0,27 s	
	83 %U	1,6 s	

## 2.03.02 Power control

### According to external signal

#### Function:

An external potential free (0/4 - 20 mA = 50(Pmin) - 100 % of nominal power) signal is a set value for the power control.

At plants with multiple modules, this signal can be used in a series loop on every Engine Management System. This provides an equal load sharing between all modules.

## 2.12 Gas warning device

### Function:

The gas warning device continuously monitors the radiated air in the engine room and warns against gases which are injurious to persons' health and against explosive gas concentrations.

The measuring head (catalytic sensor) is attached on the covering or nearby the ground, dependent upon the gas source.

### Scope of supply:

- Alarm unit voltage: 24VDC
- 2 Gas sensor(s)

## 2.13 Smoke warning device

### Function:

The smoke warning device in combination with the optical smoke detector (installed in the control room) and the thermal smoke detector (installed in the engine room) provide extensive early warning signal.

### Design:

The device has an optical display for alarm and operation.  
The smoke warning device is installed in a plastic housing.

### Scope of supply:

- Alarm unit voltage: 24 VDC
- 3 Smoke detector(s)

## 2.15 Simulations report according UK G99 for Type B Plants

Simulations report according UK G99 for Type B Plants (<10MW)  
Report includes FRT, load flow and LFSM-O simulations

Required from customer:

- Grid data at the point of connection (provided by local system operator)
- Complete electrical single diagram with information about cable types and lengths, transformer characteristics, additional loads and generation units

## 2.99 UK Packages

### 2.99.04 Electrical Metering Package

- Metering CTs for parasitic load
- Metering Cts for alternator generated power

### 3.01 Lube oil system (1/plant)

#### Consisting of:

- Electric driven fresh oil pump
- Electric waste oil pump
- Level switches
- Shut-off devices

#### Through simple switch over of the pumps following functions are given:

- Filling the fresh oil tank (fresh oil pump)
- Emptying of the oil pan into the waste oil tank (waste oil pump)
- Emptying of the waste oil tank (waste oil pump)
- Filling of the oil pan from the fresh oil tank

## 4.00 Delivery, installation and commissioning

### 4.01 Carriage

According to contract.

### 4.02 Unloading

Unloading, moving of equipment to point of installation, mounting and adjustment of delivered equipment on intended foundations is not included in JENBACHER scope of supply.

### 4.03 Assembly and installation

Assembly and installation of all JENBACHER -components is not included in JENBACHER scope of supply.

### 4.04 Storage

The customer is responsible for secure and appropriate storage of all delivered equipment.

### 4.05 Start-up and commissioning (not included)

Start-up and commissioning with the JENBACHER start-up and commissioning checklist is not included. Plants with island operation require internet connection.

## 4.06 Trial run (not included)

After start-up and commissioning, the plant will be tested in an 8-hour trial run. The operating personnel will be introduced simultaneously to basic operating procedures.

Is not included in JENBACHER scope of supply.

## 4.07 Emission measurement with exhaust gas analyser

Emission measurement by JENBACHER personnel, to verify that the guaranteed toxic agent emissions have been achieved (costs for measurement by an independent agency will be an extra charge).

## 5.01 Limits of delivery

### Electrical

- Module:
  - At terminals of module interface panel
  - At terminals of generator terminal box (screwed glands to be provided locally)
- Module control panel:
  - At terminal strips
- Auxiliaries:
  - At terminals of equipment which is supplied separately

### Warm water

At inlet and outlet flanges at the module

### Low temperature water

At inlet and outlet flanges at the module

### Exhaust gas

At outlet flange of exhaust gas connection

### Combustion air

The air filters are set mounted

### Fuel gas

- At inlet and outlet flanges of gas train
- At inlet flange of gas pipe work on module
- At outlet flange of the pre-chamber gas train
- At inlet flange of pre-chamber gas pipe work on module
- At connection for boost pressure compensation on module
- At connection for boost pressure compensation on gas pressure regulator of the pre-chamber gas train

### Lube oil

At lube oil connections on module

### Draining connections and pressure relief

At module

### Insulation

Insulation of heat exchangers and pipe work is not included in our scope of supply and must be provided locally.

### **First filling**

The first filling of module, (lube oil, engine jacket water, anti freeze-, anti corrosive agent) is not included in our scope of supply.

The composition and quality of the used consumables are to be strictly monitored in accordance with the "Technical Instructions" of JENBACHER

Suitable bellows and flexible connections **must be provided locally** for all connections.

Cables from the module must be flexible.

## **5.02 Factory tests and inspections**

The individual module components shall undergo the following tests and inspections:

### **5.02.01 Engine tests**

Carried out as combined Engine- and Module test based on ISO 3046-3 at JENBACHER test bench. The following tests are made at 100% load, and the results are reported in a test certificate:

- Engine output
- Fuel consumption
- Jacket water temperatures
- Lube oil pressure
- Lube oil temperatures
- Boost pressure
- Exhaust gas temperatures, for each cylinder

### **5.02.02 Generator tests**

Carried out on test bench of the generator supplier.

### **5.02.03 Module tests**

The engine will be tested with natural gas (methane number 94). The performance data achieved at the test bench may therefore vary from the data as defined in the technical specification due to differences in fuel gas quality.

Carried out as combined Engine- and Module test commonly with module control panel at JENBACHER test bench, based on ISO 8528-6. The following tests are made, and the results are reported in a test certificate:

Visual inspection of scope of supply per specifications.

- Functional tests per technical specification of control system.
  - Starting in manual and automatic mode of operation
  - Power control in manual and automatic mode of operation
  - Function of all safety systems on module
- Measurements at 100% load:
  - Frequency
  - Voltage
  - Current
  - Generator output
  - Power factor
  - Fuel consumption
  - Lube oil pressure

- Jacket water temperature
- Boost pressure
- Mixture temperature
- Exhaust emission (NOx)

The module test for operating frequency 50 Hz and 6,3-6,6kV / 10,5kV-11kV will be carried out with the original generator, except if it is not possible because of the delivery date. Then a test generator will be used for the module test.

To prove characteristics of the above components, which are not tested on the test bench by JENBACHER, the manufacturers' certificate will be provided.

In the case of a container unit the above-mentioned test procedure for the module is performed in Jenbach. JENBACHER reserves the right to perform the functional test of the container in a facility elsewhere.

## 5.03 Documentation

**List of standard pre-documentation provided based on the technical status at the time of order receipt:**

- Module drawing **1)**
- Technical diagram **1)**
- Drawings of the cabinet views **3)**
- Electrical interface list **2)**
- Technical specification of the control system **2)**

**Before delivery** (depending on progress in ordering the components, on request)

- Technical drawings for BoP components/accessories supplied separately (if included in scope of supply of INNIO Jenbacher GmbH & Co OG) **1)**

**Upon delivery**

- Circuit diagrams **3)**
- Cable list **3)**

**Delivered with the engine**

- Brief instructions (transport, erection, moving) **1)**

**For commissioning**

- Operation and maintenance instructions **4)**
- Spare parts catalogue **4)**
- Original supplier operation and maintenance instructions for any BoP components (installed in the INNIO Jenbacher GmbH & Co OG scope of supply) as Appendix **1)**

All the components found in the INNIO Jenbacher GmbH & Co OG scope of supply are described in the operation and maintenance instructions, and in the spare parts catalogue.

In addition, the manufacturer's original operation and maintenance instructions will be provided for every BoP component, in German and English as standard, as an Appendix for the operation and maintenance manual provided.

Additional costs of producing or providing the required documents using the KKS (power station coding system) and/or integration in subcontractors' documentation, or additional approval, design and proof of testing documentation must be negotiated or ordered separately.



**This standard offer does not include:**

- Approval documentation
- Design documentation
- Proof of testing documentation
- Printed copies and digital off-line versions (e.g. printed versions, CD, pdf, etc.) must be negotiated separately and ordered accordingly.

**Available languages (language codes as per ISO 639-1):**

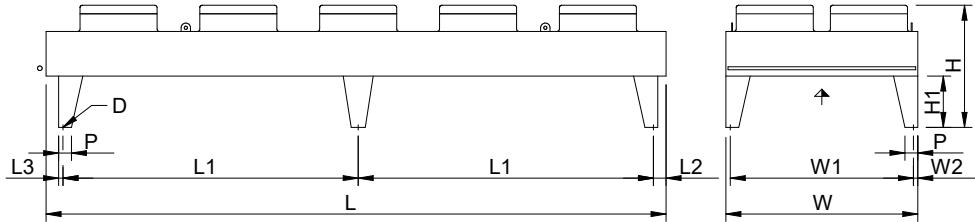
4	3	2	1	Language Code	Language Name
				de	German
				en	English
				fr	French
				it	Italian
				es	Spanish
				nl	Dutch
				hu	Hungarian
				ru	Russian
				pl	Polish
				tr	Turkish
				cs	Czech
				pt	Portuguese
				da	Danish
				sk	Slovakian
				sl	Slovenian
				sr	Serbian
				lv	Latvian
				et	Estonian
				ro	Rumanian
				no	Norwegian
				hr	Croatian
				fi	Finnish
				zh	Chinese
				el	Greek
				bg	Bulgarian
				lt	Lithuanian
				sv	Swedish

**Drycooler GFHV FD 080.3OF/25A-57**

<b>Capacity:</b>	1717.0 kW <sup>(1)</sup>	<b>Medium:</b>	Ethylene glycol 37 Vol. % <sup>(2)</sup>
Air flow:	190749 m <sup>3</sup> /h	Inlet:	82.9 °C
Air inlet:	30.0 °C 40 %	Outlet:	50.0 °C
Height above sea level:	0 m	Pressure drop:	0.86 bar
Fans (AC):	10 Piece(s) 3~400V 50HzΔ/(Y)	Volume flow:	49.00 m <sup>3</sup> /h
Data per motor (nominal data):		Noise pressure level:	57 dB(A) <sup>(3)</sup>
Speed:	850 min <sup>-1</sup> / (650 min <sup>-1</sup> )	at a distance of:	10.0 m
Capacity (mech./el.):	1.15 kW/1.55 kW	Noise power level:	90 dB(A)
Current:	3.30 A <sup>(5)</sup>	ErP:	Compliant <sup>(4)</sup>
Total el. power consumption:	16.79 kW	Energy efficiency class:	D
Casing:	Galv. Steel, Powder-coated RAL 7035	Tubes:	Copper <sup>(6)</sup>
Surface:	2585.6 m <sup>2</sup>	Fins:	Aluminum <sup>(6)</sup>
Tube volume:	538.9 l	Connections per unit:	
Fin spacing:	2.70 mm	Inlet:	88.9 * 2.00 mm
Dry weight:	2653 kg <sup>(7)</sup>	Outlet:	88.9 * 2.00 mm
Max. operating pressure:	10.0 bar	PED classification:	Art. 4, par. 3 <sup>(8)</sup>
		Passes:	4

**Dimensions:<sup>(7)</sup>**

- L = 11490 mm
- W = 2241 mm
- H = 1999 mm
- H1 = 1200 mm
- L1 = 5575 mm
- L2 = 197 mm
- L3 = 52 mm
- P = 150 mm
- W1 = 2137 mm
- W2 = 52 mm
- D = 17 mm



Attention: Drawing and dimensions not valid for all accessory options!

UI: 1WCN.34Q

Accessories	Piece(s)
Extra accessories	
Power Distribution Panel (mounted & wired)	1
1 set extended legs 1200 mm	1
Delivery time:	on request (Status: 2023-08-08)
Our general terms of sales and delivery apply!	
Subject to technical modifications	

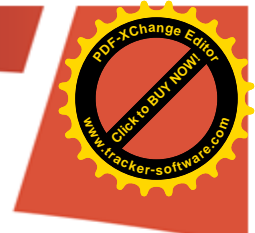
**Important remarks / explanatory notes:**

(1) Calculations and capacity tests are based on the following standards: condensers/gas coolers EN 327, evaporators/air coolers EN 328, dry coolers EN 1048.

- (2) Fluid group 2 according to pressure equipment directive 2014/68/EU
- (3) According to the enveloping surface method defined in EN 13487/EN 9614-1; tolerance = +2 dB(A). Applies only for AC fans, AC fans with sine control and EC fans. Noise caused by other control methods, water spraying systems or sound reflexions occurring at the installation site are not taken into account and may result in an increased sound pressure level.
- (4) This unit is equipped with fans that meet the efficiency requirements of Directive 2009/125/EC (ErP Directive).
- (5) The current consumption can differ in dependence of the air temperature and of the variations of system voltage according to the VDE guidance.
- (6) When using the unit in aggressive atmospheres, it is imperative to select the materials according to the specific application, see material recommendation brochure in the GPC programme menu "?".
- (7) Dimensions and weights are not valid for all possible options! They may differ for units with accessories or special units (S-...).
- (8) Piping (DN = 84.9 mm, TSmax = 100 °C, liquid). Final classification according to pressure equipment directive 2014/68/EU during order processing.



# AXCES



To : Statera Energy Ltd.  
Attention : Mr. R. Edwards.  
Mr. J.P. Gallagher.  
Mr. E. Brightwell.

Axces Industrial Stacks BV  
Ondernemersweg 12  
4691 SL THOLEN The Netherlands  
Phone +31 (0)786 459 822  
Mobile +31 (0)683 657 879  
[www.axces.com](http://www.axces.com) [www.axces.nl](http://www.axces.nl) |  
Chamber of Commerce no.20163669  
V.A.T. no. : NL 8216.26.437.B01  
ABN AMRO : NL 43 0555 3407 91

Subject : Quotation exhaust system complete.  
Your reference : Thurrock Power – 64.3000 Exhaust  
Gas System.  
Project : Thurrock UK.  
Our reference : 24015\_D  
  
Pages : 14

Hendrik Ido Ambacht July 3th 2024

Dear Sirs,

With reference to your inquiry we offer you our free of charge revised budget quotation for:

**47 pcs free standing silencer / chimneys with 2 in 1 silencers and flues + ducts.**  
**1 pcs free standing silencer / chimneys with 2 in 1 silencers and flues + 1 duct.**

**Transport to Tilbury Docks for the whole scope.**

**Optional ducts in AISI 316L.**

This quotation consists of:

- Chapter 1 - Technical specification scope.
- Chapter 2 - Prices, terms and conditions scope.

Axces Industrial Stacks B.V. is part of the Axces Group, and specialized in the engineering and, production of industrial stacks and flue gas chimneys as well as the connecting ducting or channels.

For a complete overview of the Axces Group see our website: [www.axces.com](http://www.axces.com). & [www.axces.eu](http://www.axces.eu)

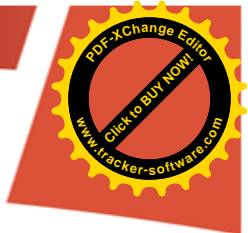
We trust to have interpreted your requirement correctly and will contact you the soonest,

Best regards,  
**Axces Industrial Stacks B.V.**

Ing. André A.J. Bassant.  
Managing Director.



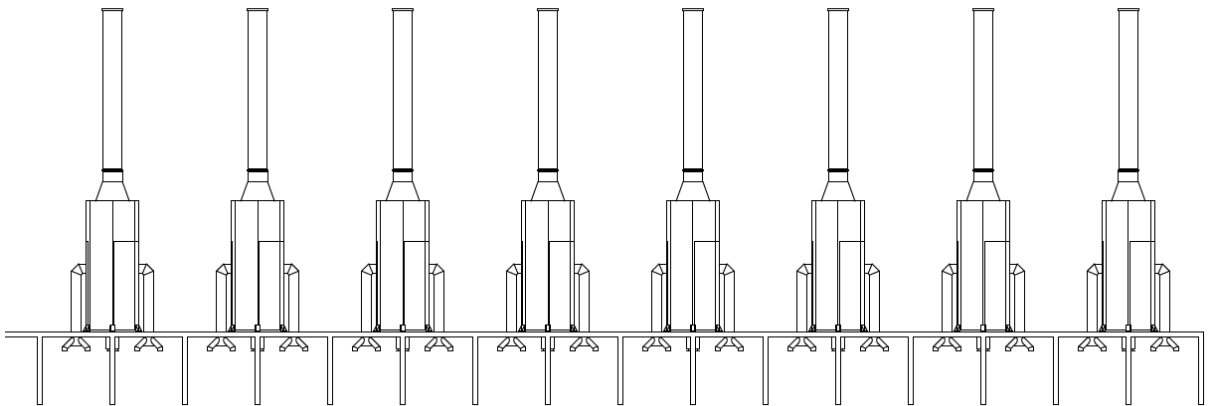
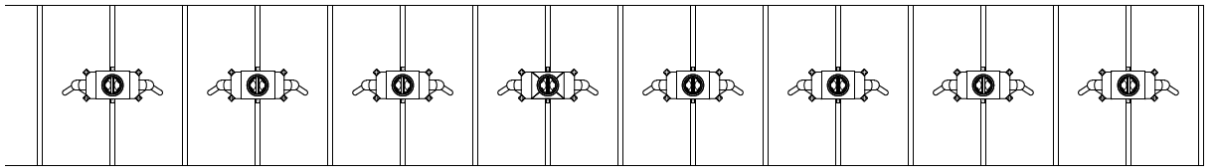
**Axces Industrial Stacks is EN 13084-7 & ISO 9001:2015 certified by**



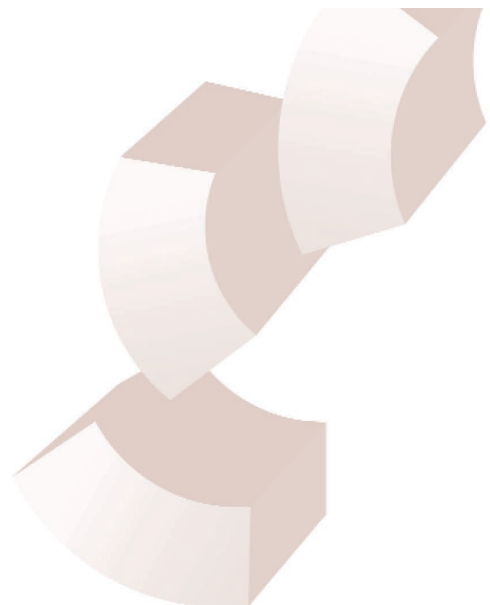
## 1. CHAPTER 1 - Technical specification.

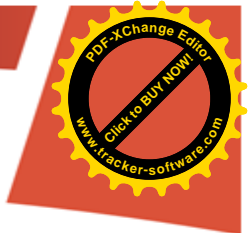
The quotation is based on the following data:

- Your RFQ as per email.
- Our alternative solution for 48 free standing silencer chimneys on the roof.
- Your revised RFQ



Impression on 1 block silencer / chimneys.





## 1) General

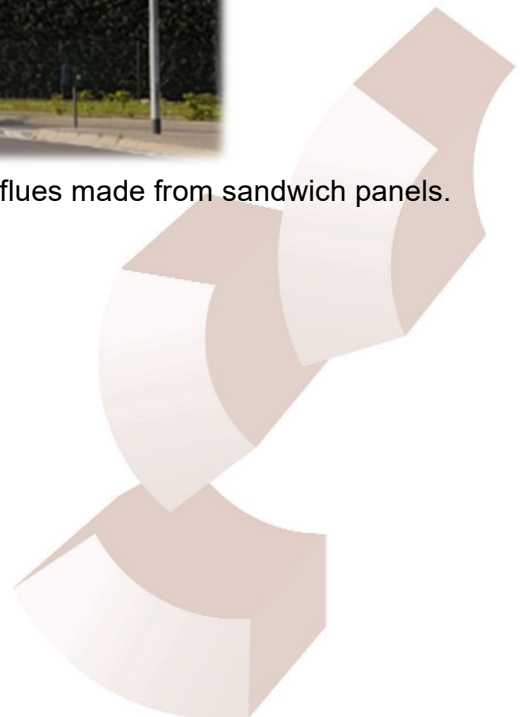
We are a company with totally open design philosophy.

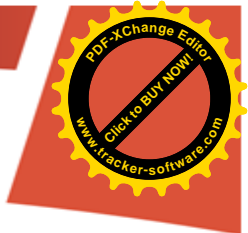
We design in inventor 3d software and use special programs for chimney design.

With clients as Siemens HTT, IV consult ( offshore), NEM and a good variety of produced chimney / stacks and steel structures we are proud to say we are confident in this project.



2x 50 m freestanding steelstructures with stainless steel flues made from sandwich panels.





## 2) Design data:

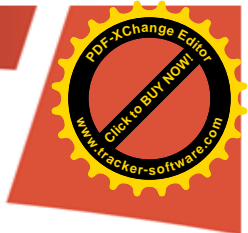
- Type of chimney : Free standing square mast structure with round windshield on new concrete.
- Situation : Windloaded over 20m.
- Design code chimney : Eurocode EN 13084-7
- Earthquake zone : N.a.
- Location : Thurrock UK.
- Type : Welded and Bolted in 2 pieces.
- Emission level flue : 25m.
- Ladders : N.a.
- CEMS : Ports in the ducts.
- **Welding flues** : **All full penetrant acc. to EN 13084-7.\***
- **Welding steel structure** : **Acc. To EN 3834-2**
- **Welding procedures** : **Acc. to EN ISO 15614-1.**
- **Identification** : **CE Marking for steel structure and Flue.**
- Diameter ducts : 600 mm.
- Temperature maximum : 600°C.
- Temperature operating : 360°C.
- Below dew point : At start and stop, several times / year.
- Gas engines : Jenbacher JMS 624.
- Duration : 24/24h .
- Corrosion allowance innerflue : 0mm
- Sound : Required sound level to be 64dB(A) @ 1m from the exhaust.

Noise levels to be considered – and **costed offer** to be provided for each:

Option	Unit	1
Sound Level per Genset Exhaust Stack Outlet	dB(A) (Lp) @ 1m	64
Sound Level per 2 in 1	dB(A) (Lp) @ 1m	68
Comment	-	In line with specification

- Noise outbreak : No value specified but limited as much as the design allows.
- Visual requirements : No specific requirements, chimney should be round.
- Number engines : 95 pcs.





### 3) General:

This project is for the engineering, design, production and delivery of 48 free standing silencer / chimneys.

1 set is equipped with 1 duct but in case later engine 96 is installed the silencer / chimney only needs a duct.

The sound requirement is this project is very strict, our silencer will meet the requirement theoretically.

We like to test 1 silencer before starting the production on all 48.

Hopefully you or the engine supplier can help us with finding an engine which we can use for testing.



After our former offer we present a new design. The design is based on the part of the former offer where we offered the standalone silencer on the roof.

We used your specification as guideline and add our knowledge of exhaust systems to design a system we think fits best in this project.

The required sound attenuation for this project with so much engines creating noise is high.

Our design is based on high attenuation on the flue top but also limit as much as possible the noise outbreak from the outside duct, silencers and flues.

*Our idea for this project is the following:*

New Axces design is a 2 in 1 freestanding silencer / chimney.

The former 4 in 1 silencer is now rectangle, the 2 silencers are back to back centered in between 2 engines.

The flue gasses are complete separate from the engine turbo to the chimney top.

Starting on the engine turbo's, connection to the engine compensators with a flange.

2 small duct angles into a larger vertical duct.

These part are considered a fixed point and need to be hanging on the concrete roof.

The vertical is going through the a roofcravat and made rain tight with a raincollar.

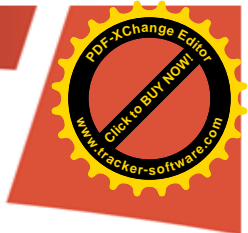
The cravats we supply to the site, probably made in the UK.

On 5\*D from the inlet in the vertical duct is are 2\* 3 " Cems connections on 90 degree angle in the horizontal.

After the Cems a flexible compensator to allow for thermal expansion. The entrance to the silencer with a 90° segmented elbow and a flanged connection.

The duct from turbo to silencer is offered in 4mm 16Mo3 and optionally in 6mm AISI 316L. The latter is due to the 7 bars explosion pressure and advise from engine supplier to have a stainless steel exhaust.





The square silencer is reflection / absorption type, several internal chambers create the sound reduction.

Both silencers are fully welded connected on the backsides.

The silencers are leading the wind loading forces into the concrete roof on 6 anchoring points.

This connection for now is with resin anchors but need to be engineered in detail with your civil engineer.

Queries info showed civil requires 8 supports each system. Details not known yet.

On top of the silencers there is a transition square to round with a flange. On this flange the chimney / silencer is connected.

The material of the silencers is S235Jr, due to internal e-glass there is no high wall temperature which gives a reason to use high strength steel.

The chimney is over full length acting as a silencer. The round chimney is divided into 2 chambers, 1 for each engine fluegas.

The strong outershell will not be heated up by the flue gas the acoustical part is separate from the outershell.

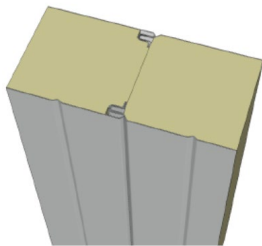
From inlet to top the silencer and chimney are complete separate per engine.

The outershell is painted in RAL.

At the bottom of each steelstructure there are 2 earthing connections to be connected to earthing system by others.

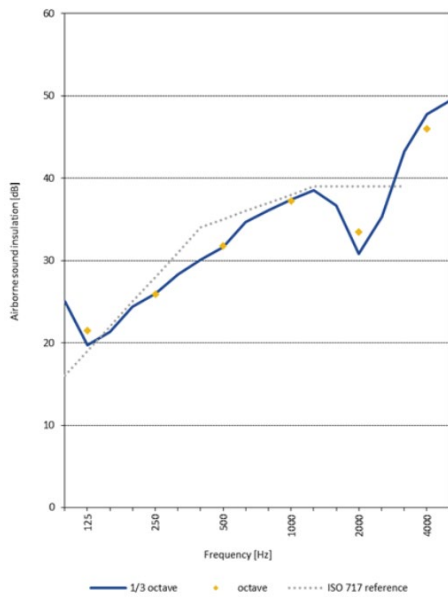
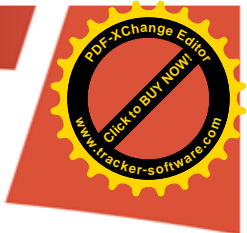
To limit the outbreak noise and cover the silencers we clad the silencers with acoustical panels in RAL.

Standard with C3 ( EN 14299) and optional possible with C5 coating.



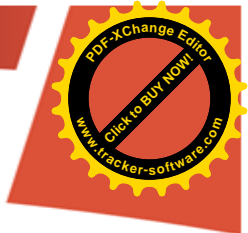
Specification on the panels

Element name	Element thickness	Outer shell	Inner cover shell	weight	Thermal resistance	Heat transfer coefficient ( $\Psi$ - Joint factor)	
	s	tN	tN	kg / m <sup>2</sup>	R	U without $\Psi$	U with $\Psi$
	mm	mm	mm	kg / m <sup>2</sup>	m <sup>2</sup> K / W	W / m <sup>2</sup> K	W / m <sup>2</sup> K
HIPERTEC WALL SOUND	60	0,60	0,60	15,3	1,34	0,711	0,731

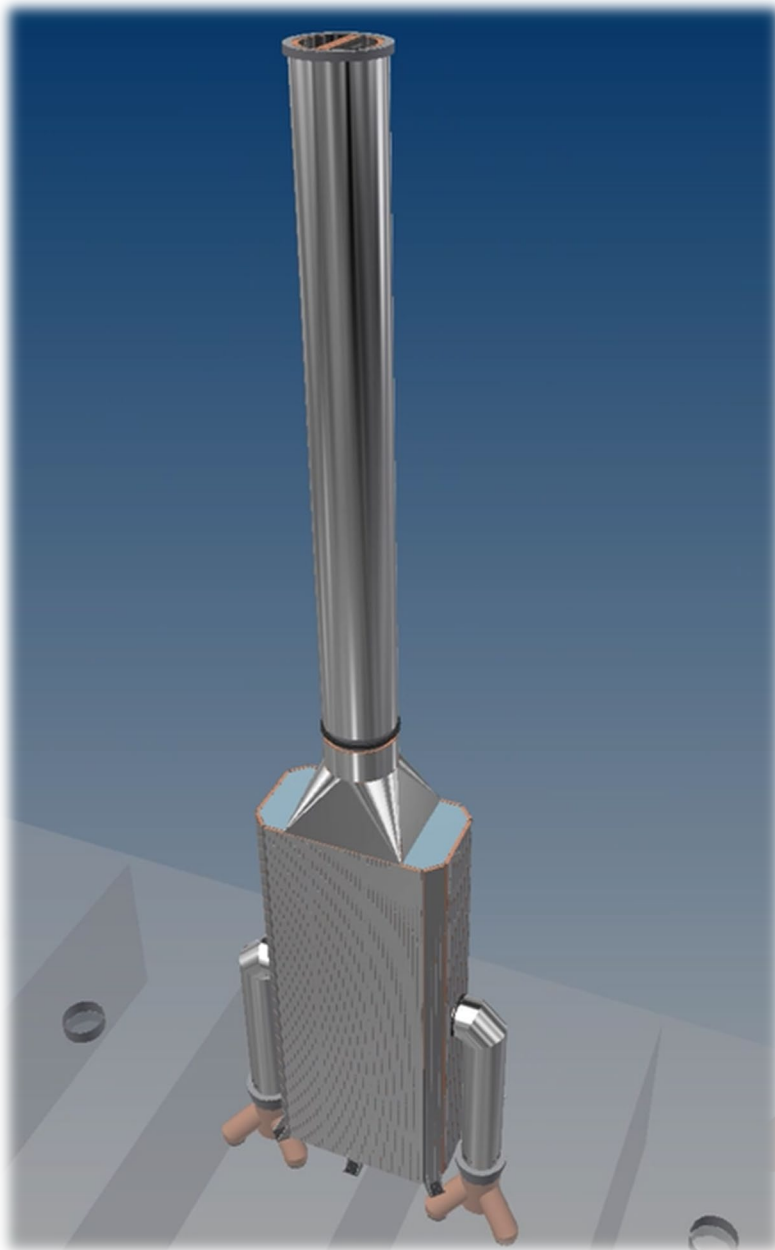


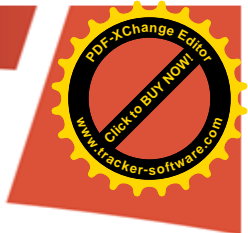
The panels are pre fab installed in our workshop in NL.





#### 4) Basic sketch of the system.





## 5) Transport:

The silencers – chimneys are prefabricated in our workshop.

The chimneys are combined with 4 pcs in a frame.

The silencers are transported from our workshop to NL.

In NL we apply the acoustical panels and wrap and combine for transport.

For now we offer 2 silencers on top of each other, which means a package 3m width 3.2 m high and 10m length.

Normal transport lengths, no exceptional transport.

We offer 2 \* a vessel transport.

Vessel 1 will contain:

Everything for 32 double silencers / chimneys ducts.

Vessel 2 will contain:

Everything for 15+1 double silencers / chimneys ducts.

Power Block	Site Delivery Date	
1 (16 units off)	15/07/2025	VESSEL 1
2 (16 units off)	15/07/2025	
3 (16 units off)	21/07/2025	
4 (16 units off)	21/07/2025	
5 (16 units off)	25/09/2025	VESSEL 2
6 (15 units off)	24/11/2025	

The vessel sails probably will be 2 weeks before ETA on site.

In case the vessel arrives to soon in Tilbury we hope to find a storage area nearby the site.

At this moment this is complete unclear as the ETA Is 1 year away.

Transport from Tilbury Docks to site + offloading at site is an estimate price.

We think for logistics and feasibility best would be if the transport and offloading at site is in the scope of the company who does the install.

They know when parts are expected at site and have grip on the progress.

Estimate transports Tilbury docks to site:

All from vessel 1:

16 trailers with 2 silencers each.

8 trailers with 4 chimneys each.

1 trailer with 32 ducts.

All from vessel 2:

8 trailers with 2 silencers each.

4 trailers with 4 chimneys each.

1 trailer with 16 ducts.

Mentioned price for loading in the docks + transport to site + offloading on site can be removed from the offer if you agree on above.

All parts will have lifting trunnions so loading unloading and install can be done safe and fast.



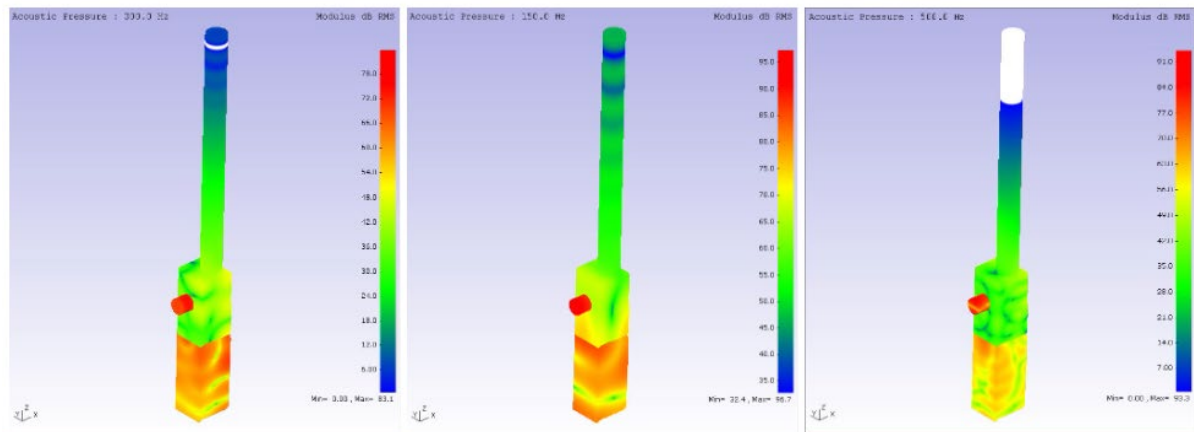


## 6) Partslist pre-fab parts per 2 engines.

- 1) 2\* Engine connection Y piece.
- 2) 2\* pcs vertical duct.
- 3) 1 pcs silencer 2 in1.
- 4) 1pcs chimney silencer.
- 5) Resin anchors.
- 6) Bolts nuts washers gaskets.

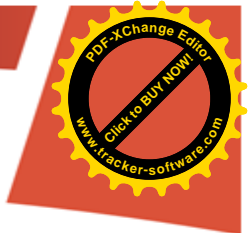
In the table the preliminary outcome of the acoustical design calculation.

Indication of the acoustical CFD



## 7) Scope of supply :

- Basic and detail engineering for chimneys acc. to BS-EN 13084-7
  - Basic and detail design anchors, supply of normal loads.
  - Schedule and planning.
  - Documents, MDR, welding, assembly, erection plans etc. **CE marking.**
  - Resin anchors for now 48\* 16pieces M20 cl. 8.8 galvanized.
  - Resin for anchoring and sufficient drills included.
- 
- 48 off silencers 2 in 1 rectangle 3000\*1500mm length 10m.  
S235Jr 6mm, acoustical e-glass filling.  
CE marking EN 13084-7  
Nameplate with identification, CE marking, Tag no. etc.  
All flanges as per DIN 86044.
  - 95 off ducts and Y pieces D 600mm 16MO3 length as per dwg.
  - 95 fixed point constructions hanging support with our Axces system.
  - Included each duct 2 \* CEMS 3' socket with cap.



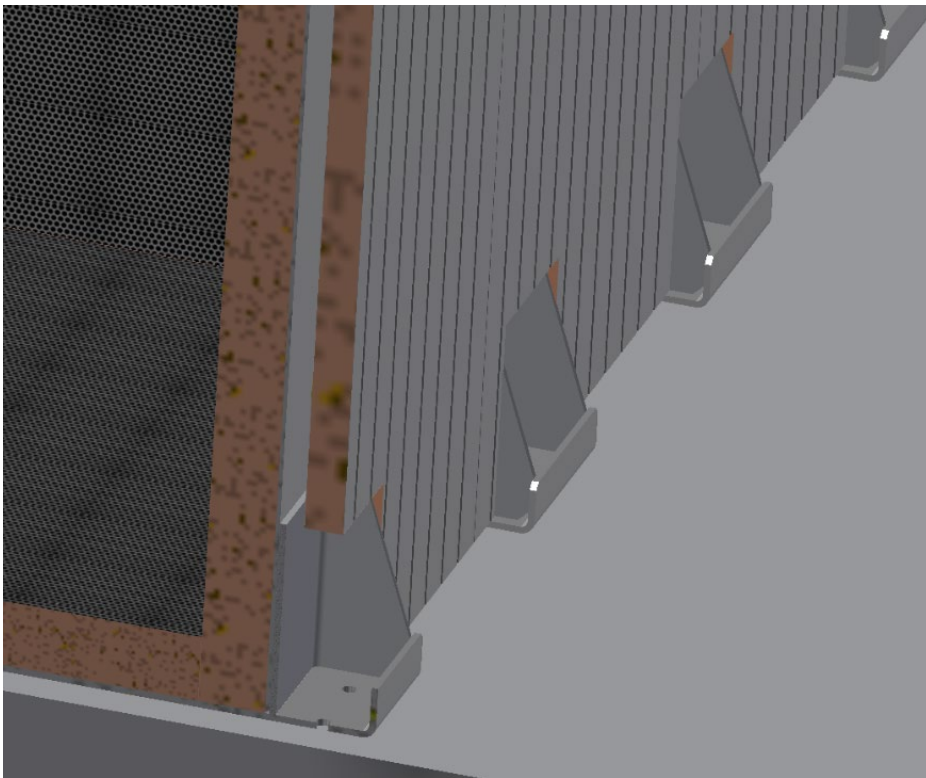
- 95 off flexible compensator welded on the pipe.
- Bolts nuts washers, gaskets for T =600C.
- 2 earthing connections each silencer.
- Top transition square -> round 6mm S235Jr.
- Outside blasting + Baril painting.
  
- Silencers covered with acoustical panel cladding on the mast structures.
- Thickness 60mm.
  
- 48 off chimney silencer diameter 1.5m Length 10m.
  
- Made from length segmented folded plates 5mm.
  
- Internally acoustical e-glass covered with carbon steel perforated plates.
- All flanges to be DIN 86044.  
Blasting SA 2.5 outside.
  
- CE marking EN 13084-7 or UK CA marking depending on delivery time.
  
- 2 layer C5 painting in RAL outside.
- Lifting trunnions on all parts.
- Transport support frames.
- Mounting and erection description in 3d.
- MDR docs, Declaration of performance, manufacturing data book.
- 

COLOR GROUP 1	COLOR GROUP 2	COLOR GROUP 3*
MC 9002 grey white	MC 6011 reeda green	MC 6020 chrome green
MC 7035 light grey	MC 9006 white aluminum	MC 6005 moss green
MC 1015 light ivory	MC 9007 grey aluminum	MC 7016 anthracite grey
MC 9010 pure white	aluzinc	MC 5010 gentian blue
	MC 7037 dusty grey	MC 8004 copper brown
		MC 8011 nut brown
		MC 8012 red brown
		MC 3000 flame red
		MC 3009 oede red

Matecno colours are oriented on RAL colours. Variations in colour may occur due to the printing process. Coloured steel samples are available for precise matching. It is recommended to check availability of colours and coating systems with sales department prior to order. Design of inner surfaces may vary with the product itself (see product data sheets).







Indication on the 8 supports of the silencer.  
All resin anchors can be drilled during installation.

#### 8) Not in our scope of supply:

- Parts not mentioned in the scope of supply.
- Optional mentioned parts.
- Measure equipment.
- Civil engineering / calculations.
- NDT testing, leakage testing.
- Roofcravats and raincollars.
- Thermal insulation on the duct in the building, we advise insulation matrasses.
- Thermal insulation on the ducts outside the building.
- Insulation matrasses to cover the compensators.

#### 9) General notes:

The silencer and chimney will be built according to Axces standards and Eurocode, we prepare drawings complete with parts list, dimension indications welding details and assembly notes.

# Noise Management Plan

## Site details

Site name: THURROCK PEAKING PLANT

Site address: .....

Operator name: .....

Permit number: .....

## Who this plan is for

This plan is for the operators of the THURROCK PEAKING PLANT

## Document owner

Document author: Peter Barling

Version number: 01

## List of revisions

Revision number	Revision authorised by	Date submitted to Environment Agency	Revision owner
01	-	-	-





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# Appendix E: Noise Management Plan

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# 1. Introduction

The Acoustics Team at Savills has been appointed by Thurrock Power Limited to prepare of a 'noise management plan' (NMP) as part of the 'Environmental Permit' (EP) application for a power generation facility (gas engines with associated plant).

## 1.1 Site description

The facility will be constructed on land to the north of Tilbury substation and southwest of Station Road in Thurrock, Essex. The site is in a rural area.

2 Whilst the facility will potentially operate on a 24/7 basis, it is envisaged to primarily only operate during peak periods of electricity demand or to prevent system instability. This would most typically be for a period ranging from one to seven hours per day, between 08:00 and 20:00 hours. However, there is the potential that the facility could be required to operate during a major power shortage or system stress events (e.g. a Notification of Inadequate System Margin) at any time of the day or night. It should be noted that the likelihood of the facility being required to start up at night is extremely low as peak electricity demand does not occur overnight.

Based on operational experience of other similar facilities, for only around 88 hours of the night-time period (23:00 to 07:00 hours) over a year, would the facility operate, i.e. 3% of the night-time period on average.

## 1.2 Maintenance and review of the NMP

- The facility manager or nominated person is responsible for the NMP and ensuring people.
- The plan stored is in the facility manager's office or nominated person's office.
- The plan is reviewed yearly, or when a substantive noise complaint has been received.
- No specific staff training is required for this NMP.
- The facility manager or nominated person will maintain records of complaints and associated investigations due to noise on site.
- The facility manager or nominated person is responsible for carrying out noise monitoring, if required, and acting on the results of this monitoring.

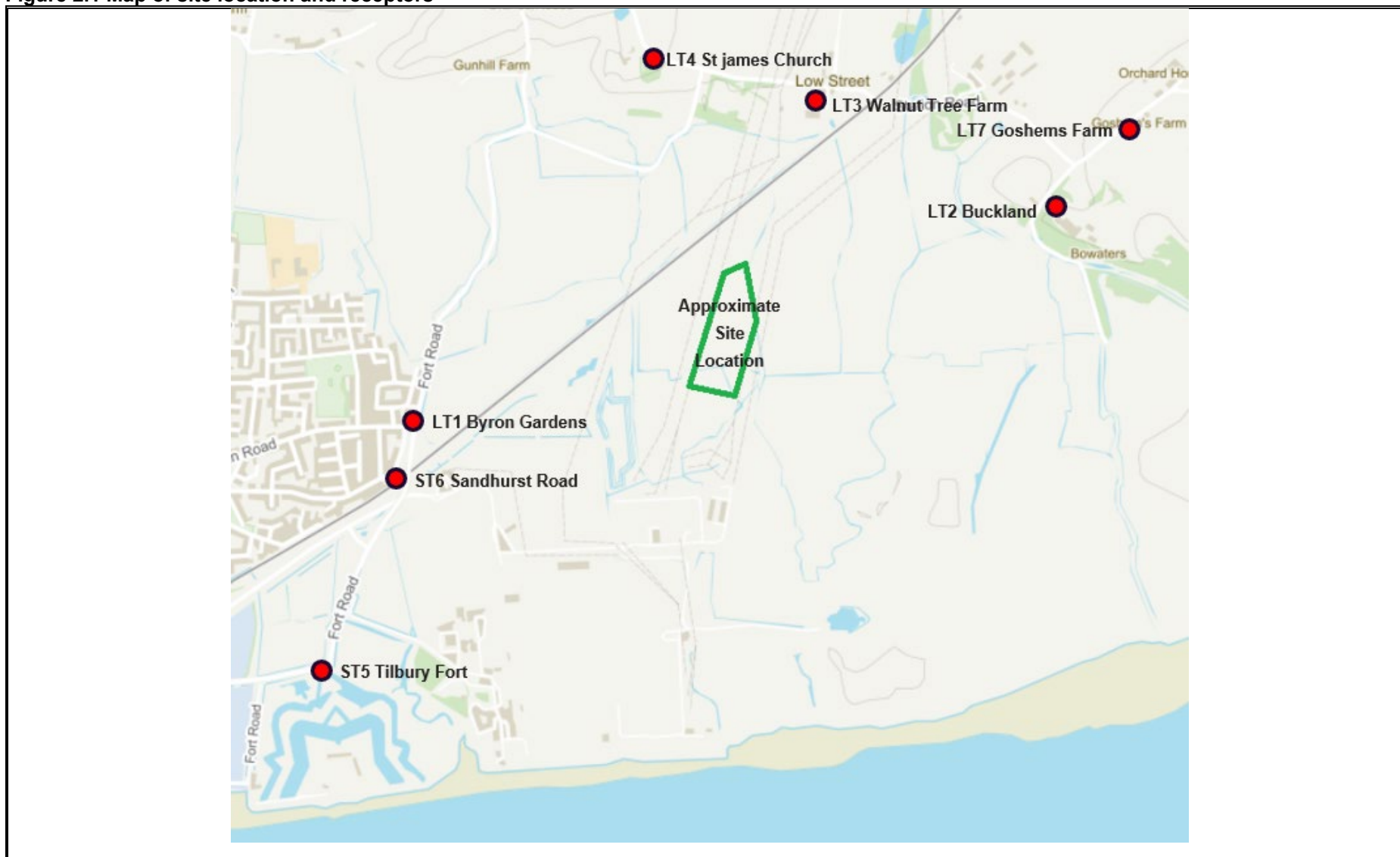
## 2. Receptors

### 2.1. Receptor List

*Table 2.1. Receptor list*

Receptor reference	Land use e.g. house, school, hospital, commercial	Direction from site (north, south, east, west)	Approximate distance to site boundary (m)
01 Byron Gardens	residential	South west	1,500
02 Gun Hill Farm	residential	north	1,000
03 Galsworthy Road	residential	west	1,500
04 Havers Lodge	residential	North	450
05 Buckland	residential	East	820
06 St James' Church	residential	North	820

Figure 2.1 Map of site location and receptors



## 3. Noise sources and processes

### 3.1 Noise impact assessment (NIA) conclusion

- state the overall conclusion of the noise impact assessment (low / below adverse / adverse / significant adverse impact) and the location at which this impact occurs.
- describe any important contextual points
- state which sound sources on site are dominant at nearby receptors

Maximum Rating Levels at NSR locations, i.e. when the facility is producing maximum power, would be up to 4, 8 and 10 dB above the representative background sound level during the daytime, evening and night-time periods, respectively.

However, due to low Rating Levels and resultant ambient sound levels not noticeably changing or being of a magnitude likely to increase the risk for annoyance in external amenity areas or cause sleep disturbance, it is considered that significant adverse impacts would not occur.

Furthermore, the risk for adverse impact during night-time period for is significantly reduced as for only 88 hours of the night-time period (23:00 to 07:00 hours) over the course of a year, would the facility likely be operational i.e. 3% of the night-time period on average. Also, Rating Levels would often be lower than considered, reflecting the reduced power demand.

Consequently, when considering the operation of the facility over the entire year period, the resulting site noise impact would be no greater than adverse, i.e. significant impacts/effects avoided at all NSRs for all time periods, as summarised in Table 3.1 below.

On the basis that significant adverse impacts would be avoided, and adverse impacts minimised (through the application of noise control methods/techniques detailed in Section 7) the proposed development would comply with the 'Noise Policy Statement for England' (NPSE), which sets out the long term overarching vision of Government noise policy.

The noise assessment completed has been based on the facility operating at 100% capacity. No unusual scenarios are anticipated. If any accident, or breakdown occurs resulting in increased noise emissions this will be rectified as soon as reasonably practicable.

Due to the nature of the facility, noise emissions are fixed and outside the control of any individual on a short-term basis. As such no controls or management practices are required in this instance.

**Table 3.1. Overall Site Noise Impact**

NSR	Overall: Site Noise Impact		
	Daytime	Evening	Night-time
Byron Gardens	Negligible	Adverse	Adverse
Gun Hill Farm	Negligible	Minor	Negligible
Galsworthy Road	Negligible	Minor	Adverse
Havers Lodge	Minor	Adverse	Adverse
Buckland	Negligible	Minor	Negligible
St James' Church	Negligible	Adverse	Negligible

### 3.2 Noise sources

**Table 3.2 Description of noise emitting processes**

Noise source	Sound power level (dBA)	Sound pressure level (dBA)	Measurement distance (m)	Operational conditions	Additional comments
Gensets	126	-	-		In concrete enclosures 112 dB L <sub>pAI</sub>
Radiators	90	-	-		On enclosure roof
Ventilation Air Intake Modules	86	-	-		Attenuated systems

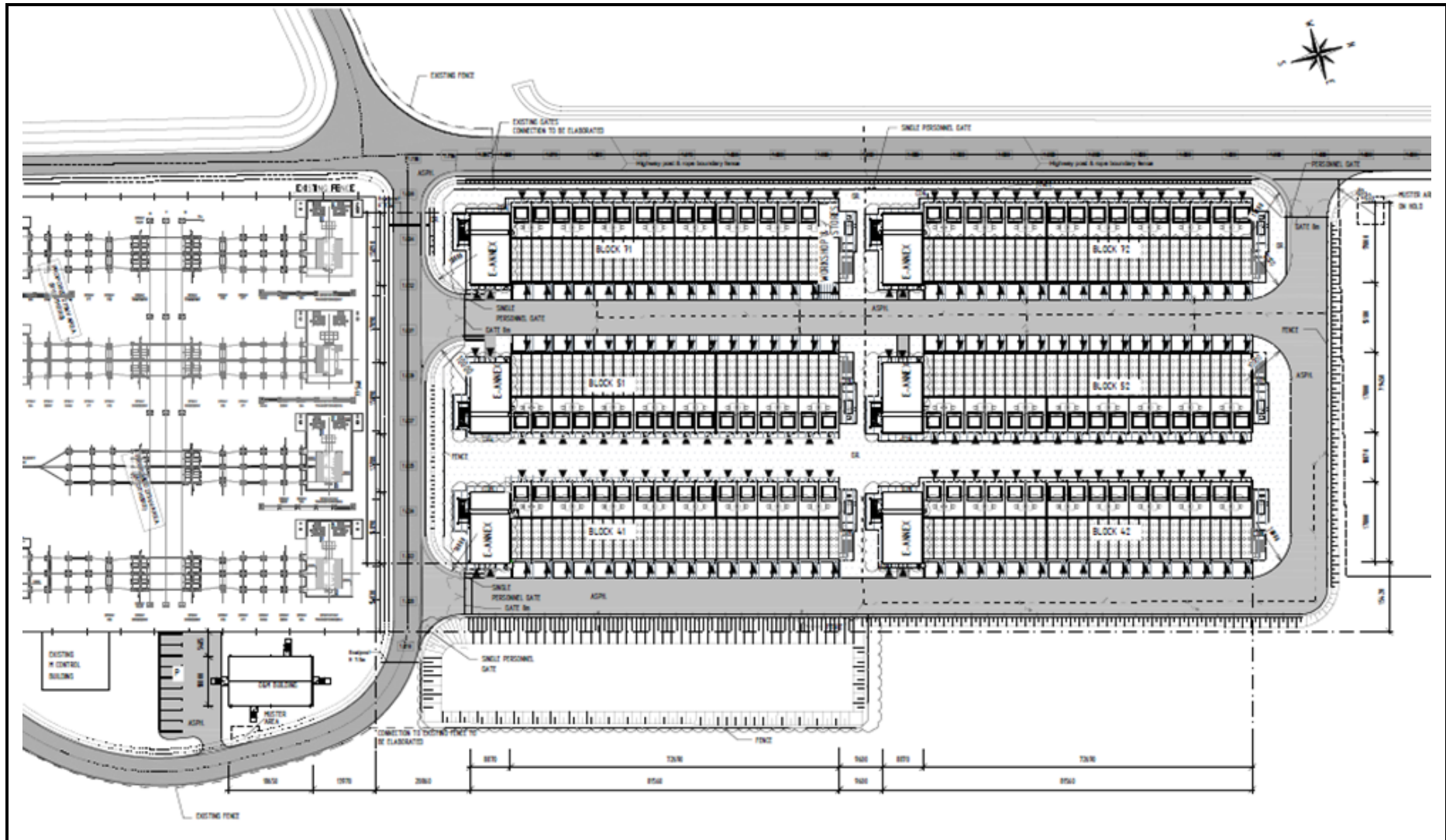
Noise source	Sound power level (dBA)	Sound pressure level (dBA)	Measurement distance (m)	Operational conditions	Additional comments
Air Outlet Attenuators	89	-	-		Attenuated systems
Exhaust Stacks	84	-	-		Silenced @ 20 m AGL
Gas Pressure Regulator Skid	93	-	-		
Transformers	85	-	-		

### 3.3 Overview of noise processes and emissions

When required the gas fired gensets, enclosed in concrete enclosures will begin to generate electricity. Exhaust will be to atmosphere via the silenced stacks. The enclosures are ventilated with air intake and air outlet attenuators. Radiators are mounted on the enclosure roof which provide cooling.



Figure 3.3 – Site plan showing locations of noise emitting processes, with routes shown of mobile noise emitting sources



## 4. Control measures and process monitoring

### 4.1 Appropriate measures / Best available techniques (BAT)

*Table 4.1 Actions and procedures which will be in place to achieve appropriate measures / best available techniques (BAT)*

<b>Activity which produces noise</b>	<b>Operational Hours / days</b>	<b>Control measures (Appropriate Measure / BAT)</b>	<b>Contribution to overall impact</b>	<b>Action taken if outside optimum process parameters</b>
Gensets	Potentially 24/7	Concrete enclosures	Medium	Investigate reasons for elevated sound levels.
Radiators	Potentially 24/7	Low noise radiators	Medium	Investigate reasons for elevated sound levels.
Ventilation Air Intake Modules	Potentially 24/7	Attenuated modules	Medium	Investigate reasons for elevated sound levels.
Air Outlet Attenuators	Potentially 24/7	Attenuated modules	Medium	Investigate reasons for elevated sound levels.
Exhaust Stacks	Potentially 24/7	Silenced	Medium	Investigate reasons for elevated sound levels.
Gas Pressure Regulator Skid	Potentially 24/7	-	Low	Investigate reasons for elevated sound levels.
Transformers	Potentially 24/7	-	Low	Investigate reasons for elevated sound levels.

## 4.2 Onsite monitoring procedures

*Table 4.2 Description of onsite processes which will ensure impacts do not increase on site.*

Description of procedure	Procedure	When will this be carried out?	Corrective action
Subjective impressions	Monthly subjective noise testing	Monthly	If a problem arises, resulting in increased noise emissions, this will be investigated by the facility manager or nominated person and rectified as soon as reasonably practicable. Increased noise emissions will be indicative of a fault or similar with the system, potentially with health and safety risks, that will need to be remedied to ensure safe operations.

## 4.3 Monitoring off site sound levels

On the basis that the resulting site noise impact would be no greater than adverse, at all NSRs for all time periods, and that noise emissions will not vary due to any change in activity or similar, no routine monitoring is proposed.

## 5. Complaints reporting

In the event that a noise complaint is received, this will be logged and investigated by the by the facility manager or nominated person. This will be logged in a specific noise complaint document.

Complaints could be received via email or telephone, details will be on the facility boundary

Upon receipt of the complaint the this will be investigated by the facility manager or nominated person and rectified as soon as reasonably practicable. Increased noise emissions will be indicative of a fault or similar with the system, potentially with health and safety risks, that will need to be remedied to ensure safe operations. Any remedial action taken will be logged in the specific noise complaint document.

It is likely that if noise levels have increased this will indicate an issue with the facility, other than just noise related, so this will be rectified promptly. However, if this does not solve the issue off site observation and monitoring, if required, will be undertaken by a competent person. Any monitoring will be logged in the specific noise complaint document.

If deemed necessary, i.e. serious issue, or one that cannot be remedied within 4-weeks the EA will be notified and logged in the specific noise complaint document.

Following the remedial works feedback will be sought from the complainant and logged, and the EA notified if necessary.