RELOCATION OF SHA TIN SEWAGE TREATMENT WORKS TO CAVERNS UNDER ENVIRONMENTAL PERMIT NO. EP-533/2017/A

COMMISSIONING TEST REPORT

FOR AIR PURIFICATION SYSTEM INSTALLED AT AIR SENSITIVE RECEIVERS

SUBMITTED BY:

Drainage Services Department
(as the permit holder of the captioned EP)

DATE:

27 May 2023

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Executive Summary

i. A Commissioning Test Report (CTR), detailing the commissioning test procedures and results; the effectiveness of the air purification system (APS); and the recommendation on the number of APS required at each air sensitive receiver (ASR) and other necessary mitigation measures to be fully implemented, is prepared for submission before the commencement of rock crushing at Ngau Kok Wan, Tsing Yi as required under Condition 2.29 of EP-533/2017/A.

ii. Measurements of the air pollutant, nitrogen dioxide (NO2) in particular, with the APS installed at the ASRs, ASR52 and ASR55, for a duration of 24 hours were carried out on 19 to 20, 20 to 21 and 26 to 27 September 2022.

iii. The CTR presents the removal efficiency of the APS based on the results of the measurements at the ASRs. No rock crushing under the Project was undertaken during the measurements.

Commissioning Test

i. Commissioning tests in terms of measurement of NO2 concentration with the APS installed at the ASRs were carried out in accordance with Appendix 3.8E of the Environmental Review Report (ERR) submitted under the Application for Variation of Environmental Permit (Application No.: VEP-618/2022). Details of the ASRs and the acceptance criteria for APS are presented in ***Table I***.

Table I Details of Air Sensitive Receivers and Acceptance Criteria for APS

<table>
<tr><th rowspan="2">ASR</th><th rowspan="2">Location of ASR</th><th colspan="2">Acceptance Criteria</th></tr>
<tr><th>NO2 Removal Efficiency (%)</th><th>Measured Daily Average of Indoor NO2 Concentration (µg/m3)</th></tr>
<tr><td>ASR52 – North West Tsing Yi Interchange Maintenance Workshops</td><td>Workshop Office</td><td rowspan="4">60(1) or above</td><td rowspan="4">40 or below(2)</td></tr>
<tr><td rowspan="3">ASR55 – Lantau Link Visitor Centre, Viewing Platform & Model Train Shop</td><td>Lantau Link Visitor Centre</td></tr>
<tr><td>Nana Café</td></tr>
<tr><td>Model Train Shop</td></tr>
</table>

Notes:
(1) 60% is set from the assumption of the past performance in the available job reference and the anticipated fluctuations due to the possible measurement uncertainties.
(2) It is to cater for the situation where the initial concentration may be on the low side which is difficult to achieve the target removal efficiency.

1 Introduction

1.1 Background

1.1.1. Rock crushing and screening facilities at Nagu Kok Wan, Tsing Yi were proposed for handling the rocks which are anticipated to be excavated on a significant amount in terms of production during excavation works of tunnels, adits, shaft and caverns for the Project.

1.1.2. With respect to fact that the works area for the rock crushing and screening facilities is located outside the project footprint addressed in the approved EIA Report (Register No.: AEIAR-202/2016), an Environmental Review Report (ERR) was prepared to assess the relevant environmental impacts associated with the operation of the rock crushing and screening facilities, and recommend the corresponding environmental monitoring and audit as well as mitigation measures implementation for the application for Variation of Environmental Permit (EP) submitted on 19 July 2022 (Application No.: VEP-618/2022).

1.1.3. An amended EP (EP-533/2017/A) was issued on 11 August 2022 with a new condition (EP Condition 2.29) added, requiring that air purification system (APS) shall be installed at air sensitive receivers (ASR), ASR52 and ASR55, and relevant recommendations as per Appendix 3.8E of the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022) shall be implemented.

1.1.4. In accordance with Condition 2.29(i) of EP-533/2017/A, commissioning tests for the installed APS and submission of three hard copies and one electronic copy of the Commissioning Test Report (CTR), which shall be certified by the ET Leader and verified by the IEC, for deposit with the Director of Environmental Protection before the commencement of rock crushing. The CTR shall record details of the commissioning test procedures and results, demonstrate effectiveness of the APS, recommend the number of APS required at each air sensitive receiver, and recommend other necessary mitigation measures(s) for implementation.

1.2 Implementation Plan

1.2.1. The implementation plan shown in ***Table 1.1*** presents the details of the commissioning test, including the implementation status of APS, with reference to Appendix 3.8E of the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022).

Table 1.1 Implementation Plan

ASR	Location of ASR	Number of Portable Air Purifier	Proposed Air Purifier Model
ASR52 – North West Tsing Yi Interchange Maintenance Workshops	Workshop Office	2	EC920, RHT
	Total	2	
ASR55 – Lantau Link Visitor Centre, Viewing Platform & Model Train Shop	Lantau Link Visitor Centre	3 (for exhibition hall) 1 (for staff office)	EC920, RHT BM150, b-MOLA
	Nana Café	1	EC920, RHT
	Model Train Shop	3	EC920, RHT
	Total	8	

1.3 Commissioning Test

1.3.1. Commissioning tests will be carried out in accordance with the measurement method as described in Appendix 3.8E of the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022) which is extracted below:

(i) Measure the ambient NO2 concentration at indoor and outdoor simultaneously at the ASRs.

(ii) Measure hourly NO2 concentration in 24 hours to capture daily fluctuation on the measurement day.

(iii) Compare the NO2 concentration at indoor and outdoor, and determine the effectiveness of the APS.

(iv) Measurement duration: 1 day.

1.3.2. The effectiveness of the APS will be determined by calculation based on the removal efficiency against the acceptance criteria as described in Appendix 3.8E of the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022) which is extracted below:

(i) Calculate the NO2 removal efficiency by the following equation:

Removal efficiency (%) = (Outdoor NO2 – Indoor NO2) / Outdoor NO2 x 100%*

*The Outdoor and Indoor NO2 concentrations are referred to the daily average of the 24-hour NO2 readings on the measurement day.

(ii) Compare the measured daily average of Indoor NO2 concentration against the absolute value of 40 μg/m3.

(iii) Compare the calculated NO2 removal efficiency/ measured daily average of Indoor NO2 concentration against the criterion presented in Table I, where appropriate.

(iv) Deploy additional APS and repeat the measurement method until the acceptance criterion is met.

1.4 Performance Test

1.4.1 Monthly performance tests will be carried out in accordance with the measurement method as described in Appendix 3.8E of the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022) which is extracted below:

(i) Measure the ambient NO2 concentration at indoor and outdoor simultaneously at the ASRs.

(ii) Measure hourly NO2 concentration in 24 hours to capture daily fluctuation on the measurement day.

(iii) Compare the NO2 concentration at indoor and outdoor, and determine the effectiveness of the APS.

(iv) Measurement duration: 1 day.

1.4.2 The performance of the APS will be evaluated by calculation based on the removal efficiency against the acceptance criteria as described in Appendix 3.8E of the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022)

which is extracted below:

(i) Calculate the NO2 removal efficiency by the following equation:

Removal efficiency (%) = (Outdoor NO2 – Indoor NO2) / Outdoor NO2 x 100% *

* The Outdoor and Indoor NO2 concentrations are referred to the daily average of the 24-hour NO2 readings on the measurement day.

(ii) Compare the measured daily average of Indoor NO2 concentration against the absolute value of 40 μg/m^3.

(iii) Compare the calculated NO2 removal efficiency/ measured daily average of Indoor NO2 concentration against the criterion presented in ***Table I***, where appropriate.

(iv) Actions to be taken if non-compliance is recorded:

a. Check, clean, maintain or replace the filter(s); or

b. Replace the faulty Air Purifier by spare unit(s); and

c. Repeat the performance test until the acceptance criterion is met.

(v) Report the results in the EM&A Programme required in the EM&A Manual in the following month of the test in accordance with Condition 2.29 (ii) of EP-533/2017/A.

1.5 Maintenance and Contingency Plan

1.5.1 Maintenance and contingency plan described in Appendix 3.8E of the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022) which is extracted below:

(i) If the NO2 removal efficiency of the Air Purifier is lower than 60% after the ad-hoc maintenance work for any malfunction of the equipment or regular maintenance work by replacement of filters, another Air Purifier shall be deployed for treatment of air pollutants.

(ii) 1 no. spare unit is ready for immediate replacement of malfunctioned Air Purifier upon notification.

(iii) Regular maintenance schedule: The HEPA filter shall be replaced every six months while the NCCO filter shall be replaced every three years under normal operational conditions insider the premises.

1.5.2 The responsibilities of relevant parties presented in ***Table 1.2*** as per Appendix 3.8E of the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022):

Table 1.2 Responsibilities Matrix

Actions	**Responsible Parties**
Implementation Plan	The Contractor (Contract No. DC/2020/05)
Commissioning Test Plan	The Environmental Team (*for measurement*)
Performance Test Plan	The Contractor (Contract No. DC/2020/05) (*for follow- up actions*)
Maintenance and Contingency Plan	The Contractor (Contract No. DC/2020/05)

2 Measurement and Results

2.1 Measurement Date and Location

2.1.1 NO_2 measurements were carried out for a duration of 24 hours at Model Train Shop (ASR55), Lantau Link Visitor Centre (ASR55), Nana Café (ASR55) and Workshop Office (ASR52) on the dates presented in ***Table 2.1***. The locations of ASRs are shown in ***Figure 1*** and the APS settings at ASRs are presented in ***Appendix C***. Specifications of instruments for NO_2 measurements are presented in ***Appendix D***.

2.2 Results

2.2.1 The measurement results are presented in ***Appendix A***. Based on the measurement results, the calculated NO_2 removal efficiency and the measured daily average of Indoor and Outdoor NO_2 concentrations are presented in ***Table 2.1*** below.

Table 2.1 Measurement Results

ASR	Location	Date of Measurement	Measured Daily Average of Indoor NO2 Conc. (µg/m3)	Measured Daily Average of Outdoor NO2 Conc. (µg/m3)	NO2 Removal Efficiency (%)
ASR52 – North West Tsing Yi Interchange Maintenance Workshops	Workshop Office	26-27/09/2022	20.2	24.3	16.9
ASR55 – Lantau Link Visitor Centre, Viewing Platform & Model Train Shop	Lantau Link Visitor Centre	20-21/09/2022	12.6	27.5	54.3
	Nana Café	26-27/09/2022	20.5	21.8	5.78
	Model Train Shop	19-20/09/2022	6.45	46.2	86.1

2.2.2 Based on the results presented in ***Table 2.1***, it was noticed that the measured daily average of indoor NO_2 concentrations at all ASRs were below 40 $\mu g/m^3$ (i.e. the absolute value) despite the outdoor NO_2 concentrations were fluctuated during the measurement periods with occasions over 40 $\mu g/m^3$ in terms of hourly of indoor NO_2 concentrations encountered (see ***Appendix A***). Moreover, it was realised that NO_2 could be effectively removed by the deployment of APS as referred to the values of indoor and outdoor NO_2 concentrations for the ASRs even the removal efficiencies deviated among all ASRs, ranging 5.78 to 86.1%, and the criterion in terms of NO_2 removal efficiency would be considered applicable in the event of the ambient NO_2 concentration was at high level.

2.2.3 Given NO_2 measurements were carried out at the ASRs on different measurement dates as well as the surrounding settings (e.g. infrastructures, near-by building units, topography, etc.) and the meteorological situation on the measurement dates (see ***Appendix B***), the measured daily average of Outdoor NO_2 concentrations reflected the ambient air quality throughout the measurement periods in the vicinity, especially for Lantau Link Visitor Centre - ASR55, Nana Café - ASR55 and Workshop Office - ASR52, ranging 21.8 to 27.5 $\mu g/m^3$ (see ***Appendix A***) which is well below 40 $\mu g/m^3$. It is understood that NO_2 removal efficiency will be improved if more units of APS are deployed at ASRs based on the NO_2 removal efficiencies for Lantau Link Visitor Centre - ASR55, Nana Café - ASR55 and Workshop Office - ASR52 as compared to the corresponding numbers of APS deployed at these ASRs. However, the APS performance in terms of NO_2 removal efficiency varies when APS is in operation

under different conditions and environment (e.g. room size, fresh air change rate, etc.) at the ASRs as identified in the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022).

2.2.4 It was, therefore, suggested that the number of APS required at each ASR would be in accordance with that recommended in the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022) as far as practicable with the number of unit(s) of APS to be installed taken into account, especially for the APS with relatively low removal efficiency, subject to the unexpected constraints (e.g. permission(s) for installation granted by the premises owner(s), etc.) in order to achieve the desired outcomes (i.e. i) measured daily average of indoor NO2 concentration at 40 $\mu g/m^3$ or below; and ii) removal efficiency of 60% or above), and the details of the recommended installation of APS at each ASR are presented in ***Table 2.2***. In addition, performance test shall also be carried out in the event of relatively high level of ambient NO2 concentration in order to keep track of the APS installed being capable of improving the air quality in the vicinity, and it will be carried out in accordance with the requirements as described in ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022) on a monthly basis.

Table 2.2 Recommended Installation of APS at ASR

ASR	Location	Number of Portable Air Purifier	Proposed Air Purifier Model
ASR52 – North West Tsing Yi Interchange Maintenance Workshops	Workshop Office	2	EC920, RHT
ASR55 – Lantau Link Visitor Centre, Viewing Platform & Model Train Shop	Lantau Link Visitor Centre	3 (for exhibition hall) 1 (for staff office)	EC920, RHT BM150, b-MOLA
	Nana Café	1	EC920, RHT
	Model Train Shop	3	EC920, RHT

2.2.5 With the implementation of off-site mitigation measure (i.e. installation of APS at ASRs) which is considered satisfactory based on the commissioning test results, no other mitigation measures were recommended. Nevertheless, good site practices as described in the ERR submitted under the application for Variation of EP (Application No.: VEP-618/2022) for minimisation of air quality impacts arising from rock crushing and screening facilities shall be implemented:

(i) Adequate training will be given to the personnel for inspection and maintenance of all the air pollution control equipment. This includes the standard operation and maintenance procedures to be carried out by the operation staff to keep all the air pollution control equipment in good operating condition.

(ii) Loading, unloading, handling and storage of raw materials, products, wastes or by- products should be carried out in an acceptable manner so as to minimize dust emission impact on the surrounding environment.

(iii) All sprinkler system used for dust suppression shall be maintained in good condition during operation. The flow rate and operating pressure of the spraying liquid/solution shall be sufficient to suppress dust emission from the corresponding sources. The sprinkler system shall be able to cover the areas of emission points concerned.

(iv) Air pollution control equipment, such as dust collector, shall be maintained in good operation condition and put into use whenever the relevant plant served by the air control equipment is in operation.

(v) The dust extraction and collection system shall be routinely inspected at least once per month. This system shall be maintained in good condition during production. Collected dust will be returned to process stream or disposed of without generating any fugitive dust.

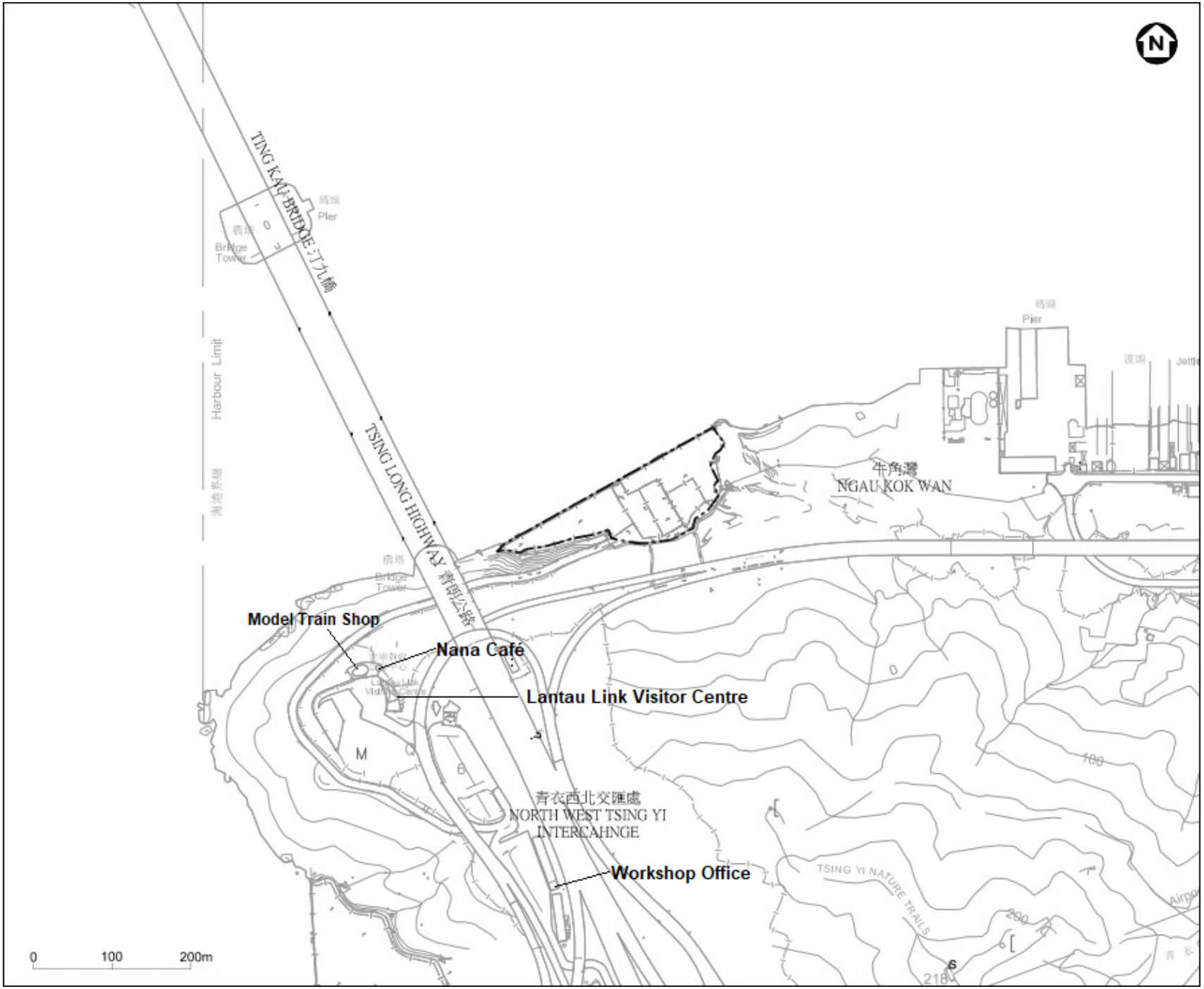
(vi) The maintenance, repair, or general cleaning of the plant facilities and vehicle within the site boundary shall be carried out in such a manner that the emission of fugitive dust is minimized.

(vii) The plant operator shall take all practical measures to minimize dust emissions which may be caused by handling the muddy waste generated from the plant operation. No accumulation and dumping of such waste are allowed in open area.

(viii) Malfunction or breakdown of equipment leading to abnormal emission shall be dealt with promptly. In any case, the abnormal emission due to equipment failure shall be stopped as soon as possible. Sufficient numbers of spare parts for air pollution control equipment shall be kept in stock to allow rapid repair of the equipment. Each fabric filter is inspected at least once per month.

Figure 1

Locations of Air Sensitive Receivers


TING KAU BRIDGE 汀九橋
TSING LONG HIGHWAY 青朗公路
Harbour Limit
Pier
Bridge Tower
牛角灣
NGAU KOK WAN
Model Train Shop
Nana Café
Lantau Link Visitor Centre
青衣西北交匯處
NORTH WEST TSING YI INTERCAHNGE
Workshop Office
TSING YI NATURE TRAILS
0
100
200m

Appendix A

Measurement Results

Location	Date and Time	Indoor NO_2 conc. ($\mu g/m^3$) [(1)]	Outdoor NO_2 conc. ($\mu g/m^3$) [(1)]	NO_2 Removal Efficiency (%)
Nana Café [(2)]	9/26/2022 16:00	47.6	53.9	5.78
	9/26/2022 17:00	39.6	43.8	
	9/26/2022 18:00	33.1	37.7	
	9/26/2022 19:00	27.4	28.3	
	9/26/2022 20:00	20.5	21.6	
	9/26/2022 21:00	17.0	18.2	
	9/26/2022 22:00	19.9	19.9	
	9/26/2022 23:00	18.6	20.3	
	9/27/2022 0:00	15.9	16.8	
	9/27/2022 1:00	8.0	7.5	
	9/27/2022 2:00	5.9	5.4	
	9/27/2022 3:00	5.7	4.4	
	9/27/2022 4:00	5.7	5.2	
	9/27/2022 5:00	9.2	9.8	
	9/27/2022 6:00	10.1	12.4	
	9/27/2022 7:00	18.7	22.0	
	9/27/2022 8:00	24.7	27.0	
	9/27/2022 9:00	27.9	31.2	
	9/27/2022 10:00	34.8	35.8	
	9/27/2022 11:00	24.7	19.7	
	9/27/2022 12:00	14.2	15.5	
	9/27/2022 13:00	14.9	15.5	
	9/27/2022 14:00	22.0	23.9	
	9/27/2022 15:00	26.8	27.5	
	24-hr average	20.5	21.8	

Notes:

(1) Conversion factor of 1.913 was applied for NO_2 from ppb to $\mu g/m^3$ at 20°C and at 1 atm.

(2) One unit of instrument was deployed for NO_2 measurements at indoor and outdoor each simultaneously.

Location	Date and Time	Indoor NO_2 conc. ($\mu g/m^3$) [(1)]	Outdoor NO_2 conc. ($\mu g/m^3$) [(1)]	NO_2 Removal Efficiency (%)
Model Train Shop [(2)]	9/19/2022 15:00	4.6	51.5	86.1
	9/19/2022 16:00	7.7	79.2	
	9/19/2022 17:00	8.8	84.4	
	9/19/2022 18:00	8.4	53.0	
	9/19/2022 19:00	8.4	71.2	
	9/19/2022 20:00	4.0	54.5	
	9/19/2022 21:00	8.0	86.9	
	9/19/2022 22:00	6.9	76.3	
	9/19/2022 23:00	8.6	79.0	
	9/20/2022 0:00	8.4	76.9	
	9/20/2022 1:00	7.5	53.4	
	9/20/2022 2:00	8.2	6.7	
	9/20/2022 3:00	7.5	9.6	
	9/20/2022 4:00	4.8	7.1	
	9/20/2022 5:00	5.5	8.0	
	9/20/2022 6:00	4.0	36.9	
	9/20/2022 7:00	4.0	39.8	
	9/20/2022 8:00	4.6	40.6	
	9/20/2022 9:00	5.0	45.0	
	9/20/2022 10:00	5.7	30.4	
	9/20/2022 11:00	7.1	29.1	
	9/20/2022 12:00	6.3	36.7	
	9/20/2022 13:00	5.2	32.7	
	9/20/2022 14:00	5.5	21.0	
	24-hr average	6.45	46.2	

Notes:

(1) Conversion factor of 1.913 was applied for NO_2 from ppb to $\mu g/m^3$ at 20°C and at 1 atm.

(2) One unit of instrument was deployed for NO_2 measurements at indoor and outdoor each simultaneously.

Location	Date and Time	Indoor NO_2 conc. ($\mu g/m^3$) [(1)]	Outdoor NO_2 conc. ($\mu g/m^3$) [(1)]	NO_2 Removal Efficiency (%)
Workshop Office [(2)]	9/26/2022 16:00	44.4	61.4	16.9
	9/26/2022 17:00	25.1	36.2	
	9/26/2022 18:00	19.3	32.5	
	9/26/2022 19:00	16.8	27.4	
	9/26/2022 20:00	12.4	20.3	
	9/26/2022 21:00	11.7	18.9	
	9/26/2022 22:00	11.1	16.6	
	9/26/2022 23:00	11.9	21.4	
	9/27/2022 0:00	12.8	16.5	
	9/27/2022 1:00	8.2	10.9	
	9/27/2022 2:00	8.6	10.5	
	9/27/2022 3:00	6.7	9.8	
	9/27/2022 4:00	8.0	9.9	
	9/27/2022 5:00	9.0	15.5	
	9/27/2022 6:00	13.2	17.4	
	9/27/2022 7:00	16.5	22.2	
	9/27/2022 8:00	21.0	27.5	
	9/27/2022 9:00	36.5	39.2	
	9/27/2022 10:00	35.8	31.0	
	9/27/2022 11:00	43.2	35.2	
	9/27/2022 12:00	21.6	19.3	
	9/27/2022 13:00	16.8	18.7	
	9/27/2022 14:00	40.6	31.4	
	9/27/2022 15:00	33.5	33.7	
	24-hr average	20.2	24.3	

Notes:

(1) Conversion factor of 1.913 was applied for NO_2 from ppb to $\mu g/m^3$ at 20°C and at 1 atm.

(2) One unit of instrument was deployed for NO_2 measurements at indoor and outdoor each simultaneously.

Location	Date and Time	Indoor NO_2 conc. ($\mu g/m^3$) [(1)]	Outdoor NO_2 conc. ($\mu g/m^3$) [(1)]	NO_2 Removal Efficiency (%)
Lantau Link Visitor Centre [(2)]	9/20/2022 16:00	13.6	37.7	54.3
	9/20/2022 17:00	19.5	49.5	
	9/20/2022 18:00	15.3	30.0	
	9/20/2022 19:00	12.1	28.3	
	9/20/2022 20:00	11.5	27.7	
	9/20/2022 21:00	12.8	26.0	
	9/20/2022 22:00	11.3	34.1	
	9/20/2022 23:00	14.5	29.3	
	9/21/2022 0:00	10.5	16.1	
	9/21/2022 1:00	8.2	11.3	
	9/21/2022 2:00	7.5	11.3	
	9/21/2022 3:00	6.7	9.4	
	9/21/2022 4:00	6.9	10.1	
	9/21/2022 5:00	7.8	29.5	
	9/21/2022 6:00	15.3	45.5	
	9/21/2022 7:00	14.7	49.5	
	9/21/2022 8:00	20.5	42.3	
	9/21/2022 9:00	15.3	31.2	
	9/21/2022 10:00	14.2	23.5	
	9/21/2022 11:00	14.3	24.5	
	9/21/2022 12:00	10.5	16.5	
	9/21/2022 13:00	12.1	26.0	
	9/21/2022 14:00	13.0	24.5	
	9/21/2022 15:00	14.0	26.8	
	24-hr average	12.6	27.5	

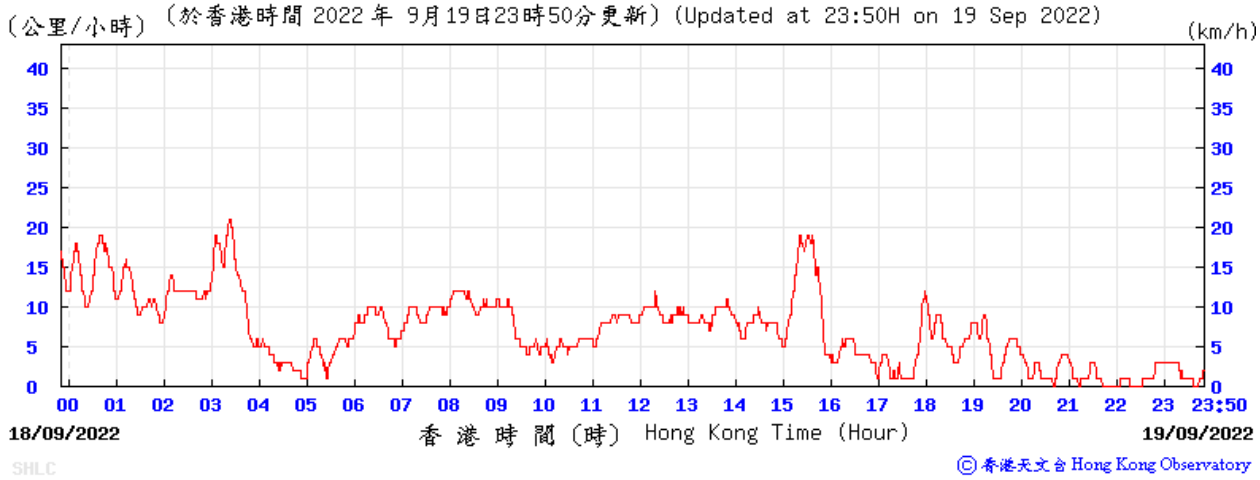
Notes:

(1) Conversion factor of 1.913 was applied for NO_2 from ppb to $\mu g/m^3$ at 20°C and at 1 atm.

(2) One unit of instrument was deployed for NO_2 measurements at indoor and outdoor each simultaneously.

Appendix B

Meteorological Data extracted from the Tsing Yi HKO Automatic Weather Station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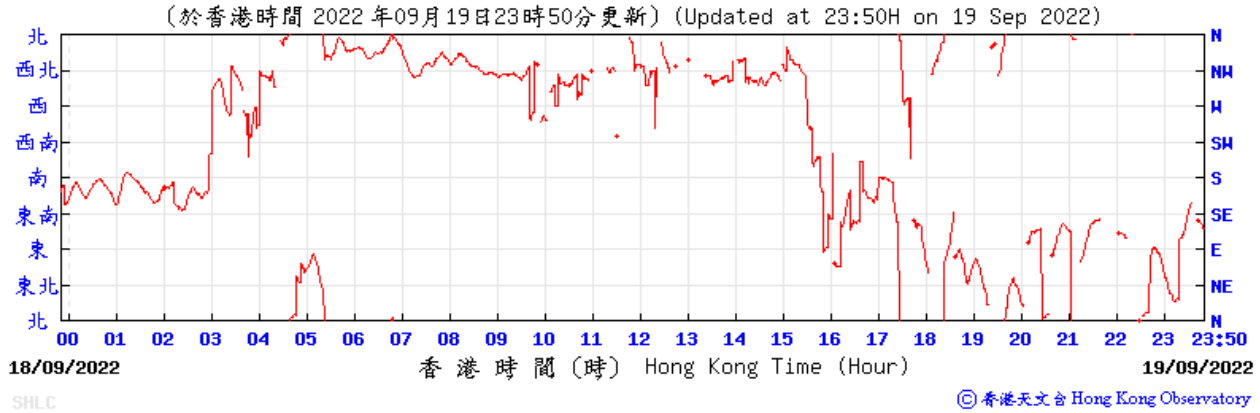
© 香港天文台 Hong Kong Observatory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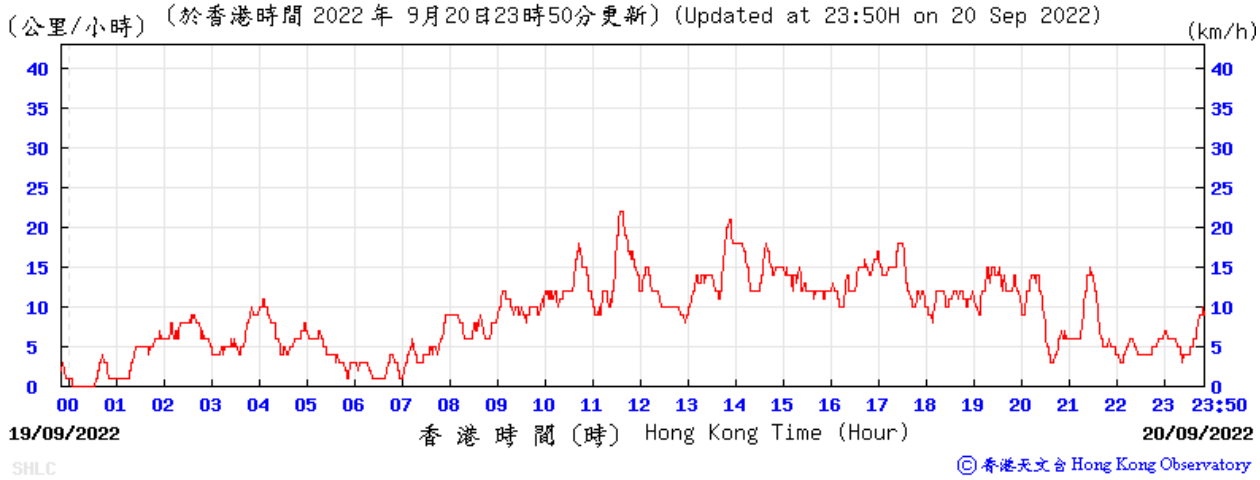
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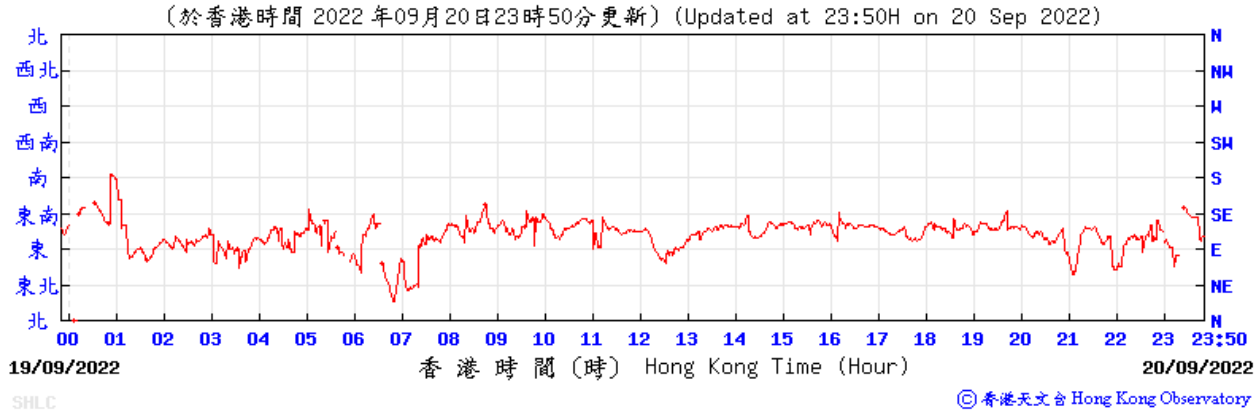
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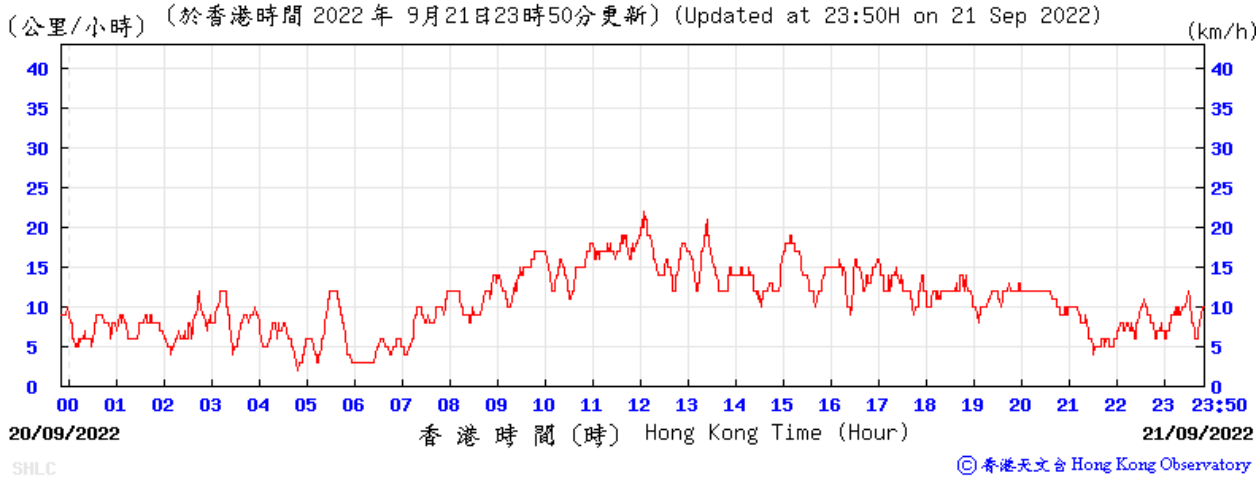
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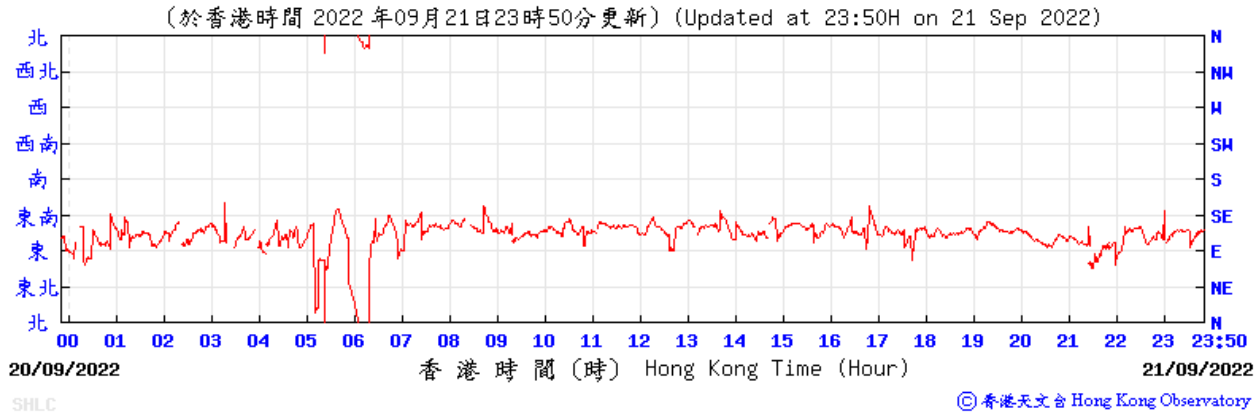
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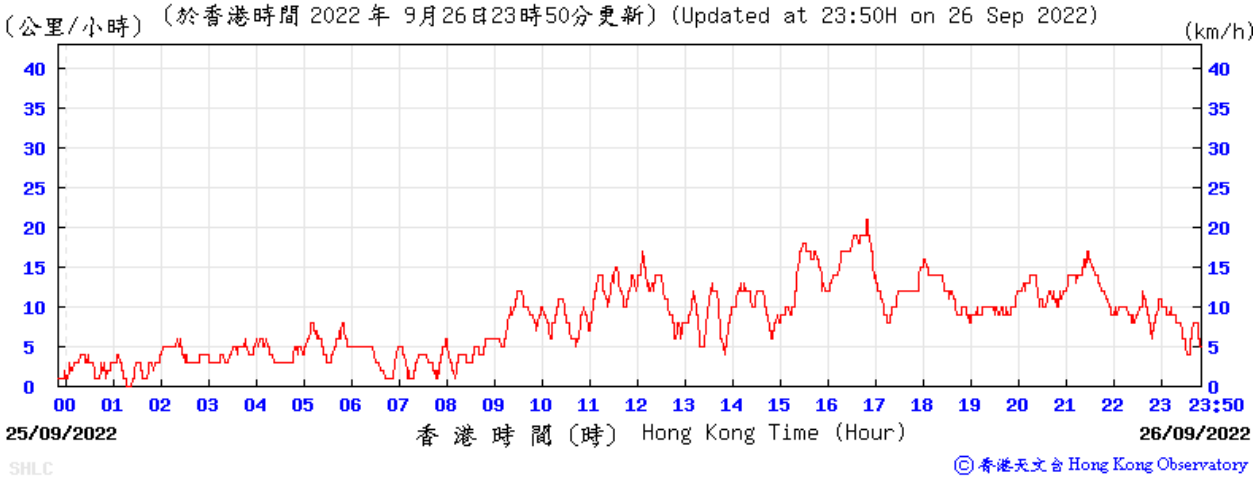
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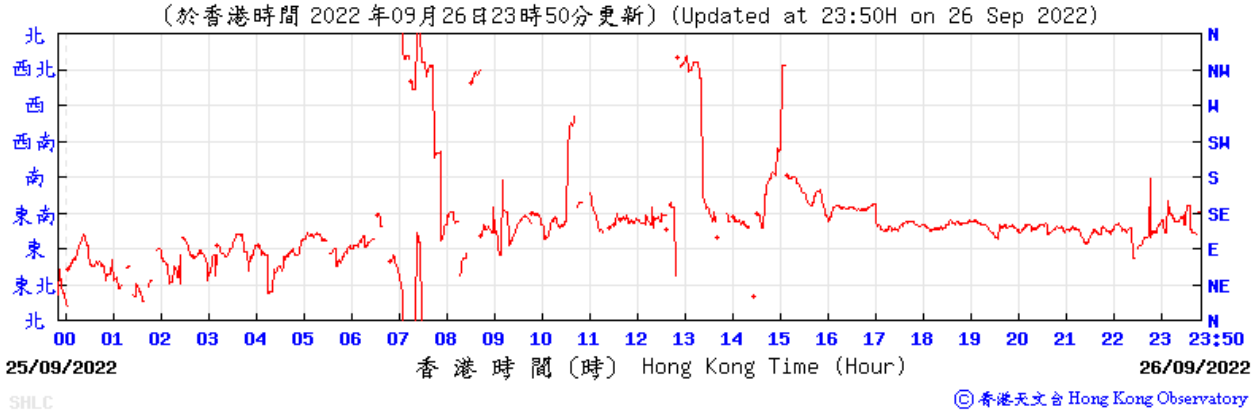
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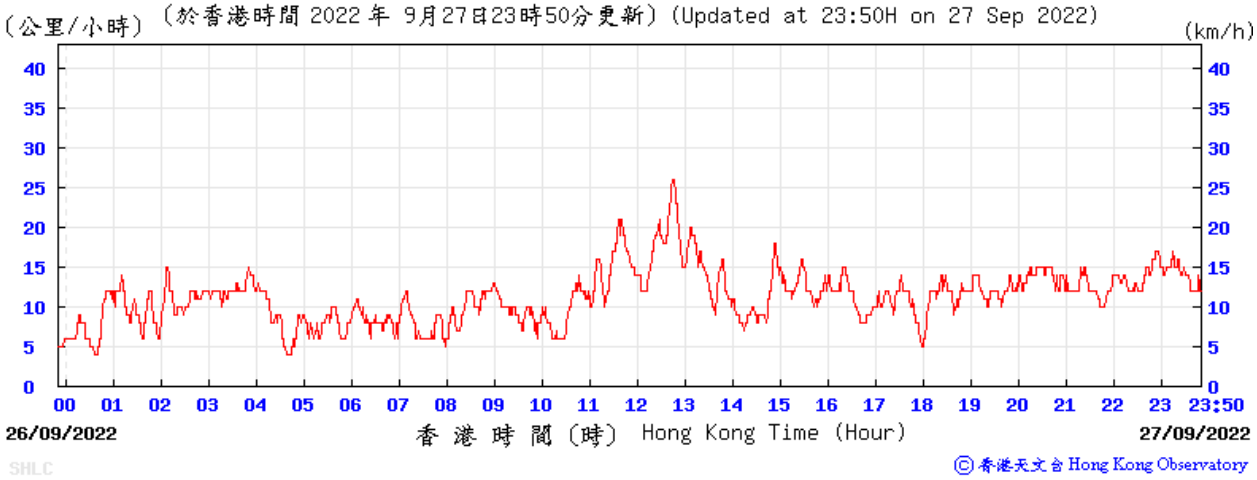
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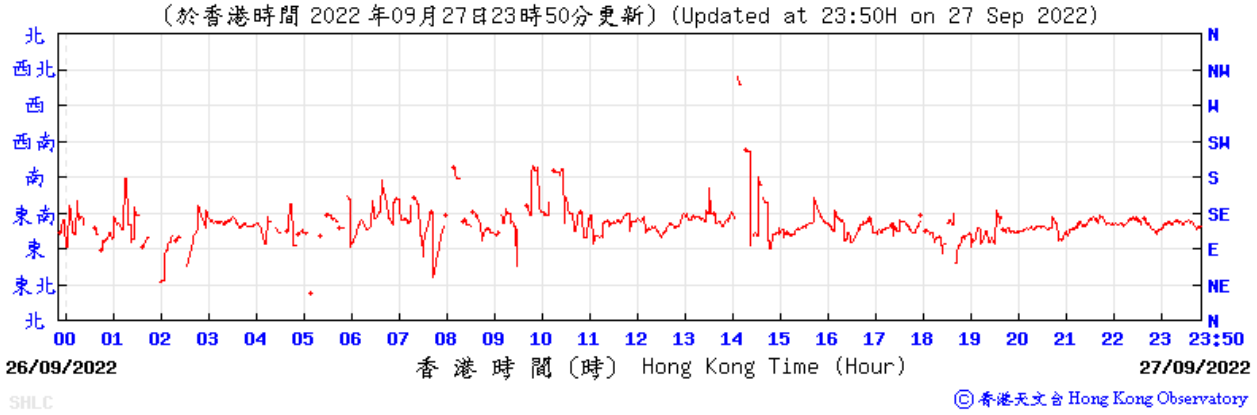
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Appendix C

Photo Records for NO_2 Measurements at Air Sensitive Receivers

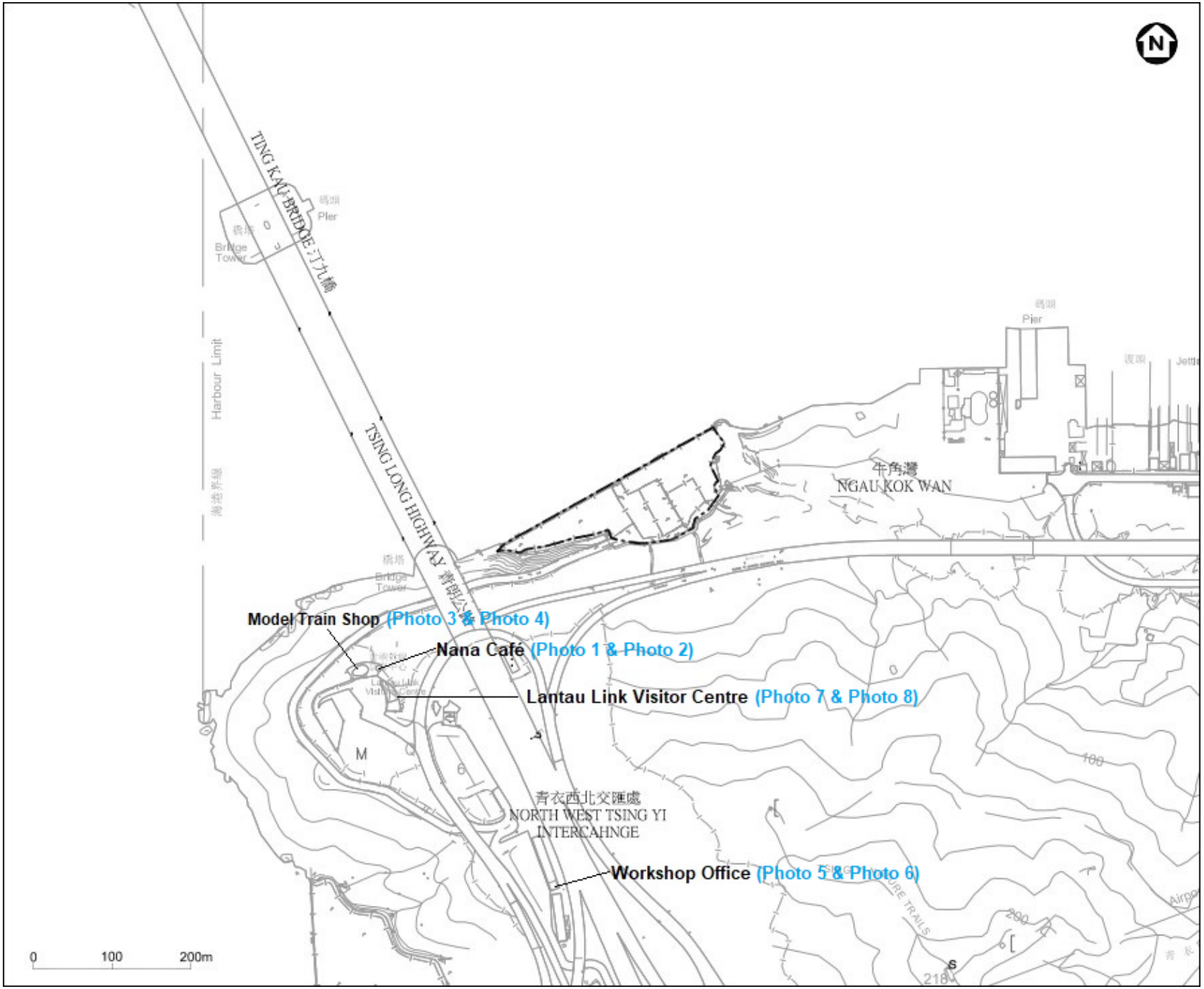

TING KAU BRIDGE 汀九橋
TSING LONG HIGHWAY 青朗公路
Harbour Limit
Pier
Bridge Tower
牛角灣
NGAU KOK WAN
Model Train Shop (Photo 3 & Photo 4)
Nana Café (Photo 1 & Photo 2)
Lantau Link Visitor Centre (Photo 7 & Photo 8)
青衣西北交匯處
NORTH WEST TSING YI INTERCAHNGE
Workshop Office (Photo 5 & Photo 6)
0
100
200m

	
Photo 1 - Indoor NO_2 was measured inside Nana Café	Photo 2 - Outdoor NO_2 was measured at the sitting-out area for Nana Café
	
Photo 3 - Indoor NO_2 was measured inside Model Train Shop	Photo 4 - Outdoor NO_2 was measured at the sitting-out area for Model Train Shop

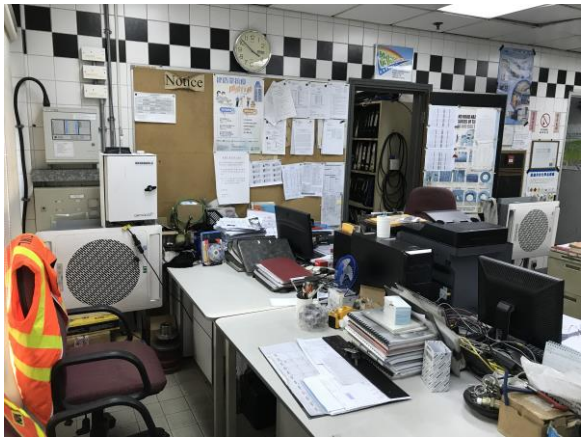


Photo 5 - Indoor NO_2 was measured inside Workshop Office	Photo 6 - Outdoor NO_2 was measured at the storage area for Workshop Office
	
Photo 7 - Indoor NO_2 was measured inside Lantau Link Visitor Centre	Photo 8 - Outdoor NO_2 was measured at the open area opposite to Lantau Link Visitor Centre

Appendix D

Specifications of Instruments for NO_2 Measurements

GENERAL INFORMATION

Instrument Type	AQS1
Serial Number	AQS1 17082022-2139

Aeroqual Connect

Version	V1.18.3	**OS Image**	V4.1.18.0
WiFi SSID	AQS1 17082022-2139	**Password**	Aeroqual
Default User	Administrator	**Password**	aqmadmin
Sensor List	AQS1 SensorList V8.10.2.aql		

Please contact Aeroqual for login and password to access your instrument on Aeroqual Cloud (http://cloud.aeroqual.com).

Instrument Configuration

Particle Channels	Gas Channels	Environmental Channels		Communication / Software
☐ TSP	☐ CO	☐ WS	☐ RAIN	☑ Connect
☐ PM 1	☑ NO2	☐ WD	☐ SOLAR	☑ Plus
☐ PM 2.5	☐ VOC	☐ AN1	☐ HAIL	☐ EXSACT
☐ PM 10		☐ AN2	☐ PRESS	☑ Modem
		☐ AN3	☐ AIR T	
		☐ Freq	☐ AIR RH	
			☐ LAT	
			☐ LON	
			☐ ALT	
			☐ Pyrano	
			☐ Leq	

Integrated Modules

Type	Serial No.	QC
EPC ARK1124C	KSA5379679	Pass
Teltonika RUT955 LTE 4G	1120966939	Pass

Type	Serial No.	QC
NO2 Module	AQM NO2 0 - 0.5ppm 2206091-003	Pass

For technical, maintenance and service information, please refer to AQS1 User Guide or contact Aeroqual for access to free online training (http://training.aeroqual.com).

PERFORMANCE REPORT

Gas Sensor Calibration Data

Sensor	Flow rate (SLPM)	Zero (ppm)	Span Gas (ppm)	Sensor reading (ppm)
NO2	0.060	0.000	0.185	0.185
Sample System Flow Rate	0.06			

Standards Used

Standard	Make	Serial Number	Calibration Due
GasCal 1100	Ecotech	09-1213	30-Mar-2023
T200 Nox Analyser	Teledyne API	5858	13-Jul-2023
Flowmeter	TSI	52002203004	12-Jan-2023

Activate Negative Number Filters on all gas and particulate channels: ***YES***

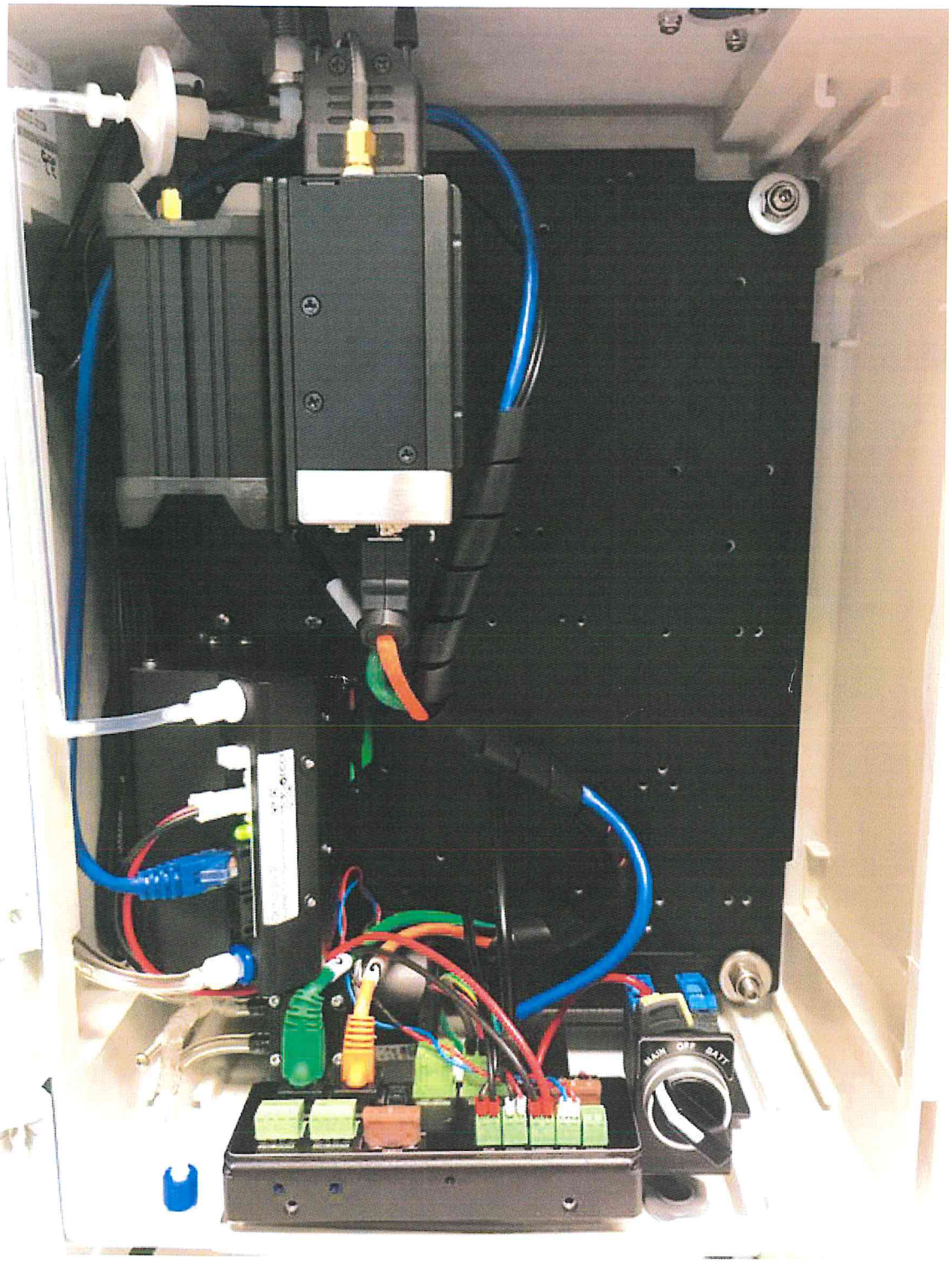
FACTORY MODULE SETTINGS

MODULE	VER	H0	H1	H2	H3	TIMA	TIMR	TEMA	TEMR	PWML	PWMH	HTR	GAIN		Gain	Offset
NO2	4.0.0	0.000	-245.725	1.000	5.000	30	30	0	0	1	0	3.00	1		0.989	0.000

Approvals

QC Technician	Josh Sinnathambi	**QC Approval**	Farid Yanes
Date	17 Aug 2022	**Date**	23 Aug 2022

Instrument Photo



GENERAL INFORMATION

Instrument Type	AQS1
Serial Number	AQS1 17082022-2140

Aeroqual Connect

Version	V1.18.3	**OS Image**	V4.1.18.0
WiFi SSID	AQS1 17082022-2140	**Password**	Aeroqual
Default User	Administrator	**Password**	aqmadmin
Sensor List	AQS1 SensorList V8.10.2.aql		

Please contact Aeroqual for login and password to access your instrument on Aeroqual Cloud (http://cloud.aeroqual.com).

Instrument Configuration

Particle Channels	Gas Channels	Environmental Channels		Communication / Software
☐ TSP	☐ CO	☐ WS	☐ RAIN	☑ Connect
☐ PM 1	☑ NO2	☐ WD	☐ SOLAR	☑ Plus
☐ PM 2.5	☐ VOC	☐ AN1	☐ HAIL	☐ EXSACT
☐ PM 10		☐ AN2	☐ PRESS	☑ Modem
		☐ AN3	☐ AIR T	
		☐ Freq	☐ AIR RH	
			☐ LAT	
			☐ LON	
			☐ ALT	
			☐ Pyrano	
			☐ Leq	

Integrated Modules

Type	Serial No.	QC	Type	Serial No.	QC
EPC ARK1124C	KSA5379674	Pass	**NO2 Module**	AQM NO2 0 - 0.5ppm 2206091-016	Pass
Teltonika RUT955 LTE 4G	1120967241	Pass			

For technical, maintenance and service information, please refer to AQS1 User Guide or contact Aeroqual for access to free online training (http://training.aeroqual.com).

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PERFORMANCE REPORT

Gas Sensor Calibration Data

Sensor	Flow rate (SLPM)	Zero (ppm)	Span Gas (ppm)	Sensor reading (ppm)
NO2	0.061	0.000	0.185	0.184
Sample System Flow Rate	0.06			

Standards Used

Standard	Make	Serial Number	Calibration Due
GasCal 1100	Ecotech	09-1213	30-Mar-2023
T200 Nox Analyser	Teledyne API	5858	13-Jul-2023
Flowmeter	TSI	52002203004	12-Jan-2023

Activate Negative Number Filters on all gas and particulate channels: ***YES***

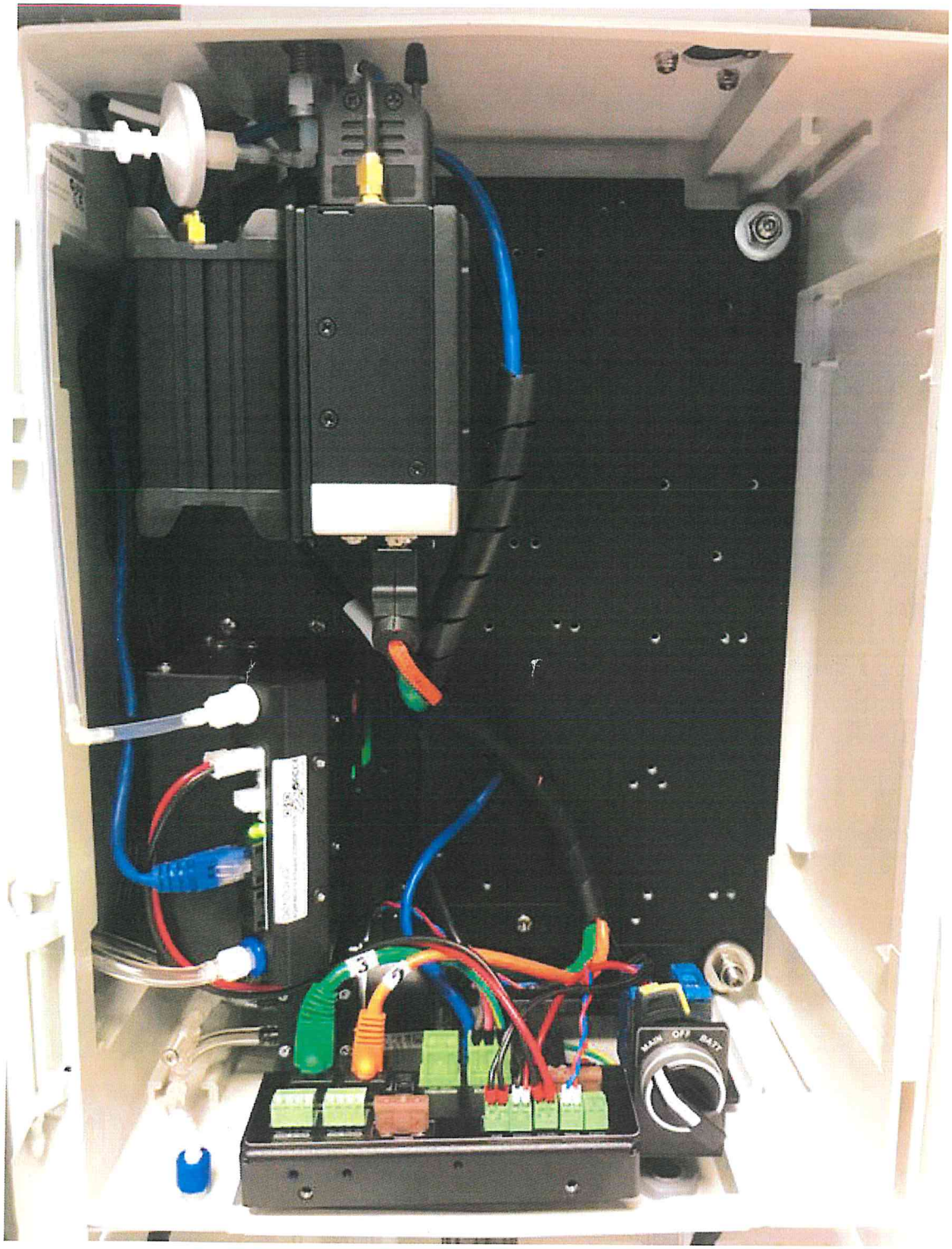
FACTORY MODULE SETTINGS

MODULE	VER	H0	H1	H2	H3	TIMA	TIMR	TEMA	TEMR	PWML	PWMH	HTR	GAIN		Gain	Offset
NO2	4.0.0	0.000	-208.812	1.000	5.000	30	30	0	0	1	0	3.00	1		0.992	0.000

Approvals

QC Technician	Josh Sinnathambi	**QC Approval**	Farid Yanes
Date	17 Aug 2022	**Date**	23 Aug 2022

Instrument Photo



GENERAL INFORMATION

Instrument Type	AQS1
Serial Number	AQS1 17082022-2141

Aeroqual Connect

Version	V1.18.3	**OS Image**	V4.1.18.0
WiFi SSID	AQS1 17082022-2141	**Password**	Aeroqual
Default User	Administrator	**Password**	aqmadmin
Sensor List	AQS1 SensorList V8.10.2.aql		

Please contact Aeroqual for login and password to access your instrument on Aeroqual Cloud (http://cloud.aeroqual.com).

Instrument Configuration

Particle Channels	Gas Channels	Environmental Channels		Communication / Software
TSP	CO	WS	RAIN	✓ Connect
PM 1	✓ NO2	WD	SOLAR	✓ Plus
PM 2.5	VOC	AN1	HAIL	EXSACT
PM 10		AN2	PRESS	✓ Modem
		AN3	AIR T	
		Freq	AIR RH	
			LAT	
			LON	
			ALT	
			Pyrano	
			Leq	

Integrated Modules

Type	Serial No.	QC	Type	Serial No.	QC
EPC ARK1124C	KSA5379671	Pass	**NO2 Module**	AQM NO2 0 - 0.5ppm 2206091-014	Pass
Teltonika RUT955 LTE 4G	1120968415	Pass			

For technical, maintenance and service information, please refer to AQS1 User Guide or contact Aeroqual for access to free online training (http://training.aeroqual.com).

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PERFORMANCE REPORT

Gas Sensor Calibration Data

Sensor	Flow rate (SLPM)	Zero (ppm)	Span Gas (ppm)	Sensor reading (ppm)
NO2	0.060	0.000	0.185	0.185
Sample System Flow Rate	0.06			

Standards Used

Standard	Make	Serial Number	Calibration Due
GasCal 1100	Ecotech	09-1213	30-Mar-2023
T200 Nox Analyser	Teledyne API	5858	13-Jul-2023
Flowmeter	TSI	52002203004	12-Jan-2023

Activate Negative Number Filters on all gas and particulate channels: ***YES***

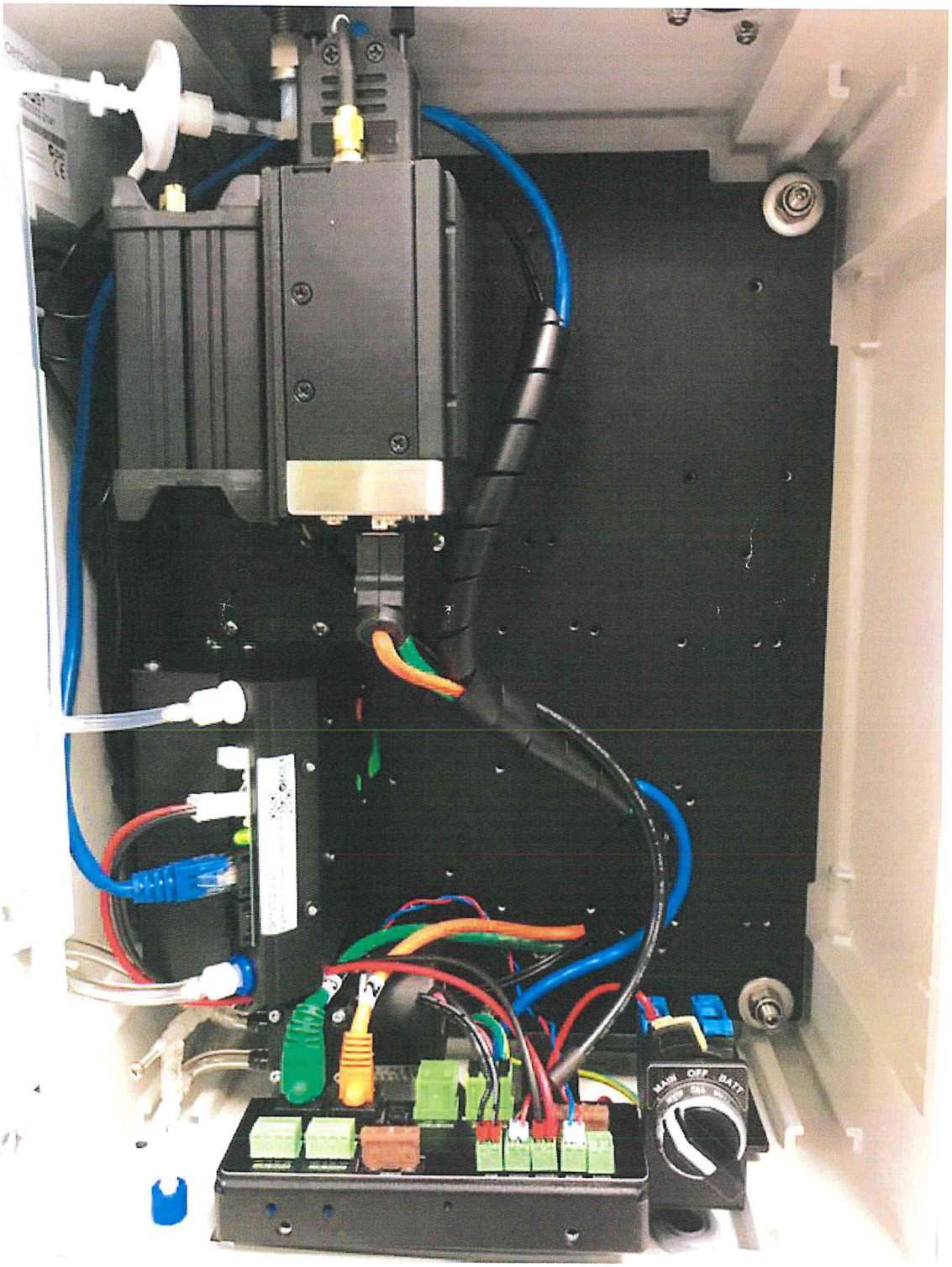
FACTORY MODULE SETTINGS

MODULE	VER	H0	H1	H2	H3	TIMA	TIMR	TEMA	TEMR	PWML	PWMH	HTR	GAIN		Gain	Offset
NO2	4.0.0	0.000	-234.207	1.000	5.000	30	30	0	0	1	0	3.00	1		0.987	0.000

Approvals

QC Technician	Josh Sinnathambi	**QC Approval**	Farid Yanes
Date	17 Aug 2022	**Date**	23 Aug 2022

Instrument Photo



GENERAL INFORMATION

Instrument Type	AQS1
Serial Number	AQS1 17082022-2142

Aeroqual Connect

Version	V1.18.3	**OS Image**	V4.1.18.0
WiFi SSID	AQS1 17082022-2142	**Password**	Aeroqual
Default User	Administrator	**Password**	aqmadmin
Sensor List	AQS1 SensorList V8.10.2.aql		

Please contact Aeroqual for login and password to access your instrument on Aeroqual Cloud (http://cloud.aeroqual.com).

Instrument Configuration

Particle Channels	Gas Channels	Environmental Channels		Communication / Software
☐ TSP	☐ CO	☐ WS	☐ RAIN	☑ Connect
☐ PM 1	☑ NO2	☐ WD	☐ SOLAR	☑ Plus
☐ PM 2.5	☐ VOC	☐ AN1	☐ HAIL	☐ EXSACT
☐ PM 10		☐ AN2	☐ PRESS	☑ Modem
		☐ AN3	☐ AIR T	
		☐ Freq	☐ AIR RH	
			☐ LAT	
			☐ LON	
			☐ ALT	
			☐ Pyrano	
			☐ Leq	

Integrated Modules

Type	Serial No.	QC	Type	Serial No.	QC
EPC ARK1124C	KSA5379450	Pass	**NO2 Module**	AQM NO2 0 - 0.5ppm 2111252-014	Pass
Teltonika RUT955 LTE 4G	1120968655	Pass			

For technical, maintenance and service information, please refer to AQS1 User Guide or contact Aeroqual for access to free online training (http://training.aeroqual.com).

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PERFORMANCE REPORT

Gas Sensor Calibration Data

Sensor	Flow rate (SLPM)	Zero (ppm)	Span Gas (ppm)	Sensor reading (ppm)
NO2	0.060	0.000	0.185	0.186
Sample System Flow Rate	0.06			

Standards Used

Standard	Make	Serial Number	Calibration Due
GasCal 1100	Ecotech	09-1213	30-Mar-2023
T200 Nox Analyser	Teledyne API	5858	13-Jul-2023
Flowmeter	TSI	52002203004	12-Jan-2023

Activate Negative Number Filters on all gas and particulate channels: ***YES***

FACTORY MODULE SETTINGS

MODULE	VER	H0	H1	H2	H3	TIMA	TIMR	TEMA	TEMR	PWML	PWMH	HTR	GAIN		Gain	Offset
NO2	4.0.0	0.000	-227.377	1.000	5.000	30	30	0	0	1	0	3.00	1		0.953	0.000

Approvals

QC Technician	Josh Sinnathambi	**QC Approval**	Farid Yanes
Date	17 Aug 2022	**Date**	23 Aug 2022

Instrument Photo