Ambient Air Quality and noise Measurements Report

Gas pipeline network in Al-Qalag, El-Gabal El-Asfar-Al Qalubia governorate

EcoConServ
ENVIRONMENTAL SOLUTIONS

CONTENTS

1. INTRODUCTION

Air quality and noise monitoring has been carried out as part of the baseline description for the Environmental and Social Impact Assessment of the proposed gas pipeline route project located in Al-Qalag, El-Gabal El-Asfar-Qalubia governorate since the route is passing in the front of Al-Qalag, primary school complex at the residential area and it is considered as a sensitive receptor. The location was set as suitable location for ambient air quality and noise level monitoring.

Air quality monitoring has been undertaken for the pollutants of primary concerns (NO_2, SO_2, T.S.P and PM_{10}), in order to better characterize the baseline air quality as part of the environmental impact assessment required where a one-hour average measurements were conducted for carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), Total Suspended Particulates (T.S.P) and particulate matter (PM_{10}) for one specific location in front of Al-Qalag, primary school complex and on the other side the agricultural area was found, where the air quality complies with the national guidelines for all the analysed parameters. The site specific air quality measurements were conducted using Standard ambient air quality monitoring instruments under the supervision of experienced specialists. Noise levels were conducted as per the international standard using type 1 precision noise level meter.

1.1 Objectives

The overall objectives of this monitoring round are to:

- Assess/confirm compliance of the air quality in the baseline environment with relevant national guidelines;
- identify any non-compliance issues, if any; and
- Provide general conclusions based on analysis results.

The objectives of the ambient air quality Monitoring activities conducted at the proposed site are:

- To verify compliance with authorized discharge limits and any other regulatory requirements concerning the impact on the public and the environment due to the normal operation of a practice or a source within a practice;
- to establish air quality baseline which will assist in the estimation of the project impact on the local physical, biological and social environment ;
- To check the conditions of operation and the adequacy of controls on discharges from the source and to provide a warning of unusual or unforeseen conditions and, where appropriate, to trigger a special environmental monitoring program.

1.2 Scope of Work

- The scope of work of the present monitoring includes the sampling and analysis of active air and noise in the surrounding area as to distinguish whether air quality is impacted by the project activities or not.
- The measurement will be conducted in the herein location within the boundaries of the sensitive object.

1.2.1 Sampling strategy

The selection of the active air measurement location is based on the prevailing wind direction; site Topography, the future layout of the proposed project components and the location of the nearest sensitive receptors with respect to the project plots. Moreover, the selection is based on the guidelines stated in the American Society for Testing Materials (ASTM) reference method[1].

The following ambient air pollutants where the target parameters to be measured during the monitoring program:

- Total Suspended Particulate (TSP)
- Thoracic particulate (PM_{10})
- Nitrogen dioxide NO_2.
- Sulfur dioxide SO_2.
- Carbon monoxide CO.

Moreover, location of the measurements is shown in the figure below

1.3 Location

The GPS coordinates of the as Ambient Air (**AA**) measurement location

Location	Latitude	Longitude
Al-Qalag, El-Gabal El-Asfar Residential area	30°10'59"N	31°21'11"E

[1] D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air

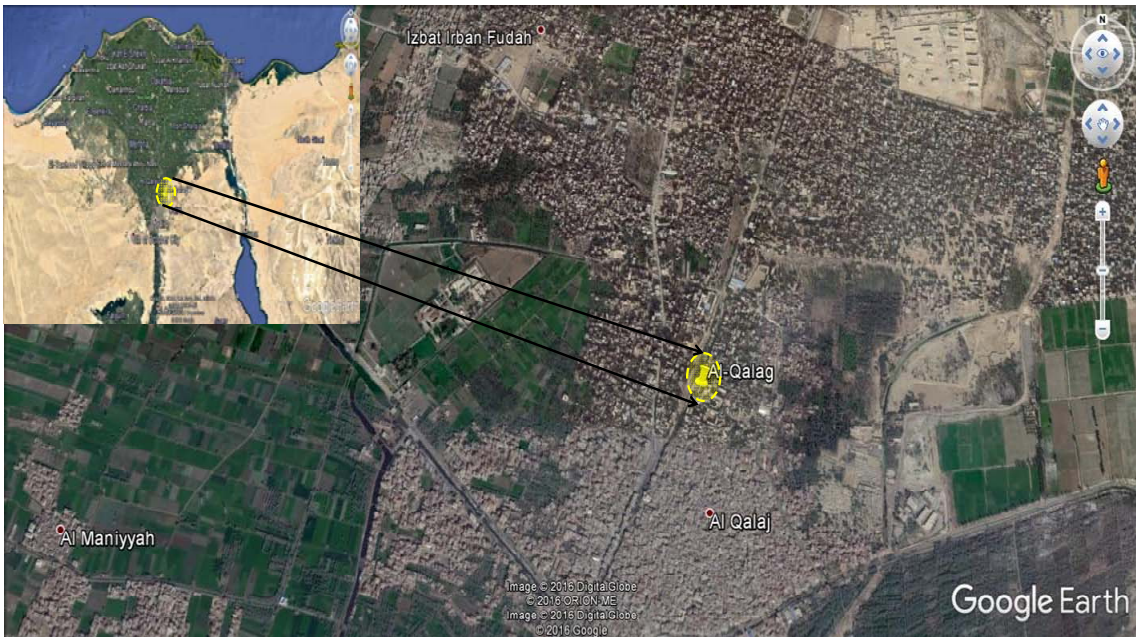

Figure 1-1 location map for Gas pipeline beside Al-Qalag, primary school complex

2. LEGISLATION AND REGULATORY FRAMEWORK

2.1 National and International Legislation

The results of ambient air quality measurements were compared to the national limits set in Annex 5 of the Executive Regulation (D1095/2011) and the guideline values of world health organization (WHO) for the ambient air quality.

Table 2-1 and Table 2-3 lists the corresponding applicable national and international ambient air quality permissible limits.

Table 2-1 Applicable national permissible limits for ambient air quality levels for rural/urban area

Pollutant	Average Period	Egyptian Standards ($\mu g.m^{-3}$)	Egyptian Standards (ppm)
Sulphur dioxide (SO_2)	1 hour	350	0.1337
	24 hours	150	0.0573
	Annual	60	0.0229
Carbon monoxide	1 hour	30,000	26
	8 hours	10,000	9
Nitrogen dioxide (NO_2)	1 hour	350	0.2
	24 hours	150	0.08
	Annual	60	0.032
Total suspended particulate T.S.P	24 hours	230	---------
	Annual	125	---------
Thoracic particles (PM_{10})	24 hours	150	---------
	Annual	100	---------
$PM_{2.5}$	24 hours	100	---------
	Annual	70	---------

Table 2-2 Applicable National and International Permissible Limits for Ambient Noise Levels

Location	LAeq (dBA) National Permissible Limits (Annex 7 Decree 710/2012)		LAeq (dBA) International Permissible Limits (IFC – EHS General Guidelines)	
	During Day (7 am to 10 pm)	During Night (10 pm to 7 am)	During Day (7 am to 10 pm)	During Night (10 pm to 7 am)
Residential	60 [2]	55 [2]	70 [3]	70 [3]

[2] National permissible limits for ambient noise levels for areas on roads 12 m wide or more or light industrial areas including other activities

[3] IFC permissible limits for ambient noise levels for industrial or commercial receptors

Table 2-3 WHO Ambient Air Quality Guidelines 4,5

Pollutant	Average Period	Guideline value ($\mu g.m^{-3}$)
Sulphur dioxide (SO_2)	24 hours	125 (interim target 1) 50 (Interim target 2) 20 (guideline)
	10 minutes	500
Nitrogen dioxide (NO_2)	1 hour	200
	1 year	40
Thoracic particles (PM_{10})	24 hrs	150 (interim target 1) 100 (interim target 2) 75 (interim target 3) 50 (guideline)
	1 year	70 (interim target 1) 50 (interim target 2) 30 (interim target 3) 20 (guideline)
Ozone	8 hours daily maximum	160 (interim target 1) 100 (guideline)

[4] World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

[5] Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

3. METHODOLOGY

3.1 Ambient air quality

Ambient Air Quality Monitoring equipment is an integrated system of which includes several analyzers with data recording devises. A typical system would include gas analyzers for ambient air analysis, data recording, and signal conduction instrumentation.

Figure 3-1 ambient air quality monitoring system

Ambient air pollutants

The most common gaseous air pollutants (also known as "criteria pollutants") are carbon monoxide, sulfur oxides, and nitrogen oxides. These pollutants can be harmful to health and the environment, and cause property damage. To acquire baseline information on background levels of Thoracic Particulates, the team conducted for one-hour active sampling using a dust sampler. The sampler measures the respirable fraction of airborne dust (of particle size 0.1 to 10 μm) with a measuring range of 0.001 to 400 mg/m^3 and an accuracy of ± 5 % of the reading. The levels measured and recorded would serve as baseline values for reference during future monitoring activities.

Ambient air quality monitoring system specifications

General Features

- Standard methods of measurement which means:

- SO_2 analyzer: ISO 10498 equivalent to(U.S.A EPA Reference method – EQSA-0486-60) – UV Fluorescence
- NOx analyzer: ISO 7996 equivalent to(U.S.A EPA Reference method – RFNA-1289-74) – Chemiluminescence
- CO analyzer: ISO 4224 equivalent to U.S.A EPA Reference method – RFCA-0981-54) – IR GFC
- PM_{10} sampler: Plow volume sampler equivalent to(EPA method, Appendix J-Reference method FR)
- T.S.P low volume sampler equivalent to(EPA method, Appendix J-Reference method FR)

Ambient Particulate Matter PM_{10} sampler

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method: Sequential Particulate sampler
- Sampling on filter membranes which can be used for further Chemical analyses as required by current regulations and standards.
- Active flow Control Flow range: 0-10 LPM
- Nominal flow: 5LPM Sampler
- Dimensions: 10” x 12” x 7” Sampler
- Weight: 9.8LBS (fully configured) Transport Case: 19.75” x 12” x 18”
- The analyzer should be equipped with batteries in order to avoid possible data losses due to power failures.
- Source: Beta Ray Source with appropriate activity
- Ranges: 0-500 µg/ m^3 (2.3 m^3/ h operating flow rate); 0-1,000 µg/ m^3 (1 m3/ h operating flow rate)
- Lower Detectable Limit: ≤ 1.5 µg/ m3 (24 hour cycle time, 2.3 m3/ h operating flow rate)
- Precision: ≤ 0.4 µg/ m^3 (24 hour cycle time, 2.3 m^3/ h operating flow rate)
- Correlation Coefficient R > 0.98

Sulphur Dioxide SO_2 Analyzer (Thermo Scientific SO_2 Analyzer model 43i-USA)

- Approval and Certification : U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method : UV Fluorescence Technology
- Ranges.: Auto ranging feature, Multiple Ranges to cover from 0 to 10 ppm (especially from 0 to 1 ppm)
- Zero Noise: ≤ 0.5 ppb
- Lower Detectable Limit: ≤ 1 ppb
- Zero drift (daily): ≤ 1 ppb
- Span drift (daily): ≤ 1% of full scale
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

Nitrogen Monoxide, Nitrogen Dioxide and Nitrogen Oxides NO, NO_2 & NO_X Analyzer
(Thermo Scientific NOx Analyzer - Model 42i- USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method.: Chemiluminescence Technology
- Ranges.: Auto ranging feature, Multiple Ranges to cover from 0 to 20 ppm (especially from 0 to 1 ppm)
- Zero Noise: ≤ 0.2 ppb
- Lower Detectable Limit: ≤ 0.4 ppb
- Zero drift (daily): < 0.5 ppb
- Span drift (daily): < 0.5% of full scale
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

Carbon Monoxide CO Analyzer (Thermo Scientific Carbon Monoxide CO Analyzer model 48i-USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method: Non Destructive Infra-Red Gas Filter Correlation (IRGFC) Technology
- Ranges: Auto ranging feature, Multiple Ranges to cover from 0 to 200 ppm (especially from 0 to 50 ppm)
- Zero Noise: ≤ 0.02 ppm
- Lower Detectable Limit: ≤ 0.04 ppm
- Zero drift (daily): ≤ 0.1 ppm
- Span drift (daily): < 0.5% of reading
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

3.2 Noise Measurement Methodology

The methodology adopted was to record ambient noise levels for one hour, as per the national and international standards, in the current location at the proposed gas pipe line route. The following devices were used during this round of noise level measurements:

- Two B & K 2238 Mediator, Integrating Sound Level Meters, Type I (precision grade), compliant with IEC 1672 Class 1 standard;
- B & K 4198 Outdoor Weatherproof Microphone Kit;
- GPS unit (Garmin MONTANA 650); and
- Digital Camera.

Noise monitoring measurements included recording the following parameters using a Type 1 precision grade hand-held sound-level meters:

- Equivalent continuous noise level (LAeq)
- 95th percentile noise level (LA95)
- 90th percentile noise level (LA90)

- 50th percentile noise level (LA50)
- 10th percentile noise level (LA10)
- Peak sound pressure level (LCpeak)

The following equation[6] is the main equation used to calculated day night equivalent sound pressure level:

$L_{den} = 10\log\frac{1}{n}\sum_{i=1}^{n}10^{0.1(L_i+D_i)}$ **Where** $L_{den} = \text{Day Night Equivalent}$, L_i = The hourly L_{eq}, D_i = the addition for the different periods of the day, n = number of measured hours.

The sound level meters were calibrated before sound measurements to ensure reliability and precision. GPS coordinates and meteorological conditions were recorded using hand-held kits at all locations prior to the start of noise measurements. It is anticipated that most of these locations would remain the same for the purpose of pre-construction, construction, performance guarantee tests and operation monitoring. Figure 1-1 shows the locations of the different noise measurement locations; furthermore, coordinate table lists the GPS coordinates of measurement locations, measurement dates, location description and a selection of photos at each location.

[6]The equation used to obtain the average noise level of a designated time interval based on weighted readings according to "Long-term Leq errors expected and how long to measure (Uncertainity & Noise Monitoring)", Dietrich Kuehner, Forum Acusticum 2005 Budapest.

4. RESULTS

The following tables present the results for ambient air quality measurements conducted at the proposed gas pipeline route location.

The air quality at the proposed site of the proposed gas pipeline route is exhibiting acceptable levels of classic air pollutants in fact the levels are way below the international guidelines. Generation and dispersion of dust from increased vehicle traffic, especially during the rash hour, may reduce visibility, relative to baseline levels, and, together with combustion engine emissions, may affect ambient air quality. Concentration of dust particles, both total suspended particulate and respirable particulate matter and other pollutants from open burning, emissions from equipment and machinery used in transportation, various activities of operations and emissions from vehicles used to transport passengers also contribute to air pollution. These impacts may affect the human environment and, typically, arise during the preparation phase and, to a much lesser extent, during the operation phase, requiring monitoring and assessment of the natural and man-made air pollutants.

One hour average results for 8 hours continuous measurements are shown in Table 4-1 for all the measured parameters

Table 4-1 one hour average results

Time	NO ($\mu g/m^3$)	NO_2 ($\mu g/m3$)	NOx ($\mu g/m^3$)	SO_2 ($\mu g/m3$)	CO (mg/m^3)	PM_{10} ($\mu g/m3$)	T.S.P ($\mu g/m3$)
10:AM	12.2	26.7	38.9	20.3	2.7	124.2	183.6
11:00	13.2	26.5	39.7	19.7	2.3		
12:00	12.8	25.3	38.1	19.3	2.2		
13:00	12.1	25.2	37.3	20.5	2.2		
14:00	11.9	23.9	35.8	15.2	2.1		
15:00	12.4	22.8	35.2	15.1	2.3		
16:00	11.6	24.1	35.7	18.3	2.1		
17:00	9.6	21.4	31	14.9	2		
Limits	150	200	150	350	30 **(mg/m^3)**	150	230

4.1 Analysis of air quality Results

In general there are two main factors affecting the ambient air concentration of a certain pollutant emitted from a certain source or sources in a selected area:

- The intensity of the emissions (e.g. concentration and flow rate) from the source or sources.
- The uncontrollable atmospheric dispersion conditions which include but not limited to (wind speed, wind direction, temperature, humidity, rain fall, atmospheric turbulence, solar radiation intensity and atmospheric pressure).

All the recorded results showed compliance with the national and international guidelines for ambient air quality moreover most of the data recorded were way below the guidelines which indicates that the ambient air quality in the project areas is one of the acceptable areas in Egypt in terms of ambient air quality which can be attributed to the absence of any major industrial sources.

Moreover, the main route will pass through urban roads/streets and side roads which make the area exposes to different source of pollution other than the construction and operation of the route

5. NOISE LEVELS RESULTS

Table 5-1 presents the results of one hour average ambient noise measurements and their corresponding national and international permissible limits.

Table 5-1 Ambient Noise Levels Readings at the proposed gas pipeline route

Time	Sound Level Equivalent & Percentile Recordings in dBA for 8 Hours						Permissible Limits LAeq (dBA)	
	LAeq	LA10	LA50	LA90	LA95	LCpeak	National	International
10:00	**52.4**	50.52	46.05	39.93	37.27	116.97	**70**	**70**
11:00	**57.2**	49.06	34.62	28.4	27.83	121.52		
12:00	**53.2**	56.87	47.47	39.7	37.8	104.96		
13:00	**55.2**	57.38	49	41.11	39.06	105.77		
14:00	**56.7**	52.54	41.9	36.13	34.77	93.7		
15:00	**59.9**	54.52	42.65	35.86	34.17	105.57		
16:00	**59.4**	60.94	53.44	45.95	43.89	104.93		
17:00	**57.9**	58.67	49.75	38.61	36.17	99.24		

The results of ambient noise measurements were compared to the national and international permissible limits.

6. CONCLUSION

Based on the environmental monitoring and measurements, that performed for the noise measurements. The results showed compliance with all the national and international guidelines.

7. FUTURE RECOMMENDATION

It is recommended that monitoring should continue for all the regulated parameters, in order to verify/assure compliance.

8. REFERENCES

- EU directive 2008 50 EC -ANNEX I Data quality objectives for ambient air quality assessment
- D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air
- Egyptian Law 4/1994 Amended by law 9/2009 and Decree 1741/2005, amended by decree 1095 /2011 Annex 6 (amendments to executive regulations of Law 4).

Appendix I - Selection of Photos from the Air Quality Monitoring activities


30°11'0"N, 31°21'10"E
accuracy: 13ft
Altitude
270 ft


مدرسة مجمع القلج القديم

Appendix II - Selection of Photos from the noise Monitoring activities


30°10'59"N, 31°21'11"E
accuracy: 10ft
Altitude
255 ft
ابو كمال


مدرسة مجمع القليج القديم
مدرستي نظيفة جميـ


مدرسة مجمع القالج القديم
محافظة القليوبية
إدارة الخانكة التعليمية
NO2
O2

CONTENTS

9. INTRODUCTION

Air quality and noise monitoring has been carried out as part of the baseline description for the Environmental and Social Impact Assessment of the proposed gas pipeline route project located in Izbet Afandena-Qalubia governorate since the route is passing along the residential area and it is considered as a sensitive receptor. The location was set as suitable location for ambient air quality and noise level monitoring.

Air quality monitoring has been undertaken for the pollutants of primary concerns (NO_2, SO_2, T.S.P and PM_{10}), in order to better characterize the baseline air quality as part of the environmental impact assessment required where a one-hour average measurements were conducted for carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), Total Suspended Particulates (T.S.P) and particulate matter (PM_{10}) for one specific location in front of Izbet Afandena Mid Road and on the other side a ceramic factory was found, where the air quality complies with the national guidelines for all the analysed parameters. The site specific air quality measurements were conducted using Standard ambient air quality monitoring instruments under the supervision of experienced specialists. Noise levels were conducted as per the international standard using type 1 precision noise level meter.

9.1 Objectives

The overall objectives of this monitoring round are to:

- Assess/confirm compliance of the air quality in the baseline environment with relevant national guidelines;
- identify any non-compliance issues, if any; and
- Provide general conclusions based on analysis results.

The objectives of the ambient air quality Monitoring activities conducted at the proposed site are:

- To verify compliance with authorized discharge limits and any other regulatory requirements concerning the impact on the public and the environment due to the normal operation of a practice or a source within a practice;
- to establish air quality baseline which will assist in the estimation of the project impact on the local physical, biological and social environment ;
- To check the conditions of operation and the adequacy of controls on discharges from the source and to provide a warning of unusual or unforeseen conditions and, where appropriate, to trigger a special environmental monitoring program.

9.2 Scope of Work

- The scope of work of the present monitoring includes the sampling and analysis of active air and noise in the surrounding area as to distinguish whether air quality is impacted by the project activities or not.
- The measurement will be conducted in the herein location within the boundaries of the sensitive object.

9.2.1 Sampling strategy

The selection of the active air measurement location is based on the prevailing wind direction; site Topography, the future layout of the proposed project components and the location of the nearest sensitive receptors with respect to the project plots. Moreover, the selection is based on the guidelines stated in the American Society for Testing Materials (ASTM) reference method[7].

The following ambient air pollutants where the target parameters to be measured during the monitoring program:

- Total Suspended Particulate (TSP)
- Thoracic particulate (PM_{10})
- Nitrogen dioxide NO_2.
- Sulfur dioxide SO_2.
- Carbon monoxide CO.

Moreover, location of the measurements is shown in the figure below

9.3 Location

The GPS coordinates of the as Ambient Air (**AA**) measurement location

Location	Latitude	Longitude
Izbet Afandena Residential area	30° 7'57.00"N	31°17'36.00"E

[7] D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air

Figure 9-1 location map for Gas pipeline beside Izbet Afandena Mid Road

10. LEGISLATION AND REGULATORY FRAMEWORK

10.1 National and International Legislation

The results of ambient air quality measurements were compared to the national limits set in Annex 5 of the Executive Regulation (D1095/2011) and the guideline values of world health organization (WHO) for the ambient air quality.

Table 2-1 and Table 2-3 lists the corresponding applicable national and international ambient air quality permissible limits.

Table 10-1 Applicable national permissible limits for ambient air quality levels for rural/urban area

Pollutant	Average Period	Egyptian Standards ($\mu g.m^{-3}$)	Egyptian Standards (ppm)
Sulphur dioxide (SO_2)	1 hour	350	0.1337
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	Annual	125	---------
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$PM_{2.5}$	24 hours	100	---------
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Table 10-2 Applicable National and International Permissible Limits for Ambient Noise Levels

Location	LAeq (dBA) National Permissible Limits (Annex 7 Decree 710/2012)		LAeq (dBA) International Permissible Limits (IFC – EHS General Guidelines)	
	During Day (7 am to 10 pm)	During Night (10 pm to 7 am)	During Day (7 am to 10 pm)	During Night (10 pm to 7 am)
Residential	60 [8]	55 [2]	70 [9]	70 [3]

[8] National permissible limits for ambient noise levels for areas on roads 12 m wide or more or light industrial areas including other activities

[9] IFC permissible limits for ambient noise levels for industrial or commercial receptors

Table 10-3 WHO Ambient Air Quality Guidelines 10,11

Pollutant	Average Period	Guideline value (μg.m^{-3})
Sulphur dioxide (SO_2)	24 hours	125 (interim target 1) 50 (Interim target 2) 20 (guideline)
	10 minutes	500
Nitrogen dioxide (NO_2)	1 hour	200
	1 year	40
Thoracic particles (PM_{10})	24 hrs	150 (interim target 1) 100 (interim target 2) 75 (interim target 3) 50 (guideline)
	1 year	70 (interim target 1) 50 (interim target 2) 30 (interim target 3) 20 (guideline)
Ozone	8 hours daily maximum	160 (interim target 1) 100 (guideline)

[10] World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

[11] Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

11. METHODOLOGY

11.1 Ambient air quality

Ambient Air Quality Monitoring equipment is an integrated system of which includes several analyzers with data recording devises. A typical system would include gas analyzers for ambient air analysis, data recording, and signal conduction instrumentation.

Figure 11-1 ambient air quality monitoring system

Ambient air pollutants

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Ambient air quality monitoring system specifications

General Features

- Standard methods of measurement which means:
- SO_2 analyzer: ISO 10498 equivalent to(U.S.A EPA Reference method – EQSA-0486-60) – UV Fluorescence
- NOx analyzer: ISO 7996 equivalent to(U.S.A EPA Reference method – RFNA-1289-74) – Chemiluminescence
- CO analyzer: ISO 4224 equivalent to U.S.A EPA Reference method – RFCA-0981-54) – IR GFC
- PM_{10} sampler: Plow volume sampler equivalent to(EPA method, Appendix J-Reference method FR)
- T.S.P low volume sampler equivalent to(EPA method, Appendix J-Reference method FR)

Ambient Particulate Matter PM_{10} sampler

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method: Sequential Particulate sampler
- Sampling on filter membranes which can be used for further Chemical analyses as required by current regulations and standards.
- Active flow Control Flow range: 0-10 LPM
- Nominal flow: 5LPM Sampler
- Dimensions: 10” x 12” x 7” Sampler
- Weight: 9.8LBS (fully configured) Transport Case: 19.75” x 12” x 18”
- The analyzer should be equipped with batteries in order to avoid possible data losses due to power failures.
- Source: Beta Ray Source with appropriate activity
- Ranges: 0-500 µg/ m^3 (2.3 m^3/ h operating flow rate); 0-1,000 µg/ m^3 (1 m3/ h operating flow rate)
- Lower Detectable Limit: ≤ 1.5 µg/ m3 (24 hour cycle time, 2.3 m3/ h operating flow rate)
- Precision: ≤ 0.4 µg/ m^3 (24 hour cycle time, 2.3 m^3/ h operating flow rate)

- Correlation Coefficient R > 0.98

Sulphur Dioxide SO_2 Analyzer (Thermo Scientific SO_2 Analyzer model 43i-USA)

- Approval and Certification : U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method : UV Fluorescence Technology
- Ranges.: Auto ranging feature, Multiple Ranges to cover from 0 to 10 ppm (especially from 0 to 1 ppm)
- Zero Noise: ≤ 0.5 ppb
- Lower Detectable Limit: ≤ 1 ppb
- Zero drift (daily): ≤ 1 ppb
- Span drift (daily): ≤ 1% of full scale
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

Nitrogen Monoxide, Nitrogen Dioxide and Nitrogen Oxides NO, NO_2 & NO_X Analyzer (Thermo Scientific NOx Analyzer - Model 42i- USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method.: Chemiluminescence Technology
- Ranges.: Auto ranging feature, Multiple Ranges to cover from 0 to 20 ppm (especially from 0 to 1 ppm)
- Zero Noise: ≤ 0.2 ppb
- Lower Detectable Limit: ≤ 0.4 ppb
- Zero drift (daily): < 0.5 ppb
- Span drift (daily): < 0.5% of full scale
- Response time: fast, ≤ 100 seconds

- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

Carbon Monoxide CO Analyzer (Thermo Scientific Carbon Monoxide CO Analyzer model 48i-USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method: Non Destructive Infra-Red Gas Filter Correlation (IRGFC) Technology
- Ranges: Auto ranging feature, Multiple Ranges to cover from 0 to 200 ppm (especially from 0 to 50 ppm)
- Zero Noise: ≤ 0.02 ppm
- Lower Detectable Limit: ≤ 0.04 ppm
- Zero drift (daily): ≤ 0.1 ppm
- Span drift (daily): < 0.5% of reading
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

11.2 Noise Measurement Methodology

The methodology adopted was to record ambient noise levels for one hour, as per the national and international standards, in the current location at the proposed gas pipe line route. The following devices were used during this round of noise level measurements:

- Two B & K 2238 Mediator, Integrating Sound Level Meters, Type I (precision grade), compliant with IEC 1672 Class 1 standard;
- B & K 4198 Outdoor Weatherproof Microphone Kit;
- GPS unit (Garmin MONTANA 650); and
- Digital Camera.

Noise monitoring measurements included recording the following parameters using a Type 1 precision grade hand-held sound-level meters:

- Equivalent continuous noise level (LAeq)
- 95th percentile noise level (LA95)
- 90th percentile noise level (LA90)
- 50th percentile noise level (LA50)
- 10th percentile noise level (LA10)
- Peak sound pressure level (LCpeak)

The following equation[12] is the main equation used to calculated day night equivalent sound pressure level:

$L_{den} = 10\log\frac{1}{n}\sum_{i=1}^{n}10^{0.1(L_i+D_i)}$ **Where** $L_{den} = \text{Day Night Equivalent}$, $L_i = \text{The hourly } L_{eq}$, $D_i = \text{the addition for the different periods of the day}$, $n = \text{number of measured hours}$.

The sound level meters were calibrated before sound measurements to ensure reliability and precision. GPS coordinates and meteorological conditions were recorded using hand-held kits at all locations prior to the start of noise measurements. It is anticipated that most of these locations would remain the same for the purpose of pre-construction, construction, performance guarantee tests and operation monitoring. Figure 11-2 shows the locations of the different noise measurement locations; furthermore, coordinates table lists the GPS coordinates of measurement locations, measurement dates, location description and a selection of photos at each location.

[12]The equation used to obtain the average noise level of a designated time interval based on weighted readings according to "Long-term Leq errors expected and how long to measure (Uncertainity & Noise Monitoring)", Dietrich Kuehner, Forum Acusticum 2005 Budapest.

12. RESULTS

The following tables present the results for ambient air quality measurements conducted at the proposed gas pipeline route location.

The air quality at the proposed site of the proposed gas pipeline route is exhibiting acceptable levels of classic air pollutants in fact the levels are way below the international guidelines. Generation and dispersion of dust from increased vehicle traffic, especially during the rash hour, may reduce visibility, relative to baseline levels, and, together with combustion engine emissions, may affect ambient air quality. Concentration of dust particles, both total suspended particulate and respirable particulate matter and other pollutants from open burning, emissions from equipment and machinery used in transportation, various activities of operations and emissions from vehicles used to transport passengers also contribute to air pollution. These impacts may affect the human environment and, typically, arise during the preparation phase and, to a much lesser extent, during the operation phase, requiring monitoring and assessment of the natural and man-made air pollutants.

One hour average results for 8 hours continuous measurements are shown in Table 4-1 for all the measured parameters

Table 12-1 one hour average results

Time	NO ($\mu g/m^3$)	NO_2 ($\mu g/m3$)	NOx ($\mu g/m^3$)	SO_2 ($\mu g/m3$)	CO (mg/m^3)	PM_{10} ($\mu g/m3$)	T.S.P ($\mu g/m3$)
10:AM	22.1	24.31	46.41	36.81	15.11	113	174
11:00	12.9	8.51	21.41	22.79	2.26		
12:00	11.2	24.76	35.96	7.64	2.56		
13:00	16.5	13.71	30.21	16.53	2.36		
14:00	12.3	21.24	33.54	52.55	6.40		
15:00	36.7	15.95	52.65	13.18	3.19		
16:00	10.5	20.59	31.09	22.35	6.53		
17:00	11.2	24.31	35.51	36.81	15.11		
Limits	150	200	150	350	30 **(mg/m^3)**	150	230

12.1 Analysis of air quality Results

In general there are two main factors affecting the ambient air concentration of a certain pollutant emitted from a certain source or sources in a selected area:

- The intensity of the emissions (e.g. concentration and flow rate) from the source or sources.
- The uncontrollable atmospheric dispersion conditions which include but not limited to (wind speed, wind direction, temperature, humidity, rain fall, atmospheric turbulence, solar radiation intensity and atmospheric pressure).

All the recorded results showed compliance with the national and international guidelines for ambient air quality moreover most of the data recorded were way below the guidelines which indicates that the ambient air quality in the project areas is one of the tolerable areas in Egypt in terms of ambient air quality which can be attributed to the absence of any major industrial sources.

Moreover, the area is mixed agricultural and industrial with a very reasonable source for any pollution other than the nearby the route.

13. NOISE LEVELS RESULTS

Table 5-1 presents the results of one hour average ambient noise measurements and their corresponding national and international permissible limits.

Table 13-1 Ambient Noise Levels Readings at the proposed gas pipeline route

Time	Sound Level Equivalent & Percentile Recordings in dBA for 8 Hours						Permissible Limits LAeq (dBA)	
	LAeq	LA10	LA50	LA90	LA95	LCpeak	National	International
10:00	**56.7**	50.52	46.05	39.93	37.27	116.97	**70**	**70**
11:00	**57.3**	49.06	34.62	28.4	27.83	121.52		
12:00	**50.7**	56.87	47.47	39.7	37.8	104.96		
13:00	**57.6**	57.38	49	41.11	39.06	105.77		
14:00	**59.9**	52.54	41.9	36.13	34.77	93.7		
15:00	**56.1**	54.52	42.65	35.86	34.17	105.57		
16:00	**54.8**	60.94	53.44	45.95	43.89	104.93		
17:00	**57.4**	58.67	49.75	38.61	36.17	99.24		

The results of ambient noise measurements were compared to the national and international permissible limits.

14. CONCLUSION

Based on the environmental monitoring and measurements, that performed for the ambient air quality. The results showed compliance with all the national and international guidelines.

15. FUTURE RECOMMENDATION

It is recommended that monitoring should continue for all the regulated parameters, in order to verify/assure compliance.

16. REFERENCES

- EU directive 2008 50 EC -ANNEX I Data quality objectives for ambient air quality assessment
- D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air
- Egyptian Law 4/1994 Amended by law 9/2009 and Decree 1741/2005, amended by decree 1095 /2011 Annex 6 (amendments to executive regulations of Law 4).

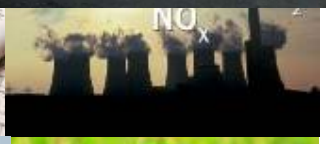
Appendix III - Selection of Photos from the Air Quality Monitoring activities


30°7'57"N, 31°17'36"E
accuracy: 11ft
Altitude
249 ft


30°7'57"N, 31°17'36"E
accuracy: 10ft
Altitude
258 ft


Thermo
Thermo
Thermo

Appendix IV - Selection of Photos from the noise Monitoring activities


NO$_x$


CH$_4$
CO$_2$
3
1
CFC
SO$_2$

CONTENTS

17. INTRODUCTION

Air quality and noise monitoring has been carried out as part of the baseline description for the Environmental and Social Impact Assessment of the proposed gas pipeline route project located in Met Asem-Qalubia governorate since the route is passing in the front of Met Asem primary school at the residential area and it is considered as a sensitive receptor. The location was set as suitable location for ambient air quality and noise level monitoring.

Air quality monitoring has been undertaken for the pollutants of primary concerns (NO_2, SO_2, T.S.P and PM_{10}), in order to better characterize the baseline air quality as part of the environmental impact assessment required where a one-hour average measurements were conducted for carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), Total Suspended Particulates (T.S.P) and particulate matter (PM_{10}) for one specific location in front of Met Asem primary school and on the other side the agricultural area was found, where the air quality complies with the national guidelines for all the analysed parameters. The site specific air quality measurements were conducted using Standard ambient air quality monitoring instruments under the supervision of experienced specialists. Noise levels were conducted as per the international standard using type 1 precision noise level meter.

17.1 Objectives

The overall objectives of this monitoring round are to:

- Assess/confirm compliance of the air quality in the baseline environment with relevant national guidelines;
- identify any non-compliance issues, if any; and
- Provide general conclusions based on analysis results.

The objectives of the ambient air quality Monitoring activities conducted at the proposed site are:

- To verify compliance with authorized discharge limits and any other regulatory requirements concerning the impact on the public and the environment due to the normal operation of a practice or a source within a practice;
- to establish air quality baseline which will assist in the estimation of the project impact on the local physical, biological and social environment ;
- To check the conditions of operation and the adequacy of controls on discharges from the source and to provide a warning of unusual or unforeseen conditions and, where appropriate, to trigger a special environmental monitoring program.

17.2 Scope of Work

- The scope of work of the present monitoring includes the sampling and analysis of active air and noise in the surrounding area as to distinguish whether air quality is impacted by the project activities or not.
- The measurement will be conducted in the herein location within the boundaries of the sensitive object.

17.2.1 Sampling strategy

The selection of the active air measurement location is based on the prevailing wind direction; site Topography, the future layout of the proposed project components and the location of the nearest sensitive receptors with respect to the project plots. Moreover, the selection is based on the guidelines stated in the American Society for Testing Materials (ASTM) reference method[13].

The following ambient air pollutants where the target parameters to be measured during the monitoring program:

- Total Suspended Particulate (TSP)
- Thoracic particulate (PM_{10})
- Nitrogen dioxide NO_2.
- Sulfur dioxide SO_2.
- Carbon monoxide CO.

Moreover, location of the measurements is shown in the figure below

17.3 Location

The GPS coordinates of the as Ambient Air (**AA**) measurement location

Location	Latitude	Longitude
Met Asem Residential area	30°25'31.00"N	31°10'29.00"E

[13] D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air

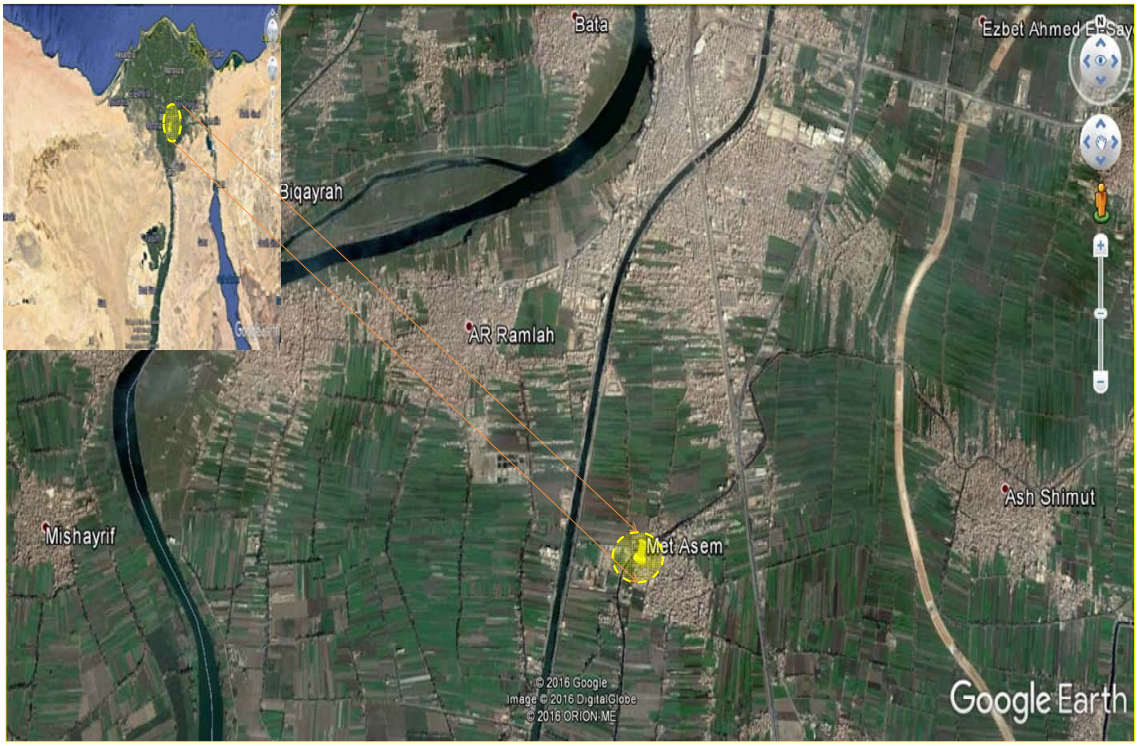


Figure 17-1 location map for Gas pipeline beside Met Asem primary school

18. LEGISLATION AND REGULATORY FRAMEWORK

18.1 National and International Legislation

The results of ambient air quality measurements were compared to the national limits set in Annex 5 of the Executive Regulation (D1095/2011) and the guideline values of world health organization (WHO) for the ambient air quality.

Table 2-1 and Table 2-3 lists the corresponding applicable national and international ambient air quality permissible limits.

Table 18-1 Applicable national permissible limits for ambient air quality levels for rural/urban area

Pollutant	Average Period	Egyptian Standards ($\mu g.m^{-3}$)	Egyptian Standards (ppm)
Sulphur dioxide (SO_2)	1 hour	350	0.1337
	24 hours	150	0.0573
	Annual	60	0.0229
Carbon monoxide	1 hour	30,000	26
	8 hours	10,000	9
Nitrogen dioxide (NO_2)	1 hour	350	0.2
	24 hours	150	0.08
	Annual	60	0.032
Total suspended particulate T.S.P	24 hours	230	---------
	Annual	125	---------
Thoracic particles (PM_{10})	24 hours	150	---------
	Annual	100	---------
$PM_{2.5}$	24 hours	100	---------
	Annual	70	---------

Table 18-2 Applicable National and International Permissible Limits for Ambient Noise Levels

Location	LAeq (dBA) National Permissible Limits (Annex 7 Decree 710/2012)		LAeq (dBA) International Permissible Limits (IFC – EHS General Guidelines)	
	During Day (7 am to 10 pm)	During Night (10 pm to 7 am)	During Day (7 am to 10 pm)	During Night (10 pm to 7 am)
Residential	60 [14]	55 [2]	70 [15]	70 [3]

[14] National permissible limits for ambient noise levels for areas on roads 12 m wide or more or light industrial areas including other activities

[15] IFC permissible limits for ambient noise levels for industrial or commercial receptors

Table 18-3 WHO Ambient Air Quality Guidelines 16,17

Pollutant	Average Period	Guideline value (µg.m^{-3})
Sulphur dioxide (SO_2)	24 hours	125 (interim target 1) 50 (Interim target 2) 20 (guideline)
	10 minutes	500
Nitrogen dioxide (NO_2)	1 hour	200
	1 year	40
Thoracic particles (PM_{10})	24 hrs	150 (interim target 1) 100 (interim target 2) 75 (interim target 3) 50 (guideline)
	1 year	70 (interim target 1) 50 (interim target 2) 30 (interim target 3) 20 (guideline)
Ozone	8 hours daily maximum	160 (interim target 1) 100 (guideline)

[16] World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

[17] Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

19. METHODOLOGY

19.1 Ambient air quality

Ambient Air Quality Monitoring equipment is an integrated system of which includes several analyzers with data recording devises. A typical system would include gas analyzers for ambient air analysis, data recording, and signal conduction instrumentation.

Figure 19-1 ambient air quality monitoring system

Ambient air pollutants

The most common gaseous air pollutants (also known as "criteria pollutants") are carbon monoxide, sulfur oxides, and nitrogen oxides. These pollutants can be harmful to health and the environment, and cause property damage. To acquire baseline information on background levels of Thoracic Particulates, the team conducted for one-hour active sampling using a dust sampler. The sampler measures the respirable fraction of airborne dust (of particle size 0.1 to 10 μm) with a measuring range of 0.001 to 400 mg/m^3 and an accuracy of ± 5 % of the reading. The levels measured and recorded would serve as baseline values for reference during future monitoring activities.

Ambient air quality monitoring system specifications

General Features

- Standard methods of measurement which means:
- SO_2 analyzer: ISO 10498 equivalent to(U.S.A EPA Reference method – EQSA-0486-60) – UV Fluorescence
- NOx analyzer: ISO 7996 equivalent to(U.S.A EPA Reference method – RFNA-1289-74) – Chemiluminescence
- CO analyzer: ISO 4224 equivalent to U.S.A EPA Reference method – RFCA-0981-54) – IR GFC
- PM_{10} sampler: Plow volume sampler equivalent to(EPA method, Appendix J-Reference method FR)
- T.S.P low volume sampler equivalent to(EPA method, Appendix J-Reference method FR)

Ambient Particulate Matter PM_{10} sampler

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method: Sequential Particulate sampler
- Sampling on filter membranes which can be used for further Chemical analyses as required by current regulations and standards.
- Active flow Control Flow range: 0-10 LPM
- Nominal flow: 5LPM Sampler
- Dimensions: 10” x 12” x 7” Sampler
- Weight: 9.8LBS (fully configured) Transport Case: 19.75” x 12” x 18”
- The analyzer should be equipped with batteries in order to avoid possible data losses due to power failures.
- Source: Beta Ray Source with appropriate activity
- Ranges: 0-500 µg/ m^3 (2.3 m^3/ h operating flow rate); 0-1,000 µg/ m^3 (1 m3/ h operating flow rate)
- Lower Detectable Limit: ≤ 1.5 µg/ m3 (24 hour cycle time, 2.3 m3/ h operating flow rate)
- Precision: ≤ 0.4 µg/ m^3 (24 hour cycle time, 2.3 m^3/ h operating flow rate)

- Correlation Coefficient R > 0.98

Sulphur Dioxide SO_2 Analyzer (Thermo Scientific SO_2 Analyzer model 43i-USA)

- Approval and Certification : U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method : UV Fluorescence Technology
- Ranges.: Auto ranging feature, Multiple Ranges to cover from 0 to 10 ppm (especially from 0 to 1 ppm)
- Zero Noise: ≤ 0.5 ppb
- Lower Detectable Limit: ≤ 1 ppb
- Zero drift (daily): ≤ 1 ppb
- Span drift (daily): ≤ 1% of full scale
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

Nitrogen Monoxide, Nitrogen Dioxide and Nitrogen Oxides NO, NO_2 & NO_X Analyzer (Thermo Scientific NOx Analyzer - Model 42i- USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method.: Chemiluminescence Technology
- Ranges.: Auto ranging feature, Multiple Ranges to cover from 0 to 20 ppm (especially from 0 to 1 ppm)
- Zero Noise: ≤ 0.2 ppb
- Lower Detectable Limit: ≤ 0.4 ppb
- Zero drift (daily): < 0.5 ppb
- Span drift (daily): < 0.5% of full scale
- Response time: fast, ≤ 100 seconds

- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

Carbon Monoxide CO Analyzer (Thermo Scientific Carbon Monoxide CO Analyzer model 48i-USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method: Non Destructive Infra-Red Gas Filter Correlation (IRGFC) Technology
- Ranges: Auto ranging feature, Multiple Ranges to cover from 0 to 200 ppm (especially from 0 to 50 ppm)
- Zero Noise: ≤ 0.02 ppm
- Lower Detectable Limit: ≤ 0.04 ppm
- Zero drift (daily): ≤ 0.1 ppm
- Span drift (daily): < 0.5% of reading
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

19.2 Noise Measurement Methodology

The methodology adopted was to record ambient noise levels for one hour, as per the national and international standards, in the current location at the proposed gas pipe line route. The following devices were used during this round of noise level measurements:

- Two B & K 2238 Mediator, Integrating Sound Level Meters, Type I (precision grade), compliant with IEC 1672 Class 1 standard;
- B & K 4198 Outdoor Weatherproof Microphone Kit;
- GPS unit (Garmin MONTANA 650); and
- Digital Camera.

Noise monitoring measurements included recording the following parameters using a Type 1 precision grade hand-held sound-level meters:

- Equivalent continuous noise level (LAeq)
- 95th percentile noise level (LA95)
- 90th percentile noise level (LA90)
- 50th percentile noise level (LA50)
- 10th percentile noise level (LA10)
- Peak sound pressure level (LCpeak)

The following equation[18] is the main equation used to calculated day night equivalent sound pressure level:

$L_{den} = 10\log\frac{1}{n}\sum_{i=1}^{n}10^{0.1(L_i+D_i)}$ **Where** $L_{den} = \text{Day Night Equivalent}$, $L_i = \text{The hourly } L_{eq}$, $D_i = \text{the addition for the different periods of the day}$, $n = \text{number of measured hours}$.

The sound level meters were calibrated before sound measurements to ensure reliability and precision. GPS coordinates and meteorological conditions were recorded using hand-held kits at all locations prior to the start of noise measurements. It is anticipated that most of these locations would remain the same for the purpose of pre-construction, construction, performance guarantee tests and operation monitoring. Figure 19-2 shows the locations of the different noise measurement locations; furthermore, coordinate table lists the GPS coordinates of measurement locations, measurement dates, location description and a selection of photos at each location.

[18]The equation used to obtain the average noise level of a designated time interval based on weighted readings according to "Long-term Leq errors expected and how long to measure (Uncertainity & Noise Monitoring)", Dietrich Kuehner, Forum Acusticum 2005 Budapest.

20. RESULTS

The following tables present the results for ambient air quality measurements conducted at the proposed gas pipeline route location.

The air quality at the proposed site of the proposed gas pipeline route is exhibiting acceptable levels of classic air pollutants in fact the levels are way below the international guidelines. Generation and dispersion of dust from increased vehicle traffic, especially during the rash hour, may reduce visibility, relative to baseline levels, and, together with combustion engine emissions, may affect ambient air quality. Concentration of dust particles, both total suspended particulate and respirable particulate matter and other pollutants from open burning, emissions from equipment and machinery used in transportation, various activities of operations and emissions from vehicles used to transport passengers also contribute to air pollution. These impacts may affect the human environment and, typically, arise during the preparation phase and, to a much lesser extent, during the operation phase, requiring monitoring and assessment of the natural and man-made air pollutants.

One hour average results for 8 hours continuous measurements are shown in Table 4-1 for all the measured parameters

Table 20-1 one hour average results

Time	NO ($\mu g/m^3$)	NO_2 ($\mu g/m3$)	NOx ($\mu g/m^3$)	SO_2 ($\mu g/m3$)	CO (mg/m^3)	PM_{10} ($\mu g/m3$)	T.S.P ($\mu g/m3$)
10:AM	20.1	20.4	40.5	18.33	6.2	101	166
11:00	19.9	9.72	29.62	11.5	2.85		
12:00	13.2	20.33	33.53	9.55	2.87		
13:00	10.5	14.72	25.22	18.3	2.49		
14:00	10.3	18.24	28.54	19.2	6.8		
15:00	35.7	13.65	49.35	19.7	3.51		
16:00	13.5	18.88	32.38	22.5	6.91		
17:00	12.2	20.4	32.6	28.7	16.2		
Limits	150	200	150	350	30 **(mg/m^3)**	150	230

20.1 Analysis of air quality Results

In general there are two main factors affecting the ambient air concentration of a certain pollutant emitted from a certain source or sources in a selected area:

- The intensity of the emissions (e.g. concentration and flow rate) from the source or sources.
- The uncontrollable atmospheric dispersion conditions which include but not limited to (wind speed, wind direction, temperature, humidity, rain fall, atmospheric turbulence, solar radiation intensity and atmospheric pressure).

All the recorded results showed compliance with the national and international guidelines for ambient air quality moreover most of the data recorded were way below the guidelines which indicates that the ambient air quality in the project areas is one of the tolerable areas in Egypt in terms of ambient air quality which can be attributed to the absence of any major industrial sources.

Moreover, the area is an agricultural with a very reasonable source for any pollution other than the nearby the route.

21. NOISE LEVELS RESULTS

Table 5-1 presents the results of one hour average ambient noise measurements and their corresponding national and international permissible limits.

Table 21-1 Ambient Noise Levels Readings at the proposed gas pipeline route

Time	Sound Level Equivalent & Percentile Recordings in dBA for 8 Hours						Permissible Limits LAeq (dBA)	
	LAeq	LA10	LA50	LA90	LA95	LCpeak	National	International
10:00	**46.2**	50.52	46.05	39.93	37.27	116.97	**70**	**70**
11:00	**47.8**	49.06	34.62	28.4	27.83	121.52		
12:00	**50.9**	56.87	47.47	39.7	37.8	104.96		
13:00	**50.4**	57.38	49	41.11	39.06	105.77		
14:00	**50.5**	52.54	41.9	36.13	34.77	93.7		
15:00	**54.2**	54.52	42.65	35.86	34.17	105.57		
16:00	**55.9**	60.94	53.44	45.95	43.89	104.93		
17:00	**47.5**	58.67	49.75	38.61	36.17	99.24		

The results of ambient noise measurements were compared to the national and international permissible limits.

22. CONCLUSION

Based on the environmental monitoring and measurements, that performed for the ambient air quality. The results showed compliance with all the national and international guidelines.

23. FUTURE RECOMMENDATION

It is recommended that monitoring should continue for all the regulated parameters, in order to verify/assure compliance.

24. REFERENCES

- EU directive 2008 50 EC -ANNEX I Data quality objectives for ambient air quality assessment
- D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air
- Egyptian Law 4/1994 Amended by law 9/2009 and Decree 1741/2005, amended by decree 1095 /2011 Annex 6 (amendments to executive regulations of Law 4).

Appendix V - Selection of Photos from the Air Quality Monitoring activities


30°25'31"N, 31°10'29"E
accuracy: 15ft
Altitude
-53 ft


30°25'31"N, 31°10'29"E
accuracy: 14ft
Altitude
4 ft

Appendix VI - Selection of Photos from the noise Monitoring activities


30°25'31"N, 31°10'29"E
accuracy: 16ft
Altitude
-30 ft


30°25'31"N, 31°10'29"E
accuracy: 13ft
Altitude
17 ft