Annex-4 Air Quality and Noise Measurements

Ambient Air Quality and noise Measurements Report

Gas pipeline network in Giza/

Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al Laban, Hadayek El-Ahram, Al-Munib, Nazlet El-Semman and Kafr El-Gabal

Petrosafe

- **Introduction**

Air quality and noise monitoring has been carried out as part of the Environmental air and noise quality measurements of Gas pipeline network project located in Jazirat Mohamed, El-Kom El-Ahmar, Tanash, Suqayl, Ausim, Saft Al Laban, Hadayek El-Ahram, Al-Munib, Nazlet El-Semman and Kafr El-Gabal districts, Giza governorate.

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 sensitive location in the study area, 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.

- **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.

- **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.

- **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

- **Location**

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

Table 0-1 Geographical coordinates of the study areas

Location	Latitude	Longitude
Jazirat Mohamed primary school	30°6'50" N	31°11'40"E
Al-Kom EL-Ahmar family health center	30° 6'35"N	31°10'13"E
Tanash Medical Centre	30°7'27"N	31°11'31"E
Suqayl family health center	30° 7'54"N	31°10'11"E
Ausim Central hospital	30° 7'18"N	31°8'27"E
Mosque in Saft al - Laban/ Residential area	31° 1'58"N	31°10'13"E
Al - Manahil Private Schools/ Residential area- AL Munib	29° 59'4"N	31°11'13"E
Hadayek Al Ahram Club / Residential area	29° 58'8"N	31°5'50"E
Nazlet El-Semman	29°58'30"N	31°8'47"E

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

Figure 0-1 location map for Jazirat Mohamed Primary school

Figure 0-2 location map for Gas pipeline beside Al Kom EL Ahmar family health center

Figure 0-3 location map for Tanash

Figure 0-4 location map for Gas pipeline beside Ausim Central Health

Figure 0-5 location map for Gas pipeline beside Suqayl family health center

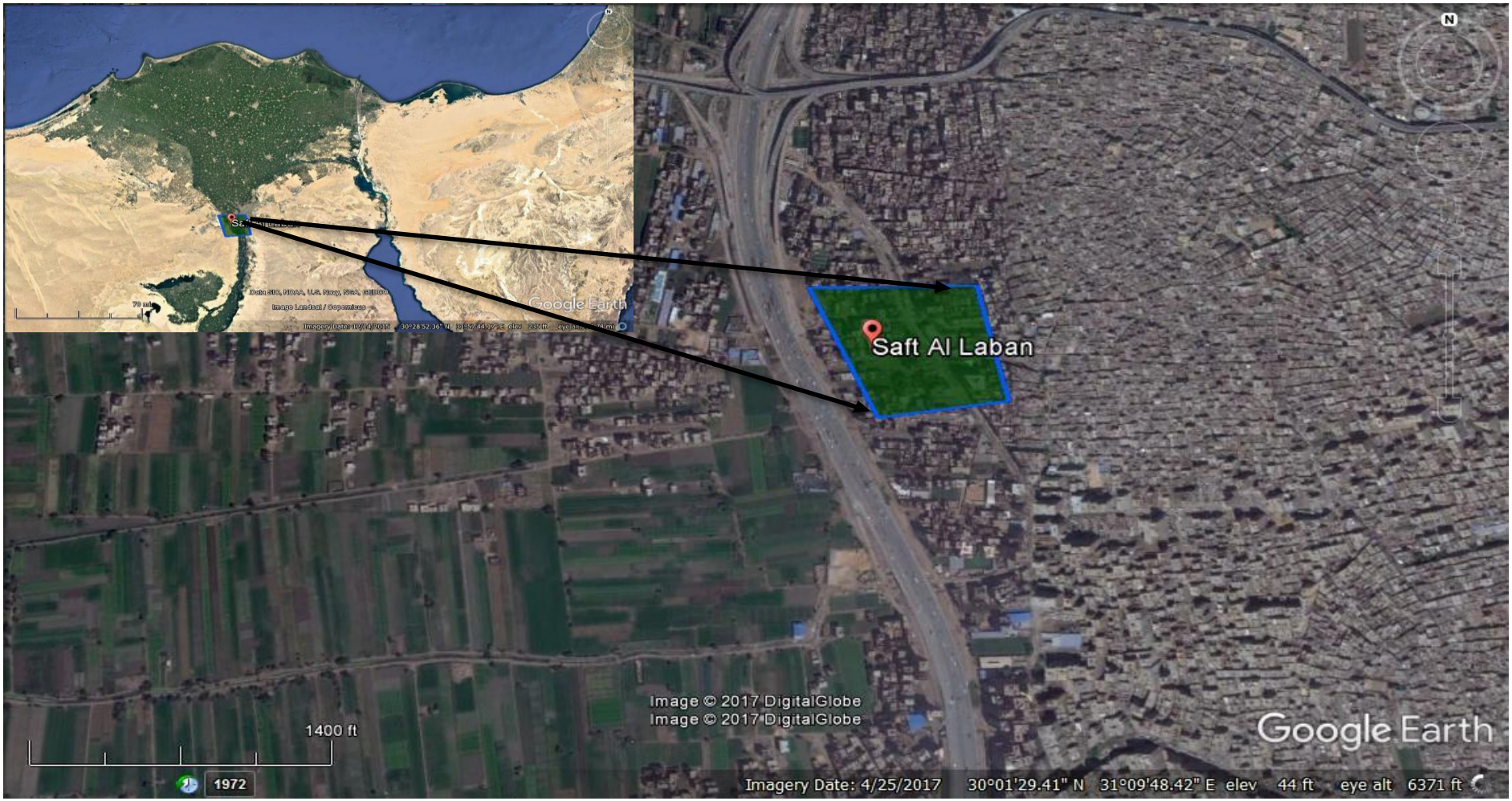


Figure 0-6 location map for Gas pipeline beside Mosque in Saft Al – Laban

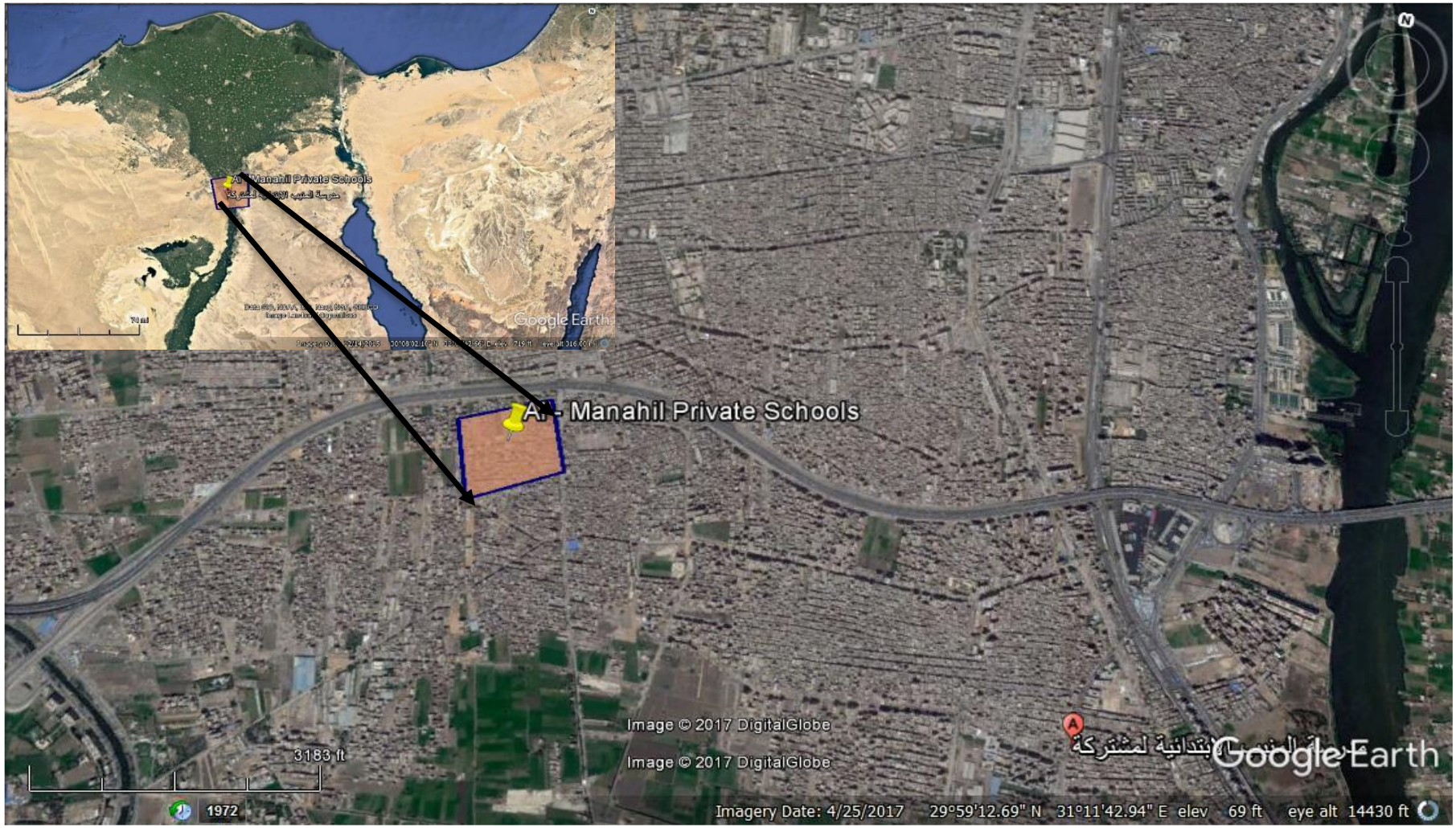


Figure 0-7 location map for Gas pipeline beside Al - Manahil Private Schools

Figure 0-8 location map for Gas pipeline beside Hadayek Al Ahram Club

Figure 0-9 location map for Nazlet El-Semman

- **Legislation and regulatory framework**

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 0-2 and Table 0-4 lists the corresponding applicable national and international permissible limits.

Table 0-2 Applicable national permissible limits for ambient air quality levels for 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 0-3 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	70 [2]	60 [2]	70 [3]	70 [3]

Table 0-4 WHO Ambient Air Quality Guidelines 4,5

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)

[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

[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.

- **Methodology**

  - **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 transmission instrumentation.

  - **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

- **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 transmission line route. The following devices were used during the first 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} = 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. **Error! Reference source not found.** Shows the locations of the different noise m easurement locations; furthermore, table (0-1) lists the GPS coordinates of measurement locations, measurement dates, location description and a selection of photos at each location.

- **Results**

The following tables present the results for ambient air quality measurements conducted at all the Project monitoring locations.

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 site impact on the local physical, biological and social environment ;

[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.

- 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.

The air qualities at the current site of the project site in all locations are exhibiting acceptable levels of classic air pollutants in fact the levels are way below the national guidelines. Generation and dispersion of dust from increased vehicle traffic, especially during the daily activities, 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 repairable particulate matter and other pollutants from open burning, emissions from equipment and machinery used in transportation, the nearby plant operations and emissions from vehicles used to transport workers also contribute to air pollution. These impacts may affect the human environment and, typically, arise during the ordinary daily activities 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 0-5 for all the measured parameters

Table 0-5 Daily average Ambient Air (µg/m3) at project locations

Name	NO	NO2	NOx	SO2	CO (mg/m3)	PM10	T.S.P
Jazirat Mohamed	15.78	26.91	43.24	16.38	2.39	122.20	151.66
Al Kom Al-Ahmar	16.93	17.04	33.97	15.96	3.5	111	170
Tanash	15.74	26.45	41.05	18.24	1.6	101.11	130.56
Ausim	11.98	24.49	36.46	15.95	3.36	94	118
Al-Munib	17.58	22.45	40.02	15.2	3.08	80	113
Saft Al-Laban	16.83	24.7	41.53	13.2	3.02	87	101
Suqayl	18.8	16.14	34.94	16.08	3.49	101	129
Hadayek Al-Ahram	16.52	22.75	39.28	13.72	2.91	74	109
Nazlet Al Samman/Kafr Al-Gabal	15.3	26.012	41.31	17.07	1.22	98.56	108.43
Limits	-	150	150	150	10 (mg/m3)	150	230

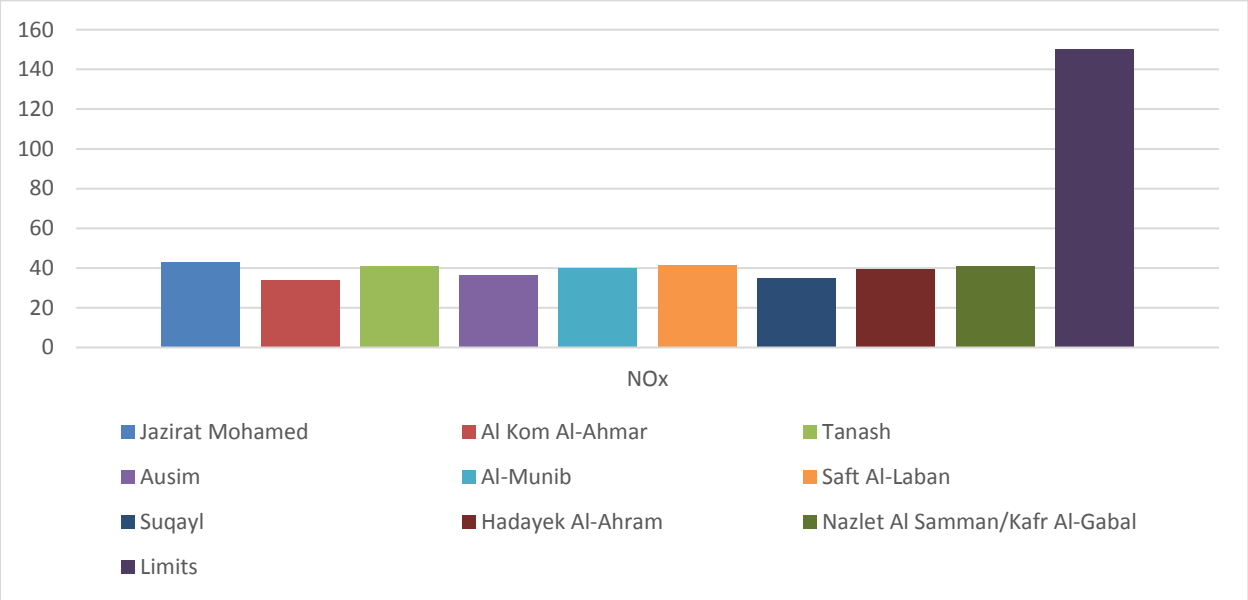


Figure 0-10 NOx variation in the Project locations

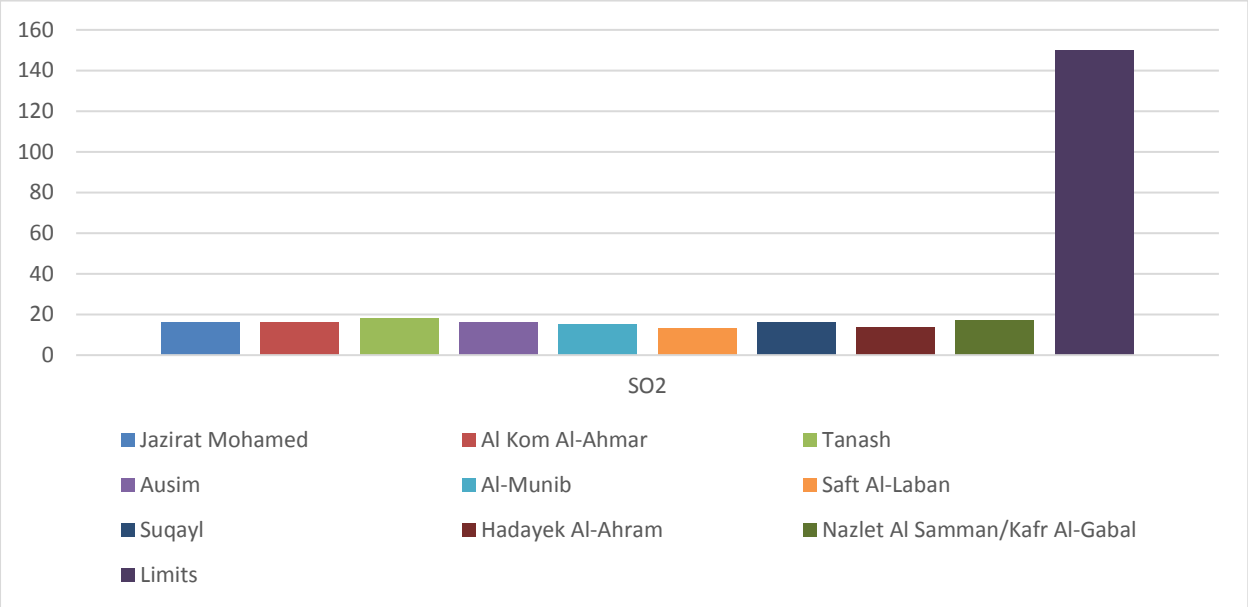


Figure 0-11 SO2 variation in the Project locations

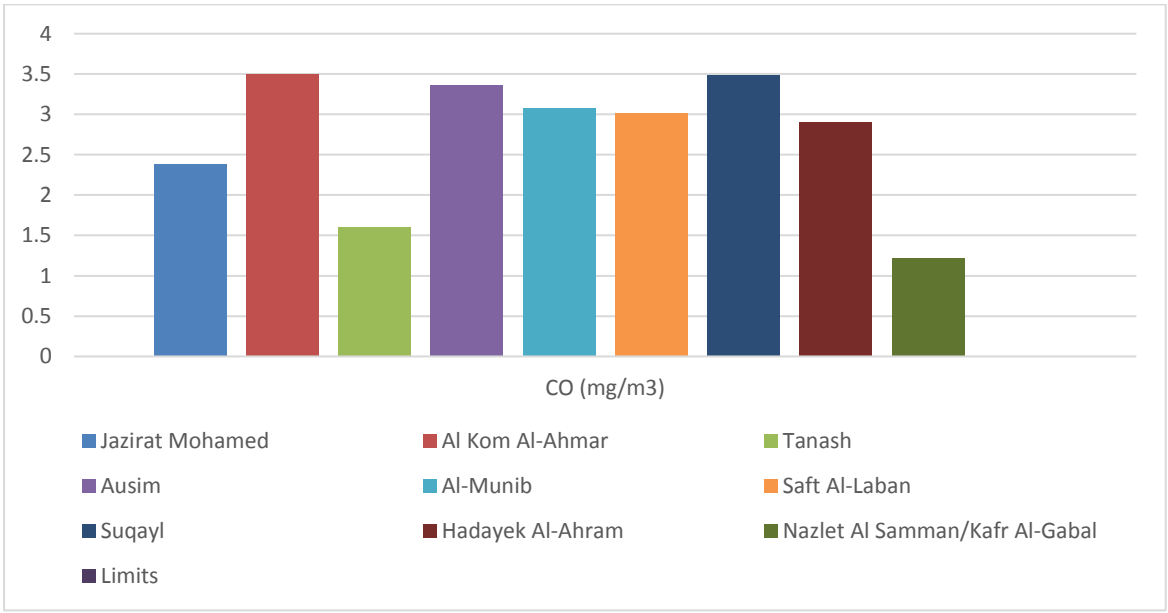


Figure 0-12 Co variation in the Project locations

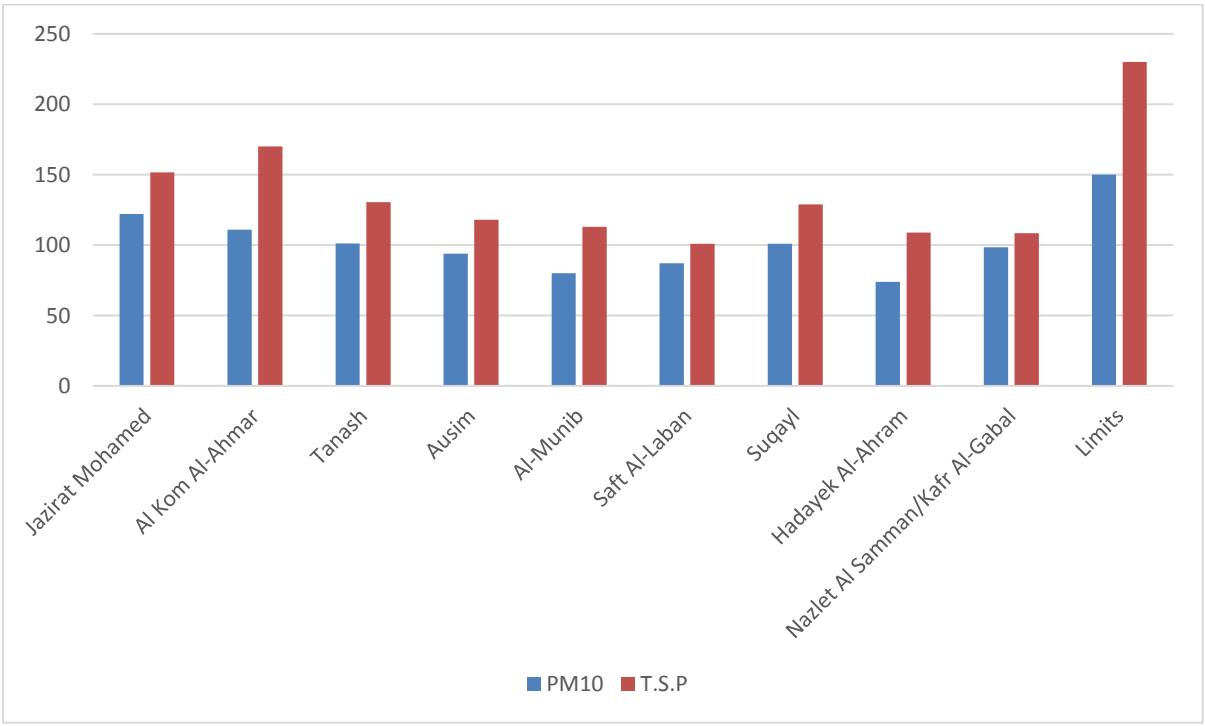


Figure 0-13 TSP& PM10 variation in the Project locations

- **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, rainfall, atmospheric turbulence, solar radiation intensity and atmospheric pressure).

All the recorded rests 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 those areas are matching with guidelines of emissions released from industrial sources.

Moreover, the areas is mainly beside a variety of other sources of air pollution other than some small roads.

- **Noise levels Results**

Table 0-6 presents the results of 8 hour average ambient noise measurements and their corresponding national and international permissible limits.

Table 0-6 Ambient Noise Levels Readings at the proposed Project locations

Name	Sound Level Equivalent & Percentile Recordings in dBA for 8 Hours						Permissible Limits LAeq (dBA)	
	LAeq	LA10	LA50	LA90	LA95	LCpeak	National	International
Jazirat Mohamed	64.73	55.06	45.61	38.21	36.37	106.58	70	70
Al Kom Al-Ahmar	66.7	67.76	55.06	45.61	36.37	106.58		
Tanash	63.97	57.80	47.55	40.89	36.47	106.76		
Ausim	64.7	62.96	55.06	45.61	38.21	106.58		
Al-Munib	49.46	55.06	45.61	38.21	36.37	106.58		
Saft Al-Laban	51.78	55.06	45.61	38.21	36.37	106.58		
Suqayl	65.08	55.06	45.61	38.21	36.37	106.58		
Hadayek Al-Ahram	54.16	55.06	45.61	38.21	36.37	106.58		
Nazlet Al Samman/Kafr AlGabal	56.36	57.80	47.55	40.89	36.47	106.77		

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

- **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.

- **FUTURE RECOMMENDATION**

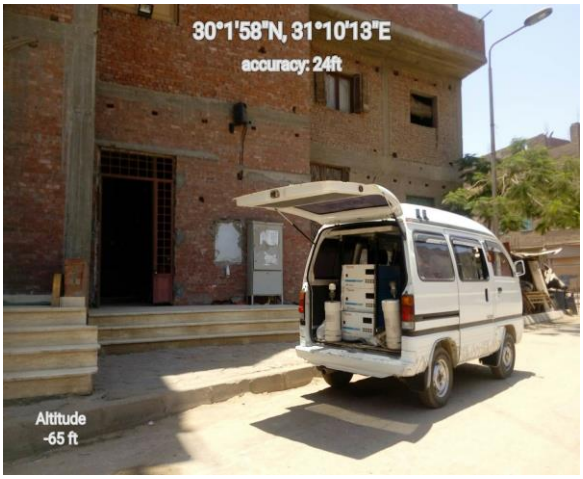
It is recommended that monitoring should continue for all the regulated parameters, in order to verify/assure compliance.

- **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

Jazirat Mohamed	Al Kom El-Ahmar
	
Tanash	**Suqayel**
	
Ausim	**Al-Munib**
	

Saft Al-Laban	Hadayek El-Ahram
	

Nazlet Al-Samman& Kafr Al-Gabal

Figure 0-14 Ambient air quality monitoring system at Project Locations

Appendix II - Selection of Photos from the noise Monitoring activities

Jazirat Mohamed	Al Kom El-Ahmar
	
Tanash	**Suqayel**
	
Ausim	**Al-Munib**
	

Saft Al-Laban	Hadayek El-Ahram
	

Nazlet Al-Samman& Kafr Al-Gabal

Figure 0-15 Noise Monitoring activities at Project Locations