Annex D

Noise and Vibration

D1 INTRODUCTION

This section presents the methodology, findings and recommendations of a Noise and Vibration Impact Assessment (NVIA) associated with the Gaziantep IHC Project (the Project), located in Gaziantep, in south Turkey.

D1.1 ASSESSMENT OVERVIEW

The NVIA considers Project activities with the potential to generate noise and vibration emissions impacting nearby receptors and noise sensitive areas during construction and operation.

D2 SCOPE OF THE ASSESSMENT

A detailed Project description is provided in the *Volume I, Chapter 2, Project Description*. This section provides a brief summary of the Project as considered appropriate to inform and record the basis of this NVIA.

The following significant noise sources are considered in the NVIA:

- **Construction -** Construction activities and blasting;
- **Operation** –the tri-generation system; and
- **Traffic –** Construction traffic and operation traffic.

D2.1 CONSTRUCTION

Construction will last for approximately three years and will take place mainly during daytime, however it is possible that some construction activities may take place during evening and night time.

Approximately 455,223 m^3 of excavated material will be generated during earthworks. Earthworks will be phased to maximise efficiency, with the Project Site being divided into multiple sections that will be excavated in parallel. Blasting will also be used to loosen rock during earth works.

The noise emissions from the excavation works have been assessed for the daytime period, since excavation will be the noisiest daytime activity due to type and number of equipment. The building construction will take place during 10 hours per day, however since there may be a possibility that construction extends for an additional 10 hours through the evening and night, evening and night time impacts have also been assessed.

D2.2 OPERATION

It is assumed that the numerous building services plant required to operate the hospital will all be designed with suitable acoustic silencers to meet the required internal and external noise and vibration standards as part of the future design of the facility as the scheme progresses.

Power will be supplied to the Project through a tri-generation system. The plant will be equipped with five co-generators of 2.5 MW of electrical load and 2.1 MW of thermal load, with a total thermal power of 36.6 MW. The CHP will use natural gas. Tri-generation system will be equipped with air cooled condensers to avoid disruptions. The tri-generation plant and other equipment such as boilers and pumps could generate noise if not attenuated.

However, the Combine Heat and Power (CHP) packages are designed to act as acoustic ventilated enclosures to limit this problem. Exhaust silencer will be installed for additional noise reduction. The CHP, boilers and pumps system is expected to be installed into buildings that have been designed to attenuate noise. The air cooled condensers can be a major noise source and will be located outdoor. However, they will not be immediately adjacent to nearby receptors. In addition, if necessary they will be located so that other non-sensitive buildings provide noise screening and the noise emissions from the air cooled condensers will be reduced by providing additional local screening with noise barriers or acoustic louvres. Noise emissions generated during the operation by the CHP system, pumps and boilers are not expected to create any significant noise impact, therefore the noise during operation has not been considered further in this NVIA. In addition, it is anticipated that operational activities will not cause any vibration.

D2.3 ROAD TRAFFIC NOISE

D2.3.1 Construction

During construction, in the worst case scenario, where it is assumed that excavation trucks, concrete mixers, trucks for materials and staff cars will operate at the same time, the daily traffic generation resulting from the construction activities will be 510 vehicles. It is stated by the SPV that the construction activities will run for 20 hours per day, with excavation works taking place only during daytime.

D2.3.2 Operation

The traffic model simulation revealed that the daily vehicle movements during the operation will be 40,489, including both private car and public transport.

D2.4 RECEPTOR LOCATIONS

Based on the review of Project data available at the time of this assessment the receptor locations shown in *Figure D2.1* have been identified. These receptors represent all noise sensitive locations identified in the vicinity of the Project. R1, R2, R3 and R5 are residential receptors and R4 is Türkiye Odalar ve Borsalar Birliği Fen Lisesi (TOBB High School), which is the closest receptor to the site. In February 2016 began boarding students; consequently, it has been included in the evening and night time assessment. *Table D2.1* presents the distances between the assessment locations and the Project Site boundaries and the centre of the Project Site.

Figure D2.1 Assessment Locations

Table D2.1 Distance between Assessment Locations and Project's Boundaries and Centre

Assessment Location	Type of Receptor	Distance from Boundaries(m)	Distance from Centre (m)
R1	Residential	415	765
R2	Residential	235	577
R3	Residential	910	1225
R4	School	20	265
R5	Residential	65	425

The area to be excavated within the site does not extend to the site boundaries. Additional existing receptors are located along the IHC Street and the road network which will be used during the operation of the Project. The future development of the area around the Project includes many more residential developments.

Existing and future residential developments along the IHC Street and the road network, which will be used during the operation of the Project, will be affected by increases in traffic noise.

D3 ASSESSMENT METHODOLOGY

D3.1 NOISE STANDARDS AND GUIDELINES

A review of the Turkish standards and the IFC/ World Bank EHS Guidelines has been conducted to inform the development of suitable criteria for the project.

D3.1.1 Turkish Regulations

Environmental noise is regulated by the Regulation on the Assessment and Management of Environmental Noise - CGDYY (Official Gazette Date and Number: 10.06.2010/27601). The regulation stipulates noise standards for areas of specific sensitivity with respect to noise exposure on human beings: residential areas, schools, industrial sites. Limits are defined for construction and operational noise exposure during daytime, evening hours, and night time (*Table D3.1, Table D3.2,Table D3.3* and *Table D3.4)*.

The Turkish Regulation on the Assessment and Management of Environmental Noise does not define limit values for noise emission sources of hospital activities to the surrounding buildings. It is anticipated that the most important noise source due to the hospital's operation, excluding traffic noise, will be the operation of tri-generation system, which is evaluated by the Turkish Regulations for industrial facilities.

Table D3.1 Turkish Standards for Construction Noise

Category of area	Day 07:00-19:00	Evening 19:00-23:00(1)	Night 23:00- 07:00(1)
Building	70	65	60
Road	75	70	65
Other Sources	70	65	60
1) Construction activities are prohibited during evening and night time hours, unless consent is obtained from the relevant authorities			

The SPV is planning on obtaining a consent if activities related with the building construction extend into evening and night time periods.

Table D3.2 Turkish Standards for Industrial Noise

Areas	Day 07:00-19:00	Evening 19:00-23:00	Night 23:00-07:00
Noise sensitive areas including residential, educational, cultural and health centres	60	55	50
Mixed use areas with predominance of dwellings	65	60	55

Areas	Day 07:00-19:00	Evening 19:00-23:00	Night 23:00-07:00
Mixed use areas with predominance of commercial	68	63	58
Industrial areas	70	65	60

Table D3.3 Turkish Standards for Road (Existing)

Noise Type	Areas	Day 07:00-19:00	Evening 19:00-23:00	Night 23:00-07:00
Road Noise	Noise sensitive areas including residential, educational, cultural and health centres	65	60	55
	Mixed use areas with predominance of dwellings	68	63	58
	Mixed use areas with predominance of commercial	70	65	60
	Industrial areas	72	67	62

Table D3.4 Turkish Standards for Road (Planned or Improved)

Noise Type	Areas	Day 07:00-19:00	Evening 19:00-23:00	Night 23:00-07:00
Road Noise	Noise sensitive areas including residential, educational, cultural and health centres	60	55	50
	Mixed use areas with predominance of dwellings	63	58	53
	Mixed use areas with predominance of commercial	65	60	55
	Industrial areas	67	62	57

In addition, the Regulation on the Assessment and Management of Environmental Noise sets limits for ground vibration at sensitive areas. The levels apply to the construction and operation of the Project, and are listed in *Table D3.5*.

Table D3.5 Turkish Standards for Vibration

Category of area	Peak Particle Velocity (mm/s) (frequency range: 1 – 80 Hz)	
	Continuous	Intermittent
Residential	5	10
Industrial and commercial	15	30

Vibration criteria from blasting at the nearest receptors specified by the Turkish Regulations are listed in *Table D3.6*.

Table D3.6 Turkish Standards for Blasting Vibration

Frequency (Hz)	Peak Particle Valocity (mm/s)
1	5
4-10	19

Frequency (Hz)	Peak Particle Valocity (mm/s)
30-100	50

For frequencies between 1 - 4 Hz the PPV changes from 5 to 19 mm/s, and between 10 – 30 Hz changes from 19 to 50 mm/s linearly.

D3.1.2 IFC EHS Guidelines – Environmental Noise Management

IFC EHS Guidelines 1.7 Noise (IFC Noise 1.7) is an internationally recognised guideline document containing information for the assessment and management of noise. It also presents noise level criterion values applicable to sites such as the proposed Project.

IFC Noise 1.7 differentiates between two principal receptor categories, residential and industrial and are summarised in *Table D3.7*. They make reference to noise from facilities and stationary noise sources, and are commonly applied as design standards for industrial facilities, and whilst this may imply they relate to some threshold of noise effects in a general sense, the IFC has indicated that they are not directly applicable to transport or mobile noise sources. Measurements are to be taken at noise receptors located outside the project property boundary.

Table D3.7 IFC/ World Bank Noise Level Guidelines

Receptor	Maximum Allowable Ambient Noise Levels, LAeq,1hr, dB(A) Free field	
	Daytime 07:00 – 22:00	Night-time 22:00 – 07:00
Residential, institutional, educational	55	45
Industrial, commercial	70	70

IFC Noise 1.7 guideline states that noise impacts should not exceed the levels presented in *Table D3.7* or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

D3.2 PROJECT NOISE AND VIBRATION IMPACT ASSESSMENT CRITERIA

This Section presents the Project-specific noise and vibration criteria adopted for the NVIA.

D3.2.1 Noise – Construction

The IFC noise standards refer to permanent noise from the operation of a project rather than short term noise impacts from construction works. It is common practice for major projects to consider noise impact from shorter term construction activities, and to do so it is necessary to use specific noise level criteria, set at higher noise levels to reflect the lower duration of the noise compared to permanent noise which could give rise to health impacts

accumulated over many years. The Turkish Noise Regulations for construction noise (see *Table D3.1*) have been used to define the construction noise criteria for the NVIA for day, evening and night time. However, ERM has adopted values and are listed below:

- Daytime 65 dB(A);
- Evening time 60 dB(A); and
- Night time 55 dB(A).

D3.2.2 Construction Vibration

The Turkish Noise Regulations for vibration (see *Table D3.5*) have been used to define the vibration criteria for the NVIA and are listed below:

- For Residential receptors:
  - 5 mm/s for continuous vibration;
  - 10 mm/s for intermittent vibration.

- For Industrial and Commercial receptors:
  - 15 mm/s for continuous vibration;
  - 30 mm/s for intermittent vibration.

For this NVIA, ERM has adopted the most stringent criterion of 5 mm/s, assuming that the vibration due to hydraulic breaker and vibratory roller will be partly continuous, albeit varying with time.

D3.2.3 Blasting

The Turkish Noise Regulations for blasting (see *Table D3.6*) have been used to define the vibration impact due to blasting activities and are listed below:

- 5 mm/s for 1 Hz;
- 19 mm/s for 4-10 Hz; and
- 50 mm/s for 30-100 Hz.

As vibrational waves travel outwards from the source of explosion, higher frequencies are damped (1). In most civil construction blasting projects, where measurements have been conducted in near field, a good blast designer can use advanced blasting techniques to channel vibration above 35 Hz(2), however, since information about frequency range due to blasting at this area was not available, ERM has adopted the most stringent criterion of 5 mm/s.

D3.2.4 Traffic

The Turkish Noise Regulations for road noise from existing and planned or improved roads have been used to define the noise criteria for the assessment

(1) Vibration Control, Book edited by: Dr. Mickaël Lallart, ISBN 978-953-307-117-6, pp. 380, September 2010,
(2) www.oricaminingservices.com | Document reference: 200281

of noise emissions due to construction and operation traffic noise and are listed below:

- Existing Roads -Noise sensitive areas including residential, educational, cultural and health centres
  - Daytime LAeq 12 hr 65 dB;
  - Evening time LAeq 4 hr 60 dB; and
  - Night time LAeq 8 hr 55 dB.

- Planned or Improved Roads -Noise sensitive areas including residential, educational, cultural and health centres
  - Daytime LAeq 12 hr 60 dB;
  - Evening time LAeq 4 hr 55 dB; and
  - Night time LAeq 8 hr 50 dB.

It has assumed that during the operation planned and improved roads will be used, whilst for construction the existing roads will be used.

D3.2.5 Building Noise Emissions – Operation

ERM has reviewed the IFC and the Turkish Noise Regulations, for sensitive areas including residential, educational, cultural and health centres from *Table D3.2*, for the assessment of the operational noise. ERM has adopted the following criteria for this assessment:

- Daytime 55 dB(A);
- Evening time 50 dB(A); and
- Night time 45 dB(A).

D3.3 EVALUATING IMPACT SIGNIFICANCE

D3.3.1 Construction Noise

The Project Noise Level (PNL) values are the values where noise impacts are expected to occur. The impact magnitude ratings, based on a review of the Turkish Noise Regulations for construction, is summarised in *Table D3.8*.

Table D3.8 Construction Noise Impact Magnitude for Residential Properties.

Period	Predicted Noise Level, LAeq			
Impact Rating	Negligible	Small	Medium	Large
Day time	<60	60-65	>65-70	>70
Evening	<55	55-60	>60-65	>65
Night time	<50	50-55	>55-60	>60

D3.3.2 Vibration and Blasting

Table D3.9 summarises ground vibration levels, from vibration activities and blasting, used to assess significance impacts.

Table D3.9 Vibration and Blasting Impact Assessment Magnitude for Residential Receptors

Vibration and Blasting	Vibration PPV mm/s			
	Negligible	Small	Medium	Large
Daytime	<2	<2-5	5-10	> 10

D3.3.3 Traffic

For the assessment and evaluation of road traffic noise impact it is important to understand that large differences in traffic flow figures are generally necessary to result in perceptible noise changes. For example, a doubling of traffic flow is required to cause an increase of 3 dB(A), which is equivalent to medium magnitude for a permanent change. For the short period this value increases to 5 dB(A). The impact rating values below have been used for this NVIA, based on the Turkish Noise Regulations.

Table D3.10 Traffic Noise Impact Magnitude (Existing Roads)

Period	Predicted Noise Level, LAeq			
Impact Rating	Negligible	Small	Medium	Large
Day time	<60	60-65	>65-70	>70
Evening	<55	55-60	>60-65	>65
Night time	<50	50-55	>55-60	>60

Table D3.11 Traffic Noise Impact Magnitude (Planned or Improved Roads)

Period	Predicted Noise Level, LAeq			
Impact Rating	Negligible	Small	Medium	Large
Day time	<55	55-60	>60-65	>65
Evening	<50	50-55	>55-60	>60
Night time	<45	45-50	>50-55	>55

The step from impact magnitude to significance may involve considering factors that influence significance, but in cases where it does not the following pairings between impact magnitude and significance can be used.

Table D3.12 Noise Significance Ratings

Impact Magnitude Classification (positive or negative)	Influencing Factors	Impact Significance Rating
Negligible	Consider other factors that have the ability to influence noise propagation and/ or the receiver perception of noise	Negligible
Small		Minor
Medium		Moderate
Large		Major

The meaning of the four impact significance ratings used, in the context of a noise impact assessment, is as follows:

- **Negligible –** no detectable effects, no need to consider in decision making, no mitigation required;
- **Minor –** the effect may be detectable, but small enough that noise management practices would ensure impacts are reduced to be Negligible;
- **Moderate –** a detectable effect, an impact that is significant, noise management practices and/or mitigation should be considered. Mitigation is likely to affect design and cost; and
- **Major –** a detectable effect, an impact that is significant, noise management practices and mitigation must be considered. Mitigation will alter project design and cost. Impacts are undesirable if not addressed.

Long term unattended noise monitoring was conducted at three locations (R1, R2 and R3). R1 and R2 are situated to the west of the Project Site and R3 to the south of the Project Site. These three locations were considered to be representative of the existing acoustic environment, located in and around the Project Site. At each location, a minimum of 48 hours continuous monitoring was conducted to provide a description of the noise levels and to understand the variation between the daytime and night time periods. At the time of the survey, noise measurements were not undertaken at R4 and R5, since the noise levels at that time were not representative of normal noise conditions due to noise from the construction site. *Appendix D1* includes the details of the noise survey.

Figure D4.1 Noise Measurement Locations

Table D4.1 summarises the results of the measurements recorded at the three long term noise monitoring locations based on the IFC day and night time period definition.

Table D4.1 Long Term Unattended Noise Monitoring Results

Measurement Location	Type of Receptor	Period (T)	Measurement Parameter, (dBA)				
			LAeq	LA90	LA10	LAmin	LAmax
R1	Residential	Day time	58	45	60	38	89
		Night time	44	35	46	31	74
R2	Residential	Day time	62	45	59	40	100
		Night time	45	43	46	42	68
R3	Residential	Day time	60	48	62	40	93
		Night time	54	37	57	27	93
Period T = 15 hours for Daytime and 9 hours for Night time.							

Daytime ambient (L_{Aeq}) noise levels are higher than the night time levels due mainly to the higher level of human activity. At the measurement location R1 and R2, during the first day of the baseline, construction activities significantly influenced the daytime levels. At these locations traffic noise and daily human activities were audible on both days, during the daytime. At the measurement location R3 construction activities were not audible; the acoustic environment was composed of traffic noise and daily human activities.

Baseline noise levels at the TOBB High School (R4) are likely to be similar to those at survey sites R2 and R3. In view of this and the additional sensitivity of the school to noise intrusion during teaching classes, a significance impact criterion of 60 dB has been adopted to assessment daytime construction noise at the school. For evening and night time the school has been assessed as residential receptor to account for the students who are boarding there.

D5 IMPACTS

This Section presents the predicted Project Noise Levels (PNL), their comparison to Project-specific noise criteria and evaluation of impact significance.

D5.1 NOISE & VIBRATION MODELLING

D5.1.1 Construction – Excavation Works

The type and quantity of equipment that will be required for the excavation works are shown in *Table D5.1*. All equipment is assumed to work simultaneously during day time to assess the worst case scenario during the daytime construction.

Table D5.1 Excavation Equipment

Type of equipment	Quantity
Trucks 18 m^3	10(1)
Excavators (385 CAT)	2
Excavators (365 CAT)	2
Excavators (336 CAT)	5
Excavators (330 CAT)	3
Excavators (349 CAT) with Jackhammer	4
Excavators (336 CAT) with Jackhammer	6
Excavators (330 CAT) with Jackhammer	6
Loader (966 CAT)	1
Dozer (D9 CAT)	1
(1) It has been assumed that there is only one truck at each one of the nine sub excavation areas, and another 40 will be travelling between the site and the dump area.	

The sound power level for each type of equipment for one unit and the operation time is provided in *Table D5.2*. The values in the table are derived from ERM's Sound Power Level database.

Table D5.2 Sound Power Level of Excavation Equipment

Type of equipment	Operation Time (%)	Sound Power Level (dBA)
Trucks 18 m^3	40	107
Excavators (385 CAT)	40	109
Excavators (365 CAT)	40	107
Excavators (336 CAT)	40	105
Excavators (330 CAT)	40	105
Excavators (349 CAT) with Jackhammer	40	106
Excavators (336 CAT) with Jackhammer	40	110
Excavators (330 CAT) with Jackhammer	40	108
Loader (966 CAT)	40	111
Dozer (D9 CAT)	40	118

The total effective sound power level is estimated to be **121** dB(A).

D5.2 CONSTRUCTION – BUILDING CONSTRUCTION

The type and quantity of equipment that will be required for building construction works are shown in *Table D5.3*. All equipment is assumed to work simultaneously during day time to assess the worst case scenario during the evening and night time.

Table D5.3 Building Construction Equipment

Type of equipment	Quantity
Diesel Powered Power Float	6
Truck Mixer 9 m^3	6
Concrete Pumps	3
Stationary Pump	1
Wheel Loader (966 CAT)	1
Concrete Vibrators with Pokers	20
Tower cranes	10
Forklift	4
Batching Plant	1
Mobile Crane 30 t	1
Mobile Crane 50 t	1

The sound power level for each type of equipment for one unit and the operation time is provided in *Table D5.4*. The values in the table are derived from ERM's Sound Power Level database.

Table D5.4 Sound Power Level of Building Construction Equipment

Type of equipment	Operation Time (%)	Sound Power Level (dBA)
Diesel Powered Power Float	40	100
Truck Mixer 9 m^3	20	108
Concrete Pumps	20	103
Stationary Pump	20	90
Wheel Loader (966 CAT)	10	111
Concrete Vibrators with Pokers	40	105
Tower cranes	20	104
Forklift	50	99
Batching Plant	50	108
Mobile Crane 30 t	25	98
Mobile Crane 50 t	25	98

The total effective sound power level is estimated to be **117** dB(A).

The excavation works and the building construction works will take place in different periods during the construction. The excavation will proceed across the whole site simultaneously covering the nine subareas as shown in *Volume I, Chapter 2, Project Description*. Therefore, the noise modelling has assumed all the equipment is spread across the site to predict a typical construction noise level. The same assumption has been made for the building construction works.

The calculations were made using the BS 5228 calculation method, but exclude air absorption, ground absorption and potential screening from intervening structures. These predictions therefore result in a conservative assessment of noise.

D5.2.1 Vibration from Construction Plant

Certain activities can produce a significant amount of ground-borne vibration which potentially can cause concern at nearby receptors. Studies show that levels of vibration from driven piling fall below the level at which vibration may be perceptible in a residential environment within a distance of 100 m from the source (1). Therefore, vibration has been considered only for receptor R4.

From other sources of vibration, such as hydraulic breaker and vibratory rollers, imperceptibility levels are reached at much shorter distances. Since no driven piling will be conducted at the project site, vibration will only be related to hydraulic breaker and vibratory rollers.

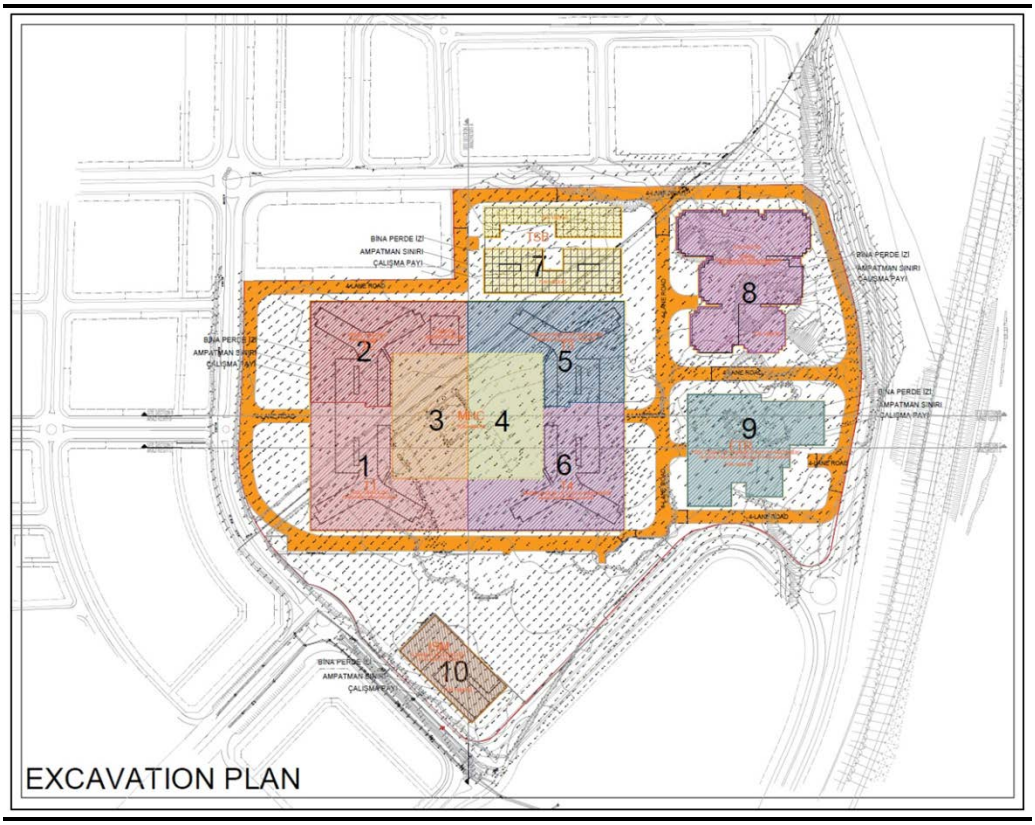
(1) TRL Report 429. Groundborne Vibration Caused by Mechanised Construction Works. D.M.Hiller & G.I.Crabb. Highways Agency 1995

The BS5228 calculation method was used to estimate the vibration levels due to the vibratory roller. Measured vibration levels were used for the assessment of vibration due to the hydraulic breaker.

D5.2.2 Blasting

Blasting shall be performed once per day at noon time, during the school's lunchtime in order to avoid any inconveniences during lessons. Blasting design details were not provided at the time of the assessment. According to the surveys held on site, section 4 and section 5 of the excavation plan (see *Figure D5.1*) will be subject to blasting.

Figure D5.1 Excavation Areas



Calculations were conducted, to estimate the allowable maximum instantaneous charge to comply with the respective criteria at various distances from the sensitive receivers.

The following equation was used to estimate the mean vector peak particle velocity according to Australian Standard 2187.2 2006:

$$V = K\left(\frac{R}{Q^{\frac{1}{2}}}\right)^{-1.6}$$

Where V is the peak particle velocity (mm/s), R the distance (m) between the receptor and the blasting location, Q is the maximum instantaneous charge (kg), K is the transmission factor, based on geological conditions. Due to lack

of geological data, a value of 1140 was used, for a free face in hard or highly structured rock referenced from Australian Standard 2187.2 2006.

D5.2.3 Traffic Construction

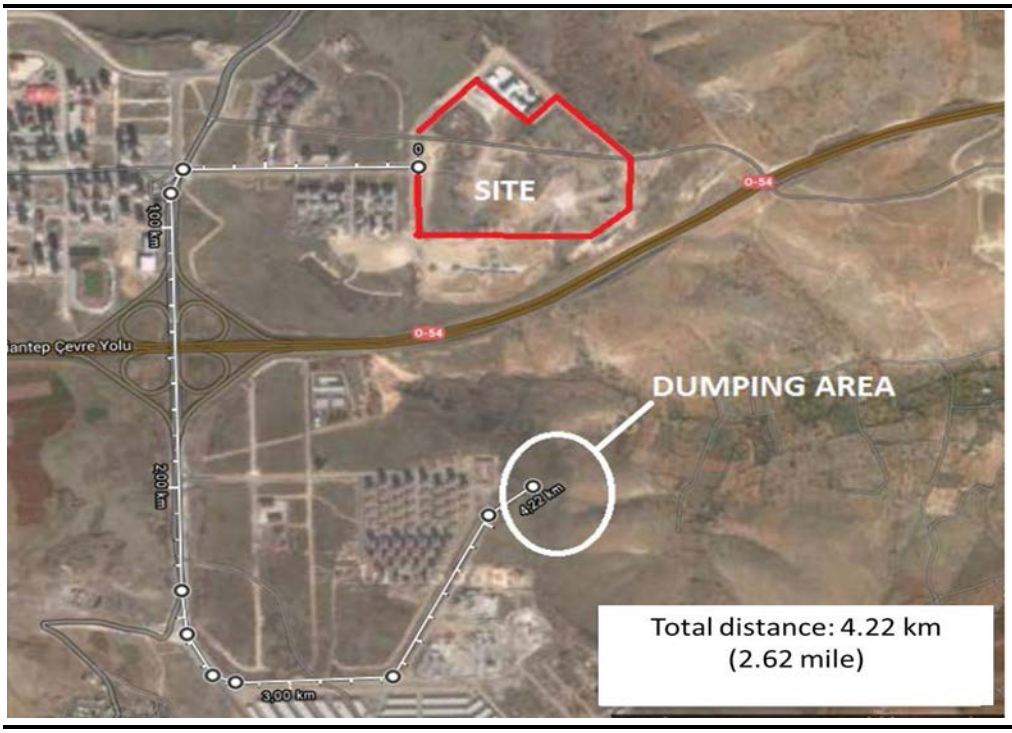
The daily traffic movements estimated for the key construction activities are:

- 200 trucks per day in the first 4 months for earthworks
- 90 transport concrete mixers per day for the first year of concrete works
- 70 trucks per day for materials mainly after the first year
- 150 cars for permanent staff, per day from 6th month to 30th month

Although it is not likely the constructions activities will take place simultaneously, the worst case scenario has been estimated by adding up the daily traffic movements per activity.

The excavation wastes that will be generated during construction will be transported to an Excavation Materials Disposal Site. The disposal site is located 4.2 km to the south of the Project site. The locations of the disposal site, together with the routes that the trucks will follow are illustrated in *Figure D5.2.*

Figure D5.2 Location of the Excavation Waste Disposal Site and its Access Route from the Project Site



The baseline data indicates that the construction traffic will cause a maximum of 1% increase in the existing traffic conditions on 400th Street, Ozdemir Street, O-54 Connection Street and O-54. Taking into account of the low increase, an

impact of negligible significance is anticipated due to traffic noise during the construction period at these streets.

The areas around IHC Street and the road that approaches the dump location are under development, the existing traffic levels can be considered very low. The noise levels only due to the vehicle movements during construction have been estimated, excluding the noise from other vehicles. Noise levels have been predicted including truck movements and the personnel's car movement to the site, for IHC Street. For the approach of the dump location, noise levels have been predicted including only the truck movements during daytime.

The traffic noise from IHC Street and the road that approached the dump location has been assessed based on the criterion for existing roads.

D5.2.4 Traffic Operation

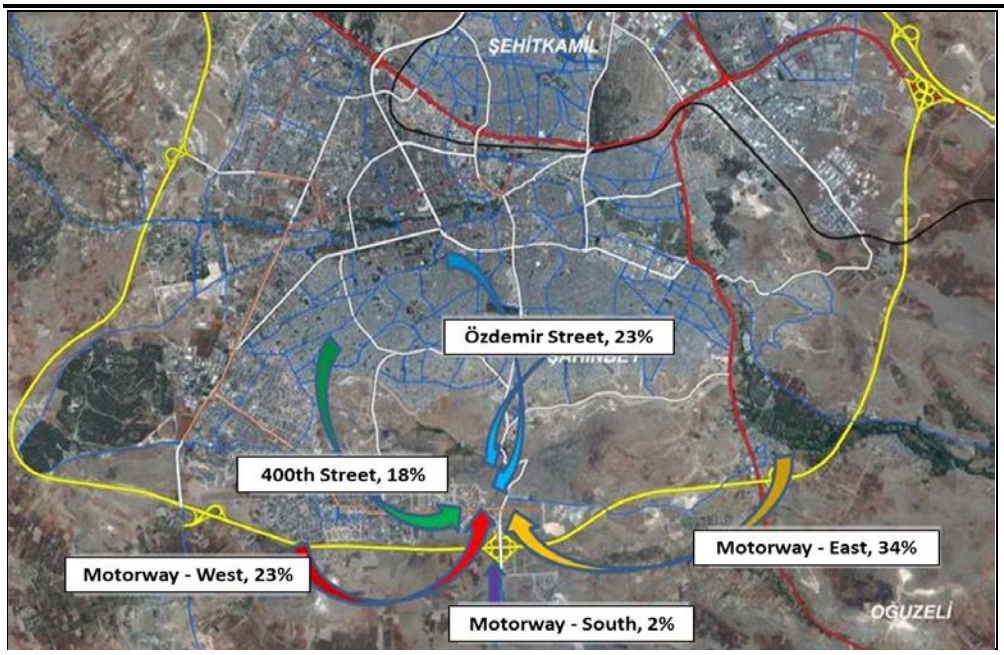
Data from the preliminary traffic impact assessment were used, for the assessment of the traffic noise during operation. These data are related to the existing flows and to the vehicle movements due to the operation of the Project, excluding vehicle movements related to the future residents or other future facilities at the area.

During the operation, the number of daily vehicles travelling to and from the hospital will be 40,489 of which the 98% will be cars and the 2% will be busses. It should be noted that this is a worst case assumption that does not consider the use of the public transport network. All the vehicles will pass through IHC Road to go to or leave the hospital, however 18% of these vehicles will travel through 400th Street, 23% through Ozdemir Street Northbound up to 94th Street, and the remaining 59% through Ozdemir Street Southbound where 57% will travel through O-54 (23% Westbound and 34% Eastbound) and 2% will travel South (*Figure D5.3*).

It should be noted that this is a worst case assumption that does not consider the use of the public transport network.

Ozdemir Street is currently being expanded from two lanes to six lanes and traffic noise has been assessed based on the planned/new roads criterion. Traffic noise from all the other roads has been assessed based on the criterion for existing roads.

Figure D5.3 Traffic Distributions



During night time, it is anticipated that traffic flows from and to the hospital will be limited to ambulance movements, the number of which is expected to be negligible comparing to the traffic flow created by the residents and other facilities at this area. Therefore, although ambulate sirens may cause intermitted local noise disturbance, traffic noise during night time operation of the Project has not been considered further in this NVIA.

The baseline data indicates that during evening time the operation traffic will cause a maximum of 51% increase in the existing traffic conditions on the 400th Street, Ozdemir Street and O-54 ring road connection. It is anticipated that an impact of minor significance will occur during the operation at these streets. However, noise levels have been predicted during evening time for the IHC Street, due to the vehicle movements during operation, excluding the noise from other vehicles.

The noise predictions due to traffic noise were carried out according to CRTN (1) and the TRL report 'Converting the UK Traffic Noise Index LA10,18h to EU Noise Indices for Noise Mapping' (2), to estimate the traffic noise levels for the day and evening time according to the Turkish Noise Regulations. This methodology uses periodically (day and evening time) light and heavy vehicle traffic data input, road surface type, and average speeds of light and heavy vehicles.

(1) Department of Transport and Welsh Office (1988). Calculation of Road Traffic Noise. HMSO, London.
(2) Abbott, P.G. and Nelson, P.M. (2002). Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping. Transport Research Laboratory, Crowthorne

D5.3 POTENTIAL IMPACTS DURING CONSTRUCTION

D5.3.1 Excavation Works and Building Construction

The significance of impacts during excavation works and building construction at each of the receptors has been determined and presented in *Table D5.5*.

Table D5.5 Impact Significance – Construction

Receptors		Construction			Noise Assessment Criterion			Excess over Noise Assessment Criterion			Impact Significance		
		Excavation Works	Building Construction										
ID	**Type of Receptor**	**PNL LAeq Day**	**PNL LAeq Evening**	**PNL LAeq Night**	**Day time**	**Evening time**	**Night time**	**Day time**	**Evening time**	**Night time**	**Daytime**	**Evening time**	**Night time**
R1	Residential	58	54	54	65	60	55	-	-		Negligible	Negligible	Minor
R2	Residential	61	57	57	65	60	55	-	-	2	Negligible	Negligible	Moderate
R3	Residential	54	50	50	65	60	55	-	-	-	Negligible	Negligible	Minor
R4	School/ Residential	68	64	64	60	60	55	8	4	**9**	Major	Major	**Major**
R5	Residential	63	59	59	65	60	55	-	-	4	Negligible	Negligible	Minor

The findings presented in *Table D5.5* indicate that the impacts associated with daytime excavation works and evening time building construction works will be **negligible** on residential receptors (R1, R2, R3 and R5). Impact of **major** significance it is anticipated for the school (R4) during day and evening time due to excavation works.

During night time, emissions from the building construction works are expected to generate **major** noise impacts to receptors R2 and R5, an impact of **moderate** significance to receptor R1 and an impact of **minor** significance to receptor R3.

If night time construction activities are required, they are predicted to cause **significant** noise impacts at night, thus a Noise Management Plan is necessary with appropriate mitigation measures.

D5.3.2 Vibration

The *Table D5.6* shows measured vibration levels from hydraulic breaker activity and vibratory roller activity.

Table D5.6 Measured Vibration Levels from Various Construction Activities

Type of Activity	PPV (mm/s)	Distance (m)
Hydraulic rock breaker*	4.3	5
* Northern Expressway Environmental Report, Volume 2, Vibrations, prepared by Kellogg Brown & Root Pty. Ltd., Sinclair Knight Merz Pty. Ltd., QED Pty. Ltd., Department for Transport Energy and Infrastructure, Government of South Australia, March 2007.		

The calculated ground vibration level, based on the specific vibratory roller characteristics level, is equal to 5 mm/s at the distance of 11 m and equal to 2 mm/s at 20 m. The measured and calculated values are lower than the threshold (5 mm/s) the Turkish Noise Regulation sets. In addition, the distance between the school and the boundaries of the Project site approximately 13 m, and hydraulic breaker and vibratory roller activities are not anticipated at the boundary of the Project site, so lower levels will be experienced. Nonetheless vibration is likely to be perceptible in the school and may give rise to adverse comment when the works are at their closest.

D5.3.3 Blasting

The calculated maximum instantaneous charge that can be used during each blast at various distances to meet the ground borne vibration criterion of 5 mm/s is shown in *Table D5.7*.

Table D5.7 Calculated Allowable Maximum Instantaneous Charge at Range of Distances to meet the 5mm/s criterion

Peak Particle Velocity (mm/s)	Distance (m)	Maximum Instananeous Charge (kg)
5	25	0.7
5	50	2.8
5	100	11.3
5	200	45.2
5	300	101.6

The blasting locations are not known; however, section 5 of the excavation area is approximately 50 m from the school. Major impacts will occur if the maximum instantaneous charge exceeds the values shown in *Table D5.7*.

D5.4 POTENTIAL IMPACTS FROM TRAFFIC NOISE

D5.4.1 Construction

During daytime predicted noise levels will not exceed 60 dB(A) at any existing or future receptor along IHC street during daytime and will not exceed 55 dB(A) during evening time. Therefore, an impact of **negligible** significance is anticipated during day and evening due to the traffic noise during construction. During night time predicted noise levels will not exceed 55 dB(A) at any existing or future receptor along IHC street; however, existing receptors along IHC Street are located within the distance zones where the predicted noise level is higher than 50 dB(A). Since the construction period is longer than six months, an impact of **minor** significance it is anticipated due to the construction traffic noise during night time.

Along the road that approaches the dump location, predicted noise levels are not exceeding 60 dB(A) during daytime, therefore an impact of negligible significance it is anticipated due to construction traffic noise.

D5.4.2 Operation

The calculated distances, where daytime noise levels of 65 and 60 dB(A) (existing roads) and 60 and 55 dB(A) (improved road) will be met at each road based on the forecast vehicle movements are shown in *Table D5.8*.

In the evening the traffic forecasts only show increases on IHC Street. The equivalent distances for evening on this road are shown in *Table D5.9*.

Table D5.8 Predicted Distances- Day

Road	Project Noise Level (LA, eq dB)	Equivalent Distance from the Edge of the Road (m)
IHC Street (existing)	65 – 60	60 – 115
400th Street (existing)	65 – 60	45 – 70
Ozderim Street Northbound (outside settlement area, widened)	60 – 55	190 – 380
Ozderim Street Northbound (inside settlement area, widened)	60 – 55	70 – 150
O-54 connection street (existing)	65 – 60	65 – 120

Table D5.9 Predicted Distances – Evening

Road	Project Noise Levels (LAeq dB)	Equivalent Distance (m)
IHC Street (existing)	60 – 55	40 – 60

The calculated distances where the forecast traffic would give rise to each levels of impact significance are summarised in *Table D5.10,* and the noise sensitive receivers within each of these distance are discussed below.

Table D5.10 Predicted Distances and Significance of Impact

Road	Time Period	Type of Criteria	Distance from the Edge of the Road (m)s where the Significance of Impact is		
			Moderate or Major	Minor	Negligible
IHC Street	Day	Existing Road	<60	60-115	>115
IHC Street	Evening	Existing Road	<40	40-60	>60
400th Street	Day	Existing Road	-<45	45-70	>70
Ozderim Street Northbound (outside settlement area)	Day	Improved Road	<190	190-380	>380
Ozderim Street Northbound (inside settlement area)	Day	Improved Road	<70	70-150	>150
O-54 connection street	Day	Existing Road	-<65	65-120	>120
O-54 Eastbound	Day	Existing Road	<200	200-410	>410
O-54 Westbound	Day	Existing Road	<125	125-270	>270

Existing receptors along IHC Street are located within the moderate or major impact distance zones, where the predicted noise level is higher than 65 dB(A) for day time and 60 dB(A) for evening time. In addition, based on the high expected traffic flows, and assuming the existing flows are much lower, it is anticipated that noise levels from traffic noise will increase more than 3 dB(A) during day and evening time, causing noise impacts of **moderate** to **major**

significance at all existing and future receptors along IHC Street within a distance of 60 metres from the edge of the road.

The predictions show that along O-54 connection street to the junction, existing receptors are located within the distance zones where the noise level is higher than 65 dB(A) during day time. In addition, the existing traffic flow will increase by more than 100%, as such an impact of **moderate** to **major** significance it is anticipated at the existing and future receptors within a distance along O-54 connection street within a distance of 65 metres.

Along the 400th Street, there are existing receptors within a distance that a **major** impact is predicted for day time. However, the predicted levels should not exceed by 3 dB(A) the existing levels since the increase of the traffic flow is 81%. An impact of minor significance is anticipated at all existing and future receptors along 400th Street.

Existing receptors along Ozdemir Street (inside the settlement area) are located within a distance where the noise levels will be lower than 55 dB(A), therefore an impact of minor significance it is anticipated to occur within a distance of 307metres from the road. Even though the traffic flow will increase by 100% during day time, it is anticipated to cause an impact of **moderate** to **major** significance to future developments within a distance of 70 metres from Ozdemir Street (inside the settlement area). It is not known if there will be any residential development along Ozdemir Street (outside the settlement area), but if so an impact of **moderate** to **major** significance it is anticipated within a distance of 190 metres.

Along O-54 Eastbound, existing residential receptors are not located within a distance of 410 metres from the road. The traffic flow is expected to increase by more than 100%. As such, an impact of **moderate** to **major** significance it is anticipated at future residential developments within a distance of 200 metres.

Existing receptors along O-54 Westbound are located within a distance where the predicted level is higher than 65 dB(A). In addition, the traffic flow will increase by 100%. An impact of **moderate** to **major** significance it is anticipated at existing and future residential developments within a distance of 125 metres from the road.

The distance values in *Table D5.10* should be used as avoidance buffers for any future residential building at this area. Provided no future residential area is developed within these buffer distances, noise impacts from hospital traffic will be avoided. Development may be possible within these buffers if mitigation is provided (see below).

D6 MITIGATION MEASURES

This Section presents the noise mitigation, management measures and/or monitoring (over and above the embedded mitigation incorporated into the design) that will be implemented to reduce predicted impacts.

The primary objective of the following mitigation and management measures is to minimise impacts on the closest and/or most affected receptors situated in the vicinity of the Project. Where impacts have been rated as *Moderate* or above, measures are included to reduce levels to where *Negligible* or *Minor* impacts are anticipated.

D6.1 CONSTRUCTION MITIGATION MEASURES

The findings of the assessment indicate that excavation works will result in **major** noise impacts at the school that lies within 20m of the site boundary and a considerable reduction in noise levels is required to one option to reduce potential sleep disturbance at the school and nearby housing is to avoid night time works. However, if night time work is necessary a considerable level of mitigation will be required.

ERM has reviewed the predicted PNLs, the anticipated impacts and receptor distances from Project noise emissions and developed the following general Project (Construction) management rules:

- Construction works scheduled to occur during night time should be managed, to mitigate the number of equipment and where possible minimise the use of the noisier equipment.
- Where practicable noisy equipment will be orientated to face away from the receptors at which **moderate** or **major** noise impact has predicted.
- Construction contractors will use alternatives to audible reversing alarms, such as visual and/ or broadband noise emitting models, that provide a safe system of work; or configuring the Project work sites to maximise forward movements of mobile plant.
- Alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, will be used, where feasible and reasonable.
- Where feasible and reasonable, stationary equipment (e.g. hand tools) will be located in an acoustically treated enclosure.
- Throttle settings will be reduced and equipment and plant turned off, when not being used.

- Onsite chutes and bins will be lined with damping material.

- Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked. Equipment will not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.

- For machines with fitted enclosures, doors and door seals will be checked to ensure they are in good working order; also that the doors close properly against the seals.

In addition, noise barriers or berms and the use of mobile screens will be used to reduce noise levels and minimise noise impacts. Where noise barriers and/or mobile screens are used, the following general design requirements will be met:

- Construction management will schedule construction of barriers/walls/berms so that they are installed on site as early as possible and prior to high noise level generating activities.

- Barriers or walls will be constructed of typical construction hoarding or plywood cladding (e.g. 18 to 25 mm) and at least 2.4 m in height (typically the standard height for construction hoarding). Materials of equivalent acoustic performance may be used. If possible, acoustic absorptive material will be fixed to the inside of the screen (facing the site) to minimise reflected noise.

- Barriers/walls/berms will be continuous and extend to the ground (as far as is practicable), have no gaps, cracks or any penetrations that are likely to adversely affect the acoustic performance of the screen.

It may also be possible to schedule the excavation phasing to provide some additional on-site screening using the unexcavated landform to screen works at lower levels from having a direct line to sight to the school. However, the school is sensitive to noise in the day and night, and because of its proximity particular mitigation should be offered.

It is assumed that thermal double glazing in the school provides a good standard of sound insulation to classrooms, dormitories and other noise-sensitive rooms (eg offices), but this should be reviewed in light of the high levels of construction noise levels that have been predicted. If not, then secondary glazing should be provided.

Excavation (and other noisy works) works closest to the school should be schedule when the school is less noise-sensitive, such as in school holidays. This will help mitigate the highest vibration as well as noise impacts.

The school has classrooms over-looking the site whose windows are opened in the summer months for cooling. Much of the excavation will be complete before the summer months after April 2016 when temperatures rise, so it may be possible to keep the windows closed to help reduce noise ingress. However, as noisy work will continue into the summer, the sound insulation properties of the school should be reviewed, and additional ventilation and cooling should be provided if necessary to allow windows to remain closed throughout the works.

Based on the successful implementation of the noise control mitigation and management measures described above, it is envisaged that the required noise level reduction would be achieved such that **minor** impacts would result. A monitoring programme, particularly at receptors R4 and R5, will be implemented to demonstrate the effectiveness of the adopted noise reductions measures, and in the event that a noise control level of Leq 55dB is exceeded working methods will be adjusted to reduce noise. Given the potential for widespread sleep disturbance at night, noise levels will be monitored permanently throughout whenever any night-time works are required.

D6.1.1 Vibration

Ground borne vibration impacts might arise close to the site boundary, including at the nearby school. In order to reduce any potential vibration, the following general Project management rules should be met:

- all plant items to be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive vibration;
- where breakers are used, they should be of a suitable size for the job.

D6.1.2 Blasting

To avoid any impacts due to ground borne vibration from blasting, a reduction in the maximum instantaneous charge would correspondingly result in a reduction of the ground borne vibration level. The maximum instantaneous charge may easily be reduced by reducing the number of holes fired at any one time. The advanced warning system use to forward neighbours of the regular blast discharges will greatly reduce the impact that noise and vibration creates. The system will be well publicised, as required by local regulation, so that anyone affected will be well warned with adequate time.

D6.2 TRAFFIC NOISE

This assessment has predicted noise levels from the proposed roads, on the basis of future traffic forecasts and existing and planned noise sensitive receivers. **Minor** impacts from construction traffic are anticipated, however, impact of **moderate** to **major** significance have predicted due to hospital traffic, based on the Turkish Noise Regulations. In addition, **moderate** to **major** noise impacts are expected based on the quantitative impact assessment, since it is the traffic flows will increase by more than 100% at some parts of the road network.

The following mitigation measures could be used to minimise traffic noise impacts:

- set back distances/buffers;
- strict speed limits;
- earthen bunds and noise barriers; and
- road surface modification and maintenance.

In addition, during the construction period, truck movements could be limited only during day and evening time.

To meet adequate internal noise standards new buildings to be constructed adjacent to the roads may require an acoustic design. In particular, the building envelope and windows should be designed to ensure adequate attenuation for internal noise levels. Ventilation systems may also need noise attenuation. It is envisaged that adequate attenuation can be provided and significant impacts will be avoided and that the relevant building developers can take account of the traffic noise generated by the hospital as part of total traffic forecast from the areas as it develops fully in the future.

D7 RESIDUAL IMPACTS

D7.1 CONSTRUCTION

With the successful implementation of a compehehnsive noise control management plan during construction, with monitoring to check its effectiness, some night work, if required,can proceed and residual impacts can be reduced to **minor**.

D7.1.1 Vibration

With the adoption of the mitigation measures, damage to buildings due to vibration levels is highly unlikely.

D7.1.2 Blasting

Providing the calculated allowed maximum instantaneous charge will be used residual effects of **negligible** significance will remain.

D7.2 TRAFFIC NOISE

The residual effects of construction traffic are predicted to be **negligible**. The residual effects of traffic noise during operation are expected to produce a **moderate** to **major** noise impact at receptors along the road network that will be used for the hospital's operation.

D7.3 OPERATION PHASE SITE NOISE

Noise impact of **negligible** significance is expected from the operation of the hospital.

A noise, vibration and blasting impact assessment of the construction and operation phase of the Project has been conducted. The assessment has predicted noise and vibration levels to determine the significance of the potential impacts.

The impact assessment has identified key noise activities on the site that have the potential to cause significant noise impacts. During construction **major** impacts are predicted during day, evening and night time. **Moderate** to **major** noise impacts are expected due to traffic noise from operation. Operational noise emissions from the site are anticipated to be **negligible**, since the acoustic design of the plants and buildings will significantly decrease the emission from the noise sources.

The implementation of the mitigation measures is expected to reduce impacts at most existing receptors. Particular attention will be needed if noise and vibration impacts at the school are to be avoided, which may include the provision of noise insulation and/or ventilation/cooling for noise-sensitive classroom and dormitory areas.

In addition, acoustic design studies will be required for each future neighbouring development to ensure set-backs from local roads are adequate and buildings are adequately designed to provide suitable internal noise levels.

Appendix D1

ELC Noise Survey Baseline Report

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0360-T

FREKANS ÇEVRE LABORATUVARI

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Y-34/181/2011
674-D -136
08-15

Deney Raporu
Test Report

Müşterinin adı/adresi Customer Name/Address	ELC Group Consulting and Engineering Inc. (GAZİANTEP INTEGRATED HEALTH CAMPUS PROJECT)
İstek numarası Order No.	-
Numunenin adı ve tarifi Name and identity of the test item	ÇEVRESEL GÜRÜLTÜ ÖLÇÜMLERİ Environmental Noise Measurements
Numunenin kabul tarihi The date of receipt of the test item	-
Açıklamalar Remarks	This report is preperad in 3 (three) copies. Bu Rapor 3(üç) nüsha olarak hazırlanmıştır
Deneyin yapıldığı tarih Date of Test	05/06/07.08.2015
Raporun Sayfa Sayısı Number of pages of the Report	18 (On Sekiz) Sayfa ve Ekler

Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Mühür *Seal*	**Tarih** *Date*	**Deneyi Yapan** **Deney Sorumlusu** *Person in charge of test*	**Kontrol Eden** **Kalite Sistem Yöneticisi** *Quality Control Manager*	**Onaylayan** **Teknik Müdür** *Technical Manager*
	10/08/2015	**Erdem KESEN**	**F. Sinem BAKIRCI**	**Ekim Şükrü BAKIRCI**

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A.INTRODUCTION

In this study, baseline noise levels in the Gaziantep Integrated Health Campus Project site and surroundings were measured. The primary noise source is the construction activities held around territory, road traffic and daily human activities around the Project site. The project site is surrounded by residential and rural areas.

B.METHODOLOGY

Noise measurements were carried out with respect to ISO 1996-1, 1996-2. Svantek 971, 34768 and Svantek 971, 44477 and Svantek 971, 34797 Class 1 Sound Level Meters were used for measurements. Measurements were conducted on 05th, 06th and 07th of August 2015. Measurement locations are shown in Figure 1. Unattended noise measurements have been carried out for approximately 48 hours per location. During the noise level measurements, height of the omni-directional microphone was kept at 15 meters, 5 meters and 20 meters off the ground, for location 1, 2 and 3 accordingly. By using this methodology, baseline noise emission values is measured for three different time periods as depicted in Turkish Regulation on the Assessment and Management of Environmental Noise. Measurement results and logger graphics are presented in the Results Section.

Figure 1. Measurement Locations

C.MEASUREMENT EQUIPMENT

Noise Monitoring Equipment

The Svan 971 is a Class 1 Sound Level Meter

- Weighting Filters A, B, C, Z
- Time constants Slow, Fast, Impulse
- RMS Detector Digital True RMS detector with Peak detection, resolution 0.1 dB
- Microphone ACO 7052E, 35 mV/Pa, prepolarised 1/2" condenser microphone
- Linear Operating Range 25 dBA RMS ÷ 140 dBA Peak (in accordance to IEC 61672)
- Total Dynamic Measurement Range 15 dBA RMS ÷ 140 dBA Peak (typical from noise floor to the maximum level)
- Internal Noise Level less than 15 dBA RMS
- Dynamic Range >110 dB
- Frequency Range 10 Hz ÷ 20 kHz
- Meter Mode Results SPL, Leq, SEL, Lden, Ltm3, Ltm5, LMax, LMin, LPeak, "running Leq" up to 60 minutes
- Simultaneous measurement in three profiles with independent set of filters and detectors
- Statistics Ln (L1-L99), complete histogram in meter mode
- Data Logger Time-history logging of summary results, spectra with adjustable double logging steps down to 100 ms

D.RESULTS

1.) Noise Measurement #1 (48:00:00, all units are dBA)

- Information about conditions while measurement was taken;

Table 1. Information (Measurement 1)

Equipment			
Serial No	34768	Calibration Factor	0.1 dB
Type	Class 1	Model	SVAN 971
Measurement			
Measurement No	1	Date	05/06/07.08.2015
SLM No	FC 12	Distance to Project Area (m)	440
Data No	F12_773	Height	15 m.
Coordinates (E/N)	355914.00 4097922.00		
Start	05.08.2015 16:30:00		
End	07.08.2015 16:30:00		
Total Time	48:00:00		
Description	Residential area		
Background Sources	Traffic, Daily Human Activities, Construction Noise		

Figure 2. Measurement Location 1

- In order to analyze all of the 15 minutes periods separately, measurements conducted as 15 minutes loops. The results given at the table below are the calculated total values for 48 hours measurements. 15 minutes periodic results are given in the appendix.

Table 2. Results of Measurement 1 (A-Weighted)

Day	Hour	Elapsed time	PEAK	PEAK (C)	MAX	MIN	LEQ	L10	L90
05.08.2015	16:30:00	48:00:00	111.4	111.8	88.8	31.2	56.5	60.4	46.8

- L_{day}, $L_{evening}$, L_{night} in A-weighted sound levels;

Table 3. Sound Levels (Day, Evening, Night) (A-Weighted)

	L_{day}	$L_{evening}$	L_{night}
First Day	56.2	49.2	42.8
Second Day	61.0	52.4	43

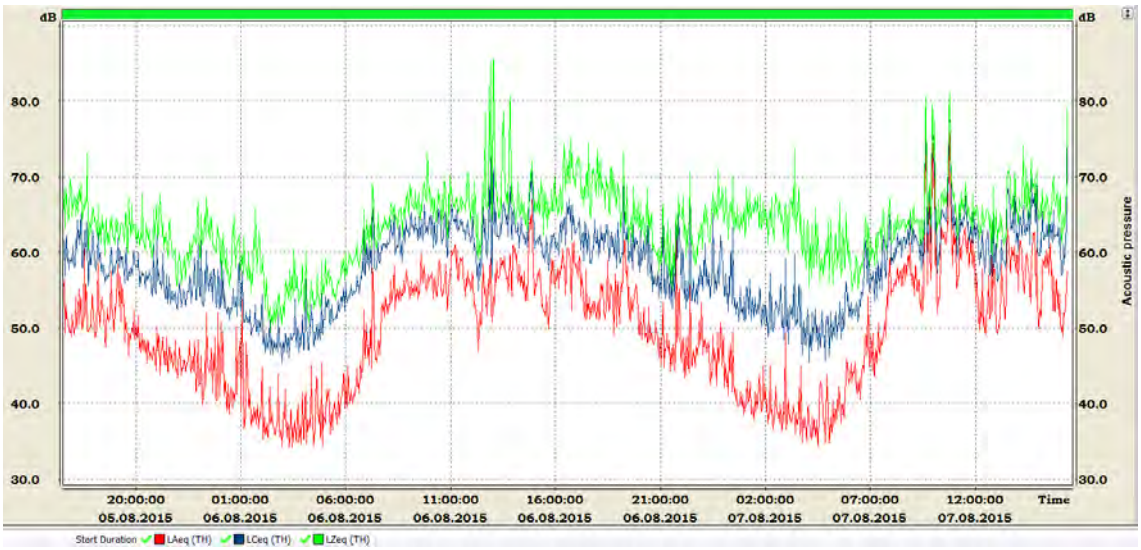

Figure 3. Logger of Noise Measurement #1

2.) Noise Measurement #2 (48:00:00, all units are dBA)

- Information about conditions while measurement was taken;

Table 4. Information (Measurement 2)

Equipment			
Serial No	44477	Calibration Factor	0.1 dB
Type	Class 1	Model	SVAN 971
Measurement			
Measurement No	2	Date	05/06/07.08.2015
SLM No	FC 15	Distance to Project Area (m)	217
Data No	53	Height	5 m.
Coordinates (E/N)	356128.00 4097865.00		
Start	05.08.2015 17:30:00		
End	07.08.2015 17:30:00		
Total Time	48:00:00		
Description	Residential area		
Background Sources	Traffic, Daily Human Activities, Construction Noise		

Figure 4. Measurement Location 2

- In order to analyze all of the 15 minutes periods separately, measurements conducted as 15 minutes loops. The results given at the table below are the calculated total values for 48 hours measurements. 15 minutes periodic results are given in the appendix.

Table 5. Results of Measurement 2 (A-Weighted)

Day	Hour	Elapsed time	PEAK	PEAK (C)	MAX	MIN	LEQ	L10	L90
05.08.2015	17:30:00	48:00:00	119.0	123.5	99.5	40.3	59.5	63.3	53.3

- L_{day}, $L_{evening}$, L_{night} in A-weighted sound levels;

Table 6. Sound Levels (Day, Evening, Night) (A-Weighted)

	L_{day}	$L_{evening}$	L_{night}
First Day	65.1	46.6	44.3
Second Day	54.7	46.8	44.9

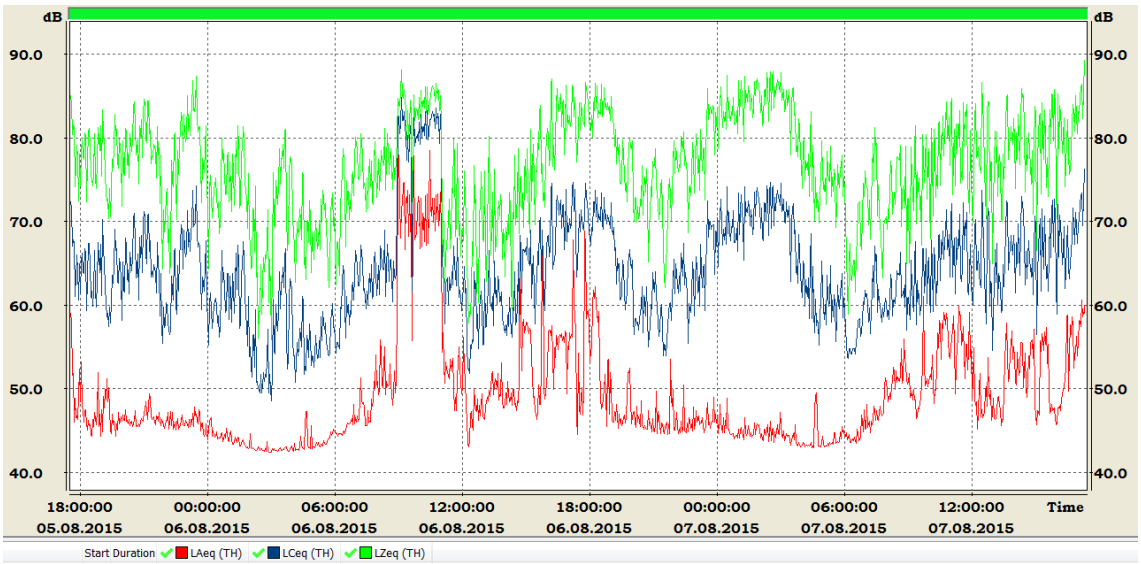

Figure 5. Logger of Noise Measurement #1

3.) Noise Measurement #3 (47:00:00, all units are dBA)

- Information about conditions while measurement was taken;

Table 7. Information (Measurement 3)

Equipment			
Serial No	34797	Calibration Factor	0.1 dB
Type	Class 1	Model	SVAN 971
Measurement			
Measurement No	3	Date	05/06/07.08.2015
SLM No	FC 13	Distance to Project Area (m)	935
Data No	F13_642	Height	20 m.
Coordinates (E/N)	356347.00 4096610.00		
Start	05.08.2015 18:50:00		
End	07.08.2015 17:50:00		
Total Time	47:00:00		
Description	Residential area		
Background Sources	Traffic, Daily Human Activities		

Figure 6. Measurement Location 3

- In order to analyze all of the 15 minutes periods separately, measurements conducted as 15 minutes loops. The results given at the table below are the calculated total values for 47 hours measurements. 15 minutes periodic results are given in the appendix.

Table 8. Results of Measurement 3 (A-Weighted)

Day	Hour	Elapsed time	PEAK	PEAK (C)	MAX	MIN	LEQ	L10	L90
05.08.2015	18:50:00	47:00:00	118.2	125.3	93.4	27.4	58.0	60.8	47.7

- L_{day}, $L_{evening}$, L_{night} in A-weighted sound levels;

Table 9. Sound Levels (Day, Evening, Night) (A-Weighted)

	L_{day}	$L_{evening}$	L_{night}
First Day	59.4	58.8	53.7
Second Day	59.4	58.8	53.3

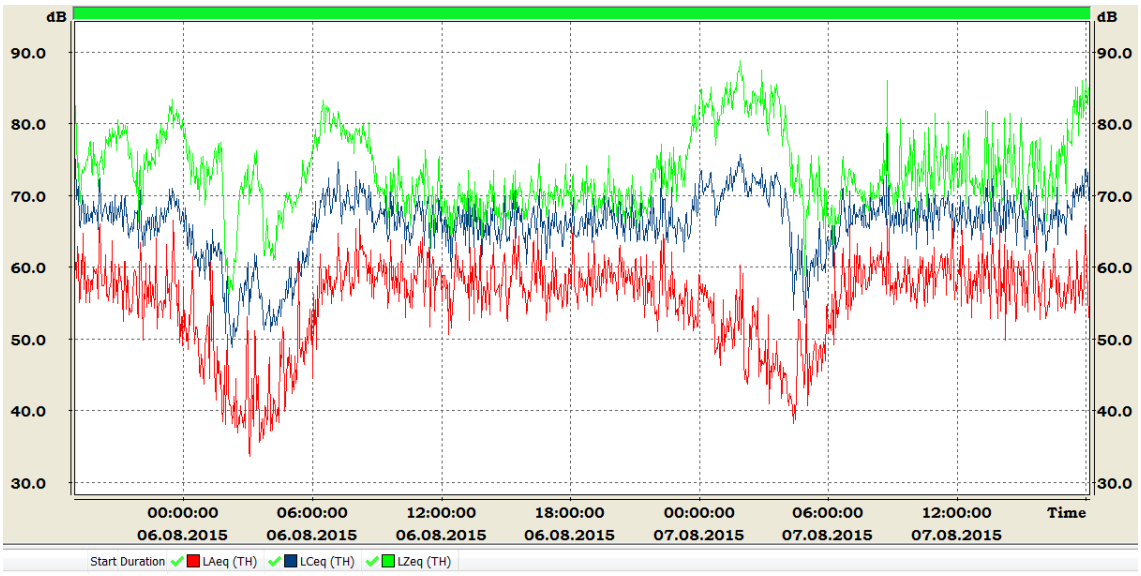

Figure 7. Logger of Noise Measurement #3

E.METEOROLOGICAL CONDITIONS

- Meteorological conditions of the Gaziantep Province at the measurement period are given at the tables below.

Table 10. Meteorological Conditions (05.08.2015)

	Time	Temparature (C)	Humidity (%)	Wind Direction	Wind Speed Km/h	Conditions
05.08.2015	12:20 AM	26	28	NW	3.7	Clear
	12:50 AM	25	32	NNW	3.7	Clear
	1:20 AM	24	34	NNW	3.7	Clear
	1:50 AM	24	36	Calm	Calm	Clear
	2:20 AM	26	32	Calm	Calm	Clear
	2:50 AM	25	34	Calm	Calm	Clear
	3:20 AM	27	30	Calm	Calm	Clear
	3:50 AM	24	41	Calm	Calm	Clear
	4:20 AM	23	44	Calm	Calm	Clear
	4:50 AM	23	50	Calm	Calm	Clear
	5:20 AM	23	41	Calm	Calm	Clear
	5:50 AM	22	46	Calm	Calm	Clear
	6:20 AM	23	44	Variable	1.9	Clear
	6:50 AM	23	47	Calm	Calm	Clear
	7:20 AM	27	39	Calm	Calm	Clear
	7:50 AM	29	35	Calm	Calm	Clear
	8:20 AM	31	33	Calm	Calm	Clear
	8:50 AM	31	31	SW	9.3	Clear
	9:20 AM	33	21	W	14.8	Clear
	9:50 AM	34	15	W	13	Clear
	10:20 AM	35	16	W	13	Clear
	10:50 AM	36	13	W	14.8	Clear
	11:20 AM	36	14	W	14.8	Clear
	11:50 AM	36	15	WSW	13	Clear
	12:20 PM	37	12	WSW	18.5	Clear
	12:50 PM	37	13	W	22.2	Clear
	1:20 PM	37	14	Variable	14.8	Clear
	1:50 PM	38	10	WNW	22.2	Clear
	2:20 PM	38	10	W	20.4	Clear
	2:50 PM	38	11	W	20.4	Clear
	3:20 PM	38	11	W	24.1	Clear
	3:50 PM	38	11	W	22.2	Clear
	4:20 PM	37	13	W	24.1	Clear
	4:50 PM	37	13	W	18.5	Clear
	5:20 PM	37	13	WNW	24.1	Clear
	5:50 PM	37	14	W	24.1	Clear

	6:20 PM	36	16	W	20.4	Clear
	6:50 PM	35	15	W	14.8	Clear
	7:20 PM	33	17	W	11.1	Clear
	7:50 PM	30	23	SW	7.4	Clear
	8:20 PM	30	25	WSW	7.4	Clear
	8:50 PM	30	27	Variable	1.9	Clear
	9:20 PM	30	29	W	13	Clear
	9:50 PM	27	34	Variable	3.7	Clear
	10:20 PM	29	33	NW	9.3	Clear
	10:50 PM	26	36	Variable	3.7	Clear
	11:20 PM	26	42	Calm	Calm	Clear
	11:50 PM	25	44	Calm	Calm	Clear

Table 11. Meteorological Conditions (06.08.2015)

	Time	Temparature (C)	Humidity (%)	Wind Direction	Wind Speed Km/h	Conditions
06.08.2015	12:20 AM	25	44	W	5.6	Clear
	12:50 AM	25	50	Variable	3.7	Clear
	1:20 AM	24	53	SW	5.6	Clear
	1:50 AM	24	50	WSW	3.7	Clear
	2:20 AM	24	53	W	7.4	Clear
	2:50 AM	23	53	Variable	1.9	Clear
	3:20 AM	23	57	WSW	3.7	Clear
	3:50 AM	23	53	WSW	5.6	Clear
	4:20 AM	23	53	WSW	7.4	Clear
	4:50 AM	22	57	Calm	Calm	Clear
	5:20 AM	22	53	Calm	Calm	Clear
	5:50 AM	21	56	NNW	5.6	Clear
	6:20 AM	22	57	Calm	Calm	Clear
	6:50 AM	24	50	Calm	Calm	Clear
	7:20 AM	26	47	Calm	Calm	Clear
	7:50 AM	29	42	Calm	Calm	Clear
	8:20 AM	31	35	Variable	1.9	Clear
	8:50 AM	32	33	Calm	Calm	Clear
	9:20 AM	34	26	Calm	Calm	Clear
	9:50 AM	35	23	Variable	5.6	Clear
	10:20 AM	35	23	Variable	3.7	Clear
	10:50 AM	36	22	Variable	5.6	Clear
	11:20 AM	37	18	Variable	1.9	Clear
	11:50 AM	37	17	Calm	Calm	Clear
	12:20 PM	37	16	SSW	11.1	Clear
	12:50 PM	37	16	S	11.1	Clear
	1:20 PM	38	12	SW	14.8	Clear
	1:50 PM	38	11	WSW	14.8	Clear
	2:20 PM	39	11	SSW	13	Clear
	2:50 PM	38	15	W	18.5	Clear
	3:20 PM	39	11	W	18.5	Clear
	3:50 PM	38	15	SW	16.7	Clear

	4:20 PM	38	18	SW	18.5	Clear
	4:50 PM	37	21	SW	14.8	Clear
	5:20 PM	36	22	SW	18.5	Clear
	5:50 PM	36	20	SW	16.7	Clear
	6:20 PM	34	30	WSW	22.2	Clear
	6:50 PM	33	31	SW	20.4	Clear
	7:20 PM	31	40	SW	20.4	Clear
	7:50 PM	30	45	SW	18.5	Clear
	8:20 PM	29	48	SW	16.7	Clear
	8:50 PM	28	54	SW	7.4	Clear
	9:20 PM	27	58	SW	9.3	Clear
	9:50 PM	26	57	SW	3.7	Clear
	10:20 PM	26	57	WSW	11.1	Clear
	10:50 PM	26	61	SW	13	Clear
	11:20 PM	26	61	SW	13	Clear
	11:50 PM	25	65	WSW	7.4	Clear

Table 12. Meteorological Conditions (07.08.2015)

	Time	Temparature (C)	Humidity (%)	Wind Direction	Wind Speed Km/h	Conditions
07.08.2015	12:00 AM	25	54	WSW	7.4	Clear
	12:20 AM	26	61	W	13	Clear
	12:50 AM	25	65	WSW	9.3	Clear
	1:20 AM	25	65	WSW	11.1	Clear
	1:50 AM	24	69	E	5.6	Clear
	2:20 AM	25	65	Variable	1.9	Clear
	2:50 AM	25	65	WSW	11.1	Clear
	3:00 AM	25	57	WSW	11.1	Clear
	3:20 AM	25	65	W	11.1	Clear
	3:50 AM	24	73	WSW	13	Clear
	4:20 AM	23	73	S	5.6	Clear
	4:50 AM	23	73	S	5.6	Clear
	5:20 AM	23	73	Variable	3.7	Clear
	5:50 AM	23	78	SW	9.3	Clear
	6:00 AM	22	73	SW	9.3	Clear
	6:20 AM	23	78	WSW	11.1	Clear
	6:50 AM	23	78	SW	11.1	Clear
	7:20 AM	24	73	SW	9.3	Clear
	7:50 AM	25	69	SW	11.1	Clear
	8:20 AM	26	65	SW	14.8	Clear
	8:50 AM	27	61	SW	13	Clear
	9:00 AM	27	50	SW	13	Clear
	9:20 AM	30	48	WSW	18.5	Clear
	9:50 AM	30	48	W	14.8	Clear
	10:20 AM	32	40	WSW	11.1	Clear
	10:50 AM	32	40	W	18.5	Clear
	11:20 AM	32	38	SW	14.8	Clear
	11:50 AM	33	36	WSW	11.1	Scattered Clouds

	12:00 PM	33	24	WSW	11.1	Overcast
	12:20 PM	33	34	W	14.8	Scattered Clouds
	12:50 PM	33	34	WSW	14.8	Scattered Clouds
	1:20 PM	34	30	WSW	18.5	Scattered Clouds
	1:50 PM	34	32	WSW	24.1	Overcast
	2:20 PM	35	28	WSW	24.1	Overcast
	2:50 PM	34	30	SW	22.2	Overcast
	3:00 PM	34	19	SW	22.2	Scattered Clouds
	3:20 PM	36	27	WSW	18.5	Overcast
	3:50 PM	35	28	WSW	22.2	Overcast
	4:20 PM	35	28	W	20.4	Overcast
	4:50 PM	35	28	WSW	18.5	Overcast
	5:20 PM	35	28	WSW	20.4	Overcast
	5:50 PM	34	30	W	24.1	Clear
	6:00 PM	34	18	W	24.1	Scattered Clouds
	6:20 PM	33	31	W	25.9	Overcast
	6:50 PM	32	38	W	29.6	Scattered Clouds
	7:20 PM	31	43	W	25.9	Scattered Clouds
	7:50 PM	30	45	W	29.6	Clear
	8:20 PM	29	48	W	13	Clear
	8:50 PM	30	40	W	14.8	Clear
	9:00 PM	30	27	W	14.8	Clear
	9:20 PM	30	33	WNW	24.1	Clear
	9:50 PM	29	33	WNW	14.8	Clear
	10:20 PM	28	35	W	14.8	Clear
	10:50 PM	27	34	W	13	Clear
	11:20 PM	27	42	W	9.3	Clear
	11:50 PM	26	51	W	14.8	Clear

F.DISCUSSION

The measurements are conducted during 48 hours at three positions. All of the three positions are selected in order to characterize all background noise aspects of the territory. About the measurements there are some aspects that need to be considered and discussed;

- At first and second measurement locations it can easily be seen that L_{day} values of the first and second day are dramatically different from each other. The reason lies behind that situation is the deviation of the day time construction activities at separate days.
- On the other hand; at the third measurement point the measurements results of the first and second day are perfectly matched with each other. Because of the fact that, the measurement conducted at third location has not been affected from construction activities that much at any time period.

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TÜRK AKREDİTASYON KURUMU

AKREDİTASYON SERTİFİKASI

Deney Laboratuvarı olarak faaliyet gösteren,

FREKANS ÇEVRE ÖLÇÜM
Mühendislik Danışmanlık Taahhüt İthalat İhracat Ve Tic. Ltd. Şti.
Rüzgarlıbahçe mahallesi, Cumhuriyet Caddesi No 39/60 Hasoğlu Plaza
Kavacık Beykoz
34805 İSTANBUL / TÜRKİYE

TÜRKAK tarafından yapılan denetim sonucunda TS EN ISO/IEC 17025:2012 Standardına göre Ek'te yer alan kapsamlarda akredite edilmiştir.

Akreditasyon No : AB-0360-T

Akreditasyon Tarihi : 16 Aralık 2010

Revizyon Tarihi / No : 7 Nisan 2015 / 03

Bu Sertifika, yukarıda açık adı ve adresi yazılı Kuruluşun TS EN ISO/IEC 17025:2012 Standardına, ilgili Yönetmelik ve Tebliğlere uygunluğunu sürdürmesi halinde , **6 Nisan 2019** tarihine kadar geçerlidir.

TÜRK AKREDİTASYON KURUMU TÜRKAK * 1999 *

Dr. H. İbrahim ÇETİN
Genel Sekreter

+90 312 410 82 00 - www.turkak.org.tr

APPENDIX - 1

Akreditasyon Sertifikası Eki (Sayfa 1/3)

Akreditasyon Kapsamı

TÜRKAK Test TS EN ISO/IEC 17025 AB-0360-T	**FREKANS ÇEVRE ÖLÇÜM** **Mühendislik Danışmanlık Taahhüt İthalat İhracat Ve Tic. Ltd. Şti.** **Akreditasyon No: AB-0360-T** **Revizyon No: 03 Tarih: 7 Nisan 2015**
Deney Laboratuvarı	
Adresi : Rüzgarlıbahçe mahallesi, Cumhuriyet Caddesi No 39/60 Hasoğlu Plaza Kavacık Beykoz 34805	**Tel** : 0216 425 2244 **Faks** : 0 216 425 2142 **E-Posta** : bilgi@frekanscevre.com **Website** : www.frekanscevre.com

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Gürültü	Çevresel gürültü düzeyini tespiti/ **LAeq, LEqT,LRegT, Lday, Lden, Levening, LNT, LE, LFmax, LCenmax; LRdn, LRden**	TS 9315 ISO 1996-1 ve TS 9315 ISO 1996-1/T1 TS ISO 1996-2 ve TS ISO 1996-2
Akustik	Yerleşim alanlarında sesin açık alanda yayılırken azaltım faktörlerinin ve çevresel gürültü düzeyinin tespiti/**Adiv, Aatm, Agr, Abar, Amisc;LAT**	TS ISO 9613-2
Akustik	Çoklu gürültü kaynağına sahip sanayi tesislerinde yapılan ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin tayini /**ΔLs, ΔLF, ΔLM, ΔLα , LAP, Lw**	TS ISO 8297
Akustik	Karayolu ulaşım araçlarının ses gücü düzeyinin ve karayolu gürültünün alansal dağılımında hesaplanması**/Lw, Leq**	Fransız ulusal hesaplama yöntemi NMPB - 96 ve Fransız standardı XPS 31-133
Akustik	Hava ulaşım araçlarından kaynaklanan gürültünün alansal dağılımının hesaplanması / **Lw, Leq**	ECAC. CEAC. DOC 29
Akustik	Demiryolu ulaşım araçlarının ses gücü düzeyinin ve demiryolu gürültüsünün alansal dağılımının hesaplanması **/Lw, Leq**	Hollanda ulusal hesaplama yöntemi RMR SRM II

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Akreditasyon Sertifikası Eki (Sayfa 2/3)

Akreditasyon Kapsamı

FREKANS ÇEVRE ÖLÇÜM
Mühendislik Danışmanlık Taahhüt İthalat İhracat Ve Tic. Ltd. Şti.

Akreditasyon No: AB-0360-T
Revizyon No: 03 Tarih: 7 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Akustik	Kapalı yapılarda bina akustik performansının yapı elemanları yoluyla belirlenmesi ve iç ortamda oluşan sesin dışarıya yayılımının hesaplanması. **Lw, D, R, Lp**	ISO 15712-4
Akustik	Gürültü kaynaklarının gözlem metodu kullanılarak yapılan ses basnci düzeyi ölçümlerinden ses gücü düzeyinin tayini **K1, K2, /LAP, Lw**	TS EN ISO 3746
Akustik	Gürültü kaynaklarının mühendislik metodu kullanılarak yapılan ses basnci düzeyi ölçümlerinden ses gücü düzeyinin tayini **K1, K2, LAP, Lw**	TS EN ISO 3744
Titreşim	Madencilik faaliyetleri sonucunda oluşan hava şoku ve yer titreşiminin ölçülmesi/**a,V**	TS 10354
Titreşim	Mekanik Titreşim ve Şok-Binaların Titreşimi, Titreşimin Ölçülmesi ve Binalara Etkilerinin Değerlendirilmesi İçin Klavuz	TS ISO 4866
Titreşim	Gaz Türbini Setlerinin dönmeyen parçalarında titreşimin ölçülmesi ve değerlendirilmesi **Vrms**	ISO 10816-5
ISG (Gürültü)	Kişilerin maruz kaldığı gürültü düzeyinin ölçülmesi ve işitme kayıplarının tespiti **LEX,8h, H, N, H'**	TS 2607 ISO 1999
İSG (Gürültü)	Dış ortamdaki gürültünün ölçülmesi ve insanlar üzerindeki etksinin tespiti	TS 2673

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Akreditasyon Sertifikası Eki (Sayfa 3/3)

Akreditasyon Kapsamı

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0360-T

FREKANS ÇEVRE ÖLÇÜM
Mühendislik Danışmanlık Taahhüt İthalat İhracat Ve Tic. Ltd. Şti.

Akreditasyon No: AB-0360-T
Revizyon No: 03 Tarih: 7 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
ISG (Gürültü)	Çalışma Ortamında Maruz Kalınan Gürültünün tespiti **/LAeq**	TS EN ISO 9612
ISG (TOZ)	Ortamda toz ve kişisel toz maruziyeti ölçümü	MDHS 14/3
ISG (Toksik Gaz ve Buhar)	Renk karşılaştırma metodu ile işyeri ortam havasında toksik gaz ve buhar konsantrasyonu tayini	ASTM - D4490 - 96
ISG (Termal Konfor)	Termal Konforun tespiti ve oğuk çalışma şartlarının insanlar üzerindeki etkisinin belirlenmesi/ **Hava akım hızı, küresel sıcaklık, ortam sıcaklığı,bağıl nem, yaş hazne sıcaklığı ve küresel sıcaklık**	TS EN ISO 7730 TS EN 27243 TS EN ISO 11079
ISG (Aydınlatma)	Aydınlatma düzeyinin tespiti/**Aydınlatma seviyesi**	COHSR-928-IPG-039

KAPSAM SONU

Dr. H. İbrahim ÇETİN
Genel Sekreter

APPENDIX - 1

TÜRKAK
TÜRK AKREDİTASYON KURUMU
TURKISH ACCREDITATION AGENCY
tarafından akredite edilmiş

PROTOS

KALİBRASYON ÖLÇÜM EĞİTİM VE DANIŞMANLIK HİZMETLERİ TİCARET LTD. ŞTİ.
KALİBRASYON LABORATUVARI

Mehmet Akif Mh. Tavukçuyolu Cd. No: 150/1 Ümraniye İSTANBUL
Telefon: 0216 415 4949 (Pbx), Faks: 0216 415 4950
e-posta: info@protos.com.tr, internet: www.protos.com.tr

TÜRKAK
Kalibrasyon
TS EN ISO/IEC 17025
AB-0078-K

AB-0078-K
624/2014
06-14

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi/ adresi *Customer / address*	**: Frekans Çevre Laboratuvarı** Rüzgarlıbahçe Mah. Cumhuriyet Cad. No:39/60 Hasoğlu Plaza Kavacık Beykoz / İSTANBUL
Talep Numarası *Order Number*	**: 346/2014**
Makine/Cihaz *Instrument/Device*	**: Ses Seviyesi Ölçer**
İmalatçı *Manufacturer*	**: SVANTEK**
Tip *Type*	**: Svan971**
Seri Numarası *Serial Number*	**: 34768**
Kalibrasyon Tarihi *Date of Calibration*	**: 05.06.2014**
Sertifikanın Sayfa Sayısı *Number of pages of the Certificate*	**: 6**

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.
This calibration certificate documents the traceabilty to national standards, which realize the unit of measurement according to the International System of Units (SI).

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.
The Turkish Accreditation Acency (TURKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation(EA) and of the International Laboratory Accreditation(ILAC) for the Mutual recognation of calibration certificates.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.

Mühür *Seal*	**Tarih** *Date*	**Kalibrasyonu Yapan** *Calibrated by*	**Laboratuvar Müdürü** *Head of Calibration Laboratory*
PROTOS KALİBRASYON	05.06.2014	Gamze ERGİYEN	Ufuk MALAK

FR510.02
rev00/02.08.2010

APPENDIX - 1

1. Test Edilen Cihaz

Adı	Üretici	Model / Tip	Seri No	Ölçme aralığı veya Tanımlama
Ses Düzeyi Ölçer (Aşağıdaki Mikrofon ve Ön Yükselteç ile)	SVANTEK	Svan971	34768	Sınıf : 1 Frekans Ağırlığı : A, B, C, Lin Zaman Ağırlığı : F:Hızlı, S:Yavaş
Ön Yükselteç	-	-	-	
Mikrofon	-	3274	AWA14423	

2. Kalibrasyonun Yapıldığı Yer : Protos Kalibrasyon Laboratuvarı

3. Cihazın Laboratuvara Kabul Tarihi : 05.06.2014

4. Kalibrasyonda Kullanılan Referans Cihazlar :

Adı	Üretici	Model / Tip	Seri No	İzlenebilirlik
Çok Fonksiyonlu Akustik Kalibratör	B&K	4226	2692346	TÜBİTAK UME, G2AK0146-31.12.2013

5. Kalibrasyon Prosedürü : PR504.08 SLM Kalibrasyon Prosedürü

Ses düzeyi ölçerin (SLM) A-Ağırlıklı, B-Ağırlıklı, C-Ağırlıklı ve Lin filtrelerinin 31,5 Hz-16 kHz frekans aralığında tepkileri, doğrusallığı, F:Fast ve S:Slow zaman ağırlıklarının tepkileri, Crest Faktörü CF=3 ve bir saatlik çalışmada kararlılığı kontrol edildi.

Kalibrasyon sırasında referans cihaz tarafından üretilen ses basınç düzeyi değerleri ortam şartlarına göre düzeltilerek dikkate alınmıştır.

6. Çevre Şartları

Sıcaklık: (23 ± 1) °C Bağıl Nem:%(65±5,0) Basınç: (1005±1,0)mbar

PROTOS KALİBRASYON

APPENDIX - 1

7. Kalibrasyon Sonuçları

Tablo 1. SLM A-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-39,4	54,6	54,8	0,2	± 2,0
63	94,0	-26,2	67,8	68,0	0,2	± 1,5
125	94,0	-16,1	77,9	78,1	0,2	± 1,5
250	94,0	-8,6	85,4	85,4	0,0	± 1,4
500	94,0	-3,2	90,8	90,8	0,0	± 1,4
1000	94,0	0,0	94,0	94,0	0,0	± 1,1
2000	94,0	1,2	95,2	95,1	-0,1	± 1,6
4000	94,0	1,0	95,0	94,3	-0,7	± 1,6
8000	93,9	-1,1	92,8	90,5	-2,4	+2,0;-3,1
12500	94,1	-4,3	89,8	85,8	-4,0	+3,0;-6,0
16000	94,1	-6,6	87,5	80,8	-6,8	+3,5;-17,0

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 2. SLM B-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	B-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-17,1	76,9	77,2	0,3	± 2,0
63	94,0	-9,3	84,7	84,8	0,1	± 1,5
125	94,0	-4,2	89,8	89,9	0,1	± 1,5
250	94,0	-1,3	92,7	92,7	0,0	± 1,4
500	94,0	-0,3	93,7	93,8	0,1	± 1,4
1000	94,0	0,0	94,0	94,0	0,0	± 1,1
2000	94,0	-0,1	93,9	93,8	-0,1	± 1,6
4000	94,0	-0,7	93,3	92,6	-0,7	± 1,6
8000	93,9	-2,9	91,0	88,7	-2,4	+2,0;-3,1
12500	94,1	-6,1	88,0	84,0	-4,0	+3,0;-6,0
16000	94,1	-8,4	85,7	79,0	-6,8	+3,5;-17,0

Tablodaki değerler SLM B-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

APPENDIX - 1

Tablo 3. SLM C-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	C-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-3,0	91,0	91,2	0,2	± 2,0
63	94,0	-0,8	93,2	93,3	0,1	± 1,5
125	94,0	-0,2	93,8	93,9	0,1	± 1,5
250	94,0	0,0	94,0	94,1	0,1	± 1,4
500	94,0	0,0	94,0	94,1	0,1	± 1,4
1000	94,0	0,0	94,0	94,0	0,0	± 1,1
2000	94,0	-0,2	93,8	93,7	-0,1	± 1,6
4000	94,0	-0,8	93,2	92,5	-0,7	± 1,6
8000	93,9	-3,0	90,9	88,6	-2,4	+2,0;-3,1
12500	94,1	-6,2	87,9	83,9	-4,0	+3,0;-6,0
16000	94,1	-8,5	85,6	78,8	-6,9	+3,5;-17,0

Tablodaki değerler SLM C-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 4. SLM Lin filtresinin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	94,2	0,2	± 2,0
63	94,0	94,1	0,1	± 1,5
125	94,0	94,1	0,1	± 1,5
250	94,0	94,1	0,1	± 1,4
500	94,0	94,0	0,0	± 1,4
1000	94,0	94,0	0,0	± 1,1
2000	94,0	93,9	-0,1	± 1,6
4000	94,0	93,2	-0,8	± 1,6
8000	93,9	91,4	-2,6	+2,0;-3,1
12500	94,1	90,2	-3,9	+3,0;-6,0
16000	94,1	87,5	-6,7	+3,5;-17,0

Tablodaki değerler SLM Lin -ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

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Tablo 5. SLM 1 kHz'deki doğrusallık kontrolü sonuçları

Frekans (Hz)	Uygulanan		Ölçülen		Tepki Farkı (dB)	Tolerans (dB)
	SPL (dB)	Seviye Artışı (dB)	SPL (dB)	Seviye Artışı (dB)		
1000	94,0	0,0	94,0	0,0	0,0	±0,6
	104,0	10,0	104,0	10,0	0,0	
	114,0	20,0	114,2	20,2	0,2	

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 6. SLM Zaman Ağırlıklı filtrelerinin Hızlı (Fast) ve Yavaş (Slow) Kontrolü Sonuçları

Frekans (Hz)	Hızlı				Yavaş			
	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
1000	105,0	105,0	0,0	±0,8	101,9	102,0	0,1	±0,8
2000	105,0	105,0	0,0		101,9	102,0	0,1	
4000	105,0	105,0	0,0		101,9	101,9	0,0	

Tablodaki değerler SLM A-ağırlıklı filtre modunda iken elde edilmiştir.

Tablo 7. SLM "Crest Factor CF=3" Kontrolü Sonuçları

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
2000	94,0	93,9	-0,1	±0,5
	104,0	103,9	-0,1	

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 8. SLM Bir saatlik çalışmasında okunan değerdeki en büyük sapma sonuçları

Nominal SPL (dB)	Ölçülen SPL (dB)	En büyük sapma * (dB)	Tolerans (dB)
94,0	94,0	0,0	± 0,3

*En büyük sapma, ölçülen değerdeki bir saatlik okuma süresi boyunca ki değişimdir.
Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

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8. Ölçüm Belirsizliği

Ses düzeyi ölçerin kalibrasyonundaki belirsizlik 0,2 dB'dir.

Beyan edilen genişletilmiş ölçüm belirsizliği, standart belirsizliğin k=2 olarak alınan genişletme katsayısı ile çarpımı sonucunda bulunan değerdir ve %95 oranında güvenilirlik sağlamaktadır.

9. Görüşler, Açıklamalar ve Uygunluk Beyanı

Ölçüm sonuçları IEC 61672-1 standartında 1.Sınıf Ses Düzeyi Ölçerler için verilen toleranslarla karşılaştırılmıştır. Cihazın ölçülen özelliklerinin IEC 61672-1 standartında 1.Sınıf Ses Düzeyi Ölçerler için belirtilen şartlara uygun olduğu tespit edilmiştir.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan ses düzeyi ölçer cihazına aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibrasyonunun sağlanmasından kullanıcı sorumludur.

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APPENDIX - 1

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Kalibrasyon TS EN ISO/IEC 17025 AB-0078-K

Mehmet Akif Mh. Tavukçuyolu Cd. No: 150/1 Ümraniye İSTANBUL
Telefon: 0216 415 4949 (Pbx), Faks: 0216 415 4950
e-posta: info@protos.com.tr, internet: www.protos.com.tr

AB-0078-K
1073/2015
06-15

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi/ adresi *Customer / address*	**: Frekans Çevre Laboratuvarı** Rüzgarlıbahçe Mah. Cumhuriyet Cad. No:39/60 Hasoğlu Plaza Kavacık Beykoz/İSTANBUL
Talep Numarası *Order Number*	**: 556/2015**
Makine/Cihaz *Instrument/Device*	**: Ses Seviyesi Ölçer**
İmalatçı *Manufacturer*	**: SVANTEK**
Tip *Type*	**: SVAN 971**
Seri Numarası *Serial Number*	**: 44477**
Kalibrasyon Tarihi *Date of Calibration*	**: 29.06.2015**
Sertifikanın Sayfa Sayısı *Number of pages of the Certificate*	**: 6**

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.
This calibration certificate documents the traceabilty to national standards, which realize the unit of measurement according to the International System of Units (SI).

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.
The Turkish Accreditation Acency (TURKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation(EA) and of the International Laboratory Accreditation(ILAC) for the Mutual recognation of calibration certificates.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.

Mühür	**Tarih** *Date*	**Kalibrasyonu Yapan** *Calibrated by*	**Laboratuvar Müdürü V.** *Head of Calibration Laboratory*
Seal	29.06.2015	Alaaddin DUYSAK	Gamze ERGİYEN

PROTOS KALİBRASYON

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1. Test Edilen Cihaz

Adı	Üretici	Model / Tip	Seri No	Ölçme aralığı veya Tanımlama
Ses Düzeyi Ölçer (Aşağıdaki Mikrofon ve Ön Yükselteç ile)	SVANTEK	SVAN 971	44477	Sınıf : 1 Frekans Ağırlığı : A,B, C, Z Zaman Ağırlığı : F:Hızlı, S:Yavaş
Ön Yükselteç	Cihaz ile birleşik.			
Mikrofon	ACO	7052E	59120	

2. Kalibrasyonun Yapıldığı Yer : Protos Kalibrasyon Laboratuvarı

3. Cihazın Laboratuvara Kabul Tarihi : 29.06.2015

4. Kalibrasyonda Kullanılan Referans Cihazlar :

Adı	Üretici	Model / Tip	Seri No	İzlenebilirlik
Çok Fonksiyonlu Akustik Kalibratör	B&K	4226	2692346	TÜBİTAK UME, G2AK0146-31.12.2013

5. Kalibrasyon Prosedürü : PR504.08 SLM Kalibrasyon Prosedürü

Ses düzeyi ölçerin (SLM) A-Ağırlıklı, B-Ağırlıklı, C-Ağırlıklı ve Z filtrelerinin 31,5 Hz-16 kHz frekans aralığında tepkileri, doğrusallığı, F:Fast ve S:Slow zaman ağırlıklarının tepkileri ve yarım saatlik çalışmada kararlılığı kontrol edildi.

Kalibrasyon sırasında referans cihaz tarafından üretilen ses basınç düzeyi değerleri ortam şartlarına göre düzeltilerek dikkate alınmıştır.

6. Çevre Şartları

Sıcaklık: (22,5 ± 1) °C Bağıl Nem:%(59,2±5,0) Basınç: (1014,3±1,0)mbar

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7. Kalibrasyon Sonuçları

Tablo 1. SLM A-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-39,4	54,6	54,9	0,3	± 1,5
63	94,0	-26,2	67,8	68,0	0,2	± 1,0
125	94,0	-16,1	77,9	78,0	0,1	± 1,0
250	94,0	-8,6	85,4	85,5	0,1	± 1,0
500	94,0	-3,2	90,8	90,8	0,0	± 1,0
1000	94,0	0,0	94,0	94,1	0,1	± 0,7
2000	94,0	1,2	95,2	95,3	0,1	± 1,0
4000	94,0	1,0	95,0	95,4	0,4	± 1,0
8000	94,0	-1,1	92,9	91,0	-1,9	+1,5;-2,5
12500	94,1	-4,3	89,8	86,7	-3,1	+2,0;-5,0
16000	94,2	-6,6	87,6	83,1	-4,5	+2,5;-16,0

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 2. SLM B-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	C-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-17,1	76,9	77,2	0,3	± 1,5
63	94,0	-9,3	84,7	84,8	0,1	± 1,0
125	94,0	-4,2	89,8	89,9	0,1	± 1,0
250	94,0	-1,3	92,7	92,7	0,0	± 1,0
500	94,0	-0,3	93,7	93,8	0,1	± 1,0
1000	94,0	0,0	94,0	94,1	0,1	± 0,7
2000	94,0	-0,1	93,9	94,0	0,1	± 1,0
4000	94,0	-0,7	93,3	93,7	0,4	± 1,0
8000	94,0	-2,9	91,1	89,2	-1,9	+1,5;-2,5
12500	94,1	-6,1	88,0	84,9	-3,1	+2,0;-5,0
16000	94,2	-8,4	85,8	81,2	-4,6	+2,5;-16,0

Tablodaki değerler SLM B-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

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Tablo 3. SLM C-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31,5	94,0	-3,0	91,0	91,2	0,2	± 1,5
63	94,0	-0,8	93,2	93,4	0,2	± 1,0
125	94,0	-0,2	93,8	94,0	0,2	± 1,0
250	94,0	0,0	94,0	94,1	0,1	± 1,0
500	94,0	0,0	94,0	94,1	0,1	± 1,0
1000	94,0	0,0	94,0	94,1	0,1	± 1,0
2000	94,0	-0,2	93,8	94,0	0,2	± 0,7
4000	94,0	-0,8	93,2	93,6	0,4	± 1,0
8000	94,0	-3,0	91,0	89,1	-1,9	+1,5;-2,5
12500	94,1	-6,2	87,9	84,8	-3,1	+2,0;-5,0
16000	94,2	-8,5	85,7	81,0	-4,7	+2,5;-16,0

Tablodaki değerler SLM C-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 4. SLM Z filtresinin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	94,2	0,2	± 1,5
63	94,0	94,2	0,2	± 1,0
125	94,0	94,1	0,1	± 1,0
250	94,0	94,1	0,1	± 1,0
500	94,0	94,1	0,1	± 1,0
1000	94,0	94,1	0,1	± 0,7
2000	94,0	94,1	0,1	± 1,0
4000	94,0	94,4	0,4	± 1,0
8000	94,0	92,0	-2,0	+1,5;-2,5
12500	94,1	91,1	-3,0	+2,0;-5,0
16000	94,2	89,8	-4,4	+2,5;-16,0

Tablodaki değerler SLM Z -ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

PROTOS KALİBRASYON

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Tablo 4. SLM 1 kHz'deki doğrusallık kontrolü sonuçları

Frekans (Hz)	Uygulanan		Ölçülen		Tepki Farkı (dB)	Tolerans (dB)
	SPL (dB)	Seviye Artışı (dB)	SPL (dB)	Seviye Artışı (dB)		
1000	94,0	0,0	94,1	0,0	0,1	±0,8
	104,0	10,0	104,1	10,0	0,1	
	114,0	20,0	114,1	20,0	0,1	

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 5. SLM Zaman Ağırlıklı filtrelerinin Hızlı (Fast) ve Yavaş (Slow) Kontrolü Sonuçları

Frekans (Hz)	Hızlı				Yavaş			
	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
1000	105,0	105,1	0,1	±0,5	101,9	102,1	0,2	±0,5
2000	105,0	105,0	0,0		101,9	102,0	0,1	
4000	105,0	105,0	0,0		101,9	102,0	0,1	

Tablodaki değerler SLM A-ağırlıklı filtre modunda iken elde edilmiştir.

Tablo 6. SLM Yarım saatlik çalışmasında okunan değerdeki en büyük sapma sonuçları

Nominal SPL (dB)	Ölçülen SPL (dB)	En büyük sapma * (dB)	Tolerans (dB)
94,0	94,1	0,1	± 0,3

*En büyük sapma, ölçülen değerdeki yarım saatlik okuma süresi boyunca ki değişimdir.
Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

8. Ölçüm Belirsizliği

Ses düzeyi ölçerin kalibrasyonundaki belirsizlik 0,2 dB'dir.

Beyan edilen genişletilmiş ölçüm belirsizliği, standart belirsizliğin k=2 olarak alınan genişletme katsayısı ile çarpımı sonucunda bulunan değerdir ve %95 oranında güvenilirlik sağlamaktadır.

PROTOS KALİBRASYON

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9. Görüşler, Açıklamalar ve Uygunluk Beyanı

Ölçüm sonuçları IEC 61672-1 standartında 1.Sınıf Ses Düzeyi Ölçerler için verilen toleranslarla karşılaştırılmıştır. Verilen tepki farklarının toleranslara uygunluğu belirsizlik değerleri hesaba katılıp yapılır. Cihazın ölçülen özelliklerinin IEC 61672-1 standartında 1.Sınıf Ses Düzeyi Ölçerler için belirtilen şartlara uygun olduğu tespit edilmiştir.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan ses düzeyi ölçer cihazına aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibrasyonunun sağlanmasından kullanıcı sorumludur.

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Kalibrasyon TS EN ISO/IEC 17025 AB-0078-K

AB-0078-K
622/2014
06-14

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi/ adresi *Customer / address*	**: Frekans Çevre Laboratuvarı** Rüzgarlıbahçe Mah. Cumhuriyet Cad. No:39/60 Hasoğlu Plaza Kavacık Beykoz / İSTANBUL
Talep Numarası *Order Number*	**: 346/2014**
Makine/Cihaz *Instrument/Device*	**: Ses Seviyesi Ölçer**
İmalatçı *Manufacturer*	**: SVANTEK**
Tip *Type*	**: Svan971**
Seri Numarası *Serial Number*	**: 34797**
Kalibrasyon Tarihi *Date of Calibration*	**: 05.06.2014**
Sertifikanın Sayfa Sayısı *Number of pages of the Certificate*	**: 6**

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.
This calibration certificate documents the traceabilty to national standards, which realize the unit of measurement according to the International System of Units (SI).

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.
The Turkish Accreditation Acency (TURKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation(EA) and of the International Laboratory Accreditation(ILAC) for the Mutual recognation of calibration certificates.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.

Mühür *Seal*	**Tarih** *Date*	**Kalibrasyonu Yapan** *Calibrated by*	**Laboratuvar Müdürü** *Head of Calibration Laboratory*
PROTOS KALİBRASYON	05.06.2014	Gamze ERGİYEN	Ufuk MALAK

FR510.02
rev00/02.08.2010

APPENDIX - 1

1. Test Edilen Cihaz

Adı	Üretici	Model / Tip	Seri No	Ölçme aralığı veya Tanımlama
Ses Düzeyi Ölçer (Aşağıdaki Mikrofon ve Ön Yükselteç ile)	SVANTEK	Svan971	34797	Sınıf : 1 Frekans Ağırlığı : A, B, C, Lin Zaman Ağırlığı : F:Hızlı, S:Yavaş
Ön Yükselteç	-	-	-	
Mikrofon	ACO	7052E	55073	

2. Kalibrasyonun Yapıldığı Yer : Protos Kalibrasyon Laboratuvarı

3. Cihazın Laboratuvara Kabul Tarihi : 05.06.2014

4. Kalibrasyonda Kullanılan Referans Cihazlar :

Adı	Üretici	Model / Tip	Seri No	İzlenebilirlik
Çok Fonksiyonlu Akustik Kalibratör	B&K	4226	2692346	TÜBİTAK UME, G2AK0146-31.12.2013

5. Kalibrasyon Prosedürü : PR504.08 SLM Kalibrasyon Prosedürü

Ses düzeyi ölçerin (SLM) A-Ağırlıklı, B-Ağırlıklı, C-Ağırlıklı ve Lin filtrelerinin 31,5 Hz-16 kHz frekans aralığında tepkileri, doğrusallığı, F:Fast ve S:Slow zaman ağırlıklarının tepkileri, Crest Faktörü CF=3 ve bir saatlik çalışmada kararlılığı kontrol edildi.

Kalibrasyon sırasında referans cihaz tarafından üretilen ses basınç düzeyi değerleri ortam şartlarına göre düzeltilerek dikkate alınmıştır.

6. Çevre Şartları

Sıcaklık: (23 ± 1) °C Bağıl Nem:%(65±5,0) Basınç: (1005±1,0)mbar

PROTOS KALİBRASYON

APPENDIX - 1

7. Kalibrasyon Sonuçları

Tablo 1. SLM A-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-39,4	54,6	55,0	0,4	± 2,0
63	94,0	-26,2	67,8	68,1	0,3	± 1,5
125	94,0	-16,1	77,9	78,1	0,2	± 1,5
250	94,0	-8,6	85,4	85,5	0,1	± 1,4
500	94,0	-3,2	90,8	90,8	0,0	± 1,4
1000	94,0	0,0	94,0	94,0	0,0	± 1,1
2000	94,0	1,2	95,2	95,2	0,0	± 1,6
4000	94,0	1,0	95,0	94,7	-0,3	± 1,6
8000	93,9	-1,1	92,8	89,9	-3,0	+2,0;-3,1
12500	94,1	-4,3	89,8	84,2	-5,6	+3,0;-6,0
16000	94,1	-6,6	87,5	80,8	-6,8	+3,5;-17,0

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 2. SLM B-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	B-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-17,1	76,9	77,3	0,4	± 2,0
63	94,0	-9,3	84,7	84,9	0,2	± 1,5
125	94,0	-4,2	89,8	90,0	0,2	± 1,5
250	94,0	-1,3	92,7	92,8	0,1	± 1,4
500	94,0	-0,3	93,7	93,8	0,1	± 1,4
1000	94,0	0,0	94,0	94,0	0,0	± 1,1
2000	94,0	-0,1	93,9	93,9	0,0	± 1,6
4000	94,0	-0,7	93,3	93,0	-0,3	± 1,6
8000	93,9	-2,9	91,0	88,1	-3,0	+2,0;-3,1
12500	94,1	-6,1	88,0	82,4	-5,6	+3,0;-6,0
16000	94,1	-8,4	85,7	78,9	-6,9	+3,5;-17,0

Tablodaki değerler SLM B-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

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Tablo 3. SLM C-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	C-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-3,0	91,0	91,4	0,4	± 2,0
63	94,0	-0,8	93,2	93,4	0,2	± 1,5
125	94,0	-0,2	93,8	94,0	0,2	± 1,5
250	94,0	0,0	94,0	94,1	0,1	± 1,4
500	94,0	0,0	94,0	94,1	0,1	± 1,4
1000	94,0	0,0	94,0	94,0	0,0	± 1,1
2000	94,0	-0,2	93,8	93,8	0,0	± 1,6
4000	94,0	-0,8	93,2	92,9	-0,3	± 1,6
8000	93,9	-3,0	90,9	88,0	-3,0	+2,0;-3,1
12500	94,1	-6,2	87,9	82,3	-5,6	+3,0;-6,0
16000	94,1	-8,5	85,6	78,8	-6,9	+3,5;-17,0

Tablodaki değerler SLM C-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 4. SLM Lin filtresinin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	94,4	0,4	± 2,0
63	94,0	94,2	0,2	± 1,5
125	94,0	94,2	0,2	± 1,5
250	94,0	94,1	0,1	± 1,4
500	94,0	94,1	0,1	± 1,4
1000	94,0	94,0	0,0	± 1,1
2000	94,0	94,0	0,0	± 1,6
4000	94,0	93,7	-0,3	± 1,6
8000	93,9	91,0	-3,0	+2,0;-3,1
12500	94,1	88,6	-5,5	+3,0;-6,0
16000	94,1	87,6	-6,6	+3,5;-17,0

Tablodaki değerler SLM Lin -ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

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Tablo 5. SLM 1 kHz'deki doğrusallık kontrolü sonuçları

Frekans (Hz)	Uygulanan		Ölçülen		Tepki Farkı (dB)	Tolerans (dB)
	SPL (dB)	Seviye Artışı (dB)	SPL (dB)	Seviye Artışı (dB)		
1000	94,0	0,0	94,0	0,0	0,0	±0,6
	104,0	10,0	104,0	10,0	0,0	
	114,0	20,0	114,1	20,1	0,1	

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 6. SLM Zaman Ağırlıklı filtrelerinin Hızlı (Fast) ve Yavaş (Slow) Kontrolü Sonuçları

Frekans (Hz)	Hızlı				Yavaş			
	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
1000	105,0	105,1	0,1	±0,8	101,9	101,9	0,0	±0,8
2000	105,0	105,1	0,1		101,9	101,9	0,0	
4000	105,0	105,1	0,1		101,9	102,0	0,1	

Tablodaki değerler SLM A-ağırlıklı filtre modunda iken elde edilmiştir.

Tablo 7. SLM "Crest Factor CF=3" Kontrolü Sonuçları

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
2000	94,0	94,2	0,2	±0,5
	104,0	104,2	0,2	

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 8. SLM Bir saatlik çalışmasında okunan değerdeki en büyük sapma sonuçları

Nominal SPL (dB)	Ölçülen SPL (dB)	En büyük sapma * (dB)	Tolerans (dB)
94,0	94,0	0,0	± 0,3

*En büyük sapma, ölçülen değerdeki bir saatlik okuma süresi boyunca ki değişimdir.
Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

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8. Ölçüm Belirsizliği

Ses düzeyi ölçerin kalibrasyonundaki belirsizlik 0,2 dB'dir.

Beyan edilen genişletilmiş ölçüm belirsizliği, standart belirsizliğin k=2 olarak alınan genişletme katsayısı ile çarpımı sonucunda bulunan değerdir ve %95 oranında güvenilirlik sağlamaktadır.

9. Görüşler, Açıklamalar ve Uygunluk Beyanı

Ölçüm sonuçları IEC 61672-1 standartında 1.Sınıf Ses Düzeyi Ölçerler için verilen toleranslarla karşılaştırılmıştır. Cihazın ölçülen özelliklerinin IEC 61672-1 standartında 1.Sınıf Ses Düzeyi Ölçerler için belirtilen şartlara uygun olduğu tespit edilmiştir.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan ses düzeyi ölçer cihazına aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibrasyonunun sağlanmasından kullanıcı sorumludur.

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KALİBRASYON LABORATUVARI

TÜRKAK
Kalibrasyon
TS EN ISO/IEC 17025
AB-0078-K

Mehmet Akif Mh. Tavukçuyolu Cd. No: 150/1 Ümraniye İSTANBUL
Telefon: 0216 415 4949 (Pbx), Faks: 0216 415 4950
e-posta: info@protos.com.tr, internet: www.protos.com.tr

AB-0078-K
579/2015
04-15

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi/ adresi *Customer / address*	**: FREKANS ÇEVRE LABORATUVARI** Rüzgarlıbahçe Mah. Cumhuriyet Cad. No:39/60 Hasoğlu Plaza Beykoz / İSTANBUL
Talep Numarası *Order Number*	**: 319/2015**
Makine/Cihaz *Instrument/Device*	**: Ses Kalibratörü**
İmalatçı *Manufacturer*	**: SVANTEK**
Tip *Type*	**: SV30A**
Seri Numarası *Serial Number*	**: 17632**
Kalibrasyon Tarihi *Date of Calibration*	**: 13.04.2015**
Sertifikanın Sayfa Sayısı *Number of pages of the Certificate*	**: 3**

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.
This calibration certificate documents the traceabilty to national standards, which realize the unit of measurement according to the International System of Units (SI).

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.
The Turkish Accreditation Acency (TURKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation(EA) and of the International Laboratory Accreditation(ILAC) for the Mutual recognation of calibration certificates.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.

Mühür *Seal*	**Tarih** *Date*	**Kalibrasyonu Yapan** *Calibrated by*	**Laboratuvar Müdürü V.** *Head of Calibration Laboratory*
PROTOS KALİBRASYON	14.04.2015	Gamze ERGİYEN	Gamze ERGİYEN

FR510.02
rev00/02.08.2010

APPENDIX - 1

1. Test Edilen Cihaz

Adı	Üretici	Model / Tip	Seri No	Ölçme aralığı veya Tanımlama
SES KALİBRATÖRÜ	SVANTEK	SV30A	17632	Sınıf : 1 Frekans: 1000 Hz Seviye : 94 dB, 114 dB

2. Kalibrasyonun Yapıldığı Yer : Protos Kalibrasyon Laboratuvarı

3. Cihazın Laboratuvara Kabul Tarihi : 13.04.2015

4. Kalibrasyonda Kullanılan Referans Cihazlar :

Adı	Üretici	Model / Tip	Seri No	İzlenebilirlik
Kapasitif Mikrofon	B&K	4192	2686160	TÜBİTAK UME, G2AK-0035, 17.02.2015

5. Kalibrasyon Prosedürü : PR504.09 SLK Kalibrasyon Prosedürü

Ses kalibratörünün (SLK) kalibrasyonu referans mikrofon kullanılarak karşılaştırma yöntemi ile yapılmıştır. Ses Kalibratörün ürettiği ses basınç düzeyleri ve frekansı ile seviye ve frekans kararlılığı kontrol edildi.

Kalibrasyon sırasında referans cihaz tarafından üretilen ses basınç düzeyi değerleri ortam şartlarına göre düzeltilerek dikkate alınmıştır.

6. Çevre Şartları

Sıcaklık: (22,0±1,0) °C Bağıl Nem:%(45,0±5,0) Basınç: (1020,2±1,0)mbar

7. Kalibrasyon Sonuçları

Tablo 1. SLK Seviye Kontrolü Sonuçları

Nominal Değer (dB)	Ölçülen Değer (dB)	Tolerans (dB)	Seviye Kararlılığı (dB)		Tolerans (dB)
			|UL-ML|	|LL-ML|	
94,00	94,36	± 0,4	0,006	0,006	± 0,1
114,00	114,38		0,001	0,001	

|UL-ML| : 20 saniye süresince kalibratörün en yüksek seviyesi ile ortalama seviyesi arasındaki fark
|LL-ML| : 20 saniye süresince kalibratörün en küçük seviyesi ile ortalama seviyesi arasındaki fark

APPENDIX - 1

Tablo 2. SLK Frekans Kontrolü Sonuçları

Nominal Değer (Hz)	Ölçülen Değer (Hz)	Tolerans (%)	Seviye (dB)	Frekans Kararlılığı (%)	
				|UF-MF|	|LF-MF|
1000,00	1000,00	± 1,0	94,0	0,001	0,006
	1000,01		114,0	0,000	0,000

|UL-ML| : 20 saniye süresince kalibratörün en yüksek frekansı ile ortalama frekansı arasındaki fark
|LL-ML| : 20 saniye süresince kalibratörün en küçük frekansı ile ortalama frekansı arasındaki fark

8. Ölçüm Belirsizliği

Ses kalibratörün seviye belirlenmesindeki belirsizlik 0,13 dB'dir.

Beyan edilen genişletilmiş ölçüm belirsizliği, standart belirsizliğin k=2 olarak alınan genişletme katsayısı ile çarpımı sonucunda bulunan değerdir ve %95 oranında güvenilirlik sağlamaktadır.

9. Görüşler, Açıklamalar ve Uygunluk Beyanı

Ölçüm sonuçları IEC 60942 standartında 1.Sınıf Ses Kalibratörleri için verilen toleranslarla karşılaştırılmıştır. Cihazın ölçülen özelliklerinin IEC 60942 standartında 1.Sınıf Ses Kalibratörleri için belirtilen şartlara uygun olduğu tespit edilmiştir.

PROTOS KALİBRASYON

APPENDIX 2 –MEASUREMENT RESULTS

Detailed measurement results are given in the previous pages.

FREKANS ÇEVRE LABORATUVARI	Gaziantep Health Campus

Measurement Location	House	Measurement Number	LT1
Standart	ISO 1996-2	Measurement Date	05.08.2015

Measurement Information				
Sound Level Meter	Type 1	SVAN 971	Coordinates (WGS 84)	355914.00 d D 4097922.00 m K
SLM No	FC 12			
Data No	F12_773		Distance to source	-
Start Time	16:30:00		Location	Balcony of house
Elapsed Time	48:00:00		Microphone Height	15 m

Background Noise Sources
Conctruction Noise, Human Activities and Low Traffic

Logger Graph (dBA, dBC, dB)

FREKANS ÇEVRE LABORATUVARI

Gaziantep Health Campus

Measurement Location	House	Measurement Number	LT1
Standart	ISO 1996-2	Measurement Date	05.08.2015

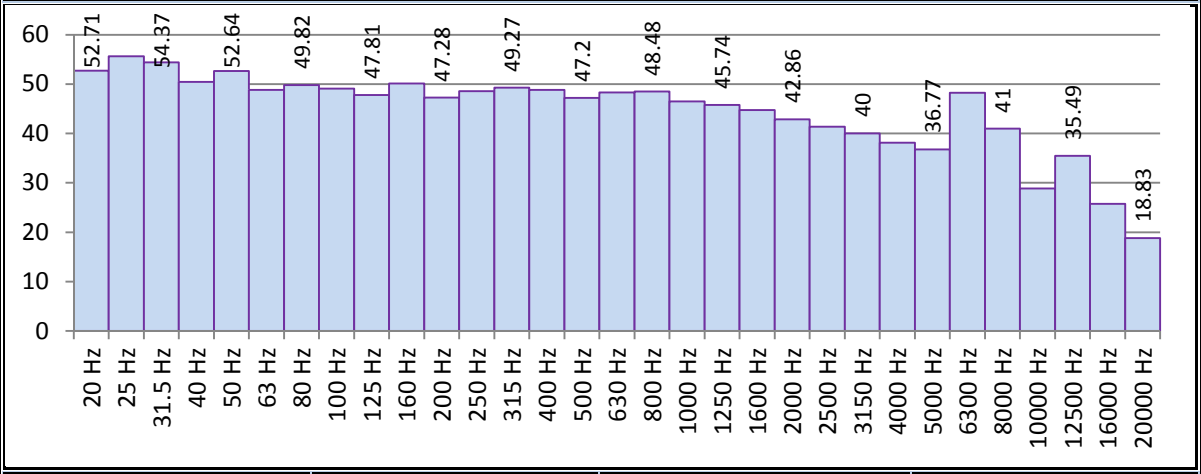
First day, Measurement Results of fifteen minutes period (dBA,dBC)									05.08.2015
16:30	-	16:45	53.13	60.37	04:30	-	04:45	40.63	49.32
16:45	-	17:00	50.07	59.22	04:45	-	05:00	39.73	51.94
17:00	-	17:15	51.67	61.26	05:00	-	05:15	40.25	52.45
17:15	-	17:30	52.42	61.89	05:15	-	05:30	38.91	51.63
17:30	-	17:45	54.82	61.25	05:30	-	05:45	39.50	52.73
17:45	-	18:00	51.92	60.53	05:45	-	06:00	42.16	54.36
18:00	-	18:15	53.52	59.71	06:00	-	06:15	41.82	54.35
18:15	-	18:30	52.22	57.93	06:15	-	06:30	41.56	54.97
18:30	-	18:45	50.85	57.18	06:30	-	06:45	43.92	56.43
18:45	-	19:00	53.03	58.49	06:45	-	07:00	48.70	59.95
19:00	-	19:15	55.84	59.69	07:00	-	07:15	52.38	61.96
19:15	-	19:30	52.89	58.39	07:15	-	07:30	50.07	60.26
19:30	-	19:45	48.92	57.67	07:30	-	07:45	50.76	60.00
19:45	-	20:00	50.14	58.54	07:45	-	08:00	52.88	61.04
20:00	-	20:15	48.92	57.61	08:00	-	08:15	54.42	62.53
20:15	-	20:30	47.44	56.76	08:15	-	08:30	55.00	61.92
20:30	-	20:45	46.84	56.42	08:30	-	08:45	54.79	61.66
20:45	-	21:00	47.26	58.25	08:45	-	09:00	56.05	62.75
21:00	-	21:15	47.57	56.84	09:00	-	09:15	54.94	63.65
21:15	-	21:30	46.33	55.32	09:15	-	09:30	55.22	63.27
21:30	-	21:45	46.28	54.74	09:30	-	09:45	57.47	63.79
21:45	-	22:00	45.47	53.61	09:45	-	10:00	56.16	63.51
22:00	-	22:15	45.75	54.62	10:00	-	10:15	56.12	63.17
22:15	-	22:30	45.47	54.3	10:15	-	10:30	56.98	64.08
22:30	-	22:45	46.06	56.37	10:30	-	10:45	55.84	63.29
22:45	-	23:00	44.97	57.06	10:45	-	11:00	56.29	62.97
23:00	-	23:15	43.05	56.35	11:00	-	11:15	59.99	64.48
23:15	-	23:30	46.74	56.97	11:15	-	11:30	58.59	63.96
23:30	-	23:45	45.98	56.53	11:30	-	11:45	56.49	62.88
23:45	-	00:00	45.63	54.61	11:45	-	12:00	56.36	62.79
00:00	-	00:15	46.82	55.84	12:00	-	12:15	53.21	60.65
00:15	-	00:30	40.74	52.29	12:15	-	12:30	52.43	60.27
00:30	-	00:45	40.96	53.26	12:30	-	12:45	55.19	62.41
00:45	-	01:00	46.83	55.47	12:45	-	13:00	55.22	68.26
01:00	-	01:15	47.75	53.39	13:00	-	13:15	56.51	64.80
01:15	-	01:30	40.45	50.59	13:15	-	13:30	58.17	64.38
01:30	-	01:45	38.61	50.69	13:30	-	13:45	57.16	64.90
01:45	-	02:00	40.36	51.36	13:45	-	14:00	59.25	65.77
02:00	-	02:15	36.63	48.26	14:00	-	14:15	58.44	62.63
02:15	-	02:30	38.66	48.37	14:15	-	14:30	56.18	62.72
02:30	-	02:45	38.8	48.47	14:30	-	14:45	59.65	64.39
02:45	-	03:00	36.94	47.76	14:45	-	15:00	62.24	67.20
03:00	-	03:15	38.11	48.09	15:00	-	15:15	56.88	61.78
03:15	-	03:30	36.75	48.51	15:15	-	15:30	52.55	59.83
03:30	-	03:45	37.33	50	15:30	-	15:45	54.57	60.46
03:45	-	04:00	37.78	49.11	15:45	-	16:00	57.24	61.49
04:00	-	04:15	38.56	51.41	16:00	-	16:15	57.24	62.02
04:15	-	04:30	39.6	50.6	16:15	-	16:30	58.29	63.91
$L_a$day		56.28	$L_a$eve	49.23	$L_a$night		42.76	$L_a$den	53.66

Second day, Measurement Results of fifteen minutes period (dBA,dBC)								06.08.2015
16:30	-	16:45	59.03	65.15	04:30	-	04:45	41.18	49.75
16:45	-	17:00	59.52	63.90	04:45	-	05:00	39.45	49.77
17:00	-	17:15	57.54	62.79	05:00	-	05:15	37.91	49.76
17:15	-	17:30	53.80	61.97	05:15	-	05:30	39.86	51.04
17:30	-	17:45	52.66	60.24	05:30	-	05:45	38.95	50.90
17:45	-	18:00	52.66	62.00	05:45	-	06:00	44.17	54.27
18:00	-	18:15	54.26	61.74	06:00	-	06:15	44.32	52.23
18:15	-	18:30	54.43	62.40	06:15	-	06:30	41.99	52.67
18:30	-	18:45	53.90	60.96	06:30	-	06:45	46.32	58.19
18:45	-	19:00	54.71	61.31	06:45	-	07:00	49.46	57.75
19:00	-	19:15	57.50	62.96	07:00	-	07:15	46.54	56.40
19:15	-	19:30	57.25	61.36	07:15	-	07:30	47.94	57.09
19:30	-	19:45	53.29	60.94	07:30	-	07:45	50.16	59.90
19:45	-	20:00	53.20	60.91	07:45	-	08:00	56.46	62.16
20:00	-	20:15	50.52	60.00	08:00	-	08:15	56.14	59.97
20:15	-	20:30	49.68	60.65	08:15	-	08:30	56.99	61.22
20:30	-	20:45	48.86	57.01	08:30	-	08:45	57.87	61.83
20:45	-	21:00	48.03	55.88	08:45	-	09:00	58.30	62.49
21:00	-	21:15	49.39	60.16	09:00	-	09:15	56.35	61.85
21:15	-	21:30	46.84	55.63	09:15	-	09:30	54.29	60.15
21:30	-	21:45	55.58	59.01	09:30	-	09:45	70.22	73.87
21:45	-	22:00	51.32	61.21	09:45	-	10:00	70.80	74.78
22:00	-	22:15	46.88	56.47	10:00	-	10:15	61.40	64.82
22:15	-	22:30	49.31	61.54	10:15	-	10:30	61.80	64.61
22:30	-	22:45	47.08	55.30	10:30	-	10:45	70.33	74.51
22:45	-	23:00	49.74	56.29	10:45	-	11:00	63.67	67.76
23:00	-	23:15	47.96	58.11	11:00	-	11:15	59.24	62.54
23:15	-	23:30	45.55	59.32	11:15	-	11:30	61.68	64.42
23:30	-	23:45	45.96	56.23	11:30	-	11:45	60.36	63.98
23:45	-	00:00	48.40	59.35	11:45	-	12:00	59.03	63.59
00:00	-	00:15	44.25	55.10	12:00	-	12:15	53.21	60.89
00:15	-	00:30	45.75	58.62	12:15	-	12:30	52.79	60.40
00:30	-	00:45	40.57	52.61	12:30	-	12:45	55.61	60.86
00:45	-	01:00	40.02	52.81	12:45	-	13:00	55.39	60.84
01:00	-	01:15	41.41	54.26	13:00	-	13:15	53.84	58.58
01:15	-	01:30	39.23	52.75	13:15	-	13:30	57.04	62.87
01:30	-	01:45	41.43	53.18	13:30	-	13:45	60.19	65.81
01:45	-	02:00	41.33	51.82	13:45	-	14:00	59.33	64.28
02:00	-	02:15	40.41	52.83	14:00	-	14:15	59.66	63.79
02:15	-	02:30	39.44	51.88	14:15	-	14:30	58.13	64.01
02:30	-	02:45	38.34	53.28	14:30	-	14:45	59.51	66.50
02:45	-	03:00	42.73	53.55	14:45	-	15:00	58.30	65.33
03:00	-	03:15	38.60	51.52	15:00	-	15:15	56.56	62.41
03:15	-	03:30	38.13	54.20	15:15	-	15:30	59.09	62.63
03:30	-	03:45	40.23	52.89	15:30	-	15:45	57.23	63.25
03:45	-	04:00	38.01	50.47	15:45	-	16:00	54.49	62.36
04:00	-	04:15	36.58	48.96	16:00	-	16:15	50.85	58.93
04:15	-	04:30	36.55	50.15	16:15	-	16:30	55.89	69.95
$L_a$day		61.00	$L_a$eve	52.40	$L_a$night		43.00	$L_a$den	58.20

FREKANS ÇEVRE LABORATUVARI	Gaziantep Health Campus

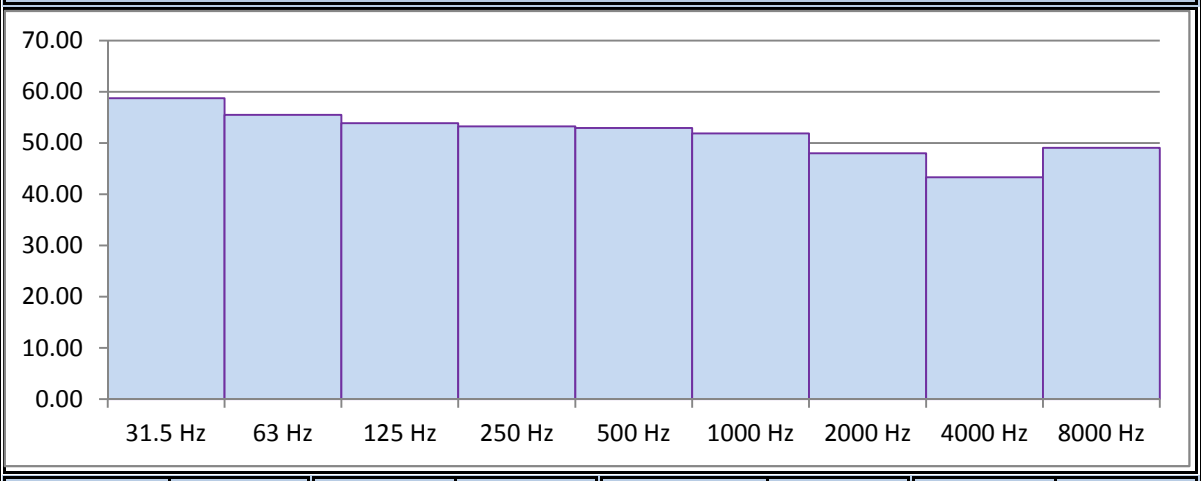
Measurement Location	House	Measurement Number	LT1
Standart	ISO 1996-2	Measurement Date	05.08.2015

1/3 Octave Band



Frequency	dB	Frequency	dB	Frequency	dB	Frequency	dB
20 Hz	52.7	160 Hz	50.1	1250 Hz	45.7	10000 Hz	28.9
25 Hz	55.7	200 Hz	47.3	1600 Hz	44.8	12500 Hz	35.5
31.5 Hz	54.4	250 Hz	48.5	2000 Hz	42.9	16000 Hz	25.8
40 Hz	50.4	315 Hz	49.3	2500 Hz	41.4	20000 Hz	18.8
50 Hz	52.6	400 Hz	48.8	3150 Hz	40.0		
63 Hz	48.8	500 Hz	47.2	4000 Hz	38.2	Total Values	
80 Hz	49.8	630 Hz	48.3	5000 Hz	36.8	Total A	56.44
100 Hz	49.1	800 Hz	48.5	6300 Hz	48.2	Total C	62.01
125 Hz	47.8	1000 Hz	46.5	8000 Hz	41.0	Total Z	67.04

1/1 Octave Band



Frequency	dB	Frequency	dB	Frequency	dB	Leq	dB
31.5 Hz	58.76	250 Hz	53.21	2000 Hz	47.99	Total A	56.44
63 Hz	55.51	500 Hz	52.93	4000 Hz	43.28	Total C	62.01
125 Hz	53.86	1000 Hz	51.84	8000 Hz	49.03	Total Z	67.04

FREKANS ÇEVRE LABORATUVARI	Gaziantep Health Campus

Measurement Location	House	Measurement Number	LT2
Standart	ISO 1996-2	Measurement Date	05.08.2015

Measurement Info				
Sound Level Meter	Type 1	SVAN 971	Coordinates (WGS 84)	355914.00 d D 4097922.00 m K
SLM No	FC15			
Data No	53		Distance to source	-
Start Time	17:30:00		Location	Balcony of house
Elapsed Time	48:00:00		Microphone Height	5 m

Background Noise Sources
Conctruction Noise, Human Activities and Low Traffic

Logger Graph (dBA, dBC, dB)

FREKANS ÇEVRE LABORATUVARI

Gaziantep Health Campus

Measurement Location	House	Measurement Number	LT2
Standart	ISO 1996-2	Measurement Date	05.08.2015

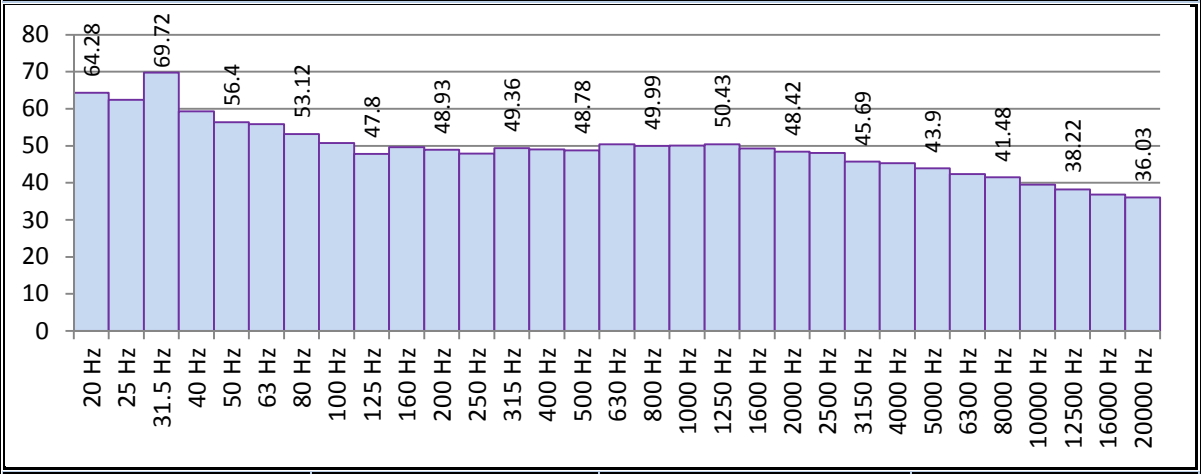
First day, Measurement Results of fifteen minutes period (dBA,dBC)									05.08.2015
17:30	-	17:45	54.88	69.17	05:30	-	18:00	43.75	55.29
17:45	-	18:00	48.81	63.85	05:45	-	06:00	44.83	58.17
18:00	-	18:15	48.99	65.52	06:00	-	06:15	44.57	56.26
18:15	-	18:30	45.48	64.77	06:15	-	06:30	44.74	62.00
18:30	-	18:45	46.00	62.55	06:30	-	06:45	45.83	59.46
18:45	-	19:00	47.98	65.31	06:45	-	07:00	46.50	63.98
19:00	-	19:15	48.96	65.58	07:00	-	07:15	48.40	64.76
19:15	-	19:30	47.56	60.17	07:15	-	07:30	47.01	62.25
19:30	-	19:45	45.50	65.96	07:30	-	07:45	47.13	62.58
19:45	-	20:00	46.45	63.81	07:45	-	08:00	51.14	63.85
20:00	-	20:15	46.35	64.98	08:00	-	08:15	52.46	65.12
20:15	-	20:30	45.88	66.34	08:15	-	08:30	51.87	65.83
20:30	-	20:45	46.02	66.71	08:30	-	08:45	50.40	64.11
20:45	-	21:00	46.23	68.48	08:45	-	09:00	72.97	78.03
21:00	-	21:15	47.88	68.98	09:00	-	09:15	72.70	82.58
21:15	-	21:30	46.95	64.90	09:15	-	09:30	71.82	79.56
21:30	-	21:45	46.43	64.15	09:30	-	09:45	72.22	79.90
21:45	-	22:00	45.76	59.47	09:45	-	10:00	70.61	80.24
22:00	-	22:15	46.38	58.39	10:00	-	10:15	70.84	81.61
22:15	-	22:30	45.79	63.95	10:15	-	10:30	73.35	81.47
22:30	-	22:45	45.82	65.92	10:30	-	10:45	71.62	82.66
22:45	-	23:00	45.99	67.12	10:45	-	11:00	71.35	81.61
23:00	-	23:15	45.83	68.90	11:00	-	11:15	53.73	63.02
23:15	-	23:30	46.78	71.47	11:15	-	11:30	52.31	62.59
23:30	-	23:45	46.27	65.37	11:30	-	11:45	50.40	65.23
23:45	-	00:00	44.64	63.59	11:45	-	12:00	52.25	61.47
00:00	-	00:15	45.63	59.12	12:00	-	12:15	51.46	61.14
00:15	-	00:30	44.28	59.73	12:15	-	12:30	45.51	54.53
00:30	-	00:45	44.20	62.68	12:30	-	12:45	48.17	60.94
00:45	-	01:00	44.36	61.61	12:45	-	13:00	47.71	59.32
01:00	-	01:15	43.98	61.68	13:00	-	13:15	48.45	62.32
01:15	-	01:30	43.87	64.37	13:15	-	13:30	50.57	61.32
01:30	-	01:45	43.47	64.41	13:30	-	13:45	50.39	61.78
01:45	-	02:00	43.30	57.65	13:45	-	14:00	49.52	59.07
02:00	-	02:15	42.82	55.69	14:00	-	14:15	49.22	58.50
02:15	-	02:30	42.77	50.53	14:15	-	14:30	49.00	59.80
02:30	-	02:45	42.66	51.03	14:30	-	14:45	59.46	64.49
02:45	-	03:00	42.67	52.76	14:45	-	15:00	57.02	65.93
03:00	-	03:15	42.65	57.72	15:00	-	15:15	56.75	66.21
03:15	-	03:30	42.66	61.52	15:15	-	15:30	48.67	63.03
03:30	-	03:45	42.82	63.55	15:30	-	15:45	60.88	68.02
03:45	-	04:00	42.74	60.77	15:45	-	16:00	57.80	65.10
04:00	-	04:15	42.79	53.73	16:00	-	16:15	56.54	70.69
04:15	-	04:30	43.20	58.22	16:15	-	16:30	54.68	70.25
04:30	-	04:45	45.28	54.07	16:30	-	16:45	56.25	71.48
04:45	-	05:00	43.49	54.95	16:45	-	17:00	55.27	69.89
05:00	-	05:15	43.29	54.79	17:00	-	17:15	61.68	72.05
05:15	-	05:30	43.34	57.4	17:15	-	17:30	54.30	69.59
$L_a$day		65.09	$L_a$eve	46.60	$L_a$night		44.25	$L_a$den	62.13

Second day, Measurement Results of fifteen minutes period (dBA,dBC)								06.08.2015
17:30	-	17:45	61.22	70.02	05:30	-	05:45	43.81	59.85
17:45	-	18:00	61.44	71.84	05:45	-	06:00	44.76	61.40
18:00	-	18:15	59.96	70.98	06:00	-	06:15	44.22	55.10
18:15	-	18:30	57.60	70.88	06:15	-	06:30	43.86	54.48
18:30	-	18:45	49.43	71.28	06:30	-	06:45	44.22	57.32
18:45	-	19:00	51.20	70.43	06:45	-	07:00	46.06	59.99
19:00	-	19:15	46.69	67.59	07:00	-	07:15	46.15	59.46
19:15	-	19:30	46.14	63.40	07:15	-	07:30	46.86	64.75
19:30	-	19:45	46.99	62.67	07:30	-	07:45	46.94	59.90
19:45	-	20:00	50.29	65.37	07:45	-	08:00	49.67	59.71
20:00	-	20:15	46.67	57.93	08:00	-	08:15	49.54	61.00
20:15	-	20:30	46.42	59.25	08:15	-	08:30	51.52	62.08
20:30	-	20:45	45.69	59.98	08:30	-	08:45	51.91	63.30
20:45	-	21:00	45.59	60.69	08:45	-	09:00	52.89	61.54
21:00	-	21:15	46.82	60.80	09:00	-	09:15	49.83	61.47
21:15	-	21:30	45.30	57.73	09:15	-	09:30	47.72	63.77
21:30	-	21:45	45.40	57.49	09:30	-	09:45	54.98	63.54
21:45	-	22:00	49.41	62.09	09:45	-	10:00	50.80	64.18
22:00	-	22:15	45.51	63.09	10:00	-	10:15	51.26	64.94
22:15	-	22:30	46.65	65.08	10:15	-	10:30	55.81	65.30
22:30	-	22:45	45.60	60.24	10:30	-	10:45	57.59	67.58
22:45	-	23:00	46.26	63.41	10:45	-	11:00	56.37	68.55
23:00	-	23:15	46.09	64.07	11:00	-	11:15	55.72	67.87
23:15	-	23:30	45.84	64.36	11:15	-	11:30	57.67	67.12
23:30	-	23:45	46.32	70.04	11:30	-	11:45	55.22	69.57
23:45	-	00:00	46.89	68.68	11:45	-	12:00	54.94	63.49
00:00	-	00:15	45.92	69.75	12:00	-	12:15	50.54	66.65
00:15	-	00:30	46.35	70.08	12:15	-	12:30	48.80	68.83
00:30	-	00:45	44.67	69.74	12:30	-	12:45	49.98	67.55
00:45	-	01:00	44.40	69.37	12:45	-	13:00	48.46	64.85
01:00	-	01:15	44.59	70.49	13:00	-	13:15	47.58	64.53
01:15	-	01:30	45.17	72.06	13:15	-	13:30	47.43	62.30
01:30	-	01:45	44.68	70.80	13:30	-	13:45	54.44	69.35
01:45	-	02:00	45.34	72.74	13:45	-	14:00	54.96	67.20
02:00	-	02:15	44.45	70.55	14:00	-	14:15	52.24	66.38
02:15	-	02:30	45.03	72.91	14:15	-	14:30	54.25	70.26
02:30	-	02:45	44.51	72.25	14:30	-	14:45	52.57	65.70
02:45	-	03:00	45.52	73.17	14:45	-	15:00	54.26	67.32
03:00	-	03:15	44.33	71.35	15:00	-	15:15	51.48	66.61
03:15	-	03:30	44.02	69.86	15:15	-	15:30	56.16	68.22
03:30	-	03:45	44.28	69.30	15:30	-	15:45	51.24	67.84
03:45	-	04:00	43.26	64.85	15:45	-	16:00	46.82	69.61
04:00	-	04:15	43.28	63.03	16:00	-	16:15	48.16	69.15
04:15	-	04:30	43.19	64.54	16:15	-	16:30	55.17	67.17
04:30	-	04:45	47.21	58.57	16:30	-	16:45	56.53	67.44
04:45	-	05:00	43.38	61.28	16:45	-	17:00	54.64	69.27
05:00	-	05:15	43.19	60.55	17:00	-	17:15	58.77	72.06
05:15	-	05:30	43.66	61.16	17:15	-	17:30	59.17	76.16
$L_a$day		54.70	$L_a$eve	46.80	$L_a$night		44.90	$L_a$den	52.20

FREKANS ÇEVRE LABORATUVARI	Gaziantep Health Campus

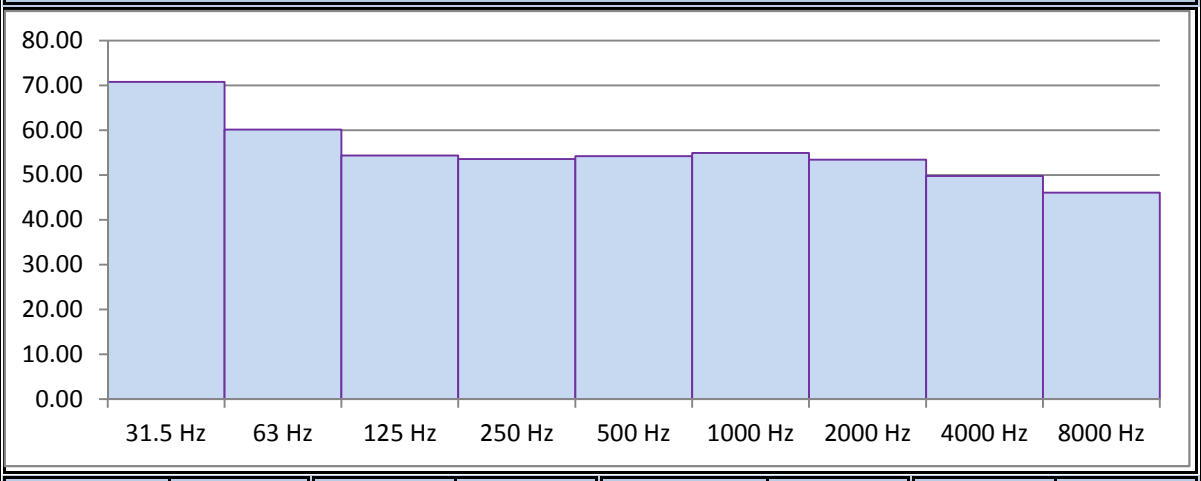
Measurement Location	House	Measurement Number	LT2
Standart	ISO 1996-2	Measurement Date	05.08.2015

1/3 Octave Band



Frequency	dB	Frequency	dB	Frequency	dB	Frequency	dB
20 Hz	64.3	160 Hz	49.7	1250 Hz	50.4	10000 Hz	39.5
25 Hz	62.4	200 Hz	48.9	1600 Hz	49.3	12500 Hz	38.2
31.5 Hz	69.7	250 Hz	47.9	2000 Hz	48.4	16000 Hz	36.8
40 Hz	59.3	315 Hz	49.4	2500 Hz	48.1	20000 Hz	36.0
50 Hz	56.4	400 Hz	49.0	3150 Hz	45.7		
63 Hz	55.9	500 Hz	48.8	4000 Hz	45.3	Total Values	
80 Hz	53.1	630 Hz	50.4	5000 Hz	43.9	Total A	59.51
100 Hz	50.7	800 Hz	50.0	6300 Hz	42.4	Total C	70.11
125 Hz	47.8	1000 Hz	50.1	8000 Hz	41.5	Total Z	80.04

1/1 Octave Band



Frequency	dB	Frequency	dB	Frequency	dB	Leq	dB
31.5 Hz	70.78	250 Hz	53.55	2000 Hz	53.40	Total A	59.51
63 Hz	60.12	500 Hz	54.22	4000 Hz	49.79	Total C	70.11
125 Hz	54.33	1000 Hz	54.94	8000 Hz	46.04	Total Z	80.04

FREKANS ÇEVRE LABORATUVARI

Gaziantep Health Campus

Measurement Location	House	Measurement Number	LT3
Standart	ISO 1996-2	Measurement Date	05.08.2015

Measurement Information				
Sound Level Meter	Type 1	SVAN 971	Coordinates (WGS 84)	355914.00 d D 4097922.00 m K
SLM No	FC 13			
Data No	F13_642		Distance to source	-
Start Time	18:50:00		Location	Balcony of the House
Elapsed Time	47:00:00		Microphone Height	20 m

Background Noise Sources
Human Activities and Low Traffic

Logger Graph (dBA, dBC, dB)

FREKANS ÇEVRE LABORATUVARI

Gaziantep Health Campus

Measurement Location	House	Measurement Number	LT3
Standart	ISO 1996-2	Measurement Date	05.08.2015

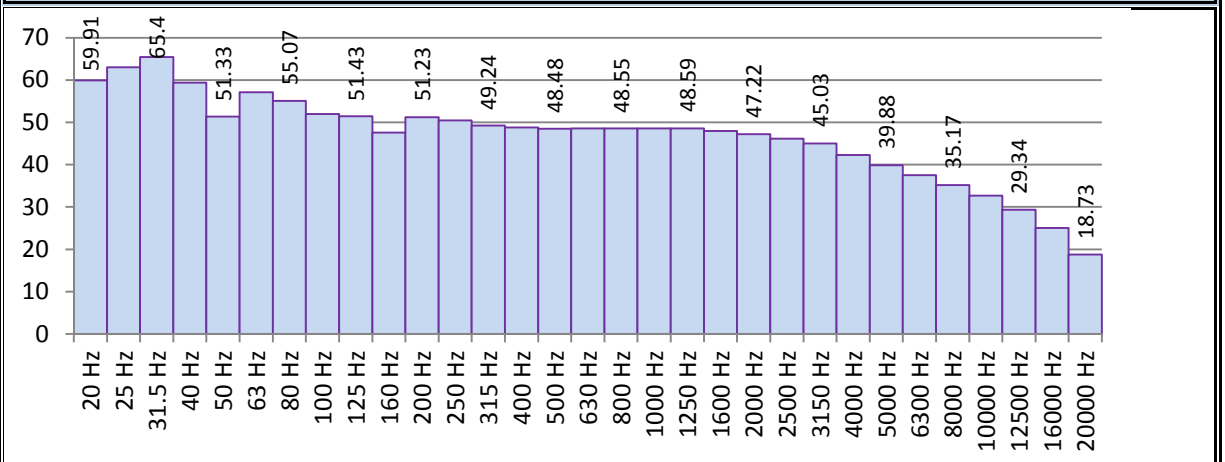
First day, Measurement Results of fifteen minutes period (dBA,dBC)								05.08.2015
18:50	-	19:05	60.02	71.08	06:50	-	07:05	59.86	71.44
19:05	-	19:20	60.93	68.13	07:05	-	07:20	59.08	69.90
19:20	-	19:35	57.49	67.01	07:20	-	07:35	60.64	69.75
19:35	-	19:50	59.11	67.88	07:35	-	07:50	57.35	68.23
19:50	-	20:05	62.39	69.72	07:50	-	08:05	62.99	70.79
20:05	-	20:20	58.43	68.06	08:05	-	08:20	62.35	70.80
20:20	-	20:35	59.06	67.77	08:20	-	08:35	60.04	69.33
20:35	-	20:50	57.32	67.64	08:35	-	08:50	59.10	67.14
20:50	-	21:05	58.24	67.93	08:50	-	09:05	60.07	67.16
21:05	-	21:20	58.74	67.89	09:05	-	09:20	59.96	68.04
21:20	-	21:35	55.38	65.19	09:20	-	09:35	59.08	67.20
21:35	-	21:50	57.7	67.2	09:35	-	09:50	58.21	66.55
21:50	-	22:05	59.13	66.65	09:50	-	10:05	59.76	67.95
22:05	-	22:20	58.07	66.19	10:05	-	10:20	57.15	65.39
22:20	-	22:35	55.82	65.91	10:20	-	10:35	56.64	64.74
22:35	-	22:50	58.26	66.55	10:35	-	10:50	59.88	68.35
22:50	-	23:05	57.72	67.21	10:50	-	11:05	61.54	67.73
23:05	-	23:20	56.76	69.08	11:05	-	11:20	60.35	67.83
23:20	-	23:35	61.81	69.68	11:20	-	11:35	58.89	65.68
23:35	-	23:50	54.45	67.61	11:35	-	11:50	59.34	67.63
23:50	-	00:05	53.08	66.6	11:50	-	12:05	57.81	66.02
00:05	-	00:20	56.83	64.51	12:05	-	12:20	56.27	64.75
00:20	-	00:35	50.58	61.3	12:20	-	12:35	59.13	64.58
00:35	-	00:50	46.52	61.18	12:35	-	12:50	59.37	67.02
00:50	-	01:05	50.5	61.76	12:50	-	13:05	58.37	66.46
01:05	-	01:20	57.26	62.6	13:05	-	13:20	59.07	67.46
01:20	-	01:35	45.74	62.41	13:20	-	13:35	59.31	66.83
01:35	-	01:50	43.03	59.39	13:35	-	13:50	58.79	65.01
01:50	-	02:05	45.48	55.55	13:50	-	14:05	57.02	65.72
02:05	-	02:20	40.47	50.99	14:05	-	14:20	60.03	67.19
02:20	-	02:35	40	55.47	14:20	-	14:35	57.00	64.99
02:35	-	02:50	44.44	56.83	14:35	-	14:50	59.51	66.12
02:50	-	03:05	46.2	57.92	14:50	-	15:05	56.07	64.86
03:05	-	03:20	46.71	60.19	15:05	-	15:20	62.15	69.12
03:20	-	03:35	39.7	56.15	15:20	-	15:35	60.94	67.42
03:35	-	03:50	41.16	52.78	15:35	-	15:50	57.25	65.15
03:50	-	04:05	42.26	53.23	15:50	-	16:05	55.97	64.87
04:05	-	04:20	39.87	52.99	16:05	-	16:20	60.79	66.95
04:20	-	04:35	49.16	55.11	16:20	-	16:35	61.89	68.36
04:35	-	04:50	45.89	57.48	16:35	-	16:50	57.06	64.83
04:50	-	05:05	45.5	57.62	16:50	-	17:05	58.65	66.46
05:05	-	05:20	54.21	59.7	17:05	-	17:20	57.77	66.36
05:20	-	05:35	48.28	60.8	17:20	-	17:35	56.39	65.09
05:35	-	05:50	52.04	63.49	17:35	-	17:50	58.39	66.31
05:50	-	06:05	52.93	66.16	17:50	-	18:05	61.55	66.99
06:05	-	06:20	58.07	68.03	18:05	-	18:20	57.48	64.78
06:20	-	06:35	58.35	69.98	18:20	-	18:35	57.62	66.27
06:35	-	06:50	57.96	69.63	18:35	-	18:50	58.92	67.46
$L_a$day		59.37	$L_a$eve	58.80	$L_a$night		53.71	$L_a$den	58.04

Second day, Measurement Results of fifteen minutes period (dBA,dBC)									06.08.2015
18:50	-	19:05	59.35	66.41	06:50	-	07:05	60.14	67.87
19:05	-	19:20	58.07	65.77	07:05	-	07:20	60.72	67.44
19:20	-	19:35	59.56	67.62	07:20	-	07:35	59.70	67.74
19:35	-	19:50	59.74	68.15	07:35	-	07:50	58.57	66.61
19:50	-	20:05	58.2	66.36	07:50	-	08:05	60.18	67.62
20:05	-	20:20	60.83	67.84	08:05	-	08:20	61.00	68.32
20:20	-	20:35	58.65	66.55	08:20	-	08:35	60.15	69.21
20:35	-	20:50	58.67	67.36	08:35	-	08:50	62.37	74.28
20:50	-	21:05	58.83	65.64	08:50	-	09:05	57.24	67.06
21:05	-	21:20	58.39	66.91	09:05	-	09:20	58.43	67.44
21:20	-	21:35	57.8	65.37	09:20	-	09:35	59.17	67.24
21:35	-	21:50	57.57	67.73	09:35	-	09:50	58.08	67.64
21:50	-	22:05	55.05	65.26	09:50	-	10:05	57.11	67.61
22:05	-	22:20	62.02	70.14	10:05	-	10:20	59.86	68.21
22:20	-	22:35	58.03	67.53	10:20	-	10:35	58.34	67.49
22:35	-	22:50	55.89	64.89	10:35	-	10:50	60.11	67.56
22:50	-	23:05	55.1	66.08	10:50	-	11:05	58.94	68.00
23:05	-	23:20	56.02	65.61	11:05	-	11:20	61.01	69.23
23:20	-	23:35	54.51	66.2	11:20	-	11:35	59.87	68.71
23:35	-	23:50	52.17	68.92	11:35	-	11:50	62.13	67.48
23:50	-	00:05	57.6	72.12	11:50	-	12:05	59.41	67.00
00:05	-	00:20	56.18	71.14	12:05	-	12:20	60.78	67.79
00:20	-	00:35	54.83	71.74	12:20	-	12:35	57.68	67.34
00:35	-	00:50	48.68	67.8	12:35	-	12:50	58.10	66.50
00:50	-	01:05	51.42	70.3	12:50	-	13:05	61.02	67.39
01:05	-	01:20	51.94	71.81	13:05	-	13:20	59.84	69.41
01:20	-	01:35	52.17	72.53	13:20	-	13:35	60.76	68.87
01:35	-	01:50	55.7	74.29	13:35	-	13:50	57.76	67.34
01:50	-	02:05	53.49	73.09	13:50	-	14:05	61.22	67.57
02:05	-	02:20	49.81	70.66	14:05	-	14:20	58.32	68.32
02:20	-	02:35	53.2	72.36	14:20	-	14:35	59.90	69.03
02:35	-	02:50	50.08	72.28	14:35	-	14:50	58.05	66.23
02:50	-	03:05	46.57	70.36	14:50	-	15:05	58.79	67.87
03:05	-	03:20	48.42	71.26	15:05	-	15:20	59.59	68.44
03:20	-	03:35	46.67	72.25	15:20	-	15:35	61.11	68.79
03:35	-	03:50	44.74	69.42	15:35	-	15:50	57.36	66.76
03:50	-	04:05	43.87	69.01	15:50	-	16:05	57.19	65.45
04:05	-	04:20	40.93	61.59	16:05	-	16:20	56.72	65.90
04:20	-	04:35	50.27	60.86	16:20	-	16:35	59.82	67.99
04:35	-	04:50	46.97	59.48	16:35	-	16:50	56.25	67.31
04:50	-	05:05	49.36	59.35	16:50	-	17:05	56.45	67.30
05:05	-	05:20	48.1	60.76	17:05	-	17:20	58.30	68.79
05:20	-	05:35	47.55	63.11	17:20	-	17:35	58.35	70.45
05:35	-	05:50	50.75	60.88	17:35	-	17:50	60.60	71.65
05:50	-	06:05	53.13	63.99	17:50	-	18:05	59.88	72.41
06:05	-	06:20	56.42	63.15					
06:20	-	06:35	58.91	68.22					
06:35	-	06:50	56.51	66.75					
$L_a$day		59.40	$L_a$eve	58.80	$L_a$night		53.30	$L_a$den	58.10

FREKANS ÇEVRE LABORATUVARI	Gaziantep Health Campus

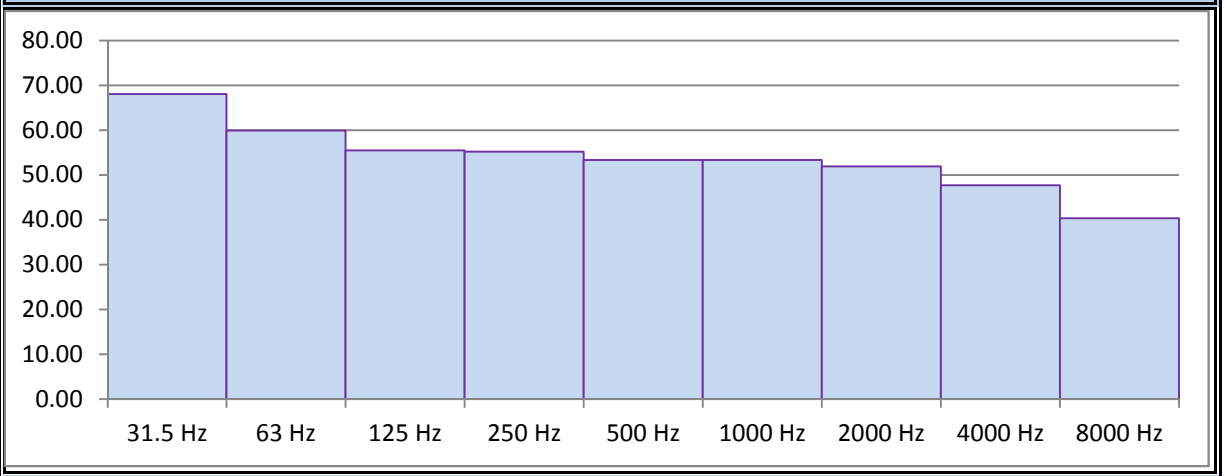
Measurement Location	House	Measurement Number	LT3
Standart	ISO 1996-2	Measurement Date	05.08.2015

1/3 Octav Band



Frequency	dB	Frequency	dB	Frequency	dB	Frequency	dB
20 Hz	59.9	160 Hz	47.6	1250 Hz	48.6	10000 Hz	32.7
25 Hz	63.0	200 Hz	51.2	1600 Hz	47.9	12500 Hz	29.3
31.5 Hz	65.4	250 Hz	50.5	2000 Hz	47.2	16000 Hz	25.0
40 Hz	59.4	315 Hz	49.2	2500 Hz	46.2	20000 Hz	18.7
50 Hz	51.3	400 Hz	48.8	3150 Hz	45.0		
63 Hz	57.1	500 Hz	48.5	4000 Hz	42.3	Total Values	
80 Hz	55.1	630 Hz	48.5	5000 Hz	39.9	Total A	58.03
100 Hz	52.0	800 Hz	48.6	6300 Hz	37.5	Total C	67.74
125 Hz	51.4	1000 Hz	48.6	8000 Hz	35.2	Total Z	76.92

1/1 Octave Band



Frequency	dB	Frequency	dB	Frequency	dB	Leq	dB
31.5 Hz	68.03	250 Hz	55.16	2000 Hz	51.94	Total A	58.03
63 Hz	59.87	500 Hz	53.37	4000 Hz	47.67	Total C	67.74
125 Hz	55.47	1000 Hz	53.34	8000 Hz	40.34	Total Z	76.92