Heraklion
International Airport, Crete

ENVIRONMENTAL MONITORING PROCEDURE

This report presents the procedures and methodology for monitoring environmental indicators during the construction period of the new International Airport of Heraklion Crete (Project), in accordance with the obligations arising from the Environmental Conditions Approval Decision (AEPO) of Project with Prot. No οικ. 143779/28.08.2009 as amended and in force.

This report presents the procedures of the Environmental Monitoring Program in terms of the following parameters:

1. Noise
2. Dust
3. Ground vibrations
4. Recording of avifauna and fauna

The following equipment was used for the implementation of the works of the Environmental Monitoring Team:

Personal Protection Measures

For the safety of the personnel during the works in the field, Personal Protection Measures (PPM) were used, such as e.g. helmet, identification vest, gloves, special clothing for outdoor work, protective goggles.

GPS Device

To identify points of interest in the field and record the coordinates during monitoring works, as well as the daily recording of work progress.

Camera

For photographic imaging where required during the monitoring operations.

Binoculars

To observe avifauna species and remote objects.

Distance meter

To calculate the distance from fauna and/or avifauna species and distant elements.

Noise measurement station - meteorological station

A specially designed monitoring station was used to cover the 24-hour noise measurements. The sound level meters were in accordance with IEC 61672-1, IEC 61672-2 and IEC 1260 standards. Together with the noise level meters, a meteorological station was installed to monitor meteorological parameters during the noise measurements.

Dust measuring equipment

Special equipment was used to measure dust particles in the atmosphere.

Vibration recording equipment

Special equipment was used to measure the vibrations, which was activated whenever the maximum ground particle vibration velocity (PPV) and/or air vibrations exceeded the lower limit of the equipment activation.

Bat monitoring equipment

Special equipment was used to monitor the bats with built-in live monitoring capabilities (mixer, resp. Superheterodyne) that automatically tunes to the different frequencies.

General Methodology of Works

The basic methodology in the operating mode followed by the Environmental Monitoring Team is as follows:

• Receipt of the Daily Work Plan by the Project Contractor.

• Examination of the work areas using satellite maps and GIS database to identify accessibility routes to the work area, assessment of the ground morphology and possible special points of interest (settlements boundaries, residential or industrial buildings, known cultural elements, possible sensitive points of presence of avifauna species, etc.).

• Visit to the points of interest identified for the installation of equipment for measuring environmental parameters and/or monitoring of avifauna and fauna. Perform data collection and photographic documentation where required.

• Return to the database to analyze the data recorded and inform the Project Coordinator of any breaches of the permitted limits of the various environmental parameters or identify any significant/sensitive fauna species or difficulties in the implementation of their tasks.

Noise monitoring methodology

The measurements were carried out near sensitive receivers located in close proximity to the project construction works, using the specially equipped noise measurement station.

Initially, a zone of 500 m from the New Airport construction site boundary was defined as a zone of potential noise impact on sensitive receivers. Four (4) settlements were identified within this zone. More specifically, the settlements of Roussochoria, Liliano, Archangelos and Evangelismos were identified.

Subsequently, monitoring equipment installation sites were selected based on the proximity to the construction site and the safety of the equipment.

In each of the above settlements, 24-hour measurements were carried out on days when construction work was taking place at the new airport.

In addition to the noise level meter, a meteorological station was installed to monitor meteorological parameters during the noise measurements.

The weather station installed with the noise station recorded the following parameters:

- Temperature
- Humidity
- Barometric pressure
- Wind velocity and direction
- Rainfall

Dust monitoring methodology

Initially, a zone of 500 m from the New Airport construction site boundary was defined as a zone of potential impact for sensitive dust receptors. Within this zone, four (4) settlements were identified. More specifically, the settlements of Roussochoria, Liliano, Archangelos and Evangelismos were identified.

Subsequently, the installation points of the monitoring equipment were selected based on the proximity to the construction site and the safety of the equipment.

In each of the above settlements, 24-hour measurements were conducted on days when construction works of the new airport were taking place.

The following indicators were obtained from the dust level measurements:

- Calculation of particle concentration according to PM1, PM2.5, PM4, PM10

The average hourly and daily PM2.5 & PM10 concentrations were then calculated, as well as the corresponding minimum and maximum hourly PM2.5 & PM10 concentrations.

Vibration monitoring methodology

Similarly, to the above parameters, a zone of 500 m from the boundary of the New Airport site was initially defined as a zone of potential impact on sensitive receptors in terms of vibration. Four (4) settlements were identified within this zone. More specifically, the settlements of Roussochoria, Liliano, Archangelos and Evangelismos were identified.

Then the installation points of the monitoring equipment were selected based on the proximity to the construction site and the safety of the equipment.

In each of the above settlements, 24-hour measurements were carried out on days when construction works of the new airport were taking place.

The vibration monitor operated continuously during the 24-hour recording period and was activated in any case where the ground and/or air vibration velocity limits exceeded the lowest equipment activation limit.

The parameters that would be recorded for each vibration due to the activation of the source points included the following

• The ground vibration velocity spectrum (mm/sec) in 3 rectangular components

• The frequency spectrum (Hz) of the 3 components of the vibration velocity

• The noise intensity/shockwave gas pressure (dB)

• The frequency (Hz) of the blast noise

The measurement of air vibrations pressure (Sound Blasting) is carried out with a special microphone attached to the vibration recorder, in order to record even air vibration pressure values, which due to their frequency spectrum would not be perceived by common acoustic noise microphones. The measurement of the intensity of the airborne vibration shall be made in dBL units of measurement.

Methodology for monitoring of avifauna - fauna

The monitoring of fauna and avifauna took place on days when construction works were taking place within the study area.

A combination of passive and active methods was used to monitor the avifauna and fauna as described below:

- Random observations made at various locations within the study area in order to record any animal or track. The monitoring was conducted by walking and no specific monitoring duration was applied.
- Visual inspection of water bodies within the wider area of the Project for the presence of important fauna species, mainly amphibians.
- Check for the presence of large mammals within the wider area of the Project works, particularly in important habitats. The monitoring consisted of visual identification of tracks or other indications of species presence, or even information from locals about the presence of a species.
- The **Point count** method was implemented to monitor avifauna at a specific location that was considered a potential area for disturbance of avifauna by the noise of the works, with the survey area extending to a radius of up to 50m. For each site, 15 minutes of monitoring was carried out and all-important bird species and any nesting sites were recorded by visual or acoustic means.
- The **Vantage point** method was implemented in open areas (meadows, agricultural land, sparse forests, wetlands, etc.), where the expert scientist was able to examine the presence of nesting sites (of mainly large species) and important avifauna species at greater distances (up to 250 m). For each site, 30 minutes of monitoring was carried out, where the area was scanned for important raptors, large nests of raptors and storks flying or standing on tree tops and rocky outcrops, as well as resting points of these species.
- The **Line transects** method was mainly implemented in spatially restricted areas and was carried out by walking at a constant pace and recording all animal activity within the walked corridor (tracks, droppings, food remains, etc.)
- The method of **time constrained search**, where a selected area was thoroughly inspected for a limited duration, on average 20 minutes (duration range 5 to 45 minutes) by searching all objects (rocks, fallen tree trunks, etc.) and/or inspecting bushes, cracks, holes, tree roots, etc. to look for hidden animals, mainly reptiles, amphibians and small mammals.

- **Car transects,** when the conditions allow. Car transects, especially if conducted in a systematic manner, are an important method for conducting surveys of raptors and/or other birds, as a large area can be studied in a short period of time. Vehicle surveys are also a key sampling method for studying reptiles, particularly snakes, as large areas can be covered in a short period of time, and these species tend to cross roads regularly as they cross their habitat.
- Surveys **using ultrasound (bus)**. It is an acoustic ultrasound method for studying bats. The measurements were conducted through automatic recordings using the Batlogger M, a bat survey device with built-in live monitoring capabilities (mixer, resp. Superheterodyne) that automatically tunes to the different call frequencies.

All field information was recorded on standardised documents-protocols used in the field by the Environmental Monitoring Team, and included details such as the date, details of the team members in the field, the coordinates of each observation point or section inspected and comments on the observations.