Environmental Impact Assessment: Annexures

Project No. 48289-002
April 2017

PAK: Peshawar Sustainable Bus Rapid Transit Corridor Project

Annexures J - R

Sample Ambient Monitoring Results
Photographs of Air Quality & Noise Monitoring
NOC from Department of Archaeology
Occupational Health and Safety Plan
Emergency Response Plan
Archaeological ‘Chance Find’ Procedure
Scope of Work for Structural Assessment of Bala Hisar Fort
Methodology for Air Quality and Noise Monitoring
ToRs of Third Party Monitor

Prepared by Peshawar Development Authority (PDA), provincial Government of Khyber Pakhtunkhwa (GoKP) for the Asian Development Bank (ADB).

ANNEXURE J

SAMPLE AMBIENT AIR QUALITY AND NOISE MONITORING RESULTS

SGS

ANNEXURE -A
Our Ref.: EHS – LHR –771/ 2016
Test Report No: 857493
November 02, 2016
Page 01 of 06

Ambient Air Quality

Client : **ADB Consultant.**

Sampling Point : **Soekarno Square**

Date of Intervention : **October 18-19, 2016**

Sr. #	Time	CO (mg/m^3)	NO ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)
1.	11:00	3.91	9.81	16.94	10.81
2.	12:00	4.12	9.75	16.81	10.55
3.	13:00	4.26	9.79	16.79	10.12
4.	14:00	4.29	10.12	16.99	10.16
5.	15:00	4.81	10.16	17.19	10.23
6.	16:00	5.62	11.02	17.59	10.51
7.	17:00	5.44	10.99	17.40	10.31
8.	18:00	4.81	10.85	17.35	10.33
9.	19:00	4.65	10.65	16.31	10.54
10.	20:00	3.92	10.45	16.19	10.56
11.	21:00	3.99	10.59	16.29	10.41
12.	22:00	4.41	11.04	16.58	10.34
13.	23:00	3.94	10.85	16.25	10.12
14.	00:00	3.59	10.80	16.18	09.99
15.	01:00	3.01	09.99	15.81	09.49
16.	02:00	3.12	09.80	15.57	09.52
17.	03:00	2.89	09.45	15.41	09.38
18.	04:00	2.71	09.12	15.12	09.30
19.	05:00	3.42	09.44	15.86	09.43
20.	06:00	3.69	09.49	15.89	09.51
21.	07:00	3.88	09.96	15.99	09.64
22.	08:00	4.45	10.70	16.21	09.78
23.	09:00	4.96	10.72	16.24	10.12
24.	10:00	4.86	10.91	16.34	10.17
Average Concentration		**4.11**	**10.27**	**16.39**	**10.06**

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Average Obtained Concentrations of Priority Pollutants

Client : **ADB Consultant.**
Sampling Point : **Soekarno Square**
Date of Intervention : **October 18-19, 2016**

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	Limits As Per NEQS
Nitrogen Oxide (NO)	µg/m^3	24Hours	1.00	10.27	40 (µg/ m^3) For 24 Hours
Nitrogen Dioxide (NO_2)	µg/m^3	24Hours	1.00	16.39	80 (µg/ m^3) For 24 Hours
Sulfur Dioxide (SO_2)	(µg/ m^3)	24 Hours	0.01	10.06	120 (µg/ m^3) For 24 Hrs
Carbon Monoxide (CO)	(mg/m^3)	24 Hours	1.00	4.11	5 (mg/m^3) For 8 Hours
Particulate Matter (PM_{10})	(µg/m^3)	24 Hours	1.00	184.08	150 µg/m^3 For 24 Hrs
Particulate Matter ($PM_{2.5}$)	(µg/m^3)	24 Hours	1.00	33.29	35 µg/m^3 For 24 Hrs
TSPM	(µg/m^3)	24 Hours	1.00	423.50	500 µg/m^3 For 24 Hrs

µg/m^3: micrograms per cubic meter
mg/m^3: miligram per cubic meter
LDL: Lowest Detection Limit
NEQS: National Environmental Quality Standards

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ANNEXURE -A
Our Ref.: EHS – LHR –771/ 2016
Test Report No: 857493
November 02, 2016
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Ambient Air Quality

Client : **ADB Consultant.**

Sampling Point : **Saddar Bazar**

Date of Intervention : **October 19-20, 2016**

Sr. #	Time	CO (mg/m^3)	NO ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)
1.	12:00	3.12	8.95	16.12	10.12
2.	13:00	3.14	8.98	16.32	9.48
3.	14:00	3.24	9.12	16.49	9.65
4.	15:00	3.18	9.11	16.48	9.55
5.	16:00	3.29	9.14	16.55	10.12
6.	17:00	3.25	9.04	16.59	10.55
7.	18:00	3.29	9.14	16.71	10.19
8.	19:00	3.18	8.95	16.85	10.29
9.	20:00	2.99	8.85	16.79	10.25
10.	21:00	2.95	8.94	16.96	10.17
11.	22:00	3.08	8.99	16.78	9.99
12.	23:00	2.85	8.76	16.12	9.62
13.	00:00	2.71	8.64	16.04	9.29
14.	01:00	2.52	8.58	15.85	9.12
15.	02:00	2.45	7.51	15.80	8.95
16.	03:00	2.49	7.43	15.91	8.90
17.	04:00	2.55	7.09	15.75	8.91
18.	05:00	2.59	7.54	15.38	8.99
19.	06:00	2.65	7.99	15.01	9.07
20.	07:00	2.72	7.95	14.89	9.12
21.	08:00	2.99	7.90	14.99	9.19
22.	09:00	3.19	8.04	15.38	10.04
23.	10:00	3.46	7.88	15.31	10.12
24.	11:00	3.51	7.95	15.41	10.11
Average Concentration		**2.97**	**8.44**	**16.02**	**9.66**

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ANNEXURE -A
Our Ref.: EHS – LHR –771/ 2016
Test Report No: 857493
November 02, 2016
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Average Obtained Concentrations of Priority Pollutants

Client : **ADB Consultant.**
Sampling Point : **Saddar Bazar**
Date of Intervention : **October 19-20, 2016**

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	Limits As Per NEQS
Nitrogen Oxide (NO)	µg/m^3	24Hours	1.00	8.44	40 (µg/ m^3) For 24 Hours
Nitrogen Dioxide (NO_2)	µg/m^3	24Hours	1.00	16.02	80 (µg/ m^3) For 24 Hours
Sulfur Dioxide (SO_2)	(µg/ m^3)	24 Hours	0.01	9.66	120 (µg/ m^3) For 24 Hrs
Carbon Monoxide (CO)	(mg/m^3)	24 Hours	1.00	2.97	5 (mg/m^3) For 8 Hours
Particulate Matter (PM_{10})	(µg/m^3)	24 Hours	1.00	177.12	150 µg/m^3 For 24 Hrs
Particulate Matter ($PM_{2.5}$)	(µg/m^3)	24 Hours	1.00	32.83	35 µg/m^3 For 24 Hrs
TSPM	(µg/m^3)	24 Hours	1.00	351.38	500 µg/m^3 For 24 Hrs

µg/m^3: micrograms per cubic meter
mg/m^3: miligram per cubic meter
LDL: Lowest Detection Limit
NEQS: National Environmental Quality Standards

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ANNEXURE - B
Our Ref.: EHS – LHR –771/ 2016
Test Report No: 857493
November 02, 2016

Meteorological Data

Client : **ADB Consultant**

Sampling Point : **Soekarno Square**

Date of Intervention : **October 18–19, 2016**

Time	Ambient Temperature	Wind Direction	Wind Speed	Humidity	Pressure (mm of Hg)
	°C		m/s	%	
11:00	34	S	1.2	40	748.9
12:00	34	S	1.8	41	749.5
13:00	34	S	1.5	40	748.6
14:00	35	S	3.1	41	748.8
15:00	34	S	2.2	42	749.0
16:00	32	S	0.9	42	749.2
17:00	32	S	0.3	46	749.6
18:00	30	S	0.2	51	749.2
19:00	28	S	1.8	58	750.7
20:00	26	SW	0.9	66	750.8
21:00	25	SW	0.9	69	751.0
22:00	25	SW	0.9	68	751.0
23:00	24	SW	0.9	73	751.6
00:00	23	SW	0.9	73	751.4
01:00	22	W	0.9	77	751.4
02:00	22	W	1.8	78	751.4
03:00	21	W	0.4	77	751.5
04:00	21	W	1.8	78	751.4
05:00	22	W	2.2	76	751.5
06:00	21	S	0.4	80	751.9
07:00	20	S	1.8	82	752.1
08:00	22	S	1.3	80	752.1
09:00	24	S	1.0	78	752.0
10:00	27	S	0.7	76	751.8

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ANNEXURE - C
Our Ref.: EHS – LHR –771/ 2016
Test Report No: 857493
November 02, 2016
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Noise Level Monitoring

Client	:	**ADB (Consultant)**
Sampling Point	:	**Soekarno Square**
Date of Intervention	:	**October 18–19, 2016**

Sr. #	Time (Hrs)	Noise Level (Reading-1)	Noise Level (Reading-2)	Noise Level (Reading-3)
1.	11:00	78.3	80.1	83.4
2.	12:00	82.0	82.9	83.6
3.	13:00	79.4	80.6	82.0
4.	14:00	78.9	79.7	80.5
5.	15:00	81.6	82.5	83.0
6.	16:00	80.5	80.9	81.9
7.	17:00	78.1	79.6	80.7
8.	18:00	79.4	79.9	80.7
9.	19:00	84.3	84.7	85.0
10.	20:00	80.9	81.6	82.6
11.	21:00	78.4	79.7	80.6
12.	22:00	79.1	79.8	80.1
13.	23:00	72.6	72.7	73.9
14.	00:00	68.1	68.6	68.9
15.	01:00	64.6	65.7	65.9
16.	02:00	61.3	61.4	61.8
17.	03:00	60.2	60.5	60.9
18.	04:00	64.1	64.7	65.1
19.	05:00	63.4	63.9	64.7
20.	06:00	62.7	63.6	64.2
21.	07:00	64.9	65.1	65.7
22.	08:00	68.7	69.5	66.8
23.	09:00	71.2	73.4	68.5
24.	10:00	78.2	68.7	70.3

As per OSHA; Standar12:d Max Permissible Limit is 90 dB
As per NEQS; Standard Max Permissible Limit is 75 dB

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Noise Level Monitoring

Client	:	**ADB (Consultant)**
Sampling Point	:	**KTH (Peshawar)**
Date of Intervention	:	**October 20–21, 2016**

Sr. #	Time (Hrs)	Noise Level (Reading-1)	Noise Level (Reading-2)	Noise Level (Reading-3)
1.	12:00	74.6	74.7	74.9
2.	13:00	73.5	73.9	74.8
3.	14:00	76.6	77.5	78.8
4.	15:00	75.1	75.8	76.3
5.	16:00	73.1	73.7	74.5
6.	17:00	69.1	69.7	69.9
7.	18:00	71.5	71.9	72.7
8.	19:00	66.6	67.4	67.9
9.	20:00	67.5	68.1	68.9
10.	21:00	70.5	71.4	71.9
11.	22:00	71.6	71.9	72.8
12.	23:00	70.0	70.6	71.5
13.	00:00	67.1	67.6	68.4
14.	01:00	66.4	66.9	67.1
15.	02:00	69.3	69.8	70.2
16.	03:00	68.1	68.9	69.2
17.	04:00	68.4	68.9	69.3
18.	05:00	65.6	66.6	66.8
19.	06:00	67.4	67.9	68.6
20.	07:00	69.3	69.8	70.5
21.	08:00	68.6	69.3	69.8
22.	09:00	69.9	70.6	70.9
23.	10:00	72.8	72.9	73.8
24.	11:00	72.6	72.9	73.7

As per OSHA; Standar12:d Max Permissible Limit is 90 dB
As per NEQS; Standard Max Permissible Limit is 75 dB

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ANNEXURE K

PHOTOGRAPHS OF AMBIENT AIR QUALITY AND NOISE MONITORING

Photograph 11-1: SGS technician conducting ambient noise monitoring

Photograph 11-2: Ambient air quality parameters being shown on handheld meter

Photograph 11-3: SGS mobile van containing all equipment for ambient monitoring

Photograph 11-4: SGS mobile van conducting ambient monitoring in Peshawar

Photograph 11-5: SGS mobile van conducting ambient monitoring in Peshawar

Photograph 11-6: SGS mobile van conducting ambient monitoring in Peshawar

Photograph 11-7: SGS mobile van conducting ambient monitoring in Peshawar

Photograph 11-8: SGS technician conducting ambient air quality monitoring

Photograph 11-9: SGS mobile van conducting ambient monitoring in Peshawar

ANNEXURE L

No Objection Certificate (NOC) issued from Directorate of Archaeology

DIRECTORATE OF ARCHAEOLOGY AND MUSEUMS
GOVT. OF KHYBER PAKHTUNKHWA, PESHAWAR

091-9223547

No. A-68/1520 Archymus
Dated: 27-9-16

C/O Peshawar Museum Peshawar

Ph. # 091-9211194, 9211488
Fax # 091-9210690

To

The Incharge
Rapid Bus Transit (RBT) Project
Peshawar.

Subject: **RAPID BUS TRANSIT (RBT) PROJECT PESHAWAR.**

I am directed to state that this Directorate has no objection on the road/route falling in the subject project. However, during excavations of tunnels, a team of experts/archaeologist will supervise the work accordingly.

Assistant Director
27/09.

ANNEXURE M

Occupational Health and Safety Plan

Occupational Health and Safety covers all personnel working under the project and will be in line with the World Bank EHS guidelines on health and safety.

The Occupational Health and Safety program will aim to ensure that the workplace is safe and healthy by: addressing the hazards and risks at the workplace; outlining the procedures and responsibilities for preventing, eliminating and minimizing the effects of those hazards and risks; identifying the emergency management plans for the workplace or workplaces; and, specifying how consultation, training and information are to be provided to employees at various workplaces.

Some of the risks/hazards associated with workplaces are due to working close to or at sites associated with the various project construction activities. Other risks associated with the project construction phase include risk of increase of vector borne and other different diseases.

The following sections will be implemented during the construction phase to address and ensure workers' health and safety.

a. Screening and regular unannounced checking of workers.

As per the procedure for hiring workers, all contractors and labor agencies are required to make all prospective workers undergo medical tests to screen for diseases and sicknesses, prior to selection and employment of any worker. The contractor is also responsible for ensuring that no worker who has a criminal record is employed at the project site. It will be ensured that all workers undergo medical tests to screen diseases at source and at sites in consultation with the designated Health Officer.

In addition to this, the Project Management will also undertake sudden, unannounced checks on workers to look for diseases such as HIV, STDs, and hepatitis. If such cases are detected, the contractor will be required to immediately release the worker from the site (as this indicates that proper screening was not conducted).

b. Minimizing hazards and risks at the workplace.

To ensure safety at all work sites, the following will be carried out:

i. Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.

ii. Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.

iii. Providing a safe storage site/area for large equipment such as power tools and chains, to

prevent misuse and loss.

iv. Proper Housekeeping: Ensuring that materials are all stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapse. Brick stacks will not be more than 7 feet in height and for concrete blocks they will not be more than 6 feet high.

v. Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.

vi. Where scaffolds are required, ensuring that each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it. The platform/scaffold plank shall be at least 15 inches wide and 1.5 inches thick. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope. Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design. Where scaffolds are not provided, safety belts/safety nets shall be provided;

vii. Ensure that all ramps or walkways are at least 6 feet wide, having slip resistance threads and not inclined more than a slope of 1 vertical and 3 horizontal.

viii. Stacking away all excavated earth at least 2 feet from the pit to avoid material such as loose rocks from falling back into the excavated area and injuring those working inside excavated sites.

ix. Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.

x. Only a trained electrician to construct, install and repair all electrical equipment to prevent risks of electrical shocks and electrocution.

xi. Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

c. Provision of Personal Protective Equipment

Risks to the health and safety of workers can be prevented by provision of Personal Protective Equipment (PPEs) to all workers. This will be included in the construction cost for each Contractor. Depending on the nature of work and the risks involved, contractors must provide without any cost to the workers, the following protective equipment:

i. Helmet shall be provided to all workers, or visitors visiting the site, for protection of the

head against impact or penetration of falling or flying objects.

ii. Safety belt shall be provided to workers working at heights (more than 20 ft) such as roofing, painting, and plastering.

iii. Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.

iv. Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.

v. Eye and face protection equipment shall be provided to all welders to protect against sparks.

vi. Respiratory protection devices shall be provided to all workers during occurrence of fumes, dusts, or toxic gas/vapor.

vii. Safety nets shall be provided when workplaces are more than 25 feet (7.5 m) above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors or safety belts is impractical.

The specific PPE requirements for each type of work are summarized below.

Table M.1 PPE Requirement List

Type of Work	PPE
Elevated work	Safety helmet, safety belt (height greater than 20 ft), footwear for elevated work.
Handling work safety	Helmet, leather safety shoes, work gloves.
Welding and cutting work	Eye protectors, shield and helmet, protective gloves.
Grinding work	Dust respirator, earplugs, eye protectors.
Work involving handling of chemical substances	Dust respirator, gas mask, chemical-proof gloves. Chemical proof clothing, air-lined mask, eye protectors.
Wood working	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Blasting	Hard hat, eye and hearing protection.
Concrete and masonry work	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Excavation, heavy equipment, motor graders,	Hard hat, safety boots, gloves, hearing protection.

and bulldozer operation	
Quarries	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.

d. Procedures to Deal with Emergencies such as Accidents, Sudden Illness and Death of Workers

First aid kits will be made available at all times throughout the entire construction period by the respective contractors. This is very important, because most work sites will be at some distance from the nearest hospital. In addition to the first aid kits, the following measures should be in place:

i. Provision of dispensaries by the individual EPC contractor.

ii. A vehicle shall be on standby from the Project Office so that emergency transportation can be arranged to take severely injured/sick workers to the nearest hospital for immediate medical attention.

iii. A designated Health Officer/worker for the Project will be identified as a focal person to attend to all health and safety related issues. This employee's contact number will be posted at all work sites for speedy delivery of emergency services. The focal person shall be well versed with the medical system and facilities available at the hospital.

iv. Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

e. Record Maintenance and Remedial action

The Project Management will maintain a record of all accidents and injuries that occur at the work site. This work will be delegated by the contractor to the site supervisor and regularly reviewed every quarter by project management. Reports prepared by the contractor shall include information on the place, date and time of the incident, name of persons involved, cause of incident, witnesses present and their statements. Based on such reports, the management can jointly identify any unsafe conditions, acts or procedures and recommend for the contractor to undertake certain mitigative actions to change any unsafe or harmful conditions.

f. Compensation for Injuries and Death

Any casualty or injury resulting from occupational activities should be compensated as per the local labor laws of Pakistan. Where compensation is sought by the injured party, proper procedures for documentation of the case will be followed, including a detailed report on the

accident, written reports from witnesses, report of the examining doctor and his/her recommendation for treatment. Each individual contractor will be responsible for ensuring compensation for the respective workers.

g. Awareness Programs

The Project management will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:

i. Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.

ii. Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person who in turn will arrange the necessary emergency transportation or treatment.

h. Nomination of a Health and Safety Focal Person

Within each site (especially if different sites are being implemented by different contractors), a Health and Safety Focal Person will be appointed. The Terms of Reference for the focal person will mainly be as follows:

i. Function as the focal person/representative for all health and safety matters at the workplace;

ii. Responsible for maintaining records of all accidents and all health and safety issues at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;

iii. Be the link between the contractor and all workers and submit grievances of the workers to the contractor and instructions/directives on proper health care and safety from the contractors back to the workers;

iv. Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;

v. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.

ANNEXURE N

Emergency Response Plan

N.1 PURPOSE

The purpose of this Emergency Response Procedure is to provide measures and guidance for the establishment and implementation of emergency preparedness plans for the Bus Rapid Transit Project. The aim of the Emergency Response Procedure is to:

(i) Ensure all personnel and visitors to the office/job sites are given the maximum protection from unforeseen events.

(ii) Ensure all personnel are aware of the importance of this procedure to protection of life and property.

N.2 EMERGENCY PREPARATION AND RESPONSE MEASURE SCOPE

The emergency management program is applied to all Project elements and intended for use throughout the Project life cycle. The following are some emergencies that may require coordinated response.

(i) Construction Accident

(ii) Road & Traffic Accident

(iii) Hazardous material spills

(iv) Structure collapse or failure

(v) Trauma or serious illness

(vi) Sabotage

(vii) Fire

(viii) Environmental Pollution

(ix) Loss of person

(x) Community Accident

N.3 RESPONSIBILITIES

The detailed roles and responsibilities of certain key members of the Emergency Response team available to assist in emergency are provided in Table M.1 below.

Table N.1 Emergency Response Team

Action Group	Responsibility
Emergency Coordinator	▪ Overall control of personnel and resources. ▪ The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. ▪ Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with news media regarding any disaster or emergency. Also assure proper coordination of news release with appropriate corporate staff or other designated people.
Site Safety Supervision (Emergency Commander)	▪ Overall responsibility for activating emergency plan and for terminating emergency actions. ▪ Be alternative of emergency response chairpersons. ▪ Disseminates warnings and information as required to ensure all people in the immediate area have been warned and evacuated either by alarms or by word of mouth. ▪ Supervise the actions of the Emergency Response Team to ensure all persons are safe from the danger. ▪ Notify outside authorities if assistance is required. ▪ Carries the responsibility for coordinating actions including other organizations in accordance with the needs of the situation. ▪ Ensure maximum co-operation and assistance is provided to any outside groups called to respond to an emergency. ▪ Establish and appoint all emergency organization structure and team. ▪ Assures adequate delegation of responsibilities for all key positions of assistants on the Project to assist with any foreseeable emergency. ▪ Ensure resources available to purchase needed emergency response equipment and supplies. ▪ Assures that all persons on the Emergency Response Team aware and fully understand their individual responsibilities for implementing and supporting the emergency plan. ▪ Establish the emergency drill schedule of all identified emergency scenarios, track the status and evaluate the emergency. ▪ The Emergency Commander shall ensure that senior management personnel have been reported of the emergency as soon as practical after the event.
Security Team	▪ Ensure that the exit route is regularly tested and maintained in good working order. ▪ Maintain station at the security gate or most suitable location to secure the area during any emergency such that only authorized personnel and equipment may enter, prevent access to the site of unauthorized personnel. ▪ Assist with strong/activation of services during an emergency. ▪ Ensure vehicles and obstructions are moved to give incoming emergency vehicles access to the scene, if ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct any incoming emergency service to the site of emergency.

Rescue & Medical Team	▪ Protect the injured from further danger and weather. ▪ Provide treatment to the victim(s) to the best of their ability by first aid and then transfer to hospital. ▪ Remain familiar with the rescue activities and rescue apparatus. ▪ Assist outside medical services personnel when they arrive
General Administration Team	Response to support any requested general facilities for assisting Emergency Response Team in their work.
Government Relation Team	▪ Coordinate with local government on a matter of concerned in the emergency response plan to liaise with local officers in their affair for support Emergency Response Team. ▪ Coordinate emergency plan with the government authorities, local community.
Environment Team	In case of emergency related to the environmental pollution such as the chemical spill, oil spill into the ambient, the environment team will support the technical advice to control and mitigate the pollution until return to the normal situation.
Department Heads	▪ Call up of personnel into the safe location for protective life and property. ▪ Take immediate and appropriate action while Emergency Response Team is being mobilized. ▪ Keep in touch with the Emergency Commander ▪ Control and supervise operators and contractors on the implementation of this procedure, with consultation with Safety Team as necessary. ▪ Provide and maintain emergency equipment of their responsible areas.
Other Staff and Employees	▪ All other staff and employees will remain at their workstations or assembly point unless directed otherwise from Emergency Response Team. ▪ Each supervisor will ensure that all members of his work group are accounted for and keep in touch with each of their Department Head.

N.4 PROCEDURE

Emergency situation and injuries to person can occur at any time or place either on Project site or elsewhere. The most two common types of emergencies on site are fire and serious accident.

Figure N.1 Emergency Procedure for Fire

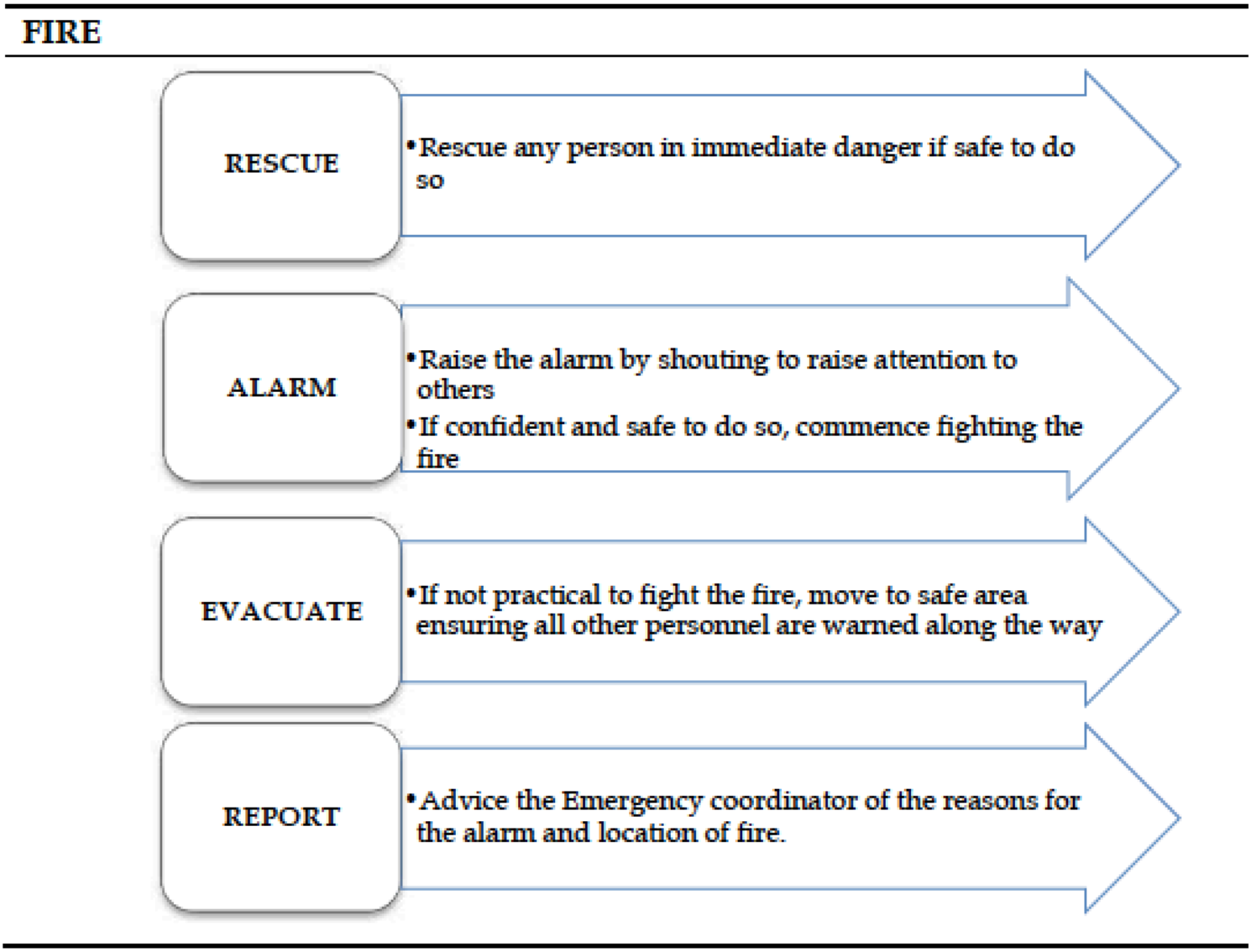


Figure N.2 Emergency Procedure for Serious Accident

ACCIDENT

In the event of injuries of persons, the first person on the scene should take the following action:

If a hazard exists consider your own safety then if possible remove the hazard or the injured person.

Assess the patient by checking for Airway, Breathing, Pulse and obvious

Report directly to First Aid or Security Centers, when raising the alarm you must clearly give the following in formation;

- Your name and the detail of accident
- The location of the injured person(s)
- The number of persons injured
- The extent of the injuries, if known
- What known hazards are in the area

Make the injured person as comfortable as possible

Treat the obvious injuries

Reassure the injured person

N.5 COMMUNICATION WITH AUTHORITIES / PRESS AT SITE

In the event of an accident or incident, only senior staff is permitted to give factual information to the authorities for resource of liability exposure. The press must be avoiding politely, at all costs, with the terse comment that "the matter is under investigation and relevant information when available will be provided by our Head Office" Do not ever give your opinion or story.

First Aid Persons

Upon advice of medical emergency, make immediate assessment to response required and if necessary, advise security to summon ambulance or medical assistance, the qualified first aid attendant should also,

- Provide treatment to the victim(s) to the best of his/her ability.
- Ensure the safety of victims by ceasing any work activity in the area.
- Protect the injured from further danger and weather.
- Assist medical services personnel when they arrive.

General Administration Team

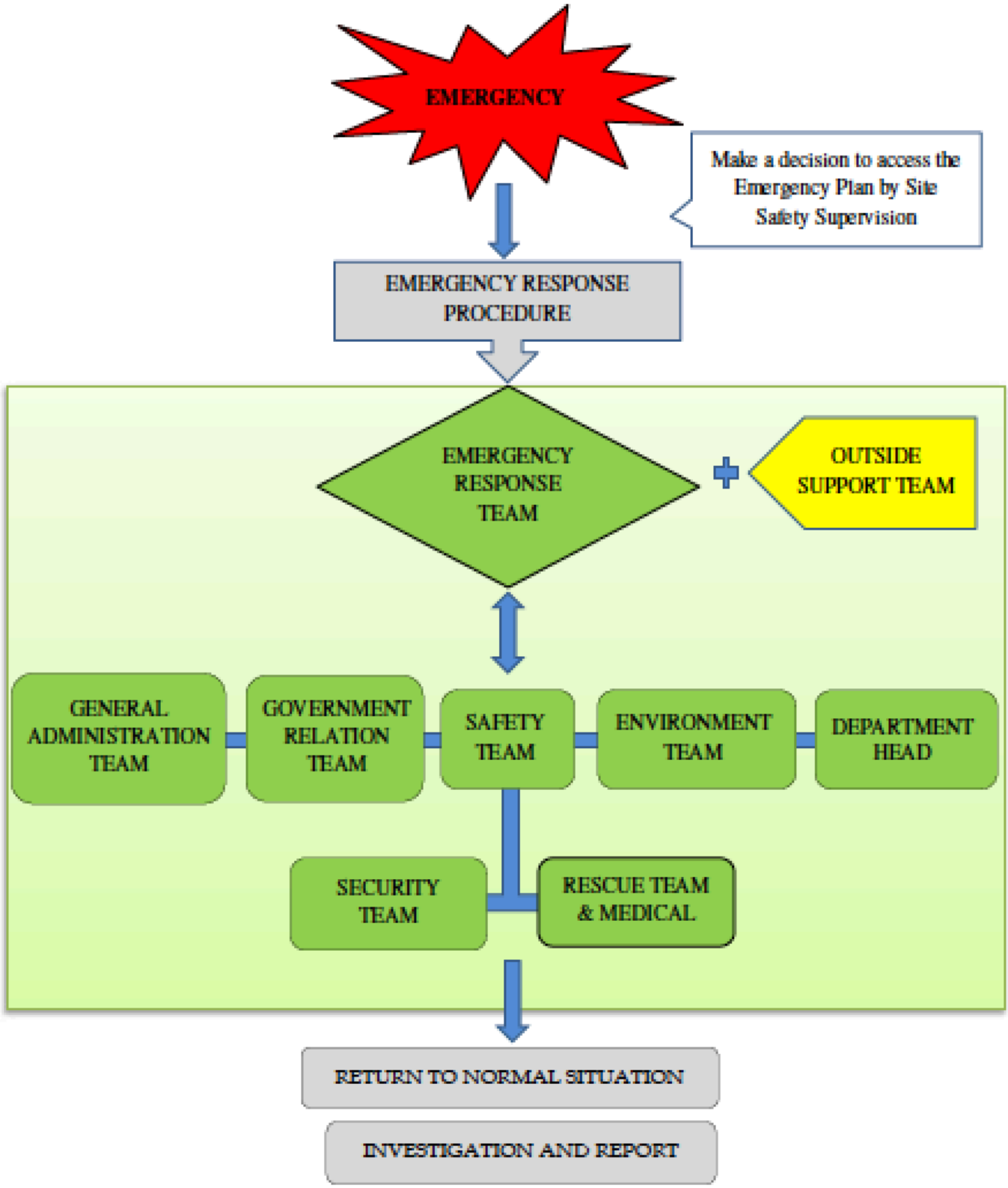
Upon advice of medical emergency, maintain contact with first aid personnel and summon ambulance if required.

Security Team

- If ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct vehicle closest to the scene.
- Prevent access to the site of unauthorized personnel (press, etc.).

Emergency Coordinator

- The Emergency Coordinator shall assist emergency personnel at the scene as required through allocation of company resources.
- The Emergency Coordinator shall ensure next-of-kin are properly notified as soon as possible and give whatever company support and assistance is necessary to assist them bundle the situation
- The Emergency Coordinator shall ensure that senior management personnel are advised of the emergency as soon as practical after the event.



Note: Name of contact person and call number from Owner/Contractor to be determined.

N.5 INCIDENT AND ACCIDENT REPORT

Section A: Identification Data			
Report No:	Date of Reported:	Reporter:	Sign:
Job Title:		Company Name:	

Section B: Violence Rate

Accident Violence: ☐ 01-Death ☐ 02-Serious Injury ☐ 03-Lost Time Injury ☐ 04-First Aid ☐ 05- Not Injury ☐ 06-Near Miss

Property Damage Cost: ☐ 1-2,000 USD ☐ 2,001-10,000 USD ☐ 10,001-50,000 ☐ > 50,001

Section C: Environmental Impact

Affected area	☐ Construction area	☐ Public area	
Receptor	☐ None	☐ Workers	☐ Community
Type of pollution	☐ Physical	☐ Chemical	☐ Biological
Toxicity	☐ Non-toxic	☐ Low - toxic	☐ High - toxic
Return to Normal	☐ 1 day	☐ 1 day to 1 week	☐ ≥ 1 week
Cumulative impact	☐ Non-cumulative	☐ Cumulative	

Section D: Injured/Illness Employee

1.Name:	Sex:	Date of Birth:			Age:	Regular Job Title:	Experience:	
	☐ Male ☐ Female	Month	Day	Year			In this job title Years Weeks	In this Project Years Weeks
Site:	Company:	Reference:			Phone No:		Social Security Number	

Part of Body Injured or Affected:

☐ Head	☐ Hands	☐ Face	☐ Nose
☐ Eyes	☐ Legs	☐ Teeth	☐ Neck
☐ Trunk	☐ Toes	☐ Elbow	☐ Shoulder
☐ Back	☐ Ankle	☐ Wrist	☐ Foot
☐ Arms	☐ Thump	☐ Fingers	☐ Internal

Remark: .....

Nature of Injury or Illness:

☐ Laceration	☐ Amputation	☐ Puncture	☐ Fracture
☐ Strain & Sprain	☐ Burns	☐ Contusion	☐ Dry Heat Friction
☐ Hernia	☐ Foreign Body	☐ Chemical	☐ Contamination
☐ Skin (Occupationnel)	☐ Rash	☐ Irritation	

Remark: .....

2.Name:	Sex:	Date of Birth:			Age:	Regular Job Title:	Experience:	
	☐ Male ☐ Female	Month	Day	Year			In this job title Years Weeks	In this Project Years Weeks
Site:	Company:	Reference:			Phone No:		Social Security Number	

Part of Body Injured or Affected:

☐ Head	☐ Hands	☐ Face	☐ Nose
☐ Eyes	☐ Legs	☐ Teeth	☐ Neck
☐ Trunk	☐ Toes	☐ Elbow	☐ Shoulder
☐ Back	☐ Ankle	☐ Wrist	☐ Foot
☐ Arms	☐ Thump	☐ Fingers	☐ Internal

Remark: .....

Nature of Injury or Illness:

☐ Laceration	☐ Amputation	☐ Puncture	☐ Fracture
☐ Strain & Sprain	☐ Burns	☐ Contusion	☐ Dry Heat Friction
☐ Hernia	☐ Foreign Body	☐ Contamination	☐ Chemical
☐ Skin (Occupationnel)	☐ Rash	☐ Irritation	

Remark: .....

Section E: Accidents/incident Details

Date Accident/Incident Occurred:	Time Accident/Incident Occurred:	Exact Location of the Accident / Incident:

Details of the actual Job Being done at the time:

Details of Accident / Incident / What actually happened?

Section F: Accident Cause (Basic cause mark X / Contributing cause, if any mark O)

UNSAFE CONDITIONS		UNSAFE ACTS	
1	☐ Inadequately Guarded	1	☐ Operating Without Authority / Training
2	☐ Unguarded	2	☐ Operating at Unsafe Speed
3	☐ Defective Tools, Equipment, or Substance	3	☐ Marking SHE Device Inoperative
4	☐ Unsafe Design or Construction	4	☐ Using Unsafe Equipment or Equipment Unsafely
5	☐ Hazardous Arrangement	5	☐ Unsafe Loading, Placing, Mixing
6	☐ Unsafe Illumination	6	☐ Taking Unsafe Position
7	☐ Unsafe Ventilation	7	☐ Working on Moving or Dangerous Equipment
8	☐ Unsafe Clothing	8	☐ Distraction, Teasing, Horse Play
9	☐ Insufficient Instruction	9	☐ Failure to use Personal Protective Devices
10	☐ Lack of system of work	10	☐ Lack of effective instruction or supervision

Why was the unsafe act committed? _____ Why did the unsafe condition exist? _____

Section G: Guide to Corrective Action (Base on the cause checked above, I am taking the following corrective action)

UNSAFE ACT	UNSAFE CONDITION	If Supervisor can't handle, then recommend to
☐ Stop the Behaviour	☐ Remove	☐ Site Engineer, or
☐ Study the job	☐ Guard	☐ Site Manager, or
☐ Instruct (tell-show-try-check)	☐ Warn	☐ Project Manager, or
☐ Follow Up	☐ Supervisory Training	☐ Safety Committee
☐ Enforce		

Detail below any immediate remedial actions that have been taken:

Detail below any corrective and preventative actions that could be taken to prevent future re-occurrence:	Responsible	Completion Date

Section H: Witness Statement	
Witness Name	**Interviewer Name**

Section I: Reviewed & Recommend by			
Recommendation:			
Reviewed By:	Position:	Signature:	Date:

Remarks : If Accident or Incident happened with lost time injury and affected to the publicity must further report to Safety Department;

: First Aid Cases will not applicable to this form;

: The accident report shall submit to Safety Department within 3 days

: Attached the photograph or sketch the location of accident / incident;

ANNEXURE O

Archaeological 'Chance Find' procedure

Background

The purpose of this document is to address the possibility of archaeological deposits becoming exposed during ground altering activities within the project area and to provide protocols to follow in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.

The KPK Antiquities Act, 2016, protects archaeological sites, whether on Provincial Government owned or private land. They are non-renewable, very susceptible to disturbance and are finite in number. Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents. The objectives of this 'Archaeological Chance Find Procedure' are to promote preservation of archaeological data while minimizing disruption of construction scheduling It is recommended that due to the moderate to high archaeological potential of some areas within the project area, all on site personnel and contractors be informed of the Archaeological Chance Find Procedure and have access to a copy while on site.

Potential Impacts to Archaeological Sites

Developments that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

Relevant Legislation

It ensures the protection, preservation, development and maintenance of antiquities in the province of KPK. The Act defines "antiquities" as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the GoKPK to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, GoKPK, any archaeological discovery made during the course of the project.

Remedies and Penalties

The KPK Antiquities Act, 2016 provides for heritage inspection or investigation orders, temporary protection orders, civil remedies and penalties to limit contraventions. These powers provide:

''A contravention of any provision of this Act or the rules shall, where no punishment has been specifically provided be punishable with rigorous imprisonment for a term which may extend to two years, or with fine up to rupees ten hundred thousand, or with both. ''

Archaeological 'Chance Find' Procedure

If you believe that you may have encountered any archaeological materials, stop work in the area and follow the procedure below:

The following 'chance-find' principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works:

(i) Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.

(ii) Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.

(iii) If the site supervisor determines that the item is of potential significance, an officer from the department of Archaeology (DoA), GoKPK will be invited to inspect the site and work will be stopped until DoA has responded to this invitation.

(iv) Work will not re-commence in this location until agreement has been reached between DoA and PDA as to any required mitigation measures, which may include excavation and recovery of the item.

(v) A precautionary approach will be adopted in the application of these procedures.

Detailed Procedural Steps

- If the Director, department of Archaeology receives any information or otherwise has the knowledge of the discovery or existence of an antiquity of which there is no owner, he shall, after satisfying himself as to the correctness of the information or knowledge, take such steps with the approval of the Government, as he may consider necessary for the custody, preservation and protection of the antiquity.
- Whoever discovers, or finds accidentally, any movable antiquity shall inform forth with the Directorate within seven days of its being discovered or found.
- If, within seven days of his being informed, the Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director or a person authorized by him in writing.
- Where the Director decides to take over an antiquity, he may pay to the person by whom it is handed over to him such cash reward as may be decided in consultation with the Advisory Committee.

- If any person, who discovers or finds any movable antiquity contravenes the provisions of the Act, he shall be punishable with imprisonment for a term which may extend to five (05) years, or with fine not less than fifteen hundred thousand rupees or with both and the Court convicting such person shall direct that the antiquity in respect of which such contravention has taken place shall stand forfeited to Government.
- The Director or any officer authorized by him with police assistance may, after giving reasonable notice, enter into, inspect and examine any premises, place or area which or the sub-soil of which he may have reason to believe to be, or to contain an antiquity and may cause any site, building, object or any antiquity or the remains of any antiquity in such premises, place or area to be photographed, copied or reproduced by any process suitable for the purpose.
- The owner or occupier of the premises, place or area shall afford all reasonable opportunity and assistance to the Director.
- No photograph, copy of reproduction taken or made shall be sold or offered for sale except by or with the consent of the owner of the object of which the photograph, copy or the reproduction has been taken or made.
- Where substantial damage is caused to any property as a result of the inspection, the Director shall pay to the owner thereof reasonable compensation for the damage in consultation with the Advisory Committee.
- If the Director after conducting an inquiry, has reasonable grounds to believe that any land contains any antiquity, he may approach the Government to direct the Revenue Department to acquire such land or any part thereof and the Revenue Department shall thereupon acquire such land or part under the Land Acquisition Act, 1894 (I of 1894), as for a public purpose.

ANNEXURE P

Scope of Work for Structural Assessment of Bala Hisar Fort

Introduction

Background

These terms of reference address the purpose, scope and duration of the Structural Vulnerability Assessment of Bala Hisar Fort for the Peshawar Bus Rapid Transit Project. The assessment of the Bala Hisar Fort will be conducted prior to the construction activity to ensure no damage takes place during the project construction phase.

The Project consists of the development of a bus rapid transit (BRT) corridor with a total length of 30.8 km to be constructed on a phase wise basis in Peshawar city. The first phase will involve construction of 25.8 km of the BRT corridor while 5 km will be constructed in the second phase. The BRT corridor will consist of a total of 31 stations and will run from Chamkani to Hayatabad.

It is proposed for the route to travel along Hospital Road to the existing overpass carrying traffic over Grand Trunk Road, after which the route may utilise the bridge (following widening) or may be routed underground on Hospital Road. As such the route will run adjacent to Bala Hisar Fort and there is a potential for damage to the structural aspects of the fort in the process of construction. A structural vulnerability assessment will be conducted that determines the potential vulnerability to cracking, mortar dislocation, or other forms of incipient failure due to vibrations set up by construction equipment during the work on the PBRT.

Objective

The objective is to determine if damage to the fort is possible due to vibrations induced during construction of the PBRT, to assess the types of damage that might occur, and to make a determination of measures necessary to mitigate damage, including specification of a limit or standard for vibration intensity from construction equipment expressed as peak particle velocity (PPV) measured at a standard distance from the vibration source.

Scope

A two-phased assessment will be conducted consisting of a) a level 1 qualitative assessment to determine if the potential for damage to the structure is considered possible and b) a level 2 quantitative assessment to confirm the initial assessment of damage, provide a description of the types of damage that could occur, and recommend mitigation actions.

Detailed Terms of Reference

Level 1 Qualitative Assessment

Buildings constituting the fort including ramparts, parapets and walls, will be assessed on the basis of the characteristics of their structural layout and material compositions and strengths that can affect vulnerability. The qualitative assessment will be performed in order to screen the structure for detailed evaluation as necessary.

The qualitative assessment will be based on the experience of the expert and on elaboration of a restricted set of qualitative data, including data gathered in-situ by means of an onsite inspection,

and data obtained through an archival search regarding the building history and its architectural and technical features.

An inspection will be undertaken to understand the structural and material features of the building, its relationship with the surroundings, state of damage and decay, and alterations made in the structure, including repair and restoration works.

Basic survey data will be recorded in order to carry out the qualitative seismic vulnerability assessment: geometric characteristics of the structure, plan configuration, storeys, lifts and junctures between segments, dimensions and presence of mezzanines.

A dimensional survey of sufficient accuracy will be conducted to understand the spatial relationship between the proposed construction activity and buildings with a potential to suffer damage.

The assessor will evaluate the potential for vibrations from construction machinery operating near to the vulnerable buildings. The types of machinery and construction activities will be characterized and evaluated for their potential to generate destructive vibrations.

Level 2 Quantitative Assessment

The quantitative assessment will be conducted based on a reasonable possibility of damage, as determined by the level 1 assessment. The quantitative assessment will utilize accepted analytical methods to categorize the potential for damage, by identifying load bearing walls and overhead structural elements, and horizontal structural systems. To the extent necessary, the assessment will evaluate masonry properties for their potential response to vibrations and resonance effects. Only non-destructive testing is allowed.

The quantitative assessment should consider:

- Load bearing masonry walls with a variety of horizontal structures, which are not vaulted.
- Load bearing masonry with vaulted structures, where the vaulted structures shall be assessed in a way that allows calculating the resultant maximum settlement loads and their effects on hinges or levels of sliding within the load bearing wall system subjected to gravity and vertical loadings.
- Gigantic load bearing masonry walls and defensive constructions that lack a masonry box layout, and which should be analyzed using global indicators such as total shear base capacity and walls or column slenderness factors
- Timber clad frames supported on masonry walls in which the lower part of the structure is made of masonry and the effectiveness of the frame action of the timber portion with respect to the masonry is critical.

The assessment will describe the potential for damage, and the types of damage that are possible, based on a variety or scenarios.

Mitigation and Standards

The assessment will lead to recommendations for limiting the potential for damage, to a vibration standard applicable to the Project, particularly in the vicinity of the Fort, and to means for monitoring vibrations (equipment, protocols and frequency) during the course of construction. Recommendations will be based on assessed needs, and will be practical and implementable, so as

not to hinder the progress of construction. No mitigation measures need be recommended if the conclusion is such that vibration damage is unlikely to occur, given an adequate factor of safety in respect to same.

Scheduling and Duration of Involvement

The level 1 assessment should be completed in one weeks' time, after which the level 2 assessment, if considered necessary, will be scheduled.

Reporting

A report of the level 1 assessment will be provided at the end of the first week. A further report will be required in the event a level 2 assessment is conducted.

The level 2 report will follow a common format emphasizing issues particularly relevant to the assessment. It should contain clear recommendations and an overall conclusion based on a logical conclusion of the analysis. Brief annexure to the report of evidences (notes, observations, calculations and other materials) is useful to the extent the practice does not lead to a bulky and unfocused result. An executive summary will be provided.

ANNEXURE Q

Methodology for Air Quality and Noise Monitoring

1. Introduction

ADB consultants services are available to businesses new or existing, large or small, which require the support of time and resource to improve, develop or grow their business and bottom line hired the services of SGS Pakistan (Pvt.) Ltd. to conduct an environmental monitoring of the said site.

1.1 Study Objective

The objective of the study is to:

- To assess the baseline conditions of the site before start of the project.
- Monitor air, and noise level at periodic intervals in project area.

1.2 Scope of Services

Scope of services covered following main components:

- Ambient Air Quality Monitoring
- Weather Conditions
- Noise Level Monitoring

1.2.1 Ambient Air Quality Monitoring

In accordance to NEQS (National Environmental Quality Standards) the following priority pollutants were monitored in the ambient air.

- Carbon Monoxide (CO)
- Oxides of Nitrogen (NO, NO_2)
- Sulphur Dioxide (SO_2)
- Particulate Matter (PM_{10})
- Particulate Matter ($PM_{2.5}$)
- Suspended Particulate Matter (SPM)

In addition to above mentioned parameters, the metrological conditions were also monitored in order to interpret ambient air quality. For the purpose following parameters would be monitored:

- Ambient Temperature
- Relative Humidity
- Barometric Pressure
- Wind Direction
- Wind Velocity

2. Methodology

Following is the brief description of methodology adopted for this environmental assessment:

2.1 Ambient Air Quality Monitoring

Ambient air quality of the selected locations was monitored for the estimation of carbon monoxide, nitrogen dioxide, sulphur dioxide and particulate matter concentrations.

2.1.1 Carbon Monoxide

Carbon monoxide monitoring was carried out using gas filter Correlation CO . Measurement range of the analyzer is 0-100 ppm. Continuous data was recorded for duration of 24 hrs and hourly average is reported. US EPA Designated Method RFCA-0981-054 was used to measure CO concentration.

2.1.2 Nitrogen Dioxide

Nitrogen Dioxide at the project site was measured using chemiluminescent analyzer. Measurement range of the analyzer is 0-50 ppb and 0-1000 ppm. Reference method used for detection of NO2 is USEPA Method RFNA-1289-074.

2.1.3 Sulphur Dioxide

Concentration of Sulphur dioxide in ambient air of the project site is measured by using Pulsed Fluorescent Analyzer. Measurement range of the analyzer is 0-50 ppb and 0-1000 ppm. USEPA Designated Method EQSA-0486-060 was used to measure SO2 concentrations.

2.1.4 Particulate Matter (SPM)

Particulate matter concentration in terms of SPM was monitored in the ambient air with the help of high Volume Sampler. Reference method used for determination in ambient air is 40 CFR Part 50, Appendix J (USEPA).

Air sample for detection of SPM concentration was drawn on fiber glass filter paper and then the collected sample was preserved in protective holder which was transported to SGS lab for further analysis Calculation under standard environmental conditions. The methodology for all the ambient air parameters are provided in the following Table

2.1.5 Particulate Matter (PM_{10})

Particulate matter concentration in terms of PM_{10} was monitored in the ambient air with the help of AEROCET 531. PM_{10} sampling was conducted for 24 hours at mutually agreed sampling locations. This method is applicable to measure ambient Particulate Matter PM_{10} concentration from 0 to 1000 ug/m^3.

2.1.6 Particulate Matter ($PM_{2.5}$)

Particulate matter concentration in terms of $PM_{2.5}$ was monitored in the ambient air with the help of AEROCET 531. $PM_{2.5}$ sampling was conducted for 24 hours at mutually agreed sampling locations. This method is applicable to measure ambient Particulate Matter $PM_{2.5}$ concentration from 0 to 1000 ug/m^3.

Table 1: Methodology of Ambient Air Quality Monitoring

Air Pollutant	Monitoring Technique	Method	Measurement Range	Lowest Detection Limit
Carbon monoxide (CO)	Automatic Potable Analyzer	40 CFR 50, App. C (US-EPA)	1 – 100 ppm	1 ppm
Sulfur Dioxide (SO_2)	Calorimetric Improved West & Gaeke (Sod. Tetrachloro Mercurate) Method	40 CFR 50, App. A (US-EPA)	0.01– 0.4 ppm 25 µg/m3 to 1000 µg/m3	0.01 ppm
Nitrogen Dioxide (NO_2)	Chemiluminescent Analyzer	US EPA Designated Method RFNA-1289-074	0 – 1000 ppb 0 – 100 ppm	0.001 ppm
Particulate Matter (PM_{10})	Laser Light	(USEPA)/ISO 21501-4:2007	1-1000µg/m^3	1 µg/m^3
Particulate Matter ($PM_{2.5}$)	Laser Light	(USEPA)/ISO 21501-4:2007	1-1000µg/m^3	1 µg/m^3
Suspended Particulate Matter (SPM)	High volume Sampler	(USEPA) 40 CFR 50 APPB	2-750 µg/m^3	2 µg/m^3

2.2 Meteorological Conditions

In addition to the mutually agreed parameters for ambient air quality, weather conditions were also monitored continuously for 24 hours with the help of mobile

weather station. Selection of sampling points was made considering the wind direction at the mutually agreed sampling site.

Pollutants	Method of measurement
SO_2	-Ultraviolet Fluorescence Method
NO	Gas Phase Chemiluminescence
NO_2	Gas Phase Chemiluminescence
O_3	Non Dispersive UV Absorption Method
Suspended Particulate Matter (SPM)	High Volume Sampling (average flow rate not less than 1.1 m3/minute)
Respirable Particulate Matter (PM_{10})	-β Ray Absorption Method
Respirable Particulate Matter ($PM_{2.5}$)	-β Ray Absorption Method
Carbon Monoxide (CO)	Non Dispersive Infra Red (NDIR) Method

2.3 Noise level monitoring

The Rion NL series sound level meter for noise measurement was utilized with a range from 35 dB to 135 dB with minimum detection limit of 0.1 dB. The details of the noise monitoring device used is provided below.

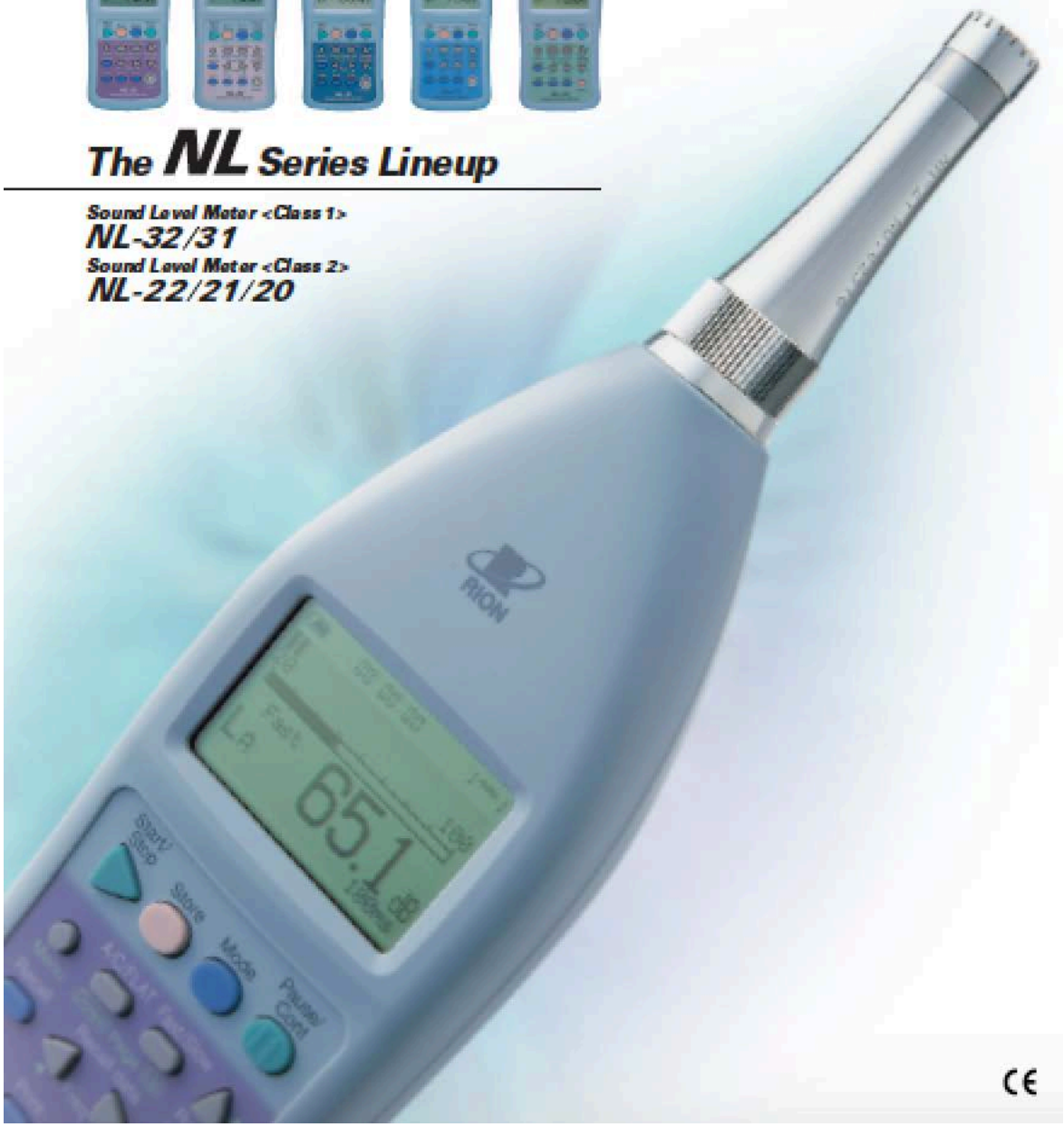
SOUND LEVEL METERS

RION

Clean and simple design, intuitive operation, wide range of applications

The NL Series Lineup

Sound Level Meter <Class 1>
NL-32/31
Sound Level Meter <Class 2>
NL-22/21/20



CE

Sound level meter characteristics and sound level measurement

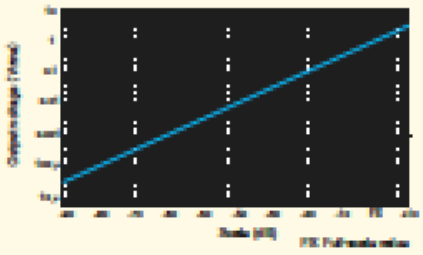
Output connector

AC Output

Supplies an AC signal after frequency weighting. When a filter card (NX-21SA, NX-21VA) is inserted, the AC signal is output after filter processing.

The relationship between display reading and output voltage is as shown below.

Output voltage: 1 Vrms ±50 mVrms (scale upper limit)
Output impedance: approx. 600 Ω
Load impedance: 10 kΩ or more
Suitable cable: BNC - RCA cable CC-24 (option)



Output signal in calibration mode (scale upper limit −6 dB, 1000 Hz sine wave) is 0.5 Vrms.

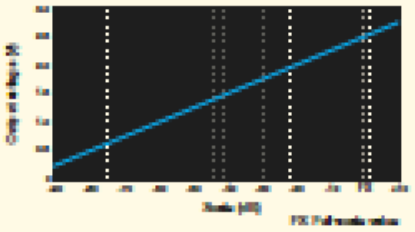
DC Output

Supplies a level-converted DC signal after frequency weighting, rms detection, and logarithmic compression.

The selected frequency weighting and time weighting characteristics are active.

The relationship between display reading and output voltage is as shown below.

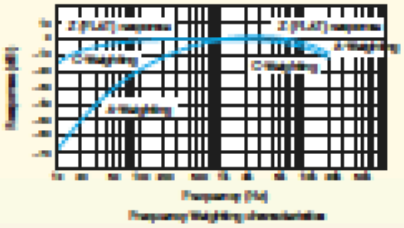
Output voltage: 2.5 V ±50 mV (scale upper limit), 0.25 V/10 dB
Output impedance: approx. 50 Ω
Load impedance: 10 kΩ or more
Suitable cable: BNC - RCA cable CC-24 (option)



Output signal in calibration mode (scale upper limit −6 dB) is 2.25 V.

Frequency weighting characteristics

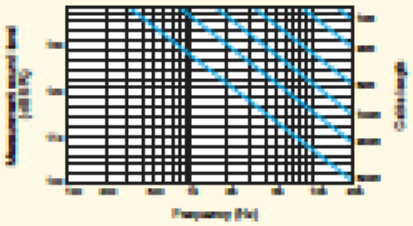
The major types of frequency weighting used by sound level meters are A, C, and Flat. The respective weighting curves are shown below. The subjective impression of how loud a sound is depends not only on the sound level. Low-frequency sounds and high-frequency sounds are perceived differently, even if they have the same level. Using the A-weighting curve when measuring sound produces results that are fairly similar to the subjective impression gained by the human hearing. Therefore A-weighting is normally used, both in Japan and internationally, for noise evaluation and similar tasks. Flat characteristics are suitable for example when the actual sound level is to be measured or when the output of the sound level meter will be used for frequency analysis. C-weighting produces results that are close to flat response characteristics, but the influence of sounds below 31.5 Hz and above 8 kHz is reduced. This setting is useful for sound pressure measurements where unwanted low-frequency components are to be excluded or where a high degree of high-frequency components exist.



Frequency Weighting characteristics

Influence of microphone extension cable

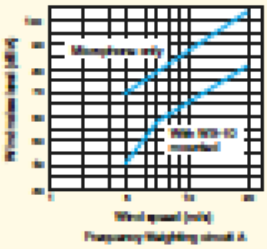
When the output of the microphone/preamplifier is routed through an extension cable, certain limitations regarding measurable sound level and frequency range will apply. This is due to the influence of the cable capacitance. The longer the cable, the lower the measurable sound level and the lower the frequency limit. The diagram below shows the relationship between cable length, measurable sound level, and frequency. If for example a sound level of 123 dB is to be measured up to 8 kHz, an extension cable length of up to about 100 meters is possible.



Frequency [Hz]

Effect of windscreen

When making outdoor measurements in windy weather or when measuring air conditioning equipment or similar, wind noise at the microphone can cause measurement errors. To prevent this, the supplied windscreen WS-10 can be attached to the microphone. The windscreen characteristics are shown below. The windscreen will reduce wind noise by about 25 dB during noise level measurement (with A-weighting), and by about 15 dB during sound level measurement.



Frequency Weighting circuit A

WS-10

All-weather windscreen WS-03

This sturdy, durable product is designed for prolonged outdoor use. It not only reduces wind noise but also provides protection against rain and dew. The product consists of a 20-cm diameter open cell type polyurethane foam structure for reducing wind noise and a ball-shaped nylon non-woven cloth for water proofing.

Specifications:
Wind noise reduction: approx. 20 dB (A-weighting), approx. 19 dB (C-weighting)
Effect on frequency response: 20 Hz to 8 kHz ±3 dB, −1.5 dB (with water droplets)
Compatible microphones: 1/2 inch, 1 inch diameter
Shape and weight: 200 mm dia. ball shape, approx. 2.5 kg
Material:
Open cell type polyurethane foam and nylon non-woven cloth

WS-03 (option)

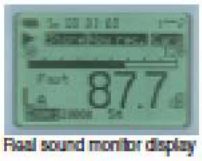
Wide 100 dB dynamic range eliminates need for level range switching

NL series is compliant with the current Measurement Law, JIS and IEC regulations. An attractive lineup of optional program cards is provided. These CompactFlash (CF) cards contain programs for adding useful functions such as sound monitoring, 1/1 and 1/3 octave real-time analysis, and FFT analysis. (Depending on the sound level meter model, some restrictions may exist as to which program cards can be used.)
Automated measurements for environmental evaluation and noise control purposes are made easy by various convenient features of these sound level meters, such as power-saving design, and optional real sound monitoring capability. Results of automatic measurement can be stored directly on CF card, making it easy to transfer such data to a computer for further processing.

Powerful functions for diverse measurements. Easy-to-read display and stable long-term operation. A new generation of sound level meters.

Real sound monitor function
NL-32/22

The real sound monitor card NX-22J integrates a sound monitor function in the sound level meter.
This allows event recording (above a certain threshold) or interval recording (at preset intervals) during sound level measurement.
By using the NL-22PB1 management software, you can perform various data processing functions while listening to the actual recorded sound.



Real sound monitor display

Power backup capability

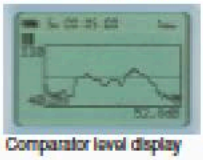
When the unit is powered from an external source (AC adapter), the inserted batteries will automatically take over if the external power is interrupted for any reason.

Compatible with CompactFlash cards
NL-32/22/31/21

Data can be recorded directly on high-capacity memory cards.
64 MB CF card can be supplied as option.
This will hold 99,999 sets of processed values such as L_{eq}, or 5.2 days worth of continuous data with sound level measurement performed every 100 ms.
By selecting a suitable card, you can easily match the storage capacity to the intended measurement.

Comparator function
NL-32/22/31/21

An open collector output linked to the comparator function can be used for various purposes.
The comparator level can be set from 30 to 130 dB in 1-dB steps. (Maximum applied voltage: 24 V DC, maximum current: 60 mA DC)



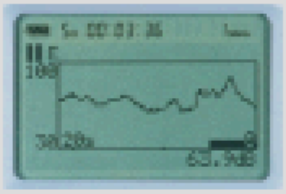
Comparator level display

Timer function
NL-32/22/31/21

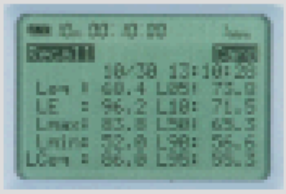
The unit can be set to start and stop measurement at specified times.
In the standby condition, the unit consumes only a small amount of power. In combination with the interval function, this enables problem-free long-term measurement.

- Simultaneous measurement of equivalent continuous sound level, percentile sound level, and maximum level
- Graphic indication of sound level fluctuations, back-erase function for excluding recent data
- Easy-to-read backlit LCD display
- Filter cards provide expanded settings for various filter functions
  NL-32/22/31/21
- USB interface
  NL-32/22 (with optional connection cable)

LCD screen examples



Level/time measurement screen



Simultaneous processing result display screen

Sound level display screen (with backlight)

Main unit functions (data recording/output)

Card slot

NL-32/22/31/21

A CompactFlash card slot is integrated in the unit. Inserting a card here enables auto store operation. Optional program cards can also be inserted, to load various expansion functions.

Card slot

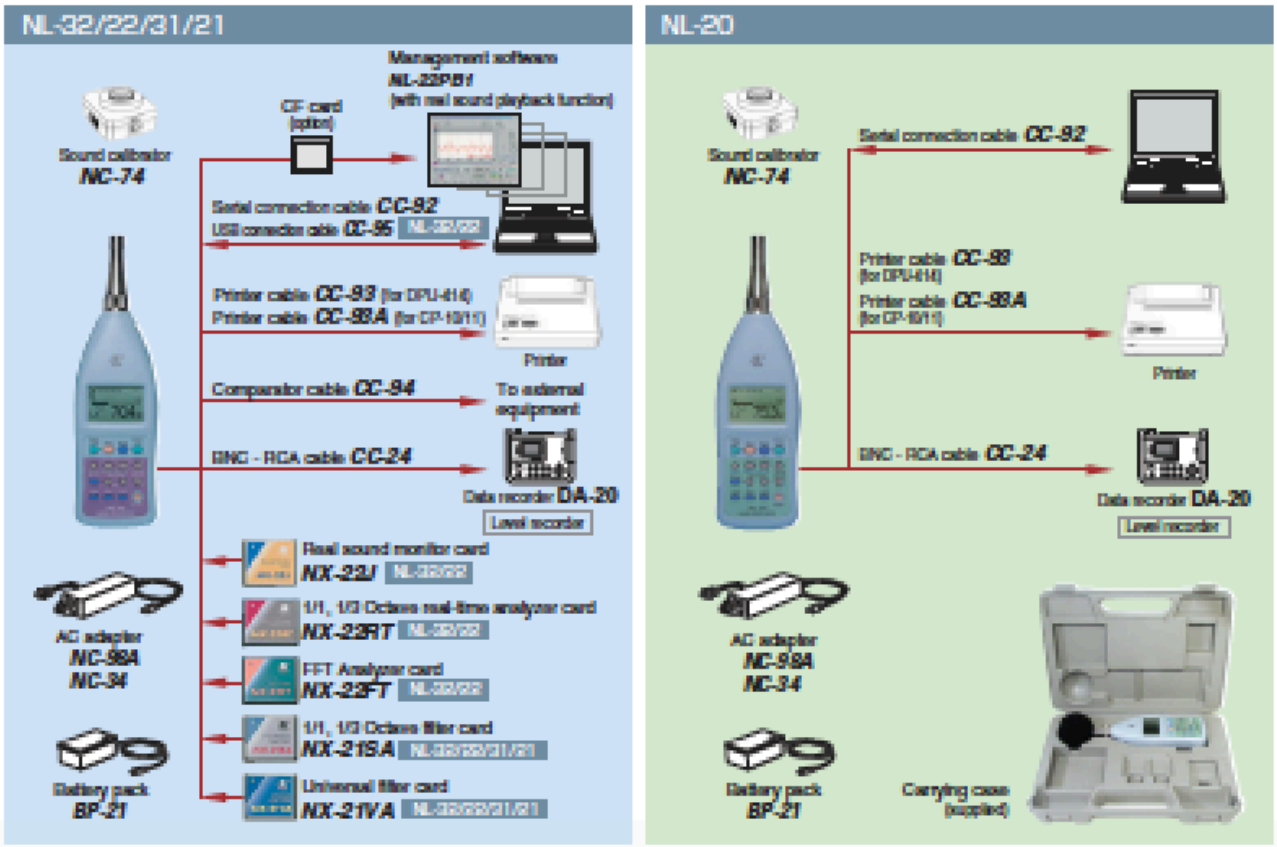
I/O connectors (RS-232C/USB)

USB compatible NL-32/22

The I/O connector allows sound level measurement control from a computer, data output to a computer, data output to a printer (optional DPU-414/CP-11/CP-10), and comparator output (dedicated cable required). In addition, an AC/DC output connector and AC adapter connection jack are also provided.

Connectors on bottom of unit

System diagram (Equipment other than sound level meter is optional)



Options

NLseries

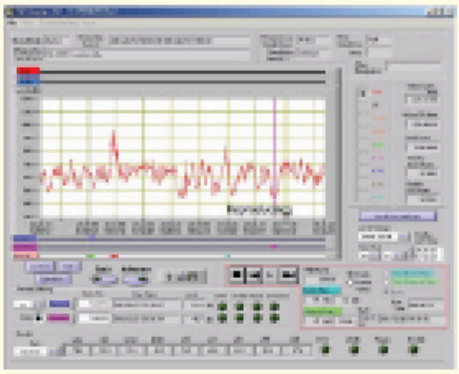
Management software NL-32/22

● Supported OS: Windows 98SE/ME/2000/XP ● Not compatible with manualy stored data

Management software

NL-22PB1

(with real sound playback function)



Daily report display screen

By reading in auto store data from memory card, processing functions such as measurement data display, editing, creation of daily and weekly reports, text file export, and printing become possible.

Edit display screen

When using the real sound monitor card NX-22J, recorded live sound can be played back. Data erase and recalculation are also possible.

Memory card recording times

Memory card capacity	Recording time
64 MB	Approx. 2 hours 10 minutes
128 MB	Approx. 5 hours
256 MB	Approx. 11 hours

Program cards NL-32/22/31/21

Real sound monitor card

NX-22J

Adds sound monitor function to sound level meter.

This allows event recording (above a certain threshold) or interval recording (at preset intervals) during sound level measurement. By using the NL-22PB1 management software, you can perform various data processing functions while listening to the recorded sound.

* The recorded sounds are not useful for the aim of frequency analysis.

1/1, 1/3 Octave real-time analyzer card

NX-22RT

Adds 1/1, 1/3 octave real-time analyzer function to sound level meter.

Supported standards:
IEC 61260: 1995 Class 1
JIS C 1514: 2002 Class 1
Measurement modes:
L_p, L_{eq}, L_E, L_{eq}(select one processing function)
Frequency analyzer bands:
1/1 octave filter: 16 Hz to 8 kHz
1/3 octave filter: 12.5 Hz to 16 kHz
Memory: Max. 100 data per file
Number of files: max. 100
AC/DC output:
Voltage always corresponds to L_p value, regardless of selected measurement type (full-scale −10 dB: 2.5 V, 0.25 V/10 dB)

FFT Analyzer card

NX-22FT

Adds FFT analyzer function to sound level meter.

Frequency span:
2 kHz, 5 kHz, 10 kHz, 20 kHz
Window types: Regular, Hanning
Number of analysis lines: 400
Zoom ratio: ×1, ×2, ×4
Processing: Instantaneous, linear average, maximum value
Memory: Max. 100 data per file
Number of files: max. 50

1/1, 1/3 Octave filter card

NX-21SA

Adds frequency band switching analyzer function to sound level meter.

Supported standards:
IEC 61260: 1995 Class 1
JIS C 1514: 2002 Class 1
Frequency analyzer bands:
1/1 octave filter: 16 Hz to 8 kHz
1/3 octave filter: 12.5 Hz to 16 kHz
(NL-21 to 10 kHz)
AC/DC output:
For selected frequency band

Universal filter card

NX-21VA (1/3 octave steps)

Adds high-pass filter and low-pass filter function to sound level meter.

3rd order high-pass filter:
16 Hz to 12.5 kHz (NL-21 to 8 kHz)
3rd order low-pass filter:
16 Hz to 12.5 kHz (NL-21 to 8 kHz)
AC/DC output:
For selected frequency band

Program card compatibility chart

		NL-32/22	NL-31/21	NL-20
Real sound monitor card	NX-22J	YES	NO	NO
1/1, 1/3 Octave real-time analyzer card	NX-22RT	YES	NO	NO
FFT Analyzer card	NX-22FT	YES	NO	NO
1/1, 1/3 Octave filter card	NX-21SA	YES	YES	NO
Universal filter card	NX-21VA	YES	YES	NO

Sound calibrator *NC-74*

Ideal for calibration of high-precision sound level meters

This device conforms to IEC 60942: 1997 Class 1 and JIS C 1515: 1991. Its performance and functions are eminently suitable for high-precision sound level meters. Sound level: 94 dB, Frequency: 1 kHz

Specifications

	NL-32	NL-31	NL-22	NL-21	NL-20
Applicable standards	High-Precision Sound Level Meter according to the following standards		General-Purpose Sound Level Meter according to the following standards		
	IEC 61672-1 : 2002 Class 1		IEC 61672-1 : 2002 Class 2		
	JIS C 1509-1 Class 1		JIS C 1509-1 Class 2		
Measurement functions (main processing)	Simultaneous measurement of all items, with selected time weighting and frequency weighting: Sound level L_p, equivalent continuous sound level L_{eq}, sound exposure level L_E, maximum sound level L_{max}, minimum sound level L_{min}, percentile sound level L_n(5 freely selectable values)				
Measurement functions (sub processing)	In addition to main processing items, one of the following can be selected for simultaneous processing: Peak sound level L_{peak}, C-weighted peak sound level L_{Cpeak}, C-weighted equivalent continuous sound level L_{Ceq}, power average of maximum sound level in a given interval L_{Amax}, impulse sound level L_{AI}, impulse equivalent continuous sound level L_{AIeq} * L_{max}, L_n and L_{peak} can only be chosen when A-weighting is selected for main processing. L_{Cpeak} can only be chosen when C-weighting and flat characteristics are selected for main processing.				———
Measurement time	10 seconds, 1, 5, 10, 15, 30 minutes, 1, 8, 24 hours, and manual (maximum 200 hours)				
Measurement level range	A-weighting: 28 to 138 dB, C-weighting: 33 to 138 dB, FLAT: 38 to 138 dB				
	C-weighted peak sound level: 55 to 141 dB, FLAT characteristics peak sound level: 60 to 141 dB				———
Inherent noise	A-weighting: 20 dB or less (Typ.17 dB), C-weighting: 25 dB or less, FLAT: 30 dB or less		A-weighting: 22 dB or less (Typ.19 dB), C-weighting: 27 dB or less, FLAT: 32 dB or less		
Linearity range	100dB				
Level range selection	20 to 80 dB, 20 to 90 dB, 20 to 100 dB, 20 to 110 dB, 30 to 120 dB, 40 to 130 dB (6 ranges in 10-dB steps)				
Frequency range (including microphone)	20 Hz to 20 kHz		20 Hz to 8 kHz		
[Digital circuit (IC section)]	10 Hz to 20 kHz				
[Electrical circuit (Frequency weighting characteristics)]	10 Hz to 20 kHz			10 Hz to 14 kHz	
Frequency weighting characteristics	A-weighting, C-weighting, Flat				
rms detection	Performed with digital processing				
[Time weighting characteristics (Sound level meter)]	Fast, Slow, Impulse (Impulse selectable only as auxiliary processing function)				Fast, Slow
Acoustic calibration	Using sound level calibrator NC-74				
Back-erase function	Data for 5-second interval before pressing Pause button can be excluded				
Processing	Digital				
Sampling frequency	20.8 μs (L_{eq}, L_{max}, L_{min}, L_n), 100 ms (Lx)			39.0 μs (L_{eq}, L_{max}, L_{min}, L_n), 100ms (Lx)	
Data store functions	Manual store in internal memory or on memory card (selectable), auto store when memory card is inserted				Store in internal memory only
Manual store	Store sound level, processed values, store time, processing start time in internal memory or on memory card (max. 100 data sets)				Manual store only
Auto store 1	Continuously store sound level (every 100 msec, 200 msec, 1 sec) or L_{eq} (every 1 sec) on memory card, with timer function				
Auto store 2	Continuously store main and sub processing values and processing start time information at preset measurement intervals on memory card, with timer function				
Microphone	1/2 inch electret condenser microphone				
Model (sensitivity level)	UC-53A (—26dB)		UC-52 (—32dB)		
Preamplifier	NH-21				
Display	LCD with LED backlight (128 X 64 dots + 121 icons), display contents: numeric and bar graph indication of sound level Combined display of all processed values, L-T screen (real-time level recording with 20-second horizontal axis) Menu screen display for operation				
Outputs	AC/DC jack (menu selectable), AC output: 1 Vrms (full scale), DC output: 2.5 V (full scale), 0.25 V/1.0 dB				
I/O connector	RS-232C, USB	RS-232C	RS-232C, USB	RS-232C	RS-232C
	Sound level measurement control from a computer, output of data to computer or printer (optional DPU-414/CP-11/CP-10)				
Comparator output	Activated when preset threshold level (30 to 130 dB in 1-dB steps) is exceeded (comparator output)				———
Power requirements	Four IEC R6P (size AA) batteries (LR6 or R6PU), AC adapter (Option: NC-34, NC-98)				
Battery life	Backlight off (battery life is reduced to about 1/2 when backlight is on), main processing on, sub processing off, options not used				
[Alkaline batteries]	Approx. 24 hours	Approx. 29 hours	Approx. 30 hours	Approx. 32 hours	Approx. 34 hours
[R6PU manganese batteries]	Approx. 10 hours	Approx. 10 hours	Approx. 11 hours	Approx. 12 hours	Approx. 14 hours
Ambient temperature for use	—10 to +50°C, 10 to 90% RH (no condensation)				
Dimensions, weight	Approx. 260 X 76 X 33 mm, approx. 400 g (including batteries)				
Supplied accessories	Windscreen WS-10 X 1,carrying case, IEC R6P (size AA) R6PU battery (manganese) X 4, hand strap, connector cover				

Options

Name	Model
Real sound monitor card	NX-22J
1/1, 1/3 Octave real-time analyzer card	NX-22RT
FFT Analyzer card	NX-22FT
1/1, 1/3 Octave filter card	NX-21SA
Universal filter card	NX-21VA
Management software	NL-22P01
64 MB CompactFlash memory card	MC-64CF
128 MB CompactFlash memory card	MC-12CF1

Name	Model
256 MB CompactFlash memory card	MC-25CF1
Microphone extension cable	EC-04 (2 m and up)
BNC - RCA cable	CC-24
Serial connection cable	CC-92
Printer cable	CC-93 (for DPU-414)
Printer cable	CC-93A (for CP-10/11)
Comparator cable	CC-94

Name	Model
USB connection cable	CC-95
Sound calibrator	NC-74
Photomphone	NC-72
All-Weather windscreen set	WS-03E
Printer	DPU-414
AC adapter	NC-34 series
AC adapter (100 to 240 V AC)	NC-98A

* Windows is a trademark of Microsoft Corporation.
* Specification subject to change without notice.

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ANNEXURE R

ToRs of Third Party Monitor

i). Develop specific monitoring indicators for undertaking monitoring and evaluation of EMP and RAP implementation including the Community Participation, consultation and disclosure;

ii). Review results of internal monitoring and verify claims through random checking at the field level to assess whether EMP and resettlement objectives have been met. Involve the affected people and community groups in assessing the impacts of EMP implementation and resettlement measures for monitoring and evaluation purposes.

iii). Review monitoring reports and conduct field inspections and verify the progress in EMP and RAP implementation of the project and prepare reports for the PMU and the ADB.

iv). Evaluate and assess the adequacy of compensation given to the PAPs and the livelihood opportunities and incomes as well as the quality of life of PAPs of project-induced changes.

v). Evaluate and assess the adequacy and effectiveness of the consultative process with PAPs, including the adequacy and effectiveness of grievance procedures and legal redress available to the affected parties, and dissemination of information about these.

vi). Socioeconomic conditions of the PAPs in the post-resettlement / rehabilitation period;

vii). Communications and reactions from PAPs on entitlements, compensation;

viii). Grievance procedures; its recording, reporting and processing time and its redressal;

ix). Institutional arrangements and effectiveness and efficiency of PMU, and Supervision Consultants in EMP and RAP Implementation;

x). Evaluation and assessment of the adequacy of compensation given to the PAPs and the livelihood opportunities and incomes as well as the quality of life of PAPs of project-induced changes.

xi). Level of satisfaction of PAPs in the post resettlement period.

xii). Assessment of the resettlement efficiency, effectiveness, impact and sustainability for drawing lessons for future resettlement policy formulation and planning.