



# **KOLKATA ENVIRONMENTAL IMPROVEMENT PROJECT**

**PROJECT MANAGEMENT UNIT**

**PROGRESS REPORT ON EMP IMPLEMENTATION OF  
KOLKATA ENVIRONMENTAL IMPROVEMENT PROJECT  
FOR THE PERIOD JULY TO DECEMBER, 2007**

**(Loan Nos. 1813-IND & 2293-IND)**

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**KOLKATA MUNICIPAL CORPORATION**

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## **List of Abbreviations**

Asian Development Bank	ADB
Department for International Development	DFID
Design and Supervision Consultants	DSC
Dry Weather Flow	DWF
East Kolkata Wetlands	EKW
EKW Management Authority	EKWMA
Environmental Impact Assessment	EIA
Environmental Management Cell	EMP
Executing Agency	EA
Government of West Bengal	GoWB
Initial Environmental Examination	IEE
Irrigation and Waterways Department	I & W D
Kolkata Environmental Improvement Project	KEIP
Kolkata Municipal Corporation	KMC
Million litres per day	MLD
Occupational Health and Safety Plans	OHSP
Project Affected Persons	PAP
Project Director	PD
Project Management Consultant	PMC
Project Management Unit	PMU
Project Preparatory Technical Assistance	PPTA
Project Specific Study	PSS
Pumping Station	PS
Report and Recommendation of the President, Asian Development Bank	RRP
Sewerage and Drainage	S & D
Sewage Treatment Plant	STP
Solid Waste Management	SWM
Storm Weather Flow	SWF
Team Leader	TL
Tollygunj Panchannagram canal	T P canal

## **PROGRESS REPORT ON EMP IMPLEMENTATION OF KEIP FOR THE PERIOD JULY TO DECEMBER, 2007**

### **I. INTRODUCTION**

1. Kolkata Municipal Corporation (KMC) is the Executing Agency (EA) for implementing the Kolkata Environmental Improvement Project (KEIP or the Project) with financial assistance from Asian Development Bank (ADB) since 2002. The Project consists of the following six parts or components (RRP, 2000):

Part A: Stakeholder Consultation Process

Part B: Sewerage and Drainage Improvement

Part C: Solid Waste Management

Part D: Slum Improvements

Part E: Canal Improvements

Part F: Implementation Assistance and Capacity Building

2. The Project Preparatory Technical Assistance (PPTA) had prepared an Initial Environmental Examination (IEE) report in 2000 that designated the Project as Category B. During detailed design and implementation of the Project over last 5 years, the physical scope and design of the Project have been modified, and approved by the ADB. These include construction of new sewerage and drainage (S & D) network in borough VII and discharge of untreated sewage from S & D works under the Project in boroughs VII, XI and XII into the existing Dry Weather Flow (DWF) channel for eventual natural treatment in the fisheries of the East Kolkata Wetlands (EKW), an ecologically sensitive area listed as a Ramsar site. Accordingly, the original IEE of 2000 has been revised and updated to screen and assess potential environmental impacts and appropriate mitigation measures have been proposed. The overall IEE shows that the Project will have a positive impact on the environment of the project area particularly on terrestrial habitats, through improved sewage and drainage facilities, reducing flood damage due to water logging during monsoon, improving the local environment and enhancing institutional capacity for providing improved civic services in the targeted areas of Kolkata and especially in the selected slum areas. The potential adverse impacts on the environment are perceived to be localized, short-term, non-significant, and can generally be mitigated. The mitigation measures have been adequately spelt out in the revised IEE and component-wise IEEs. The summary IEE developed for the Project was publicly disclosed on ADB website in August 2006.

3. Since a part of the Project extends into the environmentally sensitive EKW area, the revised KEIP has now been categorized as B sensitive. As such an interim environmental management plan (EMP), as per requirements of Environment Policy of ADB, 2002, ADB's

Environmental Guideline, 2003 and ADB's Environmental Operation Manual, 2006, has been developed. This interim EMP of the Project will be finalized shortly upon receipt of the report of the Project Specific Study (PSS) currently under way with Dr Tim Wrigley and Dr Asis Mazumdar of School of Water Resources Engineering, Jadavpur University. The PSS is being carried out as part of TA 4814-IND (component TA for capacity building for the protection of EKW) and will specifically indicate the requirement or not of any additional STP due to the additional sewage to be generated by KEIP and proposed to be conveyed and naturally treated in the EKW.

4. The present EMP implementation report relates to the progress of implementation of the provisions of interim EMP of KEIP during the last six months (July-December) of 2007 in respect of various work components of Part B, Part C, Part D and Part E in which civil constructions are involved. The report for the period January-July, 2007 has been displayed on KEIP web site. However, construction activities related to involuntary resettlement, their impacts and monitoring of mitigation measures including socio-economic benefits of the project affected persons (PAPs) in accordance with agreed revised Resettlement Plan are not reported in this write-up. The Stake Holder Consultation Process (Part A) is an important component of the Project in all phases of implementation of components of KEIP involving civil construction. Such consultations, during the design stage, have provided important inputs for addressing environmental concerns of the stakeholders and have been duly considered. During the construction phase, more frequent stakeholder consultations at work site levels have been carried out. These consultations were to confirm that the implementation of the EMP to overcome the perceived adverse environmental impacts, identified during the design stage, are being adequately and effectively implemented. The Implementation Assistance and Capacity Building of KMC (Part F) is another important component of the Project that is being implemented through various studies and consultations with DFID, UK funds. Implementation of the EMP will be facilitated by such capacity building of the KMC during the operation and maintenance phase.

## **II. CONSTRUCTION ACTIVITIES**

### **A. Sewerage and Drainage Improvement**

5. Sewerage and Drainage components of KEIP have the following four sub-components.

#### **(i) construction of combined S&D network**

6. Table 1 summarizes construction activities during July to December, 2007.

**Table 1.** Borough-wise details of construction of S & D network works, July – December, 2007

Component	Borough I		Borough XI (part)	Borough XII & XI (part)	Borough XIII		Borough XIV		
	SDD1	SDD2	SDA1	SDC	SDA2	SDA3	SDB1	SDB2	SDB3
Estimated approximate volume of soil excavated from new and replaced pipes and manholes (m <sup>3</sup> )	6677.9	7667.238	37518.899	39441.68	15269.61	36754.354	29922.031	29319.505	8828.154
Estimated approximate volume of excess excavated soil disposed (m <sup>3</sup> )	Not in BOQ	Not in BOQ	38486.003	Not in BOQ	9047.48	24152.186	2243.212	22203.944	4137.222
Estimated approximate quantity of silt removed and disposed from cleaning of existing pipes	0.023	65.949	0	0	2463.154	382.84	0	4292.2	0
Estimated approximate quantity of precipitate removed from cleaning of existing drainage channels	5726.849	234.8	12144.2	0	3471.624	7959.81	11501.5	7799.2	9250.69
Estimated approximate volume of road crust removed (m <sup>3</sup> )	8664.225	0	10763.655	5050.107	5299.266	4651.01	6391.45	16192.42	6985.023
Approximate Length of new drainage and sewerage line (m) constructed– up to 450 mm diameter	421.626	156.45	25867.696	6142.302	5099.282	11644.405	69.72	1131.463	597.911
Approximate Length of proposed new drainage and sewerage line (m) constructed – above 450 mm diameter	1199.385	1482.315	2283.53	7203.226	830.803	5045.595	5640.878	6058.011	3407.514

*No measurement has yet been carried out in respect of works in Borough VII (SDF1 & SDF2) and Borough XV (SDE) although work has commenced during the period*

**(ii) construction and augmentation of pumping stations**

7. Construction activities have picked up after the monsoon months and necessary pre-construction exercises were accomplished. The progress of work in the construction of pumping stations (PS) during July to December, 2007 under KEIP is given in Table 2.

**Table 2.** Progress of work of construction of pumping stations, July – December, 2007

Borough	Identification of PS	Type DWF / SWF	Status (Augmentation/New)	Status of Construction	Progress of work	
					Well sinking (m)	RCC (cu.m)
XII	PS - 1	DWF	New	Well sinking	3	50
XII	PS - 4	DWF	New	Well sinking	6	200
XIII	Canal Road	DWF	New	Well sinking	2	20

**(iii) disposal of wastewater into DWF channel**

8. Disposal of additional sewage into the DWF channel without any treatment will commence only if the findings of PSS by Dr Tim Wrigley and Jadavpur University are favourable and the funding agency approves the implementation of the sub-component.

**(iv) construction of augmented/refurbished sewage treatment plants (STPs) for discharge of treated effluents into the drainage canals.**

9. Construction activities during July to December, 2007 related to this sub-component has commenced after pre-construction studies and the progress made is summarized in Table 3.

**Table 3.** Progress of work in the refurbishment of Sewage Treatment Plants under KEIP from July to December, 2007

Name of Sewage Treatment Plant	Refurbished Treatment Capacity (2021) in MLD	Progress of work				
		Work elements				
		Topographical survey of the total area of the STP	Dewatering of existing ponds (m <sup>3</sup> )	Earth work in excavation of existing ponds (m <sup>3</sup> )	Earth work in filling of embankments (m <sup>3</sup> )	Laying of outlet DI pipeline (m)
		1	2	3	4	5
South Suburban East	45	Completed in the previous months	300000	6000	2500	750
Bangur	Tendering Stage					
Garden Reach						

**B. Solid Waste Management**

**10.** No major purchase of equipments connected with Solid Waste Management has been made from July to December, 2007.

**C. Slum Improvement**

**11.** Construction work undertaken in Slum Improvement Packages in KEIP during July - December 2007 is summarized in Table 4.

**Table 4.** Construction work undertaken in Slum Improvement Packages in KEIP, July – December 2007

Approximate Quantity of Work under each item							
SI No	Borough No	No of slums	Toilets/Baths/Urinals Renovated / Reconstructed	Sewer Lines (M)	Water Supply Pipes (M)	Lamp posts (Nos)	Pavement Renovation (M <sup>2</sup> )
<b>Slum Improvement Works - Package VII</b>							
1	III	1	44	410	507	0	1800
2	IV	2	0	100	0	0	0
3	V	1	0	0	0	0	0
4	VIII	3	32	648	519	55	4270
5	IX	1	0	32	0	0	1150
6	X	1	0	0	150	0	70
<b>Slum Improvement Works – Package VIII</b>							
7	VIII	4	20	15	0	0	2100
8	IX	2	0	0	0	0	0
<b>Slum Improvement Works – Package IX Lot 1</b>							
9	III	2	265	278	40	0	390
<b>Slum Improvement Works – Package IX Lot 2</b>							
10	I	1	0	0	0	0	0
11	IV	1	0	0	0	0	0
12	VIII	1	45	125	145	9	1950
<b>Slum Improvement Works - Package IX Lot 3</b>							
13	IX	3	7	800	0	5	6700

Progress report of EMP implementation  
 July - December, 2007

Approximate Quantity of Work under each item							
SI No	Borough No	No of slums	Toilets/Baths/Urinals Renovated / Reconstructed	Sewer Lines (M)	Water Supply Pipes (M)	Lamp posts (Nos)	Pavement Renovation (M <sup>2</sup> )
<b>Slum Improvement Works - Package X Lot 1</b>							
14	I	1	87	50	0	0	0
15	VII	2	95	249	0	0	0
<b>Slum Improvement Works - Package X Lot 2</b>							
16	VII	2	108	560	0	0	0
<b>Slum Improvement Works - Package X Lot 3</b>							
17	IX	2	30	515	260	0	0
18	X	4	70	518	0	0	2000
<b>Grand Total</b>			<b>803</b>	<b>4300</b>	<b>1621</b>	<b>69</b>	<b>20430</b>

#### **D. Canal Improvement Works**

12. Progress in construction activities in canal improvement works of KEIP from July to December, 2007 is given in Table 5.

### **III. REPORT ON EMP IMPLEMENTATION**

#### **Induction of contractors on implementation & monitoring requirements**

13. Consequent upon the award of any contract and during the construction activities, contractors are made aware of the basic provisions of EMP as related to their works. These were accomplished through instructions by the site engineers and Senior Construction Supervisors of Design and Supervision Consultants (DSC), KEIP.

#### **Compliance reports of contractors prior to commencement of works**

14. Works related to refurbishment of South Suburban STP commenced after the design parameters were established so as to prevent any flooding of the facility due to inadequate space, capacity and pumping requirements.

15. Works related to canal improvements commenced only when the relocation of canal bank dwellers for the selected stretches is completed. Where felling of trees is involved, tree survey along the stretch to be excavated has been carried out so that re-plantation after completion of work could be taken up vigorously.

#### **Weekly construction reports of contractors and DSC**

16. Weekly reviews of all construction activities with emphasis on mitigation measures of potential environmental impacts being undertaken by the Contractors have been taken by the respective Senior Construction Supervisors. Spot flying checks on the construction sites to ensure overall quality control including environmental and social requirements are being made by Team Leader (TL), DSC.

#### **Training of contractors on mitigation of unexpected adverse impacts**

17. Mitigation measures for any unexpected adverse impacts being faced are formulated daily by DSC and implemented by Contractors under the supervision of site engineers of DSC as soon as they crop up and reviewed about their efficacies weekly by the Senior Construction Supervisors of DSC.

#### **Monthly monitoring report of contractors**

18. Site wise monthly reports are being prepared by Senior Construction Supervisors of DSC in consultation with Environment Specialist of DSC. These reports are available with the respective Senior Construction Supervisors of DSC.

#### **Six monthly progress report of EMP implementation**

**Table 5.** Basin wise details of progress in construction activities from July to December, 2007 of rehabilitation of different canal systems under KEIP

	<b>T P main canal CW -05</b>	<b>T P main canal CW -08</b>	<b>T P main canal CW -09</b>	<b>Manikhali U/S CW -10</b>	<b>Monikhali downstream CW 11</b>	<b>Keorapukur CW 12A</b>	<b>Churial extension CW 12B</b>	<b>Churial Main CW 13</b>	<b>Churial Main CW 14</b>	<b>Churial Main CW 15</b>
1. Earth work in excavation in cubic m	12000	-	-	21773	4500	360	-	Work has not yet started	Work has not yet started	Work has not yet started
2. Geotextile filter in sq. m	1000	-	-	2296	-	-	-			
3. Precast concrete block lining in sq. m	1000	-	-	2464	-	-	-			
4. M-30 grade concrete in structures in cu. m	-	-	-	50	-	-	-			
5. Reinforcement in M. T.				1.40						
6. Disposal of excavated material	6000				4250	300				
7. Topographic survey (km)		0.500	2.650		5.40	1.20	21.13			
8. Clearing and grubbing of canal banks including disposal (km)	0.400			1.35	5.00	1.20	21.13			
9. Clearing and removal of water hyacinth including disposal in sq.m.	1200			16226	12000	15000	14000			
10. Clearing of sludge and slush including floating debris and removal (km)	0.400			1.35	0.25	0.05	0.40			

**19.** Six monthly review and report of EMP implementation is being developed by Environment Specialist of DSC based on the feed back from and in consultation with Senior Construction Supervisors of DSC incorporating the results of the required sampling, laboratory analysis and measurements. The second six monthly report (July-December, 2007) has become due after 31 December, 2007.

### **Institutional Strengthening and Training**

**20.** The recently established EKWMA of Government of West Bengal has engaged M/S Wetland International for the development of an EKW EMP. In order to safeguard the interests of KEIP while formulating the EKW EMP, Dr Stuart Bunting and Dr P Edwards, International Specialists of Wetland issues, have been engaged by ADB to provide inputs to EKWMA for finalising the EKW EMP.

**21.** KMC has already established an environment management cell (EMC). The EMC is to play an advisory and overall coordination role for KMC and the KEIP to ensure that agreed mitigation measures and monitoring are being carried out. Environment has been formally introduced as a subject in the portfolio of Sri Sushil Sharma; Member - Mayor-in-Council (Policy making Body in KMC). Sri Anindya Karforma, (a Chief Engineer Rank Officer) is the Nodal Officer of the EMC. Suitable staffing has been made in the EMC. There is a fully functional Central Water Testing Laboratory in KMC now. There is also a dedicated water testing facility at Palta Water Treatment Plant. Further the ponds and water bodies in KMC area are being cleansed and preserved in keeping with the Inland Fisheries Act and the West Bengal Town and Country Planning Act. The EMC is looking into all this.

**22.** The proposal to build 89 blocks of housing for canal bank dwellers at Nonadanga covering about a built-up area 70,000 m<sup>2</sup> will only require prior environmental clearance from WBPCB. Necessary application in prescribed Form 1 and Form 1A has been made to the Government. Comments in the form of minor clarifications have just been received and necessary clarifications are being provided. Copy of environmental clearance will be forwarded as soon as this is obtained. Once the necessary papers are received from KMWSA on transfer of the three STPS being refurbished under KEIP, necessary applications to obtain the 'consent to operate' the plants will be filed (after examination of the transferred papers), if required.

#### **IV. ENVIRONMENTAL CONDITIONS**

##### **A. Sewerage and Drainage Improvement**

###### **(i) construction of combined S & D network**

**23.** Construction activities have impacted the local environment in some sites, especially during the monsoon period from July to September, 2007, mainly in the nature of inconveniences to the residents. These inconveniences are transient in nature and will disappear once the construction phase is over. Many of the inconveniences have been mitigated to the extent practicable so that their intensities are minimized and/or shortened in time and there is no adverse permanent impact on the environment. These inconveniences are to be accepted (for which public awareness campaign has been taken up) for a short period of time for bringing in a permanent improved environment once the construction phase is completed.

###### **(ii) construction and augmentation of pumping stations**

**24.** Construction work of new pumping stations during the period has commenced in KMC lands with activities being restricted to preparatory work for installation of new pumps in some cases and well sinking in some other cases. Environmental conditions at the construction works remained unchanged due to low intensity construction activities. On the other hand, better drainage in the catchments of the pumping stations is likely to bring in improvement in environmental conditions.

###### **(iii) disposal of wastewater into DWF channel**

**25.** Disposal of additional wastewater into DWF channel will commence when pipe laying works, house connections and construction and commissioning of pumping stations in the designated catchments under the KEIP are completed. Environmental condition around the DWF channel therefore was not impacted during the period due to the Project.

###### **(iv) construction of new and augmented/refurbished sewerage treatment plants (STPs) for discharge of treated effluents into the drainage canals.**

**26.** Construction activities related to refurbishment of South Suburban East Sewage Treatment Plant was limited to cleaning of the existing facilities including preliminary excavations and raising and strengthening of peripheral embankments of the existing ponds. These activities did not lead to any perceptible change in the environmental conditions in the STP area. Excess soil and silt were used in the strengthening of embankments of the ponds without any change in environmental conditions in and around the embankments.

## **B. Solid Waste Management**

27. No activity is to be reported under this component during the period under review.

## **C. Slum Improvement**

28. The environmental conditions of selected slums have improved wherever the planned constructions of infra-structural facilities are complete. As the improvement works are all in the nature of small scale isolated spot development of basic civic amenities within the slums, construction stage adverse impacts are minimal and as such there are no change in environmental conditions at the sites during construction activities.

## **D. Canal Improvement Works**

29. With the relocation of canal bank dwellers, re-excavations of canals and bridge constructions, the canal bank areas and their surroundings are poised for an improvement in environmental conditions with relatively unpolluted canal water, elimination of foul odour, elimination of cause of solid waste dumping, better conveyance of storm weather flows, improvement of drainage in catchments and elimination of ugly shanties along canal banks. The canal bank dwellers are being rehabilitated with housings having basic civic amenities for a healthy and dignified living. The excavated silts are non-hazardous and are being disposed at pre arranged sites where no adverse impacts on environment are expected.

## **V. MEASUREMENT OR SAMPLING UNDERTAKEN AND MONITORING RESULTS**

### **Canal Silt Analysis**

30. Sampling and analysis of canal silts from 10 points of 5 different locations were carried out during the rainy season (28 July, 2007) of Churial extension canal. The summarized results of canal silt analysis are given in Table 6 and the detailed analysis report is given in Appendix 1 and 2. It is to be noted from the silt analysis report that concentrations of metals in the silt samples, collected from the Churial Extension Canal are non-hazardous when compared with limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

**Table 6.** Summarised results of analysis of silt of Churial extension canal July-December, 2007

<b>Parameters</b>		
	<b>Range</b>	<b>Mean</b>
pH(1:5)	7.3 – 8.21	7.54
Bulk Density (gm/cc)	0.88 – 1.21	1.05
Sand (%)	69.0 – 82.0	77.2
Silt (%)	7.0 – 20.0	12.7
Clay (%)	6.0 – 12.0	10.1
Total Kjeldahl Nitrogen (%)	0.10 – 0.40	0.21

Parameters		
	Range	Mean
Potassium (ppm)	19.0 – 75.6	52.4
Phenolic Compound (ppm)	Less than 1 – 20.61	8.17
Arsenic(ppm)	3.5 – 10.3	6.1
Mercury(ppm)	Less than 0.5 – 1.04	0.56
Lead(ppm)	24.69 – 150.6	104.71
Cadmium(ppm)	1.76 – 35.9	13.83
Total Chromium(ppm)	30.6 – 195.04	86.53
Chromium +6(ppm)	1.8 – 11.6	5.8
Chromium +3(ppm)	28.8 – 183.44	80.7
Zinc(ppm)	77.9 – 802.2	376.0
Nickel(ppm)	20.9 – 91.1	58.4
Copper(ppm)	31.1 – 407.1	251.5

### Sewage Silt Analysis

**31.** Sampling and analysis of sewage silt recovered due to dismantling of previous sewage lines or cleaning of old lines from 8 different locations were carried out during December, 2007. The results of sewage silt analysis are given in Appendix 3. It is to be noted from the silt analysis report that concentrations of phenolic compounds and metals like cadmium, nickel, chromium<sup>+6</sup>, mercury and arsenics in the silt samples are below the detection limits of determination. Concentrations of other metals like lead, copper, chromium<sup>+3</sup> and zinc are relatively low. They are all non-hazardous when compared with limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

### STP Silt Analysis

**32.** Sampling and analysis of silt excavated of existing ponds of SSE STP as part of refurbishment programme of the STP from 2 different locations were carried out during December, 2007. The results of STP silt analysis are given in Appendix 3. It is to be noted from the silt analysis report that concentrations of phenolic compounds and metals like cadmium, nickel, chromium<sup>+6</sup>, mercury and arsenics in the silt samples are below the detection limits of determination. Concentrations of other metals like lead, copper, chromium<sup>+3</sup> and zinc are relatively low. They are all non-hazardous when compared with limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

### Noise Level Measurement

**33.** Noise level in dBA has been measured at several work sites for each component of the KEIP where civil construction is going on. The results of the measurements are tabulated in

Appendix 4, 5, 6 and 7. All measurements were carried out during day time as all major construction activities were restricted during the day time. It could be seen from the data that at all work sites where manual operations are being carried out during the construction activities the time averaged noise level in dB(A) is around 65. Considering that ambient noise level is relatively high in typical congested mixed residential-commercial areas of Kolkata with high multi-modal traffic noise, the measured noise level is to be accepted as a temporary situation. However, where diesel pump sets were used for dewatering trenches/ponds and/or JCP/Hydra was used, the noise level reached mostly between 70-75 dB (A). Such elevated noise levels can not be avoided at work sites but were of short and/or intermittent duration and during the day time only. Highest work zone noise level in excess of 90 dBA was recorded in one site in Borough I where concrete road is being broken up by air compressor and Jack Hammers in connection with laying of sewage pipes below the concreted road. Necessary protection measures to the work men and those who are working near the site as per rule have been enforced.

#### **VI. FINDINGS ON THE COMPLIANCE STATUS**

**34.** The implementation including monitoring as planned in the interim EMP has been carried out at all work sites of the KEIP. Most of the works are related to construction phase only. The daily observations that are required to be made as per list of monitoring agenda were noted each day by the site engineers of the Contractors and DSC in their Construction records. These were summarized on a weekly basis and were reviewed by the respective Senior Construction Supervisors of DSC and extra remedial measures if required were implemented. The extra remedial measures are listed in Chapter VII vide paras 45, 47 and 49. A site wise monthly report was prepared by the respective Senior Construction Supervisors that have been used by the Environment Specialist of DSC to develop the six-monthly report of EMP implementation of KEIP.

**35.** The above structured approach for the period July to December, 2007 has ensured that the provisions of interim EMP have been enforced and complied with. The potential adverse impacts have been mitigated by continuous and timely measures as provided in the EMP. In a few cases unexpected and unavoidable situations (like water logging due to high intensity rains, difficulty faced for movement and access to houses in narrow streets with no alternate pathways, etc) have developed leading to temporary inconveniences that have been mitigated to the extent possible by taking timely appropriate measures.

## Sewerage & Drainage network

### Construction Phase

36. Summary observations of monitoring carried out during the Construction Phase during July to December, 2007 are given below item-wise:

i. **Soil erosion & surface run-off prevention**

Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure exposed surfaces are resurfaced and stabilized rapidly by the Contractors. There was no case of delayed action by the Contractors. Timely precautionary measures were taken to prevent soil erosion and landslide in a few cases where such measures were necessary. Consequent minor damages to boundary walls and walls of individual properties have been noted in some areas due to pipe laying work apparently because these were having very shallow foundations. Remedial action taken is given in Chapter VII para 45.

ii. **Prevention of dust nuisance**

There was no dust nuisance during the monsoon months. Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure (a) light water spraying on loose and fine debris whenever necessary during non-monsoon months, (b) use of masks / goggles by workmen whenever necessary & (c) covered transport of excess material whenever necessary. There was no record of heavy fugitive dust emission in the work sites. It is to be noted that site conditions did not allow use of any heavy equipment. Generation of dust was, therefore, on the low side.

iii. **Disposal of silt and excess soil**

Monthly visual inspection of sites and delivery records of the Contractors have been carried out by DSC site supervisors to ensure that timely and adequate disposal of silt and excess soil has been undertaken by the Contractors at pre-agreed sites. There was no case of unnecessary silt / soil accumulation at work sites.

iv. **Prevention of soil, ground and/or surface water contamination from contaminated silt**

No contaminated silt arising out of cleaning/dismantling of existing sewage lines has been excavated out during the present construction phase (Appendix 3).

v. **Vehicular and Construction noise pollution mitigation**

Sound level monitoring has been carried out at running work sites. The data given in Appendix 4, 5, 6 and 7 bring out that the noise levels due to increased construction activities were elevated only a few decibals over the ambient noise where works were carried out manually. Dewatering of trenches by pumps and employment of Hydra/JCP/ Air Compressors/Jack

Hammer were persistent sources of relatively high noise level at the work sites. Necessary steps through provision of preventive gears to the workmen were taken as per rule

**vii. Relocation of utility services**

Intersection of major utility lines during trenching/excavation for drainage network was avoided in most cases. Diversions of water supply lines and electrical lines have been carried out observing the required formalities and with the consent of affected people.

**viii. Prevention of water logging / flooding during trenching**

Daily inspection at all running work sites has been carried out by DSC and PMU site supervisors to check water levels in the trenches. Timely dewatering was carried out as required. However, during the monsoon months some areas especially parts of wards 109 (Purbalok area), 115, 117, 121, 128 and 131 experienced temporary water-logging due to high intensity rainfall and due to impaired and insufficient drainage. Necessary draining and pumping of water logged areas were taken up to the extent feasible by deploying additional pumps.

**ix. Traffic management**

Partial/full closure of any public road including temporary diversion was done in co-ordination with the police authorities. The situation was reviewed daily by DSC site supervisors with the Contractors to minimize inconveniences to the local people. Safe passage for bicycles and pedestrian traffic was always maintained. Cases of major traffic closures/diversions were in the places as mentioned in Table 7.

**Table 7.** Details of major traffic diversions/closures due to construction of S & D network under KEIP from July to December, 2007

Package	Ward	Road	Duration of diversion/ closure		Description of the closure/diversion and remedial measures provided
			From	To	
SDB1	128	Biren Roy Road (w)	1.7.2007	31.12.2007	From Muchipara to Bakultala; fully closed but light vehicles are being allowed to ply
SDB2	131	Kshudiram Bose Road	1.7.2007	31.12.2007	Fully closed from Parnashree Palyy to Rabindra Nagar Bus stand; parallel roads are being used
SDA3	121	Raja Rammohan Roy	1.7.2007	31.12.2007	Jayashree Park to Muchipara more. Fully closed; parallel roads are being used
SDA2 & SDA3	120	James Long Sarani	1.12.2007	31.12.2007	Alternately one way with change over at 2 P.M.
	129	Mahendra Banerjee Road	1.7.2007	31.12.2007	Fully closed; parallel road is being used.

Package	Ward	Road	Duration of diversion/ closure		Description of the closure/diversion and remedial measures provided
			From	To	
SDC	109	Purbalok Main Road	1.7.2007	31.12.2007	Fully closed but partially opened to traffic from November, 2007; parallel roads are being used
SDC	109	Road number 6, Mukundapur	1.11.2007	31.12.2007	Fully closed; likely to be opened by January, 2008; parallel roads are being used
SDD2	2	Kali charan Ghosh Road	1.8.2007	30.9.2007	Fully closed from Sinthi More to P C Lahiri Sarani; parallel roads are being used
SDD2	5	Manmotho Dutta Road	1.7.2007	31.12.2007	Half the width of the road closed

**x. Health and safety of work force**

Daily visual inspection was carried out by DSC site supervisors to ensure that Occupational Health & Safety standards were followed by the Contractors.

**xi. Environmental health & safety at construction camp sites**

A safety, health and environmental plan were submitted by each Contractor on acceptance of the work order detailing the provisions being made under the Plan. The Plan in each case provided amongst other things temporary labour camps with flush latrines. In addition available pay and use toilets came handy for the camp sites in some places. On the whole the camp sites did not pose any threat to environmental health and safety in the area. DSC site supervisors made daily visual inspections.

**xii. Conservation of places of cultural importance**

There was no case involving places of cultural importance falling along S&D network excavations.

**Pumping Stations**

**Construction Phase**

37. Summary observations of monitoring carried out in the Construction Phase during July to December, 2007 are given below item-wise:

**i. Soil erosion & surface run-off prevention**

Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure working surfaces do not remain exposed and unstable after completion of the construction work.

**ii. Prevention of dust nuisance**

There was no dust emission during the monsoon months. Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure (a) light water spraying on loose and fine debris whenever necessary during non-monsoon months, (b) use of masks / goggles by workmen whenever necessary & (c) covered transport of excess material whenever necessary. There was no record of fugitive dust emission in the work sites. It is to be noted that site conditions did not allow use of any heavy equipment. No piling was also done. Generation of dust was, therefore, on the low side.

**iii. Prevention of soil, ground and/or surface water contamination from contaminated silt**

No contaminated silt was excavated out during the present construction phase.

### **Sewage Treatment Plant**

#### **Pre-construction Phase**

**38.** Monitoring for pre-construction phase included only situations related to possible flooding of STP sites.

**i. Flooding of STP sites**

- Flooding of sites are not expected because of provision of improved drainage in the design
- Flooding of sites are not expected because of provision of adequate treatment & pumping capacity and stand by pumps in the design

#### **Construction Phase**

**39.** Summary observations of monitoring carried out during the Construction Phase in the South Suburban East STP are given below item-wise:

**i. Soil erosion & surface run-off prevention**

Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure exposed surfaces are stabilized rapidly by the Constructors. The embankments are being strengthened to accidental bank erosion and/or failure. There was no case of delayed action by the Contractors.

**ii. Prevention of dust nuisance**

There was no dust emission during the monsoon months. Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure (a) light water spraying on loose and fine debris whenever necessary during the non-monsoon months, (b) use of masks

/ goggles by workmen whenever necessary & (c) covered transport of excess material whenever necessary. There was no record of fugitive dust emission from the work sites. No piling was also done. Generation of dust was, therefore, on the low side.

**iii. Prevention of soil, ground and/or surface water contamination from contaminated silt**

Silts from excavations of ponds of the existing SSE STP are non-hazardous (Appendix 3). On the contrary they are rich in nutrients. Current disposal of silts from the existing ponds of SSE STP at pre-approved sites will not contaminate soil, ground and/or surface water.

**iv. Vehicular and Construction noise pollution mitigation**

The SSE STP site is away from residential areas. Construction activity was limited to dewatering and manual & machine excavation during December, 2007. There was hardly any vehicle movement in the area from July to November, 2007. There was minimum addition to the ambient noise level due to vehicular activities during this period.

**v. Relocation of utility services**

There was no record of any intersection of major utility lines during construction work.

**vi. Prevention of water logging / flooding during trenching/excavation of ponds**

Daily inspection at all running work sites has been carried out by DSC site supervisors to prevent water-logging/flooding due to excavation activities. However, the surrounding areas outside the STP boundary are low-lying and partially covered with water especially during the monsoon months.

**vii. Traffic management**

There was no partial / full closure of any public road including temporary diversion for construction activities under this sub-component.

**viii. Health and safety of work force**

Daily visual inspection was carried out by DSC site supervisors to ensure that Occupational Health Safety standards were followed by the Contractors.

## **Slum Improvements**

### **Construction Phase**

40. Summary observations of monitoring carried out during the Construction Phase in the boroughs are given below item-wise:

**i. Prevention of Soil erosion & surface run-off**

Slum improvement works are in the nature of small spot improvements of infrastructure. Therefore significant soil erosion and undesirable surface run-off have not been encountered. Daily checks by the Contractors and DSC site supervisors were carried out.

**ii. Prevention of dust nuisance**

There was no dust nuisance during the monsoon months. Non-significant dust nuisance has been mitigated by light water spraying whenever required under supervision of DSC site supervisors. It is to be noted that low intensity construction activity for slum improvements did not generate adverse fugitive dust.

**iii. Disposal of silt and excess soil**

Small quantities of silt and excess soil generated during spot improvement of facilities in the selected slums have been disposed adequately and in time. Monthly review was made by the Contractors and DSC site supervisors.

**iv. Prevention of soil, ground and/or surface water contamination**

Slum improvement works did not pose any significant soil, ground and/or surface water contamination.

**v. Mitigation of noise pollution**

The nature of construction activities involved only manual work with no significant additional noise generation.

**vi. Relocation of utility services**

There was no occasion for relocation of utility services during the construction phase of slum improvement works in various Boroughs.

**vii. Prevention of water logging / flooding**

There was some water logging / flooding during the construction phase of slum improvement works in various Boroughs during monsoon months. Site supervisors of the Contractors and DSC made daily inspections and took necessary emergency measures.

**viii. Traffic management**

There was no occasion of temporary / partial traffic diversion during the construction phase.

**ix. Health and safety of work force**

Daily visual inspection was carried out by DSC site supervisors to ensure occupational health and safety standards are strictly followed by the Contractors. There were no violations.

## **Operation Phase**

41. Summary observations of monitoring carried out during the Operation Phase in boroughs I to XI are given below item-wise:

**i. Regular emptying of septic tanks**

Quarterly cleaning of septic tanks has been routinely carried out by KMC.

**ii. Regular cleaning and maintenance of drains**

Boroughs of KMC have a running programme of regular cleaning and maintenance of drains in the slums.

**iii. Water quality of stand posts**

Stand posts in the slum areas receive water from KMC's filtered water supply and are free from any metal, organic and pathogenic contamination as revealed by regular analysis of water carried out in KMC water testing laboratory.

**iv. Cleaning and disinfection of urinals**

KMC through its respective Boroughs carried out cleaning and disinfection of urinals continuously. Only visual inspection of urinals was undertaken to ensure cleanliness.

## **Canal Improvements**

### **Pre-construction Phase**

42. Summary observations of monitoring carried out during the Pre-construction Phase are given below item-wise:

**i. Tree replanting**

A large number of trees will be planted along the canal banks once excavation work is completed.

**ii. Relocation of canal bank dwellers**

The status of relocation of canal bank dwellers as reported in the six monthly report for the period January-June, 2007 has remained unchanged during the current six-monthly period (July-December, 2007).

The (already) relocated sites/housings have improved environmental conditions with well-equipped sanitation and other facilities compared to the abominable environmental conditions in the canal bank shanties.

### **Construction Phase**

43. Summary observations of monitoring carried out in the Construction Phase during July to December 2007 are given below item-wise:

**i. Prevention of soil erosion & surface run-off**

Daily visual inspections have been carried out by DSC site supervisors at all running canal excavation sites to ensure that the slopes of excavated banks were stabilized rapidly by the contractor. There were minimum excavation works with on-set of monsoon. Timely precautionary measures were taken to prevent any bank failure in case of any adverse situation. There was no case of delayed action by the contractors.

**ii. Prevention of dust nuisance**

It is to be noted that canal silt was wet when excavated. Daily visual inspections were carried out by DSC site supervisors at all canal stretches under excavation to ensure (a) light water spraying on loose dried canal silt if necessary, (b) use of hand gloves / masks / goggles by workmen whenever necessary & (c) covered transport of dewatered and semi-dry canal silt.

**iii. Disposal of excavated silt**

Monthly visual inspection of excavation sites and delivery records of the contractor have been carried out by DSC site supervisors to ensure that timely and adequate disposal of excavated silt at pre-agreed sites have been undertaken by the contractor after dewatering at the canal banks. There was no case of unnecessary silt accumulation at work sites. Dry silt was transported under cover. The excavated silt is non-hazardous in nature for the analysed parameters (Appendices 1 and 2) with respect to limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

**iv. Prevention of soil, ground and/or surface water contamination from contaminated soil**

The silt excavated from the canal was temporarily stacked by the side of the same canal. The filtrate is therefore going back to where the water charged silt came from. This is to prevent any possible pollution of other water bodies and spilling of interstitial water during transportation to disposal sites. No statutory clearance is required for this operation more so because the silt itself is non-hazardous.

**v. Mitigation of noise pollution**

Sound level monitoring has been carried out at running work sites. The data given in Appendix 7 bring out that the noise levels due to canal improvement activities are relatively high where machineries like excavators were in operation. Construction noise generation due to manual excavation work was on comparatively low side. It is to be noted that construction sites are in

general away from residential areas (excluding the informal shanties of the canal bank dwellers).

**vi. Traffic Management**

There was no necessity of temporary/partial diversion/closure of roads during the construction phase. Traffic situation was regularly reviewed by the Contractors and DSC site supervisors.

**vii. Health and Safety of work force**

Daily visual inspection was carried out by DSC site supervisors to ensure occupational health and safety standards are strictly followed by the Contractors. There were no violations. Temporary labour camps had primary sanitary facilities

**VII. SUMMARY OF ANY NON-COMPLIANCE AND REMEDIAL ACTIONS TAKEN**

**S & D network construction**

44. There were minor threats of deterioration of local environmental quality, mainly in terms of inconveniences to residents in some of the work fronts opened for the construction of S & D network temporarily due to the following reasons:

- Difficulty in ingress and egress into some houses for their respective residents, for example, at Panchannagram (ward 107) during October-November, 2007 due to electric cable shifting work and at Birji area (ward 110) from September to November, 2007 due to pipe laying works
- Complete or partial closure of roads with restricted traffic movements
- Short-term water-logging in trenches especially after heavy monsoon showers
- Flooding of streets and low-lying houses after heavy monsoon showers because of impaired drainage arrangements
- Short term disruption of electricity and water supply to some households during diversion of underground electric and sewer lines falling along the alignment of S & D lines being laid at some sites.
- Elevated noise levels in some sites due to
  1. use of air compressors and jack hammers for breaking of ground/road and/or existing sewers
  2. Working of Hydra machines
  3. use of noisy diesel pumps for dewatering of trenches
  4. use of hammering technology in sheet piling to support walls of trenches

5. plying of trucks in the night especially for removing excess silt and movement of construction materials

- Minor and major damages to boundary walls and residential buildings especially in wards 115, 116, 129, 130 and 131 due to pipe laying works numbering around 250.

45. The following remedial actions were taken expeditiously mitigating the inconveniences to a large extent.

- Ingress and egress to affected houses were provided as far as practicable although in some cases there were temporary restrictions on full accessibility due to non-availability of alternate space. These restrictions were withdrawn expeditiously through suitable engineering and administrative actions.
- Alternate routes were always provided for temporary closure or part closure of roads with provisions of pathways for pedestrians and two-wheelers.
- Accumulated water was pumped out as and when required to the extent possible
- Flooding after heavy rain was mitigated by continuous pumping to the extent feasible/possible
- Restoration of accidental disruption of electricity and water supply was arranged expeditiously by pursuing the CESC and KMC water supply department to undertake diversion/repair expeditiously.
- Elevated noise levels at work sites are to be accepted, in the cases mentioned, as these are work related noise that can not be avoided. However, proper maintenance of the equipments was enforced on the contractors so that the noise levels of the used equipments remained at manufacturers' specifications. Workmen also used proper gears so that the occupational health norms were not violated.
- Suitable repairs to the boundary walls and buildings are being carried out. So far repairs to about 50 buildings have been completed. Further repair works are in progress.

### **Refurbishment of STP**

46. (i) The existing ponds of SSE STP are being excavated and the embankments of the ponds are being strengthened by increasing their heights and widths. As a consequence some surrounding built-up areas were water-logged during monsoon months due to drainage congestion.

(ii) Due to movements of heavy vehicles, the roads around the STP site are damaged inconveniencing the local people who use these roads.

47. Remedial measures that have been taken are as follows:

- (i) Pumping and draining of water from the built-up areas
- (ii) Roads are being repaired as and when required.

#### Canal Excavation work

48. Environmental problems related to stability of canal banks to be excavated were faced only at few sites. They are as follows:

- Threat of soil erosion and landslide due to bank instability along a few vulnerable stretches during excavation posing dangers to stability of the excavated canal banks and in some cases close by hutments/building and road.

49. The following remedial measures were taken expeditiously mitigating the adverse situation to a large extent.

- Extensive *Eucalyptus ballah* piling to prevent soil collapse and soil erosion along vulnerable stretches of the canals under excavation were taken up expeditiously. In cases where the design requirement is for permanent protection of canal sections, concrete lining has been provided. The details are given in Table 8.

**Table 8.** Details of bank protection measures carried out to prevent bank/slope failure along stretches canals from July to December, 2007

Serial No	Name of the canal	Chainage (m)		Piling work carried (m)		Remarks
		From	To	From	To	
<b>Eucalyptus ballah piling</b>						
1	Defunct Monikhali khal	0	568	0	568	Both banks
2	Churial Extension canal	0	2103	400	660	Both banks; temporary ballah piling work for construction of RCC U trough
3	Begore khal	0	3351	30 100	60 128	Both banks; temporary ballah piling work for construction of RCC U trough

Serial No	Name of the canal	Chainage (m)		Piling work carried (m)		Remarks
		From	To	From	To	
<b>RCC lining</b>						
4	Begore khal	0	3351	2300 2700	2520 2920	Sides and bed lining
5	Intercepting channel	0	4525	2725	2925	Sides and bed lining

**VIII. RECOMMENDATIONS FOR IMPROVEMENT/ REVISION OF THE MITIGATION MEASURES AND/ OR THE EMP IF ANY**

**50.** At this stage on the implementation of interim EMP of the revised KEIP, no improvements/revisions of the mitigation measures of the interim EMP are suggested/ recommended. Once the findings of the Project Specific Study and outlines of EMP of the EKW under preparation by the consultancy report of EKWMA are known, the current interim EMP of the KEIP will perhaps have to be modified. Progressive strict enforcement of the provisions of the interim EMP has been planned in the next six months.

# APPENDICES

**Appendix 1.** Physico chemical Properties of Silt of Churial Extension Canal

Sr. No.	Sampling Site	Sample No.	Sampling point	pH (1:5)	Bulk Density (gm/cc)	Textural Class	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (%)	Potassium (ppm)	Phenolic Compound (ppm)
1	Ramkrishna Math, Barisha	1S: Slush level	Churial Extension Canal	7.45	1.04	Sandy loam	80.0	8.0	12.0	0.21	48.8	4.46
		1D: 1 m below slush level		7.32	1.04	Sandy loam	79.0	11.0	10.0	0.23	54.84	20.61
2	Green park, Barisha	2S: Slush level	Churial Extension Canal	7.72	1.06	Sandy loam	77.0	17.0	6.0	0.18	46.7	6.55
		2D: 1 m below slush level		7.60	1.11	Sandy loam	75.0	15.0	10.0	0.20	55.6	12.2
3	Unnayan palli, Barisha	3S: Slush level	Churial Extension Canal	7.11	1.01	Loamy sand	80.0	8.0	12.0	0.40	65.33	7.8
		3D: 1 m below slush level		7.14	0.94	Sandy loam	82.0	7.0	11.0	0.31	68.62	9.36
4	Netaji palli, Purba para Barisha	4S: Slush level	Churial Extension Canal	7.12	1.05	Sandy loam	76.0	12.0	12.0	0.16	75.6	8.85
		4D: 1 m below slush level		7.03	0.88	Sandy loam	80.0	14.0	6.0	0.15	65.3	7.97

Sr. No.	Sampling Site	Sample No.	Sampling point	pH (1:5)	Bulk Density (gm/cc)	Textural Class	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (%)	Potassium (ppm)	Phenolic Compound (ppm)
5	Purbachal, Satyajit Park, Thakurpukur	5S: Slush level	Churial Extension Canal	8.21	1.21	Sandy loam	69.0	20.0	11.0	0.10	19.08	<1.00
		5D: 1 m below slush level		8.00	1.12	Sandy loam	74.0	15.0	11.0	0.15	23.8	3.4

All S samples: Surface water level - Slush Level,

All D samples: Canal bed/ slope – 1 m below slush level

**Appendix 2. Heavy Metals in Canal Silt of Churial Extension Canal**

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium (Cr <sup>+6</sup> , Cr <sup>+3</sup> )	Zinc	Nickel	Copper
				(ppm)							
1	Ramkrishna Math, Barisha	1S: Slush level	Churial Extension Canal	3.5#	1.01	71.2	9.95	36.7 (2.2, 34.5)	181.8	23.5	77.9
		1D: 1 m below slush level		4.4	<0.50	150.6*	23.98	43.0 (2.3, 40.7)	250.9	20.9#	174.9
2	Green park, Barisha	2S: Slush level	Churial Extension Canal	6.0	<0.50	126.8	22.5	91.5 (6.8, 84.7)	417.6	56.0	386.3
		2D: 1 m below slush level		7.7	<0.50	134.8	35.9*	96.7 (7.0, 89.7)	430.6	65.7	400.5

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium (Cr <sup>+6</sup> , Cr <sup>+3</sup> )	Zinc	Nickel	Copper
				(ppm)							
3	Unnayan palli, Barisha	3S: Slush level	Churial Extension Canal	6.4	0.70	105.5	10.0	78.4 (6.3, 72.1)	408.8	56.8	300.6
		3D: 1 m below slush level		7.11	1.04*	121.59	12.04	122.8 (7.8, 115)	444.27	65.44	331.62
4	Netaji palli, Purba Barisha	4S: Slush level	Churial Extension Canal	7.8	0.55#	123.5	8.46	124.7 (8.7, 116.0)	657.8	76.7	359.9
		4D: 1 m below slush level		10.30*	0.60	144.97	11.06	195.04 (11.6, 183.44)	802.2	91.1	407.1
5	Purbachal, Satyajit Park, Thakurpukur	5S: Slush level	Churial Extension Canal	3.0	<0.50	24.69#	1.76#	30.63 (1.8, 28.8)	77.9	57.5	31.1
		5D: 1 m below slush level		4.5	0.70	43.4	2.68	45.8 (3.5, 42.3)	87.8	70.5	45.5

All S samples: Surface water level - Slush Level,

All D samples: Canal bed/ slope – 1 m below slush level

**Appendix 3.** Physico chemical Properties and heavy metal concentrations of SSE STP silt and Sewage silt from different S & D works under KEIP

Sl. No.	Parameters	STP silt from cleaning of Pond		Sewage silt from cleaning/dismantling of old sewage line,							
		South Suburban East, Dhalipara	South Suburban East, Dhalipara	Khudiram Bose Road, Behala	Rabindra Pally, Kendua	R.K.Sarani, Behala	B.T.Road, Baranagore	Kamdahari, Behala	Ward 114, Behala	Ward 113, Behala	Central Park, Jadavpur
1.	Sand (%)	22.16	34.16	28.16	54.16	40.16	68.16	56.16	38.16	58.16	76.16
2.	Clay (%)	34.16	35.84	41.84	27.84	35.84	25.84	29.84	33.84	21.84	19.84
3.	Silt (%)	28.16	35.84	30.0	18.0	24.0	6.0	14.0	28.0	20.0	4.0
4.	pH (1:2.5)	7.69	8.16	7.23	7.61	8.23	7.43	7.87	7.23	7.33	8.59
5.	Bulk Density (gm./cc)	1.25	1.31	1.28	1.39	1.32	1.42	1.38	1.33	1.43	1.48
6.	Phenolic compound (mg./kg)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
7.	Lead (mg./kg)	58.37	71.35	35.67	42.16	38.91	781.62	61.62	35.67	38.91	45.40
8.	Cadmium (mg./kg)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
9.	Copper (mg./kg)	58.74	53.49	41.95	30.41	50.34	206.64	65.03	29.37	43.0	140.55
10.	Chromium (iii) (mg./kg)	96.0	96.0	96.0	90.0	90.0	108.0	108.0	96.0	96.0	102.0

Sl. No.	Parameters	STP silt from cleaning of Pond		Sewage silt from cleaning/dismantling of old sewage line,							
		South Suburban East, Dhalipara	South Suburban East, Dhalipara	Khudiram Bose Road, Behala	Rabindra Pally, Kendua	R.K.Sarani, Behala	B.T.Road, Baranagore	Kamdahari, Behala	Ward 114, Behala	Ward 113, Behala	Central Park, Jadavpur
11.	Zinc (mg./kg)	147.81	145.93	129.06	70.31	83.75	106.0	185.93	100.93	151.56	177.18
12.	Nickel (mg./kg)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.	Chromium(+6) (mg./kg)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.	Mercury (mg./kg)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.	Arsenic (mg./kg)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Appendix 4.** Noise level monitoring at different work sites of KEIP during September, 2007  
(average of 32 readings at each site within 15 minutes taken in four cardinal directions at a distance of 2 metres from the working site)

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Mean sound level in dBA	Remarks
1	SDC		XII		Green Park, Mukundapur	55.8	Sewerage & Drainage works: Plate compactor, roller and water pump working
2	SDC		XII		Purbalok	68.6	Sewerage & Drainage works: Plate compactor, roller and water pump working
3	SDC		XII		106, Gitanjali Park	72.6	Sewerage & Drainage works: water pump working
4	SDC		XII		Kamarpara, Jadavpur	72.3	Sewerage & Drainage works: roller working

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Mean sound level in dBA	Remarks
5	SDC		XI		102, Baghajatin, D-block	55.6	Sewerage & Drainage works: excavation manually
6.	SDD	2	I	5	Monmatha Dutta Rd	68.0	Sewerage & Drainage works: water pump working
7	SDD	2	I	5	Indra Biswas Road	67.3	Sewerage & Drainage works: water pump working
8	SDD	2	I	5	Tara Sankar Sarani	67.3	Sewerage & Drainage works: water pump working
9	SDD	2	I	2	Seven Tank Road	73.0	Sewerage & Drainage works: water pump working
10	SDD	3	I	1	B.T.Road	76.4	Sewerage & Drainage works: heavy vehicles plying, Water pump working
11	SDD	3	I	3	Manindra Road	70.5	Sewerage & Drainage works: water pump working
12	SDD	3	I	3	Manindra Road	71.5	Sewerage & Drainage works: water pump working, back filling excavations annually
13	SDD	1	I	1	K.K. Banerjee Rd	71.2	Sewerage & Drainage works: water pump working
14	SDD	1	I	1	Kripanath Dutta Rd	72.4	Sewerage & Drainage works: Hydra loading and manual excavation work

**Appendix 5.** Noise level monitoring at different work sites of KEIP during October, 2007  
(average of 32 readings at each site within 15 minutes taken in four cardinal directions at a distance of 2 metres from the working site)

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Mean sound level in dBA	Remarks
1	SDA	2	XIII	119	S.N.Roy Rd, Sahapur Colony	74.5	Sewerage & Drainage works: water pump and mixture machine working
2	SDA	2	XIII	81	New Alipur, B L Saha Lane	62.6	Sewerage & Drainage works: manual excavation work
3	SDA	3	XIII	115	Garaj Rd	71.5	Sewerage & Drainage works: Lowering and shoring of pipes
4	SDA	3	XIII	116	Raja Rammohan Road	72.6	Sewerage & Drainage works: hydra loading. JCP working and excavation manually

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Mean sound level in dBA	Remarks
5	SDB	2	XIV	129	M. B. Road	65.5	Sewerage & Drainage works: excavation manually and pipe lowering
6.	SDB	2	XIV	131	M.I.D. Rd	74.4	Sewerage & Drainage works: JCP, Road Roller, water pump working; heavy traffic noise
7	SDB	2	XIV	131	K.D. Bose Rd, Kalimata Colony	72.4	Sewerage & Drainage works: water pump working
8	SDB	2	XIV	131	(Airport Rd) Naba Pally	73.5	Sewerage & Drainage works: Generator and water pump working, manual excavation work
9	SDB		XIV	129	Begore Khal	68.5	Sewerage & Drainage works: water pump working and pipe lowering by chain pully
10	SDB	3	XIV	129	Gopal Mishra Rd	63.6	Sewerage & Drainage works: pipe lowering and manual excavation work
11	SDB		XIV	129	Mayo Road	66.5	Sewerage & Drainage works: pipe lowering and manual excavation work
12	SDA	1	XIV	126	Biren Roy Rd & D H Rd	71.0	Sewerage & Drainage works: pipe lowering and manual excavation work
13	SDB	1	XIV	131	Ajanta Cinema	75.6	Sewerage & Drainage works: JCP, road roller and water pump working; heavy traffic noise
14	PS-4		XII		DWF pump house	63.5	Pumping station construction; water pump working
15	SD-23		XIII	117	Canal Road	68.7	Water pump and mixture machine working

**Appendix 6.** Noise level monitoring at different work sites of KEIP during November, 2007  
(average of 32 readings at each site within 15 minutes taken in four cardinal directions at a distance of 2 metres from the working site)

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Mean sound level in dBA	Remarks
1	SDC		XII	108	VIP Nagar	55.0	Sewerage & Drainage works: dewatering by pump and plate compaction
2	SDC		XII	104	Vivek Nagar	68.5	Sewerage & Drainage works: dewatering by pump

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Mean sound level in dBA	Remarks
3	SDC		XI	101	Rabindra Pally	72.3	Sewerage & Drainage works: dewatering by pump
4	SDC		XI	102	South End Park	55.6	Sewerage & Drainage works: dewatering by pump
5	SDD	1	I	1	Sat chasi Para	72.3	Sewerage & Drainage works: dewatering by pump and excavation manually
6	SDD	2	I	3	Lala Babu Nikashi	69.9	Sewerage & Drainage works: dewatering by pump
7	SDD	2	I	5	Mabmatha Dutta Rd	68.2	Sewerage & Drainage works: dewatering by pump and pipe shoring
8	SDD	1	I	1	Gopal Chatterjee Rd	70.4	Sewerage & Drainage works: dewatering by pump
9	SDA	3	XIII	119	S N Ray Rd	74.5	Sewerage & Drainage works: mixture machine in operation
10	SDA	3	XIII	121	Raja Rammohan Roy Sarani	72.6	Sewerage & Drainage works: Hydra, JCP, dewatering pump operating
11	SDB	3	XIV	129	May Road	66.5	Sewerage & Drainage works: dewatering by pump
12	SDB	2	XIV	129	Mahendra Banerjee Rd	63.6	Sewerage & Drainage works: dewatering by pump
13	SDB	3	XIV	129	Adarsha Nagar	68.4	Sewerage & Drainage works: dewatering by pump
14	SDB	2	XIV	129	Arya Vidya Mandir	73.5	Sewerage & Drainage works: dewatering by pump
15	SDB	1	XIV	128	Biren Roy Rd (west)	71.0	Sewerage & Drainage works: dewatering by pump
16	SDA	1	XI	111	Kamdahari	75.6	Sewerage & Drainage works: dewatering by pump
17	SDA	2	XII	117	Roy Bahadur Rd	68.6	Sewerage & Drainage works: dewatering by pump

**Appendix 7.** Noise level monitoring at different work sites of KEIP during December, 2007 (average of 10 readings around each site at a distance of 1 metre from the working site)

Serial No	Borough	Ward	Package	Lot	Site	Mean noise level in dBA	Summary of activity at the site
<b>S &amp; D network construction</b>							
1	I	6	SDD	1	Lock Gate Road	97.5	Laying of pipelines for sewage water, one compressor and two jack hammer was working to break concrete road to lay sewage pipes below the road crust; heavy traffic noise from B.T.Road. One Honda Water pump (5 HP) was also running.
2	VII	56	SDF	1	Motijil Lane	73.4	Laying of NP-3 Pipe lines for sewage and drainage works being done manually. No pump was running. After four readings pump was on. No Vehicle movement was observed. After six readings pump was off. Road was partially closed.
3	VII	57	SDF	2	South Canal Road, below Railway Bridge	68.97	Light traffic movement was observed. Laying of NP-3 pipelines for sewage and drainage works being done manually. No pumping was observed.
4	VII	57	SDF	2	Kulia Tangra Second Lane	66.0	Very low traffic movement. Manual laying of pipelines. No pump, Road cutting was going on manually.
5	VII	66	SDF	2	G.J. Khan Road (Near Canal)	65.7	Laying of pipe lines going on road. No pumping of water, no traffic noise, Manual earth cutting was going on.
6	XII	109	SDC		Purbaloke (Near School)	85.2	Mixer Machine was in operation. No traffic noise and road totally closed.
7	XII	109	SDC		Pipe stack yard (near Mukundapur road)	83.2	Hydra crane was in use for pipe transferring (ACE)

Serial No	Borough	Ward	Package	Lot	Site	Mean noise level in dBA	Summary of activity at the site
8	XII	109	SDC		Mukundapur Main Road(near Pratibandhi village)	71.4	Manual laying of pipe Lines was going on. Traffic noise present. Earth cutting for pipe lines was on. No machine and no pumping operation.
9	XII	109	SDC		Mukundapur (Aahalla Nagar road connecting to Mukundapur road)	60.9	Laying of pipelines and manual construction were going on; no pumping of water; light road noise as road was partially closed.
10	XII	109	SDC		Mukundapur road (near Makali hotel) – Mukundapur-Aahalla Nagar road	60.4	Laying of pipelines and manual construction was in operation. Earth cutting for pipe lines was going on. No pump was in operation. Light road noise as road was partially closed.
11	XII	109	SDC		Nayabad, Mukundapur road	77.9	Laying of pipelines by manual process. Pump was in operation and road noise was present.
12	XII	109	SDC		Mukundapur Third Road	59.1	Earth Cutting for pipe lines of sewage water. Manually cutting. No Road Noise. No Pumping condition, road totally closed.
<b>Canal works</b>							
13	XII		CW	05	In front of International School – Intercepting channel (west of EM bypass)	82.1	Canal excavation was going on by two Tata Hitachi Excavators
14	XII		CW	05	Intercepting channel/east side of EM bypass (near Honda show room)	82.3	JCB Excavator and Tata Hitachi Excavator were in operation for Canal excavation. Road noise absent and no water pump was running.