

## MONITORING FORM

If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews. JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

### 1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
ex.) Responses/Actions to Comments and Guidance from Government Authorities	April 2017 – June 2017

### 2. Mitigation Measures

The summary of the Environmental Monitoring is shown below.

#### [Construction Phase]

Item	Parameter	Frequency and Duration	Locations( At least)
Air	PM <sub>10</sub>	2×24hours Twice/month During entire civil construction stage or even later, if directed by DMRC	20 locations
Water	Groundwater quality (IS 10500:1991)	Once/6months During entire civil construction stage or even later, if directed by DMRC	20 locations
Noise	Noise Level (Leq and Lmax)	24hours Once/week During entire civil construction stage or even later, if directed by DMRC	30 locations
Vibration	Vibration (RMS)	24hours Once/week During entire civil construction stage or even later, if directed by DMRC	10 locations
Soil	Heavy Metal	Once/6months During entire civil construction stage	In each Underground Construction Contract
Ecology	Felled and planted trees	Once a year till all trees that were to be planted by Delhi Government on behalf of DMRC, are planted	All the trees felled and newly planted trees

## [Operation Phase]

Item	Parameter	Frequency and Duration	Locations
Air	PM <sub>10</sub>	2×24hours Once/month For 3years	10 locations
Water	Effluent	Once/4months For 3years	3 locations(Depot)
	Groundwater quality (IS 10500:1991)	Once/year For 3years	3 locations(Depot)
Noise	Noise Level (Leq)	24hours Once/year For 3years	15 locations (Sensitive Receptors along the elevated section)
Vibration	Vibration level VdB	24hours Once/year For 3years	15 locations (Sensitive Receptors along the elevated and underground section)
Ecology	Bird Strike	4times/year(If no bird hit is reported in this duration, then this monitoring may be discontinued, else it will continue). From the beginning, DMRC will instruct its train operator to compulsorily blow the horn while on the bridge across the Yamuna.	On the DMRC Yamuna bridge near Okhla Bird Sanctuary

## 2.1 During Construction

## Air Quality (Ambient Air Quality)

Date: April 2017

Location: CC-04 (Azadpur) (Underground)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
PM <sub>10</sub>	µg/m <sup>3</sup>	Azadpur – 221.1 Rameshwar nagar – 195	223.6 197.4	100 (24hours) (CPCB)	-	2×24hours Twice/month During entire civil construction stage or even later, if directed by DMRC

Date: May 2017

Location: CC-79 (Okhla Phase-3) (Elevated)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
PM <sub>10</sub>	µg/m <sup>3</sup>	Activity Area– 153 Batching Plant – 161.5	157 169	100 (24hours) (CPCB)	-	2×24hours Twice/month During entire civil construction stage or even later, if directed by DMRC

Date: May 2017

Location: Janakpuri- Dabri mod CC-34 (Underground)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
PM <sub>10</sub>	µg/m <sup>3</sup>	Janakpuri – 140 Dasrathpuri – 154 Dabri Mor – 139.5	149 157 146	100 (24hours) (CPCB)	-	2×24hours Twice/month During entire civil construction stage or even later, if directed by DMRC

Date: April 2017

Location: MIE-City Park CC-43 (Elevated)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
PM <sub>10</sub>	µg/m <sup>3</sup>	MIE-187 Bus Stand- 197 City Park- 211.5 Casting Yard – 188.5	195 213 219 209	100 (24hours) (CPCB)	-	2×24hours Twice/month During entire civil construction stage or even later, if directed by DMRC

## Ground Water Quality (Drinking Water Quality: IS 10500:1991)

Date: May 2017

Location: Bahadurgarh Casting yard CC-43 (Elevated)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Color, Hazen units, Max			Colourless	5(25)	-	20 locations Once/6 months  During entire civil construction stage or even later, if directed by DMRC
Odour	-		Unobjectionable	Unobjectionable	-	
Taste	-		Agreeable	Agreeable	-	
Turbidity, NTU, Max	-		1.65	5(10)	-	
pH Value	-		7.73	6.5-8.5	-	
Total Hardness (as CaCO <sub>3</sub> ), Max	mg/l		349*	300(600)	-	
Iron(as Fe), max	mg/l		0.09	0.3(1.0)	-	
Chloride(as Cl), Max	mg/l		179	250(1000)	-	
Residual free Chlorine, Min	mg/l		Nil	0.2	-	
Fluoride(as F), Max	mg/l		3.26*	1.0(1.5)	-	
Dissolved solids, Max	mg/l		2719*	500(2000)	-	
Calcium(as Ca), Max	mg/l		-----	75(200)	-	
Magnesium(as Mg), Max	mg/l		-----	30(100)	-	
Copper(as Cu), Max	mg/l		BDL	0.05(1.5)	-	

Manganese(as Mn), Max	mg/l		BDL	0.1(0.3)	-
Sulphate(as SO <sub>4</sub> ), Max	mg/l		259*	200(400)	-
Nitrate(as NO <sub>2</sub> ), Max	mg/l		61.3*	45(100)	-
Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), Max	mg/l		BDL	0.001(0.002)	-
Mercury(as Hg), Max	mg/l		BDL	0.001	-
Cadmium(as Cd), Max	mg/l		BDL	0.01	-
Selenium(as Se), Max	mg/l		BDL	0.01	-
Arsenic( as As), Max	mg/l		BDL	0.05	-
Cyanide(as CN), Max	mg/l		BDL	0.05	-
Lead(as Pb), Max	mg/l		BDL	0.05	-
Zinc(as Zn), Max	mg/l		0.04	5(15)	-
Anionic Detergents (as MBAS), Max	mg/l		BDL	0.2(1.0)	-
Chromium (as Cr <sup>6+</sup> ), Max	mg/l		BDL	0.05	-
Polynuclear aromatic hydrocarbons( as PAH), Max	mg/l		BDL	-	-
Mineral Oil	mg/l		-----	0.01	-
Pesticides, Max	mg/l		-----	Absent	-
Radioactive Materials, Max a) Alpha emitters	Bq/l		-----	-(0.1)	-
Radioactive Materials, Max b) Beta emitters	Pci/l		-----	-(1)	-
Alkalinity, Max	mg/l		141.3	200(600)	-
Aluminum(as Al), Max	mg/l		BDL	0.03(0.2)	-
Boron, Max	mg/l		BDL	1(5)	-

Date: April 2017

Location: Ramp CC-66 (Underground)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Color, Hazen units, Max			Colourless	5(25)	-	20 locations Once/6 months
Odour	-		Unobjectionable	Unobjectionable	-	
Taste	-		Agreeable	Agreeable	-	During entire civil construction stage or even later, if directed by DMRC
Turbidity, NTU, Max	-		1.87	5(10)	-	
pH Value	-		7.85	6.5-8.5	-	
Total Hardness (as CaCO <sub>3</sub> ), Max	mg/l		287	300(600)	-	
Iron(as Fe), max	mg/l		.14	0.3(1.0)	-	
Chloride(as Cl), Max	mg/l		159	250(1000)	-	
Residual free Chlorine, Min	mg/l		Nil	0.2	-	
Fluoride(as F), Max	mg/l		2.56*	1.0(1.5)	-	
Dissolved solids, Max	mg/l		1798	500(2000)	-	
Calcium(as Ca), Max	mg/l		—	75(200)	-	
Magnesium(as Mg), Max	mg/l		—	30(100)	-	
Copper(as Cu), Max	mg/l		BDL	0.05(1.5)	-	
Manganese(as Mn), Max	mg/l		BDL	0.1(0.3)	-	
Sulphate(as SO <sub>4</sub> ), Max	mg/l		97	200(400)	-	
Nitrate(as NO <sub>2</sub> ), Max	mg/l		61.7	45(100)	-	
Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), Max	mg/l		BDL	0.001(0.002)	-	
Mercury(as Hg), Max	mg/l		BDL	0.001	-	
Cadmium(as Cd), Max	mg/l		BDL	0.01	-	
Selenium(as	mg/l		BDL	0.01	-	

Se), Max						
Arsenic(as As), Max	mg/l		BDL	0.05	-	
Cyanide(as CN), Max	mg/l		BDL	0.05	-	
Lead(as Pb), Max	mg/l		BDL	0.05	-	
Zinc(as Zn), Max	mg/l		1.68	5(15)	-	
Anionic Detergents (as MBAS),Max	mg/l		-----	0.2(1.0)	-	
Chromium (as Cr6+),Max	mg/l		-----	0.05	-	
Polynuclear aromatic hydrocarbons( as PAH),Max	mg/l		BDL	-	-	
Mineral Oil	mg/l		-----	0.01	-	
Pesticides, Max	mg/l		-----	Absent	-	
Radioactive Materials, Max c) Alpha emitters	Bq/l		-----	-(0.1)	-	
Radioactive Materials, Max d) Beta emitters	Pci/l		-----	-(1)	-	
Alkalinity, Max	mg/l		148.9	200(600)	-	
Aluminum(as Al), Max	mg/l		BDL	0.03(0.2)	-	
Boron,Max	mg/l		BDL	1(5)	-	

Date: April 2017

Location: BP CC-66 (Underground)

Item	Unit	Measure d Value (Mean)	Measured Value (Max.)	Country's Standards	Referred Internation al Standards	Remarks (Measurem ent Point, Frequency, Method, etc.)
Color,Hazen units,Max			Colourless	5(25)	-	20 locations Once/6 months
Odour	-		Unobjectio nable	Unobjection able	-	
Taste	-		Agreeable	Agreeable	-	During entire civil construction stage or even later, if directed by DMRC
Turbidity,NTU, Max	-		1.54	5(10)	-	
pH Value	-		7.78	6.5-8.5	-	
Total Hardness (as CaCO <sub>3</sub> ), Max	mg/l		129.6	300(600)	-	

Iron(as Fe), max	mg/l		0.07	0.3(1.0)	-
Chloride(as Cl), Max	mg/l		59	250(1000)	-
Residual free Chlorine, Min	mg/l		.18	0.2	-
Fluoride(as F), Max	mg/l		1.27	1.0(1.5)	-
Dissolved solids, Max	mg/l		657	500(2000)	-
Calcium(as Ca), Max	mg/l		—	75(200)	-
Magnesium(as Mg), Max	mg/l		—	30(100)	-
Copper(as Cu), Max	mg/l		BDL	0.05(1.5)	-
Manganese(as Mn), Max	mg/l		BDL	0.1(0.3)	-
Sulphate(as SO <sub>4</sub> ), Max	mg/l		47	200(400)	-
Nitrate(as NO <sub>2</sub> ), Max	mg/l		17.4	45(100)	-
Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), Max	mg/l		BDL	0.001(0.002)	-
Mercury(as Hg), Max	mg/l		BDL	0.001	-
Cadmium(as Cd), Max	mg/l		BDL	0.01	-
Selenium(as Se), Max	mg/l		BDL	0.01	-
Arsenic( as As), Max	mg/l		BDL	0.05	-
Cyanide(as CN), Max	mg/l		BDL	0.05	-
Lead(as Pb), Max	mg/l		BDL	0.05	-
Zinc(as Zn), Max	mg/l		.69	5(15)	-
Anionic Detergents (as MBAS), Max	mg/l		—	0.2(1.0)	-
Chromium (as Cr <sup>6+</sup> ), Max	mg/l		BDL	0.05	-
Polynuclear aromatic	mg/l		BDL	-	-



hydrocarbons(as PAH),Max					
Mineral Oil	mg/l		-----	0.01	-
Pesticides, Max	mg/l		-----	Absent	-
Radioactive Materials, Max e) Alpha emitters	Bq/l		-----	-(0.1)	-
Radioactive Materials, Max f) Beta emitters	Pci/l		-----	-(1)	-
Alkalinity, Max	mg/l		109.4	200(600)	-
Aluminum(as Al), Max	mg/l		BDL	0.03(0.2)	-
Boron,Max	mg/l		BDL	1(5)	-

Date:

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Color, Hazen units, Max				5(25)	-	20 locations Once/6 months
Odour	-			Unobjectionable	-	
Taste	-			Agreeable	-	During entire civil construction stage or even later, if directed by DMRC
Turbidity, NTU, Max	-			5(10)	-	
pH Value	-			6.5-8.5	-	
Total Hardness (as CaCO <sub>3</sub> ), Max	mg/l			300(600)	-	
Iron(as Fe), max	mg/l			0.3(1.0)	-	
Chloride(as Cl), Max	mg/l			250(1000)	-	
Residual free Chlorine, Min	mg/l			0.2	-	
Fluoride(as F), Max	mg/l			1.0(1.5)	-	
Dissolved solids, Max	mg/l			500(2000)	-	
Calcium(as Ca), Max	mg/l			75(200)	-	
Magnesium(as Mg), Max	mg/l			30(100)	-	
Copper(as Cu), Max	mg/l			0.05(1.5)	-	
Manganese(as Mn), Max	mg/l			0.1(0.3)	-	

Sulphate(as SO <sub>4</sub> ), Max	mg/l			200(400)	-
Nitrate(as NO <sub>2</sub> ), Max	mg/l			45(100)	-
Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), Max	mg/l			0.001(0.002)	-
Mercury(as Hg), Max	mg/l			0.001	-
Cadmium(as Cd), Max	mg/l			0.01	-
Selenium(as Se), Max	mg/l			0.01	-
Arsenic( as As), Max	mg/l			0.05	-
Cyanide(as CN), Max	mg/l			0.05	-
Lead(as Pb), Max	mg/l			0.05	-
Zinc(as Zn), Max	mg/l			5(15)	-
Anionic Detergents (as MBAS), Max	mg/l			0.2(1.0)	-
Chromium (as Cr <sup>6+</sup> ), Max	mg/l			0.05	-
Polynuclear aromatic hydrocarbons( as PAH), Max	mg/l			-	-
Mineral Oil	mg/l			0.01	-
Pesticides, Max	mg/l			Absent	-
Radioactive Materials, Max g) Alpha emitters	Bq/l			-(0.1)	-
Radioactive Materials, Max h) Beta emitters	Pci/l			-(1)	-
Alkalinity, Max	mg/l			200(600)	-
Aluminum(as Al), Max	mg/l			0.03(0.2)	-
Boron, Max	mg/l			1(5)	-

## Noise / Vibration

Date: April 2017

Location: CC-04 (Azadpur) (Underground)

Item	Unit	Measured Value (L <sub>eq</sub> )	Measured Value (L <sub>Max</sub> )	Country's Standards (Environmental Management Manual by DMRC)	Occupancy	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level (Leq) and Lmax	dB(A)	Rameshwar Leq(day) – 69.3 Leq(night)–55.2 Lmin- 52.2  Azadpur Leq(day)- 67.2 Leq(night)–60.3 Lmin- 53.8	73.6  72.6	<u>National Standards</u> Area                      Leq(d) <u>Leq(n)</u> Resi                      55 45 Comm                      65 55 Indstl                      75 70 Silence                      50 40  <u>DMRC Env Manual</u> (when pre construction levels are not known) Resi Lmax Daytime: 75 Nighttime: 65 Comm & and Indstl At all time: 85	Commercial / residence	30 locations 24hours/time Once/week  During entire civil construction stage or even later, if directed by DMRC
Vibration level	RMS (mm/s)			Structures in good condition:25 in fair condition:12 in poor condition:5 Water supply Structures:5 Heritage structure/ Bridge structures:5		10 locations 24hours/time Once/week  During entire civil construction stage or even later, if directed by DMRC

Date: May 2017

Location: CC-79 (Okhla Phase-III) (Elevated)

Item	Unit	Measured Value (L <sub>eq</sub> )	Measured Value (L <sub>Max</sub> )	Country's Standards (Environmental Management Manual by DMRC)	Occupancy	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level (L <sub>eq</sub> ) and L <sub>max</sub>	dB(A)	Activity Area Leq(Day)-71.2 Leq(night)-63.9 Lmin- 43.0  Batching Plant Leq(Day) - 68.0 Leq(night)-62.1 Lmin - 43.5	85.6  85.3	<u>National Standards</u> Area                      Leq(d) <u>Leq(n)</u> Resi                      55 45 Comm                      65 55 Indstl                      75 70 Silence                      50 40  <u>DMRC Env Manual</u> (when pre construction levels are not known) Resi Lmax Daytime: 75 Nighttime: 65 Comm & and Indstl At all time: 85.	Commercial / residence	30 locations 24hours/time Once/week  During entire civil construction stage or even later, if directed by DMRC
Vibration level	RMS (mm/s)			Structures in good condition:25 in fair condition:12 in poor condition:5 Water supply Structures:5 Heritage structure/ Bridge structures:5		10 locations 24hours/time Once/week  During entire civil construction stage or even later, if directed by DMRC

Date: April 2017

Location: CC-43(MIE- City Park) (Elevated)

Item	Unit	Measured Value (L <sub>eq</sub> )	Measured Value (L <sub>Max</sub> )	Country's Standards (Environmental Management Manual by DMRC)	Occupancy	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level (Leq) and Lmax	dB(A)	Casting Yard Leq(Day) – 73.1 Leq(night)–65.3 Lmin - 42.1  Bus Stand Leq (day) – 72.9 Leq(Night)–63.7 Lmin – 46.5  City Park Leq(Day) – 68.4 Leq(Night)-60.5 Lmin – 43.2  MIE Leq (Day)- 71.5 Leq(Night)-63.4 Lmin – 51.6	80.8  85.2  81.7  82.8	<u>National Standards</u> Area Leq(d) Resi 55 45 Comm 65 55 Indstl 75 70 Silence 50 40  <u>DMRCEnv Manual</u> (when pre construction levels are not known) Resi: Lmax Daytime: 75 Nighttime: 65 Comm & and Indstl. At all time: 85	Commercial / residence	30locations 24hours/time Once/week  During entire civil construction stage or even later, if directed by DMRC
Vibration level	RMS (mm/s)			Structures in good condition:25 in fair condition:12 in poor condition:5 Water supply Structures:5 Heritage structure/ Bridge structures:5		10locations 24hours/time Once/week  During entire civil construction stage or even later, if directed by DMRC

Date: May 2017

Location: CC-34 (Janakpuri-Dabri mod) (Underground)

Item	Unit	Measured Value ( $L_{eq}$ )	Measured Value ( $L_{Max}$ )	Country's Standards (Environmental Management Manual by DMRC)	Occupancy	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level (Leq) and Lmax	dB(A)	Janakpuri Leq (Day)- 66.8 Leq(night)-60.7 Lmin- 42.4  Dabri mod Leq(Day) – 68.5 Leq(night)-61.2 Lmin – 47.3  Dasrathpuri Leq(Day) – 70.2 Leq(night)-60.8 Lmin – 45.8	80.6   80.3   83.0	<u>National Standards</u> Area                      Leq(d) <u>Leq(n)</u> Resi                      55 45 Comm                      65 55 Indstl                      75 70 Silence                      50 40  <u>DMRC Env Manual</u> (when pre construction levels are not known) Resi Lmax Daytime: 75 Nighttime: 65 Comm & and Indstl At all time: 85	Commercial / residence	30locations 24hours/time Once/week  During entire civil construction stage or even later, if directed by DMRC
Vibration level	RMS (mm/s)			Structures in good condition:25 in fair condition:12 in poor condilion:5 Water supply Structures:5 Heritage structure/ Bridge structures:5		10locations 24hours/time Once/week  During entire civil construction stage or even later, if directed by DMRC

## Excavated soil (Leaching test)

Date: April, 2017

Location: Ramp Area CC-66

Item	Unit	Measured Value (Mean)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Mercury(as Hg)	mg/l	ND	-	0.0005	In each Underground Construction Contract Once/6months During entire civil construction stage Samples should be taken from the underground lowest point.
Cadmium(as Cd)	mg/l	ND	-	0.01	
Arsenic( as As)	mg/l	ND	-	0.01	
Cyanide(as CN)	mg/l	ND	-	Not detected	
Lead(as Pb)	mg/l	ND	-	0.01	
Chromium(as Cr6 <sup>+</sup> )	mg/l	ND	-	0.05	

Date:

Location:

Item	Unit	Measured Value (Mean)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Mercury(as Hg)	mg/l		-	0.0005	In each Underground Construction Contract Once/6months During entire civil construction stage Samples should be taken from the underground lowest point.
Cadmium(as Cd)	mg/l		-	0.01	
Arsenic( as As)	mg/l		-	0.01	
Cyanide(as CN)	mg/l		-	Not detected	
Lead(as Pb)	mg/l		-	0.01	
Chromium(as Cr6 <sup>+</sup> )	mg/l		-	0.05	

## Excavated soil (Amount)

Date:

Line	Excavated Amou Approx.('000 m <sup>3</sup> )	Name of Disposed Site	Disposed Amount Approx.('000 m3)
Line-2			
Line-6*			
Line-7*			

Line-8*			
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### Ecological Monitoring (Flora Monitoring)

CPM	Permission to fell trees	No. of trees actually felled	No. of trees planted	No. of trees transplanted	Location of plantation
CPM-1	Nil	Nil	Nil	Nil	-
CPM-2					
CPM-3					
CPM-4	Nil	Nil	Nil	Nil	
CPM-5	Nil	Nil	10	Nil	Palam Station
CPM-6					
CPM-7	Nil	Nil	Nil	Nil	
CPM-8	Nil	Nil	Nil	Nil	
CPM-9					
CPM-10	513	Nil	Nil	Nil	
ED/Tech					

\* The data collection for soil excavation & tree cutting is under process and complete details will be provided in next report.



## 2.2 During Operation

## Air Quality (Ambient Air Quality)

Date

Location:

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
PM <sub>10</sub>	µg/m <sup>3</sup>			100 (24hours) (CPCB)	IS 5182 (Part 23)	48hours/time Once/month For 3 years

## Effluent at Depot

Date:

Location:

Item	Unit	Measured Value (Mean)		Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
		Inlet	Outlet				
pH	-			-	5.5-9.0	-	(Depot) Once/4months For 3 years
TSS	mg/l			-	100	-	
BOD	mg/l			-	30	-	
COD	mg/l			-	250	-	
Oil/Grease	mg/l			-	10	-	

## Ground Water Quality (Drinking Water Quality: IS 10500:1991)

Date:

Location:

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Color, Hazen units, Max	-		-	5(25)	-	(Depot) Once/year For 3years
Odour	-		-	Unobjectionable	-	
Taste	-		-	Agreeable	-	
Turbidity, NTU, Max	-		-	-	-	
pH Value	-		-	6.5-8.5	-	
Total Hardness (as CaCO <sub>3</sub> ), mg/l	mg/l		-	300(600)	-	

Max					
Iron(as Fe), max	mg/l		-	0.3(1.0)	-
Chloride(as Cl), Max	mg/l		-	250(1000)	-
Residual free Chlorine, Min	mg/l		-	0.2	-
Fluoride(as F), Max	mg/l		-	1.0(1.5)	-
Dissolved solids, Max	mg/l		-	500(2000)	-
Calcium(as Ca), Max	mg/l		-	75(200)	-
Magnesium(as Mg), Max	mg/l		-	30(100)	-
Copper(as Cu), Max	mg/l		-	0.05(1.5)	-
Manganese(as Mn), Max	mg/l		-	0.1(0.3)	-
Sulphate(as SO <sub>4</sub> ), Max	mg/l		-	200(400)	-
Nitrate(as NO <sub>2</sub> ), Max	mg/l		-	45(100)	-
Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), Max	mg/l		-	0.001(0.002)	-
Mercury(as Hg), Max	mg/l		-	0.001	-
Cadmium(as Cd), Max	mg/l		-	0.01	-
Selenium(as Se), Max	mg/l		-	0.01	-
Arsenic( as As), Max	mg/l		-	0.05	-
Cyanide(as CN), Max	mg/l		-	0.05	-
Lead(as Pb), Max	mg/l		-	0.05	-
Zinc(as Zn), Max	mg/l		-	5(15)	-
Anionic Detergents (as MBAS), Max	mg/l		-	0.2(1.0)	-
Chromium (as Cr <sup>6+</sup> ), Max	mg/l		-	0.05	-
Polynuclear aromatic hydrocarbons(a s PAH), Max	mg/l		-	-	-
Mineral Oil	mg/l		-	0.01	-
Pesticides, Max	mg/l		-	Absent	-
Radioactive Materials, Max	Bq/l		-	-(0.1)	-

i) Alpha emitters						
Radioactive Materials, Max j) Beta emitters	Pci/l					
Alkalinity, Max	mg/l		-	200(600)	-	
Aluminum(as Al), Max	mg/l		-	0.03(0.2)	-	
Boron,Max	mg/l		-	1(5)	-	

## Noise / Vibration

Date:

Location:

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level	dB				[Railway Noise] Daytime- 60 Night time- 55	15 Location 24 hours Once in a year at sensitive receptors along the elevated section from train operation..

Date:

Location:

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)

Vibration level	mm/s				FTA standard	As and when compliant arises.

**Ecological Monitoring (Bird Strike near Okhla Bird Sanctuary)**

Date:

Location:

Duration: From / / to / /

Item	Number of Interviews with Train Operators who reported the accident during monitoring period	Number of Accidents Reported during the monitoring period	Name of Species lost in the accident	Remarks (Place of accident, frequency, Method, etc.)
Train Accidents involving bird fatality				4times/year For 2years Visual observation (If no bird hit is reported in this duration, then this monitoring may be discontinued, else it will continue). From the beginning, DMRC will instruct its train operator to compulsorily blow the horn while on the bridge across the Yamuna.

JICA Reply (Jan-Mar, 2017)

Air Monitoring

Location	NAAQS PM <sub>10</sub> (Unit µg/m <sup>3</sup> )	Baseline data PM <sub>10</sub> (Unit µg/m <sup>3</sup> )	Monitoring Results	Remarks, if any	
Lajpat Nagar	100	169	197		
Sarai Kale Khan			210		
Nizamuddin			215		
Ashram			212		
Vinobapuri			204		
MIA			367		
Ghevra		319	No Monitoring	385	
Tikri Kalan		357			
Tikri Border		274			
Johri Enclave		284			
Shiv vihar		315			
CC-41 casting yard		194		242	208
Naraina		198			
Mayapuri		189			
BRO					
Batching Plant CC-20					

**Reason for high values:**

1. The results are from monitoring conducted in winter season. In winter season, the air pollution in Delhi-NCR is at its worst and for this reason; the supreme court of India has mandated the EPCA (Environment Pollution Control Authority) to come up with a Graded Action Response Plan.
2. The reasons of air pollution in Delhi are beyond the control of citizens of Delhi though vehicular and other pollution aspects are contributing to it.
3. The main reason of air pollution is crop & stubble burning in North Indian states especially in Punjab, Haryana and Uttarpradesh. Delhi being on the downwind area has to bear the pollution burnt entering in to the Delhi region.
4. Low Wind velocity and thermal inversion during winter agglomerate the problem.

**Measures Taken:**

Since the values were higher than NAAQS Standard, In addition to EPCA suggested measures, DMRC issued advisory to the contractor to reduce air pollution.

Noise Reply

Location	Area/ Zone	CPCB Limit (dBA)		Monitored Values* (dBA)		Remarks, if any
		Day	Night	Leq (day)	Leq(night )	
Sarai Kale Khan	Commercial	65	55	68.4	57.4	

Nizamuddin	Commercial	65	55	<b>66.4</b>	54.3
MIA	Industrial	75	70	71.3	62.6
Ghevra	Commercial	65	55	<b>67.9</b>	<b>63.1</b>
Tikri Kalan	Commercial	65	55	<b>68.4</b>	<b>62.8</b>
Tikri Border	Commercial	65	55	<b>70.4</b>	<b>66.9</b>
Mundka Casting Yard	Industrial	75	65	70.2	62.6
Johri Enclave	Commercial	65	55	<b>76.3</b>	<b>65.7</b>
Shiv vihar	Commercial	65	55	<b>71.4</b>	<b>65.9</b>
CC-41 casting yard (GTB)	Residential	55	45	<b>68</b>	<b>62.8</b>
Mayapuri	Residential	55	45	<b>69.4</b>	<b>58.7</b>
BRO	Silent	50	40	<b>67.2</b>	<b>56.8</b>
Batching Plant CC-20	Residential	55	45	<b>70.6</b>	<b>59.3</b>

\*Bold indicates the values are higher than the national standard

#### Reason for higher values:

1. Most of the elevated stations are being constructed on above or by the side of busy roads such as Ring Road, National highways and State highways. Therefore, at these locations the ambient noise due to high traffic movement is already higher than the national standards.

#### Measures taken:

Following are some of the steps taken for the comfort of receptors:

1. Noise barriers have been installed at most of the sites which are nearby residential colonies.
2. Noise generating activities are planned such that two heavy noise generating activities should not carry out simultaneously.
3. DG sets at site have been provided with acoustic enclosures.

#### Ground Water Monitoring

Location	Monitoring results		Standards Value	Remarks, if any
	Particular	value	Value	
Sarita Vihar	Fluoride	3.56	1(1.5)	
	Nitrate	55.2	45(100)	
Shakarpur	Taste	Disagreeable	Agreeable	Ground Water is not used for drinking purpose here

#### Reason:

1. In this location, baseline monitoring was not carried out at the site earlier due to land issues. Although Construction activities are not a cause of fluoride discharge that would have discharged into ground water. Hence, this can be considered as characteristic of that aquifer from where sample has been taken.