MINISTRY OF ENVIRONMENT AND FORESTS

NOTIFICATION

New Delhi, the 17 June, 2005

S. O. 2151.— WHEREAS the Water Quality Assessment Authority (WQAA) was constituted by the Central Government vide Order No. S.O. 583 (E) dated the 29th May, 2001 and No. S.O. 635(E) dated the 27th October, 2004 to exercise powers under section 5 of the Environment(Protection) Act, 1986(29 of 1986) for issuing directions and for taking measures with respect to matters referred to in clauses(ix),(xi), (xii) and (xiii) of sub-section(2) of section 3 of the said Act and to standardise method(s) for water quality monitoring and to ensure quality of data generation for utilization thereof and certain other purposes;

AND WHEREAS it is necessary and expedient to evolve water quality assessment and monitoring protocol as directed by the Water Quality Assessment Authority in order to maintain uniformity in the procedure for water quality monitoring mechanism by all monitoring agencies, departments, Pollution Control Boards and such other agencies so that water related action plans may be drawn up on the basis of reliable data;

AND WHEREAS the uniform process on water quality monitoring shall provide frequency of monitoring, procedure for sampling, parameters for analysis, analytical techniques, quality assurance and quality control system, infrastructure requirement for laboratories, procedure for data processing, reporting and dissemination and such other matters as the Central Government deems necessary for the said purpose, both for surface and ground water;

AND WHEREAS due to the deterioration of the river water quality, health and livelihood of the downstream people are being severely affected and concerns are raised time and again;

AND WHEREAS the immediate maintenance and restoration of 'wholesomeness' of the river water quality is the mandate under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) and that of maintenance of the ground water quality by the Central Ground Water Authority constituted under the provisions of the Environment (Protection) Act, 1986;

AND WHEREAS sub-rule(4) of rule 5 of the Environment(Protection) Rules, 1986, provides that whenever it appears to the Central Government that it is in public interest to do so, it may dispense with the requirement of notice under clause(a) of sub-rule(3) of the said rules";

AND WHEREAS the Central Government is of the opinion that it is in public interest to dispense with the requirement of notice under clause(a) of sub-rule(3) of rule 5 of the said rules to issue the Order.

NOW, THEREFORE, in exercise of the powers conferred by section 3 of the Environment (Protection) Act, 1986, the Central Government hereby makes the following order, namely:-

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1. Short title and commencement.-

(a) This order may be called the Uniform Protocol on Water Quality Monitoring Order, 2005".

(b) It shall come into force on the date of its publication in the Official Gazette.

2. Application.- It shall apply to all organizations, agencies and any other body monitoring surface and ground water quality for observance of uniform protocol on water quality monitoring.

3. Definitions.-

In this Order, unless the context otherwise requires,-

(1) **"agencies"** means water quality monitoring agencies(government or non-government, local bodies) and other organizations including research and academic institutions involved in water quality monitoring of surface and ground waters;

(2) **"Authority"** means the Water Quality Assessment Authority (WQAA) constituted under sub-sections (1) and (2) of section 3 of the Environment (Protection) Act, 1986;

(3) **"Baseline stations"** means the monitoring location where there is no influence of human activities on water quality;

(4) **"Flux stations or Impact stations"** means the location for measuring the mass of particular pollutant on main river stem for measuring the extent of pollution due to human interference or geological feature at any point of time and is necessary for measuring impact of pollution control measures adopted;

(5) **"monitoring"** means standardised measurements of identified parameters in order to define status and trends of water quality;

(6)**"protocol"** means a system of uniform water quality monitoring mechanism developed by the Water Quality Assessment Authority constituted under sub-sections (1) and (3) of section 3 of the Environment (Protection) Act, 1986;

(7) **"Quality Assurance Programme"** means a programme described in paragraph 12 of this Order.

(8) **"Trend station"** means the monitoring location designed to show how a particular point on a watercourse varies over time due, normally, to the influence of man's activities;

(9) **"water quality monitoring network"** means a systematic planning for collection, preservation and transportation, storage, analysis of water samples and dissemination of data for national water bodies restricted to surface and ground water in the country.

4. Monitoring station and frequency of sampling.-

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(1) The frequency of sampling in respect of surface water shall be as follows:-

(a) all the stations shall be a combination of Baseline, Trend and Flux or Impact stations.

(b) the Baseline stations shall be monitored four times a year for perennial rivers and lakes and three to four times a year for seasonal rivers. Trend stations shall be monitored with an increased frequency of once in a month i.e. twelve times in a year. Flux or Impact stations shall be monitored twelve to twenty-four times in a year depending upon pollution potential or importance of water use.

(c) all agencies shall follow the sampling frequency and parameters for analysis of surface water as mentioned in the Table-I given below:-

Table-I
Frequencies and parameters for analysis of surface water samples

1 Type of Station	2 Frequency	3 Parameters
Baseline:	**Perennial rivers and Lakes:** Four times a year (seasonal) **Seasonal rivers:** 3-4 times (at equal spacing) during flow period. **Lake:** 4 times a year (seasonal)	**(A) Pre-monsoon**: Once a year Analyse 25 parameters as listed below : **(a)General** : Colour, odour, temperature, pH, Electrical Conductivity (EC), Dissolved Oxygen (DO), Turbidity, Total Dissolved Solid (TDS) **(b) Nutrients**: Ammoniacal Nitrogen (NH_3-N), Nitrite & Nitrate Nitrogen ($NO_2 + NO_3$), Total Phosphate (Total ?) **(c)Demand parameters**: Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) **(d)Major ions** : Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Carbonate (CO_3), Bicarbonate (HCO_3), Chloride (Cl), Sulphate (SO_4) **(e)Other inorganic**: Fluoride (F), Boron (B) and other location specific parameter, if any **(f)Microbiological**: Total coliform and Faecal Coliform **(B)Rest of the year** (after the pre-monsoon sampling) at every three months' interval. Analyse 10 parameters: Colour, Odour, Temperature, pH, EC, DO, $NO_2 + NO_3$, BOD, Total coliform and Faecal Coliform.
Trend or Impact or Flux:	Once every month starting April-May (pre-monsoon), i.e. 12 times a year	**(A)Pre-monsoon** Analyse 25 parameters as listed for baseline monitoring **(B)Other months** : Analyse 15 parameters as listed below **(a)General** : Colour, Odour, Temp, pH, EC, DO and Turbidity **(b)Nutrients** : NH_3-N, $NO_2 + NO_3$, Total P **(c)Organic Matter**: BOD, COD **(d)Major ions** : Cl **(e)Microbiological** : Total and Faecal coliforms **(C)Micropollutant** Once in a year / pre monsoon

		(i)Pesticides-Alpha Benzenehexachloride (BHC), Beta BHC, Gama BHC (Lindane), OP-Dichlorodiphenyltrichloroethane (OP-DDT), PP-DDT, Alpha Endosulphan, Beta Endosulphan, Aldrin, Dieldrin, Carbaryl (Carbamate), Malathian, Methyl Parathian, Anilophos, Chloropyriphos (ii)Toxic Metals-Arsenic (As), Cadmium (Cd), Mercury (Hg), Zinc (Zn), Chromium (Cr), Lead (Pb), Nickel (Ni), Iron (Fe) (The parameters may be selected based on local need).

Note: (i) The parameters mentioned in the above Table shall be the minimal requirement. This does not, however, restrict analysis of more parameters depending upon the specific requirements of the analysing agency and its manpower availability.

(ii) For lakes or reservoirs, monitoring of additional parameters, like total Kjeldhal Nitrogen, Chlorophyll, total Plankton count and productivity, shall be included in the list of parameters.

(iii) If biomonitoring is done in river or lakes or reservoirs, additional specific parameters are to be considered.

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(2) Ground Water

The frequency of sampling in respect of ground water shall be as follows:

(a) all stations shall be classified as Baseline stations.

(b) 20-25 % of Baseline stations shall be classified as Trend stations where there is a perceived problem.

(c) all agencies shall follow the sampling frequency and parameters for analysis of ground water as mentioned in the Table-2 given below:-

Table -2

Frequencies and parameters for analysis of Ground Water samples

1	2	3
Type of Station	**Frequency**	**Parameters**
Baseline	Twice a year (Pre and Post monsoon season)	(A) **Pre and Post Monsoon Season**: Analyse 20 parameters as listed below:- (a) General: Colour, odour, temperature, pH, EC, TDS (b) Nutrients: NO_2 + NO_3, orthophosphate (c) Demand Parameter: COD (d) Major Ions: Na^+, K^+, Ca^{++}, Mg^{++}, CO_3^{--}, HCO_3^-, Cl^-, SO_4^{--}, %Na & SAR (e) Other inorganics: F, B and other location-specific parameter, if any
Trend	Twice a year (pre and post	(A) April-May: Analyse 20 parameters as listed for Baseline monitoring. (B) Other times: Analyse 14 parameters as listed below:-

	monsoon)	(f) General: Colour, odour, temp, EC, pH, TDS, %Na & SAR (a) Nutrients: NO2+NO3, orthophosphate (b) Demand parameter: COD (c) Major ions : Cl (d) Other inorganics : F,B (e) Microbiological: Total coliform and faecal coliform (C) Micropollutant (parameters may be selected based on local need) (2) Pesticides – Alpha BHC, Beta, BHC, Gama BHC (Lindane), OP-DDT, PP-DDT, Alpha Endosulphan, Beta Endosulpham, Aldrin, Dieldrin, 2, 4-D, Carbaryl (Carbamate), Malathian, Methyl, Parathian, Amlphos, Chloropyriphos. (3) Toxic Metals-As, Cd, Hg, Zn, Cr, Pb, Ni, Fe (Pesticides and Toxic metals may be analysed once a year in pre monsoon on selected locations).

Note:- (i) The parameters mentioned in the above Table shall be the minimal requirement. This does not, however, restrict analysis of more parameters depending upon the specific requirements of the analysing agency and its manpower availability.

(ii) If Chemcial Oxygen Demand(COD) value exceeds 20 mg/l, the sample shall be analysed for Biochemical Oxygen Demand(BOD) also.

5. Sample Collection.

(1) The procedure for sample collection in respect of surface water shall be as under:

(a) samples for Baseline and Trend stations shall be collected from well-mixed section of the river or main stem 30 cm below the water surface using a Dissolved Oxygen (DO) sampler or weighted bottle.

(b) samples for Impact stations shall be collected from the point of interest, such as bathing ghat, down stream of point discharge, water supply intakes and other sources.

(c) the Dissolved Oxygen (DO) in the sample shall be fixed immediately after collection and Dissolved Oxygen (DO) analysis shall be done either in the field or in laboratory.

(2) The procedure for sample collection in respect of ground water shall be as under:

(a) open dug wells, which are not in use or have been abandoned, shall not be considered as water quality monitoring station. However, such well could be considered for water level monitoring.

(b) weighted sample bottle to collect sample from an open well about 30 cm below the surface of water may be used. The plastic bucket, which is likely to skim the surface layer only, shall not be used.

(c) samples from the production tube wells shall be collected after running the well for about five minutes.

(d) non-production piezometers shall be purged using a submersible pump. The purged water volume shall equal 4 to 5 times the standing water volume, before sample is collected.

(e) for bacteriological samples, when collected from tube wells or hand pump, the spout or outlet of the pump shall be sterilized under flame by spirit lamp before collection of sample in container.

6. Sample preservation and transportation.

(1) The type of containers and sample preservation to be adopted shall be as mentioned in the Table-3 below:

Table-3

1	2	3
Analysis	Container	Preservation
General	Glass, PE	4^0C, dark
BOD	Glass, PE	4^0C, dark
COD, NH_3, NO_2, NO_3	Glass, PE	H_2SO_4, PH<2
Coliform	Glass, PE, Sterilised	4^0C, dark
DO	BOD bottle	DO fixing chemicals
Fluoride	PE	None
P	Glass	None
Pesticides	Glass, Teflon	4^0C, dark
Toxic metals	Glass, PE	HNO3, PH<2

(2) Samples shall be transported to concerned laboratory as soon as possible, preferably within forty-eight hours of collection.

(3) Analysis for coliforms shall be started within twenty-four hours of collection of sample. If time is exceeded, it should be recorded with the result.

(2) Samples containing microgram/l metal level should be stored at 4^0C and analyzed as soon as possible. If the concentration is of mg/l level, it can be stored for up to 6 months, except mercury, for which the limit is 5 weeks.

(5) Sample Identification for the water sample analysis for surface and ground water samples shall be as mentioned in the Form-I and Form-II.

7. Sample records.

(1) Each laboratory shall have a bound register, which shall be used for registering samples as they are received. A format for sample receipt register is annexed as **Form – III.**

(2) The Laboratory Incharge shall maintain a register for assignment of work to specific analyst.

8. Analytical techniques.

Each agency shall follow the analytical techniques prescribed in the Standard Methods for Analysis of Water and Wastewater published by American Public Health Association(Latest Edition) or Bureau of Indian Standards(BIS) Methods for Testing Water and Wastewater-methods of sampling and testing(physical and chemical) (IS:3025)

9. Analysis records and data validation.

A recommended format for recording data including all parameters except toxic metals and trace organics is enclosed as **Form – IV**. Report of heavy metals and trace organics as per Table 2 may be recorded separately. Validation checks should be performed in the laboratory on completion of the analysis. The results of laboratory analyses shall be entered in the format provided in **Form – II** for validation.

10. Manpower requirements in laboratories.

The manpower requirements shall be optimised by the concerned monitoring agencies in order to get the maximum utilization of mandays, for timely completion of analysis.

11. Data Processing, Reporting and Dissemination.

Each monitoring agency shall process the analytical data and report the data after validation to the Data Centre at the Central Pollution Control Board. The Central Pollution Control Board shall store the data and disseminate through website or electronic mail to various users on demand.

12. Quality Assurance and Accreditation of Laboratories.

The Quality Assurance Programme for the laboratories of various agencies shall contain a set of operating principles, written down and agreed upon by the organization, delineating specific functions and responsibilities of each person involved. Each laboratory of water quality monitoring agencies shall follow the guidelines of Quality Assurance Programme prescribed by their respective Central Laboratory or Headquarters and shall participate in Inter Laboratory Quality Assurance Programme like Proficiency Testing (PT) organized by them or any other agency on regular basis. The Water Quality Laboratories shall seek recognition from the Ministry of Environment and Forests, Government of India or accreditation from National Accreditation Board for Testing and Calibration Laboratories (NABL) under the Ministry of Science and Technology, Government of India.

[F. No. 15011/8/2004-NRCD]
M. SENGUPTA, Adviser

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FORM-I

Sample identification for surface water samples analysis and record.

Sample code											
Observer	Agency						Project				
Date Time	Station code										
Parameter code	Container				Preservation				Treatment		
	Glass	PVC	PE	Tef-lon	None	Cool	Acid	Other	None	Decant	Filter
(1) General											
(2) Bacteriology											
(3) BOD											
(4) COD, NH_3, NO_3											
(5) Toxic Metals											
(6) Trace Organics											

Source of sample

Water	Point	Approach	Medium	Matrix
0 River 0 Drain 0 Canal 0Reservoir (lakes/tank/pond)	0 Main current 0 Right bank 0 Left bank	0 Bridge 0 Boat 0 Wading	0 Water 0 Suspended matter 0 Biota 0 Sediment	0 Fresh 0 Brackish 0 Salt 0 Effluent
Sample type	0 Grab 0 Time-comp	0 Flow-comp	0 Depth-integ	0 Width-integ
Sample device	0 weighted bottle	0 Pump	0 Depth sampler	

Field determinations

Temp °C	PH	EC micromhos/cm	DO mg/l
Odour Code	(1) Odour free (6) Septic (2) Rotten eggs (7) Aromatic (3) Burnt sugar (8) Chlorinous (4) Soapy (9) Alcoholic (5) Fishy (10) Unpleasant	Colour code	(1) Light brown (6) Dark green (2) Brown (7) Clear (3) Dark brown (8) Other (4) Light green (specify) (5) Green

Remarks

Weather	0 Sunny 0 Cloudy 0 Rainy 0 Windy
Water vel. M/s	0 High (> 0.5) 0 Medium (0.1-0.5) 0 Low (< 0.1) 0 Standing
Water use	0 None 0 Cultivation 0 Bathing & washing 0 Cattle washing 0 Melon/vegetable farming in riverbed. 0 Organised water supply

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FORM-II

Sample identification for ground water samples.

Sample code											
Observer	Agency							Project			
Date	Time			Station code							
Source of sample: 0 Open dug well 0 Hand pump 0 Tube well 0 Piezometer											
Parameter code	Container				Preservation				Treatment		
	Glass	PVC	PE	Tef-lon	None	Cool	Acid	Other	None	Decant	Filter
(1) General											
(2) Bacterlogical											
(3) BOD											
(4) COD, NH_3, NO_3											
(5) Toxic Metals											
(6) Tr. Organics											

Field determinations			
Temp ^0C	PH	EC micromho/cm	DO mg/l
Odour Code	(1) Odour free (6) Septic (2) Rotten eggs (7) Aromatic (3) Burnt sugar (8) Chlorinous (4) Soapy (9) Alcoholic (5) Fishy (10) Unpleasant	Colour code	(1) Light brown (6) Dark green (2) Brown (7) Clear (3) Dark brown (8) Other (4) Light green (specify) (5) Green

IF WELL IS PURGED, COMPLETE BELOW:-

Office Well Data			
Diameter	Q		cm
Depth	D		m
Static water level (avg)	SWL		m
Water column (D-SWL)	H		m
Initial volume well	V		L
Projected pump discharge	PQ		L/s
Projected time of purging (V/PQ)	PT		min

Field Flow Measurement			
Static water level on arrival	SWL		M
Actual pump setting			m
Purging duration			Min
Pump Discharge before sampling	Q		L/min
Pump Discharge after sampling	Q		L/min
Volume purged	V		L
Dynamic water level	DWL		M

Field Chemical Measurement			
Time at start of sampling started	T (^0C)	EC (micromho/cm)	pH
+10 min			
+20 min			
+30 min			
+40 min			

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FORM-III
Sample Record for Analysis

Date/Time received at lab.	Date/Time collected	Station code	Project	Collecting agency / collector	Pre-servation	Parameter code	Lab. Sample No.
1	2	3	4	5	6	7	8

Sample receipt register

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Note:-

- Column 3 gives the station code conventionally followed by the monitoring agency.
- Column (4) gives the project under which the sample is collected.
- Column (7) corresponds to the parameter(s) code given in the sample identification form.
- Column (8) gives the laboratory sample assigned to the sample as it is received in the laboratory. Note that the numbering has two parts separated by a hyphen. The first part is assigned in a sequential manner as samples are received from various stations. If two samples are collected at the same time from a station for different sets of analysis, the first part of the number is the same. The second part corresponds to the parameter code as given in the sample.
- The results of the analyses of all the samples having the same first part of the code would be entered in the data entry system as one sample having the same station code and time of sample collection

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FORM-IV

No.	Parameter	Group	Section
1.			Data record
2.			Data record
3.		Date of collection	Data record
4.	pH	Field determination	Data record
5.	EC, *micromohs/cm*	Field determination	Data record
6.	DO, mg/l	Field determination	Data record
7.	Temp, °C	Field determination	Data record
8.	Colour, code	Field determination	Data record
9.	Odour, code	Field determination	Data record
10.	pH	General	Laboratory/organization
11.	EC, umho/cm	General	Laboratory/organization
12.	TDS, mg/l	General	Laboratory/organization
13.	TSS, mg/l	General	Laboratory/organization
14.	NH_3, mg N/l	Nutrients	Laboratory/organization
15	NO_2, NO_3, mg N/l	Nutrients	Laboratory/organization
16.	Total, mg/l	Nutrients	Laboratory/organization
17.	BOD, mg/l	Org matter	Laboratory/organization
18.	COD, mg/l	Org matter	Laboratory/organization
19.	Phen, mg C_aCO_3/l	Alkalinity	Laboratory/organization
20.	Total, mg C_aCO_3/l	Alkalinity	Laboratory/organization
21.	Total, mg C_aCO_3/l	Hardness	Laboratory/organization
22.	C_a++, mg C_aCO_3/l	Hardness	Laboratory/organization
23.	Ca^{++}, mg/l	Major ions	Laboratory code
24.	Mg^{++}, mg/l	Major ions	Laboratory code
25.	Na^{+}, mg/L	Major ions	Laboratory code
26.	K^{+}, mg/l	Major ions	Laboratory code
27.	Cr, mg/l	Major ions	Laboratory code
28.	SO_4,mg/L	Major ions	Laboratory code
29.	CO_3, mg/l	Major ions	Laboratory code
30.	HCO_3, mg/l	Major ions	Laboratory code
31.	Si, mg/l	Other inorganics	Laboratory code
32.	F, mg/l	Other inorganics	Laboratory code
33.	B,mg/l	Other inorganics	Laboratory code
34.	Total, MPN/100 ml	Coliforms	Laboratory code
35.	Faecal, MPN/100ml	Coliforms	Laboratory code
36.	Chlorophyll-A, mg/l	Biol	Laboratory code

Data validation

No.	Item	Group
1		Lab sample No.
2		Station code
37	Ca^{++} meq/l	Cations
38	Mg^{++},meq/l	Cations
39	Na^{+}, meq/l	Cations
40	K^{++} meq/l	Cations
41	Total cations meq/l	Cations
42	Cl. meq/l	Anions
43	SO_4, meq/l	Anions
44	CO_3, meq/l	Anions
45	HCO_3, meq/l	Anions
46	NO_2+NO3, meq/l	Anions
47	*Total anions meq/l*	Anions
48	{(41)-(47)/(41)+(47)}; (39) / (42)	Ion balance
49	(12) / (11)	TDS/EC Ratio
50	(17) / (18)	BOD/COD Ratio
51	If (10) < 8.3, is (19)=0?	PH, Vs. Alkalinity Ratio; CO3. bal
52		Verification criteria
53	(48) (49) (50) (51) (52)	Verification criteria
54		Checked by
55		Remarks

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