Republic of the Philippines
Department of Health
OFFICE OF THE SECRETARY

JUN 2 3 2017

ADMINISTRATIVE ORDER
No. 2017 - 0010

SUBJECT: Philippine National Standards for Drinking Water of 2017

I. RATIONALE

The history of the Philippine National Standards for Drinking Water (PNSDW) started in the year 1963. It was based on the 1958 World Health Organization International Standard for Drinking Water and the 1962 United States Public Health Service Standards. The 1963 PNSDW edition was subsequently revised in 1978, 1993 and 2007.

Since the last revision of PNSDW in 2007, a number of issues and concerns from various stakeholders have emerged. Among these are: (i) experiences of water service providers in complying with the standards; (ii) publication of the fourth edition of the Guidelines for Drinking-Water Quality by the World Health Organization in 2011, which includes new parameters and an improved framework for drinking-water safety that should be considered in water quality monitoring, testing, and analysis; (iii) issuance of DOH Administrative Order Number 2014-0027, which requires all drinking-water service providers to develop and implement water safety plans; (iv) new scope and definitions of Sustainable Development Goal (SDG) water supply indicators; and (v) the need for water quality standards during emergency situations.

This led to the updating of the PNSDW of 2007 through the Inter-agency Technical Working Group (TWG), headed by the Department of Health (DOH) with support from the World Health Organization (WHO).

II. OBJECTIVES

This Administrative Order shall prescribe the standards and procedures on drinking-water quality to protect public/consumer's health.

III. SCOPE AND COVERAGE

The PNSDW of 2017 shall apply to all drinking-water service providers including government and private developers and operators, bulk water suppliers, water refilling station operators, and water vending machine operators; ice manufacturers; all food establishments, residential, commercial, industrial and institutional buildings that use/supply/serve drinking water; water testing laboratories; health and sanitation authorities; the general public and all others who are involved in determining the safety of public's drinking-water.

IV. DEFINITION OF TERMS

1. **Acceptability** – physical and chemical quality of water that refers to the appearance, taste and odor of drinking-water satisfactory to the consumer.
2. **Bulk Water Supply** – drinking-water supplied to water service providers or associated infrastructures including pumping stations, reservoirs, and pipe lines.
3. **Certified sampling personnel** – a person who underwent training for drinking-water sampling and certified by the DOH.
4. **Contamination** – a general term referring to the presence of substances found in water that make water less desirable or unfit for drinking.
5. **Drinking-water**– water intended for direct human consumption or for use in food preparation and related processes.
6. **Emergency** - any situation in which there is actual disruption or damage to communities, i.e., any actual threat to public health and safety.
7. **Health-based targets** – are measurable health, water quality or performance objectives that are established based on a judgement of safety and on risk assessments of water-borne hazards.
8. **Limit of Quantitation (LOQ)** – the analyte concentration that produces a signal sufficiently stronger than the blank, such that it can be detected with a specified level of reliability during routine operations. Typically, it is the concentration that produces the signal above the reagent water blank signal, and should have a defined precision and bias at that level.
9. **Maximum Allowable Level (MAL)** - the highest level of a contaminant that is allowed in drinking-water.
10. **Method Detection Limit (MDL)** - the constituent/contaminant concentration that when processed through the complete method, produces a signal with a 99% probability that is different from the blank.
11. **Mobile Water Tanks** – tanks designed to deliver water for domestic use or emergency purposes.
12. **Potable/Safe Water** – water with quality within the standard limits set in this PNSDW both for acceptability and health aspects.
13. **Surveillance** – the continuous and vigilant public health assessment and review of safety and acceptability of drinking-water supplies.

V. GENERAL GUIDELINES

1. Standards for drinking-water quality, water sampling and examination and evaluation of results shall conform to the criteria prescribed under this Order and its Manual of Operations.
2. To ensure the safety of drinking-water, the standards shall be applied in accordance to the improved framework for drinking-water safety comprising of three key components:
   A. Health-based targets established by the health authority;
   B. Safely managed water systems (application of water safety plan); and
   C. A system of independent surveillance.

VI. SPECIFIC GUIDELINES

The Philippine National Standards for Drinking Water of 2017 shall consist of the following criteria:

1. **Standards for Drinking-water Quality**
   A. Drinking-water must be clear and does not have objectionable taste, odor and color. It must be pleasant to drink and free from all harmful organisms, chemical substances and radionuclides in amounts which could constitute a hazard to the health of the consumer.
   B. The quality of drinking-water shall be measured in terms of its microbiological, physical, chemical and radiological constituents. Refer to *Annex A* for the Standard Values and Methods of Analysis.
   C. The parameters of drinking-water quality shall be classified as mandatory, primary and secondary. Refer to *Annex B*.

2. **Standards for Water Sampling and Examination**
   A. Initial examination shall be conducted for new or newly constructed water sources while periodic examination shall be done for existing water sources. Water samples for initial and periodic examination from all water sources shall cover microbiological, physical, chemical and radiological parameters. Refer to *Annex C* for the Minimum Frequency of Sampling.
   B. The minimum number of samples to be collected and examined periodically shall be based on the source and mode of distribution of drinking-water supply. Refer to *Annex C*.
   C. The collection of water samples shall comply with the standard sampling requirements. Refer to *Annex D*.
   D. Only certified sampling personnel shall collect water samples for regulatory purposes.
   E. All water samples for regulatory purposes shall be examined only in DOH-Accredited Laboratory. The standard methods of examination shall be based on the "*22nd edition (2012) of the Standard Methods for the Examination of Water and Wastewater*" unless otherwise stated in the Manual of Operations.
   F. Examination of water samples for radiological quality shall be done by the Philippine Nuclear Research Institute.

3. **Standards for Other Modes of Distribution of Drinking-water**
   A. Drinking-water from refilling stations, vending machines, mobile tanks and bulk water supply shall be subject for initial and periodic examinations for microbiological, physical, chemical and radiological quality.
   B. All standard values of mandatory parameters shall be applicable to product water from refilling stations and vending machines, except for the standard values of *pH* and total dissolved solids (TDS). The *pH* value shall be 5-7 while the TDS levels of product water shall not exceed 10 mg/L to validate the efficiency of reverse osmosis or distillation process.
   C. Water from mobile tanks shall have chlorine residual (as free chlorine) of at least 0.5 mg/L but not to exceed to 1.50 mg/L at the point of delivery.

D. Bulk water supply shall maintain chlorine residual (as free chlorine) level between 0.3 mg/L to 1.5 mg/L or chlorine dioxide residual between 0.2 mg/L to 0.4 mg/L prior to distribution.

E. All water-refilling stations, vending machines, mobile tanks and bulk water supply shall comply with the standard minimum number of samples and frequency of sampling requirements. Refer to *Annex C*.

4. Evaluation of Results

A. Expression of Results

a. Microbiological examination for drinking water shall provide the numbers/presence of Total Coliform, *E. coli*/Thermotolerant Coliform, and Heterotrophic Bacteria present in 100 mL of water.

b. All results from physico-chemical and radiological examinations that are not detected shall be reported as less than the method detection limit (MDL). For trace analysis, the MDL and level of quantitation (LOQ) shall be reflected in the laboratory test report.

B. Interpretation of Results

a. Drinking-water service providers shall consult the DOH/Local Drinking Water Quality Monitoring Committee (LDWQMC)/local health office for the interpretation of results.

b. When *E. coli*/Thermotolerant Coliform is present in water, a sanitary survey shall be conducted within 24 hours to determine the cause of contamination which include resampling. If resampled water still contains *E. coli*/Thermotolerant coliform, corrective actions should be applied. At the same time, the drinking-water service provider shall issue an advisory to "boil water" or other household water treatment options, or provide an alternative drinking-water supply.

c. In case of exceedance of standard values of physical and chemical parameters, monitoring shall be carried out for the next three (3) consecutive months wherein all results must comply with the standards. If the results still exceed, further study must be done to determine the cause of contamination for proper identification of corrective actions.

5. Classification of Drinking-Water Quality Parameters

A. Mandatory Parameters

a. Mandatory parameters are legally enforceable. These core parameters shall be required for examination by all drinking-water service providers. The criteria used for selection of mandatory core parameters are: parameters that directly affect health through acute or chronic exposure and/or will render the water unacceptable for drinking; indicate the possible presence of other contaminants; exceed tolerable values/standards based on local monitoring data of the previous years; have wide spatial distribution across the Philippines based on local monitoring data; and viable indicators for general quality and stability of water supply.

b. The frequency of testing for mandatory parameters, except for *E. coli*/Thermotolerant Coliform and residual disinfectant, may be reduced to every three (3) years if the LDWQMC found the consolidated water quality reports showed undetectable levels (below MDL) of a particular mandatory parameter for three (3) consecutive years.
c. The mandatory parameters are the minimum parameters required to be tested for initial and periodic examinations. However, the mandatory parameters may include additional parameters from the list of primary and secondary as determined by the LDWQMC. The additional parameters shall be based on the result of the risk assessment of the water sources where potential contamination from the natural or anthropogenic activities may occur.

B. Primary parameters
a. Primary parameters are site-specific. These are chemical impurities in water that directly affect health through acute or chronic exposure.
b. Primary parameters can also be adopted as enforceable parameters, in addition to the mandatory parameters.

C. Secondary parameters
a. Secondary parameters are those that render the water unacceptable for drinking.
b. These include operational parameters which affect the efficiency of the treatment processes.

D. Emergency Drinking-Water Parameters
a. During the first 72 hours, temporary supply of water shall be provided by the local government unit (LGU). Water should be disinfected as a minimum treatment (i.e. boiling, chlorination, etc.). Mobile treatment plant can be used as an alternative source of water.
b. The water supply shall be monitored daily for at least seven (7) days by the LGU and other respondents in terms of residual chlorine, and *E. coli*. The acceptable level of residual chlorine shall be 0.5 mg/L and a maximum level of 1.5 mg/L. *E .coli* should be absent per 100 mL sample.
c. Regular monitoring shall resume after normal condition has been declared by the appropriate government agency.

E. Sustainable Development Goal (SDG) Parameters
a. Relative to Target 6.1.1 of the SDG in achieving universal and equitable access to safe and affordable drinking water for all by 2030, the population should be using safely managed drinking water services.
b. This entails that the population uses a drinking water source which is located on premises, available when needed, and free of fecal and priority chemical contamination.

6. Quality Assurance/Quality Control for Water Laboratories

A. Only laboratories accredited by the DOH shall perform drinking-water quality examination for regulatory purposes.
B. All accredited laboratories shall provide highest quality service through the establishment, documentation, and effective operation of a Quality System (QS).
C. The laboratory personnel involved in water sampling shall be certified by the DOH.

7. **Water Safety Plan (WSP) and Drinking-water Quality Surveillance**
   A. The implementation of WSP approach can secure the safety of drinking-water. It utilizes a risk assessment and risk management approach that encompasses all steps in the water supply system, from catchment/source to consumers.
   B. All drinking-water service providers shall be required to prepare WSP as provided by the DOH Administrative Order No. 2014 – 0027 "National Policy on Water Safety Plan for All Drinking-Water Service Providers", dated September 4, 2014.
   C. The WSP of a drinking-water service provider shall be subject for review and approval as provided by the DOH Administrative Order No. 2017-0006 "Guidelines for the Review and Approval of the Water Safety Plans of Drinking-Water Service Providers", dated April 20, 2017.
   D. The WSP shall be developed to meet health-based targets consistent with the Philippine National Standards for Drinking Water.
   E. The drinking-water quality surveillance agency shall ensure that monitoring of the WSP implementation and its effectiveness meets the Philippine National Standards for Drinking Water. The surveillance activity shall include audit and direct assessment approaches.

VII. ROLES AND RESPONSIBILITIES

A. Department of Health
   a. Develop systems and procedures to operationalize this Order.
   b. Ensure compliance of all drinking-water service providers and operators to this Order.
   c. Perform independent surveillance of drinking-water service providers.
   d. Provide technical assistance to the local government units, drinking-water service providers and to the general public.
   e. Accredit water laboratories, certify training providers and water sampling personnel.

B. Local Government Unit
   a. Enforce the provisions of this Order.
   b. Develop and implement drinking water quality surveillance program.
   c. Establish a local drinking water quality monitoring committee.
   d. Advocate and create awareness to general population on the importance of drinking water quality standards, impact of water contamination on health, and control measures on addressing water quality issues and problems.

C. Water Laboratory
   a. Comply with the provisions of this Order.
   b. Secure accreditation from the Department of Health.
   c. Implement QS and develop a manual of operations describing the laboratory's policies and plans for ensuring the quality of their work provided to the public.

D. Drinking-Water Service Provider/Operator of Establishment and Building
   a. Comply with the provisions of this Order.
   b. Develop and implement WSP.
   c. Institute corrective actions for any unsatisfactory results of water sampling.
   d. Submit to the accredited laboratories water samples for examination in a manner and at such intervals prescribed under this Order.
   e. Submit results of water quality testing to the local health authority.
   f. Educate consumers on how to keep drinking-water safe at all times.

VIII. PENAL PROVISION

As provided in Sec. 103 of the Code on Sanitation of the Philippines (PD No. 856):

A. Any person who shall violate, disobey, refuse, omit or neglect to comply with any of the provisions of this Order, shall be guilty of misdemeanor and upon conviction shall be punished by imprisonment for a period of not exceeding six (6) months or by a fine of not exceeding Php 1,000.00 or both depending upon the discretion of the court.

B. Any person who shall interfere with or hinder, or oppose any officer, agent or member of the Department or of the bureaus and offices under it, in the performance of his duty as such under this Order, or shall tear down, mutilate, deface or alter any placard, or notice, affixed to the premises in the enforcement of this Order, shall be guilty of a misdemeanor and punishable upon conviction by imprisonment for a period of not exceeding six (6) months or by a fine of not exceeding Php 1,000.00 or both depending upon the discretion of the court.

IX. SEPARABILITY CLAUSE

In the event that any rule, section, paragraph, sentence, clause, or word of this Order is declared invalid for any reason, the other provisions thereof shall not be affected thereby.

X. REPEALING CLAUSE

Administrative Order No. 2007 – 0012 (2007 PNSDW) is hereby repealed. All laws, rules and regulations and administrative issuances or parts thereof inconsistent with the provisions of these standards are hereby repealed or amended accordingly.

XI. EFFECTIVITY

This order takes effect fifteen (15) days after its publication in an official gazette or in a newspaper of general circulation.

PAULYN JEAN B. ROSELL-UBIAL, MD, MPH, CESO II
Secretary of Health

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Annex A

Table A-1. Standard Values, Methods of Detection and Points of Compliance for Microbiological Quality of Drinking-Water

Parameter	Standard Values	Methods of Analysis (SMEWW 22nd ed.)	Point of Compliance
1. Total Coliform	**MTFT:** < 1.1 MPN/ 100 mL	• *9221 Multiple Tube Fermentation Technique*	• Consumer's taps • Water treatment works/plants • Water refilling stations • Water vending machines • Mobile treatment devices • Point of use treatment devices • Water haulers • Bulk Water
	EST: Absent or <1 MPN/100 mL	• *9223 Enzyme Substrate Coliform Test**	
	MFT: < 1 total coliform colonies / 100 mL	• *9222B Standard Total Coliform Membrane Filter Technique* • *9222CDelayed Incubation Total Coliform Procedure** • *9222H Simultaneous Detection of Total Coliform and E. coli by Dual-Chromogen Membrane Filter Technique**	
2. Thermotolerant Coliform/*E.coli*	**MTFT:** < 1.1 MPN/ 100 mL	• *9221 Multiple Tube Fermentation Technique* • *9221 E1 Thermotolerant Coliform Test (EC medium)* • *9221 E2 Thermotolerant Coliform Test (A-1 medium)**	• Point sources • Consumer's taps • Water treatment works • Water refilling stations • Water vending machines • Mobile treatment devices • Point of use treatment devices • Water haulers • Bulk Water • Food Establishments • All buildings • Ice Plants
	EST: Absent or <1 MPN/100 mL	• *9223 Enzyme Substrate Coliform Test**	
	MFT: < 1 thermotolerant coliform colonies / 100 mL	• *9222B Standard Total Coliform Membrane Filter Technique*	
3. Heterotrophic Plate Count (HPC)	<500 CFU/mL	• *9215 B Pour Plate Method* • *9215 C Spread Plate Method* • *9215 D Membrane Filter Method*	• Consumer's taps • Water treatment works • Water refilling stations • Water vending machines • Mobile treatment devices • Point of use treatment devices • Water haulers • Bulk Water • Food Establishments • All buildings • Ice Plants

MTFT: Multiple Tube Fermentation Technique, **MPN:** Most Probable Number
EST: Enzyme Substrate Test, **CFU:** Colony Forming Units
MFT: Membrane Filter Technique, **should be verified and approved by the DOH*

Table A-2. Summary of Standard Values and Methods of Analysis for Inorganic Chemical Parameters of Drinking-Water

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL)	Methods of Analysis
1. Antimony (Sb)	7440-36-0	0.02 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3113 B. Electrothermal Atomic Absorption Spectrometric Method · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry
2. Arsenic(As)	7440-38-2	0.01 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 G. Nitric Acid-Sulfuric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3114 B. Manual Hydride Generation/Atomic Absorption Spectrometric Method · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method
3. Barium (Ba)	7440-39-3	0.70 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3111 D. Direct Nitrous Oxide-Acetylene Flame Method · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method
4. Boron (B)	7440-42-8	2.00 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 G. Nitric Acid-Sulfuric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3120 B. Inductively Coupled Plasma Method

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL)	Methods of Analysis
			· 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method 4500B B. Curcumin Method 4500B C. Carmine Method
5. Cadmium (Cd)	7440-43-9	0.003 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method
6. Chromium, Total (Cr)	7440-47-3	0.05 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3113 B. Electrothermal Atomic Absorption Spectrometric Method · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method
7. Cyanide, Total (CN^-)	57-12-5	0.50 mg/L	· 4500-CN^- D. Titrimetric Method · 4500-CN^- E. Colorimetric Method · 4500-CN^- F. Cyanide-Selective Electrode Method
8. Fluoride (F^-)	16984-48-8	1.50 mg/L	**A. Sample Preparation** · Preliminary Distillation **B. Instrumentation** · 4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity · 4110 C. Single-Column Ion Chromatography with Direct Conductivity Detection · 4500-F^- C. Ion-selective Electrode Method
9. Lead (Pb)	7439-92-1	0.01 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL)	Methods of Analysis
			· 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method
10. Manganese (Mn)	N/A	0.4 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3111 B. Direct Air-Acetylene Flame Method · 3111 C. Extraction/Air-Acetylene Flame Method · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method
11. Mercury, Total (Hg)	7439-97-6	0.001 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 G. Nitric Acid-Sulfuric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3112 B. Cold-Vapor Atomic Absorption Spectrometric Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method · EPA 245.7 / BS EN 13506 Atomic Fluorescence Spectrometric Method · EPA 7473 Thermal Decomposition, Amalgamation, Atomic Absorption Spectrometric Method
12. Nickel (Ni)	7440-02-0	0.07 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method
13. Nitrate (NO_3^-)	C-005	50.00 mg/L	· 4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity · 4110 C. Single-Column Ion Chromatography with Direct Conductivity Detection

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL)	Methods of Analysis
			· 4500-NO_3^- B. Ultraviolet Spectrophotometric Screening Method · 4500-NO_3^- E. Cadmium Reduction Method · 4500-NO_3^- I. Cadmium Reduction Flow Injection Method · 4140. Capillary Ion electrophoresis · 4500-NO_3^- D. Nitrate Electrode Method
14.Nitrite (NO_2^-)	C-005	3.00 mg/L	· 4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity · 4110 C. Single-Column Ion Chromatography with Direct Conductivity Detection · 4500-NO_2^- B. Colorimetric Method · 4130. Flow Injection Analysis · 4140. Capillary Ion electrophoresis · 4500-NO_2^- B. Colorimetric (Diazotization)
15.Selenium (Se)	7782-49-2	0.04 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 G. Nitric Acid-Sulfuric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3114 B. Manual Hydride Generation/Atomic Absorption Spectrometric Method · 3114 C. Continuous Hydride Generation AAS · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method

Table A-3. Summary of Standard Values and Methods of Analysis for Organic Chemical Parameters from Industrial Pollution of Drinking-Water

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL) (mg/L)	Method of Analysis
1. Benzene	71-43-2	0.01	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
2. Benzo(a)pyrene	50-32-8	0.0007	• 6410B. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method • 6440B. Liquid-Liquid Chromatographic Method
3. Carbon Tetrachloride	56-23-5	0.004	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
4. 1,2-Dichlorobenzene	95-50-1	1	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
5. 1,4-Dichlorobenzene	106-46-7	0.3	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
6. 1,2-Dichloroethane	107-06-2	0.03	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
7. 1,2-Dichloroethene	156-59-2 (cis) 156-60-5 (trans)	0.05	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
8. Dichloromethane	75-09-2	0.02	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
9. Di(2-ethylhexyl) phthalate	117-81-7	0.008	• 6410B. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method
10. Ethylbenzene	100-41-4	0.3	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL) (mg/L)	Method of Analysis
11. Styrene	100-42-5	0.02	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
12. Tetrachloroethene	127-18-4	0.04	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
13. Toluene	108-88-3	0.7	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
14. Vinyl Chloride	75-01-4	0.0003	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
15. Xylenes (total)	1330-20-7	0.5	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method

Table A-4. Summary of Standard Values and Methods of Analysis for Organic Chemical Parameters (Pesticides) of Drinking-Water

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (mg/L)	Method of Analysis
1. Aldrin and Dieldrin (combined)	Aldrin: 309-00-2 Dieldrin: 60-57-1	0.00003	• 6410B. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method • 6630B. Liquid-Liquid Extraction Gas Chromatographic Method I • 6630C. Liquid-Liquid Extraction Gas Chromatographic Method II
2. Atrazine and its chloro-s-triazine metabolites	1912-24-9	0.1	• USEPA 525.2 Gas Chromatography/Mass Spectrometry • 6630C. Liquid-Liquid Extraction Gas Chromatographic Method II
3. Carbofuran	1563-66-2	0.007	• 6610B. High-Performance Liquid Chromatographic Method
4. Chlordane	57-74-9	0.0002	• 6410B. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method • 6630B. Liquid-Liquid Extraction Gas Chromatographic Method I • 630C. Liquid-Liquid Extraction Gas Chromatographic Method II
5. 1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.001	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method • 6231B Liquid-liquid extraction- Gas Chromatographic Method
6. Dichlorodiphenyltrichloroethane (DDT)	50-29-3	0.001	• 6410B. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method • 6630B. Liquid-Liquid Extraction Gas Chromatographic Method I • 6630C. Liquid-Liquid Extraction Gas Chromatographic Method II
7. Endrin	72-20-8	0.0006	• 6410B. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method • 6630B. Liquid-Liquid Extraction Gas Chromatographic Method I • 6630C. Liquid-Liquid Extraction Gas Chromatographic Method II
8. Ethylene Dibromide or 1,2-Dibromoethane	106-93-4	0.0004	• 6200B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary Column Gas Chromatographic Method
9. Glyphosate	1071-83-6	1	• 6651B. Liquid Chromatographic Post-Column Fluorescence Method

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (mg/L)	Method of Analysis
10. Lindane	58-89-9	0.002	• 6410B. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method • 6630B. Liquid-Liquid Extraction Gas Chromatographic Method I • 6630C. Liquid-Liquid Extraction Gas Chromatographic Method II
11. Pendimethalin	40487-42-1	0.02	• USEPA 525.2 Liquid-solid extraction and capillary column Gas Chromatography/Mass Spectrometry

Table A-5. Summary of Standard Values and Methods of Analysis for Physical and Chemical Quality for Acceptability Aspects of Drinking-Water

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL)	Methods of Analysis
1. Taste	N/A	No objectionable taste	Sensory Evaluation Technique Testing of taste shall be based on consumers' complaints.
2. Odor	N/A	No objectionable odor	Sensory Evaluation Technique
3. Color (Apparent)	N/A	10 CU	2120 B. Visual Comparison Method – for apparent color only
4. Turbidity	N/A	5 NTU	2130 B. Nephelometric Method
5. Aluminum (Al)	N/A	0.2 mg/L (Aesthetic)	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3500-Al B. Eriochrome Cyanine R Method · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method
6. Chloride (Cl^-)	16887-00-6	250 mg/L	• *4500 – Cl- B Argentometric method* • *4500 – Cl- D Potentiometric Method* • *4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity* • *4110 C. Single-Column Ion Chromatography with Direct Conductivity Detection*
7. Copper (Cu)	N/A	1.0 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3111 B. Direct Air-Acetylene Flame Method · 3111 C. Extraction/Air-Acetylene Flame Method · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method · 3500-Cu C. Bathocuproine Method
8. Total Hardness	N/A	300 mg/L	2430 C EDTA Titrimetric method
9. Hydrogen sulfide (H_2S)	7783-06-4	0.05 mg/L	• 4500 S^{2-} D. Methylene Blue Method • 4500 S^{2-} E. Gas Dialysis, Automated Methylene Blue Method

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL)	Methods of Analysis
			• 4500 S^{2-} I. Distillation, Methylene Blue Flow Injection Analysis Method • 4500 S^{2-} F. Iodometric Method
10. Iron (Fe)	N/A	1.0 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3111 B. Direct Air-Acetylene Flame Method · 3111 C. Extraction/Air-Acetylene Flame Method · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method · 3500-Fe B. Phenanthroline Method
11. pH	N/A	6.5 – 8.5	4500-H^+ B. Electrometric Method
12. Sodium (Na)	N/A	200 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3111 B. Direct Air-Acetylene Flame Method · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method · 3500-Na B. Flame Emission Photometric Method
13. Sulfate (SO_4^{2-})	14808-79-8	250 mg/L	• 4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity • 4140 B. Capillary Ion Electrophoresis with Indirect UV Detection • 4500-SO_4^{2-} C. Gravimetric method with Ignition of Residue • 4500- SO_4^{2-} D. Gravimetric Method with Drying of Residue • 4500- SO_4^{2-} E. Turbidimetric Method • 4500- SO_4^{2-} F. Automated Methylthymol Blue Method • 4500- SO_4^{2-} G. Methylthymol Blue Flow Injection Analysis
14. Total Dissolved Solids	N/A	600 mg/L	2540 C. Total Dissolved Solids Dried at 180°C

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL)	Methods of Analysis
15. Zinc (Zn)	N/A	5.0 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3111 B. Direct Air-Acetylene Flame Method · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3111 C. Extraction/Air-Acetylene Flame Method · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method · 3500-Zn B. Zincon Method

Table A-6. Summary of Standard Values and Methods of Analysis for Treatment Chemicals Used in Treatment and Disinfection and Disinfection by-products of Drinking-Water

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (mg/L)	Method of Analysis
a. Contaminants from Treatment Chemicals			
1. Acrylamide	79-06-1	0.0005	• USEPA 8316 High-performance Liquid Chromatography with UV Detection
2. Epichlorohydrin	106-89-8	0.0004	• 6200 B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method
b. Disinfection Chemicals			
1. Chlorine Dioxide Residual	10049-04-4	0.2 min and 0.4 max[1]	• Colorimeter-Refer to manufacturer's manual provided with the test equipt.
2. Chlorine Residual (as free chlorine)	Chlorine: 7782-50-5	0.3 min and 1.5 max	• DPD Colorimetric Method –Refer to manufacturer's manual provided with the test kit
c. Disinfection By-Products			
1. Bromate	15541-45-4	0.01	• 4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity • 4110 C. Single-Column Ion Chromatography with Direct Conductivity Detection • 4110 D. Ion Chromatographic Determination of Oxyhalides and Bromide
2. Chlorate	7775-09-9	0.7	• 4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity • 4110 C. Single-Column Ion Chromatography with Direct Conductivity Detection • 4110 D. Ion Chromatographic Determination of Oxyhalides and Bromide
3. Chlorite	7758-19-2	0.7	• 4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity • 4110 C. Single-Column Ion Chromatography with Direct Conductivity Detection • 4110 D. Ion Chromatographic Determination of Oxyhalides and Bromide
4. Dibromoacetonitrile	3252-43-5	0.07	• Gas Chromatography / Electron Capture Detector

[1]Note: WHO 2011 did not specify any guideline values for chlorine dioxide because of its rapid hydrolysis to chlorite. In addition, the provisional guideline value for chlorite (i.e. 0.7 mg/L) is considered to be adequately protective against potential toxicity from chlorine dioxide. The taste and odor threshold for this compound is 0.4 mg/L [4]

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (mg/L)	Method of Analysis
5. Dichloroacetate	79-43-6	0.05	• Gas Chromatography / Electron Capture Detector • Gas Chromatography / Mass Spectrometry • 6251 B. Micro Liquid-Liquid Extraction Gas Chromatographic Method
6. Dichloroacetonitrile	3018-12-0	0.02	• Gas Chromatography / Electron Capture Detector • 5710 D. Formation of Other Disinfection By-Products (DBPs) • USEPA 551.1
7. Monochloroacetate	79-11-8	0.02	• 6251 B. Micro Liquid-Liquid Extraction Gas Chromatographic Method
8. Trichloroacetate	76-03-9	0.2	• 6251 B. Micro Liquid-Liquid Extraction Gas Chromatographic Method
9. 2,4,6-Trichlorophenol	88-06-2	0.2	• 6251 B. Micro Liquid-Liquid Extraction Gas Chromatographic Method • 6410 B. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method • 6420 B. Liquid-Liquid Extraction Gas Chromatographic Method
Trihalomethanes			
10. Bromoform	75-25-2	0.1	• 6040 B. Closed-Loop Stripping, Gas Chromatographic/Mass Spectrometric Analysis; • 6200 B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary – Column Gas Chromatographic Method • 6232 B. Liquid-Liquid Extraction Gas Chromatographic Method
11.Bromodichloromethane (BDCM)	75-27-4	0.06	• 6040 B. Closed-Loop Stripping, Gas Chromatographic/Mass Spectrometric Analysis; • 6200 B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary – Column Gas Chromatographic Method • 6232 B. Liquid-Liquid Extraction Gas Chromatographic Method
12. Chloroform	67-66-3	0.3	• 6200 B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary – Column Gas Chromatographic Method

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (mg/L)	Method of Analysis
			• 6232 B. Liquid-Liquid Extraction Gas Chromatographic Method
13.Dibromochloromethane (DBCM)	124-48-1	0.1	• 6040 B. Closed-Loop Stripping, Gas Chromatographic/Mass Spectrometric Analysis; • 6200 B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method • 6200 C. Purge and Trap Capillary – Column Gas Chromatographic Method • 6232 B. Liquid-Liquid Extraction Gas Chromatographic Method
14. Total THM	N/A	1	The sum of the ratio of the concentration of each to its maximum allowable level should not exceed 1.

Table A-7. Standard Values and Methods of Analysis for Radiological Parameters

Radionuclides Analysis	Screening Level	Methods of Analysis
1. Gross alpha	0.5 Bq/L	• *7110 B. Evaporation Method for Gross Alpha-Beta* • *7110 C. Co-precipitation Method for Gross Alpha Radioactivity in Drinking Water* • *Low Level Liquid Scintillation Counting*
2. Gross beta	1.0 Bq/L	• *7110 B. Evaporation Method for Gross Alpha-Beta* • *7110 C. Co-precipitation Method for Gross Alpha Radioactivity in Drinking Water* • *Low Level Liquid Scintillation Counting*
3. Radon	11.0 *Bq*/L MCL-maximum contaminant level [EPA 2000]	• *7500-Rn B. Liquid Scintillation Method*
	Guidance Level	
4. Gamma* (Ra-226)	1 Bq/L	• *7120 B. Gamma Spectroscopic Method*
5. Gamma* (Ra-228)	0.1 Bq/L	• *7120 B. Gamma Spectroscopic Method*
6. Gamma* (Sr-90, I-131, Cs-134, Cs-137)	10 Bq/L	• *7120 B. Gamma Spectroscopic Method*
7. Tritium* (H-3)	10,000 Bq/L	• *7500-3H B. Liquid Scintillation Spectrometric Method*

**Gamma and Tritium in drinking water are analyzed only during emergency situations such as nuclear accidents and radioactive material spills and leakages.*

Annex B

Table B-1. Mandatory Drinking-Water Quality Parameters

No.	Parameter	Sampling Location*
1	Thermotolerant Coliform	Treatment Plant Outlet/Source and Consumers' Taps
	E. coli	
2	Arsenic (As)	Treatment Plant Outlet/Source
3	Cadmium (Cd)	Consumers' Taps
4	Lead (Pb)	Consumers' Taps
5	Nitrate (NO_3^-)	Treatment Plant Outlet/Source
6	Color (Apparent)	Treatment Plant Outlet/Source and Consumers' Taps
7	Turbidity	Consumers' Taps
8	pH	Treatment Plant Outlet/Source and Consumers' Taps
9	Total Dissolved Solids	Treatment Plant Outlet/Source
10	Disinfectant Residual	Treatment Plant Outlet/Source and Consumers' Taps

**applicable to all Level II and Level III water facilities*

Table B-2. Primary Drinking-Water Quality Parameters

No.	Parameter	No.	Parameter
1	1,2-Dibromo-3-chloropropane (DBCP)	29	Dibromochloromethane (DBCM)
2	1,2-Dichlorobenzene	30	Dibromoacetonitrile
3	1,2-Dichloroethane	31	Dichloroacetate
4	1,2-Dichloroethene	32	Dichloroacetonitrile
5	1,4-Dichlorobenzene	33	Dichlorodiphenyltrichloroethane (DDT)
6	2,4,6-Trichlorophenol	34	Dichloromethane
7	Acrylamide	35	Endrin
8	Aldrin and Dieldrin	36	Epichlorohydrin
9	Alpha Particles	37	Ethylbenzene
10	Atrazine	38	Ethylene Dibromide
11	Antimony	39	Fluoride
12	Barium	40	Glyphosate
13	Benzene	41	Lindane
14	Benzo(a)pyrene (PAHs)	42	Manganese
15	Beta Particles	43	Mercury (Total)
16	Boron	44	Monochloroacetate
17	Bromate	45	Nickel
18	Bromodichloromethane (BDCM)	46	Nitrite
19	Bromoform	47	Pendimethalin
20	Carbon Tetrachloride	48	Radon
21	Carbofuran	49	Sulfate
22	Chlorate	50	Selenium
23	Chlordane	51	Styrene
24	Chlorite	52	Tetrachloroethene
25	Chloroform	53	Trichloroacetate
26	Chromium (Total)	54	Toluene
27	Cyanide (Total)	55	Total Trihalomethane (THM)
28	Di(2-ethylhexyl)phthalate	56	Vinyl chloride

Table B-3. Secondary Drinking-Water Quality Parameters

No.	Parameter	No.	Parameter
1	Aluminum	7	Manganese
2	Chloride	8	Odor
3	Copper	9	Sodium
4	Total Hardness	10	Taste
5	Hydrogen Sulfide	11	Xylenes (total)
6	Iron	12	Zinc

Annex C

Table C-1. Minimum Frequency of Sampling for Microbiological Examination of Drinking-Water

Source and Mode of Supply	Population Served	Minimum Frequency of Sampling for Total Coliform and Thermotolerant coliform/*E.coli**	Minimum Frequency of Sampling for Heterotrophic Plate Count (HPC)*	Point of Compliance
1. Level I	-	1 sample every three (3) months	Not required	Point source
2. Level II	-	1 sample every other month	1 sample every other month *(required if treated)*	Communal faucet
3. Level III	Less than 5,000	2 samples monthly	2 samples monthly	Consumer's tap
	5,000 – 100,000	1 sample per 5,000 population + 2 additional samples monthly	1 sample per 5,000 population + 2 additional samples monthly	Consumer's tap
	More than 100,000	1 sample per 10,000 population, plus 12 additional samples monthly *Collection of samples should be spread out within a month* *<u>Compliance to total coliform:</u> At least 95% of standard samples taken in each month from each reservoir and distribution point is total coliform negative, provided that thermotolerant coliform is absent* *<u>Compliance to thermotolerant coliform:</u> No samples should test positive for thermotolerant coliform*	Required, at least 40% of the sampling points	Consumer's tap
4. All buildings (*i.e.* residential, commercial, industrial and institutional buildings)	Less than or equal to 600	1 sample every other month	1 sample every other month	Consumer's tap
	More than 600	1 sample monthly	Once a month	Consumer's tap
5. Food Establishments	-	1 sample every other month	1 sample every other month	Consumer's tap
6. Ice Plants	-	Once a month	Once a month	Product ice

* Refer to Table 1 for specific microbiological point of compliance

Table C-2. Minimum Frequency of Sampling for Mandatory Physical and Chemical Parameters

Source and Mode of Supply	Population Served Per Supply System	Number of Samples/Frequency of Sampling	Sampling Location
1. **Level I (Point Source)**	-	One sample per year	Point Source
2. **Level II (Communal Faucet)**	-	One sample per year	*Refer to Table B-1*
3. **Level III**	49,999 and below	One sample per year	
	50,000 and above	One sample for every 250,000 population served per year	
4. **All buildings** (*i.e.* residential, industrial, commercial, and institutional buildings)	-	One sample per year Parameters to be tested: • *Water from main utilities:* Lead, color, odor, turbidity, pH, TDS • *With own source of water:* All mandatory parameters • *Water from main utilities and own source:* All mandatory parameters	Consumers' taps
5. **Food Establishments**			
6. **Ice Plants**			

Table C-3. Minimum Frequency of Sampling for Radiological Parameters

Type	Frequency
Initial	Four (4) consecutive quarters for one year
Periodic	Once every three (3) years

Table C-4. Minimum Frequency of Sampling for Mandatory Microbiological and Physico-Chemical Parameters for Other Modes of Distribution of Drinking-Water

Source	Parameter	Minimum Frequency of Sampling
Water Refilling Station and Water Vending Machines	Total Coliform	One sample per month
	Thermotolerant coliform/*E. coli*	One sample per month
	Heterotrophic Plate Count	One sample per month
	All mandatory physico-chemical parameters	Two samples per year
Mobile Water Tank and Bulk Water Supply	Microbiological (total coliform, E. coli and HPC)	Once a month
	All mandatory physico-chemical	Once a year
Water Refilling Station, Water Vending Machines, Mobile Water Tank, Bulk Water Supply	Other parameters identified by the LDWQMC	One sample per year or as may be required by the LDWQMC

Annex D

Table D-1. Summary of Sampling Requirements for Inorganic Parameters

Parameters	Container Material	Minimum Volume of Sample	Mode of Preservation	Holding Time
1. Antimony	Plastic/Polyethylene or Glass containers rinsed with 50% HNO_3	100 mL	Add HNO_3 to pH < 2	28 days
2. Arsenic	Plastic/Polyethylene or Glass containers rinsed with 50% HNO_3	100 mL	Add HNO_3 to pH < 2	28 days
3. Barium	Plastic/Polyethylene or Glass containers rinsed with 50% HNO_3	100 mL	Add HNO_3 to pH < 2	28 days
4. Boron	Polyethylene bottles or alkali-resistant, boron-free glassware Fill container completely to exclude air	100 mL (Fill container completely to exclude air)	Store all reagents in polyethylene or boron-free containers	28 days
5. Cadmium	Plastic/Polyethylene or Glass containers rinsed with 50% HNO_3	100 mL	Add HNO_3 to pH < 2	28 days
6. Chromium (Total)	Plastic/Polyethylene or Glass containers rinsed with 50% HNO_3	100 mL	Add HNO_3 to pH < 2	28 days
7. Cyanide (Total)	Dark Polyethylene/Plastic or Glass bottle	500 mL	Add NaOH to pH>12. Remove sulfide Refrigerate in the dark.	24 hours
8. Fluoride	<u>Preferred:</u> Polyethylene bottles <u>Glass bottles</u> if bottle does not contain high-fluoride solutions Polytetrafluoroethylene (PTFE) containers are not suitable	200 mL	None required	28 days
9. Lead	Plastic/Polyethylene or Glass containers rinsed with 50% HNO_3	100 mL	Add HNO_3 to pH < 2	28 days
10. Manganese	Acidified Polyethylene bottle	1 liter	Acidify sample at the time of collection with HNO_3 to pH <2	28 days
11. Mercury (Total)	Glass containers rinsed with 50% HNO_3	500 mL	Add HNO_3 to unfilteredsample to pH <1.	28 days

Parameters	Container Material	Minimum Volume of Sample	Mode of Preservation	Holding Time
			Add $K_2Cr_2O_3$	
12. Nickel	Plastic or Glass bottle	500 mL	Add HNO_3 to pH <2	6 months
13. Nitrate	Glass or Plastic/Polyethylene container	500 mL	Refrigerate (unfiltered samples)	24 hours
			Filter on site (0.45 m cellulose acetate membrane filter and freeze)	1 month – consult analyst depending on analytical method
14. Nitrite	Glass or Plastic/Polyethylene container	Colorimetric Method: 50 mL sample	Freeze at -20^{0}C or store at 4^{0}C.	1 to 2 days
15. Selenium	Plastic/Polyethylene or Glass containers rinsed with 50% HNO_3	100 mL	Add HNO_3 to pH < 2	28 days

Sources: APHA 22nd ed., 2007 PNSDW, 2011 ADWG

Table D-2. Summary of Sampling Requirements for Organic Parameters

Parameters	Container Material	Minimum Volume of Sample	Mode of Preservation	Holding Time
Industrial Pollutants				
1. Benzene	Screw-cap vial with a hole in the center and TFE-faced silicone septum	2 x 40 mL	• Cool, ≤6°C • For samples that contain volatile constituents but do not contain residual chlorine, add HCl to pH <2.0(4 drops, 1:1 HCl) • For samples that contain residual chlorine, add 1000 mg ascorbic acid/L or 0.008% sodium thiosulfate	14 days
2. Benzo(a)pyrene	Amber glass bottles with a screw cap lined with TFE	1 liter	• Cool, ≤6°C • For samples that contain residual chlorine, add 1000 mg ascorbic acid/L or 0.008% sodium thiosulfate	7 days until extraction; 40 days after extraction
3. Carbon Tetrachloride	See Benzene			
4. 1,2-Dichlorobenzene	See Benzene			
5. 1,4-Dichlorobenzene	See Benzene			
6. 1,2-Dichloroethane	See Benzene			
7. 1,2-Dichloroethene	See Benzene			
8. Dichloromethane	See Benzene			
9. Di(2-ethylhexyl)phthalate	See Benzo(a)pyrene			
10. Ethylbenzene	See Benzene			
11. Styrene	See Benzene			
12. Tetrachloroethene	See Benzene			
13. Toluene	See Benzene			
14. Vinyl Chloride	See Benzene			
15. Xylenes (total)	See Benzene			
Pesticides				
1. Aldrin and Dieldrin	See Benzo(a)pyrene			
	Amber glass bottles filled with a screw cap lined with TFE.	1 liter	• Cool, ≤6° CFor samples that contain residual chlorine, add 1000 mg ascorbic acid/L or 0.008% sodium thiosulfate	7 days until extraction; 40 days after extraction
2. Atrazine	See Aldrin and Dieldrin			
3. Carbofuran	Amber glass bottles fitted with polytetrafluoroethylene (PTFE)-lined screw caps.	None specified	• Add a sufficient amount of potassium dihydrogen citrate to yield a concentration in the sample of 9.2 to 9.5 g/L to prevent hydrolysis of oxamyl, 3-hydroxycarbofuran, carbaryl, and methiocarb • Add sodium thiosulfate to yield a sample concentration in the range of 80 to 320	28 days

Parameters	Container Material	Minimum Volume of Sample	Mode of Preservation	Holding Time
			mg/L to eliminate residual chlorine • During transport: Ice, temperature should not exceed 10 degrees Celsius during the first 48 hours after collection • In the laboratory: Store samples at temperature below 6 degrees Celsius and protect from light until extraction. Do not freeze sample	
4. Chlordane	See Benzo(a)pyrene			
	See Aldrin and Dieldrin			
5. 1,2-Dibromo-3-chloropropane (DBCP)	See Benzene			
6. Dichlorodiphenyltrichloroethane (DDT)	See Benzo(a)pyrene			
	See Aldrin and Dieldrin			
7. Endrin	See Benzo(a)pyrene			
	See Aldrin and Dieldrin			
8. Ethylene Dibromide or 1;2-Dibromoethane	See 1,2-Dibromo-3-chloropropane (DBCP)			
	See 1,2-Dichlorobenzene			
	See Benzene			
9. Glyphosate	Polypropylene or amber glass container	500 mL representative sample	Add 100 mg/L sodium thiosulfate for chlorinated water and store at 4°C away from light	14 days
10. Lindane	See Aldrin and Dieldrin			
Disinfection Chemicals and By-Products				
1. Acrylamide	See Benzene			
2. Epichlorohydrin	See Benzene			
3. Chlorine Dioxide	None specified	None specified	Analyse immediately	-
4. Chlorine Residual	Plastic (polyethylene or equivalent) or Glass container	500 mL	Analyse immediately. Keep out of direct sunlight	5 minutes
5. Bromate	Glass or Plastic/Polyethylene container	500 mL	Refrigerate (unfiltered samples)	24 hours
			Filter on site (0.45 µm cellulose acetate membrane filter and freeze)	1 month - Consult analyst depending on analytical method
6. Chlorate	Glass or Plastic/Polyethylene container	500 mL	Refrigerate (unfiltered samples)	24 hours
			Filter on site (0.45 µm cellulose acetate membrane filter and freeze)	1 month - Consult analyst depending on analytical method
7. Chlorite	Glass or Plastic/Polyet	500 mL	Refrigerate (unfiltered samples)	24 hours

Parameters	Container Material	Minimum Volume of Sample	Mode of Preservation	Holding Time
	hylene container		Filter on site (0.45 µm cellulose acetate membrane filter and freeze)	1 month - Consult analyst depending on analytical method
8. Dibromoacetonitrile	Glass vial with TFE-lined screw caps	40-mL	Cool, ≤6°C -1 gram/ 60-ml amber glass vial (1% sodium phosphate dibasic/99% potassium phosphate monobasic + 0.6% ammonium chloride)	*-14 Days*
9. Dichloroacetate	Screw-cap vial with a hole in the center and TFE-faced silicone septum; zero headspace	25 or 40 mL (depending on vial used)	Refrigerate at 4°C	-14 days 21 days for sample extracts freeze at -11°C
10. Dichloroacetonitrile	Glass vial with TFE-lined screw caps	40-mL	Cool, ≤6°C -1 gram/ 60-ml amber glass vial (1% sodium phosphate dibasic/99% potassium phosphate monobasic + 0.6% ammonium chloride)	*-14 Days*
11. Monochloroacetate	See Dichloroacetate			
12. Trichloroacetate	See Dichloroacetate			
13. 2,4,6-Trichlorophenol	See Dichloroacetate			
	See Benzo(a)pyrene			
	Amber glass bottles with a screw cap lined with TFE	1 liter	• Refrigerate at 4°C • Add 80 g sodium thiosulfate per liter of sample if residual chlorine is present	40 days
14. Bromoform	See 1,2-Dichlorobenzene			
	See Benzene			
	Glass bottle sealed with TFE-lined screw caps	1 liter	Chill to 4°C	14 days
15. Bromodichloromethane (BDCM)	See 1,2-Dichlorobenzene			
	See Benzene			
	See Bromoform			
16. Chloroform	See Benzene			
	See Bromoform			
17. Dibromochloromethane (DBCM)	See 1,2-Dichlorobenzene			
	See Benzene			
	See Bromoform			

Sources: APHA 22nd ed., 2011 ADWG

Table D-3. Summary of Sampling Requirements for Physical and Chemical Parameters for Acceptability Aspects

Parameter	Container Material	Minimum Volume of Sample	Mode of Preservation	Holding Time
1. Taste	• Glass-stoppered bottles • TFE-lined enclosures	500 mL	Keep cool at ≤ 6 ^{0} C	Not more than 6 hrs
2. Odor	• Glass-stoppered bottles • TFE-lined enclosures	500 mL	Keep cool at ≤ 6 ^{0} C	6 hrs
3. Color	• Acid-washed amber glass bottles • Covered plastic bottles	100 mL	Keep cool Analyze same day	24 hours
4. Turbidity	• Polyethylene bottle • Glass bottle	100 mL	Keep cool at ≤ 4°C	24 hrs
5. Aluminum	Acid-rinsed Plastic bottles	25 mL or a portion diluted to 25 mL (In absence of fluoride and complex phosphates)	Examine sample immediately	Examine sample immediately
6. Chloride	• Plastic bottle • Glass bottle	100 mL (maximum sample portion) or a suitable portion diluted to 100 mL	No special preservative is necessary	28 days
7. Copper	Acidified Polyethylene Bottle	1 liter	Use 0.5 mL 1 + 1 HCl/100mL sample or acidify to pH <2 with HNO_3	28 days
8. Total Hardness	Plastic/Glass Container	500 mL	Add HNO_3 or H_2SO_4	7 days
9. Hydrogen sulfide	Glass bottle	100 mL	Preserve using zinc acetate solution	• 2 weeks for refrigerated samples • 1 month for frozen samples
10. Iron	Acidified Polyethylene Bottle	50 mL	Use 0.5 mL 1 + 1 HCl/100mL sample or acidify to pH <2 with HNO_3	28 days
11. pH	Polyethylene bottles	50 ml	None required	Analyze immediately or not to exceed 6 hours after sample collection

Parameter	Container Material	Minimum Volume of Sample	Mode of Preservation	Holding Time
12. Sodium	Polyethylene bottles	1 liter	None required	28 days
13. Sulfate	• Polyethylene bottles • Glass bottles	100 mL	Keep cool at 4°C	7 days
14. Total Dissolved Solids	• Resistant-glass • Plastic bottles	500 mL	Keep cool at 4°C	7 days
15. Zinc	• Quartz or TFE containers • Polypropylene or linear polyethylene with a polyethylene cap • Borosilicate glass	50 mL	• Acidify with concentrated nitric acid to pH <2 • Refrigerate at 4°C	• 6 months • 5 weeks if sample contains mercury

Sources: APHA 22nd ed.,2007 PNSDW, 2011 ADWG

Table D-4. Summary of Sampling Requirements for Radiological Parameters

Parameter	Container Material	Minimum Volume of Sample	Mode of Preservation	Holding Time
1. Alpha	Plastic (polyethylene or equivalent) or Glass container	1L	Concentrated HNO_3 or HCl to pH <2	28 days
2. Beta	Plastic (polyethylene or equivalent) or Glass container	1L	Concentrated HNO_3 or HCl to pH <2	28 days
3. Radon	Gas-tight PET bottles	1L	Bottles are to be filled full (up to the brim and no air spaces); no acidification required; samples are to be brought to PNRI lab within the day	8 days
4. Gamma	Plastic container	2L	Concentrated HNO_3 or HCl to pH <2	6 months
5. Tritium	Plastic (polyethylene or equivalent) or Glass container	1L	No preservative	6 months