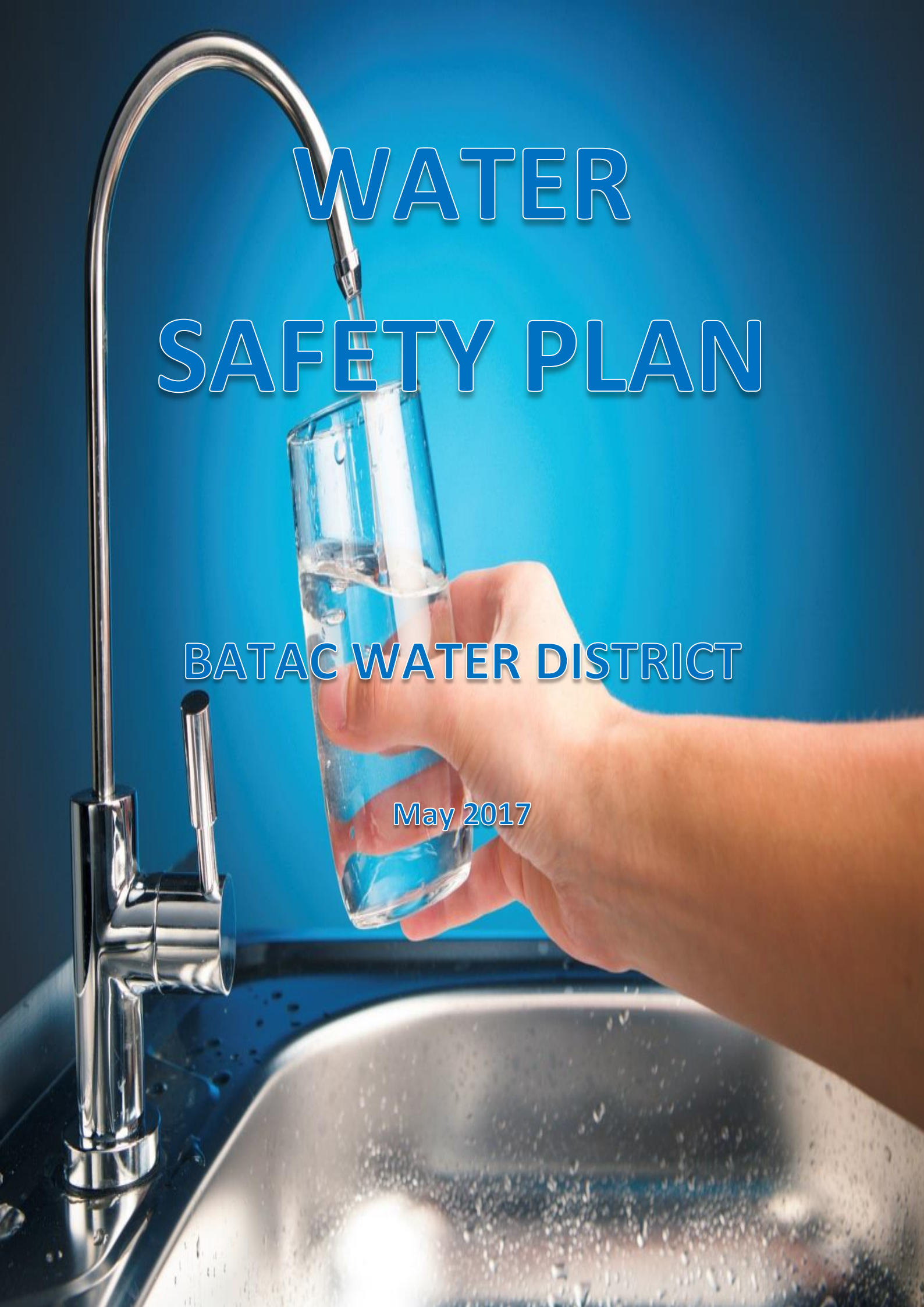

WATER SAFETY PLAN

BATAC WATER DISTRICT

May 2017

WATER SAFETY PLAN

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Abstract

City of Batac is known as the “Home of Great Leaders”, as it is the hometown of many significant figures in the history of the Philippines. Among them is the former Philippine President, Ferdinand E. Marcos. It is also the birthplace of Gregorio Aglipay, the founder of the Philippine Independent Church better known as the Aglipayan Church, and Gen. Artemio Ricarte, the Father of the Philippine Army. Because of these significant figures in the history of the Philippines, Batac is part of the Gateway Cluster Destination under the Laoag-Vigan Cluster. City of Batac contains attractions of national significance and is a major route of travel to and from the Laoag International Airport.

Batac is also well known for being the home of the Mariano Marcos State University (MMSU), high-degree granting university that has several branches throughout the province.

The Batac Water District’s goal is to keep in stride with the progress of the City of Batac; hence a need to further improve its water sources and to expand its services to accommodate the increasing number of immigrants and tourists is a must.

There are several surface water resources present in the City of Batac wherein it provides both potable water supply and irrigation purposes. However, most of the water sources in the City are not suitable for water exploitation. Their flows are very minimal during dry season. Also extensive summer heat evaporation and exploitation for irrigation purposes are either dry or stagnant as they reach the plain.

Most of the households in the City depend on underground water for consumption. And the only water works Level III system of the City is the Batac Water District serving 8,410 population of the City.

Quiaoit River is currently being utilized by the Batac Water District for water supply through its infiltration galleries. The intake structure/impounding area is made of a perforated concrete pipes that discharge collected water into a watertight chamber from which the water is pumped to treatment facilities and into the distribution system during dry season. However, during rainy season the water is first directed to the reservoir tank before serving the water systems by gravity. As measured by the flow meters installed, the Batac Water District is with rated capacity of 12lps during rainy season, however during dry season the yield is lower. Excess flow of water not utilized by the infiltration galleries is generally used by the farmers downstream for irrigation purposes. Records regarding the annual and monthly discharge of Quiaoit River are not available.

In relation with the vision of the Batac Water District to be a world-class provider of safe, potable and affordable water to every home in the City of Batac, a comprehensive Water Safety Plan has been developed in order to use comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment/source to concessionaire/consumer to consistently ensure the safety of drinking water.

I. INTRODUCTION

The City of Batac is situated on the northwestern section of Luzon Island. It is surrounded on the west and northwest section by the coastal municipality of Paoay while the municipalities of San Nicolas, Sarrat and Dingras limit the north, northeast and eastern fringes respectively. On the southern of the City of Batac lie the municipalities of Badoc and Pinili. Batac can be reached through air and land and is approximately 472km from Manila and more or less 18km from Laoag City, the capital of the Ilocos Norte Province.

The only water system of the City of Batac is operated and controlled by the Batac Water District – a government owned and controlled corporation by virtue of Supreme Court ruling in 1991. It is a self-reliant, self-liquidating whose operation depends solely on its income revenue. It does not receive any subsidy from the national or local government.

The story of the Batac Water District did not come easy. In the early 80's condition of water service by the defunct National Water Sewerage Authority (NAWASA) continued to worsen, the needs of the concessionaires were not met, water quality was unsatisfactory and water pressure was inadequate.

And cognizant of the need to have sufficient, safe and potable water to the people of Batac, the then Sangguniang Bayan Members of Batac in its special session last November 1, 1982 passed and approved Resolution No. 127 series of 1982 creating Batac Water District (BWD) by virtue of Presidential Decree (PD) 198 otherwise known as the Provincial Utilities Act of 1973. The main objective was to upgrade the quality of service.

Local Water Utilities Administration (LWUA) awarded Batac Water District Its Conditional Certificate of Conformance (CCC) No. 250 on September 26, 1983 after the requirements for the certification program were completed. The CCC entitles the Batac Water District to all the rights and privileges under PD 198.

The Batac Water District is manned by nine (9) plantilla positions and five (5) job order workers headed by General Manager Maria Dohna D. Sagun. Other permanent employees are Imelda G. Tutaan (Cashier B); Maizel Maia V. Castro (Sr. Accounting Processor A); Edilberto M. Camangeg, Jr. (Water Resources Facilitator B); Joel A. Castro (Customer Service Assistant D); Dino S. Sagun (Water Resources Facilitator C); Otis Visan P. Corpuz (Utility Worker B); Von Patrick S. Gabriel (Customer Service Assistant E); and Robert Filam C. Manglal-lan (Clerk Processor D). The five job order workers are Ruben T. Cid, Emmanuel Flojo, Filipino Rivera, Erlanger Gamet and Mary Grace Arancon.

The Board of Directors is the policy-making body of the District. It is composed of representatives from each of the community sector as mandated by PD 198. It is chaired by Mrs. Aurora V. Lumang who represents the Women's organizations. Other members are: Mr. Warlito A. Rigonan, Vice-Chairman (Educational Institutions); Dr. Mar Lu B. Magno, Secretary (Professional Associations); Mr. Jesus Ariel R. Garcia, Treasurer (Business, Commercial or Financial Organizations); and Mrs. Perla C. Marders (Civic-Oriented Service Clubs)

Since Batac became a City ten years ago the demand of water supply increases tremendously because of the increasing number of concessionaires, immigrants and tourists.

With the help of the City Government of Batac, the Batac Water District has now its own office building located at the Government Center, Brgy. Quiling Sur City of Batac. The new office was granted by the City Government of Batac through a deed of usufruct for the lot of 684sq.m and the construction of the 2-storey building was through a non-bearing interest loan with a floor area of 136sq.m.

The existing distribution network of the Batac Water District covers the 14 poblacion/urban barangays of the City of Batac namely: Ricarte, Valdez, Ablan, Cangrunaan, Nalupta; Cal-laguip; San Julian, Caunayan, Acosta, Aglipay, Barani, Lacub, Ben-agan and Pal-palicong. The network also covers portion of 10 rural barangays namely: Baay, Bungon, Baligat, Quiling Norte, Quiling Sur, Tabug, Colo, Payao, Parangopong and Bil-loca. The pipe network consists of varying pipe types of UPVC, GI and Asbestos and sizes from 25mm to 150mm. The District has a total of 12.056km transmission lines and 25.704km distribution lines. Approximately 1.5km of 150mm diameter pipe from the nearest water source is used to convey the water to the reservoir tank. A 200mm diameter pipe of approximately .55km long is used to transit the water from the reservoir to the distribution system. Distribution facilities include the distribution network, service connections, valves and hydrants.

The existing 267cum concrete ground reservoir is located in the southern portion of the poblacion at Barani Hill, Brgy. Barani, City of Batac. The bottom elevation of the reservoir is 15m above the poblacion. The other 75 cum ground reservoir with the same elevation with the other reservoir is located in Brgy. Baay, in this City.

The existing water supply facilities of the Batac Water District include four infiltration galleries to wit: 1) Infiltration Gallery 1 with 5hp pumping equipment is located in Brgy. Payao; 2) Infiltration Galley 2 with 3hp pumping equipment is located in Brgy. Parangopong; 3) Infiltration Gallery 3 with 5hp and 3hp pumping equipment is located in Brgy. Payao; and 4) Infiltration Gallery 4 with 7.5hp pumping equipment with variable frequency drive motor controller is located in Brgy. Colo. Other water sources

are two units 22m deep well located at Brgy. Quiling Norte; two units 20m deep well located at Brgy. Baay, two units 32m deep well located at Brgy. Colo and Brgy. Parangopong and one unit 50m deep well located at Brgy. Colo all in the City of Batac. The Batac Water District has 5 pump stations to wit: Baay Pump Station, Quiling Norte Pump Station, Payao 1Pump Station, Payao 3 Pump Station and Colo Pump Station. During power interruption, majority of the aforementioned pumping equipment are powered by generator sets.

To monitor the potability of water to be distributed, physical and chemical tests of water samples are done in a yearly basis, Fecal Coliform Test (FCT) and Total Coliform Test (TCT) including PH of water directly from faucets are done in a monthly basis and chlorine residual test is conducted daily. Results of these tests should conform to the standards set by the Philippine National Standards for Drinking Water.

Activities of the Batac Water District consist primarily of operating the pumps, treating the water, repairing leaks, installation, disconnection and reconnection of service lines, preparing financial reports to be submitted to other governing agencies, marketing of prospective concessionaires, implementing corporate social responsibilities to the community and other business activities.

The mandate of the Batac Water District is to manage efficiently water resources for the effective delivery of water services to the people of the City of Batac. It aims to provide safe, potable, affordable and adequate water to its concessionaires even in the rural areas 24/7.

The water system of the Batac Water District which is being improved every now and then through its projects would enhance its economic activities, reduce the risk of water borne diseases and the burden of buying the expensive bottled water for domestic use. And in line with these goals, the Batac Water District embraces the development and implementation of a Water Safety Plan pursuant to the Administrative Order No. 2014-0027 of the Department of Health.

1.1 Vision

The Batac Water District envisions itself to be a world-class provider of safe, potable and affordable water to every home in the City of Batac.

1.2 Mission

It is the mission of the men and women of Batac Water District to deliver 24 hours a day safe, potable and affordable water at the most convenient way to the people of the City of Batac.

It is also the mission of the Batac Water District to help protect, preserve and maintain the Mother Earth, the very source of its existence.

1.3 Core Values

We abide by these core values in order for us to move forward:

Customer Focus – We are committed to listed, deliver quality service and take ownership of our concessionaire's problem until it is solved.

Team Work – We work together and support each other to achieve the goals of the District.

Integrity – We abide by the highest work ethical standards, acting with honesty and honor without sacrificing the truth.

Accountability – We are responsible for our success and failures.

Commitment – We are committed to provide safe, potable and affordable water to every home in the City of Batac and committed to demonstrate corporate social responsibility to the community.

Safety – we ensure the health and safety of our concessionaires with the water we provide and the health and safety of the employees as well.

II. WATER SAFETY PLAN TEAM

Part of the Batac Water District's enormous tasks is to ensure safe drinking water through good water supply practice from catchment to consumer. In compliance with AO No. 2014-0027 of the Department of Health which was issued last September 4, 2014, the Board of Directors of the Batac Water District passed and approved Resolution No. 07 series of 2017 authorizing the General Manager, Maria Dohna D. Sagun to create a Water Safety Plan for the Batac Water District. A team of diverse and experienced personnel was created by virtue of an Office Memorandum No. 17-06 dated May 22, 2017.

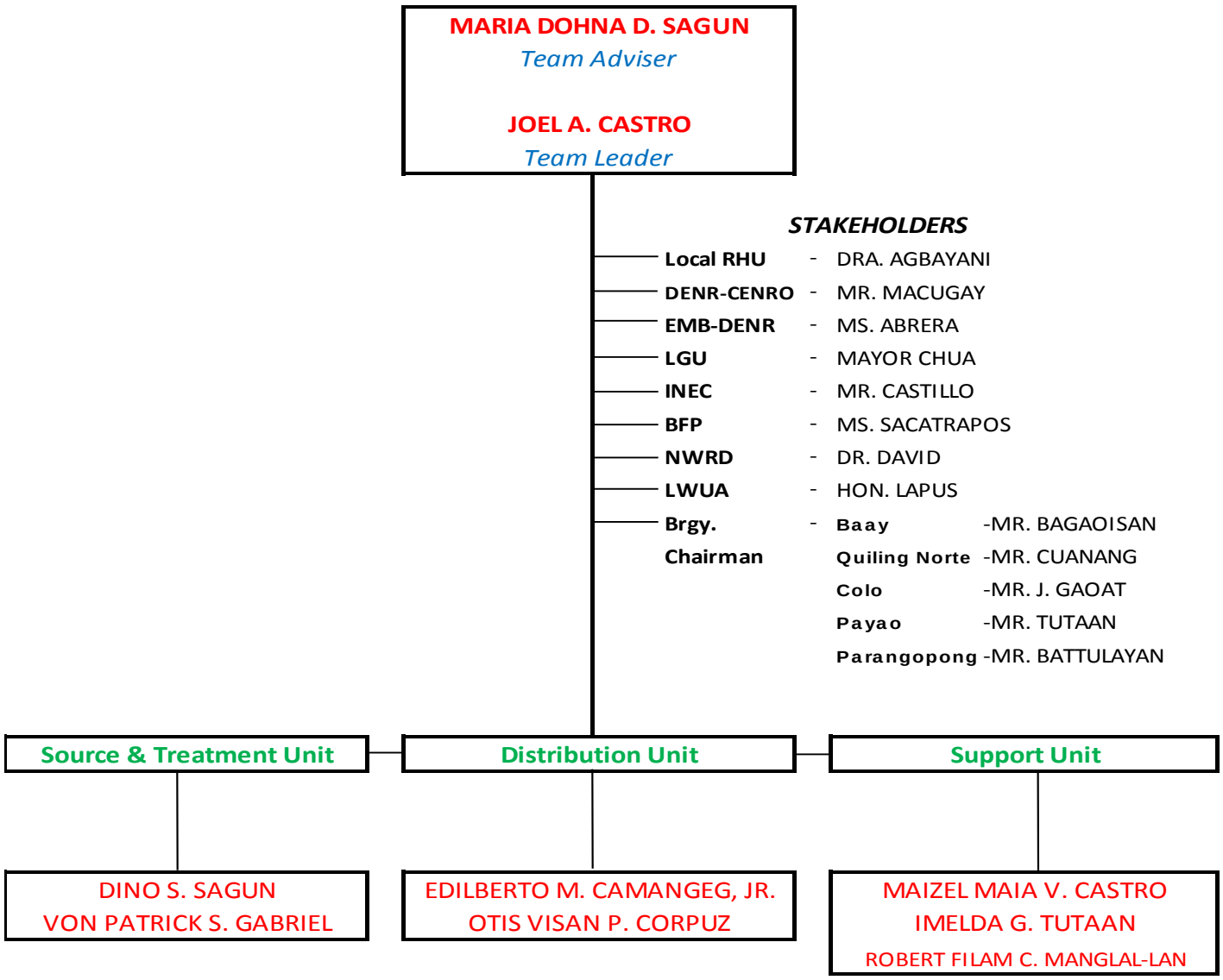
The Water Safety Plan of the District is in conjunction with its Emergency Response Plan created last 2015. The WSP comprises the protection of water sources, water treatment, pumping equipment, reservoirs from risks that will endanger the quality of water being delivered to the concessionaires.

The WSP Team mostly comes from the Operation and Technical Services Groups. The WSP Team conducted periodic meetings and consultations which helped them developed an appropriate Water Safety Plan. The WSP Team was able to identify risks affecting the safety of drinking water and prioritizing these risks, to implement control measures and assess their continuing effectiveness and respond in a timely and efficient manner whenever such identified risks occur.

The Water Safety Plan Team of the Batac Water District is composed of employees who have vast experience in understanding the quality of raw water, its treatment and distribution. They are knowledgeable and well suited to their abilities to address all concern particularly on monitoring the safety of water from its source to the District's concessionaires.

2.1 Water Safety Plan Structure

WATER SAFETY PLAN STRUCTURE



2.2. Water Safety Plan Composition

Name	Section	Official Designation	WSP Team Responsibility	Duties & Responsibilities in the WSP Team
Mr. Joel A. Castro	Commercial	Customer Service Assistant D	Team Leader	• Responsible in the proper implementation of the WSP. • Responsible in planning, setting priorities, delegating, making decision and influencing people. • Oversees the production, quality control/monitoring , storage and distribution of safe and potable water to concessionaires. • Initiates the evaluation of existing system and researches on new treatment methods, source development and distribution and submits recommendation. • Coordinates with the stakeholders to ensure understanding and smooth facilities of the work required. • Updates various water quality management program based on PNSDW and other

				recognized standards on drinking water. • Monitors and evaluates the WSP and submits recommendations. • Directs the planning, implementation and monitoring of all preventive, predictive and corrective maintenance activities.
Mr. Dino S. Sagun	Technical	Water Resources Facilities Operator C	Team Member (Source and Treatment Unit)	• Operates, safeguards and maintains pumping equipment, appurtenances, structure and grounds on all deep wells and infiltration galleries, pump stations and reservoirs. • Maintains adequate supply of safe and potable water. • Operates and maintains water treatment equipment to maintain the safety of water supply. • Initiates the evaluation of all existing water sources and submits recommendation of additional water sources if

				necessary. • Plans for, recommends and implements all preventive, predictive and corrective maintenance works on water sources, treatment facilities and reservoirs. • Implements ERP, WSP and other safety practices and recommends changes as deemed necessary. • Collects and submits water samples from sources and at the distribution system for fecal, bacteriological, physical and chemical analysis. • Determines and records proper dosage of chlorine granules. • Collects water samples at source and at the distribution system for daily chlorine residual test. • Computes and records production, chlorine usage, power usage, and other similar data during tour of duty. • Manipulates distribution valves to meet water

				supply schedule. • Logs/records important events/abnormalities during tour of duty and inform the GM if necessary. • Monitors, checks and records all meter readings and other related data and accomplishes daily operation records.
Mr. Von Patrick S. Gabriel	Commercial	Customer Service Assistant E	Team Member (Source and Treatment Unit)	• Coordinates with local government officials, non-government officials and stakeholders in the implementation and of maintenance works to ensure understanding and smooth facilitation of works required. • Assists in the monitoring of water quality requirement. • Records and computes generator sets usage and submits reports to the EMB-DENR Regional Office No. 1 • Submits Comprehensive Monitoring Report on the ECC to the EMB-DENR Regional Office

				No.1. • Coordinates with the Distribution Unit regarding the repair of leakages and other maintenance of the distribution system. • Updates maps and data base for the improvement of water supply. • Monitors all system of the District from the source to treatment to distribution in order to be able to answer queries from concessionaires and media. • Assists in the evaluation of the system and records improvement to meet the required efficiency and safety. • Entertains complaints and reports from concessionaires and concerned citizens. • Monitors availability of materials for repairs. • Monitors monthly consumption of treatment chemicals and other consumables to maintain

				adequate stock at all time. • Prepares monthly report of bacteriological and submits results to LWUA and CHO. • Attends to concessionaires complaints/requests. • Attends seminars and trainings on water treatment and quality control.
Mr. Edilberto M. Camangeg, Jr.	Technical	Water Resources Facilities Operator B	Team Member (Distribution Unit)	• Plans for, recommends and implements all preventive and corrective maintenance works of the transmission and distribution mains, line appurtenances and service connection meters. • Coordinates with the Barangay Officials in the implementation of maintenance and connection works. • Directs the operation, safeguarding and maintenance of equipment, facilities and appurtenances. • Coordinates with the Source and Treatment Unit regarding the operation of chlorine equipment

				at deep well and infiltration sources. • Assists in the evaluation of existing systems and submits recommendation. • Updates maps and data base for the improvement of water supply. • Ensures the security of BWD's structures. • Submits reports and communication to the Team Leader and to the GM regarding the monthly activities and other concerns. • Supervises and assists in leak detection and day and night time flow measurement. • Prepares, recommends and implements programs in reducing non-revenue water. • Records data gathered in the field and interprets data for further actions. • Supervises and assists in the implementation of WSP. • Supervises the restorations of all damaged roads,

				pavements and other facilities affected by the implementation of all utility projects and repairs.
Mr. Otis Visan P. Corpuz	Technical	Utility Worker B	Team Member (Distribution Unit)	• Implements existing policies on maintenance works, safety practices and recommends changes as deemed necessary. • Monitors water supply in the entire service area of Batac Water District. • Secures production and storage facilities. • Assists in leak detection and the day and night time flow measurement. • Assists in the preparation and implementation of programs in reducing non-revenue water. • Records and reports data gathered in the field and assists in the interpretation of data for further actions. • Submits reports on the activities and accomplishments of the group. • Helps maintain the availability and orderliness of

				materials and equipment. • Prepares and submits all construction and related documentation. • Assists in the restoration of all damage roads, pavement and other facilities affected by the implementation of utility projects and repairs. • Monitors, checks and records all meter readings and other related data and accomplishes daily operation records. • Logs important events/abnormalities during tour of duty and informs GM if necessary. • Attends to customer's complaints/requests.
Ms. Maizel Maia V. Castro	Administrative & Accounting	Sr. Accounting Processor A	Team Member (Support Unit)	• Files and maintains recordsof all correspondence and reports. • Prepares and dispatches request of the team needed for the operation. • Prepares notices to concessionaires. • Prepares adjustment memo based on

				complaints. • Prepares minutes of meeting during stakeholders and WSP team meetings. • Prepares minutes of meeting during WSP Team meetings.
Ms. Imelda G. Tutaan	Administrative and Accounting Section	Cashier B	Team Member (Support Unit)	• Files clippings and articles regarding water district and its activities. • Promotes and designs program that shall establish the role of the Water District to the community in providing safe and potable water. • Disseminates programs and activities on WSP. • Prepares notice to concessionaires.
Mr. Robert Filam C. Manglal-lan	Finance & Administrative Section	Clerk Processor C	Team Member (Support Unit)	• Encode the Water Safety Plan. • Encodes letters, reports, memorandum and other needed documents of the WSP. • Entertains complaints/reports .

2.3 Skills needed for an effective WSP Team Players

1) Technical competence on operation and maintenance of
    a) Source
    b) Storage
    c) Treatment
    d) Distribution
2) Ability to provide operational support in terms of
    a) Administrative
    b) Financing
    c) Technical
3) Capability of communicating the WSP objectives and output
    a) Inside the Water District
    b) Outside the Water District
4) Capability to understand water quality targets to be met
5) Capability to understand the impact of proposed water quality controls on the environment
6) Awareness on regulations
7) Familiarity on trainings and awareness programs
8) Ability to work with authority
9) Ability to work in a team environment
    a) Resource Person
    b) Coordinator
    c) Secretariat
    d) Documentation Committee/Staff

2.4 Team Members' Expertise

NAME	ROLE in the WSP Team	Expertise																		
		1				2			3		4	5	6	7	8	9				
		a	B	c	d	a	b	c	a	b						a	b	c	d	
Joel A. Castro CSA D Cell # 09159694251	Team Leader	■	■	■	■		■	■	■	■	■	■	■	■	■	■				
Dino S. Sagun WRFO C Cell # 09772137348	Team Member (Source & Treatment Unit)	■	■	■	■			■	■		■	■	■	■						
Von Patrick S. Gabriel CSA E Cell # 09393773968	Team Member (Source & Treatment Unit)			■		■	■		■	■	■	■	■	■						■
Edilberto M. Camangeg, Jr. WRFO B Cell # 09163324326	Team Member (Distribution Unit)	■	■	■	■			■	■		■	■	■	■						
Otis Visan P. Corpuz Utility Worker B Cell # 0274238673	Team Member (Distribution Unit)	■	■	■	■			■	■		■	■	■	■						
Imelda G. Tutaan Cashier B Cell# 09369516422	Team Member (Support Unit)					■	■		■	■		■	■					■	■	■
Maizel Maia V. Castro Sr Acctng Proc A Cell # 09105758159	Team Member (Support Unit)					■	■		■	■		■	■	■				■	■	■
Robert Filam C. Mang-lal-lan Clerk Processor D Cell # 09070555793	Team Member (Support Unit)					■	■		■	■		■	■					■	■	■

2.5 WSP Stakeholder Identification and Interaction

Stakeholder involvement is of importance in the developing and implanting a Water Safety Plan. The implementation of a WSP demands societal participation because of the complexity in providing safe and potable water to the concessionaires. The WSP Stakeholder Identification and Interaction Table below will focus on the questions: who the stakeholders are and why stakeholders should be involved.

Stakeholders				Interaction mechanism	Record of interaction
Name	**Relationship to drinking-water supply issues**	**Point of contact with WSP Team**	**Issues with drinking-water supply**		
SOURCE					
EMB-DENR	Issuer and Regulator of Environmental Compliance Certificate	Submission of application form for ECC and its requirements	Compliance with the ECC conditions	Meeting, dialogue, inspection and reporting	Minutes of meeting, permit issued, documentation during the inspection and Semestral Reports
DENR-CENRO	Implementor and enforcer of forest protection	Community assembly and dialogue	Illegal and salvage logging chokes streams and rivers with sediment and may affect the flow of water	Meeting, dialogue, and inspection	Documentation during inspection and minutes of meeting.
City Government of Batac	Partners in implementing the Save the Quiaoit River and the watersheds of Batac	Community assembly, tree planting activity	Illegal and salvage logging may negatively affect the flow of water in the Quaioit River which is the source of water of the District	Community Assembly, tree planting activity	Minutes of Meeting and documentation during tree planting
Department of Agriculture	Regulator on the use of pesticide, fertilizers	Community Assembly, dialogue	Pesticide and fertilizer contaminants	Community Assembly, inspection	Minutes of meeting and attendance
Barangay Council	Regulator on the cleanliness of the	Community Assembly, Clean-up drive activity	Waste and run-off water during rainy days	Community assembly, clean-up drive	Attendance to clean-up drive activity

	surroundings			activity	
Farmers and Land owners	Possible polluter of source, competing user	Community assembly, dialogue	Pesticide, fertilizer contaminants	Meeting, dialogue	Minutes of Meeting
INEC	Supplier of power/electricity	Notice from INEC of power interruption	Water supply interruption	Notice thru letter or txt	Copy of the Notice
BFP	Respondent of grass fire	Notice from BFP of grass fire	Possible water contamination	Notice thru txt or call	Copy of the Notice
NWRB	Issuer of water permit and regulator of water extraction	Submission of application for water permit and its requirements	Monitor and ensures safety, adequate and sustainable water supply	Personal submission of application forms	Water permit and Quarterly Water Extraction Report
Suppliers and Contractors	Supplier of materials or contractor of projects	Issuance of canvass or conducting a public bidding	Materials or Projects not in accordance with the District's standards or PNSDW or WSP	Sending thru fax or e-mail the canvass or holding a public bidding	Canvass forms, bid documents and minutes of pre-bidding and bidding conferences
DISTRIBUT-ION					
LWUA	Regulator on water quality	Water sampling and submission of Water Quality results	Compliance to Water Quality Standards. Monitor water quality.	Reporting of Water Quality Results	Monthly Microbial Reports, Annual Physical and Chemical Reports and Daily Chlorine Residual Reports
City Health Office	Regulator on water quality	Water sampling and submission of Water Quality results	Compliance to Water Quality Standards Monitor water quality.	Reporting of Water Quality Results	Monthly Microbial Reports, Annual Physical and Chemical Reports and Daily Chlorine Residual Reports
City Engineering Office	Regulator on the excavation of drainage/should	Application for permit to excavate for repair and new	Compliance with the Building and Sanitary Code of the Philippines.	Personal submission of application forms and	Permits Issued.

	er where transmission & distribution lines are to be installed and Implementor of Sanitary and Building Permit	connections, sanitary and building permit	Compliance with the City Ordinance on the excavation of drainage and shoulder during installation of transmission, distribution and service lines.	dialogue with the CEO Officials.	
DPWH	Regulator on the excavation of shoulders in the national highway.	Dialogue with the District Engineer and request letter.	Compliance on the regulations in excavating the shoulders of the national highway	Dialogue, Request Letter and Resolution.	Notice on the commencement and completion dates of the project.
Barangay Council	Regulator on the excavation of barangay roads	Dialogue with the Brgy. Chairman	Compliance on the regulation in excavating barangay roads	Coordinationdialogue, meeting, and request letter	Minutes of meeting or permit issued.
Suppliers and Contractors	Supplier of materials or contractor of projects	Issuance of canvass or conducting a public bidding	Materials or Projects not in accordance with the District's standards or PNSDW or WSP	Sending thru fax or e-mail the canvass or holding a public bidding	Canvass forms, bid documents and minutes of pre-bidding and bidding conferences
TREATM-ENT					
City Health Office	Regulator on water quality	Water sampling and submission of Water Quality results	Compliance to Water Quality Standards Monitor water quality.	Reporting of Water Quality Results	Monthly Microbial Reports, Annual Physical and Chemical Reports and Daily Chlorine Residual Reports
Accredited Laboratory Testing Center	Provide speedy and accurate laboratory results with the parameters requested by the District.	Water sampling/submission of water quality results.	Compliance to water Quality Standards	Proper handling of water samples for accurate results and reporting of water quality results.	Monthly Microbial Reports, Annual Physical and Chemical Reports and Daily Chlorine

					Residual Reports
Barangay Council	Regulator on the cleanliness of the surroundings.	Proper coordination with the Barangay Officials on the cleanliness of surroundings and in the issuance of permit to business establishments.	Pollution contaminants due to construction of structures within the source and pump stations.	Dialogue, meeting and approval or disapproval of permit.	Minutes of meeting and permit issued.
Suppliers and Contractors	Supplier of treatment materials or facilities	Issuance of canvass or pre-bidding and bidding conferences	Treatment materials or facilities not in accordance with the District's standards or PNSDW or WSP	Sending thru fax or e-mail the canvass or holding a public bidding	Canvass forms, bid documents and minutes of pre-bidding and bidding conferences

III. WATER SUPPLY SYSTEM DESCRIPTION

3.1 General Information

The water system of the City of Batac was constructed in 1969 by the defunct National Water Sewerage Authority (NAWASA). Due to mismanagement, NAWASA declared bankruptcy and its management and operation were turned-over to the Municipality of Batac using flat rate in billing concessionaires' water consumptions. In the early 80's condition of service continued to worsen because the needs of the concessionaires were not met, water quality was unsatisfactory, water pressure was inadequate and reliability of service was poor

And cognizant of the need to have safe, potable and sufficient water to the people of Batac, the Sangguniang Bayan Members of Batac in its special session on November 15, 1982 passed and approved Resolution No. 127 creating Batac Water District by virtue of Presidential Decree (PD) 198 otherwise known as the Provincial Utilities Act of 1973. The main objective was to upgrade the quality of service and to develop the adequacy of water supply.

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The Board of Directors is the policy-making body of the District. It is composed of representative from each of the community sectors as mandated by PD 198. It is chaired by Mrs. Aurora V. Lumang who represents the Women's Sector. Other members are:

1) Mr. Warlito A. Rigonan, Vice-Chairman, represents the Educational Institution Organization;

2) Dr. Mary Lu B. Magno, Board Secretary, represents the Professional Sector;

3) Mr. Jesus Ariel R. Garcia, Board Treasurer, represents the Business Sector; and

4) Mrs. Perla C. Marders, Board Member, represents the Civic-Oriented Service Club.

Batac Water District is a Government Owned and Controlled Corporation (GOCC) by virtue of Supreme Court ruling in 1991 (The Supreme Court, in an en banc decision dated September 13, 1991 in the case of Davao City Water District et. al. G.R. No. 95237-38). It is a self reliant, self-liquidating whose operation depends solely on its income revenue. It does not receive any subsidy from the national government.

3.1.1 Area of Coverage

Batac City is composed of forty-three (43) barangays; 14 are urban barangays and 29 are rural barangays. The present service area of Batac Water District covers the fourteen urban barangays namely – Valdez, Ricarte, Ablan, Cangrunaan, Nalupta, Cal-laguip, San Julian, Caunayan, Acosta, Aglipay, Lacub, Barani, Ben-agan, Palpalicong and ten (10) adjacent rural barangays namely – Baay, Quiling Norte, Quiling Sur, Bil-loca, Parangopong, Payao, Colo, Bungon, Tabug and Baligat. Water service in this 24 barangays is 24/7 excluding Adigi Homes of Brgy. Baligat which is 12-14 hours a day. Batac Water District is serving 55% of the total barangays of the City, however majority of the Sitios of the rural barangays are not yet covered within the area of coverage.

3.1.2 Household Coverage

The total population of the City of Batac is 55,595 as of December 31, 2016 and at present only 14.4% of the total population which is 7,995 has an access to safe, potable, dependable and affordable water from Batac Water District.

3.1.3 Transmission and Distribution Pipeline

There are twelve transmission lines originating from 12 water sources of the Batac Water District. The existing transmission and distribution network covers fourteen (14) poblacion/urban barangays and ten (10) rural barangays. The pipe network consists of varying pipe sizes from 50mm to 200mm of different types shown below:

1)	200mm (Asbestos)	373.50 m
2)	150mm (Asbestos)	1,550.60 m
3)	150mm (PVC)	4,524.00 m
4)	150mm (GI)	204.00 m
5)	100mm (Cast Iron/GI)	6,699.70 m
6)	100mm (PVC)	5,010.00 m
7)	75mm (PVC)	11,044.00 m
8)	75mm (GI)	360.00 m
9)	50mm (GI)	141.7 m
10)	50mm (PVC)	1,782.00 m
TOTAL LENGTH		**32,049.50 m or 32.049km**

3.1.4 Existing Water Rates

The existing water rates of the Batac Water District was approved by LWUA on June 23, 2005 presented in a public hearing on November 10, 2005 and was implemented last May 2006 billing. The water rates of the District are as follows:

1) Residential/Government

Minimum ½"		P 300.00
Commodity Charge	11-20cum	31.30
	21-30cum	32.70
	31-40cum	34.25
	Over 40cum	36.30

2) Direct Commercial

Minimum ½"	P 600.00
Minimum ¾"	960.00

Commodity Charge	11-20cum	62.60
	21-30cum	65.40
	31-40cum	68.50
	Over 40cum	72.60

3) Semi-Commercial A

Minimum ½”		P 525.00
Commodity Charge	11-20cum	54.75
	21-30cum	57.20
	31-40cum	59.90
	Over 40cum	63.50

4) Semi-Commercial B

Minimum ½”		P 450.00
Commodity Charge	11-20cum	46.95
	21-30cum	49.05
	31-40cum	51.35
	Over 40cum	54.45

5) Semi-Commercial C

Minimum ½		P 375.00
Commodity Charge	11-20cum	39.10
	21-30cum	40.85
	31-40cum	42.80
	Over 40cum	45.35

3.2 Source of Water

At present, water sources facilities of the Batac Water District are eight (8) drilled wells and four (4) infiltration galleries. There are several surface water resources present in

the City of Batac wherein it provides both potable water supply and irrigation purposes. Quiaoit River is currently being utilized by the Batac Water District for water supply through its infiltration galleries. During dry season all the drilled wells are being utilized and during rainy season all of the infiltration galleries are being utilized.

3.2.1 Baay Pump Station – Well Nos. 1, 2 & 9

It consists of three (3) units drilled well (Well No. 1, 2 & 8) and has a total capacity of 16-18lps during rainy season and 8lps during dry season. It could sustain approximately 1,600 concessionaires. This can supplement the increasing demand in the future since right now there are only 306 concessionaires availing water from Baay Pump Station. Inside the Pump Station is a hypo chlorinator machine that treats the water coming from the source. Treated water will be pumped to the 75cum ground reservoir before it will be distributed to concessionaires. Another partition in the Pump Station is where the 25KVA generator set is placed which is being utilized during power interruptions. The drilled wells are equipped with 3HP pumping equipment. The distribution network covers two sitios of Brgy. Baay and a portion of Brgy. Bungon. The pipe network is composed of 5.010km of 100mm PVC, 6.750km of 75mm PVC and 1.782km of 50mm. As per laboratory tests, results showed the Sulfate as the non-complying parameters.

3.2.2 Quiling Norte Pump Station – Well Nos. 3 & 4

It consists of two (2) units drilled well and has a total capacity of 2-3lps during rainy season and 1lps during dry season. It could sustain approximately 300 concessionaires. Since there is no reservoir within the area water supply is from 6am to 8pm only. Right now it is serving the Adigi Homes and its adjacent houses. The pipe network from the Pump Station to the Adigi Homes is 700m only although the distribution network is interconnected with the existing distribution network in the Poblacion. Inside the Pump Station is the hypo chlorinator machine that treats the water coming from the source which is directly pumped to the transmission and distribution network. During dry season, the yield is poor or minimal. As per Physical and Chemical Test, results showed to be complying on the parameters tested.

3.2.3 Well No. 5 (Colo)

Drilled Well No. 5 is located in Brgy. Colo, City of Batac. This is the only drilled well that has replaced the series of shallow wells which were the original water sources of the City of Batac. It is drilled along the Quiaoit River with a depth of 32m and equipped with 3hp pumping equipment. It has a yield of 3-4lps and is being utilized during dry season. The treated water is being pumped to the 267 ground reservoir located at Barani Hill, Brgy. Barani City of Batac. As per laboratory test,

water coming from this well showed complying parameters on the Physical and Chemical Analysis.

3.2.4 Well Nos. 6 & 7(Parangopong)

Drilled Well No. 6 and 7 are located in Brgy. Parangopong, City of Batac. Well No. 6 is drilled in the middle of the rice fields and near the old Deep Well No. 101 of the defunct NAWASA. It has a depth of 32m and is equipped with a 3hp pumping equipment. Well No. 7 is drilled approximately 150m away from Well No. 6. These wells are usually operational during summer season. Beside this well is an old pump house and at least 50m away is the chlorinator house. As per laboratory test, water coming from these wells showed complying parameters on the Physical and Chemical Analysis.

3.2.5 Colo Pump Station - Well No. 8 (Colo) and Infiltration Gallery 4

Drilled Well No. 7 is located in Brgy. Colo, City of Batac. This is the deepest deep well the District has with a depth of 50m with a 200mm casing. It is drilled along Quiaoit River and the most productive of all water sources of the District. It has a yield of 8-10lps during rainy season and 5-6lps during dry season. It is equipped with 7.5hp pumping equipment with variable motor frequency drive. The Colo Pump Station housed the control boxes, chlorinator machines and 25KVA generator set. It has its own transformer.AS per laboratory test, results showed the Total Dissolved Solids as the non-complying parameters.

The Infiltration Gallery 4 located approximately 100m away from Deep Well No. 8 is consists of 60pcs 1m by 1m perforated and non perforated reinforced concrete pipes lie/installed underneath the Quiaoit River bed. The 60pcs RC pipes were installed horizontally 5meters below the Quiaoit River bed as the impounding/catchbasin of the water. The RC pipes are packed with gravel with open-jointed that discharge collected water into a watertight chamber or 10pcs RC pipes installed vertically from which the water is pumped to the chlorinator machine and into the distribution system.

3.2.6 Payao Pump Station – Infiltration Gallery 1 & Infiltration Gallery 3

Infiltration Gallery 1 was constructed by the defunct NAWASA and was rehabilitated by the Batac Water District. Originally, NAWASA utilized 30hp centrifugal pump and motor but since the water flowing along the Quiaoit River is seasonal and it usually dries up during summer season, the District installed 5hp and 3hp pumping equipment in which 5hp is being utilized during rainy season and 3hp during summer season. The design of the infiltration gallery is made up of horizontal tunnel of brick masonry with open joints.

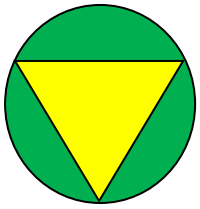
Infiltration Gallery 3 is located 100m away from Infiltration Gallery 1. It is constructed horizontally at a shallow depth below the Quaioit River. The impounding is made up of 48pcs 1mx1m perforated and non-perforated RC pipes. The water chamber is made up of 11pcs pcs non perforated RC pipes installed vertically from which the water is pumped to the chlorinator machine and to the distribution lines. Infiltration Gallery consists of two pumping equipment of 5hp and 3hp. It has a total capacity of 15lps during rainy season. This water source was constructed on March 2011.

3.2.7 Infiltration Gallery 2 - Colo

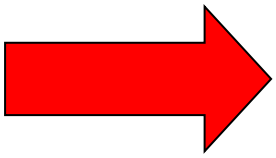
Infiltration Gallery 2 was patterned from infiltration gallery 1 but with a smaller impounding capacity. It is located 120m away from Infiltration Gallery 1. It has 3hp pumping equipment and a yield of 6lps during rainy season. It is being shut-off during summer season since it usually dries up when there is no water flowing along the Quaioit River. All the treated water coming from Infiltration Gallery 1, 2, 3 & 4 and drilled wells 5, 6, 7 & 8 will be pumped to the 267 cum ground reservoir located at Barani Hill, Brgy. Barani City of Batac before it will be distributed to the concessionaires.

3.3. Process Flow Diagram

LEGEND:

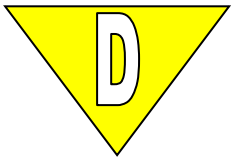


SOURCE WITH PUMP STATION/CHLORINATOR

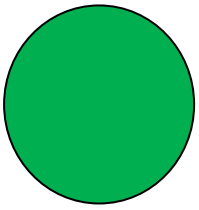


TRANSMISSION

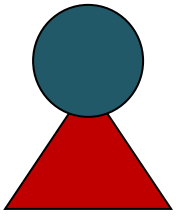
MONITORING



STORAGE

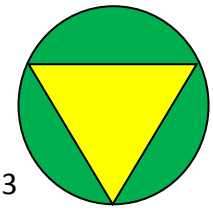
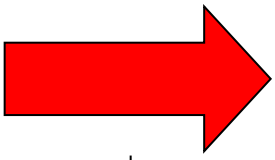
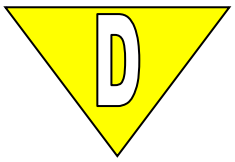
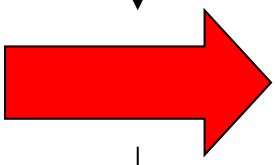
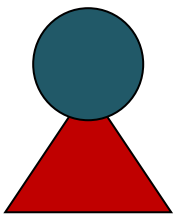


SOURCE

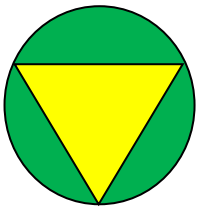
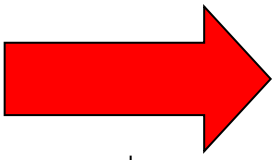
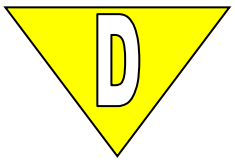
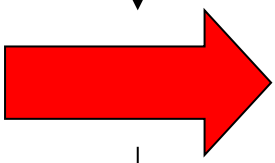
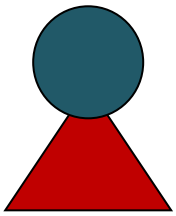


CONCESSIONAIRE

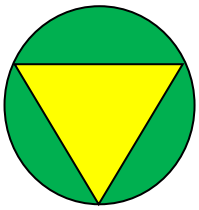
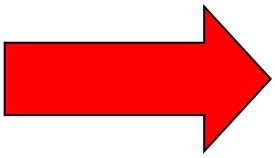
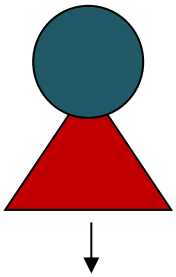
3.3.1 Process Flow Diagram – Main System

Description	Step	Responsible/In-Charge
1) Source with Pump Station/Chlorinator (Infiltration Gallery 1, 2, 3 & 4 and Well # 7)		Source and Treatment Unit Multiple Stakeholders
2) Transmission		Distribution Unit
3) Storage Unit		Source and Treatment
4) Transmission		Distribution Unit
5) Monitoring		Source and Treatment Unit Distribution Unit Multiple Stakeholders
6) Concessionaire		Support Unit
7) Monitoring		WSP Team

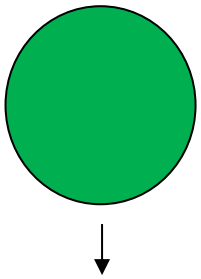
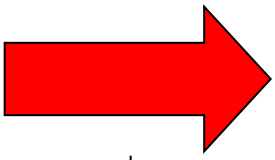
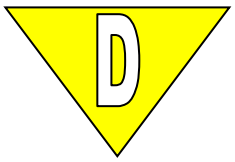
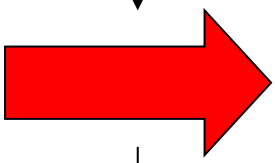
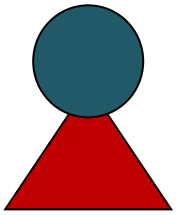
3.3.2 Process Flow Diagram – Baay Pump Station

Description	Step	Responsible/In-Charge
1. Source with Pump Station/Chlorinator (Well # 1, 2 and 8)		Source and Treatment Unit Multiple Stakeholders
2. Transmission		Distribution Unit
3. Storage		Source and Treatment Unit
4. Transmission		Distribution Unit
5. Monitoring		Source and Treatment Unit Distribution Unit Multiple Stakeholders
6. Concessionaire		Support Unit
7. Monitoring		WSP Team

3.3.3 Process Flow Diagram – Quiling Norte Pump Station

Description	Step	Responsible/In-Charge
1. Source with Pump Station/Chlorinator (Well # 3 and 4)		Source and Treatment Unit Multiple Stakeholders
2. Transmission		Distribution Unit
3. Monitoring		Source and Treatment Unit Distribution Unit Multiple Stakeholders
4. Concessionaire		Support Unit
5. Monitoring		WSP Team

3.3.4 Process Flow Diagram – Well # 5, 6 and Infiltration Gallery 2

Description	Step	Responsible/In-Charge
1. Source		Source and Treatment Unit
2. Transmission		Distribution Unit
3. Storage		Source and Treatment Unit
4. Transmission		Distribution Unit
5. Monitoring		Source and Treatment Unit Distribution Unit Multiple Stakeholders
6. Concessionaire		Support Unit
7. Monitoring		WSP Team

3.4 Treatment Process

Chlorination is the process being used by the Batac Water District since the water quality is compatible with the Philippine National Standard for Drinking Water (PNSDW). This method is used by the District in all its water sources to kill certain bacteria and microbes and to prevent the spread of waterborne diseases.

The District uses powder chlorine granular 70% purity to disinfect the water being supplied to the concessionaires with the following process:

1. The Pump Operator should always wear protective devices before preparing the chlorine solution.
2. The Pump Operator fills the 200 liters mixing drum at least one third of water.
3. Then weigh 6 kilos of chlorine granules during normal days and 9kilos during rainy days.
4. Pour the chlorine.
5. Stir the solution for about 30 minutes or until granules are fully mixed.
6. While mixing the chlorine turn on the hose to fully fill the drum.
7. Cover the mixing drum and wait for 24 hours to allow particles to settle at the bottom of the mixing tank.
8. When water is already clear, greenish in color, fill the suction hose with water until air is out and put back to the chlorinating drum to start chlorination.
9. The chlorine mixture is then injected into the transmission lines going to the reservoir.
10. Chlorinated water then flows from the reservoirs into the transmission/distribution lines.
11. The Pump Operator then check residual chlorine, if not within .3ppm to 1.5ppm, adjust flow rate.
12. Before mixing another batch, collect settled particles and put in an empty chlorine container for proper disposal.
13. Clean the other drum, ready for the next mixing.
14. End.

The Technical Staff in a yearly basis chlorinate the water sources or wells of the District. Chlorination is, in most instances, an effective means of removing contamination from a properly situated well of approved construction. Directions for this treatment process are given below as step procedures:

Step 1: Mix six (6) kilos of chlorine thoroughly with 200 liters of water.

Step 2: Remove the well cap or seal from the top of the well casing.

Step 3: Pour the chlorine mixture. Care must be taken to prevent the chlorine solution from splashing and coming in contact with skin or eyes.

Step 4: Attach a hose to the faucet on the discharge side of the pump and wash down the walls of the casing with the chlorinated water from the well for about 30minutes. This flushing not only disinfects the walls of the casing but also circulates the chlorinated water to all the pump and well parts.

Step 5: Allow the chlorine solution to act in the well for a period of 24hours.

Step 6: After 24 hours, the technical staff will flush out the water until the odor of chlorine could no longer be detected. Following chlorination, seven (7) days should elapse before the system is again sampled. If bacteriological analysis of the sample reveals it to be free of contamination, a second sample should be obtained at a later date to insure that the system remains free of contamination.

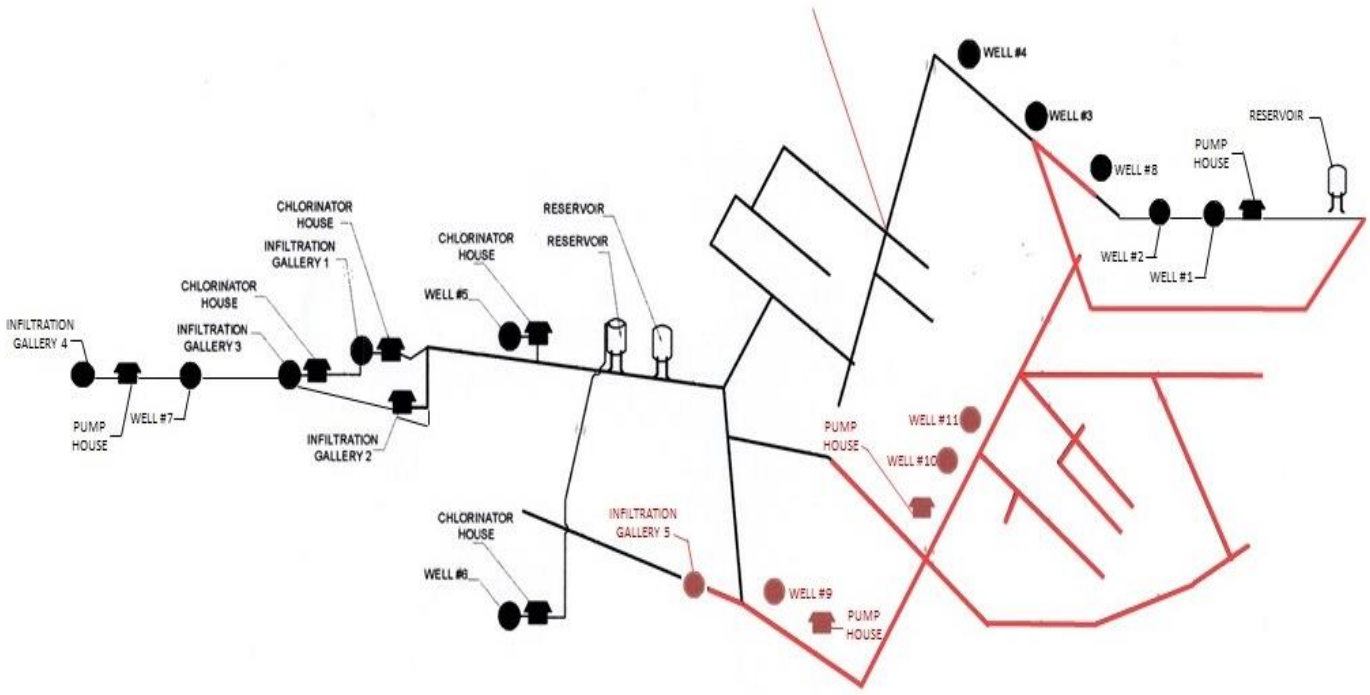
3.6 Distribution System

The existing distribution network of the Batac Water District covers the fourteen (14) poblacion/urban barangays of the City of Batac namely: Ricarte, Valdez, Ablan, Cangrunaan, Nalupta, Cal-laguip, San Julian, Caunayan, Acosta, Aglipay, Barani, Lacub, Ben-Agan and Pal-palicong. The netwok also covers ten (10) rural barangays namely: Baay, Bungon, Baligat, Quiling Norte, Quiling Sur, Tabug, Payao, Colo, Parangopong and Bil-loca.

The distribution network of Baay Potable Water System Project is exclusively for Barangays Baay and Bungon. And for Quiling Norte Pump Station the distribution network has been interconnected with the distribution network of the Poblacion or the City proper.

The distribution/pipe network of the District consists of varying pipe sizes from 25mm to 150mm of different types.

3.5.1 Distribution System of the Batac Water District



SCHEMATIC DIAGRAM
OF EXISTING AND PROPOSED SYSTEM
FACILITIES

*Legend
Red Color – Proposed Expansion Project

3.6. Water Quality Required

The Batac Water District continues to strive for full compliance on the national standard for drinking water by improving the quality of water it provides to the community by treating the water religiously through chlorination.

And to monitor the safety and potability of water to be distributed, physical and chemical tests of water samples are done in a yearly basis, Fecal Coliform Test and Total Coliform Test including Ph of water directly from the faucets are done in a monthly basis and chlorine residual test is conducted daily. Results of these tests should conform to the standards set by the Philippine National Standards for Drinking Water.

3.6.1 Physical and Chemical Analysis

Parameters	Method of Analysis	Permissible Limits
Physical Analysis		
Turbidity	Turbidimetry	5 NTU
Apparent Color (Color Units)	Visual Comparison	10 CTU
Chemical Analysis		
pH	Electrometric	6.5-8.5
Total Dissolved Solids (mg/L)	Gravimetric	500 mg/L
Sulfate (mg/L)	Turbidimetric	250 mg/L
Nitrate (mg/L)	Cd Reduction	50 mg/L 0.03MDL
Chloride	Argentometric	250 mg/L
Benzene	Qualitative Test	0.01 mg/L
Metal Analysis (mg/L)		
Iron (Total)	AAS	1.00 mg/L
Manganese (Total)	AAS	0.40 mg/L
Arsenic	Silver Diethyldithiocarbamate	0.01 mg/L 0.0092MDL
Cadmium	AAS	0.003 mg/L 0.002
Lead	AAS	0.01 mg/L 0.0094

3.6.2 Bacteriological Test

Examination	Exceeding Limit
1. Multiple Tube Fermentation Technique (MFFT)	
MPN per 100mL (Total Coliform Organism)	<1.1
2. Fecal Coliform Test (E. Coli Test)	
MPN per 100mL (Fecal Coliform Organisms)	<1.1
3. Heterotrophic Plate (HPC)	
CFU/mL (Colony-Forming Units per mL)	<500

3.6.3 Chlorine Residual Test

Chlorine residual test is conducted daily from the nearest point of every source where full chlorination shall have been attained; nearest point of every distribution dead-end; nearest point at tank or reservoir outlet and from commercial zone rotated at random from consumers.

3.7 Delivery Point, Intended users of the water and intended uses of the water

Water is essential to life and to the general well-being of the society as a whole. And it is the mission of the men and women of the Batac Water District to deliver 24 hours a day safe, potable, affordable and sufficient water at the most convenient way to the people of Batac.

The farthest water source of the Batac Water District is the Infiltration Gallery 4 located at Brgy. Colo, Batac City. It is approximately 5km away from the reservoir and around 10km away from the farthest concessionaire. The water is being supplied to the concessionaire by way of gravity. Of the 43 barangays of the City of Batac only 24 barangays have access to potable and safe water coming from the Batac Water District. And the 10 rural barangays have limited service distribution network; hence limited people have access to safe and potable water.

Batac Water District is the only Level III supplier of water in the City of Batac. There are 1,623 concessionaires or 8,115 people receiving water supply from the Batac Water District. Water of the Batac Water District is being used for domestic, industrial, commercial and office purposes.

3.8 Current Delivered Water Quality

The Batac Water District continues to strive for full compliance on the national standard for drinking water by improving the quality of water it provides to the community by treating the water religiously through chlorination and by way of the physical, chemical and metals analysis (annually); bacteriological test (monthly) and chlorine residual test (daily). Results of these tests conformed to the standards set by the Philippine National Standard for Drinking Water. Copies of these results were given to LWUA and City Health Office for monitoring purposes.

3.9 Persistent Problems

Of all the water sources of the Batac Water District two of them specifically Well No. 1 in Brgy. Baay and Well No. 6 in Brgy. Palpalicong exceeded some of the parameters in the Physical and Chemical Analysis.

For Well No. 1 in Brgy. Baay the Total Dissolved Solids and Sulfate exceeded the PNSDW limit. Since Batac is not a coastal area and the result of the test indicated an above required limit of sulfate it is assumed that the sulfate intruded said deep well making it high in Total Dissolved Solids. Although TDS is not regulated as a health issue because TDS is not a measure of any single contaminant it can affect taste and appearance of the water; hence the District addresses the problem through chlorination at least once a year. To prove that the chlorination treatment process is working is that there are no foul smell and no bitter taste afterwards.

Deep Well No. 6 in Brgy. Parangopong has the same problem with Well No. 1 in which it exceeded the limit in TDS, Turbidity and Apparent Color. This Well is an standby well, being utilized during summer season only.

IV. HAZARDS IDENTIFICATION, RISKS ASSESSMENT AND CONTROL MEASURES

4.1 Hazards Identification

The WSP Team identified the different hazards from water sources, to treatment, to pump stations, reservoir, distribution lines, and to concessionaires where the quality of water may be affected.

The Team uses the hazard/risk methodology indicating the hazards, hazardous events, existing control measures, validation and proposed control measures. Also included in the Table are the Likelihood and Severity of the hazards presented.

4.2 Hazard, Hazardous Events, Existing Control Measures and Proposed Control Measures

Hazards	Hazardous Event (Source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of Existing Control Measure	Likelihood	Severity	Score	Risk Level	Proposed Control Measure
		Likelihood	Severity	Score							
Source and Treatment											
P	Apparent Color (Well No. 6)	3	3	9	Continuous flushing	Results of the analysis after flushing conforms with the PNSDW	2	3	6	M	Monthly flushing of deep wells even not in use
P	Moderate Turbidity of water (Well No. 6)	3	3	9	Continuous flushing of wells until water is clear and no particles seen	Results of the analysis after flushing conforms with the PNSDW	2	3	6	M	Monthly flushing of deep wells even not in use
P	High Total Dissolved Solids (Well Nos. 1 & 6)	3	2	6	Chlorinatio n	Still exceeded the maximum level required by PNSDW	3	2	6	M	Use of water softener

C	Above the maximum level of sulfate	4	3	12	Chlorination	Still exceeded the maximum level required by PNSDW	4	3	12	M	Use of water softener
C	High in Manganese	3	3	9	Chlorination	Still exceeded the maximum level required by PNSDW	3	3	9	M	Use of water softener
C	Soil erosion due to charcoal making which may cause Turbidity in water	2	3	6	Tree Planting Activities and participation on the Quiaoit River and watersheds protection program of the CGB	Still exceeded the maximum level required by PNSDW	1	3	3	L	Coordination with the Barangay Officials and CGB on watersheds protection.
C	Fish poisoning activities in Quiaoit River	1	4	4			1	4	4	L	Coordination with the Brgy. Officials on the regulation of brgy. folks installing fish cages along Quiaoit River.
P/M	Unauthorized entry of persons in the Pump Stations and reservoirs which could lead to sabotage, contamination and vandalism.	4	5	20	The pump stations are padlocked including the reservoirs.	There was an instance that steel cover of the reservoir was stolen. No more intruders/ Authorized persons	1	5	5	L	Provision of fence in all Pump Stations and Reservoirs.
M	Backyard Piggery	5	5	25	Chlorination and	Zero incident of positive	2	5	10	M	Coordination with

					Clean-Up drive activities along Quiaoit River	bacte test testing within the source area with backyard piggery					the Brgy. Officials to limit hog raising near the water sources.
M	Existence of bottomless septic tank within the 25m radius from the sources	5	5	25	None		5	5	25	H	Coordination with the CGB in issuing building permit to comply with the 25m radius from the water sources
M	Presence of household garbage and human waste 10-15m away from the water sources	5	5	25	None		5	5	25	H	Coordination with the Brgy. Officials in the strict implementation of proper waste disposal.
P/M	Intrusion of flood water in the casing of deep well.	5	5	25	None		5	5	25	H	Construction of Elevated cement grout (Well annulus)
Storage M	Presence of algae in the reservoir	3	5	15	Periodic maintenance	No dirty water complaints and no positive results in microbial testing	2	5	10	M	Continue the periodic maintenance.
Storage C	Water contamination due of the metal	2	4	8	Cleaning and repainting	No contamination of rust	1	4	4	L	Continue the regular

	rust of the tank cover					particles					cleaning and repainting of tank cover.
P	Falling debris/leaves	5	2	10	Regular removal of debris and cleaning of surroundings	The surroundings is clear from debris and leaves	2	2	4	L	Continue the regular removal of debris, cleaning of surroundings and brushing of trees in the area.
M	Failure of chlorination due to power failure	3	5	15	Regular monitoring of the Chlorinator machine especially during power interruption	Chlorine Residual is within the permissible limit	2	5	10	M	
M	Failure of chlorination due to clogging of chlorine	3	5	15	Regular monitoring of chlorinator machine	Chlorine Residual is within the permissible limit	2	5	10	M	Consider liquid solution/chlorine instead of granules.
M	Overdosing or underdosing of chlorine	3	5	15	Regular monitoring of chlorine residual	Chlorine Residual is within the permissible limit	1	5	5	L	Continue the daily testing of chlorine residual
M	Non-available of chlorine due to fortuitous event	2	5	10	Regular monitoring of stock availability at reorder level	Chlorine is readily available in all treatment sites.	1	5	5	L	Consider chlorine stock in all pump stations
M	Poor quality of chlorine	2	5	10	Chlorine Granules	The quality is maintained	1	5	5	L	Provision for a

	granules due to exposure to rain or heat				are properly kept						separate stock room exclusively for chlorine.
M	Poor quality of chlorine granules	2	5	10	Purchasing preferred and tested brand of chlorine granules.	The required quality is obtained.	1	5	5	L	Consider chlorine dioxide or other treatment substance.
Distribut-ion M/C	Transmission main leak causing ingress of contamination	3	5	15	Immediate Repair	No contamination	2	5	10	M	Use of good quality pipes and sand bedding
M	Leakages and contamination due to pressure fluctuations	3	5	15	Immediate Repair	No contamination	2	5	10	M	Installation of air release valves
P/M	Low or No pressure which may cause dirty water and contamination	3	5	15	Utilizing standby deep wells to augment water supply	Normal pressure and no complaint on dirty water	2	5	10	M	Continuous construction of water sources
M	Power interruption	3	5	15	Use of standby gen set	Continuous supply of water	1	5	5	L	Provision of one gen set per pump station and additional construction of reservoir tank
P	Defective Gate Valve due to frequent opening and closing	3	3	9	Slow opening of gate valve	Turbidity within the permissible limit is maintained	2	3	6	M	Flushing of hydrants
M	Ingress of contaminants	3	5	15	Immediate Repair	No contamination	2	5	10	M	Proper coordinati

	due to projects constructions by DPWH & LGUs										on with DPWH, LGUs and Contractors during implementation of projects.
M	Ingress of contaminants due to old pipes	3	5	15	Immediate repair	No contamination	2	5	10	M	Replacement of old pipes
M	Poor quality of PVC pipes	2	5	10	Purchase good and tested brand of pipes	No leak problems therefore no contamination of water	1	5	5	L	Replacement of old or poor quality of pipes.
P/M	Accumulation of suspended sediments at dead ends	3	5	15	Regular flushing of hydrants at dead ends	No problem of dirty water and contamination	2	5	10	M	Continue the practice of regular flushing of hydrants at dead ends.
P/M	Service line traverse drainage canals	5	5	25	Avoid service line traversing drainage canal	No problem of dirty water and contamination	2	5	10	M	Relocation of pipes
Consumers M	Dual water source	3	5	15	Install gate valve	No problem of contamination and high consumption	2	5	10	M	Use check valve or encourage separate pipeline
M	Pilferages	2	5	10	Monetary Incentive to informant and Ocular inspection to disconnected concessionaires	Several pilferages problems were settled	1	5	5	L	Higher monetary incentive and regular monitoring of disconnected concessionaires
M	Clogging of	3	5	15	Reclogging	Decrease in	2	5	10	M	Regular

	service lines				procedure and flushing	low pressure complaints					flushing of water meter
M	Backflow of concessionaire's overhead tank during low pressure	3	5	10	Installation of check valves	Occurrence of negative reading or high consumption	1	5	5	L	

V. IMPROVEMENT PLAN

Risk Reference	Priority	Hazard	Hazardous Event	Action to be taken	Responsible Party/Person	Funding Source/Cost	Target Due	Status
			Source and Treatment					
Well No. 6	M	P	1.Apparent Color	Continuous flushing, filtering system or exploration of other possible source	Source and Treatment Unit	For funding - From P 25,000.00 to P 1.5M	2018	Under study
Well No. 6	M	P	2. Water Turbidity	Continuous flushing, filtering system or exploration of other possible source	Source and Treatment Unit	For funding - From P 25,000.00 to P 1.5M	2018	Under study
Well Nos. 1 & 6	M	P	3. High Total Dissolved Solids	Chlorination and use of water softener	Source and Treatment Unit	Corporate Funds – Minimum of P 50,000.00	As soon as possible	On-going
Well No. 1	M	C	4. Above the maximum level of sulfate	Chlorination and use of water softener	Source and Treatment Unit	Corporate Funds – Minimum of P 50,000.00	As soon as possible	On-going
Well No. 1	L	C	5.High in Manganese	Chlorination and use of water softener	Source and Treatment Unit	Corporate Funds – Minimum of P 50,000.00	As soon as possible	On-going
Well No. 6	L	C	6.Soil erosion due to charcoal making	Tree Planting Activities and participation and coordination with CGB and Brgy. Officials on watersheds protection	WSP Team; DENR, CGB Officials and Brgy. Officials	GAD Fund – P 50,000.00	Year-round	On-going
Infiltr	L	C	7.Fish	Coordination	WSP Team	Corporate	Year-	On-

ation Gallery No.s 1, 2 & 3			poisoning activities in Quiaoit River	with the Brgy. Officials on the formulation of regulation of brgy. folks installing fish cages along Quiaoit River	and Brgy. Officials	Funds – P 5,000.00	round	going
Reservoir/tank	L	P/M	8.Unauthorized entry of persons in the pump stations and reservoirs which could lead to sabotage, contamination and vandalism	All Pump stations and reservoirs are being padlocked and provision of fence in these restricted areas.	WSP Team	For funding – P 300,000.00	2018	Planning Stage
Infiltration Gallery No. 2	M	M	8.Backyard Piggery	Chlorination, Clean-Up Drive and Coordination with the CHO and Brgy. Officials to strictly implement the limitation on hog raising activity near water sources	WSP Team; City Health Office, Brgy. Officials	Corporate Funds – P 25,000.00	Year-round	On-going
All Sources	H	M	9.Existence of bottomless septic tank within the 25m radius from the water sources	Coordination with the CGB in issuing building permit to comply with the 25m radius from the water sources	WSP Team, Building Permit Officials	For funding – P 25,000.00	2018	For deliberation
All Sources	H	M	10.Presence of household garbage and	Coordination with the Brgy. Officials in the	WSP Team, Brgy. Officials	Corporate Funds – P 15,000.00	Year-round	On-going

			human waste within the 10-15m distance from the water sources	strict implementation of proper waste disposal				
All Sources	H	M	11.Intrusion of flood water in the casing of deepwell	Construction of elevated cement grout (well annulus)	Source and Treatment Unit	Corporate Funds - P 30,000.00	Completed	Completed
Reservoir/Tank	M	M	12.Presence of Algae in the reservoir	Periodic maintenance	Source and Treatment and Distribution units	Corporate Funds – P 25,000.00	Year-round	On-going
Reservoir/Tank	L	C	12.Water contamination due to metal rust of the tank cover	Cleaning, repainting and periodic maintenance	Source and Treatment and Distribution Units	Corporate Funds – P 25,000.00	Once a year	Completed
All Sources/Reservoir	L	P	13.Falling debris/leaves	Regular removal of debris, cleaning of surroundings and brushing of trees.	Source, Treatment and Distribution Units	Corporate Funds – P 5,000.00	Once a year	Completed
All Pumping Stations	M	M	14.Failure of chlorination due to power interruption	Installation of gen sets in Quiling Pump Station	Source and Treatment Unit	For funding – P 600,000.00	2019	Planning Stage
All Pumping Stations	M	M	15.Clogging of chlorinator machine	Regular monitoring and consider liquid solution instead of granules	Source and Treatment Unit	For funding – P 500,000.00	2018	Planning Stage
All Pumping Stations	L	M	16.Overdosing or underdosing of chlorine	Daily testing of chlorine residual	Source and Treatment Unit	Corporate Funds – P 7,000.00	Daily	On-going
All Pumping	L	M	17.Non-availability of chlorine due	At least 30% is always on hand or stock	Source and Treatment Unit	Corporate Funds – P 20,000.00	Monthly	On-going

Stations			to fortuitous event	available				
All Pumping Stations	L	M	18.Poor quality of chlorine granules due to exposure to rain or heat	Chlorine granules are properly kept	Source and Treatment Unit	Corporate Funds – P 20,000.00	Year-round	On-going
All Pumping Stations	L	M	19.Poor quality of chlorine granules	Preferred and tested brand should be the basis and consider chlorine dioxide	Source and Treatment Unit	For funding – P 300,000.00	2018	Planning Stage
			2. Distribution Unit					
Pipelines	M	M/C	1.Ingress of contamination due to transmission mains leak	Rehabilitate old pipe lines and use of good quality pipes and sand bedding	Distribution Unit	For funding – P 8M	2018	Planning Stage
Pipelines	M	M	2.Leakges and contamination due to pressure fluctuations	Installation of release air valves	Distribution Unit	For funding – P 50,000.00	2018	Planning Stage
All Sources		P/M	3.Low or negative pressure resulting to dirty water and contamination	Continuous construction of water sources	Source and Distribution Units	For funding – P 20M	2018	Planning Stage
Electric subscriber	L	M	4.Power interruption	Installation of gen set in all pump stations	WSP Team	For funding – P 600,000.00	2018	Planning Stage
Manpower	M	P	5.Defective gate valve due to frequent	Proper or slow opening of gate valve and flushing	Distribution Unit	Corporate Funds – P 25,000.00	Year-round	On-going

			opening and closing	of hydrants				
Contructors/Suppliers	M	M	6.Ingress of contaminants due to constructions of projects by DPWH and LGU	Proper coordination with DPWH, LGU and Contractors during implementation of projects	Distribution Unit, DPWH, LGU and Contractors	Corporate Funds – P 20,000.00	As need arises	As need arises
Pipelines	M	M	7.Ingress of contaminants due to old pipes	Replacement of old pipes	Distribution Unit	For funding – P 8M	2019	Planning
Contructors/Suppliers	L	M	8.Poor quality of PVC pipes	Replacement of old and poor quality of pipes	Distribution Unit	For funding – P 8M	2019	Planning
Pipelines	M	P/M	9.Accumulation of suspended sediments at dead ends	Regular flushing of hydrants at dead ends	Distribution Unit	Corporate Funds – P 5,000.00	Year-round	On-going
Pipelines	M	P/M	10.Service line traverse drainage canals	Relocation of service line pipes	Distribution Unit	For funding – P 300,000.00	2019	Planning
			3. Consumers					
Consumers	M	M	1.Dual water source	Use check valve or encourage separate pipeline	Distribution Unit	-	Year-round	On-going
Public	L	M	2.Pilferages	Higher monetary incentive to informant and regular monitoring of disconnected concessionaires	WSP Concessionaires Public	Corporate Funds – P 50,000.00	Year-round	On-going
Pipelines	M	M	3.Clogging of service lines	Regular flushing of water meter	Distribution Unit	Corporate Funds – P 5,000.00	Year-round	On-going
Consu	L	M	4.Backflow of	Installation of	Distribution	Corporate	Year-	On-

mers			concessionaire's overhead tank during low pressure	check valves	Unit	Funds – P 5,000.00	round	going

VI. OPERATIONAL MONITORING AND CORRECTIVE ACTIONS OF CONTROL MEASURES

WATER SOURCE AND TREATMENT

PROCESS STEP/CONTROL MEASURE	CRITICAL LIMIT	WHAT	WHERE	WHEN	HOW	WHO	CORRECTIVE ACTION
Water Quality Monitoring	Maximum level of 10 CTU	Apparent color Maximum level of 10 CTU	Source outlet deep well no. 6	Daily when in use	Water Sampling Sends Samples to DOH accredited Laboratory Visual Comparison	WRFO C	If color apparent is so high after re-sampling stop using the deep well Continue flushing until the color confirms to PNSDW standard
	Maximum level of 5 NTU	High Turbidity	Source outlet deep well no. 6	Daily when in use	Water Sampling Send samples to DOH accredited Laboratory	WRFO C	Continuous Flushing Re-sampling and if result is still above 5 NTU shut off the deep well
	Total dissolved solids 500 mg/L	High total dissolved solids	Source outlet deep well no. 6 and no. 1	Daily when in use	Water Sampling Send samples to DOH accredited Laboratory	WRFO C	Re-Sampling and if result is still above PNSDW standards shut off the deep well
	Sulfate 250 mg/L	High in Sulfate	Source outlet deep well No. 1	Daily when in use	Water Sampling Send samples to DOH Accredited Laboratory	WRFO C	If result is still above the PNNSDW maximum level shut off the deep well

		High in manganese	Source outlet deep well No. 6	Daily when in use	Water Sampling Send samples to DOH Accredited Laboratory	WRFO C	If result is still above the PNSDW maximum level shut off the deepwell
Power Interruption	More than 1 hour	Emergency/unscheduled power interruption	Baay, Payao and Colo pump stations	Daily	Daily Monitoring	WRFO C	Coordinate with INEC to know the duration of Power Interruption
Preventive maintenance of pumping equipment and appurtenances	Stand-by pumping equipment	Bogged down of pumping equipment	All sources and pump stations	Daily Monitoring	Daily Monitoring	WRFO C CSA D	Daily monitoring of the equipment Make sure that pumping equipment is available in case of equipment bogged down
Clogging of chlorinator nozzle	Chlorine residual must be >0.3 and <1.5 PPM	Flow rate Chlorine residual	All chlorinator machines	Daily	Regular monitoring and maintenance of the chlorinator machine	WRFO C	Regular check up of the chlorinator machine and if clogged pull out but use standby chlorinator machine to avoid treatment interruption

Transmission and Distribution

PROCESS STEP/ CONTROL MEASURE	CRITICAL LIMIT	WHAT	WHERE	WHEN	HOW	WHO	CORRECTIVE ACTION
Water Quality monitoring	Chlorine residual permissible limit 0.3 to 1.5ppm	Chlorine Residual	Entry point and end point of the distribution system	Daily	Daily Water sampling with the use of chlorine residual kit	WRFO C	Below permissible limit: increase chlorine dosage Above permissible limit: decrease chlorine dosage
	Microbiological Test	Monthly fecal and coliform test/HPC	Consumers tap	Monthly	Monthly random water sampling to be tested at DOH accredited laboratory	CSA D	For positive result conduct flushing and after that conduct re-sampling to be tested at DOH accredited testing laboratory
	Turbidity	Flushing of hydrants	Valves and hydrants	Quarterly	Quarterly flushing of hydrants	Technical Staff	Flushing will only stop when the water is clear
Leak detection and repair programme	Established threshold level on the number of leaks per day	Complaints and reports on leaks	Customer Service Office	As reported	Analysis of report	Technical Staff	Immediate repair on reported leaks

Storage

PROCESS STEP/CONTROL MEASURE	CRITICAL LIMIT	WHAT	WHERE	WHEN	HOW	WHO	CORRECTIVE ACTION
Quarterly cleaning and flushing of reservoir	Turbidity	Complaints dirty water	Customer service office	quarterly	Quarterly flushing	Technical Staff	Quarterly cleaning and flushing of reservoir to remove sediments

Concessionaires

PROCESS STEP/CONTROL MEASURE	CRITICAL LIMIT	WHAT	WHERE	WHEN	HOW	WHO	CORRECTIVE ACTION
Intrusion of contaminants	Microbiological test	Positive monthly fecal and coliform test	Concessionaires residences	Monthly	Sample tested by accredited DOH testing laboratory	CSA D Technical Staff	Advise the consumer the proper pipe laying Inspect the pipe for possible series connection Disallow series connection or advise Concessionaires to install check and valves
No water supply	Negative pressure	No water on concessionaires tap	Concessionaires residences	As reported	Checking of gate valves Reclogging of service line	Technical Staff	Modify/Adjust the openness and closeness of valve Reclogging procedure and flushing of meter

VII. VERIFICATION PROCEDURES

7.1 Compliance Monitoring Plan consistent

Activity	Description	Frequency of Monitoring	Responsible Party	Records
Existing Water Sources				
Physical/Chemical Analysis	Assess if the Parameters required are still within the permissible limit set by PNSDW	Twice a year	Source and Treatment Unit Laboratory or Testing Centers accredited by DOH	Results are submitted to LWUA and City Health Office
Fecal Coliform Test (Microbiological)	Assess if it meets standard (PNSDW)	Monthly	Source and Treatment Unit Laboratory or Testing Centers accredited by DOH	Results are submitted to LWUA and City Health Office
Heterothrophic Plate Count (HPC)	Assess if it meets standard (PNSDW)	Monthly	Source and Treatment Unit Laboratory or Testing Centers accredited by DOH	Results are submitted to LWUA and City Health Office
Water Quality Monitoring	Assess if chlorine residual is within .03 to 1.5ppm	Daily	Source and Treatment Unit	Results are submitted to LWUA and City Health Office
Proposed Water Sources				
Physical/Chemical Analysis	Assess if the Parameters required are within the permissible limit set by PNSDW	Twice a year	Source and Treatment Unit Testing Centers accredited by DOH	Basis to continue the drilling project

7.2 Verification Monitoring Program

Verification Activity	Location of Activity	Type of Activity	Frequency of Activity	Analyst	Recipient of Analysis Result*	Action on Unusual/Failing Result	3rd-Party Recipient of Results
Existing Water Sources							
Physical/Chemical Analysis	In all water sources	Sampling	Twice a year	DOH accredited Testing Centers	Source and Treatment Unit	Check the possible causes Repeat sampling	GM LWUA CHO
Fecal Coliform Test (Microbiological)	Consumer's faucet randomly selected	Sampling	Monthly	DOH accredited Testing Centers	Source and Treatment Unit	Check the possible causes Repeat Sampling	GM LWUA CHO
Heterothrophic Plate Count (HPC)	Consumer's faucet randomly selected	Sampling	Monthly	DOH accredited Testing Centers	Source and Treatment Unit	Check the possible causes Repeat Sampling	GM LWUA CHO
Water Quality Monitoring	Consumer's faucet randomly selected	Sampling	Daily	Source and Treatment Unit	Source and Treatment Unit	Adjust dosage of chlorine	GM LWUA CHO
Distribution System							
Leak Detection	Disconnected lines and old pipe lines	Repair	As needed	Distribution Unit	Distribution Unit	Rehabilitate or replacement of pipes	GM
Verification of Equipment	Stock yard	Internal Audit	Twice a Year	Property Custodian	GM	Replace the equipment	GM
Concessionaires							
Customers' Feedback		Walk-in or Thru Phone	As needed	Officer of the Day	GM	Dialogue with the complainant	GM

Updating of WSP	BWD Office	Meeting	Annually	WSP Team	GM	Review, amend and update the WSP	LWUA DOH
Proposed Water Sources							
Physical/Chemical Analysis	Drilling Site	Sampling	Once	DOH accredited Testing Centers	Source and Treatment Unit	Stop the drilling	Board GM

7.3 External Audit Plans

Activity	Description	Frequency	Responsible Party
Physical/Chemical Analysis	Sampling	Twice a year	LWUA, CHO
Microbial Analysis	Sampling	As needed	Refilling Stations, Concessionaires (Government agencies and business establishments)

VIII. MANAGEMENT PROCEDURES

8.1 Water Sources - Pumping Operation Procedures

1) Turn on control board main breaker and check voltage. Voltage must be 220-240 volts.
2) Turn on motor. Check amperes.
3) Open the discharge valve for 3-5 minutes or until water is clear.
4) Open valve going to the transmission line slowly likewise close the discharge valve slowly.
5) Fully open valve going to the transmission line and maintain pressure not less than 40psi.
6) Turn-on the chlorinator machine making sure that the tank is full.
7) Check the chlorinator machine if functioning.
8) Monitor the chlorine residual at the nearest source point. Adjust if more or less 1.5ppm.
9) After 24 hours operation, Water Resources Facilities Operator C, record the Flow Meter Reading.

8.2 Generator set operation during power interruption

1) Turn off all electrical breakers.
2) Check the fuel level of the generator set making sure the tank is full.
3) Check water and oil level making sure it is within the required level of the gen set.
4) Start the engine.
5) Warm up the engine for 3-5 minutes.
6) Turn on generator set main breaker.
7) Turn on generator set breaker in the double throw breaker.
8) Make sure that the gen set is set 60hertz.
9) Proceed to pumping operation procedure.
10) The WRFO C should check the gen set at least every hour for fuel level.
11) Turn-off pumping equipment when power from the electric cooperative resumes.
12) Turn off gen set breaker in the double throw breaker.
13) Turn on breaker in the electric cooperative power source.
14) Check the voltage and once it is within 220-240volts, proceed to pumping operation procedure.
15) Check the psi and the chlorinator machine.
16) Record the time the gen set has been used.

8.3 Treatment Procedure

1) The Pump Operator should always wear protective devices before preparing the chlorine solution.
2) The Pump Operator fills the 200 liters mixing drum at least one third of water.
3) Then weigh 6 kilos of chlorine granules during normal days and 9kilos during rainy days.
4) Pour the chlorine.
5) Stir the solution for about 30 minutes or until granules fully mixed.
6) While mixing the chlorine turn on the hose to fully fill the drum.
7) Cover the mixing drum and wait for 24 hours to allow particles to settle at the bottom of the mixing tank.
8) When water is already clear, greenish in color, fill the suction hose with water until air is out and put back to the chlorinating drum to start chlorination.
9) The chlorine mixture is then injected into the transmission lines going to the reservoir.
10) Chlorinated water then flows from the reservoirs into the transmission/distribution lines.
11) The Pump Operator then check residual chlorine, if not within .3ppm to 1.5ppm, adjust flow rate.
12) Before mixing another batch, collect settled particles and put in an empty chlorine container for proper disposal.
13) Clean the other drum, ready for the next mixing.

8.4 Transmission Line Procedure

8.4.1 Transmission/Distribution Lines Repair

1) Attend to the complainant immediately.
2) Properly identify the leak and fill out maintenance form.
3) The Plumber will assess the work to be done and report the same to the General Manager.
4) The General Manager will approve the request including the RIS for the materials to be needed.
5) The Admin will post the work/activity and the duration of the activity at the Website of the District if it will cause water service interruption.
6) The Technical staff will then proceed to the affected area bringing with them the materials to be used.
7) Before the actual work will start, close the nearest gate valves to prevent water from flowing in the affected transmission line.
8) Water pump is used to drain the water while cutting the affected pipe to prevent ingress of contaminants.
9) Before installing the new pipe chlorine granules about 200grams is place inside the pipe to disinfect the affected line.
10) After the installation of new pipe, nearest blow-off is then open and the main valve is also slowly open.
11) Close the blow-off when water becomes clear.
12) While pressure is building up, check the fitting for leaks, if there is any; tighten the bolt if none and leave the area but be sure that cautious signage is provided to avoid accident.
13) Backfilling, compaction and restoration are to be done the following day.

8.4.2 Installation of new connection

1) Provide the client/applicant with the application form and brief him/her on the services and charges.
2) Receive and review the application form. Advise the applicant to return to the office after 4hours for the result of the area survey.
3) Plumber will inspect, assess and verify the area where to be installed.
4) Plumber will estimate the additional materials if any.
5) Plumber will submit the application form indicating the additional materials to be paid.
6) Once paid by the applicant, the General Manager will approve the application and the Plumber will ready the materials needed.

7) The technical staff proceeds immediately to the site and install service connection.
8) The technical staff will see to it that backfilling, compaction and restoration are to be done immediately.
9) Have the concessionaire conform job order that new connection is well done.
10) Plumber will submit the duplicate copy of the application form to the Commercial Section for recording purposes.

8.5 Water Meter Maintenance

1) Recalibration of new water meters.
2) Replacement of water meters 5-year old and above.
3) Removal/replacement of faulty or defective water meters.
4) Clustering of water meters.

IX. SUPPORTING PROGRAMS

Program	Activity	Purpose	Target Date
Upgrading of Treatment and Treatment Facilities	Shifting from Chlorine Granules to Chlorine Dioxide	To avoid chlorinator nozzle clogging and for better treatment of water supply	2018
Upgrading of old pipes (Asbestos)	Replacing old pipes (asbestos)	To lower NRW and for safer water supply	2018
Safety Measure	Strict implementation of wearing of safety gears	To avoid accident and maintain safety and good health of staff exposed to danger	On-going
Professional Advancement	Trainings, seminars and bench marking	To enhance the capabilities of employees for better output	On-going
Upgrading of system	Computerized meter reading, billing and payment. Leak detection system. All water sources are equipped with VFD All pumping stations equipped with gen sets	For faster, easier and lesser manpower. To lower NRW and avoid ingress of contaminants. For lower electric consumption For continuous water supply during power interruption	2019
Septage and Sewerage Management Program	Construction of its own sepatage and sewerage management project	Mandated by law.	2019

X. WATER SAFETY PLAN REVIEW PROCEDURES

Purpose of Review	Schedule	Responsible Unit
Additional and upgrading of water sources	Every other year	Board, Officers and WSP Team
Procedural Revision	As needed	WSP Team
Updates and improvement of the whole system	Every year	WSP Team
Additional manpower	As needed	WSP Team, HR
Changes in stakeholders	Anytime there are changes to be adopted	WSP Team Support Unit

XI. INCIDENT RESPONSE PLAN

Purpose of Review	Schedule	Responsible Unit
Natural Disasters	After fortuitous events (earthquake, typhoon, flood)	Officers WSP Team
Manmade Disasters	After land developments After kaingin, charcoal making and timber poaching	WSP Team

ANNEXES

PROVINCE OF ILOCOS NORTE
CITY OF BATAC
BATAC WATER DISTRICT

EXCERPT FROM THE MINUTES OF THE REGULAR MEETING OF THE BOARD OF DIRECTORS OF BATAC WATER DISTRICT, BATAC CITY DULY HELD ON APRIL 11, 2017.

Members Present:

AURORA V. LUMANG	Chairman/Presiding Officer
WARLITO A. RIGONAN	Vice-Chairman
MARY LU MAGNO	Board Secretary
JESUS ARIEL GARCIA	Board Treasurer

Member Absent: NONE

In Attendance:

Ms. Maria Dohna D. Sagun	General Manager

RESOLUTION NO. 07
Series of 2017

A RESOLUTION AUTHORIZING THE GENERAL MANAGER, MARIA DOHNA D. SAGUN TO CREATE A WATER SAFETY PLAN TEAM FOR THE BATAC WATER DISTRICT AND ALLOCATING AN INITIAL FUND OF THIRTY THOUSAND PESOS (P 30,000.00) PURSUANT TO ADMINISTRATIVE ORDER NO. 0027 SERIES OF 2014.

WHEREAS, the Batac Water District adheres with the development and implementation of Water Safety Plan as a national policy for drinking water quality management, in support of the goals of international and local initiatives to improve the quality of life of Filipinos;

WHEREAS, creating a Water Safety Plan requires a team of diverse and experienced personnel and funds to implement the same in order that the water being provided by the Batac water District meets the required standards to ensure that it is potable and safe;

On motion made by Board Secretary Mary Lu B. Magno and duly seconded by the other members of the Board;

RESOLVES, as it is hereby resolved by the Board in its regular meeting duly assembled and by the authority of the same to authorize the General Manager, Maria Dohna D. Sagun to create a Water Safety Plan Team for the Batac Water District and allocating an initial fund of Thirty Thousand Pesos (P 30,000.00) pursuant to Administrative Order No. 0027 series of 2014.

RESOLVED FURTHER, to furnish as it is hereby furnished, a copy of this Resolution to the General Manager, Maria Dohna D. Sagun for her information, reference and guidance.

Approved this 11th day of April 2017 City of Batac.

AURORA V. LUMANG
Chairman

WARLITO A. RIGONAN
Vice-Chairman

MARY LU B. MAGNO
Board Secretary

JESUS ARIEL R. GARCIA
Board Treasurer

BATAC WATER DISTRICT

Batac City, Ilocos Norte

MEMORANDUM : NO. 17-06

TO : ALL EMPLOYEES CONCERNED

FROM : MARIA DOHNA D. SAGUN
GENERAL MANAGER

SUBJECT : CREATION OF WATER SAFETY PLAN TEAM

DATE : MAY 22, 2017

PURSUANT TO MC NO. 010-14 OF THE LOCAL WATER UTILITIES ADMINISTRATION DIRECTING ALL WATER DISTRICTS TO DEVELOP AND IMPLEMENT WATER SAFETY PLAN AND COMPLYING WITH THE PROVISIONS OF THE DEPARTMENT OF HEALTH AO NO. 2014-0027; HEREUNDER ARE THE MEMBERS OF THE WATER SAFETY PLAN TEAM OF THE BATAC WATER DISTRICT:

JOEL A. CASTRO	- Team Leader
DINO S. SAGUN	-Team Member (Source, Treatment and Quality Unit)
VON PATRICK S. GABRIEL	-Team Member (Source, Treatment and Quality Unit)
EDILBERTO M. CAMANGEG	- Team Member (Distribution Unit)
OTIS VISAN P. CORPUZ	-Team Member (Distribution Unit)
MAIZEL MAIA V. CASTRO	-Team Member (Support Unit)
IMELDA G. TUTAAN	-Team Member (Support Unit)
ROBERT FILAM MANGLAL-LAN	- Team Member (Support Unit)

FOR YOUR INFORMATION AND GUIDANCE.

PROVINCE OF ILOCOS NORTE
CITY OF BATAC
BATAC WATER DISTRICT

MINUTES OF THE MEETING OF THE WATER SAFETY PLAN (WSP) TEAM OF THE BATAC WATER DISTRICT, BATAC CITY DULY HELD ON MAY 27, 2017.

Members Present:

Ms. Maria Dohna D. Sagun	Team Adviser
Mr. Joel A. Castro	Team Leader
Mr. Dino S. Sagun	Team Member, Source and Treatment Unit
Mr. Von Patrick S. Gabriel	Team Member, Source and Treatment Unit
Mr. Edilberto M. Camangeg Jr.	Team Member, Distribution Unit
Mr. Otis Visan P. Corpuz	Team Member, Distribution Unit
Ms. Maizel Maia V. Castro	Team Member, Support Unit
Ms. Imelda G. Tutaan	Team Member, Support Unit
Mr. Robert Filam C. Manglallan	Team Member, Support Unit

CALL TO ORDER

A Meeting of the Water Safety Plan (WSP) Team of the Batac Water District was called to order at exactly 8:20 in the morning by the WSP Team Leader Mr. Joel A. Castro. Ms. Imelda G. Tutaan led the opening prayer.

CALENDAR OF BUSINESS

Mr. Castro, being the Team Leader and attendee to the Water Safety Plan Orientation held at Baguio City last March 2017, oriented the other members of the WSP Team about the Water Safety Plan. He briefly discussed about the following:

- Administrative Order No. 2014-0027
- Roles and Responsibilities of the DOH, LWUA, DILG, DENR, NWRB, LGUs and other government agencies as well as the NGOs and drinking-water service providers in the implementation of AO 2014-0027
- 11 modules of the 5-stage WSP process

He informed the body that the Team will discuss the WSP thoroughly as they will proceed with the step-by-step process.

Before the Team started crafting the WSP, the Team Leader enlightened the other members about the WSP Organogram, skills and expertise required to complete the WSP Team, the role of each of the WSP members, their assigned duties and responsibilities and the expertise expected of them in the preparation and implementation of the WSP.

With the guidance, wisdom and expertise of their Team Adviser GM Maria Dohna D. Sagun, the WSP Team started developing the WSP plan. Mr. Robert Filam C. Manglal-lan, Team Member under the Support Unit is assigned to encode the WSP. The Team initially prepared the Abstract and Introduction. Based from the Citizen's Charter, the Team also included the Vision, Mission and Core Values of the District in the WSP.

Before identifying the various stakeholders to be included in the WSP, The Team Leader stressed out to the body that the stakeholders play a vital role in bringing quality water to the concessionaires. He mentioned that they could affect the agency's actions, objectives and policies in relation to providing safe and potable water to the concessionaires.

After understanding the concept about stakeholders, the WSP Team together with their Team Adviser discussed and listed down the different stakeholders for each of the components (Source, Storage, Treatment, and Distribution) of the water system, their relationship to drinking-water supply issues and other related information.

All queries, opinions and suggestions were considered during the meeting. After some clarifications, corrections and addendum, the WSP Team printed a copy of the output from Module 1 of the WSP. The Team scheduled the next WSP meeting on June 24, 2017 to continue the preparation of the WSP.

Adjournment

There being no other matters to be discussed, Team Member (Source and Treatment Unit) Mr. Dino S. Sagun, moved for the adjournment of the meeting at exactly 12:15 P.M.

Ms. MAIZEL MAIA V. CASTRO
Team Member, Support Unit

Attested by:

Mr. JOEL A. CASTRO
WSP Team Leader

PROVINCE OF ILOCOS NORTE
CITY OF BATAC
BATAC WATER DISTRICT

MINUTES OF THE MEETING OF THE WATER SAFETY PLAN (WSP) TEAM OF THE BATAC WATER DISTRICT, BATAC CITY DULY HELD ON JUNE 24, 2017.

Members Present:

Ms. Maria Dohna D. Sagun	Team Adviser
Mr. Joel A. Castro	Team Leader
Mr. Dino S. Sagun	Team Member, Source and Treatment Unit
Mr. Von Patrick S. Gabriel	Team Member, Source and Treatment Unit
Mr. Edilberto M. Camangeg Jr.	Team Member, Distribution Unit
Mr. Otis Visan P. Corpuz	Team Member, Distribution Unit
Ms. Maizel Maia V. Castro	Team Member, Support Unit
Ms. Imelda G. Tutaan	Team Member, Support Unit
Mr. Robert Filam C. Manglallan	Team Member, Support Unit

CALL TO ORDER

A Meeting of the Water Safety Plan (WSP) Team of the Batac Water District was called to order at exactly 8:10 in the morning by the WSP Team Leader Mr. Joel A. Castro. Ms. Imelda G. Tutaan led the opening prayer.

CALENDAR OF BUSINESS

Mr. Castro informed the body that Module 2 under the System Assessment (Stage II) of the Water Safety Plan (WSP) is about the detailed description of the district's Water Supply System. He added that the basic arrangement of a water supply is Catchment, then Storage/treatment, followed by the Distribution and lastly the Consumers. He added that a detailed and accurate system description is essential for the identification of hazards and assessment of risk.

The WSP Team and their Team Adviser created a brief introduction for Module 2 by providing general information such as the creation of Batac Water District, composition of the members of the Board of Directors, Plantilla of

Personnel as well as the Job Order Workers. The Support Unit Members Ms. Imelda G. Tutaan, Ms. Maizel Maia V. Castro and Mr. Robert Filam C. Manglal-lan provided data on the district's coverage area, household coverage and existing water rates. The Team Adviser and the Distribution Team members Mr. Edilberto M. Camangeg, Jr. and Mr. Otis Visan P. Corpuz provided information about transmission and distribution pipelines.

The Team and their Adviser identified the different water sources of the district. For each of the pumping stations, the Team elaborated the following:

- capacity (volume of water produced in liters per second) during rainy and dry seasons
- number of concessionaires it could sustain for both seasons
- type of pumping equipment, chlorinator machine and generator sets
- water test results
- service area supplied by each pumping station

After identifying the matters mentioned above, the Team with their Team Adviser created Process Flow Diagrams. Water sources falling under the same type of Diagram are grouped together. The Team also described the storage facilities of the district.

The Team then proceeded with the Treatment process. Being his official designation, Mr. Sagun enumerated the step-by-step method of treating water through chlorination. The method of chlorination of the water sources or wells which is done on a yearly basis, was also discussed and included in the Water Safety Plan.

After the Treatment Process, the Team discussed about the Distribution System of the district. They enumerated the different urban and rural Barangays covered by the distribution network. The Team also mentioned about the sizes of the district's pipelines. A schematic diagram was also drawn to illustrate the existing and proposed system facilities.

Mr. Castro and Mr. Sagun lead the Team as they discussed about Water Quality Monitoring. Mr. Castro mentioned that the quality of the water provided to concessionaire must conform to the standards set by the Philippine National Standards for Drinking Water (PNSDW). He also informed the Team about the Bacteriological Test and its exceeding limits. Mr. Sagun cited the different parameters, method of analysis and permissible limits of a Physical and Chemical Analysis of Water. He also mentioned the procedure of Chlorine Residual Test which is conducted daily.

The Team proceeded to identifying the delivery point, intended users and uses of water and the current status of the quality of water produced. The Team

also discussed about the water sources that exceeded some of the parameters in the Physical and Chemical Analysis.

All queries, opinions and suggestions were considered during the meeting. After some clarifications, corrections and addendum, the WSP Team printed a copy of their output for Module 2 of the WSP.

Mr. Castro introduced to the Team Module 3 which is the identification of hazards and hazardous events and assessing the risk. He explained the concept of hazards and hazardous events. After some queries and concerns from the body, he told them to prepare a list of hazards and hazardous events that could contaminate, compromise or interrupt the water supply, because they will be discussing the matter next meeting, which is scheduled on July 15, 2017.

Adjournment

There being no other matters to be discussed, Team Member (Source and Treatment Unit) Mr. Von Patrick S. Gabriel, moved for the adjournment of the meeting at exactly 4:45 P.M.

Ms. MAIZEL MAIA V. CASTRO
Team Member, Support Unit

Attested by:

Mr. JOEL A. CASTRO
WSP Team Leader

PROVINCE OF ILOCOS NORTE
CITY OF BATAC
BATAC WATER DISTRICT

MINUTES OF THE MEETING OF THE WATER SAFETY PLAN (WSP) TEAM OF THE BATAC WATER DISTRICT, BATAC CITY DULY HELD ON JULY 15, 2017.

Members Present:

Ms. Maria Dohna D. Sagun	Team Adviser
Mr. Joel A. Castro	Team Leader
Mr. Dino S. Sagun	Team Member, Source and Treatment Unit
Mr. Von Patrick S. Gabriel	Team Member, Source and Treatment Unit
Mr. Edilberto M. Camangeg Jr.	Team Member, Distribution Unit
Mr. Otis Visan P. Corpuz	Team Member, Distribution Unit
Ms. Maizel Maia V. Castro	Team Member, Support Unit
Ms. Imelda G. Tutaan	Team Member, Support Unit
Mr. Robert Filam C. Manglallan	Team Member, Support Unit

CALL TO ORDER

A Meeting of the Water Safety Plan (WSP) Team of the Batac Water District was called to order at exactly 8:15 in the morning by the WSP Team Leader Mr. Joel A. Castro. Mr. Von Patrick S. Gabriel led the opening prayer.

CALENDAR OF BUSINESS

Mr. Castro briefly reviewed to the body the underlying concept of Module 3 of System Assessment (Stage II) of the Water Safety Plan (WSP), which is the identification of hazards and hazardous events that could contaminate, compromise or interrupt the water supply, and assessing the risk thereof. He reminded the team that they were tasked last meeting to list the potential hazards and hazardous events in the water supply system.

The WSP Team, with the wisdom and assistance of their Team Adviser, carefully identified and listed these potential hazards and hazardous events. These hazards were grouped according to their effect on Source, Storage,

Treatment and Distribution, and subsequently classified as to Microbial, Chemical and Physical.

After enumerating the hazards and hazardous events that may affect the water supply system, the Team classified the likelihood or probability of the happening of the hazardous event as to whether almost certain (once a day), likely (once a week), moderate (once a month), unlikely (once a year) or rare (once every 5 years) based from the Risk Factor Matrix, and rated them accordingly.

In identifying the severity or consequence of the hazardous events, the Team and Team Adviser considered the impact on public health if the hazardous event occurs. Severity of each hazard were classified as to Microbial, Chemical – Toxic, Chemical – non-toxic/physical-minor objection, and hazardous event with insignificant or no impact and assigned the corresponding score.

When the Team finished assigning the corresponding scores to both the likelihood and severity of each of the hazardous events, the raw risk score was subsequently computed by multiplying the likelihood score by the severity score. After the computation, the risk scores are classified to low, moderate, and high.

Mr. Castro informed the body that a high risk score should be given priority, moderate score should be kept under observation and low score should also be reviewed. He then introduced the concept under Module 4, which is determining and validating control measures, and reassessing and prioritizing risks.

After ranking the raw risks from highest down to the lowest score, the Team identified the existing control measures of the district for each of the hazards and hazardous events. Subsequently, they re-evaluated the risk scores to check if the existing control measures are effective. The Team, with the assistance and wisdom of their Team Adviser, formulated proposed control measures especially to hazardous events which scored high and moderate after the re-assessment of risk.

After accomplishing Modules 3 & 4, the Team proceeded to Module 5, which is the development and implementation of an improvement plan and upgrading the same when an incident occurs. The Team with their Team adviser established the Improvement Plan by identifying the different hazardous events, the action to be taken for each event, the responsible party/person, as well as the cost and funding source, target date of implementation and status of implementation.

All queries, opinions and suggestions were considered during the meeting. After some clarifications, corrections and addendum, the WSP Team printed a copy of their outputs from Modules 3, 4 and 5 of the WSP. The body agreed to have their next WSP meeting on August 12, 2017.

Adjournment

There being no other matters to be discussed, Team Member (Distribution Unit) Mr. Edilberto M. Camangeg, Jr. moved for the adjournment of the meeting at exactly 4:25 P.M.

Ms. MAIZEL MAIA V. CASTRO
Team Member, Support Unit

Attested by:

Mr. JOEL A. CASTRO
WSP Team Leader

PROVINCE OF ILOCOS NORTE
CITY OF BATAC
BATAC WATER DISTRICT

MINUTES OF THE MEETING OF THE WATER SAFETY PLAN (WSP) TEAM OF THE BATAC WATER DISTRICT, BATAC CITY DULY HELD ON AUGUST 12, 2017.

Members Present:

Ms. Maria Dohna D. Sagun	Team Adviser
Mr. Joel A. Castro	Team Leader
Mr. Dino S. Sagun	Team Member, Source and Treatment Unit
Mr. Von Patrick S. Gabriel	Team Member, Source and Treatment Unit
Mr. Edilberto M. Camangeg Jr.	Team Member, Distribution Unit
Mr. Otis Visan P. Corpuz	Team Member, Distribution Unit
Ms. Maizel Maia V. Castro	Team Member, Support Unit
Ms. Imelda G. Tutaan	Team Member, Support Unit
Mr. Robert Filam C. Manglallan	Team Member, Support Unit

CALL TO ORDER

A Meeting of the Water Safety Plan (WSP) Team of the Batac Water District was called to order at exactly 8:20 in the morning by the WSP Team Leader Mr. Joel A. Castro. Ms. Imelda G. Tutaan led the opening prayer.

CALENDAR OF BUSINESS

Mr. Castro opened the meeting by briefly discussing the concept behind Module 6 which is the monitoring of control measures. He told the Team that operational monitoring is conducted to assess whether the control measures are achieving their objectives. He added that when critical limits are exceeded, corrective actions should be made. He further mentioned that these actions should be specific and pre-determined to enable their rapid execution.

Based from the outputs made from Modules 4 & 5, the WSP together with their Team Adviser developed their Operational Monitoring Plan indicating the control measures to be taken, critical limits, monitoring locations, monitoring

frequency, monitoring procedures and the responsible party. The Team also provided corrective actions for any deviations from the critical limits.

After some clarifications, corrections and addendum, the WSP Team printed a copy of their output from Module 6 of the WSP.

The Team then continued with Module 7 which is verification of the effectiveness of the Water Safety Plan. Mr. Castro informed the body that procedures should be established to verify if the WSP is working effectively and meets the health-based targets. He also mentioned about the three activities involved in the Verification Process which are compliance monitoring, internal and external auditing of operational activities and consumer satisfaction. He added that these activities should be undertaken together to provide evidence that the WSP is working effectively. He also informed them about the 14 Priority Drinking-Water Quality Parameters for Monitoring (PNSDW 2007).

The Team and their Team Adviser proceeded with the development of Compliance Monitoring Plan, Internal and External Auditing Plan and Customer Satisfaction Plan.

All queries, opinions and suggestions were considered during the meeting. After some clarifications, corrections and addendum, the WSP Team printed a copy of their output from Module 7 of the WSP. The next WSP meeting is scheduled on September 09, 2017.

Adjournment

There being no other matters to be discussed, Team Member (Support Unit) Ms. Imelda G. Tutaan moved for the adjournment of the meeting at exactly 4:15 P.M.

mvcastro

Ms. MAIZEL MAIA V. CASTRO
Team Member, Support Unit

Attested by:

Mr. JOEL A. CASTRO
WSP Team Leader

PROVINCE OF ILOCOS NORTE
CITY OF BATAC
BATAC WATER DISTRICT

MINUTES OF THE MEETING OF THE WATER SAFETY PLAN (WSP) TEAM OF THE BATAC WATER DISTRICT, BATAC CITY DULY HELD ON SEPTEMBER 09, 2017.

Members Present:

Ms. Maria Dohna D. Sagun	Team Adviser
Mr. Joel A. Castro	Team Leader
Mr. Dino S. Sagun	Team Member, Source and Treatment Unit
Mr. Von Patrick S. Gabriel	Team Member, Source and Treatment Unit
Mr. Edilberto M. Camangeg Jr.	Team Member, Distribution Unit
Mr. Otis Visan P. Corpuz	Team Member, Distribution Unit
Ms. Maizel Maia V. Castro	Team Member, Support Unit
Ms. Imelda G. Tutaan	Team Member, Support Unit
Mr. Robert Filam C. Manglallan	Team Member, Support Unit

CALL TO ORDER

A Meeting of the Water Safety Plan (WSP) Team of the Batac Water District was called to order at exactly 8:15 in the morning by the WSP Team Leader Mr. Joel A. Castro. Ms. Imelda G. Tutaan led the opening prayer.

CALENDAR OF BUSINESS

Mr. Castro informed the body that the Water Safety Plan should include Management Procedures to be followed during routine operations and emergency situations. He added that these procedures should be updated including developing corrective actions when an "incident" occurs.

The Team proceeded with developing Management Procedures of the WSP. The step-by-step procedure on how to operate pumping equipment, generator set during power interruptions, treatment procedures, repair of leaks and busted pipe lines, installation of new connections and maintenance of water meters were included in the Procedures for Normal Activities.

The Team with their Team Adviser also prepared Management Procedures for major incident operation activities and Response Plan for emergency operation activities.

The Team then proceeded to Module 9 which is about developing supporting programs. Mr. Castro informed the Team that supporting programs are important in ensuring drinking-water safety, but do not directly affect drinking water quality. The Supporting Programs include upgrading of treatment and treatment facilities, upgrading of old pipelines and professional advancement (trainings, seminars and benchmarking). The Team also included the Target Date of implementation.

Mr. Castro informed the body that Modules 10 and 11 of the WSP is all about planning and carrying out periodic review of the WSP and revising the same if an "incident" occurs. He added that the WSP should be up-to-date and effective through regular review and revision.

The Team prepared the schedule for WSP regular review and revision, indicating the purposes of review as well the responsible unit or person.

All queries, opinions and suggestions were considered during the meeting. After some clarifications, corrections and addendum, the WSP Team printed a copy of their outputs from Modules 8 up to the last module of the WSP.

After some discussions, the Team finalized the WSP from Module 1 up to last Module. The Team printed a copy for the Team Adviser's review, corrections and approval. After some clarifications, The WSP team printed the final copy of the Water Safety Plan ready for submission.

Adjournment

There being no other matters to be discussed, Team Member (Support Unit) Mr. Robert Filam C. Manglal-lan moved for the adjournment of the meeting at exactly 4:50 P.M.

mvcastro
Ms. MAIZEL MAIA V. CASTRO
Team Member, Support Unit

Attested by:

Mr. JOEL A. CASTRO
WSP Team Leader

CONCESSIONAIRE/CLIENT FEEDBACK FORM

Thank you for visiting BATAC WATER DISTRICT and availing our services. Because we want to serve you better, please answer the following questions relevant to your visit.

I. Name:_____
II. Address:_____
III. Service/s Availed:_____

OUR OFFICE	YES	NO
1. Is the office clean & orderly? 2. Did you feel comfortable? 3. Was there a long waiting line of customers?		
OUR FRONTLINERS		
1. Is the employee-in-charge available? 2. Is the employee-in-charge knowledgeable? 3. Is the employee-in-charge accommodating? 4. Were you received properly? 5. Were your needs attended promptly? 6. Were you made to wait long?		
REQUIREMENTS		
1. Were you made aware of the requirements? 2. Was there so many additional requirements?		
OUR OFFICERS		
1. Was the authorized official(s) available? 2. Did it take him/her long to sign the documents?		
OUR INFORMATION		
1. Is the needed document available? 2. Is the document well organized? 3. Is the data complete? 4. Is the data relevant to your request? 5. Are instructions clear, brief and concise?		

Other Comments/Suggestions:

_____

_____

Thank you very much.

MAMAMAYAN MUNA PROGRAM

Form 2- REQUEST FOR ASSISTANCE (Paghingi ng Tulong)

Date (Petsa): _____

Name of Commending Party: _____ Tel. / Fax/ Cellphone No.: _____
(Pangalan ng Humihingi ng Tulong)

Office/ Address: _____
(Tanggapan / Adres)

Residence Address: _____
(Tirahan)

Particulars of Request* _____
(Tulong na Hinihingi) _____
_____
_____
_____

_____
Signature (Lagda)

*You may use the back page for additional information.
(Maaring gamitin ang likuran ng papel para sa karagdagang impormasyon)

MAMAMAYAN MUNA PROGRAM

Form 3 – COMPLAINT (REKLAMO)

Date (Petsa): _____

Name of Complainant: _____ Tel./ Fax/ Cellphone No.: _____
(Pangalan ng Nagrereklamo)

Office/Address: _____
(Tanggapan/ Adres)

Residence Address: _____
(Tirahan)

Name of Person Being Complained of: _____
(Pangalan ng Nirereklamo)

Position / Office: _____
Posisyon/ Tanggapan

Particulars of Complaint*
(Detalye ng Reklamo)
_____
_____
_____

_____
Signature (Lagda)

*You may use the back page for additional information.
(Maaaring gamitin ang likuran ng papel para sa karagdagang impormasyon)

Republic of the Philippines
Department of Health
OFFICE OF THE SECRETARY
San Lazaro Compound, Rizal Avenue, Sta. Cruz, Manila, Philippines 1003
Tel. No. (632) 743-8601 locals 1107, 1125; (632) 711-9502/03;
TeleFax: (632) 743-1829
Email Address: osec@doh.gov.ph Website: http://www.doh.gov.ph

09 March 2007

ADMINISTRATIVE ORDER
No. 2007- 0012

SUBJECT: Philippine National Standards for Drinking Water 2007

I. RATIONALE/INTRODUCTION

Access to safe drinking water is not only essential for the promotion and protection of public health but is a basic human right. Provision of safe water supply prevents the transmission of waterborne pathogens and reduces the exposure of individuals to chemical and physical hazards that could be ingested through contaminated drinking water. Diarrheas and other waterborne diseases still rank among the leading causes of illnesses in the country. It is apparent that continuous development or refinement of policies and programs geared towards minimizing the risk of contracting waterborne diseases should be supported to provide optimal health service for the population.

Setting standards for drinking water establishes threshold limits for different impurities found in drinking water. These limits are intended to minimize risk and therefore prevent deleterious health repercussions that result from lifelong exposure to these impurities through consumption of water. The Department of Health is mandated to formulate standards to this effect. Chapter II (Water Supply), Section 9 of the Code on Sanitation of the Philippines states that "Standards for drinking water and their microbiological and chemical examinations, together with the evaluation of results, shall conform to the criteria set by the National Drinking Water Standards."

The government recognizes recent quality-related developments in the water supply sector in the country and elsewhere such as the following:

1. **New information on many chemicals**. As an outcome of evolving agricultural, industrial and even domestic practices, new chemicals find their way into the environment and contaminate drinking water sources

2. **Proliferation of water refilling stations as alternative (or main) sources of drinking water**. The quality of "processed" water from these stations may require distinct standards compared to the water from large water systems.

3. **Detection of naturally occurring hazardous substances in groundwater**, e.g. arsenic and fluoride. The presence of these chemicals is inevitable constituent in some water sources.

4. **The need for different approaches in supporting safe management of water supply systems**.

While PNSDW 2007 aims to achieve more comprehensive parameters to address issues on water quality, it also advocates for an efficient water quality surveillance system by prioritizing the parameters that need to be monitored (**refer to Annex 1**). The concept of performance targets through the application of water safety plans has been introduced to encourage water providers to systematically monitor the quality of water at all phases of production and distribution.

The standards set in 2007 PNSDW are based on guidelines or criteria that are recommended by international institutions like the World Health Organization, United States Environmental Protection Agency, etc. There are certain factors that the national government should consider whether or not to adapt these guideline values. First, standards that are very stringent could limit the availability of water supply that meets such levels. National standards are influenced by national priorities and economic factors. The judgment of safety, or what is acceptable level of risk in particular circumstances, is a matter that our society should decide.

II. OBJECTIVE

To protect public health, safety and welfare by ensuring quality standards of drinking water.

III. SCOPE/COVERAGE

These standards shall apply to all waterworks officials, developers and operators of water supply systems both government and private entities, water refilling station operators, water vending machine operators, ice manufacturers, all establishments and institutions that supply or serve drinking water, drinking water laboratories, health and sanitation authorities, the general public and all other concerned

IV. DEFINITION OF TERMS

As used in this document, the terms below shall be defined as follows:

Acceptability – physical or chemical quality of water that conforms to the appearance, taste and odor or drinking water that satisfy the consumer.

Aerobic bacteria – bacteria that live or occur only in the presence of oxygen.

Agricultural land - a tract of land cultivated for the purpose of agricultural production including but not limited to crop production, raising and breeding of domestic animals, raising, breeding, or production of a specific aquatic animal, and similar activities.

Algae - any of various chiefly aquatic, eukaryotic, photosynthetic organisms, ranging in size from single-celled forms to the giant kelp.

Anaerobic – a descriptive term for a process such as fermentation that can proceed only in the absence of oxygen or a living thing that can survive only in the absence of oxygen.

Banned pesticides – pesticides whose use in the country has been prohibited by official order by the government

Bioaccumulation – is the accumulation of substances in life forms or biological system through uptake from the environment or the food chain

Biofilm – a microbial (bacterial, fungal, algal) community, enveloped by the extracellular biopolymer, which these microbial cells produce, that adheres to the interface of a liquid and a surface

By-product - a secondary or incidental product deriving from a manufacturing process or chemical reaction that is not the primary product or service being produced.

Chlorination – the process of adding the element chlorine to water disinfection to make it fit for human consumption as drinking water.

Coagulation – is a water treatment process that promotes aggregation of small particles into larger particles that can be subsequently removed by sedimentation and/or filtration.

Coliform Organisms (Total Coliforms) - refers to any rod-shaped, non-spore-forming gram negative bacteria capable of growth in the presence of bile sales, or other surface-active agents with similar growth-inhibiting properties which are cytochrome-oxidase negative and able to ferment lactose at either 35 or 37^{o}C with the production of acid, gas and aldehyde within 24-48 hours.

Composite sample- a series of individual grab samples taken at different times from the same sampling point and mixed together

Consumer's tap - a valve and spout used to regulate delivery of water supply located at end of the water distribution systems usually within the vicinity of the houses or buildings.

Contact time – the length of time water supply is held in direct contact with a treating agent, e.g. chlorine solution.

Contamination – a general term referring to the introduction of materials not normally found in water that make the water less desirable or unfit for its intended use.

Cyanotoxin – any of several poisonous substances produced by certain cyanobacteria.

Decomposition – refers to the reduction of the body of a formerly living organism into simpler forms of matter.

Detergent – a substance used to enhance the cleansing action of water , which acts similarly to soap but is made from chemical compounds rather than fats and lye

Disinfection – water treatment processes designed to destroy disease-causing microorganisms. The efficacy of disinfection is often assessed by measuring the coliform group of indicator organisms.

Dissolution – any of a class of chemical reactions in which solute and solvent molecules combine with relatively weak covalent bonds.

Drinking water – water intended for direct human consumption or use in food preparation. Where high quality waters are scarce, the quality of water used for other domestic purposes need not be as high as that of drinking water.

Effluent – an outflowing of water from a natural body of water or from a sewage treatment facility

Facultative Bacteria – bacteria that can adapt themselves to growth and metabolism under aerobic or anaerobic conditions. Many organisms of interest in wastewater stabilization are among this group.

False negative – negative test result when the attribute for which the subject is being tested actually exists in that subject

False positive – a positive finding of a test when, in fact, the true result was negative.

Fecal coliforms – subgroup of coliform bacteria that has a high positive correlation with fecal contamination associated with all warm blooded animals. These organisms can ferment lactose at 44.5^{o}C and produce gas in a multiple tube procedure (EC Confirmation) or acidity with Membrane Filter procedure

Fecal indicator organisms – microorganisms that when detected present in water supply signals fecal pollution of water

Fitting – any machine, piping, or tubing part that can attach or connect two or more larger parts in a plumbing system

Flora – refers to the collective bacteria and other microorganisms in an ecosystem (usually an animal host or a single part of its body

Freshwater – water with less than 0.5 parts per thousand dissolved salts which may be found in lakes, rivers, and groundwater.

Galvanized pipe – iron or steel pipe that is coated with rust-resistant zinc.

Grab sample- a single water sample collected at one time from a single point.

Gram-negative bacteria – bacteria that decolorize and accept the safranin stain which appears pink using the gram-stain technique

Gross alpha and gross beta radioactivity – radioactivity emanating from radionuclides belonging to the uranium, thorium and actinium series, which are terrestrial in origin. It also includes radionuclides that occur singly and are produced by cosmic rays and are terrestrial in origin.

Groundwater – water that occurs below the surface of the Earth, where it occupies spaces in soils or geologic strata

Humic Acid – a complex organic acid that is present in soil, peat, and coal formed from the decomposition of vegetable matter. It is responsible for much of the color in water.

Igneous - rocks or processes involving the formation and solidification of hot, molten magma produced under conditions involving intense heat

Ion - an atom or a group of atoms that has acquired a net electric charge by gaining or losing one or more electrons

Leaching - is the loss of soluble substances and colloids from ores or other rock formations beneath the Earth's surface into groundwater. It is also the separation of soluble substances from plumbing materials into water supply.

Level I (or point source) – a protected well or a developed spring with an outlet but without distribution system, generally adaptable for rural areas where the houses are thinly scattered. A level I facility normally serves 15 to 25 households and its outreach must not be more than 250 meters from the farthest user. The yield or discharge is generally from 40 to 140 liters per minute.

Level II (communal faucet system or standposts) – a system composed of source, a reservoir, piped distribution network and communal faucets, located no more than 25 meters from the farthest house. The system is designed to deliver 40 to 80 liters per capita per day to an average of 100 households, with one faucet per 4 to 6 households. It is generally suitable for rural and urban areas where houses are clustered densely to justify a simple pipe system.

Level III (waterworks system or individual house connections) – a system with a source, a reservoir, a piped distribution network and household taps. It is generally suited for densely populated areas. This level of facility requires a minimum treatment of disinfection.

Local health authority – a government official or employee responsible for application of a prescribed health measure in a local political subdivision. It is the provincial governor, city or municipal mayor, as the case maybe.

Metabolite – organic compound that is a starting material in, an intermediate in, or an end product of metabolism.

Methylation – refers to the replacement of hydrogen atom (H) with a methyl group (CH_3), regardless of the substrate.

Most Probable Number (MPN) - a statistical method of determining microbial populations. A multiple dilution tube technique is utilized with a standard medium and observations are made for specific individual tube effects. Resultant coding is translated by mathematical probability tables into population numbers.

Oxidation – a chemical reaction in which the atoms in an element lose electrons and the valence of the element is correspondingly increased

Persistence – extent to which compounds in the environment tend to accumulate and do not easily degrade as a result of natural processes of decomposition

Pesticide – chemical substance or biological agent used against pests including insects, plant pathogens, weeds, mollusks, birds, mammals, fish, nematodes, and microbes that compete with humans for food, destroy property, spread disease or are a nuisance.

Petroleum – a substance, generally liquid, occurring naturally in the earth and composed mainly of mixtures of chemical compounds of carbon and hydrogen with or without other nonmetallic elements such as sulfur, oxygen, and nitrogen.

Pipe – a long hollow cylinder used chiefly to convey water supply or sewage

Plumbing – includes the pipes, materials, fixtures and other appurtenances used in the installation, maintenance, extension or alteration of building water supply system and building drainage system.

Potable water – water suitable (both health and acceptability considerations) for drinking and cooking purposes

Proteinaceous – pertains to any adhesive material having a protein base such as animal glue, casein, and soya.

Radioactivity – the spontaneous emission of radiation, generally alpha and beta particles, often accompanied by gamma rays, from the nucleus of an unstable isotope.

Registered pesticides – types of pesticides that are imported or manufactured locally and are officially recognized by the government for use in the country.

Residual chlorine – When a sufficient dosage of chlorine is applied to water, microorganisms of sanitary significance are destroyed and there is a reaction on all oxidizable matter. After all these reactions have taken place, at the end of a specified contact time, there remains a certain minute quantity of chlorine in the water. Its presence in the water is usually an indication of sufficiency of treatment or chlorination, and is therefore an assurance of protection of the microbiological quality.

Risk assessment – an estimate of the severity or likelihood of harm to populations or ecosystems from exposure to hazard

Sedimentary rock – rock that has formed through the deposition and solidification of sediment, especially sediment transported by water (rivers, lakes, and oceans), ice (glaciers), and wind.

Solvent – a substance, ordinarily a liquid, in which other materials dissolve to form a solution. The most familiar and widely used solvent is water. Other compounds valuable as solvents because they dissolve materials that are insoluble or nearly insoluble in water are acetone, alcohol, benzene (or benzol), carbon disulfide, carbon tetrachloride, chloroform, ether, ethyl acetate, furfural, gasoline, toluene, turpentine, and xylene (or xylol).

Trace element –an element found in small quantities (usually less than 1.0%) in a mineral also known as accessory element or guest element.

Turbidity - a cloudiness or haziness of water (or other fluid) caused by individual particles that are too small to be seen without magnification. Turbidity in drinking water is caused by particulate matter that may be present from source as a consequence of inadequate filtration or from resuspension of sediment in the distribution system

Water Refilling stations – establishments where water is purified, sold and placed in water containers

Water safety plan – a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchments to consumer to ensure the safety of drinking water supply.

Water softening – any physical or chemical process of reducing the concentration of divalent cations (including calcium and magnesium) in water supply.

Water treatment works – includes devices and equipment or physical and chemical processes for making water suitable for human consumption and other purposes

V. GENERAL REQUIREMENTS

1. Microbiological Quality

1.1. Public Health Implications

Drinking-water supplies should be free from contamination by human and animal excreta, which can contain a variety of microbial contaminants. Microbiological parameters are indices of potential waterborne diseases and, in general, are limited to bacteria, viruses and pathogenic protozoa. The major interest in classifying and issuing standards is the identification, quantification, and evaluation of organisms associated with waterborne diseases. Practically, all pathogenic organisms that can be carried by water originate from the intestinal tract of warm blooded animals.

Bacterial intestinal pathogens known to be transmitted in drinking-water are strains of *Salmonella, Shigella, enterotoxigenic Escherichia coli, Vibrio cholerae, Yersinia enterocolitica* and *Campylobacter fetus, Legionella pneumophila* although, a soil bacterium, may be contracted by inhalation exposure to the bacteria in water.

There are also many common viral and protozoan organisms that transmit disease in humans. Human enteric viruses that may be present in water include *Poliovirus, Echovirus, Coxsackie Virus A, Coxsackie Virus B,* new *enterovirus* types *68-71, Hepatitis type A, Gastroenteritis type Norwalk, Rotavirus and Adenovirus*. The protozoans are *Giardia*, *Cryptosporidium* spp, *Entamoeba histolytica, Balantidium coli, Naegleria* and *Acanthamoeba*.

Public health concern regarding cyanobacteria relates to their potential to produce a variety of toxins, known as “cyanotoxins.” In contrast to pathogenic bacteria, cyanobacteria do not proliferate within the human body after uptake; they proliferate only in the aquatic environment before intake. Toxic peptides (e.g., microcystins) are usually contained within the cells and may be largely eliminated by filtration. However, toxic alkaloids such as cylindrospermospsin and neurotoxins are also released into the water and may pass through filtration systems.

Some microorganisms will grow as biofilms on surfaces (e.g. pipelines) in contact with water. Although most of these organisms do not cause illness to human, they can cause nuisance through generation of taste and odor or discoloration of drinking-water supplies. Growth following drinking-water treatment is referred to as “regrowth”. It is typically reflected in measurement of increasing heterotrophic plate counts (HPC) in water samples. Elevated HPC occur especially in stagnant parts of piped distribution systems, in domestic plumbing, in some bottled water

and in plumbed-in devices such as water softeners, carbon filters and vending machines.

Potential consequences of microbial contamination are such that it must be of paramount importance and must never be compromised. It should be the primary concern of water providers to secure microbial safety of drinking-water supplies based on the use of multiple barriers, from catchments/source to consumer, to prevent the contamination of drinking-water or to reduce contamination to levels not deleterious to public health. Two approaches can be used to reduce the risk of bacterial, viral and parasitic infection to a negligible level: providing drinking water from a source verified free of fecal contamination or adequately treating fecal contaminated water. It is particularly more important to prevent or reduce the entry of pathogens into water sources than to rely on treatment processes to remove these pathogens.
Local health authorities should advocate the preparation and implementation of water safety plans **(refer to Annex 2)** to consistently ensure drinking water safety and thereby protect public health.

1.2. Microbiological Indicators of Drinking-Water Quality

Frequent examinations for fecal indicator organisms remain as the most sensitive and specific way of assessing the hygienic quality of water. Fecal indicator bacteria should fulfill certain criteria to give meaningful results. The tests required to detect specific pathogens are generally very difficult and expensive so it is impractical for water systems to routinely test for specific types of organisms. A more practical approach is to examine the water for indicator organisms specifically associated with fecal contamination. An indicator organism essentially provides evidence of fecal contamination from humans or warm-blooded animals. The criteria for an ideal organism are as follows:

a. Always present when pathogenic organism of concern is present, and absent in clean, uncontaminated water.
b. Present in large numbers in the feces of humans and warm-blooded animals
c. Respond to natural environmental conditions and to treatment process in a manner similar to the waterborne pathogens of interest
d. Readily detectable by simple methods, easy to isolate, identify and enumerate
e. Ratio of indicator/pathogen should be high
f. Indicator and pathogen should come from the same source (gastrointestinal tract).

No organism fulfills all the criteria for an indicator organism, but the coliform bacteria fulfill most. The coliform group of bacteria (also called as total coliforms) is defined as all the aerobic and facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria that ferment lactose with gas formation within 48 h at 35^{o}C. This definition includes *E. coli*, the most numerous facultative bacterium in the feces of warm-blooded animals, plus species belonging to the genera *Enterobacter*, *Klebsiella*, and *Citrobacter*.

Total coliform could be considered as part of natural aquatic flora because of their regrowth in water. Because of this characteristic, their detection in water supply may mean false positive for fecal contamination. Another way by which false positive can occur is when the bacteria *Aeromonas* is present in the sample. *Aeromonas* can biochemically mimic the coliform group. False negatives can occur

when coliforms are present along with high populations of HPC bacteria. The presence of HPC bacteria may restrict the activities of coliform group bacteria.

Thermotolerant fecal coliforms are a subgroup of total coliforms that are differentiated from the total coliforms through laboratory examinations using elevated temperature (43 to 44.5^{o}C). Although fecal coliforms provide stronger evidence of fecal contamination than total coliforms, they could not be distinguished as human or animal origin. *E. coli* is the indicator organism of choice for fecal contamination.

On the other hand, Heterotrophic Plate Count (HPC) describes a broad group of bacteria that include pathogens, nonpathogens and opportunistic microorganisms. HPC could be used to indicate general biological condition of drinking-water as a consequence of insufficiency of treatment processes, regrowth or recontamination of drinking water in the distribution system.

Water intended for human consumption should contain no indicator organisms. However, pathogens more resistant to conventional environmental conditions or treatment technologies may be present in treated drinking-water in the absence of E. coli or total coliforms. Protozoa and some enteroviruses are more resistant to many disinfectants including chlorine, and may remain viable and pathogenic in drinking-water following disinfection process.

1.3. Standard Methods of Detection and Values for Microbiological Quality

Parameters	*Method of Determination*	*Value*[*]	*Units of Measurement*	*Point of Compliance*
Total coliform	Multiple Tube Fermentation Technique (MTFT)	< 1.1	MPN/ 100 mL	▪ Service reservoirs ▪ Water treatment works ▪ Consumer's Taps ▪ Refilling Stations ▪ Water Haulers ▪ Water Vending Machines
	Chromogenic substrate test (Presence-Absence)[*]	Absent <1.1	MPN/100 mL	
	Membrane Filter (MF) Technique	< 1	Total coliform colonies / 100 mL	

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998

* Should be validated and approved by Department of Health

	Compliance to Total coliform			
	(a) For water systems analyzing at least 40 samples per month, no more than 5% of the monthly sample may be positive for total coliform; (b) For water systems analyzing fewer than 40 samples per month, no more than one (1) sample per month may be positive for total coliform			▪ Consumer's Taps
	At least 95% of standard samples taken in each year from each reservoir are total coliform negative			▪ Service reservoirs
	No standard sample taken each month should exceed maximum allowable value specified in the above.			▪ Water treatment works ▪ Refilling stations ▪ Water haulers ▪ Water vending machines
Fecal coliform	Multiple Tube Fermentation Technique (MTFT)	< 1.1	MPN/ 100 mL	▪ Service reservoirs ▪ Water treatment works ▪ Consumer's Taps ▪ Refilling Stations ▪ Point Sources (Level I) ▪ Water Haulers ▪ Water Vending Machines
	Membrane Filter Technique (MFT)	< 1	Fecal coliform colonies / 100 mL	
	Chromogenic substrate test (Presence-Absence)*	< 1.1	MPN/100mL	
Heterotrophic Plate Count	▪ Pour Plate ▪ Spread Plate ▪ Membrane Filter Technique	<500	CFU / mL	▪ Service reservoirs ▪ Water treatment works ▪ Consumer's taps nearest the meter ▪ Refilling Station ▪ Water Vending Machines

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998

* Should be validated and approved by Department of Health

1.4. Sampling and Analysis for Microbiological Quality

To determine the safety and acceptability of drinking-water supply, appropriate laboratory examinations should be conducted on representative samples of water taken at all critical stages in the production and consumption of water supply. These stages include, and not limited to: the water sources, in the course of and after the treatment process (if any), and from a reasonable number of points in the distribution network. Microbiological examination, i.e. determination of fecal contamination of water supply, is conducted more frequently than the other tests

because of the high probability of microbial contamination and the extent of public health it might cause.

Volume of sample

The volume of sample should be sufficient to carry out all tests required, preferably not less than 100 ml.

Sample container

Collect samples for microbiological examination in 120 ml clear bottles that have been cleansed and rinsed carefully, given a final rinse with distilled water and sterilized as directed in the standard method of analysis for water and wastewater. Sampling bottles should be provided with either ground glass stoppers or plastic screw caps. A paper or a thin aluminum foil cover should protect both the stopper and neck of the bottle. For waters that have been chlorinated, add 0.1 ml of a 3% solution of sodium thiosulfate ($Na_2S_2O_3$) to a clean sample bottle before sterilization

Sample Collection, Handling and Storage

The sample should be representative of the water under examination. Contamination during collection and before examination should be avoided.

The tap should be cleaned and free from attachments and fully opened with water allowed to waste for a sufficient time to permit the flushing/clearing of the service lines. Flaming is not necessary. Taps with a history of previous contamination may be disinfected with hypochlorite solution (NaOCl 100 mg/L). No samples shall be taken from leaking taps.

The sampling bottle should be kept unopened until it is ready for filling. Remove stopper or cap as a unit; do not contaminate inner surface of stopper or cap and neck of bottle. Fill container without rinsing, it should be filled without rinsing and ample space (at least 2.5 cm) must be left to facilitate mixing by shaking. Replace stopper or cap immediately.

Water samples should be processed promptly or within six (6) hours after collection or if not possible the use of ice coolers for storage of water samples during transport to the laboratory is recommended. The time elapsed between collections and processing should in no case exceed 24 hours.

Identification of Samples

Sampling bottles must be tagged with complete and accurate identification and description. The information about the samples can be recorded in a request form for analysis of water quality.

Frequency of Sampling

The minimum number of samples to be collected and examined periodically must be based on the mode and source of water supply **(as shown in Table 1).**

However, frequency of sampling should also take into account the past frequency of records yielding unsatisfactory results, the quality of raw water treated, the number of raw water sources, the adequacy of treatment and capacity of the treatment plant, risks of contamination at the source and in the distribution system, the size and complexity of the distribution system, the risk of an epidemic and the practice of disinfection.

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

Source and mode of Supply	Population Served	Minimum Frequency of Sampling
a. Level I	90 – 150	Once in three (3) months
b. Level II	600	Once in two (2) months
c. Level III	Less than 5,000	1 sample monthly
	5,000 – 100,000	1 sample per 5,000 population monthly
	More than 100,000	20 samples and additional one (1) sample per 10,000 population monthly
d. Emergency Supplies of Drinking Water		Before delivery to users
e. Water Refilling Stations (product water)		1 sample monthly
f. Water Vending Machines (product water)		1 sample monthly

Location of Sampling Points.

Adherence to the set guidelines for sampling point selection must be observed. These guidelines cover zoning of piped water supply as well as sampling from the point source **(refer to Annex 3)**.

2. Chemical and Physical Quality

2.1 Chemical Contaminants

Various forms of chemicals, which occur naturally in the environment and in raw, water or used in agriculture, industries, and water treatment processes or domestically may be found in drinking water supplies. There are few chemical constituents of water that can lead to acute health problems except through

massive accidental contamination of drinking water supply. In such incidents, water usually becomes undrinkable owing to unacceptable taste, odor, and appearance.

Certain inorganic constituents may be present in drinking water as a result of leaching out of piping or plumbing materials such as lead, copper, asbestos, nickel and cadmium. Some of these chemicals are known or suspected carcinogens such as arsenic, lead, chromium, and cadmium among others. Organic constituents in water could come from various sources such as the decomposition of organic debris, domestic, agricultural and industrial activities and contamination that occur during water treatment and distribution. These activities generate wastewater discharges, agricultural and urban runoff and leachates from contaminated soils that may include pesticides, solvents, metal degreasers and plasticizers and petroleum products. Other organic contaminants are formed during water treatment processes such as coagulation, chlorination and ozonation. It is recommended that Local Drinking Water Monitoring Committee should look into the possible sources of these chemicals in their respective areas and direct efforts to monitor its possible implications to drinking water supplies.

2.2 Acceptability Aspect

The chemicals and physical quality of water may affect its acceptability by consumers. Problems resulting to taste, odor, turbidity, color and similar nature may originate in raw water sources, within the treatment processes, in the distribution system or in the plumbing systems of the consumers. Although acceptability aspects of drinking water quality do not have adverse health implications, standards are set to satisfy the need of consumers for a colorless, odorless and tasteless drinking water. Sections 2.9 to 2.13 indicate the physical and chemical quality requirements of drinking water supply to be provided to consumers.

2.3 Particulates in Water Supply

Particles in water may consist of suspended finely divided solids and colloids, clay, silt, fibrous substances as well as living organisms. Particles affect the aesthetic quality or acceptability by the consumers. They can also be of significant health concern since they could be toxic or could adsorb toxic substances. Particulates could interfere with disinfection and other treatment processes. There are no recommended standard values for floating and settled materials, but it is suggested that no floating or settled materials should be found in drinking water.

2.4 Water Sampling for chemical and physical analysis

The actual collection of the water sample is a matter of considerable importance. Refer to section 1.4.6 for sampling location. It is impossible to state unequivocally how much time should be allowed between the time of collection of a sample and its analysis. This depends on the character of the sample, the particular analyses to be made and the conditions of storage. For sampling, the following procedures should be observed:

2.4.1 Collect samples from wells only after the well has been pumped sufficiently to ensure that the samples represent the quality of groundwater that feeds the well. Sometimes it will be necessary to pump at a specified rate to achieve a characteristic drawdown as part of the sample record. New wells

will require sufficient utilization and abstraction before sampling. Collect samples from open shallow wells by taking a composite sample.

2.4.2 When samples are collected from surface water sources such as river or stream, it is best to take a composite sample from three depths (top, middle and bottom). In this way, the sample becomes representative. If only a grab or catch sample can be collected, it is best to take it in the middle of the stream and at mid-depth.

2.4.3 When sampling lakes and reservoirs, which are naturally subjected to considerable variations from normal causes, the choice of location, depth, and frequency of sampling will depend on the local conditions and the purpose of the investigation.

2.4.4 Before samples are collected from distribution systems, flush the lines sufficiently to ensure that the sample is representative of the supply, taking into account the diameter and length of the pipe to be flushed and the velocity of flow.

2.4.5 Sample of oil films recovered from the surface of stream or other bodies of water will be almost impossible to evaluate in relation to the total volume of water, the total film area, and the thickness involved. A method commonly used to estimate total volume is to divert the water into a wide-mouth container (washed with solvent and air-dried before use). The glass-stopped container should not be completely filled, as a loss of floating oil may occur in stoppering. It is advisable to collect the desired quantity of sample in an oversized bottle that has previously been marked at the desired volume.

2.5 Minimum Frequency of Sampling

The minimum frequency of sampling for drinking water supply systems for physical and chemical analysis is provided in **Table 2**.

Table 2. Minimum Frequency of Sampling for Drinking-Water Supply Systems for Physical and Chemical Analysis

Source and mode of Supply	Minimum Frequency of Sampling
a. Level I	Once a year
b. Level II	
c. Level III	
d. Emergency Supplies of Drinking Water	
e. Water Refilling Stations	Twice a year
f. Water Vending Machines	

2.6 Volume of Sample

Three (3) liters of sample should suffice for physical and chemical analyses.

Note: No attempt should be made to use the sample for microbiological and microscopic examination because collection and handling methods for are quite different for these analyses.

2.7 Sample Container

In all cases, the container should be chosen so that it will not contaminate the sample.

2.7.1 Chemically resistant glass (Pyrex), polyethylene, or hard rubbers are suitable materials for containers **(see Table 3)**. For samples containing organics, avoid plastic containers except those made of fluorinated polymers such as polytetrafluoroethylene (PTFE). Glass containers generally are preferred for volatile organics. Sample containers must be carefully cleaned to remove all extraneous surface dirt, thoroughly rinsed with distilled water and drained before use.

a. For glass bottles, rinsing with chromic acid cleaning solution is necessary. An alternative method is with the use of alkaline permanganate solution followed by an oxalic acid solution.

b. For polyethylene bottles, detergents or concentrated hydrochloric acid can be used.

2.7.2 Stoppers, caps and plugs should be chosen to resist the attack of material contained in the vessel or container. Cork stoppers wrapped with a relatively inert metal foil are suitable for many samples, or polytetrafluoroethylene (PTFE).

2.7.3 The sample containers should be such that when filled with the desired amount of sample, space roughly equivalent to 1 percent of the volumetric capacity of the containers is available for expansion of the liquid.

2.7.4 Sample containers must be properly labeled. A gummed label, or a cardboard or tag securely affixed to the container should be provided with the following information.

- Date and time of sampling
- Source of sample
- Point of sampling (designed in sufficient detail to enable anyone to collect a second sample from the identical spot from which the first sample was taken)
- Temperature of the sample
- Sampled by: (name of collector)

2.8 Sample Handling and Storage

In general, the shorter the time lapse between collection of a sample and its analysis, the more reliable will analytical results be.

2.8.1 For certain constituents and physical values, immediate analysis in the field is required in order to obtain dependable results, because the composition of the sample may change before it arrives at the laboratory.

2.8.2 Changes caused by the growth of organisms may be greatly retarded by keeping the sample in the dark and at a low temperature until it can be analyzed.

2.8.3 It is necessary to keep the samples cool or refrigerated. Storage at a low temperature ($4^{o}C$) is the best way to preserve most samples.

2.8.4 Add chemical preservatives to samples only as specified in specific analytical methods. Suitable preservative that will not affect the results of the analyses to be made must be selected.

The recommended sampling and preservation of sample according to parameters for analysis are presented in Table 3. The list is by no means inclusive. It is clearly impossible to prescribe absolute rules for the preservation of all possible changes. Advice is included in the notes under the individual determination.

Table 3. Sampling and Preservation methods according to parameters[†]

Determination	Container Material	Minimum Sample (mL)	Mode of Preservation	Holding Time Recommended /Regulatory[‡]
Acidity	P, G(B)	100	Refrigerate	24 h / 14 d
Alkalinity	P, G	200	Refrigerate	24 h / 14 d
Boron	P (PTFE) or Quartz	1000	HNO_3 to pH <2	28 d / 6 months
Chloride	P, G	50	None required	N.S. / 28 d
Chlorine, residual	P, G	500	Analyze immediately	0.25 h / 0.25 h
Color	P ,G	500	Refrigerate	48 h / 48 h
Cyanide, total	P, G	1000	Add NaOH to pH >12, refrigerate in the dark	24 h / 14 d; 24 h if sulfide present
Fluoride	P	100	None required	28 d / 28 d
Hardness	P, G	100	Add HNO_3 or H_2SO_4 to pH<2	6 mo / 6 mo
Iodine	P, G	500	Analyze immediately	0.25 h / N.S.
Metals, general	P(A), G(A)	1000	For dissolved metals filter immediately, add HNO_3 to pH <2	6 mo / 6 mo
Chromium VI	P(A), G(A)	1000	Refrigerate	24 h / 24 h
Mercury	P(A), G(A)	1000	Add HNO_3 to pH<2, 4^{o}C, refrigerate	28 d / 28 d
Nitrate	P,G	100	Analyze as soon as possible; refrigerate	48 h / 48 h (28 d for chlorinated)
Nitrite	P, G	100	Analyze as soon as possible; refrigerate	None / 48 h
Odor	G	500	Analyze as soon as possible; refrigerate	6 h / N.S.
Organic Compounds				
MBAs	P, G	250	Refrigerate	48 h / N.S.
Pesticides	G(S), PTFE-line cap	1000	Refrigerate, add 1000 mg ascorbic acid/L if residual chlorine present	7 d / 7 d until extraction; 40 day after extraction
Phenols	P,G, PTFE-line cap	500	Refrigerate, add H_2SO_4 to pH<2	* / 28 d until extraction
PH	P, G	50	Analyze immediately	0.25 / N.S.
Phosphate	G(A)	100	For dissolved phosphate filter immediately; refrigerate	48 h / N.S.
Sulfate	P, G	100	Refrigerate	28 d / 28 d
Turbidity	P, G	100	Analyze same day; store in dark up to 24 h, refrigerate	24 h / 48 h

[†] For determination not listed, use glass or plastic containers; preferably refrigerate during storage and analyze as soon as possible

[‡] Environmental Protection Agency, 40CFR Part 136 Table II, Dated July 1, 1999

P = plastic (polyethylene or equivalent); G = glass; G(A) or P(A) – Rinsed with 1 + 1 HNO_3; G(B) – Glass, borosilicate; G(S) – Glass, rinsed with organic solvents or baked; N.S. – Not stated in cited reference; Stat – no storage allowed; analyze immediately

2.9 Standard Values for Inorganic Chemical Constituents with Health Significance

Constituent	Maximum Level (mg/L)	Remarks (Sources/Occurrence)	Method of Analysis
Antimony	0.02	Antimony is a contaminant from pipe and fitting materials. It is not a raw water contaminant.	FAAS. EAAS; ICP/MS;
Arsenic	0.05	For existing water supply systems. Arsenic may be naturally occurring in water sources. Where maximum level of arsenic is unachievable, concentration in water supply must be kept as low as possible. By 2010, the maximum level shall be 0.01 mg/L	ICP/MS; hydride generation AAS; Silver Diethyldithiocarbamate Method, EAAS (Graphite furnace AAS)
Barium	0.7	Barium occurs naturally as trace elements in both igneous and sedimentary rocks.	ICP/MS; FAAS; EAAS, ICP
Boron	0.5	Present in surface water due to discharge of treated sewage effluent, which still contains detergents; could be naturally occurring in certain areas. Maximum level has been elevated from 0.3 mg/L (PNSDW 1993) to 0.5 mg/L (PNSDW 2007) because it is difficult to achieve in areas with high natural levels and limited access to treatment technology.	ICP/MS; ICP/AES
Cadmium	0.003	Cadmium is used in manufacture of steel, plastics and battery and released to the environment through wastewater or fumes. Cadmium is released in water supply as impurity of the zinc coating of galvanized pipes and solders and metal fittings.	ICP/MS; FAAS
Chromium (Total)	0.05	Chromium is widely distributed in the Earth's crust. Occurs in wastewater in certain industries such as chromium plating of bumpers, grills and ornaments.	FAAS; EAAS, ICP, ICP/MS
Cyanide (Total)	0.07	Cyanides are occasionally found in drinking water primarily as a consequence of industrial contamination.	Titrimetric; Colorimetric; CN Selective Electrode
Fluoride	1.0	In areas where high natural fluoride levels occur, the maximum level may be difficult to achieve due to limited access to treatment technology.	Ion chromatography, Ion-selective electrodes; SPADNS colorimetric; Complexone Method
Lead	0.01	Lead may be present in water primarily from plumbing systems containing lead pipes, solder, fittings or the service connections to the homes. Although it may be found naturally occurring in certain areas, rarely is it present in water supply as a result of its dissolution from natural sources.	FAAS; EAAS; ICP/MS; Anodic Stripping Voltammetry; Dithizone

2.9 Standard Values for Inorganic Chemical Constituents with Health Significance - Continuation

Constituent	Maximum Level (mg/L)	Remarks (Sources/Occurrence)	Method of Analysis
Mercury (Total)	0.001	Mercury is used in industries such as in the electrolytic production of chlorine, in electrical appliances, in dental amalgams and as a raw material for various mercury compounds. Mercury occurs naturally in freshwater and groundwater in the inorganic form. Methylation of inorganic mercury occurs in freshwater and seawater.	Cold vapor AAS; ICP/MS
Nickel	0.02	Nickel is very toxic and usually occurs in water supply as a result of nickel or nickel-plated plumbing components. Although nickel could be naturally occurring in certain areas, it is not usually a raw water contaminant.	ICP/MS; EAAS; ICP; FAAS
Nitrate	50	Nitrate concentration in groundwater and surface water can reach high levels as a result of leaching or run-off from agricultural land or contamination from human or animal wastes. Anaerobic conditions may result in the formation and persistence of nitrite.	Cd Reduction Method; IC; Capillary Ion electrophoresis Colorimetric (Diazotization); IC; Flow Injection Analysis
Nitrite	3		
Selenium	0.01	Selenium occurs naturally in groundwater sources.	AAS with hydride generation; Colorimetric, Fluorometric, EAAS, ICP, ICP/MS

2.10 Organic Chemical Constituents from Industrial Pollution (with health significance)

Constituent	Maximum Level (mg/L)	Sources	Method of Analysis
Benzene	0.01	Benzene may be introduced into water by industrial effluents and atmospheric pollution due to vehicular emissions.	GC/PID; GC/MS
Carbon Tetrachloride	0.004	From industrial discharges, carbon tetrachloride levels in anaerobic groundwater may remain elevated for months or even years.	GC/PID; GC/ELCD; GC/MS
1,2-Dichlorobenzene	1.0	DCBs are widely used in industry and in domestic products such as odor-masking agents, chemical dyestuffs and pesticides	GC/PID; GC/ELCD; GC/MS
1,4-Dichlorobenzene	0.30		
1,2-Dichloroethane	0.03	Used as an intermediate in the production of vinyl chloride and other chemicals and as a solvent.	GC/PID; GC/ELCD; GC/MS
1,1-Dichloroethene	0.03	Used as monomer in the production of polyvinylidene chloride co-polymers and as an intermediate in synthesis of other organic chemicals.	GC/PID; GC/ELCD; GC/MS
1,2-Dichloroethene	0.05	Its presence appears as metabolites of other unsaturated halogenated hydrocarbons in wastewater and anaerobic groundwater, which may indicate the simultaneous presence of more toxic organochlorine chemicals such as vinyl chloride.	GC/PID; GC/ELCD; GC/MS
Dichloromethane	0.02	Dichloromethane or methylene chloride is widely used as a solvent for many purposes including coffee decaffeination and paint stripping.	GC/MS
Di(2-ethylhexyl) phthalate	0.008	Used mainly as a plasticizer.	GC/MS
Edetic Acid (EDTA)	0.6	Maximum value of 0.6 mg/L for EDTA as the free acid. Human exposure to EDTA arises directly from its use in food additives, medicines, and personal care and hygienic products.	Potentionmetric stripping analysis
Ethylbenzene	0.3	Primary sources are petroleum industry and use of petroleum products.	GC/PID; GC/MS

2.10 Organic Chemical Constituents from Industrial Pollution (with health significance) - Continuation

Constituent	Maximum Level (mg/L)	Sources	Method of Analysis
Nitrilotriacetic acid (NTA)	0.2	Used primarily in laundry detergents as a replacement for phosphates and in the treatment of boiler water to prevent accumulation of mineral scale.	GC with nitrogen-specific detector
Polynuclear aromatic hydrocarbons (PAHs)	0.0007	Used as coal-tar coating in drinking-water distribution pipes	GC/MS; reverse-phase HPLC with a fluorescence detector
Styrene	0.02	Used in the production of plastics and resins	GC/PID; GC/MS
Tetrachloroethene	0.04	Used as solvent in dry cleaning industries and as a metal degreasing solvent.	GC with ECD; GC/MS
Toluene	0.7	Used in the blending of petrol, as a solvent and as a raw material in chemical production. It may penetrate plastic pipes from contaminated soil.	GC/ FID; GC/MS
Trichloroethene	0.07	Used in dry cleaning and metal degreasing processes. Trichloroethene in anaerobic groundwater may degrade to more toxic compounds, including vinyl chloride.	GC/ ECD; GC/MS
Vinyl chloride	0.0003	Used primarily for production of PVC. Migration of vinyl chloride monomer from unplasticized PVC is possible source of vinyl chloride in drinking water. Degradation product of the chlorinated solvents trichloroethene and tetrachloroethene in groundwater.	GC / ECD; FID ; with MS for confirmation
Xylene	0.5	Used in blending petrol, as a solvent and as a chemical intermediate.	GC/MS; GC/ FID

2.11 Standard Value for Organic Chemical Constituents (Pesticides)

Constituent	Maximum Level (µg/L)	Status in the Philippines[§]	Remarks (Persistence)	Method of Analysis
Aldrin and Dieldrin (combined)	0.03	Banned	Highly persistent organochlorine compounds	GC with ECD
Atrazine	2.0	Registered	Relatively stable in soil and aquatic environments; half-life measured in months, but is degraded by phytolysis and microbial action in soil	GC/MS
Carbofuran	7.0	Registered	0.007 mg/L is based on the 1998 amendment to the 1993 WHO GV	GC with nitrogen-phosphorus detector; reverse-phase HPLC with fluorescence detector
Chlordane	0.2	Banned	Chlordane is highly persistent and has a high bioaccumulation potential.	GC /ECD, GC/MS
DDT	1.0	Banned*	DDT is highly persistent.	GC /ECD, GC/MS
1,2-Dibromo-3-chloropropane (DBCP)	1.0	Banned	Highly soluble in water	GC /ECD, GC/MS
2,4-Dichlorophenoxyacetic acid (2,4-D)	30.0	Registered	2,4 D is rapidly biodegraded in the environment	GC/ECD, GC/MS
Endrin	0.6	Banned	Endrin is highly persistent	GC / ECD, GC/MS
1,2-Dibromoethane (Ethylene dibromide)	0.4	Banned	Used also in industry as solvent WHO GV is provisional value due to serious limitations of the critical studies. PNSDW adapts precautionary approach.	GC/MS; GC/ELCD; GC/PID
Heptachlor and Heptachlor epoxide (combined)	0.03	Banned	Heptachlor is quite persistent in soil where it is transformed into its epoxide. Heptachlor epoxide is resistant to further degradation.	GC/MS;/GC/ECD
Lindane	2.0	Restricted		GC/MS; GC/ECD
MCPA [4-(2methyl-4-chlorophenoxy)acetic acid]	2.0	Registered	Very soluble, highly mobile and can leach from soil. It has limited persistence in water.	GC/MS; GC/ECD
Pendimethalin	20.0	Registered	Fairly immobile and persistent in soil	GC/MS
Pentachlorophenol (PCP)	9.0	Banned	WHO GV is provisional value due to serious limitations of the critical studies.	GC/ ECD, GC/FID, GC/MS

[§] Fertilizer and Pesticide Authority Pesticide Circular No. 04, Series of 1989

* Fertilizer and Pesticide Authority Board Resolution No. 04, Series of 2005

2.12 Standard Values for Physical and Chemical Quality for Acceptability Aspects

Constituent		Maximum Level (mg/L) Or Characteristic	Remarks	Method of Analysis
Taste		No objectionable Taste	The cause of taste must be determined.	Sensory Evaluation Technique
Odor		No objectionable odor	The cause of odor must be determined.	Sensory Evaluation Technique
Color	Apparent	10 Color Units	Decomposition of organic materials such as leaves or woods usually yield coloring substances to water; Tannins, humic acid, and humates from the decomposition of lignin; Insoluble form of iron and manganese; colored suspended matters	Visual Comparison Colorimetric
	True	5 Color Units		
Turbidity		5 NTU	Turbidity increases with the quantity of suspended matters in water.	Turbidimetry
Aluminum		0.2	Aluminum sulfate is used in water treatment as coagulants	FAAS, EAAS, ICP, Colorimetry Method
Chloride		250.0	Chloride in drinking water originates from natural sources, sewage and industrial effluents, urban runoff, and seawater intrusion.	Argentometric Method, IC
Copper		1.0	Copper in drinking water occurs primarily as corrosion of interior of copper plumbing especially with acid pH or high-carbonate waters with alkaline pH.	FAAS, EAAS, ICP, Neocuproine Method, Bathocuproine Method
Hardness		300 as $CaCO_3$	Hardness is due to the presence of naturally occurring divalent cations, such as calcium, magnesium, and strontium resulting from contact of acidic groundwater with rocks such as limestone and dolomites. Hardness beyond the standard value maybe acceptable for drinking by the consumers in certain areas.	FAAS, EAAS, ICP, Colorimetry Method
Hydrogen sulfide		0.05	Hydrogen sulfide may be generated by microorganisms under anaerobic conditions in bottom of swamps, marshes, eutrophic lakes and groundwater.	Methylene Blue Method, Iodometric Method
Iron		1.0	Applicable for existing and new water supply systems. Iron is found in natural fresh waters. It may be present in drinking water as a result of the use or iron coagulants or the corrosion of steel and cast iron pipes during water distribution.	Phenanthroline, AAS, ICP, Colorimetric Method
Manganese		0.4	Applicable for existing and new water supply systems. Manganese is naturally occurring in many surface and groundwater sources, particularly in anaerobic or low oxidation conditions.	Persulfate Method, AAS, ICP, ICP/MS

2.12 Standard Values for Physical and Chemical Quality for Acceptability Aspects

Constituent	Maximum Level (mg/L) Or Characteristic	Remarks	Method of Analysis
pH	6.5 – 8.5 5 – 7 for product water that undergone reverse osmosis or distillation process	The pH range is based on aesthetic consideration only. The acceptable range may be broader in the absence of a distribution system. pH is important as operational water quality parameter	Electrometric method
Sodium	200	Sodium is usually associated with chloride, thus, it may have the same sources in drinking water as chloride. Water softeners can add significantly to the sodium content in drinking water especially from water refilling stations.	AAS (Flame absorption mode) , ICP/MS, Flame photometry
Sulfate	250	High levels of sulfate occur naturally in groundwater.	Turbidimetric Method, Ion Chromatography, Gravimetric Method
Total Dissolved Solids (TDS)	500 <10 for product water that undergone reverse osmosis or distillation process	TDS in drinking water originate from natural sources, sewage, urban runoff and industrial wastewater.	Gravimetric, dried at 180^{o}C
Zinc	5.0	Zinc may occur naturally in groundwater. Concentration in tap water can be much higher as a result of dissolution of zinc from pipes.	FAAS, ICP, ICP/MS

2.13 Standard Values for Chemicals Used in Treatment and Disinfection and Disinfection by-products

Constituent	Maximum Level (mg/L)	Occurrence	Method of Analysis
a. Contaminants from Treatment Chemicals			
Acrylamide	0.0005	Residual acrylamide monomer occurs in the use of anionic, cationic and non-ionic polyacrylamide coagulant aids;	GC/ELCD; HPLC with UV Detection
Epichlorohydrin	0.0004	Epichlorohydrin is used for the manufacture of glycerol, unmodified epoxy resins and water treatment resins.	GC /ECD, GC/MS, GC/FID
b. Disinfection Chemicals			
Chlorine Residual	0.3 min	Detected at the farthest point of the distribution system	Iodometric; Amperometric Titration; DPD Colorimetric Method
	1.5 max	Detected at any point in the distribution system	
Iodine	Not recommended for long term disinfection		Leuco Crystal Violet/ Amperometric Method
c. Disinfection by-products			
Bromate	0.01	As DBP, bromate is formed during ozonation when bromide ion is found in water or in concentrated hypochlorite solutions used to disinfect drinking water. The maximum level is based on the recent (2003) risk assessment as reported in WHO Guidelines (2004).	IC
Chlorite	0.7	The maximum values for chlorite and chlorate are provisional values. When chlorine dioxide is used as a disinfectant, chlorite or chlorate levels may be allowed to exceed the maximum level. Difficulty in meeting the maximum level is not a reason for compromising adequate disinfection.	IC with suppressed conductivity detection for chlorate
Chlorate	0.7		
Chloral hydrate (trichloroacetaldehyde)	0.01	Chloral hydrate is formed as a by-product of chlorination when chlorine reacts with humic acids.	GC /ECD; GC/MS
Dibromoacetonitrile	0.07	Dibromoacetonitrile is produced during water chlorination from naturally occurring substances including algae, fulvic acid and proteinaceous material.	GC/ ECD
Dichloroacetic acid	0.05	Chlorinated acetic acids are formed from organic material during water chlorination.	GC/ECD; GC/MS
Dichloroacetonitrile	0.02	Dichloroacetonitrile is produced during water chlorination from naturally occurring substances including algae, fulvic acid and proteinaceous material.	GC/ECD

2.13 Standard Values for Chemicals Used in Treatment and Disinfection and Disinfection by-products - Continuation

Constituent	Maximum Level (mg/L)	Occurrence	Method of Analysis
Formaldehyde	0.9	Formaldehyde in drinking water results primarily from oxidation of natural organic matter during ozonation and chlorination.	GC/ECD
Monochloroacetate	0.02	Chlorinated acetic acids are formed from organic material during water chlorination.	GC/ ECD; GC/MS
Trichloroacetate	0.20	Chlorinated acetic acids are formed from organic material during water chlorination.	GC /ECD; GC/MS
2,4,6-trichlorophenol	0.2	Chlorophenols are present in drinking water as a result of the chlorination of phenols, as by-products of hypochlorite with phenolic acid, as biocides or as degradation products of phenoxy herbicides.	GC/ ECD;GC/MS
Trihalomethanes			
Bromoform	0.1	Trihalomethanes are generated principally as by-products of chlorination of drinking water, being formed from naturally occurring organic compounds.	GC /ECD; GC/MS
Dibromochloro-methane	0.1		
Bromodichloro-methane	0.06		
Chloroform	0.2		

- AAS - Atomic Absorption Spectrometry
- DPD -N,N-diethyl-p-phenylenediamine (under residual chlorine method)
- EAAS - Electrothermal Atomic Absorption Spectrometry
- ELISA - Enzyme-linked Immunosorbent Assay
- FAAS - Flame Atomic Absorption Spectrometry (FAAS)
- FID – Flame Ionization Detector
- GC - Gas Chromatography
- GC/ECD - Gas Chromatography/Electron Capture Detector
- GC/ELCD - Gas Chromatograph/Electrolytic Conductivity Detector
- GC/FID -Gas Chromatograph/Flame Ionization Detector
- GC/MS - Gas Chromatography / Mass Spectrometry
- GC/PID - Gas Chromatograph/Photoionization Detector
- HPLC - High-performance Liquid Chromatography
- ICP/AES - Inductively Coupled Plasma / Atomic Emission Spectrometry
- ICP/MS - Inductively Couple Plasma / Mass Spectrometry (ICP/MS)

3. Radiological Quality

Radioactive contaminants in drinking water may come from naturally-occurring radionuclides present in rocks and soils from earth's formation and from man-made radionuclide arising from power generated by nuclear energy. Deepwells, groundwater and mineral springs have been known to be sources of natural radioactivity, principally radium and radon. Deposition of radioactive fallout from nuclear weapon testing abroad or from nuclear accidents, nuclear power plants facilities or from medical use of radioactive substances may also be a source of contamination. Although the contribution of radioactivity in drinking water from above sources is very minimal, it is still important to monitor radioactivity to protect the public from undue exposure to radiation,

The World Health Organization has set radioactivity levels for gross alpha and gross beta activity as shown on Section 3.7, in radioactivity units of Becquerel per liter (Bq/L). The guidelines are based on the fact that radioactivity in drinking water contributes only a minor part of the total radiation dose received from natural sources. Screening of gross alpha and gross beta emitters is used to determine whether more complete analyses for specific radionuclides are needed. The term screening value is used in the same manner as reference level as defined by the International Commission on Radiological Protection (ICRP). A reference level is not a dose limit requirement.

The values of the gross alpha and beta which is used as the initial screening technique for assessing the radiological quality of drinking water do not include gaseous radionuclide such as radon, so that if its presence is suspected, special measurement should be used. The Environmental Protection Agency has established Maximum Contaminant Level and Alternate Maximum Contaminant Level for radon in drinking water. (Refer to Section 3.7).

3.1. Collection of Samples

Samples of drinking water are collected directly from the source, typically from household faucets. Groundwater and springwater used as drinking water are also collected directly from pumpwells or deepwells.

3.2. Sample Size: containers: handling and storage

One liter of water sample is collected and contained in a properly labeled polyethylene plastic container. After sample collection, the sample is acidified to a pH of less than 2 using minimum amounts of diluted hydrochloric acid to minimize losses caused by adsorption in the container walls as well as to preserve the sample. Radiochemical analysis is then performed in the laboratory at any time except perhaps when short-lived radionuclides are known to be present in the sample.

3.3. Sampling frequency

Based on the 2000 EPA final rule on radiological requirements on drinking water, the PNRI established monitoring frequency for the Philippine drinking water (Section 3.8). In case of emergencies such as nuclear accidents from neighboring countries, immediate sampling and analysis should be done.

3.4. Resampling

Re-sampling and reexamination of the source of drinking water should be performed in cases where gross alpha and gross beta radioactivity levels exceed the standard values. In the event that gross alpha is exceeded, analysis of specific alpha-emitting radionuclides, total Radium shall be conducted. If the gross beta activity is exceeded, analysis of specific beta-emitting radionuclides, tritium (3H) and Strontium (90Sr) shall be performed. Additional advice may be obtained from the Philippine Nuclear Research Institute, Commonwealth Avenue, Diliman, Quezon City.

3.5. Method of Analysis

The methods for analyses of gross alpha and gross beta radioactivity), 226Ra, 3H and 90Sr shall be based on the standard procedures by the Health Physics Research Section and Analytical Measurement Research Section of the Philippine Nuclear Research Institute. The procedures are based on the procedure manual of the Environmental Measurements Laboratory (EML-300) and the United States Environmental Protection Agency (USEPA) Prescribed Procedures for Measurement of Radioactivity in Drinking water (EPA 600/4-80-032).

The determination of gross alpha radioactivity should be made as soon as practicable to minimize the in growth of radon and its daughter products in the prepared sample. If the gross alpha and gross beta levels are less than the standard values, no further examination is necessary except for routine surveillance as may be required in the vicinity of nuclear installations or the major sources of radionuclides pollution.

3.6. Health Effects

Radiation causes a variety of health effects, depending on the dose rate, Linear Energy Transfer (LET) of the type of radiation and several other factors. At low doses, the health effects of radiation are primarily cancer induction and genetic disorder. However, these effects may take a number of years before they are manifested. The conservative approach in radiation protection is to assume that any dose, no matter how small, carries with it a finite, albeit small, probability of inducing cancer.

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) has estimated that the probability of fatal cancer induction after low-dose, low dose-rate irradiation of the total population to be 5 x 10-3 sievert per year (Sv/y). For instance, the limits for 3H(7600 Bq/L) and 90Sr(5 Bq/L) in drinking water, when combined, are estimated to have probability of causing in two out of one million persons exposed. However, based on the data obtained at the Philippine Nuclear Research Institute on 3H and 90Sr as well as 222Rn in drinking water, the limits for drinking water are generally not reached, much less exceeded.

Breathing radon from the indoor air in homes is the primary public health risk from radon contributing to about 20,000 lung cancer death each year in the United States according to 1999 landmark report by the National Academy of Sciences (NAS) on radon in indoor air. Radon from tap water is a smallest source of radon in indoor air. Only about 1-2 percent of radon in indoor air comes from drinking water.

3.7. Standard Values for Radiological Constituents

Constituents	Activity Level (Bq/liter)
gross alpha activity	0.1 (excluding radon)
gross beta	1.0
radon	11(MCL)

3.8. Sampling Frequency Requirements for Radiological Constituents

Type	Frequency	Condition
Initial	Four consecutive quarters for one year	
Routine	One sample every 3 years	If running average from four consecutive quarterly samples > 50% of MCL
Reduced	One sample every 6 years	If initial average is 50% of MCL

VI. REPEALING CLAUSE

All administrative orders, rules and regulations and administrative issuances or parts thereof inconsistent with the provisions of these standards are hereby repealed or amended accordingly.

VII. EFFECTIVITY

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

FRANCISCO T. DUQUE III, MD, MSc
Secretary of Health

Annex 1.

Guidelines in Identifying Priority Drinking-Water Quality Parameters for Monitoring

The Local Health Authority at the municipal or city level shall identify the list of parameters that will be examined to determine the potability of drinking water supply provided in the local area. To achieve this, the local health authority through the Local Drinking Water Quality Monitoring Committee shall undertake a systematic assessment of all the parameters listed in the 2007 Philippine National Standards for Drinking Water (PNSDW 2007) in consultation with, but not limited to, the following authorities: health, water resources, water supply provision, environment, agriculture, geological services/mining, industry, and radiological services. As a matter of prudent public health decision, particularly in situations where resources are limited, to give priority to ensuring availability and accessibility of water supply all individuals over rendering treatment to water for the benefit of few individuals.

Based on its health significance and acceptability, the following priority parameters shall be tested:

1. microbiological
2. arsenic
3. cadmium
4. lead
5. nitrate
6. benzene
7. color
8. turbidity
9. iron
10. pH
11. manganese
12. chloride
13. sulfate
14. TDS

In addition to the above, other physical and chemical parameters shall be tested based on the following conditions:

1. Chemical/Physical Quality

1.1 All naturally occurring chemicals based on the geological characteristics in the local area that are of health significance and are found in drinking-water supply should be in the priority list.

1.2 An inventory of chemicals used in local agricultural practices such as pesticide, herbicide and fungicides shall be the basis for identifying which the organic constituents (pesticides) to include in the priority list.

1.3 Industries that transport, use as raw materials, produce either as intermediate or final product or by-product or generate as wastes any or all of the chemicals listed in PNSDW 2006 shall be identified and mapped. Water sources taken within 50 meters from the location of the said industries should be examined for such chemicals.

1.4 Chemical disinfection by-products shall be identified based on the type of disinfectants used. If water providers could provide evidence of control of generation of disinfection by-product such as pretreatment to remove precursors, use of treatment technology that evidently removes disinfection by-product or two successive analysis showing that suspected by-product does not occur then such chemical disinfection by-products will be removed from the priority list.

1.5 Chemicals leaching from plumbing system materials or facilities such as copper, lead, zinc and nickel shall be included in the list if the pH of water is 6 or below.

1.6 Hardness will only be in the list if the general population deems it unacceptable at certain level due to taste or odor.

1.7 The list of priority physical and chemical parameters to be monitored may change based on the results of previous water examinations. Parameters that are less likely to occur in water may be tested less frequent.

Radiological Quality.

2.1 Radiological quality shall be included in the priority list if there is fall-out or contamination from suspected sources of radiological impurities of water such as hospitals or other industries.

2.2 Sources of naturally occurring radiological contaminants should be identified by the Department of Health or Philippine Nuclear Research Institute

Annex 2.

Water Safety Plans

The application of an extensive risk assessment and risk management approach that encompasses all steps in water supply system from sources, production, storage and conveyance to consumers will ensure safety of drinking water supply. Such approach is termed as Water Safety Plans. It follows the principles and concepts of multiple-barrier approach and Hazard Analysis Critical Control Point (HACCP) as used in the food industry. It is proposed that these plans will be prepared by all water providers from large water systems to water refilling stations.

Three key-components of Water Safety Plans:

- System assessment – to determine whether the drinking water supply chain as a whole can deliver water of quality that meets health-based targets. This also includes the assessment of design criteria or new systems

- Operational monitoring – to identifying control measures in a drinking-water system that will collectively control identified risks and ensure that the health-based targets are met; to rapidly detect any deviation from required performance

- Management plans – to describe actions to be taken during normal operations or incident conditions

A thorough discussion of water safety plans is presented in WHO's Guidelines for Drinking-water Quality, 2004, Third Edition.

Annex 3

Guidelines for Selecting the Location of Sampling Points

1. Sample Location

Piped water supply zoning

Zoning of piped water supplies should be undertaken to ensure that different parts of the water supply system that may have different level of risk are adequately covered for water quality sampling.

A zone can be considered as coverage area per source, service reservoir supplies specific area , an area where different parts of distribution system operates at different pressures and elevations and an area where leakage or reliability is different in different parts of the system

Point Source

Samples should be taken from the point source from the principal outlet – handpump or spring outlet.

For routine monitoring boreholes or deepwells generally requires less frequent sampling as they are usually of better quality than shallow groundwater given the greater depths of water abstraction.

It is also important to undertake an extended assessment of point source quality in order to develop an understanding of the process causing water quality failure and thus the appropriate interventions required to improve the source.

Selection of Sampling Sites

When the sample locations and frequencies of sampling visits have been calculated, the final stage is the selection of sampling sites. Sample sites will usually be taken as being representative of a wider area. Samples sites can be either fixed – i.e. every time sampling is carried out in the area, a sample is always picked from the same point. Sample sites can also be random, with the exact location of the sample point in zone or area varying between sample rounds.

1.3.1. Key fixed points that should always be included in the surveillance include:

- water leaving treatment works (usually the first tap)
- the inlets and outlets of service reservoirs
- critical points in the distribution system - (e.g. low-pressure area or parts of the system prone to frequent discontinuity

1.3.2. Regular sampling points will include public taps in high-density areas or in places such as markets where large number of people congregate.

R**eferences**

American Public Health Association, American Water Works Association, Standard Methods for the Examination of Water and Wastewater, 20th edition, 1998

CFR Title 40 Part 136 Table II, Dated July 1, 1999

Committee on Water Treatment Chemical, Food and Nutrition Board, Water Chemical Codex

Connell, Gerald F., The Chlorination/Chloramination Handbook, AWWA, 1996

De Zuane, John, Handbook of Drinking Water Quality, 2nd edition

Degremont, Water Treatment Handbook, 5th edition, 1979

Fertilizer and Pesticide Authority Pesticide Circular No. 04, Series of 1989

Fertilizer and Pesticide Authority Board Resolution No. 04, Series of 2005

Hayashi, Tabata, Catapang, Evaluation Report: LWUA-JICA Technical Cooperation Project on "Improvement of Water Quality in the Philippines", JICA, 2003

Hem, John D., Study and Interpretation of the Chemical Characteristics of Natural Water, USGS, 1985

JICA, Baseline Survey on Nationwide Ground Water Quality Monitoring in the Philippines, 2003

Letterman, Raymond D., (Technical Editor), Water Quality and Treatment – A Handbook of Community Water Supplies, 5th edition, AWWA

Sabandeja, Victor V., Development of 2006 Philippine National Standards for Drinking Water, Paper Presented at the National Convention of Philippine Society of Sanitary Engineers, Baguio City, June 8, 2006.

Sommerfield, Elmer O., Iron and Manganese Removal Handbook, AWWA, 1999

WHO's Guidelines for Drinking-water Quality, 2004, Third Edition.

BATAC WATER DISTRICT 1983

OPERATIONS MANUAL

OPERATIONS MANUAL

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Foreword

Warm greetings from the men and women of the Batac Water District! As things change – and they do – so the Operations Manual must be written as a booklet (and to be updated) where officers and employees use it as an instructing tool and as a solid guide in achieving the objectives of the District.

This Operations Manual provides important information as well as operations policies and procedures of the Batac Water District.

The purpose of this Operations Manual is to provide each officer and employee an idea on how to use things properly and efficiently, utilize the best preventive maintenance for the devices and equipments and operate the facilities effectively.

A smart Operations Manual has the ability to answer all frequently asked questions and prevent people from the situation of uncertainty because it guides them how to use at least the main functions of something.

Indeed, officers and employees can fix things without the possible errors or problems under the assistance of a smart Operations Manual.

I. GENERAL INFORMATION

1.1 Historical Sketch

The City of Batac is situated on the northwestern section of Luzon Island. It is surrounded on the west and northwest section by the coastal Municipality of Paoay while the Municipalities of San Nicolas, Sarrat and Dingras limit the north, northeast and eastern fringes respectively. On the southern of the City of Batac lie the municipalities of Badoc and Pinili. Batac can be reached through air and land and is approximately 472km from Manila and more or less 18km from Laoag City, the capital of the Ilocos Norte Province.

The only water system of the City of Batac is operated and controlled by the Batac Water District – a government owned and controlled corporation by virtue of Supreme Court ruling in 1991. It is a self-reliant, self-liquidating whose operation depends solely on its income revenue. It does not receive any subsidy from the national or local government.

The story of the Batac Water District did not come easy. In the early 80's condition of water service by the defunct National Water Sewerage Authority (NAWASA) continued to worsen, the needs of the concessionaires were not met, water quality was unsatisfactory and water pressure was inadequate.

And cognizant of the need to have sufficient, safe and potable water to the people of Batac, the then Sangguniang Bayan Members of Batac in its special session last November 1, 1982 passed and approved Resolution No. 127 series of 1982 creating Batac Water District (BWD) by virtue of Presidential Decree (PD) 198 otherwise known as the Provincial Utilities Act of 1973. The main objective was to upgrade the quality of service.

Local Water Utilities Administration (LWUA) awarded Batac Water District its Conditional Certificate of Conformance (CCC) No. 250 on September 26, 1983 after the requirements for the certification program were completed. The CCC entitles the Batac Water District to all the rights and privileges under PD 198.

Activities of the Batac Water District consist primarily of operating the pumps, treating the water, repairing leaks, installation, disconnection and reconnection of service lines, preparing financial reports to be submitted to other governing

agencies, marketing of prospective concessionaires, implementing corporate social responsibilities to the community and other business activities.

The mandate of the Batac Water District is to manage efficiently water resources for the effective delivery of water services to the people of the City of Batac. It aims to provide safe, potable, affordable and adequate water to its concessionaires even in the rural areas 24/7.

Since Batac became a City ten years ago the demand of water supply increases tremendously because of the increasing number of concessionaires, immigrants and tourists.

With the help of the City Government of Batac, the Batac Water District has now its own office building located at the Government Center, Brgy. Quiling Sur City of Batac. The new office was granted by the City Government of Batac through a deed of usufruct for the lot of 684sq.m and the construction of the 2-storey building was through a non-bearing interest loan with a floor area of 136sq.m.

1.2 Vision

The Batac Water District envisions itself to be a world-class provider of safe, potable and affordable water to every home in the City of Batac.

1.3 Mission

It is the mission of the men and women of Batac Water District to deliver 24 hours a day safe, potable and affordable water at the most convenient way to the people of the City of Batac.

It is also the mission of the Batac Water District to help protect, preserve and maintain the Mother Earth, the very source of its existence.

1.4 Core Values

We abide by these core values in order for us to move forward:

Customer Focus – We are committed to listed, deliver quality service and take ownership of our consumer's problem until it is solved.

Team Work – We work together and support each other to achieve the goals of the District.

Integrity – We abide by the highest work ethical standards, acting with honesty and honor without sacrificing the truth.

Accountability – We are responsible for our success and failures.

Commitment – We are committed to provide safe, potable and affordable water to every home in the City of Batac and committed to demonstrate corporate social responsibility to the community.

Safety – we ensure the health and safety of our concessionaires with the water we provide and the health and safety of the employees as well.

1.5 Water Supply Description

1.5.1 General Information

The water system of the City of Batac was constructed in 1969 by the defunct National Water Sewerage Authority (NAWASA). Due to mismanagement, NAWASA declared bankruptcy and its management and operation were turned-over to the Municipality of Batac using flat rate in billing consumers' water consumptions. In the early 80's condition of service continued to worsen because the needs of the consumers were not met, water quality was unsatisfactory, water pressure was inadequate and reliability of service was poor

And cognizant of the need to have safe, potable and sufficient water to the people of Batac, the Sangguniang Bayan Members of Batac in its special session on November 15, 1982 passed and approved Resolution No. 127 creating Batac Water District by virtue of Presidential Decree (PD) 198 otherwise known as the Provincial Utilities Act of 1973. The main objective was to upgrade the quality of service ad to develop the adequacy of water supply.

Local Water Utilities Administration (LWUA) awarded Batac Water District its Conditional Certificate of Conformance (CCC) NO. 250 on September 26, 1983

after the requirements for the certification program were completed. The CCC entitles the Batac Water District to all the rights and privileges under PD 198.

The Batac Water District is currently manned by nine (9) plantilla positions and five (5) Job Order workers headed by General Manager, Maria Dohna D. Sagun. Other Management Staff are Imelda G. Tutaan, Cashier B; Maizel Maia V. Castro, Senior Accounting Processor A; Edilberto M. Camangeg, Jr., Water Resources Facilities Operator B; Joel A. Castro, Customer Service Assistant D; Dino S. Sagun, Water Resources Facilities C; Otis Visan P. Corpuz, Utility Worker B; Von Patrick S. Gabriel, Customer Service Assistant E; and Robert Filam C. Manglal-lan, Clerk Processor D. The five Job Order workers are Ruben T. Cid, Filipino Rivera, Emmanuel Flojo, Erlanger Gamet and Mary Grace Arancon.

The Board of Directors is the policy-making body of the District. It is composed of representative from each of the community sectors as mandated by PD 198. It is chaired by Mrs. Aurora V. Lumang who represents the Women's Sector. Other members are:

1) Mr. Warlito A. Rigonan, Vice-Chairman, represents the Educational Institution Organization;
2) Dr. Mary Lu B. Magno, Board Secretary, represents the Professional Sector;
3) Mr. Jesus Ariel R. Garcia, Board Treasurer, represents the Business Sector; and
4) Mrs. Perla C. Marders, Board Member, represents the Civic-Oriented Service Club.

Batac Water District is a Government Owned and Controlled Corporation (GOCC) by virtue of Supreme Court ruling in 1991 (The Supreme Court, in an en banc decision dated September 13, 1991 in the case of Davao City Water District et. al. G.R. No. 95237-38). It is a self reliant, self-liquidating whose operation depends solely on its income revenue. It does not receive any subsidy from the national government.

1.5.2 Area of Coverage

Batac City is composed of forty-three (43) barangays; 14 are urban barangays and 29 are rural barangays. The present service area of Batac Water District covers the fourteen urban barangays namely – Valdez, Ricarte, Ablan, Cangrunaan, Nalupta, Cal-laguip, San Julian, Caunayan, Acosta, Aglipay, Lacub,

Barani, Ben-agan, Palpalicong and ten (10) adjacent rural barangays namely – Baay, Quiling Norte, Quiling Sur, Bil-loca, Parangopong, Payao, Colo, Bungon, Tabug and Baligat. Water service in these 24 barangays is 24/7 excluding Adigi Homes of Brgy. Baligat which is 12-14 hours a day. Batac Water District is serving 55% of the total barangays of the City, however majority of the Sitios of the rural barangays are not yet covered within the area of coverage.

1.5.3 Household Coverage

The total population of the City of Batac is 55,595 as of December 31, 2016 and at present only 14.4% of the total population which is 7,995 has an access to safe, potable, dependable and affordable water from Batac Water District.

1.5.4 Transmission and Distribution Pipelines

There are twelve transmission lines originating from 12 water sources of the Batac Water District. The existing transmission and distribution network covers fourteen (14) poblacion/urban barangays and ten (10) rural barangays. The pipe network consists of varying pipe sizes from 50mm to 200mm of different types shown below:

1) 200mm (Asbestos)	373.50 m
2) 150mm (Asbestos)	1,550.60 m
3) 150mm (PVC)	4,524.00 m
4) 150mm (GI)	204.00 m
5) 100mm (Cast Iron/GI)	6,699.70 m
6) 100mm (PVC)	5,010.00 m
7) 75mm (PVC)	11,044.00 m
8) 75mm (GI)	360.00 m
9) 50mm (GI)	141.70 m
10)50mm (PVC)	1,782.00 m
TOTAL LENGTH	**32,049.50 m or 32.049km**

1.5.5 Existing Water Rates

The existing water rates of the Batac Water District was approved by LWUA on June 23, 2005 presented in a public hearing on November 10, 2005

and was implemented last May 2006 billing. The water rates of the District are as follows:

1) Residential/Government		
Minimum ½"		P 300.00
Commodity Charge	11-20cum	31.30
	21-30cum	32.70
	31-40cum	34.25
	Over 40cum	36.30
2) Direct Commercial		
Minimum ½"		P 600.00
Minimum ¾"		960.00
Commodity Charge	11-20cum	62.60
	21-30cum	65.40
	31-40cum	68.50
	Over 40cum	72.60
3) Semi-Commercial A		
Minimum ½"		P 525.00
Commodity Charge	11-20cum	54.75
	21-30cum	57.20
	31-40cum	59.90
	Over 40cum	63.50
4) Semi-Commercial B		
Minimum ½"		P 450.00
Commodity Charge	11-20cum	46.95
	21-30cum	49.05
	31-40cum	51.35
	Over 40cum	54.45
5) Semi-Commercial C		
Minimum ½		P 375.00
Commodity Charge	11-20cum	39.10
	21-30cum	40.85
	31-40cum	42.80
	Over 40cum	45.35

1.5.6 Source of Water

At present, water sources facilities of the Batac Water District are eight (8) drilled wells and four (4) infiltration galleries. There are several surface water resources present in the City of Batac wherein it provides both potable water supply and irrigation purposes. Quiaoit River is currently being utilized by the Batac Water District for water supply through its infiltration galleries. During dry season all the drilled wells are being utilized and during rainy season all of the infiltration galleries are being utilized.

1.5.6.1 Baay Pump Station – Well No. 1, 2 & 8

It consists of three (3) units drilled well (Well No. 1, 2 & 8) and has a total capacity of 16-18lps during rainy season and 8lps during dry season. It could sustain approximately 1,600 consumers. These can supplement the increasing demand in the future since right now there are only 306 consumers availing water from Baay Pump Station. Inside the Pump Station is a hypo chlorinator machine that treats the water coming from the source. Treated water will be pumped to the 75cum ground reservoir before it will be distributed to concessionaires. Another partition in the Pump Station is where the 25KVA generator set is placed which is being utilized during power interruptions. The drilled wells are equipped with 3HP pumping equipment. The distribution network covers two sitios of Brgy. Baay and a portion of Brgy. Bungon. The pipe network is composed of 5.010km of 100mm PVC, 6.750km of 75mm PVC and 1.782km of 50mm. As per laboratory tests, results showed the Sulfate as the non-complying parameter.

1.5.6.2 Quiling Norte Pump Station – Well No. 3 & 4

It consists of two (2) units drilled well and has a total capacity of 2-3lps during rainy season and 1lps during dry season. It could sustain approximately 300 consumers. Since there is no reservoir/tank within the area water supply is from 6am to 8pm only. Right now it is serving the Adigi Homes and its adjacent houses. The pipe network from the Pump Station to the Adigi Homes is 700m only although the transmission network is interconnected with the existing transmission network in the Poblacion. Inside the Pump Station is the hypo chlorinator machine

that treats the water coming from the source which is directly pumped to the transmission and distribution network. During dry season, the yield is poor or minimal. As per Physical and Chemical Test, results showed to be complying on all the parameters tested.

1.5.6.3 Well No. 5 (Colo)

Drilled Well No. 5 is located in Brgy. Colo, City of Batac. This is the only drilled well that has replaced the series of shallow wells which were the original water sources of the City of Batac. It is drilled along the Quiaoit River with a depth of 32m and equipped with a 3hp pumping equipment. It has a yield of 3-4lps and is being utilized during dry season. The treated water is being pumped to the 267 ground reservoir located at Barani Hill, Brgy. Barani City of Batac. As per laboratory test, water coming from this well showed complying parameters on the Physical and Chemical Analysis.

1.5.6.4 Well No. 6 & 7 (Parangopong)

Drilled Well No. 6 and 7 are located in Brgy. Parangopong, City of Batac. It is drilled in the middle of the rice fields and near the old Deep Well No. 101 of the defunct NAWASA. Well No. 6 has a depth of 32m and is equipped with a 3hp pumping equipment while Well No. 7 is a standby well without pumping equipment. The wells are usually operational during summer season. Beside Well No. 6 is an old pump house and at least 50m away is the chlorinator house. As per laboratory test, water coming from this well showed complying parameters on the Physical and Chemical Analysis.

1.5.6.5 Colo Pump Station - Well No. 8 (Colo) and Infiltration Gallery 4

Drilled Well No. 8 is located in Brgy. Colo, City of Batac. This is the deepest deep well the District has with a depth of 50m with a 200mm casing. It is drilled along Quiaoit River and the most productive of all water sources of the District. It has a yield of 8-10lps during rainy season and 5-6lps during dry season. It is equipped with 7.5hp pumping equipment with variable motor frequency drive. The Colo Pump Station housed the control boxes, chlorinator machines and 25KVA generator set. It has its own

transformer. As per laboratory test, results showed the Total Dissolved Solids as the non-complying parameters.

The Infiltration Gallery 4 located approximately 100m away from Deep Well No. 7 is consists of 60pcs 1m by 1m perforated and non perforated reinforced concrete pipes lie/installed underneath the Quiaoit River bed. The 60pcs RC pipes were installed horizontally 5meters below the Quiaoit River bed as the impounding/catch basin of the water. The RC pipes are packed with gravel with open-jointed that discharge collected water into a watertight chamber or 10pcs RC pipes installed vertically from which the water is pumped to the chlorinator machine and into the distribution system.

1.5.6.6 Payao Pump Station – Infiltration Gallery 1 & Infiltration Gallery 3

Infiltration Gallery 1 was constructed by the defunct NAWASA and was rehabilitated by the Batac Water District. Originally, NAWASA utilized 30hp centrifugal pump and motor but since the water flowing along the Quiaoit River is seasonal and it usually dries up during summer season, the District installed 5hp and 3hp pumping equipment in which 5hp is being utilized during rainy season and 3hp during summer season. The design of the infiltration gallery is made up of horizontal tunnel of brick masonry with open joints.

Infiltration Gallery 3 is located 100m away from Infiltration Gallery 1. It is constructed horizontally at a shallow depth below the Quaioit River. The impounding is made up 48pcs 1mx1m perforated and non-perforated RC pipes. The water chamber is made up of 11pcs non-perforated RC pipes installed vertically from which the water is pumped to the chlorinator machine and to the distribution lines. Infiltration Gallery consists of two pumping equipment of 5hp and 3hp. It has a total capacity of 15lps during rainy season. This water source was constructed on March 2011.

1.5.6.7 Infiltration Gallery 2 - Colo

Infiltration Gallery 2 was patterned from infiltration gallery 1 but with a smaller impounding capacity. It is located 120m away

from Infiltration Gallery 1. It has 3hp pumping equipment and a yield of 6lps during rainy season. It is being shut-off during summer season since it usually dries up when there is no water flowing along the Quaioit River. All the treated water coming from Infiltration Gallery 1, 2, 3 & 4 and drilled wells 5, 6, 7 & 8 will be pumped to the 267 cum ground reservoir located at Barani Hill, Brgy. Barani City of Batac before it will be distributed to the concessionaires.

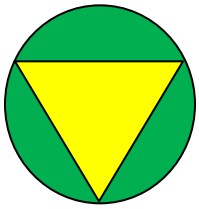
1.5.6.8 Reservoir/Tanks

There are two reservoirs/tanks of the Batac Water District. The first is the 267 ground, concrete reservoir located at Barani Hill, Brgy. Barani City of Batac. All the treated water coming from Infiltration Gallery 1, 2, 3 and 4 and Deep Wells No. 5, 6, 7 and 8 is being pumped to the said reservoir before it will be distributed to the consumers.

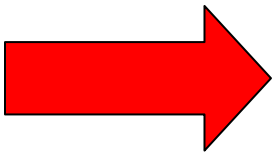
The other reservoir is located in Brgy. Baay City of Batac. It is a 75cum ground, concrete reservoir. Water coming from Deep Well Nos. 1, 2 and 9 is pumped into this reservoir before it will be distributed to the consumers.

1.5.7. Process Flow Diagram

LEGEND:

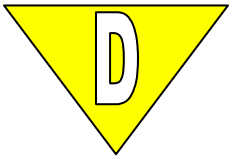


SOURCE WITH PUMP STATION/CHLORINATOR

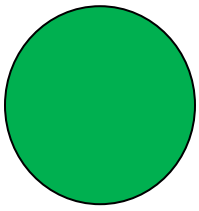


TRANSMISSION

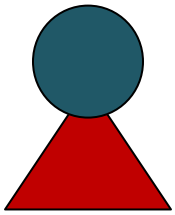
MONITORING



STORAGE

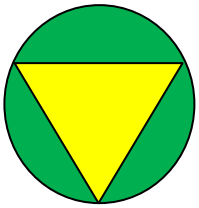
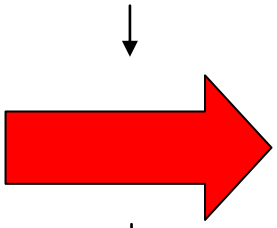
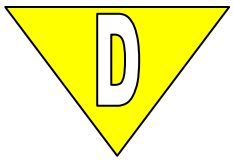
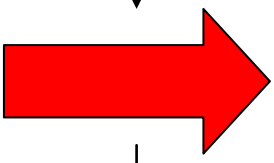
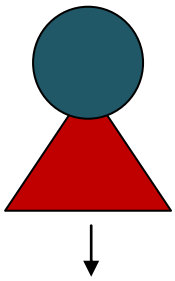


SOURCE

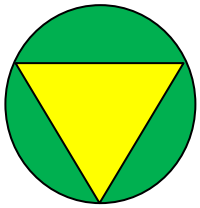
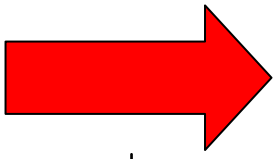
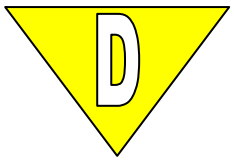
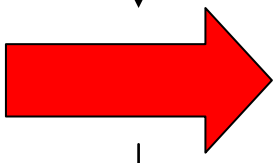
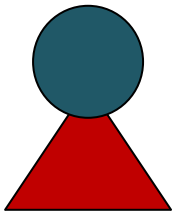
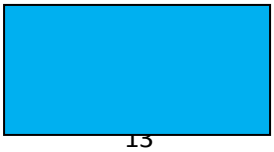


CONCESSIONAIRE

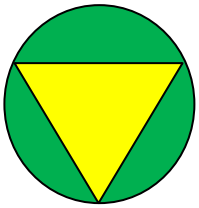
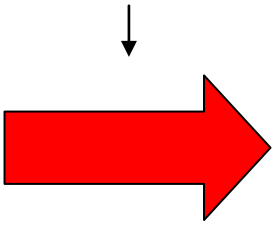
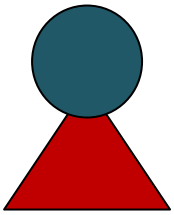
1.5.7.1Process Flow Diagram – Main System

Description	Step	Responsible/In-Charge
1. Source with Pump Station/Chlorinator (Infiltration Gallery 1, 2, 3 & 4 and Well # 7)		Source and Treatment Unit Multiple Stakeholders
2. Transmission		Distribution Unit
3. Storage		Source and Treatment Unit
4. Transmission		Distribution Unit
5. Monitoring		Source and Treatment Unit Distribution Unit Multiple Stakeholders
6. Concessionaire		Support Unit
7. Monitoring		WSP Team

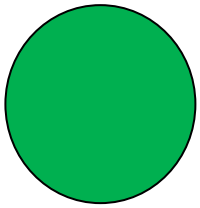
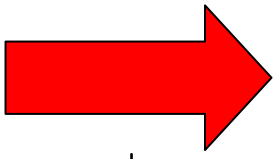
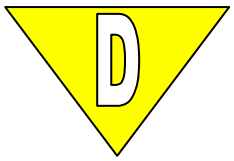
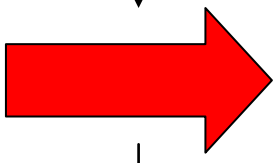
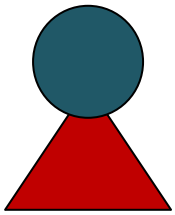
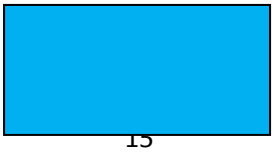
1.5.7.2 Process Flow Diagram – Baay Pump Station

Description	Step	Responsible/In-Charge
1. Source with Pump Station/Chlorinator (Well # 1, 2 and 8)		Source and Treatment Unit Multiple Stakeholders
2. Transmission		Distribution Unit
3. Storage		Source and Treatment Unit
4. Transmission		Distribution Unit
5. Monitoring		Source and Treatment Unit Distribution Unit Multiple Stakeholders
6. Concessionaire		Support Unit
7. Monitoring		WSP Team

1.5.7.3 Process Flow Diagram – Quiling Norte Pump Station

Description	Step	Responsible/In-Charge
1. Source with Pump Station/Chlorinator (Well # 3 and 4)		Source and Treatment Unit Multiple Stakeholders
2. Transmission		Distribution Unit
3. Monitoring		Source and Treatment Unit Distribution Unit Multiple Stakeholders
4. Concessionaire		Support Unit
5. Monitoring		WSP Team

1.5.7.4 Process Flow Diagram – Well # 5, 6,7 and Infiltration Gallery 2

Description	Step	Responsible/In-Charge
1. Source		Source and Treatment Unit
2. Transmission		Distribution Unit
3. Storage		Source and Treatment Unit
4. Transmission		Distribution Unit
5. Monitoring		Source and Treatment Unit Distribution Unit Multiple Stakeholders
6. Concessionaire		Support Unit
7. Monitoring		WSP Team

1.5.8 Treatment Process

Chlorination is the process being used by the Batac Water District since the water quality is compatible with the Philippine National Standard for Drinking Water (PNSDW). This method is used by the District in all its water sources to kill certain bacteria and microbes and to prevent the spread of waterborne diseases.

The District uses powder chlorine granular 70% purity to disinfect the water being supplied to the concessionaires with the following process:

1) The Pump Operator should always wear protective devices before preparing the chlorine solution;
2) The Pump Operator fills the 200 liters mixing drum at least one third of water;
3) Then weigh 6 kilos of chlorine granules during normal days and 9kilos during rainy days;
4) Pour the chlorine;
5) Stir the solution for about 30 minutes or until granules fully mixed;
6) While mixing the chlorine turn on the hose to fully fill the drum;
7) Cover the mixing drum and wait for 24 hours to allow particles to settle at the bottom of the mixing tank;
8) When water is already clear, greenish in color, fill the suction hose with water until air is out and put back to the chlorinating drum to start chlorination;
9) The chlorine mixture is then injected into the transmission lines going to the reservoir;
10) Chlorinated water then flows from the reservoirs into the transmission/distribution lines;
11) The Pump Operator then check residual chlorine, if not within .3ppm to 1.5ppm, adjust flow rate;
12) Before mixing another batch, collect settled particles and put in an empty chlorine container for proper disposal;
13) Clean the other drum, ready for the next mixing;
14) End.

The Technical Staff in a yearly basis chlorinate the water sources or wells of the District. Chlorination is, in most instances, an effective means of removing contamination from a properly situated well of approved construction. Directions for this treatment process are given below as step procedures:

Step 1: Mix six (6) kilos of chlorine thoroughly with 200 liters of water.

Step 2: Remove the well cap or seal from the top of the well casing.

Step 3: Pour the chlorine mixture. Care must be taken to prevent the chlorine solution from splashing and coming in contact with skin or eyes.

Step 4: Attach a hose to the faucet on the discharge side of the pump and wash down the walls of the casing with the chlorinated water from the well for about 30minutes. This flushing not only disinfects the walls of the casing but also circulates the chlorinated water to all the pump and well parts.

Step 5: Allow the chlorine solution to act in the well for a period of 24hours.

Step 6: After 24 hours, the technical staff will flush out the water until the odor of chlorine could no longer be detected. Following chlorination, seven (7) days should elapse before the system is again sampled. If bacteriological analysis of the sample reveals it to be free of contamination, a second sample should be obtained at a later date to insure that the system remains free of contamination.

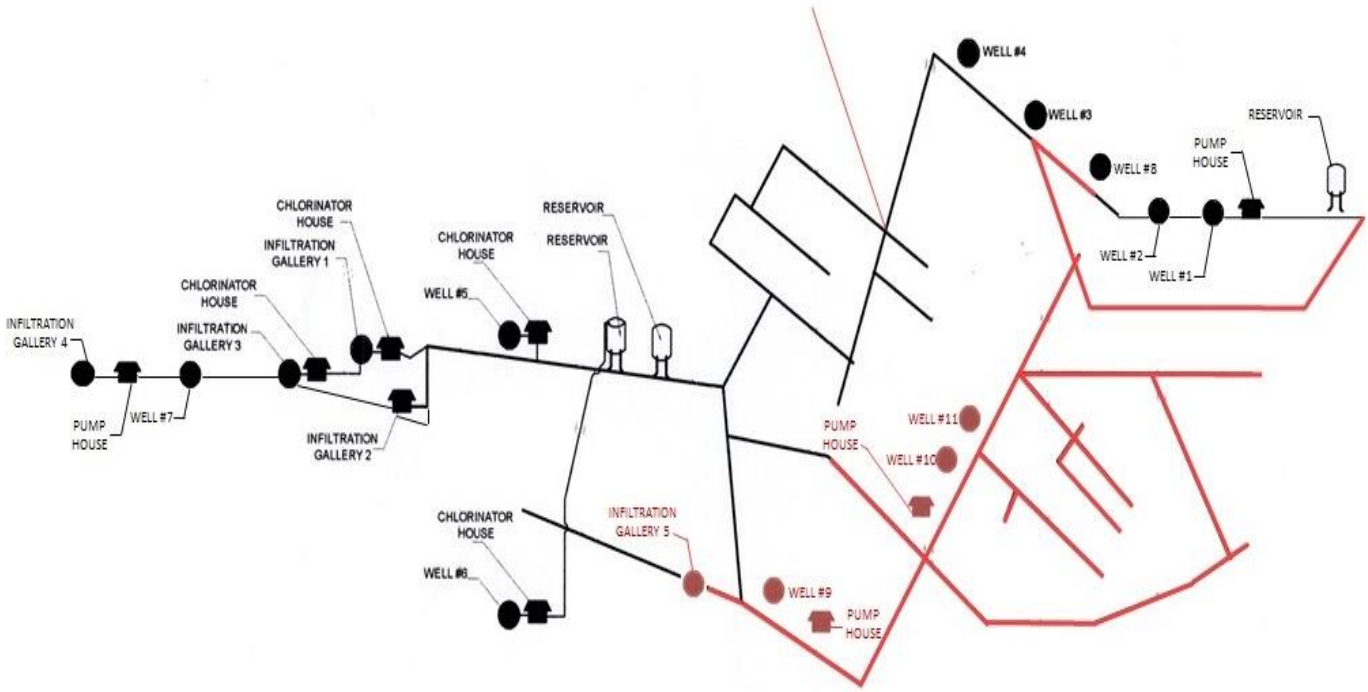
1.5.9 Distribution System

The existing distribution network of the Batac Water District covers the fourteen (14) poblacion/urban barangays of the City of Batac namely: Ricarte, Valdez, Ablan, Cangrunaan, Nalupta, Cal-laguip, San Julian, Caunayan, Acosta, Aglipay, Barani, Lacub, Ben-Agan and Pal-palicong. The netwok also covers ten (10) rural barangays namely: Baay, Bungon, Baligat, Quiling Norte, Quiling Sur, Tabug, Payao, Colo, Parangopong and Bil-loca.

The distribution network of Baay Potable Water System Project is exclusively for Barangays Baay and Bungon. And for Quiling Norte Pump Station the distribution network has been interconnected with the distribution network of the Poblacion or the City proper.

The distribution/pipe network of the District consists of varying pipe sizes from 25mm to 150mm of different types.

1.5.9.1 Distribution System of the Batac Water District



SCHEMATIC DIAGRAM
OF EXISTING AND PROPOSED SYSTEM
FACILITIES

*Legend
Red Color – Proposed Expansion Project

1.5.10. Water Quality Required

The Batac Water District continues to strive for full compliance on the national standard for drinking water by improving the quality of water it provides to the community by treating the water religiously through chlorination.

And to monitor the safety and potability of water to be distributed, physical and chemical tests of water samples are done in a yearly basis, Fecal Coliform Test and Total Coliform Test including Ph of water directly from the faucets are done in a monthly basis and chlorine residual test is conducted daily. Results of these tests should conform to the standards set by the Philippine National Standards for Drinking Water.

1.5.10.1 Physical and Chemical Analysis

Parameters	Method of Analysis	Permissible Limits
Physical Analysis		
Turbidity	Turbidimetry	5
Apparent Color (Color Units)	Visual Comparison	10
Chemical Analysis		
pH	Electrometric	6.5-8.5
Total Dissolved Solids (mg/L)	Gravimetric	500
Sulfate (mg/L)	Turbidimetric	250
Nitrate (mg/L)	Cd Reduction	50 0.03MDL
Chloride	Argentometric	250
Benzene	Qualitative Test	0.01
Metal Analysis (mg/L)		
Iron (Total)	AAS	1.00
Manganese (Total)	AAS	0.40
Arsenic	Silver Diethyldithiocarbamate	0.01 0.0092MDL
Cadmium	AAS	0.003 0.002
Lead	AAS	0.01 0.0094

2. SYSTEM OPERATIONS OVERVIEW

2.1 Organization and Responsibilities

2.1.1 Board

The Board is the Policy-Making Body of the Batac Water District. It is composed of five citizens of the Philippines who are of voting age, residents within the district and not government employees whether appointed or elected. One member shall be a representative of civic oriented clubs, one member a representative of professional associations, one member a representative of business, commercial or financial organizations, one member a representative of educational institutions and one member a representative of women's organizations. (Chapter III Sec. 8, PD 198) They shall be appointed by the Local Executive from the list of nominees submitted by the Board Secretary. If no nominations are submitted by the Board, the appointing authority shall appoint any qualified person of the category to the vacant position. In the event that the Local Executive fails to appoint one from the list submitted within 30 days, the vacancy shall be filled from such list by a majority vote of the remaining members of the Board of Directors. The term of office of the Board of Directors is 6 years per term and renewable. Board of Directors may be removed for cause only, subject to review and approval of the Local Water Utilities Administration.

The Board being the Policy-Making Body has the function to establish policy and they shall not engage in the detailed management of the Batac Water District.

The General Manager is appointed by the Board by a majority vote and will define his/her duties and responsibilities. Said officer (General Manager) shall not be removed from office except for cause and after due process.

The Board has all the powers, privileges and duties of the BWD and shall be exercised and performed such by and through them. And that any executive, administrative or ministerial power shall be delegated and re-delegated by the Board to officers or agents designated for such purpose by the board. (Chapter V, Sec.17, PD 198)

The members of the Board of Directors of the BWD are the following:

1) Mrs. Aurora V. Lumang – Chairman (Women's Sector);

2) Mr. Warlito A. Rigonan – Vice-Chairman (Educational Institutions);

3) Dr. Mary Lu B. Magno – Secretary (Professional Associations);

4) Mr. Jesus Ariel R. Garcia – Treasurer (Business, Commercial and Financial); and

5) Mrs. Perla C. Marders – Member (Civic-Oriented Clubs)

2.1.2 General Manager

The General Manager is appointed by the Board of Director and his/her duties shall be determined and specified from time to time by the board. The General Manager shall not be removed from office, except for cause and after due process. (As amended by Sec. 9, PD 768; RA 9286)

The duties of the General Manager who shall not be a director are the following:

1) To supervise and control the maintenance and operation of the BWD facilities;

2) To direct the basic efforts of all organic personnel towards achieving utility goals and objectives within established policies;

3) To prepare office policies, rules and regulations and budget for Board's actions;

4) To carry out Board policies;

5) To prepare agenda for meetings of the Board of Directors and to keep the Board informed as to utility status; and

6) To appoint all personnel of the BWD.

At present the General Manager is Ms. Maria Dohna D. Sagun.

2.1.3 Legal Counsel

The legal counsel of the Batac Water District since January 2008 is Atty. Howard Randy Arzadon, a native of the City of Batac and connected with the Office of the Government Corporate Counsel (OGCC). His duties are to render legal services, special tasks and other corporate assistance to the BWD.

2.1.4 Board Recording Secretary

The Board Recording Secretary attends board meetings in order to create a more systematic way of narrating the events, facts and decisions transpired during board meeting. His/her other duty is to file all resolutions and minutes of meeting for documentation and future references.

2.2. Operation Control and Supervision

2.2.1 Finance and Administrative Section

The Finance and Administrative Section is composed of the Accounting, Human Resource Management, Planning and Property Management units.

2.2.1.1 The Accounting Unit

It is the center of the business operations of the BWD. It is the unit that responsible for the day to day business transactions of the BWD from disbursements, cash collections, payroll, properties and inventories and financial reporting. It maintains accounting records in strict adherence to the prescribed government accounting principles and standards. It complies with other government agencies such as COA and BIR. This unit is responsible for managing properly the cash flow ensuring that all payables in GSIS, PHIC, Pag-Ibig, LWUA, lending institutions and suppliers are being paid. It provides Board and the General Manager with the necessary financial information in order to help in planning, directing and coordinating programs, projects and other financial activities.

2.2.1.2 Human Resource Management Unit

This Unit administers all personnel matters from posting of vacancies; preparing and maintaining of File 201 and appointments;

performance ratings merits and awards, sanctions and promotes human resource development programs.

This Unit also enforces laws, rules and regulations as contained in the Omnibus Rules on Civil Service and BWD internal rules.

2.2.1.3 Property Management Unit

This Unit is responsible in the procurement, recording, storing, issuing and distributing of supplies, materials and equipment necessary in the operation of the BWD.

This Unit is also responsible in the disposition of unserviceable materials, supplies and equipment subject to the existing rules and regulations of COA.

2.2.1.4 Planning Unit

This Unit assists in the periodic planning and evaluation processes. It coordinates and provides recommendations with the medium and long term plan of the General Manager to be approved by the Board of Directors.

This Unit also prepares budget proposals and allots obligation of funds.

2.2.2 Commercial Section

The Commercial Section is composed of the Billing and Collection Units. It also includes the collection of fees received from frontline services of the BWD such as application fee on water service connection, re-connection fee, transfer meter fee, charges on additional materials, penalties and other charges.

2.2.2.1 The Billing Unit

This Unit is responsible in billing the consumers from the application fee, additional materials in installing the water service connection, monthly water bills, penalties and other charges.

This Unit is also responsible in issuing demand letters to delinquent concessionaires. It also implements rules and regulations on pilferages.

This Unit recommends for study to the General Manager and for the approval of the Board if the application fee is still reasonable or not

based from the cost of the materials needed for a new water service connection.

2.2.2.2 The Cash Unit

This Unit takes charge of the collection and disbursement of funds. It ensures that all cash received and receivables from water sales, materials and all other sources are properly identified, recorded and maintained.

2.2.3 Technical Section

The Technical Section is the backbone of the BWD. This Unit is responsible in the production and monitoring of water sources. It ensures stability of water supply 24/7. It takes charge in recording the production of each water source and pressure of water from the source up to consumers.

The Technical Unit ensures the potability and safety of water from the source to the consumers through treating the water religiously and conducting several tests to conform to the Philippine National Standard for Drinking Water such as physical and chemical tests, microbial test and chlorine residual test.

The Technical Unit implements new service connection, reconnection and disconnection services, repairs and maintenance of pipe network, recommends possible source development and expansion projects, and prepares estimates for proposed projects.

This Unit also implements flushing of hydrants and non-revenue water management.

It also recommends and assists in the implementation of watershed activities such as tree planting, water shed monitoring, and environmental monitoring plan.

2.3 Operating Procedure

2.3.1 Production

2.3.1.1- Water Sources-Pumping Operation Procedures

1) Turn-on control board main breaker and check voltage. Voltage must be 220-240 volts;

2) Turn-on motor. Check amperes;

3) Open the discharge valve for 3-5 minutes or until water is clear;

4) Open valve going to the transmission line slowly likewise close the discharge valve slowly;

5) Fully open valve going to the transmission line and maintain pressure not less than 40psi;

6) Turn-on the chlorinator machine making sure that the tank is full;

7) Check the chlorinator machine if functioning;

8) Monitor the chlorine residual at the nearest source point. Adjust if more or less 1.5ppm;

9) After 24 hours operation, Water Resources Facilities Operator C, record the Flow Meter Reading.

2.3.1.2 Generator Set Operation during Power Interruption

1) Turn-off all electrical breakers;

2) Check the fuel level of the generator set making sure the tank is full;

4) Check the water and oil level making sure it is within the required level of the gen set;

5) Start the engine;

6) Warm up the engine for 3-5minutes;

7) Turn-on generator set main breaker;

8) Turn-on generator set breaker in the double throw breaker;

9) Make sure that gen set is set at 60hertz;

10) Proceed to pumping operation procedure;

11) The WRFO C should check the gen set at least every hour for fuel level;

12) Turn-off pumping equipment when power from the electric cooperative resumes;

13) Turn- off gen set breaker in the double throw;

14) Turn-on breaker in the electric cooperative power source;

15) Check the voltage and once it is within 220-240 volts, proceed to pumping operation procedure;

16) Check the psi and chlorinator machine;

17) Record the time the gen set has been used.

2.3.1.3 Preparation of Monthly Production Report

1) Compute the volume of water produced by the various water sources based from the Production Logbook;

2) Compute the metered sales in cubic meters based from the Monthly Billing Summary;

3) Compute the unaccounted water based from the data arrived from Steps 1 and 2;

4) Submit the Monthly Production Report to the Finance Section and to the General Manager.

2.3.1.2 Treatment Procedure

2.3.1.2.1 Chlorine Treatment Procedure

1) The Pump Operator should always wear protective devices before preparing the chlorine solution;

2) The Pump Operator fills the 200 liters mixing drum at least one third of water;

3) Then weigh 6 kilos of chlorine granules during normal days and 9kilos during rainy days;

4) Pour the chlorine;

5) Stir the solution for about 30 minutes or until granules fully mixed;

6) While mixing the chlorine turn on the hose to fully fill the drum;

7) Cover the mixing drum and wait for 24 hours to allow particles to settle at the bottom of the mixing tank;

8) When water is already clear, greenish in color, fill the suction hose with water until air is out and put back to the chlorinating drum to start chlorination;

9) The chlorine mixture is then injected into the transmission lines going to the reservoir;

10) Chlorinated water then flows from the reservoirs into the transmission/distribution lines;

11) The Pump Operator then check residual chlorine, if not within .3ppm to 1.5ppm, adjust flow rate;

12) Before mixing another batch, collect settled particles and put in an empty chlorine container for proper disposal;

13) Clean the other drum, ready for the next mixing.

2.3.1.2.2 Chlorine Treatment Procedure at Source

The Technical Staff in a yearly basis chlorinate the water sources or wells of the District. Chlorination is, in most instances, an effective means of removing contamination from a properly situated well of approved construction. Directions for this treatment process are given below as step procedures:

Step 1: Mix six (6) kilos of chlorine thoroughly with 200 liters of water;

Step 2: Remove the well cap or seal from the top of the well casing;

Step 3: Pour the chlorine mixture. Care must be taken to prevent the chlorine solution from splashing and coming in contact with skin or eyes;

Step 4: Attach a hose to the faucet on the discharge side of the pump and wash down the walls of the casing with the chlorinated water from the well for about 30minutes. This flushing not only disinfects the walls of the casing but also circulates the chlorinated water to all the pump and well parts;

Step 5: Allow the chlorine solution to act in the well for a period of 24hours;

Step 6: After 24 hours, the technical staff will flush out the water until the odor of chlorine could no longer be detected. Following chlorination, seven (7) days should elapse before the system is again sampled. If bacteriological analysis of the sample reveals it to be free of contamination, a second sample should be obtained at a later date to insure that the system remains free of contamination.

2.3.1.2.3 Bacteriological Test

1) Sampling from a tap or household faucet at random making sure that areas covered shall be coming from the nearest point from every source where full chlorination shall have been attained, nearest point of every distribution dead-end, nearest point at tank or reservoir outlet and sample for each Commercial zone rotated at random from concessionaires;

2) Clean the tap or faucet by wiping the outlet with a clean cloth to remove dirt;

3) Turn-on the faucet at maximum flow rate allowing the water flow for 1-3 minutes;

4) Sterilize the faucet for 1 minute with the flame of an ignited cotton wool swab soaked in alcohol either denatured or 70% Isoprophyl;

5) Carefully turn on the faucet and allow 1-2 minutes at medium flow before sampling;

6) Open a sterilized bottle and immediately hold the bottle under the water faucet and fill the bottle at least 100ml of water sample. Make sure that a small air space should be left to facilitate shaking at the time of inoculation prior to analysis;

7) Capped the bottle and labeled properly i.e. date and time of sampling and source/point of sampling;

8) Deliver water sample to Ilocos Norte Water District – DOH accredited laboratory center. The water sample collector should see to it that the water analysis shall be done 6 hours from the time of collection and the time of lapsing between collection and processing should not exceed 24 hours;

9) When the results is on hand, prepare the Summary Report on Microbiological Test filling-up all the necessary data and information and send to LWUA-Management Advisor;

10) Another copy of the Summary Report on Microbial Test shall be forwarded to the City of Batac Health Office;

11) Maintain a file of the Summary report on Microbial Test.

2.3.1.2.4 Chlorine Residual Test

1) Sampling from a tap or household faucet at random making sure that areas covered shall be coming from the nearest point from every source where full chlorination shall have been attained, nearest point of every distribution dead-end, nearest point at tank or reservoir outlet and sample for each Commercial zone rotated at random from concessionaires;

2) Clean the tap or faucet by wiping the outlet with a clean cloth to remove dirt;

3) Turn-on the faucet at maximum flow rate allowing the water flow for 1-3 minutes;

4) Sterilize the faucet for 1 minute with the flame an ignited cotton wool swab soaked in alcohol either denatured or 70% Isoprophyl;

5) Carefully turn on the faucet and allow 1-2 minutes at medium flow before sampling;

6) Remove the cap of the CL tube of the Chlorine Residual Kit and rinse;

7) Fill the CL tube with water sample until the level with line just under CL marking on tube;

8) Remove the cap of the ortho-tolidine solution and squeeze 5 drops of solution into the CL tube;

9) Cover the CL tube with the cap and invert the tube several times to mix ortho-tolidine solution with water sample for 10 seconds;

10) Compare the color of the solution with the adjacent color markings to determine the numerical reading;

11) Record the result in the Daily Chlorine Residual Monitoring Report;

12) On the third day of the ensuing month, submit the Daily Chlorine Residual Monitoring Report to the WSP Team Leader and to the General Manager;

13) Submit the Daily Chlorine Residual Monitoring Report to LWUA and to the City Health Office.

2.3.1.2.5 Physical and Chemical Test

The Physical and Chemical Test is a twice a year laboratory testing of the raw water or water at source without treatment yet. There are several parameters to be tested and these should conform to the standards set by the PNSDW 2007.

The following are the parameters to be tested, method of analysis and permissible limits.

Parameters	Method of Analysis	Permissible Limits
Physical Analysis		
Turbidity	Turbidimetry	5
Apparent Color (Color Units)	Visual Comparison	10
Chemical Analysis		
pH	Electrometric	6.5-8.5
Total Dissolved Solids (mg/L)	Gravimetric	500
Sulfate (mg/L)	Turbidimetric	250

Nitrate (mg/L)	Cd Reduction	50 0.03MDL
Chloride	Argentometric	250
Benzene	Qualitative Test	0.01
Metal Analysis (mg/L)		
Iron (Total)	AAS	1.00
Manganese (Total)	AAS	0.40
Arsenic	Silver Diethyldithiocarbamate	0.01 0.0092MDL
Cadmium	AAS	0.003 0.002
Lead	AAS	0.01 0.0094

The following are the procedures to be followed:

1) Flush the water from the discharge test line for at least 20-30 minutes to ensure that the sample is safe and clean;

2) Clean the opening of the discharge test line with clean cloth to remove dirt;

3) Then flush again for 15 minutes before sampling;

4) Fill the 1.5 bottles with water sample, then capped the bottle and labeled properly with date and time of sampling, source/point of sampling;

5) Place (In a vertical potion) the bottle in a cooler with cube ice making sure that it reaches the DOH accredited laboratory testing within 24 hours;

6) Submit the results to LWUA and to City Health Office. In case it exceeded the permissible limit of any of the parameter, implement corrective measure immediately or abandon if necessary.

2.3.1.3 Non-Revenue Water Reduction

One of the major challenges the BWD is facing is the Non-Revenue Water. If a large proportion of water that is supplied is lost, meeting consumer demands is much more difficult. Since this water yields no revenue, heavy losses also make it harder to stabilize the BWD's finances.

Non-Revenue water is water which is produced and supplied but not paid for, including technical losses (leakage), not billed water (conflagration), illegal

connections, poor water meter performance and inaccurate reading and accounting of metered flows.

The following are the Non-Revenue Management Program of the BWD:

2.3.1.3.1 Technical Losses (Leakages)

1) The Commercial Section attends to maintenance request such as repair of leakages whether transmission line leak, service line leak and meter leak immediately upon receipt of complaint from consumer whether walk-in or phone call;

2) Properly identify the leak and fill out Maintenance Request Form;

3) Submit the accomplished Maintenance Request Form to the General Manager for approval;

4) The General Manager approves the request and schedules the work implementation;

5) The Technical Section implements repair;

6) The Technical Section returns the Maintenance Request Form as a proof that the work has been accomplished to the Commercial Section;

7) The Commercial Section files the returned Maintenance Request Form for generating report.

2.3.1.3.2 Illegal Connection

The BWD has a policy on providing monetary rewards to informant of illegal connection.

1) Receives information from informant on illegal connection of a disconnected consumer or non-consumer;

2) The Technical Section will survey the alleged illegal connection with witnesses coming from the alleged individual committing pilferages and BWD staff;

3) If the result is positive, document the illegal connection;

4) Then immediately disconnect the illegal connection;

5) Advise the person concerned to appear immediately before the General Manager;

6) The General Manager informs the person concerned on the two sanctions of committing illegal connection;

7) Let the person concerned choose between the two sanctions;

8) Prepare the agreement of settlement to be entered by the two parties.

2.3.1.3.3 Poor water meter performance

Commercial losses such as poor water meter performance is always less in volume than physical losses, but this does not mean is any less important. Because of the laws on lowest responsive bidder quality is being sacrificed which will lead to commercial losses.

The BWD has a policy (BOD Resolution No. 11 series of 2016) to replace five years old meter to a new one in order to get the most accurate reading/performance.

1) The Commercial Section issues mandatory Water Meter Replacement Project letter to the affected consumer;

2) Upon acceptance by the consumer, the Commercial Section will report to the General Manager;

3) The General Manager will issue the Job Order;

4) The Technical Section implements the Job Order and retrieve the old meter;

5) Stock the old meter for auditing purposes;

2.3.1.3.4 Inadequate Reading and Accounting of Metered Flows

1) The Meter Reader compares the reading from the previous months if suspicious reading is noticed;

2) Make a report to the Commercial Section;

3) The Commercial Section prepares Maintenance Request Form and submits to the General Manager for approval;

4) The General Manager approves the request and schedules the work activity;

5) The Technical Section inspects the water meter, calibrate if necessary;

6) If it is defective, immediately change the water meter;

7) In case of high consumption, average the three months consumption including the current;

8) Prepare Adjustment Memo and serve to the consumer concerned;

9) Record the adjusted bill in the Daily Billing Summary Report and Ledger Cards;

2.3.1.4 Transmission and Distribution Line Procedures

2.3.1.4.1 Transmission/Distribution Line Repair

1) Attend to the complainant immediately;

2) Properly identify the leak and fill-out maintenance form;

3) The Technical Section assesses the work to be done and list down the materials needed;

4) Request the Commercial Section for a Requisition and Issue Slip;

5) Submit to the General Manager the duly accomplished Maintenance Form and RIS for approval;

6) The General Manager approves request and schedules the repair immediately;

7) The Admin posts the work/activity and the duration of the activity at the Website of the District if it will cause water service interruption;

8) The Technical Staff proceeds to the affected area bringing with them the materials to be used;

9) Before the actual work will start, close the nearest gate valves to prevent water from flowing in the affected transmission line;

10) Water pump is used to drain the water while cutting the affected pipe to prevent ingress of contaminants;

11) Before installing the new pipe, place chlorine granules about 200grams inside the pipe to disinfect the affected line;

12) After the installation of new pipe, nearest blow-off is then open and the main valve is also slowly open;

13) Close the blow-off when water becomes clear;

14) While pressure is building up, check the fitting for leaks, if there is any; tighten the bolt if none and leave the area but be sure that cautious signage is provided to avoid accident;

15) Backfilling, compaction and restoration are to be done the following day.

2.3.1.4.2 Installation of new connection

1) Provide the client/applicant with the application form and brief him/her on the services and charges;

2) Receive and review the application form. Advise the applicant to return to the office after 4hours for the result of the area survey;

3) Inspect, assess and verify the area where to be installed;

4) Estimates the additional materials if any

5) The Technical Section submits the application form indicating the additional materials to be paid;

6) Once paid by the applicant, the General Manager will approve the application and the Plumber will ready the materials needed;

7) The technical staff proceeds immediately to the site and install service connection;

8) The technical staff will see to it that backfilling, compaction and restoration are to be done immediately;

9) Have the concessionaire conform job order that new connection is well done Plumber will submit the duplicate copy of the application form to the Commercial Section for recording purposes.

2.3.1.4.3 Water Meter Maintenance

1) Recalibration of new water meters;

2) Replacement of water meters 5-year old and above;
3) Removal/replacement of faulty or defective water meters;
4) Clustering of water meters.

2.3.2. Commercial

2.3.2.1 Service Connection

It is the topmost service of the BWD to residents of the City of Batac who want to have safe, potable and affordable water at their most convenient way. If requirements are complete, service connection can normally be installed in one (1) working day.

Attached services are reconnection and disconnection of water service and transfer meter.

2.3.2.1.1 Water Service Connection

1) Provide the client/applicant with the application form and brief him/her on the services and charges;

2) Receive and review the application form;

3) Advise the applicant to pay the application fee first;

4) Receive payment and issue the corresponding official receipt;

5) Advise the applicant to return to the office or call the office after four hours for the result of the area survey, if there are additional materials to be paid;

6) Receive payment and issue corresponding official receipt for the additional materials;

7) Submit the application form for approval and work scheduling to the General Manager;

8) The General Manager approves the application, schedules the work activity and returns the application form to the Commercial Section;

9) The Commercial Section gives the application form to the Technical Section for installation;

10) The Technical Section returns the duplicate of the application form to the Commercial Section;

11) The Commercial Section records the name of the new consumer, address and assigned account number in the logbook, meter reading card and ledger card;

12) The Commercial Section files the duplicate copy of the application form.

2.3.2.1.2. Reconnection of Water Service

1) Verify the name of the client from the list of disconnected consumers or ledger card if she/he has arrears;

2) If the disconnection date is beyond the three-year policy of disconnection the request is taken as new connection; hence she/he has to pay the application fee including arrears, if there's any;

3) If the disconnection date is within three years, she/he has to pay the reconnection fee including arrears, if there's any;

4) Receive payment and issue the corresponding official receipt;

5) Prepare the Service Request Form and submit to the General Manager for approval and scheduling;

6) The General Manager returns the Service Request Form to the Technical Section for implementation;

7) The Technical Section implements the work activity and returns the Service Request Form to the Commercial Section;

8) The Commercial Section records the reconnection data to the log book to be included in the next billing.

2.3.2.1.3 Disconnection of Water Service

1) Verify the client consumer's ledger card if she/he has still unpaid account to the BWD;

2) In case there is unpaid account, inform him/her to settle the account before the request shall be granted;

3) Receive payment and issue corresponding official receipt;

4) Prepare the Service Request Form and submit to the General Manager for approval and scheduling;

5) The General Manager approves, schedules the work activity and returns the Service Request Form to the Commercial Section;

6) The Commercial Section gives the Service Request Form to the Technical Section for implementation;

7) The Technical Section returns the duplicate of the Service Request Form to the Commercial Section for recording;

8) The Commercial Section records the name and date disconnection;

9) The Commercial Section files the Service Request Form for generating report purposes.

2.3.2.1.4 Transfer of Water Service Connection

1) Inform the consumer of the charges;

2) Receive payment and issue corresponding official receipt;

3) Prepare the Service Request Form and submit to the General Manager for approval and scheduling;

4) The General Manager approves the request, schedules the work activity and returns the Service Request Forms to the Commercial Section;

5) The Commercial Section gives the Service Request Forms to the Technical Section for implementation;

6) The Technical Section returns the duplicate of the Service Request Form to the Commercial Section for recording;

7) The Commercial Section records the name and date disconnection;

8) The Commercial Section files the Service Request Form for generating report purposes.

2.3.2.1.5 Application for Senior Citizen Program

1) Verify the date of water service connection of the applicant if it is one year and above;

2) If his/her connection is already one year and above, provide him/her Senior Citizen Application Form;

3) Inform the applicant of the documentary requirements for availing the 5% discount and the Implementation, Rules and Regulation of the Program;

4) Upon submission of the documentary requirements, review the completeness of the same;

5) Submit the Senior Citizen Application Form and the documentary requirements to the General Manager for approval;

6) The General Manager approves the application and returns the papers to the Commercial Section for notification, recording and filing;

7) The Commercial Section notifies the applicant for the approval of his/her Senior Citizen Program availment;

7) The Commercial Section records the name of the concerned Senior Citizen availing the Program and files the Forms and other documents.

2.3.2.2 Billing

The current billing cycle of the BWD is 30 calendar days. This includes meter reading up to the last day of penalty date. A penalty charge of 25% shall be imposed in addition to the water charge if the payment is not made on or before the due date. The water service shall be disconnected after another 20 days without further notice and shall not be reconnected except upon payment of all amounts due. The BWD currently utilizes the read and bill method. A meter reading cards, monthly billing consumption reports and ledger cards are maintained to keep all the records of the consumers which give ease in the billing process and answering consumers' complaints and inquiries.

2.3.2.2.1 Pre-addressing and Posting of Arrearages

1) Before the reading period, the Customer Service Assistant D prepares the Billing Statement for each billed consumer;

2) Fill-out the Billing Statement of the name of the consumer, account number, reading date, covering period, previous reading, present reading, tax, discounts, penalty and total amount;

3) For consumer with arrears it includes in the Billing Statement the previous balance;

4) After posting all the needed data, insert the Billing Statement of each consumer in the Meter Reading Card;

5) Issue the Meter Reading Cards with the Billing Statements to the Meter Readers on or before the reading period;

6) The Meter Readers submits the Meter Reading Cards to the CSA D for recording.

2.3.2.2.2 Meter Reading

1) On the reading date, the Meter Reader checks the Meter Reading Cards and Billing Statement before leaving the office;

2) Meter Reader reads water meters and records the current readings in the Meter Reading Cards;

3) Fill-up the Billing Statement as to other data such as present reading, consumption/usage, franchise tax, early payment discount, Senior Citizen discount if applicable, total amount before due date and total amount after due date;

4) Affix signature of the Meter Reader in the Billing Statement;

5) Serve the Billing Statement to the consumer or leave it the mail box. (The failure to receive the Bill does not relieve the consumer of his/her liability under the contract of services);

6) The Meter Reader submits the Meter Reading Card to the CSA D for posting/recording.

2.3.2.2.3 Billing

1) Immediately after the submission of the Meter Reader of the Meter Reading Cards, post the cubic meters consumed and the corresponding amount, franchise tax and total bill amount in the Monthly Billing Report;

2) Prepare the Monthly Billing Report in duplicate for verification and posting;

3) Adjust any incorrect entry, if any and prepare the Billing Adjustment Memo to be submitted to the General Manager for approval;

4) The General Manager approves the Billing Adjustment Memo and returns to the Commercial Section for its issuance to the consumer concerned;

5) The Meter Reader serves the Billing Adjustment Memo to the concerned consumer.

2.3.2.2.4 Posting of Water Bills in the Ledger Cards

1) Submit the Monthly Billing Report to the Finance Section for verification;

2) After checking the Monthly Billing Report vis-à-vis the Meter Reading Cards the Finance Section submits the verified Monthly Billing Report to the General Manager;

3) The General Manager approves for posting in the Ledger Cards the Monthly Billing Report;

4) The CSA E posts the Monthly Billing Report to the Consumers' Ledger Cards.

2.3.2.3 Collection

Water Bills are due and payable at the Office of the Batac Water District on the date of delivery of Billing Statement to the consumer or his authorized representative agents and shall be declared delinquent fifteen (15) days thereafter. On due date, however field collection is also conducted to enhance the collection efficiency of the BWD.

2.3.2.3.1 Payment of Bills at the Office

1) Give priority to the Senior Citizens, Pregnant Women and Persons with Disability;

2) Receive, review and verify the figures in the Billing Statement from the Monthly Billing Report or Consumers' Ledger Cards;

3) Receive payment and issue the corresponding official receipt;

4) Prepare the Daily Collector's Report and submit to the Finance Section for verification;

5) After verifying the correctness of the report, turn-over the amount collected to the Cashier including payments of application fee, reconnection, transfer meter, and sale of materials.

2.3.2.3.2 Field Collection

1) Water bills not paid during due dates are given half-day allowance to settle the bill;

2) Field Collector follows-up the unpaid bill the following day after due date;

3) Field Collector at 12:00 noon submits his collection to the office;

4) The CSA D posts the field collection in the Daily Collector's Report;

5) The CSA D submits the amount collected to the Cashier.

2.3.2.3.3 Posting of Payments in the Ledger Cards

1) The Cashier turns-over the Daily Collector's Report including the triplicate of official receipts to the CSA E for posting;

2) The CSD E posts water bill payments made by the consumers in the Consumer's Ledger Card.

2.3.2.3.4 Penalty

At the end of due date, bills not paid plus half-day allowance are subject of the 25% penalty.

1) The CSA D submits to the CSA E the Billing Statements not paid on the due date;

2) The CSA E computes the penalty of the bills not paid;

3) The CSA E prepares the Penalty Report and submits to the Finance Section for verification;

4) After verifying the correctness of the Report, the Finance Section submits the same to the General Manager for approval;

5) The General Manager approves the Penalty Report and turns-over to the Commercial Section for posting in the Consumers' Ledger Cards;

6) The Commercial Section posts the penalty in the Consumers' Ledger Cards and files the Penalty Report.

2.3.2.3.5 Issuance of Demand Letters

1) Scrutinize the latest Ageing of Accounts Receivable to identify the disconnected or inactive concessionaires with arrearages;

2) Prepare first demand letters and submit to the General Manager for approval;

3) GM approves the first demand letters and turns-over to the Commercial Section for its issuance to the concerned delinquent consumers;

4) If not settled, prepare the second demand letters and submit to the General Manager for approval;

5) GM approves the second demand letters and turns-over to the Commercial Section for its issuance to the concerned delinquent consumers;

6) Again if not settled, issue the final demand letter duly signed by the OGCC Legal Counsel to concerned delinquent consumers, copy furnished the Barangay Chairmen in their respective areas;

7) If remained unsettled within the prescriptive period, request the Barangay Chairman to summon the concerned delinquent consumer for a possible amicable settlement;

8) If not settled within the three meetings prescribed by law, then file a case against the delinquent consumer.

2.3.2.4 Cashiering

2.3.2.4.1 Receipts and Deposits

1) Receive the collection of water bills, application fee, reconnection fee, transfer meter and sale of materials of the day from the CSA D at the closing hour of 4:00 in the afternoon;

2) Cash and check collections received from the CSA D are kept in the safety vault for safekeeping;

3) Deposit the collections in tact the following day;

4) Record the collection at the Cashier's Collection Summary;

5) Record the collection and deposit at the Cash Receipts and Deposits Record;

6) File the deposit slips;

7) On the fifth day of the ensuing month submit the Cashier's Collection Summary and Cash Receipts and Deposits Record to the Finance Section for verification;

8) The Finance Section submits the verified Cashier's Collection Summary and Cash Receipts and Deposits Record to the General Manager;

9) On the 10^{th} day of the ensuing month, the Finance Section submits the Cashier's Collection Summary and Cash Receipts and Deposits Record to COA.

2.3.2.4.2 Check Preparation

1) Receive Disbursement Voucher from the Finance Section for checking;

2) Verify the amount stated in the Disbursement Voucher and the supporting documents if correct and complete;

3) If complete, prepare the check making sure no alteration and indicating the check number, date, name of payee, amount in words and number and signatures over names of the authorized signatories;

4) Record the check to be issued in the Report of Check Issued;

5) Issue the check to the payee;

6) After the check has been received by the payee, a copy of the check slip is filed.

2.3.2.4.3 Preparation of Daily Cash Position Report

1) After the closing hour of 4:00 in the afternoon, the Cashier prepares the Daily Cash Position Report;

2) Submits one copy of the Daily Cash Position Report to the Finance Section;

3) File the other copy for generating reports.

2.3.2.4.4 Petty Cash Report

1) Record petty cash transactions everyday at the Petty Cash Register;

2) Prepare the daily petty cash voucher;

3) If the petty cash fund is at least 75% exhausted, replenishment could be made;

4) Submits the daily petty cash vouchers to the Finance Section for the preparation of the Disbursement Voucher;

5) Record the check to be issued in the Report of Check Issued;

6) Issue the check for encashment to fund the succeeding petty cash transactions;

2.3.2.4.5 Other Finance and Commercial Activities

2.3.2.4.5.1 Payroll Preparation

1) Compute the salaries including overtime pay of employees on or before the 15th and 31st day of each month;

2) Deduct the employees' shares on GSIS, Pag-Ibig Fund, and PHIC premiums every 15th day of the month and Withholding Taxes every 31st day of the month;

3) Submits the payroll to the Finance Section for the preparation of Disbursement Voucher;

4) If the Disbursement Voucher is complete, prepare the Check;

5) Record the check to be issued in the Report of Check Issued;

6) Issue the check for encashment for the payment of salaries of employees;

7) Pay the salaries of employees immediately.

2.3.2.4.5.2 Renewal of Registration of Service Vehicles

1) Prepare a master list of all the service vehicles indicating the date of registration of each of them;

2) Make a cash advance for the payment of the renewal of registration;

3) Renew the insurance of the service vehicle at least two weeks before the expiration date;

4) After the renewal of insurance, apply for smoke emission test;

5) Once completed, apply for the renewal of registration at LTO;

6) File the newly registered papers of the service vehicle;

7) Liquidate cash advances immediately.

2.3.2.4.5.3. Renewal of Insurable Properties

1) Make sure that fund for the renewal of insurable properties is included in the budget;

2) Request a billing statement from GSIS at least one week before the expiration of the insurable properties;

3) Submit the Billing Statement to the Finance Section for the preparation of Disbursement Voucher;

4) If the Disbursement Voucher is complete, prepare the Check;

5) Record the check to be issued in the Report of Check Issued;

6) Issue the check to the GSIS on or before the expiration date;

7) Keep the papers on file.

2.3.2.4.5.4 Liquidation of Cash Advances

1) Prepare the liquidation report immediately after the travel or completion of the undertaking for which it was granted;

2) Attach the supporting documents to liquidation report;

3) After verification of the documents and report, record in the book of accounts;

4) Once completed, prepare the Journal Entry Voucher;

5) Submit the Liquidation Report including vouchers, payrolls and supporting documents to COA;

2.3.2.4.5.5 Remittances of Premiums

1) On or before the 5th day of the ensuing month, prepare all the documents needed in remitting premiums;

2) Submit all the documents to the Finance Section for the preparation of Disbursement Vouchers;

3) Once completed and verified, prepare the check for the payments;

4) Record the check to be issued in the Report on Checks Issued;

5) On or before the 10th day of the ensuing month premiums and withholding taxes checks should be served to the concerned national agencies;

6) Keep all the papers on file.

2.3.3 Administrative

2.3.3.1 Human Resources

2.3.3.1.1 Preparation of Appointment

1) The HRMO Designate submits to the Civil Service Commission (CSC) Field Office the Notice of Vacant Position to be posted to the CSC Bulletin of Vacant Positions;

2) The HRMO Designate posts the photocopy of the received and approved Notice of Vacant Position at the conspicuous places including in front of the BWD Office within the period prescribed by the CSC;

3) After the prescribed period had lapsed, the HRMO Designate organizes the documents submitted by various applicants including those qualified applicants who applied for previous vacant positions but were not luckily selected;

4) The HRMO Designates presents the documents to the Personnel Selection Board (PSB) to rank the qualified applicants vis-à-vis the qualifications required by the BWD;

5) PSB prepares a resolution recommending the most qualified from the list of qualified applicants and submits the same to the General Manager;

6) The General Manager appoints the qualified applicant based from the recommendation of the PSB;

7) The General Manager notifies the selected applicant for the preparation and submission of the documents needed before the issuance of his/her appointment;

8) The General Manager also notifies the other applicants the result of the selection process;

9) The HMRO Designate verifies the completeness and correctness of the documents submitted by the selected applicant;

10) The HRMO prepare the other documents needed and submits the same to the General Manager for the issuance of the appointment;

11) The General Manager issues the appointment;

12) The HRMO Designate submits the appointment and the attached documents to the CSC for confirmation of the appointment;

13) After the confirmation of the appointment, the HRMO Designate posts the confirmed appointment in front of the office.

2.3.3.1.2 Time and Attendance

1) Upon arrival at the office, in the morning and in the afternoon each employee should record his/her time in at Logbook and at the Daily Time Record;

2) Break time is from 10:00 to 10:15 in the morning and 3:30 to 3:45 in the afternoon;

3) Before leaving the office for lunch break at 12:00 noon and at 5:00 in the afternoon, each employee should record his/her time out at the Logbook;

4) Employees going out of the office are required to ask permission from the HRMO Designate or to the General Manager.

2.3.3.1.3 Leave Applications

1) Request an Application for Leave Form from the HRMO Designate three to five days before the vacation leave and one day after the sick leave;

2) Fill-up the upper portion of the form or the date of leave and reason of leave;

3) Submit the Leave Application Form to the HRMO Designate;

4) The HRMO will verify the leave credits balances and indicate in the Application for Leave Form;

5) The HRMO submits the application form to the General Manager for approval;

6) The General approves or disapproves the leave application.

2.3.3.1.4 Filing of Compensatory Time-Off (CTO)

1) Employee requests a CTO Form from the HRMO Designate;

2) Properly fill-up the CTO Form and submit to the HRMO Designate;

3) HRMO Designate receives the CTO Form for verification of the COC balances;

4) HRMO Designate properly fill-up the COC balances and submits the CTO Form to the General Manager;

5) The General Manager approves or disapproves the request for Compensatory Time-Off.

2.3.3.1.5 201 Filing

All employees of the Batac Water District have their 201 File under the custody of the HRMO Designate. The 201 File is being updated upon order from the CSC or at least every two years as mandated by the BWD. In addition, employees who have changes/updates in their status, additional dependents and beneficiaries and continuous studies shall furnish the HRMO Designate a photocopy of the document/documents for the purpose of updating their 201 File. The 201 File is being kept safe in the locked stock room.

Each File 201 contains the following:

1) Appointment (CSC Form No. 33);

2) Assumption of Duty;

3) Personal Data Sheet (CSC Form No. 212);

4) Position Description Form (CSC Form No. 122-D);

5) Oath of Office;

6) Certificate of Eligibilities;

7) Copies of Medical Certificate;

8) NBI Clearance;

9) Copies of Diplomas, Transcript of Records, Commendations, Awards etc.

10) Copies of Marriage Certificate, if married;

11) Copies of Disciplinary Action, if there is;

12) Designations;

13) Notice of Salary Adjustments/Step Increments;

14) Certificate of Leave Balances, if transferees;

15) Clearance from Property and Money Accountabilities, if transferees; and

16) Certificates from Trainings and Seminars.

2.3.3.1.6 Statement of Assets, Liabilities and Net worth Preparation and Filing

1) On or before March 1 of each year, HRMO Designate provides SALN Forms, two copies each employee;

2) The Finance Section issues the outstanding loan balances of each employee as of December 31 of the previous year;

3) Employees fill-up the SALN Form properly and completely;

4) Employees submit the SALN Form to the HRMO Designate on or before April 1 of each year;

5) HRMO Designate verifies the SALN Form and if found in order let a private lawyer notarized said Forms;

6) The HRMO Designate submits the original copy to the Office of the Ombudsman and the duplicate copy has a separate file at the locked stock room.

2.3.3.1.7 Individual Performance Commitment and Review Preparations and Ratings

1) The General Manager convenes with the employees for their commitment to deliver the targets with the indicated measures in their strategic, core and support functions at least one week before the rating period;

2) The employees submits to the General Manager their actual accomplishment every 5th day of the ensuing month for the whole semester;

3) The General Manager computes the employees ratings based from their actual accomplishments;

4) The General Manager presents to the employees their ratings for the rating period and submits to the HRMO for the OPCR ratings;

5) The HRMO Designate prepares the final copies of the IPCR and the OPCR and submits to the General Manager for approval;

6) The General Manager and the Chairman of the Board approves the OPCR and IPCR;

7) The HRMO Designate prepares the summary of ratings and submits the same to the CSC Field Office on or before last week of the ensuing semester;

8) The HRMO files the original copy of the OPCR and IPCR and the duplicate copy to be issued to the employees.

2.3.3.1.8 Office Performance Commitment and Review Preparations and Ratings

1) The HRMO presents to the General Manager the targets to be met by the BWD with the indicated measures in their strategic, core and support functions, the allotted budget for each function and the accountable individuals for the rating period;

2) The HRMO Designate prepares the accomplishments for each of the Major Final Output indicated in the OPCR in which some of the bases are the accomplishments of individual employees;

3) Rate the performance achieved on each MFO based from the CSC approved Output reference Table;

4) Compute the Final Average Rating and indicate the Adjectival Rating;

5) Submit to the General Manager the OPCR for review;

6) Submit to the Chairman of the Board the OPCR for approval;

7) The HRMO Designate prepares the summary of ratings and submits the same to the CSC Field Office on or before last week of the ensuing semester;

8) The HRMO files the original copy of the OPCR and IPCR and the duplicate copy to be issued to the employees.

2.3.3.1.9 Preparation of Civil Service Matters and Reports

1) On the 3rd day of the ensuing month, prepare the DBAR, Report on Personnel Action and ACEC;

2) Submit said reports to the General Manager for approval and confirmation;

3) Submit said reports to the Civil Service Field Office on or before the 5th day of the ensuing month;

4) File the receiving copy of all the reports.

5) E-mail the Monthly and Quarterly Reports on Accession and Separation to the CSC Field Office.

2.3.3.1.10 Filing of Memorandum Circulars (MCs), Executive Orders (EOs), and other issuances from COA, LWUA, DBM and other government agencies

1) Sort out the received or downloaded issuances as to appropriate category or group making sure each has its own file;

2) File issuances in each own folder for at least two-three years;

3) Keep it safe it the locked stock room.

2.3.3.2 Stock and Supplies Inventory

2.3.3.2.1 Purchasing and Stocking of Supplies and Equipment

1) End-users submit Purchase Request to the General Manager for approval;

2) Approved Purchase Request is forwarded to the BAC for the preparation of the canvass to be floated to at least three suppliers;

3) Upon the submission of quotes/bids from various suppliers, prepare the Abstract of Quotation to identify the Lowest Calculated Bidder;

4) Submit the Abstract of Quotation duly signed by all members of the BAC to the General Manager for approval;

5) Prepare the Purchase Order and serve to the winning bidder either personally or thru e-mail and fax;

6) Upon receipt of the items, the Property Custodian Designate inspects and prepares the Inspection and Acceptance Report;

7) Posts in the stock card those received and inspected items.

2.3.3.2.2 Issuance of Stocks and Supplies

1) The Property Custodian Designate provides Requisition and Issue Slip to the end-user;

2) The end-user listed down the materials needed in the RIS;

3) Submit the RIS to the General Manager for approval;

4) Upon approval check the listed materials if available and post the same to the index card;

5) Issue the materials to the end-user;

6) File the RIS.

7) Conduct inventory count every end of the month. (If materials on hand is 75% consumed the Property Custodian Designate

submits to the BAC the materials to be replenished. Process of purchasing shall follow)

2.3.3.2.3 Preparation and Updating of Property, Plant and Equipment (PPE) Record

1) Obtain from the Finance and Administrative Section the list of PPE recorded in the books as of year-end;

2) Conduct inventory count based from the PPE listed in the books with representative from the Technical and Finance and Administrative Sections;

3) List down discrepancies per books and per inventory count, if any;

4) Submit the result of the inventory count vis-à-vis the books to the General Manager;

5) Request COA for inventory count, if necessary.

2.3.3.2.4 Updating of Records of Meters, Pumping Equipment and other machineries

1) Record the purchased meters, pumping equipment and other materials after inspection;

2) Conduct inventory count of the recorded meters, pumping equipment and other machineries on hand every end of the month.

2.3.4 Finance

2.3.4.1 Preparation of Disbursement Voucher

1) Organize and check the completeness of the various documents needed for a single transaction;

2) Compute the tax to be withheld and prepare the corresponding BIR Forms;

3) Prepare the Budget Utilization Slip (BUS);

4) Certify the availability of budget funds;

5) Prepare the Disbursement Vouchers and Journal Entry Voucher;

6) Turn-over to the Cashier for the issuance of Check;

7) Submit the payment papers to the General Manager for approval.

2.3.4.2 Preparation of Job Order Workers' Weekly Payroll

1) Inquire from the General Manager the number of days including overtime the Job Order Workers have rendered;

2) Request the Job Order Workers to submit their work accomplishment at 1:00 in the afternoon of every Friday;

3) Prepare the payroll;

4) Prepare the Disbursement Voucher following the required procedures;

5) Turn-over the DV to the Cashier for the issuance of check;

6) Submit to the General Manager the complete DV with the payroll for approval;

7) The Cashier C pays the wages of the Job Order Workers immediately.

2.3.4.3 Preparation of Employees Remittance List, Alpha List of Payees and Monthly Tax Return

1) On or before the 5th day of the ensuing month, list down the payees who were subjected to tax withheld;

2) Classify the various taxes withheld based from the BIR Forms 1600 and 1601;

3) Encode these taxes withheld to the BIR format and email to BIR;

4) Prepare the corresponding disbursement voucher and journal entry voucher following the required procedures;

5) Prepare the BIR payment slip form;

6) Turn-over to the Cashier C for the issuance of check;

7) Submit the DV with the complete documents to the General Manager for approval;

8) Once approved by the General Manager, the Cashier C issues the payment on or before the 10th day of the ensuing month.

2.3.4.4 Preparation of Detailed Estimate of Income and Expenditures

1) Each End-User Section submits its detailed expenditures to the Finance Section;

2) Prepare the Detailed Estimate of Income and Expenditures based from submitted expenditure (end-users) the actual data for the first nine months of the current year, with considerations to future events that could be ascertained at the time of preparation;

2) Submit a draft copy to the General Manager for review, corrections and initial approval;

3) Revise the Detailed Estimate of Income and Expenditure based from the General Manager's review;

4) Print the revised copy and submit to the General Manager for Board deliberations and approval;

5) After approval, print the final copy of the Detailed Estimate of Income and Expenditures for Board's signatures;

6) Furnish a copy of the complete Detailed Estimate of Income and Expenditures to LWUA;

7) File several copies for future use.

2.3.4.5 Preparation of Annual Procurement Plan

1) On the first week of October of each year prepare the Annual Procurement Plan for Common –Use Supplies and Equipment for the ensuing year with the 9-month historical basis and using the DBM format;

2) Prepare also an Annual Procurement Plan for Supplies and Equipment and Capital Expenditures not readily available from the DBM Virtual Store;

3) Prepare the Project Procurement Management Plan;

4) Submit to the General Manager for review, corrections and approval;

5) E-mail the approved Procurement Plans to DBM on or before the 15th day of November of every year.

2.3.4.6 Maintenance of Book of Accounts

1) Adjust the data posted in the General and Subsidiary Ledgers to effect the corrections on the Ageing of Accounts Receivable;

2) Close the General and Subsidiary Ledgers on or before the 5th day of the ensuing month for the preparation of financial reports.

2.3.4.7 Preparation of Monthly Financial Reports

1) List down all the cash advances for the month based from the Report of Checks Issued;

2) List down the liquidated and non-liquidated cash advances for the month;

3) Receive the metered sales and accounts receivable data from the Commercial Section;

4) Prepare the journal entries for non-cash transactions;

5) Prepare the summary of non-cash transactions, disbursement and journal entry vouchers;

6) Receive the summary of cash receipts;

7) Post transactions data to the General and Subsidiary Ledgers;

8) Compute the total balances of each account in the General and Subsidiary Ledgers;

9) Prepare the trial balance;

10) Prepare the Income Statement making sure that the totals of the debits and credits in the trial balance are the same;

11) Prepare the Balance Sheet;

12) Prepare the Statement of Cash Flow based from the Summary of Cash Receipts Register (CRR) and Voucher Register;

13) Prepare the Monthly Data Sheet. Obtain data not available from the Financial Statement from the General Manager and from other Sections;

14) Submit a draft copy to the General Manager for review, corrections and approval;

15) Print the final copy to be presented to the Board of Director during BOD meeting.

16) Reproduce additional copies for COA and LWUA;

17) Upload the monthly financial statements to the website of the BWD;

18) File hard copies for office future reference uses.

2.3.4.8 Preparation of Quarterly Variance Report

1) Input data of actual receipts and expenses vis-à-vis the corresponding budget;

2) Compute the variance for each account in peso amount and in percentage;

3) Identify if the variance is favorable or unfavorable;

4) Input remarks/reasons on negative variances;

5) Submit a draft copy to the General Manager for review, corrections and approval;

6) Present the final copy before the Board of Directors every last meeting of the ensuing semester.

2.3.4.9 Preparation of Statement of Accountability for Accountable Forms without Money Value;

1) At the end of the month, total the issued official receipts and checks;

2) Tally the official receipts and checks issued in the Cashier's Collection Summary and in the Daily Collector's Report vis-à-vis the last month SAAF record;

2) If without discrepancy, register the details in the current month SAAF record;

3) Submit the computerize SAAF to the General Manager for approval;

4) Submit the approved SAAF to COA every 10th day of the ensuing month.

5) Maintain a file.

2.3.4.10 Preparation of Schedule of Ageing of Accounts Receivable

1) Post the current water bills, payments and penalties in the Consumer's Ledger Card;

2) At the end of the month, list the arrears of consumers based from the number of days;

3) Total the accounts receivable from consumers;

4) Tally the accounts receivable with that of the Cashier's Collection Summary;

5) If no discrepancy, furnish a copy of the Schedule of Ageing of Accounts Receivable to the Commercial Section for the issuance of the demand letters.

6) Maintain a file.