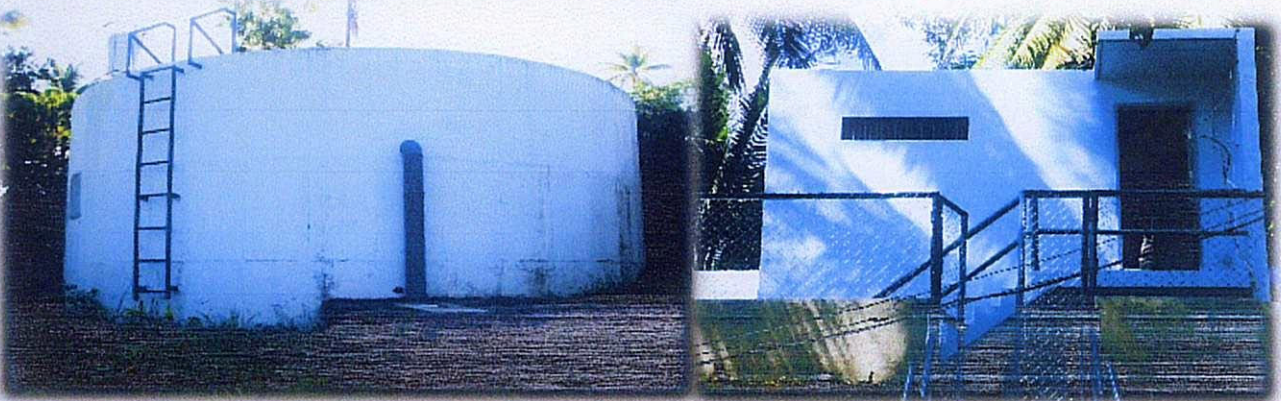




# LIANGA WATER DISTRICT

## *Operations Manual*



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# INTRODUCTION

This Manual focuses on Category D Water Districts, as a public utility and answers to the questions “What are the requirements to effectively manage the and sustainably operate a water district. It covers the requirements of running a water district, the demands of ensuring water safety through proper treatment, the nature and requirements of operating and maintaining the water distribution system, and its administration, commercial, financial and social aspects.

To cope with the demands of obtaining the trust of its concessionaires, this manual must be updated on a regular basis.

## DEFINITION OF TERMS AND ACRONYMS

### Government and Other Organizations

<b>AWWA</b>	American Water Works Association	<b>LIWAD</b>	Lianga Water District
<b>BIR</b>	Bureau of Internal revenue	<b>LWUA</b>	Local Water Utilities Administration
<b>DAR</b>	Department of Agrarian Reform,	<b>MSG</b>	Management Services Group
<b>(ARISP)</b>	Agrarian reform Infrastructure Support Program		
<b>DILG</b>	Department of Interior and Local Government	<b>NSO</b>	National Statistics Office
<b>DOH</b>	Department of Health	<b>NWRB</b>	National Water Resources Board (formerly NWRC)
<b>DPWH</b>	Department of Public Works & Highways	<b>WHO</b>	World Health Organization

### Technical & Operational Terms, Units of Measure

<b>AC</b>	alternating current	<b>D or diam</b>	Diameter
<b>ADD</b>	average daily demand	<b>dm</b>	Decimeter
<b>AL</b>	Allowable leakage	<b>Elev</b>	Elevation
<b>BOD</b>	Biological Oxygen Demand	<b>EV</b>	Equivalent volume
<b>CAPEX</b>	Capital expenditure	<b>F/A</b>	Force/ Area
<b>CBO</b>	Community-Based Organization	<b>g</b>	Grams
<b>Cc</b>	Cubic centimeter	<b>G.I. pipe</b>	Galvanized iron pipe
<b>CIP</b>	Cast iron pipe	<b>GPM</b>	Gallons per minute
<b>Cm</b>	Centimeter	<b>HGL</b>	Hydraulic grade line
<b>COD</b>	Chemical oxygen demand	<b>hm</b>	Hectometer
<b>CPC</b>	Certificate of Public Conveyance	<b>HP</b>	Horsepower
<b>CT</b>	Contact Time	<b>HTH</b>	High-Test hypochlorite
<b>cumecs</b>	Cubic meters per second	<b>IDHL</b>	Immediately dangerous to Life and Health
<b>Dam</b>	Dekameter	<b>kg</b>	Kilograms
<b>Dep</b>	Depreciation expenses	<b>kgf</b>	Kilogram force
<b>Km</b>	Kilometer	<b>Opex</b>	Operational expenses
<b>kPa</b>	Kilopascals	<b>Pa</b>	Pascal
<b>KPIs</b>	Key performance indicators	<b>PE pipe</b>	Polyethylene pipes
<b>LGUs</b>	Local Government Units	<b>PEER</b>	Property and equipment entitled to return
<b>lm</b>	Linear Meter	<b>PNS</b>	Philippine National Standards
<b>lpcd</b>	Liters per capita per day	<b>PNSDW</b>	Philippine National Standards for

<b>lps</b>	Liters per second	<b>psi</b>	Drinking Water
<b>m</b>	meter	<b>PVC pipe</b>	Pounds per square inch
<b>m<sup>2</sup></b>	Square meter	<b>PWL</b>	Polyvinyl chloride pipe
<b>m<sup>3</sup></b>	Cubic meter	<b>ROI</b>	Pumping water level
<b>m<sup>3</sup>/d</b>	Cubics meter per day	<b>RR</b>	Return on investment
<b>MaxNI</b>	Maximum allowable net income	<b>RWSA</b>	Revenue requirements
			Rural Water & Sanitation Association
<b>MDD</b>	Maximum day demand	<b>SCBA</b>	Self-contained breathing apparatus
<b>Mg/l</b>	Milligrams per liter	<b>SMAW</b>	Shielded metal arc welding
<b>mm</b>	Millimetre	<b>SSWP</b>	Small-Scale Water Provider
<b>mld</b>	Million liters per day	<b>SWL</b>	Static water level
<b>mm/hr</b>	Millimetres per hour	<b>TDH</b>	Total dynamic head
<b>MOA</b>	Memorandum of Agreement	<b>TDS</b>	Total dissolved solids
<b>N/m<sup>2</sup></b>	Newtons per square meter	<b>VC</b>	Volume container
<b>NGO</b>	Non-Government Organization	<b>VIM</b>	Variation in mass
<b>NPSH</b>	Net positive suction head	<b>Wc</b>	Container
<b>NPSHa</b>	Net positive suction head available	<b>Wcm</b>	Container + material
<b>NPSHr</b>	Net positive suction head requirement	<b>WHP</b>	Water horsepower
<b>NRW</b>	Non-revenue water	<b>WL</b>	Water level
<b>NTU</b>	Nephelometric Turbidity Unit		
<b>O&amp;M</b>	Operation & maintenance		
<b>OD</b>	Outside diameter		

## DEFINITION OF TERMS

1. **Major Final Output (MFO)** – the good or service that a water district is mandated to provide its external clients through the implementation of programs, activities, and projects. It may be a single output or group of outputs targeted at the same organizational/ sector outcome and capable of being summarized by a common performance indicator.
2. **Performance Indicator** – A characteristic of performance (quality, quantity, timeliness or cost) that is to be measured and will illustrate the standard by which a water district is expected to deliver its MFO. Performance Indicators should be verifiable, observable, credible and sustainable.
3. **Performance Target (PT)** – a predetermined numerical target level of performance (quantity, quality, timeliness and cost of an output) against which actual are tracked by a reporting system within the year and verified by LWUA.
4. **Delivery Units** - Departments and Divisions of the LWD responsible for the achievement of the LWD's MFO and committed to performance targets which are tracked by a reporting system within the year and verified by LWUA.
5. **Potability** – the quality of water that renders it safe and fit for human consumption. LWD Performance with respect to this indicator shall mean compliance to the Philippine National Standards for Drinking Water (PNSDW) and all issuances and guidelines by the Department of Health (DOH) and the Local Water Utilities Administration (LWUA).
6. **Adequacy and Reliability of Service** – performance of LWD rated in accordance with 24/7 availability of supply, capacity to meet the present and future water demand.
7. **Access and Coverage** – performance of LWD in pursuing the goal of providing access and water service to the greater percentage of the population within their respective service areas.
8. **Affordability** – performance of LWD rated in accordance with their ability to ensure that their rates are kept affordable for the low income groups (LIG). It has been ascertained that a water

consumption of 1 cubic meters per month will provide for the basic requirements of those in the LIG based on NSO and LGU data.

9. **Low Income Group (LIG)** – the sector of residential consumers having the lowest capability to pay for water service. For this purpose, the minimum charge for ½” residential connection should not exceed 5% of the average income of the LIG in the service area. This is a measure of the reasonableness of rates and has been regarded as the maximum amount that this income group can pay for their monthly bill.



# GENERAL INFORMATION ABOUT THE AGENCY

Lianga Water District is the major water service provider of the municipality of Lianga and Barangay Wakat of the nearby town Barobo. The district is currently serving 9 barangays out of 13 within the service area and 1 barangay outside the service area. It was created by virtue of the Sangguniang Bayan Resolution No. 17 dated on March 30, 1979. It was awarded with its Conditional Certificate of Conformance (CCC) No. 104 on December 4, 1979, after complying with the minimum requirements of the Local Water Utilities Administration (LWUA).

Under the Local Water District Manual on categorization, Re-categorization and Other Related Matters (LWD-MaCRO), Lianga Water District was categorized as Category "D" effective on March 2012. Category D water district is defined as a local water district having 2,999 service connections and below.

## MANDATES:

The LIANGA WATER DISTRICT, by virtue of Presidential Decree No. 198, CHAPTER II-Purpose and Formation SECTION 5:

- Acquiring, installing, improving, maintaining and operating water supply and distribution systems for domestic, industrial, municipal, and agricultural uses for residents and lands within the boundaries of such district;
- Providing, maintaining, and operating wastewater collection, treatment and disposal facilities, and;
- Conducting such other functions and operations incidental to water resource development, utilization and disposal within such district, as are necessary or incident to said purpose.

## VISION:

LIANGA WATER DISTRICT envisions itself to be of utmost reliable, adequate, safe, and potable water service provider, environmental-oriented and financially viable utility.

## MISSION:

LIANGA WATER DISTRICT is committed to provide efficient water service with dependable workforce abreast-resiliency, sustainable water supply and a good steward of our natural resources.

## MAJOR FINAL OUTPUTS:

1. Potability
2. Adequacy
3. Access and Coverage
4. Affordability
5. Financial Viability and Sustainability

## GOALS:

- ✓ To safeguard and maintain existing water resource, facilities and structures;
- ✓ To achieve maximum operational efficiency and attain effectiveness in all key result areas for Lianga Water District viability;
- ✓ To take active part in environmental protection program particularly in watershed; and
- ✓ To reduce unaccounted for water to an acceptable 20% level.

Figure 1. ORGANIZATIONAL STRUCTURE OF LIANGA WATER DISTRICT

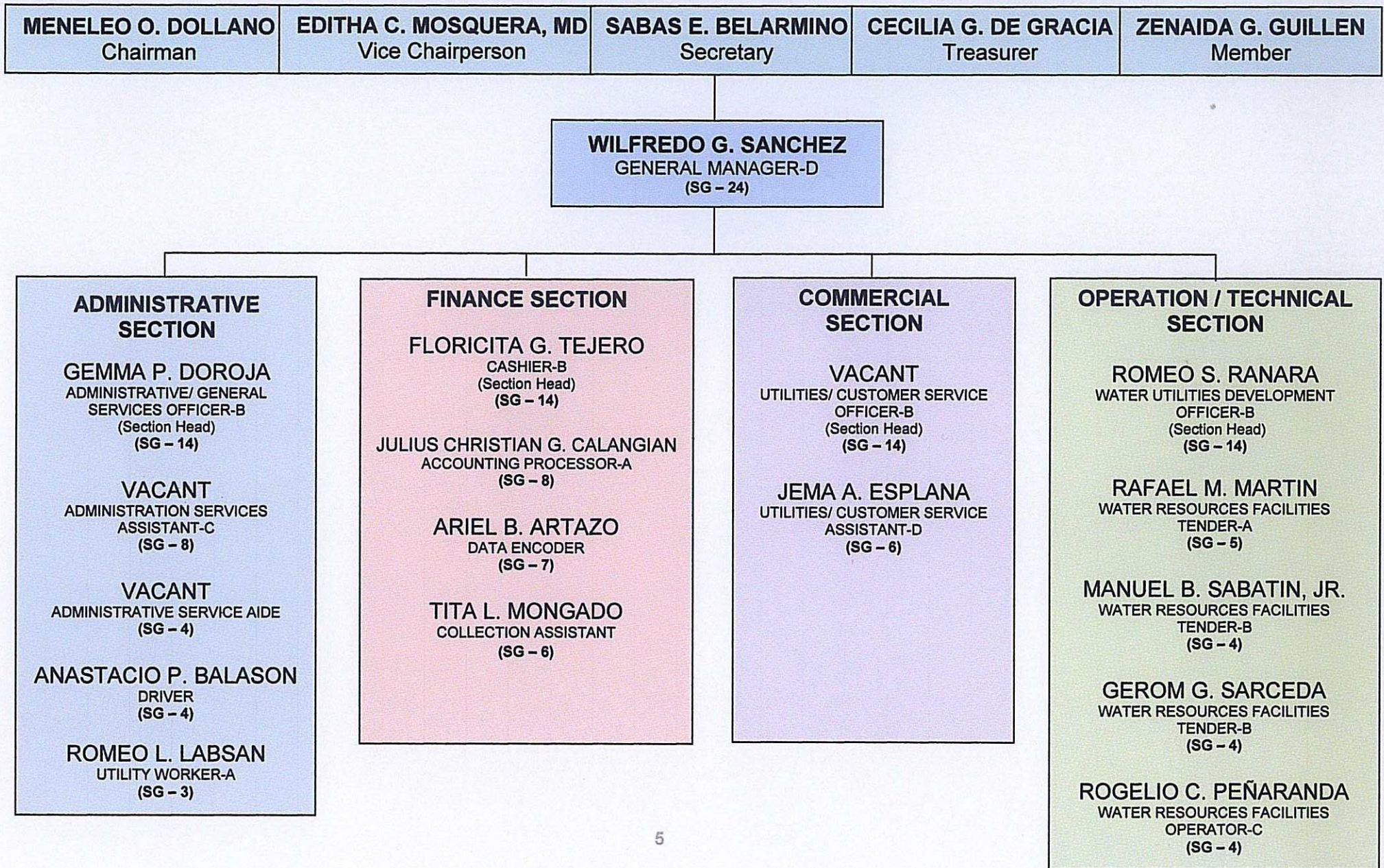
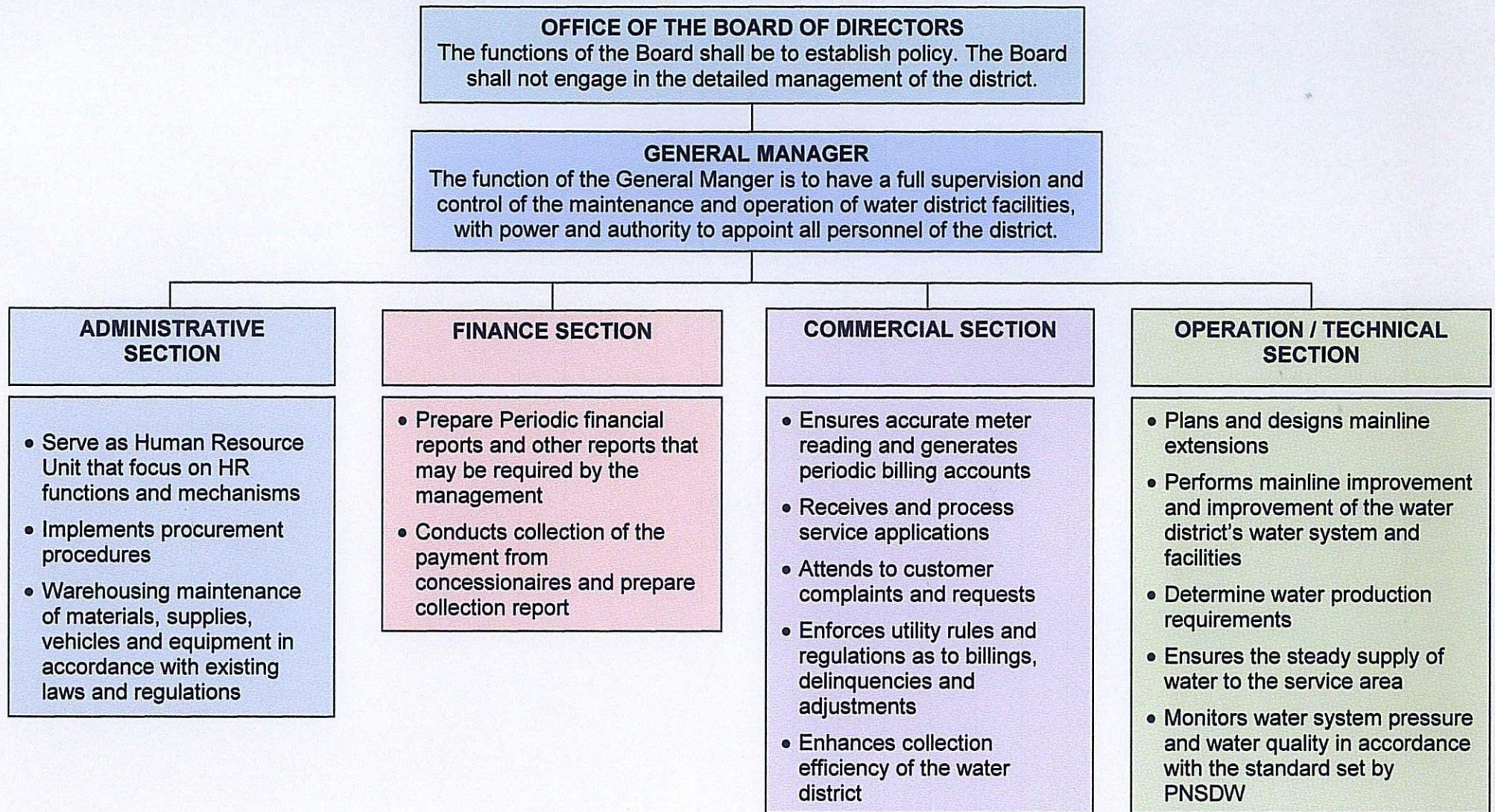


Figure 2. FUNCTIONAL CHART OF LIANGA WATER DISTRICT



# OPERATING PROCEDURES

This chapter provides a basic reference on the daily operations of the water district. Basically, the daily operation of a water district is consisting of Water Production & Distribution, Administration and Financial Aspects and Commercial Operations. The procedures should be written, filed/ recorded, review and assessed when a system is operating under a normal condition or any incident happened. A procedure will be designed to serve as guide of its day to day operations and will be reviewed periodically. The records that will be compiled will be the basis of the management procedure to prevent any untoward incident in the future and improve the operation.

## **I. WATER PRODUCTION & DISTRIBUTION**

This section covers the basic concepts of water sources and the equipment used at these sources to prepare the water for distribution, the quality standards that should be observed and the importance of managing Non-Revenue Water (NRW).

### COLLECTING & IMPOUNDING RESERVOIR CLEANING & DISINFECTION

Reservoirs are designed to operate with source supply and demand correspondingly, and should be capable of supplying the incremental difference between the maximum day and peak hour demands must be adopted primarily to assure both quantity and quality of water.

#### **Procedure to be carried out as follows:**

1. Request chlorine granules to the store keeper including all the materials needed.
2. Drain reservoir to get rid of accumulated silt and debris followed by cleaning and scrubbing of concrete walls and flooring.
3. Dissolve 4.20 kg. of 70% of Calcium Hypo-chlorite powder in 400 liters of water to obtain a 50 mg/l dose for disinfection. Then, place the solution in a plastic container similar to container used in drip type chlorination with an outlet at its side to draw its contents.
4. Close the drainage water line and start filling reservoir until its overflow on each chamber for the sustainable, safe and clean water supply.
5. Measure chlorine residual after disinfection at any service connection line for completing the procedure and the assurance of safe water.
6. Complete cleaning and disinfection is recommended weekly of operation or it depends upon the weather condition.
7. Replace discharge screen annually to avoid entering debris and leave into the discharge pipe for clog-up.

### CONCRETE GROUND RESERVOIR FOR CLEANING & DISINFECTION

Reservoirs are so designed to operate with source supply and demand correspondingly, and should be capable of supplying the incremental difference between the maximum day and peak hour demands must be adopted primarily to assure both quantity and quality of water.

#### **Procedure to be carried out as follows:**

1. Request chlorine granules to the store keeper including all the materials needed.
2. Open manhole and closed inlet & outlet gate valve for one chamber.
3. Drain reservoir to get rid of accumulated silt and debris until reservoir tank is empty.
4. Closed drainage plug and open inlet valve and full the reservoir and drain after 24 hours.
5. Mixed water and two (2) kg of chlorine granules for disinfection then drained.
6. Closed the drain plug and open inlet valve until the water flow continuously for complete recovery of flowing water passing thoroughly to the concessionaires then closed the manhole.

## CHLORINE DISINFECTION

This section details the procedures for using chlorine safely as a disinfectant and the methods of calculating the chlorine dosages required in the water system.

### **1. GENERAL**

This disinfection is necessary to ensure that drinking water is free from disease-causing microorganisms. Water disinfection means the removal, deactivation or killing of pathogenic<sup>2</sup> microorganisms. Disinfection is often universally employed by water distribution systems, even when water at the source is deemed already potable – as a precautionary measure to control the spread of waterborne diseases. In Level III Systems, this precaution is particularly important because of the risk of contamination due to breaks and other types of seepages anywhere throughout the extensive pipe network, and the magnified impact of the risk due to the number of users.

### **2. CHLORINE DISINFECTION (CHLORINATION)**

Chlorination is the process of adding the element chlorine to water to make it safe for human consumption as drinking water. Chlorine (and its compounds) is the most widely used disinfectant for water systems because of its effectiveness, cheap cost and availability.

Chlorination has the advantage of oxidizing bacteria and virus even after the point of application due to its residual action. Hence any bacteria introduced to the system after the point of chlorination can still be eliminated by the residual chlorine in the water.

### **3. DETERMINANTS OF CHLORINE EFFECTIVENESS**

1. **Contact Time (CT & Dosage)** – refers to the period of time allowed for disinfectant to react with the microorganisms that may be in the water. Dosage refers to the amount of chlorine infused in relation to the volume of the water being treated.
2. **The Type of Microorganisms** – Chlorine is quite effective in destroying the most significant pathogenic organisms that are dangerous to humans and are commonly borne in water. Different pathogens and parasites, however, have different levels of resistance to it. Thus, the dosages, the CT, and other conditions of the water that intensify or inhibit the oxidizing action of chlorine such as temperature and pH (acidity or alkalinity) need to be considered in order to be sure that the harmful organisms and undesirable substances are eliminated.
3. **Characteristics of the Source Water** – The nature of the water that requires treatment influences and disinfection. Materials in the water, for example, iron, manganese, hydrogen sulphide, and nitrates often react with disinfectants, effectively increasing the chloride demand. Turbidity of the water also reduces the effectiveness of disinfection.
4. Usually, the tests on the water from a new source are the basis for prescribing the dosage and CT needed to eliminate the harmful and undesirable substances. Additional tests on the water at source need to be conducted when there are indicators that the source water characteristics have changed. The possibility of contaminants (whether pathogens or minerals that change its acidity or turbidity) in the path of the water or in the proximity of the spring box or reservoir need to be checked.
5. **Temperature of Water** – Higher temperatures usually increase the speed of reactions and or disinfection.

#### 4. TERMINOLOGY AND DEFINITIONS


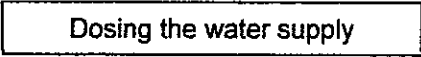
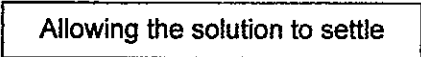
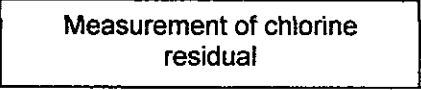
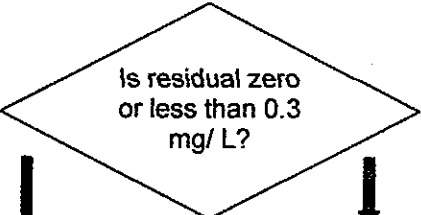
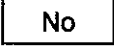

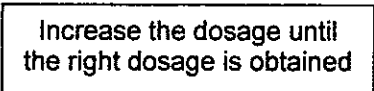
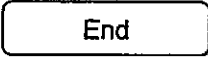
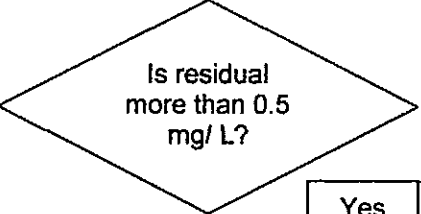

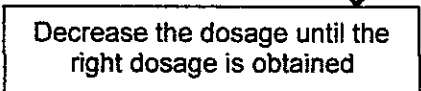
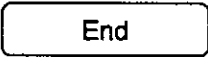
1. **Available Chlorine Content** – is the amount of chlorine in a chlorine compound, which determines its potential disinfecting power.
2. **Chlorine Demand** – is the total amount of chlorine needed to oxidize all the materials in the water that react with chlorine within a given period. After all the reactions within that period are completed, the pathogens and undesirable organic substances, as well as the soluble iron, manganese and hydrogen sulphides are deemed to have been destroyed, neutralized, or eliminated. Chlorine demand is the difference between the amounts of chlorine added to water and the amount of residual (remaining) chlorine at the end of a specific contact period. If no residual chlorine is detected, it means that the chlorine demand was so great it exhausted the chlorine; thus the chlorine infused into the water (dosage) was sufficient.
3. **Chlorine Residual** – is the total amount of chlorine (combined and free available chlorine) remaining in water at the end of a specific contact period following the infusion of chlorine. The chlorine residual is an important indicator of safe water because as long as the residual Chlorine is present in the water disinfection is a continuing process.
4. **Dosage of Chlorine** – is the quantity of chlorine applied to a specific quantity of water, Dosage is expressed in milligram per liter (mg/l) of chlorine.
5. **Dosage Rate** – is the amount of chlorine applied per unit time. It is usually in grams/ day or kg/ day.
6. **Superchlorination** – this means applying chlorine at very much higher than the usual dosages. If a system design or requirements do not allow adequate contact time for the normal dosages of chlorine to eliminate the pathogens and undesirable substances in the water, superchlorination could be resorted to. Superchlorination provides a chlorine residual of 3.0 – 5.0 mg/l, which is 10 times the recommended minimum breakpoint chlorine concentration<sup>a</sup>. Retention time for superchlorination is approximately 5 minutes.
7. **Dechlorination** – removes excessive levels of chlorine from the water. Dechlorination is considered a necessary phase after superchlorination in order to remove the odor, taste and the other objectionable traces of excessive chlorine to the water. Dechlorination commonly involves the use of an activated carbon filter.
8. **Shock Chlorination** (dosage of 200 mg/l for 3–4 hours) is recommended whenever a spring box or impounding dam, reservoir or pipeline is new, repaired, or found to be contaminated. This treatment introduces high levels of chlorine to the water. Unlike superchlorination, shock chlorination is a "one time only" occurrence, and a chlorine is depleted as water flows or is flushed through the system. If bacteriological problems persists following shock chlorination, the source of the contamination of the system should be determined and eliminated.

#### 5. CHLORINE DOSAGE AND DEMAND

There are two ways of determining the chlorine dosage.

##### Method 1:

1. Dose the water supply with an arbitrary amount, say 1 mg/l.
2. Wait for 30 minutes and measure the chlorine residual.
3. If residual is zero or less than 1.2 mg/l, increase the dosage until the right residual is obtained.
4. If residual is more than 0.5 mg/l, then the dosage can be reduced.

Activity	Person Responsible	Details
	Chlorine operator	
	Chlorine operator	Chlorine operator doses the water supply with an arbitrary amount of chlorine, say 1 mg/L.
	Chlorine operator	Wait for 30 minutes.
	Chlorine operator	The Chlorine operator on-duty measures the chlorine residual.
	Chlorine operator	If the chlorine residual is zero or less than 0.3 mg/L, increase the dosage until the right dosage is obtained.
		
		
		
		
		If residual is more than 0.5 mg/L, decrease the dosage until the right dosage is obtained.
		
		
		

**Method 2:**

Use a 1% 1% chlorine solution<sup>2</sup> to conduct the following procedures:

1. Prepare a 1% chlorine solution, the quantity depending upon type of chlorine used (see Table 1 below);
2. Take 3 or 4 non-metallic containers of known volume (e.g. 20 liters buckets);
3. Fill the containers with some of the water to be treated and check the pH of the water;
4. Add to each bucket a progressively greater dose of 1% solution with a measuring device:

5. Wait 30 minutes. (This is essential as this is the minimum contact time for the chlorine to react. If the pH of the water is high, this minimum time will increase);
6. Measure the free chlorine residual in each bucket;
7. Choose the samples which shows a free residual chlorine level between 0.3 mg/l and 0.5mg/l;
8. Extrapolate the 1% dose to the volume of water to be treated;
9. Check chlorine demand at several water distribution points and adjust if required.

## 6. CHLORINE/ CHLORINE COMPOUND USED IN DISINFECTION

1. **Chlorine** – chlorine is a poisonous yellow-green gas with a penetrating pungent odor. It is extracted from chlorides through oxidation and electrolysis. In water, chloride (chlorine compounds) hydrolyses to form hypochlorous acid and the hypochlorite ion (free available residual chlorine), which are very toxic to bacteria.
2. **Bleaching Powder or Chlorine of Lime** – Bleaching powder or calcium hypochlorite is a yellow white solid which has a strong smell of chlorine. It is not highly soluble in water, and is preferably used in soft to medium-hard water. Bleaching powder losses strength rapidly whenever it is exposed to moist air so that it should be kept in closed containers.
3. **High-Test hypochlorite (HTH)** – it is more stable and stronger compound than bleaching powder.
4. **Sodium hypochlorite (NaOCl)** – This is a highly corrosive, slightly yellow liquid. It is used extensively in many industries as a disinfectant, deodorizer, bleach, and to neutralize certain undesirable chemicals and compounds used or formed in productions processes. For households, it is supplied as the common household bleach.

Table 1 shows the percent available chlorine of various chlorine compounds

TABLE 1 PERCENTAGE OF AVAILABLE CHLORINE

Material	Available Chlorine	Quantity to Make a Liter of 1% Chlorine Solution
Chlorine Gas	100%	-
Calcium Hypochlorite	70-74%	14 grams
Bleaching Powder	34-37%	30 grams
Sodium Hypochlorite (HTH)	12-15%	80 grams

Liang Water District uses hypochlorination or injecting of chlorine solution into the water. Granular chlorine or calcium hypochlorite is utilized in this disinfection process due to the following reasons:

1. It has longer shelf-like and keeps its full strength almost indefinitely as long as it kept in a closed and dry container.
2. Calcium hypochlorite contains 70% usable chlorine thus, less storage space is needed and
3. Although all forms of chlorine are dangerous if handled carelessly, granular chlorine will not spill or splash thus, poses less danger to the handlers' eyes, skin or clothing.

## 7. CHLORINE DOSAGE

The commonly used dosages for various disinfection requirements are as follows:

1. For disinfection of water supplies:
  - Dosage: 0.5 – 2.0 mg/l
  - Contact Time: 20 – 30 minutes



2. For disinfection of newly constructed/ repaired storage tanks, pipelines, spring box, etc.:
  - Dosage: 50 mg/l
  - Contact Time: 24 hours
  - Dosage: 300 mg/l
  - Contact Time: 1 hour

**3. Sample Calculations:**

To clearly illustrate the calculation proportions, dosage and feed rates, numerical values is being used in this manual. It should be noted that each pump station uses different values as their flow vary and this may vary from time to time depending on the pump's flow rate.

Supposed it is desired to inject a 2 percent solution of calcium hypochlorite to a flow of 100 l/s at a dosage rate of 1.0 mg/l. Find the amount of calcium hypochlorite and volume of water required for a 24-hour supply and determine the feed rate setting of the hypochlorinator.

1. Required amount of available chlorine:  
 = 1.0 mg/l x 50 l/s x 3600 sec/ hr x 24 hr  
 = 4,320,000 mg or 4.32 kg/ day
2. Required amount of calcium hypochlorite:  
 Note that calcium hypochlorite contains only 70 percent available chlorine,  
 Hence,  
 = 4.32 kg/0.70  
 = 6.17 kg
3. Required water:  
 = 4.32 kg available chlorine x 98 kg/2  
 = 211.7 kg or 2.11.7 liters

Therefore, it would be necessary to mix 6.17 kg of calcium hypochlorite in 211.7 liters of water. It can be rounded off to 6.25 kg of calcium hypochlorite and 225 liters of water resulting in a negligible error in dosage rate (1.0 mg/l vs. 1.0 mg/l)

4. Required Feed Rate of solution:  
 Feed Rate  
 = 231.25 kg solution/ day x day/ 24 hours  
 = 9.6 kg/ hour

**8. WATER QUALITY**

The sole product of the water district is water and it is mandatory for this product to meet at least the minimum standard specified by the PNSDW. The water district is required to have a sample of its water tested by an accredited DOH laboratory for bacteriological presence at least once a month. Should a sample test positive for coli forms, the Utility must immediately have a re-sampling done and, without waiting for the results, take the actions needed to determine the possible source or contamination in order to eliminate the cause.

Where the sampling method indicates that customers are at risk of using unsafe water, the water district itself must take measures to warn its customers to take the necessary precautionary measures, such as boiling their drinking water before using, until there is assurance that the risk has been eliminated.

In case of a second positive testing, the LIWAD would consider suspension of operations until the problem is solved, and if this is not possible, it would reinforce its advisory to all customers to boil their drinking water until they receive notice that the problem is solved.

The LIWAD's responsibility for safe water makes it imperative to eliminate harmful organisms by some means, of which the standard is treatment with chlorine, as thoroughly discussed. As part of its routine water quality maintenance procedures, the water district should routinely, on a daily basis, take readings of chlorine residuals at different distribution points using a chlorine comparator.

### 1. MICROBIOLOGICAL INDICATORS FOR 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 fill 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 of organisms specifically associated with 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. Really 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).

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 (PNSDW 2007).

#### Water Sampling and Analysis for Microbiological Quality

To guarantee safety and acceptability of drinking water supply, Lianga Water District carries out sampling of its water and submits it to Southern Philippines Medical Center (SPMC) laboratory for microbiological analysis. Careful sampling point determination is employed to ensure that water samples are representative of the water throughout the system. Sampling points include but not limited to tapping sources, storage tanks, and consumer taps. Sampling is done twice a month. The following are the methods of detection and the standard values being observed:

TABLE 2 METHODS OF DETECTION AND STANDARD VALUES BEING OBSERVED BY LIANGA WATER DISTRICT

Parameters	Method of Determination	Value	Units of Measurement
Total Coliform	Multiple Tube Fermentation Technique (MTFT)	<1.1	MPN/ 100 ml
Fecal Coliform	Multiple Tube Fermentation Technique (MTFT)	<1.0	MPN/ 100ml
Heterotrophic Plate Count	Pour Plate Method	<500	CFU/ ml

Furthermore, Lianga Water District complies with the prescribed standards in Total Coliform as indicated in Table 3.

**TABLE 3 STANDARDS IN TOTAL COLIFORM**

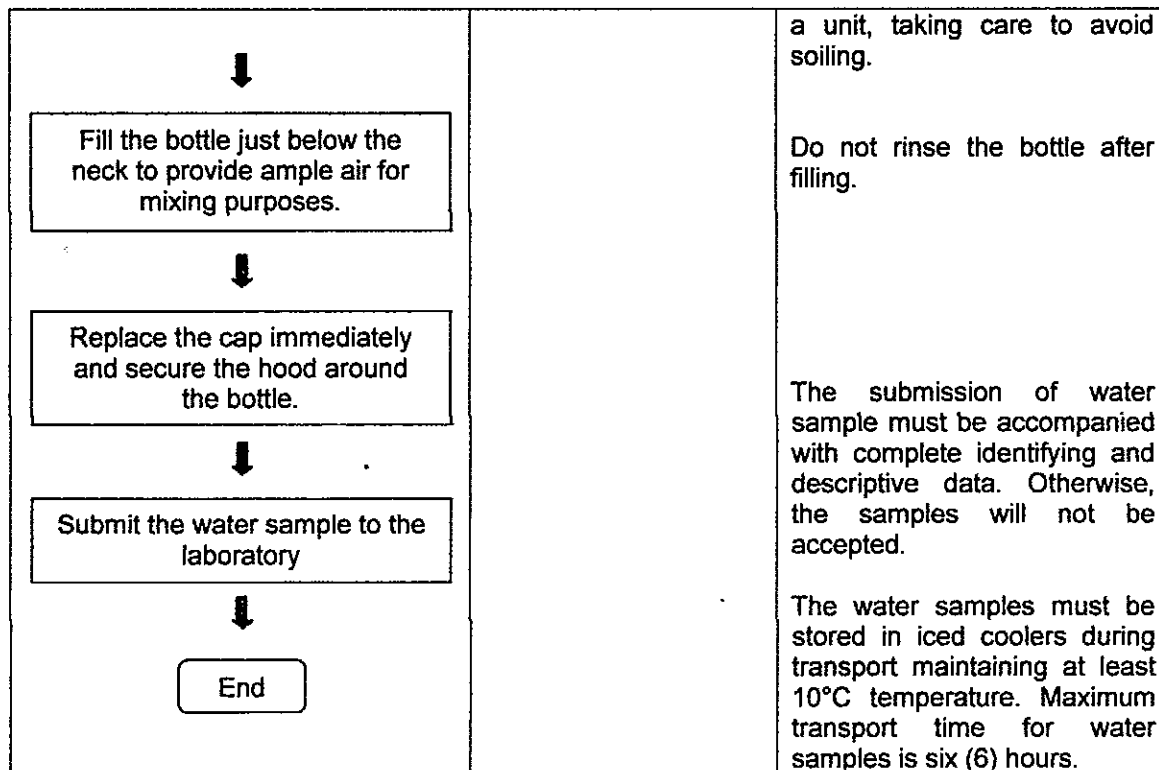
<b>Compliance to Total Coliform</b>	<b>Point of Compliance</b>
For water systems analyzing at least 40 samples per month, no more than 5% of the monthly sample may be positive for total coliform	Consumer's taps
For water systems analyzing fewer than 40 samples per month, no more than one (1) sample per month may be positive for total coliform	
At least 90% of standard samples taken in each year from each reservoir are total coliform negative	Service reservoir
No standard sample taken each month should exceed maximum allowable value specified in the above	

Procedure for Water Sample Collection

The sample should be representative of the water under examination. Contamination during collection and before examination should be avoided. Lianga Water District adheres to the protocol set by SPMC laboratory in sample collection: viz:

1. The sampling bottle should be kept unopened until the moment it is filled. Care must be exercised to take samples that will be representative of the water being tested and to avoid contamination of the sample at the time of collection and in the period before examination.
2. Flame the top for 2-3 minutes.
3. Open the tap fully and allow the water to run to waste for 2 to 3 minutes.
4. Restrict the flow from the tap to one that will permit filling the bottle without splashing.
5. Hold the bottle near the base, remove the cover and head as a unit, taking care to avoid soiling.
6. Do not rinse the bottle. Fill it just below the neck to provide ample air space for mixing purposes.
7. Replace the cap immediately and secure the hood around the neck of the bottle.
8. Submit the water sample immediately after collection to the laboratory accompanied by complete and accurate identifying and descriptive data. Samples not so identified will not be accepted for examination.
9. The use of iced coolers for storage of water samples during transport to the laboratory is a must. The temperature should be held below 10°C during maximum transport time of six (6) hours.

Activity	Person Responsible	Details
<div style="border: 1px solid black; border-radius: 10px; padding: 5px; width: fit-content; margin: 0 auto;">Start</div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Flame the top of sample bottle for 2-3 minutes.</div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Open the tap fully and allow the water to run waste for 2-3 minutes.</div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Hold the bottle near the base.</div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Remove the cover and head as a unit.</div>	Water Utilities Development Officer-B (WUDO-B)	The sampling bottle should be kept unopened until the time it is filled. Care must be exercised by the employee concerned to take samples to avoid contamination.  In opening the tap, the water sample collector must restrict the flow from the tap that will permit filling the bottle without splashing.  The water sample collector will remove the cover and head as



### Frequency of Sampling

The number of water samples to be collected and examined depends on the population served. Table 4 shows the minimum frequency of sampling for drinking water supply systems for microbiological examination.

Source and Mode of Supply	Population Served	Minimum Frequency of Sampling
Level I	90 – 150	Once in three months
Level II	600	Once in two months
Level III	Less than 5,000	1 sample monthly
	5,000 – 100,000	1 sample per 5,000 population monthly
Emergency Supplies of Drinking Water		Before delivery to users
Water Refilling Stations (product water)		1 sample monthly
Water Vending Machines		1 sample monthly

### Selection of Sampling Point Location

PNSDW sets the guidelines for selecting the location of sampling points as follows:

#### **1. 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 the distribution system operates at different pressures and elevations and an area where leakage or reliability is different in different parts of the system.

### **1.1 Point source**

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

For routine monitoring, boreholes or deep wells 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 development understanding of the process causing water quality failure and this the appropriate interventions required to improve the source.

### **1.2 Selection of Sampling Sites**

When the samples locations and frequencies of sampling visits have been calculated, the final stage is the selection of sampling sites. Sampling sites will usually be taken as being representative of a wider area. Sample 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 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)

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

## **2. Primary Health Care (PHC) Test and Analysis**

Aside from the monthly quantitative microbiological analysis of water samples which is done in an accredited laboratory, LIWAD also conducts periodic water sampling and analysis through the use of Primary Health Care (PHC) Test. PHC Test is a rapid 24-hour qualitative analysis of water samples. PHC is a laboratory prepared media that test presence or absence of bacteria in samples through 24-hour observation. If water sample inside the clear bottle does not react with the media and remains yellow, water sample is clear or negative. If water turns black or the media turns black, it is positive of bacteria.

### *Procedure for Water Sample Collection*

1. Keep sampling bottle unopened until the moment it is filled.
2. Take samples that will represent the water being tested.
3. Avoid contamination of the sample during collection and examination.
4. Open the tap fully and allow the water to run to waste for 2 to 3 minutes.
5. Restrict the flow from the tap to one that will permit filling the bottle without splashing.
6. Hold the bottle near the base, remove the cover and head as a unit, taking care to avoid soiling.
7. Do not rinse the bottle. Fill it just below the neck to provide ample air space.
8. Replace the cap immediately.
9. Label the sample as to location, date and time of collection.
10. Samples must be kept in room temperature during the 24-hour observation time.
11. Examine samples periodically – after 12 hours, 18 hours and 24 hours from collection. Take note of your observation (s).

12. Fill forms of Bacteriological Analysis (Method of Sampling – PHC)
13. Submit accomplished forms to supervisor.

### 3. Chemical and Physical Quality

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.

#### Water Sampling for Chemical and Physical Analysis

The actual collection of the water sample is a matter of considerable importance. Selection of Sampling Point location is same as microbiological quality. 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 procedure should be observed:

1. Collect samples directly from spring/ creek sources. 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 catch sample can be collected, it is best to take it in the middle of the stream and mid-depth.
2. 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.
3. 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 the flow.
4. Samples of oil films recovered from the surface of stream or other bodies of water will be almost impossible to evaluation 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 should not be completely filled, as loss 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.

#### Minimum Frequency of Sampling

The minimum frequency of sampling for drinking water supply systems for physical and chemical analysis is provided in table 5.

**TABLE 5 MINIMUM FREQUENCY SAMPLING FOR DRINKING WATER SUPPLY SYSTEMS FOR PHYSICAL AND CHEMICAL ANALYSIS**

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

#### Sample Container

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

1. Chemically resistant glass (Pyrex), polyethylene, or hard rubbers are suitable materials for containers. 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.

1.1 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.

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

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).
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 to the fluid.
4. Sample containers must be properly labelled. 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)

#### Sample Handling and Storage

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

- 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.
- Changes caused by the growth of organisms may be greatly retarded by keeping the sample in the dark and at low temperature until it can be analyzed.
- It is necessary to keep the samples cool or refrigerated. Storage at a low temperature (4°C) is the best way to preserve more samples.
- 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 the Philippine National Standards of Drinking Water (PNSDW) 2007.

#### DISTRIBUTION SYSTEM

The O & M of a water distribution system is directed at the following general objectives:

- To ensure adequate pressure in the system 24/7;
- To minimize non-revenue water (NRW);
- To ensure that the water delivered is potable

The distribution system consists of four components, whose O & M requirements are based on their unique characteristics as well as their function and contribution to the total system.

They are:

- a. Distribution pipelines
- b. Storage tanks and reservoirs
- c. Service connections and standpipes
- d. Valves and other appurtenances

## 1. DISTRIBUTION PIPELINES

### **SOUND OPERATION PRACTICES**

Properly constructed, pipelines can provide years of trouble-free operations. However, sound operation practices need to be observed, both to ensure water quality and to prevent the deterioration of pipeline efficiency. Sound operation practice can be summarized as follows:

- 1.1 Always maintain positive line pressure. Negative pressure could result in backflow from private storage and the intrusion of foreign water/ matter that may pollute or contaminate the system.
- 1.2 Always open and shut off valves gradually. Abruptly opening or shutting off a valve can cause sudden surge, changes in water velocity, and reversals or flow that might produce water hammer effects that could stir up sediments, making the water dirty, and damage valves and weaken THE PIPE JOINTS.
- 1.3 Implement an appropriate flushing program to clear sediments from the system. Such a program should institute the regular, periodic flushing of the pipes, as well as prescribe the maintenance measures for those sections of the system that are more prone to sediment build-up, such as dead-end pipes and low sections. These sediment-prone sections should be pre-identified and, if needed, provided with additional blow-offs and hydrants to facilitate flushing and disinfection.

### **LOCATING WATER MAINS**

The exact location of pipes can be determined by referring to records or as-built plans of the water supply system. In cases where records are inadequate or lost, underground pipes might be pinpointed:

- By asking old residents who witnessed their installation;
- By using pipe locators;
- By trial excavation.

#### **Plan of the Distribution Facilities**

Ideally, the local water district should have a clear, detailed plan of its distribution facilities, as well as information about the appurtenances like valves. If a pipeline problem is reported, the first thing to do is to ascertain the exact location of the main involved.

Without a plan of the distribution facilities, the repair crew will have to take the extra step of locating the main where the problem has occurred, before it can start the repairs.

#### **a. Locating Pipes with Pipe Locators**

The position of water mains can easily be pinpointed with the use of a pipe locator. A small water utility, however, is unlikely to own this very expensive piece of equipment. It may have to rent one, unless it can be borrowed from a government agency that has one.

#### **b. Locating Pipelines by Trial Excavation**

1. In the vicinity of the reported problem, select a primary reference point that you can use to establish the position of the problem pipeline. An exposed pipe section, a gate valve, or gate valve box would be a good primary reference point;
2. Where there is no exposed piped section, select any point on the north or east side of the road and make an excavation. In the Philippines, water mains are usually installed at the north or east side of the road;



3. If a water main is not found at the first point excavated, try again at another point on the north or east side of the road with the same vicinity. Continue the trial and error process until a water main is located;
4. Using the water main just located as reference point, select a second point 50 to 100 meters from it and make another excavation;
5. Once a second excavation point reveals the water main, draw an imaginary line connecting the successful excavation points 1 and 2. The connection of the two points is the exact position of the buried pipe;
6. Repeat the above process using the identified points as reference until all pipelines are pinpointed.

### **CLEANING PIPELINES**

Water going through the pipelines may sometimes carry sand, sediments, and organic and other objectionable matter. When water velocity is low, these tend to get deposited and build up inside the pipes. The build-up deposits decrease the carrying capacity of the pipes and increase internal friction, making the pipelines less efficient. Less water can be delivered per given time, pumping costs increase, and the added and uneven pressure within the pipelines increases the likelihood of breaks and leaks. These effects are complicated when magnesium and calcium salts are present in the water (hard water), as their precipitation results in scaling inside the pipes. Likewise, when organic matter is present in the deposits, bacteria proliferate, causing undesirable odors, and an off-taste and color in the delivered water.

The method for removing solids which are not cemented to the inside surface of pipes is to flush with water at high velocity. Annual flushing is generally sufficient to maintain the pipelines clean. (But note that different water and pipe materials may need a different schedule). Dead end pipes should be flushed and disinfected at least once a year. Furthermore, whenever mains are opened for repair, they should also be flushed and disinfected.

The flushing procedure is as follows:

- 1.1 Isolate the water mains to be cleaned by closing the appropriate control valves;
- 1.2 Empty the water mains by opening the blow-off valve or other temporary outlet at the lower end of the pipelines. In some cases, to expedite the emptying of water mains without pumping, compresses air may be introduced at the highest point of the isolated system;
- 1.3 Inject water at high-induced velocity (1.0 meter per second or higher) until the objectionable materials are expelled;
- 1.4 As needed, disinfect the pipelines. After disinfection, flush the pipeline with clean water until the chlorine-odor is hardly detectable;
- 1.5 Put pipelines back to operation.

### **Conditions that require Frequent Flushing**

When recurring complaints about water quality are received despite regular flushing, the LWD should investigate the possibility that stagnant water in dead end lines may be the cause. It should determine and eliminate conditions that make repeated flushing necessary, among them: (a) a dead end or low point in the main that allows sediment to accumulate; and (b) insufficient chlorination, which enables slime organisms to grow inside the pipes.

Activity	Person Responsible	Details
<pre> graph TD     Start([Start]) --&gt; Isolate[Isolate the water mains]     Isolate --&gt; Empty[Empty the water mains]     Empty --&gt; Inject[Inject water at high induced velocity until chlorine-odor is hardly detectable]     Inject --&gt; Disinfect[Disinfect the pipelines as needed]     Disinfect --&gt; Flush[Flush the pipeline with clean water]     Flush --&gt; Operate[Put pipelines back to operation]     Operate --&gt; End([End]) </pre>	<p data-bbox="782 168 1069 257">Water Resources Facilities Tender (WRFT)</p>	<p data-bbox="1085 302 1468 380">The employee isolates the water mains by closing the appropriate control valves.</p> <p data-bbox="1085 414 1468 660">The employee empties the water mains by opening the blow-off valve or other temporary outlet at the lower end of the pipeline. In some cases, to expedite the emptying of water mains without pumping, compressed air may be introduced at the highest point of the isolated system.</p> <p data-bbox="1085 739 1468 795">The employee disinfects the pipelines as needed.</p> <p data-bbox="1085 873 1468 952">Flushing of pipelines with clean water will be done until the chlorine-odor is hardly detectable.</p>

## REPAIRING PIPE LEAKS

Leaks in water mains should be fixed as soon as they are detected. Once the leak is pinpointed, the water in the isolated main must be removed (see items #1 and #2 of flushing procedure above). The repair job then consists of sealing the leaks and/ or replacing the defective pipe section. The different methods of fixing leaks are as follows:

### a. Using Epoxy (for Small Leaks)

1. Dry the surface of the area to be repaired;
2. File the surface to make it rough, and slightly enlarge the crack or hole;
3. Apply the epoxy, forcing some of it into the crack or hole to produce a seal;
4. Normally, the epoxy will set in 2 to 4 hours before the pipe can be disinfected and put back into service, however, be sure to check the directions for use of the epoxy as some types may require more or less time.

### b. Using Sleeve Type Coupling

Put a split sleeve/ repair clamp around the leak opening.

### **c. Using Strips from the Inner Tube ("Interior") of a Rubber Tire**

In emergency work when no other repair materials are available, cut a discarded inner tube of a rubber tire into strips and wind the strong, flexible rubber strips tightly around the pipe to cover the leak and its surrounding surfaces.

### **d. After the Leak is Repaired**

1. Open the control valve or allow water to flow into the repaired section;
2. Observe carefully to verify if the leak is completely sealed;
3. After sealing, backfill the excavation and restore the surface to its former condition;
4. Apply the disinfection procedures.

## **REPLACING DAMAGED SECTIONS OF PIPELINES**

When the damage in a certain section of a water main is extensive, repair may involve cutting off and replacing the damaged section. The procedures for repairs are as follows:

### **a. For Galvanized iron (G.I.) Pipes**

1. Isolate the defective section by closing appropriate control valves;
2. Excavate the water main;
3. Determine the exact location of the leak;
4. Cut the defective portion of the water main;
5. If a nipple of appropriate length is not available, prepare a substitute nipple using a short pipe of the same kind, diameter and length as the cut off defective pipe;
6. Thread the ends of pipe to be joined;
7. Install G.I. coupling and union parts;
8. Assemble them as shown in Figure 6.1;
9. Open the control valve to allow water to flow into the repaired section. Observe carefully if the repaired section is not leaking;
10. If there is no more leak, backfill the excavation and restore the surface to its former condition;
11. Disinfect the repaired section.

### **b. For Polyvinyl Chloride (PVC) Pipes**

1. Isolate the defective section by closing appropriate control valves;
2. Excavate the water main;
3. Pinpoint the leak;
4. Measure and cut the defective portion of the pipeline. The length of the pipe cut should have an equivalent commercially available threaded nipple;
5. Install the PVC socket and adaptor union;
6. Join the two cut portions of the water main with the nipple in between. (In case PVC threaded nipple is not available, use the equivalent G.I. threaded nipple);
7. Open the control valve to allow water to flow into the repaired section and observed if it is not leaking;
8. If there is no more leak, backfill the excavation and restore the surface to its former condition;
9. Disinfect the repaired section.

### **c. For Polybutylene (PB) and Polyethylene (PE) Pipes**

1. Isolate the defective section by closing appropriate valves and excavate main;
2. Cut the defective portion of the water main;
3. Check if the two separate ends of the cut can be pulled together to be joined. (This is usually possible because PB and PE pipes are laid in serpentine fashion as shown in Figure 6.2.) Otherwise, a small connecting section must be inserted;

4. Join the 2 separated ends. For PB, use the flaring method. For PE pipes, use the butt-welding method;
5. Open the control valve to allow water to flow and observe for leaks;
6. Backfill and restore surface to its former condition;
7. Disinfect the repaired section.

## 2. STORAGE TANKS AND RESERVOIRS

### **OPERATION**

Water for distribution is pumped from the water source to the system's water tank or reservoir, from which it is delivered to the consumers through the pipelines. The reservoir is designed, based on the requirements of the system, to distribute the water by gravity or by pumping.

### **CLEANING**

The quality of water coming from the reservoir must be maintained within the standards for potable water. To ensure the quality of the water supply, the reservoir must be cleaned and disinfected periodically. Failure to apply this routine will result in the accumulation of solids and proliferation of bacteria in the tank, making the water unsafe for drinking.

### **GENERAL PRECAUTIONS**

1. Storage facilities tend to attract children who like to play around the facilities, climb the ladders, and play on top of concrete roof, oblivious of the serious hazards involved. All gates, access hatches and manholes of reservoirs should be locked. Never leave a storage facility for even a few minutes without locking all access openings.
2. Vandals are known to intentionally damage storage facilities. Utilities should keep watch against vandalisms to protect the stored water and the public from health hazards. If a covered storage facility is found to have been forced open, it must be assumed that the water has been contaminated. Therefore the reservoir should be drained to waste and disinfected before being refilled with new water. All fences should maintain in good condition. Do not allow any materials to be staked out on fences, as these could aid trespassers to climb over.
3. Keep reservoir roof ladders and walkways free of dirt, debris and grease to prevent slipping contamination.
4. Never enter a closed reservoir alone without someone standing by to help if you get in trouble.
5. Keep alert for cracks/ leaks in the reservoir and repair these at once.
6. Never store unchlorinated water in a reservoir for more than 72 hours.
7. The foundations of concrete reservoirs and elevated steel tanks are subject to differential settlement when the soil beneath one part of the foundation compresses more than the soil at another part. A differential of only 1-2 cm can cause large stresses in the reservoir wall or legs. When differential settlement is discovered, corrective measures are urgent. These require the services of a soil engineer and special equipment.

## 3. SERVICE CONNECTIONS

In general, domestic meters should be taken out of service every 5 to 7 years and completely overhauled. The systematic inspection and replacement of consumption meters is an important aspect of routine maintenance. Records should be kept on the condition of meters to guide future procurement and enable the water district to take measures against water loss.

### **INSPECTION OF WATER METERS**

1. Clean all water meter parts thoroughly;
2. Make sure the gear train runs freely;
3. Check the action of the disc in the chamber;
4. Remember that friction is just as detrimental to correct registration (reading) as slippage;

5. Store meters away from heat;
6. Newly purchased water meters shall undergo and pass the standards of water meter calibration as follows:

	Discharge (Q)	Allowable Percent
Nominal	150 L/hr	+2% to -2%
Transitional Flow	120 L/hr	+2% to -2%
Minimum Flow	30 L/hr	+5% to -5%

7. If 20% or less of the water meters failed the standard calibration, the said water meters shall be returned to the supplier for replacement. However, if more than 20% of the water meters did not pass the standards of water meter calibration, all meters delivered shall be returned to the supplier.
8. Water meters that passed the test will place under the custody of GSO and shall be ready for issuance.
9. The storekeeper shall record the brand, size, serial number and meter reading of the water meter before issuance.
10. The engineering Division shall be responsible for the installation of issued water meters.
11. Once the water meter is installed, the concessionaire shall be the one responsible for the water meter.

#### 4. VALVES

Valves and public faucets are flow control devices in the water distribution system. Their useful life depends to a large extent on the manner they are operated and maintained.

Valves installed in a small water supply system may be manual or automatic. The valves commonly used are the manual type. Globe, gate, angle and blow-off valves are manually operated, while check, air vacuum, foot and float valves regulate the flow of water automatically.

Prior to system operation, all manually operated valves should be located and data recorded on the direction of opening and number of turns to either close or open each one.

The operability of air release valves, special valves and other appurtenances with mechanical components must be checked twice a year.

#### VALVE OPERATION

- 1.1 Valves operated manually should be opened all the way, then closed one-quarter turn of the hand wheel to prevent the valve from sticking in the open position;
  - 1.2 Valves should be opened and closed slowly at an even rate to reduce the risk of water hammer;
  - 1.3 Unless otherwise indicated, valves are opened by turning the hand wheel or key
- a. **To check whether a valve is operational or not**
    1. First close the valve completely and then open it completely;
    2. Back off on the valve about one turn to avoid locking it in an open position; and
    3. If the valve does not operate properly, repair or replace at once.
  - b. **Things to check**
    1. Ensure that the valve boxes are not full of mud or debris, or become buried;
    2. Inspect the valves for leaks around the valve stem;
    3. Ensure that the valve handles are intact;
    4. Ensure that each valve can be fully opened and fully closed;
    5. Record the inspection date, whether the valve is right-or-left-handed, and whether it is normally CLOSED;
    6. Record any needed repairs or replacements.

## COMMON CAUSES OF FAILURE AND THEIR REMEDIES

### a. Corrosion

If valves are not operated or lubricated for a long time, they may become inoperable due to corrosion. If the corrosion damage is not extensive, the valve may be made operable again by pouring kerosene or dilute lubricating oil down the valve key to lubricate the joint between the stem and packing. However, if the valve is still inoperable after this procedure, it should be replaced.

### b. Closing the Valve Too Tightly

Closing the valve too tightly may damage the valve washer, the valve seat, or the threads of the valve stem, causing the water to leak. To solve this problem, it is suggested to put markers showing the direction of opening and closing and to close the valve just tight enough to stop the flow of water.

### c. Worn-out Washer or Loose Packing

Worn-out washers or loose packing should be replaced to prevent the loss of water.

### d. Cavitation

Cavitation results when a valve is left partially closed or open for a long period. Leaving a valve partially closed or open will cause a partial vacuum or void in the downstream side that may eventually be filled with low-pressure vapors from water. When these vapour pockets collapse, a mechanical shock (cavitation) is created, this may produce cavities. After some time, the valve will be destroyed and even the pipelines may be affected. Cavitation can be avoided by keeping the valves fully opened at all times.

### e. Water Hammer

Water hammer is caused by sudden closing of valves. When the flow of water is suddenly stopped, enormous pressure is created which may damage the pipe or valves. This problem can be prevented by closing the valve slowly.

## 5. HYDRANTS

Fire Hydrants are mainly used for fire protection. Other uses include flushing water mains and sewers, and filling tank trucks for street washing and tree spraying. Hydrants may also be used as temporary water source for construction jobs.

Hydrants should be inspected and tested by water utility personnel accompanied by a fire department representative. Hydrants can usually be maintained by replacing all worn parts and seats through the top of the hydrant. The operator is generally responsible for ensuring that the proper tools are used. Each year, the hydrant should be tested to ensure that the joints and fittings are tight.

### Procedures on executing flushing Fire Hydrant:

#### 1. Schedule regularly

Follow schedule regularly every last week of the month or it depends upon the condition of the weather if it is rainy season then automatically perform a flushing procedure.

#### 2. Prepare/Request tools needed

Prepare all the tools or materials needed; fire hydrant hose, pipe wrench, valve key & service vehicle for transportation then a maximum of two persons to perform the said operation.

### 3. Flushing proper

- Open the fire hydrant cap then flush immediately, use fire hydrant hose if it's necessary
- Topping of fire hydrant hose to its nozzle, perform this to avoid slippery/ flood to the said area
- Turn valve key to open the hydrant gate valve or check valve
- Hold the pipe wrench, record the time upon opening and let the water flow until turbidity water turns into clear water then record the time upon closing.
- Check the chlorine residual using comparator test kit. Then record the time and its reading.
- Turn back the valve key tools to the check/gate valve to turn off.
- Remove the fire hydrant hose from fire hydrant nozzle upon closing.
- Closed the nozzle cup and hydrant head properly or tightly.

### 4. Clean the area

- Clean the area or surroundings, remove grasses and debris to avoid leakage on it.
- Check gate valve packing to avoid leakage and entering the micro organism.

### 6. BLOW-OFF

#### **Procedures on executing flushing Blow - Off:**

##### **1. Schedule regularly**

Follow schedule regularly (twice a month) or it depends upon the condition of the weather if it's rainy season then automatically perform a flushing procedure.

##### **2. Prepare/Request tools needed**

Prepare all the tools or materials needed; fire hydrant hose, pipe wrench, valve key & service vehicle for transportation then a maximum of two persons to perform the said operation.

##### **3. Flushing proper**

- Hold the pipe wrench tools to blow-off plug or blow-off cap to open.
- Record the time upon opening.
- Hold & twist the gate valve for flushing until turbidity and sediments comes out and clear water comes in.
- Twist to close the gate valve and blow-off plug.

**Note:** Do flushing fire hydrant & blow-off regularly in order to provide clean and safe potable water to our concessioners.

### REDUCING NON-REVENUE WATER

Non-revenue water (NRW) is water that has been produced but does not result in revenues for the Utility. NRW may be due to "real losses" (as a result of leaks and wastage, sometimes called "physical losses") or "apparent losses" (for example through theft or metering inaccuracies). High levels of NRW are detrimental to the financial viability of water utilities, as well to the quality of water itself. NRW is typically measured as the volume of water "lost" as a share of net water produced.

#### **1. ANALYZING NRW LEVEL**

The Percentage NRW can be determined by the formula:

$$NRW (\%) = \left\{ \frac{\text{Production (m}^3\text{)} - \text{Billed Consumption (m}^3\text{)}}{\text{Production (m}^3\text{)}} \right\} \times 100$$

If NRW of a new system is more than 10%, or for an old system more than 25%, the Utility can benefit an NRW reduction program. To accurately determine the NRW, reliable and functional meters must be installed at all sources and service connections.

## **2. BETTER TO PREVENT THAN TO CURE**

For water supply pipelines, always remember that "an ounce of prevention is worth a pound of cure". If, in the first place, the facilities were not constructed properly, there is probably very little that can be done to reduce NRW. Therefore for pipeline installation, all materials should pass quality control/ testing and should undergo pressure tests prior to backfilling.

Many leaks emanate from service connections joints when installing service connections do not skimp on Teflon tape on threaded joints and inspect for leakage before backfilling.

## **3. BENEFITS OF NRW REDUCTION**

1. Financial gains for increased water sales or reduced water production, including possibly the delay of costly capacity expansion;
2. Reduced operational cost which will result in a lower tariff;
3. Increased firefighting capability due to increased pressure;
4. More consumers can be served, or longer operational hours;
5. easier to self increased tariffs; and
6. Reduced risk of contamination.

Leakage reduction may also be an opportunity to improve relations with the public and employees. A leak detection program can be made highly visible so that water conservation can be at the forefront in people's awareness. The reduction of commercial losses, while politically and socially challenging, can also improve relations with the public, since some consumers may reluctant to pay their water bills knowing that many others use services without being billed or being underbilled.

## **4. SOURCES OF NRW**

NRW can be analyzed on whether they are physical or actual losses due to commercial policies or deficiencies.

### **1. Physical Losses**

- Leaks/ breaks
- Illegal connections
- Water usage by water district (flushing, etc.)

### **2. Commercial Losses**

- Non-metered connections
- Under-registration of meters
- Poor collection performance

## **5. NRW REDUCTION APPROACHES**

A number of approaches have been used successfully by some of the major water utility companies. These can be adopted by the LWDs to control their NRW ratios.

1. Isolation of zones and the continuous measurement and analysis of inflows to determine areas with high NRW.
2. Programs to improve the reliability of customer metering and reading.



3. Hydraulic analysis of the distribution system to determine calculated versus actual pressures. (This requires updated system maps).
4. Analysis of maintenance records to determine what repairs have been done, where, and their frequency. This may lead to decisions to replace rather than repair some pipelines. (For this reason, it is important to inculcate among field personnel the value of clear, reliable reports, and to have a good-user friendly repository of records).
5. Leak detection programs. While there should be a continuing program of leak detection, periodic high-visibility campaigns involving the public have also been found to be effective.
6. Modulation of pressure in pipelines. Higher pressures will naturally increase the rate of leakage.
7. Strengthening the procurement and stock management of critical and often used repair and maintenance materials, so that this will always be available when needed. While many repairs can be done with readily available substitute materials, temporary stop-gap solutions cannot be relied upon to fix long term and recurring problems.
8. Continuous management attention: The reduction of NRW should be considered by management and the board as continuing oversight concern.

## **6. NRW SURVEY**

When NRW is analyzed to have increased, due likely to pipelines leaks, an NRW survey should be carried out to pinpoint the problem. The steps are as follows:

1. Divide the entire distribution system into zones;
2. Isolate the different zones by closing or installing appropriate control valves. Observe the water consumption rate in each zone and compare with billed consumption. Determine the zones with abnormally high NRW.
3. Divide the pinpointed zones, which consume a large quantity of water into sub-zones. The water inflow can be measured using zone and sub-zone meters.
4. Isolate these different sub-zones and study their respective NRW.
5. Select the sub-zone(s) with usually high water consumption rates, Subdivide further and measure their water consumption rate.
6. Repeat the above process until the locations of leak(s) are pinpointed.

## **7. LOCATION OF LEAKS**

Leaks in water mains cause the loss of good water and at the same time increase the risk of contaminants in the ground entering the piping system. These leaks may be due to ruptures or disintegration of pipes and pipe joints, usually caused by corrosion, vibrations from vehicular traffic, stresses generated by expansion and contraction, or ground movements.

### **a. Locating Leaks by Direct Observation**

The method is the simplest and most applicable leak detection technique for use in small water supply systems. This requires being alert to the following signs of leaks:

1. appearance of wet spots at early dawn during dry season.
2. Greening of patches of ground in areas where plants generally could hardly grow.
3. A soft wet spot in the ground during dry season.
4. Abnormal drops in pressure.

The consumers can help detect leaks if they are made aware of these indicators. If they look at the Utility's water service in a positive light, and consider it to be to their benefit, there is no reason why they would not go of their way to inform the operator if they notice any of these signs.

**b. Finding the Exact Location of Leaks in Pipelines**

After finding the approximate location of leaks in the water distribution system, their exact location can be determined by using a sounding rod. Leaks in water pipes usually make sound-small leaks makes more noise than large ones. The sounding rod is a pointed metal rod used to relay to the observer the sound caused by leaks in buried pipes. The procedure involves the following:

1. Push the sounding rod into the ground until its end touches the buried pipe. Be careful not to push it too hard in order not to destroy a PVC water main when its point strikes the pipe.
2. Put your ear to the exposed end of the rod and listen for the sound. If the sound is too faint, a hearing aid such as a stethoscope would be helpful.
3. Push the rod into the ground against the same pipe at a different location. If the sound is louder, they you are getting closer to the leak. If the sound is fainter, it means you are moving away from the location of the leak.

**8. ILLEGAL CONNECTIONS**

Illegal connections can be detected by any of the following methods:

**1. Block Census**

Key the information to be obtained in a block census is where those who are not connected to the system are getting their water. If their source cannot be determined, the dwelling unit is considered suspect.

**2. Reward System**

Offering rewards to those who can pinpoint illegal connections has been known to be effective. The reward can be a portion of the collectibles.

**3. Monitoring Consumption**

A high NRW within a sub-zone without any leaks indicates the presence of illegal connections. Any customer whose consumption drops to a small percentage of his average consumption without any adequate cause should be suspect.

The Board should come up with a policy on penalties for those caught with illegal connections, which would be the basis of management actions.

**4. Optimum Meter Replacement Cycle**

LIWAD adopted the Change Water Meter Program, an initiative to reduce non-revenue water by replacing water meters 5 years old and above.

**II. ADMINISTRATION AND FINANCIAL ASPECTS**

**ADMINISTRATION**

A public utility such as a water district faces enormous challenges in meeting the water needs of a growing population. Many of these challenges are result of inappropriate utility management principle. This section presents the certain rules and practices adopted by Lianga Water District to achieve efficiency and effectiveness as it carries out its administrative, management and operating functions.

## **GENERAL**

The most important factor for the success of the water district is the quality of the people who manage and operate it. They need, however, to work within a clear, supportive administrative system that channels their capabilities and enables them to fulfil their unique functions within the organization. Lianga Water District is composed of a Board of Directors, a General Manager, and the staff. The Board establishes policies and regulations to carry out the business affairs of the water district while the management and operating staff, headed by the general manager, handles the day-to-day operations.

### **DELINEATION OF BOARD AND MANAGER FUNCTIONS**

All powers, privileges and duties of the district is exercised and performed by and through the Board. However, the executive, administrative and ministerial power is delegated to the General Manager.

#### **The Board of Directors**

All power, privileges and duties of the district is exercised and performed by and through the Board. While all powers and authority of the water district are vested in its Board, its specific proper functions are the following:

1. To enact policies and rules for the water district;
2. To set the overall goals and objective of the organization;
3. to approve budgets, plans major contracts, and undertakings; and
4. To evaluate the performance of the water district and its management.

The Board shall limit itself to fulfilling these functions, using Board meetings as their venue. These Board meetings are recommended not to exceed two in a month. Holding meetings too frequently would force management to spend an excessive amount of time on preparing for and attending them, thereby undermining management performance.

The transparency, improvement and systemization in governance are overseen by the Board of Directors. The BOD is the guardian of fairness, transparency and accountability in all major financial and business dealings of the WD in order to serve its mandate.

#### **Management Functions**

The General Manager, on the other hand is responsible for the following functions:

1. Implementing the policies and rules set by the Board;
2. fulfilling the goals and objectives of the water district;
3. Preparing effective plans and recommendations for Board approval; and
4. Making accurate and timely reports to keep the Board updated on the water district's performance on relation to fulfilling its goals and objectives.

Most these functions he/ she fulfils indirectly but through the management team and the operating staff. As such, leadership, decision-making, communication, staff development, and problem solving are the focus of his day-to-day operations of the water district; it is the manager's responsibility to ensure the success and sustainability of the public utility. While the Board may not interfere in the way the manager runs day-to-day operations, the manager must answer to the Board for results.

### **POLICY FORMULATIONS**

#### **1. WHAT ARE POLICIES?**

A policy is a committed guideline. It is a principle that guides the performance for a certain activities leading to the attainment the water district's goals. It may be a broad statement of general

guidelines, or a specific set of procedures detailing how certain tasks (e.g., handling of the utility's funds) must be done. Whether they are broad or specific statements, policies are best communicated and implemented in written directives or resolutions. Written rules provide a ready reference for the management and staff, and make it possible to ascertain whether they are being followed or not, and to hold the persons concerned accountable. Verbal policies are not effective, as they have a way of being misinterpreted. As time passes, even the initiators themselves sometimes get lost as to their original intent or interpretation. In general, policies may be classified into three types as to their origin:

1. **Originated policy**- this type of policy come from the Board. It is designed to provide guidelines to management in the operation of the system.
2. **Appealed Policy**- this type of policy arises when problems of operation at the lower level cannot be properly or consistently handled. Management therefore "appeals" to the Board for guidelines.
3. **Imposed policy**- this type of policy is set to comply with existing laws, government regulations, court rulings and the like social practices and public influence may result in imposed policies. Some of the important areas should be covered by written water district policies are outlined in the box with the caption "IMPORTANT POLICY AREAS FOR LIWAD".

### **IMPORTANT POLICY AREAS FOR LWD**

1. **By-laws**: Establish internal guidelines for the Board itself; e.g., how often where to meet, establishment of a quorum, board elections, etc.
2. **Utility Rules and Regulations**: Establish policies and procedures for dealing with the public.
3. **Personnel Rules/ Regulations**: These policies seek to ensure proper code of conduct among the staff.
4. **Staffing Patterns/ Remunerations**: Establish guidelines on the number and qualifications and remuneration of staff to be hired.
5. **Hiring**: These policies set guidelines and checks on the hiring of new staff. As a rule, all requirements for additional staff must be cleared with the Board, usually through the proposed *plantilla* which, once approved, can then be already implemented without further clearance. However, specific Board approval must be obtained before the actual appointment of higher level staff. The policy must be in accordance with the existing rules and regulations issued by the Civil Service Commission (CSC).
6. **Tariff Formulation**: Establish guidelines on tariff formulation. Tariff strategy must enable the water district to operate sustainably and effectively in relation to its purpose of supplying water. It must consider the requirements to obtain approval from LWUA, and often, the measures needed to gain acceptance by the public.
7. **Budgets**: Establish guidelines on budget formulation, timetable and content.
8. **Delegation of Authority**: Establish guidelines on what decisions are to be delegated and to whom.  
Example: Delegated Cheque Signatories: "In the absence of the General Manager, the joint signatories shall be the Cashier and the Officer-in-Charge"
9. **Matters Requiring Board Action**: Establish guidelines on what need to be submitted for Board clearance before management can act on it.
10. **New Connections and Disconnections**: Establish guidelines on the requirements for new connections, how much to be charged; as well as when to disconnect.  
Example: Connection policy: All connection costs are to be borne by the customer. This is translated in the connection rules/ regulations and amount of connection fees.
11. **Delinquent Accounts**: Set guidelines for handling delinquent accounts, including when a delinquent account is to be written off as bad debts. It is futile to maintain long standing debts as active as they will only distort the financial figures. However records should still be kept and diligent attempts made to collect these accounts as if they were not written off.
12. **Dealing with Illegal Connections**: The penalty should include penal and financial impositions based on provisions of prevailing laws.

13. **Goal Setting:** Normally, these establish annual and intermediate goals (e.g., semi-annual, quarterly) for the water district. Goals can be set based on the number of people to be served or number of connections and on the target performance parameters outlined in page 54.
14. **Performance Standards:** The Board should define performance standards for the water district that management should attain, and monitor results against these standards at least on a quarterly basis.
15. **Funding Sources:** Board policies should be established on where to get funds for meter replacement or expansion projects or emergency repairs if the water district does not have those funds.

## 2. POLICY REVIEW

In any progressive undertaking, policies need to evolve in response to changing conditions and needs. Thus, aside from periodic reviews to evaluate how effectively established policies contribute to the achievement of goals, there may be changes in national policies, laws and ordinances, as well as in economic conditions, that may dictate the adjustment, amendment, or formulation of new policies.

In reviewing a policy, the first step is to consider the spirit, intent, wisdom and fairness of a policy, and then its relevance. The way the policy is being implemented should also be reviewed. The intention of even the best-conceived policy may be negated due to the manner in which it is implemented. The Board should not hesitate to review, restate, amend, or even reverse existing policies if it believes that by doing so, the best interest of both the water district and the public will be served.

## ORGANIZATIONAL STRUCTURE

Liangga Water District's current set-up is built on its need to effectively serve its market, being a "Category D" water district based on the Revised Local Water District Manual on Categorization, Re-categorization and Other Related Matters (LWD-MaCrO). It has a lean structure consisting of (4) sections – administrative, Finance, Commercial and Operation/ Technical. The section heads directly report to the General Manager who is primarily responsible for the management and performance of the district, and who in turn reports to the Board of Directors, the policy-making body of the water district. (*See organizational structure in Figure 1*).

## UTILITY RULES

The water district has Level II system. To guide the management and the staff in their dealings with the public, it adopted basic operational rules that describes how much to charge; how to determine volume usage; how to manage the service; and how to collect fees from consumers.

Basically, the utility rules of LIWAD have the following basic contents:

1. Requirements in Applying for Service Connection;
2. Responsible of the Consumer;
3. Tariff levels;
4. Payment of Bills;
5. Billing Adjustments;
6. Fees for Other Services (reconnection, meter testing, etc.);
7. Rule Infractions and Penalties.

These rules are collated and printed in a manual form for easy dissemination. This can help prevent future misunderstanding or conflicts. Some of the contents, such as tariff levels and penalties, will need a growing population. Many of these challenges are results of inappropriate utility management principle. Its day-to-day operations, Lianga Water District is guided by the following principles as far as operation is concerned:

### 1. DELIVERING WATER SERVICE 24/7

To ensure reliable service, the trust in the maintenance of facilities should be, as much as possible, preventive. However, the water district should plan ahead and have ready responses for emergencies. The aim is to enable it, ideally, to provide continuous service even during emergencies. Where this is not possible, such preparation should seek to limit the duration of interrupted service.

## 2. IMPORTANCE OF COLLECTION EFFICIENCY

Cash inflows are essential to enable the water utility to operate in a reliable and predictable manner. Thus, tariff levels are generally set to cover normal operation and maintenance costs, as well as to provide surplus funds to cover emergency requirements. However, regardless of how well designed the tariff structure maybe, if bills are not collected, or are not collected on time, the water district will experience cash shortages that could compromise service levels. The water district maintains collection efficiency of 94-96% to ensure that it has sufficient funds to finance its operations. To facilitate collection, the service area is divided into different zones and its zones is assigned with different due dates. Imposing surcharges is one of CWD's ways to discourage delayed payments.

## 3. PRESERVING THE HEALTH OF THE COMMUNITY

The sole product of the water district is water and it is imperative for this product to meet the specified standards of the PNSDW. As a minimum, the water district should have a sample tested in an accredited DOH laboratory for bacteriological presence at least once a month. Should a sample test positive for coli forms, a re-sampling should be done immediately, while the water district, without waiting for the results, should simultaneously search for the possible source of contamination. A second positive test should cause the water district to consider suspension of operations (or advice all customers to boil their drinking water) until the problem is solved.

It is, therefore, essential to follow the procedures for chlorine water treatment to eradicate harmful organisms.

## 4. REDUCING NON-REVENUE WATER (NRW)

Non-revenue water (NRW) represents water that is produced but does not bring revenues for the water district. It is the sum of the water lost to physical leaks, illegal connections, unauthorized withdrawals, unmetered connections and metering errors.

The NRW should be kept as low as is practical, technically and economically, in order to reduce operation cost, keep tariff levels low, and conserve water.

How low should NRW be? For a new system, the NRW should be kept to less than 10%. For older systems with NRW greater than 25%, the SSWP should bring the NRW down to 20% or below. However, the cost of the efforts to reduce NRW should be guided by the principle of "not spending ₱2.00 in order to earn ₱1.00."

## PERFORMANCE PARAMETERS (KEY PERFORMANCE INDICATORS)

A local water district should have at least a quarterly report of certain key performance indicators (KPIs) to enable the Management/ Board to determine the water district's performance efficiency and to track the progress of the utility. In case of Lianga Water District, the Board/ Management is being apprised with Financial Reports on a monthly basis and the strategic plan implementation on a quarterly basis.

DBM and LWUA in a series of memorandum circulars established a standard Major Final Outputs (MFOs) and Performance Indicators (PIs) under operations that local water districts are mandated to adopt. These are the following:

### WATER FACILITY SERVICE MANAGEMENT

PI 1 (Quantity) access to potable water	Percentage of barangay with access to potable water against the total number of barangays within the coverage of the LWD
PI 2 (Quality) reliability of service	Percentage of household connections receiving 24/7 supply of water
PI 3 (Timeliness) Adequacy	Source capacity of LWD to meet demands for 24/7 supply of water

## **WATER DISTRIBUTION SERVICE MANAGEMENT**

PI 1 (Quantity) Non Revenue Water

PI 2 (Quality) Potability

Percentage of unbilled water to water production  
Average deviation from the parameters set forth under PNSDW of 2007 from January 1 to December 31.

PI 3 (Timeliness) Adequacy/ Reliability of Service

Average response time to restore service when there are interruptions based on the Citizen's Charter of LWD proposed for approval by CSC.

## **SUPPORT TO OPERATION**

PI 1 Staff Productivity Index

The staff Productivity Index shall be one (1) staff for every one hundred (100) service connections for Category D; and one hundred twenty (120) service connections for Categories A to C.

PI 2 Affordability

Reasonableness/ Affordability of water rates to consumers with access connections. Water rate for the first 10 cu.m. must not exceed 5% of the average income of low income group.

PI 3 Customer Satisfaction

Percentage of customer complaints acted upon against received complaints.

## **GENERAL ADMINISTRATION AND SUPPORT SERVICES**

PI 1

Financial viability & sustainability of LWD operations (Collection Ratio, Operating Ration, Current Ratio)

a. Compliance with COA reporting requirements in accordance with content and period of submission. (Submission of five financial reports i.e. Balance Sheet, Statement of Cash Flows, Statement of Government Equity, Notes to Financial Statement, Report on Ageing of Cash Advance).

PI 2

b. Compliance with LWUA reporting requirements in accordance to content and period of submission.

These KPIs should be part of the information the Board should get from its management at least every quarter. These KPIs are also required in the annual report that the water district must submit to the different regulatory bodies to comply with regulatory reporting requirements.

## **HUMAN RESOURCE MANAGEMENT CORE AREAS**

### **Program to Institutionalize Meritocracy and Excellence in Human Resource Management (PRIME-HRM)**

#### **A. Recruitment, Selection and Placement**

The Personnel Selection Board (PSB) adopts a formal screening procedure and formulates criteria for the candidates of posted permanent plantilla positions. They shall maintain fairness and impartiality in the assessment of candidates based on merit and fitness, specifically on the minimum qualification requirements:

- Education
- Eligibility
- Experience
- Training

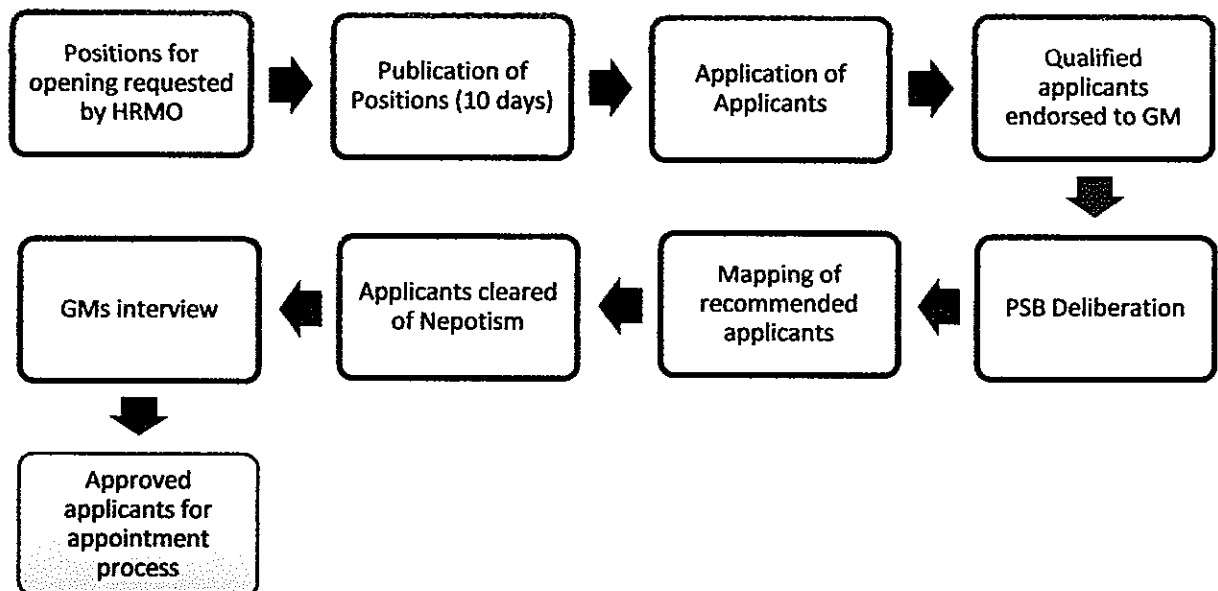
## Qualification Standards

The LIWAD observes the minimum requirements set by the Civil Service Commission in the qualification standards. A qualification standard is the minimum requirement for a class of positions in terms of education, experience, training, civil service eligibility and physical characteristics and other personality traits required by the job for efficient performance.

The degree of qualifications, whether entrant or as candidate for promotion, is determined by the General Manager with the assistance of the Personnel Selection Board on the basis of the qualification standards for the particular position.

Also, qualification standards are used as bases for civil service examinations, as guides in appointment and other personnel actions, in the adjudication of protested appointments and in determining training needs.

### FLOW OF SELECTION PROCESS



The PSB recommends to the General Manager the top 5 applicants, with the concurrence of the Personnel Officer.

### Appointment

The HRMO shall inform the newly hired employee to comply all the requirements needed per CSC approved checklist of appointment requirements. After the compliance of the requirements, the HRMO will prepare and accomplished the KSS PORMA BLG 33, submit it and all pertinent documents to the CSC field office or CSC region office.

### Merit Selection and Promotion (MSP)

Implemented by LIWAD pursuant to Sec. 32, Book V of Administrative Code of 1987 (Executive Order 292) and Civil Service Commission Memorandum Circulars.

It establishes a well and sound promotion system that is characterized by strict observance of the merit, fitness and equality principles in selecting and promoting employees to a higher position in the career service and non-career service in all levels. It includes policies and procedures in selection and promotion, functions and responsibilities of the PSB, the personnel officer, and the appointing authority. It serves as a guide in fair adjudication.



## **System Ranking Positions**

The hierarchical arrangement of positions from highest to lowest, which shall be a guide in determining which positions, is next-in-rank, taking into consideration the following:

- Organizational structure
- Salary grade allocation
- Classification and functional relationship of positions

In processing the final list of applicants, qualified incumbents of the next-in-rank positions are advised of the said vacancy and are given the options to either confirm their application or waive their right for promotion by not applying for the said vacancy.

### **B. Performance Management System**

#### **Strategic Performance Management System (SPMS)**

As central human resource management agency of the Philippine bureaucracy, the Civil Service Commission (CSC) is constitutionally mandated to adopt measures to promote morale, efficiency, integrity, responsiveness, courtesy and public accountability among government employees.

The SPMS was developed by CSC as a new strategy that will establish a culture of performance and accountability in the bureaucracy.

It was created to establish a high-performance culture by aligning individual objectives to the organizational objectives. It will link the employees' performance in relation to the District's vision, mission and strategic goals by using a "technology composed of various strategies, methods and tools for ensuring fulfilment of the functions of the offices and its personnel as well as for assessing the quality, quantity and timeliness of the accomplishments.

It is one of the requirements of the Program to Institutionalize Meritocracy and Excellence in Human Resource Management (PRIME-HRM) that need to be complied to obtain the Level II accredited status.

It is also one of the key requirements for the grant of Performance-Based Bonus (PBB) per EO 80, seeking to strengthen performance monitoring and appraisal. Hence, all agencies must submit their own SPMS Manual to Civil Service Commission for approval. The LIWAD-SPMS manual was approved on June 22, 2014.

Performance goals and measures are aligned to the national developmental plans and the mandate, vision, mission and strategic priorities of a LWD. Performance standards calibrated by the Performance Management Team (PMT) are integrated into the success indicators of each Major Final Output.

Major Final Outputs (MFOs) contribute to the realization of organizational mandate, vision, mission, strategic priorities, outputs and outcomes.

Accountabilities and individual roles in the achievement of organizational goals are clearly defined; individual work plan or commitment and rating form is linked to the division/ unit office work plan or commitment and rating form in order to establish a clear linkage between organizational performance and personnel performance.

### **C. Learning and Development**

Simple information system supports monitoring and evaluation of: Learning and Development activities per employee based on Individual Development Plan, annual learning and development

programs/ interventions, and list of participants. Learning and Development is based on simple individual Learning and Development needs identification, it is done occasionally. Learning and Development calendar design is based on identified performance and core competency gaps. The Lianga Water District send participants for training and seminars through the invitation received from the various Regional Training Centers and other training accredited agencies.

#### Career Development Plan

Pursuant to Rule VIII, Section 14 under Executive Order No. 292, Personnel Development Committee shall be established in each department and agency, both the national and local governments, including government-owned and controlled corporation with original charters which shall provide support functions to management in matters pertaining to selection of agency nominees to training, development, scholarships programs in accordance with existing civil service policies and standards.

The role of LIWAD PDC is to provide support to management in matters concerning the development of the agency's workforce by planning, organizing and executing projects for staff development; assisting in the selection of nominees to training and development in accordance with existing civil service policies and standards; and reviewing the existing training guidelines of LIWAD.

#### Training and Development

The LIWAD regularly designs and recommends to management the implementation of different programs in the Career Development Plan. Such program includes:

- **Induction Program** refers to the program for new entrants in LIWAD to develop their pride, belonging and commitment to government service.
- **Orientation Program** refers to activities designed to inform new employees about LIWAD programs, thrusts, and operations as well as benefits.
- **Reorientation Program** refers to activities designed to introduce new duties and responsibilities, new policies and programs to employees who have been in the service for quite some time.

#### D. Rewards and Recognition

##### Programs on Awards & Incentive for Service Excellence (PRAISE)

In line with the revised Policies on Employee Suggestions and Incentive Awards System (ESIAS) provided under CSC Resolution No. 010112 and CSC MC No. 01, series of 2001, the Lianga Water District adopts the Program on awards and Incentives for Service Excellence (PRAISE) per the aforesaid provision.

Designed to encourage creativity, innovativeness, efficiency, integrity, and productivity in the public service by recognizing and rewarding officials and employees, individually or in groups for their suggestions, inventions, superior accomplishments, and other personal efforts which contribute to the efficiency, economy, and other improvement in government operations or for other extraordinary acts or service in the public interest.

Provides Monetary and Non-Monetary awards and incentives such as:

- Loyalty Incentive
- Productivity Incentive
- Longevity Incentive
- Length of Service
- Plaques and Certificates

## **OTHER PROGRAMS**

### **Committee on Decorum and Investigation (CODI)**

Pursuant to Republic Act 7877, all government agencies are mandated to create a Committee on Decorum and Investigation (CODI).

The CODI receives the complaint, conduct fact-finding investigation and recommend the filing of the formal charge in accordance with the Uniform Rules of Procedure in the Conduct of Administrative investigation. The CODI shall submit a report of its findings with the corresponding recommendation to the general Manager, which shall be considered strictly confidential.

### **Grievance Machinery**

In line with the Revised Policies on the Settlement of grievance in the Public Sector in CSC Resolution No. 010113, dated January 10, 2001 and implemented through CSC Memorandum Circular No. 02, s. 2001, the Lianga Water District hereby adopts herein Grievance Machinery.

Committee conducts an investigation and hearing regarding complaints on non-implementation of policies, practices and procedures except:

- Disciplinary cases
- Sexual harassment cases
- Union-related issues and concerns

The Grievance Committee may conduct an investigation and hearing within 10 working days from receipt of the grievance and render a decision within 5 working days after the investigation. Provided, however, that were the object of the grievance is the grievance committee, the aggrieved party may submit the grievance to the top management.

### **Gender and Development**

Pursuant to the Joint Memorandum Circular (JMC) 2012-01 issued by National Economic Development Authority (NEDA), Department of Budget and Management (DBM) and Philippine Commission on Women (PCW) which provides for the mandatory preparation of annual Gender and Development plans and budget and accomplishment to implement the provisions of the Magna Carta of Women or the Republic Act 9710, LIWAD recognizes its role as duty bearer in the promotion of gender equality enshrined in the RA 9710 and other national and international commitments.

### **Health and Wellness Program**

With LIWAD's pursuit to maintain a healthy and productive workforce, various health and wellness activities have been conceptualized and implemented.

Wellness programs promote a healthy lifestyle in and out of the workplace. The goal of such programs is to provide employees with opportunities to find self-improvement efforts that meet their needs, increase awareness, stimulate healthy lifestyle changes, and improve overall workplace productivity.

On the quest for health and wellness, a variety of programs were already carried out in order to encourage our employees to maintain a healthy lifestyle.

Many programs are intended to encourage good nutrition, healthy hearts, weight management, work-life balance, emotional intelligence, and self-help.

The following health and wellness programs are being implemented which target specific disease prevention, management, and healing:

- Annual Executive check-up for Section Heads and Manager;
- Annual Physical Examination for Permanent, Casual and JO employees;
- Physical fitness program (Sportsfest, zumba);
- Information Campaign through health education and teachings; and
- Counselling on weight management

Civil Service Commission documents

Monthly Report Preparation

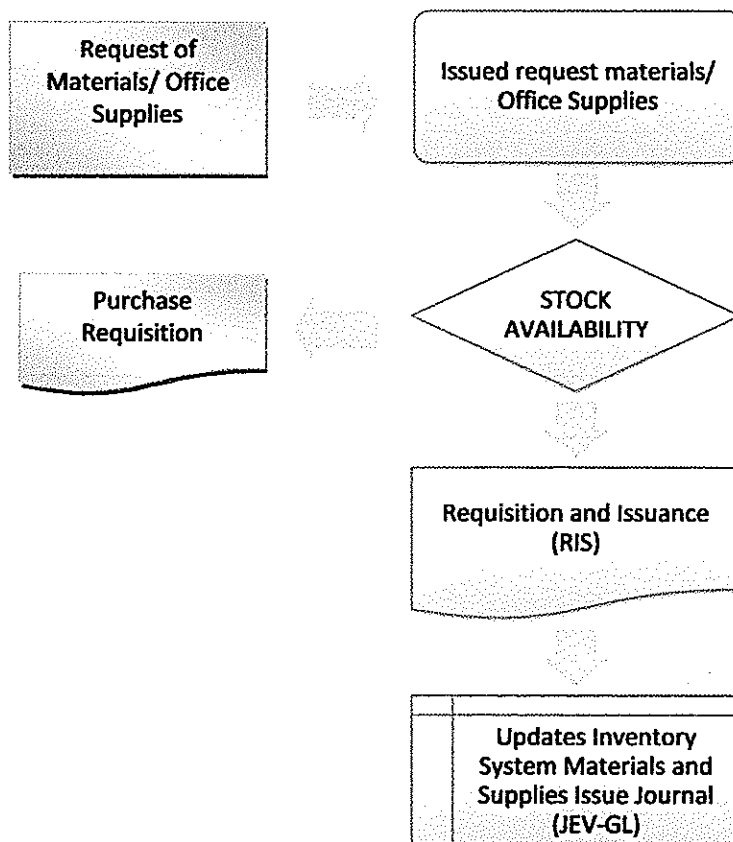
- Check Accession database if there are records of new hired employee/s; input the information using CSC required forms.
- Check Separation database if there are records of relieved, resigned and dismissed employee/s, input the information using CSC required forms.
- Check DIBAR database if there are records of employee/s with Administrative, Criminal & Civil cases, input the information using CSC required forms
- Prepare a summary of report using CSC required forms and submit to the CSC field office or region office not later done every 5<sup>th</sup> day of the following month.

The checking and monitoring of Daily Time Record, preparing and maintaining Leave Credit Records, and monitoring of Tardiness and Undertime is in pursuant to Omnibus Rules Rule XVI Book V (Executive Order 292) and Civil Service Commission Memorandum Circulars.

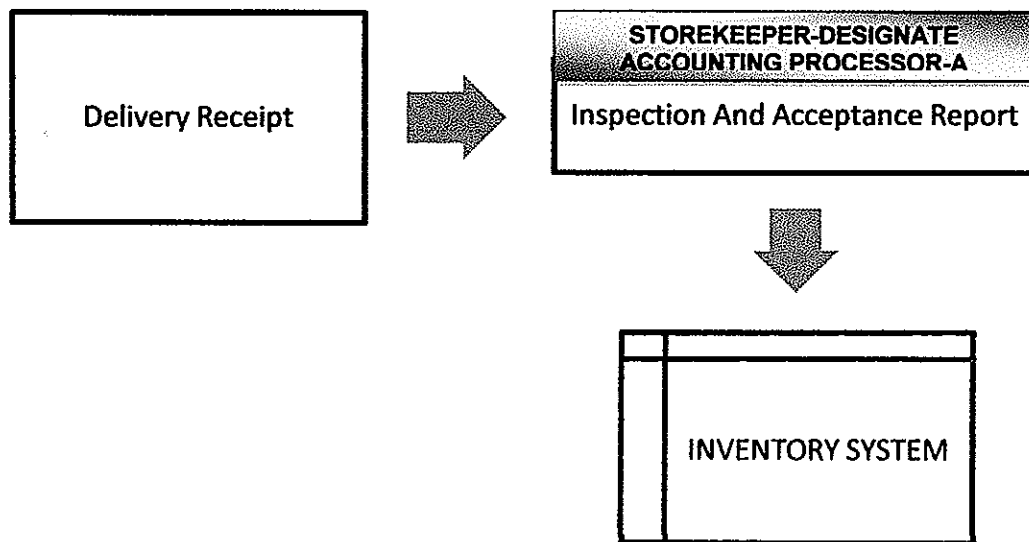
The preparation and submission of SALN to the Ombudsman is in pursuant to Section 17, Article XI of the 1987 constitution and Section 10 of RA 6713.

**MATERIALS AND OFFICE SUPPLIES**

Issuance of Materials/ Office Supplies



## Receipt of Deliveries of Inventory



### **FINANCE**

This Chapter presents the unique financial aspects of a water district, especially those elements that play an important role in the effective management of a utility and to a large extent determine its viability and sustainability. These key financial elements include the tariff-setting considerations and methodologies, and the financial management and control system, including the reporting requirements.

This section is organized into these three main functions:

1. Budget Preparation;
2. Tariff Setting Methodologies;
3. Financial Systems and Controls.

### **BUGET PREPARATION**

#### **1. NATURE OF BUDGET**

A Budget is merely a plan expressed in quantitative (monetary) terms. Its preparation involves setting targets for the revenues and expenditures of the water district. Being a simulation of how the financial inflows, outflows and other accounts will behave as it implements its plan within the budget period; it also involves the analysis of trends and anticipated changes within business categories, such as operations and capital expenditures. The adoption of a relatively detailed annual budget is a key element in improving the water district's effectiveness.

The budget is prepared by management, usually during the last quarter of the year, and should be approved by the Board before being endorsed to the stakeholders and to the regulatory bodies like DBM, COA or LWUA.

The basic components of a Budget are:

1. Statement of Objective;
2. Operation and Maintenance Budget;
3. Capital Expenditure Budget; and
4. Financial Statements, including the Cash Flow and Income Statement

## 2. STATEMENT OF OBJECTIVES

For an on-going business, the first step in any budgeting process is generally an analysis of the current year's actual expenditure as compared with the approved budget, and the presentation of objectives and goals for the coming calendar year. The deviations between the actual estimated disbursements (because the actual presentation could be made in October or November while the figures cover up to December) and budgeted amounts for the current year have to be explained, and related to the water district's performance in terms of the current year's objectives.

1. These analyses need to be presented to the Board, which needs to appreciate and evaluate whether the objectives set for the following year are the right ones, are worth the budgetary outlays proposed, and are realistic in the sense that they can be supported by the revenues to be realized by the water district. In other words, management should state the reasons (objectives) for having a budget.
2. Depending on management's presentation and the Board's appreciation of the budgetary proposal, the Board may request management to make the modifications it deems necessary, or approve the budgetary plan outright.
3. It generally takes a minimum of 2 to 3 Board meetings before the Board approves the budget.

## 3. OPERATION AND MAINTENANCE BUDGET

The O & M cost is the total estimated cost required to manage, operate and maintain the water supply system. The projection of the O & M Budget usually is fairly straightforward, unless major deteriorations of the facilities have created expectations of unpredictable cost levels, or serious local or global events are expected to cause large spikes in the prices of some essential supplies. Otherwise, it is projected from the results of past operations and adjusted to fit the current or projected prices and costs.

### a. Nature of O & M Costs

It is important to realize that in a well-managed water utility, there are only two major groups of expenditures:

1. Capital Outlay/ Investment, the costs of which are determined at the initial stages of the business, or when it expands, upgrades, or replaces the physical facilities for water supply and distribution. The annual costs are then composed of the depreciation of the major facilities, the financial costs incurred in their acquisition and installation, and actual Capital Expenditures (Capex) disbursements during the year.
2. Operation and Maintenance, which involves practically all the activities of the business whose focus is basically to employ its physical facilities to distribute the water 24/7, reliably and efficiently, and to ensure that these physical facilities remain capable of continuing to distribute the water 24/7, reliably and efficiently. From this it will be clear that the O & M cost is one of the two major components considered in determining the initial water tariff of the system and the necessary adjustments in tariff that may be dictated by external factors and as the system expands in the succeeding years of operation.

From this it will be clear that the O & M cost is one of the two major components considered in determining the initial water tariff of the system and the necessary adjustments in tariff that may be dictated by external factors and as the system expands in the succeeding years of operation.

### b. Revenues Needed to Support O & M Costs

From the foregoing discussion, it becomes very clear also that the water district need to collect water revenues continually and promptly in order to reliably operate and maintain the water distribution facilities. In too many instances, insufficiency of funds is at the root of poor water district maintenance.

### **c. Need to Educate Users**

Each water user should be made to realize the importance of a well-supported O & M on the reliability of their water system. They should be educated on what the O & M budget comprises and why a collection is made for the Utility's O & M.

### **d. O & M Cost Items**

The following is a list and description of what are generally included as O & M cost items:

1. Salary/ wages refers to the gross personal services expenses;
  2. Power costs and related expenses refer to the total electricity and fuel, oil, and lubricants incurred in the operation;
  3. Maintenance expenses refer to the repairs and maintenance costs of facilities, exclusive of salaries and wages of water district staff who undertook the repairs and maintenance;
  4. Permits/ Regulatory fees are expenses incurred in obtaining or updating business permits, licenses and payments for regulatory fees;
  5. Board costs are expenses incurred during Board meetings as well as board per Diems, if any;
  6. Operation Capex are disbursements made which do not enhance the physical distribution system but are necessary in improving the office environment, work efficiency, or security, examples of which are fax equipment, light fixtures, housekeeping equipment, vault and filing cabinets, and computers;
  7. Miscellaneous costs refer to other maintenance and operating expenses like representation expenses excluding depreciation, interest and other bank charges.
- Capital Expenditures (Capex) Budget.

The annual capex budget summarizes the cost of the projects that the water district will implement during the budget year. These are cost items that involve large amounts, like pipelines, reservoir, connections, source development, major repairs or expansion of the network. The amount is determined based on the project plans and the estimates of their cost.

## **4. CASH FLOW STATEMENT**

The Cash Flow Statement is a plan showing the sources and levels of cash revenues that will be realized, and the cash disbursements planned during the budget year. This document is essential in matching and timing the expenditures with the cash that will be available. It prevents fund shortfalls at the time critical items are scheduled to be purchased. When a cash shortfall is foreseen, the budget planners (management) can adjust spending priorities, delaying the purchase of non-critical items and, when needed, obtain additional funds from external sources. Serious prolonged cash deficiencies that are foreseen should trigger the consideration of tariff adjustments.

The Cash Flow Statement is based on the cash method of accounting rather than on the accrual method.

(See Annex-A)

## **5. INCOME STATEMENT**

While the Cash Flow Statement may indicate cash sufficiency during the budget period, it does not show that the Utility is earning a profit. The statement designed to determine profitability is the Income Statement, which uses the accrual method of accounting.

(See Annex-B)

## 6. BUDGET MONITORING

Management must monitor the level of expenditures against the budget on a monthly basis in order to control overruns that could lead to unexpected fund shortfalls. Monitoring the budgeted expenditures enables management to take cost reduction measures, make decisions on budget realignments, and consider the need for a supplemental budget if it is forecast that the approved budget for essential expenditures will be exceeded.

### TARIFFS

Tariffs are the life blood of a small utility business. Tariffs set by the regulators are basically its only source of the revenues it needs to support its capital investments, operations and maintenance. They define the contributions that the water district may demand from the users of the water distribution system, as their share in the cost of its construction and upkeep.

#### 1. TARIFF-SETTING REQUIREMENTS

Tariff setting should NOT be done in a poorly considered, arbitrary manner. A deficient tariff, once set, will be very difficult to remedy; and an excessive level would be unsustainable for the users, be subject to complaints, and tend to result in delays of payment and bad debts.

For this reason, the practice is for the water tariff to be fixed by the Utility in consultation with the users, considering basically the capacity of the users to pay and costs of the O & M, as well as other relevant factors.

In the public consultations, the users and the Utility itself should see tariffs as instruments for recovering the cost of providing adequate water service to customers and must reflect not only the fixed costs of the supply system but also its operating expense and long-term sustainability. Tariff rates must satisfy the following requirements:

1. **Adequacy:** The revenues generated from a water rate schedule must be sufficient to meet the revenue requirements of the Utility. The rates should be able to promote the Utility's financial viability and growth.
2. **Public Service:** The tariffs must be set at a reasonable level that reflects the Utility's role as a public utility providing a public service.
3. **Equitable and Socialized Pricing:** The tariffs must equitably distribute the cost of the service to all classifications and sizes of connections. Their structure should define a relatively low fixed rate for some minimum level of consumption to benefit the low income users, and higher rates for those who use greater quantities of water.
4. **Affordability Level:** The rates must be kept affordable to the low income group (LIG). For this reason, the minimum charge for a 1/2" residential connection should, as a rule of thumb, not exceed 5% of the average income of the LIG within the service area.
5. **Water Conservation:** The rates must encourage the wide water usage needed to attain economies of scale, but must also discourage unreasonable and wasteful usage of water.
6. **Enforceability:** The rates must be fair, reasonable and transparent. They should be justifiable and acceptable to the consumers.

#### TARIFF SETTING METHODOLOGIES

There are two nationally accepted tariff methodologies, the Return on Investment (ROI) Method adopted by the NWRB, and the Cash Flow Needs Method utilized by the LWUA/ Water Districts. There are many similarities between the two methods such as the use of quantity blocks of consumption and meeting the financial requirements of the utility. Lianga Water District makes use of the Cash Flow Needs Method as required by LWUA.



The difference between the ROI method and this method is the enumeration of the items which can be included in the cash flow (Table 9.1) which incidentally is equivalent to the revenue requirement per year.

Table 9.1 Items included in the cash Flow

Cash Flow Expense Items	ROI Method
O & M	-same-
Debt Service	-n/a-
Reserve (2-5% of revenue)	-n/a-
Other Administrative Expenses	-same-
Capex	-n/a-
-n/a-	Net Income

This method also requires projections of the following:

1. Number and type of connections; estimated volume sold and population to be served;
2. Production capacity, NRW, water supply storage/ surplus;
3. Required investments; and
4. O & M expenses to be incurred.

The projected consumptions are then converted into equivalent volume units similar to the ROI method. Cash flow projections for 5 years are made with the "cash flow needs" as the revenue requirements. The annual average tariff is then calculated by getting the revenue requirements divided by the volume sold.

For more details, please log on to LWUA's website at [www.lwua.gov.ph](http://www.lwua.gov.ph) and access their primer on Water Rates and Related Practices.

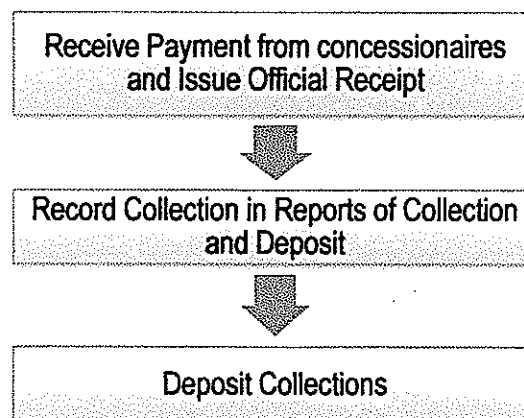
## FINANCIAL SYSTEM & CONTROLS

### 1. CASH SECURITY

There are several instances wherein a water district can receive cash. These are from collections, donations or sales of assets. It is very important for the utility to have a procedure for each instance to ensure that the cash obtained is documented and secured.

As an example for office collections, based on the copies of the Official Receipts, the cashier prepares the Cash Collection Summary and compares collections with the Summary at the end of each day. Collections are then kept in the steel vault. The collections are then deposited the next day with a copy of the deposit slip. The deposited amount is recorded in the Daily Cash Position Report.

### RECEIPT AND COLLECTION PROCESS

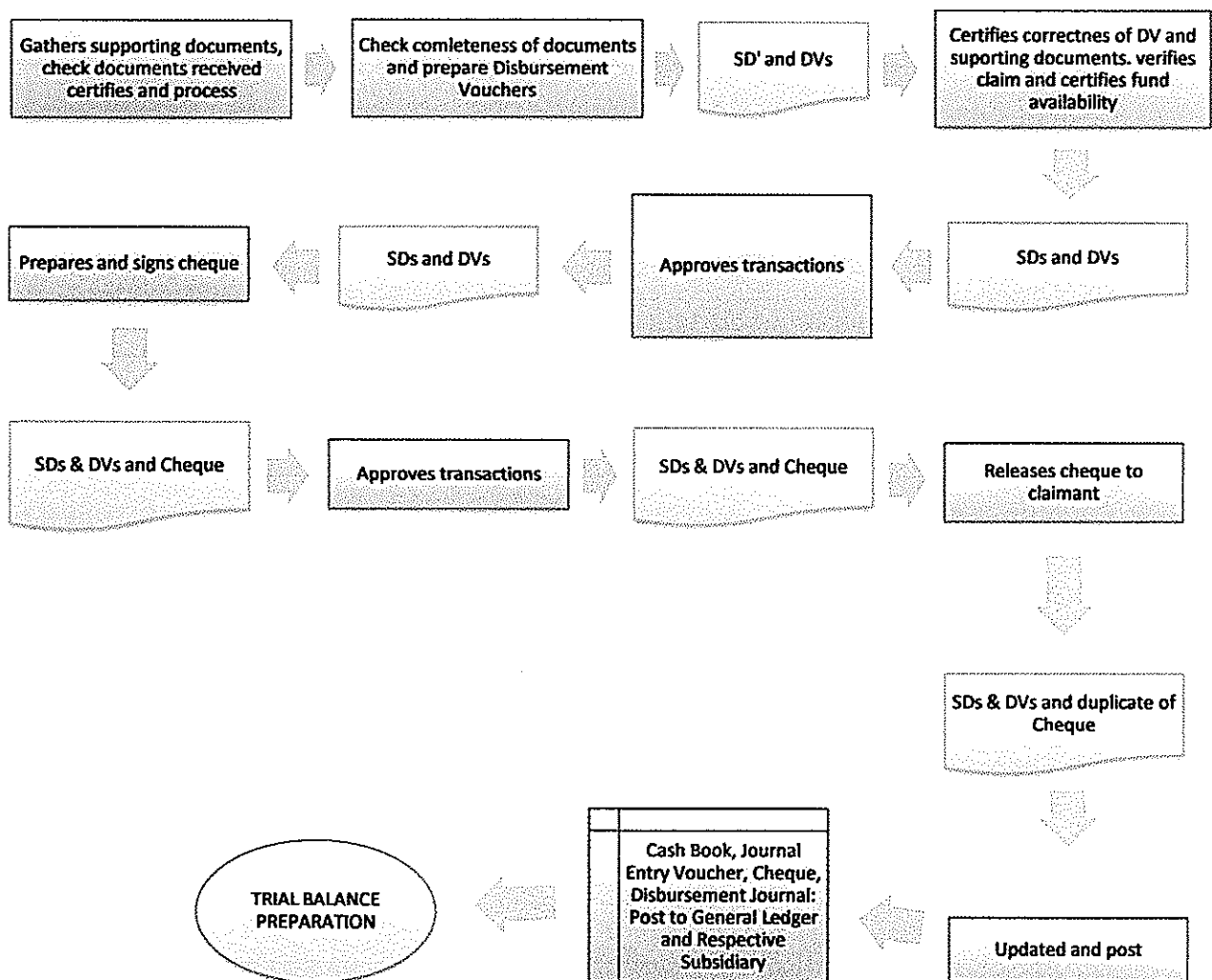


## 2. DISBURSEMENT VOUCHERS

The water district maintains disbursement procedures to keep track of the expenses and accountability purposes. There are different purposes for the disbursements and the water district ensures that their disbursement procedures cover the following purposes:

- 2.1 Payrolls
- 2.2 Operational expenses like chemicals, fuel, repairs
- 2.3 capital Expenditures
- 2.4 Debt service
- 2.5 New connections
- 2.6 Maintenance expenditures
- 2.7 Emergency procurement

### DISBURSEMENT PROCESS



## 3. ASSET REGISTER

This a list of assets currently owned by the water district. The Register has 3 uses:

- 3.1 It documents the list of the assets owned by the water district;
- 3.2 It guides the utility in the computation of its depreciation expenses; and
- 3.3 It gives the regulatory office or a lender an idea of the Utility's size and assets owned.

#### 4. DONATED ASSETS

There are instances when properties are being donated to the water district such as land or service vehicle. The manager must ensure that the donation includes the documents of the donation or title aside from the asset. Unless the accompanying documents indicate the value of the asset, a value must be assigned to it for inclusion in the Asset Register and for depreciation purposes.

The bookkeeper prepares the corresponding journal voucher and lists the asset in the Asset Register. The asset, if transportable is then consigned to a designated or accountable person to stockyard for safekeeping.

#### OBTAINING LOAN FINANCING

Sources of commercial funds are available and it is to the water district's advantage to be able to access these when the need arises. To be able to do this, the water district must have both the credibility and capacity to service the loan. The water district is then termed creditworthy.

A water district is considered creditworthy when its financial performance and management meet the tests that reasonable leaders adopt in assessing loan applications. The water district must be able to show a history of sound financial and operational management, usually evidenced by several years of acceptable audited financial statements.

Other factors that affect creditworthiness are management capacity and governance or accountability of the institutions and customer demographics. Water districts applying for credit must present financial projections to confirm that sufficient revenue will be generated to cover relevant costs, including routine operation and maintenance cost, renewal and replacement of assets, system expansion and debt service. In developed markets, utilities can receive a credit rating indicating their level of creditworthiness and the level of risk involved in lending to it. The rating affects the cost of borrowing-utilities with strong credit ratings can borrow at lower interest rate, while those with less borrowing experience or poorer financial performance will have to pay higher rates. They may further be required to obtain a guarantee from the municipality or owners, or they may not be able to borrow on the market.

The Local Water Utilities Administration (LWUA) offers loan financing to local water districts at reasonable rates. Other government financial institutions are also offering loan packages to water district at lower interest rates.

### III. COMMERCIAL OPERATIONS

#### GENERAL

Commercial Operations pertain to the systems and procedures in dealing with customers and their bills. These systems and procedures touch on the following aspects of the water Utility's business:

1. Service Connection Applications
2. Customer Classification
3. Billing and Collection
4. Customer Complaints
5. Dealing with Delinquent Accounts
6. management Reports
7. Improving Collection Efficiency
8. Block Census
9. Use of Booster Pumps by Customers

## **SERVICE CONNECTION APPLICANTS**

### **1. SERVICE CONTRACTS**

Liang Water District provides the water directly to each customer through a metered connection, and bills them on a monthly basis. The provision of a service connection and water supply services implies a contract between two parties. Hence all prospective consumers must sign to Application/ service Contract with the water district provides them with the house connection.

#### **NEW SERVICE CONNECTION**

- |   |  |
|---|--|
| 1. a.) Application Form   | OFFICER-IN-CHARGE (Commercial Section)   |
| b.) Orientation/ Briefing   | Responsible person (25 minutes)  |
| 2. Investigates and Estimates the proposed service connection line and the corresponding charges of materials and fittings. | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (25 minutes)<br>Member: METER READER/ PLUMBER |
| 3. Payment of Installation Fees & Materials/ Fittings to Cashier of LIWAD (P2,000.00 Installation Fee)                      | CASHIER-B<br>Responsible person (3 minutes)  |
| 4. Signing of Service Connection Contract   | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (3 minutes)                                   |
| 5. Encoding of New Service Connection   | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (2 minutes)                                   |
| 6. Issuance of Materials & Fittings   | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (2 minutes)                                   |
| 7. Installation of New Service Connection   | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (2 hours)<br>Members: Meter Reader/ Plumber   |

The Application/ Service Contract establish enforceable contractual obligations between the water district and the customer, so either can take legal action in case of any breach contract. (Refer to Annex C for basic Application/ Contract of Service form) By practice, customers do not pay for the water meter. The logic is that the water district should own the water meter, and thus can install it outside the consumer's property line. If the meter is owned by the consumer, the water district may have the difficulty reading it, make repairs, or pulling it out if it is defective-if the owner places it inside the residence or for any reason takes possession of the meter. The water district however, charges a token amount for monthly maintenance of the meter.

It is advisable that a Contract should specify the connection fees to be paid. In addition to eservice fee, a guarantee deposit is also required to guarantee payments of delinquent bills.

### **2. CUSTOMER BRIEFING**

It is good practice to educate the customers on the mutual obligations between themselves and their water system, and the importance of complying with these obligations in order to ensure a reliable, sustainable, predictable supply of potable water.

In case of LIWAD, everytime a new house connection is made and prior to activation, the customer should be given a briefing, even for a few minutes on the roles and responsibilities of both the LWD and customer. The rules of the utility can be explained and questions clarified. Such briefing and information also serve as a public relations tool for the LWD.

### **3. ASSIGNMENT OF CUSTOMER ACCOUNT NUMBERS**

An account number is permanently issued to identify each service connection, before it is installed. The account number identifies each connection as to location, consumer class and customer number.

## **CLASSIFICATION OF WATER CUSTOMERS**

Generally water customers or users drawing water from the water district are categorized into 3 major types or classes for purpose of billing to wit:

- a. Residential/ Domestic
- b. Commercial/ industrial
- c. Bulk/ Wholesale

These classifications are important because water tariffs are different for each category. In general, Commercial/ Industrial users are billed 2 times the rate and Bulk connections 3 times the rate of Domestic users.

### **1. RESIDENTIAL/ DOMESTIC**

Persons and establishments drawing water from the water utility and using it in pursuit of their day to day living are classified under this category, and charged the lowest rate.

Normally, the usage of water includes cooking, washing, bathing drinking, lawn watering and any domestic use to sustain everyday life.

Government offices and buildings are likewise classified under this category because they perform public services and the consumption is only in connection with the performance of their duties.

### **2. COMMERCIAL/ INDUSTRIAL**

Persons and establishments drawing water from the system for the purpose of using this water directly or indirectly, to promote their trade or occupation or to produce a commercial or saleable product or services, are classified under this category and should be charged according to the established water rate schedule for commercial/ industrial enterprises.

Included among these users are construction contractors, laundries, restaurants, hotels, bottling companies, gasoline stations (washing vehicles) and the likes.

In every dwelling of water subscribers, one (1) water meter should be provided and that two (2) or more dwelling (doors) having only one (1) meter shall be considered as "commercial" service connection.

### **3. BULK/ WHOLESALE**

Persons or establishments drawing water from the system for the purpose of reselling the same without transforming into a new product are classified under this category and should be billed in accordance with the established rates for bulk consumers.

Users of water drawn from the water district's fire hydrants and blow-offs for the purpose other than the firefighting.

Included among these users are those providing water to carriers (ships, airplanes, etc.), farms and homes outside or within the district, not connected to the system, subdivision, etc.

### **4. IMPLEMENTATION**

#### **Issues in Classification**

When a water consumer falls distinctly under any of the above categories, classification for billing purposes becomes easy. However in some instances, a consumer may fall in-between two categories. For example, given a residential house with a small sari-sari store or carinderia, how should the connection be classified? It is usual to consider the principal purpose of the water.

Somehow, the water district has devised some objective means of weighing the obvious mixed use in order to decide the classification. Customers falling in this type of situation are advised to open a separate water connection for their home and heir business to avoid issues of billing.

## **BILLING AND COLLECTION**

### **1. MASTER LIST OF CUSTOMERS**

In order to keep track of existing account numbers and control the number of customers in each Meter Reading Book, a Master List of service connections is being prepared and grouped according to areas (or zones).

Concessionaires in each meter reading book will be numbered consecutively from number 001 taking into consideration potential concessionaires within the area including vacant lots, which will be reserved with a corresponding account number. *(See Billing and Collection System Flow-New Version Annex-D)*

### **2. METER READING**

Service activities are best grouped to achieve a system in which meters within an area can be read within a day. (The number of meters that can be read in a day should be determined). A group of areas lump together, which could be read in 5 to 10 days, could be grouped into a billing zone.

The water meters are read on a monthly schedule. The areas assignments of meter readers are rotated monthly, if possible, so that no meter reader will be making two consecutive readings of any meter.

### **METER READING AND PAYMENT OF WATER BILL**

1. Meter reading of registered consumption	METER READER Responsible person (30 seconds)
2. Computer encoding of meter reading and computation of cubic consumption and billing.	OFFICER-IN-CHARGE (Commercial Section) Responsible person (30 seconds)
3. Printing of water bill and statement of accounts	OFFICER-IN-CHARGE (Commercial Section) Responsible person (30 seconds)
4. Delivery of statement of account/ water bill to respective concessionaires with complete information as to due date and date of disconnection if water bill remain unpaid after the grace period.	METER READER/ PLUMBER Responsible person (30 seconds)
5. Issuance of Official Receipt to any water bill payment receive thereof	CASHIER-B Member: Designated Collection Clerk Responsible Person (2 minutes)

### **3. BILLING**

A billing statement or Statement of Account should include the Due Date for the payment and Notice to the customer that a penalty will apply for late payments. (An example of such a billing statement is shown in Annex-E)

### **4. PAYMENTS FROM CUSTOMERS**

As a rule, customers pay only at the water district office where official receipts shall be issued. There is strictly no collector from the water district going to the individual customers.

Customer ledger cards are maintained electronically and are regularly updated. Customers cannot be expected to keep records of their payments for long and there is no reason for the water district to have incomplete or un-updated records. As soon as payments are received, they must be recorded in the customer's ledger cards.

Collection of water bills in the office is scheduled on specific dates during the month. The Due Date is indicated on the copies of the water bills for the customer's information and as reference for the imposition of penalty charge.

The bill should indicate the Penalty Charge for bills not paid on time. This will added to and collected together with the amount of the outstanding bill. An Official Receipt is issued when payment is made.

All daily collections are tallied with the official receipts issued. A Daily Collection Summary is then made as shown in Form 3. The collections are then deposited in the bank every day.

**LIANGA WATER DISTRICT (LIWAD)**  
**Lianga, Surigao del Sur**

**DAILY CASH POSITION REPORT**

Date:

BAL.	YESTERDAY UNDEPOSITED	-	TOTAL COL.	-
ADD:	COLLECTIONS	-	LESS: DEPOSIT	-
	CURRENT BILL	-		-
	METER RENTAL	-		-
	SURCHARGE	-		-
	ARREARS:	-		-
	CURRENT YEAR	-		-
	PREVIOUS YEAR	-		-
	GUARANTEE DEPOSIT	-		-
	SERVICE FEE	-		-
	MATERIALS & SUPPLIES	-		-
	A/R OTHERS	-	LBP-CA	-
	REFUND FROM CA	-		-
	SENIOR CITIZEN DISCOUNT	-		-
	OTHERS	-	TOTAL DEPOSIT	-
		-		-
		-	BAL. TODAY:	-
		-	CASH ON HAND	-
	TOTAL COLL. FOR THE DAY	-	CASH COUNT	-
		-	OVER (UNDER)	-

**5. DISCONNECTIONS**

The water district sets a reasonable but clear deadline for all customers to pay their duties. A customer unable to pay his/ her bill for two months will be issued a notice of disconnection.

If payment is still not yet receives after the Disconnection Notice Deadline, a Disconnection Job Order is issued to the one in charge of disconnection. This person goes to the consumer abode and presents the Disconnection order. If obligation is not fully paid, the disconnection proceeds.

## DISCONNECTION

- |   |  |
|---|--|
| 1. Preparation of list of concessionaires due for disconnection                                     | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (15 minutes)                                  |
| 2. Follow-up of the concessionaires   | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible Person (3 minutes)                                   |
| 3. Accommodation of concessionaires request to defer the disconnection within limited grace period. | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (2 minutes)                                   |
| 4. Implementation of Disconnection Policy.  | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (30 minutes)<br>Members: METER READER/PLUMBER |

## 6. BILLING ADJUSTMENTS

### WATER BILL ADJUSTMENT

- |  |   |
|--|---|
| 1. Filling-up of Service Request form                                    | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (3 minutes)  |
| 2. Investigation for validity of complaint                               | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (30 minutes) |
| a.) Calibration and/ or replacement of water meter.                      |   |
| b.) replacement of defective materials and fittings.                     |   |
| 3. Payment of Service fee ₱50.00   | CASHIER-B<br>Responsible Person (2 minutes)                               |
| 4. Preparation of result of investigation approval of Reconnection order | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible persons (5 minutes) |
| 5. Recommendation  | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible persons (5 minutes) |
| 6. Approval/ Disapproval   | WILFREDO G. SANCHEZ<br>Responsible person (3 minutes)                     |

## 7. RECONNECTION

### RECONNECTION PROCESS

- |  |   |
|--|---|
| 1. Verification of total unpaid water bills or outstanding accounts. | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (10 minutes) |
| 2. Payment of:   | CASHIER-B   |
| a.) Outstanding Accounts   | Responsible Person (3 minutes)  |
| b.) Reconnection Fee (Php. 50.00)                                    |   |
| 3. Preparation of Reconnection order                                 | STOREKEEPER<br>Responsible person (3 minutes)                             |
| 4. Investigation if necessary  | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (30 minutes) |
| 5. Approval of Reconnection Order                                    | GENERAL MANAGER<br>Responsible person (1 minute)                          |
| 6. Reconnection  | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (30 minutes) |
- \*In-active service connection over 6 months will do same process for New Water Service Connection



## **CUSTOMER COMPLAINTS**

As a rule, every customer's complaint should be attended to as quickly as possible.

1. There are several ways by which the water district can receive complaints from its customers. These can be made directly to the Meter Reader, or the customer can call or report directly to the office. These complaints must be recorded, classified as to their nature and date received and resolved or acted upon. The report for each complaint should also indicate the dates for subsequent monitoring.

### **PROCEDURES FOR FILING COMPLAINT**

- |   |  |
|---|--|
| 1. Filling-up of Service Request form       | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (3 minutes)   |
| 2. Determination of nature of the complaint | OFFICER-IN-CHARGE (Commercial Section)<br>Responsible person (30 minutes)  |
| 3. Investigation                            | OFFICER-IN-CHARGE (Commercial Section)<br>Members: METER READER (Liang)<br>METER READER (Diatagon)<br>Responsible persons (30 minutes) |
| 4. Issuance of Job-Order                    | OFFICER-IN-CHARGE (Commercial Section)<br>METER READER/ PLUMBER<br>Responsible persons (3 minutes)                                     |
| 5. Preparation of Accomplish Report         | METER READER/PLUMBER Concerned<br>Responsible person (5 minutes)   |

## **CONTROL OF RECORDS AND DOCUMENTS**

### **1. COMMERCIAL/ OPERATIONAL INFORMATION**

As part of the management Information system (MIS) of the water district, the following commercial operational information should be summarized and reported on a monthly basis:

- a. **Report on Billing and Collection**-the source data emanates from the Customer accounts Section in-charge of billing and Finance section, in-charge of collection activities.
- b. **Production and per Capita Consumption**-the per capita consumption can be obtained from the total domestic consumption divided by the number of domestic persons served (no. of domestic connections x average family size). Production data can be obtained from Operation/ Technical section.
- c. **New Connection Applicants**-number filed and number of active connections per category.
- d. **Complaints**-number and nature of complaints and average resolution time.

### **2. BILLING AND COLLECTIONS**

The billing and collection system should be able to summarize every month the following information:

- **Total Billings & Collections by Type of Connections**
- **Total Number of Connections**
- **Collections on Current Billings and Arrears**
- **Cubic Meters Billed**
- **Average Consumption per Domestic Connection**
- **Connections with Arrears of more than 1 month**

# ANNEX-A

**LIANGA WATER DISTRICT  
CASH FLOW STATEMENT**  
For the Month of June 30, 2016


	Actual Month	Budget Month	Over (Under)	Years-to-Date Budget		Over (Under)
				Actual	Month	
<b>Cash Flows from Operating Activities</b>						
<b>Cash Inflows:</b>						
Collection of Receivables	1,191,406.45	1,283,281.81	(91,875.36)	7,356,203.60	7,699,690.86	(343,487.06)
Collection of Income	88,774.43	75,000.00	13,774.43	387,174.38	450,000.00	(62,825.62)
Refund of overpayment of expenses	-	5,000.00	(5,000.00)	25,349.72	30,000.00	(4,650.28)
Refund of Cash Advance	932.44	-	932.44	12,157.28	-	12,157.28
Payment of Prepaid Expenses	-	-	-	-	-	-
<b>Total Cash Inflows</b>	<b>1,281,113.32</b>	<b>1,363,281.81</b>	<b>(82,168.49)</b>	<b>7,780,885.18</b>	<b>8,179,690.86</b>	<b>(398,805.68)</b>
<b>Cash Outflows:</b>						
Payment of operating expenses (schedule 1 & 2)	414,058.34	1,034,815.99	(620,757.65)	2,926,115.12	6,208,895.94	(3,282,780.82)
Payment of payables (schedule 3)	145,402.82	-	145,402.82	600,929.34	-	600,929.34
Remittance of GSIS/PAG-IBIG/PHIC/Withholding taxes (schedule 4)	452,844.43	-	452,844.43	1,430,551.85	-	1,430,551.85
Purchase of office supplies	5,689.38	-	5,689.38	88,742.39	-	88,742.39
Payment of Accountable Forms	-	-	-	38,720.00	-	38,720.00
Purchase of Materials/Fittings	79,418.37	-	79,418.37	420,029.01	-	420,029.01
Construction in Progress	-	-	-	-	-	-
Advances to Officers and Employees	13,217.68	-	13,217.68	210,331.04	-	210,331.04
Petty Cash Fund	-	-	-	15,000.00	-	15,000.00
<b>Total Cash Outflows</b>	<b>1,110,631.32</b>	<b>1,034,815.99</b>	<b>75,815.33</b>	<b>5,730,418.75</b>	<b>6,208,895.94</b>	<b>(478,477.19)</b>
<b>Total Cash Provided (Used) by Operating Activities</b>	<b>170,482.00</b>	<b>328,465.82</b>	<b>(157,983.82)</b>	<b>2,050,466.43</b>	<b>1,970,794.92</b>	<b>79,671.51</b>
<b>Cash Flows from Investing Activities:</b>						
<b>Cash Inflows:</b>						
Proceeds from sale of:	-	-	-	-	-	-
Office Equipment, Furniture and Fixtures	-	-	-	-	-	-
Transportation Equipment	-	-	-	-	-	-
Other Property, Plant and equipment	-	-	-	-	-	-
<b>Total Cash Inflows</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Cash Outflows:</b>						
Purchase/construction of:	-	-	-	-	-	-
Leasehold Improvement Building	-	-	-	-	-	-
Equipment	-	241,401.82	(241,401.82)	55,061.25	1,448,410.92	(1,393,349.67)
Furniture and Fixtures	-	-	-	-	-	-
IT Equipment Software	-	-	-	-	-	-
Machines	-	-	-	-	-	-
Motor Vehicles	-	-	-	-	-	-
Other Property, Plant and Equipment	34,218.75	-	34,218.75	65,649.84	-	65,649.84
Artesian Wells, Reservoirs, Pumping Stations and Conduits	-	-	-	-	-	-
<b>Total Cash Outflows</b>	<b>34,218.75</b>	<b>241,401.82</b>	<b>(207,183.07)</b>	<b>120,710.89</b>	<b>241,401.82</b>	<b>(120,690.93)</b>
<b>Total Cash Provided (Used) by Investing Activities</b>	<b>136,263.25</b>	<b>87,064.00</b>	<b>49,199.25</b>	<b>1,529,755.54</b>	<b>1,729,393.10</b>	<b>200,362.44</b>

<b>Cash Flows from Financing Activities</b>						
<b>Cash Inflows:</b>						
Proceeds from Borrowings	-	-	-	-	-	-
<b>Cash Outflows:</b>						
Cash payment of interest on loans/bonds payable and other financial charges	250,000.00	267,083.50	(17,083.50)	1,500,000.00	1,602,501.00	(102,501.00)
Payments of domestic and foreign loans	-	-	-	-	-	-
<b>Total Cash Provided (used) by Financing Activities</b>	<b>250,000.00</b>	<b>267,083.50</b>	<b>(17,083.50)</b>	<b>1,500,000.00</b>	<b>1,602,501.00</b>	<b>(102,501.00)</b>
<b>Cash Provided by Operating, Investing and Financing Activities</b>	<b>(113,736.75)</b>	<b>(180,019.50)</b>	<b>66,282.75</b>	<b>429,755.54</b>	<b>126,892.10</b>	<b>302,863.44</b>
Add: Cash and Cash Equivalents - Beginning	1,328,074.12	-	1,328,074.12	784,581.83	-	784,581.83
<b>Cash and Cash Equivalents, Ending</b>	<b>1,214,337.37</b>	<b>-</b>	<b>1,214,337.37</b>	<b>1,214,337.37</b>	<b>-</b>	<b>1,214,337.37</b>

Prepared by:

  
**JULIUS CHRISTIAN G. CALANGIAN**  
Accounting Processor - A

Verified by:

  
**GEMARA P. DOROJA**  
Admin. Services Officer - B

Approved by:

  
**WILFREDO G. SANCHEZ**  
General Manager - D



# ANNEX-C



Republic of the Philippines  
**Lianga Water District**  
Lianga, Surigao del Sur, Code - 8307

CABLE ADDRESS  
**"LIWAD"**

## C O N T R A C T

The Parties Agrees That:

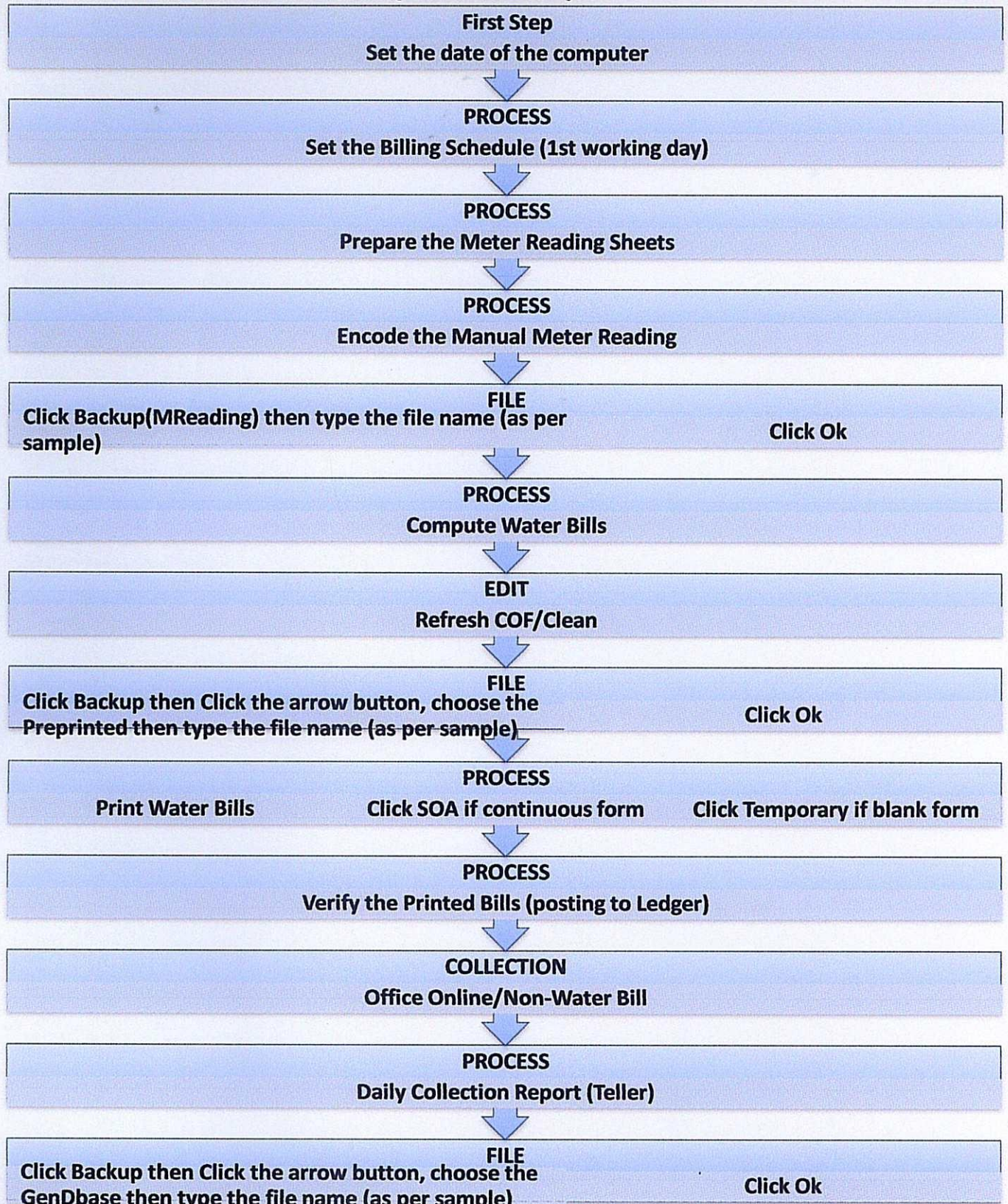
1. LIWAD will install water service connection to the concessionaire at the address given on the application for service connection upon full payment of Installation Fee and excess Materials installed thereof.
2. LIWAD shall not be responsible for the interruption of the service for causes beyond its control, nor liable to the customer for damages caused by defective in-house plumbing not installed by LIWAD employees.
3. LIWAD reserves the right to cut-off the supply or disconnection of service connection and any for the following reasons;
  - a. For Repairs
  - b. For Non-payment of water bill
  - c. For fraudulent practices in relation to the use of water meter and illegal tapping.
4. The Concessionaire shall conform and abide with all LIANGA WATER DISTRICT Policies, Rules & Regulations & Resolutions appertaining to water service.
5. The Concessionaire shall protect the water meter from any damage and the same shall pay if the water meter was stolen and damaged.
6. The water meter shall be installed in such way that it would be accessible for LIWAD employees to read and/or repair the water meter.
7. LIWAD reserves the right to determine the size of service connection and their location with respect to the boundaries of the premises to be served.
8. The Concessionaire shall pay his/her water bill monthly to LIWAD office according to the reading of water meter including the leakages at the faucet, coupling, elbow or joints thereof, on or before the date due indicated in the water bill.
9. The concessionaire shall likewise pay the 10% penalty charge after the date due.
10. The Concessionaire shall inform the water district in the event that he/she will transfer permanently or in case of transfer of ownership or when tenent leases the premises.
11. Offices and/or employees of Lianga Water District shall have the access to the premises all hours for the purpose of inspection, testing, repair and disconnection and that no one shall be permitted to remove, change or tamper the installation unless duly authorized by Lianga Water District.
12. If for the reason, the authorized representative of Lianga water District is prevented from entering the Concessionaire's premise to perform any of the works enumerated under the paragraph 3 & 12 of this contract, the District reserves the right to disconnect the water service connection from the distribution line.
13. When the accuracy of the water meter is questioned by the concessionaire, LIWAD upon the request of the customer will cause an official water meter test.
14. If during the reading period the water consumption was abnormal for the reason of malfunctioning water meter such as; stocked-up, tampered or the like average consumption will be the basis for the billing. Average consumption means three months consumption divided by three.
15. The Concessionaire shall maintain the installation in proper condition while it is connected with distribution of LIWAD and liable that no tapping will be made on the service pipes nor allow sub-connection without the authority from LIWAD
16. This contract shall not be binding upon the District unless it is signed by the concessionaire and duly accepted by the General manager or authorized officer of the District.

LIANGA WATER DISTRICT  
By:

Witnessed By:

# ANNEX-D

## BILLING AND COLLECTION SYSTEM FLOW (New Version)



### Penalty Application:

Set the date of the Computer → End of day

Click Process → Click Application of Penalty → Select Zone → Click Ok

Collection → Office on line → Report Generation of Collection Report (Teller)

Click File → Click Backup → Click the arrow button, choose the Gen Data base then file name

# ANNEX-E

Republic of the Philippines  
**LIANGA WATER DISTRICT**  
 Lianga, Surigao del Sur  
 A Government Owned & Controlled Corporation  
 Tel. No. (086) 616-0020  
 TIN - 000-556-812 NON VAT

Bill No.: 00165564

**STATEMENT OF ACCOUNT**      **NO. 163740**

RES

CONCESSIONAIRE'S NAME & ADDRESS				MONTH			
<b>BONIFACIO MORA</b> Bauco, Lianga				January 2017			
ACCOUNT NUMBER		METER NUMBER		CUBIC METER			
0111200542		Mtr. 158788693		24			
PERIOD COVER				READING		NET BILL AMOUNT	
FROM		TO		PREVIOUS	PRESENT		
Dec	01	-	Jan	03	381	405	712.50

**NOTICE**      **DISCONNECTION DATE:**

*Please bring this bill when making payments to our office.*

*A five-day grace period from due date shall be granted before your water service shall be discontinued.*

	Arrears	0.00
	Sr.Citizen	0.00
Total Amount Due	18-Jan-17	<b>712.50</b>
	Penalty	71.25
Total Amount Due AFTER	19-Jan-17	<b>783.80</b>

**CUSTOMER'S COPY**