WATER SAFETY PLAN 2017

"Managing Drinking-Water Quality from Catchment to Consumer"

Revision No. 000, January 2018

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DOCUMENT HISTORY

Revision Number and Date	Sections of the document were revised
Revision 000, January 2018	Issue of first revision – all sections new

INTRODUCTION

Convergence of the North and South and where East meets West, Murcia is fast becoming an alternative site for residential development of Negros. Traffic and pollution free, the place boasts of an abundant water and power supply. Murcia's transformation from predominantly agricultural town to an economic zone reflects the local government's effort in replicating the industrialization boom in Metro Manila, Laguna, Cavite and Subic areas. These are made possible with the establishment of road networks, bridges and other infrastructure projects connecting Murcia to Negros' capital city, Bacolod.

From waterfalls to river resorts, Murcia is home to the province's flagship tourism attraction, the scenic and romantic Mambukal Summer Resort. Sportsmen frequent the Bacolod Gold and Country Club in Hacienda Binitin, Brgy. Blumentritt, site of various national tournaments. It is also in Blumentritt where the best Tanduay spirits are distilled. Murcia is a co-host to the North Negros Geothermal Project of the Philippine National Oil Company-Energy Development Corporation, that would provide the electricity needs of the province in the coming years. Murcia is guaranteed priority is use of geothermal power.

Founded in 1860 by Augustinian Recollect priest, Fr. Miguel Alvarez, Murcia is believed to have gotten its name from a town in Spain. During the Second World War, its municipal hall was used as a garrison by the Japanese, who were constantly attacked by guerillas who drove them out on April 21, 1945. It was in the mountains of Murcia were a Free Negros Government was set up under Gov. Alfredo Montelibano, Sr.

Murcia is approximately 16.5 kilometers away from Bacolod City. At present, the Municipality of Murcia has a total number of 23 barangays. Due to the abundant sources of supply of water in Murcia be it springs, rivers, and creeks or surface and ground, drinking water in Murcia was not a great problem. Enough hand pumps were established to all barangays to those without springs as source of their drinking water. Several deep wells were also dry and Buro-Buro spring was developed as the main sources of drinking water for the town proper.

With the increase of population and commercial establishment, the demand of drinking water became a problem and a priority. The abundant sources of water were revisited. Surveys and studies were made to address the shortage of water being served to fast growing population so that safe regular, ever ready supply of drinking

water are to be made available to murciahanons, and maximize the use of potable drinking water. As a result, Murcia Water District was created.

Fifty Two percent (52%) of the municipality's water supply comes from Murcia Water District. Murcia Water District (MWD) is a government-owned and controlled corporation, created under the leadership of former Mayor Sonny Coscolluela. It was formalized by a Sangguniang Bayan Resolution No. 2005-138 during their regular session dated October 18, 2005. A conditional Certificate of Conformance No. 611, dated March 8, 2006 was then issued by Local Water Utilities Administration and in May 25, 2009 the National Water Resources Board issued Water Permit No. 021739 to the Water District after all pertinent documents were submitted in support for all the permits applied by the water district of the municipality.

It is mandated to provide safe and potable water and sanitation to the residents of the Municipality of Murcia. Murcia Water District serves 13 out of 23 barangays in the Municipality of Murcia with 3,307 total number of active service connection (as of December 31, 2017).

MISSION

"To promote better quality of life by providing adequate, safe, and potable water in the community.

To properly develop and manage water sources and resources ad help in the preservation of the environment."

VISION

"The Murcia Water District envisions itself to be the premier water utility in the province, committed to provide quality, sufficient and affordable water supply through an honest and efficient service."

I. WATER SAFETY PLAN TEAM

1.1 Water Safety Plan

Waterborne diseases are caused by drinking contaminated or dirty water. Contaminated water can cause many types of diarrhea diseases, including Cholera, and other serious illness such as Guinea worm disease, Typhoid, and Dysentery. Water related diseases cause 3.4 million deaths each year.

As mandated by the Department of Health's Administrative Order 2014-0027 which declares the development and implementation of Water Safety Plan (WSP) by all drinking-water service providers and as required by the Local Water Utilities Administration Memorandum Circular No. 010.14, the Board of Directors of the Murcia Water District passed a Resolution No. 017-016 (***Figure1-1)*** adopting the development and implementation of the Water Safety Plan for the Murcia Water District per Memorandum Circular No. 014-14 and to direct its General Manager to create a WSP Team.

Figure 1-1. Board Resolution No. 017-016

MURCIA WATER DISTRICT
Municipality of Murcia
Province of Negros Occidental
Republic of the Philippines
Email add: murcia_waterdistrict@yahoo.com
Tele/Fax No: (034) 345-2125

Excerpts from the Minutes of the Regular Meeting of the Board of Directors, MURCIA WATER DISTRICT, held at the MWD Boardroom, Murcia Negros Occidental on July 19, 2016.

Present:

Director Alfredo T. Amada,	-	Acting Chairman/Vice-Chairman
Director Anita C. Espayos,	-	Secretary
Director Lilitha T. Obordo,	-	Treasurer
Director Haris N. Nandwani,	-	Member

Absent:
None

* *

RESOLUTION NO. 017-016
Series of 2016

"RESOLUTION ADOPTING THE DEVELOPMENT AND IMPLEMENTATION OF THE WATER SAFETY PLAN FOR THE MURCIA WATER DISTRICT (MWD) PER MEMORANDUM CIRCULAR NO. 014-14 AND TO DIRECT ITS GENERAL MANAGER TO CREATE A WSP TEAM".

WHEREAS, the Department of Health (DOH) has issued on September 4, 2014, Administrative Order (AO) No. 2014-0027 declaring the development and implementation of Water Safety Plan (WSP) by all drinking –water service providers as a national policy for drinking-water quality management;

WHEREAS, in support of the objectives of the DOH and in compliance with the AO, LWUA adopted the 11-step process of the World Health Organization (WHO), as the main guideline in developing WSP for all WD and RWSA;

WHEREAS, in view of this, Management recommended to adopt the development and implementation of the WSP for the MWD;

WHEREAS, the Board further directs its General Manager, Engr. Winston M. Makilan to create a WSP Team;

NOW THEREFORE, upon motion presented by Director Obordo, duly seconded by Director Espayos, **be it resolved,** as it is **hereby resolved,** to adopt the development and implementation of the WSP for the MWD.

CARRIED BY THE VOTE OF:
Affirmative:
Directors Alfredo T. Amada, Anita C. Espayos, Lilitha T. Obordo, Haris N. Nandwani.
Negative:
None

Passed: July 19, 2016

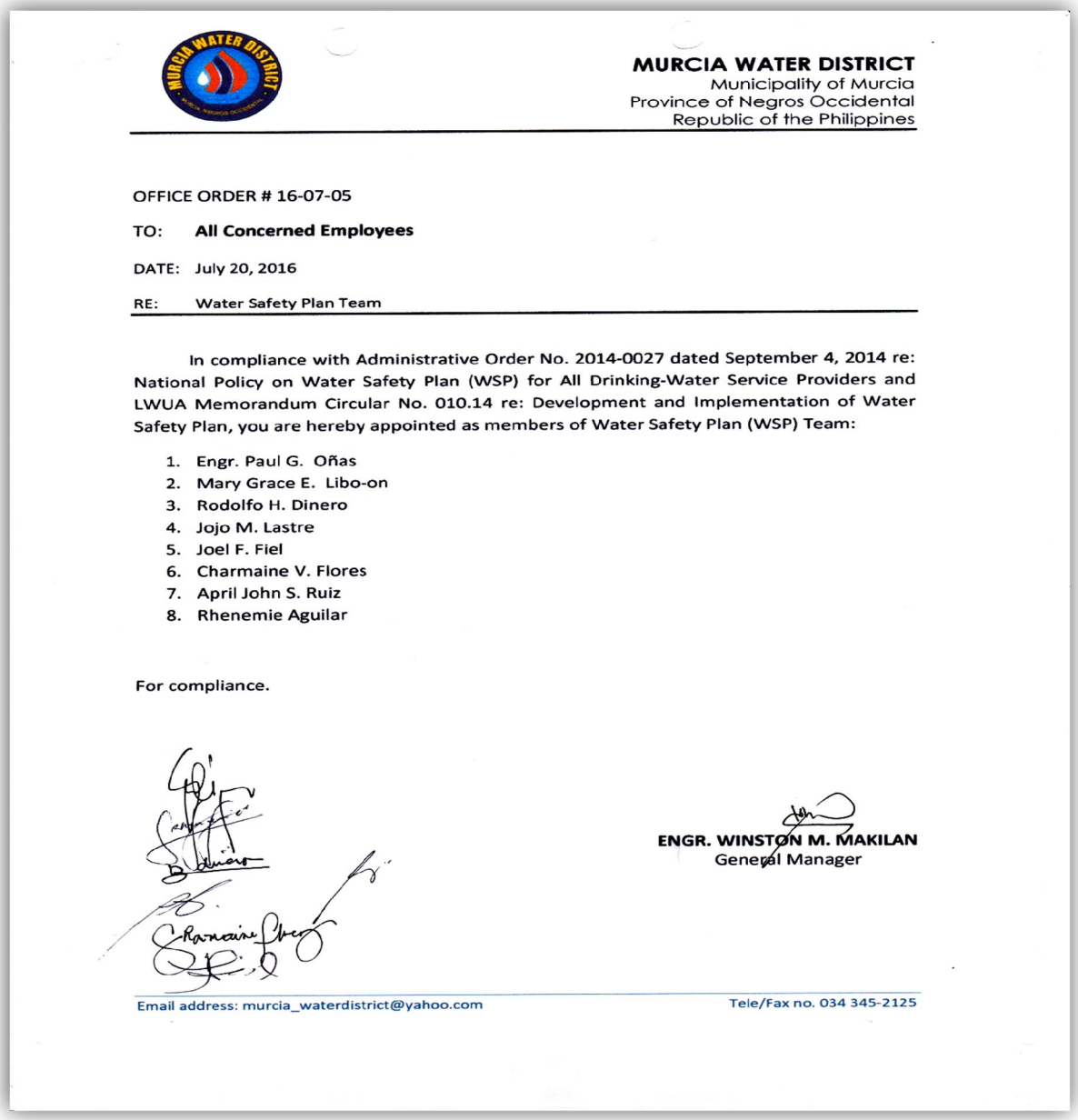
ANITA C. ESPAYOS
Secretary

ATTESTED:

ALFREDO T. AMADA
Acting Chairman/Vice-Chairman

The management of Murcia Water District issued an Office Order No. 16-07-05 (***Figure 1-2)*** dated July 20, 2016 directing a team who experts in water quality monitoring to create and develop a Water Safety Plan. The newly assembled WSP Team mostly comes from the Operations and Maintenance Section. The team underwent to trainings, workshops, and walkthroughs to identify and assess the hazards and risks that may jeopardize the quality of water being delivered to concessionaires.

Figure 1-2. Office Order No, 16-07-05



MURCIA WATER DISTRICT
Municipality of Murcia
Province of Negros Occidental
Republic of the Philippines

OFFICE ORDER # 16-07-05

TO: **All Concerned Employees**

DATE: July 20, 2016

RE: Water Safety Plan Team

In compliance with Administrative Order No. 2014-0027 dated September 4, 2014 re: National Policy on Water Safety Plan (WSP) for All Drinking-Water Service Providers and LWUA Memorandum Circular No. 010.14 re: Development and Implementation of Water Safety Plan, you are hereby appointed as members of Water Safety Plan (WSP) Team:

1. Engr. Paul G. Oñas
2. Mary Grace E. Libo-on
3. Rodolfo H. Dinero
4. Jojo M. Lastre
5. Joel F. Fiel
6. Charmaine V. Flores
7. April John S. Ruiz
8. Rhenemie Aguilar

For compliance.

ENGR. WINSTON M. MAKILAN
General Manager

Email address: murcia_waterdistrict@yahoo.com Tele/Fax no. 034 345-2125

The WSP Team conducted periodic meetings and consultations which helped them developed an appropriate Water Safety Plan. Control measures were considered for each identified hazard. The effectiveness of these control measures was validated and was included in the improvement plan.

The WSP on the other hand, focuses on monitoring the safety of water from its source to Murcia Water District's concessionaires. This WSP comprises the protection of the water sources, transmission lines, reservoir, and distribution lines from risks that will endanger the quality of water being delivered to the concessionaires.

Specifically, this plan aims to:

a) Ensure the safe quality of supplied water from its catchment to the tap of every home in Municipality of Murcia.

b) Prevent contamination of water by identifying potential risks and addressing these risks quickly and effectively with appropriate control measures.

c) Provide policies and procedures to maintain quantity and quality of service even during adverse conditions.

d) Facilitate decision-making on critical issues in a potentially stressful environment and define responsibilities and roles during emergency situation.

e) Provide procedures for using the lessons gained following every emergency or unforeseen event to guarantee that every hazard and issues are covered and will not recur in the future.

1.2 Skills Required for WSP Team (Expertise)

1) Technical expertise on operation and maintenance of:

    a) Source
    b) Storage
    c) Treatment
    d) Distribution

2) Provide operational support for the WSP in terms of:

    a) Administrative
    b) Financing
    c) Technical

3) Capable of communicating the WSP objectives and outcomes:

    a) Inside the WD
    b) Outside the WD

4) Understand water quality targets to be met.
5) Understand the impact of proposed water quality controls on the environment.
6) Knows the regulation.
7) Familiar with training and awareness programs
8) With authority
9) Other team members

    a) Resource persons
    b) Coordinator
    c) Secretariat
    d) Documentation Committee / Staff

1.3 Water Safety Plan Team Structure

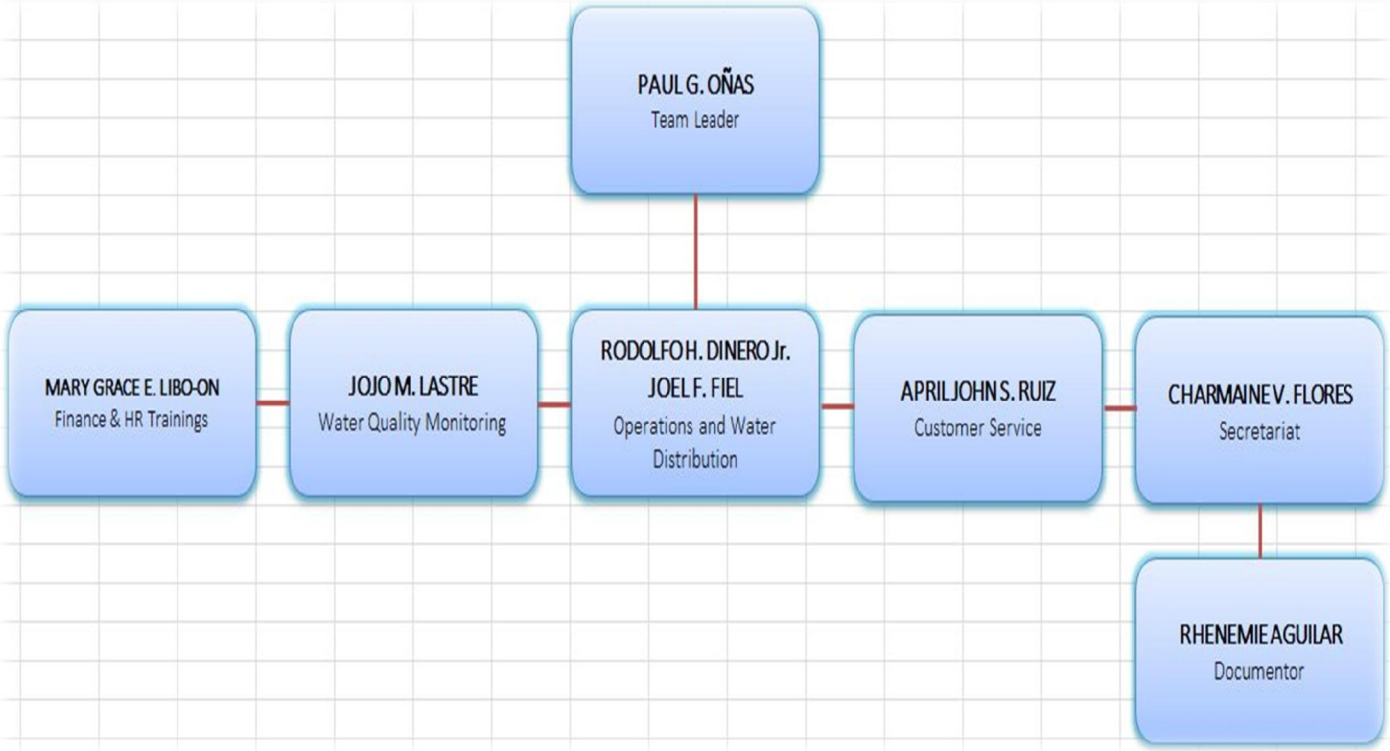


Figure 1-3. Water Safety Plan Structure

1.4 WSP Team Schedule of meetings, member roles, and responsibilities

In preparation, implementation, and review the Murcia WD Water Safety Plan, the team decided that the Water Safety Plan Team meeting is scheduled twice a year.

Role and Responsibility of each member in the Water Safety Plan Team are as follows:

Table 1-1. WSP Team schedule of meetings, member roles, and responsibilities

PAUL G. OÑAS – Team Leader Oversees the following: • Production, quality control/monitoring, storage, and distribution of safe and potable water to the concessionaires. • Ensures 24/7 potable water supply with full chlorination under the 2017PNSDW standards. • Operation, safeguarding and maintenance of equipment, appurtenances, structures, and grounds on all Spring Sources, lift / booster stations and reservoir station and elevated storage tank within the Poblacion Murcia. • Initiates the evaluation of existing systems and submits recommendation. • Supervises and prepares the ff. activities of the Water Quality Management Group: a) Implementation of the expansion projects; b) Upgrading, and improvements Works; c) Preparation of program of works with hydraulic design analysis; d) NRWD reduction program. • Submits reports and communications to the General Manager regarding the status and accomplishment of the project. • Maintains availability and orderliness of materials and equipment of the project. • Supervises the restoration of all damage roads, pavement and other facilities affected by the implementation of all WD utility projects and repairs. • Monitors and submits reports on the status of the actual construction of the water supply system of subdivisions turned-over to the WD.
MARY GRACE E. LIBO-ON – Public Information (Finance and HR Trainings) • Complies and writes press releases, news items, captions, and features articles of the water district for publication at local newspaper. • Establishes and maintains cordial relations with the media and other civic oriented groups. • In charge in the newsletter, brochures, information aides and the annual report of the water district. • Files clippings and articles regarding water district and its activities.

- Recommends to management solutions to public relation problems.
- Monitor all systems operations of the water district so as to be aware on pertinent facts and data whenever queries are raised by media group, etc.
- Promotes and designs programs that shall establish the role of the water district in the community in which it is dedicated to the advancement of the public interest / to gain the confidence of the public in the water district's capacity to render good if not excellent service and to provide safe and potable water.
- Performs any public relations related works as been taken by the General Manager.
- Performs other related duties that may be assigned from time to time by the General Manager.

JOJO M. LASTRE – Water Quality Monitoring

- Implements, supervises, and updates various water quality management programs of Operation & Maintenance Section based on PNSDW 2017 and other recognized standards on drinking water quality.
- Implements programs in reducing non-revenue water.
- Submits reports and communications regarding activities and accomplishments of the group.
- Taking water samples from all sources and at the distribution system including random samples from the tap of the concessionaires for bacteriological and physical / chemical test.
- Conducts daily chlorine residual monitoring.
- Monitoring of water pressure (daily)
- Conducts Non-Revenue Water Survey (House to house survey).

RODOLFO H. DINERO, JR. and JOEL F. FIEL – Operations-Water Distribution

- Implements all corrective and preventive maintenance works on Murcia Water District transmission and distribution mains, line appurtenances, reservoir and tanks, and service connection meters.
- Implements all preventive and corrective maintenance works on Murcia Water District reservoir and tanks.
- Implements existing Murcia Water District policies, Standard Operating Procedures (SOPs), safety practices regarding maintenance works; reviews said policies, SOPs, safety practices and recommends changes as deemed necessary.
- Coordinates with local government officials and other non-government officials in the implementation of maintenance works to ensure understanding and smooth facilitation of the works required.
- Directs the operation and safeguarding of spring sources, booster stations, reservoir, storage tanks, and other distribution system appurtenances.
- Coordinates with Water Quality Management Group regarding the operation of chlorination equipment at spring source and reservoir.

- Assists in the evaluation of existing systems.
- Monitors water supply in the entire service area of Murcia Water District.
- Supervise and monitors corrective and preventive maintenance on all production facilities.
- Ensures the security of Murcia Water District's structure.
- Evaluate existing maintenance system and recommends improvement to meet the required efficiency and safety.
- Submits report and communications to superiors regarding the monthly accomplishment activities and other concerns of the Section.
- Supervises and assists in the following activities of the Section: a) leak detection; b) day and night time flow measurement.
- Inspects and estimates all applicants for New Connection.

APRIL JOHN S. RUIZ – Customer Service

- Assists in supervising and monitoring service application aspect of Commercial Section.
- Approved processed New Connection (NC) applications, Maintenance Orders (MO), Reconnection, Disconnection, and Service Requests.
- Disseminates Water District programs and policies.
- Entertains complaints / reports from WD concessionaires and concerned citizens.
- Verifies adjustment to receivables and prepares notice to concessionaires.
- Prepares adjustment memo based on complaints.

CHARMAINE V. FLORES – Secretariat

- Perform clerical job.
- Type letters, reports, memorandums and other needed documents.
- Files and maintains records of all correspondence and reports.
- Prepares and dispatches request of the needed for the operation.
- Performs other function that may be assigned from time to time.

RHENEMIE AGUILAR – Documentation and Record

- Files and maintains records of all correspondence and reports.
- Performs other function that maybe assigned from time to time.

1.5 Water Safety Plan Team Composition

Table 1-2. Murcia WD WSP Team Composition

Name	Job Title	Role in the WSP Team	Contact Details	Expertise																	Remarks
				1				2			3		4	5	6	7	8	9				
				a	b	c	d	a	b	c	a	b						a	b	c	d	
PAUL G. OÑAS	Senior Engr. A	Team Leader	09175100076	✓	✓	✓	✓			✓			✓	✓	✓	✓	✓	✓				Core
MARY GRACE E. LIBO-ON	Administrative Service Officer A	Finance and HR -Trainings (Public Information)	09175511565					✓	✓		✓	✓			✓		✓					Core
JOJO M. LASTRE	Water Maintenance Man B	Water Quality Monitoring	09499195765			✓				✓			✓	✓	✓							Core
RODOLFO H. DINERO	Water Maintenance Man B	Operations-Water Distribution	09054265508		✓		✓			✓				✓	✓							Core
JOEL F. FIEL	Water Maintenance Man A	Operations-Water Distribution	09166007745	✓			✓			✓					✓							Core
APRIL JOHN S. RUIZ	Customer Service Officer A	Customer Service	09178850788								✓				✓				✓			Core
CHARMAINE V. FLORES	Eng'g Aide B	Secretariat	09776839147												✓	✓			✓	✓	✓	Core
RHENEMIE AGUILAR	Admin. Services Asst. D	Documentation and Record	09772807680					✓			✓				✓					✓	✓	Documentor

1.6 WSP Stakeholder Identification and Interaction

Table 1-3. WSP Stakeholder Identification and Interaction

Stakeholders				Interaction mechanism[3]	Record of Interaction
Name	**Relationship to Drinking Water Supply Issues[1]**	**Point of Contact with WD/WSP Team[2]**	**Issues with Drinking Water Supply**		
Farmers and landowners beside the spring source	A	*P - WD/ SH: Farmers' Coop Head*	Poorly or untreated domestic wastes contaminates source water due to poor sanitation nearby intake.	*P - Informal and scheduled meetings and dialogues*	Minutes of meetings / dialogue Attendance sheet
Municipal Health Office	B	*P - WD: O&M personnel/ SH: Sanitary Inspector*	Compliance with bacteriological quality of drinking water supplied and submittal of Physical & Chemical Result as per PNSDW 2007.	*P - Joint Sampling (i.e., it is proposed to conduct joint sampling)*	Joint Sampling Report Bacteriological Test Result
LGU	B, C,E,F	*P - WD:GM/SH: Mayor*	Compliance laws and regulations regarding water safety, and watershed protections	*P - Informal and scheduled meetings*	Minutes of meetings Attendance sheet
DENR	B, C	*P - WD:GM/SH: Agency Head*	Watershed protection and development	*P - Informal and scheduled meetings and dialogues*	Minutes of meetings / dialogue Attendance sheet
BFP	A,G	*P - WD: O&M Head/SH: Agency Head*	Possible water contamination through improper and unregulated usage of fire hydrants	*P - Informal and scheduled meetings and dialogues*	Minutes of meetings / dialogue Attendance sheet

DPWH	A,G	*P - WD: O&M Head/SH: Agency Head*	Possible water contamination through accidentally damages the transmission/ distribution pipelines because of uncoordinated programs and activities in the service area.	*P - Informal and scheduled meetings and dialogues*	Minutes of meetings / dialogue Attendance sheet
Concessionaires	C	*Commercial Head/SH*	Source of information and monitoring such as illegal pilferages, leakages and other related concerns from the tapping to their individual in-house connections	*E- Formal and Informal complaints*	Service Request and Maintenance Order

Suggested Types of Relationship to Drinking Water Supply Issues

A – Effluent contributor (source of contamination)

B – Regulator

C – Source of Information/monitoring entity

D – Supplier/contractor

E – Policy maker/legislator

F – Police authority

G – Cross-concern entity

Interaction Mechanism

Precede entries with **"E"** for ***Existing*** and **"P"** for ***Proposed*** Point of Contract from the WD/WSP Team and Stakeholder

Examples:

E-WD: PIO/SH: Farmers' Coop Head

P-WD/Lab Aide / SH: Sanitary Inspector

Interaction Mechanism

Precede entries with **"E"** for ***Existing*** and **"P"** for ***Proposed*** interaction mechanism

Examples:

E: Monthly meeting *(i.e., there is an existing monthly meeting)*

P: Joint Sampling *(i.e., it is proposed to conduct joint sampling)*

Murcia Water District WSP team chooses the above-mentioned stakeholders for developing the water safety plan because they have a big impact and influenced the quality of safe drinking water. These are as follows;

Farmers and landowners beside the spring source to be one of the stakeholder. Such stakeholder may introduce contaminants into the environment, unintentionally or accidentally. Poorly or untreated domestic wastes contaminates source water due to poor sanitation nearby intake. These problems will be lessened through informal and scheduled meeting with Farmer's Coop Head, minutes of meeting and dialogue attendance sheet shall be recorded.

Municipal Health Office as a Sanitary Inspector, formulates and implemented policies, programs, and projects to promote the health of the people in the community. Maintain proper sanitation and cleanliness in accordance with the sanitation code. The Murcia Water District will propose a monthly joint sampling to comply with bacteriological quality of drinking water supplied and submittal of Physical & Chemical Result as per PNSDW 2017 once a year.

LGU-Murcia in the process of developing of water safety plan is essential. Local role can be immediately applied to human activities that are threats to water safety, these hazardous human activities can be given right away an immediate action. Local government is the front liner of the institution, the educator of the community. The District shall communicate with the Municipality Mayor through Informal and scheduled meeting to comply the laws and regulations regarding water safety and watershed protections.

The **DENR** is a government agency that is responsible in preservation of the environment. MWD WSP team decided DENR to be one of the stakeholders for this agency promulgates and implemented rules and regulations in conservation, management, and development of the environment. It gives us security for the conservation of the watershed that holds water for the supply.

Bureau of Fire Protection (BFP) as an effluent contributor and cross-concern entity is also part of the stakeholders to inform the agency head regarding on the possible water contamination through improper and unregulated usage of fire hydrants through Informal and Scheduled meetings/dialogues.

Department of Public Works and Highways (DPWH) as an effluent contributor and cross-concern entity is also part of the stakeholders to inform the agency head regarding on the possible water contamination through accidentally damages the

transmission/ distribution pipelines because of uncoordinated programs and activities in the service area through Informal and Scheduled meetings/dialogues.

Concessionaires as the primary user of the potable water produced by the Murcia Water District.

II. SYSTEM DESCRIPTION

The Murcia Water District as of June 2017, serves 12 out of 23 barangays. These barangays are as follows:

1) ZONE I
2) ZONE II
3) ZONE III
4) ZONE IV
5) ZONE V
6) ABU-ABO
7) ALEGRIA
8) BLUMENTRITT
9) CALIBAN
10) LOPEZ JAENA
11) SALVACION
12) TALOTOG

Murcia water system operates by gravity. The spring sources elevation is higher than the Ground Reservoir and its service areas. Murcia Water District serves more than 3,000 residences and establishments within the municipality twenty-four hours a day, seven days a week. Service connections are classified as 94.06 % which comprises the majority of the served population, 4.36% government entity, 1.58 % commercial and a marginal percentage for backyard farming, agriculture, and livestock.

2.1 Water Source (Buro-Buro Spring Source)

The existing Murcia WD is utilizing Buro-Buro Spring as its source of water. Located in Bgy. Alegria, at an elevation of 379.0 m above mean sea level and about 6.8 km northeast of the Poblacion, the source discharges an average of 36.0 liters per second.

The spring is provided with reinforced concrete intake, collection box and production meters and covered with gym-type structure with vermin proof nets and canvass around the entire structure.

There are other springs which had been inspected by the Murcia WD personnel and estimated the capacity of each springs. These springs will be utilized for future use.

Water from spring source undergoes regular chemical, and physical analysis.

Figure 1-4. Buro-Buro Spring Source

The Murcia WD personnel located and inspected different possible spring water sources within the municipality of Murcia. The table below shows the possible spring water sources for future use.

2.2 Reservoir, Tanks, and Pumping Facilities

Murcia Water District has an existing 400m³ dome-covered concrete ground reservoir which is utilized for fill-and-draw mode of operation with Hypo chlorinator equipment installed located in Prk. Linasan, Brgy. Salvacion.

To ensure 24/7 supply of water, meets the peak-hour demands, and provision for fire demand, the district rehabilitated and utilized the existing three (3) – 30 cu.m storage facilities with float valves within the Poblacion. Since Hacienda Binitin, Brgy. Blumentritt is located at a higher elevation than Murcia Proper, the district installed a 2.0 HP booster pump located at the public plaza to supply the Had. Binitin's existing elevated tank with a capacity of 100 cu.m. The average 7 hrs. daily operation of the booster pump addresses the demands of concessionaires in Had. Binitin's area.

Figure 1-5. Reservoir

Figure 1-6. Tanks and Pumping Facilities

Hda. Binitin's 100u.m. Elevated Tank

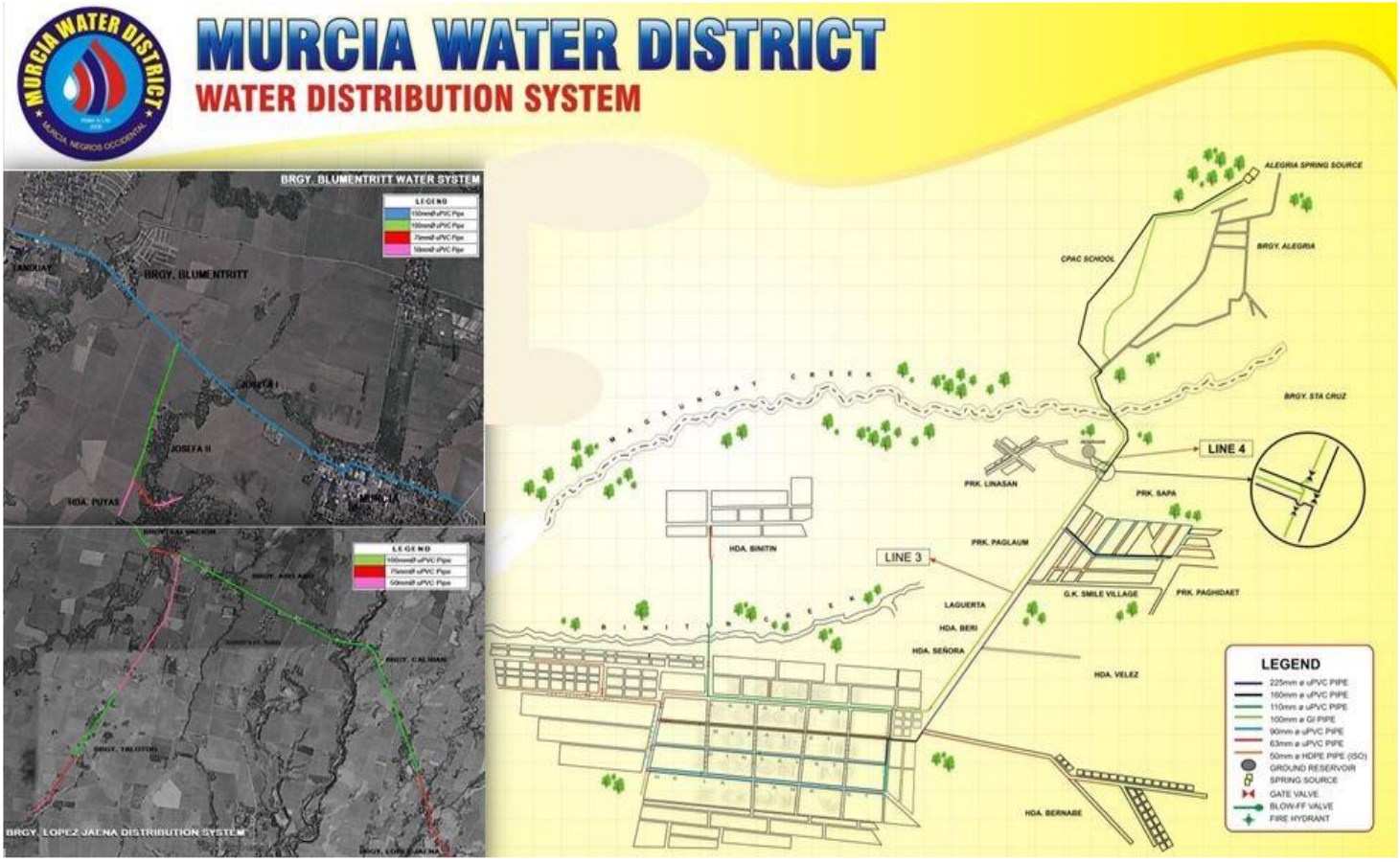
Public Market 30cu.m. Elevated Tank

2HP Booster Pump

2.3 Distribution System

The Murcia WD has an existing 4.0 km-6"Ø and 4.0 km-4"Ø Transmission pipelines from Buro-Buro spring source going to 400m³ Linasan's Dome Type Ground Reservoir, 4 km-8" Ø Distribution Pipeline, 5.10 km- 6"Ø Distribution Pipelines, 10.80 km. 4"Ø Distribution Pipelines, 7.50 km. 3"Ø Distribution Pipelines, and 7.00 km. 2"Ø Distribution Pipelines along the twelve (12) served Barangays of the District. Production meters were installed in strategic areas for records and flow rates monitoring purposes. Pressure-sustaining valves, pressure gauges, and air-release valves were installed along transmission and distribution lines to ensure adequate 24/7 system pressure monitoring and day to day operations. Six (6) hydrants located in Poblacion and Farmville and thirteen (13) blow-offs located in end point areas.

Figure 1-7. Schematic Diagram of Murcia WD Water Supply System



2.4 Treatment Process

From the Spring Sources, water is conveyed to the ground reservoir where the disinfection process takes place using granular chlorine (Calcium Hypochlorite) as the primary disinfectant. To ensure continuous disinfection of water, daily monitoring of chlorine residual to all service areas is required.

As soon as water leaves the ground reservoir, the chlorine is injected using an automatic metering pump (chlorinator). Chlorine dosage in kilograms per day is being computed based on volume of water to be served and automatically monitored by the production personnel. The Production Team of Operation and Maintenance Section regularly monitor residual chlorine in some specific locations (extremities). This is to ensure that the residual chlorine is present within the required standard of 0.3ppm to 1.5ppm set by the Philippine National Standards for Drinking Water (PNSDW) 2017.

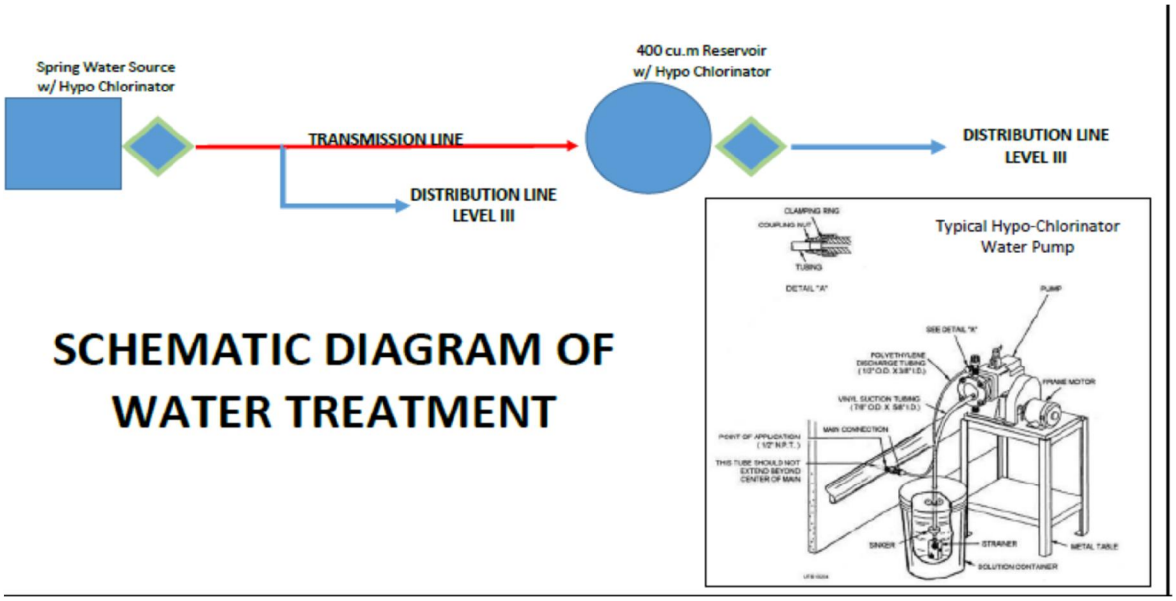


Figure 1-8. Schematic Diagram of Murcia WD Water Supply System with inset on Schematic Diagram of Water Treatment.

2.5 Process Flow Diagram

To accurately define the hazards in the water supply system, it is best to describe first components of the system in detail. The diagram shows the flow of water from the source to the treatment, and to distribution. In between are operational and inspection processes to ensure the quality of water.

Table 1-4. Process Flow Diagram

Process / Step	Symbol	Description	Responsible Unit
1		Spring Source with treatment process (chlorination)	Operation and Maintenance Section
2		Transmission & distribution networks with Service Areas	Operation and Maintenance Section
3		400 m³ Ground Reservoir with treatment process (chlorination)	Operation and Maintenance Section
4		Distribution Networks with Service Areas	Operation and Maintenance Section
5		30 m³ Elevated Tank with Booster Pump	Operation and Maintenance Section
6		Residential, Commercial Establishments, Institutions, Industries, etc.	Operation and Maintenance Section

2.6 MWD Concessionaires, and Customer Relations

As of December 2017, the Murcia WD has a total of 3,307 active service connections, 95.56% of which are residential including government accounts and 4.44% are commercial. The percentage illustrates that the water being supplied by Murcia WD is mainly used by households for drinking and domestic purposes. The table below shows the summary of active service connections.

Table 1-5. Summary of Active Connections

Classification	Number of Active Connections
Residential / Government	3,160
Commercial	147
TOTAL	3,307

As observed by the WSP Team, some after water meter connections are installed along the drainage lines or open canals. Sub-standard plumbing materials are usually used inside the concessionaires' premises, and others are improperly installed. Almost all of the customers have no overhead tanks or pumps. Unauthorized connections have also been unearthed. Murcia WD receives an average of 16 leak reports per month. Some of these are seen as potential sources of contamination of the treated water.

On Customer complaint, a Commercial Section staff shall receive and identify the request based on the query or complain. The staff fills out the service request signed by the concessionaire and signs the logbook as reference for the said request. The service request automatically forwards to O&M Section for execution. Assigned O&M personnel inspects service connection based on complain and perform quality check after service has been addressed. After the repairs, the customer will sign the service request for conformance. O&M field personnel return the signed service request to Commercial Section staff for record purposes. Time frame for the services is 4 hours maximum or based on Murcia WD Citizens Charter.

Table 1-6. Reported Leakages 2017

Month	Leakages Reported	Total Leak Repaired
January	8	8
February	2	2
March	10	10
April	7	7
May	23	23
June	18	18
July	17	17
August	25	25
September	11	11
October	31	31
November	22	22
December	13	13
TOTAL	**187**	**187**

2.7 Water Quality

Being the sole water provider in the Municipality of Murcia, Murcia WD is committed to provide safe and potable water to the community it serves. This commitment is coupled with the greater responsibility of protecting public health and safety through delivery of water which adheres to generally accepted standards of drinking water.

In partnership with our stakeholders, Murcia WD is committed to:

- Comply with the government mandated and internationally accepted standards of drinking water;
- Manage, maintain, and ensure water quality from all points along the water delivery chain – catchment to the customer's tap;

- Adopt a health-based approach in which potential hazards are identified and managed to minimize any threat to water quality, thus ensuring that effective incident and emergency response are in place;

- Establish effective monitoring programs to systematically monitor the quality of drinking water and respond to all concerns in a timely manner;

- Participate in research and development to ensure that Murcia WD is up to date with current standards.

All drinking water supplied by Murcia WD should pass the quality standards set by the Philippine National Standards for Drinking Water 2017. It should not pose any significant health risk to the consuming public. Water must be free of pathogenic organisms responsible for waterborne diseases. No objectionable color, odor and taste should be detected. Residual chlorine reading should be within 0.3 ppm – 1.5 ppm throughout the distribution system. The water quality requirements are listed below.

Table 1-7. Murcia WD Target Water Quality

Parameter	PNSDW Max. Allowable Level
I. Microbiological	
Thermotolerant Coliform / *E. coli*	MTFT: <1.1 MPN/ 100 mL EST: Absent or<1 MPN/100 mL MFT: <1 thermotolerant coliform colonies/100 mL
II. Physical	
Color	
- Apparent	10 color units
Turbidity	5 NTU
III. Chemical	
Arsenic	0.01 mg/L
Cadmium	0.003mg/L
Lead	0.01 mg/L
Nitrate	50.00 mg/L
pH	6.5 - 8.5
Total Dissolved Solids	600 mg/L
IV. Disinfectant Residual	
Chlorine Residual (ppm)	0.3 ppm to 1.5 ppm
Chlorine Dioxide (ppm)	0.2 ppm to 0.4 ppm

MTFT:* *Multiple Tube Fermentation Technique,* ***MPN**: Most Probable Number*

EST*: Enzyme Substrate Test,* ***CFU:*** *Colony Forming Units*

MFT: *Membrane Filter Technique, *should be verified and approved by the DOH*

2.8 Intended users of water and intended uses of the water

The water supplied by Murcia Water District is primarily intended for domestic use and consumption such as drinking, personal hygiene, foodstuff preparation, washing clothes, utensils and other human activities that utilize water.

The intended consumers do not include those who are significantly immuno-compromised or industries with special water quality needs. It should be noted that the water is not recommended for use for Hospital products, medical procedures and pharmaceuticals requiring special purification process. These groups are advised to provide additional points-of-use-treatment.

The water is not safe also for use with freshwater aquarium fish species, amphibians and other sensitive domesticated animals that may be intoxicated by the chlorine present in the water.

III. HAZARDS AND RISKS, CONTROL MEASURES, VALIDATION, AND PRIORITIZATION

3.1 Risk Assessment Methodology

The plan shall focus on meeting the health-based targets in water quality by ensuring the safety of drinking water from catchment to the consumer. This is based on the concept of “multi-barrier approach”, wherein if one barrier fails, the drinking water still stays safe.

The Murcia WD Water Safety Plan shall include the following:

1. Hazard identification and risk prioritization
2. Operational Monitoring
3. Plan for corrective action

In identifying the hazards and hazardous events, the WSP Team discussed all possible sources of contaminants from the catchment to consumer after which an ocular inspection was conducted to come up with reliable data and analysis on the identified potential hazards which may affect the quality of the water supply.

Hazards were then assessed and ranked using the semi-quantitative risk assessment method in order to streamline the list of risks which need priorities. Table 1-8, as shown below, describes the semi-quantitative risk matrix that the WSP Team used in prioritizing hazardous events which pose the most significant hazards and the highest risks.

Table 1-8. Semi-Quantitative Risk Matrix

Risk Factor Matrix		**Severity / Consequence**				
		Insignificant No Impact/Not Detectable Rating 1	Minor Compliance Impact Rating 2	Moderate Aesthetic Impact Rating 3	Major Regulatory Impact Rating 4	Catastrophic Public Health Impact Rating 5
Likelihood / Frequency	**Almost certain** Once a day **Rating 5**	**5**	**10**	**15**	**20**	**25**
	Likely Once a week **Rating 4**	**4**	**8**	**12**	**16**	**20**
	Moderate Once a month **Rating 3**	**3**	**6**	**9**	**12**	**15**
	Unlikely Once a year **Rating 2**	**2**	**4**	**6**	**8**	**10**
	Rare Once every 5 years **Rating 1**	**1**	**2**	**3**	**4**	**5**
Risk Score			**1-5**	**6-14**		**15-25**
Risk Rating			**Low**	**Moderate**		**High**

Table 1-9. Hazard Table Rating

Hazards	Consequence	Severity Rating
Microbial	May cause mortality; Should have highest severity rating	5
Chemical	**With health significance (toxic)**; Should have very high severity rating but lower than microbial	4
	With no health significance (non-toxic) but will make water objectionable	3
Physical	Will make water objectionable and lead to its non-use (e.g. turbidity)	3
	May make water objectionable but may not lead to its non-use	2

Table 1-10. Risk Prioritization Rating

Priority Level	Priority Type	Risk Score	Action Levels
1	High	15-25	The risk requires immediate control measures
2	Moderate	6-14	The risk requires determination of additional control measure
3	Low	1-5	Risk should be documented and requires revisiting in the future

Table 1-11 to Table 1-15 shows the output of hazard risk assessment, and the control measure using the semi-quantitative approach covering the various points of the Murcia WD Water System.

Table 1-11. Identification of Hazards, Hazardous Events and Risk Assessment and Control Measures for Spring Source

Hazardous Event (source of hazard)	Hazard	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Res. Risk				Proposed Control Measure
		Likelihood	Severity	Score			Likelihood	Severity	Rating	Risk Level	
1. Damaged spring source due to natural calamities such as earthquake can cause water turbidity and contamination	Physical	1	2	2	None-required	-	1	2	2	L	-
2. Intrusion of contaminants due to flood water entering the spring box caused by heavy rainfall	Physical	4	2	8	Securely covered roofs with concrete spring box, and disinfection facility (chlorination)	Canals and secured roofs prevented the water from entering the spring box which resulted in the absence of turbidity in the water supply	1	2	2	L	-
	Microbial	4	5	20		No contamination in water supply occurs	1	5	5	L	-
3. Disruption and disinfection failure due to power supply interruption	Microbial	5	5	25	None	-	5	5	25	H	Procurement of standby generator
4. Intrusion of contaminants (Wildlife entry) due to unsecured source covers	Microbial	5	4	20	Covered with 4 spring boxes which have concrete / cyclone with barb wire perimeter fence, with vermin proof nets and canvass	No presence of wildlife crossing the threshold	1	4	4	L	-

Hazardous Event (source of hazard)	Hazard	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Res. Risk				Proposed Control Measure
		Likelihood	Severity	Score			Likelihood	Severity	Rating	Risk Level	
5. Contamination of water supply due to discharges of domestic wastes and agricultural chemicals nearby settlers	Microbial	5	4	20	Covered with perimeter fence gate and 24/7 monitoring of security personnel to prevent unauthorized access or dumping / throwing	No contamination in water supply occurs	1	4	4	L	-
	Chemical	4	4	16			1	4	4	L	-
6. Terrorism attack	Chemical	1	5	5	None-Required	-	1	5	5	L	-

Table 1-12. Identification of Hazards, Hazardous Events and Risk Assessment and Control Measures for Transmission Lines

Hazardous Event (source of hazard)	Hazard	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Res. Risk				Proposed Control Measure
		Likelihood	Severity	Score			Likelihood	Severity	Rating	Risk Level	
1. Intrusion of contaminants (caused by mainline leak) due to vandalism or sabotage	Microbial	3	5	15	Regular preventive maintenance or mainline leak every three (3) months	No mainline leak detected as of October 2017 that caused by vandalism or sabotage	1	5	5	L	-
2. Intrusion of contaminants due to improper repair of mainline leak	Microbial	5	5	25	Flushing after the repair of mainline leak and checking the chlorine residual	Water quality results showed no characteristic of odor; Bacte-Test result: NEGATIVE	1	5	5	L	-
3. Damaged transmission line due to natural calamities such as earthquake that can cause water turbidity and interruption of water supply	Microbial	4	5	20	Immediate site inspection in all transmission line	Immediate repair of leakages	1	5	5	L	-
	Physical	3	2	6			1	2	2	L	-

Table 1-13. Identification of Hazards, Hazardous Events and Risk Assessment and Control Measures for Reservoir

Hazardous Event (source of hazard)	Hazard	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Res. Risk				Proposed Control Measure
		Likelihood	Severity	Score			Likelihood	Severity	Rating	Risk Level	
1. Damaged reservoir due to natural calamities such as earthquake that can cause water turbidity	Physical	1	2	2	None Required	-	1	2	2	L	-
2. Contamination of water supply due to heavy rainfall, and flooding	Physical	4	2	8	Securely covered by dome-typed concrete with disinfection facility (chlorination) and reservoir tender	Dome-typed concrete covers prevented the water entering the reservoir box which resulted in the absence of contamination in water supply	1	2	2	L	-
	Microbial	4	5	20		No contamination in water supply occurs	1	5	5	L	
3. Power supply interruption causing treatment interruption and/or loss of disinfection	Microbial	5	5	25	Drip type method of chlorination for disinfection	Bacte-Test result: NEGATIVE	1	5	5	L	-

Hazardous Event (source of hazard)	Hazard	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Res. Risk				Proposed Control Measure
		Likelihood	Severity	Score			Likelihood	Severity	Rating	Risk Level	
4. Contamination of water supply due to discharge of domestic wastes and agricultural chemicals of nearby settlers	Microbial	5	5	25	Covered with perimeter fence gate and 24/7 monitoring of security personnel to prevent unauthorized access of dumping / throwing	No contamination of water supply occurs	1	5	5	L	-
	Chemical	2	5	10			1	5	5	L	
5. Terrorism attack	Chemical	1	5	5	None Required	-	1	5	5	L	-

Table 1-14. Identification of Hazards, Hazardous Events and Risk Assessment and Control Measures for Distribution Pipelines

Hazardous Event (source of hazard)	Hazard	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Res. Risk				Proposed Control Measure
		Likelihood	Severity	Score			Likelihood	Severity	Rating	Risk Level	
1. Intrusion of contaminants (caused by distribution line leak) due to Vandalism or Sabotage	Microbial	3	5	15	Regular preventive maintenance of mainline leak every three (3) months	No distribution line leak detected as of December 31, 2017 caused by Vandalism or Sabotage	1	5	5	L	-
2. Turbidity and contamination of water supply due to improper repair of distribution line leak	Microbial	5	5	25	Flushing after the repair of distribution line leak and checking the chlorine residual	Water quality results showed no characteristic of odor; Bact-Test Result: NEGATIVE	1	5	5	L	-
3. Turbid water due to pressure fluctuations and intermittent supply	Microbial	5	5	25	Constant monitoring of pressure gauges as reference for possible mainline leakage	Immediate response/repair for emergency leaks	1	5	5	L	Development of additional water sources
4. Damaged distribution line due to natural calamities such as earthquake that can cause water turbidity and interruption of water supply	Microbial	4	5	20	Ripraps and spillways were restricted	Immediate repairs of leakages	1	5	5	L	-
	Physical	4	2	8			1	2	2	L	

Table 1-15. Identification of Hazards, Hazardous Events and Risk Assessment for Service Lines

Hazardous Event (source of hazard)	Hazard	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Res. Risk				Proposed Control Measure
		Likelihood	Severity	Score			Likelihood	Severity	Rating	Risk Level	
1. Intrusion of contaminants due to illegal tampering	Microbial	5	5	25	Existing policy on illegal tampering and pilferages	Discovered and penalized	4	5	20	H	Information dissemination and giving rewards to the person reported the incident and take legal actions
2. Contamination of water supply caused by improper repair of service line	Microbial	5	5	25	Daily chlorine residual monitoring and regular (monthly) Bacte-Test in specified areas	Water quality results showed no characteristic of odor; Bacte-Test Result: NEGATIVE	1	5	5	L	-

IV. IMPROVEMENT / UPGRADE PLAN

Based on hazard assessment, improvement plans were developed for those identified as high risks in order to eliminate or control the hazard. **Table 1-16 to Table 1-17** shows the improvement plan developed by the WSP Team.

Table 1-16. Improvement / Upgrade Plan for Spring Source

PCM Reference Number (Table / No.)	Action (Proposed Control Measure)	Arising from (Hazardous Event)	Identified specific improvement plan	Accountabilities	Cost /Funding Source	Due	Status
1-11 / 3	Procurement of standby generator	Disruption and disinfection failure due to power supply interruption	Procure two (2) units of generator set	Water Maintenance Man B	P 150,000.00	3RD Quarter of 2018	Budget review and canvassing of 2 units' generator set

Table 1-17. Improvement / Upgrade Plan for Service Lines

PCM Reference Number (Table / No.)	Action (Proposed Control Measure)	Arising from (Hazardous Event)	Identified specific improvement plan	Accountabilities	Cost/ Funding Source	Due	Status
1-15 / 1	Information dissemination and giving of rewards to the person who reported the incident and take legal actions	Intrusion of contaminants due to illegal tampering	Immediate cut-off of illegal connection upon	Commercial Section and O&M Section	-	1st Quarter of 2018	Strict existing policy on illegal tampering and pilferages are being implemented

V. OPERATIONAL MONITORING OF CONTROL MEASURES AND CORRECTIVE ACTIONS

The operational parameters and critical limits were defined for all identified control measures with hazardous event classified as high risk for monitoring purposes. These are criteria that indicate whether the control measure is functioning.

Monitoring is done by comparing the actual operational parameters with agreed critical limits. **Table 1-18** shows what should be monitored, the frequency of monitoring, who and how it will be monitored. Certain corrective actions are also indicated if the operation deviates from the normal situations (normal or critical limits) to prevent contamination of supplied water.

Table 1-18. Operational Monitoring & Corrective Action

Process Step: Control Measure	Critical limit	What	Where	When	How	Who	Corrective action
Securely covered roofs with concrete spring box, and disinfection facility (chlorination)	Damaged	Roof	Source	As scheduled	As planned	Water Resources Facilities Tender	Report to Supervisor for repair
Covered with perimeter fence gate and 24/7 monitoring of security personnel to prevent unauthorized access or dumping/throwing of domestic waste.	Damaged / Destroyed	Perimeter fence	Source and Reservoir	As reported	As planned	Water Resources Facilities Tender	Report to Supervisor for repair
Regular preventive maintenance of mainline leak every three (3) months	Sabotage / Vandalism discovered	Mainline	Service Area	As discovered	Immediately	O & M Section	Emergency repair

Immediate site inspection in all transmission line and distribution line system	No water	Pipeline	Service Area	After the calamity	Immediately	O & M Section	Emergency repair
	Positive	e.coli			After testing		Residual and Bacte-Test
Securely covered by dome-typed concrete with disinfection facility (chlorination) and reservoir tender	Turbidity	Water	Reservoir	After the heavy rainfall	After testing	O & M Section	Residual and Bacte-Test
	Positive	e.coli					
Covered with 4 spring boxes which have concrete/cyclone with barb wire perimeter fence, with vermin proof nets and canvass	Presence of wildlife	Perimeter fence	Source and Reservoir	Visual inspection	Rehabilitation and procurement of nets	O & M Section	Rehabilitation and repair
Covered with perimeter fence gate and 24/7 monitoring of security personnel to prevent unauthorized access or dumping/throwing of domestic waste.	Damaged/ Destroyed	Perimeter fence	Source and Reservoir	As reported	As planned	Water Resources Facilities Tender	Report to Supervisor for repair
Regular preventive maintenance of mainline leak every three (3) months	Sabotage/ Vandalism discovered	Mainline	Service Area	As discovered	Immediately	O & M Section	Emergency repair
Riprap and spillways were constructed	No water	Pipeline	Service Area	After the calamity	Immediately	O & M Section	Emergency repair
	Positive	e.coli			After testing		Residual and Bacte-Test
Flushing after the mainline leak and checking the chlorine residual	Positive	e.coli	Service Area	As scheduled	After testing	O & M Section	Residual and Bacte-Test

Existing policy on illegal tampering and pilferages	Sabotage/ Vandalism discovered	Mainline	Service Area	As discovered	Immediately	O & M Section	Emergency repair
Daily Chlorine Residual monitoring and regular bacte-test in specified areas	Positive	e.coli	Service Area	As scheduled	After testing	O & M Section	Residual and Bacte-Test

VI. VERIFICATION

Verification activities are necessary to determine the compliance of WSP with the existing standards. This includes internal and external auditing, monitoring of water quality and customer satisfaction. **Table 1-19** shows the verification monitoring programs which are part of the Murcia WD regular operation.

After the implementation of the Water Safety Plan, the procedure and records should be reviewed to confirm that the plan is being carried out. This is called periodic auditing. An audit-based approach places responsibility on every unit involved to provide information regarding system performance against agreed indicators. It is the collection of data to evaluate the level of conformance to the quality system indicated in the WSP as well as the degree of compliance to regulatory requirements.

Periodic auditing also involves the completion of factual input for management decision, determines if company is at risk, identifies areas or opportunities for improvements, assesses individual performance, assists company staff training needs, improve communication and motivation of personnel.

Furthermore, there will be interim review of the WSP in addition to the periodic review once following changes take place:

1. Changes in the catchment, treatment, and distribution
2. Revised procedures
3. Staff changes
4. Stakeholder contact changes

To guarantee the effectiveness of the audit system, the audit requires an Internal Audit procedure which will serve as an assessment of the WSP. The auditors should have no direct involvement with the auditee but are qualified enough having a technical understanding of the audit area.

Since the team is composed of water quality management staffs from Operation and Maintenance Section, the WSP will be checked by the authorized representative from the Office of the General Manager.

Table 1-19. Verification Monitoring Program

Verification Activity	Location of Activity	Type of Activity	Frequency of activity	Analyst	Recipient of Analysis Result*	Action on unusual/ failing result	3rd-Party Recipient of Results
Disinfection Residual							
Chlorine Residual	Consumer's taps randomly selected per designed sampling plan	Chlorine residual monitoring using chlorine comparator kit	Daily	Production Team Personnel	O&M Head	For re-chlorination of non-complying residual in selected areas, adjustment of chlorine dose	**OGM, LWUA**
Microbiological Quality Test (External Laboratory)							
Total Coliform	Consumer's taps randomly selected per designed sampling plan	Sampling	Monthly	DOH Accredit Laboratory	O&M Head	For re-sampling of positive consumer's tap as well as before and after the sample location	**MURCIA HC, OGM, LWUA**
Thermotolerant Coliform/E.coli	Consumer's taps randomly selected per designed sampling plan	Sampling	Monthly	DOH accredit lab	O&M Head	For re-sampling of positive consumer's tap as well as before and after the sample location	**MURCIA HC, OGM, LWUA**

Heterotrophic Plate Count (HPC)	Consumer's taps randomly selected per designed sampling plan	Sampling	Monthly	DOH accredit lab	O&M Head	For re-sampling of positive consumer's tap as well as before and after the sample location	**MURCIA HC, OGM, LWUA**
Verification Activity	**Location of Activity**	**Type of Activity**	**Frequency of activity**	**Analyst**	**Recipient of Analysis Result***	**Action on unusual/ failing result**	**3rd-Party Recipient of Results**
PHYSICAL-CHEMICAL TEST (External Laboratory)							
Turbidity	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head	In case of high turbidity; Flushing of hydrants and blow-offs	**MURCIA HC, OGM, LWUA**
pH	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**
Total Dissolved Solids	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**
Chloride	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**
Iron	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**
Nitrate	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**
Color	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**

Arsenic	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**
Lead	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**
Cadmium	Raw water	Sampling	Once a year	DOH accredit lab	O&M Head		**MURCIA HC, OGM, LWUA**
Verification Activity	**Location of Activity**	**Type of Activity**	**Frequency of activity**	**Analyst**	**Recipient of Analysis Result***	**Action on unusual/ failing result**	**3rd-Party Recipient of Results**
INTERNAL AUDITING							
Verification of Chlorine Dosing Logbook	Spring Source and Reservoir	Audit of records	Monthly	Water Facilities Tender/Water Maintenance Man	O&M Head	SOP for spring source and reservoir	**OGM, LWUA**
EXTERNAL AUDITING PLAN							
Murcia Water District will abide by the External Auditing Guidelines that will be issued by the Department of Health (DOH) and Local Water Utilities Administration (LWUA).							
CUSTOMER SATISFACTION							
Customer Feedback	Public Assistance and Complaints Desk (PACD)	Suggestion box and walk-in complaints	Daily	Customer Service Assistant	OGM	Service Requests / Investigation	
	Email and Social Media	Complaints	Monthly			Follow-ups	

VII. MANAGEMENT PROCEDURES

Part of the WSP is the integration of Murcia WD's standard operating procedures particularly those that affect the quality of water from catchment to consumer. Standard Operating Procedures, as shown below, are SOPs under normal operating and maintenance conditions, major incident, and emergency situations.

7.1 STANDARD OPERATING PROCEDURE for Normal Operating and Maintenance Conditions

1) Installation of new service connection
2) Disconnection
3) Reconnection
4) Minor Leak Repair
5) Production of Water
6) Water Treatment
7) Bacteriological Testing
8) Physical-Chemical Test for Water
9) Line Survey

7.2 STANDARD OPERATING PROCEDURE for Major Incident Conditions

1) Major Leak Repair
2) Preventive Maintenance Pipelines

7.3 RESPONSE PLAN ON EMERGENCY

The development of the Water Safety Plan ensure decline in the number and severity of incidents affecting or would possibly affect the quality and safety of water distributed to the concessionaires. However, such incidents may still take place.

It is therefore necessary to review and/or revise the WSP following every emergency, incident, or unforeseen event or near misses to guarantee that the same incident / emergency will not recur in the future and to determine whether the response was effective or needs to be improved

Most likely, the results of a post incident review will determine the areas for improvement of the WSP whether it is a new hazard, or a revised risk for the risk assessment, a revision for an operating procedure or a training issue. It is important that the WSP must be revised so that changes may be reflected and lessons from WSP documentations and procedures are incorporated.

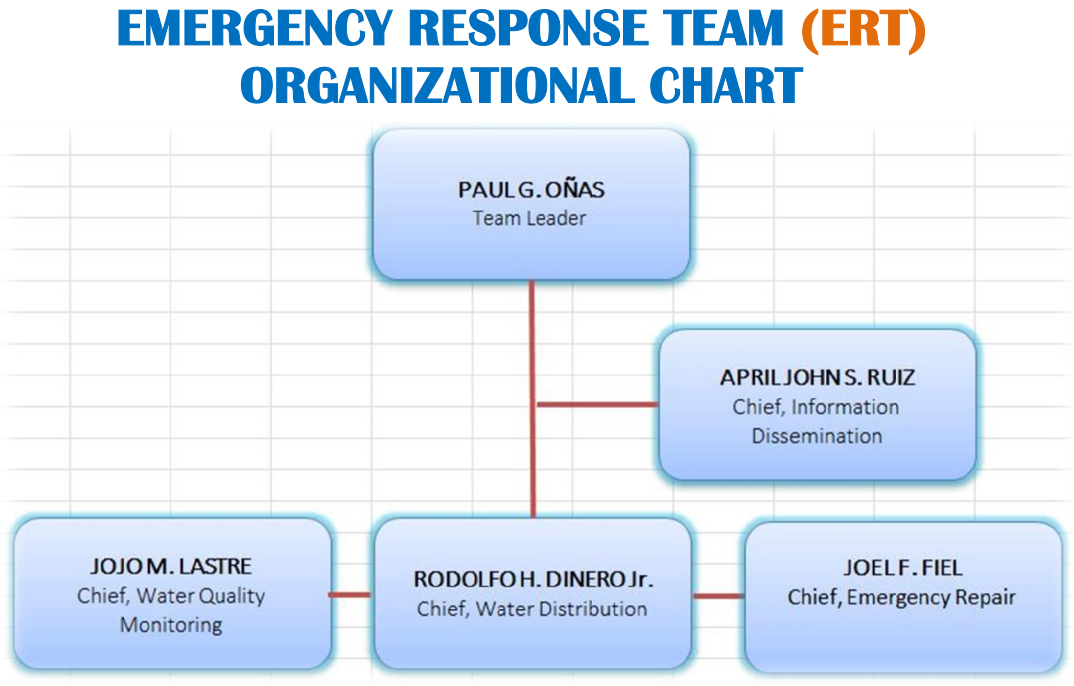


Figure 1-9. Emergency Response Team Organizational Chart

RESPONSE PLAN IN CASE OF MAJOR WATER INTERRUPTIONS

The ff. is the list of events/incidents that would trigger and activate the (**ERT**) Emergency Response Team:

1. **Typhoons/La Niña.** That would cause major *flash floods* in rivers where the transmission pipelines were located.
2. **Earthquakes**. Damage results as the earth shifts along geological faults. Shaking and ground settling can cause severe structural damage to all water system facilities, including sources, transmission and distribution lines, tanks and reservoirs.
3. **Fire (Level 5).** It can cause widespread power outages and damages water system facilities in addition to the devastating loss of properties.
4. **El Niño (Drought).** El Niño is a weather phenomenon characterized by an unusual increase in ocean surface temperatures or warming in the center and eastern equatorial Pacific Ocean. Occurring every two to 7 years, it can bring either heavy rain or drought that may last for a year, and may heavily impact the agricultural sector, and supply of water and power in the country.
5. **Vandalism.** Using materials at hand, vandals often break into systems, and damage transmission and distribution lines that can cause water outage for hours or worst, for days.

Table 1-20. Emergency Contact Information when Emergency Occurs

NAME	POSITION	AGENCY	CONTACT NUMBER	REMARKS
Rolly H. Dinero	Executive Asst. II	Mayor's Office	0917-3081-170	Representative
Leilani C. Pitallar	Sanitary Inspector	Murcia Health Center	(034) 441-2683	Representative
SFO2 Ramil Plaza	Fire Chief	BFP	0921-3994-927	Representative
Vicente Leonida	Dept. Head	MDRRO	0920-9681-411	Representative

Ruben Lanzar	Supplier	MGL Enterprises	(034) 446-0259	Fittings supplier
Jose V. Uy Jr.	Supplier	Elastic Industrial Sales	(034) 434-5212	Pipelines supplier
Romeo Michael A. Sison	Supplier	Bacolod Chemical Supply	(034) 433-3141	Chlorine supplier (Calcium Hypochlorite)
Daisy V. Desengaño	Water Quality Division	Bacolod City Water District	(034) 708-0233	For Technical Assistance

In addition to phone contact numbers, the district is seriously considering forming partnerships with the Local Government Units (LGU's) and other agencies concerned to help deliver important information when needed. The district also gives the concessionaires some general safety information before an emergency occurs.

RESPONSE PLAN FOR PROVIDING AND DISTRIBUTING EMERGENCY WATER SUPPLY

When major water interruption occurs caused by typhoons, earthquakes, fire (level 5), El Niño, vandalism, and other major incidents, the **ERT** will be the one who investigate, evaluate, and assess the damaged facilities and report as soon as possible to the General Manager the magnitude of the said problem. If the repairs of the damaged facilities like the transmission lines and distribution lines will take days, the O&M Section Head will recommend to the General Manager to schedule or restrict the water supply to all service areas. After consulting to the General Manager, the O&M Section Head will initiate the scheduling of water supply to service areas.

1. The General Manager confers with key staff to verify problems.
2. The O&M Section Head organizes staff and directed them to their designated valves area to close.
3. The General Manager coordinates with LGU about the problem.
4. To provide and deliver emergency water to all service areas, the assigned three (3) team O&M field personnel close temporarily within four (4) hours respectively the specific group of valves in order to divert

the water supply to four (4) to five (5) areas until all twelve (12) zones will be catered. Repeat all procedures until the water supply will go back to normal operations.

5. Water system operation section head continues to investigate problems and make repairs as necessary and as soon as possible.

6. Commercial Section support person will provide a pre-scripted message to phone callers and log in each phone call.

7. Operation and Maintenance Section Head continuously updates the General Manager on status of the repairs.

8. Commercial Section Head and staff re-notify customers when water interruptions are resolved.

9. Coordinate/communicate with other WD's and other relevant agencies if external support/assistance is needed.

The Murcia Water District is dedicated and committed to deliver sufficient potable drinking water to its concessionaires. In order to achieve our commitment, the district surveyed and located potential water sources within the municipality. These identified water sources will secure the future water demands of Murcia and for the district to be ready when catastrophic event such as *El Niño* will occur in the near future.

PROCEDURES FOR NOTIFYING CONCESSIONAIRES OF POTENTIAL WATER SHORTAGE / INTERRUPTIONS

The General Manager must make the decision to notify concessionaires about a potential water shortage/interruption and the need for water-use restrictions or scheduling of water supply to service areas. After consulting with the General Manager, the Commercial Section Head will initiate the notification procedure.

1. The General Manager confers with key staff to verify problems.

2. The Commercial Section Head organizes staff to develop the message delivered to the customers

3. The General Manager coordinates with LGU about the problem.

4. To deliver the water shortage notification, a **TEXT BLAST** will automatically send to all registered concessionaires within the service

areas, O&M field personnel and commercial field personnel will inform all Barangay Captains within the affected service areas, and two (2) follow-up field personnel will go to all service areas with megaphones repeating continuously the water shortage message.

5. Water system operation section head continues to investigate problems and make repairs as necessary and as soon as possible.

6. Commercial Section support person will provide a pre-scripted message to phone callers and log in each phone call.

7. Operation and Maintenance Section Head continuously updates the General Manager on status of the repairs.

8. Commercial Section Head and staff re-notify customers when water shortage is resolved.

Emergencies don't just happen during business hours. The Murcia Water district service is always available even if it falls on weekend, or holiday. Concerned concessionaires may call or text at **09171334263** or they can go directly to the district's office during weekend or holiday.

VIII. SUPPORTING PROGRAMS

The effective implementation of the Water Safety Plan is greatly dependent on management's support and commitment to equip and capacitate its employees to efficiently carry out their task in the production and delivery of safe water.

Table 1-21. Supporting Programs

Program	Purpose	Activity	Target Date
Calibration	To ensure and maintain accuracy and reliability of equipment monitoring	a) Chemical dosing pumps	Semi-annually
		b) Portable Utility Service Analyzer	Monthly

Preventive Maintenance	To ensure that malfunction of important processes is prevented and strategies and assets are in good working order.	a) Valves Manipulation	Quarterly
		b) Reservoir and Tank Facilitates	Annually
		c) Grass Cutting Program in Spring Source and Reservoir's Station	Monthly
		d) Hydrants and Blow-0ffs testing	Semi-Annually
Hygiene and Sanitation	To prevent organization, personnel, and equipment from introducing hazards to the water.	a) PPEs	Quarterly
		b) Sealing of stocked pipes	3rd quarter of 2018
Training and Awareness	To ensure organization (and contractor if applicable) personnel understand water safety, their role in achieving compliance to water quality targets, their role in sustaining the effective implementation of the Water Safety Plan and the influence of their actions	a) Water Safety Plan Training	Look for LWUA and other Training Center for schedule
		b) Water Resource Facility Operator Course	Look for LWUA and other Training Center for schedule
		c) Training on Hygiene and Sanitation Procedures	Look for LWUA and other Training Center for schedule
		d) Water Quality Management	Look for LWUA and other Training Center for schedule
		e) Competency Requirements	Look for LWUA and other Training Center for schedule
		f) Chlorine Handling and Safety	Look for LWUA and other Training Center for schedule
		g) Understanding the Concept of Water Contamination	Look for LWUA and other Training Center for schedule

IX. WSP REVIEW PROCEDURES

Water Safety Plan shall be reviewed at least once a year to ensure that new risks threatening the water sources, production and distribution of safe water are regularly assessed and addressed. An updated Water Safety Plan will ensure the employees and stakeholders confidence and support in the WSP approach. Murcia Water District's water quality management system consists of a stage by stage analysis, making sure that no possible hazard could enter the system at all times.

List of Abbreviations

WSP	-	Water Safety Plan
DOH	-	Department of Health
PNSDW	-	Philippine National Standards for Drinking Water
SOP	-	Standard Operating Procedures
LGU	-	Local Government Unit
MWD	-	Murcia Water District
DENR	-	Department of Environment and Natural Resources
BFP	-	Bureau of Fire Protection
LWUA	-	Local Water Utilities Administration
PACD	-	Public Assistance and Complaints Desk
NSC	-	New Service Connection
CSA	-	Customer Service Assistant

GLOSSARY OF TERMS

Chlorine – a halogen element, a heavy, greenish-yellow, incombustible, water-soluble, poisonous gas that is highly irritating to the respiratory organs, obtained chiefly by electrolysis of sodium chloride brine: used for water purification, bleach making etc.

Chlorine Residual – when a sufficient dosage of chlorine is applied to water, microorganisms of sanitary significance are destroyed and there is a reaction on all oxidable matter. After all these reactions have taken place, at the end of a specified contact time there remains a certain minute quantity of chlorine in the water.

Contaminant – materials not normally found in water that make the water less desirable or unfit for its intended use.

Thermotolerant coliforms – the group of coliform bacteria which produce gas from lactose in 48 hours at 44.5ºC. These organisms are sometimes referred to as “faecal coliforms”; however, the term “thermotolerant coliforms” is now accepted as more appropriate, since not all of these organisms are of faecal origin.

Total Coliform – refers to any rod-shapes, non-spore-forming gram-negative bacteria capable of growth in the presence of bile sales, or other surface-active agents with similar growth-inhibiting.

Water Quality – refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose.

Hazards –is any agent that can cause harm or damage to life, health, property or the environment.

Hazardous Event – Event that can cause harm.

Stakeholders – A person, group or organization that has interest or concern in an organization.

Microbial – A unicellular or small multicellular organism including bacteria, protozoa, some algae and fungi, viruses, and some worms, esp. those that are injurious to other organisms.

Arsenic – the chemical element of atomic number 33, a brittle steel-gray metalloid.

Cadmium – is a chemical element with symbol Cd and atomic number 48. This soft, bluish-white metal is chemically similar to the two other stable metals in group 12, zinc and mercury.

Lead – is a chemical element with symbol Pb and atomic number 82. It is a heavy metal with a density exceeding that of most common materials; it is soft, malleable, and melts at a relatively low temperature.

Nitrate – is a polyatomic ion with the molecular formula NO^{-}_{3} and a molecular mass of 62.0049 u. Nitrates also describe the organic functional group $RONO_2$. These nitrate esters are a specialized class of explosives.

Turbidity – is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air.

pH –is a numeric scale used to specify the acidity or basicity of an aqueous solution.

Chloride – It is formed when the element chlorine gains an electron or when a compound such as hydrogen chloride is dissolved in water or other polar solvents.

REFERENCES

1) Department of Health. "*Philippine National Standard for Drinking Water 2017"*

2) Maynilad Water Safety Plan 2015

3) Water Safety Plan Manual:" Step by Step Risk Management for Drinking Water"

4) San Jose Water – Water Safety Plan 2015

5) Murcia Water District Operations Manual or Quality Management System

6) Murcia Negros Occidental Profile