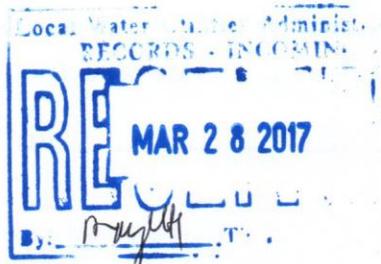


Villasis Water District Water Safety Plan (WSP)

Revision No 000 Dated 15/11/2016



Villasis Water District

Water Safety Plan (WSP)

Contents

1. Introduction	1
1.1 Background	1
1.2 Justification of development of this WSP	3
1.3 Main risks in the system.....	3
1.4 Key reference material for this WSP	4
2. WSP Team.....	5
2.1 History of team development (Optional)	5
2.2 WSP team members, roles and responsibilities	5
3. System Description.....	8
3.1 General information on the supplier.....	8
3.2 Stakeholders.....	8
3.3 Source of water: Catchment and extraction from source	9
3.4 Flow diagram	9
3.5 Treatment processes.....	10
3.6 Distribution system.....	10
3.7 Customer's practices	11
3.8 Water quality required	11
3.9 Delivery Point, Intended users of water and intended uses of the water	13
3.10 Current delivered-water quality.....	13
3.11 Persistent Problems.....	13
4. Risk Assessments, Hazard Table and Existing Control Measures.....	14
4.1 Risk assessment methodology	14
4.2 Hazard / Risk table and existing controls	14
4.3 Prioritised hazardous events.....	14
5. Improvement Plans	21

6. Operational Monitoring and Corrective Actions of Control Measures.....	26
7. Verification Procedures	30
8. Management Procedures	31
9. Supporting Programs.....	31
10. WSP Review Procedures	31
11. Incident Response Plans.....	31

Annex:

- A: WSP Minutes of the Meeting
- B: Map of Villasis Pipeline Network
- C: Legend Map of Villasis Pipeline Network
- D: BOD Resolution adapting WSP to VWD
- E: Supplier Information
- F: System Description
- G1: Well/Spring Survey Checklist (Pump station 1)
- G2: Well/Spring Survey Checklist (Pump station 2)
- G3: Well/Spring Survey Checklist (Pump station 3)
- G4: Well/Spring Survey Checklist (Pump station 4)

Abbreviations

- WHO World Health Organisation
- WSP(s) Water Safety Plan(s)
- WTP Water Treatment Plan
- VWD Villasis Water District

Document History

This page records the changes made to the document since its inception. Every time a revision is made to the document,

Revision Number and Date	Which sections of the document were revised
Rev 0. Date 15 November, 2016	Issue of first revision – all sections new



1. Introduction

1.1 Background

Water Safety Plans (WSP) are a recent internationally recognized comprehensive risk based approach to achieving safe water. They are considered best practices. WSPs are the most effective means of consistently achieving the safety of a drinking-water supply. They do this by using a risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer.

Numerous complaints bombard the district daily. Ranging from complaints on leakages, low pressure, odorous and murky water supply. These complaints reflect lapses and failures in the operations of the district that needs to be checked regularly through proper monitoring and evaluation of the management and operations system. Responsible and accountable officers and staffs need a review of their job responsibilities in order to be effective in their respective fields. Accordingly, in government institutions several evaluations on employee performance are being conducted, all in the aim of improving employee performance of their respective mandate.

Clean water is one of the world's most precious resources. People use water every day for a variety of reasons, such as drinking, bathing, recreation, agriculture, cooling, industry, and medical uses. Many of us depend on groundwater as our primary sources of drinking water - whether we use a private well, public water supply, or some other groundwater source. The quality of most drinking water in Villasis is good; however, it is possible for the well and pumped water to be contaminated by bacteria, nitrate, arsenic or other toxic chemicals and foreign matters.

This is the very reason why Villasis Water District production division ensures that its water systems meet the guidelines for safe drinking water through the creation of Water Safety Plan (WSP). The water safety plan (WSP) covers all the hazards and risks on the quality of water that runs to consumer houses and the health of consumers from the hazardous events identified in the WSP. These hazardous events are assessed, controlled and monitored to ensure the safety of consumer health in general. Systematic approach, thorough management and supporting procedures are formulated by the WSP team to control and possibly avoid hazards and risks on the quality of water being provided by Villasis Water District (VWD). Also, WSP builds good practice and sense of responsibility not only to the employees and management of VWD but also the consumers and the society as a whole.

The aim of a WSP is to ensure that a drinking water supply consistently produces safe drinking water that is acceptable to consumers. The scope and application of the WSP should not only concern hazard identification and risk assessment and control through catchment, treatment and distribution. It should also envelop all operations linked to water supply including the management and management procedures, training, internal and external communications, monitoring, laboratories, reporting and incident and emergency procedures.

The WSP is comprehensive hazard identification, risk assessment and risk management that puts emphasis on controlling risks. Monitoring becomes more targeted towards

demonstrating that the controls are working and WSP procedures should enable early identification of new or increased risks. Incidents and events should become more predictable and preventable. Further WSP will enable stakeholders to better realize their responsibilities towards the safety of water supplies and enable consumers to have more confidence in the quality of their drinking water and will also increase their awareness and participation in lessening the risks and hazards to the quality of water supply.

The supply system consists of four elements, catchment including the source water, treatment, distribution and consumers. Development of a water safety plan requires the support of management, stakeholders and the employees because there will be cost and time requirements and because without such support the approach will not get widespread staff acceptance. Below is an outline of the main points of a WSP.

- Recognize that developing a WSP will require financial, management and human resource support.
- Set up a team to decide on WSP methodology and oversee implementation with a leader able to drive the project and motivate people. The team consist of experienced individuals representing all aspects of drinking water production and distribution, each with a specific role and responsibility. Stakeholders with an interest in the water supply are involved. The size of the team reflects the complexity of the supply system. For VWD the team seek some external expertise.
- Describe and document the water supply system and identify through existing records, local knowledge and site visits all the hazards that can affect the safety of a water supply from the catchment, through treatment and distribution to the consumer. Potential hazards are considered in the widest possible sense it is not just restricted to chemical and microbiological parameters. Also, including such things as flooding, power supplies, availability of alternative supplies, availability of trained staff, laboratory facilities and reporting and communications.
- Assess the risk presented by each hazard by considering the likelihood of its happening and the consequences for the safety of the water if it does occur.
- For any risks assessed as significant consider if controls or barriers are in place and demonstrate that these are effective and will ensure that water quality standards are met.
- Ensure that there are management plans for actions to be taken during normal operation and incident conditions and documentation of the system assessment, monitoring and communication plans and supporting programs.
- Make sure that there are adequate and effective programs for training, maintenance, research and development and consumer information and that the WSP is subject to audit.
- Regularly review the hazards, risks, controls and functioning of the WSP, particularly after something has gone wrong.

For example, if the existing pump station has no fence the hazard of intrusion, sabotage and vandalism would be immediately obvious from a site visit and would represent a significant risk to the safety of the water supply. The most effective sustainable control would not be occasional monitoring of the water for chemical, or other toxic substances in the water; it would be prevention of human or animal access or intrusion to the pump station by building a sturdy fence and the monitoring would be regular checking that the fence was intact and effective.

The success of the WSP then, is a crucial indicator of the service quality being provided by the VWD officers and employees.

1.2 Justification of development of this WSP

As a government institution Villasis Water District (VWD) adheres to the advocacy and objective of a WSP. This is for the reason that VWD is a service oriented institution focused in providing the best quality delivery services. Specifically, in providing potable, clean and safe water supply to all its consumers. VWD mandate is basically to provide and protect its consumers from incidences that may harm them through the services that VWD serves.

Villasis is generally a flat terrain with a river crossing at its southern part. That makes Villasis rich in ground water source and aquifer. Generally, water distribution and water pressure related problems are very rare. Areas with perennial low water pressure during peak hours are areas that are far from the water source or pump stations of the district. This is because Villasis Water District (VWD) has only 4 pump stations serving sixteen (16) barangays from a total of twenty-one (21).

On issues of water quality, the district has also rarely received complaints on odor and color of the water supply being distributed. These instances only occur on the endpoints of the water service lines not being flushed as scheduled. This is because endpoints that are neglected tend to be silted i.e. unflushed. These reported incidents and complaints are being catered immediately by the maintenance and production division as scheduled by the commercial division.

WSP will be beneficial in terms of identifying problem areas and evaluating them as soon as it is identified and verified by the responsible entities and persons. Solutions like strategies and action plans will also be produced through WSP. Further WSP will serve as guide in troubleshooting and evaluating identified problem areas in the delivery services of the district.

The Local Government Unit has always been a strong support to all activities and projects of the district. They have been cooperative and helpful in every decision of the district for the betterment of serving the people when it comes to water supply quality.

1.3 Main risks in the system

Seepage, power interruption, vandalism/sabotage, well located low grounds, chlorinator clogging and possible contamination are the main risks identified by the WSP members with the help of all the employees who have first-hand experienced on these incidents. These employees are the ones assigned inside pump stations, repair leakages of water lines and those who have received complaints from consumers on a daily basis.

In line with these identified hazards on the water quality the district had conducted control measures to avoid these incidents to affect the water quality of the supply being produced by the district. The Wells have installed blank casings down to 30mbgl and sanitary grout down to 15mbgl to prevent seepage of domestic wastes and insecticides and/or pesticides from the neighbouring households and agricultural lands. The water pump is immediately turned off whenever there exists a threat of flooding due to bad weather condition like storms and typhoons. A standby generator, fence around the perimeter of pump stations and a 24 hour on duty operator are being installed, built and assigned respectively, in every pump station to safeguard the area and in so doing the water supply quality. Immediate repair of damaged well-head, cleaning of nozzles every three weeks and sectional line flushing are also measures to ensure contaminant free water supply by the district. Regular monitoring on proper FAC measurement, test reagent's expiry date and storage of spare chlorine together with free Available Chlorine are being collected and compared with residual chlorine. This is to determine the strength of the chlorine content in the water supply and to ensure steady disinfection of supply. Coordination with

the contractor and backhoe operator to keep them informed about the location of the existing embedded distribution pipes to avoid deliberate destruction of water mains. This is to further prevent water supply interruption and contamination due to the decline of water pressure caused by the destruction of the water lines. Once flood subsides by-pass is administered by flushing water out for about ten (10) minutes to flush out silt brought by flood.

Along with the existing control measures the WSP team has also come up with proposed control measures to further strengthen the protection of the quality of water supply being produced by the district. Installation of screen on the intake section of raw water to minimize siltation to the distribution lines and elevation of the water pump addresses the pre-empted flooding of the pump equipment. Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails will help avoid delay of switching to generator set. Further the preparation of reports on FAC measurements, proper labelling of readable expiry dates of test reagents, rehabilitation of water mains to a safer distance from the national high way and annual inspection of old pipes in consumer houses would all address the incidents of water contamination brought by low or no water pressure. While installation of alarm system and CCTV cameras directly connected to PNP is also being proposed for additional security of the area. Strict monitoring of the valve's efficiency and functionality and installation of additional chlorinator before the distribution lines would address the issue on safety of the pump station premises and the prevention of bacterial or microbial contaminants.

1.4 Key general WSP reference used to develop this WSP are:

- Bartram J, Corrales L, Davison A, Deere D, Drury D, Gordon B, Howard G, Rinehold A, Stevens M. 2009. Water safety plan manual: step-by-step risk management for drinking-water suppliers. World Health Organization. Geneva, 2009. Available at <http://www.wspportal.org/ibis/water-safety-portal/eng/home>
- The Participant's Handbook and course notes of a WSP Training conducted at Cozy Place Resort, Rosales, Pangasinan from August 8 to September 2 of 2016.
- Monthly Billing Report
- Water Production Monthly Report
- Monthly Bacteriological Test Report
- Annual Chemical-Physical Report
- Monthly Frontline Services Report
- VWD Citizen's Charter

2. WSP Team

2.1 History of team development

The employees were convened on October 3, 2016 to talk and discuss important matters regarding WSP. On the same day election of officers was conducted and assigned their respective responsibilities for the preparation of a WSP. The next meeting was set on November 14, 2016 to present the team's concepts and suggestions on the WSP. (see annex for the minutes of the meeting that transpired during the October 3 and November 14, 2016 meeting).

2.2 WSP team members, roles and responsibilities

The WSP team was formed for the implementation and monitoring of WSP for the safety of VWD's water supply. Pablo O. Ragasa was elected as team leader for his expertise on the maintenance of water quality and technical aspects of the equipment and machines used for extracting water from groundwater. The same is true to all the members of the team who have qualities and expertise in their respective fields that are essential in the formulation and implementation of WSP.

Table 2.1 WSP Team Members

Name	Job Title	Organization, Work Group and Expertise/ Knowledge	Role and responsibility in team	Contact details
Pablo O. Ragasa	Sr. Water/ Sewerage Maintenance Man A	Responsible in overseeing the plan's implementation and monitoring of WSP	Team leader	(075)632-1080
Rogelio D. Matabia	Water/Sewerage Maintenance Foreman	Responsible in the maintenance of water lines	Maintenance Monitoring	0925-3333741
Leonides L. Gavina	Senior Corporate Accountant B	Responsible in the preparation of the needed attachments for the funding and allocation of the realization of WSP	Provide Budget Assistance	(075) 632-1093
Marben A. Sante	Executive Assistant/Acting Division Manager	Responsible in communicating with dignitaries regarding WSP matters	Communications Officer	0998-8499617
Joy C. Gamboa	Utilities/Customer Service Assistant A	Responsible in the safekeeping and filing of records, reports and communication letters	Records Keeper	0917-8059715
Zaldy R. Ordoñez	Water/Sewerage Maintenance Man B	Responsible in ensuring the safety of the water pumped from water source and premises of the pump house	Water Supply Operator	0995-1022557

Jose M. Bautista	Water/Sewerage Maintenance Man B	Responsible in restoration and repair of all leakages	Water Quality Distribution Officer	0917-9803295
Romel A. Romero	Water/Sewerage Maintenance Man C	Responsible in restoration and repair of all leakages	Water Quality Distribution Officer	0905-8230158
Samuel N. Maraña	Utilities/Customer Service Assistant A/HR	Responsible in safekeeping of employee records including trainings attended for the skill development of employees	Employee Records Officer	0927-2084564
Maureen Grace U. Rabut	Billing Assistant	Responsible in documenting all meetings and gatherings of WSP team including reported incidents regarding the safety of water supply	Documentation Officer	0916-4615476
Marilou Atanoc		Serves as adviser and resource person of WSP team regarding policies and guidelines on water quality.	Resource Person	0917-3209713
Al Basco		Serves as adviser and resource person of WSP team regarding policies and guidelines and specifications of materials needed in all WSP activities.	Resource Person	0917-5048071

Table 2.2 WSP Team Expertise

Expertise														Name				
1				2			3		4	5	6	7	8		9			
a	B	c	d	a	b	c	a	b							a	b	c	d
x	X	x	x			x	x	x	x	x	x	x	x					Pablo O. Ragasa
x	X	x	x			x	x	x	x	x	x	x	x					Rogelio D. Matabia
					x		x	x	x	x	x		x					Leonides L. Gavina
				x			x	x	x	x	x		x					Marben A. Sante
				x			x	x	x	x	x							Joy C. Gamboa
x	x	x	x			x	x	x	x	x	x	x						Zaldy R. Ordoñez
			x			x			x	x	x							Jose M. Bautista
			x			x			x	x	x							Romel A. Romero
			x			x			x	x	x							Samuel N. Maraña
				x			x	x	x	x	x							Maureen Grace U. Rabut

Table 1 shows the members of the WSP team with their corresponding responsibilities, respective titles and contact details. The team was elected among the employees of the district who have skills needed by the team. Each have their own expertise regarding the maintenance and monitoring of water supply quality. Included in the team are two (2) resource persons for the

needed guidance on policies regarding standards on water quality. Further, they are chosen for their expertise in their respective fields and length of stay with the water district and familiarity of the employees. Familiarity with the employees is a big factor to consider for easy flow of communication and understanding. The comfort and ease of working together with the adviser is also considered in choosing the resource persons. This is for the reason that a team should work in achieving the goal in order to be successful and effective.

Table 2.3 Skills needed to complete a WSP Team

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

Table 2.3, shows the needed skills in the WSP team. These skills are significant in the proper implementation of the WSP. This is because a properly implemented WSP ensures the safety of all consumers' health and well-being. The needed skills also involved good communication among the proponents of the WSP for fast and proper dissemination of the plan and its effectiveness. Accordingly, the WSP cannot be properly implemented without the help and cooperation of all the proponents involved.

3. System Description

3.1 General information on the supplier

This section refers to the basic information of Villasis Water District. Location, number of barangays served and not served, number of staffs and employees regular and non-regular, member of WSP team and not, number of consumers and its classification and monthly production in cubic meters are included. (please see annex F for the specifications)

3.2 Stakeholders

Table 3-1 Stakeholders

Component of water supply	Stakeholder	Summary of stakeholder's roles and responsibilities	Stakeholder Contact details	Interaction mechanism
Policy maker/legislator	Local Government Office	Policy maker on sanitation	632-2152	P: Annual meeting with the Mayor and Sangguniang Bayan Officials
Regulator	Municipal Health Office	Compliance with bacteriological quality of drinking water supplied	09175124512	P: Joint Sampling (i.e., it is proposed to conduct joint sampling)
Effluent contributor (source of contamination)	Piggery, poultry raisers	Animal manure seeps in ground water	Billing section records of VWD	P: Annual meeting with the Owners
Effluent contributor (source of contamination)	Farmer Cooperatives	Pesticide seeps in ground water	Billing section records of VWD	P: Annual meeting with the Owners
Supplier/contractor	Supplier of fittings and other materials used for water service connections	Quality standards of materials delivered	09063447193	E: Philgeps portal
Police authority	Philippine National Police (Villasis)	Safety of water pipelines from vandalism and sabotage	09175126832	P: Police intervention on reported cases of vandalism and sabotage
Cross concern entity	Department of Public Works and Highway	Relocation of pipelines during road widening	09178078708	E: Consultation with DPWH field engineers
Source of information/monitoring entity	Environmental-Health Laboratory Service Cooperative	Conducts bacteriological test on samples submitted by VWD	632-8100, 09773923870, 09214455997	E: Monthly bacteriological test of water samples

Table 3-1 summarises the main stakeholders for the water supply system. Their contact details, interaction mechanism, roles and responsibilities of stakeholders are included in the table.

The Local Government Office (LGU) serves as the policy maker on sanitation. A strong policy based on the main issues and concerns on sanitation would generate an effective policy that is worth implementing. LGU has the greatest and most extensive information on the citizens' practices since they are the ones responsible to their welfare and development which makes them eligible enough to identify areas of sanitation that needs attention. The Municipal Health Office serves as the regulator that would watch the VWD's compliance with bacteriological tests for quality of drinking water. The suppliers and contractors are also included as stakeholders for they are responsible with fittings and other materials to be used for water service connections. Their supplies are crucial since durable materials have a big effect on the distribution of water, the more durable the materials the safer the water supply to pass through it. And conversely the weaker and lower quality the materials the bigger the chance of cracks and leakage. That will cause contamination to the water supply by providing an entry point of bacteria and other microorganisms. Piggery, poultry, farmers i.e., all consumers are stakeholders that contribute pollution to the water supply. Their practices on sanitation, disposal of garbage and daily household chores that cause harm to the water supply makes them effluent contributors. The Philippine National Police is responsible to the safety of the water pipelines and pump stations from vandalism and sabotage being the watchdogs of peace and order over the community. The Department of Public Works and Highway is a cross concern entity accountable to a number of major harm hitting the watermains caused by their widening projects. Lastly, the Environmental-Health Laboratory Service Cooperative serves as a source of information on the quality of water supply. They are the ones responsible in conducting bacteriological test on the water samples taken from the water supply of the VWD.

3.3 Source of water: Catchment and extraction from source

Groundwater is the main source of VWD water supply. VWD has four pump stations located strategically to supply majority of the citizens of Villasis. (please refer to annex B for the map of Villasis pipeline network i.e., the distribution lines of VWD)

3.4 Flow diagram

Figure 1.

SCHEMATIC

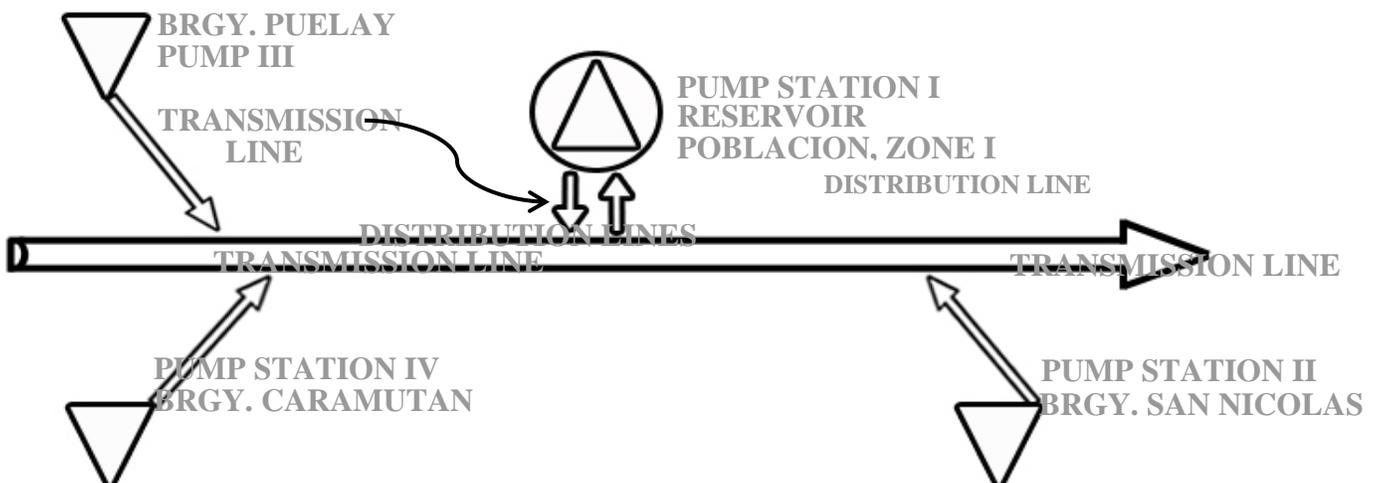


Figure 2.

PROCESS STEP FLOW DIAGRAM:

PROCESS STEP	SYMBOL	DESCRIPTION	RESPONSIBLE UNIT
Source		Well # II, III, IV (300mm Diameter, Casing and screen x 100m deep)	Production Division Pump Operator
Treatment		Chlorinator (Sodium Hypochlorite) liquid injected Via. Chlorinator located within the pump house	Production Division Pump Tender B
Inspection		Daily sampling of chlorine residual and water quality test analysis within the distribution line	Production Division Pump Operator
Transport		150mm Diameter uP.V.C. Transmission line going to Distribution line 100mm diameter uP.V.C. Distribution Main	Engineering Division Water Sewerage Maintenance
Storage		350m ³ Elevated Reservoir	Engineering Division Water Sewerage Maintenance

Figures 1 and 2, shows the schematic diagram and process step flow diagram. Further it shows the four pump stations and the transmission lines of the district. Responsible units for every process step are also included. The symbols used in the process flow diagram have descriptions provided for further understanding of the processes involved in the production of water supply.

3.5 Treatment processes

The water pumped from pump stations I and II would directly flow to the elevated tank and before being distributed to consumers. From the elevated tank the water will be injected with chlorine for disinfection before it reaches the consumers. This is to ensure safety of the water supply being distributed by the district. For pump stations III and IV the chlorinator is attached before the distribution line. A standard amount of chlorine for every liter of water pumped is being followed strictly by the district. Water that reaches the consumers should have at least 0.3mg/L of chlorine residual, with a pH level of 6.5-7.5 and turbidity of less than 1 NTU. In addition, the water supply should have no objectionable color, odor and taste, free of the indicator organism (*E. coli*) and has chemical constituents that are within the limits set by the PNSDW2007. The chlorine content of the water supply is being monitored every day at the water source and at the distribution line for consumers.

3.6 Distribution system

Piped water system consists of pipes, valves, fire hydrants, elevated tanks/ reservoirs and service connections. The sizes of pipes used vary also in sizes. It depends on the population being served the larger the population the bigger the size of pipes to use and conversely with small populations. This is to ensure ample amount of water supply to be distributed to all the consumers. The water pipes being utilized by the district for consumer water lines are PE tubings with three different ½", ¾" and 1".

3.7 Customer's practices

Some of consumer's water lines are being submerged into canals and other filthy areas of their houses. Especially in areas like the kitchen and laundry areas. Other consumers use materials of low quality for financial reasons which is not under control of the district anymore. This is the reason why most of the leakages reported to the office are caused by low quality materials used by consumers. The district has been disseminating and educating consumers on quality of materials needed but still some of the consumers insist using those low-quality materials.

3.8 Water quality required

Based on Standard Methods for the Examination Water & Wastewater, American Public Health Association, American Water Works Association, 22nd ed., 2012 and Philippine National Standards for Drinking Water-2007

Table 3-2. PNSDW standards

Test	Unit	PNSDW Standards
Total Coliform	MPN/100ml	Less than 1.1
Fecal Coliform	MPN/100ml	Less than 1.1
Heterotrophic Plate Count	CFU/ml	Less than 500

Table 3-2 shows the standards of the Philippine National Standards for Drinking Water. These standards are strictly being followed for the quality of water being distributed by the district. The district conducts bacteriological tests on randomly selected faucets of consumers on a monthly basis and on the annual basis the district also conducts physical and chemical testing. Further, the water that reaches the consumers should have no objectionable color, odor and taste and is expected to have chemical constituents that are within the limits set by the PNSDW2007 and should be free of the indicator organism (*E. coli*).

Table 3.3 Parameters of Water Quality

Parameters	Unit	PNSDW Limit
Turbidity	NTU	5
True Color	Color unit	5
pH	-	6.5-8.5
Total dissolved solids	Mg/L	500
Sulfate	Mg/L	250
Nitrate	Mg/L	50
Chloride	Mg/L	250
Iron	Mg/L	1.0
Manganese	Mg/L	0.4
Arsenic	Mg/L	0.01
Cadmium	Mg/L	0.003
Lead	Mg/L	0.01
Taste	-	No objectionable taste
Odor	-	No objectionable odor



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

The district serves residential, commercial and government establishments. These include houses, warehouses, clinics, schools, apartments, restaurants and other business establishments within the service area of VWD. The residential consumers use water in their daily household chores, while the government classified consumers use water in the government offices like Brgy. Halls, clinics, public schools, Local Government units and other offices and establishments owned by the government meant for serving the public. Lastly, commercial consumers use water for their business operations. Commercial consumers are categorized into four. They are categorized according to the nature of business the consumer owns.

3.10 Current delivered-water quality

Normally water being distributed by the district is within the standard set by PNSDW. Cases on rare complaints of odorous and murky water received by the district originates from water lines that are not flushed as scheduled. Flushing of endpoints are scheduled by the production and maintenance division and with the help of the plumbers of the district. With the heavy influx of repairs, installations and other requests of consumers that rare cases of neglect on flushing of lines occur. Although once found reported and/or discovered the ones responsible immediately conduct flushing and testing of chlorine content of water supply. After which a report is made by the production unit. The said report would then be filed and recorded for WSP team reference and basis of the amendment of the WSP.

3.11 Persistent Problems

On a monthly basis, the district receives a total of about a hundred complaints, concerns, and requests on the services being offered by the district. Most of these are leak repairs on consumer water lines. This is because the district assumes the responsibility of repairing all leaks whether inside houses and establishments or outside the consumer houses' premises. Accordingly, the district feels that all kinds of leaks are the responsibility of the district not only because of the threat it may pose to the safety of water supply if left unrepaired but also the amount of water that is wasted. As part of the district's mandate on the preservation and mitigation of clean water the district has diligently repair leaks no matter how small or simple it may seem.

The quality of water produced or pumped and distributed is always monitored by the employees specifically the maintenance and production division. They always see to it that water distributed to all its consumers are safe clean and potable. This is because it is part of their duties and responsibilities as mandated by law as government employees. Consequently, it is the right of every consumer to demand quality water supply for their consumption.

4. Risk Assessments, Hazard Table and Existing Control Measures

4.1 Risk assessment methodology

The risks, hazards and existing control measures of the district are classified according to type, severity and frequency of occurrences. Potential biological, physical and chemical hazards associated with each aspect of drinking water supply production process that can affect the safety of the water is identified to measure the control measure to be used. These hazards pose threats to the water supply being distributed by the district. The following are the identified hazards of the district: Septic system leakage of bacteria, viruses, household chemicals and other contaminants, wells that have no plans and documents that were turned over are considered hazardous due to the anonymity that lies underground where the well is located.

Well located in low grounds which would be affected by flooding may cause turbidity or promote the introduction of microbial pathogens in the water source. Power interruption leads to low or no pressure at all along the water lines. Thus, increasing the risk of microbes and other microorganisms that can enter the water line cracks or holes which is considered a hazardous event that needs serious attention.

Vandalism/ sabotage pose different degrees of threat depending on the severity of sabotage or vandalism that occurred. A vandalism/sabotage of mere throwing of stones at pump stations would also pose slight or minor effect to the quality of water and is considered only as physical hazard and only needs low priority. While a vandalism/sabotage of intrusion pose serious threat like chemical and microbial hazards to the pump station and the water supply in general.

Periodic treatment failure due to chlorinator clogging (Nozzles get clogged every month) is a type of hazard that needs high priority because of the risk it poses to the quality of water supply. Water mains burst due to road widening excavation causing entry of contamination is a common hazard occurrence that the district faces whenever Department of Public Works and Highways (DPWH) conduct widening projects on national roads. Water contamination in the distribution of lines of consumers due to leakages in the consumer houses caused by old and sub-standard materials used, illegal connection of service lines in effect possible backflow and water contamination and possible contamination (paint scraped, algae) during the planned maintenance or cleaning of 150cu m overhead tank are all hazards typically experienced by the district.

These hazards are assessed, evaluated and classified according to severity and priority to properly manage these occurrences for the safety of water supply of the district.

4.2 Hazard / Risk table and existing controls

Catchment, treatment, distribution network and customer premises are the stations where hazards are most likely to occur. Below is a Severity Rating of WSP Hazards, Table 4.1:

Table 4.1 Hazard Classification

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)	2
	May make water objectionable but may not lead to its non-use	1

Table 4.2 Hazardous Events

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	
				Likelihood	Severity	Score			Likelihood	Score
S1	L	M	Septic system leakage of bacteria, viruses, household chemicals and other contaminants (P3 & P4)	5	5	25	Wells have blank casings down to 30mbgl and sanitary grout down to 15mbgl	Septic tank leakage would normally produce odor on the water; WQ results showed no characteristic odor; Bacte test result: Negative	1	5
S2	H	M	Septic system leakage of bacteria, viruses, household chemicals and other contaminants of wells that have no plans and documents that were turned over; No plans and	5	5	25	Since well design is not available to check presence of sanitary grout, assume that it is not existing			

			documents are available (P1 &P2)							
S4-1	M	P	Well located in low grounds/ Floods (P2)	3	3	9	Elevated the gen set high enough compared to the level of flood that hit the town	The occurrence of a big flood brought by typhoon will be closely monitored by local authorities and San Roque dam. Floods no longer reach the genset.	1	3
S4-2	M	C		3	4	12			1	4
S4-3	M	M		3	5	15			1	5
S5	M	M	Power interruption	3	5	15	Install standby generator	Shortens the duration of power interruption.	1	5
S6	H	M	Vandalism/ sabotage	5	5	25	Build fence around the perimeter of pump stations and assign 24 hour on duty operator	Fence serves as block to intruders and other persons with bad intent.	1	5
		C		5	4	20			1	4
		P		5	3	15			1	3
T1	H	M	Periodic treatment failure due to chlorinator clogging (Nozzles get clogged every month)	4	5	20	Cleaning of nozzles every three weeks	Accurate forecasting saves time, energy and effort. Continuous flow of chlorine from the chlorinator pump.	1	4
T2	M	M	Power failure	5	5	25	Install standby generator	Shortens the duration of power interruption.	1	5
T3	H	M	Vandalism/ sabotage	5	5	25	Build fence around the perimeter of pump stations and assign 24	Fence serves as block to intruders and other persons with bad intent.	1	5
T4		C		5	4	20			1	4
T5		P		5	3	15			1	3

							hour on duty operator			
D1	M	P	Occasional complaint of discoloration of water at specific locations and time of the day	3	2	6	Sectional line flushing	Decreased frequency of complain	2	4
	H	M		3	5	15			2	10
D2	M	C	Occasional complaint on the decrease/increase of chlorine in water	3	3	9	Collect Free Available Chlorine and compare with residual chlorine	Comparison of FAC and Residual Chlorine will form basis of inconsistency of Chlorine distribution	1	3
D3	M	C	Chlorine supply runs out	3	3	9	Storage of spare container of chlorine	According to studies having the right amount of spare is crucial in the continuity of operations.	1	3
D4	M	C	Power failure	4	3	12	Keeping of stand by generator	Shortens the duration of power interruption	1	4
D5	M	M	Problems with FAC measurement: wrong method, incorrect calibration, test reagents gone off	5	5	25	Regular monitoring on proper FAC measurement and test reagent's expiry date	Accurate reading of results saves time, energy and effort.	1	5
D6	M	M	Water mains burst due to road widening excavation causing entry of contamination.	4	5	20	Coordination with the contractor and backhoe operator to keep them informed about the location of the existing embedded distribution pipes.	Using as build distribution plan, the contractor will know the exact location of the distribution pipes	1	5
C1	H	M	Water contamination in the distribution of lines of consumers due to leakages in the consumer houses caused by	5	5	25	Immediate leak repair by VWD plumbers.	Reduce leaks on service lines in effect reduced complaints from consumers	1	5

			old and sub standard materials used.							
C2	H	M	Illegal connection of service lines in effect possible backflow and water contamination	5	5	25	Installation of check valves	Water contamination through backflow is eliminated	1	5
S1	M	M	Power failure	5	5	25	Install standby generator	Shortens the duration of power interruption.	1	5
S2	H	M	Vandalism/sabotage	5	5	25	Build fence around the perimeter of pump stations and assign 24 hour on duty operator	Fence serves as block to intruders and other persons with bad intent.	1	5
		C		5	4	20			1	4
		P		5	3	15			1	3
S3	H	M	Possible contamination (paint scraped, algae) during the planned maintenance or cleaning of 150cu m overhead tank	3	5	15	Isolate the storage tank by shutting off the valves (from supply & distribution lines), manual disinfection by increasing chlorine dosage at the storage	Residual chlorine level is within the acceptable limit, bacte test, negative result	1	5
	M	C		3	4	12	Opening of drainage valve; covering of distribution intake pipe inside the tank	Absence of foreign objects	1	4

Table 4.3 Control Source

Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	Proposed Control Measure	Validation	PCM Ref
Likelihood	Severity	Score			Likelihood	Score		

5	5	25	Wells have blank casings down to 30mbgl and sanitary grout down to 15mbgl	Septic tank leakage would normally produce odor on the water; WQ results showed no characteristic odor; Bacte test result: Negative	1	5	Siphoning of septic tanks (where fecal wastes, household chemical and other contaminants from the drains were flushed) for treatment as part of services rendered by VWD.	Report on the number, location and owner of septic tanks being siphoned	PCM01			
5	5	25	Since well design is not available to check presence of sanitary grout, assume that it is not existing				Siphoning of septic tanks (where fecal wastes, household chemical and other contaminants from the drains were flushed) for treatment as part of services rendered by VWD.	Report on the number, location and owner of septic tanks being siphoned	PCM02			
3	3	9	Turn off the water pump while there is flood. Once flood subsides by pass is administered	Non-turbidity or clear water is pumped	1	3	Installation of screen on the intake section of raw water to minimize siltation to the distribution lines. Elevation of the water pump.	Presence of screen to the intake.	PCM03-1			
3	4	12			1	4				Elevation of the well.	Elevated well.	PCM0 3-2
3	5	15			1	5						
5	5	25	Install standby generator	Shortens the duration of power interruption. Normal residual chlorine level at distribution lines.	1	5	Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails.	Presence of Contactor Transfer Switch	PCM04			
5	5	25	Build fence around the perimeter of pump stations and assign 24 hour on duty operator	Fence serves as block to intruders and other persons with bad intent.	1	5	Additional security/protection on the water pump area (padlocked enclosure around the well)	Presence of padlocked enclosure around the well	PCM05-1			
5	4	20			1	4				PCM05-2		
5	3	15			1	3				PCM05-3		
5	5	25	Immediate repair of damaged well-head	Shortens the duration of the well being exposed to threat and danger.	1	5	Construct a well head that meets the requirements of the Drilling Standards.	Presence of a well designed and constructed well head.	PCM06-1			
5	4	20			1	4				PCM06-2		

5	3	15			1	3			PCM06-3
5	5	25	Immediate repair of pump	Shortens the duration of water interruption.	1	5	Preparation of maintenance schedule.	Presence of Maintenance Report.	PCM07-1
5	4	20			1	4			PCM07-2
5	3	15			1	3			PCM07-3
4	5	20	Cleaning of nozzles every three weeks	Accurate forecasting saves time, energy and effort. Continuous flow of chlorine from the chlorinator pump.	1	4	Preparation of Monitoring Report and Schedule of Cleaning of chlorinator nozzle	Presence of Report on monitoring and maintenance of chlorinator condition	PCM01-1
5	5	25	Install standby generator	Shortens the duration of power interruption.	1	5	Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails.	Presence of Contactor Transfer Switch	PCM01-2
5	5	25	Build fence around the perimeter of pump stations and assign 24 hour on duty operator	Fence serves as block to intruders and other persons with bad intent.	1	5	Additional security/protection on the water pump area (padlocked enclosure around the well)	Presence of padlocked enclosure around the well	PCM02-1
5	4	20			1	4			PCM02-2
5	3	15			1	3			PCM02-3
3	2	6	Sectional line flushing	Decreased frequency of complain and residual chlorine level is within the acceptable limit	2	4	Preparation of sectional flushing schedule, monitoring and mapping of complaints to predict and evaluate underlying problem on water quality.	Presence of Flushing Report, Monitoring Report and Map of Area of Frequent Complaints	PCM01-1
3	5	15			2	10			PCM01-2
3	3	9	Collect Free Available Chlorine and compare with residual chlorine	Comparison of FAC and Residual Chlorine will form basis of inconsistency of Chlorine distribution	1	3	Preparation of Daily Monitoring Report on FAC and Residual Chlorine Level	Report on Daily Monitoring Report on FAC and Residual Chlorine Level	PCM02

3	3	9	Storage of spare container of chlorine	According to studies having the right amount of spare is crucial in the continuity of operations.	1	3	Preparation of Report on Chlorine Consumption to effectively forecast needed chlorine amount	Report on Chlorine Consumption and Schedule of Purchase Requests	PCM03
4	3	12	Keeping of stand by generator	Shortens the duration of power interruption	1	4	Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails.	Presence of Contactor Transfer Switch	PCM04
5	5	25	Regular monitoring on proper FAC measurement and test reagent's expiry date	Accurate reading of results and knowing the exact date of expiry saves time, energy and effort.	1	5	Preparation of reports on FAC measurements. Proper labeling of readable expiry dates of test reagents.	FAC Report and test reagents with label.	PCM05
4	5	20	Coordination with the contractor and backhoe operator to keep them informed about the location of the existing embedded distribution pipes.	Using as build distribution plan, the contractor will know the exact location of the distribution pipes	1	5	Rehabilitation of water mains to a safer distance from the national high way.	Water mains are at a safer distance away from the national highway where DPWH usually conducts widening projects.	PCM06
5	5	25	Immediate leak repair by VWD plumbers and testing of residual chlorine.	Residual chlorine level is within the acceptable limit.	1	5	Annual inspection of old pipes in consumer houses.	Annual report on consumer pipes' specification and description.	PCM01
5	5	25	Installation of check valves	Water contamination through backflow is eliminated	1	5	Disconnections should be done at the main line to avoid illegal connection.	Disconnected lines are disconnected at the main line.	PCM02
5	5	25	Install standby generator	Shortens the duration of power interruption	1	5	Replace old generator of pump station 3- Brgy. Puelay	New generator in Brgy. Puelay Pump Station	PCM01
5	5	25	Build fence around the perimeter of pump	Fence serves as block to intruders and	1	5	Installation of alarm system and CCTV cameras directly connected to PNP	CCTV and Alarm system at Pump Stations.	PCM02
5	4	20			1	4			
5	3	15			1	3			

			stations and assign 24 hour on duty operator	other persons with intent.					
3	5	15	Isolate the storage tank by shutting off the valves (from supply & distribution lines), manual disinfection by increasing chlorine dosage at the storage	Residual chlorine level is within the acceptable limit, bacteriological test, negative result	1	5	Strict monitoring of the valve's efficiency and functionality and installation of additional chlorinator before the distribution lines	Well maintained valve and presence of chlorinator before the distribution lines	PCM03



5. Improvement Plans

This section shows the proposed control measures on top of the existing control measures. This is to further intensify the non-occurrence of hazards in the identified stations where hazards are most likely to occur. These proposed control measures include new techniques, new equipment or machine and more intensified monitoring, evaluation and record keeping of the operations of the district.

The record keeping that is lacking from the existing control measure is a big change in the operations of the district. Proper filing and recording of events and occurrences will form basis of future decisions and will form part of analysis of present situations.

Table 5.1 Improvement Plan

PCM Ref	Action (Proposed Control Measure)	Arising from (Hazardous Event)	Identified specific improvement plan	Accountabilities	Due	Status
PCM 01	Siphoning of septic tanks (where fecal wastes, household chemical and other contaminants from the drains were flushed) for treatment as part of services rendered by VWD.	Septic system leakage of bacteria, viruses, household chemicals and other contaminants (P3 & P4)	Schedule of siphoning services to all septic tanks of consumers would serve as preventive measure for septic tanks that are already full. This is to prevent the contents of the septic to seep in to the ground when held for longer period inside the tank.	Production head	For deliberation	Allocation: For deliberation
	Siphoning of septic tanks (where fecal wastes, household chemical and other contaminants from the drains were flushed) for treatment as part of services rendered by VWD.	Septic system leakage of bacteria, viruses, household chemicals and other contaminants of wells that have no plans and documents that were turned over; No plans and documents are available (P1 & P2)	Schedule of siphoning services to all septic tanks of consumers would serve as preventive measure for septic tanks that are already full. This is to prevent the contents of the septic to seep in to the ground when held for longer period inside the tank.	Production head	For deliberation	Allocation: For deliberation
PCM 02	Elevation of the water pump and installation of screen on the intake section of raw water to minimize siltation to the distribution lines.	Well located in low grounds/ Floods (P2)	Elevation of well would serve as preventive measure during typhoon and floods. Concreting the well head according to standards imposed will prevent the flood from reaching the well head and possible	Production head	For deliberation	Allocation: For deliberation

			contamination would be prevented.			
PCM 03	Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails.	Power interruption	CTS will automatically transfer power during power failure eliminating the problem on the delay on switching of gen set by operators that affects the pressure on distribution lines.	Production head	For deliberation	Allocation: For deliberation
PCM 04	Additional security/protection on the water pump area (padlocked enclosure around the well)	Vandalism/sabotage	Implement additional preventive measures to secure the well from being contaminated or sabotaged. The padlocked enclosure would serve as an additional security from people with bad intent.	Production Head	immediately	Allocation: For deliberation Construction: For establishment
PCM 05	Construct a well head that meets the requirements of the Drilling Standards.	Well- head damaged	the well head's functionality will be closely monitored and if replacement is needed construction of well head will be constructed according to standards.	Production Head and operators	immediately	Allocation: For deliberation Construction: For establishment
PCM 06	Preparation of maintenance schedule.	Pump doesn't work	the well's functionality will be closely monitored on a regular basis using the schedule prepared by the production head	Production Head and operators	immediately	Allocation: For deliberation Construction: For establishment
PCM 01	Preparation of Monitoring Report and Schedule of Cleaning of chlorinator nozzle	Periodic treatment failure due to chlorinator clogging (Nozzles get clogged every month)	Implement preventive maintenance by replacing the nozzles every 2 weeks. Replacement to be undertaken during period of least demand where the source can be stopped and minimal effect on the overall production requirement. The program would require stocking of spare nozzles. Efficiency of the program shall be measured in terms of chlorinator downtime and chlorine residual monitoring.	Production Head Operator	immediately	Stocking Process: For establishment Maintenance SOP: For Drafting
PCM 02	Installation of Contactor Transfer Switch (CTS) that will automatically	Power failure	Manual transfer of power requires steady operators at pump stations who are able to switch the gen set	Production Head	For deliberation	Allocation: For deliberation

	transfer power when power fails.		manually to transfer power. With the use of CTS precision and accuracy is achieved with minimal supervision.			
PCM 03	Additional security/protection on the water pump area (padlocked enclosure around the well)	Vandalism/sabotage	Implement additional preventive measures to secure the well from being contaminated or sabotaged. The padlocked enclosure would serve as an additional security from people with bad intent.	Production Head / Operator	For deliberation	Allocation: For deliberation Construction: for allocation
PCM 01	Preparation of sectional flushing schedule, monitoring and mapping of complaints to predict and evaluate underlying problem on water quality.	Occasional complaint of discoloration of water at specific locations and time of the day	Schedule of flushing would be strictly implemented. Recorded complaints on water discolorations and its specific location will be used as determinant of the efficiency of the flushing schedule.	Production head/Operators	ASAP	Record keeping: for implementation
PCM 02	Preparation of Daily Monitoring Report on FAC and Residual Chlorine Level	Occasional complaint on the decrease/increase of chlorine in water	Daily monitoring and recording of FAC and Residual chlorine level would serve as basis on troubleshooting underlying problems on the efficiency of the chlorinator.	Production head/Operators	ASAP	Record keeping: for implementation
PCM 03	Preparation of Report on Chlorine Consumption to effectively forecast needed chlorine amount	Chlorine supply runs out	Recording of chlorine consumption would serve as basis for forecasting future purchase requests for chlorine to avoid chlorine shortage.	Production head/Operators	ASAP	Record keeping: for implementation

6. Operational Monitoring and Corrective Actions of Control Measures

This section involves factors that are needed in the implementation of the proposed control measures. First the proposed measure is identified and stated then the location and date it happened is determined. Together with the process on how the proposed measure should be conducted and implemented. Lastly, the implementer is also identified in this section.

Table 6.1 Monitoring of Hazardous Events

PCM Ref	Process Step: Control Measure	Critical limit	What	Where	When	How	Who	Corrective action
PCM 01	Siphoning of septic tanks (where fecal wastes, household chemical and other contaminants from the drains were flushed) for treatment as part of services rendered by VWD.	Almost full septic tanks	siphoning of septic tanks	consumer houses	as planned	Siphoning of septic tanks	VWD maintenance department	
PCM 02	Siphoning of septic tanks (where fecal wastes, household chemical and other contaminants from the drains were flushed) for treatment as part of services rendered by VWD.	Almost full septic tanks	siphoning of septic tanks	consumer houses	as planned	Siphoning of septic tanks	VWD maintenance department	
PCM 03	Elevation of the water pump and installation of screen on the intake section of raw water to minimize siltation to the distribution lines.	Flood water level and a small slit at the screen	Elevation of the water pump and installation of screen on the intake section	pump stations	as planned	Elevate and install screen	VWD maintenance & production department	
PCM 04	Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails.	Perpetual long delays on switching on the gen set during power interruptions	Contact or Transfer Switch (CTS)	Pump stations	as planned	Annual maintenance check on CTS	VWD maintenance & production department	Early signs of rust formation should be treated immediately
PCM 05	Additional security/protection on the water pump area	incident of break-in,	Padlocked enclosure	Pump stations	as planned	Daily monitoring of	VWD maintenance &	Early signs of rust

	(padlocked enclosure around the well)	vandalism or sabotage at the pump station	leak around the well			padlock functionality and its parts	production department	formation should be treated immediately
PCM 06	Construct a well head that meets the requirements of the Drilling Standards.	Estimated life span of the well head	Well head that meets the requirements of the Drilling Standards	Pump stations	as planned	Annual maintenance check on well-head	VWD maintenance & production department	Early signs of rust formation should be treated immediately
PCM 07	Preparation of maintenance schedule.	Estimated life span of the well head	maintenance schedule	Pump stations				
PCM 01	Preparation of Monitoring Report and Schedule of Cleaning of chlorinator nozzle	Residual chlorine of not less than .3ppm	Residual chlorine monitoring	Consumer's faucet	Daily	Testing of residual chlorine	VWD maintenance department	Increase of dose of chlorine and investigate
PCM 02	Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails.	Estimated life span of CTS	CTS	Pump station	Every six months	Annual maintenance CTS	VWD maintenance department	Troubleshooting of CTS
PCM 03	Additional security/protection on the water pump area (padlocked enclosure around the well)	Estimated life span of enclosure and padlock	Enclosure and padlock	Pump station	Every six months	Annual maintenance check on enclosure and padlock	VWD maintenance department	Troubleshooting of enclosure and padlock
PCM 01	Preparation of sectional flushing schedule, monitoring and mapping of complaints to predict and evaluate underlying problem on water quality.	As planned (e.g., not to exceed 15 minutes/flushing)	Flushing time	Flushing points	As planned	As established in SOP	WRFO	Continue flushing as required; Initiate investigation and act accordingly
PCM 02	Preparation of Daily Monitoring Report on FAC and Residual Chlorine Level	Residual chlorine of not less than .3ppm	Residual chlorine monitoring	Consumer's faucet	Daily	Testing of residual chlorine	VWD maintenance dept.	Increase of dose of chlorine and investigate

PCM 03	Preparation of Report on Chlorine Consumption to effectively forecast needed chlorine amount	Residual chlorine of not less than .3ppm	Residual chlorine monitoring	Consumer's faucet	Daily	Testing of residual chlorine	VWD maintenance department	Increase of dose of chlorine and investigate
PCM 04	Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails.	Estimated life span of CTS	CTS	Pump station	Every six months	Annual maintenance check on CTS	VWD maintenance department	Troubleshooting of CTS
PCM 05	Preparation of reports on FAC measurements. Proper labelling of readable expiry dates of test reagents.	Date before test reagent's expiry.	FAC measurement and test reagent expiry date	Pump station	annually	Operators will keep logbooks for FAC measurements and date of purchase of the test reagent with expiry date.	Operators and production head	Finance and administrative division should also have a record on the expiry date of the test reagents.
PCM 06	Rehabilitation of water mains to a safer distance from the national high way.	distance of water mains from road widening of DPWH	Rehabilitation of water mains	National High Way	as planned	design program of works and allocate funds	VWD maintenance department	Evaluate and study carefully the program of works
PCM 07	Immediate leak repair by VWD plumbers and testing of residual chlorine.	Residual chlorine of not less than .3ppm	Residual chlorine monitoring	Consumer's faucet	Daily	Testing of residual chlorine	VWD maintenance department	Increase of dose of chlorine and investigate
PCM 08	Installation of check valves	Residual chlorine of not less than .3ppm	Residual chlorine monitoring	Water service lines	Once illegal connection is found	Testing of residual chlorine	VWD maintenance department	Increase of dose of chlorine and investigate
PCM 09	Install standby generator	Residual chlorine of not less than .3ppm	Residual chlorine monitoring	Consumer's faucet	Daily	Testing of residual chlorine	VWD maintenance department	Increase of dose of chlorine and investigate
PCM 10	Build fence around the perimeter of pump	Residual chlorine of not	Residual chlorine	Water service lines	Once illegal connecti	Testing of	VWD maintenance	Increase of dose of

	stations and assign 24 hour on duty operator	less than .3ppm	monitoring		on is found	residual chlorine	department	chlorine and investigate
PCM 11	Isolate the storage tank by shutting off the valves (from supply & distribution lines), manual disinfection by increasing chlorine dosage at the storage	Residual chlorine of not less than .3ppm	Residual chlorine monitoring	Water service lines	Once illegal connection is found	Testing of residual chlorine	VWD maintenance department	Increase of dose of chlorine and investigate
PCM 06	Construct a well head that meets the requirements of the Drilling Standards.	Estimated life span of the well head	Well head that meets the requirements of the Drilling Standards	Pump stations	as planned	Annual maintenance check on well-head	VWD maintenance & production department	Early signs of rust formation should be treated immediately
PCM 07	Preparation of maintenance schedule.	Estimated life span of the well head	maintenance schedule	Pump stations				
PCM 01	Preparation of Monitoring Report and Schedule of Cleaning of chlorinator nozzle	Residual chlorine of not less than .3ppm	Residual chlorine monitoring	Consumer's faucet	Daily	Testing of residual chlorine	VWD maintenance department	Increase of dose of chlorine and investigate
PCM 02	Installation of Contactor Transfer Switch (CTS) that will automatically transfer power when power fails.	Estimated life span of CTS	CTS	Pump station	Every six months	Annual maintenance CTS	VWD maintenance department	Troubleshooting of CTS
PCM 03	Additional security/protection on the water pump area (padlocked enclosure around the well)	Estimated life span of enclosure and padlock	Enclosure and padlock	Pump station	Every six months	Annual maintenance check on enclosure and padlock	VWD maintenance department	Troubleshooting of enclosure and padlock
PCM 01	Preparation of sectional flushing schedule, monitoring and mapping of complaints to predict and evaluate underlying problem on water quality.	As planned (e.g., not to exceed 15 minutes/flushing)	Flushing time	Flushing points	As planned	As established in SOP	WRFO	Continue flushing as required; Initiate investigation and act accordingly

7. Verification Procedures

Table 7.1 shows the processes involved in the verification process on incidents that show positive results thereby affecting the quality of the water supply. Included in the table is the verification activity, location, type, frequency of occurrence of the identified incident, analyst and recipient of the verification process. The verification activity is divided into three parts, the water quality, audit of records and customer satisfaction. Each of these parts have indicators that have corresponding protocols whenever these indicators appear.

Table 7.1 Verification Monitoring Programme

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
Water Quality							
Total Coliform	Consumer's taps randomly selected per designed sampling plan	Sampling	Daily	DOH accredit lab	WSP Team	Protocol for positive TC results	Production Manager, LWUA
Odor and color	Consumer's taps, distribution lines and end points are scheduled for sampling	Sampling	Daily	DOH accredit lab	WSP Team	Protocol for positive TC results	Production Manager, LWUA
Toxic metal salts, flouride, mercury, PCBs or polychlorinated biphenyls, Dioxins, pesticides, lead, bacteria, protozoa	Consumer's taps randomly selected per designed sampling plan	Sampling	Daily	DOH accredit lab	WSP Team	Protocol for positive TC results	Production Manager, LWUA
Audit of Records							
Verification of equipment's efficacy	Records custodian	Internal audit	Twice a year	As appointed by WSP Team	WSP Team		
Verification of the presence of the equipment	Records custodian	Internal audit	Twice a year	As appointed by WSP Team	WSP Team		
Verification of the presence of the establishment	Records custodian	Internal audit	Twice a year	As appointed by WSP Team	WSP Team		
Customer Satisfaction							
Customer Satisfaction Survey	Customer Service Assistants Section and Public Assistance Complaint Desk	Survey	Annual		Customer Service Section		GM, Concerned Units
Verification of the presence of the establishment	Records custodian	Internal audit	Twice a year	As appointed by WSP Team	WSP Team		

8. Management Procedures, Supporting Programs, WSP Review Procedures, Incident Response Plans

The Villasis Water District (VWD) being a government entity conforms to the laws, rules and regulations of the Civil Service Commission (CSC). Included in CSC's mandate is to promote morale, efficiency, integrity, responsiveness, progressiveness, and courtesy in the Civil Service. In realization of this mandate CSC has initiated the CSC ARTA to support the implementation of Republic Act No. 9485 or the Anti-Red Tape Act (ARTA) of 2007. In ARTA Watch, CSC officials spot check agencies' frontline services.

Included in the frontline services of VWD are requests and concerns from consumers like, leak repairs, low water pressures and other concerns on the quality of water supply being provided by the district. Odorous and turbid water reports from consumers are being recorded to be used as basis for future plans or program of works and amendments on the Water Safety Plan (WSP).

Incidents signify weakness or loop holes in the WSP that may have been overlooked or unanticipated by the WSP Team should be amended immediately. Here are the following steps whenever incidents happen:

1. Incident report by responsible person.
2. Convene members.
 - *regular meeting, if date of incident falls on the day of the scheduled meeting of WSP members include in the agenda the incident that happened
 - *emergency meeting, if date of incident does not fall on the scheduled meeting of WSP members
3. Members will evaluate the report and Identify the root cause.
4. Amendment of WSP plan.
 - *For vandalism, sabotage and intrusion: amendment on the control measures at source
 - *For turbid and odorous water: amendment on the control measures at source, distribution lines and consumers
 - *For damage of water pump and water pipes due to acts of God: amendment on the control measures at source and distribution lines
5. Approval of the head of the agency.
6. Drafting of program of works for the resolution of the incident reported. If any.
7. Allocation of funds for the program of works drafted.
8. Implementation of the WSP plan to the reported incident.

Standard Operating Procedures:

In case of power failure, operators need to conduct the following procedures:

1. Transfer switch from PANELCO to generator set.
2. Open gate valve to bypass.
3. Switch on the generator set.
4. Bypass for 15 minutes.
5. Close the gate valve.
6. Open the valve for distribution.

In case of clogged chlorinator nozzle, operators need to conduct the following procedures:

1. Turn off the chlorinator pump.
2. Remove the nozzle from the chlorinator pump by turning it counter clockwise.
3. Clean the nozzle by unclogging and removing the crystallized or foreign matter using a sand paper. Also, remove the Teflon wrap on the nozzle.
4. Replace the removed Teflon tape from the nozzle with a new Teflon tape.
5. Return the cleaned nozzle with a new Teflon tape to the chlorinator pump by turning it clockwise this time.
6. Turn on the chlorinator pump.

In case of flood reaching the well, operators need to conduct the following procedures:

1. Shut off the well.
2. Call Maintenance Head to inform the situation.
3. Maintenance Head informs the General Manager.

In case of flood reaching the well, operators need to conduct the following procedures:

1. Shut off the well.
2. Call Maintenance Head to inform the situation.
3. Maintenance Head calls Fire Department.
4. Maintenance Head calls General Manager to inform the incident.

In case of pump operator suddenly felt sick and needs to go home, operators need to conduct the following procedures:

1. Operator calls Maintenance Head to inform situation.
2. Maintenance Head assigns reliever for the sick operator.
3. Reliever goes to pump station and relieves the sick operator.
4. Sick operator endorses his post to the reliever and goes home if possible logs out and have his DTR signed up at the office by the Maintenance Head, HR, or Division Chief.
5. Maintenance Head informs the HR of the date and time the sick operator left his post.
6. HR takes note of the date and time the sick operator left his post.
7. Reliever checks the psi reading and chlorinator.

In case of positive bacteriological test result, Production Head needs to conduct the following procedures:

1. The production head reports the Bacteriological Test Result to the General Manager.
2. Flushing of distribution lines for 30minutes where bacteriological test results of high Total Coliform and HPC level based on PNSDW standards.
3. Test for the FAC and Residual Chlorine.
4. Gather sample from the same area that bacteriological test results of high Total Coliform and HPC level based on PNSDW standards.
5. Deliver samples to the laboratory for re testing.
6. Claim Bacteriological Test Result from the laboratory.

*If the results turn out to be positive again, a longer flushing duration is conducted to ensure that the distribution line is free of coliform and other foreign bodies. Then repeat procedure 4-6 until a negative result is obtained.

In case of pump station trespassing incident or theft, operators need to conduct the following procedures:

1. Operators calls Maintenance Head.
2. Maintenance Head reports the incident to PNP and Head of Agency.
3. PNP conducts investigation.
4. Operator prepare incident report.
5. Operator submits report to Maintenance Head.
6. Maintenance Head forwards and recommends possible action to Head of Agency.
7. Head of Agency verifies the incident and give orders.

Communication Protocol:

Leak repair:

1. PACD receives request from consumer.
2. PACD forwards request to U/CSA.
3. U/CSA writes the request at the service schedule.
4. Head of maintenance monitor service schedule and sees to it that everything that is written in the service schedule board is accomplished on time.
5. Plumber reports to U/CSA concern of the accomplished for recording and proceed to the next repair to be accomplished.
6. Plumbers report to U/CSA for recording of the accomplished repairs.

Turbid and Foul Water:

1. PACD receives request from consumer.
2. PACD forwards request to U/CSA.
3. U/CSA informs head of production and records the date and details of complaint.
4. Head of production proceeds immediately to the location of reported turbid or smelly water.
5. Head of production gather samples of the water.
6. Head of production conducts FAC and Residual chlorine testing.
7. Head of production conducts flushing at the area concern.
8. Head of production conducts re testing of FAC and Residual chlorine testing.

Responsibilities of persons involved in the conduct of Standard Operating Procedures:

Production Head

1. Over-all responsible in the water production department.
2. Spearhead bacteriological test of water samples.
3. Responsible in communicating bacteriological test results to the General Manager.

Maintenance Head

1. Over-all responsible in the maintenance of distribution lines and mains.
2. Ensures that all leakages are repaired properly and according to standards.
3. Responsible in monitoring and maintenance of equipment and plumbing tools.

Operator

1. Responsible in starting operation of pump for production.
2. Check the chlorinator if it is functioning well i. e. pumping chlorine.
3. Check daily chlorine residual.

4. Guard the pump and motor.
5. Records water production, chlorine and crude gasoline used.
6. Clean the surroundings of the pump station.

Plumber

1. Install water lines, conduct disconnection, reconnection and leak repairs according to the standards set and Citizen's Charter.
2. Estimate materials needed for installation accurately and promptly.

Meter reader

1. Report illegal connections, leakages

Operators' Responsibilities

1. Operators must arrive on time and perform tasks immediately.
2. Operators must not leave post during duty.
3. Drinking of liquors is not allowed inside pump station and within the premises.
4. Operators must not allow unauthorized person inside the pump station.
5. In case of emergency or any untoward incident inside the pump station must be reported immediately to the Production Head.
6. Operators must maintain the pump station by cleaning the premises and other equipment.
7. Operators must properly endorse post to incoming operator.
8. Operators must regularly monitor, pressure reading, residual chlorine content, initial reading of meter and electric consumption (kw/hr) for production record.

New Connection Process

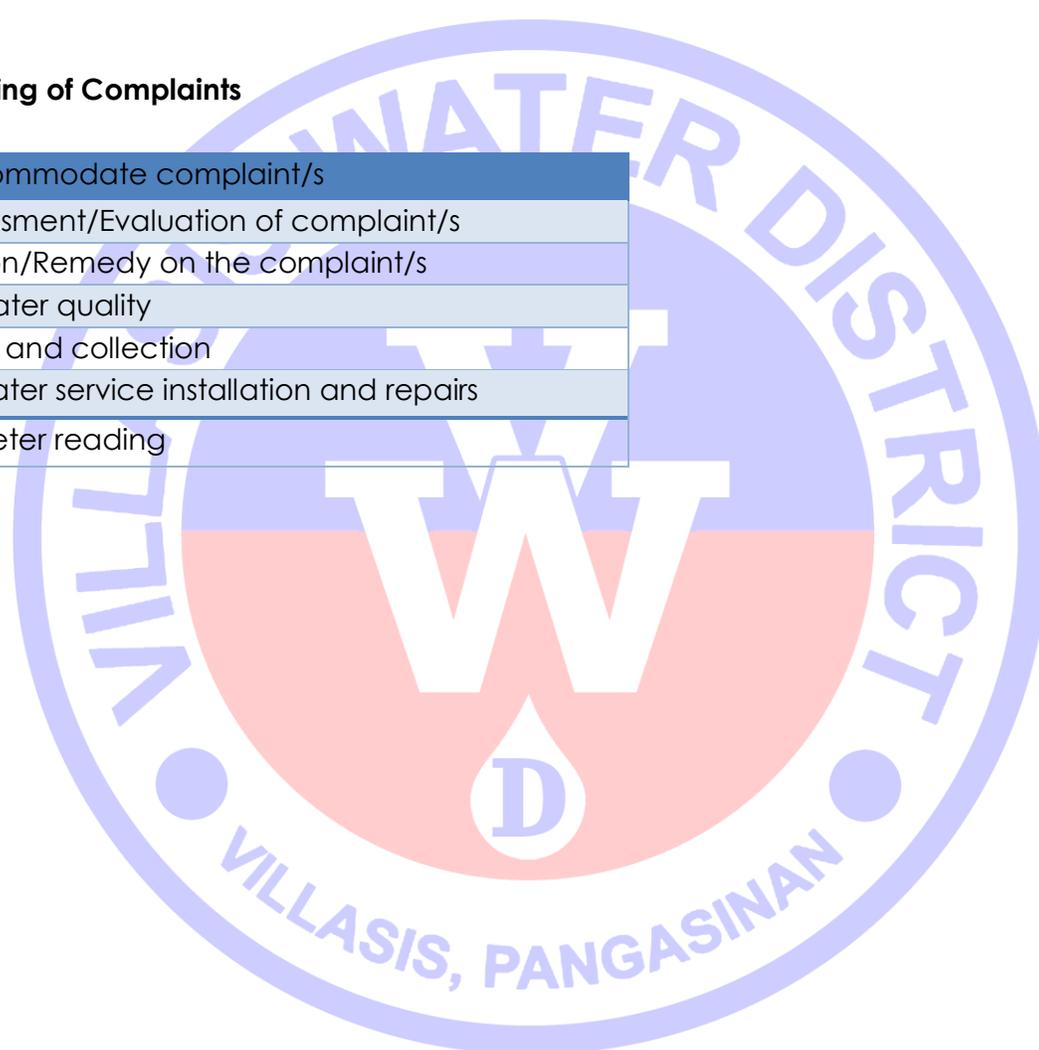
1. Consumer inquires for new connection application
2. Scheduling for the estimation of needed materials for installation
3. Estimation of materials needed for installation
4. Actual inspection/verification of Estimate Form
5. Checking of accuracy on price of materials and total amount of materials listed in the estimate form
6. Issuance of clearance & approval of the installation
7. Signing of Service Connection Agreement & validation of requirements
8. Payment of installation & materials
9. Scheduling of installation
10. Releasing of materials
11. Installation

Steps on Leak Repair and Inspection

1. Receipt of request
2. Scheduling of inspection
3. Inspection and assessment
4. Acceptance of payment (if necessary)
5. Releasing of materials
6. Repair of leakage

Steps in Filing of Complaints

1. Accommodate complaint/s
2. Assessment/Evaluation of complaint/s
3. Action/Remedy on the complaint/s
a. Water quality
b. Bill and collection
c. Water service installation and repairs
d. Meter reading



Annex A

WSP Minutes of the Meeting

EXCERPT FROM THE MINUTES OF THE PREVIOUS MEETING OF THE WATER SAFETY PLAN (WSP) TEAM ON THE 3rd DAY OF OCTOBER 2016 AT 9:00 A.M. IN VILLASIS WATER DISTRICT

PRESENT:

NAME	JOB TITLE
PABLO O. RAGASA	SENIOR WATER/ SEWERAGE MAINTENANCE MAN A
ROGELIO D. MATABIA	WATER/SEWERAGE MAINTENANCE FOREMAN
LEONIDES L. GAVINA	SENIOR CORPORATE ACCOUNTANT B
MARBEN A. SANTE	EXECUTIVE ASSISTANT
JOY C. GAMBOA	UTILITIES/CUSTOMER SERVICE ASSISTANT A
SAMUEL N. MARAÑA	UTILITIES/CUSTOMER SERVICE ASSISTANT A/HR
JOSE M. BAUTISTA	WATER/SEWERAGE MAINTENANCE MAN B
ZALDY R. ORDOÑEZ	WATER/SEWERAGE MAINTENANCE MAN B
ROMEL A. ROMERO	WATER/SEWERAGE MAINTENANCE MAN C
MAUREEN GRACE U. RABUT	BILLING ASSISTANT

I. CALL TO ORDER

Acting DM Marben Sante called the meeting to order at exactly 9:00 in the morning and appointed secretariat Rabut to record the minutes. A quorum of employees was present, and the meeting, having been duly convened, was ready to proceed with the business.

II. INTRODUCTION OF THE WATER SAFETY PLAN (WSP) AND ELECTION OF WSP TEAM LEADER

Acting DM Sante introduced the WSP to the body and stated the importance of WSP in a Water District. He informed the body that the WSP must be submitted on or before the first quarter of CY 2017. He also highlighted the need to elect or appoint a team leader to act as the overall chairman of the WSP.

Acting DM Sante opened the table for nomination. Mr. Matabia nominated Mr. Pablo Ragasa to be the team leader. Mr. Ragasa also nominated Mr. Matabia. Mr. Bautista moved to close the nomination and was seconded by Mr. Ordoñez. Acting DM Sante called for votation and counted the votes for Mr. Ragasa and Mr. Matabia. The vote was 6 and 4, respectively. Acting DM Sante formally introduced Mr. Ragasa as the team leader.

III. APPOINTMENT OF ROLES

Acting DM Sante handed the floor to Mr. Ragasa being the team leader. Mr. Ragasa appointed 1) Mr. Matabia as the Maintenance Monitoring Officer 2) Leonides Gavina as the Finance Data Officer 3) Marben Sante as the Communications Officer 4) Joy Gamboa as the Records Keeper 5) Zaldy Ordoñez as the Water Supply Operator 6) Jose Bautista and 7) Romel Romero as the Water Quality Distribution Officer and 8) Samuel Maraña as the Employee Records Officer. Mr. Ragasa also appointed Ms. Rabut as the Documentation Officer.

IV. DISTRIBUTION OF WORKS ON THE WSP TEAM MEMBERS

After the appointment of roles on the WSP, Mr. Ragasa distributed the 11 Modules of the WSP to the team. He appointed Mr. Matabia to fill out the Water Supply System Description which is to be included in Module 2 of the WSP. Ms. Gamboa, Mr. Bautista, Mr. Romero and Mr. Ordoñez were assigned to make Modules 3-8. He appointed Mr. Maraña to create Module 9, Ms. Gamboa and Ms. Rabut on Module 10, and the necessary revisions must be documented for Module 11. The team accepted the works and was given a deadline of November 11, 2016.

V. ADJOURNMENT

There being no more matters to discuss, the meeting was adjourned at 11:30 A.M.

Prepared by:

(Sgd)MAUREEN GRACE U. RABUT

Documentation Officer

EXCERPT FROM THE MINUTES OF THE PREVIOUS MEETING OF THE WATER SAFETY PLAN (WSP) TEAM ON THE 14th DAY OF NOVEMBER 2016 AT 9:00 A.M. IN VILLASIS WATER DISTRICT

PRESENT:

NAME	JOB TITLE	ROLE IN THE WSP
PABLO O. RAGASA	SENIOR WATER/ SEWERAGE MAINTENANCE MAN A	TEAM LEADER
ROGELIO D. MATABIA	WATER/SEWERAGE MAINTENANCE FOREMAN	MAINTENANCE MONITORING
MARBEN A. SANTE	EXECUTIVE ASSISTANT	COMMUNICATIONS OFFICER
JOY C. GAMBOA	UTILITIES/CUSTOMER SERVICE ASSISTANT A	RECORDS KEEPER
SAMUEL N. MARAÑA	UTILITIES/CUSTOMER SERVICE ASSISTANT A/HR	EMPLOYEE RECORD OFFICER
JOSE M. BAUTISTA	WATER/SEWERAGE MAINTENANCE MAN B	WATER QUALITY DISTRIBUTION OFFICER
MAUREEN GRACE U. RABUT	BILLING ASSISTANT	DOCUMENTATION OFFICER

ON DUTY		
ZALDY R. ORDOÑEZ	WATER/SEWERAGE MAINTENANCE MAN B	WATER SUPPLY OPERATOR

ON LEAVE		
ROMEL A. ROMERO	WATER/SEWERAGE MAINTENANCE MAN C	WATER QUALITY DISTRIBUTION OFFICER
ABSENT		
LEONIDES L. GAVINA	SENIOR CORPORATE ACCOUNTANT B	PROVIDE FINANCE DATA

VI. CALL TO ORDER

Team leader Pablo O. Ragasa called the meeting to order at exactly 9:00 in the morning and Documentation Officer Rabut recorded the minutes. A quorum of team members was present, and the meeting, having been duly convened, was ready to proceed with the business.

VII. PRESENTATION OF WSP STAKEHOLDERS

Team leader Ragasa presented the existing stakeholders and asked the body for proposed stakeholders. The body agreed to include Local Government Office, Municipal Health Office (MHO), Philippine National Police (PNP), Farmer Cooperatives, and piggery and poultry raisers.

VIII. PRESENTATION OF WATER SUPPLY SYSTEM DESCRIPTION

Team leader Ragasa presented the description of water supply system and Mr. Rogelio Matabia, Mr. Jose Bautista, Mr. Marben Sante and Miss Joy Gamboa filled some of the missing information. Moreover, team leader Ragasa volunteered to do the Process/Step Flow Diagram of every Pump Station.

IX. PRESENTATION OF HAZARDOUS EVENTS

Team leader Ragasa presented the potential hazardous events in catchment, treatment, distribution, and consumer and asked the body for other additional events that may arise. Everybody gave their opinions and Ms. Gamboa assessed the severity and likelihood of each event.

X. PRESENTATION OF STANDARD OPERATING PROCEDURES

Team leader Ragasa presented the existing operating procedures and asked the body for additional opinions. Mr. Matabia, Mr. Sante, Mr. Bautista and Ms. Gamboa added some of the missing procedures. Moreover, Mr. Maraña and Ms. Gamboa added the responsibilities of the operators, plumbers and meter readers.

XI. ADJOURNMENT

There being no more matters to discuss, the meeting was adjourned at 11:30 A.M.

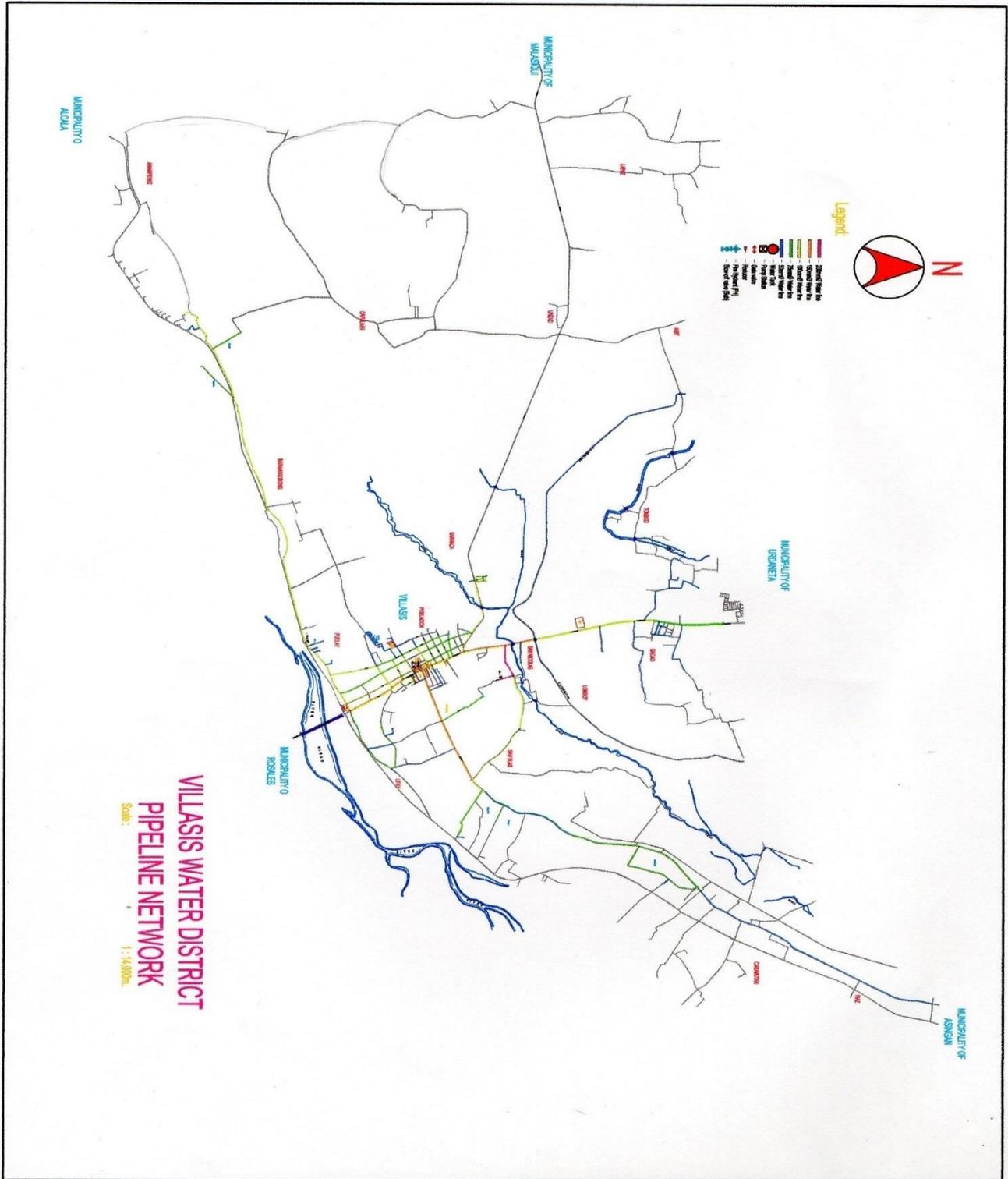
Prepared by:

(Sgd) MAUREEN GRACE U. RABUT

Documentation Officer

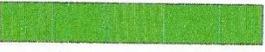
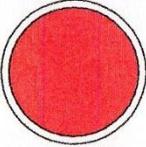
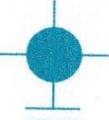
Annex B

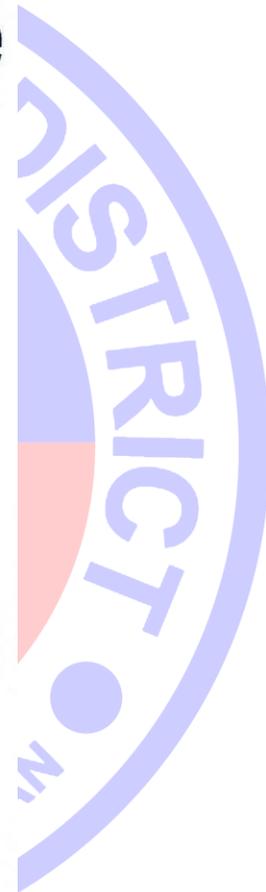
Map of Villasis Pipeline Network



Annex C

Legend for Map of Villasis Pipeline Network

	—	200mmØ Water line
	—	150mmØ Water line
	—	100mmØ Water line
	—	75mmØ Water line
	—	50mmØ Water line
	—	Water Tank
	—	Pump Station
	—	Gate valve
	—	Reducer
	—	Fire Hydrant (FH)
	—	Blow-off valve (Boh)



Annex D
BOD Resolution Adapting WSP



Villasis Water District

Villasis, Pangasinan, 2427
(075) 632-1093 / (075) 632-1080
villasis_wd@yahoo.com

EXCERPT FROM THE MINUTES OF THE PREVIOUS BOARD MEETING OF THE BOARD OF DIRECTORS ON THE 5th DAY OF SEPTEMBER 2016 AT 9:00 A.M. IN VILLASIS WATER DISTRICT BOARDROOM.

Directors Present:

- | | | |
|------------------------------|---|---------------|
| 1. Mr. Camilo L. Barrozo | - | Chairman |
| 2. Ms. Maria Lolita L. Sison | - | Vice-chairman |
| 3. Ms. Prescilla C. Bajit | - | Member |
| 4. Ms. Gloria T. Padilla | - | Member |
| 5. Mr. Jimmy Boy O. Chan | - | Member |

Others Present:

- | | | |
|------------------------|---|---------------------------|
| 1. Ms. Susan Q. Sison | - | General Manager C |
| 2. Mr. Marben A. Sante | - | Acting Division Manager |
| 3. Ms. Paulyn V. Sales | - | Board Recording Secretary |

Resolution No. 30
Series 2016

RESOLUTION APPROVING THE VILLASIS WATER DISTRICT TO DEVELOP AND IMPLEMENT ITS WATER SAFETY PLAN.

WHEREAS, a *Water Safety Plan (WSP)* is a management tool that can be applied in all types of water systems to ensure the safe quality of supplied water;

WHEREAS, pursuant to Memorandum Circular No. 010.14 dated December 1, 2014, the Local Water Utilities Administration (LWUA) is directing all Water Districts to develop and implement their own water safety plan;

WHEREAS, as stated in the aforementioned Memorandum Circular, LWUA requires all WDs to develop and implement their WSP because it is one of the institutional requirements in evaluating the Districts' performance;

WHEREAS, pursuant to the Administrative Order No. 2014-0027 dated September 4, 2014, the Department of Health (DOH) hereby declares development and implementation of water safety plan by all drinking-water service providers as a national policy for drinking water quality management;

Tubig Sa Mamamayan Sa Bansa'y Kaunlaran