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Item No.: 11
Date: 13 2024 AUG

SANGGUNIANG PANLALAWIGAN
RECEIVED
07 AUG 2024
PROVINCE OF LEYTE

Republic of the Philippines
Province of Leyte
Municipality of Matag-ob
-o0o-
OFFICE OF THE SECRETARY TO THE SANGGUNIAN

INDORSEMENT

August 5, 2024

HONORABLE LEONARDO "SANDY" JAVIER
Vice-Governor
Presiding Officer
Sangguniang Panlalawigan of Leyte

Sir:

Respectfully forwarding to your good office the herein attached Matag-ob, Leyte Resolution No. 24-156 series 2024 entitled: "A RESOLUTION REQUESTING THE HONORABLE SANGGUNIANG PANLALAWIGAN OF LEYTE THROUGH THE PRESIDING OFFICER, HONORABLE LEONARDO "SANDY" M. JAVIER, JR., PROVINCIAL VICE-GOVERNOR, TO REVIEW AND APPROVE THE HEREIN ATTACHED WATER SUPPLY IMPROVEMENT PROJECT PLAN OF THE MUNICIPALITY OF MATAG-OB, LEYTE." for review and approval by the Sangguniang Panlalawigan of Leyte.

Very truly yours,

ANA MARIA SANORIA-ECIJA
Secretary to the Sanggunian

Republic of the Philippines
Province of Leyte
MUNICIPALITY OF MATAG-OB
OFFICE OF THE SANGGUNIANG BAYAN

SANGGUNIANG PANLALA
RECEIVED
07 AUG 2024
PROVINCE OF LEY

EXCERPTS FROM THE MINUTES OF THE REGULAR SESSION OF THE SANGUNIANG BAYAN OF MATAG-OB, LEYTE, HELD AT THE LEGISLATIVE SESSION HALL ON JULY 29, 2024.

RESOLUTION NO. 24-156
Proponent: Honorable Joel N. Denoy

A RESOLUTION REQUESTING THE HONORABLE SANGGUNIANG PANLALAWIGAN OF LEYTE THROUGH THE PRESIDING OFFICER, HONORABLE LEONARDO "SANDY" M. JAVIER, JR., PROVINCIAL VICE-GOVERNOR, TO REVIEW AND APPROVE THE HEREIN ATTACHED WATER SUPPLY IMPROVEMENT PROJECT PLAN OF THE MUNICIPALITY OF MATAG-OB, LEYTE.

WHEREAS, the Municipality of Matag-ob, Leyte is in need of an improved water supply system to address the growing demand of our constituents;

WHEREAS, the Local Government Unit of Matag-ob, Leyte has prepared a water supply improvement project plan to address the said concern;

WHEREAS, the said Water Supply Improvement Project Plan needs to be reviewed and approved by the Sangguniang Panlalawigan of Leyte before it can be implemented;

WHEREAS, the approval of the Sangguniang Panlalawigan is one of the requirements for the Local Government Unit of Matag-ob, Leyte to secure a loan from a reputable lending institution to finance the said project;

Wherefore, the Sangguniang Bayan, on motion of the Honorable Joel N. Denoy, with the unanimous accord of all other members present, be it:

RESOLVED, as it is HEREBY RESOLVED, to REQUEST THE HONORABLE SANGGUNIANG PANLALAWIGAN OF LEYTE THROUGH THE PRESIDING OFFICER, HONORABLE LEONARDO "SANDY" M. JAVIER, JR., PROVINCIAL VICE-GOVERNOR, TO REVIEW AND APPROVE THE HEREIN ATTACHED WATER SUPPLY IMPROVEMENT PROJECT PLAN OF THE MUNICIPALITY OF MATAG-OB, LEYTE.

info@lgumatag-ob.com ONE LGU Matag-ob, Leyte 09173222248 Brgy. San Guillermo, Matag-ob, Leyte

RESOLVED FINALLY, to furnish copy of this resolution to the Sangguniang Panlalawigan of Leyte, through the Honorable Presiding Officer, HONORABLE LEONARDO "SANDY" JAVIER, Vice-Governor, Province of Leyte, New Provincial Capitol, Barangay Guindapunan, Palo, Leyte, for their information and most kind consideration; Honorable Bernandino G. Tacoy, Municipal Mayor Matag-ob, Leyte, and all others concerned for their information and guidance.

ADOPTED this 29th. day of July 2024.

x.....x

I HEREBY CERTIFY to the correctness of the foregoing resolution which was duly adopted by the Sangguniang Bayan during its regular session held on July 29, 2024.

ANA MARIA SANORIA-ECIJA
Secretary to the Sanggunian

ATTESTED AND CERTIFIED
TO BE DULY ADOPTED:

HONORABLE VINCENT LYNBERN P. TACOY
Presiding Officer

APPROVED:

HONORABLE BERNANDINO G. TACOY
Municipal Mayor

31 JUL 2024
Date Signed

info@lgumatag-ob.com ONE LGU Matag-ob, Leyte 09173222248 Brgy. San Guillermo, Matag-ob, Leyte

LANDBANK

SERVING THE NATION

MUNICIPALITY MAYOR'S OFFICE
RECEIVED
By: MAdmacio
Date: JUL 15 2022
11:35 am

July 15, 2022

HON. BERNANDINO G. TACOY
Mayor
Municipal Government of Matag-ob
Municipal Building, Poblacion, Matag-ob, Leyte

Dear ***Mayor Tacoy:***

May we submit for your consideration our offer for a Credit Facility to support the funding requirements of the Municipality's priority infrastructure projects listed in the Approved Development and/or Annual Investment Plan. We outline the basic terms and conditions of *our proposal subject to final approval of LANDBANK's top management*:

Facility	:	Term Loan or Omnibus Term Loan Facility
Purpose	:	To finance various infrastructure projects such as but not limited to the following: – Environmental projects (Flood Control, Sanitation, and Drainage Projects; – Construction of School Buildings; – Rehab & Upgrading of Transport Terminals; – Construction/Upgrading of Provincial Hall; – Market/slaughter Houses/Abattoir; – Ports/Wharfs/Seaports; – Street Lights; – Roads and Bridges; – Commercial Buildings; – Sports Complex/Gymnasium; – Hospitals/health services; – Housing Projects; – Water System Projects; – Computerization and Traffic Signaling; – Irrigation Projects; – Solid Waste Management Projects; – Renewable Energy Projects; and – All other revenue generating and service-oriented projects
Amount	:	Contract price but not to exceed the Municipality's Maximum Borrowing Capacity as certified by the DOF-BLGF.

LANDBANK

SERVING THE NATION

Tenor	:	For infrastructure projects, maximum of fifteen (15) years inclusive of two (2) years grace period on the principal repayment. *For equipment acquisition, based on the estimated useful life of the* equipment up to maximum of seven (7) years
Interest Rate	:	At LANDBANK's prevailing interest rate at the time of actual drawdown.
Fees and Charges	:	– Negotiable – Prepayment fee, waived, except if taken out by other financial institutions, penalty of 2% based on the amount to be pre-paid shall be charged. – Taxes that may accrue to the BIR shall be for the account of the LGU.
Mode of Release	:	In accordance with R.A. 9184 or the Harmonized Procurement Procedure. Proceeds of the loan shall be credited to the deposit account of the LGU.
Availability	:	The loan shall be available within one (1) year from date of approval.
Repayment	:	*Principal, quarterly in arrears to start at the end of the quarter after end of the* grace period. Interest, quarterly in arrears to start at the end of the 1st quarter from date of initial release.
Loan Security	:	Deed of Assignment of the 20% IRA.
Others	:	– Subject further to the Bank's standard terms and conditions that shall be outlined in the Loan Agreement and other legal documents and to the regulatory requirements of the BLGF, Monetary Board – Banko Sentral of the Philippines, DENR, and other agencies.

The following are the basic processing requirements:

1. Sanguniang Bayan Borrowing Resolution;
2. Approved Development Plan or Annual Investment Program or Public Investment Program;
3. Plans and specification with Cost Estimate/Bill of Quantities, for infrastructure projects
4. Quotation from suppliers, for equipment acquisition

We look forward to a mutually beneficial partnership between Land Bank of the Philippines and the Municipal Government of Villaba.

Thank you for giving us the opportunity to serve your banking needs.

Very truly yours,

BUENAVENTURA V. LEYVA
Assistant Vice President
So. Leyte Lending Center

MAROL L. REPOSAR
Department Manager
Ormoc Branch

LANDBANK

SERVING THE NATION

MUNICIPALITY MAYOR'S OFFICE
RECEIVED
By: [signature]
Date: JUL 15 2022
11:35 am

July 15, 2022

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Mayor
Municipal Government of Matag-ob
Municipal Building, Poblacion, Matag-ob, Leyte

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Repayment	:	*Principal, quarterly in arrears to start at the end of the quarter after end of the grace period.* Interest, quarterly in arrears to start at the end of the 1st quarter from date of initial release.
Loan Security	:	Deed of Assignment of the 20% IRA.
Others	:	– Subject further to the Bank's standard terms and conditions that shall be outlined in the Loan Agreement and other legal documents and to the regulatory requirements of the BLGF, Monetary Board – Banko Sentral of the Philippines, DENR, and other agencies.

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Very truly yours,

BUENAVENTURA V. LEYVA
Assistant Vice President
So. Leyte Lending Center

MAROL L. REPOSAR
Department Manager
Ormoc Branch

WATER SUPPLY IMPROVEMENT PROJECT FOR MATAG-OB

Final Report

APPROVED

BERNARDINO G. TACOY
Municipal Mayor

JL Hydrosolution

December 2023

PROJECT AREA:

1 INTRODUCTION

1.1 GENERAL

The Municipality of Matag-ob with a population as determined by the 2020 census was 17,522 is situated at approximately 110 9'North, 1240 28'East, on the island of Leyte. Elevation at this coordinate is estimated at 35.4 meters or 116 ft above mean sea level.

The Local Government Unit of Matag-ob operates and maintains the level 3 water supply services with 539 active service connections serving the barangays Poblacion-Riverside, Poblacion-Talisay and San Guillermo.

Over the last two decades, the water supply system has seriously deteriorated resulting in a water supply deficit in some of the service areas. The water supply deficit is primarily due to the increase in population brought about by the rapid development in the area both in commercial and tourism industry. Moreover, the absence of a properly design water system also contributed to the water supply shortages.

Other barangays at present did not cover by the LGU operated water supply systems due to high elevation and far distance from the supply lines is utilizing the local spring sources in their area as the primary source of water supply for domestic use.

To improve the situation and to address the future requirements for water supply, a Feasibility Study (FS) on the Improvement of the Water Supply System on the above-mentioned areas was prepared. The FS is focused on improving the current water supply service in the above-mentioned areas by developing additional water source by constructing spring intake structures, collection tank, design of transmission and distribution systems to increase water service area coverage and rehabilitation of existing reservoir. It proposes a comprehensive plan to improve the present water supply conditions to meet the demand in 2028 with an investment cost of PhP 118,584,895 covering the entire project area. Furthermore, the FS did not address how the existing problems could be resolved related to the ultimate goal given the constraints of realistic capital funding. This study is required to formulate projects which have immediate effect to relieve the water supply problems and can be implemented under the designed and build scheme.

1.2 OBJECTIVES AND AREA OF STUDY

The objectives of the study are:

To formulate a plan for the urgent improvement of the existing water supply system in the study area.

Design and estimate the water source development structure and water conveyance (transmission lines) from point source to the existing reservoir.

Use of hydraulic model in the design of the transmission and distribution line to analyze systems hydraulic behavior.

The FS comprised the following study areas and project scope:

- San Vicente / Beto Spring. Design of spring intake structure and collection tank utilizing the spring flow of Beto spring in barangay San Vicente. Design of transmission line from point source to the existing concrete reservoir located in barangay San Vicente.

- Bulak Spring. Design of transmission line from point source (Bulak spring) to the existing collection tank and filter tank.

- Distribution System. Design of distribution systems that will expand the water supply service area coverage to barangays Balagtas, Mansahaon, Naulayan, San Vicente, Santo Rosario, and Imelda.

- Rehabilitation of Concrete Reservoir. Existing concrete reservoir located at the back of Matag-ob Elementary School in barangay Poblacion will be rehabilitated (inlet and outlet pipe will be re-designed).

To improve the water supply conditions of the service areas, the Matag-ob LGU requested a Philippine Peso loan from Land Bank of the Philippines to implement the water supply improvement project. This study will be utilized for preparation of detailed contents of the Philippine Peso loan, which is subject for evaluation by the concerned loan agency.

Proposed Water Supply System Expansion Coverage showing the Spring Sources, Transmission Pipelines and Supply Area.

1.3 OUTLINE OF THE STUDY

The field study was undertaken during a period of four months between October 2023 and January 2024, through the three stages as shown below.

Stage 1 (October 2023)

- Conclusion of the S/W of the study
- Preparation of Draft Inception Report (IC/R)
- Finalizing of IC/R

Stage 2 (November to December 2023)

- Preparation of Basic Plan, including review of master plan and rehabilitation plans for each of the facilities
- Submission of Interim Report
- Submission of Progress Report

Stage 3 (January 2024)

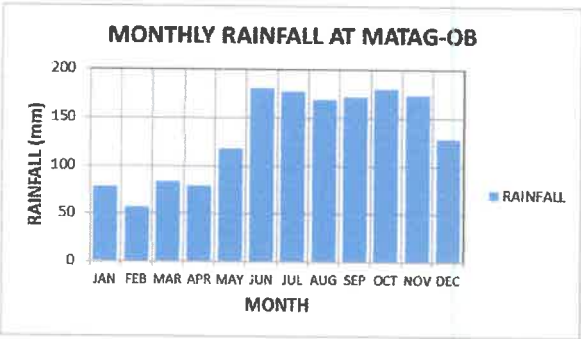
- Preliminary design of project including procurement and construction plan, cost estimates, initial environmental examination, and project evaluation.
- Submission of Draft Final Report
- Submission of Final Report

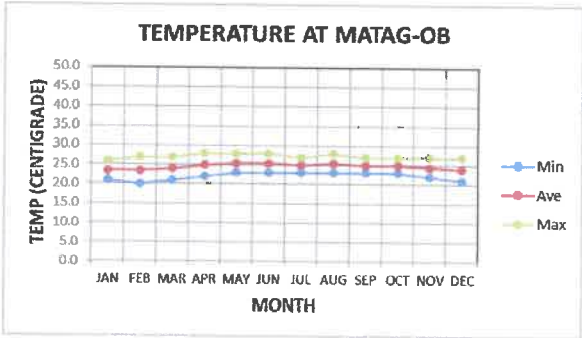
2 EXISTING CONDITIONS

2.1 GENERAL CONDITIONS

2.1.1 Climate

The following figures show monthly temperature and rainfall at Matag-ob from 1991-2021.The average temperature was 24.7 degrees centigrade with the highest of 25.5 degrees centigrade during the month of May and June and the lowest was 23.5 degrees centigrade during the months of January and February. The lowest rainfall was 57 mm during the month of February and the highest was 181 mm during the month of June.





2.1.2 Socio-economic Condition

Population

In the 2020 census, the population of Matag-ob, Leyte was 17,522 people with density of 170 inhabitants per square kilometers or 440 inhabitants per square mile.

Economy

The distribution of the labor force among various economic sectors in Matag-ob shows that the main activities attracting large proportions of this force are as follows: Agriculture sector 60 percent, commerce 25 percent, industry 8 percent, tourism 4 percent and service sector with its various activities 3 percent.

Health Status

The number one cause of morbidity in Leyte was ARI, followed by pneumonia, skin diseases, a water-washed disease and bronchitis. Diarrhea and intestinal parasitism, both water-related diseases ranked fifth and sixth, respectively. Regarding mortality, the number one cause was pneumonia, followed by heart diseases. Other accidents and vascular diseases ranked third and fourth, respectively. Pneumonia, prematurity and asphexia neonatorium were the 3 leading causes of infant mortality in the province.

Water and Electricity

An LGU operated water system provides potable water to the town of Matag-ob and its neighboring barangays. About 539 concessionaires are enjoying 24/7 water supply services. Other barangays which are not covered by the services of the LGU operated water system have its own independent water system. The Leyte Electric Cooperative (LEYECO) V is tasked to energize a potential of 74,220 households in the 417 barangays within its coverage area. This covers eleven municipalities and one city, namely: Merida, Isabel, Palompon, Villaba, Tabango, San Isidro, Calubian, Leyte, Matag-ob, Kananga, Albuera and Ormoc City.

2.2 WATER RESOURCES

2.2.1 General

Bulak Spring

The LGU operated water system is using the Bulak Spring as its source of water supply which served the areas of Poblacion (Riverside), Poblacion (Talisay) and San Guillermo totaling to 539 household connections. The water supply system facility comprised the spring-intake structure, the collection tank, the filter tank, and the series of reservoir. The transmission pipeline is made of PVC with 150 mm diameter in size. The water is delivered to the individual household by gravity with level 3 type of water system. Water supply service availability is 24/7 in low-lying areas and intermittent low pressure in areas with high elevation. Monthly minimum consumption for the first 10 cubic meter is set at 40 pesos and 5 pesos for the succeeding cubic meter of consumption.

Barangay Bonoy also utilizes the Bulak Spring as the source for water supply. Although they have the same source as the LGU operated water system, the operation and maintenance are handled exclusively by barangay Bonoy. A transmission line made of PVC pipe with sizes of 75 mm and 50 mm is connected to the overflow pipe at the filter tank located in sitio Mat-an. From the transmission line the water is stored at the 63 cubic meter concrete reservoir at the barangay center. From the reservoir, the water is distributed to the 140 concessionaires by gravity. The water is mostly used for drinking by the residents. The cost of the water for the first 10 cubic meters consumption is 20 pesos and 5 pesos per cubic meters for the succeeding volume of consumption. Some areas very far from the reservoir will experience water service fluctuation during peak hours.

Bulak-Spring Intake

Bulak-Collection Tank

Bulak-Filter Tank

Masab-a (Barraks) Spring

Barangay San Vicente also has its own operated level 3 water supply system utilizing Masab-a (Barraks) Spring as a source for water supply for domestic use. The system comprised the spring-

intake structure, a collection tank and a 343 cubic meter concrete reservoir. Transmission pipeline is a combination of PVC and PE pipes with 75 mm and 100 mm in diameter. The spring flow can be easily affected by seasonal variation which resulted in low pressure to no water in some areas. Water is also becoming turbid during heavy rain. The water is used by about 500 households for domestic use except drinking. Although individual household consumption is determined through metering systems, but monthly water bill is fixed at 20 pesos.

Masab-a (Barraks) Spring-Intake.

Masab-a (Barraks) 343 cubic meter reservoir.

Buski Spring

Buski Spring is use by barangay Naulayan as a source of water supply for domestic use except drinking. The spring is in sitio Buski, Naulayan, Matag-ob, Leyte, at geographical coordinates 11^0 12' 02.8" N and 124^0 29' 53.0" E at elevation of about 109 meters above sea level (m asl). The system also has the spring-intake box, a collection tank and a reservoir located at the barangay center. The transmission line is made of 38 mm diameter PE pipe. The system has 168 household connections each with individual water meter to account the volume of monthly consumption. Although water meter readings are done monthly, but monthly bill is fixed at 30 pesos per household connections. The spring flow is also easily affected by seasonal variations which also resulted to a low pressure to no water in some parts of the barangay. Turbid water is also experienced by the spring source during heavy rain.

Buski Spring Intake Box.

Concrete Reservoir at Naulayan Proper.

Tubod Spring

Tubod spring is utilized by barangays Balagtas, Imelda and Sto. Rosario as a source of water supply for domestic purposes. The spring is developed with spring intake box with three outlet pipes provided for the three served barangays.

The first served barangays is barangay Balagtas with 500 household connections. From the spring source in sitio Tubod in barangay San Marcelino, the water is stored at the concrete reservoir in barangay center. From the reservoir, the water is delivered to the individual household by gravity. Each household connection is provided with a water meter. The water is used for domestic purposes except drinking. The cost of water is 8 pesos per cubic meter. The operation and maintenance of the water system is handled by barangay Balagtas. The supply of water from the spring source is not sufficient during the dry season.

The second barangay served by the spring source is barangay Imelda with 200 household connections each with individual water meter. From the spring source, water is delivered through the PVC and PE transmission line with sizes combination of 100 mm, 50 mm, and 38 mm in diameter. The water is also used for domestic purposes except drinking. The cost of water per month is fixed at 20 pesos per household with operation and maintenance handled by barangay Imelda. The water supply is also not sufficient during the dry season. The water from the spring source also becomes turbid during heavy rain.

The third served barangay by the spring source is barangay Sto. Rosario, with approximately 800 household connections each also has individual water meter. From the spring source, the water is transported via 75 mm diameter P.E. pipe to the concessionaires by gravity. The water is also used for domestic purposes except drinking. The cost of water per household connection is 20 pesos per month (fixed). Like the other barangay served by the spring source, the water is not sufficient during the dry season, and this will also become turbid during heavy rain. The operation and maintenance of the water system is handled by barangay Sto. Rosario.

Tubod Spring-Intake Box.

Tubod Spring-Intake Box.

Liga Spring

Liga Spring is the source of the level 3 water supply system of barangay Mansahaon. It is in sitio Liga at elevation of 124 m amsl with geographical coordinates 11° 9.530'N and 124° 27.278'E. The spring is developed with spring-intake box, a collection tank, and a 38 mm diameter P.E. transmission line. It is currently used by about 75 household each provided with individual water meter to account monthly consumption. Water consumption is billed at 30 pesos for the first 10 cubic meter. Spring flow can be easily affected by seasonal variation. Meaning, the supply is not sufficient during the dry season and water becomes turbid during the heavy rain. Most of the residents do not use the water for drinking but only for washing, cooking, and other household requirements. Other residents who are not served by the water system have their own dug wells.

Spring-Intake Box

Collection Tank

2.2.2 Physiography

The municipal center of Matag-ob is situated at approximately 11° 9' North, 124° 28' East, in the island of Leyte. Elevation at this coordinate is estimated at 35.4 meters above mean sea level.

The municipality of Matag-ob is bounded by the Municipality of Villaba in the north-northwest, by the Municipality of Palompon in the south-southwest, by the Municipality of Kananga in the north-northeast, and by the City of Ormoc in the south-southeast.

The study area is gentle to moderately from the Matag-ob town proper and it becomes steeply sloping in the eastern areas which are underlain by hard indurated Taog Formation and Calubian Limestone.

Karst features such as sinkhole, underground drainage and sharp ridges are common in the limestone area, especially in the Carabian.

Matag-ob is generally devoid of primary forest growth. The watershed of the main Sabang and Agbanga Rivers as well as other minor streams are either open grassland, or planted to coconut, fruit trees, root crops or rice, whenever terracing is possible. The lowlands are cultivated to rice and corn while the hilly land areas are generally planted to coconut.

The general surface configuration and natural drainage pattern of the study area earlier presented in Figure 1, Topographic Map of Matag-ob.

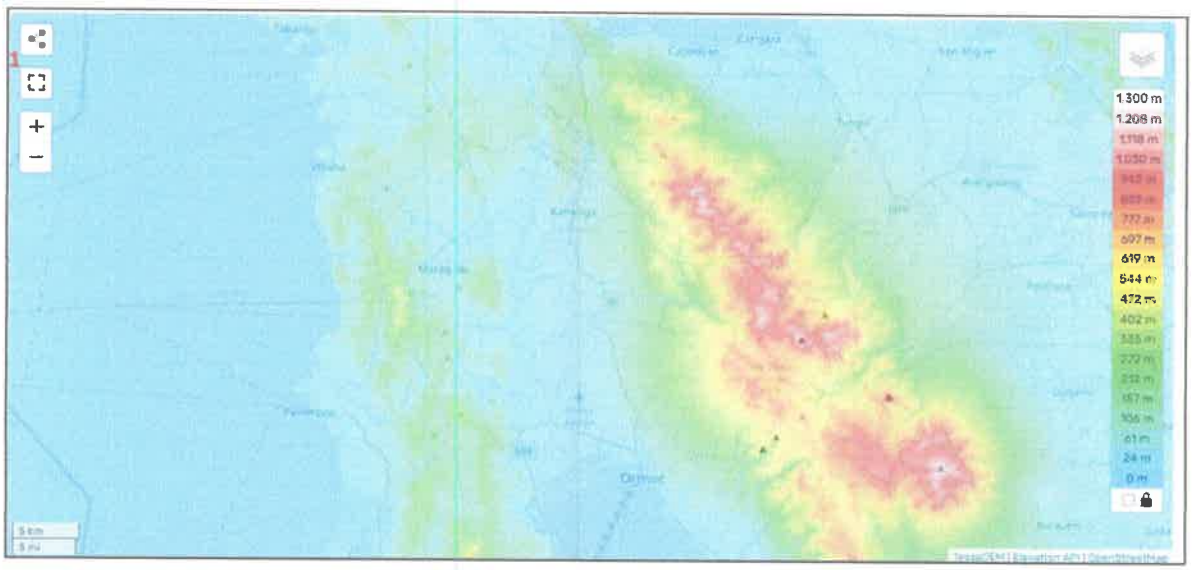


Figure 1-Matag-ob Topographic Map

2.2.3 Geology

The oldest rocks in the study area are the Early Miocene Taog Formation which consists of shale, conglomerate, sandstone, and minor carbonaceous beds. This is conformably overlain by the Tagnocot Formation which consists dominantly of shale with minor sandstone interbeds. These older formations are overlain by the Calubian limestone followed by the Bata shale with calcareous sandstone, minor clastics limestone and conglomerate lenses. The succeeding Plio-Pleistocene Hubay Formation consists of coralline to clastic limestone, sandstone, and conglomerate lenses with shale at the base of the section. Recent deposits of clay, silt sand and gravel occur on narrow valleys and coastal areas. The areal distribution of these different formations is shown in Figure 2, Geologic Map of Leyte.

Litho-stratigraphy

The stratigraphic of the different rock units in the Palompon area based on the work of Juan Pilac (1965) in Northern Leyte is given below.

Age	Formation	Estimated Thickness (m)
Recent	Alluvium	0-20
Pliocene to Pleistocene	Hubay Formation	50-100
Upper Miocene to Pliocene	Bata Formation	50-400
Middle Miocene	Calubian Limestone	150

	Tagnocot Formation	1300
Early Miocene	Taog Formation	2200

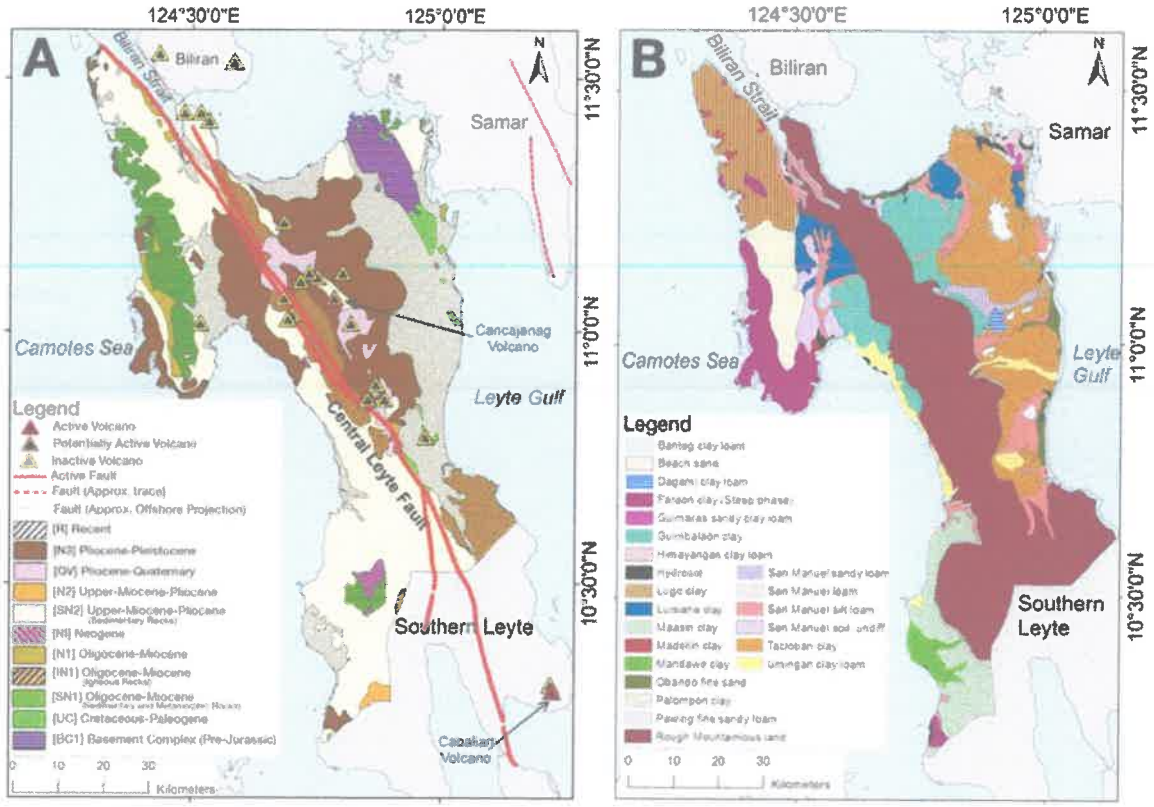


Figure 2-Geologic Map of Leyte

Taog Formation

The term Tagnocot Formation was first used by Corby, et al, (1951) to describe a sequence a sedimentary rock in Tagnocot, Tabango. This formation is composed chiefly of poorly bedded to massive, dark shale with thin beds of sandy shale, coarse sandstone, and conglomerate. The shale is generally sticky and bluish gray when weathered. Small yield is possible where the well encounter sandstone layer near the ground surface.

This formation as measured along the Guinabuyan section has a thickness of about 1,300 m.

Calubian Limestone

The name Calubian Limestone was used by Corby, et al, (1951) for its occurrence in the municipality of Calubian. The outcrop of this limestone occurs as a high ridge from the vicinity of Abijao, Palompon to the southern end of the peninsula. This limestone overlies unconformably the Tagnocot Formation as observed on the north of the Matag-ob-Palompon road. On the other hand, this limestone as observed in the south of the same road overlies unconformably the Taog Formation.

The Calubian limestone is coralline, locally marly, and porous. It is white fresh and generally weathers to dark brown soil. Solution channels and extensive caves are common features in the vicinity of Matag-ob. Pumpable groundwater is generally limited. However, several springs with yields of 2.3 L/s to 85.0 L/s were noted.

The maximum thickness of this limestone, east of Matag-ob, is about 175 m.

Bata Formation

The Bata Formation occurs on both flanks of the Matag-ob fold as a narrow stretch which trends northwesterly. This formation is made up chiefly of shale and sandstone with occasional lenses of conglomerate and thin bedded limestone. The shade is locally bentonitic while the sandstone is notably calcareous in some parts of the section. The conglomerate is made up mainly of sub-rounded andesitic fragments measuring from new centimeters to about ten centimeters in diameter cemented by tuffaceous and clay materials with some amount of sand.

The confined sandstone layer yields 0.63 to 1.26 L/s in existing wells in Matag-ob. The sequence is not thick enough for large scale production.

The thickness of this formation in the vicinity of Matag-ob is estimated to be between 50-400 m.

Hubay Formation

The Hubay Formation unconformably overlies the Bata Formation. This formation is composed dominantly of limestone with minor occurrence of sandstone, conglomerate, and shale at the base of the section. The limestone is coralline, poorly bedded to massive and in places marly. It is white when fresh but weathers to a dark brown to reddish brown soil. The sandstone and shale beds are locally calcareous.

Wells of 6 m to 50 m depth drilled into this formation have yields of 0.95 to 12.6 L/s with estimated transmissivity from 20 to 80 m^2/day.

The estimated thickness of this formation is in the range of 50-100 m.

Quarternary Alluvium

Recent deposits include clay, silt, gravel, shells, and marsh deposits. Unconsolidated deposits are located mostly along the floodplains and mouth of major drainage. Shells and reefs are generally noted along coastal areas.

Major sources of domestic water supply are wells drilled into these deposits. Groundwater is generally tapped by shallow wells intermittently pumped at 0.32 to 1.58 L/S.

The thickness includes clay, silt, gravel, shells, and marsh deposits. An unconsolidated deposit in Matag-ob is estimated to be between 0 to 20 m.

2.2.4 Structural Geology

Intense folding and faulting of the Taog Formation probably during the Middle Miocene time resulted into tight folding and in some instances overturning of beds. Highly dipping to almost vertical beds is noted along the Palompon-Matag-ob road.

The steepening of the Tagnocot beds north of Palompon was attributed by Pilac (1965) to volcanic intrusion during Pliocence. The fold axes of Taog and Tagnocot Formations strike NNE-SSW. In the Palompon area, the Calubian, Bata and Hubay formations dip gently SSW towards the sea. Faults/fractures noted in the area generally strike NNW-SSE. Sinkholes, caverns and underground channelways are common features in the Calubian and Hubay limestones.

2.2.5 Surface Water

Rivers

The main rivers flowing in the area are the northeast flowing Matag-ob River draining the northern portion and Bugabuga River draining the western part. These rivers merged in Bgy. Sto. Rosario, flowing southward into Camotes Sea. Several small streams and ephemeral creeks drain the coastal area north and south of Matag-ob. Areas underlain by limestone convey surface run-off through sinkholes into underground solution channel way system.

Most of the small streams and creeks are dry during summer. The Matag-ob and Bugabuga Rivers flow continuously throughout the year.

2.2.6 Groundwater

Springs

Several springs abound in the Middle Miocen Calubian limestone. Water emanates either from the fissures, sinkholes, or solution channel ways. The approximate locations of these springs are shown in Figure 3 while the Spring Data Summary is given in Table 1.

a. Masab-a (Barrak) Spring

The main source of water supply barangay San Vicente is the Masab-a (Barraks) Spring. This spring in Purok 5, about 0.5 km SW of the barangay proper at elevation 107 m above mean sea level (amsl). It also emanates from highly fractured limestone. It is developed with a spring-intake box, collection tank and a 343 cubic meter concrete reservoir and transmission pipeline. Water service type is level 3 with an estimated connection of 500 households. Spring discharge is estimated at 2-3 liters per second (lps).

b. Buski Spring

This is the main source of barangay Naulayan in sitio Buski, about 1.5 km. NW of Naulayan proper. The spring which emanates from the fissured Calubian limestone is 109 m amsl with geographical coordinates 11^0 12' 02.8" N and 124^0 29' 53.0" E. It also developed with a spring-intake box, a collection tank and a concrete reservoir located at the barangay center. The water is delivered to the 168 household concessionaires by gravity. Spring discharge is estimated at 1-2 lps.

c. Bulak Spring

This spring is the main source of the LGU maintained and operated water supply system which serves the barangays Bonoy, Poblacion Riverside, Poblacion Talisay and San Guillermo. The spring is in sitio Tangke about 2.6 km SE from the town proper. The spring is about 183 m amsl with geographical coordinates 11° 8.386'N and 124° 29.696'E. It is developed with spring-intake box, a collection tank, a filter tank, and series of reservoir located at the town proper. It is used by about 679 households with level 3 water supply services. Spring discharge is estimated at 7-10 lps.

d. Tubod Spring

This spring is the source of water supply for barangays Balagtas, Imelda and Sto. Rosario. The spring is developed with spring-intake box with three outlet pipes intended for the three served barangays. Situated at an elevation of 71 m amsl at geographical coordinates 11° 9.387'N and 124° 29.622'E. It is also used by approximately 1500 households with level 3 water supply services. Spring discharge is estimated at 10-15 lps.

e. Veto Spring

This spring, which was developed by the previous administration of Matag-ob is situated at 139 m amsl with geographical coordinates 11° 8.594'N and 124° 30.542'E. The spring-intake structure is not properly design and spring seepage is not totally captured and visibly flowing at the side of the

intake box. The collection tank is also not properly design and it is constructed in a place almost level in elevation with the spring source. Spring discharge is estimated between 8 and 12 liters per second (lps). A 150 mm diameter PVC transmission pipeline was already laid from the spring source to the concrete reservoir located in barangay San Vicente. From the reservoir in San Vicente, it reaches farther down to the bridge in barangay Bonoy. The spring is partially used by the residents of San Vicente.

f. Liga Spring

The spring is in sitio Liga in barangay Mansahaon at elevation 122 m amsl and geographical coordinates 11° 9.530'N and 124° 27.278'E. It is developed with a spring intake box, a collection tank, and a 38 mm diameter P.E. transmission line. It is used by approximately 75 households with level 3 water supply system. Spring discharge is estimated at 0.6-1 lps.

Table 1-Spring Source Data.

SPRING SOURCE	LONGITUDE	LATITUDE	ELEVATION (m amsl)	DISCHARGE (Lps)
Masab-a (Barrak)	124° 30.123'	11° 9.337'	107	2-3
Buski	124° 29.883'	11° 12.047'	109	1-2
Bulak	124° 29.696'	11° 8.386'	183	7-10
Tubod	124° 29.622'	11° 9.387'	71	10-15
Veto	124° 30.532'	11° 8.592'	139	8-12
Liga	124° 27.278'	11° 9.530'	122	0.6-1

Figure 3-Location of the Spring Sources

Wells

Wells are commonly used throughout the study area for domestic water supply. Based on available records, the deepest well drilled by NWSA in the area is the 19.82 m deep well in San Guillermo. This well was drilled on clay and limestone formation.

Shallow wells are usually drilled in the Poblacion and in barangays located along the valley. Deeper wells are generally drilled in areas where limestone is the water-bearing formation. Well depth generally varies from 6.1 to 50 m with static water levels ranging from zero (or ground surface level) to about 14 m below ground level. Some dug wells with depths of 3 to 4 m were also noted.

Wells drilled by the DPWH produce water either from an open hole below the casing or from a short length slotted pipe or screen at the bottom of the well. Well yield varies from 0.32 to 1.26 L/s with specific capacity of 0.05 to 0.83 L/s m of drawdown. These relatively low yields and specific capacities could be attributed to the poor characteristics of the aquifer.

Reservoir Geometry

Ground water in the area occurs and moves through the interstitial pore spaces of the unconsolidated recent deposits, clastic members of the Hubay, Bata and Tagnocot formations and in the fractured zones and solution channel-ways of the limestone deposits. The highly indurated and steeply folded nature of the Taog Formation limits ground water occurrence to leached/ weathered zones and fracture openings. Underground water in the Hubay and Calubian limestones are stored in fissure, solution cavities and channel ways and interstices of its clastic impurities.

The actual thickness of the unconfined aquifer which consists of sand and gravel cannot be fully established as there are no available logs on any of the wells drilled in the unconsolidated deposits. Based on the work of J. Pilac (1965), the thickness of this aquifer rarely exceeds 20 m.

The very limited borehole logs available showed that most of the DPWH drilled wells have limestone as an aquifer wherein the upper clay layer acts as barrier to the infiltration of either rain or surface water. The exact thickness of this type of aquifer is not known, however, it can be as deep as 50 m as revealed by the Palompon Institute of Technology well. Unlike other rock types, the hydrogeologic properties of limestone deposits vary so much.

Piezometric Conditions

The accurate presentation of the piezometric picture for the entire municipality cannot be made to the limited data.

The static water level in the unconsolidated deposits is generally shallow while that in the limestone areas is relatively deep. SWL generally ranges from zero (or ground surface level) to about 14 m below ground level.

The general groundwater flow direction in the study area is from east to west with a very gentle gradient. Water elevation in the proper ranges from 0.65 to about 1.4 m amsl.

Aquifer Characteristics

Groundwater occurs in all the rocks units underlying the study area although the potential in each large-scale source depends on their water-bearing characteristics. Only those with groundwater significance will be discussed in the following subsections.

Calubian Formation

The Calubian limestone is coralline, locally marly, and porous. Sinkholes, solution channels and extensive caves are common features making it a good recharge area and reservoir for groundwater. Springs are common in this limestone. They are tapped by the LGU and barangay people to supply their water needs. The Veto, Tubod, Bulak, Masab-a (Barrak), Liga and Buski springs are all emanating from this limestone. Estimated spring yields vary from 0.6 L/s to as much as 15.0 L/s.

Bata Formation

On account of dominant shale and fine calcareous sandstone and clastic limestone, potential pumpable ground water in this formation is restricted to small intermittent usage. The public well located in Matag-ob town showed a potential for small withdrawal of 0.63 to 1.26 L/s. NWSA Well Nos. 18497 and 11457 located in San Guillermo and Tinabilan were drilled in this formation. As shown in the borehole logs, limestone is the aquifer and the clay layer (possibly shale) acts as barrier to ground water flow. Limited amount of pumpable ground water is expected from these wells.

Hubay Formation

This formation occurs along the coastal areas, rimming the peninsula from Palompon to Merida. It consists mainly of limestone with a minor occurrence of sandstone and shale at the base.

The limestone is characterized by numerous sinkholes, solution cavities and caves which make it an excellent recharge area. Springs are common wherein the larger ones are used for domestic and irrigation purposes. Wells drilled at 6 m to 50 m depth yield 0.95-12.6 L/s. Other areas have lower well yields. There is no successful well reported at depths of 60 m or more.

Pump wells using the sandstone member of this formation yield as much as 1.5 L/s. Estimated transmissivity values range from 20-80 m^2 /d indicating poor aquifer.

Properly located and designed wells can yield moderate amount of water, however, the open structure at the surface makes it easily susceptible to pollution from surface sources (wastewater, fertilizers, insecticides, etc.). Saltwater contamination due to over pumping and tidal influence is also possible since this formation lies along the coast and extends below sea level.

Quaternary Alluvium

This consists mainly of unconsolidated beach and river sand, silt, and clay with gravel along river courses, and marsh deposits. The highly permeable fluvial and beach sand are confined to a very limited area along the coast and river course. The thickness of these deposits rarely exceeds 20 m.

Hydrogeological System

Groundwater in the study area occurs and moves through the pore spaces of the unconsolidated deposits, clastic members of the Hubay, Bata and Tagnocot formations and in the fractured zones and solutions channel ways of the limestone deposits. The highly indurated and steeply folded nature of the Taog Formation limits the occurrence of ground water along fault/fracture openings and/or weathered zones. Underground water in the Calubian and Hubay limestone are stored in fissures, solution cavities and channel ways and interstices of its clastic impurities.

Natural discharge includes ground water run-off to surface drainage. Spring discharge can be easily accounted for, but other ground water outflow cannot be dependably estimated.

Recharge to the Bata Formation is restricted by its high percentage area of shale deposits which act as barrier to ground water flow. Areas overlying the Bata Formation are likely to discharge all the rainfall into surface drainage.

Recharging or input to the Hubay and Calubian limestone through sinkholes, solution channels and extensive caves is as variable as rainfall. Underground waterways may be located with respect to exposed fracture trends, sinkholes, and spring discharge points.

The unconsolidated deposits are subject to dewatering during long droughts unless there is recharge coming from perennial rivers. Direct rainfall is usually the main source of recharge of this type of deposit.

Groundwater Evaluation

The evaluation of pumpable ground water in the different soil/rock formations cannot be made with high degree of accuracy because of insufficient knowledge on the thickness.

As previously discussed, a great amount of ground water is stored within the Hubay and Calubian limestones. Springs are issued out from these limestones that are utilized for domestic and irrigation purposes.

Pumpable ground water within the Bata Formation is restricted to small intermittent usage on account of the dominant shale, fine calcareous sandstone, and clastic limestone.

2.2.7 Water Quality

Surface water is generally exposed to the atmosphere and therefore subject to pollution and contamination. Water in Matag-ob and Bugabuga Rivers are relatively turbid and contain suspended solids during rainy season. There have been no available records on the water quality profile of these rivers.

2.3 WATER MANAGEMENT IN MATAG-OB

2.3.1 Municipal Waterworks

The existing water supply system maintained and managed by the Matag-ob LGU utilizes the Bulak Spring as a source. The spring is at geographical coordinates 11° 8.388'N and 124° 29.680'E, at elevation 175 m above sea level (m amsl). The spring source is developed with spring-intake box, collection tank, filter tank, reservoir, and 100 mm diameter transmission pipelines. From the point source at barangay Bulak, the water is conveyed to the collection tank to the filter tank and into the reservoir located in barangay Poblacion at geographical coordinates 11° 8.732'N and 124° 28.202'E with elevation of about 44 m amsl. The difference in elevation between the spring source and the reservoir is about 131 m. The filter tank is at elevation 68 m amsl located at geographical coordinates 11° 8.891'N and 124° 29.249'E. Thus, the difference in elevation between the filter tank and the reservoir is about 24 m.

The existing water supply system only served and covers the barangays Poblacion-Riverside, Poblacion-Talisay and portion of San Guillermo with a total of 539 active service connections. With the absence of properly designed water system, some supply areas will experience low pressure to no water even if the water continued to overflow at the filter tank.

2.3.2 Organizational Structure

There is no defined organizational structure that focuses on the operation and maintenance of the LGU operated water supply system. At present, the Engineering Office of the LGU oversees the collection, operation, and maintenance of the system with a limited number of personnel while the collection of payment is undertaken by the Office of Municipal Treasurer.

2.3.3 Tariff Structure

Each service connection managed by the Municipal Waterworks is equipped with water meters to ensure precise measurement of consumption. Monthly billing for each connection is determined by their individual water usage, computed at a fixed rate of 10 pesos per cubic meter.

2.3.4 Unserved Areas

Unserved Areas of the Municipal Waterworks system comprised the following barangays:

- Balagtas
- Mansahaon
- Naulayan
- San Vicente
- Santo Rosario
- Imelda

2.3.4.1 Source

Masab-a (Barraks Spring)

Barangay San Vicente utilize the Masab-a (Barraks Spring) as the main source of water supply for domestic use. The spring is in Purok 5, about 0.5 km SW of the barangay proper at elevation 107 m above mean sea level (amsl). It also emanates from highly fractured limestone. It is developed with a spring-intake box, collection tank and a 343 cubic meter concrete reservoir and transmission pipeline. Water service type is level 3 with an estimated connection of 500 households. Spring discharge is estimated at 2-3 liters per second (lps).

Buski Spring

This is the main source of barangay Naulayan in sitio Buski, about 1.5 km. NW of Naulayan proper. The spring which emanates from the fissured Calubian limestone is 109 m amsl with geographical coordinates 110 12' 02.8" N and 1240 29' 53.0" E. It also developed with a spring-intake box, a collection tank and a concrete reservoir located at the barangay center. The water is delivered to the 168 household concessionaires by gravity. Spring discharge is estimated at 1-2 lps.

Tubod Spring

This spring is the source of water supply for barangays Balagtas, Imelda and Sto. Rosario. The spring is developed with spring-intake box with three outlet pipes intended for the three served barangays.

Situated at an elevation of 71 m amsl at geographical coordinates 11° 9.387'N and 124° 29.622'E. It is also used by approximately 1500 households with level 3 water supply services. Spring discharge is estimated at 10-15 lps.

Liga Spring

The spring is in sitio Liga in barangay Mansahaon at elevation 122 m amsl and geographical coordinates 11° 9.530'N and 124° 27.278'E. It is developed with a spring intake box, a collection tank, and a 38 mm diameter P.E. transmission line. It is used by approximately 75 households with a level 3 water supply system. Spring discharge is estimated at 0.6-1 lps.

2.3.4.1 Water Quality

As to the water quality of the above spring sources, the barangay has kept no records on the physical, chemical, and bacteriological parameters. Simple chlorination is the only treatment applied to the water before distribution.

2.3.4.1 Tariff Structure

In general, no defined tariff structure was implemented in these areas due to the insufficient supply of water and inefficiency of the system. Despite the presence of individual water meters to account for consumption, but on average, monthly water bill is at PhP30.00 per month and usually on a flat rate basis.

3. WATER DEMAND PROJECTION (2020-2030)

3.1 MATAG-OB Projected Population

3.1.1 Population Data

The Municipality of Matag-ob, encompassing 21 barangays across 104.4 square kilometers, is home to a population that surpassed 17,522 residents according to the 2020 Philippine Statistics Authority Census. This marks a notable shift from 2015, witnessing a total population decrease of -4.63% from 18,373. Interestingly, 13 of the 21 barangays experienced an annual population decline, with Brgy. Riverside recording the highest at -4.79%.

Currently, the municipal water system serves only 3 out of the 21 barangays, constituting 14% of the total barangays. It is crucial to highlight the municipality's strategic vision, which aims to extend water service to more barangays. Over the next five years, there is a planned expansion to include a total of 11 barangays, reaching 52% of the total barangays. This ambitious initiative underscores the municipality's commitment to enhancing water accessibility and service coverage for a significant portion of its population.

Municipality of Matag-ob Population per Barangay:

BARANGAY	Population Percentage (2020)	2020 population	2015 population	Change (2015 - 2020)	Annual Population Growth Rate (2015 - 2020)
		17,522	**18,373**	**-4.63%**	**-0.94%**
Balagtas	10.24%	1,795	2,045	-12.22%	-2.57%
Bulak	3.28%	575	570	0.88%	0.17%
Cambadbad	2.84%	497	534	-6.93%	-1.43%
Candelaria	4.17%	731	789	-7.35%	-1.52%
Cansoso	4.14%	726	692	4.91%	0.96%
Mansahaon	5.01%	878	923	-4.88%	-0.99%
Masaba	2.27%	398	397	0.25%	0.05%
Naulayan	3.19%	559	580	-3.62%	-0.73%
Bonoy (Pob.)	3.37%	590	599	-1.50%	-0.30%
Mansalip (Pob.)	7.34%	1,286	1,253	2.63%	0.52%
Riverside (Pob.)	3.73%	654	836	-21.77%	-4.79%
Talisay (Pob.)	3.49%	612	632	-3.16%	-0.64%
San Dionisio	2.07%	362	330	9.70%	1.87%
San Marcelino	5.06%	886	840	5.48%	1.07%
San Sebastian	4.29%	751	880	-14.66%	-3.12%
San Vicente	11.46%	2,008	1,989	0.96%	0.19%
Santa Rosa	6.86%	1,202	1,378	-12.77%	-2.70%
Santo Rosario	9.83%	1,723	1,741	-1.03%	-0.21%
Imelda	2.33%	408	437	-6.64%	-1.36%
Malazarte	1.52%	267	258	3.49%	0.69%

San Guillermo	3.50%	614	670	-8.36%	-1.73%

As shown in the table below, there is a steady decreasing trend in the average household size since year 2007 and based from the latest 2020 census the average household is at 3.75 persons per household.

Census date	Household population	Number of households	Average household size
1990 May 1	15,468	3,131	4.94
1995 Sep 1	17,333	3,512	4.94
2000 May 1	17,523	3,523	4.97
2007 Aug 1	16,764	3,683	4.55
2010 May 1	17,089	3,911	4.37
2015 Aug 1	18,373	4,570	4.02
2020 May 1	17,522	4,671	3.75

3.1.2 Population Growth Rate

Analyzing data retrieved from the Philippine Statistics Authority (PSA) census, the Municipality of Palompon exhibits a nuanced pattern in its population growth rate over the past two decades. The most notable peaks in growth were observed in the 2015 and 2010 censuses, registering average annual growth rates of 1.39% and 0.70%, respectively. However, the latest 2020 census unveils a shift, indicating a negative population growth rate. Similar instances of negative growth were also noted in the 1990 and 2007 censuses, with rates of -0.58% and -0.61%, respectively.

To establish a more reliable trend, we focused on the growth rate data from the last decade. This narrowed scope reveals an average annual growth rate of 0.251%. Leveraging this data as a foundation, we derive population projections for the forthcoming decade, spanning from 2021 to 2030. This approach allows for a more nuanced understanding of Matag-ob's population dynamics, aiding in strategic planning and resource allocation for the municipality's future development.

Matag-ob Average Annual Growth Rate

Year	Pop.	±% p.a.
1960	9,226	—
1970	9,474	0.27%
1975	11,970	4.80%
1980	16,401	6.50%

1990	15,474	-0.58%
1995	17,333	2.15%
2000	17,527	0.24%
2007	16,764	-0.61%
2010	17,089	0.70%
2015	18,373	1.39%
2020	17,522	-0.93%

3.1.3 Projected Population (2020 – 2030)

The Municipality of Matag-ob is poised to see its total population reach 17,966 by the year 2030, marking an increase of 444 individuals from the 2020 census. This growth projection is grounded in a calculated population growth rate of 0.251%, translating to an estimated 4,789 households.

Within the current area covered by the municipal water system, encompassing 3 out of the 21 barangays, the anticipated population by 2030 is 1,928, equivalent to a household population of 514.

As part of Matag-ob's strategic expansion plan to include 11 out of the 21 barangays within its municipal water system, the projected population for 2030 is expected to reach 11,409, encompassing 3,041 households. If each service connection equates to a single household, this indicates that the Municipal Waterworks has the potential to cater to an additional 2,502 households. This estimate is contingent on a 100% willingness to connect and complete distribution network coverage in the serviced barangays. Recognizing this potential serviceable household population is integral for forecasting sourcing requirements up until 2030.

MATAG-OB POPULATION PROJECTION (2020-2030)

BARANGAY	2020	2023	2024	2025	2026	2027	2028	2029	2030
Total	**17,522**	**17,654**	**17,698**	**17,743**	**17,787**	**17,832**	**17,876**	**17,921**	**17,966**
Balagtas	1,795	1,809	1,813	1,818	1,822	1,827	1,831	1,836	1,840
Bulak	575	579	581	582	584	585	587	588	590
Cambadbad	497	501	502	503	505	506	507	508	510
Candelaria	731	737	738	740	742	744	746	748	750
Cansoso	726	731	733	735	737	739	741	743	744
Mansahaon	878	885	887	889	891	894	896	898	900
Masaba	398	401	402	403	404	405	406	407	408

Naulayan	559	563	565	566	567	569	570	572	573
Bonoy (Pob.)	590	594	596	597	599	600	602	603	605
Mansalip (Pob.)	1,286	1,296	1,299	1,302	1,305	1,309	1,312	1,315	1,319
Riverside (Pob.)	654	659	661	662	664	666	667	669	671
Talisay (Pob.)	612	617	618	620	621	623	624	626	628
San Dionisio	362	365	366	367	367	368	369	370	371
San Marcelino	886	893	895	897	899	902	904	906	908
San Sebastian	751	757	759	760	762	764	766	768	770
San Vicente	2,008	2,023	2,028	2,033	2,038	2,043	2,049	2,054	2,059
Santa Rosa	1,202	1,211	1,214	1,217	1,220	1,223	1,226	1,229	1,232
Santo Rosario	1,723	1,736	1,740	1,745	1,749	1,753	1,758	1,762	1,767
Imelda	408	411	412	413	414	415	416	417	418
Malazarte	267	269	270	270	271	272	272	273	274
San Guillermo	614	619	620	622	623	625	626	628	630

MATAG-OB HOUSEHOLD PROJECTION (2020-2030)

BARANGAY	2020	2023	2024	2025	2026	2027	2028	2029	2030
Total	**4,671**	**4,706**	**4,718**	**4,730**	**4,742**	**4,754**	**4,765**	**4,777**	**4,789**
Balagtas	479	482	483	485	486	487	488	489	491
Bulak	153	154	155	155	156	156	156	157	157
Cambadbad	132	133	134	134	134	135	135	136	136
Candelaria	195	196	197	197	198	198	199	199	200
Cansoso	194	195	195	196	196	197	197	198	198
Mansahaon	234	236	236	237	238	238	239	239	240
Masaba	106	107	107	107	108	108	108	109	109
Naulayan	149	150	151	151	151	152	152	152	153
Bonoy (Pob.)	157	158	159	159	160	160	160	161	161
Mansalip (Pob.)	343	345	346	347	348	349	350	351	352
Riverside (Pob.)	174	176	176	177	177	177	178	178	179
Talisay (Pob.)	163	164	165	165	166	166	166	167	167
San Dionisio	97	97	97	98	98	98	98	99	99
San Marcelino	236	238	239	239	240	240	241	242	242
San Sebastian	200	202	202	203	203	204	204	205	205
San Vicente	535	539	541	542	543	545	546	547	549

Santa Rosa	320	323	324	324	325	326	327	328	329
Santo Rosario	459	463	464	465	466	467	469	470	471
Imelda	109	110	110	110	110	111	111	111	112
Malazarte	71	72	72	72	72	72	73	73	73
San Guillermo	164	165	165	166	166	167	167	167	168

3.2 Per Capita Consumption

The average per capita consumption is determined to be 120 liters per person, relying on data provided by the Municipal Waterworks regarding the average monthly consumption per service connection. It is further assumed that each domestic or residential service connection is treated as equivalent to one (1) household, with an average of 3.75 persons per household.

3.3 Non-Revenue Water

The Municipal Waterworks production facilities in the Municipality of Matag-ob currently lack flow metering devices, which hampers our ability to accurately assess the total water demand. Additionally, the existing facility faces a consistent overflow issue, both at the spring source and the sand filter facility. This overflow points to a significant surplus supply volume from the source relative to the current connections served by the Municipal Waterworks.

Further, based on a comprehensive inspection and evaluation of the existing water system's condition, as well as the installation procedures for appurtenances and service connections, the Non-Revenue Water (NRW) is estimated to be at 50%. This assumption is grounded in a comparative analysis of NRW levels in similar water systems facing conditions akin to Matag-ob. Notably, this NRW assumption is applicable to the supply area for the Bulak Spring source covering barangays, namely Riverside, Talisay, San Guillermo, Mansahaon and Mansalip.

Considering the strategic initiative to develop a new source (San Vicente Spring) and optimize the capacity of the existing Bulak spring through an enhanced distribution system, the barangays to be supplied by these facilities are assumed to have a conservative NRW level of 20%. This assumption is applicable to Barangays Balagtas, Bonoy, Imelda, Naulayan, San Vicente, and Sto. Rosario.

3.4 Water Demand Projection

The projected total water demand for the Municipality of Matag-ob by 2030 is estimated to be 3,068 cubic meters per day (cmd). This comprehensive calculation accommodates different assumed Non-Revenue Water (NRW) rates of 50% and 20% for the distinct supply areas of Bulak Spring and SanVicente Spring sources, respectively. The surge in population from 2020 to 2030 contributes to an additional water demand of 76 cubic meters per day. As of 2023, the current total water demand stands at 3,015 cmd, as detailed in the table below.

For the barangays currently serviced by the municipal water system, the total water demand is expected to reach 463 cubic meters per day by 2030. However, the water demand for the targeted 11 barangays earmarked for coverage is projected to be 2,085 cubic meters per day by 2030. Given

the absence of metering devices to assess the production volume capacity of existing sources and acknowledging the diverse supply areas of the two identified sources, the projected source capacity of Bulak Spring and SanVicente Spring should reach 995 cubic meters per day and 1,089 cubic meters per day, respectively.

If such production capacity is achieved, the municipal waterworks is poised to meet 100% of the water demand for the 11 projected barangays. This signifies a demand coverage of 68% or an equivalent population coverage of 63.5%. This represents a substantial increase from its existing population coverage of 11.45%, highlighting the municipality's commitment to expanding water services and catering to the evolving needs of its growing population.

MATAG-OB WATER DEMAND PROJECTION (2020-2030)

BARANGAY	2020	2023	2024	2025	2026	2027	2028	2029	2030
Total	**2,992**	**3,015**	**3,022**	**3,030**	**3,038**	**3,045**	**3,053**	**3,060**	**3,068**
Balagtas	269	271	272	273	273	274	275	275	276
Bulak	86	87	87	87	88	88	88	88	88
Cambadbad	75	75	75	75	76	76	76	76	76
Candelaria	110	110	111	111	111	112	112	112	112
Cansoso	109	110	110	110	111	111	111	111	112
Mansahaon	211	212	213	213	214	214	215	216	216
Masaba	60	60	60	60	61	61	61	61	61
Naulayan	84	84	85	85	85	85	86	86	86
Bonoy (Pob.)	89	89	89	90	90	90	90	91	91
Mansalip (Pob.)	309	311	312	313	313	314	315	316	316
Riverside (Pob.)	157	158	159	159	159	160	160	161	161
Talisay (Pob.)	147	148	148	149	149	149	150	150	151
San Dionisio	54	55	55	55	55	55	55	56	56
San Marcelino	133	134	134	135	135	135	136	136	136
San Sebastian	113	113	114	114	114	115	115	115	116
San Vicente	301	303	304	305	306	307	307	308	309
Santa Rosa	180	182	182	183	183	183	184	184	185
Santo Rosario	258	260	261	262	262	263	264	264	265
Imelda	61	62	62	62	62	62	62	63	63
Malazarte	40	40	40	41	41	41	41	41	41
San Guillermo	147	148	149	149	150	150	150	151	151

EXISTING WATER SUPPLY FACILITIES

4.1) Existing Reservoirs

The Municipal Waterworks of Matag-ob relies solely on a single reservoir situated in the Poblacion area of the Municipality, positioned at coordinates 11° 8'43.92"N / 124°28'12.12"E. This reservoir comprises three smaller storage structures, with a total capacity of less than 100 cubic meters, situated at an elevation of 47 meters above mean sea level (AMSL).

Primarily designed to accommodate the supply from the existing Bulak source, the reservoir operates on a 'fill and draw' mode, directly receiving water from the spring source. Strategically engineered with an elevation conducive to ensuring continuous water availability across the distribution network, including remote areas, it plays a crucial role in sustaining water provision throughout Matag-ob.

However, during inspection, it was noted that the reservoir's piping system was improperly configured, resulting in a dead storage component. This misconfiguration poses potential issues regarding water quality if left uncorrected. Consequently, rectifying the configuration of the existing reservoir forms an integral part of the improvement project scope.

The adequacy of the current reservoir's capacity cannot be conclusively determined at this time due to the undetermined capacity of the existing Bulak Source. Compounding this uncertainty is the ongoing issue of constant overflow from the said source.

Matag-Ob Distribution Reservoir Map

4.2) Existing Water Sources

Currently, the municipal waterworks of Matag-ob relies solely on the existing Bulak Source to supply water to its service connections across three barangays, effectively reaching nearly 100% of the total household population within these areas. Remarkably, the entire supply capacity is internally generated, with no dependence on external private bulk supply sources. Notably, 100% of this capacity is sourced from natural springs, including the Beto spring source.

The Municipality of Matag-ob is blessed with an abundance of spring sources, and it's worth noting that the entirety of the production volume is derived from these natural springs, either managed by the Municipal Waterworks or by Barangay Water Providers. However, despite this abundance, the full potential of Matag-ob's spring sources remains largely untapped, presenting an opportunity for further development and optimization of its water supply infrastructure.

Bulak Spring Source

The Bulak spring source presently caters to the three barangays serviced by the municipality. However, it grapples with a persistent issue of overflow at its filter facility, leading to underutilization of this valuable resource. Despite the source currently meeting reliable and adequate service levels, this challenge stems from irregular maintenance of the filter facility and the distribution scheme in place—a "fill and draw" system mandating that the supply must attain the reservoir's elevation of 47 meters above mean sea level (AMSL) before distribution.

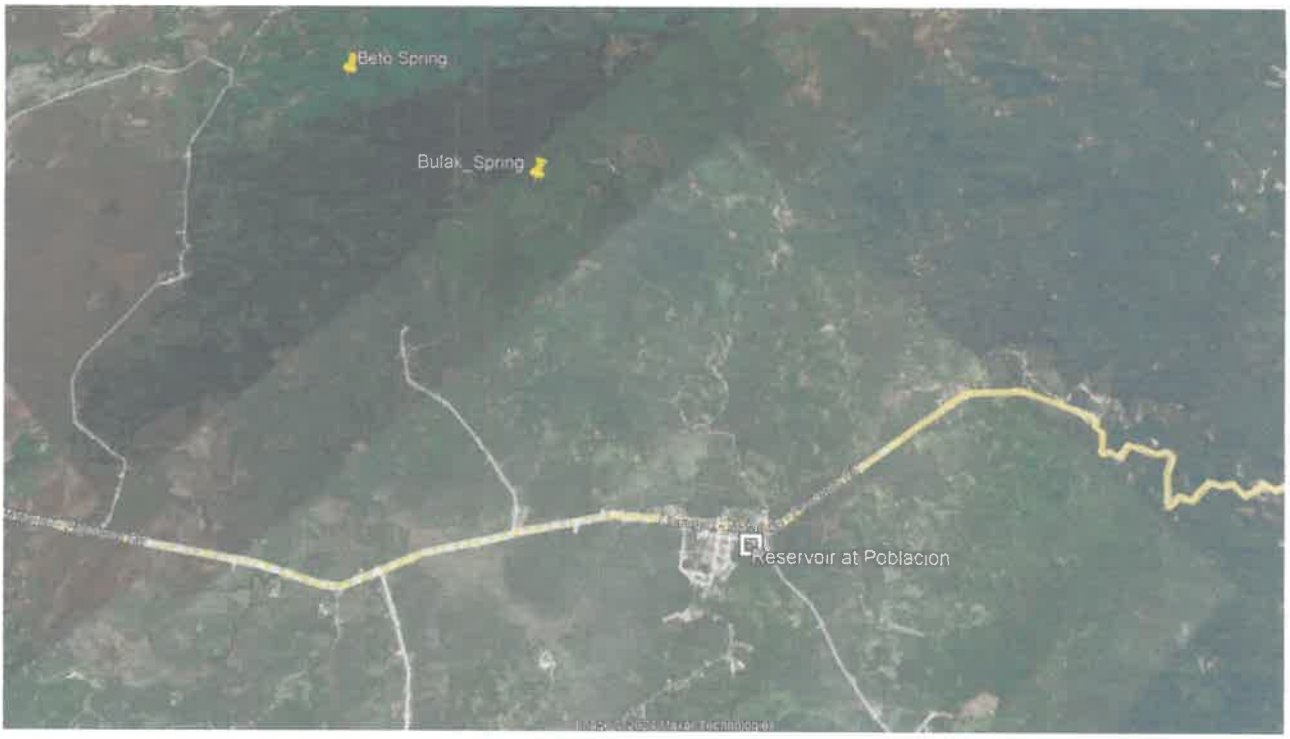
In aiming to expand its coverage to neighboring barangays, particularly Mansahaon and Mansalip, the municipality faces the challenge of these areas being at higher elevations than its current served regions. To achieve this expansion goal, the spring source must be optimized, ensuring that the water supply can reach the elevated target barangays effectively. Thus, reconfiguring the setup to accommodate the distribution of water to these higher-elevation areas becomes imperative.

San Vicente Spring Source

The San Vicente Spring source stands as one of the forthcoming sources for the municipal waterworks. Despite initial development efforts, this source remains unserviceable at present. Completion of the project is pending, with necessary rectifications required before the source can be fully commissioned for operation.

The original distribution scheme of the San Vicente Spring source was to employ a "fill and draw system" which will be directly injected into the existing Poblacion Reservoir. However, upon inspection and technical analysis, the Poblacion reservoir cannot accommodate the volume for both Bulak and San Vicente Spring Sources. Moreover, it deems uneconomical and inefficient to employ such scheme. Therefore, it is highly recommended that the San Vicente would have in separate supply area in order to fully maximize the capacity of the said source. This means that the production volume coming from the San Vicente Spring will be supplied to possible New Expansion areas namely Imelda, Naulayan, Balagtas, Sto. Rosario, San Vicente and Bonoy.

Matag-ob Spring Sources Location Map



Profile of Existing Matag-ob Spring Sources

Name of Water Source	BULAK SPRING	SAN VICENTE SPRING
Type (spring/deep well)	Spring	Spring
Location (Barangay)	Brgy. Bulak, Matag-ob, Leyte	Brgy. San Vicente, Matag-ob, Leyte
Geographical Coordinates (Lat/Long)	11° 8'23.15"N/ 124°29'41.78"E	11° 8'35.51"N/ 124°30'31.90"E
Elevation	185 amsl	141 amsl
Capacity/Yield (liters per second)	TBD	TBD
If Deep Well:		
Depth, size of casing and pump rated capacity	N/A	N/A

4.3) Existing Distribution Network

According to data provided by the Municipal Waterworks of Matag-ob, their distribution network spans a total length of 15,697 linear meters, predominantly comprising water mains ranging from 150mm to 25mm in diameter. The transmission lines encompass 10,060 linear meters, representing 64% of the entire distribution network. Notably, this figure includes pipelines from the

San Vicente Spring source, although it remains uncommissioned. Conversely, distribution lines cover 5,637 linear meters, constituting the remaining 36% of the network.

The transmission lines play a crucial role in conveying water from the spring intakes to the reservoir interconnections. Among these, the most significant component is the 100mm pipeline, serving as the primary transmission line for the Bulak spring source, alongside the 150mm transmission pipeline designated for the yet-to-be-commissioned San Vicente spring. In contrast, distribution lines carry water from the reservoir to the pipelines responsible for distributing water to end-users, completing the vital link between the water source and consumers.

Profile of Matag-ob Municipal Water Distribution Network

PIPE SIZE	TOTAL DISTRIBUTION NETWORK		TRANSMISSION LINES		DISTRIBUTION LINES	
	LENGTH (LM)	% TO TOTAL PIPELINES	LENGTH (LM)	% TO TOTAL PIPELINES	LENGTH (LM)	% TO TOTAL PIPELINES
150MM	7,020	44.72%	7,020	69.78%		0.00%
100MM	4,423	28.18%	3,040	30.22%	1,383	24.53%
63MM	1,415	9.01%			1,415	25.10%
38MM	1,385	8.82%			1,385	24.57%
25MM	1,454	9.26%			1,454	25.79%
TOTAL	15,697	100.00%	10,060	100.00%	5,637	100.00%

Matag-ob Municipal Water Distribution Network

4.4) Service Connection

According to the provided data, the Municipal Waterworks currently provides a total of 539 service connections across three barangays: Riverside, Talisay, and San Guillermo. This coverage represents approximately 12% of the total household population of the entire municipality of Matag-ob. This percentage aligns with expectations, given that the municipal waterworks currently only serves three out of the twenty-one total barangays. Additionally, there is no distinction made between residential and commercial connections, as the municipal waterworks employs a flat rate per cubic meter tariff for all users.

While the current coverage may seem modest, it's crucial to emphasize that within the served barangays, the service coverage has already achieved an impressive 100%. Building on this success and to fully leverage the potential of upcoming water sourcing projects, it is imperative for the municipal waterworks to extend its services to currently unserved barangays. This expansion endeavor will involve the installation of additional pipelines, as outlined in this study.

NAME OF BARANGAY	NO. OF SC	% TO TOTAL SC
RIVERSIDE	203	37.7%
TALISAY	187	34.7%
SAN GUILLERMO	149	27.6%
TOTAL	539	100.00%

5 WILLINGNESS TO CONNECT SURVEY

The Socioeconomic and Willingness-to-Connect Survey was initiated to comprehensively grasp the social dynamics and considerations inherent in the Water Supply Improvement Project for Matag-ob. The survey aimed to achieve the following objectives:

- Establish a baseline dataset to inform the Social, Economic, and Financial Analysis phase of the project.
- Evaluate the satisfaction levels of current consumers served by the Municipal Waterworks of Matag-ob.
- Assess the willingness of existing consumers and potential consumers in the designated expansion areas to connect to improved water services.
- Determine the willingness of both existing and prospective consumers to pay for enhanced water services.
- Gauge the priority levels assigned to different areas earmarked for expansion within the project scope.

This survey serves as a vital tool in shaping the project's strategies, ensuring that the social and economic aspects are taken into account for the successful implementation of the Water Supply Improvement Project for Matag-ob

5.1 SURVEY SAMPLE SIZE

The survey only covers the existing and target areas for expansion of the municipal waterworks of Matag-ob. The survey covers 11 barangays namely Balagtas, Mansahaon, Mansalip, Naulayan, Bonoy, Riverside, Talisay, San Vicente, Santo Rosario, Imelda, San Guillermo. The 11 barangays have a total household population of 2,803 households.

A total of 39 household-respondents were interviewed in both in the served and prospected expansion areas. The sample size was arrived using Slovin's formula with a level of confidence of 84% or a margin of error of 16%.

Survey sample size computation

population size (N) = 2,803
margin of error (e) = 16%

sample size = $N / (1+Ne^2)$
sample size = $2,803 / (1+2,803 \times 0.16^2)$
sample size = 38.5256086
sample size = 39

Distribution of Sample Size of Household Respondents

Barangay	no. of samples	sample size	
		Connected	not connected
Total	**39**	**6**	**33**
Balagtas	4		4
Mansahaon	3		3

Naulayan	2		2
Bonoy (Pob.)	2		2
Mansalip (Pob.)	4		4
Riverside (Pob.)	2	2	
Talisay (Pob.)	2	2	
San Vicente	8		8
Santo Rosario	8		8
Imelda	2		2
San Guillermo	2	2	

5.2 SURVEY QUESTIONAIRE

The survey encompasses both existing covered areas and potential expansion zones. Two distinct sets of questionnaires have been developed: one tailored for current users connected to the Waterworks of Matag-ob and another for prospective barangays to be served.

The questionnaire for respondents currently connected to the Municipal Waterworks of Matag-ob is structured into four components:

1. Household Demographics: This segment is designed to unveil the socio-economic profile of respondents, covering essential aspects such as:
   a. Name and Age of Respondent
   b. Number of Individuals in the Household
   c. Gender Profile of Household Members
   d. Average Age of Household Members
   e. Monthly Household Income
   f. Average Monthly Water Consumption in the Household

2. Water Usage and Sources of Water: Aiming to ascertain the perceived water quality provided by the municipal waterworks and assess diverse water usage patterns, this component explores:
   a. Source of Drinking Water
   b. Cost of Drinking Water Source
   c. Source of Water for Daily Use
   d. Water Usage Patterns
   e. Cost of Daily Water Use
   f. Water Storage Capacity

3. Ratings on Water Service Provided: This section evaluates respondents' perceptions on various aspects of the water service, including:
   a. Water Rates
   b. Taste
   c. Odor
   d. Clarity
   e. Water Pressure
   f. Water Availability
   g. Overall Rating

4. Willingness to Connect: Focusing on the willingness of respondents to connect to an improved water service, this component addresses:
   a. Willingness to Connect for Improved Water Service
   b. Willingness to Pay for Enhanced Services

The questionnaire tailored for respondents not currently connected to the Municipal Waterworks of Matag-ob but residing in prospected expansion areas is organized into three comprehensive components:

1. Household Demographics: This segment aims to reveal the socio-economic profile of respondents, encompassing crucial details such as:
   a. Name and Age of Respondent
   b. Number of Individuals in the Household
   c. Gender Profile of Household Members
   d. Average Age of Household Members
   e. Monthly Household Income
   f. Average Monthly Water Consumption in the Household

2. Water Usage and Sources of Water: This component, focused on evaluating water quality perceptions, diverse usage patterns, and factors like frequency, distance, and mode of sourcing water, explores:
   a. Source of Drinking Water
   b. Cost of Drinking Water Source
   c. Source of Water for Daily Use
   d. Water Usage Patterns
   e. Water Service Level
   f. Mode of Bringing Water to the Household
   g. Mode of Transporting Water
   h. Distance of Water Source from the House
   i. Frequency of Water Delivery
   j. Cost of Transporting Water/Water Bill (Monthly)
   k. Storage Capacity

3. Willingness to Connect: Concentrating on the inclination of respondents to connect to an enhanced water service, this segment addresses:
   a. Willingness to Connect for Improved Water Service
   b. Willingness to Pay for Enhanced Services

5.3 SURVEY RESULTS

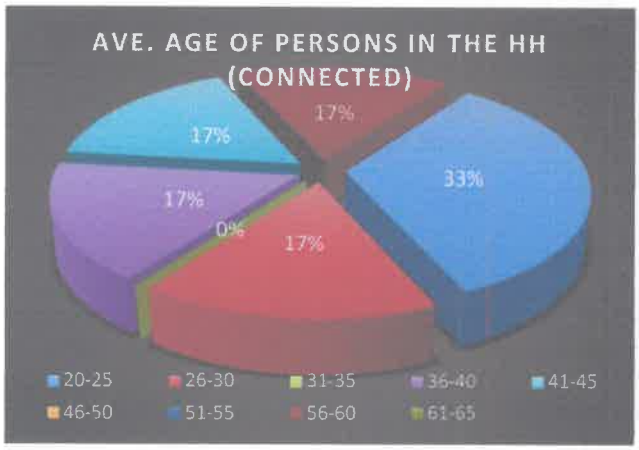
1.) SOCIO-ECONOMIC PROFILE OF RESPONDENTS

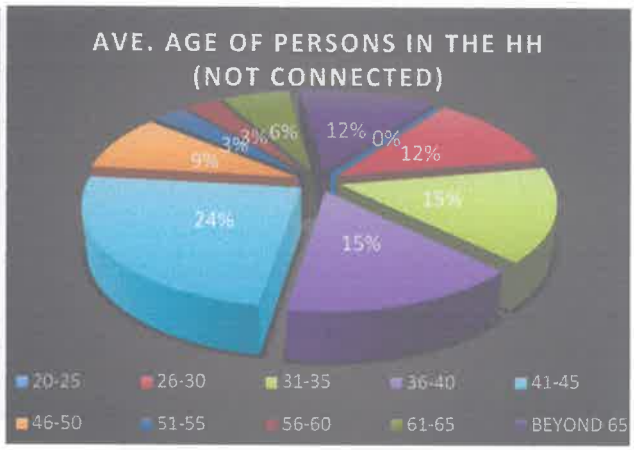
Sex, Age and Household Size of Respondents

The predominant demographic among the respondents consists of females, primarily engaged as housewives, while others hold proprietorship of small businesses. Among those currently connected to the Municipal Waterworks, all respondents are female, contrasting with the areas not yet covered by the waterworks, where 63% of respondents are female.

Both connected and unconnected respondents exhibit an average household size of 4 persons. Furthermore, within these households, 57% or 2.4 individuals are female, while 47% or 1.96 individuals are male.

Roughly 50% of the connected respondents have individuals in the household aged between 26-40 years old, with the remaining 50% falling within the 41-65 years old range. In contrast, among the unconnected respondents, 42% have persons in the household aged 26-40 years old, while 45% fall within the 41-65 years old range. Additionally, 12% of the unconnected respondents have an average age exceeding 65 years old.

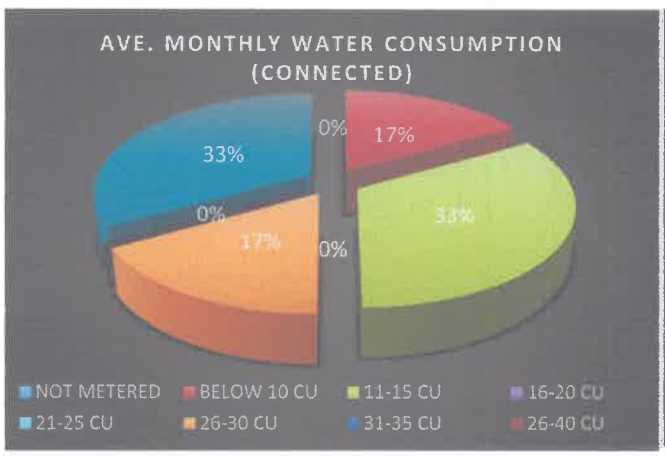


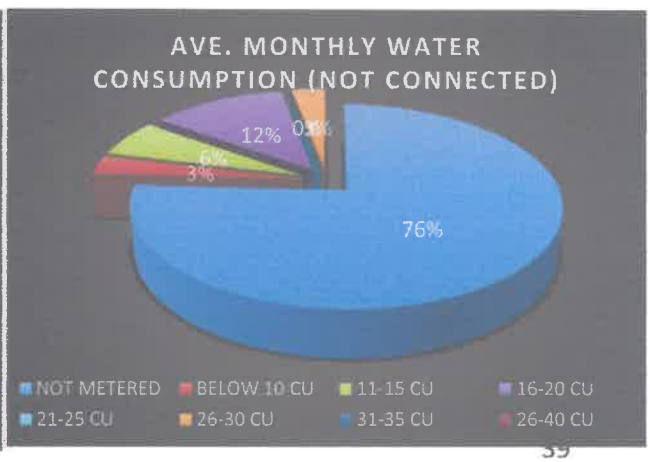


Monthly Household Income and Average Consumption

All the connected respondents report an average monthly household income below Php 20,000. To break it down, 67% of these respondents fall within the Php 10,000 – Php 20,000 income range, while the remaining 33% fall below the Php 10,000 range. Conversely, among the unconnected respondents, 88% have an average household income below Php 20,000, with 12% falling within the Php 10,000 – Php 20,000 range and 76% below Php 10,000. Moreover, 12% of the unconnected respondents report a household income exceeding Php 20,000.

It is noteworthy that the presumed minimum service charge (0 – 10 cubic meters) for the Municipal Waterworks is set at Php 100.00, assuming a consumption of 10 cubic meters, although the tariff rate remains flat at Php 10 per cubic meter. Importantly, this tariff rate falls significantly below the threshold of 5% of disposable income recommended for the low-income group by the Local Water Utilities Administration (LWUA).





Approximately 67% of the connected respondents report household average monthly water consumption below 50 cubic meters, with the remaining 33% surpassing the 50 cubic meters mark. To delve deeper, 50% of these respondents consume below 15 cubic meters monthly, while the remaining 17% fall within the 16 – 50 cubic meters consumption range.

Contrastingly, among the unconnected respondents, 76% have unmetered consumption, while 24% report monthly consumption below 30 cubic meters. It is worth noting that metered connections are exclusively present in Barangays Sto. Rosario, Balagtas, and Mansalip.

2.) Water Usage and Sourcing Water

Drinking Water Source and Cost

Consumer perception of water quality is pivotal, reflecting the confidence the public has in the water service provider. It's essential to clarify that opting for an alternative drinking water source doesn't necessarily indicate poor water quality. Similarly, consuming water provided by the water service provider doesn't automatically imply good water quality. The preference for alternative sources, especially water refilling stations, is primarily rooted in consumer perception and does not serve as a direct measure of the quality of water provided.

Among connected respondents, 67% solely rely on water refilling stations for their drinking water, while 33% have dual source, water provided by the municipal waterworks and water refilling station. In the case of unconnected respondents, 82% favor water refilling stations as their drinking water source, with only 15% opting for water from the barangay water provider. Additionally, 3% use communal water sources, and 8% have dual sources for drinking water. This diversity in choices underscores the varied preferences of consumers regarding their drinking water sources, highlighting the complexity of factors influencing these decisions.

The cost of drinking water for connected respondents varies from 0 to 300 pesos. Breaking it down, 50% of respondents spend less than Php 100 for their drinking water, while 17% and 33% spend within the 101-200 pesos and 201-300 pesos range, respectively. During the interviews, it was noted that the cost of a water gallon from water refilling stations is around 20-25 pesos.

For unconnected respondents opting for water from the barangay water provider, the expenditure is only 20 pesos, covering all their water consumption needs. Among those utilizing water refilling stations, 66% spend within the Php 400 range. To provide more detail, 16%, 19%, 16%, and 16% of respondents spend within the 0-100-, 101-200-, 201-300-, and 301–400-peso range, respectively.

It's noteworthy that some respondents from Barangays Sto. Rosario, Naulayan, and Mansahaon spend more than 500 pesos for their water usage, particularly for drinking. This is primarily attributed to the scarcity of water service in these areas, compelling respondents to rely on water refilling stations for their overall water consumption, especially for drinking water.

Source and Uses of Water for Daily Consumption

For connected respondents, the municipal waterworks serves as their primary source for daily consumption. The entirety of these respondents, comprising 100%, utilizes the provided water

for various daily activities such as cooking, bathing, washing clothes, tooth brushing, cleaning, toilet flushing, and gardening. Additionally, 33% of the respondents also rely on the municipal water for drinking purposes.

In contrast, unconnected respondents' resort to various sources for their daily consumption needs, with some opting for dual sources to meet their water demands. Breaking it down, 73% of respondents rely on water provided by the barangay. However, 27% supplement their supply with additional sources like spring water, private dug wells, and communal water. This indicates that the water provided by the barangay falls short of meeting their daily water requirements. This situation is particularly evident in parts of Barangays Sto. Rosario, Naulayan, Mansahaon, and Bonoy. Respondents from Mansahaon have even taken to developing their own dug wells due to the unavailability of water supply from the barangay provider, while those from Imelda do so merely due to its availability. Moreover, 27% of the respondents were not connected to the barangay water provider and rely their water source either through communal water, develop their own dug well and manual water delivery.

Moreover, unconnected respondents utilize their water source, whether provided by the barangay or another alternative, primarily for bathing, washing clothes, tooth brushing, cleaning, toilet flushing, and gardening. Among them, 85% use this source for cooking, while 15% reserve it for drinking purposes.

Mode, Distance, Frequency and cost of Sourcing water

For connected respondents, sourcing of water is not a concern, as the municipal waterworks ensures an ample and consistent supply through piped connections, meeting their daily requirements seamlessly.

Among unconnected respondents, 64% have a piped connection for their water supply, either being connected to the barangay water provider or having developed their own dug well. This eliminates the need for manual water fetching to supplement their water requirements. However, for the remaining 36%, fetching water becomes a necessity, with 12% hiring someone for this task and 24% doing it themselves.

Within the 36% needing to fetch water, various modes of transportation are employed, including tricycle, motorcycle, pushcart, and manual walking. Breaking it down, 9%, 9%, 3%, and 15% out of the 36% use tricycle, motorcycle, pushcart, and walking, respectively. The distance covered ranges between 20 to 1000 meters, with 15% fetching water within 100 meters, and 21% covering distances from 100 to 1000 meters.

Moreover, the 36% fetching water do so frequently, with 9% fetching water twice a day, another 9% fetching once a day, and the remaining 18% fetching water 2-4 times a week.

Connected respondents to the barangay water provider generally pay less, often a flat rate of Php 20.00 per month for their water consumption. In contrast, respondents connected to the barangay provider in Balagtas pay a rate based on cubic meter consumption. For the 36% who need to fetch water, the expense exceeds 200 pesos for their water consumption. It's worth noting that some respondents from Barangays Mansahaon and Sto. Rosario pays more than Php 1,000 pesos for their water.

Storage Capacity

Among connected respondents, 83% report having a storage capacity of less than 100 liters, reflecting the generally sufficient water supply from the municipal waterworks. The remaining 17% possess a more substantial storage capacity, ranging from 800 to 1000 liters. This variance is particularly notable in the elevated part of Barangay San Guillermo, where occasional limitations in water supply necessitate larger storage capacities.

For unconnected respondents, the storage capacity varies widely, with no clear correlation between capacity and the service level of the water provider. Moreover, the necessity for larger storage capacity among respondents who need to fetch water, was being mitigated by the frequency of fetching. Specifically, 21% of unconnected respondents have less than 100-liter storage capacity, while 54% and 25% have storage capacities ranging from 101 to 400 liters and beyond 400 liters, respectively.

3. Rating on Water Service Provided

Connected Respondents

On Water Rates

Half of the respondents perceive the water rates as generally affordable, while 33% consider them high but still within reasonable affordability. Only 17% believe the rates are expensive. It's important to note that the water rates of the municipal waterworks are uniformly set at a flat rate of 10 pesos per cubic meter of consumption.

On Taste

Half of the respondents find the taste of the water very pleasant, while 33% experience no unpleasant taste. Only 17% believe there is an unpleasant taste, but it remains tolerable.

On Odor

All respondents unanimously report that the provided water has no discernible odor.

On Clarity

Half of the respondents find the water to be very clear, while 33% perceive it as generally clear. Additionally, 17% noted occasional cloudiness. It is crucial to highlight that, as per respondents during the interview, water clarity issues are intermittent and primarily occur after maintenance on the water source. Generally, the water is described as very clear.

On Water Pressure

Half of the respondents enjoy high water pressure from the municipal waterworks, while 17% experience consistently normal pressure. Notably, 33% of respondents, mainly from Barangay San Guillermo, encounter fluctuating pressure. This variation is attributed to the elevation of the area and the heightened water demand during peak hours, making it more susceptible to supply fluctuations.

On Water Availability

All respondents unanimously confirm that the provided water is available consistently, providing a service window spanning 19 to 24 hours.

Over-all Rating

The respondents express a high satisfaction level with the water service provided by the municipal waterworks, giving it an admirable rating of 8.92 during the interview.

Unconnected Respondents

The ratings on water service for unconnected respondents are applicable only to those who have a substantial water supply to assess. Among the total unconnected respondents, only 42% have provided their ratings for the water service from the barangay water service provider. This assessment includes barangays such as Balagtas, a portion of Sto. Rosario, Imelda, and San Vicente. However, respondents from barangays Mansahaon, Mansalip, Bonoy, Naulayan, and another portion of Sto. Rosario expressed their inability to confidently rate the level of service by the water provider due to low to no water supply at all.

Among the 42% of respondents who provided ratings for the water service, the feedback indicates that the water, in terms of clarity, is generally clear. Specifically, within this subset, 39% mentioned that the water is clear, while only 3% perceived it as cloudy.

Regarding water pressure, 39% experience high water pressure, while only 3% note fluctuations.

In terms of water availability, 36% of respondents within this group enjoy a consistent 19–24-hour water service, while 6% report having 7-18 hours of water service.

4. Willingness to Connect and Pay

Willingness to Connect

For unconnected respondents, a significant 85% express a strong willingness to connect to the municipal waterworks, provided that an enhanced and high-quality water service is guaranteed. Conversely, only 15% of respondents are content with the current water service provided by the barangay and are not willing to connect. It's worth noting that these 15% of respondents, who choose not to connect, hail from barangays with sufficient water supply, namely Balagtas, a portion of Sto. Rosario, and San Vicente. However, even within these barangays, most respondents express a desire to connect to the municipal waterworks as long as the water is potable and safe.

Remarkably, all respondents from barangays Naulayan, Mansalip, Mansahaon, Bonoy, and another portion of Sto. Rosario is very eager to connect to an improved water service.

For those already connected, the measure shifts to their willingness to pay a higher water bill for an improved, safe, and potable water service. Among these respondents, 50% state their

willingness to pay, as long as the increase is not substantial. Conversely, the remaining 50% express contentment with the existing water service level and are not willing to pay more.
Willingness to Pay

Among the 85% of unconnected respondents expressing a willingness to connect, their preferences for connection fees and monthly water fees are varied. Specifically, 39% are willing to pay a connection fee of not more than Php 1,000, while 34% are open to a fee within the range of 1001 – 2000 pesos. Additionally, 12% are willing to pay within the 2001 – 3000 pesos range.

Regarding monthly water fees, 32% are willing to pay below 100 pesos, 36% are open to fees within the 101-200 pesos range, and 21% express a willingness to pay within the 201 – 300 pesos range. Furthermore, 11% are open to monthly fees within the 301 – 500 pesos range.

In contrast, connected respondents are prepared to pay higher water fees, ranging from 100 to 400 pesos, for an improved and reliable water service.

5.4 RECOMMENDATION

Based on the findings of the willingness-to-connect survey, residents currently connected to the municipal waterworks in Riverside, Talisay, and San Guillermo are overwhelmingly satisfied with the existing water service. These respondents expressed contentment with the quality, quantity, and reliability of the provided water service. Consequently, only 50% of them are open to the idea of paying a higher water bill, reflecting their high level of satisfaction.

For unconnected respondents served by barangay water providers in San Vicente, Balagtas, Imelda, and a portion of Sto. Rosario, satisfaction with the water service is evident. Particularly in San Vicente and Balagtas, respondents report clear, high-pressure, and reliable water supply. Despite this satisfaction, a significant number of unconnected respondents express a willingness to connect and pay for an improved, safe, potable, and reliable water service.

Conversely, the issue of water supply is severe in barangays Naulayan, Mansahaon, Bonoy, and a portion of Sto. Rosario. Residents in these areas face higher costs and resort to alternative sources such as developing their own dug wells or fetching water. During interviews, respondents in these areas expressed a strong desire for improved water service to reduce costs and ensure access to quality, potable water. Notably, all respondents from these barangays are eager to connect and willing to pay for an enhanced water service.

In response to these findings, it is highly recommended to expand water service coverage in areas facing current challenges with their existing water supply. The prioritization for expansion is outlined as follows:

- Mansahaon: 199 households (Priority Level 1)
- Sto. Rosario: 220 households (Priority Level 2)
- Mansalip: 225 households (Priority Level 3)
- Bunoy: 130 households (Priority Level 4)
- Naulayan: 112 households (Priority Level 5)

It's essential to highlight that addressing the water supply concerns in Barangay Naulayan requires the installation of additional distribution pipelines from the San Vicente source transmission line to

the boundary of Barangay Balagtas. This expansion will contribute significantly to improving water accessibility and service quality in the identified areas.

6 WATER MANAGEMENT DEPARTMENT

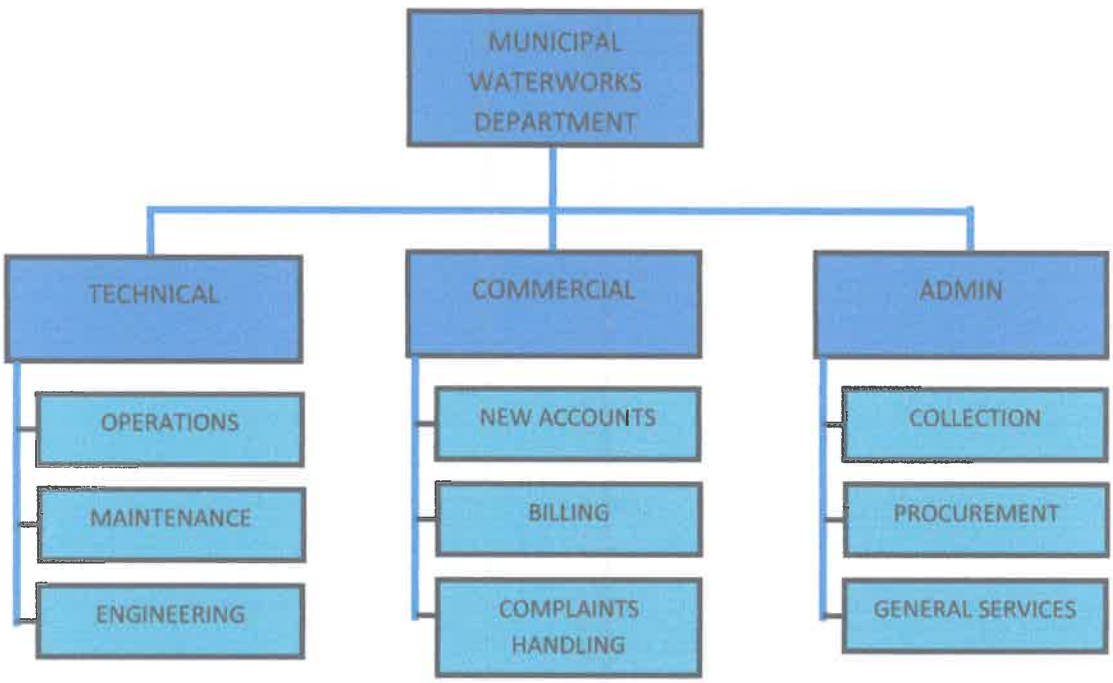
Water management extends beyond the simple act of supplying water to customers; it involves a comprehensive approach that encompasses a set of strategies and programs. The goal is to secure a sufficient, sustainable, and reliable source of water while maintaining an equitable and well-balanced distribution. The aim is to meet the current and future demands of customers, thereby contributing to and ensuring the economic growth of the municipality. Effective water management requires careful planning and execution to address both immediate and long-term water needs, fostering sustainability and resilience in the face of evolving demands and challenges.

The current water management structure in the Municipality of Matag-ob is characterized by fragmentation, where different areas or barangays have their individual water providers. This decentralization impedes the achievement of an equitable and sustainable water supply for the entire municipality. Furthermore, the organizational structure of the municipal water system itself is notably fragmented, with various units or departments within the LGU or Municipality handling distinct functions.

As it stands, the Billing and Collection function falls under the purview of the Treasurer's office, while the daily operation and maintenance responsibilities rest with the office of the municipal engineer. The necessary support in terms of inventory and equipment for daily operation and maintenance is managed by the General Services and Materials Management Department.

To realize the strategic objective of the Municipality, which aims to cover a total of eleven barangays and ensure a continuous, efficient, and safe water supply for both existing and potential customers, a more holistic approach to water management is imperative. This entails integrating and streamlining various functions under a unified framework, fostering collaboration and synergy under a single unit, and ultimately enhancing the overall effectiveness and sustainability of the municipal water system.

6.1 PROPOSED ORGANIZATIONAL STRUCTURE



6.2 TECHNICAL UNIT

Operation Functions

The operational unit plays a pivotal role in guaranteeing the availability of water services to customers. Its scope spans from efficiently operating water sources to produce the required volume, to the meticulous distribution of water. The aim is to ensure that a consistent, potable, and reliable water service reaches every customer's faucet. The operational unit is intricately involved in the entire process, covering production, distribution, and maintaining water quality standards. This holistic approach ensures that every facet of the water supply chain is effectively managed to meet the needs and expectations of the customers.

The **Production function** shoulders the crucial responsibility of overseeing the efficient operation and management of water production facilities. This comprehensive role spans across water treatment facilities, chlorination systems, storage reservoirs, standby power equipment, and raw water mains. The overarching goal is to guarantee a steady, sufficient, and uninterrupted water supply to the municipality. In the context of Matag-ob municipal water works, enhancing this facet of the operation becomes imperative, particularly following inspections that revealed a significant overflow in the sand filter facility due to irregular maintenance practices. Additionally, in pursuit of maximizing the Bulak source, there arises a need for designated and well-trained personnel who can promptly address concerns related to water quality in production facilities, particularly when raw water exhibits elevated turbidity levels.

The **Distribution function** is tasked with the meticulous and equitable distribution of water across the service area. This involves the efficient operation and management of water distribution facilities, including control valves, fire hydrants, and other appurtenances within the distribution system. The unit regulates water distribution across supply zones and is also engaged in the maintenance of distribution system appurtenances. It executes routine and planned maintenance and rehabilitation works, encompassing the rehabilitation of valve boxes.

In the realm of **water quality**, the dedicated function is committed to maintaining a satisfactory quality of supply and distribution in adherence to the standards set by the Philippine National Standards for Drinking Water (PNSDW) and the World Health Organization (WHO). A strategic sampling strategy is implemented to monitor the microbiological quality of water at representative points in the distribution systems and water supply sources. Laboratory results are rigorously evaluated for compliance with drinking water standards. Additionally, the unit monitors the physical and chemical quality of source water, ensuring alignment with the health-related contaminant standards set by the PNSDW and WHO. Further, it oversees the quality of the adjacent air, sediments, and soil environment of the water sources, ensuring strict compliance with environmental and public health requirements outlined by regulatory agencies.

Maintenance Functions

The role of maintenance is linked with operational functions, making it indispensable for the seamless and effective distribution of water services. A comprehensive and routine maintenance is essential to ensure the efficiency of the distribution system. Among the key operational assets, pipelines and associated consumer and production meters play a pivotal role.

Establishing a well-organized and consistent maintenance program is crucial to uphold the integrity and functionality of these operational assets. Neglecting maintenance can compromise the reliability of the entire water distribution system, making it imperative to prioritize the upkeep of pipelines and meters through a structured maintenance approach.

Pipeline maintenance is crucial for ensuring the efficient delivery of water to consumers' taps. Inefficiencies often arise from losses in the distribution system, primarily attributed to pipeline failures or leakages in both the main distribution mains and service lines. This is particularly significant for the Matag-ob municipal waterworks, where the establishment of an effective maintenance function becomes imperative.

In the course of site inspections, it becomes evident that the existing installed pipelines and service lines did not adhere to established standards, contributing to inefficiencies in the distribution system. As plans for expansion with the intention of doubling the length of the existing distribution network, it becomes vital to institute maintenance practices to safeguard the longevity and optimal performance of these new assets. Of equal importance is the development of a standardized leak repair procedure. This should include clear guidelines on the materials and fittings to be used during repairs, ensuring consistency and reliability in addressing pipeline issues.

The significance of water distribution extends beyond its mere supply; it must be complemented by accurate billing to truly serve its purpose. The Matag-ob Municipal Waterworks adopts a consumer billing system based on cubic meter consumption, utilizing water meters. Unfortunately, the meticulous maintenance of these water meters, a critical aspect often overlooked by many water utilities in the Philippines, poses a substantial challenge.

Recognizing the significance of accurate billing, Matag-ob Municipal Waterworks places a strong emphasis on institutionalizing the **Meter Maintenance function**. This involves proactive measures, both corrective and preventive, for the replacement of water meters. Preventive measures entail replacing water meters once they exceed their optimal lifespan, typically around 10 years. On the other hand, corrective actions involve the replacement of defective water meters that have not reached their designated lifespan.

Engineering Functions

The primary function of Engineering is to guarantee that the installation, construction, and mapping of new assets align with established standards. This unit is responsible for preparing, designing, and documenting the distribution system to facilitate seamless operations.

The **Engineering team** plays a pivotal role in the planning and execution of water expansion, rehabilitation, and infrastructure projects. This involves the meticulous preparation of detailed engineering design estimates and program of work. Additionally, the team is tasked with regularly updating design standards, conducting engineering investigations, and generating technical reports to ensure that projects adhere to current industry norms.

Furthermore, the Engineering department actively oversees the construction phase of identified projects, ensuring that the implementation aligns with the approved designs and specifications. This comprehensive involvement in the project lifecycle underscores the Engineering unit's commitment to maintaining high standards, efficiency, and technical excellence throughout the development and enhancement of water distribution infrastructure.

Installation of Service Connection for New Accounts is also part of the function of the engineering unit. Part of this function is the inspection of the location of the applicant and identifying the materials required as well as the location of the tapping point of the service line. It is important to note that it is critical to establish a standard for the materials as well as standard meter assembly for every new meter / account installation.

6.3 COMMERCIAL UNIT

The Commercial unit plays a critical role in ensuring the accurate billing of the volume of water consumed by customers, taking charge of handling all customer concerns and effectively communicating these issues to different units within the organization.

Application of New Accounts

In managing applications for new service connections or accounts, the Commercial unit oversees the processing and receipt of applications, including necessary documentation. Subsequently, these applications are forwarded to the Technical unit, initiating the inspection process and facilitating the preparation of required materials for upcoming installations.

Billing and Meter Reading

The billing function involves timely billing, water bill distribution, and the meticulous maintenance of complete, accurate, and updated records of concessionaire accounts. This necessitates adhering to a scheduled meter reading activity, ensuring timely and precise readings of water meters, and distributing water bills promptly to provide consumers with ample time to settle and pay their bills. Moreover, the billing function conducts reconnection and disconnection of customers failing to timely pay for their water bill.

Customer Complaints Handling

When it comes to handling customer complaints, the Commercial unit is responsible for addressing concerns related to billing, water service issues, and reporting leaks or failures in the distribution system. They play a crucial role in ensuring all customer concerns are promptly relayed, addressed, and resolved. Additionally, the Commercial unit provides feedback to customers regarding the resolution of their concerns or complaints, fostering effective communication and customer satisfaction.

6.4 ADMIN UNIT

The Administrative Unit serves as a crucial support hub for both the Technical and Commercial units, offering assistance with readily available inventory of materials, apparatus, and office supplies. Additionally, the Admin Unit ensures the provision of necessary transportation and equipment for the seamless operation of various functions.

Materials Procurement

In terms of procurement, the Admin Unit is responsible for identifying materials and establishing minimum stock levels to guarantee the availability of resources for both operational maintenance of the existing distribution system and the installation of new

connections. They meticulously prepare specifications and bidding documents for the procurement of required materials, facilitating a smooth process. Once materials are available, the Admin Unit ensures swift withdrawal and monitors their usage.

Collection

The Admin Unit takes charge of the collection of payments from customers for water bills and new account applications. The tellers and cashier are responsible for the efficient collection, accounting, and reporting of these transactions It is noteworthy that these collection activities are distinct from the Treasurer's office function.

General Services

Additionally, the Admin Unit plays a pivotal role in providing the necessary transport and equipment for maintenance and the installation of new accounts. The careful determination of vehicle and equipment requirements ensures a seamless and expedited resolution for operational activities and projects, contributing to the overall efficiency of the organization.

7 PROPOSED WATER SUPPLY IMPROVEMENT PROJECTS

7.1 San Vicente Supply Area

7.1.1 Water Source

Beto Spring located in Barangay San Vicente is the source of water for Supply Area 1. The spring is located at 139 m amsl with geographical coordinates 11° 8.594'N and 124° 30.542'E. Estimated spring flow is 8-12 lps and is expected to increase once a properly design spring-intake structure is constructed. The water source development comprised the construction of a new wing-wall to capture all the spring flow, spring intake box, and collection tank to store the water prior to conveyed it into the transmission mains. The construction of the proposed spring-intake structures will conform to the optimum basic requirements in terms of hydraulics and structural design for a spring source development. Flow meter will be installed at the outlet of the collection tank to account the volume of water conveyed into the transmission mains. Bypass pipe equipped with gate valve will also be installed for cleaning and maintenance purposes. Properly designed spring-intake and collection tank cover will be provided to ensure the water is free from any form of contamination. Injector type chlorination device with housing will be provided for pre-treatment purposes.

It is crucial to highlight that the mentioned source has undergone initial development. However, during the site inspection, it became apparent that the intake source needed rectification. The existing facility proved insufficient in capturing the total volume of the source.

7.1.2 Transmission and Distribution Lines

To ensure the extended reach of water supply services throughout the service area with ample pressure, the existing 4,600 linear meters of 150mm diameter PVC conveyance line will undergo rectification. Damaged or dilapidated pipes will be systematically replaced with new ones. The rehabilitation process includes repairing and strengthening pipe joints to eliminate any potential leakage during operations. The conveyance pipe will be meticulously installed and laid below ground, with a provision of sand bedding materials to mitigate the risk of damage or leaks resulting from potential water hammer incidents. This approach not only safeguards against mechanical stress but also serves as a deterrent to vandalism, a common concern in rural areas.

Additionally, the distribution mains, consisting of 150mm diameter PVC pipes at Kinawa and Bagacay bridge in Sto. Rosario, will be strategically realigned, ensuring optimal water flow. The installation of valves, equipped with housing, cover, and barricades, at key points within the water supply transmission and distribution mains adds an extra layer of control and accessibility for efficient system management. This comprehensive approach aims to enhance the overall integrity and functionality of the water supply infrastructure.

PROJECT: SAN VICENTE RECTIFICATION	
PIPELAYING	
1	RECTIFICAITON OF 150MM X 4,600 LM UPVC TRANSMISSION PIPE
2	INSTALLATION OF 8 UNITS - AIR RELEASE/VACCUUM VALVE ASSEMBLY
3	INTERCONNECTION TO THE PROPOSED 150MM PIPELINE FROM

	BULAK SOURCE
4	HYDROTESTING
5	DISINFECTION
6	COMMISSIONING
SOURCE INTAKE	
1	SPRING INTAKE AND CONCRETE STRUCTURE
2	CHLORINATOR AND METER ASSEMBLY
3	RESERVOIR RECTIFICATION

The estimated cost for this project is Php 14,394,121.62, encompassing both direct and indirect expenses. It is crucial to highlight the need to prioritize this source since it will serve more additional barangays as compared to the Bulak Source.

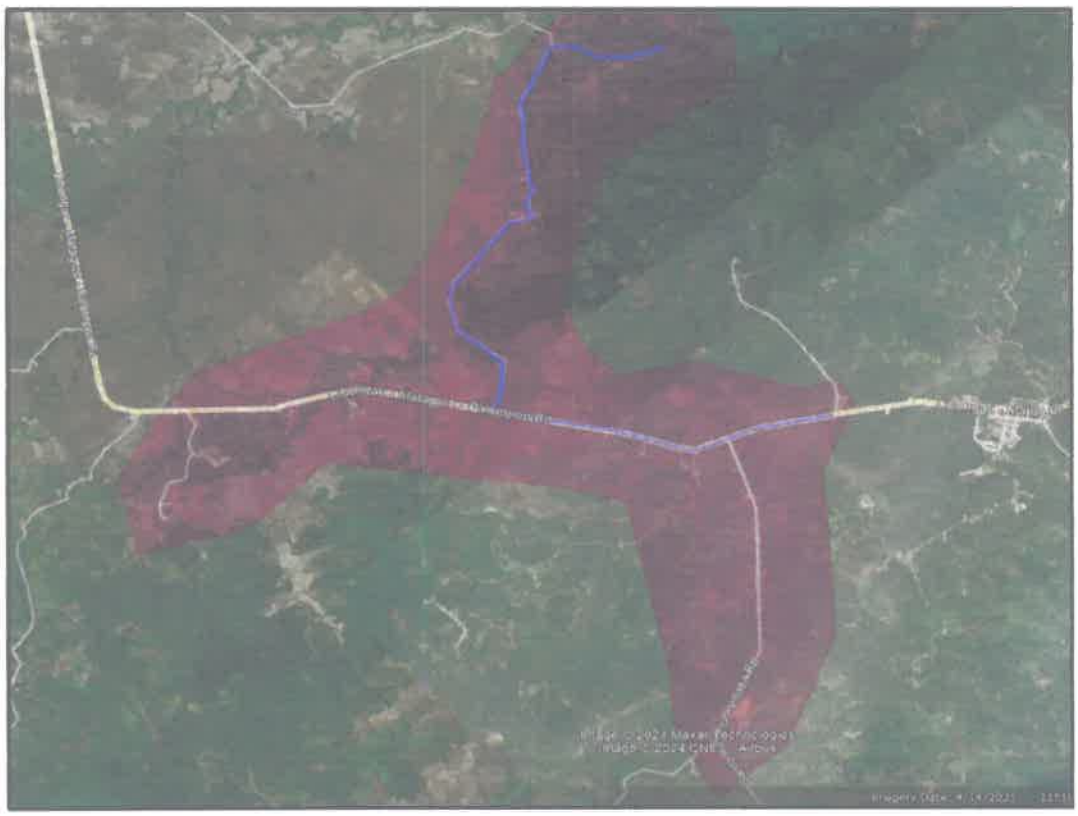
7.1.3 Water Supply Area Coverage

The water supply area 1 comprised the following barangays (Table__):

BARANGAY	CENTRAL ELEVATION (m amsl)	CENTRAL COORDINATES		2023 POPULATION (Households)
San Vicente	33	11° 9.492'N	124° 30.303'E	405
Naulayan	28	11° 10.708'N	124° 29.984'E	113
Balagtas	35	11° 10.828'N	124° 30.310'E	362
Imelda	37	11° 9.895'N	124° 28.549'E	82
Sto. Rosario	33	11° 9.667'N	124° 28.997'E	345
Bonoy	34	11° 9.205'N	124° 28.817'E	119
			TOTAL	**1426**

With the implementation of the above improvement scheme, these barangays that composed the supply area 1 will have sufficient and potable water supply in the coming months.

Location Map of San Vicente Supply Area



7.2 Bulak Supply Area

7.2.1 Water Source

Bulak Spring located in Barangay Bulak is the source of water for Supply Area 2. The spring is located at 185 m amsl with geographical coordinates 11° 8' 23.15" N and 124° 29' 41.78" E. No major improvements will be implemented at the source since properly designed spring-intake structures and appurtenances are already in place.

It is essential to highlight that the Bulak source is presently experiencing a consistent overflow in its Sand Filter Capacity, indicating the necessity for ongoing maintenance of the sand filter facility. Moreover, the full capacity of the source has yet to be maximized. Consequently, the primary goal of this project is to optimize the utilization of the Bulak source, extending its reach to cover additional service areas within its neighboring barangays. the estimated additional spring volume for this project is projected at 8-10 lps.

7.2.2 Transmission and Distribution Lines

At Bulak filter in sitio Mat-an, San Marcelino, a 3,040 linear meter of 150 mm diameter PVC transmission line will be installed down to the existing concrete reservoir at Barangay Poblacion. A control valve with bypass pipe will be provided to divert the water from passing through the filter tank during times when water is clear and free of sediments. By doing this, an estimated head of about 37 m will be added to the system ensuring sufficient pressure even at the far end of the service area. At the Poblacion area, another bypass pipe with control valve will be installed. The purpose is to directly inject the water from the tank filter or from the collection tank into the distribution mains during peak hours. During off-peak, the valve at the bypass pipe will be controlled enabling the water to enter directly into the concrete reservoir for storage purposes. This will also provide additional volume to be utilized during the next peak hours.

Pipe rectification will also be implemented at the existing concrete reservoir in Barangay Poblacion. Currently, the overflow pipes at the same time used as the outlet pipe. Thus, stored water below the overflow pipe level cannot be utilize and this will become a dead storage. Manhole cover will also be redesigned to not allow any form of contaminants from entering the stored water. In general, standard design for storage tank and appurtenances will be strictly followed.
Pipe replacement at distribution mains at Talisay and Matag-ob bridge comprising the 150 mm diameter PVC with length of 55 and 36 linear meter, respectively will also be implemented as derived from the result of the hydraulic model design.

Detailed Scope of the Project

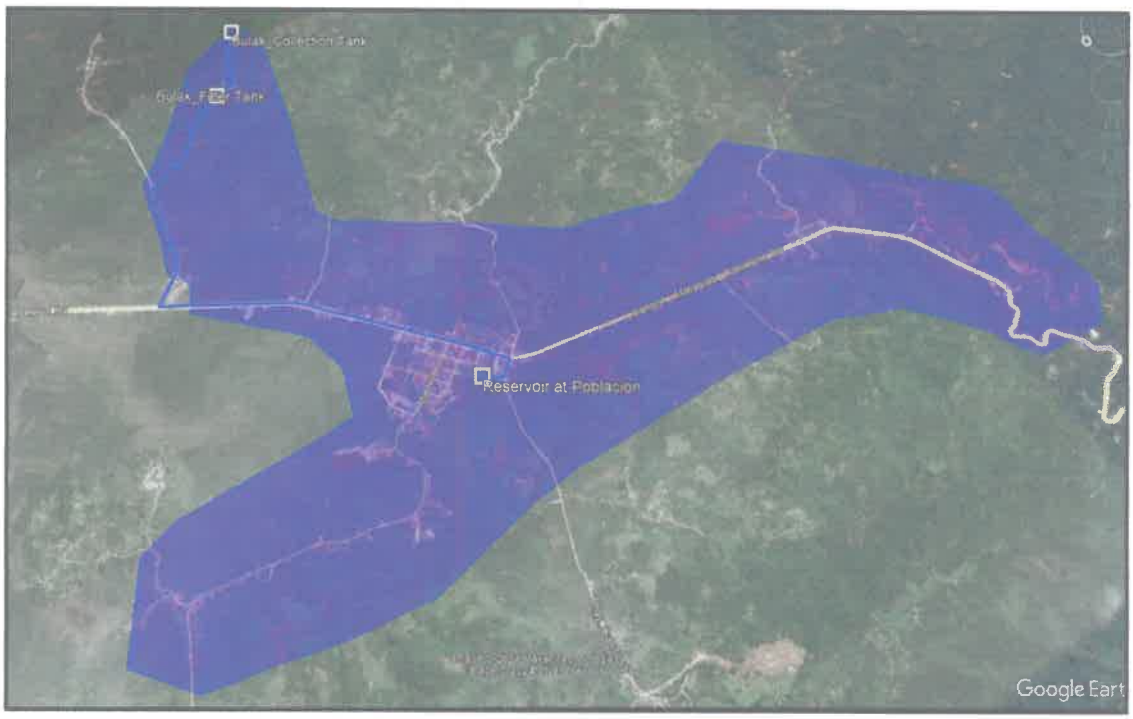
PROJECT: SAN VICENTE RECTIFICATION	
PIPELAYING	
1	PIPELAYING OF 150MM X 3,040 LM UPVC TRANSMISSION PIPE
2	BYPASS LINE (BULAK TANK TO FILTER) – 150MM X 500 LM
3	PIPE CROSSINGS 150MM X 121 LM GI PIPE
4	INSTALLATION OF 7 UNITS - AIR RELEASE/VACCUUM VALVE ASSEMBLY
5	5 DIFFERENT INTERCONNECTION POINTS

6	HYDROTESTING
8	DISINFECTION
9	COMMISSIONING
SOURCE INTAKE	
1	FILTER FACILITY RECTIFICATION
2	CHLORINATOR AND METER ASSEMBLY

The estimated cost for this project is Php 40,987,124.70, encompassing both direct and indirect expenses.

7.2.3 Water Supply Area Coverage

The water supply area 2 covers the following barangays (Table_____).



BARANGAY	CENTRAL ELEVATION (m amsl)	CENTRAL COORDINATES		2023 NO. OF HOUSEHOLDS
Poblacion-Riverside	40	11° 8.652'N	124° 28.228'E	165
Poblacion-Talisay	35	11° 8.822'N	124° 28.402'E	154
San Guillermo	48	11° 7.846'N	124° 28.094'E	155
Mansalip	37	11° 8.447'N	124° 28.178'E	324
Mansahaon	48	11° 9.538'N	124° 28.005'E	221
			TOTAL	**1,019**

The above barangays comprise water supply service area 2 is currently supplied by the LGU operated water system. However, in the absence of properly design water supply system, some areas still experience low pressure to no water specially during peak hours. This prevailing problem can now be resolved once the recommendation derived from this feasibility study will be implemented.

8 EXPANDING COVERAGE PROJECTS

As the San Vicente Spring Source is developed and the existing Bulak Source is maximized, expanding the service coverage of the Municipal Waterworks of Matag-ob becomes imperative. The goal is to cover 11 barangays, necessitating the implementation of multiple expansion projects to fully utilize these upcoming sources. It is crucial to align the execution of these expansion projects with the schedule of the new sources to ensure seamless integration.

Additionally, prioritizing these expansion projects is key to maximizing the return on investment. Strategic sequencing and prioritization will enable efficient deployment of resources and infrastructure, ultimately enhancing the overall effectiveness of the water distribution system.

8.1 SAN VICENTE SUPPLY AREA EXPANSION PROJECTS

The San Vicente Supply area encompasses several barangays, namely San Vicente, Bonoy, Balagtas, Naulayan, Sto. Rosario, and Imelda, and is intended to be serviced by the upcoming San Vicente Spring Source. Presently, none of these identified barangays receive coverage from the municipal waterworks of Matag-ob. Therefore, it becomes imperative to extend services to these areas to capitalize on the forthcoming water source.

It is crucial to highlight the prioritization of expansion into these areas, given that most of them already have existing water service providers. The willingness of customers to connect plays a pivotal role in the successful implementation or expansion into these regions.

Sto. Rosario – Imelda Expansion

The sto. Rosario – Imelda Expansion extends from the intersection of Matag-ob – Palompon Road and Sto. Rosario – Villaba Road until the boundary of Barangay Imelda. The expansion project covers a length of 2,750 linear meters and is projected to cater to 220 household within the area. The proposed pipeline shall be interconnected to the existing 150mm transmission pipelines coming from the San Vicente Spring Source.

Location Map of Sto. Rosario – Imelda Expansion Pipeline

Below are the detailed components of the Project:

PROJECT: STO. ROSARIO – IMELDA EXPANSION	
PIPELAYING	
1	LAYING OF 100MM X 2,750 LM UPVC DISTRIBUTION PIPE
2	LAYING OF 100MM X 30 LM UPVC PIPE CROSSINGS
3	INSTALLATION OF 4 UNITS - AIR RELEASE/VACCUUM VALVE ASSEMBLY
4	INSTALLATION OF 1 UNIT – FIRE HYDRANT
5	INSTALLATION OF 10 UNITS 50MM STUB-OUTS
6	INTERCONNECTION TO THE EXISTING 150MM PIPELINE
7	HYDROTESTING
8	DISINFECTION
9	COMMISSIONING

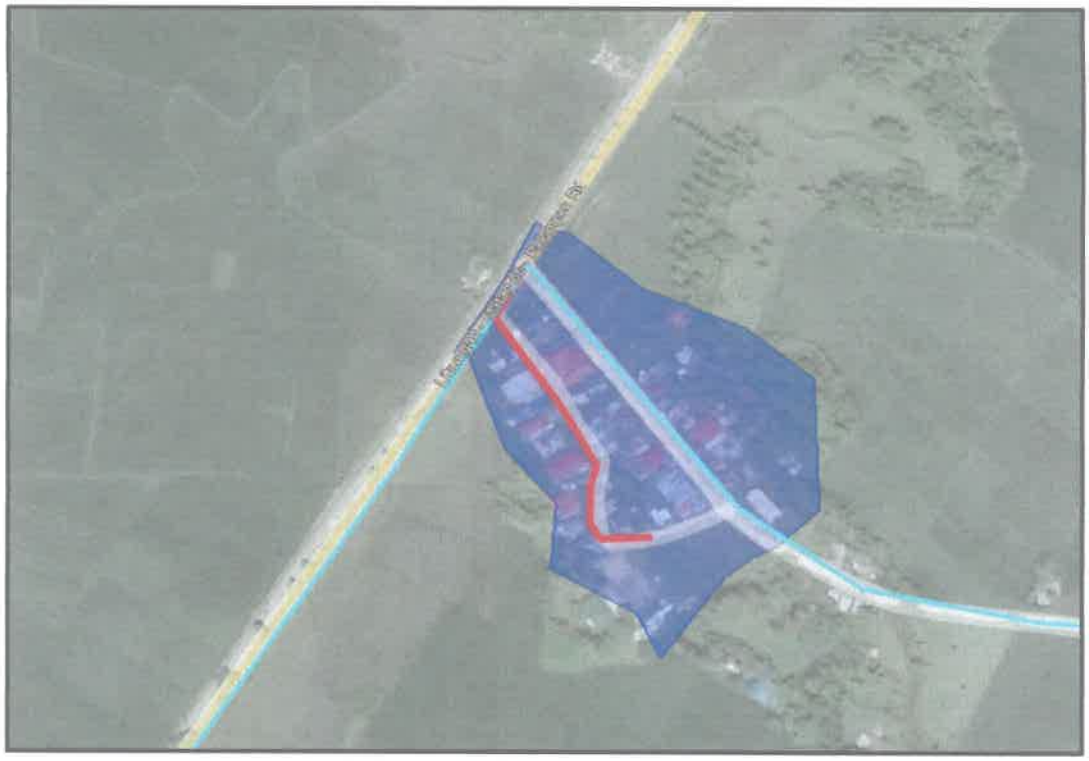
The estimated cost for this project is Php 14,055,694.95, encompassing both direct and indirect expenses. It is crucial to highlight the contrasting experiences of households in Sto. Rosario and Imelda with their existing water service providers. Residents in Sto. Rosario have faced challenges with poor water supply, emphasizing the urgent need for improvement. Conversely, households in Imelda have enjoyed satisfactory water service.

Given the demand density per linear meter and the severity of the water situation in Sto. Rosario, the expansion project emerges as a critical and high-priority initiative. Addressing this need aligns with the overarching goal of enhancing water accessibility and quality for communities in need.

Bonoy Expansion

The community in Barangay Bonoy comprises an estimated 161 households, currently served by the barangay provider. However, feedback from residents suggests that the existing source is inadequate, resulting in subpar service levels. In response, the proposed expansion is designed to reach from the end point of the San Vicente transmission line to the interior part of the barangay road. Covering a distance of 180 linear meters, the expansion pipeline will be equipped with three stub-outs to facilitate service connections for residents in the area.

Location Map : Bonoy Expansion Project



The estimated cost for this project is Php 1,207,997.90, encompassing both direct and indirect expenses. It is imperative to underscore that given the demand density per linear meter and the evident need for enhanced service in Barangay Bonoy, this expansion project is not only highly viable but also a top priority for implementation. Below is the detailed scope of the project:

PROJECT: BONOY PIPELINE EXPANSION	
1	LAYING OF 50MM X 180 LM UPVC DISTRIBUTION PIPE
2	LAYING OF 100MM X 30 LM G.I. PIPE CROSSINGS
3	INSTALLATION OF 1 UNIT - AIR RELEASE/VACCUUM VALVE ASSEMBLY
4	INSTALLATION OF 3 UNITS 50MM STUB-OUTS
5	INTERCONNECTION TO THE EXISTING 150MM PIPELINE
6	HYDROTESTING
7	DISINFECTION
8	COMMISSIONING

Balagtas Naulayan Expansion

Balagtas stands out as one of the most densely populated barangays in Matag-ob, projecting a household count of 491 by 2030. In contrast, barangay Naulayan has a much smaller 2030 projected population of 153. Despite Balagtas experiencing satisfactory water service from its barangay provider, Naulayan has faced challenges with poor water service. Nevertheless, a noteworthy percentage of respondents interviewed in both barangays express a willingness to connect to an improved water service provided by the municipal waterworks.

The Balagtas expansion spans from the interconnection point of the existing 150mm San Vicente transmission line to the boundary of Barangay Balagtas. Covering a length of 1,665 linear meters with a pipe size of 100mm, this project is designed to meet the water demand of both Balagtas and Naulayan. Concurrently, the Naulayan expansion extends from the boundary of Barangay Balagtas to the interior part of Barangay Naulayan, covering a length of 1,660 linear meters. The primary focus of the expansion project is to address the severely poor water service level experienced by residents of Naulayan. It is crucial to implement both expansion areas, totaling 3,325 linear meters, to effectively meet the water needs of the communities in Balagtas and Naulayan.

Location Map : Balagtas – Naulayan Expansion Project

The estimated cost for the Balagtas expansion project is Php 10,488,455.42, covering both direct and indirect expenses. It is crucial to emphasize that despite an assumed 50% willingness to connect from Barangay Balagtas, the demand density per linear meter remains notably high compared to other areas. This makes the expansion project not only highly viable but also a top

priority for implementation. It is essential to recognize that this project not only addresses the water needs of residents in Barangay Balagtas but is also a prerequisite for expanding to Barangay Naulayan. Below is the detailed scope of the project:

PROJECT: BALAGTAS PIPELINE EXPANSION	
1	LAYING OF 100MM X 1,665 LM UPVC DISTRIBUTION PIPE
2	LAYING OF 100MM X 53 LM GI PIPE CROSSINGS
3	INSTALLATION OF 2 UNIT - AIR RELEASE/VACCUUM VALVE ASSEMBLY
4	INSTALLATION OF 1 UNIT FIRE HYDRANT
4	INSTALLATION OF 11 UNITS 50MM STUB-OUTS
5	INTERCONNECTION TO THE EXISTING 150MM PIPELINE
6	HYDROTESTING
7	DISINFECTION
8	COMMISSIONING

On the other hand, the estimated cost for the Naulayan expansion project is Php 9,397,068.31, accounting for both direct and indirect expenses. Residents in Barangay Naulayan are not only willing to connect but are actively seeking intervention from Municipal authorities for an enhanced water system in the area. Given this situation, coupled with the demand density per linear meter, the expansion project emerges not only as highly viable but also as a top priority for implementation. Below is the detailed scope of the project

PROJECT: NAULAYAN PIPELINE EXPANSION	
1	LAYING OF 100MM X 1,660 LM UPVC DISTRIBUTION PIPE
2	INSTALLATION OF 2 UNIT - AIR RELEASE/VACCUUM VALVE ASSEMBLY
3	INSTALLATION OF 1 UNIT FIRE HYDRANT
4	INSTALLATION OF 8 UNITS 50MM STUB-OUTS

5	INTERCONNECTION TO THE EXISTING 150MM PIPELINE
6	HYDROTESTING
7	DISINFECTION
8	COMMISSIONING

The two expansion projects accumulate a total project cost of Php 19,885,523.73, accounting for both direct and indirect expenses. Among all the expansion areas, this project is the most viable considering the return on investment and as well as the demand density per linear meter.

8.2 BULAK SUPPLY AREA EXPANSION PROJECTS

The existing Bulak source is currently characterized with constant overflow in its sand filter facility. To fully utilize the production capacity of the said source, the municipal waterworks of Matag-ob must extend or expand its served area to its neighboring barangays. these barangays are Mansahaon and Mansalip.

It is critical to underscore that the identified areas are currently grappling with a poor water service level from their existing barangay service provider. The survey revealed that residents in these barangays are expending significant amounts of money to secure access to water, both for drinking and daily use. The willingness of customers to connect becomes pivotal for the successful implementation or expansion into these regions, reflecting the urgent need for improved water services in Mansahaon and Mansalip.

Mansahaon Expansion

The Mansahaon Expansion project extends from the intersection of Matag-ob – Palompon Road to the boundary of Barangay Mansahaon, covering a distance of 2,680 linear meters. This initiative is poised to provide water services to 240 households in the area. The proposed pipeline will seamlessly integrate with the proposed 150mm transmission pipelines originating from the Bulak Source.

It is noteworthy that the expansion line's route includes Barangay San Guillermo, even though the latter already has an existing pipeline to serve the community. However, the pipe size in San Guillermo, which is currently 38mm, cannot accommodate the additional demand from Barangay Mansahaon. Consequently, to effectively serve Mansahaon, the expansion pipeline must commence from the main transmission pipeline originating from the Bulak source.

Location Map : Mansahaon Expansion Project

The estimated cost for this project is Php 13,247,167.27, encompassing both direct and indirect expenses. It is imperative to underscore the challenges faced by households in Mansahaon with their existing water service providers. Residents in Mansahaon have encountered difficulties with a subpar water supply, underscoring the pressing need for improvement.

The urgency of the water situation in Mansahaon is the driving force behind the implementation of this expansion project. Notably, the demand density per kilometer stands at 89 connections per KM, which is comparatively lower than the demand density in other expansion areas. Below is the detailed scope of the project:

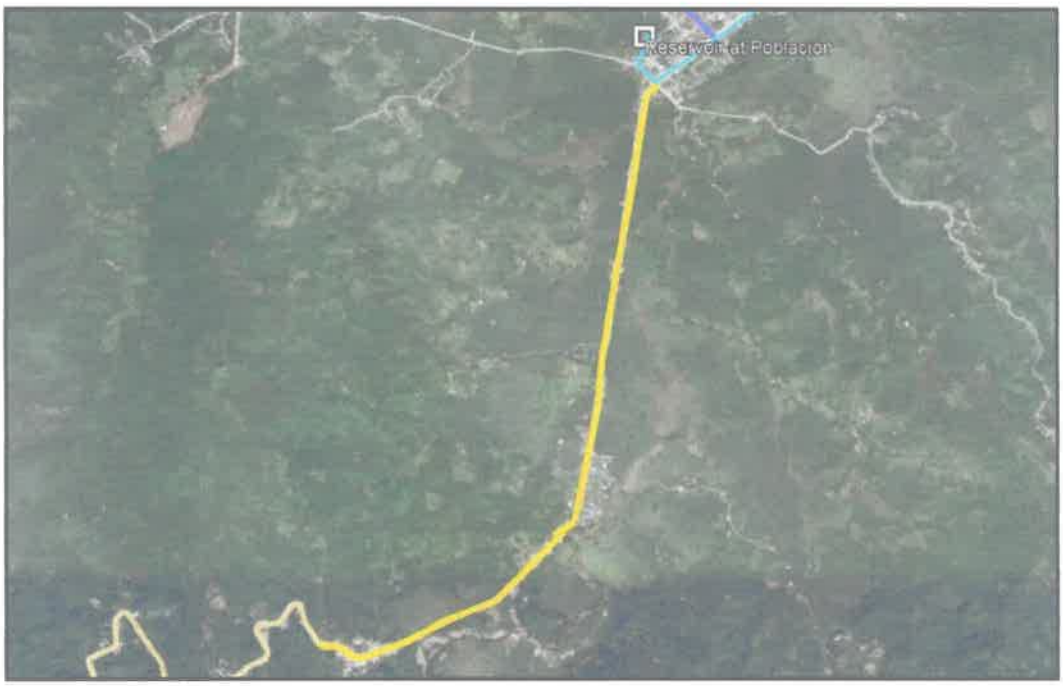
PROJECT: MANSAHAON PIPELINE EXPANSION	
1	LAYING OF 100MM X 2,680 LM UPVC DISTRIBUTION PIPE
2	INSTALLATION OF 5 UNIT - AIR RELEASE/VACCUUM VALVE ASSEMBLY
4	INSTALLATION OF 1 UNIT FIRE HYDRANT
4	INSTALLATION OF 11 UNITS 50MM STUB-OUTS
5	INTERCONNECTION TO THE PROPOSED 150MM PIPELINE
6	HYDROTESTING

7	DISINFECTION
8	COMMISSIONING

Mansalip Expansion

The Mansalip Expansion project extends from the endpoint of the proposed 150mm transmission line originating from the Bulak Source, running along Matag-ob – Palompon Road, covering a distance of 2,420 linear meters. This initiative is designed to deliver water services to 246 households in the area.

Location Map : Mansalip Expansion Project



The estimated cost for this project is Php 14,807,265.23, covering both direct and indirect expenses. Residents in Mansalip have also encountered challenges with a suboptimal water service level from their barangay service provider, although not as severe as that in Mansahaon.

The water situation in Mansahaon serves as a catalyst for the implementation of this expansion project. The demand density per kilometer stands at 101 connections per KM, which is higher than that of Mansahaon but comparatively lower than the demand density in other expansion areas in San Vicente. The following provides a detailed scope of the project:

PROJECT: MANSALIP PIPELINE EXPANSION	
1	LAYING OF 100MM X 2,420 LM UPVC DISTRIBUTION PIPE

2	LAYING OF 100MM X 35 LM GI PIPE CROSSINGS
2	INSTALLATION OF 7 UNIT - AIR RELEASE/VACCUUM VALVE ASSEMBLY
4	INSTALLATION OF 2 UNIT FIRE HYDRANT
4	INSTALLATION OF 18 UNITS 50MM STUB-OUTS
5	INTERCONNECTION TO THE PROPOSED 150MM PIPELINE
6	HYDROTESTING
7	DISINFECTION
8	COMMISSIONING

9 PROJECT SUMMARY AND BENEFITS

The Water Supply Improvement project for Matag-ob comprises two essential elements: sourcing projects linked with transmission pipelines and six expansion initiatives aimed at serving eight additional barangays. These efforts are carefully planned and prioritized, utilizing the delineation of the supply area, which is based on the development projects of two distinct sourcing springs, Bulak and San Vicente. The total investment in both expansion and sourcing activities reaches Php 118,584,895.

The San Vicente Supply area encompasses a total cost of Php 49,543,338.00, covering the development of the San Vicente Spring Source and four expansion zones spanning 6,254 linear meters. This expansion includes 32 stub-outs to accommodate six additional covered barangays, facilitating the connection of 1,100 households or concessionaires. Given the projected additional connections, demand density, and the number of barangays served, it is strongly recommended to prioritize the implementation of this supply area. This recommendation is based on a careful analysis of the project cost relative to its expected impact and outreach within the community.

Below is the details of the San Vicente Supply Area Project

SAN VICENTE SUPPLY AREA					49,543,338	
PROJECTED BARANGAYS TO BE COVERED						
1.) San Vicente				4.) Bunoy		
2.) Sto Rosario				5.) Balagtas		
3.) Imelda				6.) Naulayan		
SOURCE DEVELOPMENT						
Item	description		quantity	unit	amount	
1	San Vicente Source Development a.) Rectification of 150mm x 4,600 transmission lines b.) Spring intake construction c.) Chlorinator and meter assembly d.) Reservoir Rectification		1200	cmd	14,394,122	
EXPANSION PROJECT						
Item	description	pipe size (mm)	quantity	unit	amount	no. of s.o
1	Balagtas Expansion	100	1665	lm	10,488,455	11
	a.) Balanac 1 Bridge		30	lm		
	b.) Balanac 2 Bridge		23	lm		
2	Naulayan Expansion	100	1659	lm	9,397,068	8
3	Imelda Expansion	100	2750	lm	14,055,695	10
	a.) Laray Bridge		30	lm		
4	Bunoy Expansion	50	180	lm	1,207,998	3
	a.) small culvert bridge		6	lm		

The Bulak Supply area entails a substantial investment of Php 69,041,557, aimed at

BULAK SUPPLY AREA					69,041.557
PROJECTED BARANGAYS TO BE COVERED					
1.) Riverside		4.) Mansalip			
2.) Talisay		5.) Mansahaon			
3.) San Gullermo					
SOURCE DEVELOPMENT					
item	description	pipe size	qty	unit	amount
1	Bulak Source Development		1200	cmd	40,987,125
	a.) Installation of Chlorine Injector in Bulak Filter		1	LS	
	b.) Bulak Filter Transmission Line	150	3040	lm	
	c.) Poblacion Reservoir Rectification		1	LS	
	d.) Bulak Tank - Filter By-pass line	150	500	lm	
	c.) Chlorinator and meter assembly		36	lm	

developing the Bulak Spring Source and extending into two zones covering 5,100 linear meters. This expansion initiative includes the installation of 29 stub-outs, facilitating service to two additional barangays, and connecting a total of 486 households or concessionaires.

EXPANSION PROJECT						
item	description	pipe size (mm)	qty	unit	amount	no. of s.o
1	Mansahaon Expansion	100	2680	lm	13,247,167	11
2	Mansalip Expansion	100	2420	lm	14,807,265	18
	Marao Bridge		35	lm		

Project Benefits

With the implementation of the identified Matag-ob water supply improvement projects, we anticipate several significant enhancements in our service area. The expected benefits from these two sourcing and five proposed expansion projects are as follows:

Increase in Production Capacity: with the maximization of the Bulak Source and the activation of the San Vicente Source, there will be an increase in production volume equivalent to 1,700 cubic meters per day.

Increased Service Coverage: The boost in production volume will enable us to extend service connections to an additional 1,586 households, elevating our current coverage from three (3) to eleven (11) barangays. Further, this will increase the current service connection covered from 539 to 2,135 which is equivalent to almost 300% increase.

Improved Water Distribution: With rectification of the Bulak Filter Facility as well as the Rectification of the existing Poblacion Reservoir, the service level of the existing distribution is expected to improve. Further, the additional expansion areas are design and evaluated to ensure reliable service level in its coverage area.

Accurate Data: Accurate data is essential for informed decision-making. The installation of flow meters will enable us to analyze the NRW levels in different supply areas, allowing us to formulate concrete activities and programs to further improve the supply conditions in these areas."

10. ANNEXES

10.1 MATAG-OB POPULATION / DEMAND PROJECTION

MATAG-OB POPULATION PROJECTION

BARANGAY	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	17,522	**17,566**	**17,610**	**17,654**	**17,698**	**17,743**	**17,787**	**17,832**	**17,876**	**17,921**	**17,966**
Balagtas	1,795	1,799	1,804	1,809	1,813	1,818	1,822	1,827	1,831	1,836	1,840
Bulak	575	576	578	579	581	582	584	585	587	588	590
Cambadbad	497	498	499	501	502	503	505	506	507	508	510
Candelaria	731	733	735	737	738	740	742	744	746	748	750
Cansoso	726	728	730	731	733	735	737	739	741	743	744
Mansahaon	878	880	882	885	887	889	891	894	896	898	900
Masaba	398	399	400	401	402	403	404	405	406	407	408
Naulayan	559	560	562	563	565	566	567	569	570	572	573
Bonoy (Pob.)	590	591	593	594	596	597	599	600	602	603	605
Mansalip (Pob.)	1,286	1,289	1,292	1,296	1,299	1,302	1,305	1,309	1,312	1,315	1,319
Riverside (Pob.)	654	656	657	659	661	662	664	666	667	669	671
Talisay (Pob.)	612	614	615	617	618	620	621	623	624	626	628
San Dionisio	362	363	364	365	366	367	367	368	369	370	371
San Marcelino	886	888	890	893	895	897	899	902	904	906	908
San Sebastian	751	753	755	757	759	760	762	764	766	768	770
San Vicente	2,008	2,013	2,018	2,023	2,028	2,033	2,038	2,043	2,049	2,054	2,059
Santa Rosa	1,202	1,205	1,208	1,211	1,214	1,217	1,220	1,223	1,226	1,229	1,232
Santo Rosario	1,723	1,727	1,732	1,736	1,740	1,745	1,749	1,753	1,758	1,762	1,767
Imelda	408	409	410	411	412	413	414	415	416	417	418
Malazarte	267	268	268	269	270	270	271	272	272	273	274
San Guillermo	614	616	617	619	620	622	623	625	626	628	630

MATAG-OB HOUSEHOLD PROJECTION

BARANGAY	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	4,671	**4,683**	**4,694**	**4,706**	**4,718**	**4,730**	**4,742**	**4,754**	**4,765**	**4,777**	**4,789**
Balagtas	479	480	481	482	483	485	486	487	488	489	491
Bulak	153	154	154	154	155	155	156	156	156	157	157
Cambadbad	132	133	133	133	134	134	134	135	135	136	136
Candelaria	195	195	196	196	197	197	198	198	199	199	200
Cansoso	194	194	195	195	195	196	196	197	197	198	198
Mansahaon	234	235	235	236	236	237	238	238	239	239	240
Masaba	106	106	107	107	107	107	108	108	108	109	109
Naulayan	149	149	150	150	151	151	151	152	152	152	153
Bonoy (Pob.)	157	158	158	158	159	159	160	160	160	161	161
Mansalip (Pob.)	343	344	345	345	346	347	348	349	350	351	352
Riverside (Pob.)	174	175	175	176	176	177	177	177	178	178	179
Talisay (Pob.)	163	164	164	164	165	165	166	166	166	167	167
San Dionisio	97	97	97	97	97	98	98	98	98	99	99
San Marcelino	236	237	237	238	239	239	240	240	241	242	242
San Sebastian	200	201	201	202	202	203	203	204	204	205	205
San Vicente	535	537	538	539	541	542	543	545	546	547	549
Santa Rosa	320	321	322	323	324	324	325	326	327	328	329
Santo Rosario	459	460	462	463	464	465	466	467	469	470	471
Imelda	109	109	109	110	110	110	110	111	111	111	112
Malazarte	71	71	72	72	72	72	72	72	73	73	73
San Guillermo	164	164	165	165	165	166	166	167	167	167	168

MATAG-OB WATER DEMAND PROJECTION PER BARANGAY

BARANGAY	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	2,992	**3,000**	**3,007**	**3,015**	**3,022**	**3,030**	**3,038**	**3,045**	**3,053**	**3,060**	**3,068**
Balagtas	269	270	271	271	272	273	273	274	275	275	276
Bulak	86	86	87	87	87	87	88	88	88	88	88
Cambadbad	75	75	75	75	75	75	76	76	76	76	76
Candelaria	110	110	110	110	111	111	111	112	112	112	112
Cansoso	109	109	109	110	110	110	111	111	111	111	112
Mansahaon	211	211	212	212	213	213	214	214	215	216	216
Masaba	60	60	60	60	60	60	61	61	61	61	61
Naulayan	84	84	84	84	85	85	85	85	86	86	86
Bonoy (Pob.)	89	89	89	89	89	90	90	90	90	91	91
Mansalip (Pob.)	309	309	310	311	312	313	313	314	315	316	316
Riverside (Pob.)	157	157	158	158	159	159	159	160	160	161	161
Talisay (Pob.)	147	147	148	148	148	149	149	149	150	150	151
San Dionisio	54	54	55	55	55	55	55	55	55	56	56
San Marcelino	133	133	134	134	134	135	135	135	136	136	136
San Sebastian	113	113	113	113	114	114	114	115	115	115	116
San Vicente	301	302	303	303	304	305	306	307	307	308	309
Santa Rosa	180	181	181	182	182	183	183	183	184	184	185
Santo Rosario	258	259	260	260	261	262	262	263	264	264	265
Imelda	61	61	62	62	62	62	62	62	62	63	63
Malazarte	40	40	40	40	40	41	41	41	41	41	41
San Guillermo	147	148	148	148	149	149	150	150	150	151	151

10.2 WILLINGNESS TO CONNECT SURVEY

WILLINGNESS TO CONNECT SURVEY RESULTS (UNCONNECTED)

BARANGAY	ADDRESS	GENDER		AGE
		M	F	
Mansahaon			1	45
Mansahaon			1	57
Mansahaon		1		54
Mansalip (Pob.)	MANSANITAS	1		47
Mansalip (Pob.)		1		58
Mansalip (Pob.)		1		71
Mansalip (Pob.)			1	73
Balagtas	RIVERSIDE	1		72
Balagtas	RIVERSIDE		1	58
Balagtas	RIVERSIDE		1	66
Balagtas			1	62
Naulayan	PUROK 1		1	53
Naulayan			1	50
Bonoy (Pob.)		1		56
Bonoy (Pob.)			1	85
San Vicente	PUROK 2		1	42
San Vicente	PUROK 1		1	68
San Vicente	PUROK 4		1	44
San Vicente	PUROK 4	1		57
San Vicente	PUROK 1		1	49
San Vicente	PARILLA	1		68
San Vicente			1	73
San Vicente		1		71
Santo Rosario		1		38
Santo Rosario			1	70
Santo Rosario	SITIO CABULAD	1		60
Santo Rosario			1	48
Santo Rosario			1	77
Santo Rosario	PROPER		1	59
Santo Rosario		1		67
Santo Rosario			1	22
Imelda			1	72
Imelda			1	55
TOTAL		12	21	
AVE / PERCENTAGE		36%	64%	59

WILLINGNESS TO CONNECT SURVEY RESULTS (UNCONNECTED)

BARANGAY	ADDRESS	HOUSEHOLD DEMOGRAPHICS												
		1			2									
		NO. OF PERSONS IN THE HH	NO. OF MALE	NO. OF FEMALE	AVE. AGE OF PERSONS IN THE HH (NOT CONNECTED)									
					20-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	BEYOND 65
Mansahaon		4	1	3		1								
Mansahaon		3	2	1					1					
Mansahaon		6	3	3					1					
Mansalip (Pob.)	MANSANITAS	11	3	8		1								
Mansalip (Pob.)		5	2	3					1					
Mansalip (Pob.)		3	1	2						1				
Mansalip (Pob.)		4	1	3						1				
Balagtas	RIVERSIDE	5	3	2					1					
Balagtas	RIVERSIDE	4	3	1				1						
Balagtas	RIVERSIDE	4	2	2					1					
Balagtas		5	3	2		1								
Naulayan	PUROK 1	5	3	2				1						
Naulayan		3	2	1					1					
Bonoy (Pob.)		5	1	4			1							
Bonoy (Pob.)		4	1	3						1				
San Vicente	PUROK 2	7	3	4			1							
San Vicente	PUROK 1	5	2	3			1							
San Vicente	PUROK 4	4	1	3				1						
San Vicente	PUROK 4	7	3	4		1								
San Vicente	PUROK 1	4	1	3			1							
San Vicente	PARILLA	2	1	1									1	
San Vicente		2	1	1										1
San Vicente		3	1	2										1
Santo Rosario		3	2	1					1					
Santo Rosario		2		2							1			
Santo Rosario	SITIO CABULAD	2	1	1								1		
Santo Rosario		5	2	3					1					
Santo Rosario		1		1										1
Santo Rosario	PROPER	4	2	2				1						
Santo Rosario		2	1	1									1	
Santo Rosario		8	4	4				1						
Imelda		1		1										1
Imelda		5	3	2			1							
TOTAL														
AVE / PERCENTAGE		4.181818182	1.966666667	2.393939394	0%	12%	15%	15%	24%	9%	3%	3%	6%	12%

WILLINGNESS TO CONNECT SURVEY RESULTS (UNCONNECTED)

BARANGAY	ADDRESS	HOUSEHOLD DEMOGRAPHICS																				
		3										4										
		AVE. MONTHLY INCOME IN THE HH										AVE. MONTHLY WATER CONSUMPTION (NOT CONNECTED)										
		BELOW 10K	11-20K	21-30K	31-40K	41-50K	51-60K	61-70K	71-80K	81-100K	BEYOND 100K	NOT METERED	BELOW 10 CU	11-15 CU	16-20 CU	21-25 CU	26-30 CU	31-35 CU	26-40 CU	41-45 CU	46-50 CU	BEYOND 50 CU
Mansahaon		1										1										
Mansahaon		1										1										
Mansahaon		1										1										
Mansalip (Pob.)	MANSANITAS								1						1							
Mansalip (Pob.)				1											1							
Mansalip (Pob.)		1										1										
Mansalip (Pob.)		1										1										
Balagtas	RIVERSIDE	1															1					
Balagtas	RIVERSIDE	1													1							
Balagtas	RIVERSIDE	1												1								
Balagtas		1												1								
Naulayan	PUROK 1		1									1										
Naulayan		1										1										
Bonoy (Pob.)		1										1										
Bonoy (Pob.)			1									1										
San Vicente	PUROK 2	1										1										
San Vicente	PUROK 1			1								1										
San Vicente	PUROK 4				1							1										
San Vicente	PUROK 4	1										1										
San Vicente	PUROK 1		1									1										
San Vicente	PARILLA	1										1										
San Vicente		1										1										
San Vicente		1										1										
Santo Rosario		1										1										
Santo Rosario			1									1										
Santo Rosario	SITIO CABULAD	1										1										
Santo Rosario		1										1										
Santo Rosario		1										1										
Santo Rosario	PROPER	1										1										
Santo Rosario		1													1							
Santo Rosario		1											1									
Imelda		1										1										
Imelda		1										1										
TOTAL		25	4	2	1	0	0	0	1	0	0	25	1	2	4	0	1	0	0	0	0	0
AVE / PERCENTAGE		76%	12%	6%	3%	0%	0%	0%	3%	0%	0%	76%	3%	6%	12%	0%	3%					

WILLINGNESS TO CONNECT SURVEY RESULTS (UNCONNECTED)

BARANGAY	ADDRESS	WATER USAGE AND SOURCING WATER																																				
		1											2															3											
		SOURCE OF DRINKING WATER											COST OF DRINKING WATER MONTHLY															SOURCE OF WATER FOR DAILY USE										
		PRIVATE PROVI	BARANGAY PROVI	WATER REFILLING	COMMUNAL WAYER	PUBLIC DEEPWELL	OWN DUG WELL	RAINWATER	WATER FROM SPRING	WATER TANKER	BOTTLED WATER		0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1500	1501-2000	BEYOND 2000	PRIVATE PROVI	BARANGAY PROVI	WATER REFILLING	COMMUNAL	PUBLIC DEEPWELL	OWN DUG WELL	RAINWATER	WATER FROM SPRING	WATER TANKER	MANUAL DELIVE			
Mansahaon				1												1											1		1									
Mansahaon				1													1										1		1									
Mansahaon				1																		1									1							
Mansalip (Pob.)	MANSANITAS			1													1									1											
Mansalip (Pob.)				1												1														1							
Mansalip (Pob.)				1										1																1							
Mansalip (Pob.)				1												1										1						1					
Balagtas	RIVERSIDE	1		1										1												1											
Balagtas	RIVERSIDE			1									1													1											
Balagtas	RIVERSIDE			1									1													1				1							
Balagtas				1									1													1											
Naulayon	PUROK 1			1														1								1											
Naulayon			1						1				1																	1							
Bonoy (Pob.)				1													1									1											
Bonoy (Pob.)				1											1											1				1							
San Vicente	PUROK 2		1										1													1											
San Vicente	PUROK 1			1											1											1											
San Vicente	PUROK 4	1		1											1											1											
San Vicente	PUROK 4		1										1													1											
San Vicente	PUROK 1			1										1												1											
San Vicente	PARILLA		1						1				1													1											
San Vicente				1												1										1						1					
San Vicente			1										1													1											
Santo Rosario				1										1															1								
Santo Rosario				1												1																			1		
Santo Rosario	SITIO CABULADO			1									1													1											
Santo Rosario				1											1											1											
Santo Rosario					1																							1								
Santo Rosario	PROPER			1											1														1							
Santo Rosario				1										1															1							
Santo Rosario				1														1								1			1							
Imelda				1									1													1				1							
Imelda				1										1												1						1					
TOTAL		2	5	27	1	0	0	0	1	0	0	0	10	6	5	5	3	1	1	0	0	0	1	0	0	0	24	0	7	0	7	0	3	0	1	0		
AVE / PERCENTAGE		12%	30%	164%	6%	0%	0%	0%	6%	0%	0%	0%	63%	38%	31%	31%	19%	6%	6%	0%	0%	0%	6%	0%	0%	0%	145%	0%	42%	0%	42%	0%	18%	0%	6%	0%		

WILLINGNESS TO CONNECT SURVEY RESULTS (UNCONNECTED)

BARANGAY	ADDRESS	WATER USAGE AND SOURCING WATER																																				
		5			6								7							8							10											
		MODE OF BRINGING WATER TO THE HOUSE			MODE OF TRANSPORTING WATER								DISTANCE OF WATER SOURCE FROM HOUSE							FREQUENCY OF DELIVERING WATER							STORAGE TANK IN LITERS											
		PIPED CONNECTION	HIRED SOMEONE	OWN FAMILY MEMBER	WATER TRUCK	PUJ	MULTICAB	TRICYCLE	MOTOR CYCLE	BICYCLE	WALKING	PUSHCART	LESS THAN 20M	20-50	50-100	100-200	200-500	500-1000	1000-2000	BEYOND 2000	2X A DAY	1 DAY A WEEK	2 DAYS A WEEK	3 DAYS A WEEK	4 DAYS A WEEK	5 DAYS A WEEK	6 DAYS A WEEK	7 DAYS A WEEK	25 LITERS	25-50	75 - 100	125 - 150	175 - 200	200 - 400	400 - 600	600 - 800	800 - 1000	MORE THAN 1000
Mansahaon				1							1				1								1					1										
Mansahaon				1							1				1								1															
Mansahaon		1																														1					
Mansalip (Pob.)	MANSANITAS	1																																				1
Mansalip (Pob.)		1																																		1	
Mansalip (Pob.)		1																																			
Mansalip (Pob.)		1																																			1
								1																														
Balagtas	RIVERSIDE	1																																	1		
Balagtas	RIVERSIDE	1														1																		1			
Balagtas	RIVERSIDE	1																																			
Balagtas		1													1																						
Naulayan	PUROK 1			1							1		1															1										1
Naulayan				1							1							1			1																	
Bonoy (Pob.)		1																							1													
Bonoy (Pob.)				1							1		1																				1					
San Vicente	PUROK 2	1																																				
San Vicente	PUROK 1	1																																1				
San Vicente	PUROK 4	1																																	1			
San Vicente	PUROK 4	1																																				
San Vicente	PUROK 1	1																																	1			
San Vicente	PARILLA	1																														1						
San Vicente		1																														1						
San Vicente		1																														1						
Santo Rosario				1				1						1							1												1					
Santo Rosario			1						1							1							1											1				
Santo Rosario	SITIO CABULAD	1																																				
Santo Rosario				1								1				1													1						1				
Santo Rosario			1						1								1						1															
Santo Rosario	PROPER		1					1									1				1												1					
Santo Rosario				1					1							1								1									1					
Santo Rosario			1					1									1											1										
Imelda		1																																				
Imelda		1																															1					
TOTAL		21	4	8	0	0	0	3	3	0	5	1	2	1	2	3	3	1	0	0	3	0	4	1	1	0	0	4	3	2	1	2	7	6	1	1	1	4
AVE / PERCENTAGE		127%	24%	48%	0%	0%	0%	25%	25%	0%	42%	8%	17%	8%	17%	25%	25%	8%	0%	0%	23%	0%	31%	8%	8%	0%	0%	31%	11%	7%	4%	7%	25%	21%	4%	4%	4%	14%

WILLINGNESS TO CONNECT SURVEY RESULTS (UNCONNECTED)

BARANGAY	ADDRESS	4				5				6			
		RESPONDENT'S RATING ON CLARITY				RESPONDENT'S RATING ON PRESSURE				RESPONDENT'S RATING ON WATER AVAILABILITY			
		VERY CLEAR	GENERALLY CLEAR	CLOUDY	BROWNISH / YELLOWISH	VERY HIGH	NORMAL OR CONSTANT	FLUCTUATING	LOW OR VERY LOW	19-24 HOURS	13-18 HOURS	7-12 HOURS	0-6 HOURS
Mansahaon													
Mansahaon													
Mansahaon													
Mansalip (Pob.)	MANSANITAS												
Mansalip (Pob.)													
Mansalip (Pob.)													
Mansalip (Pob.)													
Balagtas	RIVERSIDE		1			1						1	
Balagtas	RIVERSIDE			1		1				1			
Balagtas	RIVERSIDE		1				1				1		
Balagtas			1			1				1			
Naulayan	PUROK 1												
Naulayan													
Bonoy (Pob.)													
Bonoy (Pob.)			1						1	1			
San Vicente	PUROK 2		1			1				1			
San Vicente	PUROK 1		1			1				1			
San Vicente	PUROK 4		1			1				1			
San Vicente	PUROK 4		1			1				1			
San Vicente	PUROK 1		1				1			1			
San Vicente	PARILLA		1				1			1			
San Vicente			1				1			1			
San Vicente													
Santo Rosario													
Santo Rosario													
Santo Rosario	SITIO CABULAD	1				1				1			
Santo Rosario													
Santo Rosario													
Santo Rosario	PROPER												
Santo Rosario													
Santo Rosario													
Imelda			1			1				1			
Imelda													
TOTAL		1	12	1	0	9	4	0	1	12	1	1	0
AVE / PERCENTAGE		7%	86%	7%	0%	64%	29%	0%	7%	86%	7%	7%	0%

WILLINGNESS TO CONNECT SURVEY RESULTS (UNCONNECTED)

BARANGAY	ADDRESS	WILLINGNESS TO CONNECT																											
		1		2			3								3														
		WILLING TO CONNECT		REASON FOR NOT WILLING			WILLINGNESS TO PAY FOR CONNECTION FEE								WILLINGNESS TO PAY FOR WATERBILL														
		WILLING	NOT WILLING	WATER RATE IS HIGH	HEALTH RISK FROM EXISTING SOURCE IS NOT	HAPPY WITH EXISTING SERVICE	1000	2000	3000	4000	5000	6000	7000	8000	0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1500	1501-2000	BEYOND 2000
Mansahaon		1						1								1												
Mansahaon		1						1								1												
Mansahaon		1						1									1											
Mansalip (Pob.)	MANSANITAS	1							1									1										
Mansalip (Pob.)		1						1									1											
Mansalip (Pob.)		1					1									1												
Mansalip (Pob.)		1						1									1											
Balagtas	RIVERSIDE	1															1											
Balagtas	RIVERSIDE	1					1									1												
Balagtas	RIVERSIDE	1					1								1													
Balagtas			1			1																						
Naulayan	PUROK 1	1							1							1												
Naulayan		1					1								1													
Bonoy (Pob.)		1						1										1										
Bonoy (Pob.)		1							1							1												
San Vicente	PUROK 2	1					1								1													
San Vicente	PUROK 1	1						1							1													
San Vicente	PUROK 4	1					1								1													
San Vicente	PUROK 4	1					1								1													
San Vicente	PUROK 1	1						1							1													
San Vicente	PARILLA	1					1									1												
San Vicente			1			1																						
San Vicente			1			1																						
Santo Rosario		1						1								1												
Santo Rosario		1							1										1									
Santo Rosario	SITIO CABULADO		1			1																						
Santo Rosario		1					1									1												
Santo Rosario		1					1								1													
Santo Rosario	PROPER	1						1								1												
Santo Rosario		1					1								1													

WILLINGNESS TO CONNECT SURVEY RESULTS (CONNECTED)

BARANGAY	ADDRESS	m	F	AGE	HOUSEHOLD DEMOGRAPHICS														
					1			2											
					NO. OF PERSONS IN THE HH	NO. OF MALE	NO. OF FEMALE	AVE. AGE OF PERSONS IN THE HH (CONNECTED)											
								20-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	BEYOND 65
Riverside (Pob.)	RIVERSIDE		1	65	5	4	1						1				
Riverside (Pob.)	RIVERSIDE		1	74	3	1	2									1	
Talisay (Pob.)	REPUBLIC ST		1	42	4	0	4					1					
Talisay (Pob.)	TALISAY		1	44	3	1	2			1							
San Guillermo	SAN GUILLERMO		1	28	4	3	1		1								
San Guillermo	SAN GUILLERMO		1	34	7	2	5		1								
	TOTAL/AVE			48	4.33	1.8	3		33%	17%	0%	17%	17%			17%	

WILLINGNESS TO CONNECT SURVEY RESULTS (CONNECTED)

BARANGAY	ADDRESS	m	F	AGE	HOUSEHOLD DEMOGRAPHICS																				
					3										4										
					AVE. MONTHLY INCOME IN THE HH										AVE. MONTHLY WATER CONSUMPTIONIN THE HH (CONNECTED)										
					BELOW 10K	11-20K	21-30K	31-40K	41-50K	51-60K	61-70K	71-80K	81-100K	BEYOND 100K	NOT METERED	BELOW 10 CU	11-15 CU	16-20 CU	21-25 CU	26-30 CU	31-35 CU	26-40 CU	41-45 CU	46-50 CU	BEYOND 50 CU
Riverside (Pob.)	RIVERSIDE		1	65	1																				1
Riverside (Pob.)	RIVERSIDE		1	74	1											1									
Talisay (Pob.)	REPUBLIC ST		1	42		1																			1
Talisay (Pob.)	TALISAY		1	44		1											1								
San Guillermo	SAN GUILLERMO		1	28		1											1								
San Guillermo	SAN GUILLERMO		1	34		1														1					
	TOTAL/AVE			48	33%	67%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	33%	0%	0%	17%	0%	0%	0%	0%	33%

WILLINGNESS TO CONNECT SURVEY RESULTS (CONNECTED)

BARANGAY	ADDRESS	AGE	WATER USAGE AND SOURCING WATER																								
			1											2													
			SOURCE OF DRINKING WATER											COST OF DRINKING WATER MONTHLY													
			MUNICIPAL WATER	BARANGAY PROVIDER	WATER REFILLING	OWN DEEPWELL	PUBLIC DEEPWELL	OWN DUG WELL	RAINWATER	WATER FROM SPRING/RIVER	WATER TANKER	BOTTLED WATER		0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1500	1501-2000	BEYOND 2000
Riverside (Pob.)	RIVERSIDE	65			1											1										
Riverside (Pob.)	RIVERSIDE	74			1										1											
Talisay (Pob.)	REPUBLIC ST	42			1											1										
Talisay (Pob.)	TALISAY	44	1		1									1												
San Guillermo	SAN GUILLERMO	28			1									1												
San Guillermo	SAN GUILLERMO	34	1		1									1												
	TOTAL/AVE	48	25%	0%	75%	0%	0%	0%	0%	0%	0%	0%	0%	50%	17%	33%	0%	0%	0%	0%	0%	0%	0%	0%		

WILLINGNESS TO CONNECT SURVEY RESULTS (CONNECTED)

BARANGAY	ADDRESS	AGE	WATER USAGE AND SOURCING WATER																														
			3								4													5									
			USES OF WATER PROVIDED BY THE MUNICIPALITY								AVE. MONTHLY WATER BILL													STORAGE TANK IN LITERS									
			DRINKING	COOKING	BATHING	WASHING OF CLOTHES	CLEANING	FLUSHING OF TOILETS	GARDENING	BRUSHING OF TOOTH	0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1500	1501-2000	BEYOND 2000	25 LITERS	25-50	75-100	125-150	175-200	200-400	400-600	600-800	800-1000	MORE THAN 1000
Riverside (Pob.)	RIVERSIDE	65		1	1	1	1	1	1	1							1						1									
Riverside (Pob.)	RIVERSIDE	74		1	1	1	1	1	1	1		1												1									
Talisay (Pob.)	REPUBLIC ST	42		1	1	1	1	1	1	1							1								1								
Talisay (Pob.)	TALISAY	44	1	1	1	1	1	1	1	1		1												1									
San Guillermo	SAN GUILLERMO	28		1	1	1	1	1	1	1		1												1									
San Guillermo	SAN GUILLERMO	34	1	1	1	1	1	1	1	1			1																			1	
	TOTAL/AVE	48	33%	100%	100%	100%	100%	100%	100%	100%	0%	50%	17%	0%	0%	0%	33%	0%	0%	0%	0%			50%	17%	17%	0%	0%	0%	0%	0%	17%	0%

WILLINGNESS TO CONNECT SURVEY RESULTS (CONNECTED)

BARANGAY	ADDRESS	AGE	RATINGS ON WATER SERVICE PROVIDED											
			1				2				3			
			RESPONDENTS PERCEPTION ON WATER RATES				RESPONDENTS RATING ON TASTE				RESPONDENTS RATING ON ODOR			
			HARDLY AFFORDABLE	HIGH BUT STILL AFFORDABLE	FAIR AND AFFORDABLE	LOW/CHEAP	VERY PLEASANT TASTE	NO UNPLEASANT TASTE	AFTER TASTE IS EVIDENT BUT TOLERABLE	TASTE IS INTOLERABLE / NOT FIT FOR	NO ODOR AT ALL	SLIGHT ODOR	ODOR IS EVIDENT BU TOLERABLE	ODOR IS INTOLERABLE
Riverside (Pob.)	RIVERSIDE	65	1				1				1			
Riverside (Pob.)	RIVERSIDE	74		1					1		1			
Talisay (Pob.)	REPUBLIC ST	42		1				1			1			
Talisay (Pob.)	TALISAY	44				1	1				1			
San Guillermo	SAN GUILLERMO	28				1		1			1			
San Guillermo	SAN GUILLERMO	34				1	1				1			
	TOTAL/AVE	48	17%	33%		50%	50%	33%	17%	0%	100%			

WILLINGNESS TO CONNECT SURVEY RESULTS (CONNECTED)

BARANGAY	ADDRESS	AGE	RATINGS ON WATER SERVICE PROVIDED											
			4				5				6			
			RESPONDENTS RATING ON CLARITY				RESPONDENTS RATING ON PRESSURE				RESPONDENTS RATING ON WATER AVAILABILITY			
			VERY CLEAR	GENERALLY CLEAR	CLOUDY	BROWNISH / YELLOWISH	VERY HIGH	NORMAL OR CONSTANT	FLUCTUATING	LOW OR VERY LOW	19-24 HOURS	13-18 HOURS	7-12 HOURS	0-6 HOURS
Riverside (Pob.)	RIVERSIDE	65	1				1				1			
Riverside (Pob.)	RIVERSIDE	74			1			1			1			
Talisay (Pob.)	REPUBLIC ST	42		1			1				1			
Talisay (Pob.)	TALISAY	44	1				1				1			
San Guillermo	SAN GUILLERMO	28		1					1		1			
San Guillermo	SAN GUILLERMO	34	1						1		1			
	TOTAL/AVE	48	50%	33%	17%	0%	50%	17%	33%		100%			

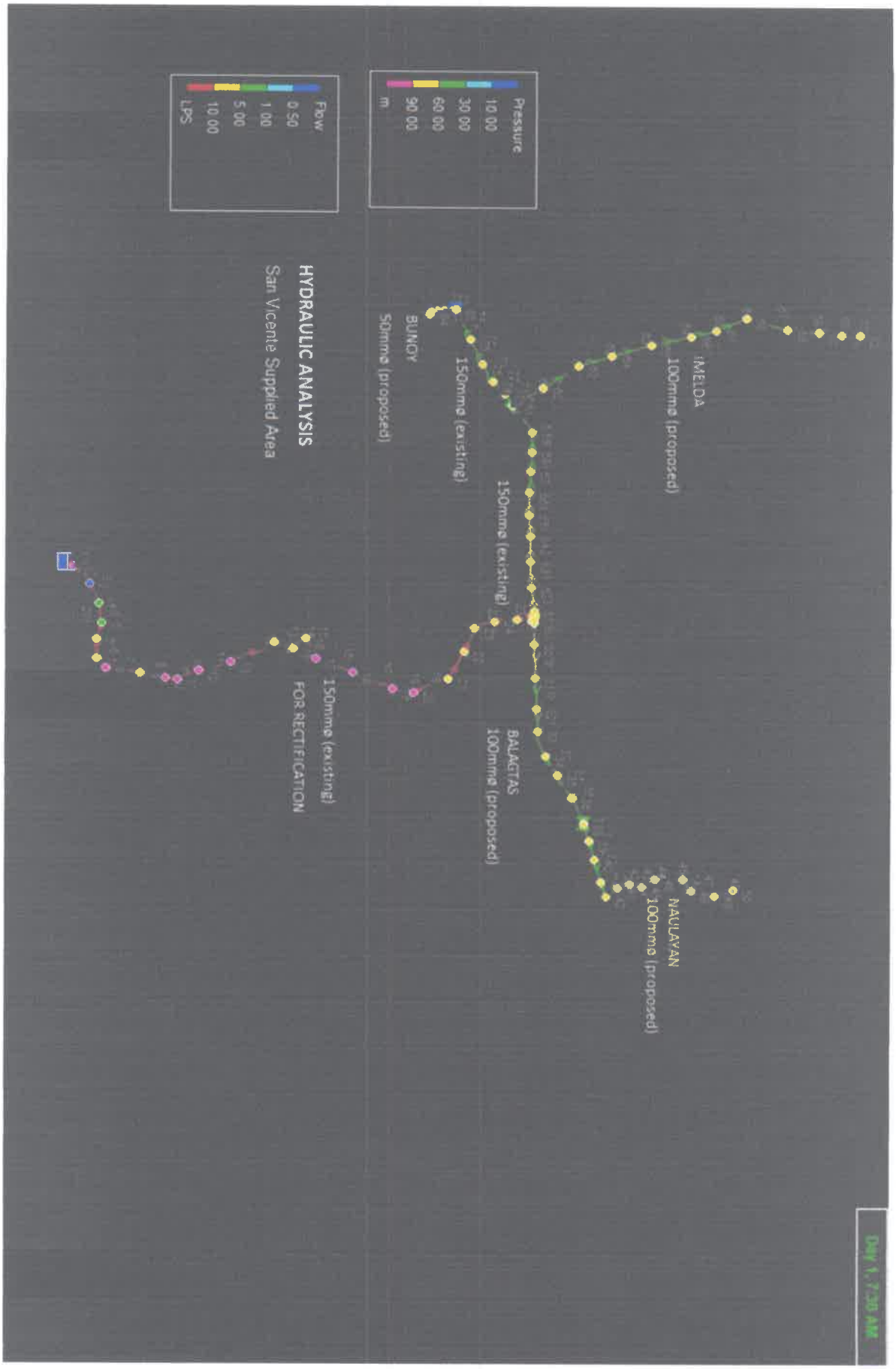
WILLINGNESS TO CONNECT SURVEY RESULTS (CONNECTED)

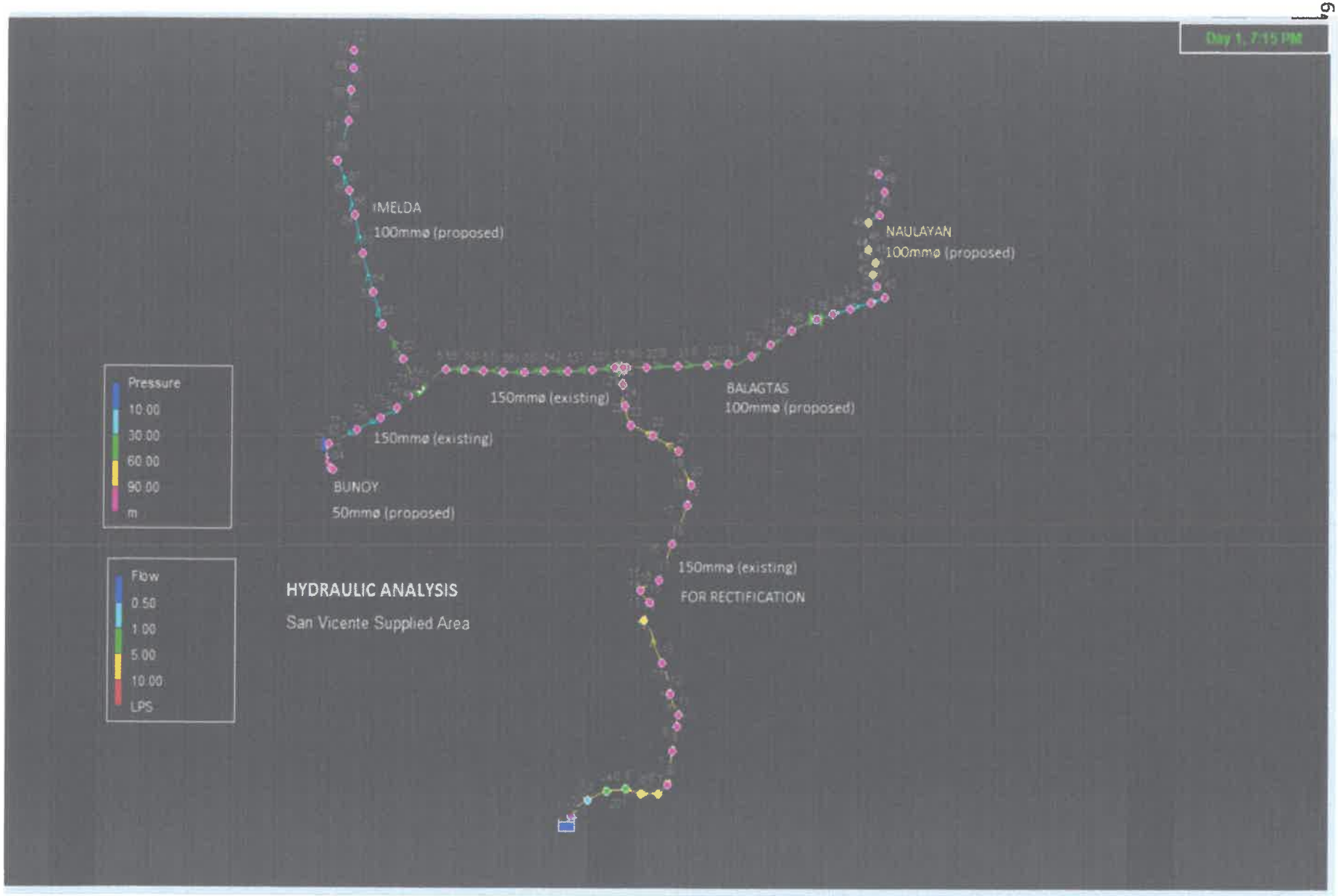
BARANGAY	ADDRESS	AGE	RATINGS ON WATER SERVICE PROVIDED										
			7										8
			STORAGE TANK IN LITERS										OVERALL RATING
			25 LITERS	25-50	75 - 100	125 - 150	175 - 200	200 - 400	400 - 600	600 - 800	800 - 1000	MORE THAN 1000	
Riverside (Pob.)	RIVERSIDE	65	1										10
Riverside (Pob.)	RIVERSIDE	74	1										8
Talisay (Pob.)	REPUBLIC ST	42			1								9
Talisay (Pob.)	TALISAY	44	1										10
San Guillermo	SAN GUILLERMO	28	1										7
San Guillermo	SAN GUILLERMO	34									1		9.5
	TOTAL/AVE	48	67%		17%						17%		8.916666667

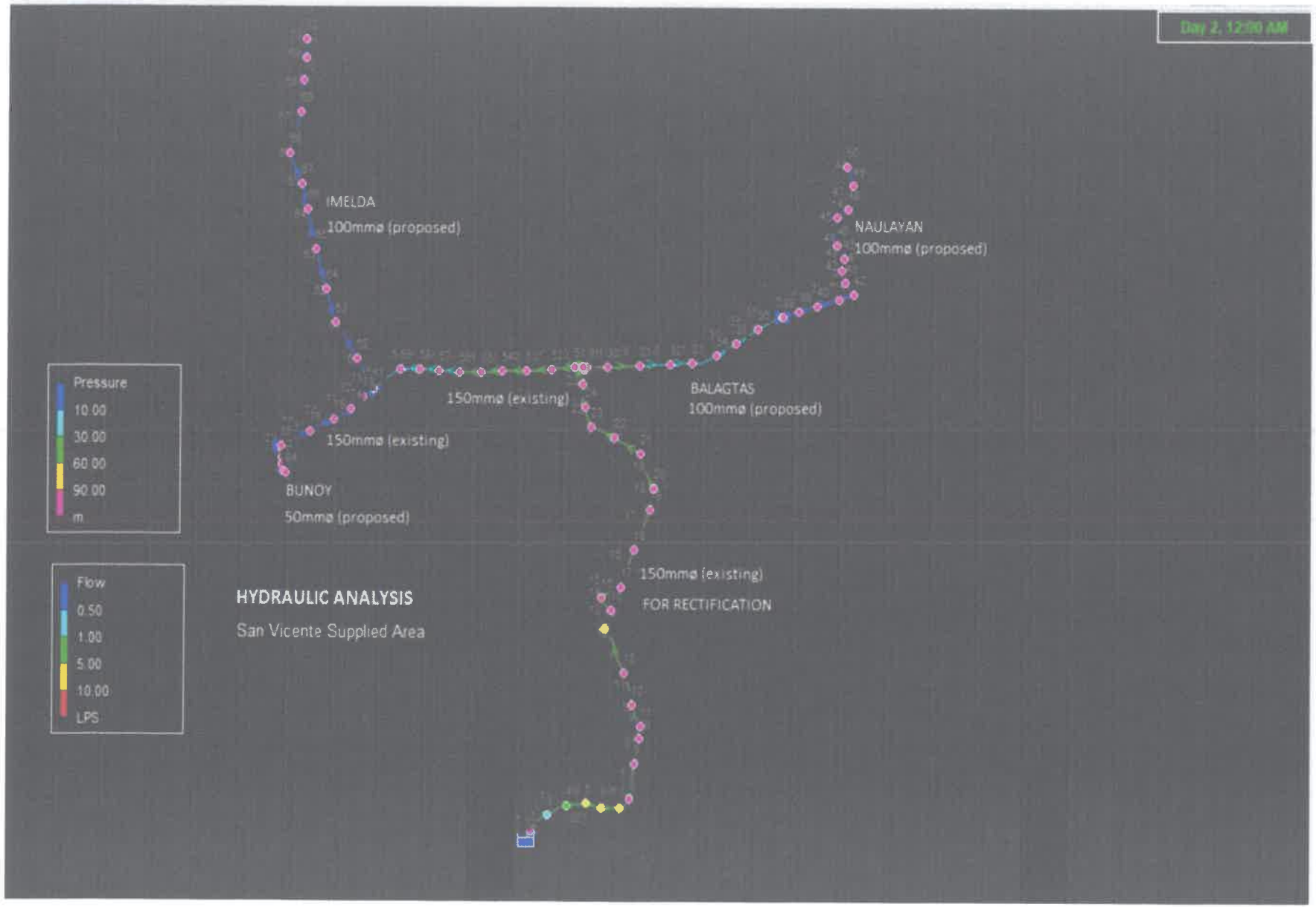
WILLINGNESS TO CONNECT SURVEY RESULTS (CONNECTED)

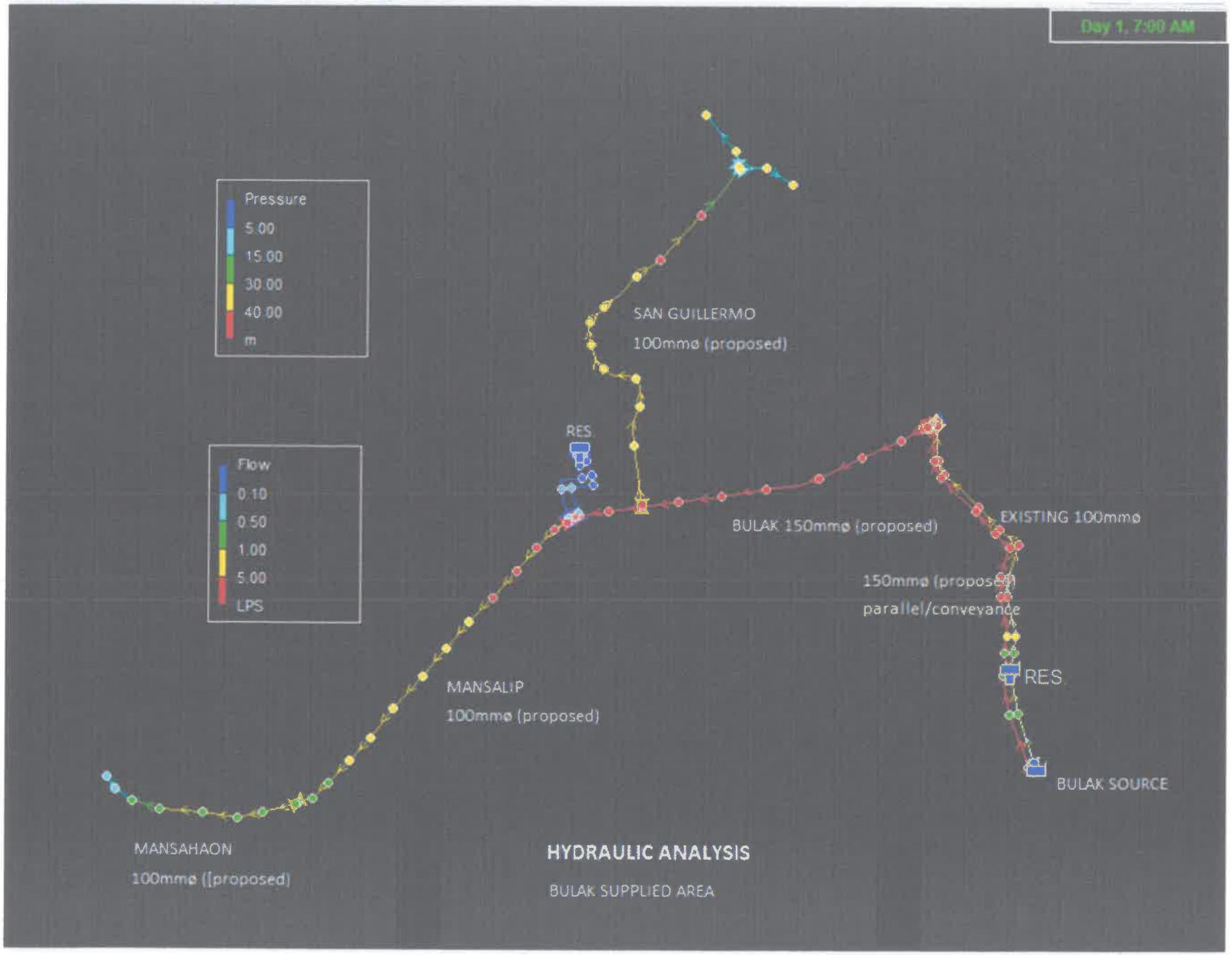
BARANGAY	ADDRESS	AGE	WILLINGNESS TO CONNECT																				
			1		2			3															
			IF SERVICE WILL BE IMPROVED (PRESSURE, AVAILABILITY AND QUALITY), ARE YOU WILLING TO		REASON FOR NOT WILLING			WILLINGNESS TO PAY FOR WATERBILL														
			WILLING	NOT WILLING	WATER RATE IS HIGH	HEALTH RISK FROM EXISTING SOURCE IS NOT AN ISSUE	HAPPY WITH EXISTING SERVICE	0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1500	1501-2000	BEYOND 2000
Riverside (Pob.)	RIVERSIDE	65		1			1													
Riverside (Pob.)	RIVERSIDE	74	1							1										
Talisay (Pob.)	REPUBLIC ST	42		1			1													
Talisay (Pob.)	TALISAY	44		1			1													
San Guillermo	SAN GUILLERMO	28	1						1											
San Guillermo	SAN GUILLERMO	34	1								1									
	TOTAL/AVE	48	50%	50%			50%		33%	33%	33%									

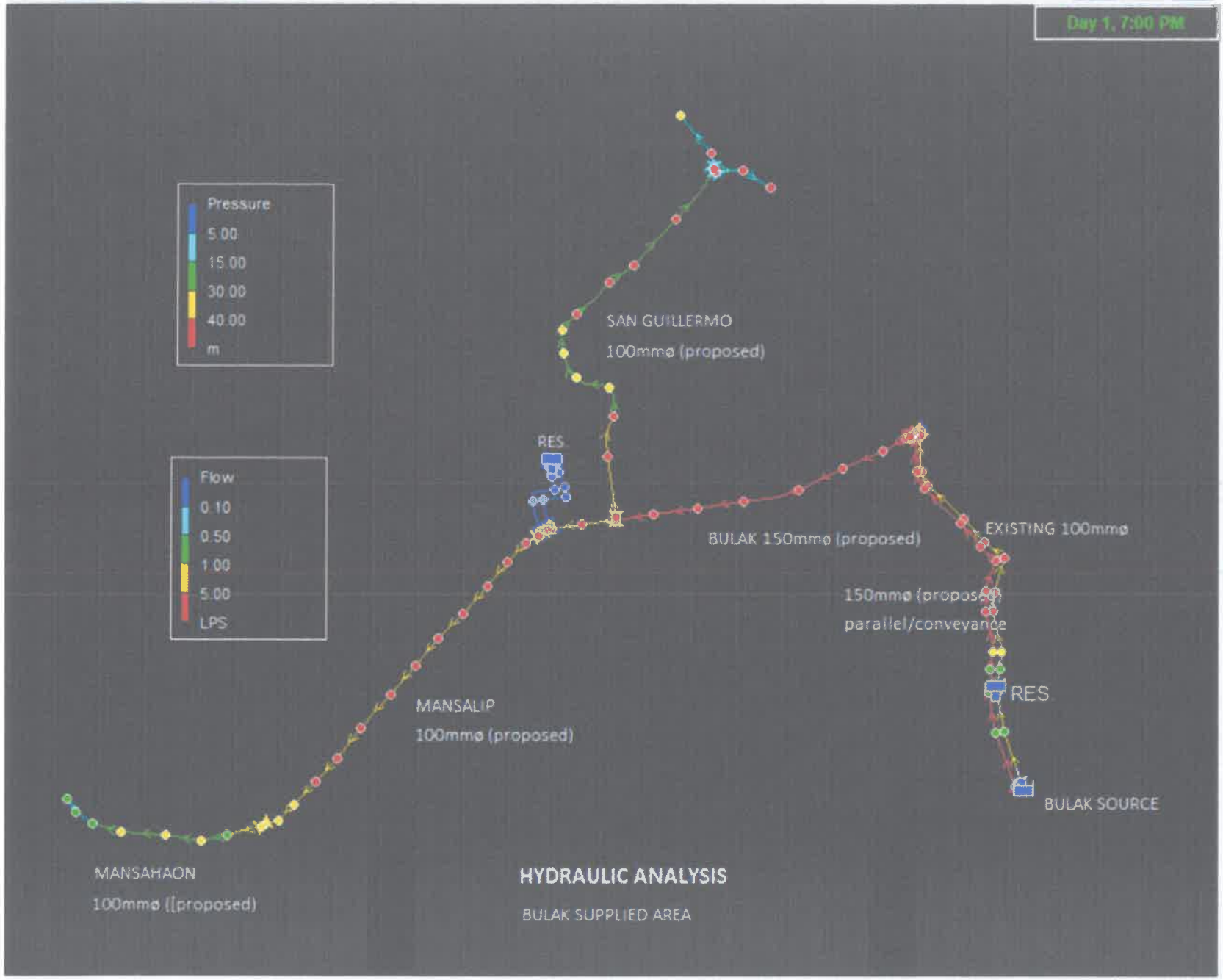
10.3 HYDRAULIC ANALYSIS RESULT

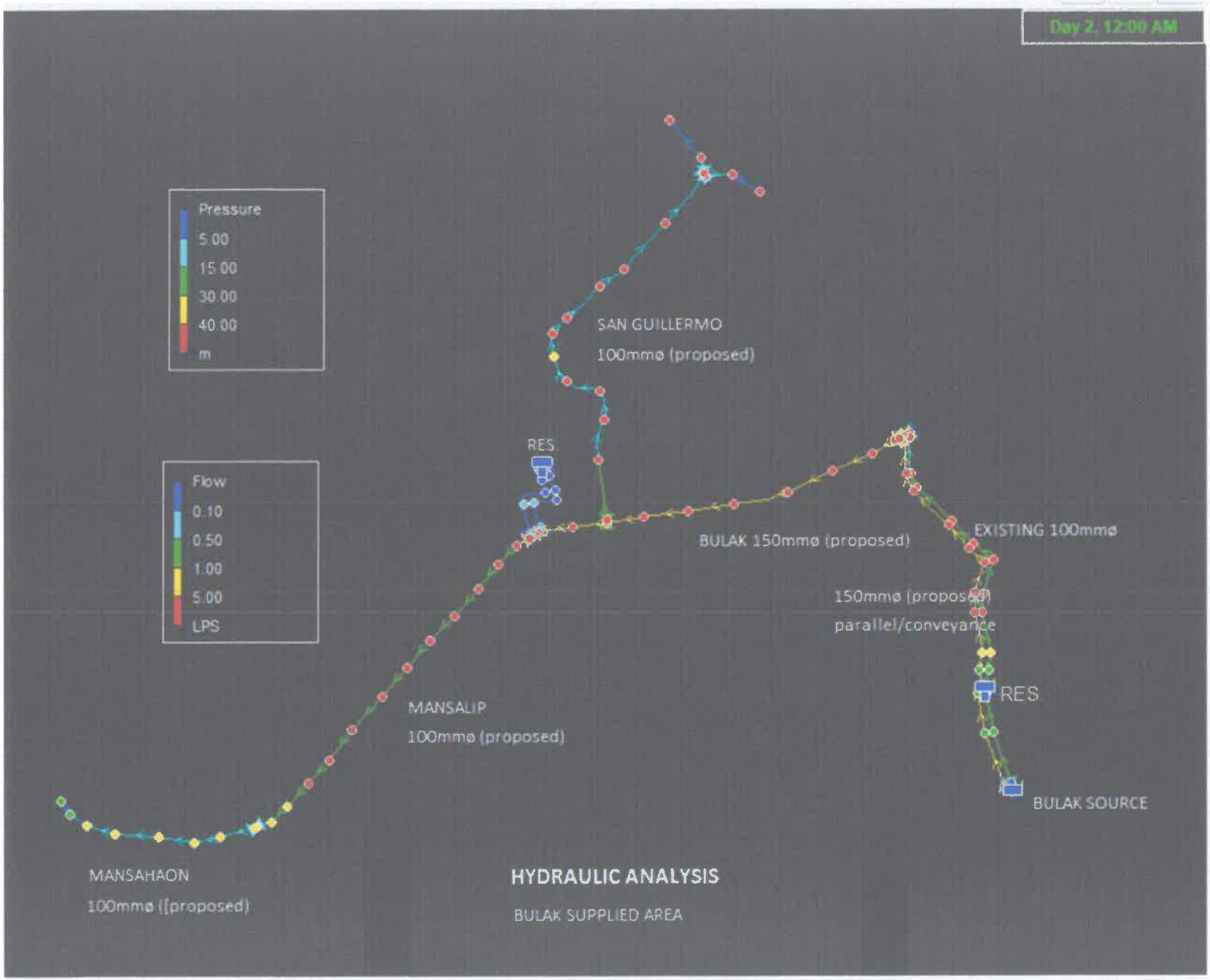



Day 1, 7:15 PM
IMELDA
100mmø (proposed)
NAULAYAN
100mmø (proposed)
150mmø (existing)
BALAGTAS
100mmø (proposed)
150mmø (existing)
BUNOY
50mmø (proposed)
150mmø (existing)
FOR RECTIFICATION
Pressure
10.00
30.00
60.00
90.00
m
Flow
0.50
1.00
5.00
10.00
LPS
HYDRAULIC ANALYSIS
San Vicente Supplied Area


Day 2, 12:00 AM
IMELDA
100mmø (proposed)
NAULAYAN
100mmø (proposed)
BALAGTAS
100mmø (proposed)
150mmø (existing)
150mmø (existing)
BUNOY
50mmø (proposed)
150mmø (existing)
FOR RECTIFICATION
Pressure
10.00
30.00
60.00
90.00
m
Flow
0.50
1.00
5.00
10.00
LPS
HYDRAULIC ANALYSIS
San Vicente Supplied Area


Day 1, 7:00 AM
Pressure
5.00
15.00
30.00
40.00
m
Flow
0.10
0.50
1.00
5.00
LPS
SAN GUILLERMO
100mmø (proposed)
RES
BULAK 150mmø (proposed)
EXISTING 100mmø
150mmø (proposed)
parallel/conveyance
RES
MANSALIP
100mmø (proposed)
BULAK SOURCE
MANSAHAON
100mmø ([proposed)
HYDRAULIC ANALYSIS
BULAK SUPPLIED AREA


Day 1, 7:00 PM
Pressure
5.00
15.00
30.00
40.00
m
Flow
0.10
0.50
1.00
5.00
LPS
SAN GUILLERMO
100mmø (proposed)
RES
BULAK 150mmø (proposed)
EXISTING 100mmø
150mmø (proposed)
parallel/conveyance
RES
MANSALIP
100mmø (proposed)
BULAK SOURCE
MANSAHAON
100mmø ([proposed)
HYDRAULIC ANALYSIS
BULAK SUPPLIED AREA


Day 2, 12:00 AM
Pressure
5.00
15.00
30.00
40.00
m
Flow
0.10
0.50
1.00
5.00
LPS
SAN GUILLERMO
100mmø (proposed)
RES
BULAK 150mmø (proposed)
EXISTING 100mmø
150mmø (proposed)
parallel/conveyance
RES
MANSALIP
100mmø (proposed)
BULAK SOURCE
MANSAHAON
100mmø ([proposed)
HYDRAULIC ANALYSIS
BULAK SUPPLIED AREA