

WATER SUPPLY SCHEME TO KUNHIMANGALAM GRAMA PANCHAYAT

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Abstract— The project is aimed to design a water supply scheme to Kunhimangalam Grama Panchayat in Kannur District. Water for this scheme is to be collected from Vannathipuzha, which is a perennial one. The scheme is based on 2013 census population. The supply level proposed is 70lpcd. The scheme is designed for a period of 30 years. Geometrical increase method is adopted for the calculation of future population in this Panchayat by adopting growth rate method. On implementing this water supply scheme, there will be drastic change in the socio-economic status of the area by the conversion of vacant plains into residential, commercial and industrial area as other services are available. There will be improvement in the health and economic status of the people in this area. In addition to it, this scheme also controls the water scarcity of the area and thereby improves the health and sanitation of people. The project thus provides safe drinking water supply coverage to Kunhimangalam Grama Panchayat.

Keywords—Rural Water Supply Scheme(RWSS); Galvanised Iron(GI) ;Litres Per Capita Per Day(LPCD); Cast Iron(CI); Million Litres PerDay(MLD)

1. INTRODUCTION

The project envisages safe drinking water supply coverage to Kunhimangalam Grama Panchayath in Kannur taluk of Kannur district. At present, the inhabitants of the Panchayat are facing acute scarcity of drinking water, posing major threat, in the coming years. People of different status are residing in this Panchayat having prominent percentage belonging to agriculturists. Government employees, businessmen etc, share the remaining percentage. To boost the living standards of the people of the Panchayat the capacity of the existing water supply scheme has to be enhanced substantively, to meet the present requirements. The scheme is designed for a period of 30 years.

A. Need for the study

At present there are existing water supply schemes in the project area, there are also three independent bore wells fitted with hand pumps. The sources of the scheme are not reliable in summer even to provide water supply to its limited population. In the absence of piped water supply scheme people are depending on all available bore wells, dug wells, natural streams and rivers in the project area for their water requirement. The entire Kunhimangalam Grama panchayat is in short of adequate water supply network and access to piped water supply i.e. a huge gap is existed between demand and supply which is likely to widen drastically in future.

In the absence of proper water supply, sanitation will be poor as substantial portion of the population is depending on local sources, which are either saline or polluted. The scheme on commissioning will provide protected water supply to the community which in turn will improve the quality of life and the overall development of the Panchayat including socio and economic status apart from improvement in health.

B. Objectives and scope of the work

The main objective of the study is to propose a water supply scheme for the above mentioned Panchayat. Other

works includes finding out possible location of sources of water in the area, testing of the water quality, comparison of those values with standards specified by the concerned authority. Proposal of water treatment technologies depending upon the results of water quality tests carried out in the area. Water quantity estimation, population estimation, proposal of intake structures, and pumping apparatus, mode of conveyance of water, water storage structures and finally water distribution network.

The sources of the scheme are not sufficient to meet the needs of the people in summer. During summer, these sources get dried up and getting water just for the minimum daily needs. It is the women members of the family who are really suffering a lot for this. They have to walk long distances for fetching water especially in coastal belt and steep hilly area. Further disinfection is the only treatment carried out in the existing ground water based scheme and people are not always happy about the quality. In brief there is a huge gap in water supply due to lack of adequate water supply schemes for the Panchayat. Hence a distribution network is required for the entire Panchayat to cater to the increased demand to urban growth. The entire Grama panchayat is in short of sufficient water supply and a properly designed piped water supply.

Moreover, contamination of water due to salt water intrusion and depletion of water table increases the drinking water scarcity in the Panchayat. Hence it is very essential for providing a dependable piped water supply scheme for the inhabitants of the project area, with adequate quality, quantity and reliability. The institutions like Payyanur College, Sanskrit University Payyanur unit, Kendriya Vidhyalaya etc are located in the eastern side of the Kunhimangalam Grama panchayat. The provision of piped water supply was given in these areas also.

2.METHODOLOGY

A. Site survey

The site survey is conducted for securing overall details of the Kunhimangalam Grama Panchayat for designing a new water supply scheme. It covers the entire area benefitted by this project, boundaries of the project area, geographical features like topography, rivers, water table, soil structures etc.

B. Project area and population

The project area is situated at Kannur Taluk of Kannur district. The topography of the area is fairly plain with very few exceptions. The sub strata of the project area consist of ordinary soil and hard laterite. The area has moderate tropical climate, in general which is humid and temperature ranging from 20 to 37 degree Celsius. The maximum rainfall is during the months of June-July averaging 300cm. Even though the area is blessed with two monsoons, viz, southwest monsoon from June-September and north-east monsoon in October, it is the most drought-prone during rest of the area.

C. Boundaries of the project area

The project area covers the entire portion of the Kunhimangalam Grama panchayat which is situated in the northern side of Kannur district. The boundaries of the Kunhimangalam Gramapanchayat area are listed below.

- North: Cheruthazham Grama Panchayat
- South: Cheruthazham Grama Panchayat
- East : Payyanur Municipality
- West: Ramanthali Grama Panchayat

D. Population

As per 2001 census, population of the project area and occupied households are shown in the table below.

Table 1. DETAILS OF POPULATION AS PER 2013 CENSUS
(SOURCE:KUNHIMANGALAM GRAMAPANCHAYAT OFFICE)

Name of Panchayat	Area in Sq.km	Occupied House holds	Total Population
Kunhimangalam Grama panchayat	15.44	4785	18014

E. Topography

Average altitude is around 2m above Mean Sea Level (MSL). The average rainfall is 3617mm. The landscape of this Panchayat is peculiar with hills, slopes and plain areas. The town is located in the coastal region and to the east rise of the Western Ghats. The soil is sandy in the western coastal part of the town whereas it is hard soil, laterite, medium and hard rocks in almost other parts of the Panchayat area.

F. Geology and vegetation

The terraced character of the low lands of Malabar is seen in Kunhimangalam Grama panchayat. The most extensively occurring rock type is the genuine Quartz and Magnetite. A few basic igneous intrusive are also seen in association with gneiss. The warkalli beds consist of a succession of beds of different clays carrying lignite. These beds are typically exposed in the beach, beneath a cover of laterite. The coastal bed of reasoned deposits includes all the marine and alluvial deposits of recent origin.

G. Water Table

The water table in Kunhimangalam Gramapanchayat is comparatively high about 5.00m. to 7.00m. from ground level except during rainy season, but the water table on east side which is a hilly terrain is comparatively deep about 10m. to 20m. from ground level except during rainy season.

H. Rivers

Kunhimangalam Gramapanchayat is endowed with a free river system. The river is perennial and provides good scope for irrigation and controlling floods through minor irrigation.



Fig1. River Perumba

I. Socio-Economic Status

The major source of the income of the people is from agriculture, business, and Government employment. Most of the people can afford to avail house connection. Majority of the population are engaged in agricultural activities, a small group runs business, as in any other town, another group comprises of the salaried class. A number of government offices and private offices are also in this Panchayat. This Panchayat is in close proximity to the municipalities of Thaliparamba and Payyanur.

The Ezhimala Naval Academy is only 8 kilometers from the Panchayat. The towns in this Panchayat are acquiring urban characteristics very fast. It is high time to think of providing better living environment. Basic amenities like potable water supply assume prime role among this.

J. Rain water harvesting and ground water recharging

The Panchayat has already implemented the project for collection of rain water from roof top of newly

constructed building and recharging the water sources. Moreover the Panchayat area comprises of 20% paddy land which is a good source for natural recharging of ground water. The east side of Panchayat is having hilly terrain and contour bunds are constructed along with collection ditches for conservation of rain water. A number of rain water harvesting projects are already implemented in the different parts of the Panchayat.

K. Existing Water Supply Schemes

At present there are two water supply schemes in Kunhimangalam Grama panchayat. Details of the present schemes are shown in the table below. The sources for both schemes are 6m diameter open well. Both schemes are old and cannot be utilized along with the proposed scheme. Hence these schemes will be abandoned on completion of the proposed scheme.

The existing water supply has neither sufficient coverage nor the capacity to meet the present day to day requirements of the majority of the people. During summer months, acute scarcity of portable water is felt in these areas. Open wells dries up in summer and in low lands there is intrusion of salinity in the wells. The basic amenity of drinking water is much short in supply especially during summer season, when it is required the most.

3. PLANNING AND LAYOUT

Under this head the planning and layout of intake well is described. The various details regarding intake well components are included

A. Intake Well Cum Pump House

The site for the source is proposed at Kottakunnu in the bank of Perumba river in Cheruthazham Grama Panchayat. This topic deals with the construction of the intake well cum pump house complete in all respects including construction of all structures for the various units, gantry girder system, supply and installation of all structures for the various electrical wiring and accessories and all other connected works.



Fig 2. Site for Intake Works at Kottakunnu

B. Leading Channel

The work includes construction of an RCC leading channel for a minimum length of 12.00m with RCC bracing wherever required with a bottom width of 2.00m. The depth varying from 2.50m to 5.50m with bottom level 1.20m below average bed level.

C. Side Protection Works

This work includes construction of an RCC side protection retaining wall at the site of Intake well at 3 sides including the river side. The RCC retaining wall shall be provided with sufficient stability to withstand the earth pressure. Necessary RCC steps are proposed from the top retaining wall in the river side for the access into the river. Compound wall is also to be provided along three sides of the site. The river sides are proposed with 90cm height GI hand rails fixed on RCC posts.

D. Yard levelling

The yard of the intake well shall be filled in layers of 15 cm after consolidation to a height of 2.5 m. The yard shall be filled with earth of standard quality. Laterite masonry in CM 1:4 having a minimum thickness of 20cm and height 1.20m with intermediate pillar posts 0.40x0.40x1.40m at 3.00m interval is proposed along the boundary of area (3 sides except river side). Crossing entrance with Reinforced Cement Concrete pillars of size 0.45mx1.20m along with mild steel gate of 4.00mx1.20m is proposed provided at the road entrance.

E. Mechanical Works

Under this head, arrangements for lifting the machineries for removal, repair and annual maintenance; and arrangements for entry of raw water into the well are provided.

F. Intake Arrangements

2 Nos. of 900mm CI Flanged pipe with sliding gate arrangements at different levels with gate rod above the floor slab of the pump house are proposed for the entry of raw water into the well, suitable screens shall be provided in the channel to prevent the entry of foreign matters and other impurities from entering in.

G. Electrical Works

This work shall include supply and erection of three phase connected wiring for all electrical fitting like tube light, fans, light points, power points etc. Electrification of pump house and yard for proper operation of pump house is also proposed. Details of items offered should be specifically mentioned showing light points inside and outside the buildings. All electrifications should be done as per Indian Electricity Rules.

4. WATER QUALITY ANALYSIS

It is essential to conduct water quality test for determining the amount of pollutants in the water and to compare with its standard permissible limit. The water quality analysis includes testing the various physical, chemical and biological parameters. The physical parameters include temperature, colour, turbidity etc. The chemical parameters include Total Dissolved Solids (TDS), pH, chlorides etc.

If the limits are within the permissible range water will be suitable for public supply otherwise proper treatment should be carried out in order to make water safe for drinking purpose.

The sample is collected from Perumba river at different locations and the corresponding latitude and longitude of each points are noted. The test is carried out as per the standards. For conducting this test, water sample is collected and preserved until before testing. The test is conducted four times. Then the test results are compared and suitable site for intake well is selected.

Characteristics	Units	Acceptable	Cause for rejection	Actual content
Turbidity	NTU	5	10	4.9
pH	-	6.5 to 8.5	6.5 to 8.5	8.4
Temperature	°c	10 to 15	10 to 15	25.4
Acidity	mg/l	6	4	8
Alkalinity	mg/l	200	600	14
Hardness	mg/l	300	600	26
Calcium	mg/l	75	200	5.61
Magnesium	mg/l	30	100	2.92
Chloride	mg/l	250	1000	49.63
Iron	mg/l	0.3	1	0.3

5. DESIGN AND CALCULATIONS

A. Population Forecasting And Water Demand Calculation

Rate of water supply = 70 liter per capita per demand
 Yearly increase in Population = 5%
 According to geometrical increase method,
 $P_n = P [1 + (r/100)]^n$

Where

P = Present population
 P_n = projected population
 n = number of decades

B. Capacity Of Treatment Plant

Water demand in ultimate stage including 15% wastage = 1.788 million litre per day
 Hours of pumping proposed = 16
 Capacity required including wastage = $(1.788 \times 24) / 16$

= 2.700 million litre per day

The treatment capacity may be provided for ultimate stage.

Hence provide 2.700 million litre per day capacity for treatment plant.

C. Capacity Of Tank

Capacity required at ultimate stage (including 13% wastage) = 1.555×1.13
 = 1.757

= $(1.757 \times 8) / 24$
 = 0.586 million litres
 = 6 lakh litres

D. Design Of Street Fountain

No. of street fountains = $22219 / 250$
 = 88.88
 = 89 No's

It is proposed to provide one street fountain for 250 people at ultimate stage.

E Design Of Pumping Main From Intake Well To Treatment Plant

Length of pumping main = 2100m
 Ultimate demand = 1.788 million litre per day.
 Hours of pumping = 16
 Rate of pumping in litre per second = $(1.788 \times 10^6) / (16 \times 60 \times 60)$
 = 31.05
 = 32 litre per second
 = $32 \times 10^{-3} \text{ m}^3 / \text{sec}$

Assume velocity = 1m/s

Rate Q = AV
 $Q = (\pi/4) d^2 v$
 $d^2 = 4Q / \pi v$
 $d = \sqrt{4Q / \pi v}$
 = 0.202m
 d = 202mm

Hence provide 250mm DI (Ductile iron) pipe

F. Design Of Pumpset

H P of pump set = $Q \times H / 70\% \times 75$
 70% is the maximum efficiency constant
 Head to be raised
 Total head = static head + pressure head
 Initial level of aerator at treatment plant = 30+5
 = 35m
 Foot valve level = 13m
 Static head including 1m residual pressure = 35+13-1
 = 47m
 Pressure head or head loss can be calculated from the eqn
 $V = 0.85 h_{wc} (d/4000)^{0.63} (HL/L)^{0.54}$

Where d = diameter of pipe
 h_{wc} = Hassen Williams Co efficient
 $h_{wc} = 140$ for 250mm diameter pipe
 $V = Q/d$

= $(1.788 \times 24 \times 10^5) / 16$
 = 2.682×10^5
 $2.682 \times 10^5 = 0.031 \times 140 (250)^{2.63} (HL/L)^{0.54}$
 $HL/L = (0.035)^{1/0.54}$
 = 1.56×10^{-3}
 $HL = 1.56 \times 10^{-3} \times 2100$

$$=3.28\text{m}$$

Minor loss=10% of major loss

$$\text{Total Head} = 47 + 3.28 + [(10/100) \times 3.28]$$

$$H = 50.61\text{m}$$

Say 51m

$$\text{HP required} = (Q \times H) / (0.7 \times 75)$$

$$= 31.086 \text{ say } 35\text{HP}$$

Hence provide 2 no's 35 HP vertical turbine pump set one as stand by

6. SUMMARY AND CONCLUSIONS

Kunhimangalam Gramapanchayat is in Kannur Taluk of Kannur district has a highly undulating terrain. The project extends over an area of 15.44 sq.Kms. Now there is a huge gap existing between the demand and supply of treated water and the vision document of Kunhimangalam Gramapanchayat top priority is given for the implementation of a water supply scheme and it is very essential for a dependable piped water supply scheme for the project area. The major cause of interruption in most of the water supply schemes are due to breakages of pipes used in pumping main and gravity mains. In order to avoid this DI pipes (K7 and K9) are proposed for the pumping main, gravity main and the portion of distribution network. The scheme will be serving the needy people.

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