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Design and Mapping of Underground Sewerage Network using GIS & GPS - A Case Study of Hatkanangle Village

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ABSTRACT:-

Houses & factory activities have produce dirty fluid in rural region. String, emulsion & disestablish form of sendriya & ajaivika of houses dirty fluid. In a rural zone dirty fluid is a big problem ahead of grampanchayat. The serious effect of pose is to the nature, if not correctly together, treated & persuade dirty fluid by grampanchayat.

Hatkalangda, gaon has no proper dirty fluid fetched system. In this area there are open gutters used for disposal & at some places the dirty fluid is directly persuade on open grounds near houses.

During rainy seasons, due to the intensive rainfall there is overflow of the gutters as a result dirty fluid spreads on open ground & streets. Hence, there is a chance of the percolation of the dirty fluid from the ground & contamination of the ground fluid resulting from percolation of dirty fluid. There are chances of spreading of various diseases due to the openly spread dirty fluid. Due to the openly spread dirty fluid there is problem of accident of vehicle due to skidding.

To delineation efficient & mapping of dirty fluid fetched networks in GIS Software which is capable of providing adequate services should be provided in the gaon also using GPS to take down the points from each & every area of gaon & to provide underground closed channel lines for fetched of dirty fluid due to development of Hatkalangda, gaon.

***Keywords: - Fluid, suspended, colloidal, grampanchayat, skidding, efficient,* development, underground, GIS & GPS**.

1. INTRODUCTION

Houses & factory activities have produce dirty fluid in rural region. String, emulsion & disestablish form of sendriya & ajaivika of houses dirty fluid. The grampanchayat dirty fluid management is a critical issue in a rural environment. In a rural zone dirty fluid is a big problem ahead of grampanchayat. The serious effect is posing to the nature if not correctly together, treated & persuade dirty fluid by grampanchayat. To avoid the pollution due to the openly persuade sludge so, the proper waste H2O fetched system & its proper action is necessary.

Every household is a pollution contributor because of its dirty fluid, and as per the "polluter pays" concept, every polluter should accept the burden of dirty fluid treatment. So, to avoid the pollution due to the openly disposed sewage the proper waste water collection system and its proper treatment is necessary.

Hatkalangda, gaon has no proper dirty fluid fetched system. In this area there are open gutters used for disposal & at some places the dirty fluid is directly persuade on open grounds near houses.

During rainy seasons, due to the intensive rainfall there is overflow of the gutters as a result dirty fluid spreads on open ground & streets. Hence, there is a chance of the percolation of the dirty fluid from the ground & contamination of the ground fluid resulting from percolation of dirty fluid. There are chances of spreading of various diseases due to the openly spread dirty fluid. Due to the openly spread dirty fluid there is problem of accident of vehicle due to skidding.

The motivation is to provide underground closed channelage line in Hatkalangda, gaon. Hatkalangda grampanchayat has a Development Plan (DP). In that DP, the focuses are on three points due to development of gaon such as Infrastructure Development, Underground Closed channel Line, Industrial suvidha. I would like to take the delineation of closed channel line & mapping a closed channel line networks by using GPS & GIS.

2. RELEVANCE OF DATA

Many Researchers have given solution for the various villages & cities for providing proper collection system of dirty fluid. To use given solution by providing proper sewerage system to my case study area.

Hatkanangale village is situated on **16⁰ 44' 38" N Latitude** and **74⁰26'46" E Longitude**. Hatkanangale is a Taluka in Kolhapur District of Maharashtra State, India. Hatkanangale Taluka Head Quarters is Hatkanangale village.

Hatkanangle village has a population of **13679**. It faces a harsh problem of collection and treatment of dirty fluid. According to recent evaluation, for dirty fluid collection, no system is present in Hatkanangle village. Hence, design & mapping of sewage disposal system which is

capable of providing adequate services should be provided in the village.

This project has an objective to design efficient dirty fluid collection system for the development of Hatkanangle village. It specifically aims to increase access to improve and sustainable domestic sewage disposal system using GIS & GPS and hence provide clean & healthy atmosphere.

Survey of existing network and open drain is carried out. There are no sewer network only open drains and nallas. The total Sewage generated is **1.06 MLD** which directly discharge into nallas and pollute the ground water.

3. PREVIOUS RESEARCH WORKS

There is vigorous interest in the research on delineation of closed channel lines & it gives a broad range of implementation. A no. of analyst has been employed investigation towards research & delineation of closed channels.

1. Optimized location of dirty fluid actions plants Using GIS: Umm research area.

Gorani, M. A. & Jordan E., powerful dirty fluid planning, control & nature security purpose spatially-referenced & updated data network is one of the most convenient devices. It gives suvidha through earth-spatial bonds by a network. A control network based on GIS for accessible action towards plant are good compliment for advising better analysis & perception of problems of available action towards plant to perform a reliability to improve analysis & underst& of the existing situation to choose the appropriate location of treatment through a GIS MODEL BASE using ARCGIS. This study-plan solves the issues & undertaken logics of GIS to recognize the censorious socio-economic & natural elements, & it realize that, dirty fluid action towards suvidha that are convenient for different local conditions due to a more comprehensive & suitable way of optimal locations. The multi-norms investigation gave final map resulting from a total zone convenient for dirty fluid plant of more than 2 km of the total area examined. Some areas were obviously unsuitable for their excessive elevation & steep slopes.

2. GIS-based approach to closed channel system delineation

R. Green, G. V. Loganathana & N. Agbenawosi, planning & delineation of closed channel systems, most resolves are spatially based on because of the correct way considerations & the flow by gravity have required. GIS has capable for the spatial analysis & closed channel delineation event to grow united process for the delineation of closed channel networks. To develop uses the user particular 'manholes' locations to produce the closed channel system. To recognize by GIS topography of different region, layer features, & road network to delineate sub fluid sheds, to situate pump stations & to find the force main path. In the Blackburg gaon, exhibit the program successfully for two regions. The force main path was compared with a traditional delineate & to develop towards results in a better delineation. It was a complete closed channel system with less human involvement.

3. Delineation of closed channel line

P. K. Swamy, in a dirty fluid network cost of closed channel includes the most part. In the delineation process closed channel line & network was takes place more times. Overall cost of the closed channel network will affect by savings during the delineation of this unit. Use of linear & dynamic programming for closed channel line delineation algorithms & also shows that the present status of closed channel line delineation. The objective function & constraints in every cycle are piecewise linearized. Other way, it was used by dynamic programming algorithms. In this paper, the closed channel link delineation problem cost is reduced using proportionally compatible opposition equation. The solution of the problem is done by Lagrange-multiplier method.

4. Closed channel & fluid provide network delineation for town with increasing Loksankhya (Haridwara, Bharat) using GIS

K. Venkatarao, U. B. Chitranshi, & O. P. Dubey, The fluid & closed channel network are provided for the developed areas of infra-structural town. The work gives some strategy & a methodology for projection of new channel in fluid & closed channel network. GIS & ARCGIS tools helps for estimate the dem& of existing structure of town & it helps to solve the future pipes problem. The future work is limited to the development of model for fluid & closed channel network for the town with more increasing Loksankhya (Haridwara). For effective provide fluid & open channel network is combined by using GIS platform.

5. Optimal situation of sludge action towards plants & outfalls–China of Nanasha Jilha in Guangzahou town, a case study

Y. W. Zhaoo & Y. Qina,. In this paper, the solution is provided for situation problem of sludge action towards plants & outfalls. The aim is to find the important element used to be disregard & a more comprehensive & suitable way to solve the optimal situation compared to the previous analyst. GIS-based assessment in sight, assess & index system for convenient regions to calculate the sludge action towards plants & outfalls situations. GIS technology & ecological purpose are combined for proposal, all type of convinces are together, & vital role of local bodies towards nature security.

4. OBJECTIVES OF STUDY

- Data collection required for design of domestic sewage collection system.
- Design of underground sewage collection system.
- Location of Sewage Treatment Plant (STP).
- Mapping sewage network using GIS.

5. DATA FETCHED & SITE INVESTIGATION

The grassland information required for the delineation of the closed channel network such as specific of leaving fluid provide, the Loksankhya as per count, etc. has taken from the Hatkanangale Grampanchayat. To determine the natural gravity of the land, it required topographical data of the gaon. So, it assists in completing the order & way of the closed channels. Sample taking information is given here.

Sr. No.	Waypoints		Ground Level in Metre		Length in Metre	No. of Homes	Loksankhya	Type of Sewer Line (probable)	Remarks
	From	To							
1	374	373	579	578.5	39.40	10	10	Primary	Near Shivaji Talim Mandal
2	373	372	578	577.2	31.60	10	20		
3	372	371	576	575	34.50	5	25		
4	371	370	574	573.5	34.20	10	35		
5	370	369	576	572.6	33.40	15	50		
6	369	368	571	570.4	35.00	5	55		
7	368	367	570	571	31.20	5	60		
8	367	366	570.8	570.1	29.00	5	65		
9	366	365	570	570.9	27.40	10	75		
10	365	364	569.7	569.1	26.70	0	75		
11	364	363	568.3	568	33.10	5	80		
12	363	362	567.6	567.2	30.20	5	85		
13	362	361	566.8	566	33.90	10	95		
14	361	339	565.7	565	36.90	5	100		
15	339	340	564.5	564	27.60	25	125		

Table No. 1 Sample Gathered Information from Hatkalangda Gaon

6. LOKSANKHYA PROJECTION

➢ Common Assumptions

Closed channel projects are assuming the all-inclusive low cost & renewal norms are approved to delineation to fulfill the needs over a 30 yrs kalavadhi after its finalization. It is required 2 yrs (i.e.) 2020 yr kalavadhi for delineation & finalization. So, succeeding 30 yrs (i.e.) 2050 yr to predict the Loksankhya of the Hatkanangale gaon is required. Delineation Loksankhya i.e. Loksankhya succeeding 30 yrs should get into account elements like a scope of future extension & growth in factory, trading, academic, management & communal group etc.

➢ Loksankhya Forecasting is Needed

It is assumed that the kalavadhi of 2 years be required for taking the Technical Sanction of the Closed channelage Scheme & for actual completion of the Execution of the closed channelage scheme. Hence year 2020 will be the current year from which the actual utilization of the closed channelage scheme will start. The Immediate Stage will be after 10 yrs i.e. yr 2030 & the Ultimate Stage will be after 30 yrs i.e. 2050. Therefore following are the years for which Loksankhya forecasting has been prepared below.

Table No. 2 Year & Stages

Sr. No.	Year	Stage
1.	2020	Present
2.	2030	Immediate
3.	2050	Ultimate

➢ Loksankhya Details

Loksankhya information for last decades is obtainable as tabulated in Table No. 3 with the information is assist; Loksankhya predicting has been completed. The delineation kalavadhi is taken as 30 yrs for the work. The ultimate yr for delineation of closed channel plan is getting as 2050, when the starting of the plan at 2020 yr.

The past growth of trend of Loksankhya was studied & the details of Loksankhya are given in Table No. 3. The Loksankhya of Hatkanangale gaon in the previous decades is as follows: -

Table No. 3 Loksankhya Projection

Sr. No.	Year	Loksankhya	Increase	Incremental Increase	Rate of Growth (R_g = 0.468)
1.	1951	1456			
2.	1961	1864	408		0.280
3.	1971	2458	594	186	0.319
4.	1981	3324	866	272	0.352
5.	1991	4598	1274	408	0.383
6.	2001	7015	2417	1143	0.526
7.	2011	13679	6664	4247	0.950
Total =		**34394**	**12223**	**6256**	**2.810**
Average =		**4913**	**2037**	**1251**	**0.468**

7. TECHNIQUES OF LOKSANKHYA PREDICTING

Loksankhya prediction has many techniques convenient for the gaon. These techniques are as follows:

➢ Arithmetical Increase Technique

The avg. increase of Loksankhya per decade is determined from the past data & plus to the present Loksankhya to get Loksankhya in the future decades. This technique provides low value & is convenient for good fixed & situated group.

Aphorisme of this method as below:

"$P_n = P_1 + n*X$"

Where, P_n = Loksankhya in the n^{th} 'Decades'

P_1 = Loksankhya in the 'latest Decades'

n = No. of 'Decades'

X = 'Average Arithmetical Increase'

Example:

Information:

Yr = 2020, P_1 = 13679, n = 0.9, X = 2037 & P_n =?

P_n = 13679 + 0.9* 2037

P_n = 15512 ..... *(1)*

➢ Incremental Increase Technique

The increment in arithmetical increase is calculated from the past decades & the avg. of that increment is plus to the avg. increase. This technique increases the figures got by the arithmetical increase technique.

Aphorisme of this technique as follows:

"$P_n = P_1 + n*X + n * (n+1) * (Y/2)$"

Where, P_n = Loksankhya in the n^{th} 'Decades'

P_1 = Loksankhya in the 'latest Decades'

n = No. of 'Decades'

X = "Average Arithmetical Increase"

Y = "Average Incremental Increase"

Example:

Information:

Yr = 2020, P_1 = 13679, n = 0.9, X = 2037, Y = 1251& P_n =?

$$P_n = 13679 + 0.9* 2037 + 0.9*(0.9+1)*(1251/2)$$
$$P_n = 14749 \text{ ..... } (2)$$

➢ **Geometric Progression Technique**

The % increase is considered to be the improve rate & the avg. of the % increase is used to determine future increment in Loksankhya. This addition has to be done carefully & it wants lot of experience & well perception. It provides much higher value & mostly relevant for improving gaons & sahara having lot of scope for addition.

Aphorisme of this technique as follows:

$$"P_n = P_1 * (1 + Z)^n"$$

Where, P_n = Loksankhya in the n^{th} 'Decades'

P_1 = Loksankhya in the 'latest Decades'

n = No. of 'Decades'

Z = 'Geometric Mean'

Example:

Information:

Yr = 2020, P_1 = 13679, n = 0.9, Z = 0.468 & P_n =?

$$P_n = 13679*(1+0.468)^{0.9}$$
$$P_n = 19324 \text{ ..... } (3)$$

Get the avg. of these 3 solutions as follow ways:

Avgerage 1 = (1+2) / 2 = (15512 + 14749) / 2 = 15130

Avgerage 2 = (1+3) / 2 = (15512 + 19324) / 2 = 17418

Avgerage 3 = (2+3) / 2 = (14749 + 19324) / 2 = 17036

Choose a lowest figure i.e. **P2020 = 15512** from 3 avg. & example of rest of yrs.

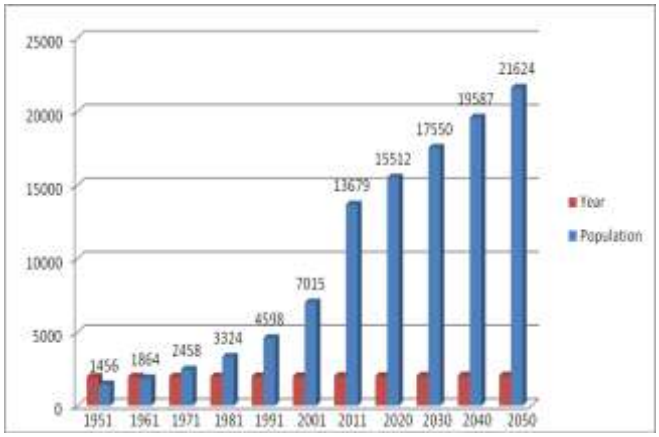


Fig. No. 1 Loksankhya of Last Decades & Predicting of Next Yrs

8. DELINEATION OF CLOSED CHANNEL

➢ **Elements**

Closed channel network contents mostly of:-

- Fetched network (closed channel, closed channel accessories)
- Assured network (injecting station, injecting main etc.)
- 'Sludge Treatment Plant (STP)'

➢ **Preparation**

- Preparation of general dirt fluid removal network is done by different organizations in charge; the countryside & state govt. fix up the priorities of function & general need of the local due to stay in sight.

- The different state funded agencies at their don't for all time have all the necessary fundamentals for assessment by removal of dirty fluid projects aphorismted. Agencies are not agreeable for relative research & evaluation, when projects are evaluated for their 'cost benefit ratio' & for financial support purposes. Central & state organizations are concerning different delineation parameters for adoption of various norms. So, therefore to certain suitable norms & delineation criteria & stay away from various proceed towards are required.

- It is improved performance to delineation closed channels with incomplete packed situation to supply aeration & observance sludge in clean situation. The range of peak factor for delineation closed channel shall bet^n '2 to 3.5'. Closed channels should not be delineationed to flow packed cause of deliberation of aeration in dirty fluid run. Every closed channel is delineationed to run '80 %' of packed vital run. In this network, the gradient & dia. of closed channels should be definite to gather circumstances below:

a. at present peak run is require to keep a 'self cleansing velocity'.

b. at 80% packed vital peak run through a closed channel.

9. DELINEATION CONSTRAINTS

- **Loksankhya:**

The Loksankhya is main constraint because of fluid provide amount is prevailage.

- **Fluid provide rate:**

Dirty fluid amount may be considered to be '80%' of the amount of fluid provide. The closed channels should be delineationed for lowest of 150 lit. Per capita day.

- **Self cleansing velocity:**

The closed channel flow seasonally & varies from hr to hr. The adoption of projected peak run is required cause of hydraulic delineation. The sufficient ability of closed channel dimension is required for the peak run to be gained at the end of delineation kalavadhi hence to stay away from steeper slope & deeper dig. For higher velocity to delineation closed channels is required. The hygienic closed channel is delineationed to get sufficient 'scouring velocity' at the avg. or at the highest run at the starting of the delineation kalavadhi for a specified run & gradient.

The suggested gradient for lowest & highest velocity as follows:

Lowest velocity: 0.60 to 1.05 m/s &

Highest velocity: 2.50 to 3.00 m/s.

In the delineation to be assumed lowest 'self cleansing velocity' & to make sure that deposition of perched solids does not occur. At all depths self cleansing properties have equal hydraulic components of rounded closed channels. The self cleansing properties for closed channel medium are as follows:

Hygienic closed channel: For delineation peak run – 0.8 m/s

For current peak run – 0.6 m/s

- **Shape of Pipe:**

The pipe should be circular. Minimum 100 mm dia. of pipe is suggested.

- **Peak Factor:**

Peak factor is the ratio of max. to avg. run. On the Loksankhya peak factor is dependent. As per Loksankhya, the peak factor is as follows:

Table No. 4 Loksankhya and Peak Factor

Sr. No.	Contributory Loksankhya	Peak Factor
1	Up to 20000	3.5
2	20000 to 50000	2.5
3	50000 to 750000	2.25
4	Above 750000	2.0

The Hatkalangda gaon has range upto 20000 Loksankhya, so as per the Loksankhya the peak factor is **3.5**.

- **Gradient:**

Gradient is depends upon the geography of earth & levels. Gradient is also another main constraint becoz the rate of run is depends ahead the type of gradient.

The gradient aphorisme,

Slope (S) = (U/s RL – D/s RL) / Length betⁿ two manholes

Example, S = (583.000 – 582.200) / 81.60 = 0.01

10. MANHOLES

- **Location**

Sludgeholes are provided at each turn, intersection, change of slope, or change of closed channel diameter. The closed channel line betⁿ two sludgeholes is laid in a straight line with still slope. Even when the closed channel line runs in a straight line, the sludgeholes are provided at usual intervals.

- **Clean-out**

It shall not be sub-situated for sludgeholes nor installed at the finish of laterals larger than 45 m in span & may be provide just for unique circumstances. As per the 'State Plumbing Code', it shall be provided on all service lines. It shall be built-up by a 45^0 turn going to downstream on straight up riser conduit to the plane. Clean-out dimension shall be the same as the conduit dimension.

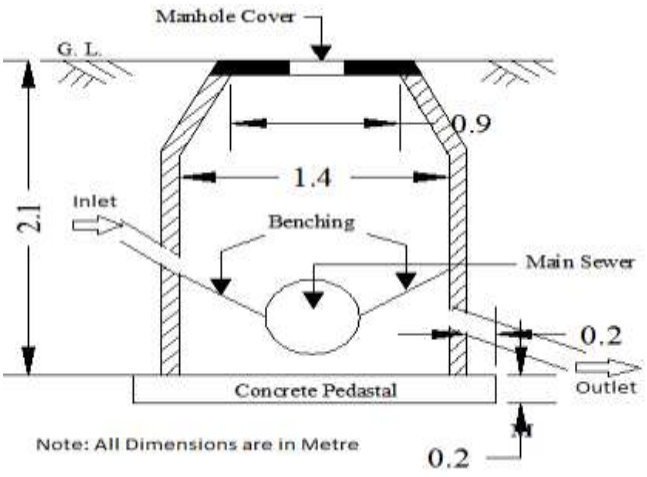


Fig. No. 2 A Typical Section of Rounded Sludgehole

11 HYDRAULIC DELINEATION APHORISM

Usually, the 'equation of Manning's' is used mainly for the delineation of hygienic closed channels becoz it is competent, admired & completely pleased the investigational outcome & similar is used for this delineation.

'Equation of Manning's' as follows,

"V = (1/n) x R (2/3) x S (1/2)"

Where, "V = Velocity in m/s"

"n = Friction factor"

= "0.011 (For Plastic smooth pipe)"

= "0.013 (For Cement-concrete pipe)"

"R = Hydraulic radius in meter"

$$= \frac{\text{(Cross-section area of flow in sq. m)}}{\text{Wetted perimeter in m}}$$

"S = Slope of Energy Grade Line"

"Dirty fluid = 0.80 of fluid provide per person"

Delineation Flow, (Q_d) = Loksankhya x **Peak Factor** x **Dirty fluid Quantity** x **Slope**

But, $Q_d = q_{act}$

$(q_{act}) / (Q_{full}) = 0.5$

(This value is taken from Table No 5 as below)

Table No. 5 Value of Hydraulic Elements

d/D	v/V	q/Q
0.1	0.401	0.021
0.2	0.615	0.088
0.3	0.776	0.196
0.4	0.902	0.337
0.5	1	0.5

Q_{full} = V x A

Provide, Diameter (D) in metre & again calculate, Q_{full} & calculate the value of $[(q_{act}) / (Q_{full})]$.

By using interpolation aphorism, calculated velocity of flow is > 0.75 metre/sec.

Fig. No. 3 Waypoints & Primary Closed Channel Line

Fig. No. 3 shows waypoints no such as 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 360 & STP No. 3 (Industry Road) & these points are connected by one colour of line because this is a primary line to connect STP.

Consider PWP339 is the starting point & STP No. 3 (Industry Road) is the end point of closed channel network. In that PWP339 to PWP360 is primary line to STP No. 3. The waypoints are connected with help of reduced levels; here consider the RL's of start & end points only. In between these two points RL's is up & down then for that point depth is also increase & decrease respectively.

Fig. No. 3 shows the cross-section of the closed channel line between two manholes. The figure also shows level from initial waypoints (MH374) to final or next waypoints (MH373) & other details are shown.

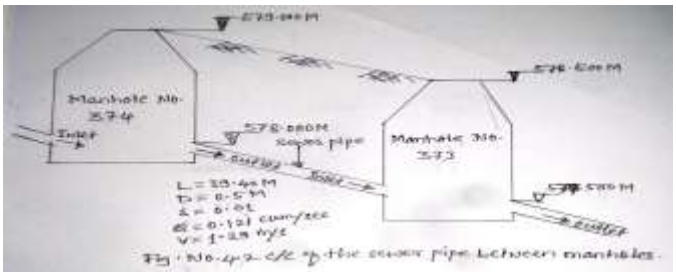
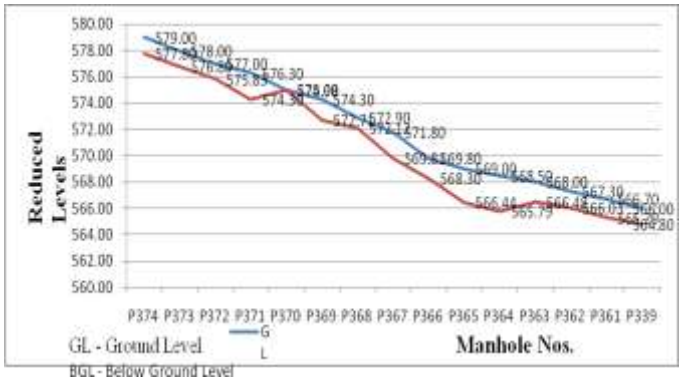


Fig. No. 4 Cross-section of the Closed Channel bet^n Sludgeholes

Table No. 6 Determined Values of Closed Channel Network

From	To	U/s RL, m	D/s RL, m	L, M	P	Q, m^3/s	D, m	Vel, m/s	Gradient	PF
P374	P373	579	578.5	39.46	1240	0.121	0.50	1.39	0.013	3.5
P373	P372	578	577.2	66.67	1250	0.122	0.50	1.39	0.012	3.5
P372	P371	577	576.3	53.85	1255	0.122	0.50	1.39	0.013	3.5
P371	P370	576.3	575.2	89.43	1265	0.123	0.50	1.4	0.012	3.5
P370	P369	575	574.5	44.64	1280	0.124	0.50	1.4	0.011	3.5
P369	P368	574.3	573	86.67	1285	0.125	0.50	1.4	0.015	3.5
P368	P367	572.9	572	90.00	1290	0.125	0.50	1.41	0.010	3.5
P367	P366	571.8	570	112.50	1295	0.126	0.50	1.41	0.016	3.5
P366	P365	569.8	569.4	40.00	1305	0.127	0.50	1.41	0.010	3.5
P365	P364	569	568.7	30.00	1305	0.127	0.50	1.41	0.010	3.5
P364	P363	568.5	568.2	30.00	1310	0.127	0.50	1.41	0.010	3.5
P363	P362	568	567.6	40.00	1315	0.128	0.50	1.42	0.010	3.5
P362	P361	567.3	567	30.00	1325	0.129	0.50	1.42	0.010	3.5
P361	P339	566.7	566.4	30.00	1330	0.129	0.50	1.42	0.010	3.5
P339	P340	566	565.8	20.00	2985	0.290	0.50	2.03	0.010	3.5



Graph No. 1 Geometry of Closed Channel Line (from P374 to P339)

Fig. No. 5 Map of Closed Channel Networks for Hatkalangda Gaon

- Obtained values from this table, total length of this particular line is 803.22 m. In that, all diameter of closed channel pipe is 50 mm is required. In this map, four STP locations are shown to collect the dirty fluid from houses.

12. SLUDGE TREATMENT PLANT (STP)

The purpose of sludge treatment is to steady decomposable sendriya substance present in sludge & the sewage & mud which can be persuade of in the nature without causing fitness hazards or pain. In house dirty fluid towards action by employed the usual process role & item used to get these utilities are listed below:

Guidelines for Locations of STP

- Nearby territory or existing airstream will influence the dispersion or spread of odors, aerosol spray &/or infection vectors, there buffer distances are established.
- Stabilization pools are situated at least '100 m' from a origin of fluid provide, '30 m' from borders of housing property & '15 m' from campsite.
- No any location of dirty fluid treatment plant inside '15 m' of a origin of fluid provide, or at such larger space as necessary by a in charge authority.

- All basics of STP should be open to view as far as possible for effortless procedure & maintenance.
- All equipments are simply installed & the access of vehicles to each equipment.

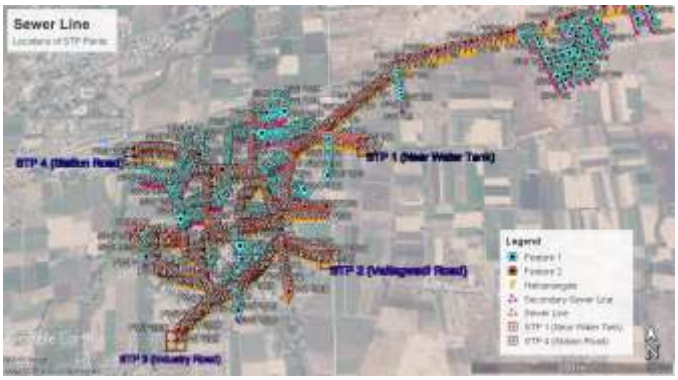


Fig. No. 6 STP Locations of Hatkalangda Gaon

13. REPRESENTS INFORMATION

The information of project work is in picture type for continuous data (ex. categorized information). Appearance of information in a 'GIS' in tabular or diagram type is however tan preferred. A 'GIS' creates it feasible to combine data that is not easy to relate during any other indicate. Thus a 'GIS' can utilize mixture of drawing variables.

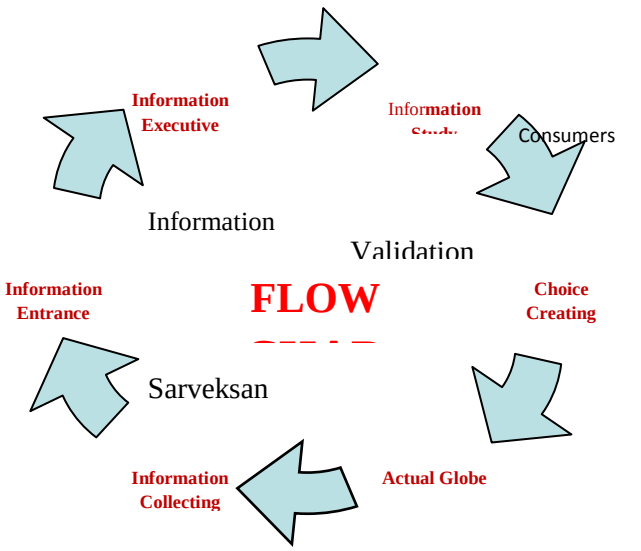


Fig. No. 7 GIS as a Management Tool

14. RESULTS & DISCUSSION

After completion of this project, I can conclude that one part of project work of delineation of closed channel line & other part of project work of drawing is completed. To plan a base diagram of Hatkalangda gaon is the most important purpose of this project, contour street system which is also helpful for closed channel line as closed channel lines are situated in the center of street.

Determined entire span of closed channel line is 39.60 Kilometers & the range of dia. of closed channel line is regarding 150 to 750 mm. & also determined entire discharge amount of dirty fluid of Hatkalangda gaon is 1.06 m^3/s. Result shows a variety of dia. of closed channel conduit span & the STP in different positions in Hatkalangda gaon as shown in Table No. 7 & 8 respectively.

Table No. 7 Various Diameter of Closed Channel Pipe Length

Sr. No.	Different Dia. of Pipe in mm	Span in Metre
01.	200	9124
02.	250	6584
03.	300	5383
04.	350	3824
05.	400	4228
06.	450	3654
07.	500	3125
08.	550	2154
09.	600	765
10.	650	600
11.	700	72
12.	750	87

Table No. 8 Locations of STP in Hatkalangda Gaon

STP Point No.	Collected Discharge Quantity in cum/sec	Latitude	Longitude	Location in Hatkalangda gaon
01.	0.184	16°44'52.16"	74°25'51.84"	Near Water Tank
02.	0.369	16°44'39.39"	74°25'47.51"	Shree Nagar Road
03.	0.231	16°44'31.62"	74°25'31.79"	Industry Road
04.	0.276	16°44'51.66"	74°25'25.41"	Station Road

14. CONCLUSIONS

- From the yr 1951 to 2011, Hatkalangda gaon Loksankhya information is obtainable & the annual rate of increase is 0.468 of Loksankhya.
- No any dirty fluid system is provided, so less contamination & infections, subversive closed channel system is required.
- Four 'STP' are needed for fetched of dirty fluid.
- As per study & delineation, the entire area of Hatkalangda, dirty fluid is collected in four 'STP' & amount is 1.06 m^3/s.

- Entire span of closed channel line is 39.60 Kilometers & the range of dia. of closed channel line is about 150 to 750 mm.
- Closed channel network of Hatkalangda gaon diagram is added.

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