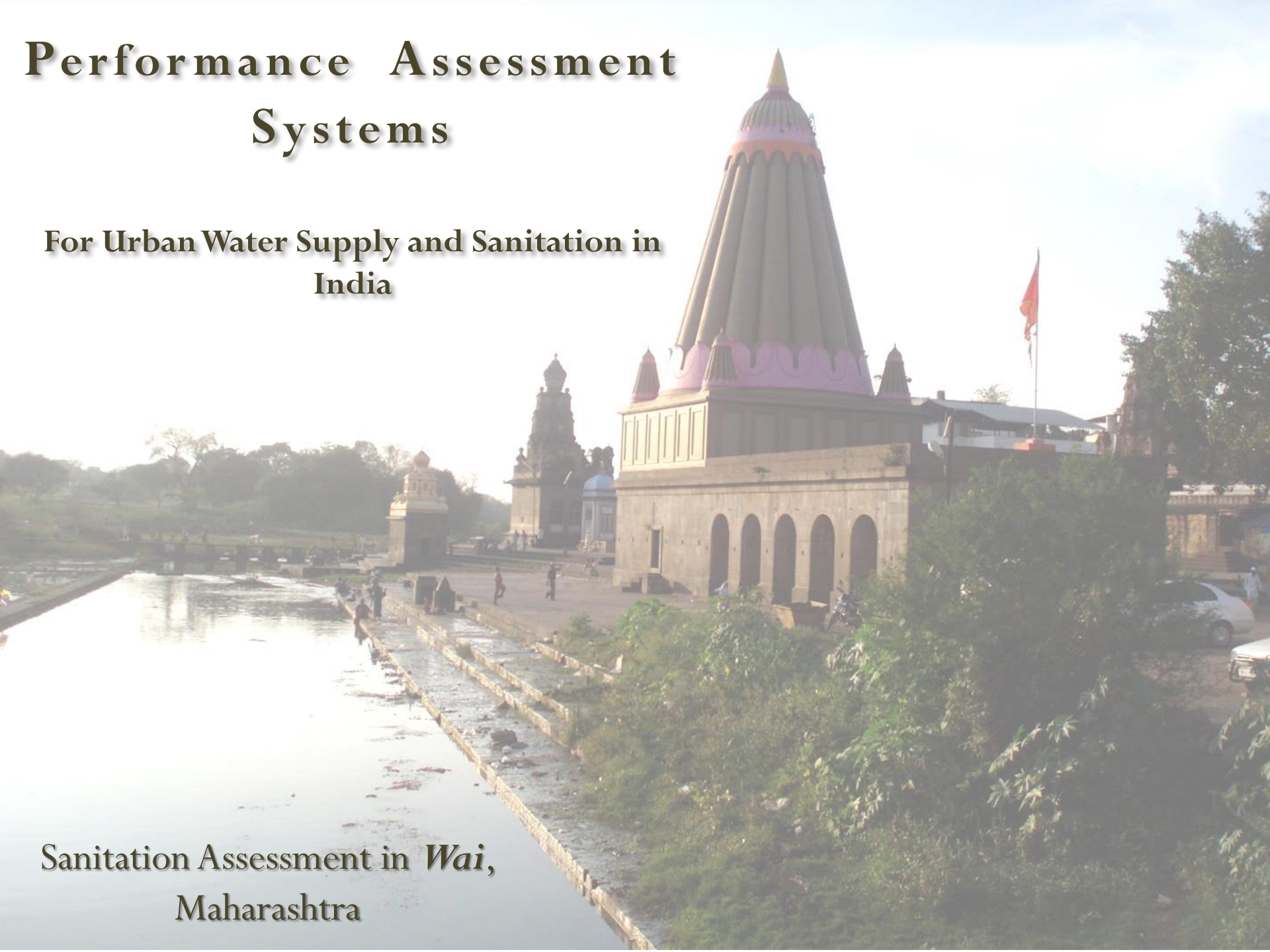
Performance Assessment Systems

For Urban Water Supply and Sanitation in India



Sanitation Assessment in *Wai*, Maharashtra

CONTENTS

METHODOLGY

General Observations

- Entire city
- Development pattern of the town
- Prevalent housing typologies

Sample Survey

- Sample selection criteria
- Inspection of HH level sanitation facilities
- Documentation of ground conditions

Analysis

- Laboratory testing of collected samples
- Review of relevant norms and standards
- Comparisons with standards

Conclusion

- Way forward

SAMPLE SELECTION

In this project for carrying out the above assessment, a total of 25 household surveys are to be carried out. For the initial stage only 10 households have been studied.

Process of Selecting samples:

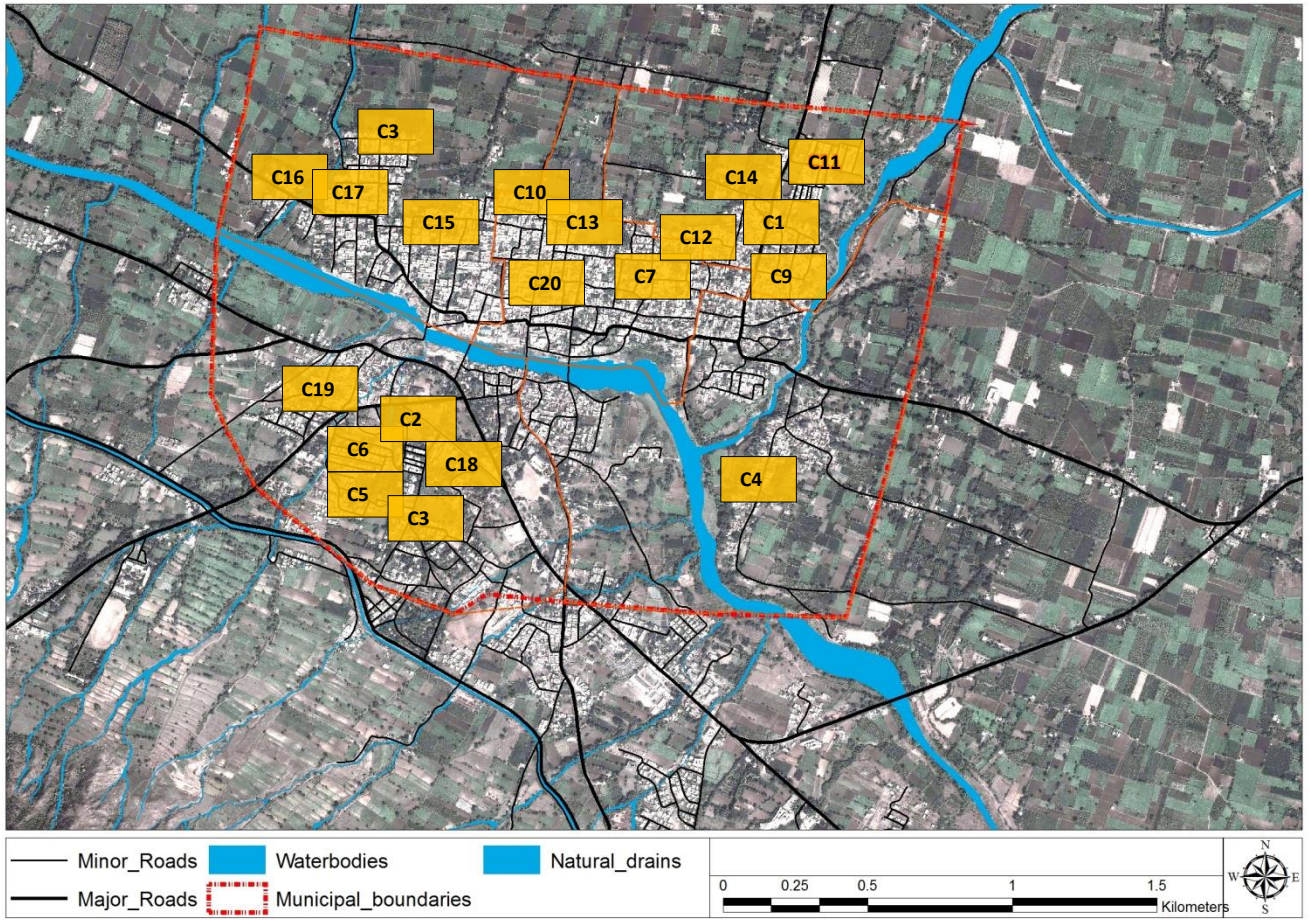
Based on observations carried out during the CSP exercise, tentative clustering of various building typologies has been done. The prevalent housing typologies in Wai can be broadly classified into 4 types:

SR NO	BUILDING TYPOLOGY	DESCRIPTION	OBSERVATION
1	**Old Town (Samples from this typology: 13 Numbers)**	**Old Houses:** • Predominant in Old Wai town. • Character: Narrow plots with toilets outside residence but within premise. • Space constraints for constructing septic tanks.	• The core of the city is densified due to which there is an issue of land avaibility for sanitation services.
2	**New town (Samples from this typology: 7 Numbers)**	**Individual Plotted Development:** • Such development is mainly seen in Prabhag 4. • Well planned typology with proper road hierarchy. • Character: Plotted layouts with uniform plot size.	• The new town are develop at the periphery of the old city they required a proper guidance for implementation sewage treatment and should make aware about its importance.
3	**Institutions (Samples from this typology: 5 Numbers)**	• They are predominantly present in Prabhag 1 and 4 • Toilets are constructed within the premises or outside and are not maintain properly • It consist of schools, administrative, colleges, Public buildings	---

MAP SHOWING SAMPLE LOCATIONS

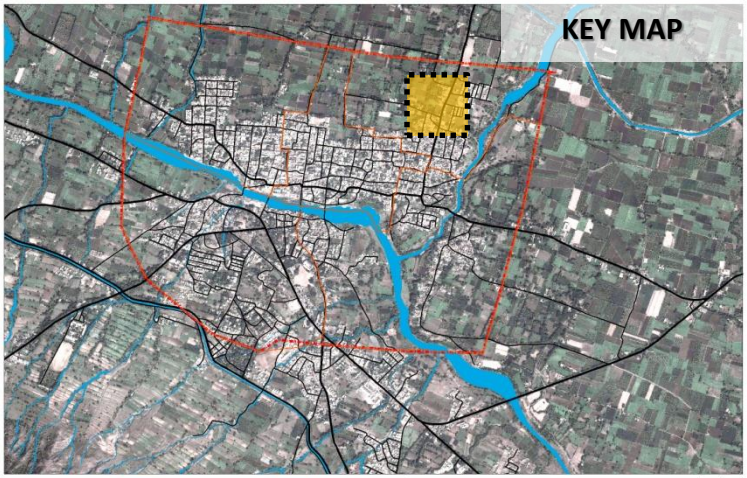
NUMBER OF SAMPLE SELECTED IN RESIDENTIAL PROPERTIES		
SR NO	**BUILDING TYPE**	**NO OF SAMPLE**
1	Single storey	9
2	Two storey	6
3	Three storey	5
	TOTAL	**20**

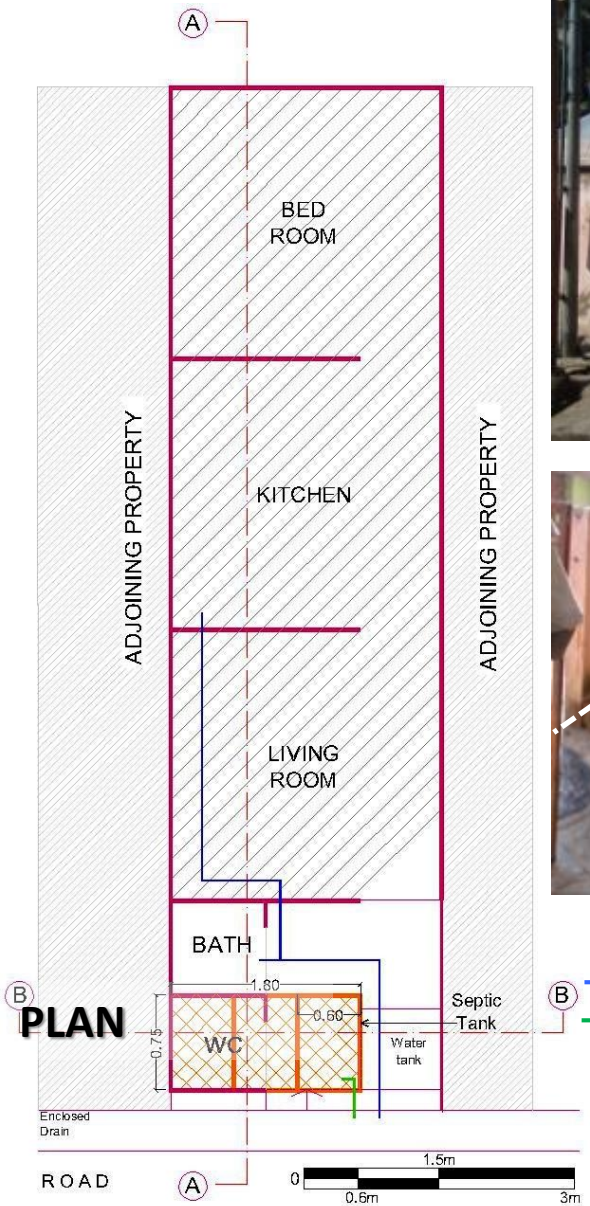
INSTITUTIONAL BUIDINGS	**Prabhag**
Court Building	5
Panchayat Samiti	5
Post Office	5
Police station, Tehshil office,	5
Vishwakosh office	3
Hospital	2
Navin Marathi School	3



	***PRABHAG* 1**	***PRABHAG* 2**	***PRABHAG* 3**	***PRABHAG* 4**	***PRABHAG* 5**
Distribution of HHs as per PRABHAG	**C10** Ganpati Ali (G+1)	**C1** Nhavi Ali (G)	**C3** Damle Ali (G+1)	**C2** Dattanagar (G)	**C4** Fulenagar (G+1)
	C13 Dharmpuri (G+2)	**C7** Nhavi Ali (G)	**C15** Madhali Ali (G)	**C5** Navechwadi (G)	
	C20 Dharmapuri (G+2)	**C9** Ravivar peth (G)	**C16** Dwarka Ali (G+2)	**C6** Shantinagar (G+2)	
		C11 Dhage Ali (G)	**C17** Dwarka Ali (G)	**C8** Dakbangla Rd (G+1)	
		C12 Ravivar Peth (G+2)		**C18** Siddhnath wadi (G)	* C refers to Case study
		C14 Dhage Ali (G)		**C19** Vishwakosh (G+1)	

CASE 1: *NHAVI ALI*, INDIVIDUAL PLOT (PRABHAG 2)



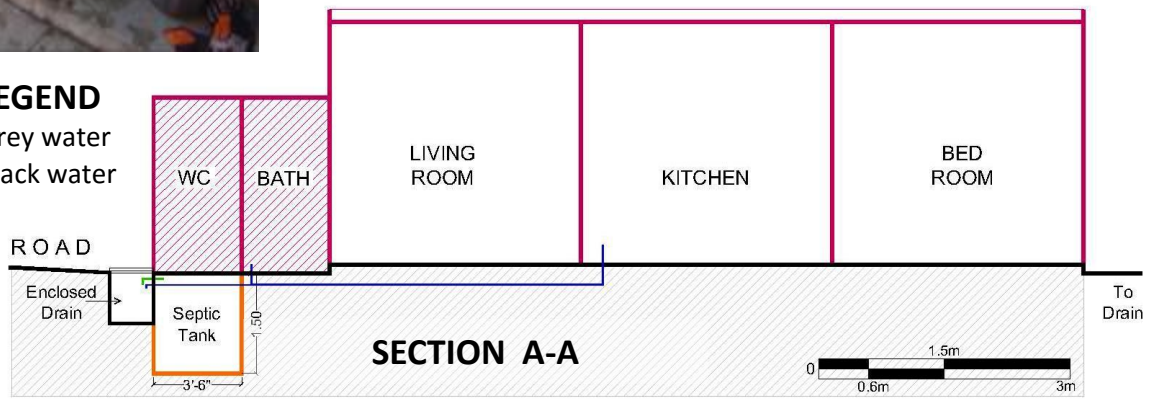


PLAN

LEGEND

Grey water

Black water



SECTION A-A

CASE 1: *NHAVI ALI*, INDIVIDUAL PLOT (PRABHAG 2)

Users	Building type	Inputs to septic tank	Cleaning frequency of the tank	When was the septic tank last emptied?	How toilet is cleaned?
2-5	**Ground floor**	**Black water**	**Nil**	**Not yet cleaned (Since Construction year 2010)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

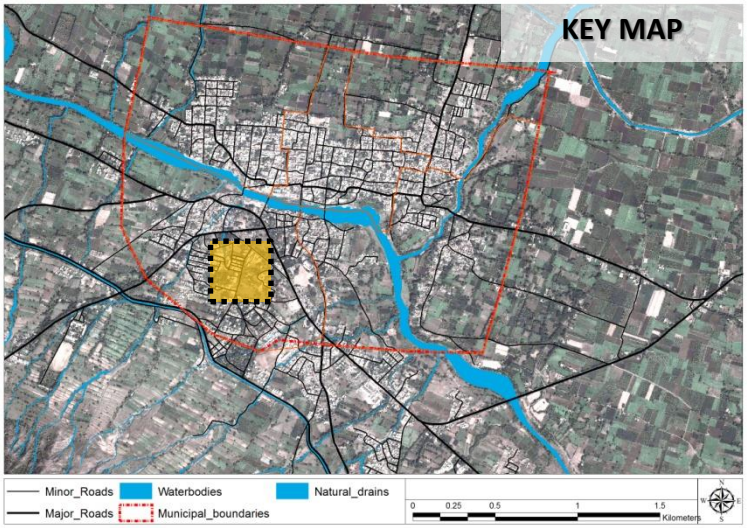
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m) (Liquid Capacity)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) (*CPHEEO*)	1.5	0.75	1.3	1.35	**1.46** (Two year Cleaning Interval) **1.52** (Three year cleaning interval)

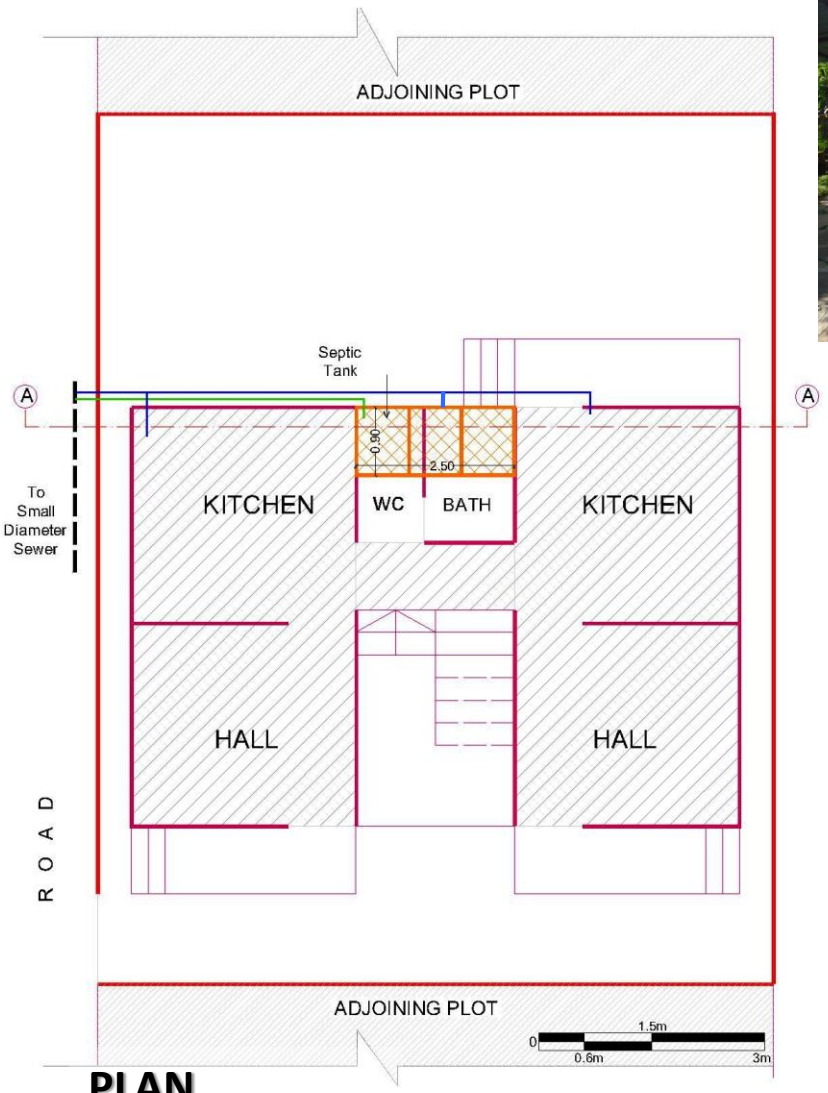
	L	**B**	**Height (m)**	**Volume of the tank** (cu m) (Liquid Capacity)
Actual Size of the tank	1.80	0.75	1.5	**2.03**
			Observations	**Oversized (34% Bigger)**

WATER QUALITY

Sr No	Location, Area	Waste water	Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Nhavi Ali	Black Water	--	26.4	--	--	70	--	--	7.74	--	14.8	--
2	Nhavi Ali	Grey Water	--	84	--	--	210	--	--	7.43	--	117	--

CASE 2: *DATTANAGAR*, BUNGLOW (G+1) (PRABHAG 4)



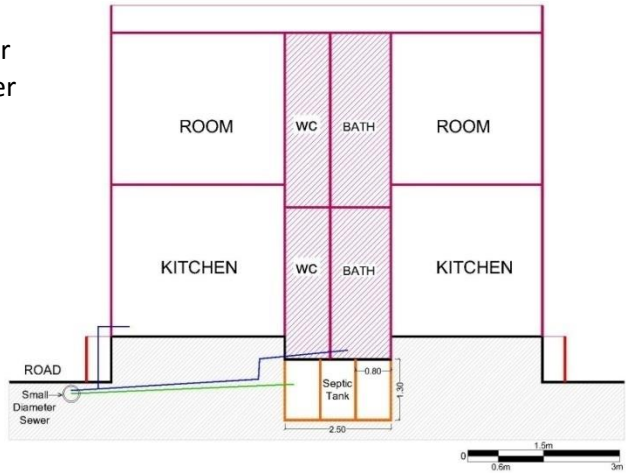


PLAN

LEGEND

Grey water

Black water



SECTION A-A

CASE 2: *DATTANAGAR*, BUNGLOW (G+1) (PRABHAG 4

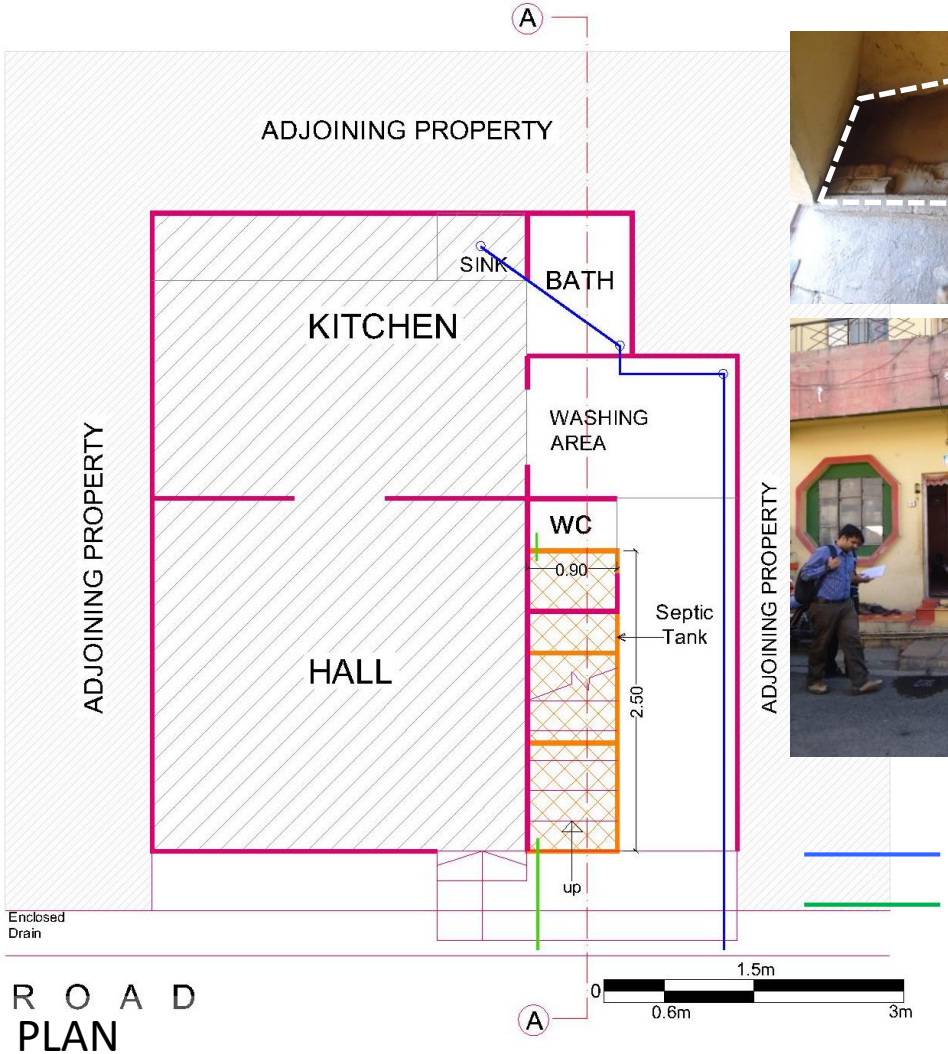
Users	Building type	Inputs to septic tank	Cleaning Frequency of the tank	When was the septic tank last emptied?	How toilet is cleaned?
5	**G+1**	**Black Water**	**Nil**	**Not yet cleaned (Since construction year 2004-05)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

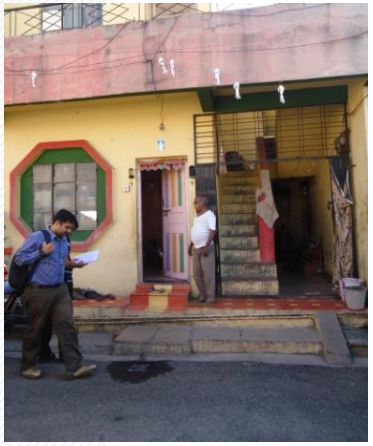
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) ***(CPHEEO)***	1.5	0.75	1.3	1.35	**1.46** (One year Cleaning Interval) **1.52** (Two year cleaning interval)
	L	**B**	**Height (m)**		**Volume of the tank** (cu m)
Actual Size of the tank (5 Users)	2.50	0.90	1.30		**2.93**
				Observations	**Oversized (93% Bigger)**

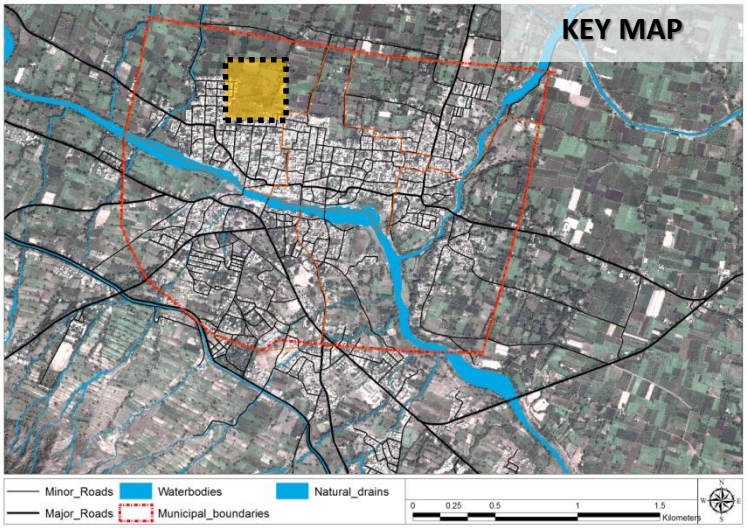
WATER QUALITY

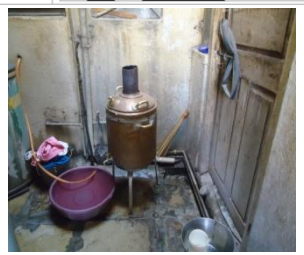
Sr No	Location, Area	Waste water	Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Datta Nagar	Grey Water	--	30	--	--	85	--	- -	7.43	--	70	--
2	Datta Nagar	Black Water	--	31.8	--	--	105	--	- -	7.43	--	66	--

CASE 3: *DAMLE ALI*, RAW HOUSE(G+1) (PRABHAG 3)





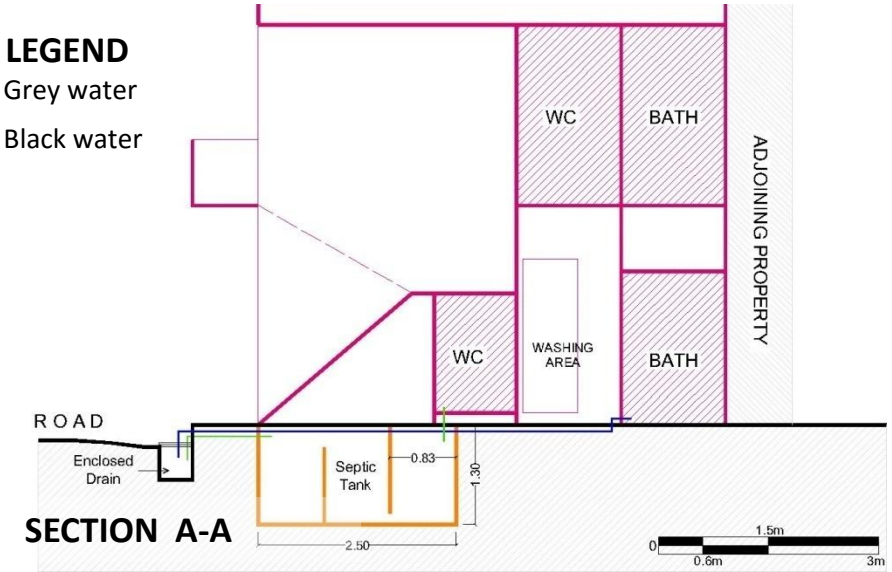




LEGEND

Grey water

Black water



CASE 3: *DAMLE ALI*, RAW HOUSE(G+1) (PRABHAG 3)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
6	**G+1**	**Black Water**	**Nil**	**Not yet cleaned (Since construction year 2001)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) **(*CPHEEO*)**	1.5	0.75	1.3	1.35	**1.46** (One year Cleaning Interval) **1.52** (Two year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank	2.50	0.90	1.30	**2.93**
			Observations	**Oversized (93% Bigger)**

CASE 3: *DAMLE ALI*, RAW HOUSE(G+1) (PRABHAG 3)

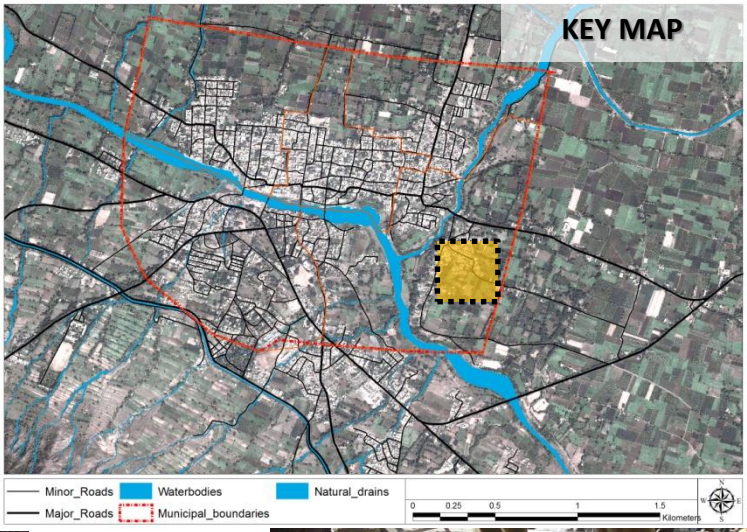
WATER QUALITY

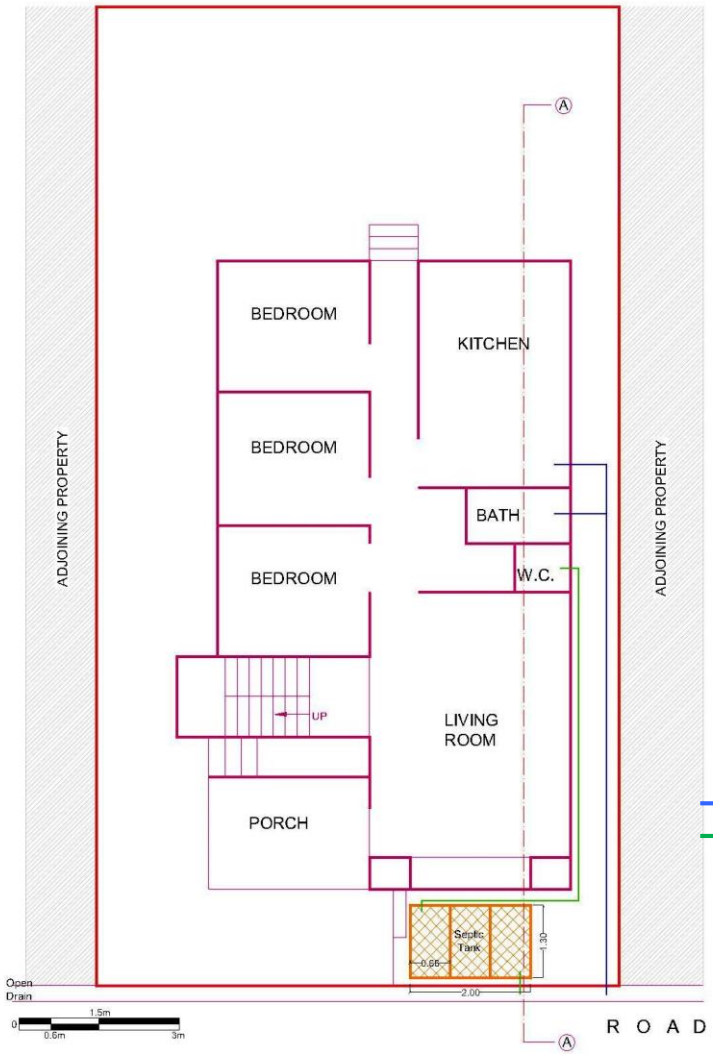
Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	Damle Ali	Grey Water	--	204	--	--	430	--	--	--	--	280	--	

SEPTAGE SAMPLE QUALITY

Sr No.	Parameter	Unit	Result
1	**pH**	-	7.58
2	**Total Solids**	%	0.864
3	**Total Nitrogen (as N)**	%	4.71
4	**Phosphorus (as P)**	%	<0.0001
5	**Potassium (as K)**	%	0.0084

CASE 4: *FULENAGAR*, BUNGLOW(G+1) (PRABHAG 5)



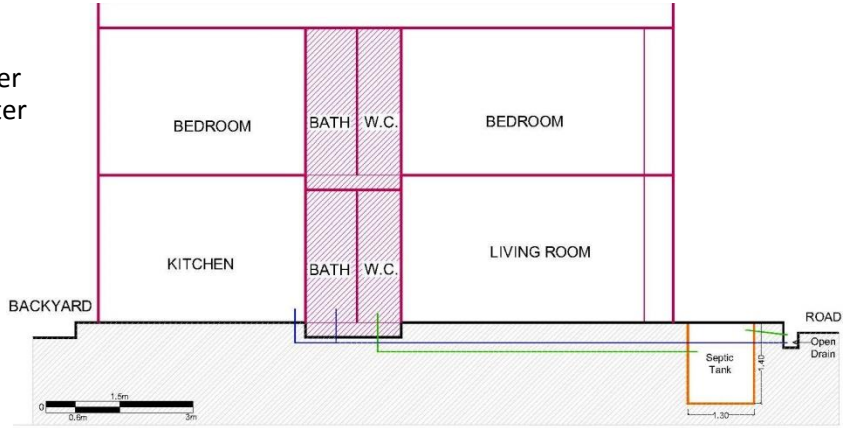


PLAN

LEGEND

Grey water

Black water



SECTION A-A

CASE 4: *FULENAGAR*, BUNGLOW(G+1) (PRABHAG 5)

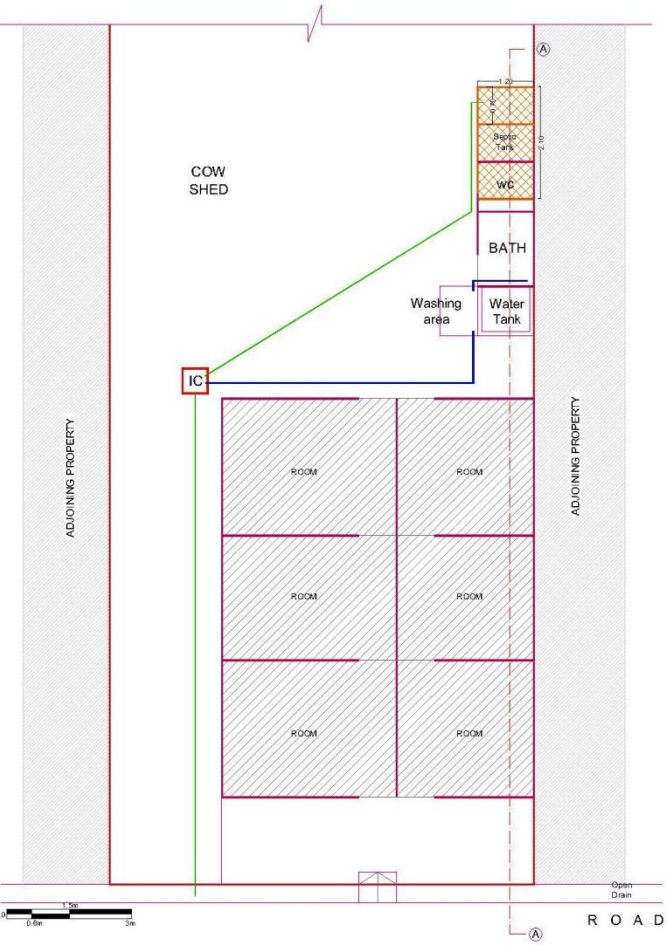
Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
16	**G+1**	**Black Water**	**Nil**	**Not yet cleaned (Since construction year 2002)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

	Length (m)	Breadth (m)	Height (m) (300mm free board has been considered)		Volume of the tank (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (15 Users) (*CPHEEO*)	2.0	0.90	1.6	2.3	**3.31** (Two year Cleaning Interval) **4.14** (Three year cleaning interval)
	L	**B**	**Height (m)**		**Volume of the tank** (cu m)
Actual Size of the tank (16 Users)	2.0	1.3	1.4		**3.42**
Observations					**Undersized (17% Smaller)**

WATER QUALITY

Sr No	Location, Area		Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
		Waste water	Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Fule Nagar	Grey Water	--	186	--	--	460	- -	--	5.96	--	216	--

CASE 5: *NAVECHIWADI*, INDIVIDUAL HOUSE (G+1) (PRABHAG 4)



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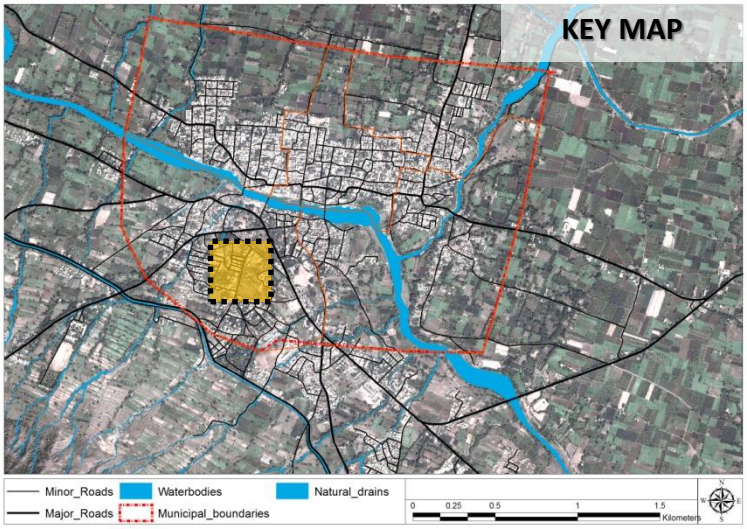


LEGEND

Grey water

Black water

SECTION A-A

CASE 5: *NAVECHIWADI*, INDIVIDUAL HOUSE (G+1) (PRABHAG 4)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
4	**Ground Floor**	**Black Water**	**Nil**	**Not yet cleaned (Since construction year 2002)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

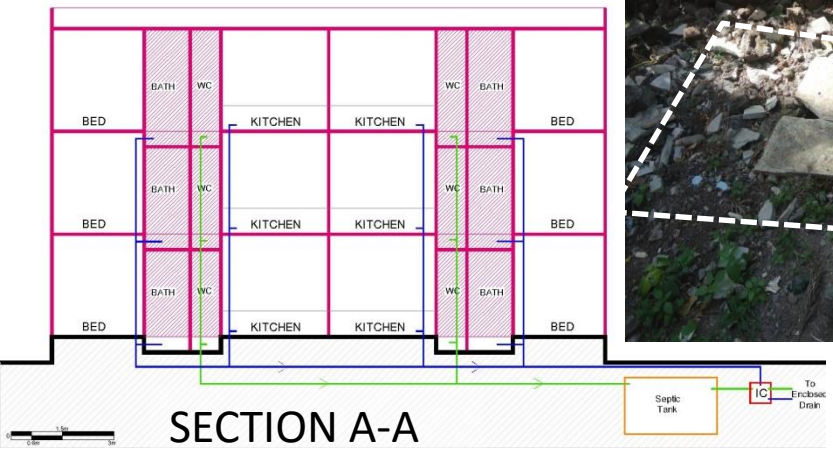
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) ***(CPHEEO)***	1.5	0.75	1.3	1.35	**1.46** (Two year Cleaning Interval) **1.52** (Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (4 Users)	2.1	1.2	1.2	**3.02**
Observations				**Oversized (99% Bigger)**

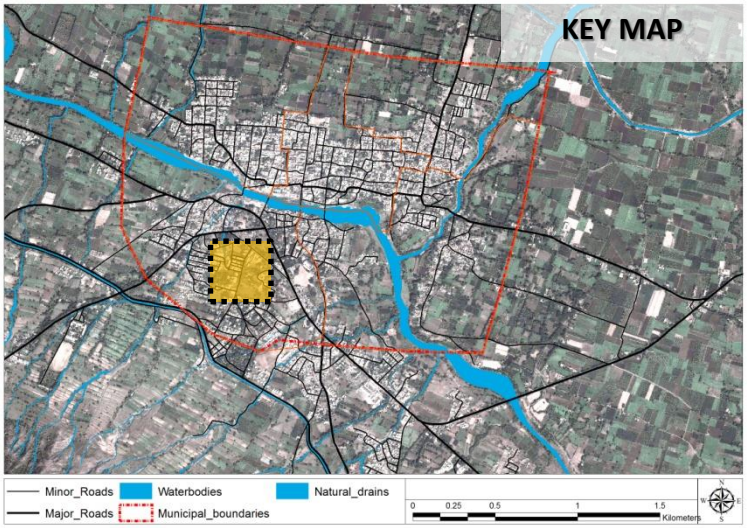
WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**											
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	Navechi Wadi	(Grey+ Black)	--	14.1	--	--	35	--	--	7.76	--	29	--	

CASE 6: *SHANTINAGAR SOCIETY*, GROUP HOUSE(G+2) (PRABHAG 4)



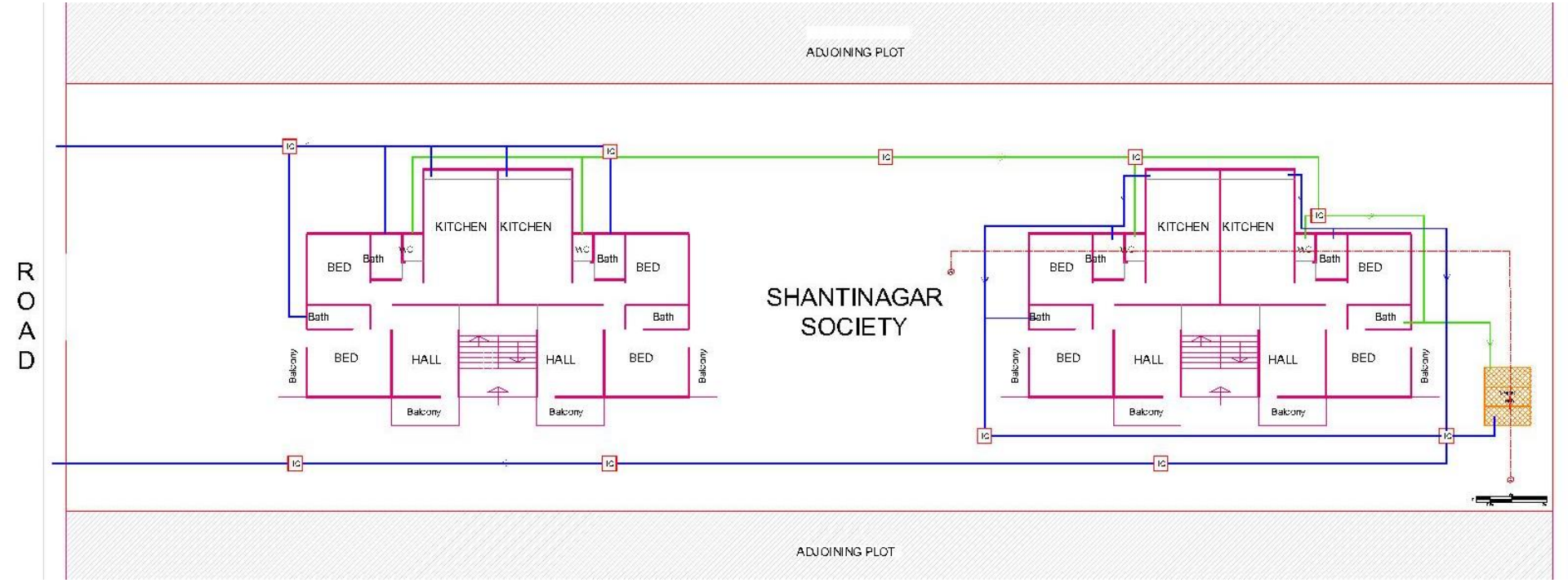
SECTION A-A



LEGEND

Grey water

Black water



PLAN

CASE 6: *SHANTINAGAR SOCIETY*, GROUP HOUSE(G+2) (PRABHAG 4)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
60	**G+2**	**Black Water**	**More Than 8-10 times**	**2012** (Cleaning frequency- Once in every year)	**Daily(Water) & Weekly (*Harpic/ detergent*)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (50 Users) (***CPHEEO***)	5.0	2.0	1.3	1.54	**13.00** (Two year Cleaning Interval) **15.50** (Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (Users 60)	2.5	1.2	1.5	**4.5**
			Observations	**Undersized (71% Smaller)**

CASE 6: *SHANTINAGAR SOCIETY*, GROUP HOUSE(G+2) (PRABHAG 4)

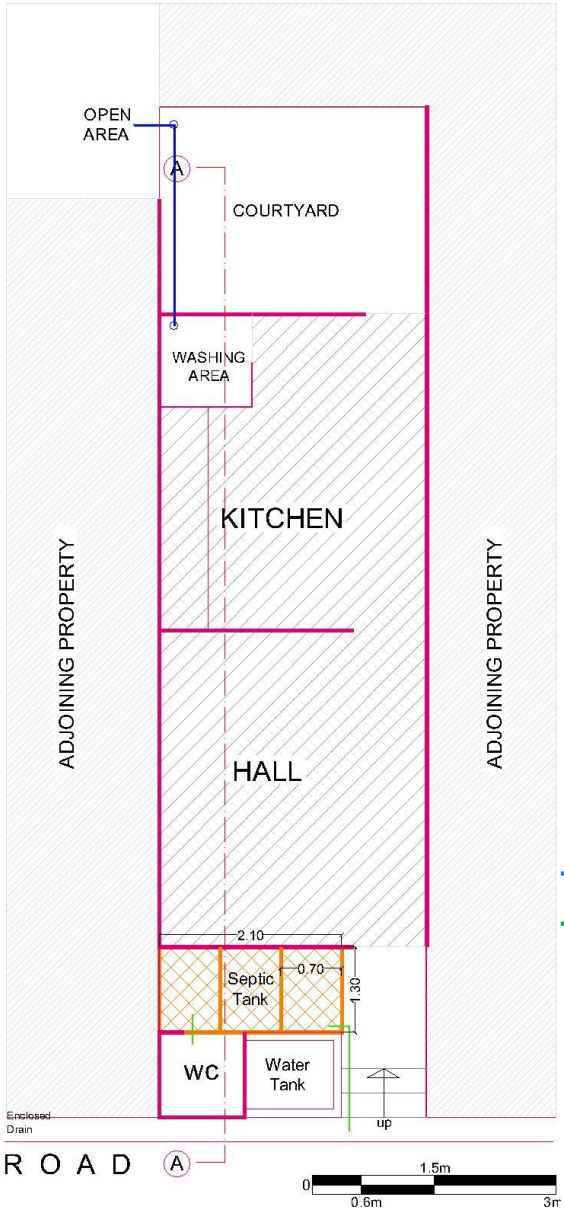
WATER QUALITY

Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	Shantinagar Society	Grey Water	--	78	--	--	200	--	--	7.21	--	69	--	
2	Shantinagar Society	Black Water	101.3	66	23	305	160	47	7.46	7.18	136	129	5	

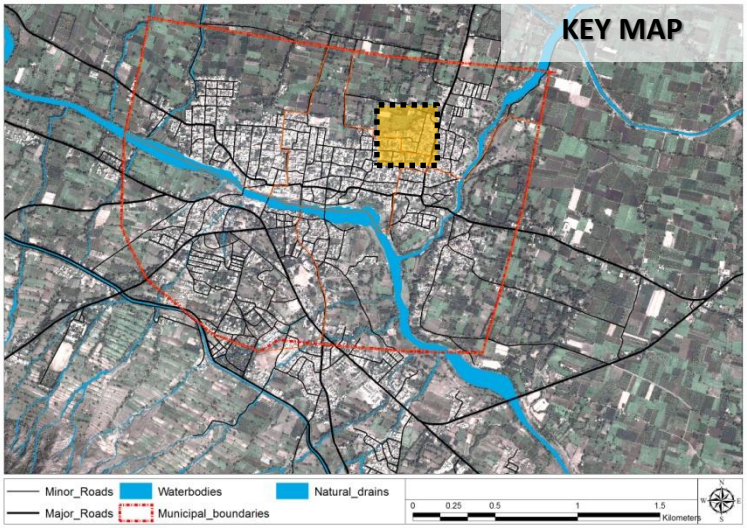
SEPTAGE SAMPLE QUALITY

Sr. No.	Parameter	Unit	Result
1	**pH**	-	8.14
2	**Total Solids**	%	0.14
3	**Total Nitrogen (as N)**	%	14.42
4	**Phosphorus (as P)**	%	0.002
5	**Potassium (as K)**	%	0.0055

CASE 7: *NHAVI AALI*, RAVIVAR PETH (PRABHAG 2)

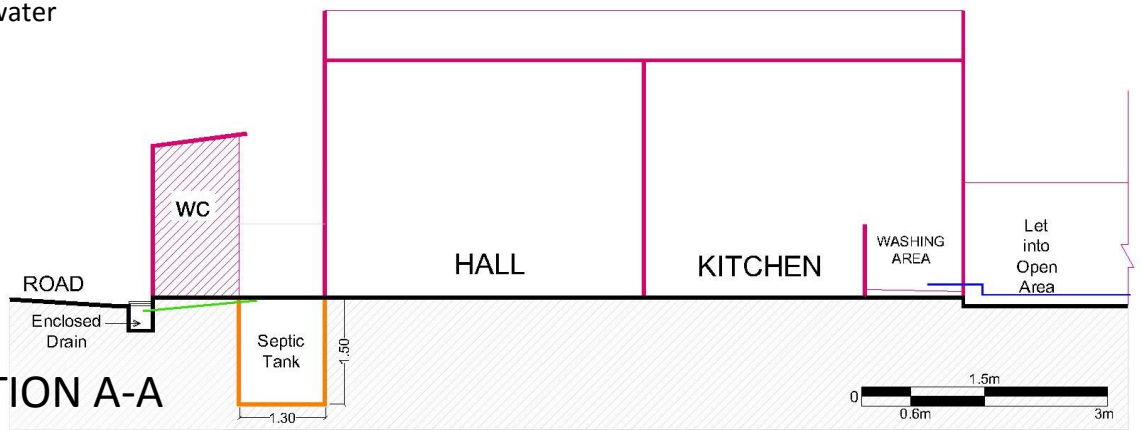


PLAN



LEGEND

- Grey water
- Black water



SECTION A-A

CASE 7: *NHAVI AALI*, RAVIVAR PETH (PRABHAG 2)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
2	**Ground Floor**	**Black Water**	**Nil**	**Not Yet cleaned (Since construction year 2007-08)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

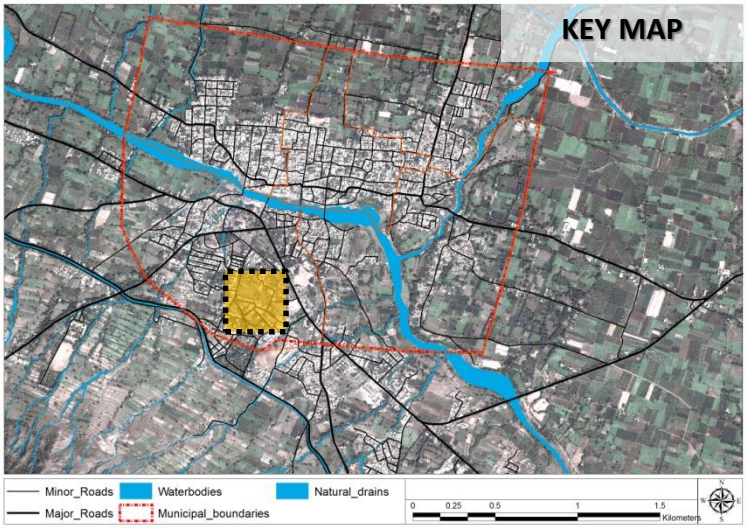
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) ***(CPHEEO)***	1.5	0.75	1.3	1.35	**1.46** (Two year Cleaning Interval) **1.52** (Three year cleaning interval)

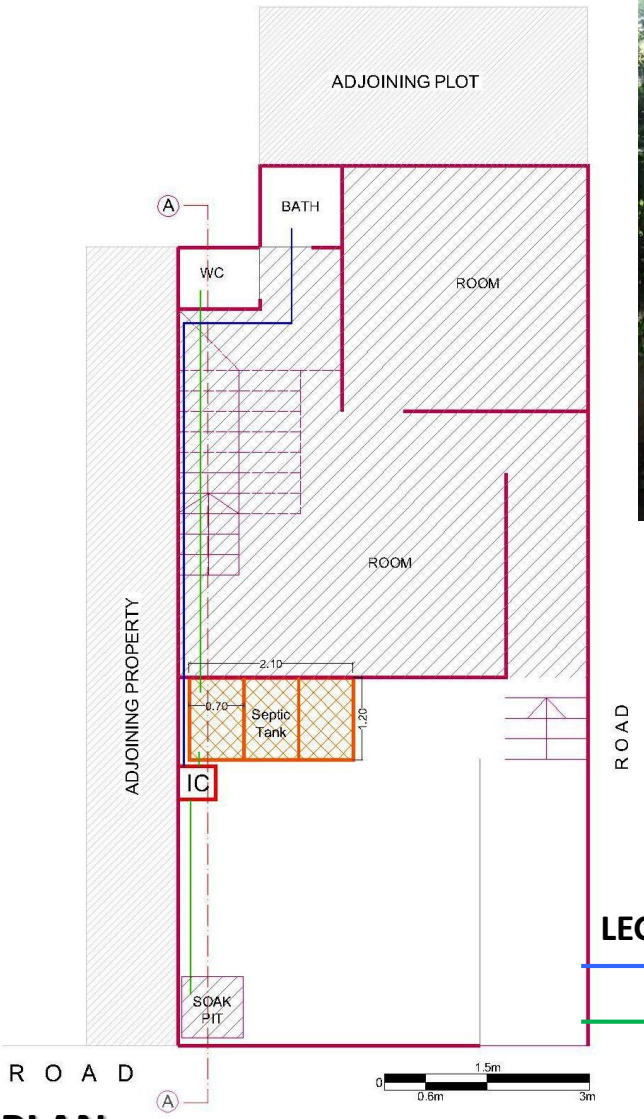
	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (Users 2)	2.1	1.3	1.5	**4.10**
			Observations	**Oversized (170% Bigger)**

WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**										
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Nhavi Ali	Black Water	--	--	--	--	--	--	--	--	--	--	--

CASE 8: *SURAJA (DAKBANGLA ROAD)*(PRABHAG 4)





PLAN

LEGEND

Grey water

Black water

SECTION A-A

CASE 8: *SURAJA (DAKBANGLA ROAD)*(PRABHAG 4)

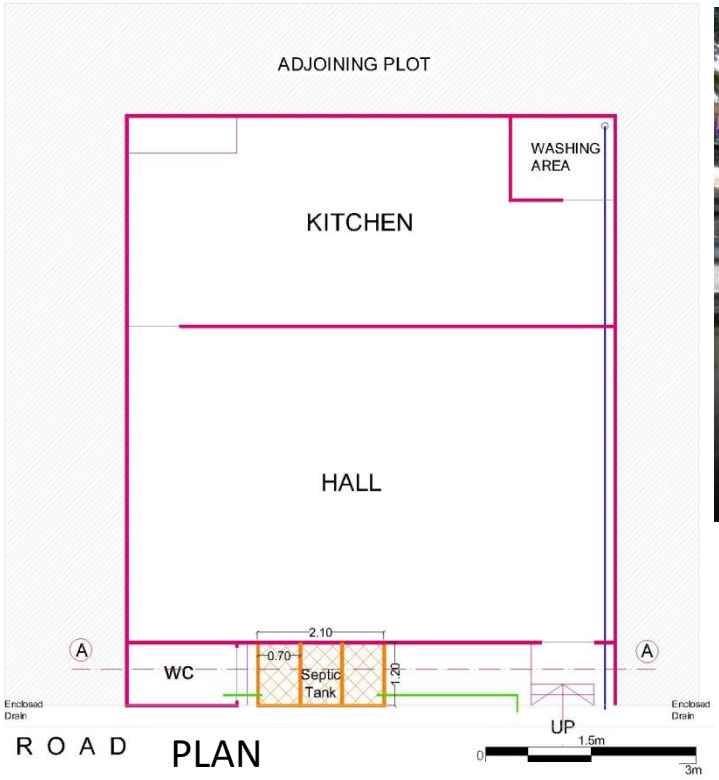
Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
5	**G+1**	**Black Water**	**Nil**	**Not Yet cleaned (Since construction year 2004-05)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) ***(CPHEEO)***	1.5	0.75	1.3	1.35	**1.46** (Two year Cleaning Interval) **1.52** (Three year cleaning interval)
	L	**B**	**Height (m)**		**Volume of the tank** (cu m)
Actual Size of the tank (Users 5)	2.1	1.2	1.5		**3.78**
				Observations	**Oversized (149% Bigger)**

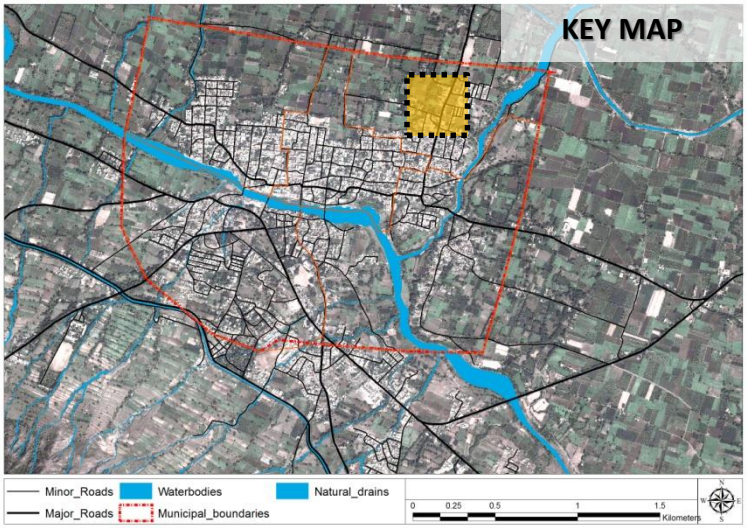
WATER QUALITY

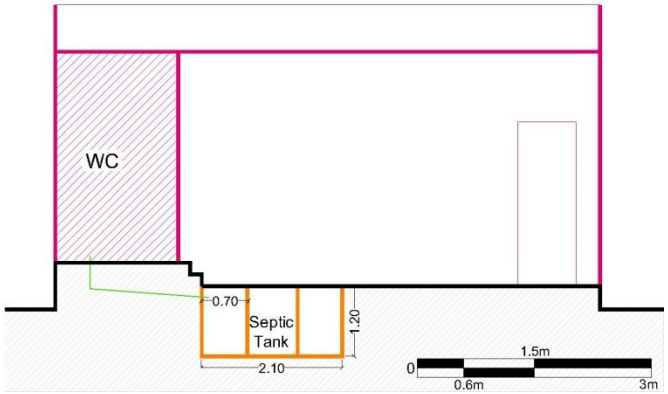
Sr No	Location, Area	Waste water	Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Dakbangla Road (Guesthouse Road)	Grey & Black water	--	135	--	--	320	--	--	5.93	--	210	--

CASE 9: *RAVIVAR PETH, DHOR GALLI* (PRABHAG NO 2)



PLAN





SECTION A-A

LEGEND

Grey water

Black water

CASE 9: *RAVIVAR PETH, DHOR GALLI* (PRABHAG NO 2)

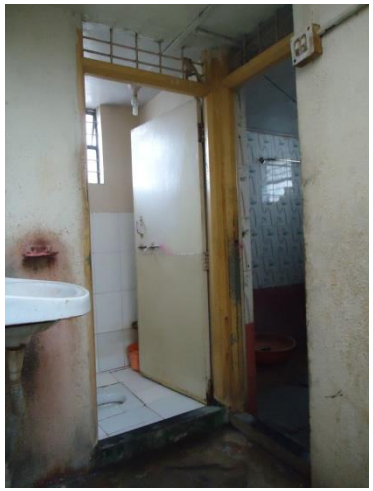
Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied? **(Precast Septic tank)**	How toilet is cleaned?
3	**Ground Floor**	**Black Water**	**Nil**	**Not Yet cleaned Since construction year 2007-08)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

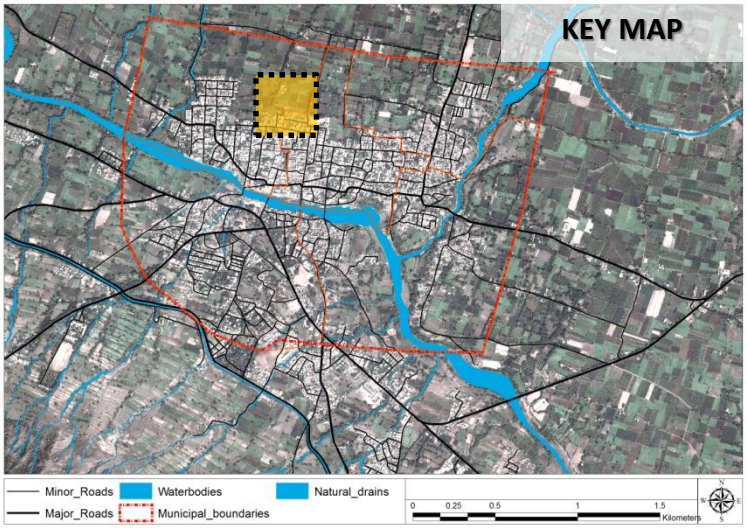
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) **(*CPHEEO*)**	1.5	0.75	1.3	1.35	**1.46** (Two year Cleaning Interval) **1.52** (Three year cleaning interval)
	L	**B**	**Height (m)**		**Volume of the tank** (cu m)
Actual Size of the tank (3 Users)	2.7	--	1.2		**3.02**
				Observations	**Oversized (99% Bigger)**

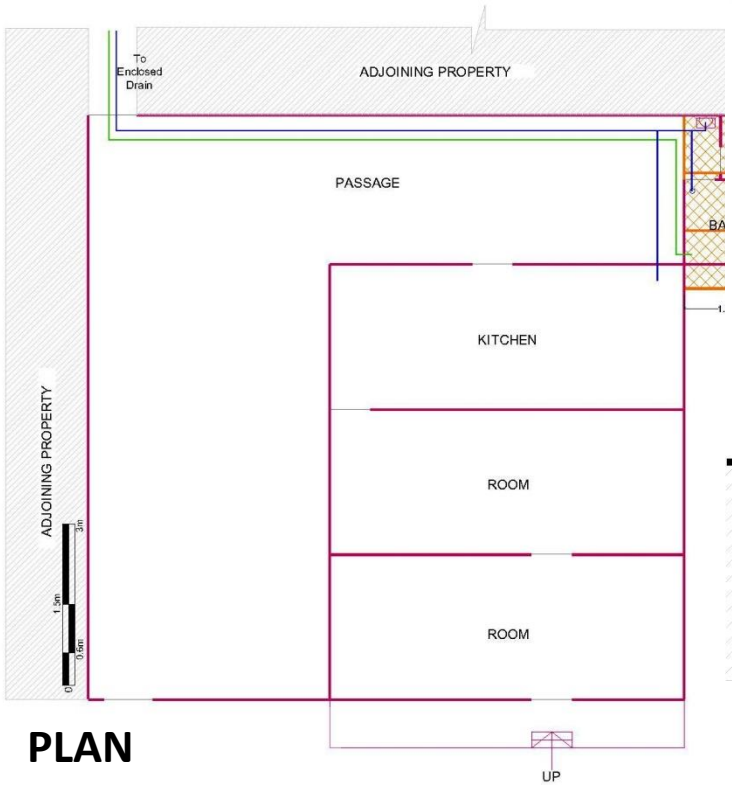
WATER QUALITY

Sr No	Location, Area	Waste water	Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Dhor Galli	Grey & Black Water (Sample was taken from the drain)	--	228	--	-	580	-	-	7.23	--	294	--

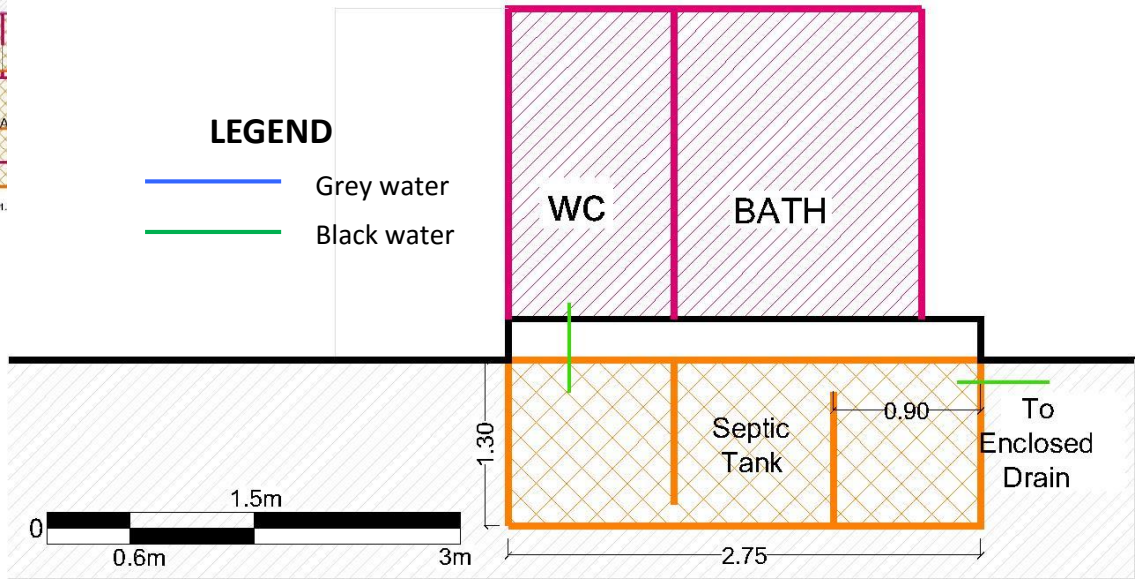
CASE 10: *GANPATI ALI*, INDIVIDUAL PLOT (PRABHAG NO 1)







PLAN



SECTION A-A

CASE 10: *GANPATI ALI*, INDIVIDUAL PLOT (PRABHAG NO 1)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
11	**G+1**	**Black + Grey Water**	**Nil**	**Not Yet cleaned (Since construction year 2011-12)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

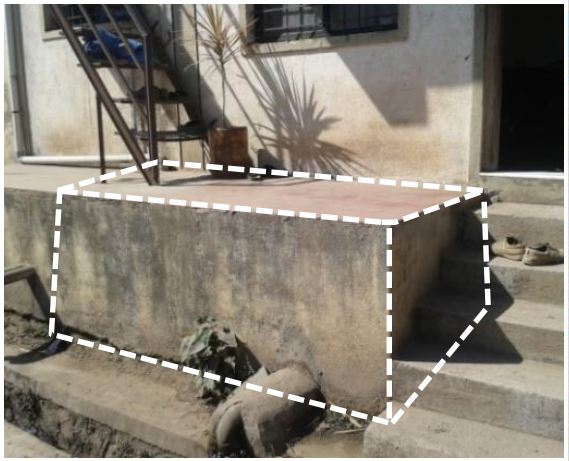
	Length (m)	Breadth (m)	Height (m) (300mm free board has been considered)		Volume of the tank (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (10 Users) ***(CPHEEO)***	2.0	0.90	1.3	1.7	**2.34**(Two year Cleaning Interval) **3.06**(Three year cleaning interval)

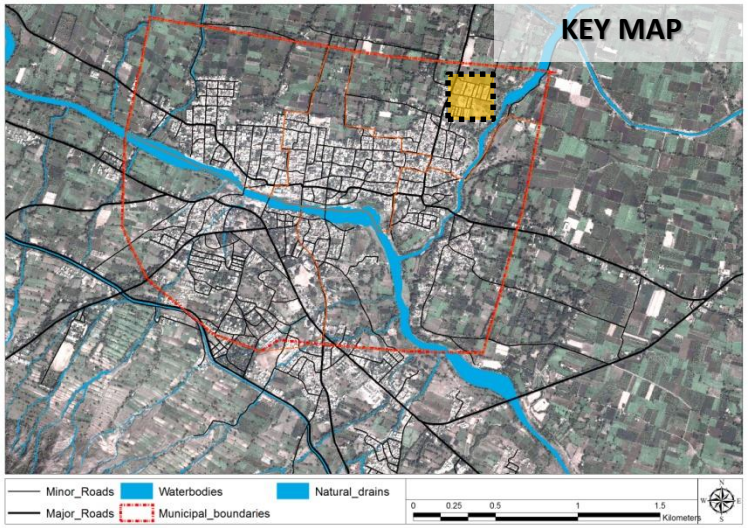
	L	B	Height (m)	Volume of the tank (cu m)
Actual Size of the tank (11 Users)	2.75	1.35	1.3	**4.83**
			Observations	**Oversized (58% Bigger)**

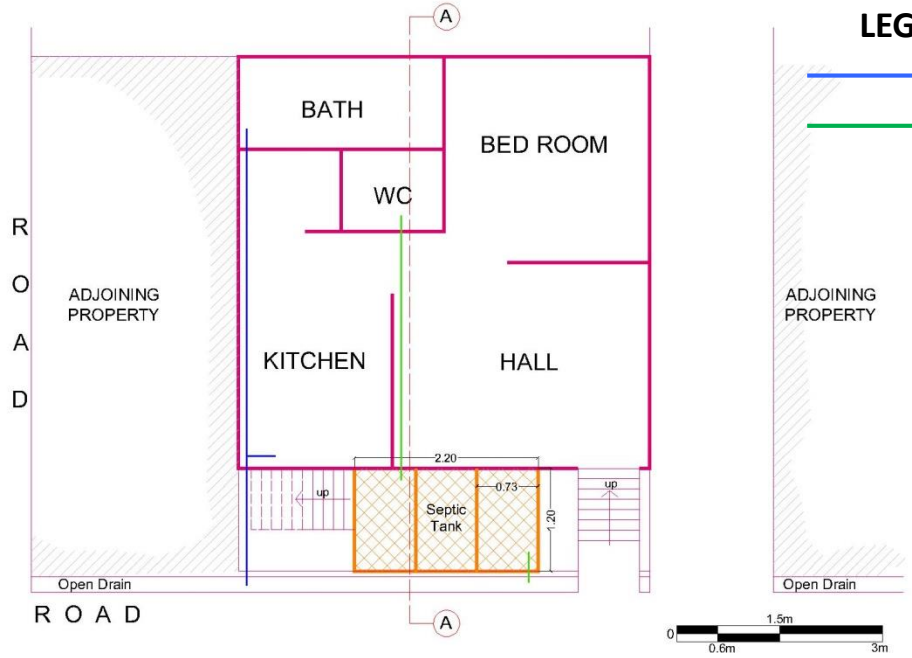
WATER QUALITY

Sr No	Location, Area	Waste water	Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Ganpati Ali	Black Water	--	153	--	--	390	--	--	7.18	--	174	--

CASE 11: *DHAGE ALI*, INDIVIDUAL PLOT (PRABHAG NO 2)





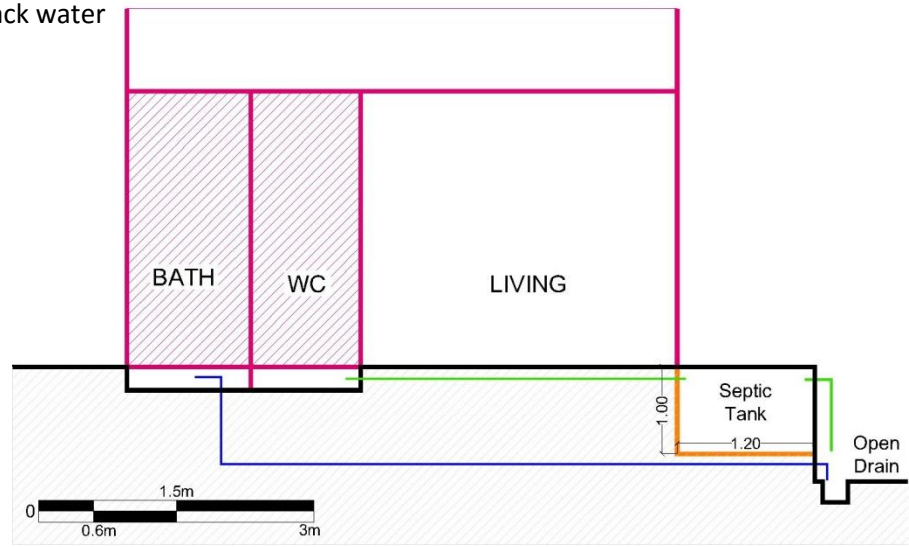


PLAN

LEGEND

Grey water

Black water



SECTION A-A

CASE 11: *DHAGE ALI*, INDIVIDUAL PLOT (PRABHAG NO 2)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
4	**Ground Floor**	**Black water**	**Nil**	**Not Yet cleaned (Since construction year 2008)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

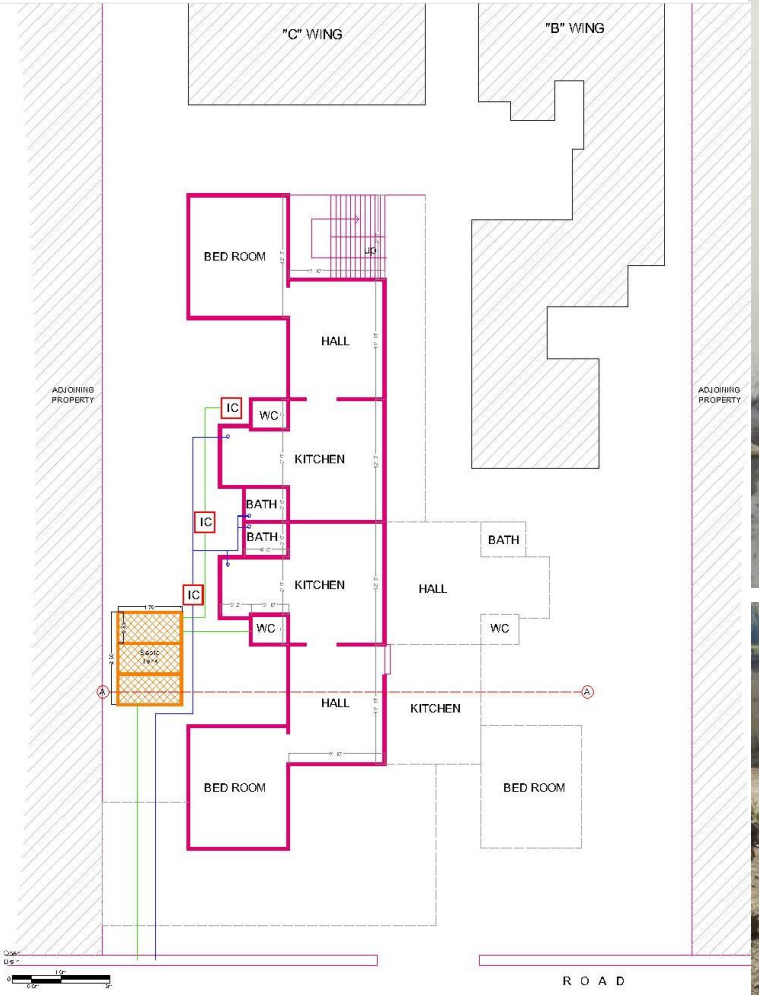
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) **(*CPHEEO*)**	1.5	0.75	1.3	1.35	**1.46**(Two year Cleaning Interval) **1.52** (Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (4 Users)	2.2	1.2	1.0	**2.64**
			Observations	**Oversized (74% Bigger)**

WATER QUALITY

Sr No	Location, Area	Waste water	Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Dhage Ali	Grey Water	--	88.5	--	--	240	--	--	7.02	--	132	--
2	Dhage Ali	Black Water	--	108	--	--	295	--	--	7.66	--	118	--

CASE 12: *RAVIVAR PETH, APARTMENT* (PRABHAG NO 2)

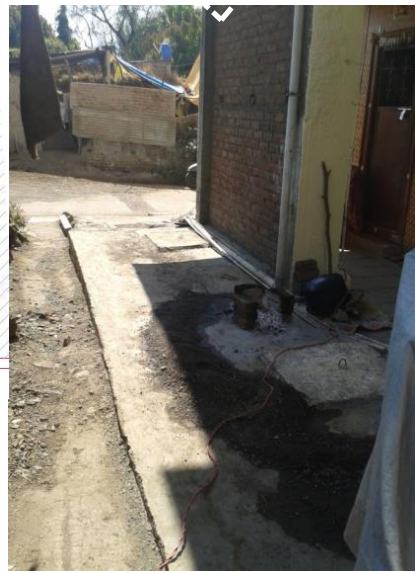


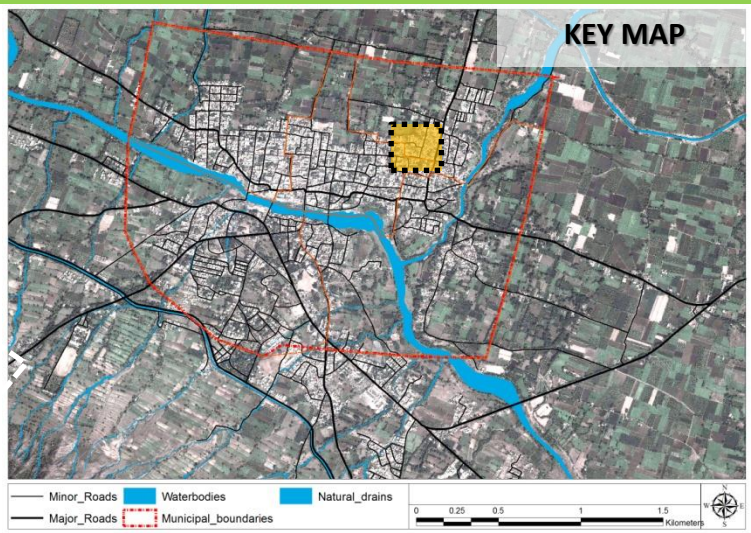
PLAN

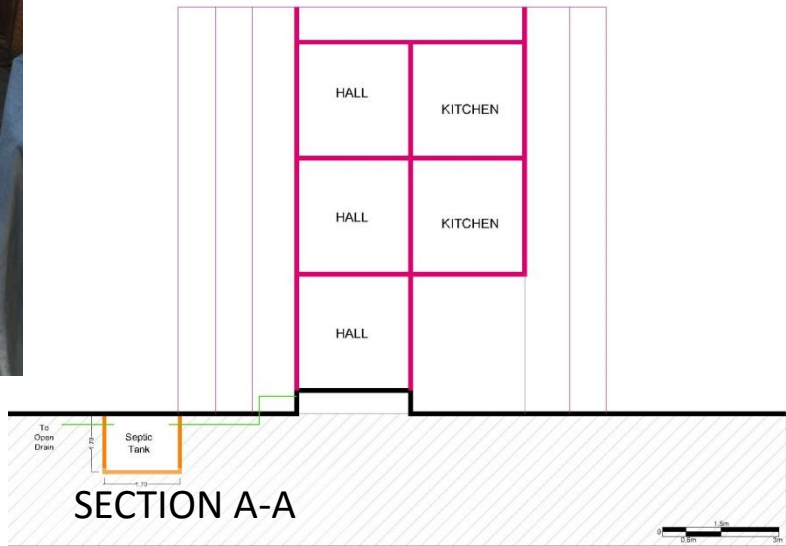
LEGEND

Grey water

Black water







SECTION A-A

CASE 12: *RAVIVAR PETH, APARTMENT* (PRABHAG NO 2)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
40	**G+2**	**Black water**	**Nil**	**Not Yet cleaned (Since construction year 2007)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

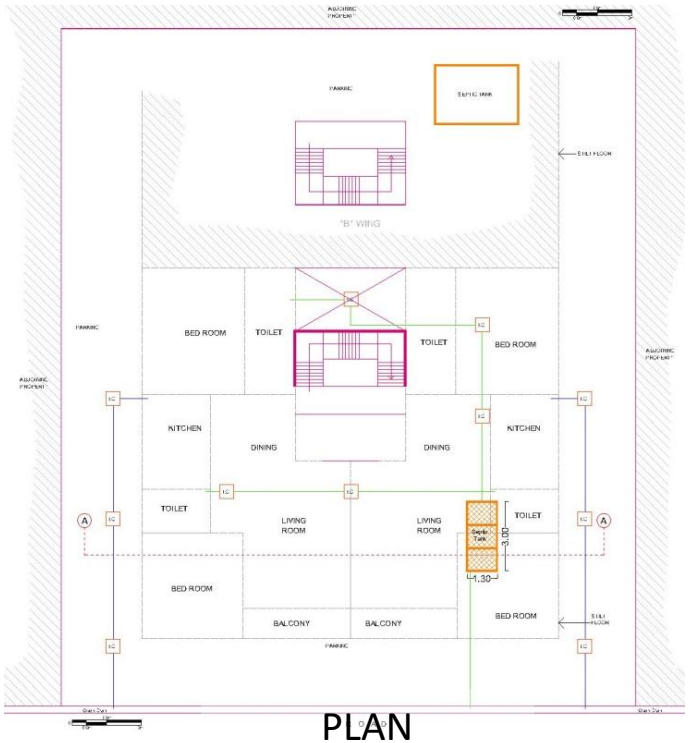
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (50 Users) ***(CPHEEO)***	5.00	2.00	1.3	1.54	**13.00**(Two year Cleaning Interval) **15.40**(Three year cleaning

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (40 Users)	2.5	1.7	1.7	**7.23**
			Observations	**Undersized (53% Smaller)**

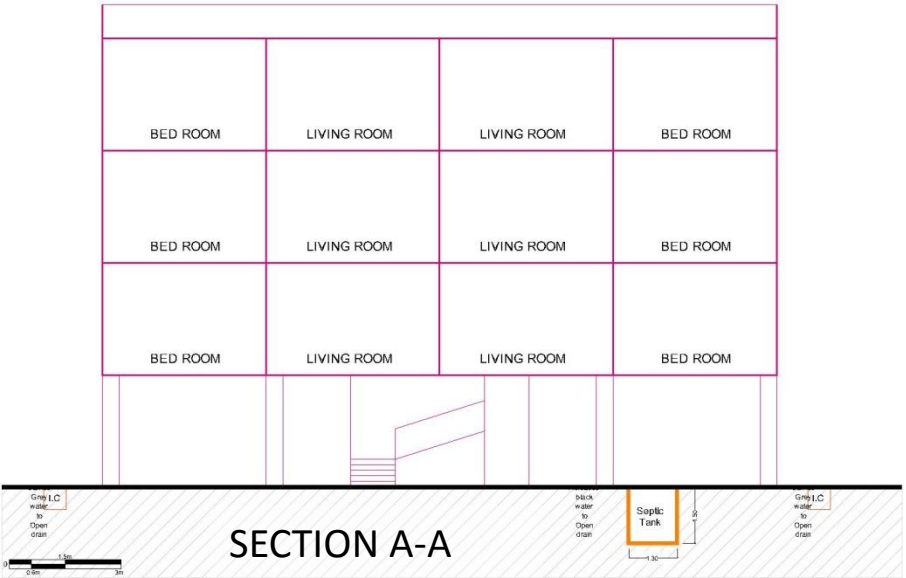
WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**										
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Ravivar Peth	Black Water	138	112.5	18	416	315	24	7.82	7.66	185	120	35

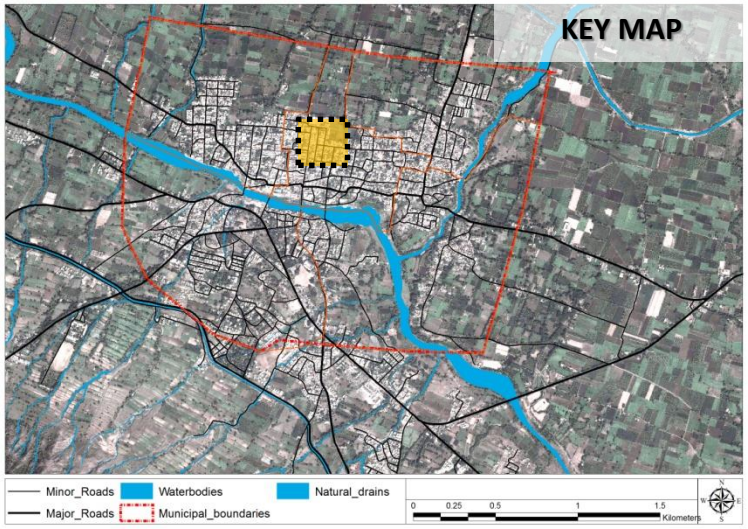
CASE 13: *DHARMAPURI, APARTMENT* (PRABHAG NO 1)



PLAN



SECTION A-A



LEGEND

Grey water

Black water

CASE 13: *DHARMAPURI, APARTMENT* (PRABHAG NO 1)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
30	**G+2**	**Black water**	**Once in a every year**	**In a year 2013 (Cleaning frequency -Once in a year)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

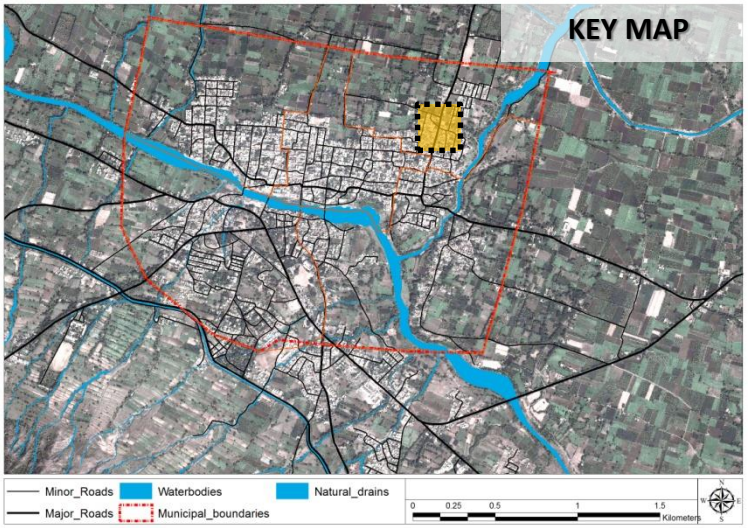
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (50 Users) ***(CPHEEO)***	5.00	2.00	1.3	1.54	**13.00**(Two year Cleaning Interval) **15.40**(Three year cleaning interval)

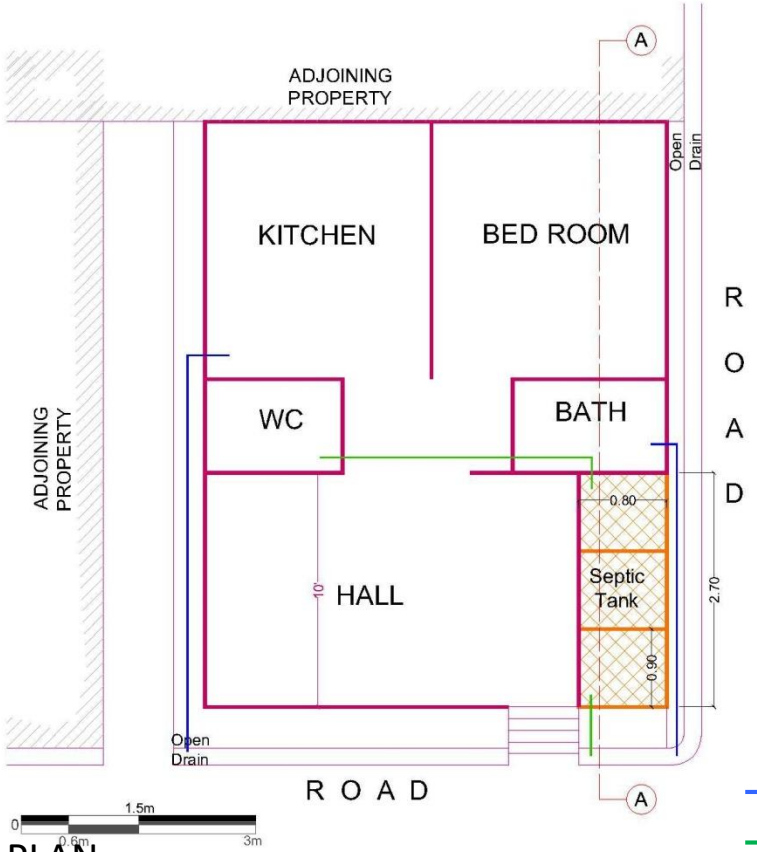
	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (30 Users)	2.5	1.7	1.7	**7.23**
			Observations	**Undersized (53% Smaller)**

WATER QUALITY

Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	Dharmpuri	Grey Water	--	87	--	--	210	--	--	7.66	--	108	--	
2	Dharmpuri	Black Water	109	42	61	328	105	67	7.51	7.36	146	48	67	

CASE 14: *RAVIVAR PETH,* INDIVIDUAL PLOT (PRABHAG NO 2)



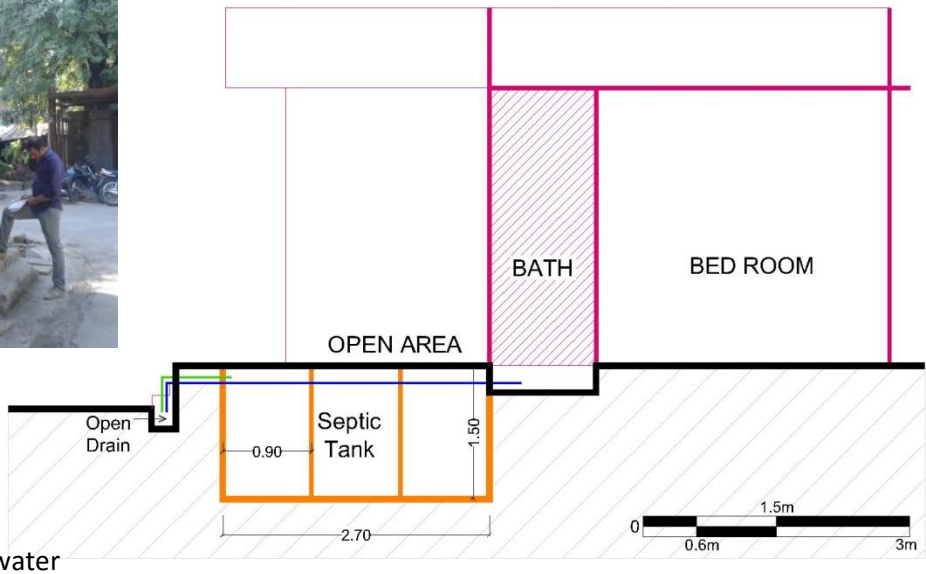


PLAN

LEGEND

Grey water

Black water



SECTION A-A

CASE 14: *RAVIVAR PETH,* INDIVIDUAL PLOT (PRABHAG NO 2)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
4	Ground Floor	Black water	Nil	Not yet cleaned (Since construction year 2012)	Daily(Water) & Weekly (*Harpic/ detergent*)

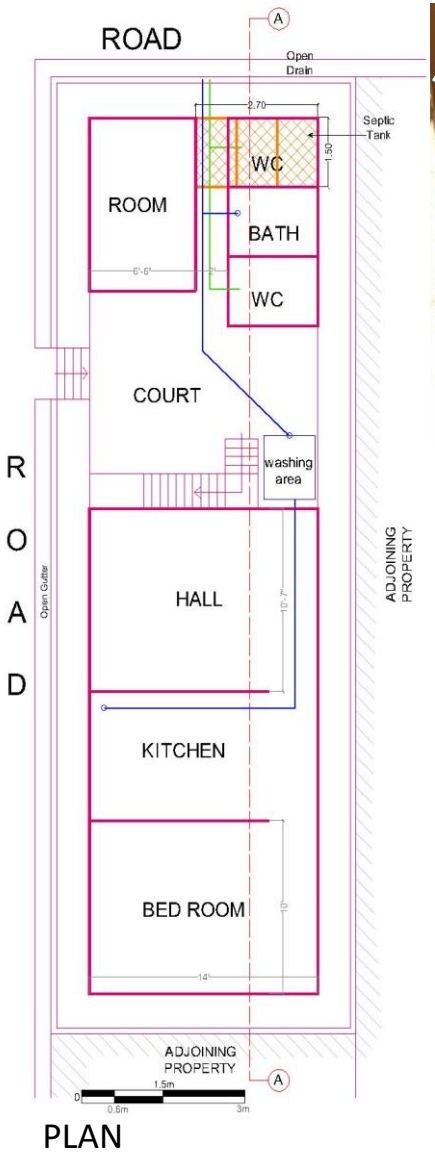
	Length (m)	Breadth (m)	Height (m) (300mm free board has been considered)		Volume of the tank (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) (*CPHEEO)*	1.50	0.75	1.3	1.35	**1.42**(Two year Cleaning Interval) **1.52**(Three year cleaning interval)

	L	B	Height (m)	Volume of the tank (cu m)
Actual Size of the tank (4 Users)	2.7	0.8	1.5	**3.24**
			Observations	**Oversized (113% Bigger)**

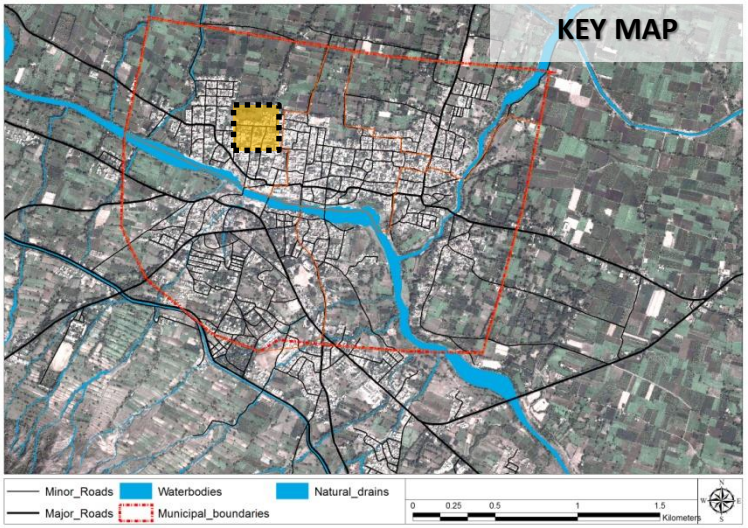
WATER QUALITY

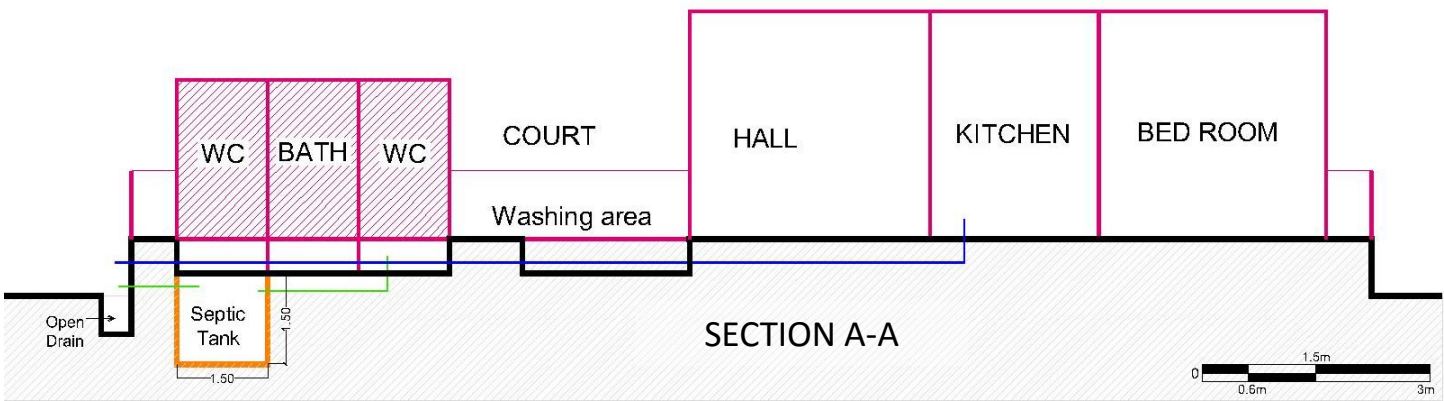
Sr No	Location, Area	Waste water	Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Ravivar Peth	Grey Water	--	88.5	--	--	220	--	--	8.36	--	128	--
2	Ravivar Peth	Black Water	--	93	--	--	210	--	--	7.68	--	134	--

CASE 15: *MADHALI ALI,* INDIVIDUAL PLOT (PRABHAG NO 3)



PLAN





LEGEND

Grey water

Black water

CASE 15: *MADHALI ALI,* INDIVIDUAL PLOT (PRABHAG NO 3)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
2	**G+1**	**Black water**	**One time**	**Not cleaned (Since year 2009)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

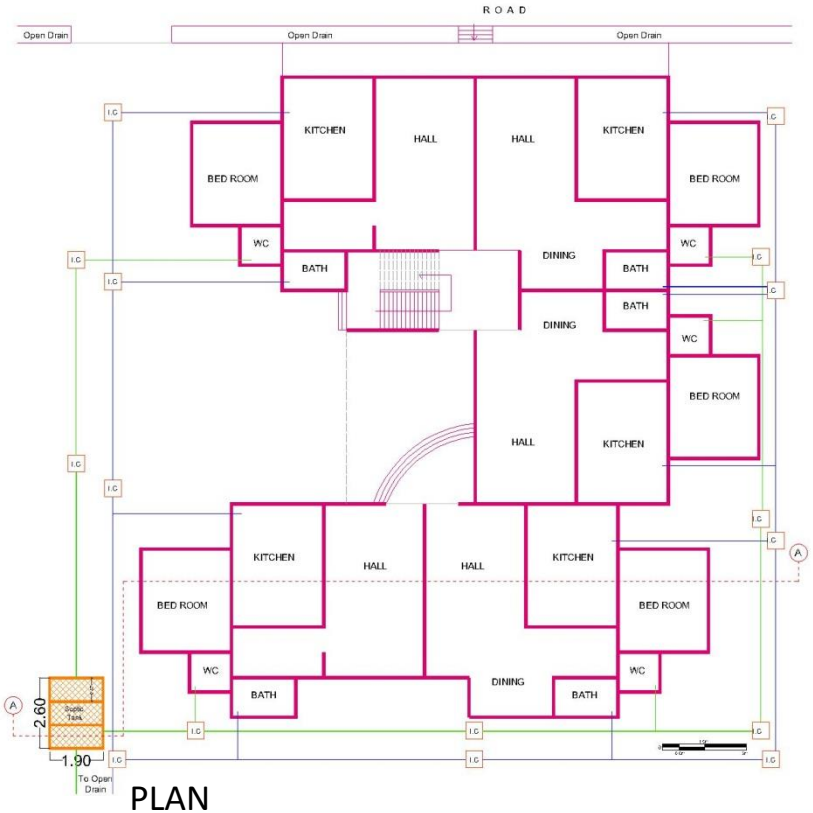
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) ***(CPHEEO)***	1.50	0.75	1.3	1.35	**1.42**(Two year Cleaning Interval) **1.52**(Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (2 Users)	2.7	1.5	1.5	**7.29**
			Observations	**Oversized (380% Bigger)**

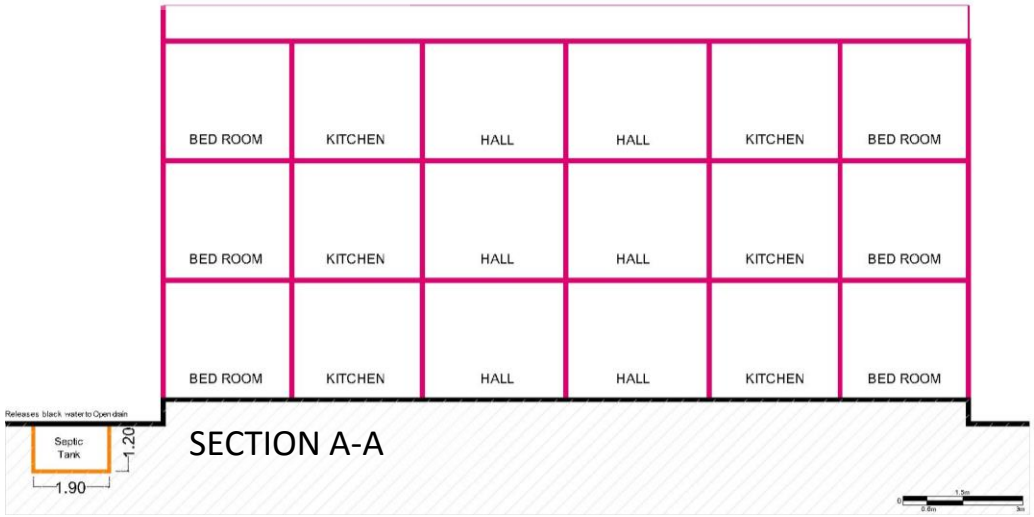
WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**										
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Madhali Ali	Black Water	--	52.5	--	--	170	--	--	7.66	--	92	--

CASE 16: *DWARKA ALI,* APARTMENT (PRABHAG NO 3)



PLAN

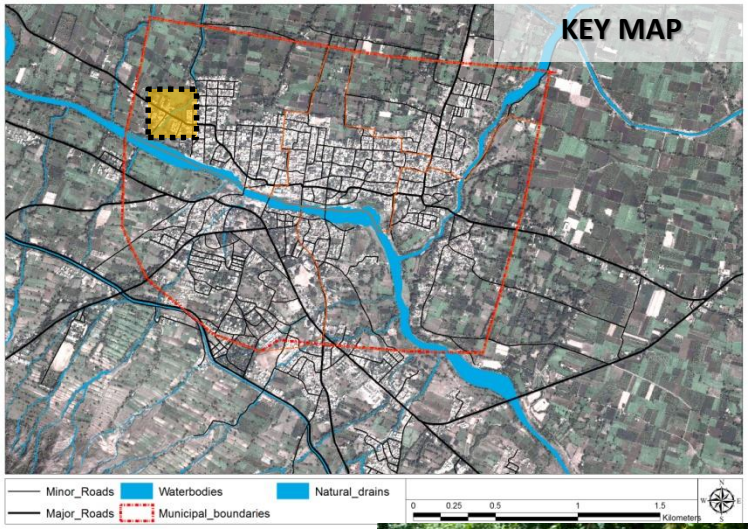


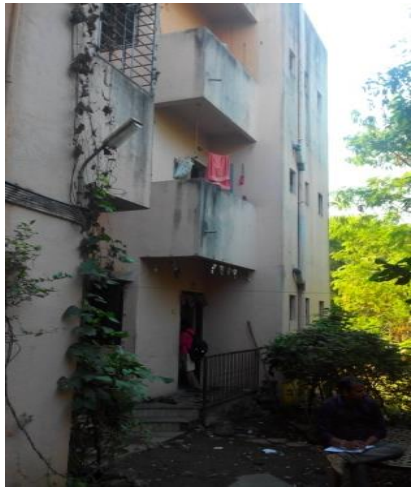
SECTION A-A

LEGEND

Grey water

Black water





CASE 16: *DWARKA ALI,* APARTMENT (PRABHAG NO 3)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
80	**G+2**	**Black water**	**One time**	**Not cleaned (Three years ago -2011)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

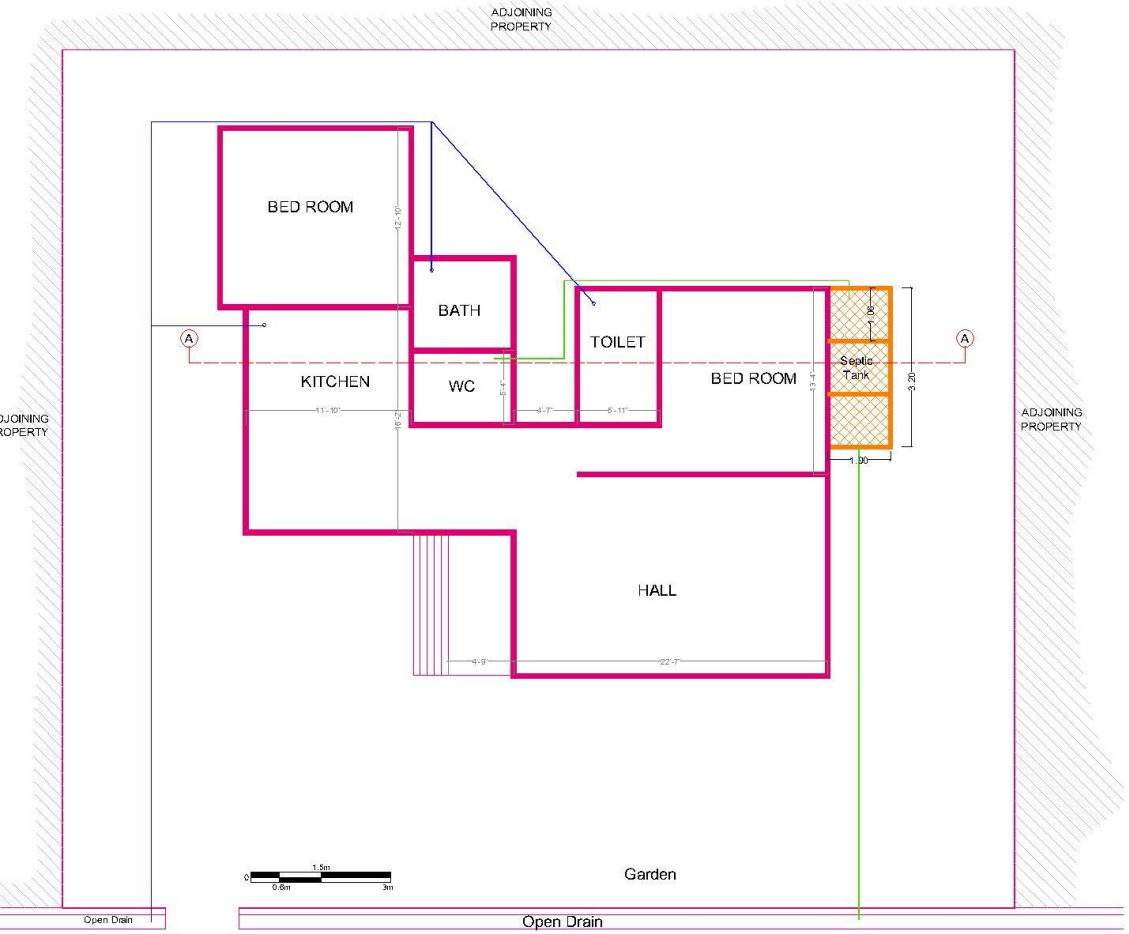
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (100 Users) **(*CPHEEO*)**	7.50	2.65	1.3	1.54	**25.84**(Two year Cleaning Interval) **30.61**(Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (80 Users)	2.6	1.9	1.2	**5.93**
			Observations	**Undersized (81% Smaller)**

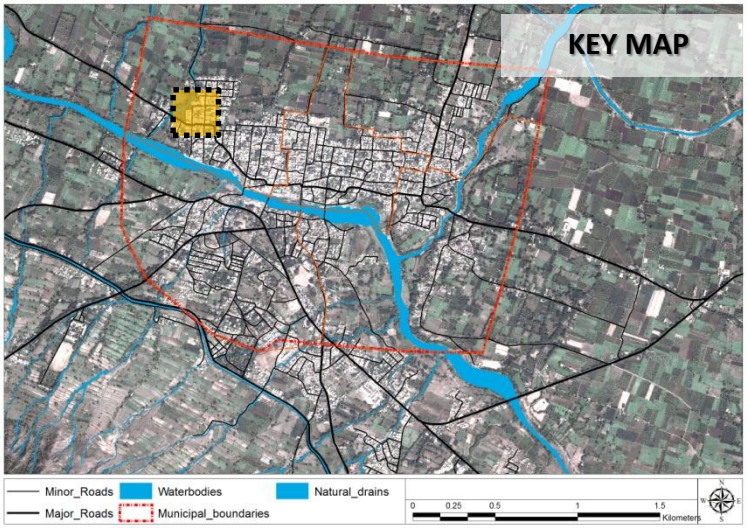
WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**											
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	Dwarka Ali	Raw Swage	--	10.2	--	--	38.2	--	--	7.66	--	13	--	
2	Dwarka Ali	Black Water	142	115	19	428	358	16	7.43	7.67	191	154	20	

CASE 17: *DWARKA ALI, BUNGLOW* (PRABHAG NO 3)



PLAN

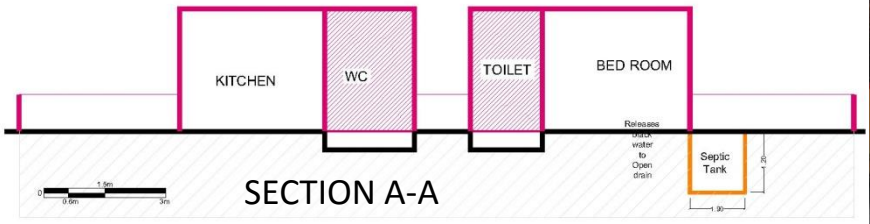


ROAD

LEGEND

Grey water

Black water



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CASE 17: *DWARKA ALI, BUNGLOW* (PRABHAG NO 3)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
5	**Ground Floor**	**Black water**	**Nil**	**Not yet cleaned (Since construction year 2000)**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

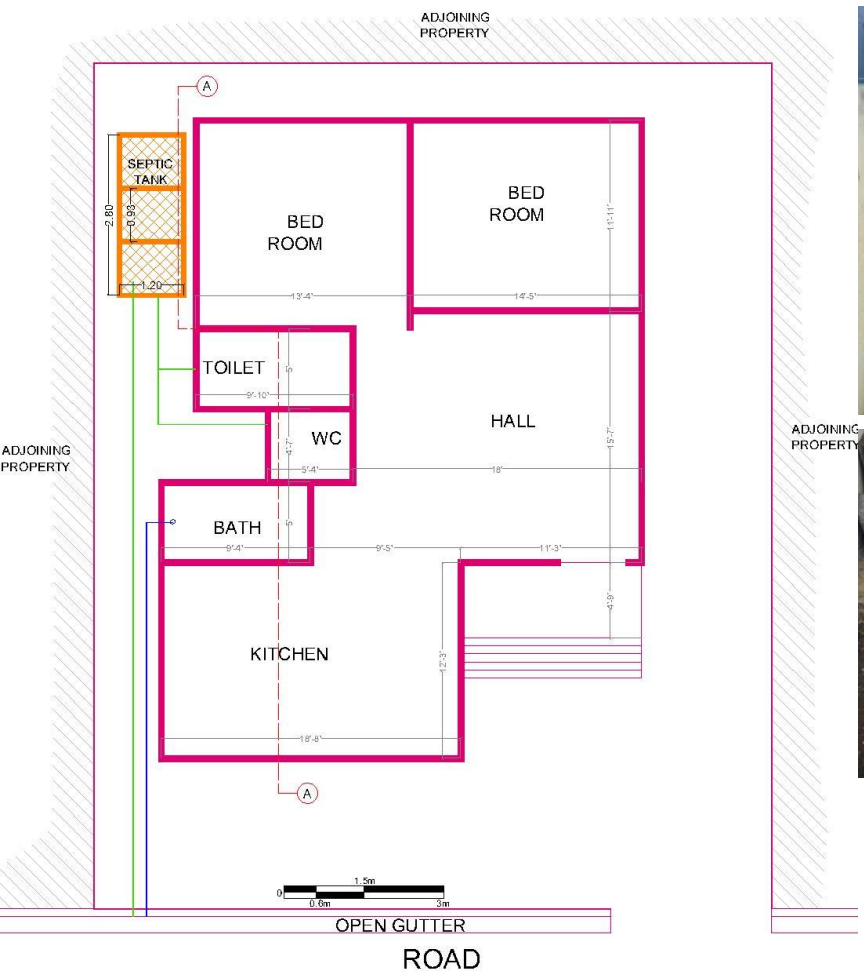
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) ***(CPHEEO)***	1.50	0.75	1.3	1.35	**1.46**(Two year Cleaning Interval) **1.52**(Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (5 Users)	3.2	1.4	1.2	**5.98**
			Observations	**Oversized (293% Bigger)**

WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**											
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	Dwarka Ali	Raw Swage	--	--	--	--	--	--	--	--	--	--	--	
2	Dwarka Ali	Black Water	--	195	--	--	--	--	--	7.56	--	110	--	

CASE 18: *SIDHNATH WADI, BUNGLOW* (PRABHAG NO 4)



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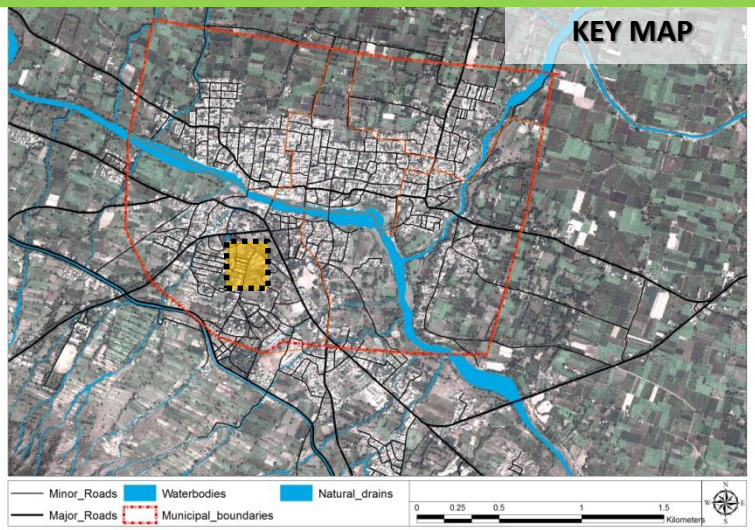
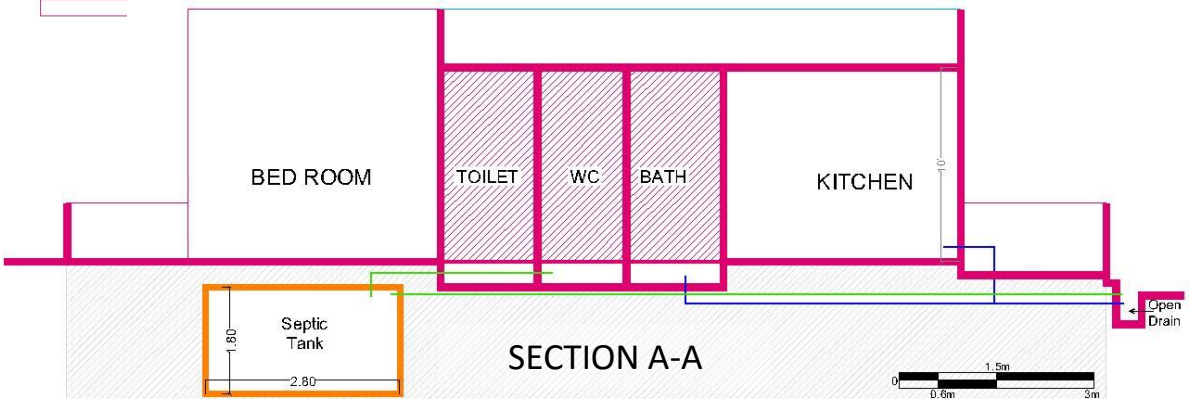




LEGEND

- Grey water
- Black water

CASE 18: *SIDHNATH WADI, BUNGLOW* (PRABHAG NO 4)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
5	**Ground Floor**	**Black water**	**One time**	**First time cleaned in March 2014**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

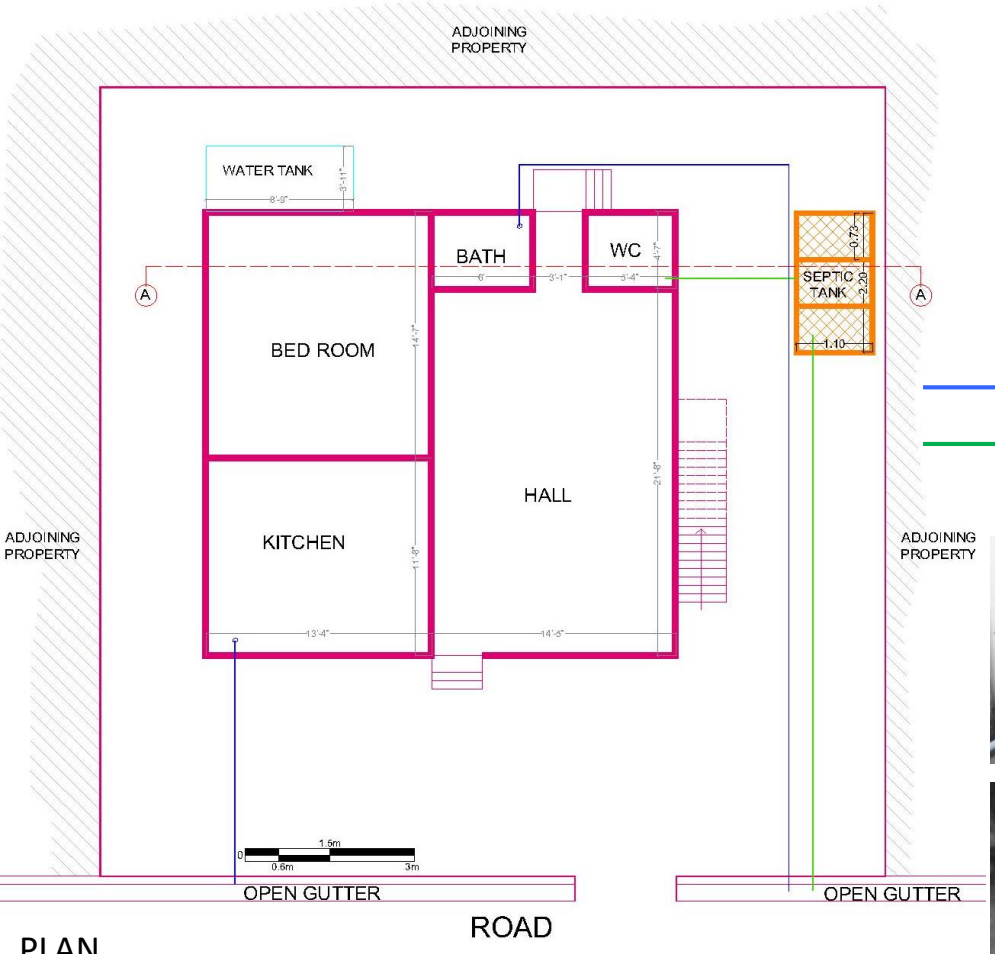
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) ***(CPHEEO)***	1.50	0.75	1.3	1.35	**1.46**(Two year Cleaning Interval) **1.52**(Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (5 Users)	2.8	1.2	1.8	**5.83**
			Observations	**Oversized (284% Bigger)**

WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**											
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	Sidhnat Wadi	Grey Water	--	--	--	--	--	--	--	--	--	--	--	
2	Sidhnath Wadi	Black Water	--	102	--	--	254	--	--	7.86	--	58	--	

CASE 19: *SIDHNATH WADI, BUNGLOW* (PRABHAG NO 4)



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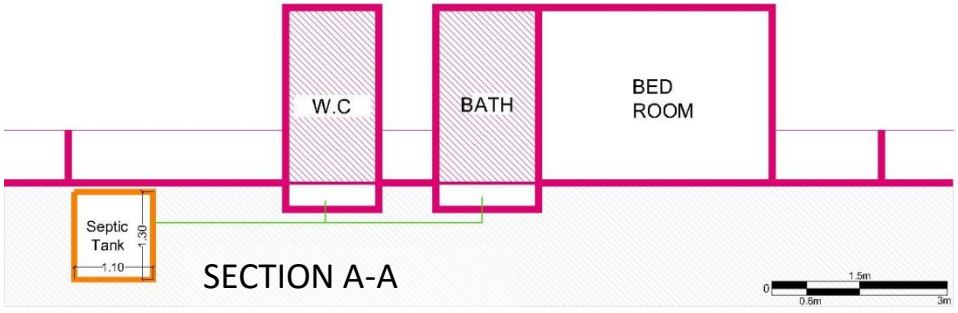
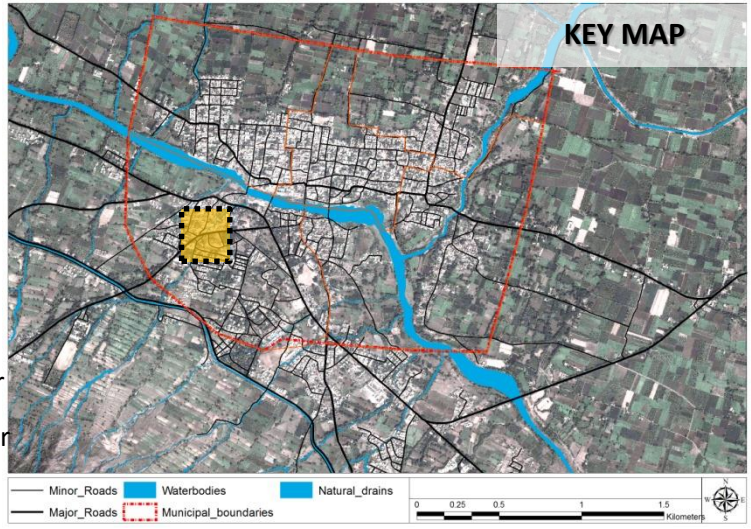




LEGEND

Grey water

Black water

CASE 19: *SIDHNATH WADI, BUNGLOW* (PRABHAG NO 4)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
2	**G+1**	**Black water**	**More than two times**	**Two years ago-2012**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

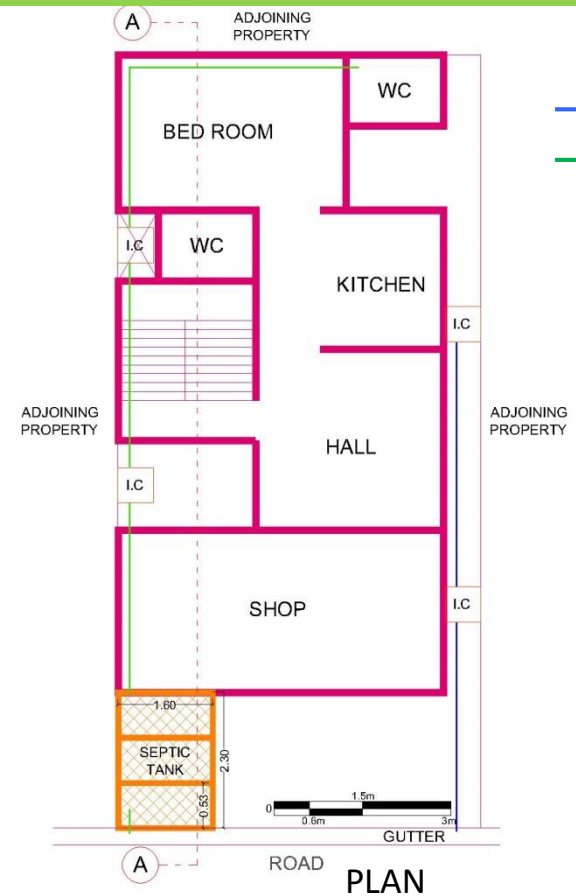
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (5 Users) ***(CPHEEO)***	1.50	0.75	1.3	1.35	**1.46**(Two year Cleaning Interval) **1.52**(Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (5 Users)	2.2	1.1	1.3	**3.15**
			Observations	**Oversized (107% Bigger)**

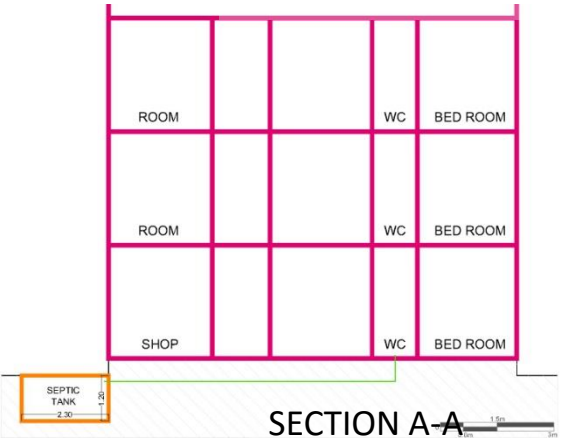
WATER QUALITY

Sr No	Location, Area	Waste water	Parameters										
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Sidhnat Wadi	Raw Swage	--	--	--	--	--	--	--	--	--	--	--
2	Sidhnath Wadi	Black Water	--	185	--	--	256	--		7.87	--	116	--

CASE 20: *DHARMPURI, APARTMENT* (PRABHAG NO 4)



PLAN



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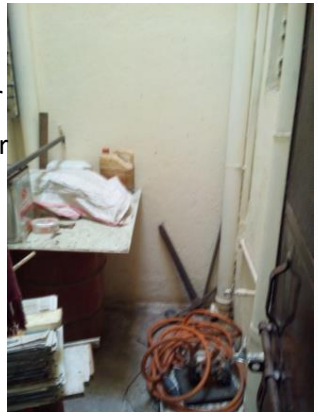
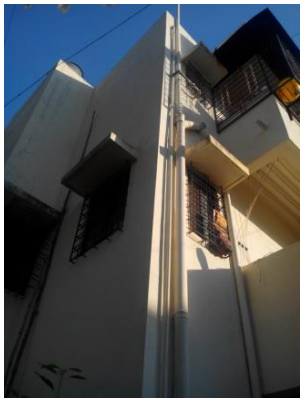
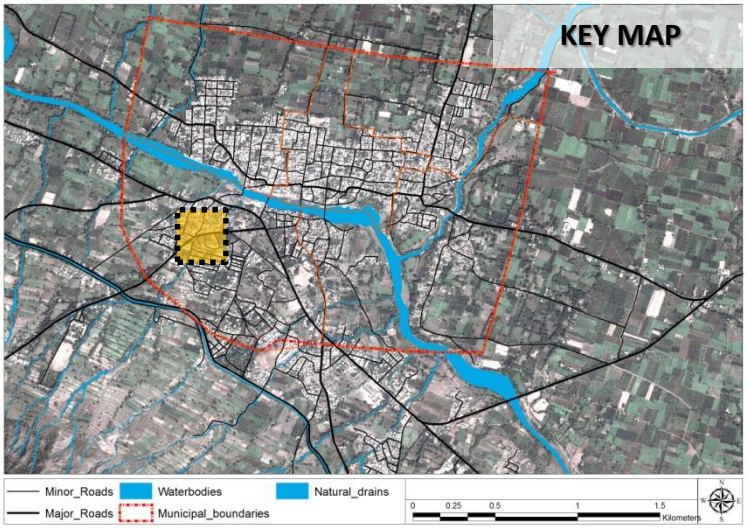
LEGEND

Grey water

Black water







CASE 20: *DHARMPURI, APARTMENT* (MIXED USE) (PRABHAG NO 4)

Users	Building type	Inputs to septic tank	Cleaning frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
20	**G+2**	**Black water**	**One time**	**Two years ago-2012**	**Daily(Water) & Weekly (*Harpic/ detergent*)**

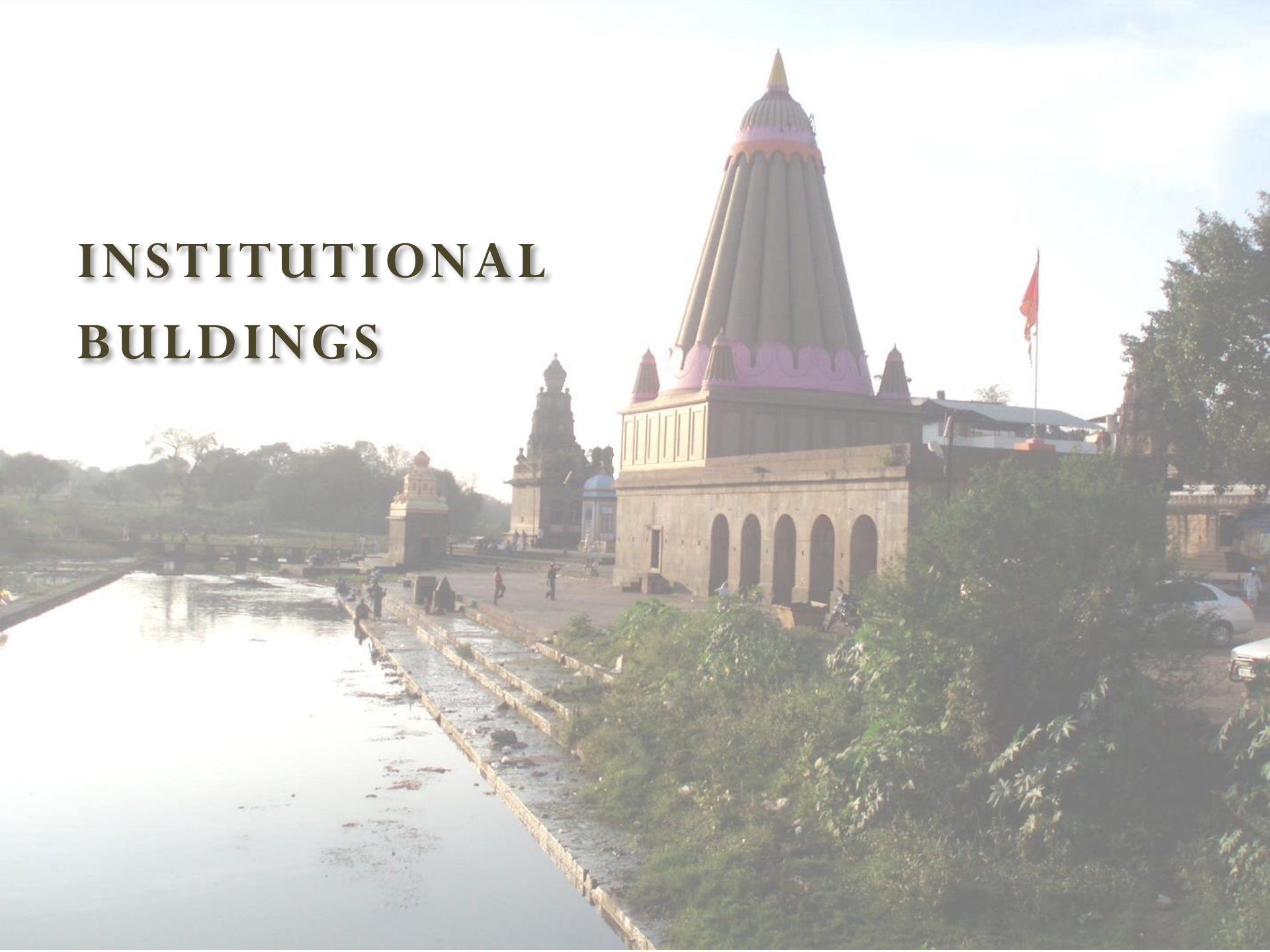
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)		**Volume of the tank** (cu m)
			(Cleaning interval - 2 year)	(Cleaning interval - 3 year)	
Recommended Size of the Septic tank (20 Users) (***CPHEEO***)	2.3	1.10	1.6	2.1	**4.04**(Two year Cleaning Interval) **5.31**(Three year cleaning interval)

	L	**B**	**Height (m)**	**Volume of the tank** (cu m)
Actual Size of the tank (20 Users)	2.3	1.6	1.2	**4.41**
			Observations	**Undersized (17% Smaller)**

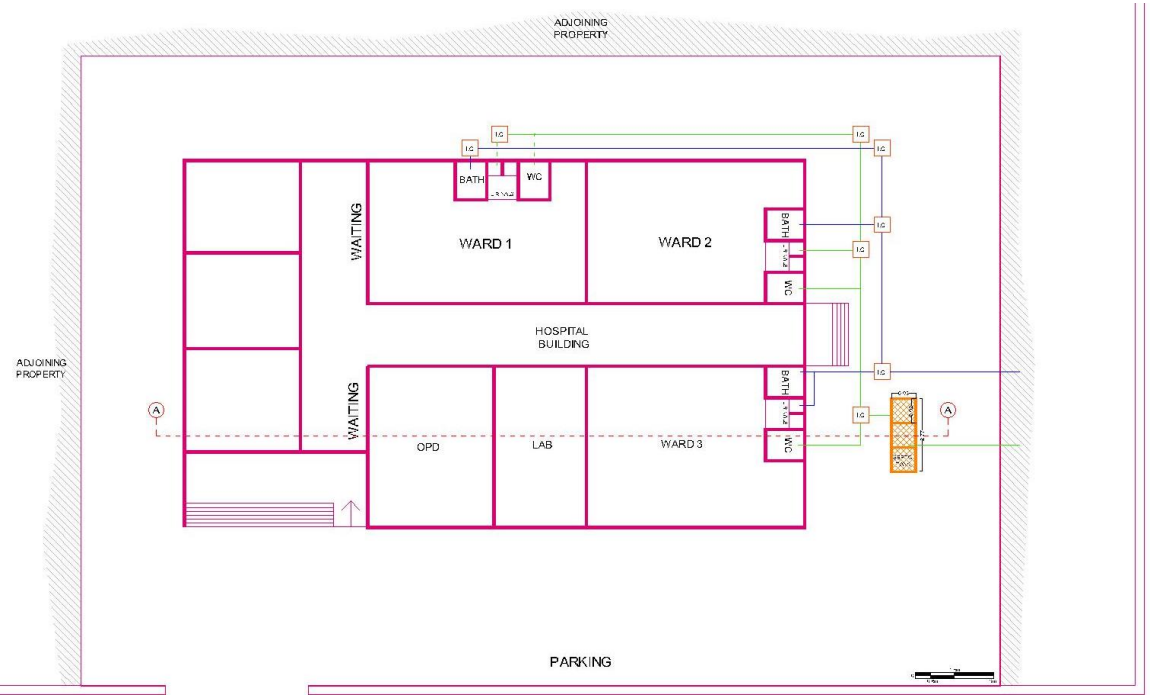
WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**										
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**		
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction
1	Dharmpuri	Raw Swage	--	--	--	--	--	--	--	--	--	--	--
2	Dharmpuri	Black Water	--	24	--	--	65	--	--	7.48	--	32.8	--

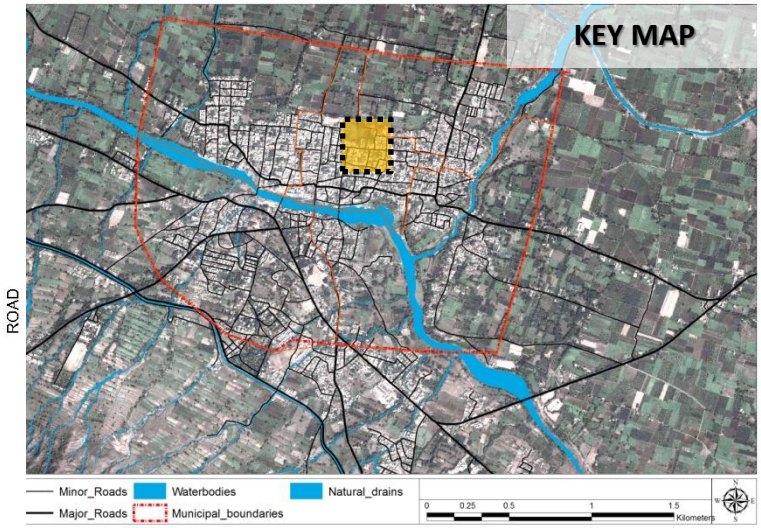
INSTITUTIONAL BULDINGS

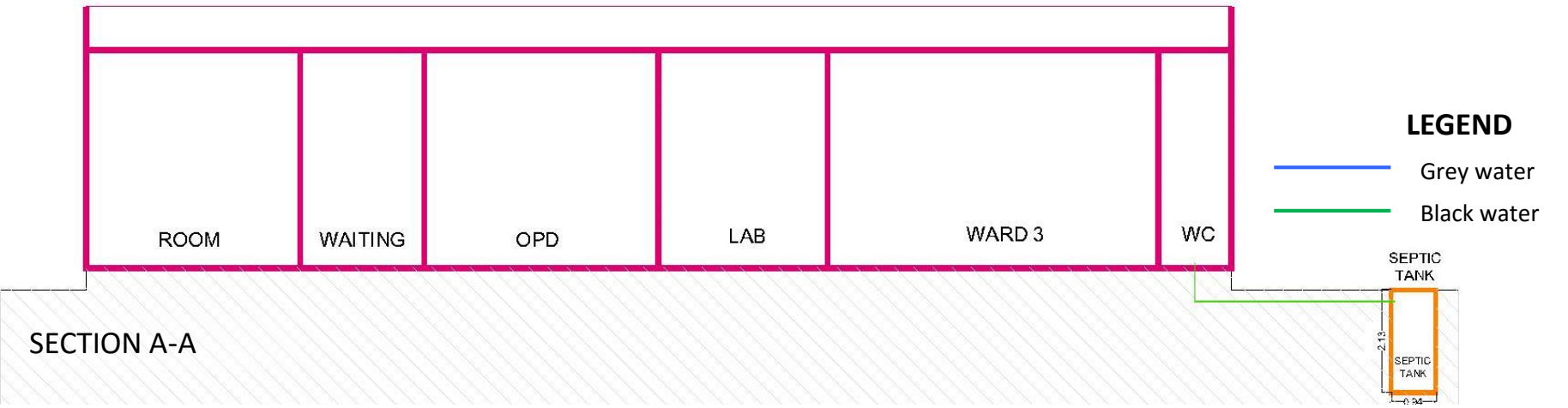


CASE 21: HOSPITAL *(PRABHAG 1)*



PLAN





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CASE 21: *HOSPITAL (PRABHAG 1)*

CASE 21: HOSPITAL (*Prabhag 1*)

Wai General Hospital

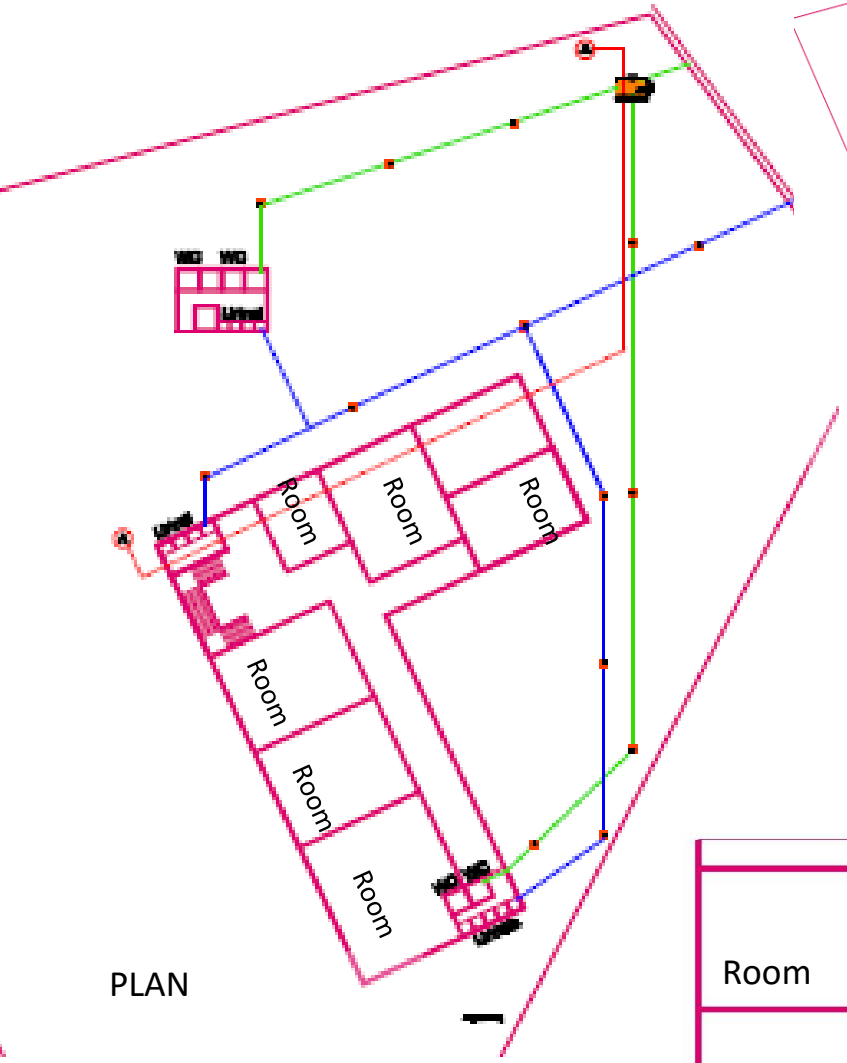
Users	Building type	Inputs to septic tank	Cleaning Frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
75	**G+1**	**Black Water**	**Once in every year**	**Year ago-2013**	**Daily (Water) & Weekly (Harpic)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)	**Volume of the tank** (Cum)
Size of the Septic tank (100 Users) (*As per Expert/Consultant)*	3.5	1.2	1.3 (Cleaning interval of one year)	5.46 (Cleaning interval of one year)
Actual Size of the tank (75 Users)	2.77	0.94	2.13	5.54
			Observation	**Adequately sized**

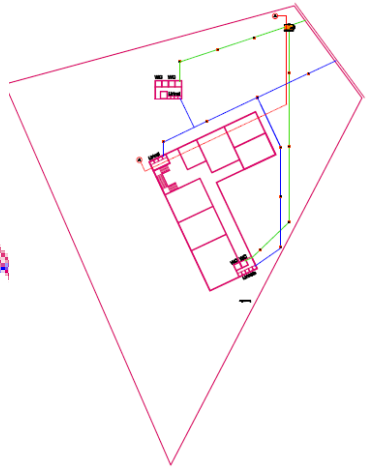
WATER QUALITY

Sr No	Location, Area	Waste water	**Parameters**											
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	*Wai Hospital*	Black Water	220	177	19.55		450			7.66	350	250	28.57	
2	*Wai Hospital*	Grey Water	--	--	--	--	--	--	--	--	--	--	--	

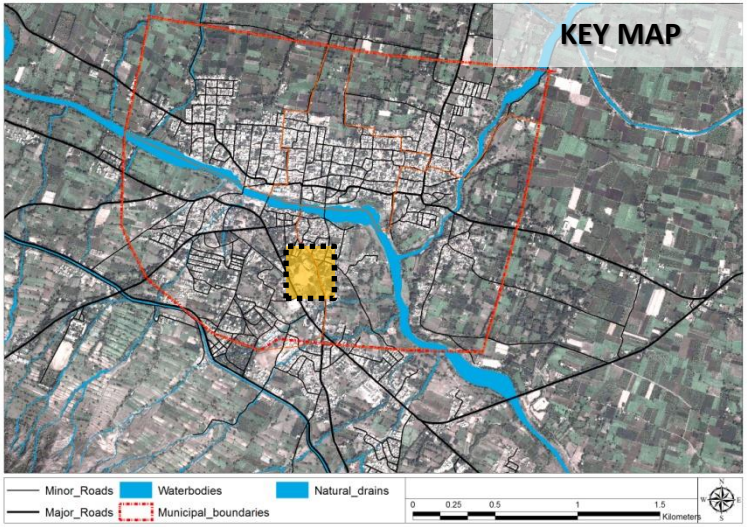
CASE 22: COURT BUILDING *(PRABHAG 5)*



PLAN



KEY PLAN

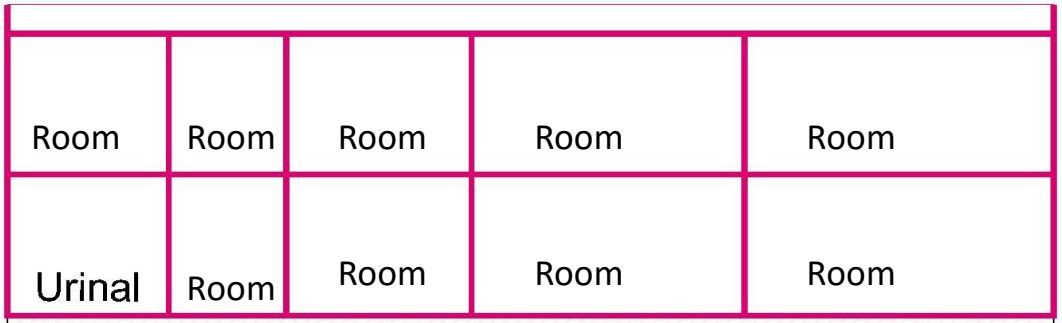


Room

LEGEND

Grey water

Black water



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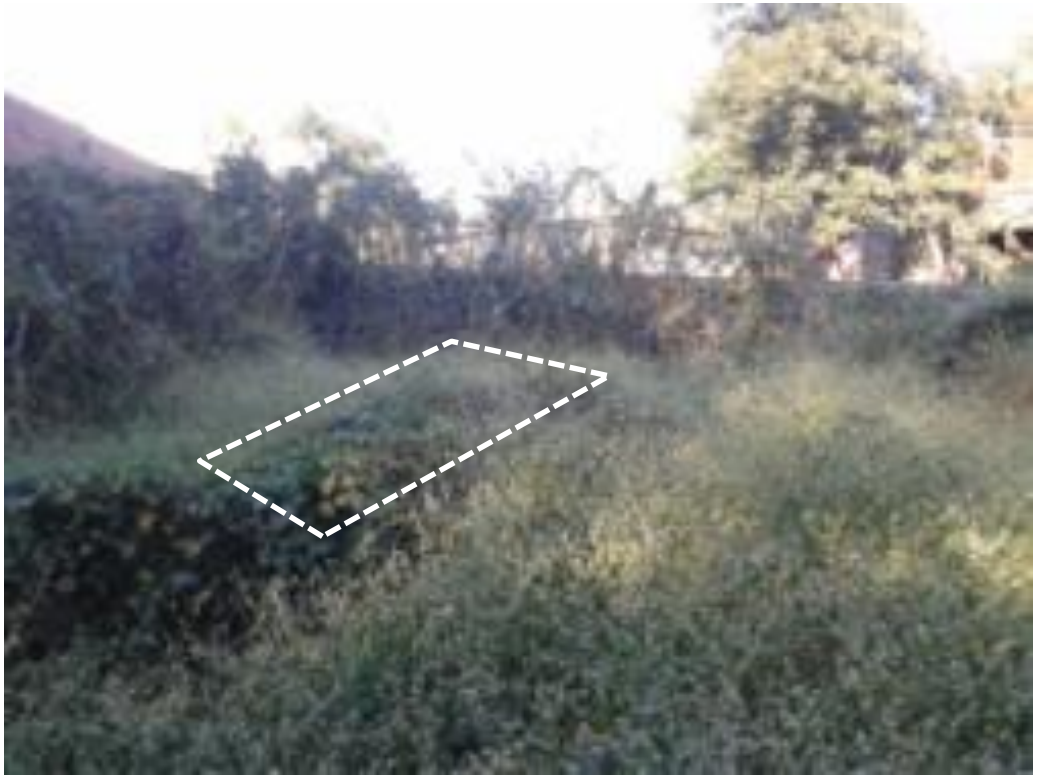
CASE 22: COURT BUILDING *(PRABHAG 5)*



CASE 22: COURT BUILDING (*Prabhag 5*)

Court building

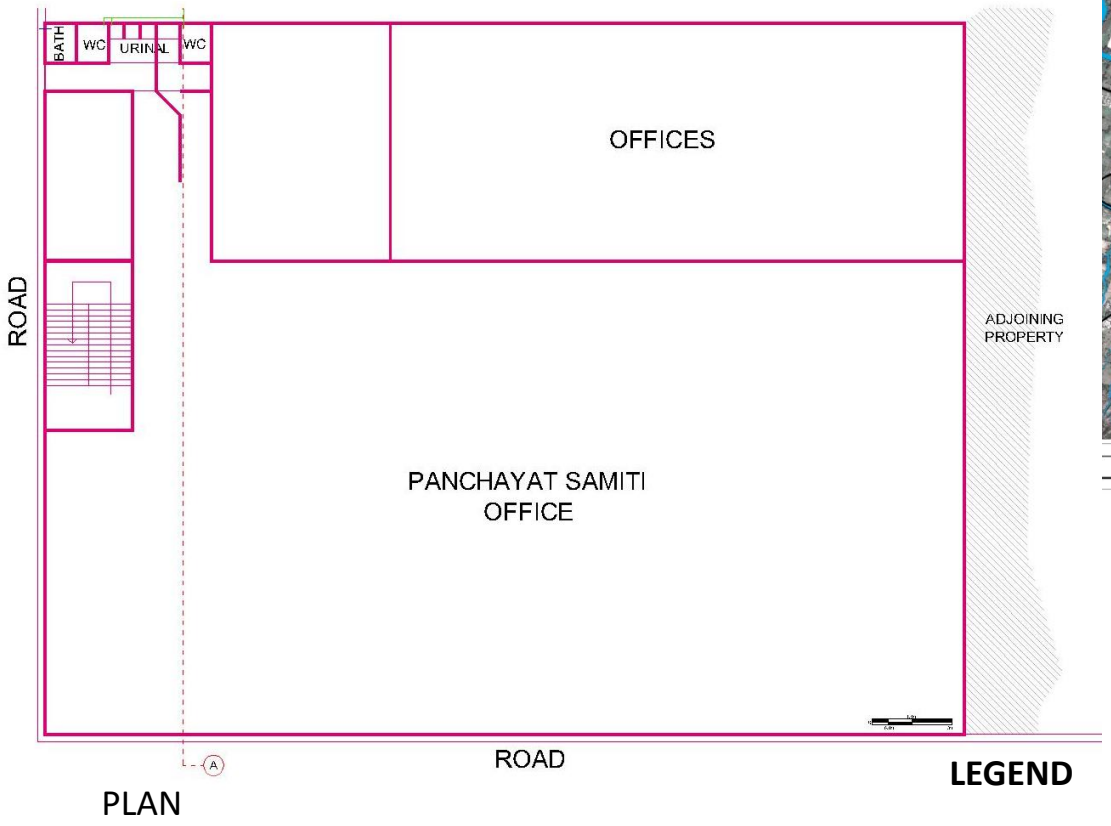
Users	Building type	Inputs to septic tank	Cleaning Frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
121	**G+1**	**Black Water**	**Nil**	**Not Cleaned (More than 10 years)**	**Daily (Water) & Weekly (Harpic)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)	**Volume of the tank** (Cum)
Size of the Septic tank (150 Users) (*As per Expert/Consultant)*	4.2	1.4	1.3 (Cleaning interval of one year)	7.46 (Cleaning interval of one year)
Actual Size of the tank (121 Users)	2.5	1.1	2.0	5.5
			Observation	**Undersized (25% Smaller)**

WATER QUALITY

Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	*Court building*	Black Water	--	--	--	--	--	--	--	--	--	--	--	
2	*Court building*	Grey Water	--	--	--	--	--	--	--	--	--	--	--	

CASE 23: *PANCHAYAT SAMITI (PRABHAG 5)*



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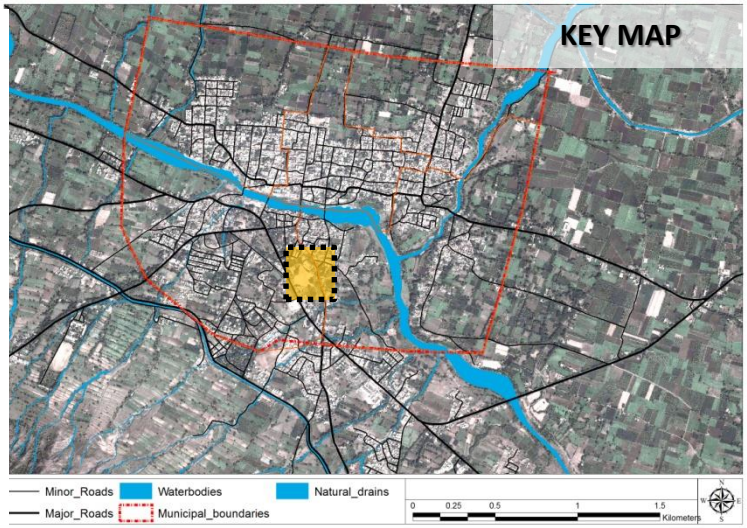


LEGEND

Grey water

Black water

SECTION A-A

CASE 23: *PANCHAYAT SAMITI (PRABHAG 5)*

CASE 23: PANCHAYAT SAMITI (*Prabhag 5*)

Panchayat Samiti

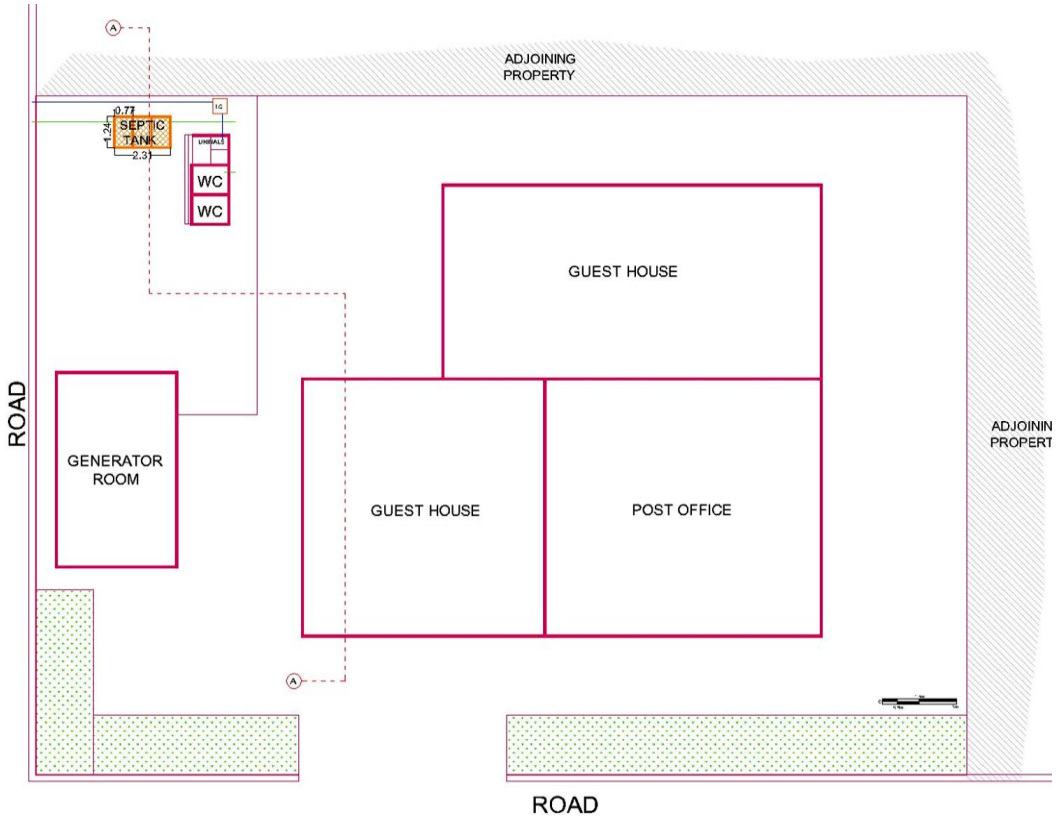
Users	Building type	Inputs to septic tank	Cleaning Frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
210	**G+1**	**Black Water**	**Nil**	**Not Cleaned (More than 8 years)**	**Daily (Water) & Weekly (Harpic)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)	**Volume of the tank** (Cum)
Size of the Septic tank (200 Users) (***As per Expert/Consultant)***	5	1.6	1.3 (Cleaning interval of one year)	10.4 (Cleaning interval of one year)
Actual Size of the tank (121 Users)	3.4	2.22	1.5	11.32
			Observation	**Oversized (9 % bigger)**

WATER QUALITY

Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
2	*Panchayat Samiti*	Black water	186	114	38	495	330	33	7.79	7.82	110	69	37	

CASE 24: POST OFFICE (PRABHAG 5)



PLAN

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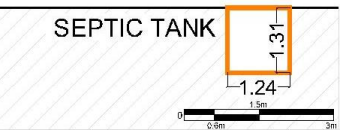
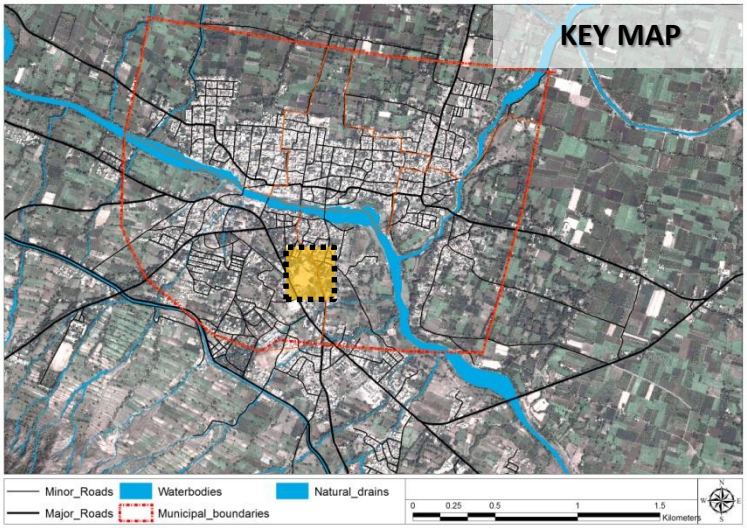


LEGEND

Grey water
Black water



CASE 24: POST OFFICE (PRABHAG 5)

CASE 24: POST OFFICE (*Prabhag 5*)

Post Office

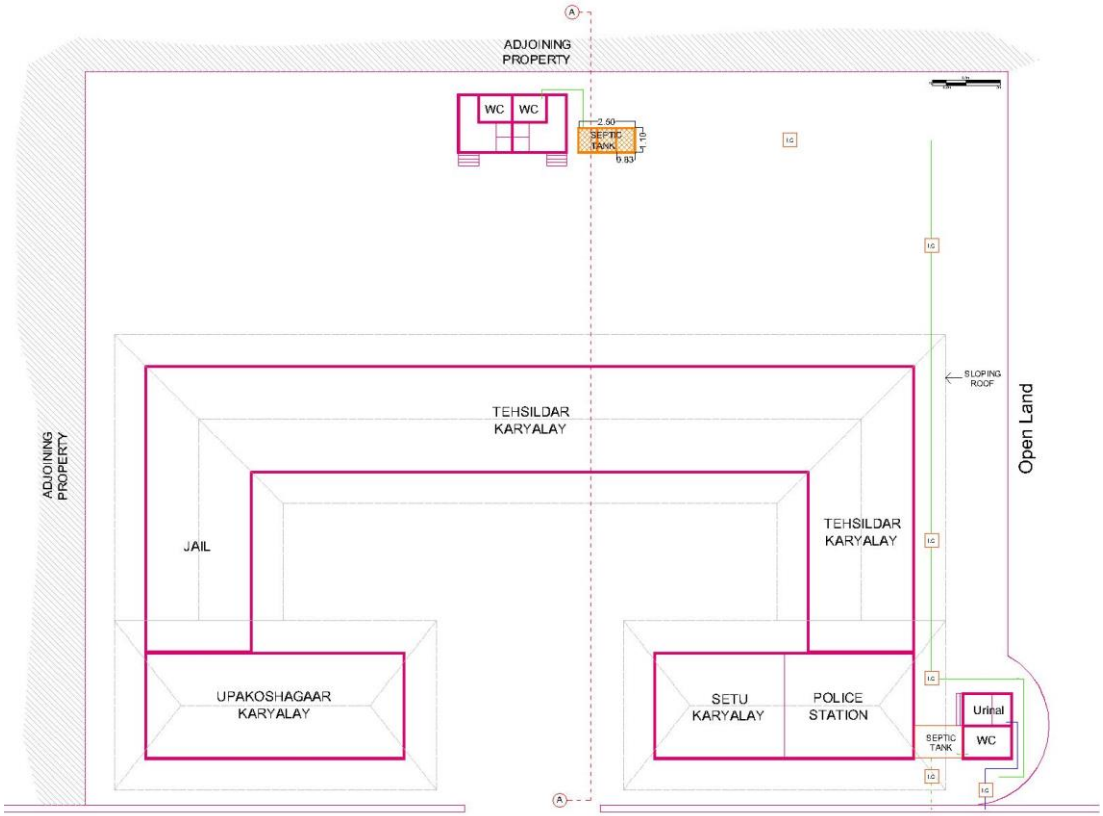
Users	Building type	Inputs to septic tank	Cleaning Frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
75	**Ground Floor**	**Black Water**	**Nil**	**Not Cleaned (More than 8-10 years)**	**Daily (Water) & Weekly (Harpic)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)	**Volume of the tank** (Cum)
Size of the Septic tank (100 Users) (*As per Expert/Consultant)*	3.5	1.2	1.3 (Cleaning interval of one year)	5.46 (Cleaning interval of one year)
Actual Size of the tank (75 Users)	2.31	1.24	1.31	3.75
			Observation	**Undersized (31% Smaller)**

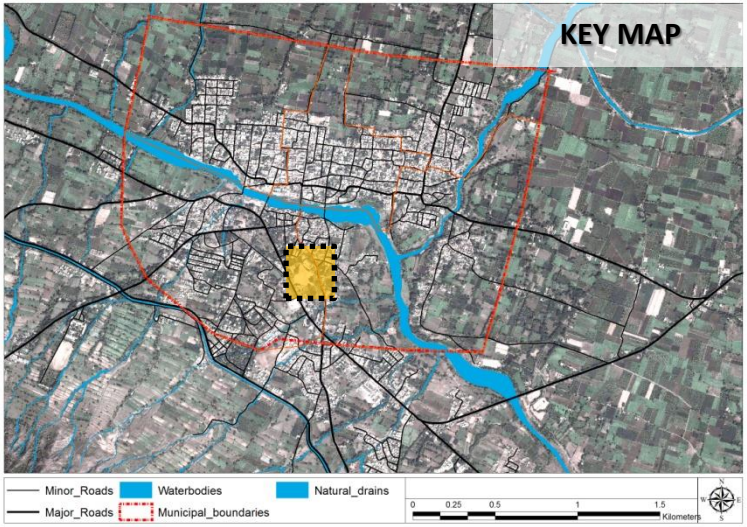
WATER QUALITY

Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	*Post Office*	Black water	--	--	--	--	--	--	--	--	--	--	--	

CASE 25: POLICE STATION, TEHSHIL OFFICE, COLLECTOR OFFICE (PRABHAG 5)



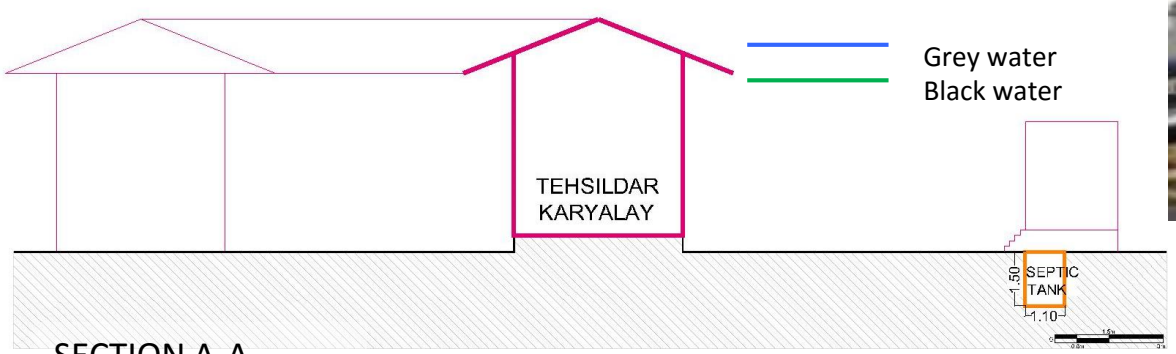
PLAN



LEGEND

Grey water

Black water



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CASE 25: POLICE STATION, TEHSHIL OFFICE, COLLECTOR OFFICE (PRABHAG 5)












CASE 25: POLICE STATION, TEHSHIL OFFCIE, COLLECTOR OFFICE (*Prabhag 5*)

Police station, *Tehshil* office, Collector office

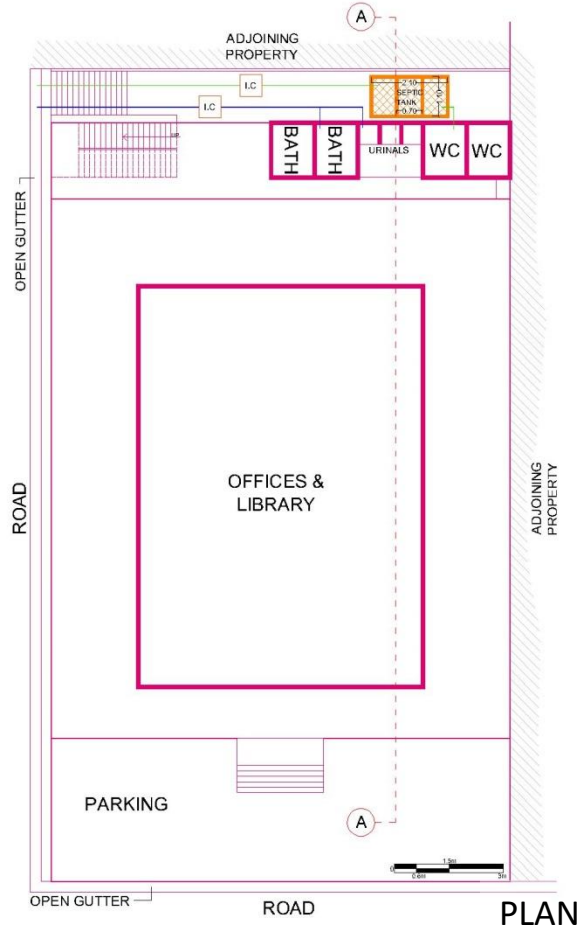
Users	Building type	Inputs to septic tank	Cleaning Frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
135	**Ground Floor**	**Black Water**	**Nil**	**Not Cleaned (More than 5-10 years)**	**Daily (Water) & Weekly (Harpic)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)	**Volume of the tank** (Cum)
Size of the Septic tank (150 Users) (***As per Expert/Consultant)***	4.2	1.4	1.3 (Cleaning interval of one year)	**7.64** (Cleaning interval of one year)
Actual Size of the tank (135 Users)	2.5	1.1	1.5	**4.125**
			Observation	**Undersized (46% Smaller)**

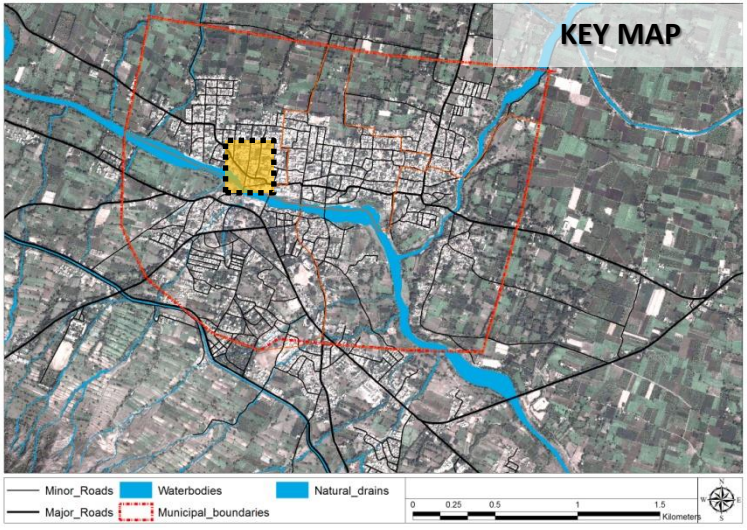
WATER QUALITY

Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	*Police station*	Black water	420	330	21	1120	895	20	--	7.46	625	588	5	

CASE 26: VISHWAKOSH EDUCATION CENTER (PRABHAG 1)



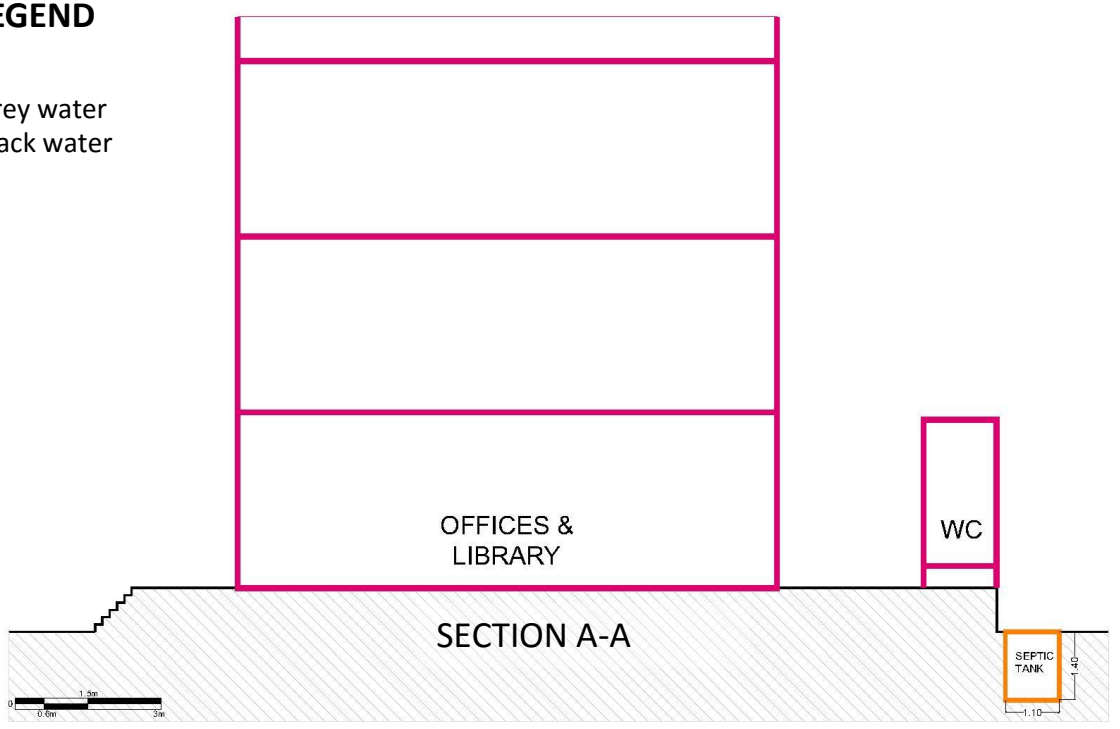
PLAN



LEGEND

Grey water

Black water



CASE 26: VISHWAKOSH EDUCATION CENTER (PRABHAG 1)

CASE 26: VISHWAKOSH EDUCATION CENTER (*Prabhag 1*)

Police station, *Tehshil* office, Collector office

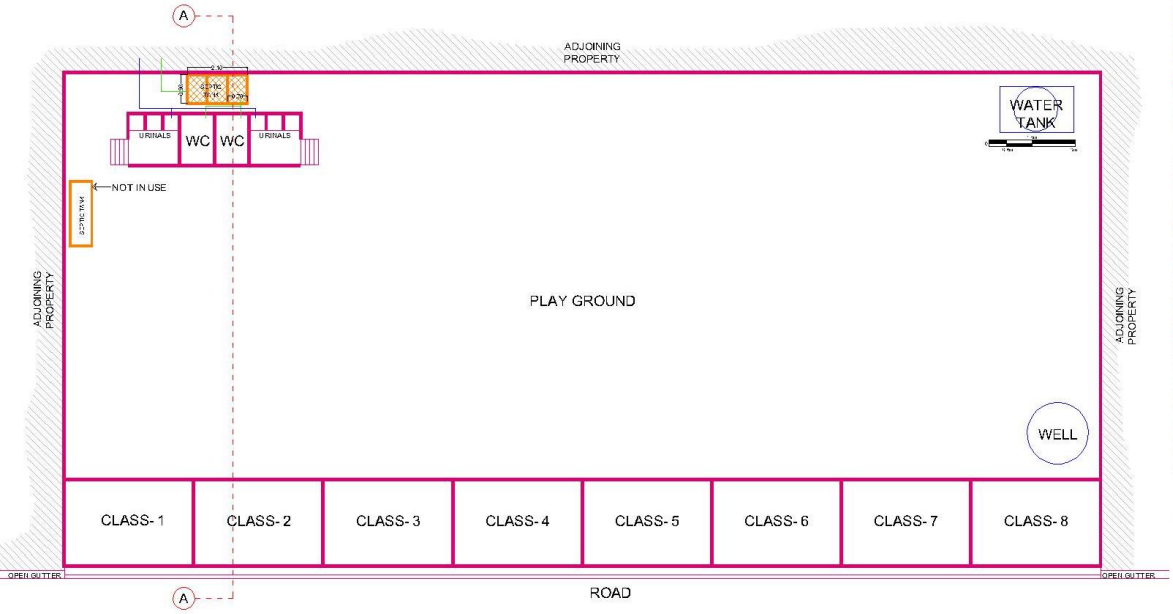
Users	Building type	Inputs to septic tank	Cleaning Frequency of ST	When was the septic tank last emptied?	How toilet is cleaned?
45	**G+2**	**Black Water**	**Nil**	**Not Cleaned (More than 5-6 Years)**	**Daily (Water) & Weekly (Harpic)**

	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)	**Volume of the tank** (Cum)
Size of the Septic tank (50 Users) (*As per Expert/Consultant)*	2.5	0.8	1.3 (Cleaning interval of one year)	**2.6** (Cleaning interval of one year)
Actual Size of the tank (45 Users)	2.5	1.1	1.4	**3.2**
			Observation	**Oversized (23% Bigger)**

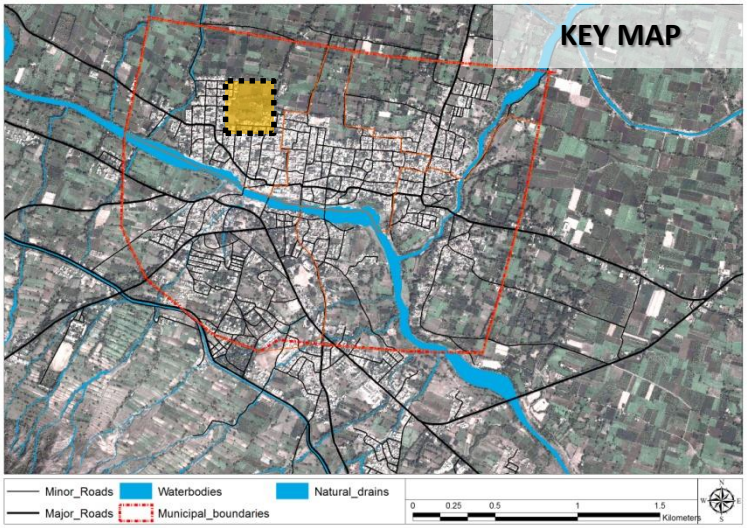
WATER QUALITY

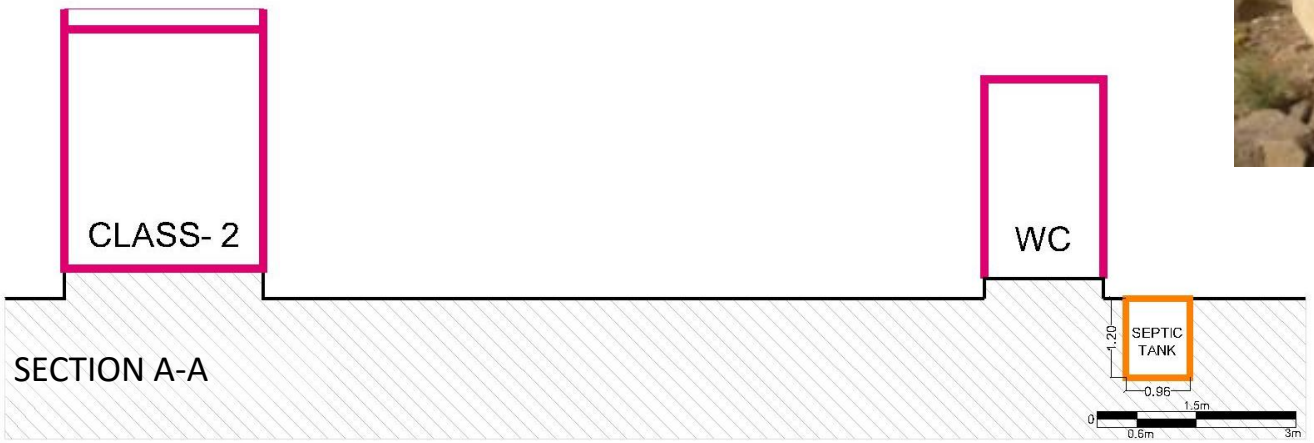
Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			**COD (mg/l)**			**pH**		**TSS (mg/l)**			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	*Vishwakosh*	Black water	--	156	--	--	205	--	--	7.45	--	128	--	

CASE 27: SCHOOL (MARATHI) (PRABHAG 1)



PLAN





SECTION A-A

LEGEND

Grey water

Black water

CASE 27: SCHOOL (MARATHI) (PRABHAG 1)

CASE 27: SCHOOL (*MARATHI)* (*Prabhag 1*)

Police station, *Tehshil* office, Collector office

Users	Building type	Inputs to septic tank	Cleaning Frequency of ST	Cleaning frequency of the tank	How toilet is cleaned?
264	**G**	**Black Water**	**Nil**	**Not Cleaned (More than 5 years)**	**Daily (Water) & Weekly (Harpic)**

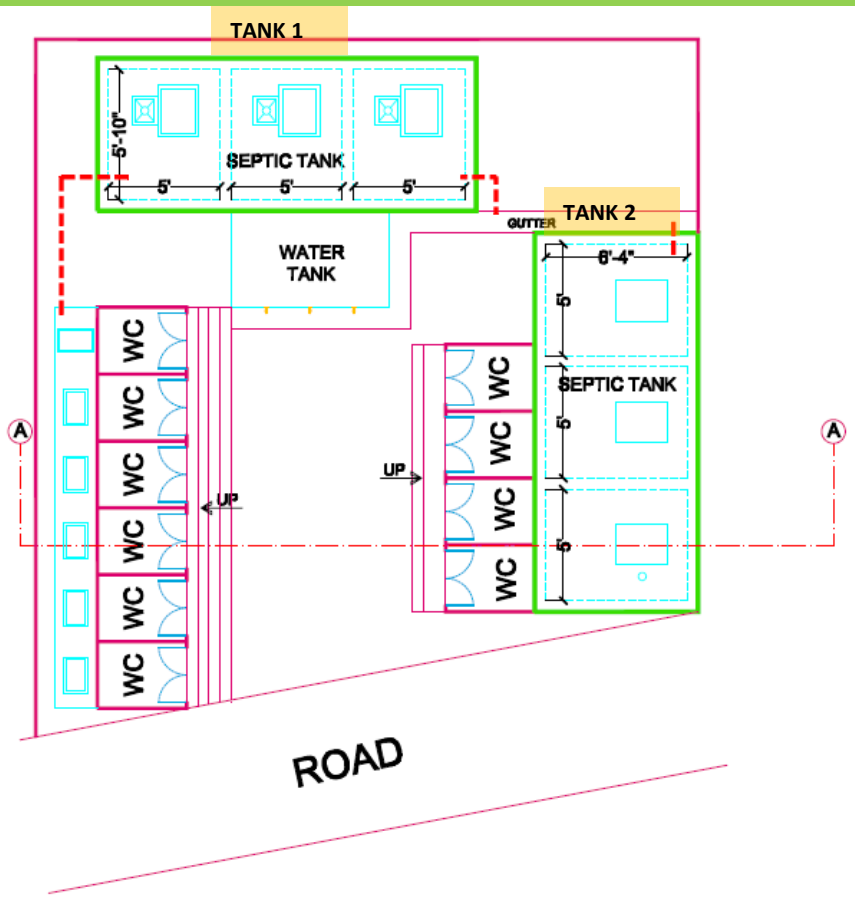
	Length (m)	**Breadth (m)**	**Height (m)** (300mm free board has been considered)	**Volume of the tank** (Cum)
Size of the Septic tank (300 Users) (***As per Expert/Consultant)***	6.0	2.06	1.3 (Cleaning interval of one year)	**15.6** (Cleaning interval of one year)
Actual Size of the tank (264 Users)	2.1	0.94	1.2	**2.41**
			Observation	**Undersized (85% Smaller)**

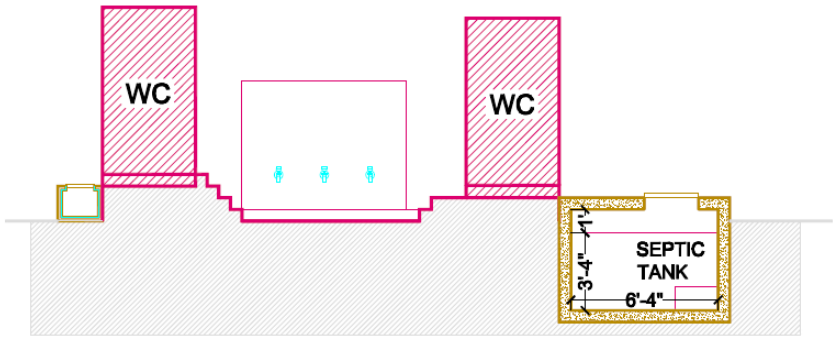
WATER QUALITY

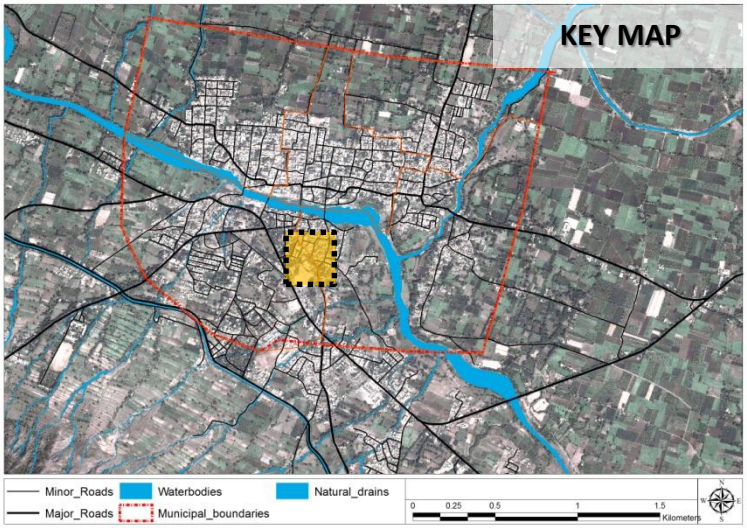
Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	*School*	Black water	354	307.5	13	935	865	7	8.85	8.21	456	288	36	

COMMUNITY TOILET

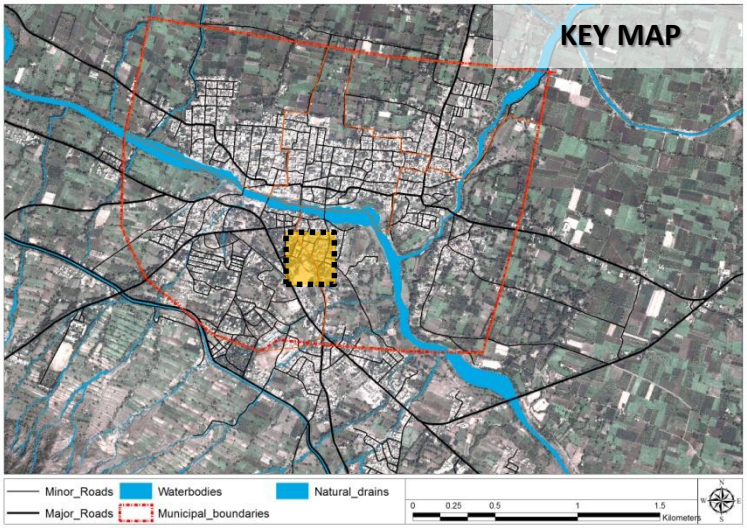
CASE 1: COMMUNITY TOILET (Opposite Police station) (*PRABHAG* 5)







CASE 1: COMMUNITY TOILET (Opposite Police station) (*PRABHAG* 5)



CASE 1: COMMUNITY TOILET (Opposite Police station) (*PRABHAG* 5)

The following **norms** for number of seats, urinals, bathrooms and area for washing may be adopted:

Sr. No	Type of toilets	Toilet Seats	Bath units	Urinal units	Clothes Washing area
1	Community Toilet	One seat per 50 users	One unit per 50 users	One unit per 2003-300 users	4 to 5 square meter per 10 toilet seats; Min.1.5 m x 1.2 m
2	Public toilet near railway stations (may be used at all hours)	One seat per 100 users	One unit per 70 users	One unit per 300-500 users	4 to 5 square meter per 30 toilet seats; Min.1.5 m x 1.2 m
3	Public toilet near market place/offices (will mostly be used during working hours)	One seat per 100 users	One unit per 200-300 users	One unit per 200-300 users	4 to 5 square meter 10 toilet seats; Min.1.5m x 1.2 m

Source: The guidelines for community toilet , 1995, *Ministry of urban affairs & employment , Government of India*

Note: The numbers of toilet seats, baths, urinals and washing area given in the table have been derived from the conclusions made during and data collected from the primary survey.

Note: The number of users assumed in the further assessment is 35 persons per seat.
This assumed number of users has been concluded from the experiences and data collected during the primary survey.

In all the further calculations, even though the number of users per seat have been assumed as per the learning's from the primary surveys, the methodology used for calculating the volume of septic tanks is based on the CPHEEO guidelines and the IS Code

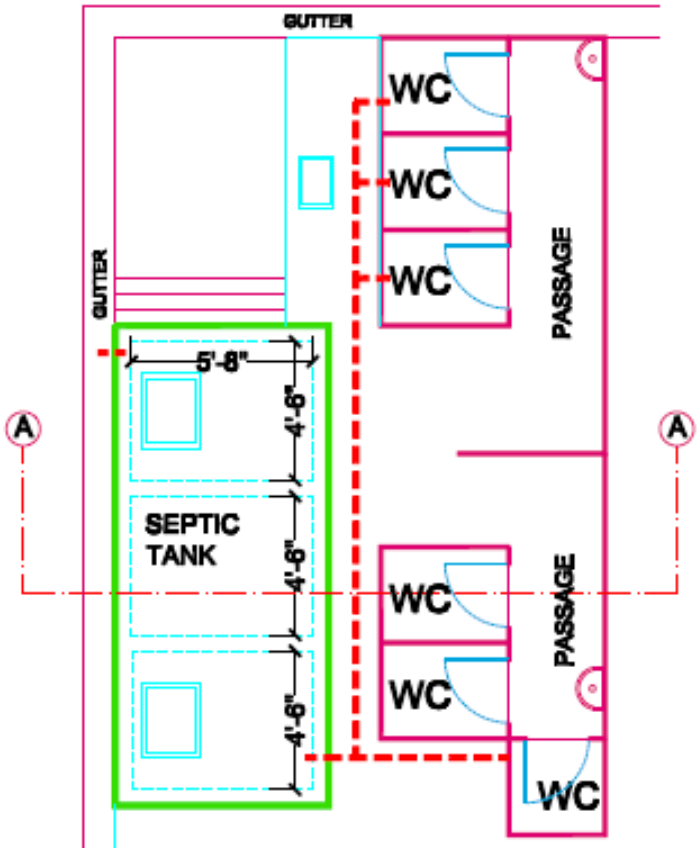
CASE 1: COMMUNITY TOILET (Opposite Police station) (*PRABHAG* 5)

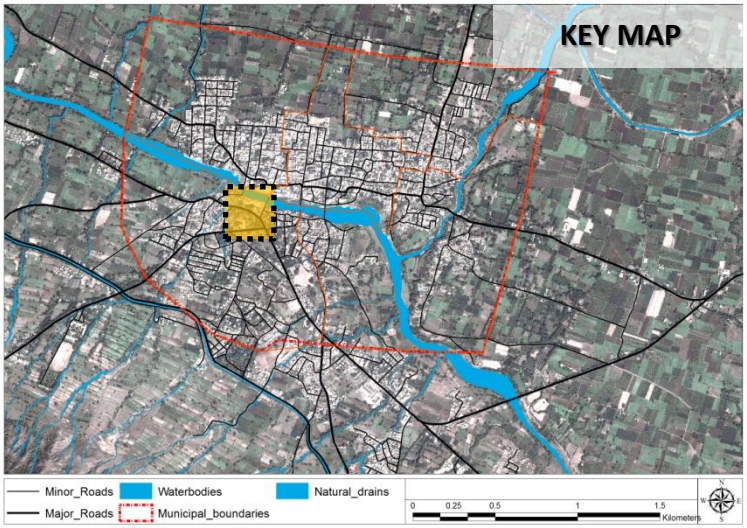
Users	Building type	Inputs to septic tank	Cleaning frequency of the tank	How toilet is cleaned?
140-210	Community toilet	Black water	Once In Every 8-10 days	Daily

	Length (m)	Breadth (m)	Height(m) (300 mm free board has been considered)	Volume of the septic tank (Cu m)
Actual Size of the tank 1	4.5	1.8	1.3	**10.53**
Actual Size of the tank 2	4.5	1.95	1.5	**13.16**
Size of the Septic tank (140 Users) (Calculated based on certain assumption for same has been mentioned in previous slide)	6.02	2.01	1.34	**16.16** (One year Cleaning Interval)
Size of the Septic tank (210 Users) (Calculations based on certain assumption for same has been mentioned in previous slide)	6.87	2.29	1.54	**24.25** (One year cleaning interval)
References: Indian Standards (2470 (PART 1) -1958), " Code of practices for installation of septic tanks", Design criteria and construction (Second revision) CPHEEO manual 2013 (Chapter 9)				**Undersized** **Tank 1 (35% Smaller)** **Tank 2 (46% Smaller)**

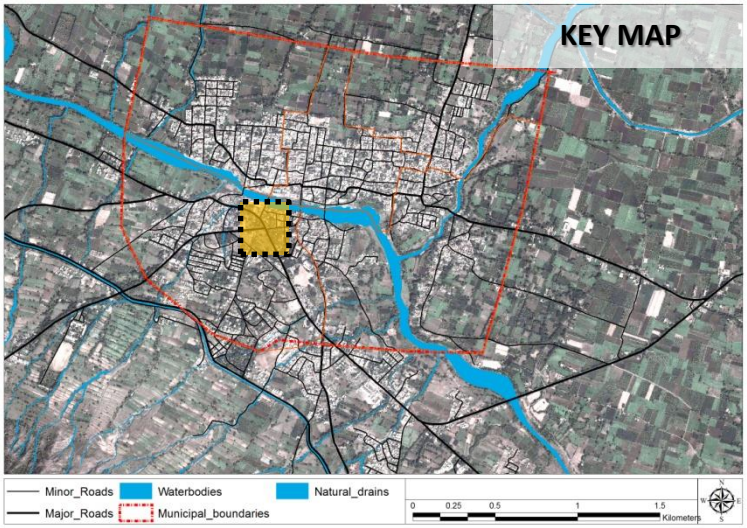
Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	

CASE 2: COMMUNITY TOILET (Opposite Bus Stand) (*PRABHAG* 5)





CASE 2: COMMUNITY TOILET (Opposite Bus Stand) (*PRABHAG* 5)



CASE 2: COMMUNITY TOILET (Near Bus Station) (*PRABHAG* 5)

Users	Building type	Inputs to septic tank	Cleaning frequency of the tank	How toilet is cleaned?
210	Community toilet	Black water	Once in a every 8-10 days	Weekly

	Length (m)	Breadth (m)	Height(m) (300 mm free board has been considered)	Volume of the septic tank (Cu m)
Actual Size of the tank	4.5	2.0	1.8	**16.2**
Size of the Septic tank (210 Users) (Calculated based on certain assumption for same has been mentioned in previous slide)	7.37	2.29	1.34	**24.25** (One year cleaning interval)

References:
Indian Standards (2470 (PART 1) -1958), " Code of practices for installation of septic tanks", Design criteria and construction (Second revision)
CPHEEO manual 2013 (Chapter 9)
The capacities are recommended on the assumption that the discharges from only WC will be treated in the septic tank.

Undersized (33% Smaller)

Sr No	Location, Area	Waste water	Parameters											
			BOD (mg/l)			COD (mg/l)			pH		TSS (mg/l)			
			Inlet	Outlet	% Reduction	Inlet	Outlet	% Reduction	Inlet	Outlet	Inlet	Outlet	% Reduction	
1	Near Bus stand	Black Water	--	705	--	--	1880	--	--	7.52	--	318	--	

ANALYSIS-

Design Parameters
Water Quality Assessment

GENERAL OBSERVATION-SEPTIC TANKS

VENTILATION PIPES:
In some of the cases no ventilation pipes have been provided to the septic tanks. This is leading to significant odour problems in the vicinity

ACCESSIBILITY:
In few cases the septic tanks are not accessible for maintenance and repairs. This is probably due to location of them below the toilet blocks

OUTFALL:
In newly developed areas effluents from the septic tank are let off into soak pits or nearby areas. In the old city areas these effluents are let-off directly into open/ closed gutters.

DESIGN:
All the septic tanks in the cases studied are rectangular in shape with 2 baffles and 3 chambers. Only one case (case no 9) have precast septic tank.

METHOD OF CONSTRUCTION:
Only in a single case, the septic is precast and circular in shape. Rest all the cases have septic tanks constructed on-site

BAFFLES:
In all the cases the septic tanks have been provided with two baffles which separate the tanks into 3 compartments (seen in precast as well)

INPUTS TO SEPTIC TANK:
In all the cases only black water is let-off into the septic tanks. The grey water is directly let-off into nearby drains

MAINTENANCE:
For timely maintenance of the septic tanks adequate number of openings have been provided. The problem is that the openings have been permanently sealed leading to breakage and no re-usability of the lid

MATERIALS:
Almost all the septic tanks in the cases studied have been constructed in brick masonry with cement plastering and RCC lid on top

ANALYSIS- General Observations

Overall Cleaning Practices	For daily cleaning of the toilets/ bathrooms water is used. But chemical detergents such as *Harpic*, *Domex* are used for cleaning once in a week
Septic Tank Cleaning	Out of the total cases studied the septic tanks were never cleaned in 14 cases, in 6 cases it was cleaned one time or more than two times.

Following table shows the septic tank cleaning practices in Wai town (Based on samples):

Case no	Year of construction of Septic tank	Age of the Septic tank (Year)	Cleaning Frequency of ST	When septic tank last emptied?
1	2010	4	Nil	Not cleaned yet**
2	2004-05	10	Nil	Not cleaned yet **
3	2001	13	Nil	Not cleaned yet **
4	2002	12	Nil	Not cleaned yet **
5	2012	2	Nil	Not cleaned yet **
6	1988	26	More than 8-10 times	2012
7	2007-08	7	Nil	Not cleaned yet **
8	2004-05	10	Nil	Not cleaned yet **
9	2007-08	7	Nil	Not cleaned yet **
10	2011-12	3	Nil	Not cleaned yet **

**Not cleaned indicates the septic tank has not been cleaned till date

ANALYSIS- General Observations

Case no	Year of construction of Septic tank	Age of the Septic tank (Year)	Cleaning Frequency of ST	When septic tank last emptied?
11	2008	6	Nil	Not cleaned yet**
12	2007	7	Nil	Not cleaned yet**
13	2011-12	3	Once in every year	2013
14	2012	3	Nil	Not cleaned yet**
15	1982	32	One time	2009
16	2001	13	One time	2011
17	2000	14	Nil	Not cleaned yet**
18	2003	11	Once in two year	March 2014
19	1987	27	More than two times	Two years ago-2012
20	2000	4	One time	Two years ago-2012

**Not cleaned indicates the septic tank has not been cleaned till date

Cleaning Frequencies of the Septic Tanks:

Out of the total cases studied the septic tanks can be divided into 3 categories on the basis of their cleaning frequencies:

a.) Tanks never cleaned or cleaned before 5 years: 13 cases
b.) One time cleaned: 3
c.) More than two times or Regularly clean (Once every one or two year): 4

•*Above conclusions show there is severe need of spreading awareness related to cleaning and proper maintenance of the septic tanks in the users.*

*** It has also been observed that the general awareness of the people in the cases studied related to the use of toilets and the maintenance of Septic tanks is lacking.**

ANALYSIS- Design Parameters of septic tank

RESIDENTIAL PROPERTIES					Volume of the Septic tank (cum)				
Case No	Building type	Users (Actual)	Users considered	Age of Septic tank (Year)	Actual	AS PER CPHEEO manual (2013) (Cleaning interval of three years)	When was the septic tank last emptied??	Observations**	PERCENT (Smaller/ Bigger)
1	Individual plot (G)	2	5	4	2.03	1.52	Not cleaned**	Oversized	+ 34%
2	Bungalow (G+1)	5	5	10	2.93	1.52	Not cleaned**	Oversized	+ 93%
3	Row House (G+1)	6	5	13	2.93	1.52	Not cleaned**	Oversized	+ 93 %
4	Bungalow (G+1)	16	20	12	3.42	4.76	Not cleaned**	Undersized	- 17 %
5	Individual plot (G)	4	5	2	3.02	1.52	Not cleaned**	Oversized	+ 99%
6	Group Housing (G+2)	60	50	26	4.5	15.50	In year 2012	Undersized	- 71%
7	Individual plot (G)	5	5	7	4.10	1.52	Not cleaned**	Oversized	+ 170%
8	Bungalow (G+1)	5	5	10	3.78	1.52	Not cleaned**	Oversized	+ 149%
9	Individual plot (G)	3	5	7	3.02	1.52	Not cleaned**	Oversized	+ 99%
10	Individual plot (G+1)	11	10	3	4.83	3.06	Not cleaned**	Oversized	+ 58%
11	Individual plot (G)	4	5	6	2.64	1.52	Not cleaned**	Oversized	+ 74%
12	Apartment (G+2)	40	50	7	7.23	15.40	Not cleaned**	Undersized	- 53%

Continued.....

**Not cleaned indicates the septic tank has not been cleaned till date

ANALYSIS- Design Parameters of septic tank

RESIDENTIAL PROPERTIES					Volume of the Septic tank (cum)				
Case No	Building type	Users (Actual)	Users considered	Age of Septic tank (Year)	Actual	AS PER CPHEEO manual (2013) (Cleaning interval of three years)	When was the septic tank last emptied??	Observations	PERCENT(%) ** Smaller/ Bigger
13	Apartment (G+2)	30	50	3	5.85	15.40	Not cleaned**	Undersized	- 53%
14	Individual plot (G)	4	5	3	3.24	1.52	Not cleaned**	Oversized	+ 113%
15	Individual plot (G+1)	2	5	32	7.29	1.52	Not cleaned** (More than Two years)	Oversized	+ 380%
16	Apartment (G+2)	80	100	13	5.93	30.61	Not cleaned** (More than three years)	Undersized	- 81%
17	Bungalow (G)	5	5	14	5.98	1.52	Not Cleaned**	Oversized	+ 293%
18	Bungalow (G)	5	5	11	5.83	1.52	Jan 2012	Oversized	+ 284%
19	Bungalow (G+1)	2	5	27	3.15	1.52	In year 2011	Oversized	+ 107%
20	Apartment (G+2)	20	20	4	4.41	5.31	In a year 2010	Undersized	- 17 %

**Not cleaned indicates the septic tank has not been cleaned till date

ANALYSIS- Design Parameters of septic tank

RESIDENTIAL PROPERTIES			
Sr. No.	**Analysis**	**%**	**Note**
1	**Oversized**	70% (14 Nos.)	From the analysis it is observed that the capacity of the septic tank is additional for the users up to 10-15, as it clearly indicated in table that the contractors are following standard design for every households within the city.
2	**Undersized**	10% (2 Nos.)	For users above 20, capacity of the tanks is not adequate, therefore it has to reconstructed as per standard for better result.
3	**Adequate Sized**	20% (4 Nos.)	Case no 4 & case no 20 which have followed the design standards.
TOTAL		**100% (20 Nos.)**	--

Note:

*CPHEEO 2013 manual is used for the analyzed the septic tank scenario in the city.

** for the analysis the actual volume of the septic tank is compared to the standard volume.

*** IS Code 2470 (Part 1) is also used for the analyzing septic tanks.

ANALYSIS- Comparison of Design Parameters of septic tank

As per IS Code		Current Practices Observed	
Parameter	**Criteria**	**Y/N**	**Observation from the case studies**
Design	Usually the design of a septic tank must be rectangular or circular Rectangular Tanks: length must be 2 to 4 times the width Circular: Diameter must be 1.35 meter (minimum)	Y	Design of the septic tanks observed has been as per the standards. Majority of the septic have followed the minimum dimensions
Construction Technique/ Materials	The walls and floor of the septic tank must be of thickness to provide adequate strength and water tightness. Thickness: for brick work 200 mm thick with 12 mm thick plaster, for stone masonary minimum thickness must be 370 mm	Y	All the cases have the septic tanks built in brick masonry and are built as per standards
No. of Baffles	If ST volume exceeds 2000 litres, tank must be divided into two chambers. It must be divided using a fixed durable partition. Suitable openings must be provided to the partitions (100 to 150mm opening/dia)	Y	Mostly the septic tanks have 2 baffles and 3 compartments with adequate openings in the partitions
Openings	Each compartment of the tank must have an opening (Rect. - min 455x610 mm/ Circ. -min. 500 mm dia.) Cover to this opening: RCC or of Cast Iron Must be removable and must be sealing the opening properly	N	In all the cases, the septic tanks have adequate number of openings. The problem is that the opening have been sealed, which leads to breakage in case of maintenance

* The above table shows a comparison between the design parameters as per the IS Code with the observations made of the cases studied in the site visit

ANALYSIS- Design Parameters of septic tank

As per IS Code		Current Practices Observed	
Parameter	**Criteria**	**Y/N**	**Observation from the case studies**
Ventilation	Every tank must have a ventilation pipe (50mm dia) with a suitable cage/ mesh on top Height of pipe: 2m if tank is 20 mtr or more away from building, 2m above building top if tank is closer than 20 mtr to the building	N	In several cases the septic tanks have ventilation pipes, the desired height (minimum 2 m) of the ventilation pipe described as per standard has not been followed in many cases.
Accessibility/ Location	Location should be open to sky, as far as possible from the exterior wall of a building, should not be located in swampy areas or flood prone areas	N	Locations are as per standards and mostly the septic tanks are accessible
Outfall of ST	Effluent should not be let-off into an open channel drain or water body	N	Effluents in most of the cases is let-off into open/ closed drains. In few cases it is let-off into soak pits
Cleaning Practices	Large tanks must be cleaned on half yearly/ yearly basis. For domestic tanks cleaning must be done once in two years	N	Very few septic tanks are regularly cleaned. Awareness related to cleaning of septic tanks is less

Y – as per IS Code and N – not as per the standards

ANALYSIS- Design Parameters of septic tank

INSTITUTIONAL BUILDINGS					Volume of the Septic tank (cum)				
Case No	Building type	Users (Actual)	Users considered	Age of Septic tank (year)	Actual	Calculations based on experience of experts/ consultants (Cleaning interval of one year)	When was the septic tank last emptied??	Observations	PERCENT(%) ** Smaller/ Bigger
21	Hospital (G+1)	75	100	28	5.54	6.46	Once in a two year	Adequately sized	+ 1%
22	Court Building (G+1)	121	150	52	5.5	9.05	Not Cleaned**	Undersized	- 25%
23	Panchayat Office (G+1)	210	200	27	11.32	12.32	Not Cleaned**	Adequately sized	+ 9%
24	Post Office (G)	75	100	34	3.75	6.46	Not Cleaned**	Undersized	- 31%
25	Police Station, Tehshil Office, Collector off. (G)	135	150	32	4.12	9.05	Not Cleaned**	Undersized	- 46%
26	Vishwakosh Karyalaya (G+2)	45	50	52	3.2	3.05	Not Cleaned**	Adequately sized	+ 23%
27	School (G)	264	300	24	2.41	18.48	Not Cleaned**	Undersized	- 85%

NOTE:

- In case of institutional buildings majority of the existing septic tanks are undersized.
- Cleaning frequency of septic tank is almost nil, the municipality & intuitional administrative department is not given any attention to this sector.
- The sewage generation is taken 20 PLCD for the institutional buildings. And for the design IS Code 2470 has been followed.
- **Not cleaned indicates-As per information gathered from current employees the septic tanks have not been cleaned since(10-15 years) they are working- and information prior to that could not be collected.**

**Not cleaned indicates the septic tank has not been cleaned till date

ANALYSIS- Design Parameters of septic tank

Community toilet				Volume of the Septic tank (cum)				
Case No	Building type	Users (Actual)	Users considered	Actual	Calculations based on experience of experts/ consultants (Cleaning interval of one year)	Cleaning Frequency	Observations	PERCENT(%) **Smaller/ Bigger
1	Near police station (Tank 1)	140-210	200	10.53	60.98	Once in every 8-10 days	Undersized	- 35%
2	Near police station (Tank 2)			13.16	60.98	Once in every 8-10 days	Undersized	-46%
3	Opposite Bus stand	210	200	16.2	60.98	Once in every 8-10 days	Undersized	- 33%

Note:

•In both cases the size of septic tank is not sufficient, the local body have to clean this tank once in a every month because the tank is fill in very short period of time. After that suspended solids come along with outlet and creates unhygienic condition.

•For analyzing of septic tank 35 users per seat has been considered and detention period is 24 hours. IS code 2470 is also used.

Notes:

*The septic tank reduces BOD up to 50% ***. (Source-CPHHEO manual 2013, Chapter 9, Section 9.1.2.2)***

****Conventional Septic tank removal efficiency -*** if properly designed and with proper septage removal frequency can effectively remove about 40-50% BOD and 50-70% TSS***. (Source-CPHHEO manual 2013, Chapter 9, Section 9.1.2.3)***

****For comparing the BOD results of samples, few samples were collected from Inspection chambers to analyze Inlet BOD. It varied in the range of 100 to 600. It was considered as influent BOD value against which effluent values were compared. It is considered only for cases in residential areas. This has been explained in the next slide.***

Sample Collection Technique







ANALYSIS- Functioning of septic tanks

RESIDENTIAL PROPERTIES		QUALITY ASSESSMENT				
Case study No.	Inlet BOD (mg/l)	Outlet BOD (mg/l)	% (Reduction of BOD)	Cleaning Frequency of ST	When septic tank last emptied?	Note
1	--	84	--	Nil	Not cleaned yet	Septic tank inlet pipe is concealed
2	--	31.8	--	Nil	Not cleaned yet	Septic tank inlet pipe is concealed
3	Sample not collected due to inaccessibility					
4	Sample not collected due to inaccessibility					
5	--	14.1	--	Nil	Not cleaned yet	Septic tank inlet pipe is concealed
6	101.3	78	23%	More than 8-10 times	2012	Defunct, Septic tank is not clean frequently
7	Sample not collected due to inaccessibility					
8	--	135	--	Nil	Not cleaned yet	Septic tank inlet pipe is concealed
9	--	228	--	Nil	Not cleaned yet	Septic tank inlet pipe is concealed
10	--	153	--	Nil	Not cleaned yet	Septic tank inlet pipe is concealed
11	--	108	--	Nil	Not cleaned yet	Septic tank inlet pipe is concealed
12	138	112.5	18%	Nil	Not cleaned yet	Defunct, Septic tank has not been cleaned past 5-6 years
13	109	42	61%	Once in a every year	2013	Functioning well
14	--	93	--	Nil	Not Cleaned yet	Septic tank inlet pipe is concealed
15	--	52.3	--	One Time	20009	Septic tank inlet pipe is concealed

ANALYSIS- Functioning of septic tanks

RESIDENTIAL PROPERTIES		QUALITY ASSESSMENT				
Case study No.	**Inlet BOD (mg/l)**	**Outlet BOD (mg/l)**	**% (Reduction of BOD)**	**Cleaning frequency of ST**	**When septic tank last emptied?**	**Note**
16	142	115	19%	One time	2011	Defunct, Septic tank has not been cleaned past 5-10 years
17	--	195	--	Nil	Not cleaned yet	Septic tank inlet pipe is concealed
18	--	102	--	Once in two year	March 2012	Septic tank inlet pipe is concealed
19	--	185	--	More than two times	Two years ago-2012	Septic tank inlet pipe is concealed
20	--	24	--	One time	Two years ago-2012	Septic tank inlet pipe is concealed

For comparing the BOD results of samples, few samples were collected from Inspection chambers to analyze Inlet BOD. It varied in the range of 100 to 600. It was considered as influent BOD value against which effluent values were compared. It is considered only for cases in residential areas.

•As per the CPHEEO standards, a septic tank generally reduces the BOD levels around 25 - 50%. In the cases studied, in case no. 13 , the reduction of BOD has been as per the standards. This shows that this septic tank is working efficiently.

• In other cases the BOD reduction level is very less – indicates that the septic tanks are not working efficiently and are not cleaned regularly.

ANALYSIS- Functioning of septic tanks

INSTITUTIONAL BUILDINGS	QUALITY ASSESSMENT					
Institutional	**Inlet BOD (mg/l)**	**Outlet BOD (mg/l)**	**% (Reduction of BOD)**	**Cleaning frequency of ST**	**When septic tank last emptied?**	**Note**
Hospital	--	177	--	Once in every year	More than 10 times	Septic tank inlet pipe is concealed
Court Building	Sample not collected due to inaccessibility					
***Panchayat* Samiti**	186	114	38%	Nil	Not cleaned yet	Functioning well
Post Office	Sample not collected due to inaccessibility					
Police station	420	330	21.42%	Nil	Not cleaned yet	Defunct, not cleaned past 10-12 years
Vishwakosh	Sample not collected due to inaccessibility					
School (Marathi)	354	307.5	13.13 %	Nil	Not cleaned yet	Defunct, not cleaned past 5 years

- As per the CPHEEO standards, a septic tank generally reduces the BOD levels around 25 - 50%.
- In the cases studied, in case of Hospital, the reduction of BOD has been as per the standards. This shows that this septic tank is working efficiently.
- In other cases the BOD reduction level is very less (BOD reduction below 25%)– indicates that the septic tanks are not working efficiently and are not cleaned regularly.

ANALYSIS- Functioning of septic tanks

COMMUNITY TOILET		QUALITY ASSESSMENT		
Name	**Inlet BOD (mg/l)**	**Outlet BOD (mg/l)**	**% (Reduction of BOD)**	**Note**
Opposite Police station	502	412.5	17.82	Defunct, Design of septic tank is not as per standards
Opposite Bus stand	805.3	705	12.42	Defunct, Design of septic tank is not as per standards

• As per the CPHEEO standards, a septic tank generally reduces the BOD levels around 25 - 50%.

• In both cases, septic tanks are not following standards because the design o f the septic tank is not proper. The municipality have made efforts to clean septic tank every month but it will increase the maintained cost.

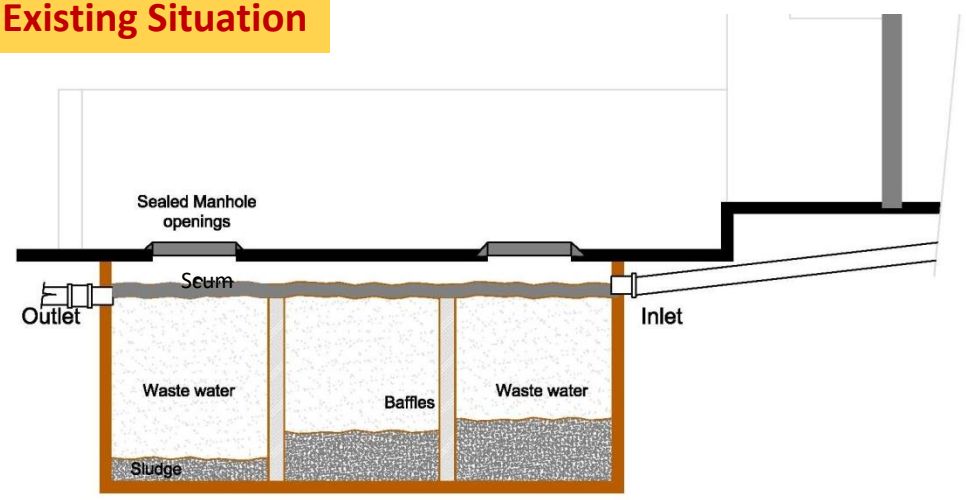
Septic Tank Improvements

SUGGESTIONS- RELATED TO USE OF SEPTIC TANK

Cleaning Practices	As per standard, after every usage the toilet must be flushed using 2 to 3 buckets of water to maintain
Septic Tank Cleaning	For creating awareness related to the cleanliness of septic tanks people should be made aware of the desired practices through IEC material, septic tank cleaning manuals.
Construction Material of Septic Tank	Locally available materials are being used for construction of septic tanks. No changes in this practice is required.
Design of the Septic Tank	Design of septic tanks should be as per standards. Also, the local contractors should be trained to acquaint them with the best practices in constructing septic tanks.
Accessibility	Removable lids must be used instead of sealing the openings with fixed tiles. Even though the cost of the tiles (Rs. 200 approx.) is half than the concrete lid (Rs. 600), breaking the tile every time cleaning the septic tank proves expensive.
Input to the Septic Tank	As per standards, both black and grey water can be let-off into the septic tank

SUGGESTIONS- related to design parameters

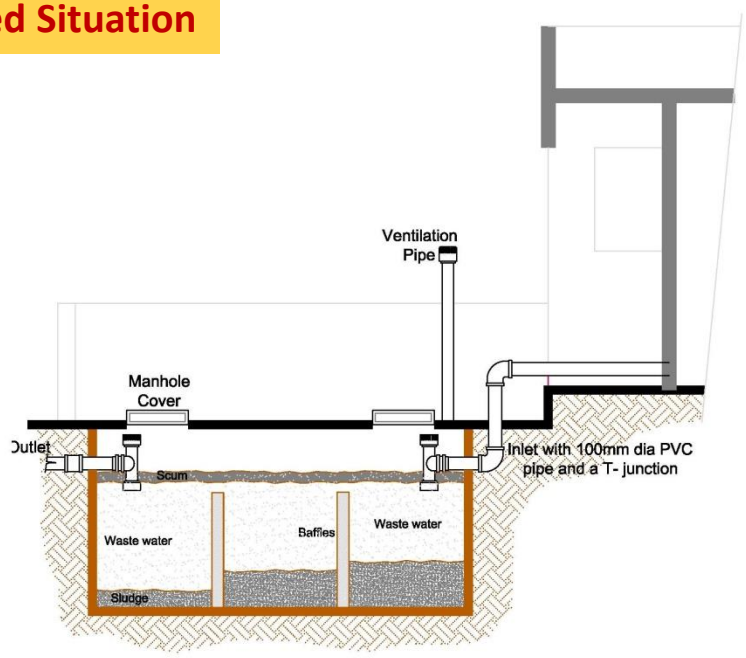
Existing Situation



Schematic Sketch

Sr No	Component	Current Scenario
1	T Junction (Inlet & Outlet)	Absent
2	Access manhole cover	Absent
3	Ventilation Pipe	Absent (In Some cases)

Proposed Situation



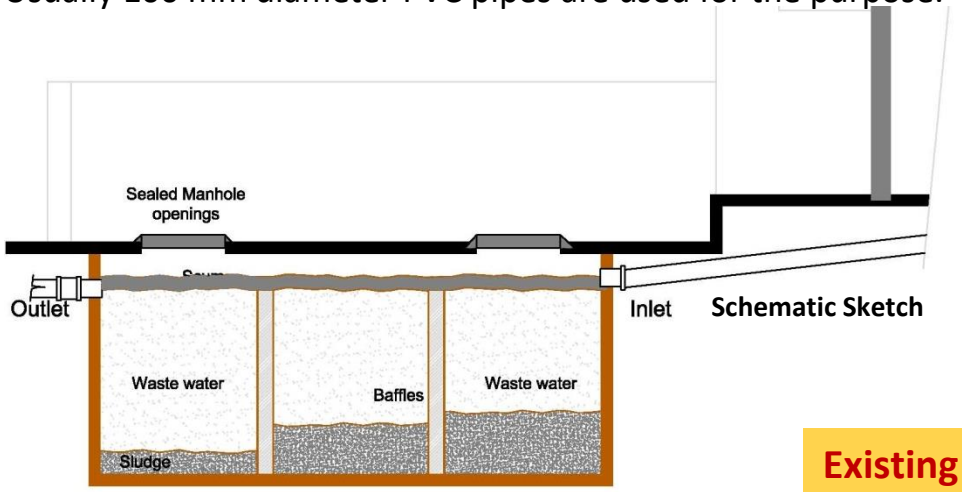
Schematic Sketch

Sr No	Component	Current Scenario
1	T Junction (at Inlet & Outlet)	Proposed
2	Access manhole cover	Proposed
3	Ventilation Pipe	Proposed (In Some cases)

SUGGESTIONS- related to design parameters

1.) Inlet/ Outlet Pipe: As per best practices for construction of a septic tank, it is advisable to use a T- junction pipe joint at both the inlet and outlet of the septic tank. Usually 100 mm diameter PVC pipes are used for the purpose.

Case 4: Fulenagar, **No proper design for inlet pipe**



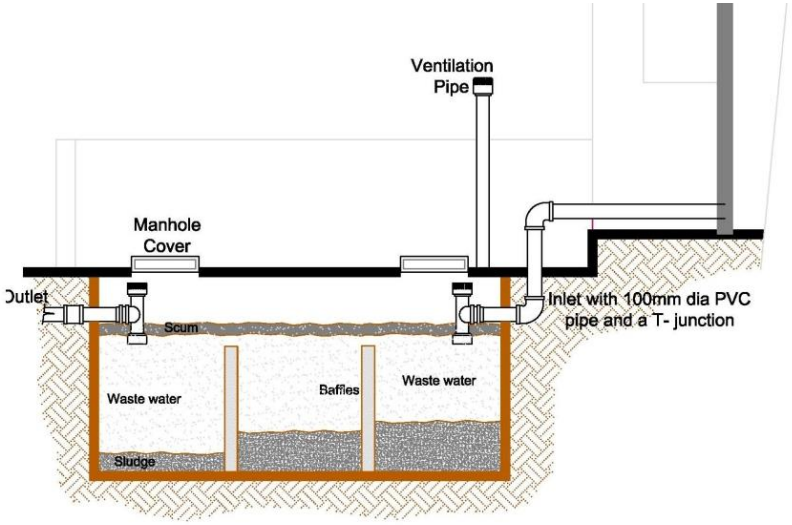
Schematic Sketch

Existing Situation

Proposed Situation

For efficient working of the septic tanks the methods adopted for constructing a Septic tank must be as shown in the adjacent diagram.

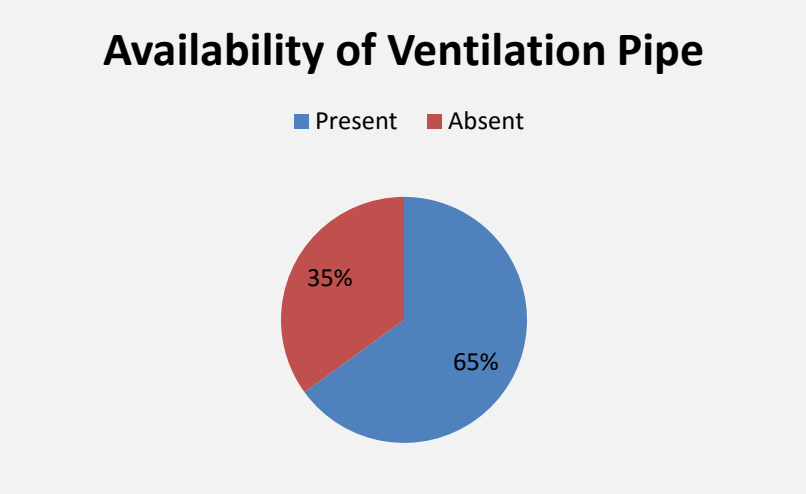
* The use of T-junction pipes in the inlet and outlet help **avoid the choking/ blocking** of the sludge flow through the pipes due to the gathered scum.

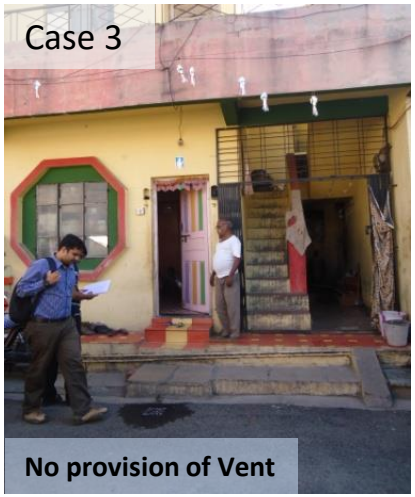


Schematic Sketch

SUGGESTIONS- related to design parameters

2.) Ventilation Pipes: In the cases studied, in several cases the ventilation pipes required for the septic tanks is absent. In a few cases ventilation pipes have been provided above the inspection chambers only.



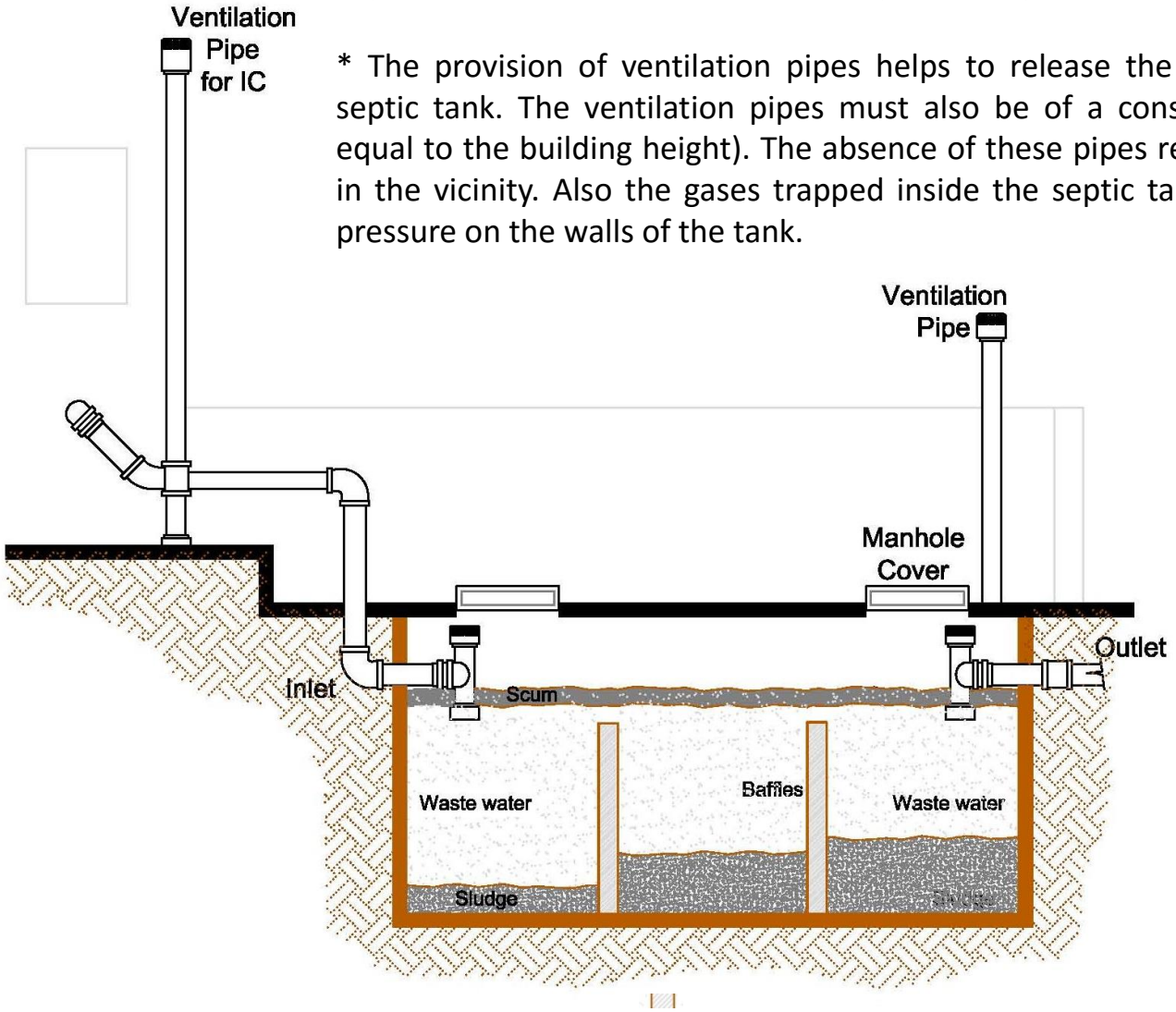


SUGGESTIONS- related to design parameters

2.) Ventilation Pipes: (contd)

For efficient working of the septic tanks the methods adopted for constructing a Septic tank must be as shown in the adjacent diagram.

* The provision of ventilation pipes helps to release the gases generated in the septic tank. The ventilation pipes must also be of a considerable height (usually equal to the building height). The absence of these pipes results in odour problems in the vicinity. Also the gases trapped inside the septic tank result into additional pressure on the walls of the tank.



Schematic Sketch

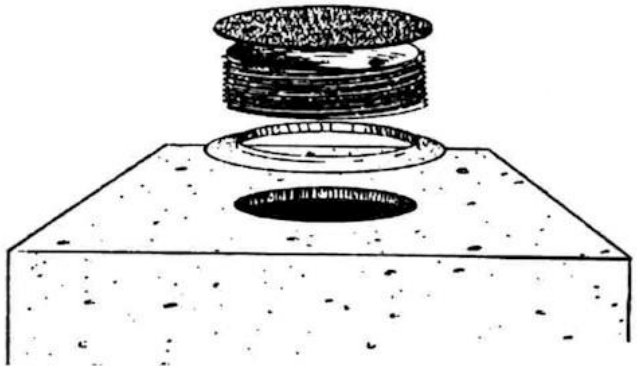
SUGGESTIONS- related to design parameters

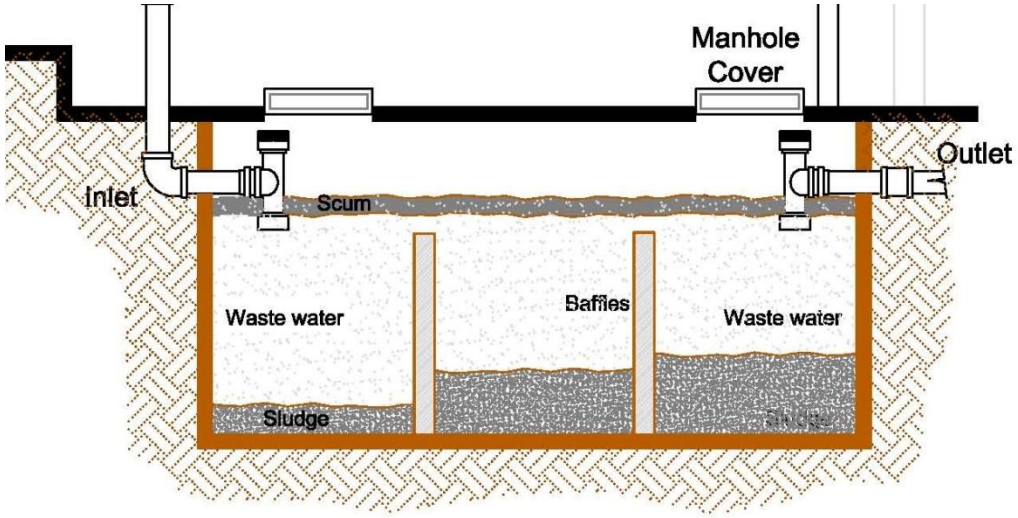
3.) Openings of the Septic Tanks:

Adequate number of openings for a septic tank is very necessary for the maintenance and cleaning purpose.
In few cases the septic tanks had no accessibility due to the location of septic tanks below the toilet block.

Ideally a septic tank must have atleast two manholes of adequate size and must be covered properly with a concrete lid. This opening help for keeping the maintenance of the septic tanks and the lids prevent odour problems as well as any mishaps/ accidents.

Case no 7: *Nhavi Ali*
No provision of lid/ openings

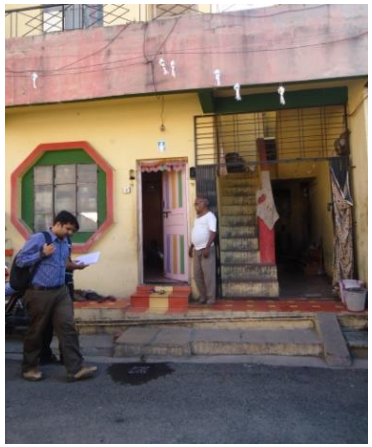




Schematic Sketch

SUGGESTIONS- related to design parameters

4.) Solutions for oversized Septic Tanks:



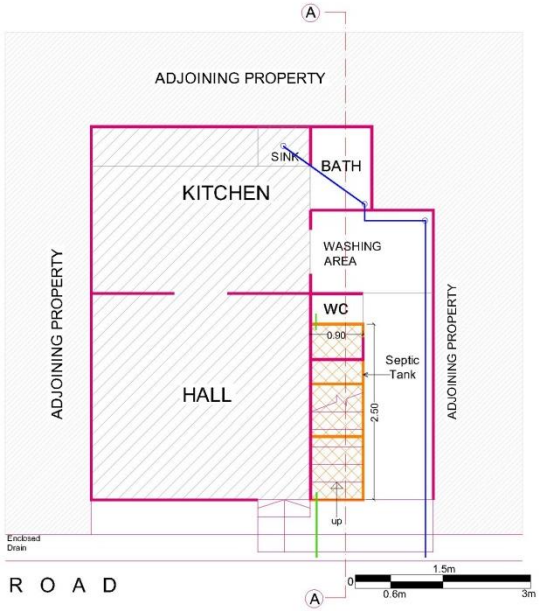
Case no 3: Damle Ali
- **No provision of lid/ openings**
- **Volume of septic tank: Oversized**
- **Inlet: Only Black water**

In a few cases studied, it was observed that the septic tanks are oversized as compared to the actual required sizes as per the standards.
To make proper use of the volume of the septic tanks the grey water generated in the households can also be let off into the septic tanks.

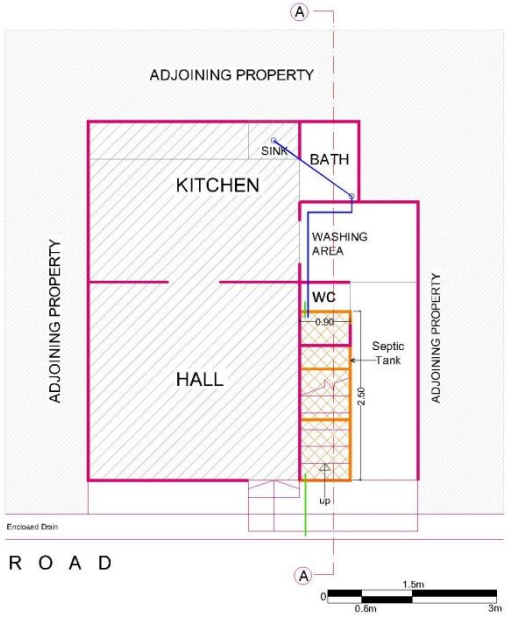
Only precaution that need to be taken is to minimize the use of chemicals and acids to clean the bathrooms and for washing purpose. These chemicals hamper the biological process in the septic tanks.

Existing Scenario:
Only Black water let-off into Septic Tank. Grey water is directly let-off into nearby drains

LEGEND
Grey water
Black water



Proposed Scenario:
Black and Grey water let-off into Septic Tank.



COSTING DETAILS

Improvements in Septic Tanks are suggested as a case study, for case no. 16. And cost required for respective improvements is estimated here.

(Costs are taken from Schedule of Rates (SoR), Satara, however for certain items/ works for which costs are not included in SoR, they are taken from local masons/ contractors)

	Items required for the improvements of septic tank			
Sr No	**Installation of ventilation pipe**	**Criteria (IS CODE:2470)**	**Amount (INR)**	**Reference**
1	PVC pipe	100 mm dia (Not less than 50 mm dia)	89	**IS CODE 2470 (Part 1) :**Generally the ventilating pipe may extend to a height of about 2 m when the septic tank is at least 20 m away from the nearest building and to a height of 2 m above the top of the building when it is located closer than 20 metres. The ventilating pipe may also be connected to the normal soil ventilating system of the building where so desired. **SOR 2012-13 (Pune Region):** Section H- Miscellaneous works Local Market rate-130/m
2	Cage of mosquito proof mesh	Mosquito proof mesh	35-50	Local Market Rate
3	Access opening & cover	• For Rectangular- Not less than 455x600 mm • For circular- Not less than (circular opening) 500 mm dia	600-750 (Rectangular R.C.C)	**IS CODE 2470 (Part 1) :** Section 3.4.9-Access opening & cover , Page no. 12 **Local Market Rate**

(contd..)

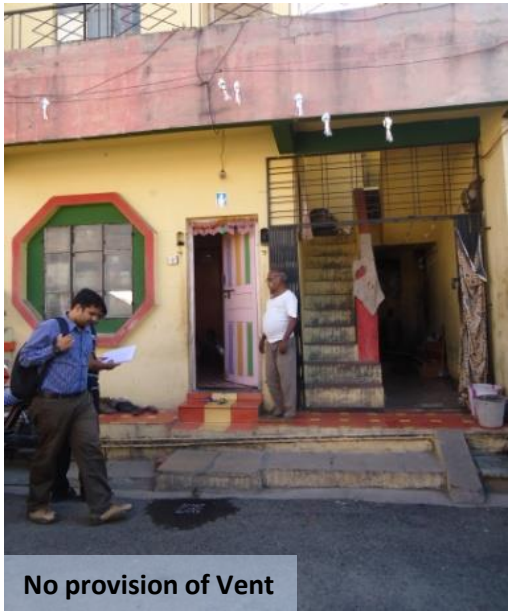
COSTING DETAILS

	Items required for the improvements of septic tank			
Sr No	**Installation of ventilation pipe**	**Criteria (IS CODE:2470)**	**Amount (INR)**	**Reference**
4	T junction	100 mm dia	120	Local market rate (2014)
5	L junction	100 mm dia	100	Local market rate (2014)

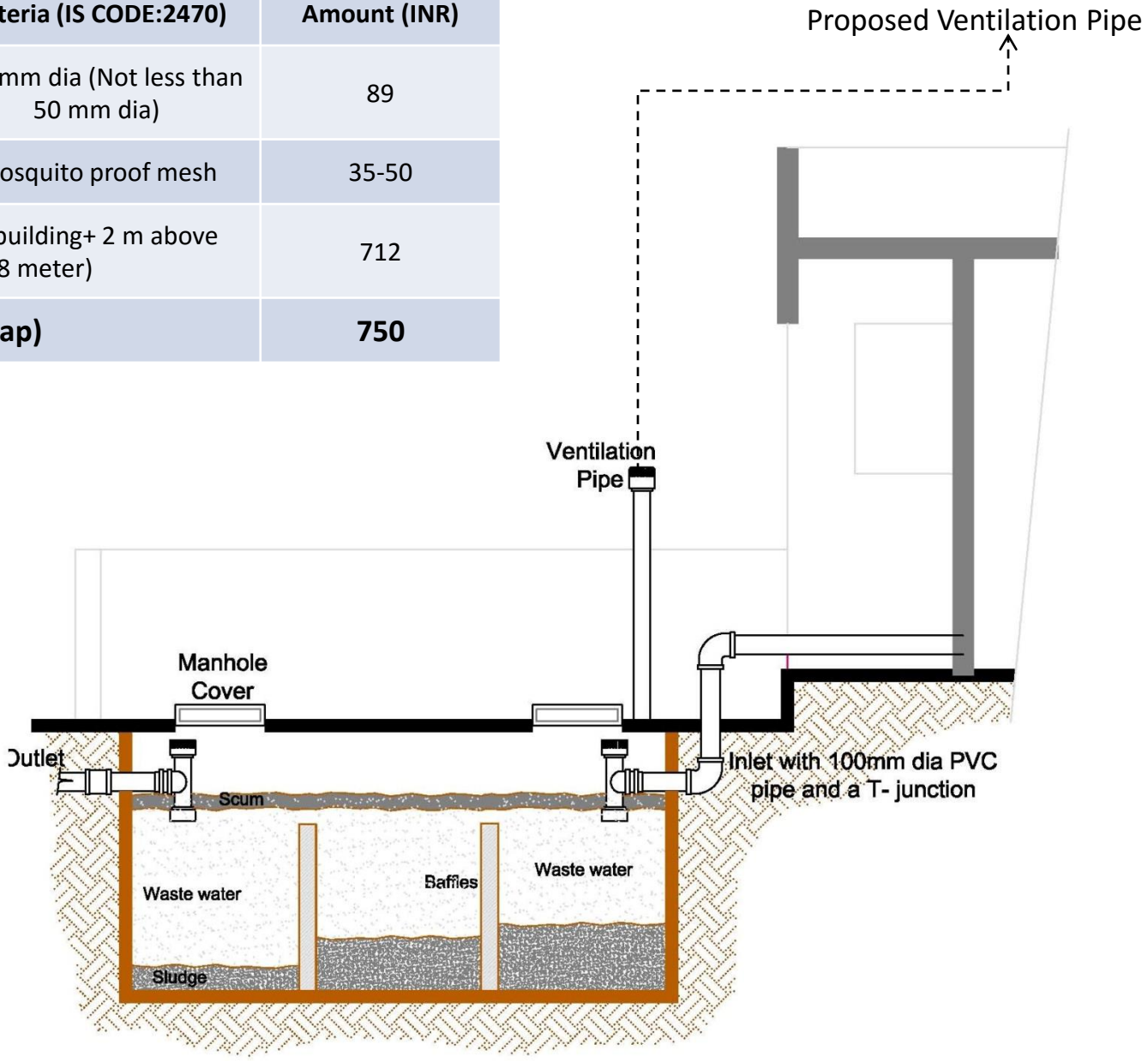
COSTING DETAILS

1. INSTALLATION OF VENTILATION PIPE

Installation of ventilation pipe	Criteria (IS CODE:2470)	Amount (INR)
PVC pipe	100 mm dia (Not less than 50 mm dia)	89
Cage of mosquito proof mesh	Mosquito proof mesh	35-50
Requirement of PVC pipe= height of building+ 2 m above from the building height (8 meter)		712
Total (INR) (PVC+Cap)		**750**



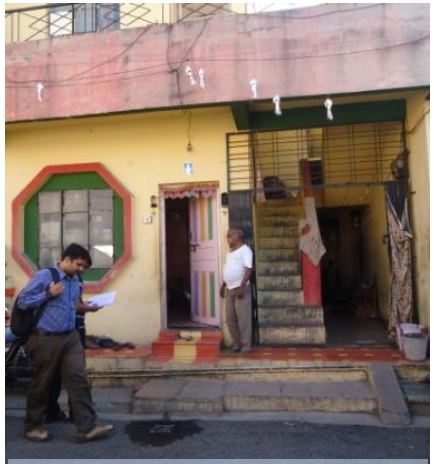
No provision of Vent



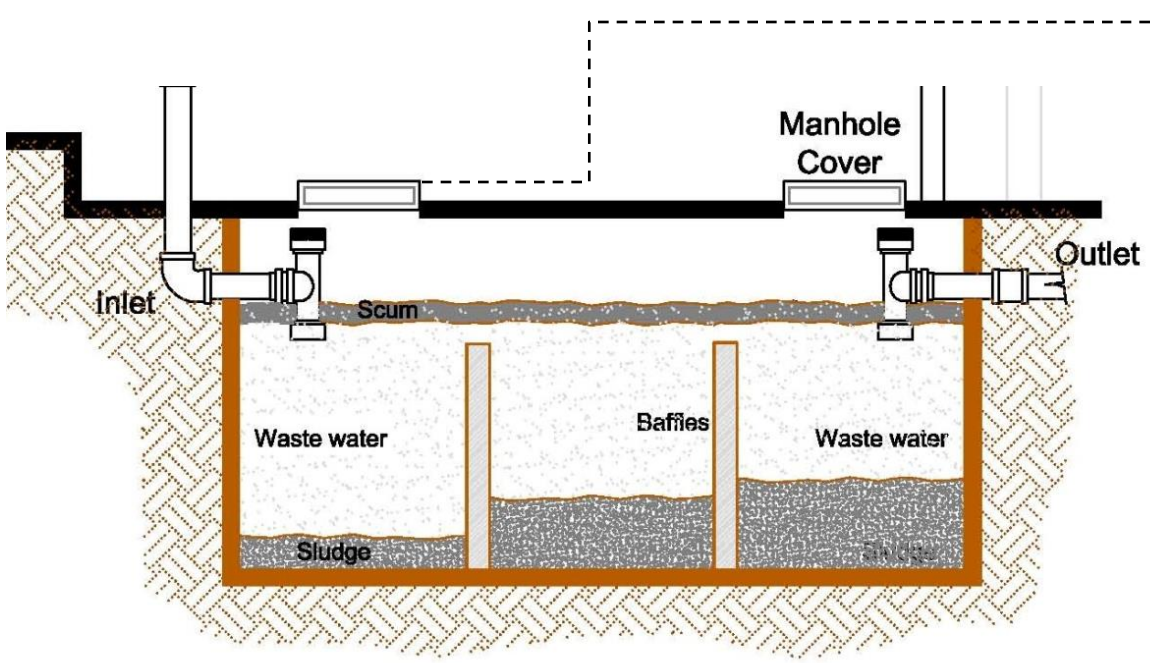
COSTING DETAILS

2. ACCESS AND OPENING COVER

Installation of cover	Criteria (IS CODE:2470)	Amount (INR)
Access opening & cover (1 Nos.)	• For Rectangular- Not less than 455x600 mm • For circular- Not less than (circular opening) 500 mm dia	650 (R.C.C) Local Market rate



No provision of lids/Openings

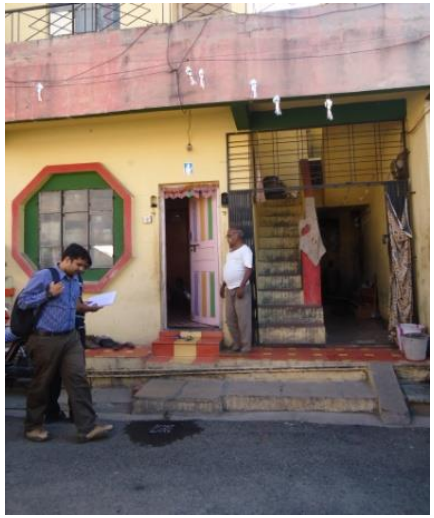


Note: in this case due to constraint of space (WC constructed over the septic tank) only one access can be provided wit openable lid.

COSTING DETAILS

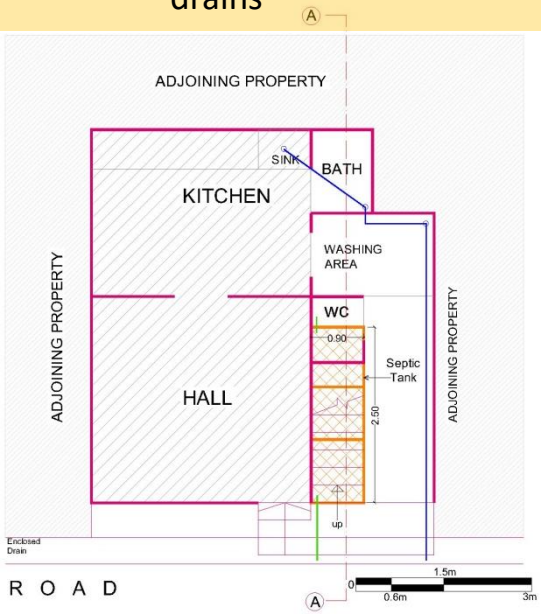
3. CONNECT GREY WATER PIPE TO SEPTIC TANK (SOLUTION OF FOR OVERSIZED SEPTIC TANKS)

Installation of PVC pipe to combine (Grey water)	Criteria (IS CODE:2470)	Amount (INR)
Inlet pipe (PVC Pipe-required 1.5 meter)	100 mm dia	133.5
T Joint (2 nos.)	100 mm dia	240
L joint (3 nos.)	100 mm dia	300
Total (INR)		**673.5**



Existing Scenario:

Only Black water let-off into Septic Tank. Grey water is directly let-off into nearby drains

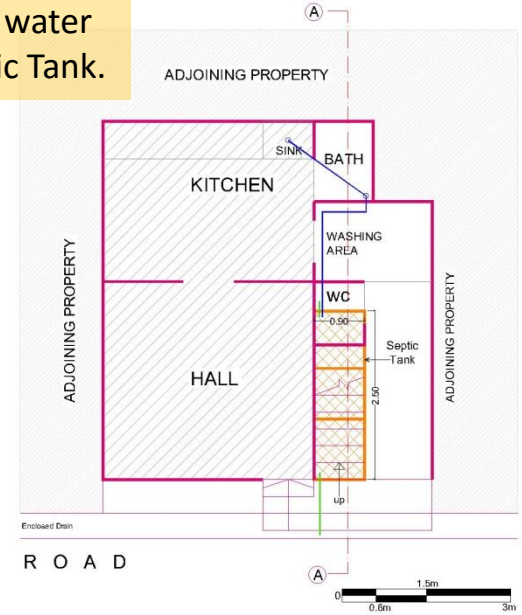


Grey water

Black water

Proposed Scenario:

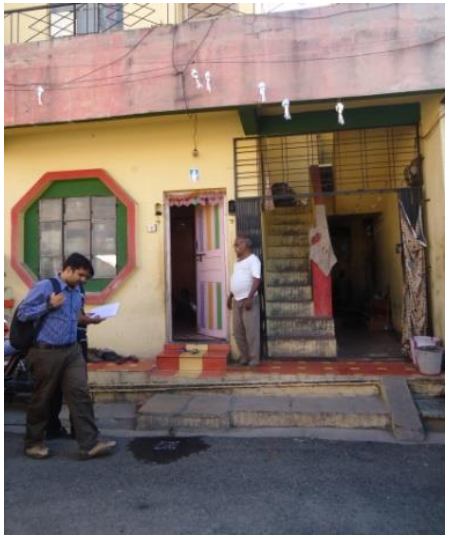
Black and Grey water let-off into Septic Tank.

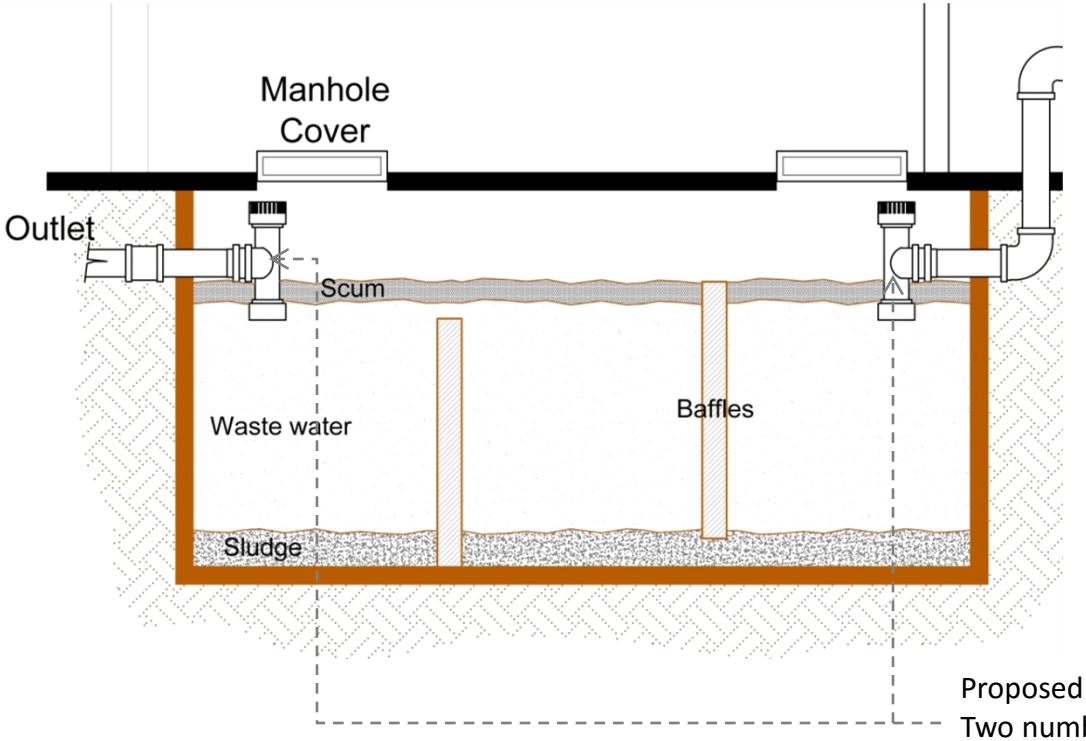


COSTING DETAILS

4. CONSTRUCTION OF T JUNCTION AND NECESSARY PIPE CONNECTIONS

Installation of ventilation pipe	Criteria (IS CODE:2470)	Amount (INR)
PVC pipe (1 m)	100 mm dia (Not less than 50 mm dia)	178
2 T Joint	100 mm dia	240
Total (INR)		**418**





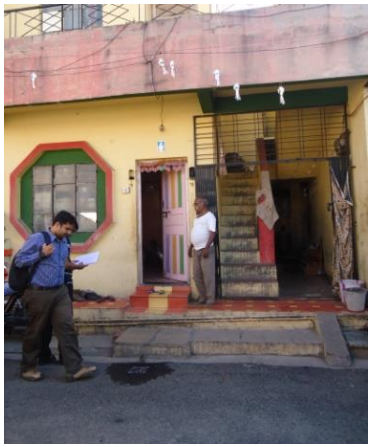
Proposed T Junction:
Two number of T Junction required

COSTING DETAILS FOR CASE NO. 3

Sr .no.	Improvements	Cost (INR)
1	Installation of ventilation pipe	**750**
2	Access & Opening cover	**650**
3	Connect Grey Water pipe to septic tank	**673.5**
4	Construction of T junction	**418**
	TOTAL COST	**2491.5**

Note: only material costs are considered

Considering the local costs of the labor (having discussed with the local contractors) for implementing the above works on site, the labor costs shall be Rs. 2000



Case no 3: Damle Ali
- **No provision of lid/ openings**
- **Volume of septic tank: Oversized**
- **Inlet: Only Black water**

In this case, there is no ventilation pipe for the septic tank and the openings do not have a removable cover. Also the inlet, outlet of the septic tank do not have a T-junction PVC pipe and the grey water is not let-off in the septic tank. To implement all the above works, the costing has been given as given here.